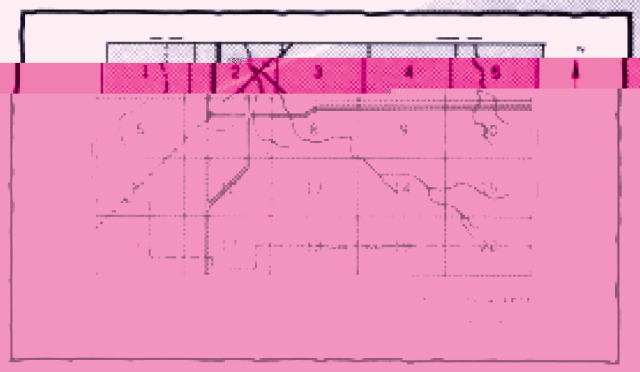
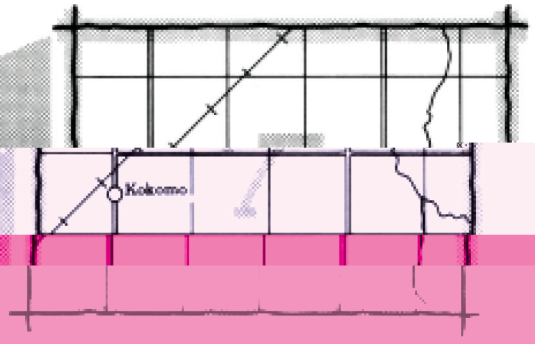
SOIL SURVEY OF
SAN SIMON AREA, ARIZONA
PARTS OF COCHISE, GRAHAM, AND GREENLEE COUNTIES

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Arizona Agricultural Experiment Station

HOW TO USE

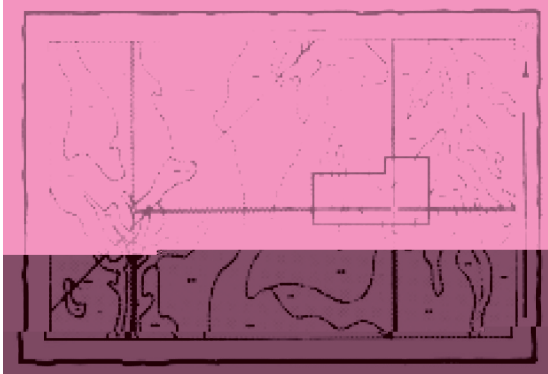
1. Locate your area of interest on the "Index to Map Sheets"

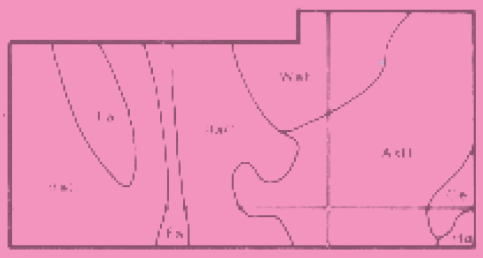




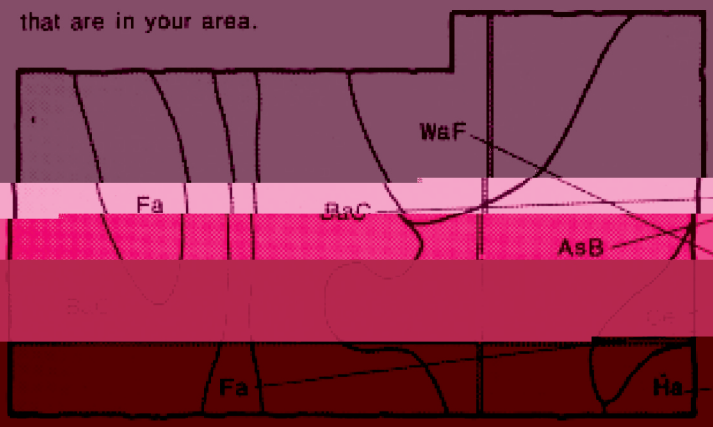
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area.

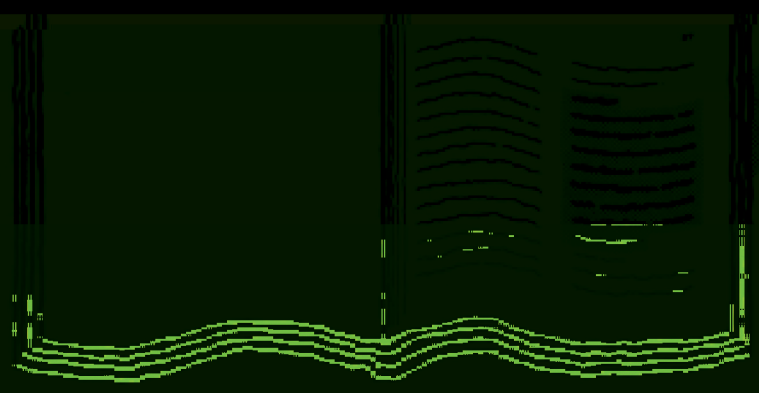


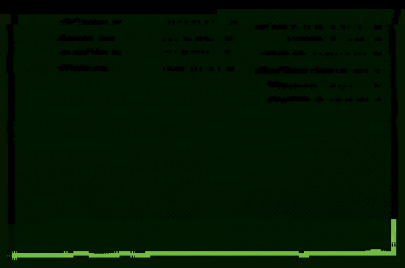
Symbols

- AsB
- BaC
- Ce
- Fa
- Ha
- WaF

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.





6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.

"Contents" lists parts of the publication that will meet your specific needs.

Consult

?

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1973-75. Soil names and descriptions were approved in September, 1975. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1975. This survey was made cooperatively by the Soil Conservation Service, the Arizona Agricultural Experiment Station, and the Bureau of Land Management. It is part of the technical assistance furnished to the Gila Valley Natural Resource Conservation District and the Willcox-San Simon Natural Resource Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: Typical scene in survey area, Faraway-Rock outcrop complex is on hills in background and White House-Forrest association is in the nearly level area in foreground.

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Foreword

The Soil Survey of San Simon Area, Parts of Cochise, Graham, and Greenlee Counties, Arizona contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

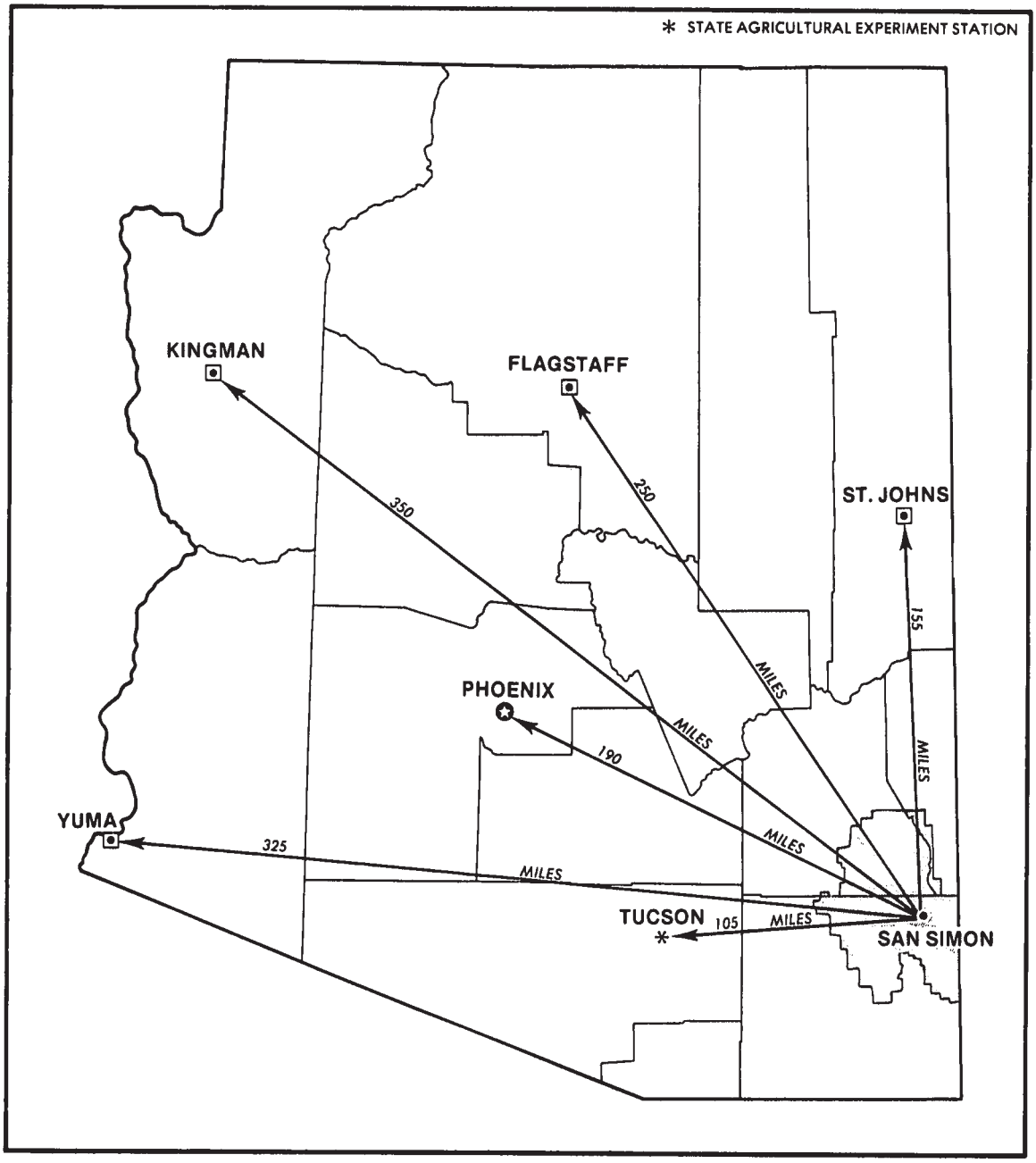
Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

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 kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

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

Thomas G. Rockenbaugh

Thomas G. Rockenbaugh
State Conservationist
Soil Conservation Service



Location of San Simon Area, Parts of Cochise, Graham, and Greenlee Counties in Arizona.

SOIL SURVEY OF SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM, AND GREENLEE COUNTIES

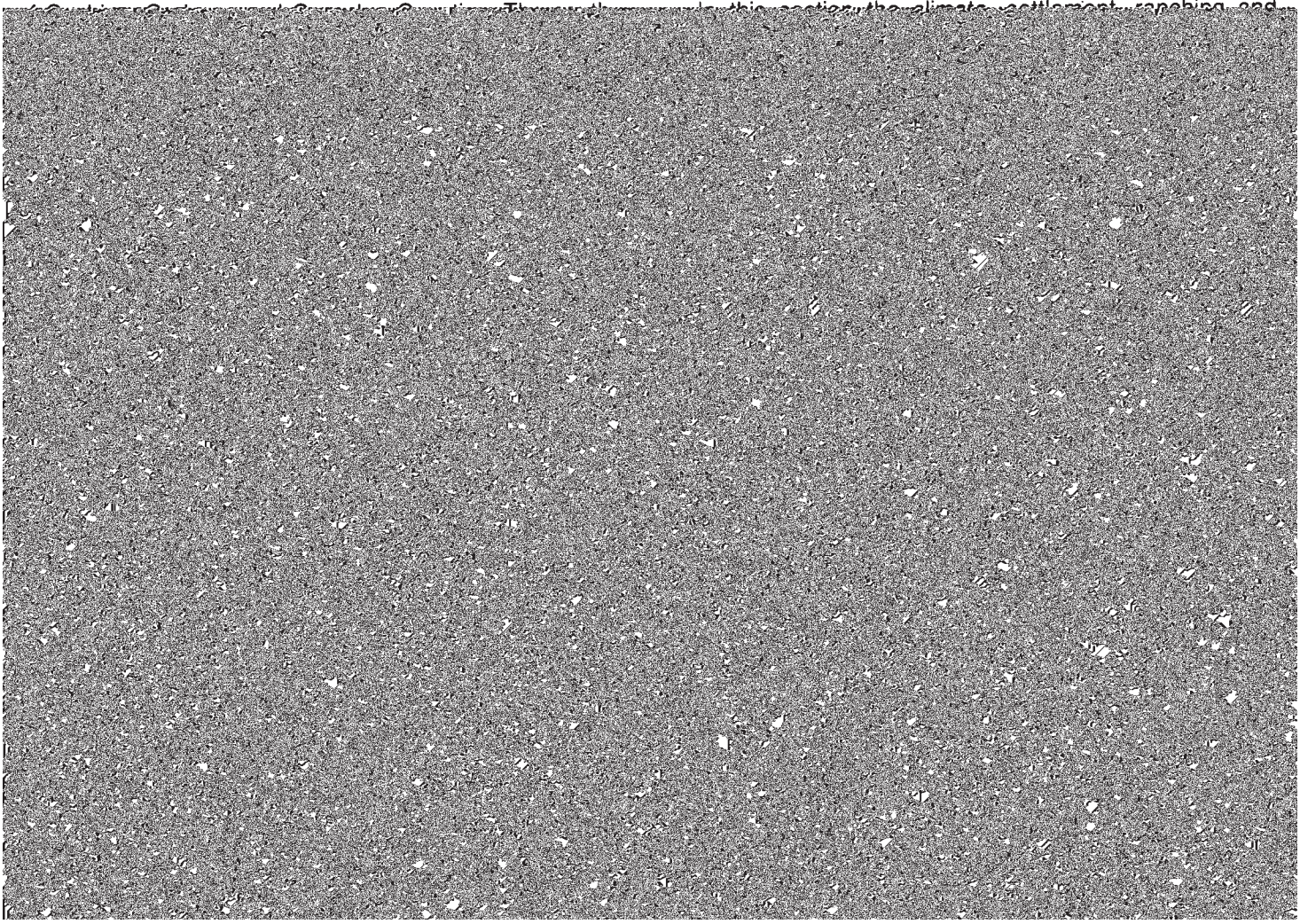
By Kenneth D. Vogt, Soil Conservation Service

Soils surveyed by Kenneth D. Vogt, Russel L. Barmore, and Larry H. Humphrey, Soil Conservation Service

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

General nature of the survey area

The SAN SIMON AREA is in the southeastern part of Arizona (see map on facing page). It is made up of parts



est temperature, 109 degrees, was recorded on June 26, 1970.

Growing degree days, shown in tables 1 and 2, are equivalent to "heat units." Beginning in spring, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). 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.

Of the total annual precipitation, 6 inches, or 60 percent, generally falls during April through September, which includes the growing season for most crops. In 2 years in 10, rainfall for April through September is less than 4 inches at Safford and less than 6 inches at Willcox. The heaviest 1-day rainfall during the period of record was 2.25 inches at Safford on August 31, 1963. The heaviest 1-day rainfall at Willcox was 2.00 inches on

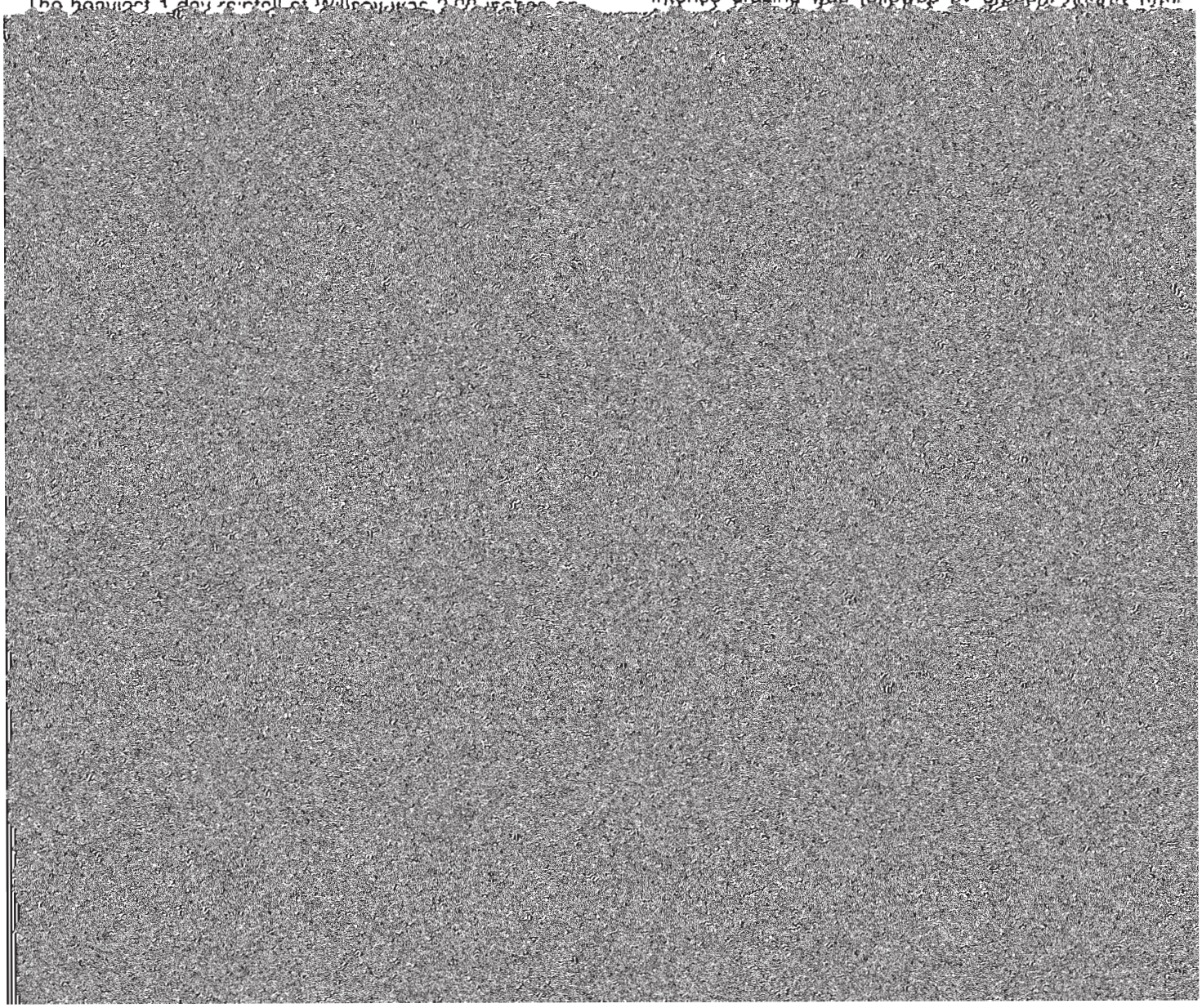
area, and they service local farmers and ranchers. Both towns have elementary and secondary schools. Larger towns that serve the area are Willcox and Safford, Arizona, and Lordsburg, New Mexico. The economy is based primarily on ranching, farming, and some tourism.

Ranching and farming

When Colonel Phil Cooke first viewed the San Simon River in 1848, it ran bank-full through a lush valley. A grassland of waist-high grasses stretched to as much as a mile in width.

Following the Indian wars, settlers and miners entered the valley. The demand for meat increased, and vast herds of cattle were driven from Texas. In 1895 an estimated 50,000 head grazed the valley grassland.

Intense grazing was followed by drought shortly after



presently two Natural Resource Conservation Districts

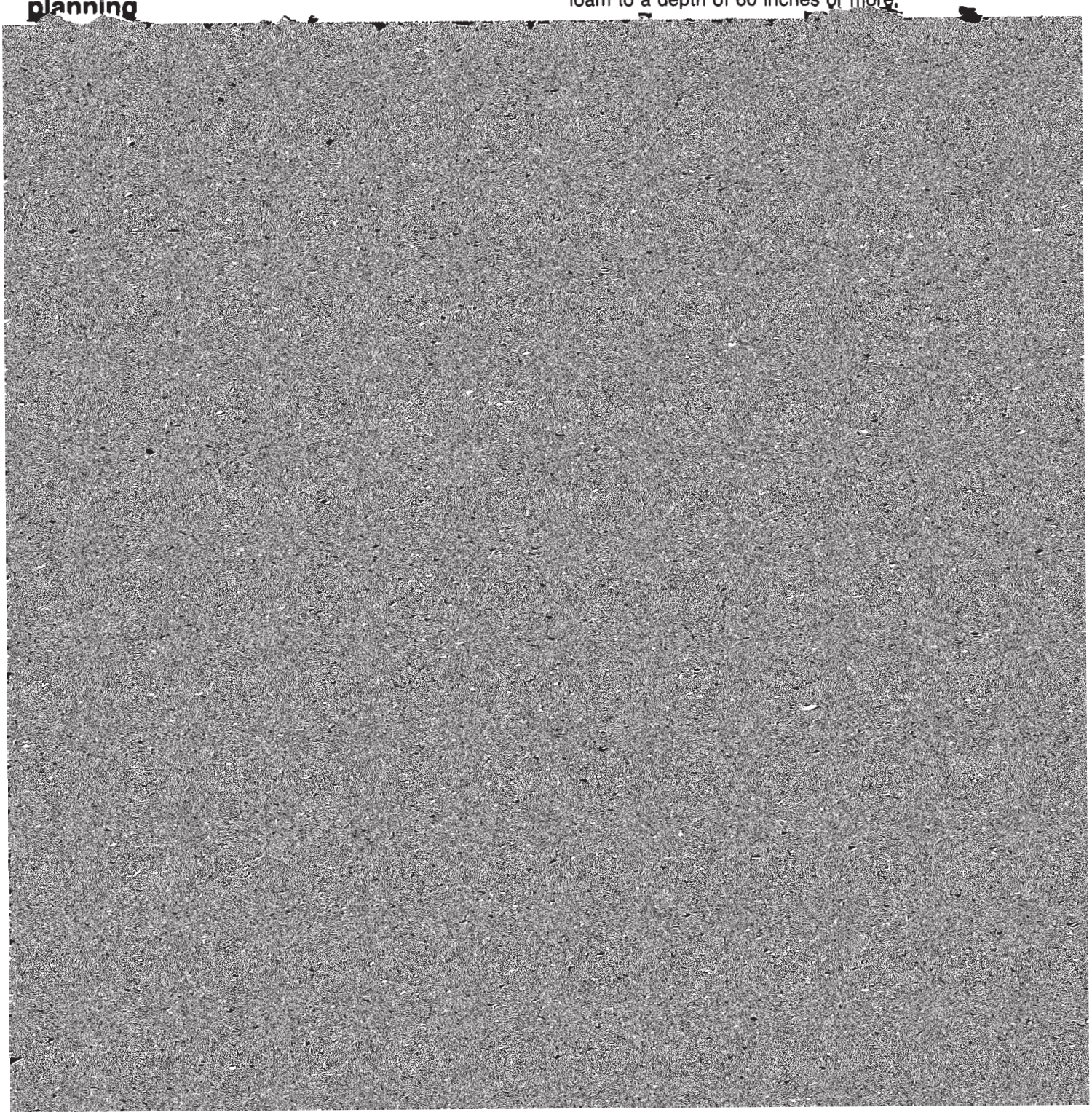
How this survey was made

engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

has thin layers of fine sandy loam to silt loam to a depth of 60 inches or more.

Typically, Glendale soils have a pale brown silty clay loam surface layer. The underlying material is stratified pale brown or very pale brown silty clay loam and silt loam to a depth of 60 inches or more.



respond to treatment, and alkali-tolerant crops can be economically grown.

3. Tres Hermanos-Artesia

Very deep to moderately deep, well drained soils on alluvial fans and terraces

The soils in this map unit formed in old gravelly alluvium derived from basic igneous rock, volcanic ash, and tuff. Slope ranges from 0 to 30 percent. Vegetation is creosotebush, bush muhly, catclaw, Mormon-tea, cacti, and annuals. Elevation ranges from 3,200 to 5,200 feet. Average annual rainfall is 8 to 12 inches, average annual soil temperature is 60 to 68 degrees F, and the frost-free period is 180 to 240 days.

This map unit makes up 14 percent of the survey area. About 45 percent is Tres Hermanos soils and 20 percent is Artesia soils. The rest is Cave, Bonita, Arizo, Eba, and Dona Ana soils and Durothids, Calciorthids, and Torriorthents.

Typically, Tres Hermanos soils have a pink gravelly loam surface layer. The subsoil is reddish brown gravelly clay loam and gravelly loam. The substratum is pink and light reddish brown gravelly loam and pink gravelly fine sandy loam to a depth of 60 inches or more.

Typically, Artesia soils have a light brown cobbly fine sandy loam surface layer. The subsoil is brown very gravelly sandy clay loam and reddish brown very gravelly clay loam and gravelly clay. A pink, silica- and lime-cemented pan is at a depth of 20 to 40 inches.

The soils in this map unit are droughty and are used mainly for rangeland.

4. Eba-Tres Hermanos-Dona Ana

Very deep, well drained soils on alluvial fans and terraces

The soils in this map unit formed in old alluvium derived from mixed rocks. Slope ranges from 0 to 15 percent. Vegetation is creosotebush, mesquite, catclaw, bush muhly, dropseed, tarbush, cacti, and annuals. Elevation ranges from 3,700 to 5,000 feet. Average annual rainfall is 8 to 14 inches, average annual soil temperature is 60 to 66 degrees F, and the frost-free period is 180 to 220 days.

This map unit makes up 11 percent of the survey area. About 35 percent is Eba soils, 20 percent is Tres Hermanos soils, and about 20 percent is Dona Ana soils. The rest is Tubac, White House, Forrest, Continental, Santo Tomas, Comoro, Arizo, Anthony, and Gila soils.

Typically, Eba soils have a brown gravelly fine sandy loam surface layer. The subsoil is reddish brown very gravelly sandy clay loam and yellowish red very gravelly clay and gravelly clay. The substratum is pinkish white and reddish yellow very gravelly loam to a depth of 60 inches or more.

Typically, Tres Hermanos soils have a pink gravelly loam surface layer. The subsoil is reddish brown gravelly clay loam and gravelly loam. The substratum is pink and light reddish brown gravelly loam and pink gravelly fine sandy loam to a depth of 60 inches or more.

Typically, Dona Ana soils have a light brown fine sandy loam surface layer. The subsoil is brown loam. The substratum is pinkish white and light brown or pinkish gray and light brown loam to a depth of 60 inches or more.

The soils in this map unit are used mainly for rangeland. Dona Ana and Eba soils are irrigated and farmed in some areas south of San Simon.

Semiarid soils of the valley

The soils in this group are dominantly deep, well drained, and nearly level to moderately steep. These soils are on flood plains, alluvial fans, valley side slopes, and hills. They are semiarid.

5. Pima-Comoro-Santo Tomas

Very deep, well drained soils on flood plains, alluvial fans, and terraces

The soils in this map unit formed in alluvium derived from mixed sources. Slope ranges from 0 to 9 percent. Vegetation is mesquite, tobosa, catclaw, lovegrasses, cacti, yucca, burroweed, and annuals. Juniper and oak are on higher elevations of the Santo Tomas soils. Elevation ranges from 3,500 to 5,400 feet. Average annual rainfall is 9 to 14 inches, average annual soil temperature is 59 to 68 degrees F, and the frost-free period is 170 to 240 days.

This map unit makes up 9 percent of the survey area. About 35 percent is Pima soils, 30 percent is Comoro soils, and 20 percent is Santo Tomas soils. The rest is Grabe, Arizo, Eba, White House, Forrest, Tubac, Sonoita, Bucklebar, Dona Ana, and Anthony soils.

Typically, Pima soils have a brown silt loam surface layer. The underlying material is stratified brown silty clay loam and silt loam to a depth of 60 inches or more.

Typically, Comoro soils have a brown fine sandy loam surface layer. The underlying material is stratified brown and pale brown fine sandy loam and grayish brown gravelly fine sandy loam to a depth of 60 inches or more.

Typically, Santo Tomas soils have a surface layer that is grayish brown cobbly fine sandy loam in the upper part and dark brown gravelly loam and dark grayish brown very gravelly fine sandy loam in the lower part. The underlying material is grayish brown very fine sandy loam to a depth of 60 inches or more.

The soils in this map unit are commonly used for livestock grazing and wildlife habitat. Pima soils are irrigated and farmed in some areas. Santo Tomas soils are a source of gravel.

6. Tubac-Sonoita-Signal

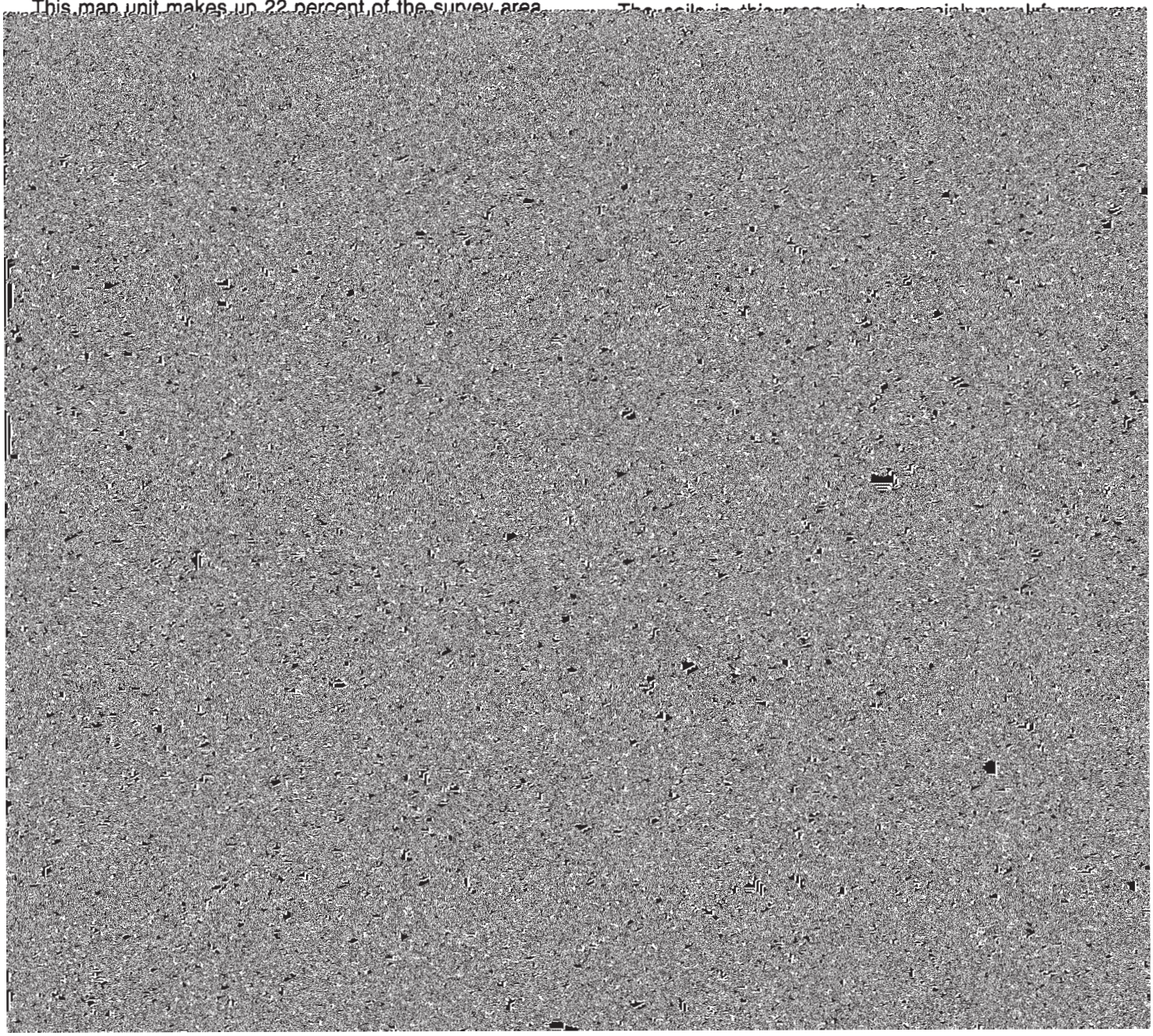
Very deep, well drained soils on valley side slopes, alluvial fans, and terraces

The soils in this map unit formed in old alluvium derived mainly from acid igneous rock. Slope ranges from 0 to 15 percent. Vegetation is mesquite, catclaw, perennial broomweed, Mormon-tea, tobosa, grama grasses, cacti, and annuals. Elevation ranges from 3,200 to 5,000 feet. Average annual rainfall is 8 to 16 inches, average annual soil temperature is 60 to 68 degrees F, and the frost-free season is 180 to 220 days.

This map unit makes up 22 percent of the survey area. [illegible] Forrest soils. The rest is Kimbrough, Santo Tomas, Comoro, Grabe, Pima, and Guest soils.

Typically, White House soils have a brown gravelly loam surface layer. The subsoil is reddish brown and yellowish red clay in the upper part and is yellowish red gravelly clay in the lower part to a depth of 60 inches or more.

Typically, Forrest soils have a brown sandy loam surface layer. The subsoil is reddish brown, yellowish red, and brown clay and gravelly clay. The substratum has lime accumulation and is brown or light brown clay loam to a depth of 54 inches or more.



9. Atascosa-Chiricahua-Mabray

Shallow, well drained soils on mountains and hills

The soils in this map unit formed in residuum of acid igneous rock and limestone. Slope ranges from 9 to 70 percent. Vegetation is grama grasses, catclaw, mesquite, cacti, beargrass, tobosa, ocotilla, and annuals. Elevation ranges from 4,000 to 5,800 feet. Average annual precipitation is 10 to 16 inches, average annual soil temperature is 59 to 66 degrees F, and the frost-free period is 180 to 240 days.

This map unit makes up 6 percent of the survey area. About 45 percent is Atascosa soils, 15 percent is Chiri-

that are similar to these soils but are over fractured limestone and colluvial soils that are deeper than 20 inches at the base of slopes and along drainages.

Typically, Mokiak soils have a dark grayish brown cobbly sandy clay loam surface layer. The subsoil is brown and light gray very gravelly sandy clay loam. The substratum is yellowish brown weathered granite. Hard granite is at a depth of 30 inches.

Typically, Faraway soils have a grayish brown very cobbly loam surface layer. The underlying material is light gray fractured rhyolite. Hard rhyolite is at a depth of 18 inches.

Rock outcrop is more than 90 percent exposed bed-

the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Eba gravelly sandy loam is one of several phases within the Eba series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes, soil associations, and undifferentiated groups.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Anthony-Gila complex is an example.

The acreage and proportionate extent of each map unit are given in table 7, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

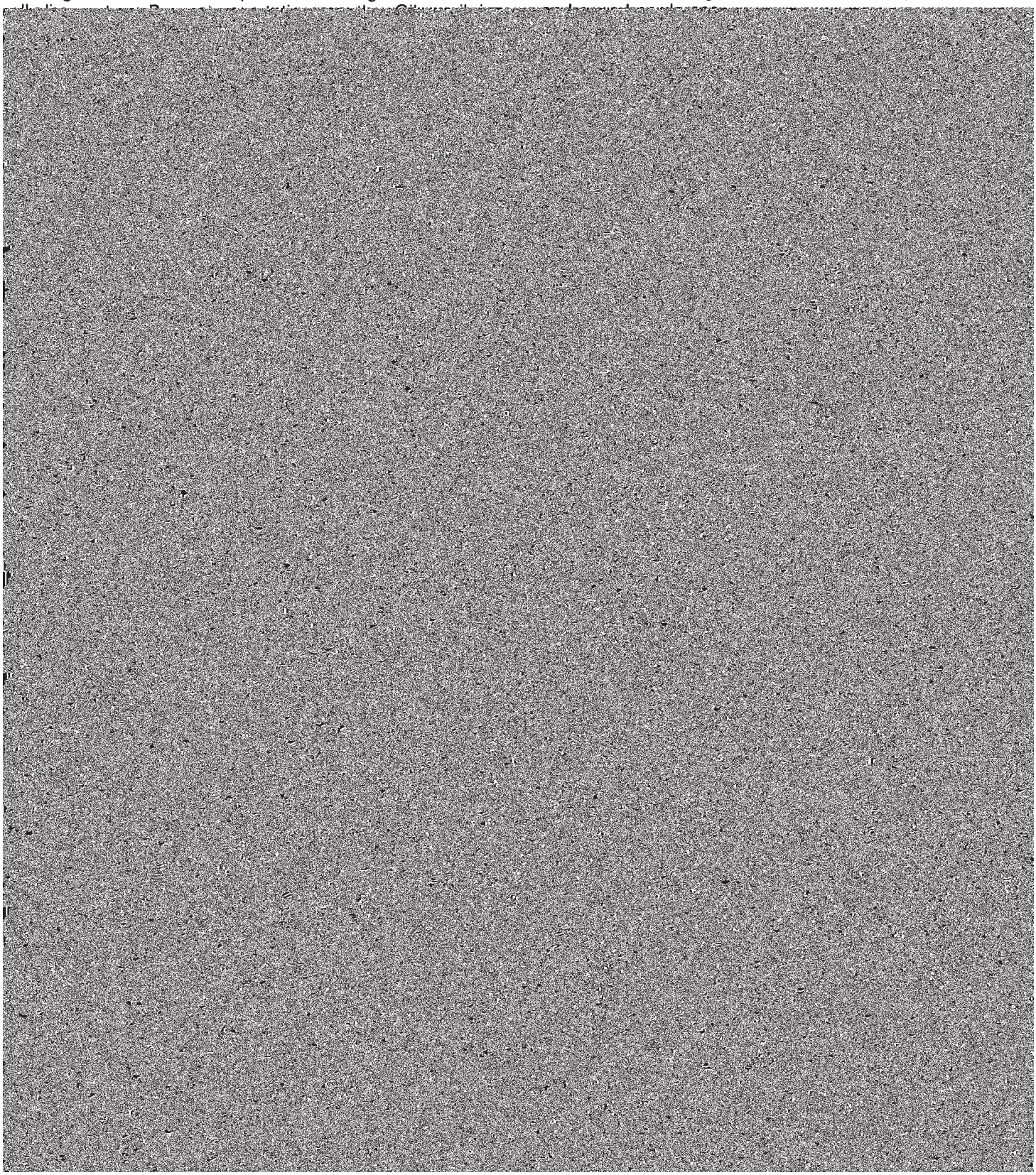
1—Anthony-Gila complex. These nearly level to gently sloping soils are on alluvial fans and flood plains. Elevation ranges from 3,100 to 4,000 feet. Average annual precipitation is about 9 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 210 days. Slope dominantly is 0 to 3 percent, but in places it ranges to 5 percent.

Anthony sandy loam makes up about 45 percent of the map unit, and Gila loam makes up 30 percent. These soils are intermingled with Anthony soils on the interfluves and Gila soils in the drainageways.

Included with these soils in mapping are small areas of Glendale soils, small areas of Calciorthids and Torriorthents, eroded, and localized areas of soils that are saline or alkali.

black grama, and in some places, fourwing saltbush and

duction of sideoats grama, Arizona cottontop, bush muhly,



This soil is in capability subclass VIe.

4—Atascosa-Chiricahua-Rock outcrop complex. These strongly sloping to steep soils and Rock outcrop are on hills and mountains. Elevation ranges from 4,000 to 5,400 feet. Average annual precipitation is about 14 inches, average annual air temperature is about 61 degrees F, and average frost-free period is about 200 days. Slope dominantly is 15 to 50 percent but, in places, ranges from 8 to 50 percent.

Atascosa stony sandy loam makes up about 50 percent of this map unit, Chiricahua gravelly sandy loam makes up 20 percent, and Rock outcrop makes up 10 percent. These soils and Rock outcrop are intermingled with moderately steep to steep Atascosa soils between the outcrops and with strongly sloping to moderately steep Chiricahua soils on ridges and lower side slopes.

Included with these soils in mapping are small areas of White House, Santo Tomas, and Mabray soils.

The Atascosa soil is shallow and well drained. It formed in residuum from granite. Typically, the surface layer is brown stony sandy loam about 2 inches thick. The subsoil is dark grayish brown very gravelly sandy clay loam to a depth of about 7 inches. The substratum is white, fractured granite and has clay films along the fractures. Hard, white granite is at a depth of 10 inches.

The Atascosa soil has moderate permeability above the bedrock, and available water capacity is low. Observed rooting depth is 7 inches, and the potential rooting depth is to bedrock. The water supplying capacity is 8 to 10 inches. Intermingled Rock outcrop and stone contribute runoff to this soil. Surface runoff is medium to rapid. The hazard of soil blowing is slight and that of water erosion is moderate.

The Chiricahua gravelly sandy loam is shallow and well drained. It formed in residuum from granite and related rock. Typically, the surface layer is brown gravelly sandy loam about 2 inches thick. The subsoil is reddish brown gravelly clay loam and reddish brown gravelly clay to a depth of about 18 inches. The substratum is reddish yellow and white weathered granite and reddish brown gravelly clay to a depth of about 27 inches. White granite is at a depth of 27 inches.

The Chiricahua soil has slow permeability, and available water capacity is low. Observed rooting depth is to bedrock. The water supplying capacity is 8 to 10 inches. Surface runoff is moderate. The hazard of soil blowing is slight and that of water erosion is moderate.

Rock outcrop is more than 90 percent exposed bedrock, mainly granite. It provides concealment for wildlife and is used mainly for wildlife habitat and recreation.

The soils in this complex are used mainly for livestock grazing, wildlife habitat, and recreation. The present vegetation on the Atascosa soil is sideoats grama, blue grama, catclaw, and cacti and, at a higher elevation, some oak and juniper. The present vegetation on the Chiricahua soil is mesquite, catclaw, perennial broomweed, sideoats grama, black grama, and tobosa. Proper management of the vegetation on both soils is designed to increase the production of sideoats grama, black grama, blue grama, and cane beardgrass.

Grazing management that maintains the plant cover is important. Livestock utilize the accessible parts of the area, and small rills can develop along trails. Grazing systems that include developing water sources and building fences are beneficial.

Controlling grazing and developing water sources help in managing wildlife. The uneven surface together with large boulders that give the area a rugged appearance and the wide variety of plants provide aesthetic appeal. Popular recreation activities include hiking, wildlife observation, and hunting.

These soils are in capability subclass VIIs.

5—Atascosa-Graham-Rock outcrop complex. These strongly sloping to very steep soils and Rock outcrop are on hills and mountains. Elevation ranges from 3,400 to 5,600 feet. Average annual precipitation is about 13 inches, average annual air temperature is about 61 degrees F, and average frost-free period is about 200 days. Slope dominantly is 15 to 50 percent but, in places, ranges from 9 to 70 percent.

Atascosa cobbly loam makes up about 45 percent of the map unit, Graham cobbly clay loam makes up 20 percent, and Rock outcrop makes up 20 percent. These soils and the Rock outcrop are intermingled with the moderately steep to very steep Atascosa soils that are between outcrops of rhyolite and andesite bedrock and with the strongly sloping to steep Graham soils that are on side slopes between outrops of basalt bedrock.

Included with these soils in mapping are small areas of Arizo, Cave, and Tres Hermanos soils.

The Atascosa cobbly loam is shallow and well drained. It formed in residuum from rhyolite and some andesite. Typically, the surface layer is brown cobbly loam about 2 inches thick. The subsoil is dark grayish brown very gravelly clay loam to a depth of about 10 inches. The substratum is pinkish gray fractured rhyolite about 2 inches thick over hard rhyolite.

The Atascosa soil has moderate permeability above the bedrock, and available water capacity is low. Observed rooting depth is 10 inches, and potential rooting depth is to bedrock. The water supplying capacity is 7 to 9 inches. Surface runoff is medium to rapid. The hazard of soil blowing is slight and that of water erosion is moderate to high.

The Graham cobbly clay loam is shallow and well drained. It formed in residuum from basalt and some andesite. Typically, the surface layer is brown cobbly clay loam about 2 inches thick. The subsoil is reddish brown gravelly clay to a depth of 13 inches. The substratum is fractured basalt that has a lime accumulation about 4 inches thick. Hard basalt is at a depth of 17 inches.

The Graham soil has slow permeability, and available water capacity is low. Observed rooting depth is 13 inches, and potential rooting depth is to bedrock. The water supplying capacity is 8 to 10 inches. Surface runoff is slow. The hazards of soil blowing and water erosion are slight.

Rock outcrop is more than 90 percent bedrock, mainly basalt, rhyolite, and andesite. It provides concealment for wildlife and is used mainly for wildlife habitat and recreation.

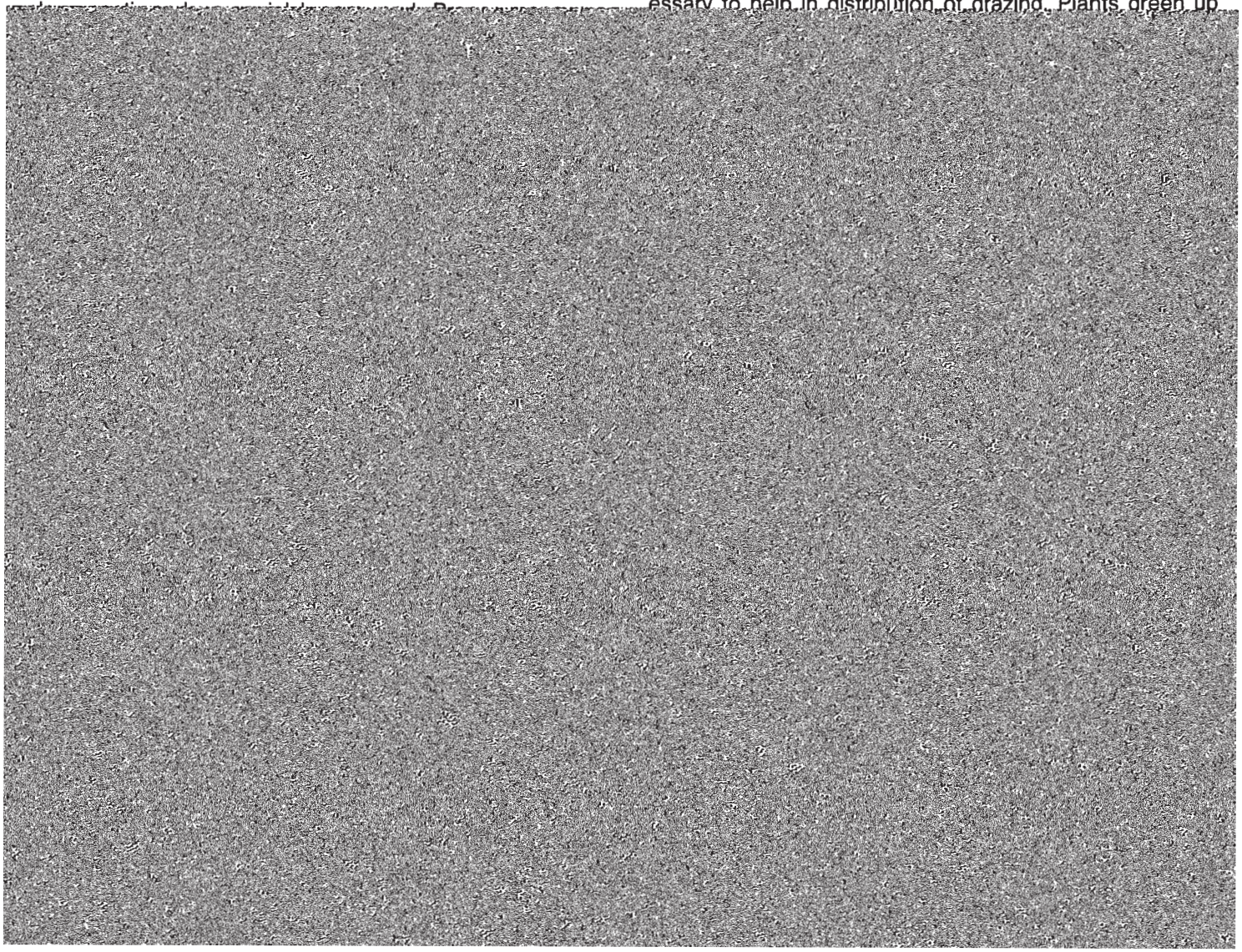
The soils in this complex are used for livestock grazing, wildlife habitat, and recreation. The present vegetation on the Atascosa soil is sideoats, black, and hairy gramas, prickly pear, cactus, perennial broomweed, and juniper. Proper management of the vegetation is designed to increase the production of sideoats and black gramas, cane beardgrass, and plains lovegrass. The present vegetation on the Graham soil is tobosa, cat-

pale brown loamy sand and brown and very pale brown loamy fine sand to a depth of 60 inches or more.

Permeability is rapid, and available water capacity is moderately low. Observed rooting depth is 40 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 5 to 8 inches. Surface runoff is slow. The hazard of soil blowing is high and that of water erosion is slight.

This soil is mainly used for livestock grazing. The present vegetation is mesquite, fourwing saltbush, and annuals. Proper management of the vegetation is designed to increase the production of fourwing saltbush, spike and mesa dropseed, and bush muhly.

Grazing management that maintains the plant cover is very important. Soil blowing is a hazard. The surface of this unit has dunes or is hummocky because of windblown material deposited around the base of shrubs. Building fences and developing water sources are necessary to help in distribution of grazing. Plants green up



The Gothard fine sandy loam is very deep and moderately well drained. It formed in old lake and fan deposited alluvium from mixed sources. Typically, the surface layer is very pale brown fine sandy loam about 2 inches thick. The subsoil is light brown and very pale brown sandy clay loam to a depth of about 22 inches. The substratum is stratified light brownish gray sandy loam, very fine sandy loam, and loamy sand to a depth of 60 inches or more. This soil is saline and strongly alkaline, except in the surface layer.

The Gothard soil has slow permeability, and available water capacity is moderately low to moderate. Observed rooting depth is 24 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 6 to 8 inches. Surface runoff is slow. The hazard of soil blowing is high and that of water erosion is slight.

The soils in this complex are used mainly for livestock grazing. The present vegetation on the Bluepoint soil is mesquite, fourwing saltbush, and annuals. Proper management of the vegetation is designed to increase the production of fourwing saltbush, spike and mesa dropseed, and bush muhly. The present vegetation on the Gothard soil is alkali sacaton and fourwing, desert, and mount saltbush. Proper management of the vegetation is designed to increase the production of the alkali sacaton.

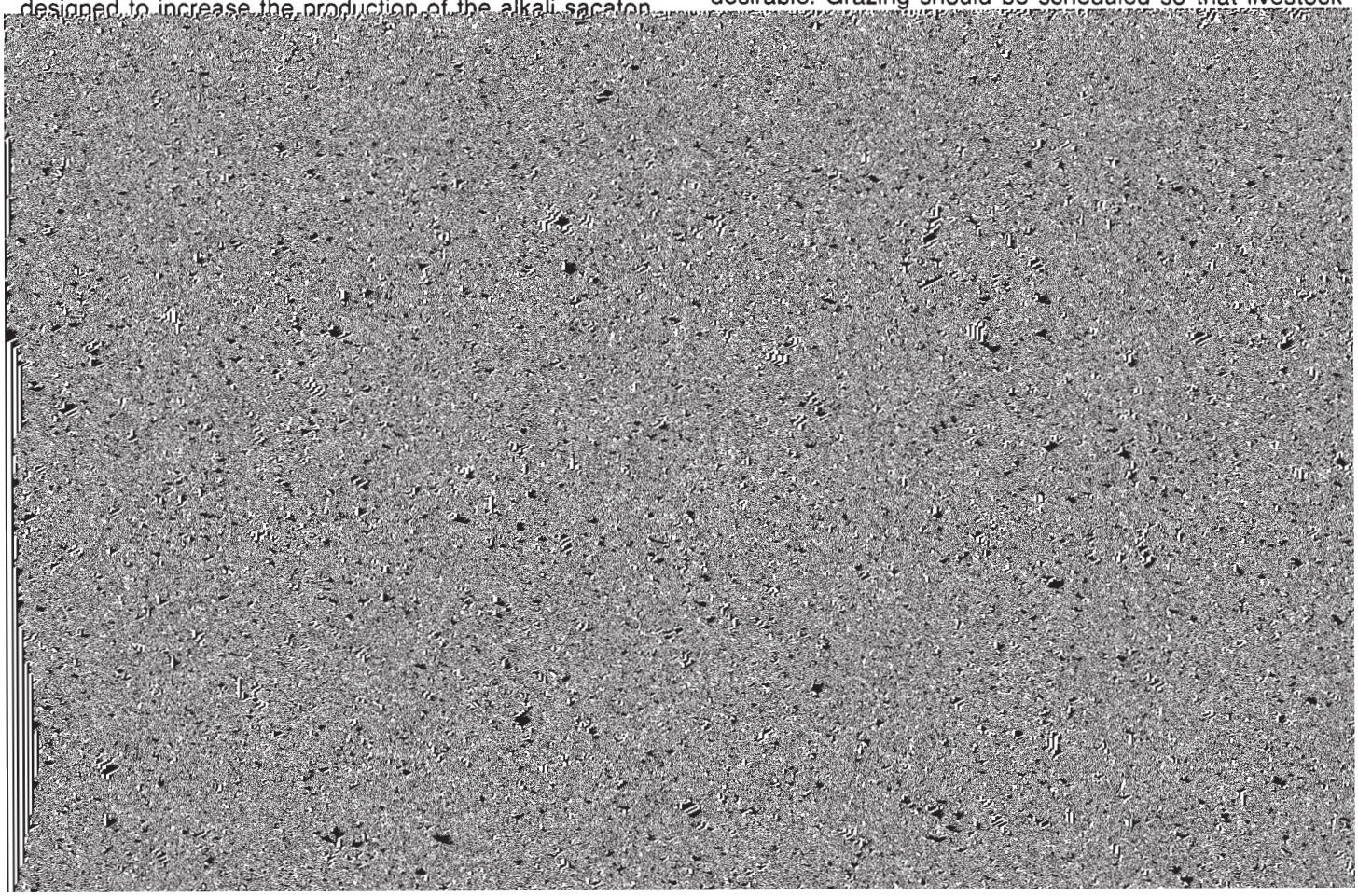
Bonita cobbly silty clay makes up 70 percent of this map unit. Included with this soil in mapping are 10 percent Bonita cobbly clay loam and 20 percent Hantz, Cave, and Tres Hermanos soils and soils that are similar to this Bonita soil but have weak subsoil development.

Typically, the upper part of the surface layer is brown cobbly silty clay about 3 inches thick, and the lower part is dark brown clay about 8 inches thick. The underlying material is reddish brown and brown clay to a depth of about 38 inches and brown very gravelly clay to a depth of 55 inches or more. This soil cracks widely and deeply upon drying.

Permeability is very slow, and available water capacity is high. Observed rooting depth is 30 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 10 to 12 inches. Surface runoff is slow when dry and moderate when moist. The hazards of soil blowing and water erosion are slight to moderate.

This soil is used mainly for livestock grazing. Present vegetation is tobosa, vine-mesquite, creosotebush, cacti, and bluedicks. Proper management of the vegetation is designed to increase the production of vine-mesquite and tobosa.

Grazing management that maintains the plant cover is desirable. Grazing should be scheduled so that livestock



runoff is medium to slow. The hazard of soil blowing is moderate and that of water erosion is slight to moderate.

About half of the acreage of this soil is used for livestock grazing. The present vegetation is mesquite, burroweed, perennial broomweed, condalia, and Mormon-tea. Proper management of the vegetation is designed to increase the production of bush muhly, sand dropseed, black grama, and plains bristlegrass.

Grazing management that maintains the plant cover is desirable. Soil blowing is a hazard. The surface is hummocky because of deposition of material around the base of shrubs. Building fences and developing water sources are necessary to help in distribution of grazing. Management of brush helps improve some deteriorated range. Seeding of adapted species of plants is needed.

About half of the acreage of this soil is irrigated and cropped. Grain sorghum, cotton, and alfalfa are the main crops. This soil is well suited to the crops commonly grown in the survey area.

A rotation that contains a soil-building crop should be considered. Organic matter can be added and soil blowing can be reduced by returning crop residue and using green-manure crops. Minimum tillage and variable depth of plowing help to avoid forming a plowpan.

Controlling grazing, developing water sources, and leaving some brush for use as cover help in managing rangeland wildlife habitat. Leaving some brush along field borders to provide cover helps in managing openland wildlife habitat.

This soil is in capability subclass VIe, dryland, and capability unit I-2, irrigated.

10—Calciorthids and Torriorthents, eroded. This undifferentiated group is made up of soils that have a rough broken land appearance on low hills. Elevation ranges from 3,200 to 4,000 feet. Average annual precipitation is about 9 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 220 days. Slope ranges from 2 to 58 percent.

Calciorthids make up 35 percent of the map unit, and Torriorthents make up about 25 percent. These soils are intermingled in some areas, and in other areas they are separate. They are in many positions on the landscape. Calciorthids are loamy and have layers of lime and silica accumulation and are cemented in places. Torriorthents are stratified and have textures ranging from loamy sand to clay.

Included with these soils in mapping is 20 percent barren and exposed geologic material. This material is made up of sandstone and siltstone that may or may not have a cemented sandstone cap. Also included are small areas of Tres Hermanos, Anthony, and Gila soils.

The soils in this unit are variable in texture and other characteristics. They formed in old lacustrine deposits and in the material eroded from those deposits. They are commonly saline and strongly alkaline in some part of the profile.

Permeability and available water capacity in these soils are variable. The water supplying capacity is 2 to 4 inches. Surface runoff and sediment production are high. The hazard of soil blowing is moderate and that of water erosion is high.

These soils are used mainly for livestock grazing. Forage production is low, but the vegetation consists of a wide variety of drought-tolerant plants. Examples of these plants are shadscale, fourwing and desert saltbush, tobosa, ratany, turkshead, ocotillo, Mormon-tea, desert zinnia, fluffgrass, burroweed, and annuals.

Calciorthids and Torriorthents are better used when managed with areas of the adjacent and included soils, since they contribute runoff to those areas.

Controlling grazing and developing water sources are good management for wildlife habitat. Some areas of this map unit are used for mining diatomaceous earth, where this material is exposed at the land surface.

This undifferentiated group is in capability subclass VIIe.

11—Cave-Durorthids complex. These nearly level to moderately sloping soils are on old high alluvial fans. Elevation ranges from 3,500 to 4,500 feet (fig. 6). Average annual precipitation is about 10 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 210 days. Slope is dominantly 0 to 8 percent but ranges to 20 percent on breaks.

Cave gravelly loam makes up about 50 percent of this map unit, and Durorthids make up about 30 percent. These soils are intermingled with Cave soils on fans below mountains where basalt is dominant and with durorthids on fans below mountains where ash and tuff are dominant. Included with these soils in mapping are small areas of Artesia, Bonita, Tres Hermanos, and Arizo soils and small areas of Rock outcrop.

The Cave gravelly loam is shallow and well drained. It formed in old alluvium from mixed sources. Typically, the surface layer is light brown gravelly loam about 11 inches thick. The underlying material is a white, lime-cemented pan about 3 inches thick over white very gravelly sandy loam to a depth of 48 inches or more.

Permeability is moderate above the pan, and available water capacity is low. Observed rooting depth is about 11 inches, and potential rooting depth is to the pan. The water supplying capacity is 5 to 7 inches. Surface runoff is medium. The hazard of soil blowing is slight and that of water erosion is slight to moderate.

Durorthids are shallow to moderately deep. They formed in old alluvium from mixed sources. They are similar in all characteristics to the Cave soil, except they have a silica-cemented layer and the pan is at a different depth.

The soils in this complex are mainly used for livestock grazing. The present vegetation is creosotebush, bush muhly, and annuals. Proper management of the vegeta-

tion is designed to increase the production of bush muhly.

Grazing management that maintains the plant cover is desirable. Developing water sources and building fences are important in planning grazing systems.

Controlling grazing and developing water sources help in managing wildlife habitat.

This complex is in capability subclass VIIe.

12—Comoro soils. This undifferentiated group is made up of nearly level to gently sloping soils on alluvial fans and terraces. Elevation ranges from 3,500 to 5,200 feet (fig. 7). Average annual precipitation ranges from 10 inches to about 13 inches, average annual air temperature is about 63 degrees F, and average frost-free period is about 200 days. Slope is 0 to 5 percent.

Comoro fine sandy loam, Comoro gravelly sandy loam, and Comoro sandy loam are nearly equal in extent and make up 80 percent of this map unit. Included with these soils in mapping are small areas of White House, Eba, Santo Tomas, and Grabe soils.

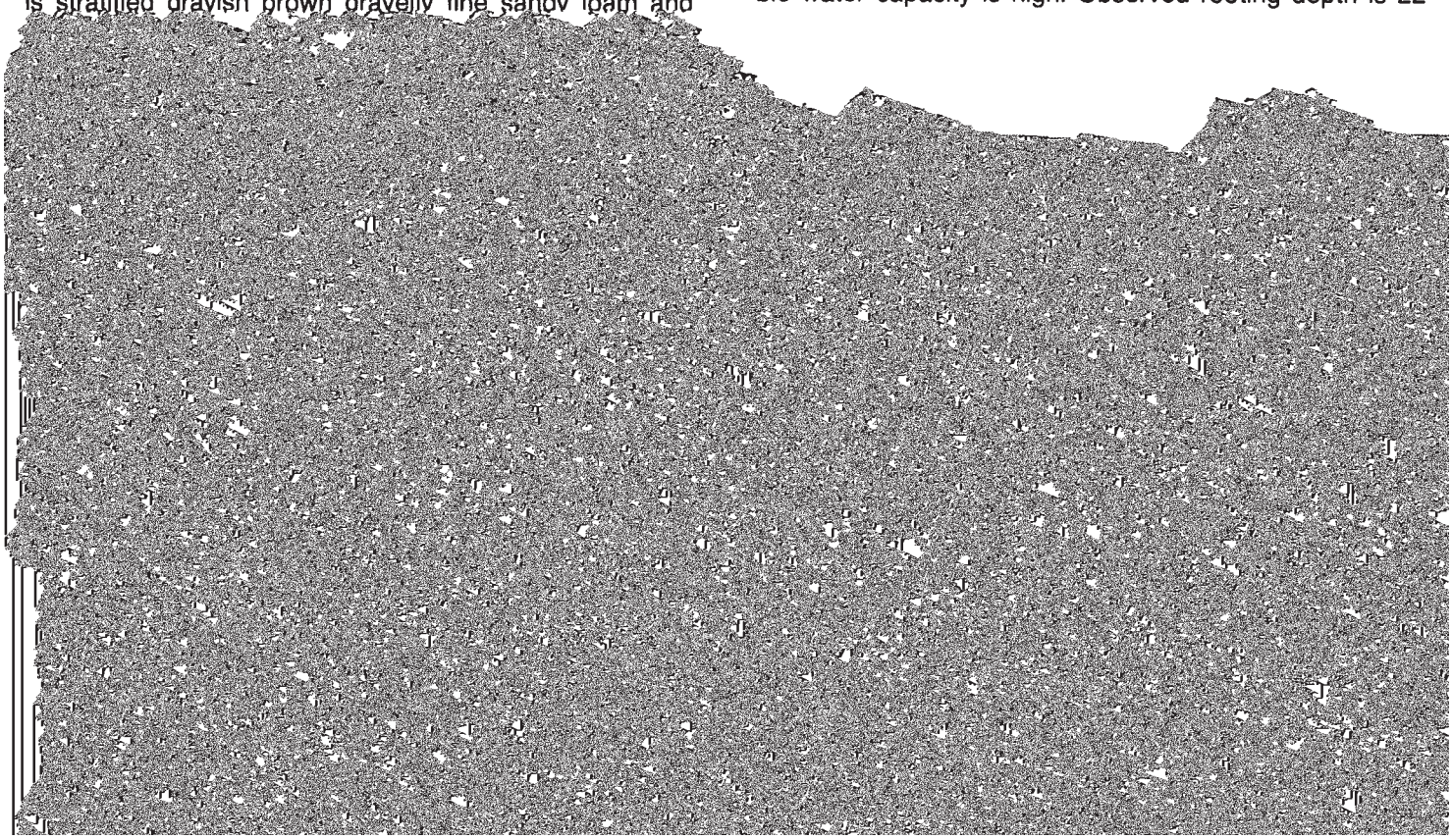
The Comoro soils are very deep and well drained. They formed in alluvium and colluvium from dominantly acid igneous rock and some limestone. Typically, the upper part of the surface layer is brown fine sandy loam, gravelly sandy loam, or sandy loam about 2 inches thick. The lower part of the surface layer is grayish brown fine sandy loam about 8 inches thick. The underlying material is stratified grayish brown gravelly fine sandy loam and

13—Continental-Tubac complex. These nearly level to strongly sloping soils are on alluvial fans and terraces that extend from the Pinaleno Mountains. Elevation ranges from 3,400 to 5,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 63 degrees F, and average frost-free period is about 220 days. Slope is 8 to 15 percent.

Continental gravelly sandy loam makes up about 40 percent of this unit, and Tubac gravelly sandy loam makes up about 40 percent. These soils are intermingled with the gently sloping to strongly sloping Continental gravelly sandy loam on side slopes and the nearly level Tubac gravelly sandy loam on interfluves. Included with these soils in mapping are small areas of Sonoita, Santo Tomas, and Anthony soils and small areas of Rock outcrop.

The Continental gravelly sandy loam is very deep and well drained. It formed in old alluvium from dominantly acid igneous rock. Typically, the surface layer is brown gravelly sandy loam about 4 inches thick. The upper part of the subsoil is reddish brown and yellowish red gravelly clay and gravelly sandy clay to a depth of about 35 inches. The lower part of the subsoil is reddish brown and yellowish sandy clay loam to a depth of about 46 inches. The substratum is reddish yellow gravelly fine sandy loam to a depth of 60 inches or more.

The Continental soil has slow permeability, and available water capacity is high. Observed rooting depth is 22



black grama, plains bristlegrass, bush muhly, and sideoats grama.

Grazing management that maintains the plant cover is desirable. For grazing, livestock prefer areas of this map unit. Developing water sources and building fences are important in planning grazing systems. Management of the brush and pitting help improve some deteriorated range. The soils in this complex are favorable for seeding.

Controlling grazing, developing water sources, and leaving some brush in associated drainageways for use as cover help in managing wildlife habitat.

This complex is in capability subclass VIe.

14—Dona Ana fine sandy loam, 0 to 2 percent slopes. This very deep and well drained soil is on terraces. Elevation ranges from 3,500 to 4,200 feet. This soil formed in old alluvium from mixed sources. Average annual precipitation is about 10 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 210 days. Slope is 0 to 2 percent on rangeland and 0 to 1 percent where the soil is cultivated.

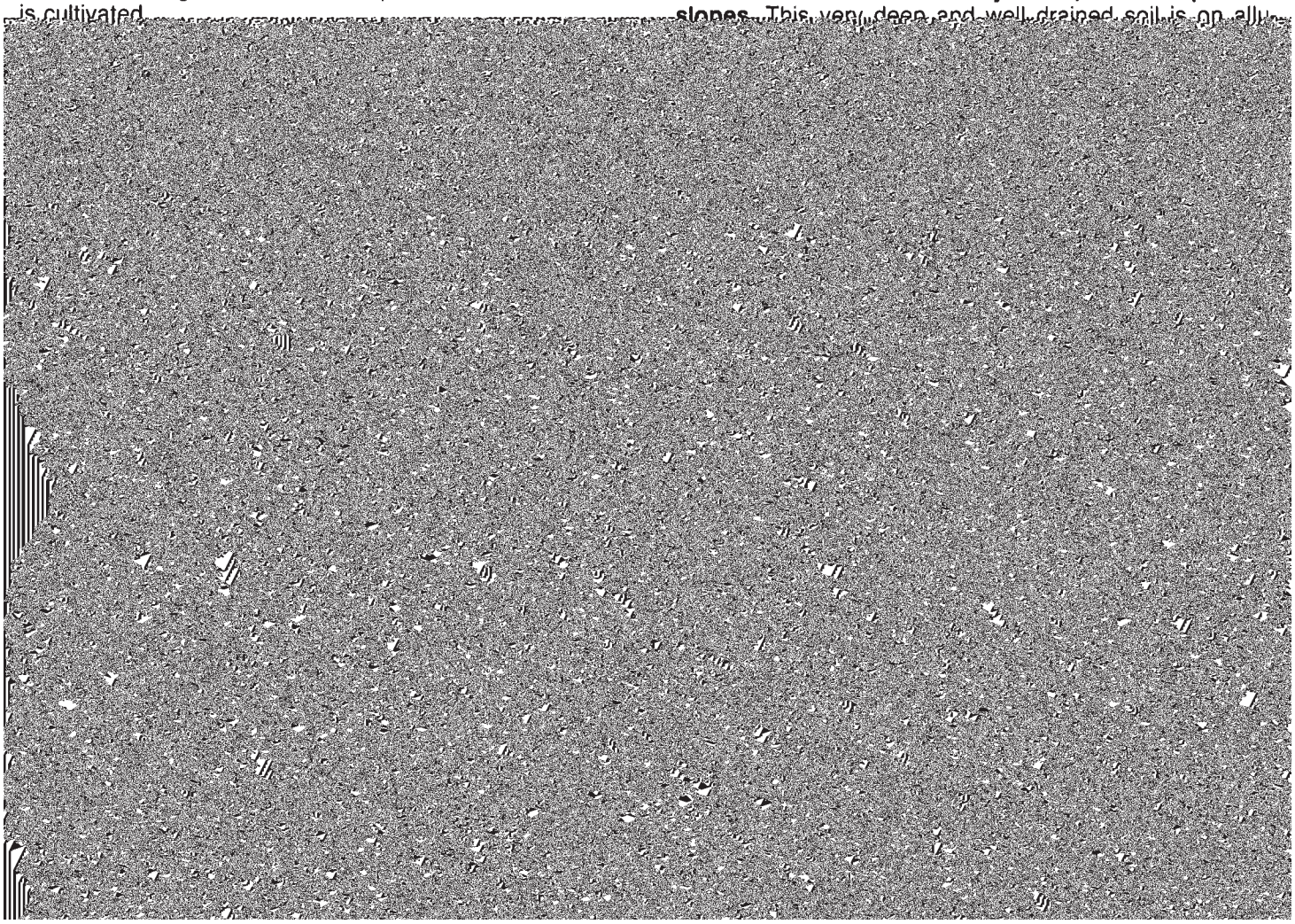
ing can be reduced by returning crop residue and using green-manure crops. Addition of organic material is especially important where land leveling has exposed the limy layer at a depth of 20 to 40 inches. When grain sorghum or fruit trees are grown in areas where the limy layer is exposed, additional applications of nitrogen and iron are necessary for healthy plant growth. Adding sulfuric acid to irrigation water is being researched in selected areas.

Minimum tillage and variable depths of plowing are needed to avoid forming a plowpan. Special attention to intervals between irrigations and amounts of water applied is important.

Controlling grazing, developing water sources, and leaving some brush for use as cover help in managing rangeland wildlife habitat. Leaving some brush along field borders to provide cover helps in openland wildlife habitat.

This soil is in capability subclass VIc, dryland, and capability unit I-2, irrigated.

15—Dona Ana fine sandy loam, 0 to 5 percent slopes. This very deep and well drained soil is on allu-



are necessary to assist in distribution of grazing. Management of the brush helps improve deteriorated range.

Controlling grazing and developing water sources help in managing wildlife habitat. Saltbush and other desirable brush should be left in areas to provide food and cover.

This soil is in capability subclass VIe.

16—Eba gravelly sandy loam. This very deep and well drained soil is on high alluvial fans and terraces. Elevation ranges from 3,500 to 5,200 feet (fig. 8). This soil formed in old alluvium from mixed sources. Average annual precipitation is about 11 inches, average annual air temperature is about 63 degrees F, and average [illegible] days. Slope is 0 to 5 percent on rangeland and 0 to 2 percent where the soil is cultivated.

Eba soils make up about 85 percent of this map unit. Included with this soil in mapping are small areas of Tubac gravelly loam, Continental gravelly sandy loam, Santo Tomas cobbly fine sandy loam, and Comoro soils.

Typically, the surface is brown gravelly fine sandy loam about 3 inches thick. The upper part of the subsoil is reddish brown very gravelly sandy clay loam to a depth of about 15 inches. The lower part of the subsoil is yellowish red very gravelly clay to a depth of 33 inches. The substratum to a depth of 56 inches or more is [illegible]

nantly 30 to 60 percent but, in places, ranges from 20 to 70 percent.

Faraway very cobbly loam makes up about 55 percent of this map unit, and Rock outcrop makes up 25 percent. This soil and Rock outcrop are intermingled with the Faraway soils on side slopes between the areas of Rock outcrop. Included with this complex in mapping are small areas of Mokiak soils, shallow soils over limestone, and moderately deep soils that have a clay subsoil on ridges.

The Faraway very cobbly loam is shallow and well drained. It formed in residuum from rhyolite, andesite, and related rocks. Typically, the surface layer is grayish brown very cobbly loam about 10 inches thick. The underlying material is light gray fractured rhyolite to a depth of about 18 inches. Hard rhyolite is at a depth of 18 inches.

Permeability is moderate above the bedrock, and available water capacity is low. Observed rooting depth is 10 inches, and potential rooting depth is to bedrock. The water supplying capacity is 12 to 14 inches. Surface runoff is medium to rapid. The hazard of soil blowing is slight and that of water erosion is moderate.

Rock outcrop is more than 90 percent exposed bedrock, mainly rhyolite and andesite. It provides concealment for wildlife.

This complex is used for livestock grazing, wildlife habitat, and recreation. The present vegetation is plains lovegrass, sideoats grama, oak, and juniper. Proper management of the vegetation is designed to increase the production of sideoats grama, plains lovegrass, and cane beardgrass.

Grazing management that maintains a mixed cover of grass and brush is desirable. Developing water sources and building fences are important in planning grazing systems. Limited numbers of potholes, springs, and seeps are present naturally in this map unit.

Controlling grazing and having a balance among shrubs, forbs, and grass for food and cover help in managing wildlife habitat.

This unit has aesthetic appeal because of its rugged appearance and variety of plants. Popular recreation activities include hiking and wildlife observation.

This complex is in capability subclass VIIs.

19—Forrest-White House-Kimbrough complex. These gently sloping to strongly sloping soils are on old lower fans. Included with these soils in mapping are small areas of Comoro, Grabe, and Pima soils and small areas of Rock outcrop.

The Forrest soils are very deep and well drained. They formed in old alluvium from igneous rock and limestone. Typically, the surface layer is brown gravelly loam about 2 inches thick. The subsoil is reddish brown clay and gravelly clay, yellowish red clay, and excessively limy brown clay to a depth of about 38 inches. The substratum to a depth of 54 inches or more is brown and light brown clay loam. It has a zone of lime accumulation.

The Forrest soils have slow permeability, and available water capacity is high. Observed rooting depth is 26 inches, and potential rooting depth is 54 inches or more. The water supplying capacity is 10 to 12 inches. Surface runoff is medium to slow. The hazards of soil blowing and water erosion are slight.

The White House gravelly loam is very deep and well drained. It formed in old alluvium from dominantly igneous rock and some limestone. Typically, the surface layer is brown gravelly loam about 2 inches thick. The upper part of the subsoil is reddish brown and yellowish red clay to a depth of about 28 inches. The lower part of the subsoil is yellowish red gravelly clay to a depth of 50 inches or more.

The White House soil has slow permeability, and available water capacity is high. Observed rooting depth is 28 inches, and potential rooting depth is 50 inches or more. The water supplying capacity is 10 to 12 inches. Surface runoff is medium. The hazard of soil blowing is slight and that of water erosion is moderate.

The Kimbrough soil is shallow and well drained. It formed in old alluvium from limestone and some igneous rock. Typically, the surface layer is brown gravelly loam about 14 inches thick. The underlying material is a white, lime-cemented pan.

The Kimbrough soil has moderate permeability above the pan, and available water capacity is low. Observed rooting depth is 14 inches, and potential rooting depth is to the pan. The water supplying capacity is 10 to 12 inches. Surface runoff is slow to medium. The hazards of soil blowing and water erosion are slight.

The soils in this complex are used mainly for livestock grazing. The present vegetation is similar on the Forrest and White House soils because of their surface layers and their fine textured subsoils. The vegetation consists

brush and pitting on the Forrest and White House soils help improve deteriorated range.

Controlling grazing, developing water sources, and leaving some brush for use as cover in associated swales and drainageways help in managing wildlife habitat.

This complex is in capability subclass VIe.

20—Gila loam. This very deep and well drained soil is on flood plains and alluvial fans. Elevation ranges from 3,100 to 4,000 feet. This soil formed in recent alluvium from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 220 days. Slope is 0 to 3 percent.

Gila loam makes up 70 percent of this map unit. Included with this soil in mapping are small areas of Gila fine sandy loam and very fine sandy loam. Also included are small areas of Anthony and Glendale soils and localized areas of soils that are saline and alkali.

Gila loam makes up about 35 percent of this map unit, Anthony sandy loam makes up 25 percent, and Bluepoint loamy sand makes up 25 percent. These soils are intermingled with the Gila soils in small drainageways, the Anthony soils on interfluves, and the Bluepoint soils on higher fans and dunes. Included with these soils in mapping are small areas of Glendale soils; Calciorthids and Torriorthents, eroded; and localized areas of soil that are saline and alkali.

The Gila loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is pale brown loam about 4 inches thick. The underlying material is pale brown loam that has thin strata of fine sandy loam to a depth of 60 inches or more.

The Gila soil has moderate permeability, and available water capacity is high. Observed rooting depth is 14 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 8 to 10 inches. Surface runoff is medium. The hazards of soil blowing and water

management of the vegetation is designed to increase the production of fourwing saltbush, spike and mesa dropseed, and bush muhly.

Grazing management that maintains the plant cover is important. Developing water sources and building fences are important in planning grazing systems. Management of the brush on all the soils and pitting on the Gila soil help improve some deteriorated ranges. Seeding adapted species of plants is needed.

Controlling grazing, developing water sources, and leaving brush for use as food and cover help in managing wildlife habitat.

This complex is in capability subclass VIe.

22—Glendale-Gila complex. These nearly level soils are on flood plains and alluvial fans. Elevation ranges from 3,400 to 4,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 215 days. Slope is 0 to 2 percent on rangeland and 0 to 1 percent where the soil is cultivated.

Glendale silty clay loam makes up 55 percent of this map unit, and Gila loam makes up 30 percent. These soils are intermingled with the Glendale soils on the lower parts of flood plains and with the Gila soils on the higher parts of flood plains and low terraces.

Included with these soils in mapping are small areas of Hondale fine sandy loam, Anthony sandy loam, and Hondale loam.

The Glendale silty clay loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is pale brown silty clay loam about 2 inches thick. The underlying material is stratified pale brown and very pale brown silty clay loam and silt loam to a depth of 60 inches or more.

The Glendale soil has moderately slow permeability, and available water capacity is high. Observed rooting depth on rangeland is 29 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 12 to 16 inches. It consists of precipitation and of the runoff from adjacent areas. Surface runoff is slow, and the hazard of erosion is slight.

The Gila loam is very steep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is pale brown loam about 4 inches thick. The underlying material is pale brown loam that has thin strata of silt loam and fine sandy loam to a depth of 60 inches or more.

The Gila soil has moderate permeability, and available water capacity is high. Observed rooting depth on rangeland is 15 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is about 10 to 14 inches. It consists of precipitation and of the runoff from adjacent areas. Surface runoff is slow to medium, and the hazard of erosion is slight.

About 80 percent of the acreage of this unit is used mesquite, catclaw, vine-mesquite, fourwing saltbush, and in some places on the Gila soil, creosotebush and bush muhly. Proper management of the vegetation is designed to increase the production of sacaton, sideoats grama, trichloris, cane beardgrass, and tobosa.

Grazing systems that include developing water sources and building fences should be designed so that livestock utilize forage when it is most palatable. Grazing the areas should be only for a short time. Grazing should be deferred for 1 year out of every 3 or 4, depending on the amount of water overflow and forage production. Other beneficial measures are management of brush and pitting if runoff is restricted to small channels or gullies. Seeding adapted species of plants is also needed.

About 20 percent of the acreage of this unit is irrigated and cropped. Grain sorghum and cotton are the main crops. The soils are well suited to crops commonly grown in the survey area.

A successful rotation system includes a soil-building crop. Organic matter is added by using crop residue and green-manure crops. Minimum tillage is desirable in order to maintain soil structure and to avoid compaction.

The Glendale soil is less permeable than the Gila soil, and this is a factor in the design of irrigation systems.

Controlling grazing and leaving some brush for use as cover help in managing rangeland wildlife habitat. Leaving some brush along field borders to provide cover helps in managing openland wildlife habitat. A significant amount of water development is needed for wetland wildlife.

These soils are in capability subclass VIc, dryland, and capability unit, I-1, irrigated.

23—Glendale-Gila complex, eroded. These nearly level to gently sloping soils are on flood plains and alluvial fans. Elevation ranges from 3,020 to 4,000 feet (fig. 9). Average annual precipitation is about 9 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 220 days. Slope is 0 to 3 percent.

Glendale silty clay loam makes up about 50 percent of this map unit, and Gila loam makes up 25 percent. These soils are intermingled with the Glendale soils on the lower parts of flood plains and with the Gila soils on the higher parts of flood plains and low alluvial fans.

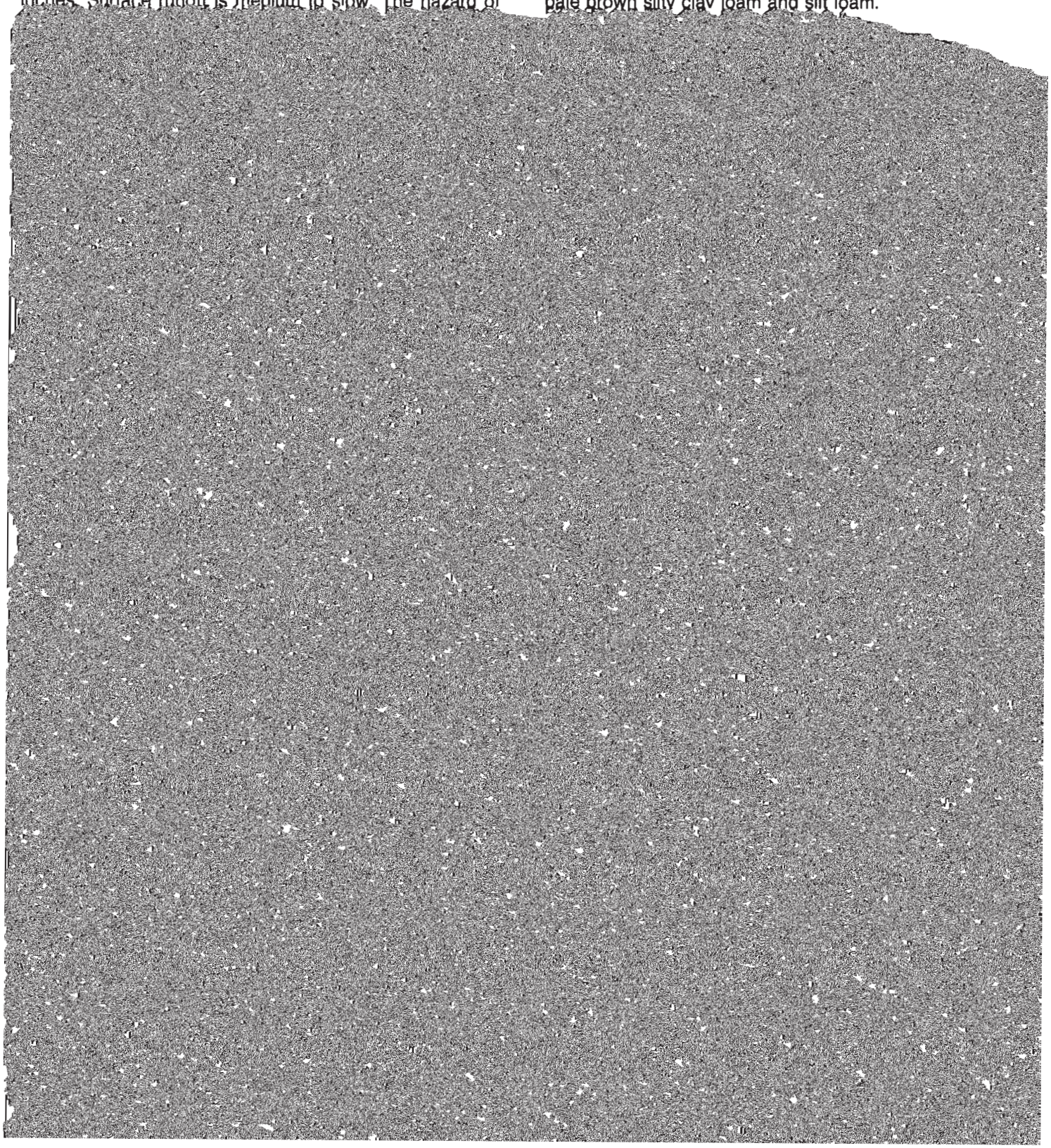
Included with these soils in mapping are small areas of Anthony and Hantz soils, localized areas of soil that are saline and alkali, and riverwash materials in the San Simon River channel.

The Glendale silty clay loam is very deep and well drained. It formed in alluvium from mixed sources. Typically, the surface layer is pale brown silty clay loam about 2 inches thick. The underlying material is stratified pale brown or very pale brown silty clay loam and silt loam to a depth of 60 inches or more.

The Glendale soil has moderately slow permeability

depth is 29 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 6 to 10 inches. Surface runoff is medium to slow. The hazard of

about 2 inches thick. The underlying material to a depth of 60 inches or more is stratified pale brown and very pale brown silty clay loam and silt loam.



brown gravelly clay about 11 inches thick. The substratum is fractured basalt with lime accumulation about 4 inches thick. Hard basalt is at a depth of 17 inches.

Permeability is slow, and available water capacity is low. Observed rooting depth is 13 inches, and potential rooting depth is to bedrock. The water supplying capacity is 8 to 10 inches. Surface runoff is slow. The hazards of soil blowing and water erosion are slight.

Rock outcrop is more than 90 percent exposed bedrock, mainly basalt and andesite. It provides concealment for wildlife.

This complex is used for livestock grazing, wildlife habitat, and recreation. The present vegetation is tobosa, catclaw, cacti, and perennial broomweed. Proper management of the vegetation is designed to increase the production of black and sideoats gramas, cane beardgrass, and Arizona cottontop.

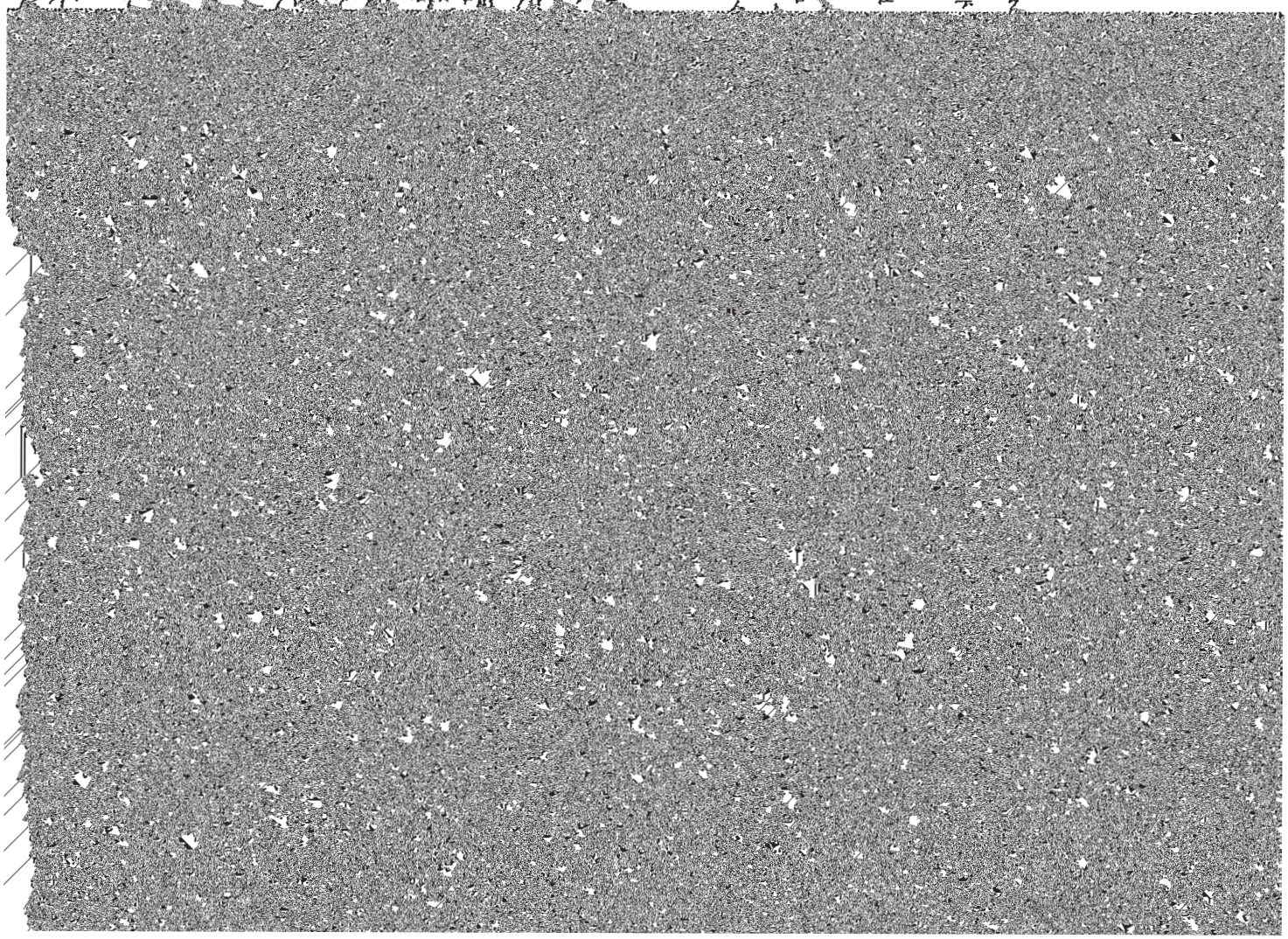
Grazing management that maintains the plant cover is desirable. Building fences, developing water sources, and clearing trails are necessary to assist in distribution of grazing. Cobbles on the surface limit the use of the

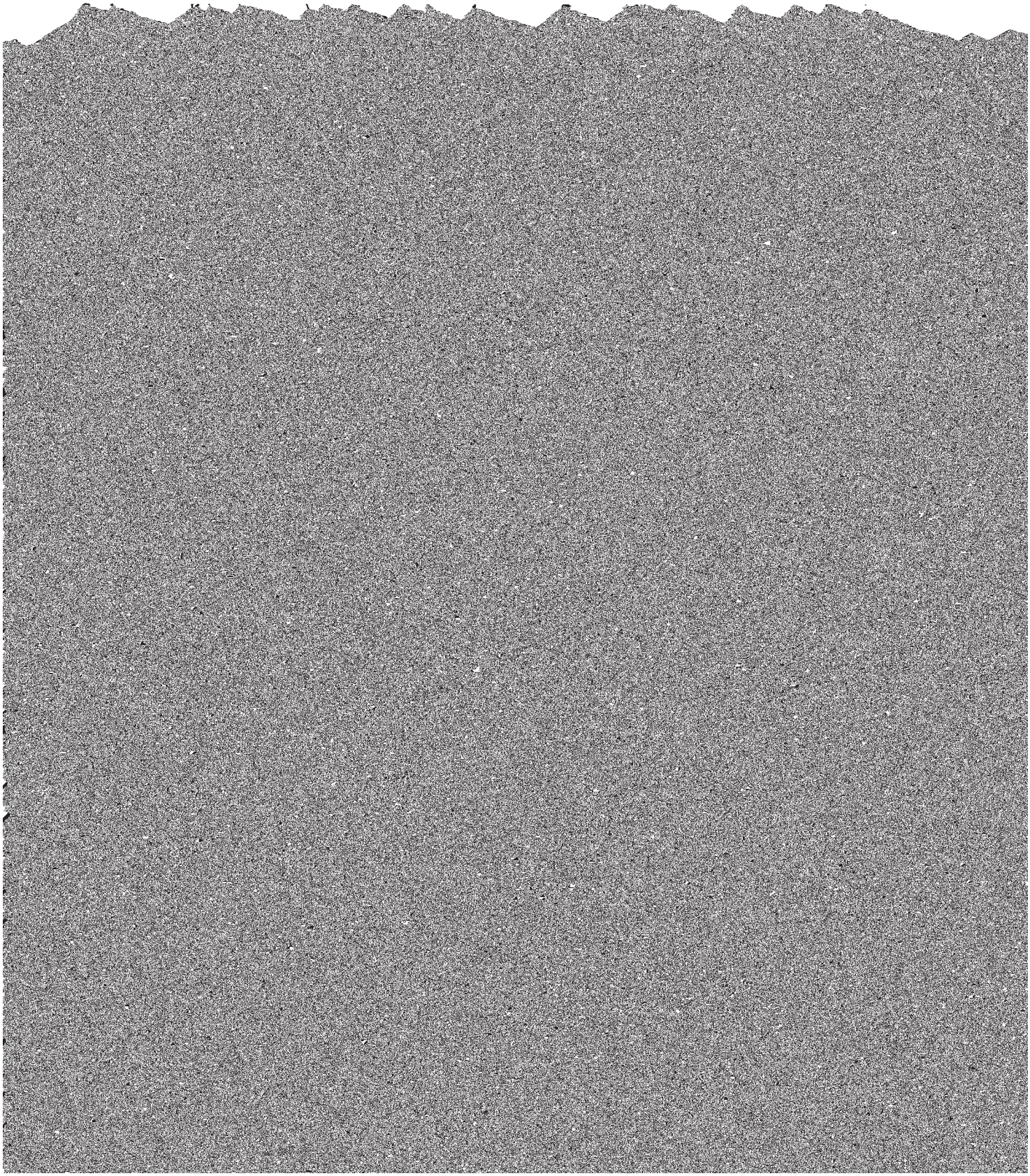
About half of the acreage of this soil is used for livestock grazing. The present vegetation is tobosa, bush muhly, and vine-mesquite. Proper management of vegetation is designed to increase the production of vine-mesquite, tobosa, cane beardgrass, alkali sacaton, and in some places, fourwing saltbush.

Grazing should be managed so that livestock will utilize forage when it is most palatable. Building fences and developing water sources are needed for grazing distribution and proper range use.

About half of the acreage of this soil is irrigated and cropped. Grain sorghum, cotton, and barley are the main crops. This soil is better suited to alkali-tolerant crops than most other crops, but other crops can be grown if management is good. A successful rotation system includes a soil-building crop. Soil structure and tilth can be maintained and improved by returning crop residue and by using minimum tillage. Irrigation should be managed to attain adequate penetration of water into the slowly permeable subsoil.

Controlling grazing and leaving some brush for use as





inches or more. The subsoil and substratum are excessively high in lime.

Permeability is very slow, and available water capacity

Grazing management that maintains the plant cover is desirable. Grazing systems that include building fences and developing water sources are needed to help in

32—Mokiak-Faraway-Rock outcrop complex. These moderately steep to very steep soils and Rock outcrop are on mountains. Elevation ranges from 5,200 to 7,500 feet (fig. 15). Average annual precipitation is 16 inches, average annual air temperature is about 54 degrees F, and average frost-free period is about 160 days. Slope dominantly is 30 to 60 percent, but in places, ranges from 15 to 70 percent.

Mokiak cobbly sandy loam makes up about 50 percent of this map unit, Faraway very cobbly loam makes up 20 percent, and Rock outcrop makes up 15 percent. These soils and the Rock outcrop are intermingled with moderately steep to steep Mokiak soils between outcrops of granite and related rocks. The Faraway soil is steep to very steep, higher, and between outcrops of andesite or rhyolite.

Included with these soils in mapping are areas of gravelly and stony Mokiak soils, small areas of colluvial soils that are deeper than 40 inches, and shallow soils over fractured and tilted limestone.

The Mokiak cobbly sandy clay loam is moderately deep and well drained. It formed in residuum from granite and related rocks. Typically, the surface layer is dark grayish brown cobbly sandy clay loam about 4 inches thick. The subsoil is brown very gravelly sandy clay loam to a depth of 26 inches. The substratum to a depth of 30 inches is yellowish brown and light gray weathered granite that has clay films along the fractures. Below this is hard yellowish brown and light gray granite.

The Mokiak soil has moderate permeability above the bedrock, and available water capacity is low. Observed rooting depth is 26 inches, and potential rooting depth is to bedrock. The water supplying capacity is 12 to 14 inches. Surface runoff is medium. The hazard of soil blowing is slight and that of water erosion is moderate.

The Faraway very cobbly loam is shallow and well drained. It formed in residuum from rhyolite, andesite, and related rocks. Typically, the surface layer is grayish brown very cobbly loam about 10 inches thick. The underlying material is light gray fractured rhyolite to a depth of 18 inches. Below this is hard rhyolite.

The Faraway soil has moderate permeability above the bedrock, and available water capacity is low. Observed rooting depth is 10 inches, and potential rooting depth is to bedrock. The water supplying capacity is 12 to 14 inches. Surface runoff is medium to rapid. The hazard of soil blowing is slight and that of water erosion is moderate.

Rock outcrop is more than 90 percent exposed bedrock, mainly granite and rhyolite. It provides concealment for wildlife and is used mainly for wildlife habitat and recreation.

The soils in this complex are used mainly for grazing, wildlife habitat, and recreation. The present vegetation on the Mokiak soil is sideoats grama, cane beardgrass, beargrass, mesquite, yucca, oak, juniper, and mountain-mahogany. Proper management of the vegetation is designed to increase the production of sideoats, blue, and hairy gramas; cane beardgrass; and Arizona cottontop. The present vegetation on the Faraway soil is black grama, plains lovegrass, juniper, and oak. Proper management of the vegetation is designed to increase the production of black grama, sideoats grama, plains lovegrass, and cane beardgrass.

Grazing management that maintains a mixed cover of dominantly grass and some brush is desirable. Livestock use the accessible parts of the area, and small rills may develop along trails. Developing water sources and building fences are important in grazing systems. Limited numbers of potholes, springs, and seeps are present in this complex.

Controlling grazing helps in managing wildlife habitat.

This unit, with its rugged appearance and variety of rocks and vegetation, provides aesthetic appeal. Popular recreation activities are rock hunting, hiking, wildlife observation, and hunting. Several old inactive mines are in areas of these soils, and some interest and exploration for minerals are continuous.

This complex is in capability subclass VIIs.

33—Pima-Grabe silt loams. These nearly level soils are on flood plains and alluvial fans. Elevation ranges from 3,400 to 4,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 220 days. Slope is 0 to 3 percent on rangeland and 0 to 1 percent where the soil is cultivated.

Pima silt loam makes up 65 percent of this map unit, and Grabe silt loam makes up 20 percent. These soils are intermingled with the Pima soils on the lower parts of flood plains and with the Grabe soils on low terraces between drainageways. Included with these soils in mapping are small areas of Comoro sandy loam, Tubac sandy clay loam, Bucklebar fine sandy loam, Dona Ana fine sandy loam, and Hondale silty clay loam.

The Pima silt loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is brown silt loam about 31 inches thick. The underlying material is silty clay loam to a depth of 60 inches or more.

The Pima soil has moderately slow permeability, and available water capacity is high. Observed rooting depth on rangeland is 28 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 12 to 16 inches. It consists of precipitation and of the runoff from adjacent areas. Surface runoff is slow, and the hazard of erosion is slight. Floodwater is diverted from areas that are used for cropland. The areas in native rangeland receive occasional flooding.

The Grabe silt loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is brown silt loam about 24 inches thick. The underlying material is pale brown and brown loam to a depth of 60 inches or more.

The Grabe soil has moderate permeability, and available water capacity is high. Observed rooting depth on rangeland is 38 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 10 to 12 inches. Surface runoff is slow to medium, and the hazard of erosion is slight.

About 70 percent of the acreage of these soils is used for livestock grazing. The present vegetation is mesquite, tobosa, catclaw, perennial broomweed, and fourwing saltbush. Proper management of the vegetation is designed to increase the production of sacaton, sideoats grama, trichloris, cane beardgrass, and tobosa.

Developing water sources and building fences are needed to help in distribution of grazing for proper range use. Management of the brush, pitting, and seeding on deteriorated range are also beneficial.

About 30 percent of the acreage of this map unit is irrigated and cropped. Cotton, grain sorghum, and alfalfa are the main crops grown. A few small orchards are on Pima silt loam. The soils in this unit are well suited to the crops commonly grown in the survey area and to other specialty crops.

A successful rotation includes a soil-building crop. Organic matter can be added by returning crop residue and using green-manure crops. Minimum tillage maintains soil structure and avoids compaction.

from adjacent areas. Surface runoff is slow, and the hazard of erosion is slight. This soil is subject to frequent flooding.

The Grabe gravelly loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is brown gravelly loam about 5 inches thick. The underlying material to a depth of 40 inches is brown gravelly loam, and below this to a depth of 60 inches or more it is yellowish brown gravelly loamy sand.

The Grabe soil has moderate permeability, and available water capacity is moderate to high. Observed rooting depth is 38 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 8 to 12 inches. Surface runoff is medium to slow, and the hazard of erosion is slight. This soil is subject to frequent flooding.

The soils in this association are mainly used for livestock grazing. The present vegetation on the Pima soil is sacaton and mesquite. Proper management of the vegetation is designed to increase the production of sacaton, sideoats grama, and vine-mesquite. The present vegetation in included areas of lower rainfall is tobosa, mesquite, and catclaw. Proper management of the vegetation is designed to increase the production of sacaton, sideoats grama, trichloris, cane beardgrass, and tobosa.

Typically, the surface layer is gray silty clay loam about 1 inch thick. The subsoil is gray and light brownish gray silty clay to a depth of 29 inches. The substratum is mottled pale yellow, grayish brown, and light brownish gray clay to a depth of 60 inches or more. Surface gravel is present in local areas.

Permeability is slow, and available water capacity is high. Observed rooting depth is 29 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 16 to 20 inches from precipitation and seeps. Surface runoff is slow, and the hazard of erosion is slight. This soil is subject to occasional flooding for brief periods.

The Pridham soil is used mainly for livestock grazing. The present vegetation is tobosa, alkali sacaton, burroweed, and mesquite. Proper management of the vegetation is designed to increase the production of blue and hairy grama, alkali sacaton, and tobosa.

Grazing management that maintains the plant cover is desirable. Building fences and developing water sources are needed for grazing distribution.

Controlling grazing and developing water sources help in managing wildlife habitat.

This soil is in capability subclass VIw.

36—Santo Tomas soils. This undifferentiated group is

The soils in this unit are used for livestock grazing, wildlife habitat, and construction material. The vegetation varies, but includes sideoats grama, sacaton, plains lovegrass, Arizona cottontop, green spangletop, Apache plume, desert willow, and desert broom, and at higher elevations includes oak, sycamore, and Arizona walnut trees.

Grazing management that maintains the plant cover is desirable. Building fences and developing water sources are necessary for distribution of grazing. Management of the brush and seeding are needed in areas that have deteriorated.

Controlling grazing and developing water sources help in managing wildlife habitat.

In the survey area, Santo Tomas soils are better than most other soils as a source of gravel and sand.

This map unit is in capability subclass VIe.

37—Signal gravelly loam. This very deep and well drained soil is on high dissected alluvial fans. Elevation ranges from 4,000 to 5,500 feet. This soil formed in old alluvium from mixed sources. Average annual precipitation is about 14 inches, average annual air temperature is about 62 degrees F, and average frost-free period is about 200 days. Slope is dominantly 5 to 15 percent, but

Controlling grazing, developing water sources, and leaving some brush in associated drainageways for use as cover help in managing wildlife habitat.

This soil is in capability subclass VIe.

38—Sonoita gravelly sandy loam. This very deep and well drained soil is on alluvial fans and terraces. Elevation ranges from 3,200 to 5,000 feet. This soil formed in old alluvium from acid igneous rock and some limestone. Average annual precipitation is about 10 to 13 inches, mean annual air temperature is about 64 degrees F, and frost-free period is about 220 days. Slope is 0 to 5 percent.

Sonoita gravelly sandy loam makes up 75 percent of this map unit. Included with this soil in mapping are Sonoita sandy loam and small areas of Continental, Tubac, Comoro, and Gila soils. Included soils make up 25 percent of the map unit.

Typically, the surface layer is light reddish brown gravelly sandy loam about 3 inches thick. The subsoil is reddish brown and brown gravelly sandy loam to a depth of about 33 inches. The substratum is light reddish brown fine sandy loam about 10 inches thick over reddish brown and yellowish red gravelly sandy clay loam to a depth of 60 inches or more.

Permeability is moderately rapid, and available water capacity is moderate. Observed rooting depth is 33 [illegible] is about 65 degrees F, and average frost-free period is about 220 days. Slope is 0 to 5 percent on rangeland and 0 to 2 percent where the soil is cultivated.

Sonoita fine sandy loam makes up 85 percent of this map unit. Included with this soil in mapping are small areas of Bucklebar fine sandy loam and Tubac sandy clay loam.

Typically, the surface layer is light brown fine sandy loam about 5 inches thick. The subsoil is reddish brown sandy loam and light reddish brown gravelly sandy loam to a depth of 36 inches. The substratum is reddish brown gravelly sandy loam to a depth of 60 inches or more. Localized areas have a surface layer of sandy loam, loamy sand, or gravelly sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Observed rooting depth on rangeland is 33 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 7 to 9 inches. Surface runoff is slow. The hazard of soil blowing is moderate and that of water erosion is slight in irrigated areas and moderate on rangeland.

About 60 percent of the acreage of this soil is used for livestock grazing. The present vegetation is mesquite, yucca, catclaw, Mormon-tea, perennial broomweed, and burroweed. Proper management of the vegetation is designed to increase the production of bush muhly, Arizona cottontop, black grama, and plains bristlegrass.

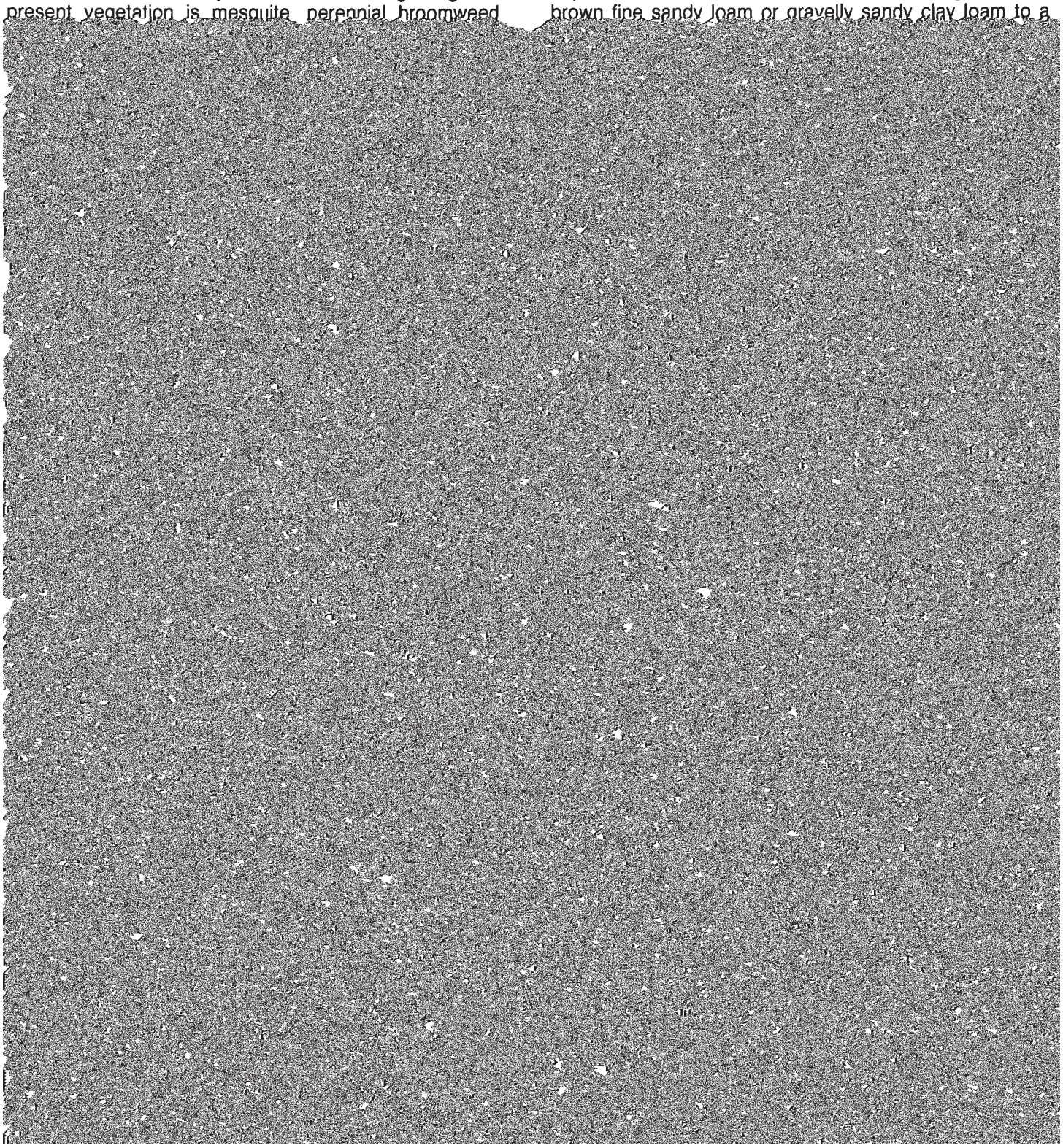
formed in old alluvium from dominantly basic igneous rock. Average annual precipitation is about 10 inches, [illegible]

water supplying capacity is commonly 8 to 10 inches, but the water supplying capacity can be 12 to 15 inches in [illegible]

capacity is 7 to 10 inches. Surface runoff is medium. The hazard of soil blowing is slight and that of water erosion is slight to moderate, depending on slope.

These soils are mainly used for livestock grazing. The present vegetation is mesquite, perennial broomweed

rock. Typically, the surface layer is light reddish brown sandy loam about 4 inches thick. The subsoil is reddish brown or brown sandy loam or gravelly sandy loam to a depth of about 34 inches. The substratum is light reddish brown fine sandy loam or gravelly sandy clay loam to a



and potential rooting depth is 54 inches or more. The water supplying capacity is 7 to 9 inches. Surface runoff is slow, and the hazard of erosion is slight.

About 70 percent of the acreage of this soil is irrigated and cropped. Cotton, grain sorghum, and alfalfa are the main crops. This soil is well suited to the crops commonly grown in the survey area.

A successful cropping system needs to include a soil-building crop. Organic matter can be added by returning a crop residue and using green-manure crops. Minimum tillage and variable depth of tillage help to maintain soil structure and avoid forming a plowpan. Care must be used in irrigating to attain adequate penetration of water into the slowly permeable subsoil.

About 30 percent of the acreage of this soil is used for livestock grazing. The present vegetation is creosotebush, mesquite, fourwing saltbush, and bush muhly. Proper management of the vegetation is designed to increase the production of bush muhly, black grama, and plains bristlegrass and, in some places, fourwing saltbush.

Grazing management that maintains plant cover is desirable. Developing water sources and building fences are important in grazing systems. Management of the brush, pitting, and seeding help improve deteriorated range.

Leaving some brush along field borders to provide cover helps in managing openland wildlife habitat. Controlling grazing, developing water sources, and leaving some brush for use as cover help in managing rangeland wildlife habitat.

This soil is in capability unit IIIs-8, irrigated, and capability subclass VIs, dryland.

45—White House-Forrest association. This association is made up of nearly level to gently sloping soils on alluvial fans and terraces. Elevation ranges from 4,700 to 5,300 feet (fig. 22). Average annual precipitation is about 14 inches, average annual air temperature is about 62 degrees F, and average frost-free period is about 200 days. Slope is 0 to 5 percent.

This association is about 45 percent White House gravelly loam and 30 percent Forrest sandy loam. The White House soil is high on the fans, and the Forrest soil is low on the fans and along drainageways. Included with these soils in mapping are small areas of Santo Tomas, Comoro, Pima, Grabe, and Guest soils.

The White House gravelly loam is very deep and well drained. It formed in old alluvium from dominantly igneous rock and some limestone. Typically, the surface layer is brown gravelly loam about 2 inches thick. The upper part of the subsoil is reddish brown and yellowish red clay to a depth of about 28 inches. The lower part of the subsoil is yellowish red gravelly clay to a depth of 60 inches or more.

The White House soil has slow permeability, and available water capacity is high. Observed rooting depth is 28 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 10 to 12 inches. Surface runoff is medium. The hazards of soil blowing and water erosion are slight.

The Forrest sandy loam is very deep and well drained. It formed in old alluvium from igneous rock and limestone. Typically, the surface layer is brown sandy loam about 2 inches thick. The subsoil is reddish brown, yellowish red, and brown clay and gravelly clay to a depth of about 38 inches. The substratum is brown and light brown clay loam that has a layer of lime accumulation to a depth of 54 inches or more.

The Forrest soil has slow permeability, and available water capacity is high. Observed rooting depth is 26 inches, and potential rooting depth is 54 inches or more. The water supplying capacity is 10 to 12 inches. Surface runoff is medium to slow. The hazards of soil blowing and water erosion are slight.

The soils in this association are used mainly for livestock grazing. The present vegetation on both soils is grama grasses, tobosa, cane beardgrass, and mesquite. Proper management of the vegetation is designed to increase the production of sideoats, black, blue, and hairy gramas; cane beardgrass; Arizona cottontop; and plains bristlegrass.

Grazing management that maintains the plant cover is desirable. Developing water sources and building fences are important in grazing systems. Management of the brush, pitting, and seeding help improve deteriorated range.

Controlling grazing, developing water sources, and leaving some brush in associated swales and drainageways for use as cover help in managing wildlife habitat.

This association is in capability subclass VIe.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses

the distribution system of pipelines or concrete ditches and to field leveling. Irrigation ponds and pumpbacks are commonly part of these systems.

Most of the farms are furrow or row irrigated, some fields in alfalfa are bordered and corrugated, and some areas are sprinkled. Attention should be given to the kind of crop and the soil to be irrigated. Efficient irrigation adjusts to the needs of the crop, the soil moisture rela-

The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 8 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management, crops, and productivity of the soils

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 limitation is 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 too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the

cipitation and the temperatures are such that growing conditions are substantially better than average; in a normal year these conditions are about average for the area; in an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight refers to the total air-dry vegetation produced per acre each year by the potential natural plant community. Vegetation that is highly palatable to livestock and vegetation that is unpalatable are included. Some of the vegetation can also be grazed extensively by wildlife.

Characteristic species of grasses, grasslike plants, forbs, and shrubs that make up most of the potential

creased by using management that is effective for specific kinds of soil and range sites.

In areas in which climate and topography are about the same, differences in the kind and amount of vegetation that range can produce are related closely to the kind of soil. Effective management is based on the relationships among soils, vegetation, and water.

In the northern part of the survey area, most of the soils are on mountains in materials derived from basic igneous rock and on alluvial fans in materials transported from that rock. In the southern part, most of the soils are on mountains in material derived from acid igneous rock and limestone and on alluvial fans in material transported from those rocks.

The soils are commonly gravelly and have some lime accumulation. Moderately fine to medium textured alluvial soils are along the San Simon River channel. Sandy hummocks and dunes are in some areas. In these areas, the hazard of soil blowing is high.

The major management concern on most of the rangeland is controlling grazing so vegetative cover is maintained or increased and the kinds and amounts of plants that make up the potential plant community are reestablished. Controlling or abating erosion and minimizing soil blowing are also important management concerns that help to increase the amount of vegetative cover.

The potential is good for increasing the vegetative cover and reducing erosion in the San Simon Area if sound range management, based on the soil survey information and rangeland inventories, is provided.

Engineering

Bobby G. Kilcrease, area engineer, Soil Conservation Service, assisted in preparing this section.

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

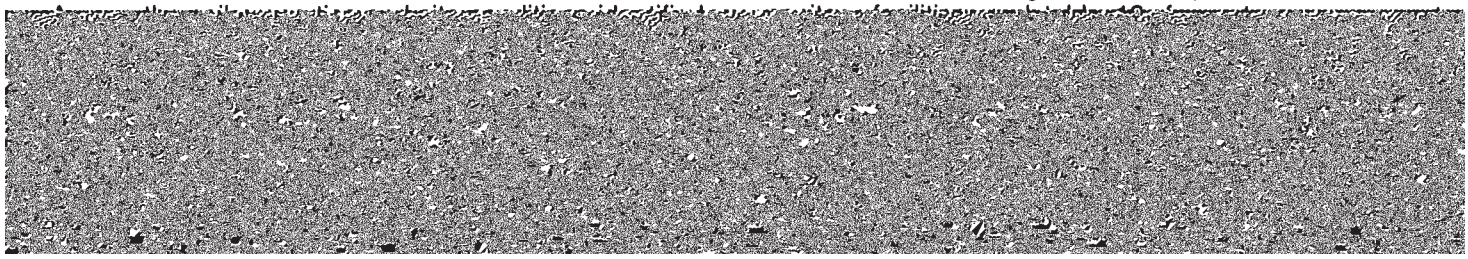
material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 10 shows, for each kind of soil, the degree and kind of limitations for building site development; table 11, for



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

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 10. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet

Local roads and streets referred to in table 10 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 11 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local

age and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils

moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of

have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor.*

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 12 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 16.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones

moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 13 the degree of soil limitation and soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Aquifer-fed excavated ponds are bodies of water made by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 13 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of

Recreation

The soils of the survey area are rated in table 14 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the 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 14 can be supplemented by [illegible]

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

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Wildlife habitat

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable [illegible]

wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

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

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, or foliage used by wildlife or that provide cover and shade for some species of wildlife. Major soil properties that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and moisture. Examples of shrubs are mountain-mahogany, bitterbrush, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, and cordgrass and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, and red fox.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Rangeland habitat consists of areas of wild herbaceous plants and shrubs. Wildlife attracted to rangeland include antelope, white-tailed deer, desert mule deer, sage grouse, meadowlark, and lark bunting.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

Engineering properties

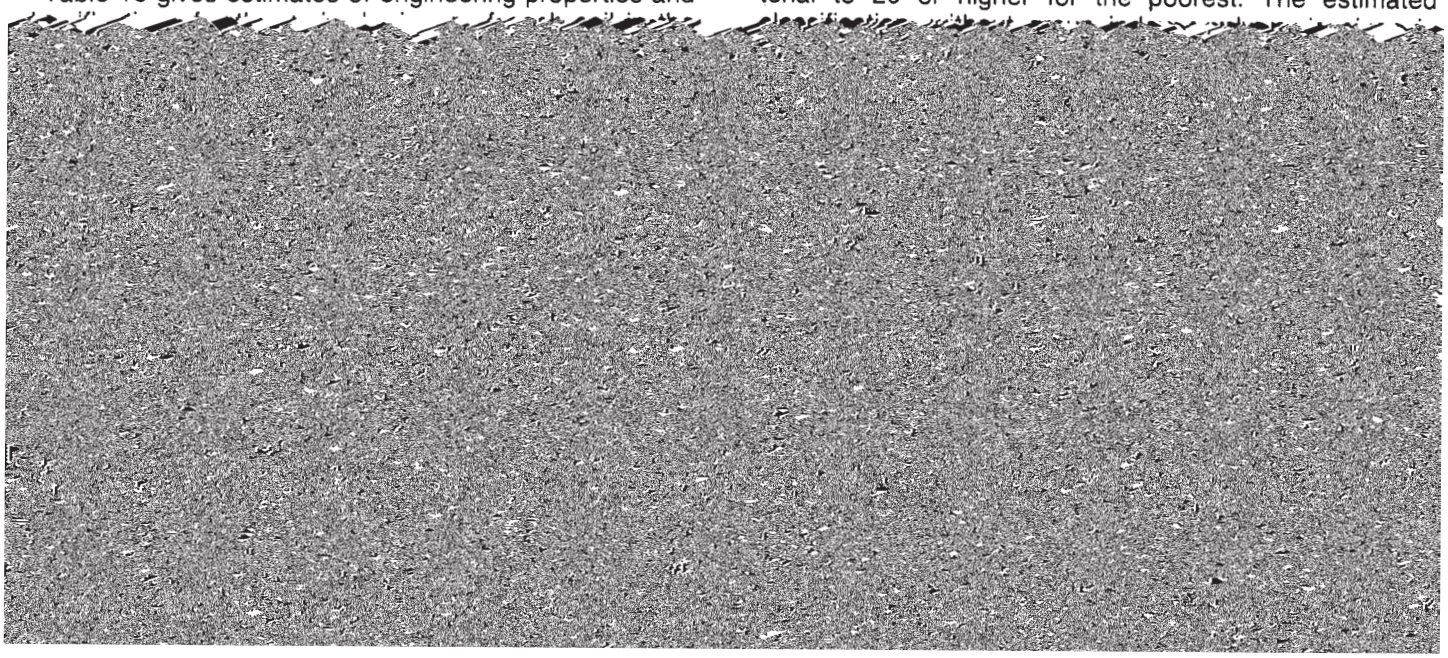
Table 16 gives estimates of engineering properties and

System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

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, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging 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. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated



In some surveys, the estimates are rounded to the [illegible] field checks. For many soils, the values have been veri-

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible, and crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible, and crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter of the plow layer is expressed as a percent, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter of 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 of the soil. It is a source of nitrogen and other nutrients for crops.

Soil and water features

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. 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 that have a layer that impedes the downward movement of water or soils that have 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 clay soils 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 is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific,

water observed in many borings made during the course of the soil survey. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In

cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is coarse-loamy, mixed, (calcareous), thermic Typic Torrifluvents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

many very fine roots; common very fine interstitial and few very fine tubular pores; strongly effervescent; moderately alkaline; abrupt wavy boundary.

C1—4 to 13 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common fine tubular and many very fine interstitial pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—13 to 17 inches; light yellowish brown (10YR 6/4) gravelly sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic;

1,000 feet south of NE corner sec. 7, T. 8 S., R. 29 E.:

A1—0 to 3 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak thin and medium platy structure; very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and many very fine and fine tubular pores; moderately alkaline; clear wavy boundary.

C1—3 to 26 inches; light brown (7.5YR 6/4) very gravelly loamy sand, dark brown (7.5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine and fine interstitial pores; 70 percent fine gravel; moderately alkaline; clear wavy boundary.

C2—26 to 60 inches; light brown (7.5YR 6/4) very gravelly loamy sand, dark brown (7.5YR 4/4) moist; single grain appearing massive in places; loose, nonsticky and nonplastic; many very fine and fine interstitial pores; 75 percent medium gravel; slightly effervescent; moderately alkaline.

These soils are stratified with finer and coarser textured materials. Coarse fragment content averages more than 35 percent.

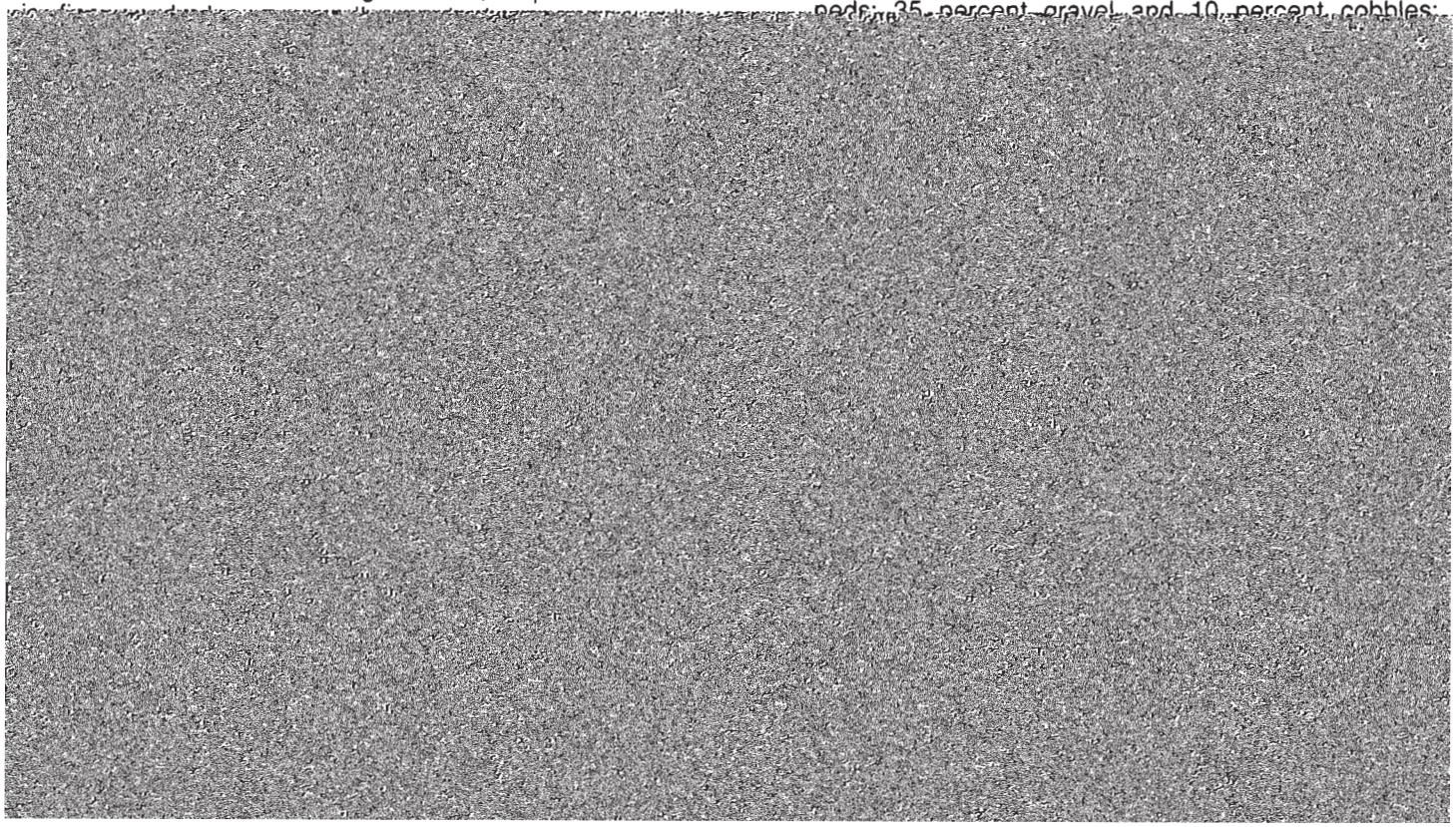
The A horizon is brown, light brown, or pale brown. It

interstitial and few very fine vesicular pores; 15 percent cobbles and 5 percent gravel; neutral; abrupt smooth boundary.

B1t—3 to 7 inches; brown (7.5YR 5/4) very gravelly sandy clay loam, reddish brown (5YR 4/4) moist; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial and common very fine tubular pores; few thin clay films on faces of peds; 55 percent gravel; mildly alkaline; clear wavy boundary.

B21t—7 to 13 inches; reddish brown (5YR 5/4) very gravelly clay loam, reddish brown (5YR 4/4) moist; moderate very fine and fine subangular blocky structure; slightly hard and hard, friable, sticky and plastic; many very fine roots; many very fine interstitial and tubular pores; common moderately thick clay films on faces of peds; 60 percent gravel and few cobbles; mildly alkaline; clear wavy boundary.

B22t—13 to 25 inches; reddish brown (5YR 5/4) very gravelly clay, reddish brown (5YR 4/4) moist; moderate very fine and fine subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; many very fine and fine interstitial and very fine tubular pores; common thin clay films on faces of peds; 35 percent gravel and 10 percent cobbles;



clay and less than 35 percent coarse fragments in the control section.

Typical pedon of Atascosa stony sandy loam, in an area of Atascosa-Chiricahua-Rock outcrop complex, in Cochise County 0.9 mile northwest of Mulkins Ranch; 1,000 feet east and 800 feet south of NW corner sec. 10, T. 15 S., R. 29 E.:

A1—0 to 2 inches; brown (10YR 4/3) stony sandy loam, dark brown (10YR 3/3) moist; weak thin and medium platy structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots;

Simon River, 1,000 feet south and 200 feet west of NE corner sec. 36, T. 10 S., R. 28 E.:

A1—0 to 2 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; weak thin platy structure; soft, friable, nonsticky and nonplastic; few very fine and fine roots; many very fine interstitial pores; moderately alkaline; clear smooth boundary.

C1—2 to 15 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine, common fine, and few medium roots; many very fine interstiti

Bonita soils are near Cave and Hantz soils. Cave soils have a lime-cemented pan at a shallow depth. Hantz soils are light colored.

Typical pedon of Bonita cobbly silty clay, in Graham County 3.3 miles east of Whitlock Wash at Bat Tank, 2,000 feet north and 100 feet west of SE corner sec. 4, T. 9 S., R. 29 E.:

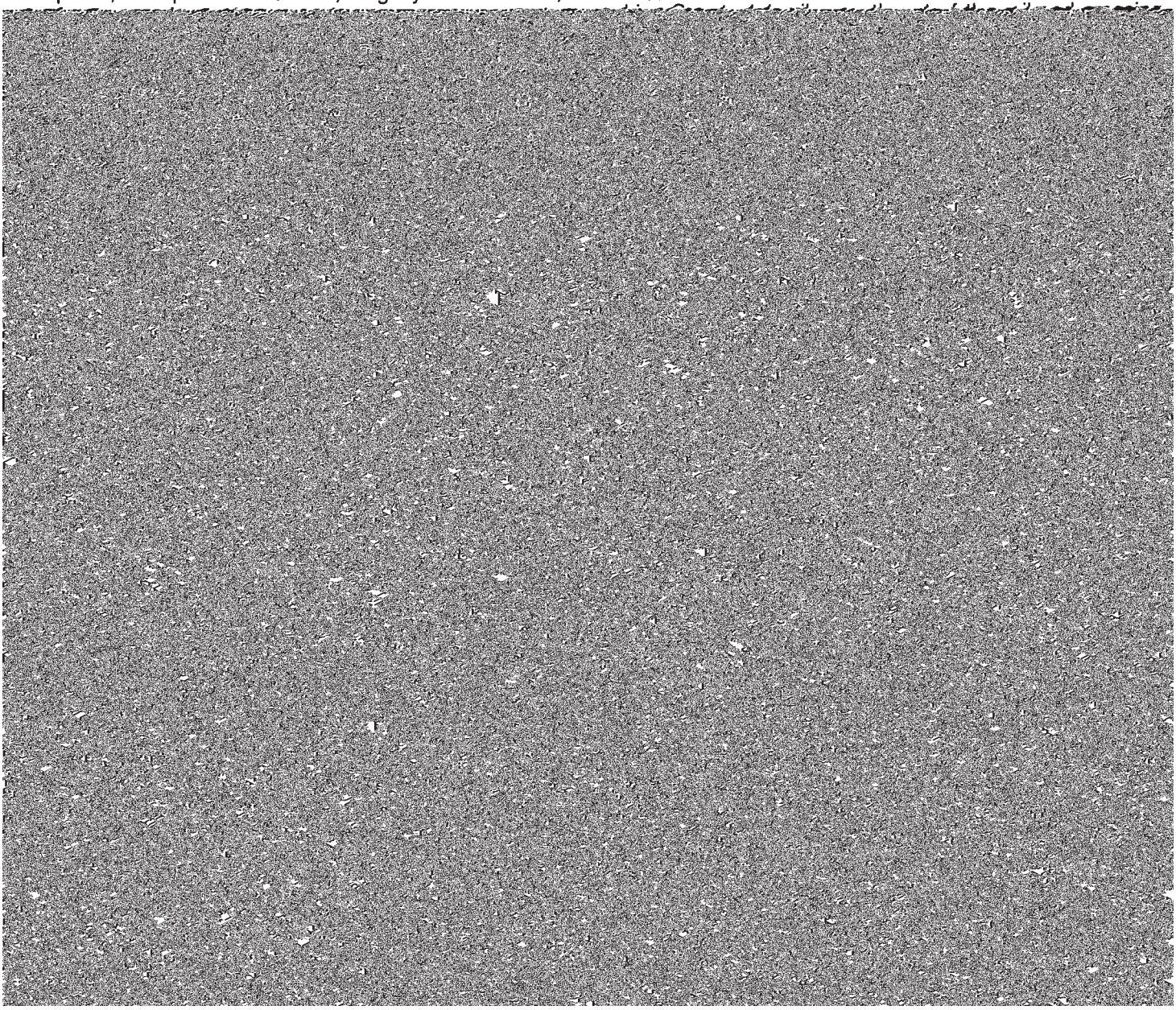
A1—0 to 3 inches; brown (10YR 5/3) cobbly silty clay, dark reddish brown (10YR 3/3) moist; weak thin and medium platy structure; hard and very hard, friable, sticky and plastic; many very fine and few fine roots; few fine interstitial and common very fine tubular pores; 20 percent cobbles; slightly effervescent;

Bucklebar series

The Bucklebar series consists of very deep, well drained soils that formed in alluvium weathered from mixed sources. Bucklebar soils are on alluvial fans and terraces. Slope ranges from 0 to 3 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 65 degrees F.

Bucklebar soils are similar to Dona Ana and Tres Hermanos soils and are near Dona Ana, Sonoita, and Tubac soils. Dona Ana and Tres Hermanos soils have a calcic horizon. Sonoita soils have a coarse-loamy control section. Tubac soils are in a fine family.

Typical pedon of Bucklebar fine sandy loam, in Co-



Thickness of the solum ranges from 20 to 40 inches. Depth to the weak zone of carbonate accumulation is less than 40 inches.

The A horizon is brown or light brown. It is fine sandy loam or sandy loam. The B2t horizon is brown, reddish brown, and yellowish red. The C horizon is sandy loam to gravelly loamy sand.

Cave series

The Cave series consists of shallow, well drained soils that formed in old alluvium weathered from basic igneous rock. Cave soils are on high alluvial fans. Slope dominantly is 0 to 8 percent but, in places, ranges to 20 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 64 degrees F.

Cave soils are near Anthony, Arizo, Bonita, and Tres Hermanos soils. Anthony, Arizo, and Bonita soils do not have an indurated Ccam horizon. Tres Hermanos soils have an argillic horizon and are in a fine-loamy family.

Typical pedon of Cave gravelly loam in an area of Cave-Durorthids complex, in Graham County 0.8 mile east of Hackberry Ranch, 800 feet south and 2,600 feet east of NW corner sec. 14, T. 9 S., R. 29 E.:

A11—0 to 3 inches; light brown (7.5YR 6/4) gravelly loam, dark brown (7.5YR 4/4) moist; weak thin platy structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine vesicular and few very fine tubular pores; 25 percent fine gravel and 10 percent cobbles; strongly effervescent; moderately alkaline; abrupt wavy boundary.

A12—3 to 11 inches; light brown (7.5YR 6/4) gravelly loam, dark brown (7.5YR 4/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; 35 percent fine gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

C1cam—11 to 14 inches; white (5YR 8/1) pan indurated to strongly cemented by calcium carbonate, pinkish gray (5YR 7/2) moist; thin (approximately 0.25 to 0.5 inch thick) laminar layer in the upper part of the horizon; massive; extremely hard, very firm; 80 percent lime-coated gravel; violently effervescent; strongly alkaline; abrupt wavy boundary.

C2ca—14 to 29 inches; white (5YR 8/1) very gravelly sandy loam, pinkish gray (5YR 7/2) moist; massive; very hard, very firm, slightly sticky and nonplastic; very fine tubular pores; 50 percent fine lime-coated gravel; strongly effervescent; strongly alkaline.

Depth to the Ccam horizon ranges from 4 to 20 inches, and this horizon can be fractured or continuously indurated. From 0 to about 20 percent of the surface is covered by cobbles.

The A horizon is cobbly loam and gravelly loam.

Chiricahua series

The Chiricahua series consists of shallow, well drained soils that formed in residuum weathered from acid igneous bedrock or quartzite. Chiricahua soils are on uplands. Slope ranges from 8 to 30 percent. Average annual precipitation is about 10 to 14 inches, and average annual air temperature is 57 to 67 degrees F.

Chiricahua soils are similar to Graham and White House and are near Atascosa, Comoro, Santo Tomas, and White House soils. Atascosa and Graham soils have a mollic epipedon. Comoro and Santo Tomas soils are deep and stratified. White House soils are deep, formed in mixed alluvium, and do not have bedrock within a depth of 40 inches.

Typical pedon of Chiricahua gravelly sandy loam in an area of Atascosa-Chiricahua-Rock outcrop complex, in Graham County 0.8 mile west of U. S. Highway 666, 1,600 feet north and 2,600 feet west of SE corner sec. 21, T. 10 S., R. 26 E.:

A1—0 to 2 inches; brown (7.5YR 5/4) gravelly sandy loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and common fine roots; common very fine interstitial and common very fine tubular pores; 30 percent fine and medium gravel; neutral; abrupt wavy boundary.

B1t—2 to 5 inches; reddish brown (5YR 5/3) gravelly clay loam, dark reddish brown (5YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots; many very fine interstitial and few fine tubular pores; few thin clay films on faces of peds; 20 percent fine gravel; neutral; abrupt wavy boundary.

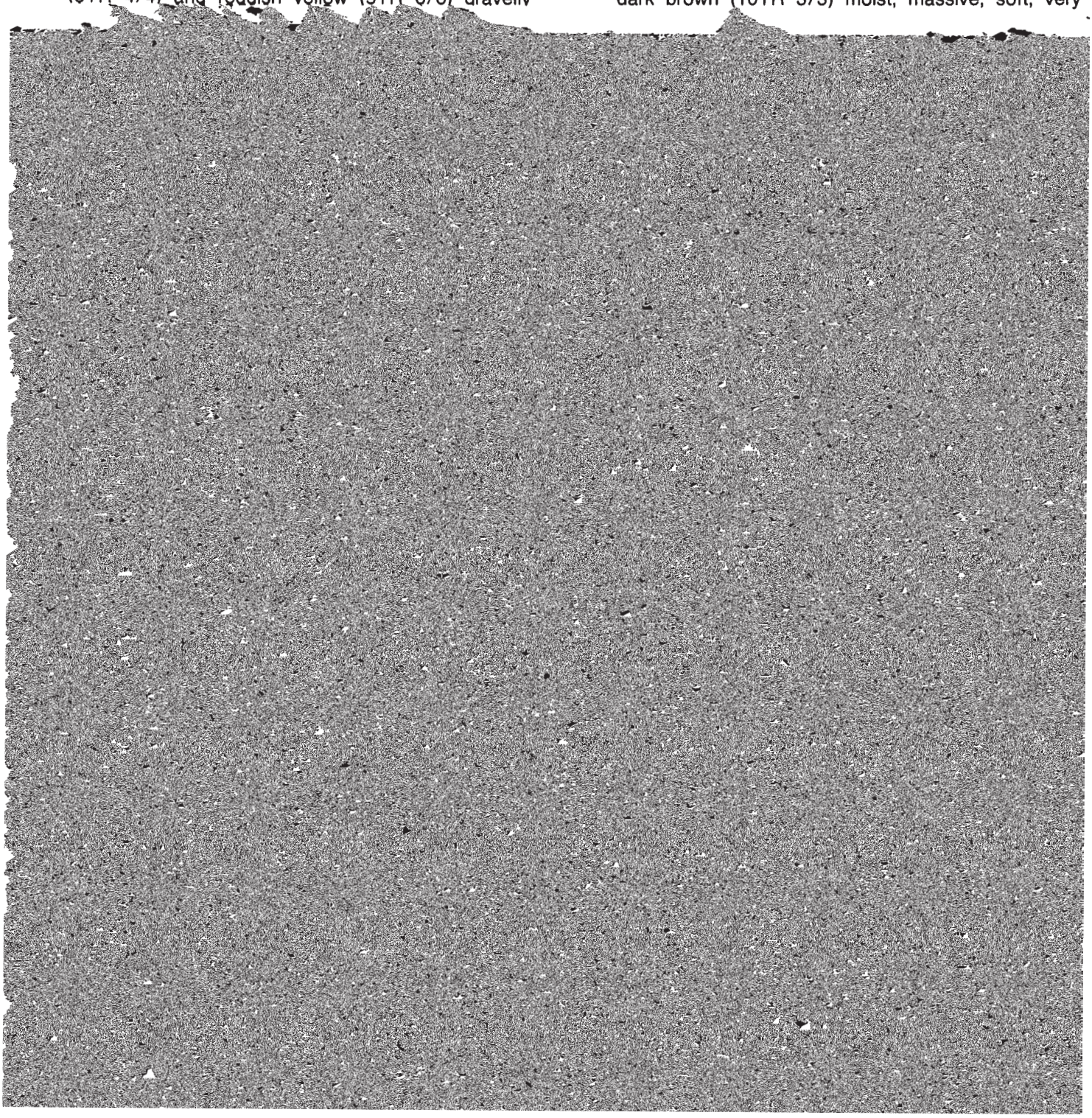
B21t—5 to 12 inches; reddish brown (5YR 4/4) gravelly clay, dark reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; very hard, friable, sticky and plastic; common very fine and few fine roots; common very fine interstitial and few very fine tubular pores; common moderately thick clay

moderately thick clay films on faces of peds; 35 percent fine and medium gravel; mildly alkaline; clear wavy boundary.

Cr—18 to 27 inches; reddish yellow (7.5YR 7/4) and white (N 8/) weathered granite and reddish brown (5YR 4/4) and reddish yellow (5YR 6/6) gravelly

nonplastic; many very fine and common fine roots; many very fine and common fine tubular pores; 15 percent fine gravel; very slightly effervescent; moderately alkaline; clear wavy boundary.

C2—19 to 28 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; massive; soft, very



and 200 feet east of NW corner sec. 15, T. 10 S., R. 26 E.:

A1—0 to 4 inches; brown (7.5YR 5/4) gravelly sandy loam, dark reddish brown (5YR 3/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine interstitial and many very fine tubular pores; 30 percent fine and medium gravel; slightly acid; abrupt wavy boundary.

B1t—4 to 9 inches; reddish brown (5YR 5/4) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine interstitial and many very fine and fine tubular pores; few thin clay films on faces of peds; 35 percent fine and medium gravel; neutral; abrupt wavy boundary.

B21t—9 to 22 inches; reddish brown (5YR 5/4) gravelly clay, reddish brown (5YR 4/4) moist; strong medium prismatic structure parting to strong angular blocky; hard and very hard, very firm, very sticky and very plastic; common very fine and fine roots; common

Thickness of the solum is 30 to 60 inches or more. Some pedons have a calcic horizon below a depth of 30 inches. Coarse fragment content ranges from 5 to 35 percent.

The A horizon is brown, light brown, or reddish brown. It is gravelly sandy loam or sandy loam. The B2t horizon is reddish brown or light reddish brown. It is gravelly clay or gravelly sandy clay or clay. The C horizon is dominantly gravelly sandy clay loam or gravelly fine sandy loam but ranges from clay loam to gravelly loamy sand.

Dona Ana series

The Dona Ana series consists of very deep, well drained soils that formed in alluvium from mixed sources. Dona Ana soils are on alluvial fans and terraces. Slope is dominantly 0 to 2 percent but, in places, ranges to 5 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 64 degrees F.

Dona Ana soils are similar to Tres Hermanos soils and are near Bucklebar and Sonoita soils. Tres Hermanos soils have less than 45 percent sand and more than 15

many very fine tubular pores; violently effervescent; 20 percent hard lime nodules; moderately alkaline; abrupt wavy boundary.

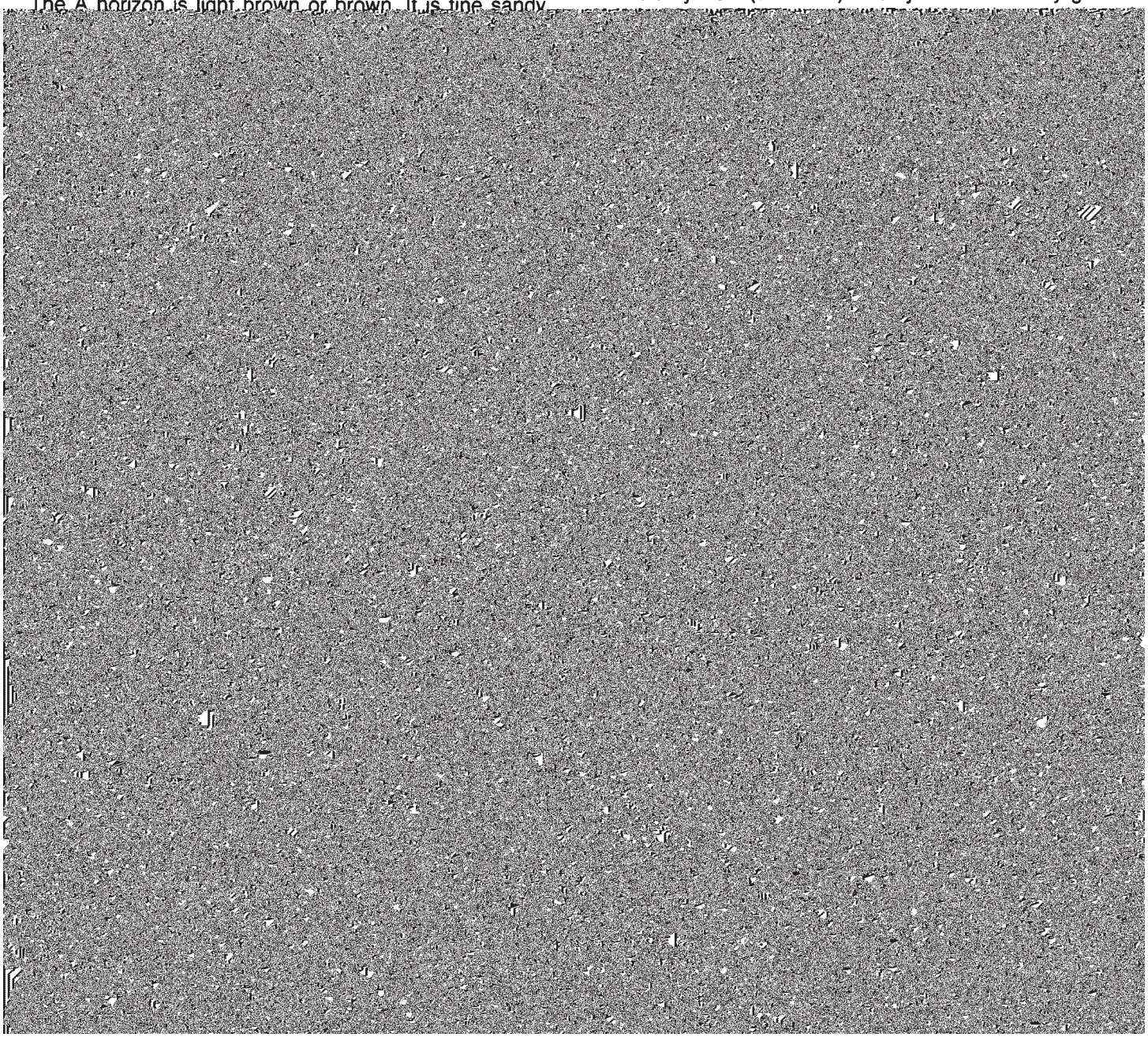
C2ca—37 to 60 inches; light brown (7.5YR 6/4) and pinkish gray (7.5YR 7/2) loam, dark brown (7.5YR 4/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; strongly effervescent; moderately alkaline.

Thickness of the solum is 16 to 30 inches. Depth to the calcic horizon is 12 to 30 inches.

The A horizon is light brown or brown. It is fine sandy

B22tca—25 to 33 inches; yellowish red (2.5YR 5/6) very gravelly clay, yellowish red (2.5YR 4/6) moist; moderate fine and medium angular blocky structure; hard, friable, sticky and plastic; few very fine roots; common fine tubular pores; 40 percent fine and medium gravel; many moderately thick clay films on faces of peds; slightly effervescent; few very fine pinkish white (5YR 8/2) lime filaments, pinkish gray (5YR 7/2) moist; moderately alkaline; abrupt wavy boundary.

Cca—33 to 56 inches; pinkish white (5YR 8/2) and reddish yellow (5YR 6/6) weakly cemented very gravel-



R—18 inches: light gray (10YR 7/1) rhyolite bedrock.

B22t—11 to 19 inches: reddish brown (5YR 4/4) gravelly

tured. Dona Ana and Tres Hermanos soils have a moderately fine textured argillic horizon. Hondale soils have a fine-textured natric horizon.

Typical pedon of Gila loam, in Graham County 0.1 mile north of Graham-Cochise county line road, 200 feet east and 400 feet north of SW corner sec. 36, T. 11 S., R. 29 E.:

A1—0 to 4 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium platy structure; slightly hard, friable, sticky and plastic; many very fine and common fine roots; many fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—4 to 18 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; massive; slightly hard, friable, sticky and plastic; many very fine and common fine roots; common very fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—18 to 60 inches; pale brown (10YR 6/3) loam with thin strata of fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable, sticky and plastic; many very fine and common fine roots; few very fine interstitial and common very fine tubular pores; stratified layers with worm casts; strongly effervescent; moderately alkaline.

These soils are stratified, and thickness and texture of the strata are variable. In some areas, reaction is strongly alkaline.

The A horizon is pale brown or brown. It is loam, very fine sandy loam, or fine sandy loam. The C horizon is silt loam to very fine sandy loam.

Glendale series

The Glendale series consists of very deep, well drained soils that formed in alluvium derived from mixed sources. Glendale soils are on flood plains and low terraces. Slope ranges from 0 to 1 percent. Average annual precipitation is about 9 inches, and average annual air temperature is about 65 degrees F.

Glendale soils are similar to Gila, Grabe, and Pima soils and are near Anthony and Gila soils. Gila soils have less than 18 percent clay in the control section. Grabe and Pima soils have value darker than 3.5 moist and 5.5 dry and chroma less than 2.5 moist. Anthony soils are moderately coarse textured.

Typical pedon of Glendale silty clay loam in an area of Glendale-Gila association, frequently flooded, in Graham County 2 miles east of the San Simon River, 2,600 feet west of NE corner sec. 30, T. 8 S., R. 28 E.:

A1—0 to 2 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak thin and medium platy structure; slightly hard, very friable, sticky and plastic; common very fine and many fine roots; many very fine interstitial and few very fine vesicular pores; strongly effervescent; moderately alkaline; abrupt wavy boundary.

C1—2 to 18 inches; pale brown (10YR 6/3) silty clay loam with thin strata of silt loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, sticky and plastic; many very fine and common fine roots; many very fine and common fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—18 to 33 inches; very pale brown (10YR 7/3) light silty clay loam, brown (10YR 5/3) moist; massive; slightly hard, friable, sticky and plastic; many very fine and few fine roots; many very fine and common fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C3—33 to 43 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; massive; slightly hard, friable, sticky and plastic; common very fine and few fine roots; many very fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C4—43 to 60 inches; very pale brown (10YR 7/3) heavy silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, sticky and plastic; common very fine roots; many very fine tubular pores; strongly effervescent; moderately alkaline.

These soils are stratified with finer and coarser textured materials. In some areas, reaction is strongly alkaline.

The A horizon is pale brown or brown. It is dominantly silty clay loam. The C horizon is pale brown and very pale brown. It is silty clay loam and silt loam.

Gothard series

The Gothard series consists of very deep, moderately well drained soils that formed in old lake deposits and alluvium from mixed sources. Slope is dominantly 0 to 1 percent but, in places, ranges to 2 percent. Average annual precipitation is about 9 inches, and average annual air temperature is 65 degrees F.

Gothard soils are similar to Hondale soils and are near Bluepoint, Glendale, and Hondale soils. Bluepoint soils have a sandy control section and do not have an argillic horizon. Glendale soils do not have an argillic horizon. Hondale soils have a fine control section.

Typical pedon of Gothard fine sandy loam in an area of Bluepoint-Gothard complex, in Graham County about 13 miles northeast of Bowie, 50 feet south and 50 feet east of NW corner sec. 25, T. 11 S., R. 29 E.:

A2—0 to 2 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; weak medium platy structure; soft, very friable, nonsticky and non-

plastic; many very fine roots; few fine interstitial and many fine tubular pores; very slightly effervescent; moderately alkaline; abrupt wavy boundary.

B21tsa—2 to 10 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, sticky and plastic; many very fine and common fine roots; few fine interstitial and many fine tubular pores; common thin clay films on faces of peds; slightly effervescent; few fine pinkish white (7.5YR 8/2) soft lime masses; very strongly alkaline; clear wavy boundary.

about 11 inches, and average annual air temperature is about 64 degrees F.

Grabe soils are similar to Gila and Comoro soils and are near Pima, Comoro, Dona Ana, and Eba soils. Gila soils have less than 1 percent organic matter in the upper horizons. Comoro soils have a sandy loam control section. Pima soils are fine-loamy. Dona Ana soils have a fine-loamy B2t horizon. Eba soils have a fine-textured B2t horizon and have more than 35 percent coarse fragments in the control section.

Typical pedon of Grabe silt loam in an area of Pima-Grabe association, in Cochise County, about 2.5 miles

Graham series

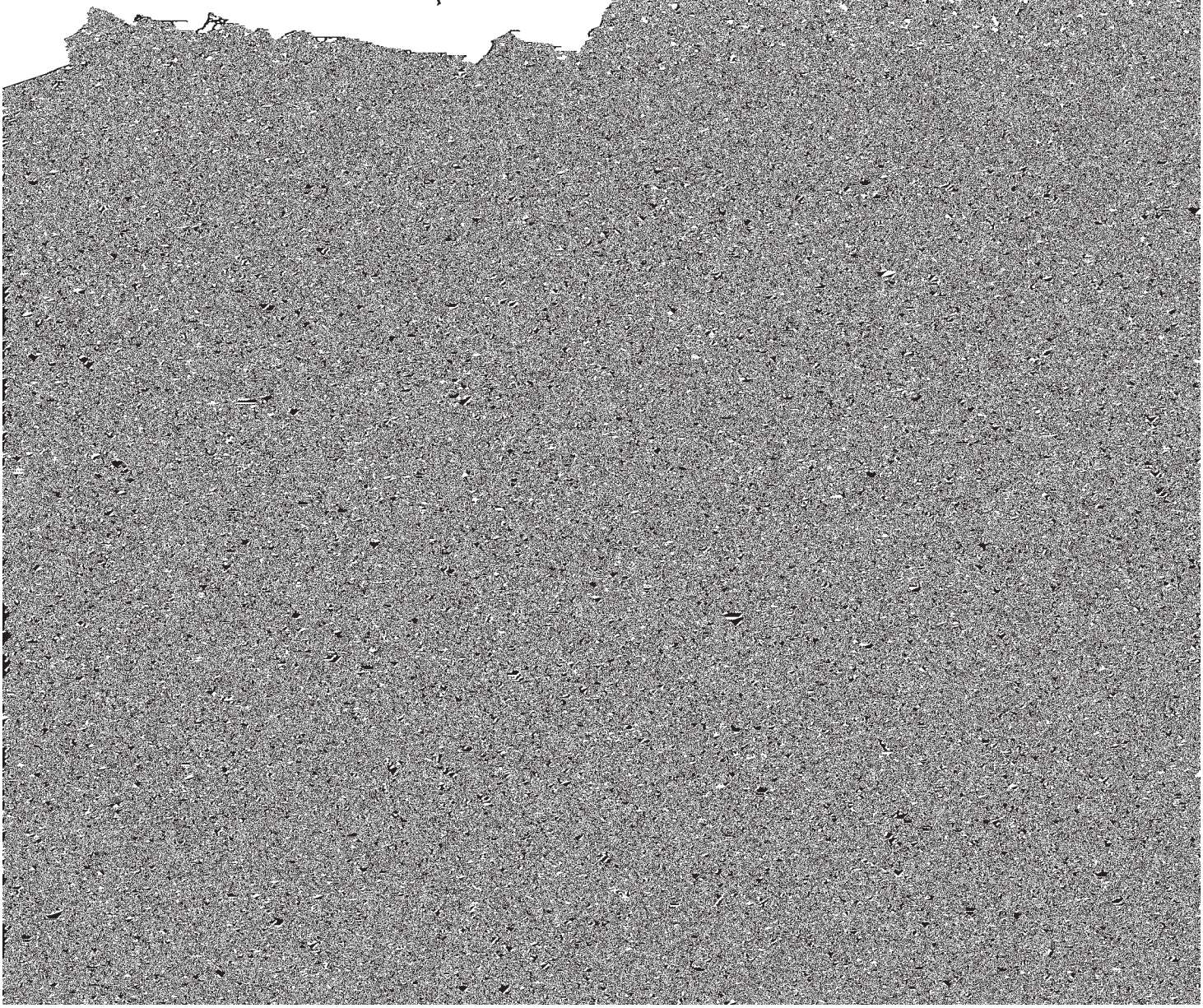
The Graham series consists of shallow, well drained soils that formed in residuum weathered from basalt. Graham soils are on hills and mountains. Slope is dominantly 15 to 30 percent but, in places, ranges to 60 percent. Average annual precipitation is about 13 inches, and average annual air temperature is 61 degrees F.

Graham soils are similar to Atascosa soils and are near Cave, Eba, and Atascosa soils. Cave soils have a lime-cemented pan at a shallow depth. Eba and Atascosa soils have more than 35 percent coarse fragments in the control section, and Eba soils are very deep.

Guest series

The Guest series consists of very deep, well drained soils that formed in alluvium derived from mixed sources. Guest soils are on flood plains, alluvial fans, and low terraces. Slope is 0 to 1 percent but, in places, ranges to 2 percent. Average annual precipitation is about 8 to 12 inches, and average annual air temperature is 63 to 64 degrees F.

Guest soils are similar to Hantz, Tubac, White House, Vekol, and Pima soils. Hantz soils have value lighter than 3.5, moist, and 5.5, dry, and chroma less than 3.5, moist. Pima soils have a fine-silty control section. Hondale soils have a fine-textured argillic horizon. Tubac, White House,



In some areas, gypsum crystals are in the lower part of the C horizon.

The A horizon is dark grayish brown or brown. It is silty clay, clay, or silty clay loam. The C horizon is dark grayish brown and brown or reddish brown. It is clay, silty clay, and clay loam.

Hantz series

The Hantz series consists of very deep, well drained soils that formed in alluvium from mixed sources. Hantz soils are on alluvial fans, flood plains, and low terraces. Slope ranges from 0 to 2 percent. Average annual precipitation is about 10 to 13 inches, and average annual air temperature is about 63 degrees F.

Hantz soils are similar to Gila, Glendale, and Guest soils and are near Glendale, Bonita, and Tres Hermanos soils. Gila soils are in the coarse-loamy family, and Glendale soils are in the fine-silty family. Bonita soils are montmorillonitic. Tres Hermanos soils have an argillic horizon. Guest soils have darker colors in the profile.

Typical pedon of Hantz silt loam in an area of Guest and Hantz soils, in Graham County about 4 miles south of Hackberry ranch headquarters, 800 feet west and 1,800 feet south of NE corner sec. 1, T. 10 S., R. 29 E.:

IIC2cab—41 to 60 inches; pinkish gray (7.5YR 7/2) gravelly silt loam, light brown (7.5YR 6/4) moist; massive; hard, very friable, slightly sticky and slightly plastic; few fine roots; few very fine tubular and interstitial pores; 30 percent fine gravel; violently effervescent; moderately alkaline.

These soils are stratified with coarser textured materials. In some places, a buried horizon is not present.

The A horizon is light brown or pale brown. It is silt loam, silty clay loam, or silty clay. The C1 horizon is light reddish brown silty clay or clay. The buried horizon, if present, is reddish brown clay to gravelly silt loam.

Hondale series

The Hondale series consists of very deep, well drained soils that formed in alluvium derived from mixed sources. Hondale soils are on alluvial fans and terraces. Slope ranges from 0 to 3 percent. Average annual precipitation is about 8 to 10 inches, and average annual air temperature is 64 degrees F.

Hondale soils are similar to Gothard soils and are near Glendale, Guest, Pima, and Vekol soils. Gothard soils have a fine-loamy control section. Guest and Vekol soils do not have a natric horizon. Glendale and Pima soils do

angular blocky; very hard and hard, firm, sticky and plastic; many very fine roots; many very fine tubular pores; few thin clay films on faces of peds; strongly effervescent; very strongly alkaline; clear wavy boundary.

B3tca—26 to 35 inches; brown (7.5YR 5/4) silty clay loam, brown (7.5YR 5/4) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots; common very fine and fine tubular pores; few thin clay films on faces of peds; strongly effervescent; few fine pinkish white (7.5YR 8/2) soft lime masses, pinkish gray (7.5YR 7/2) moist; strongly alkaline; abrupt wavy boundary.

Ccacs—35 to 60 inches; pinkish gray (7.5YR 7/2) silty clay loam, pinkish gray (7.5YR 6/2) moist; massive; hard, firm, sticky and plastic; few very fine roots; many very fine interstitial and common fine tubular pores; violently effervescent; common fine pinkish white (7.5YR 8/2) soft lime masses; few fine gypsum crystals; moderately alkaline.

Thickness of the solum is 20 to 40 inches. These soils are saline in some areas. Reaction is moderately alkaline to very strongly alkaline.

The A horizon is pale brown and brown. It is loam, silt loam, fine sandy loam, or silty clay loam. The B2t horizon is light brown and brown. It is silty clay loam and [illegible]

A12—3 to 14 inches; brown (7.5YR 5/2) gravelly loam, dark brown (7.5YR 3/2) moist; massive; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; 25 percent gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

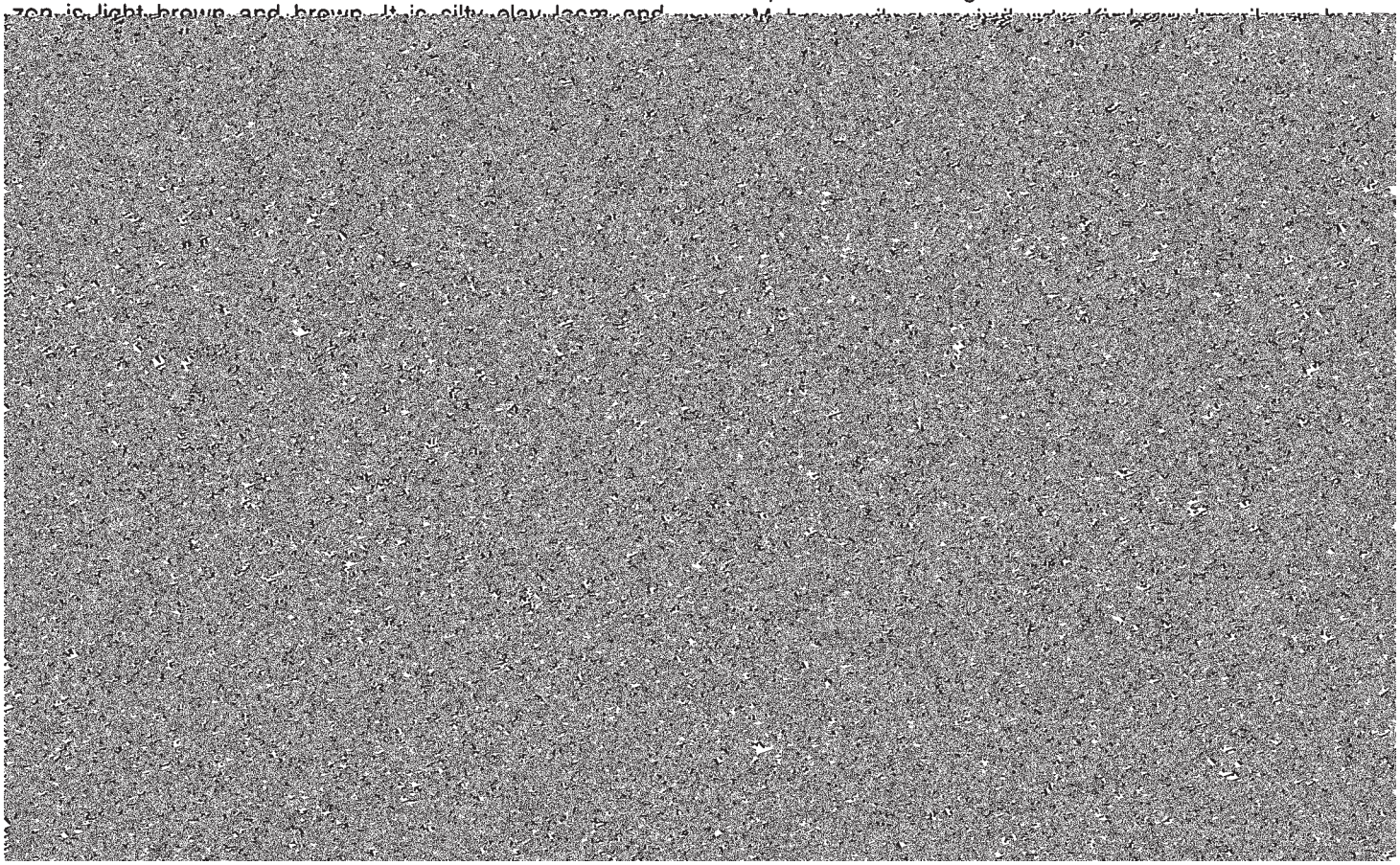
Ccam—14 to 16 inches; white (5YR 8/1) indurated pan with 1/4- to 1/2-inch laminar cap, pinkish gray (5YR 7/2) moist; massive; extremely hard, extremely firm, nonsticky and nonplastic; 25 percent gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

Depth to the indurated pan ranges from 4 to 20 inches, and the pan may be fractured or continuous.

The A horizon is brown or dark grayish brown. It is gravelly fine sandy loam and gravelly loam.

Mabray series

The Mabray series consists of shallow, well drained soils that formed in residuum from limestone and marble. Mabray soils are on gently rolling ridges to very steep hills. Slope ranges from 15 to 45 percent. Average annual precipitation is 14 inches, and average annual air temperature is 62 degrees F.



Depth to bedrock ranges from 4 to 20 inches. Coarse fragments make up 35 to 85 percent of the control section. Reaction is moderately alkaline.

The A horizon is brown and grayish brown. It is very gravelly loam or very cobbly loam.

R—30 inches; yellowish brown (10YR 5/6) and light gray (10YR 7/2) granite bedrock; extremely hard.

Thickness of the solum ranges from 26 to 33 inches. Depth to bedrock is 30 to 40 inches. The mollic epipedon is 10 to 19 inches thick. Reaction is neutral to

These soils are stratified with coarser textured materi[illegible] [illegible]atitial pores; few thin clay films on faces of peds;

structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; 60 percent fine, medium, and coarse gravel and 15 percent cobbles; moderately alkaline; clear wavy boundary.

C—36 to 60 inches; grayish brown (10YR 5/2) very gravelly fine sandy loam, dark brown (10YR 3/3) moist; massive; soft, friable, nonsticky and nonplastic; many very fine and common fine and medium roots; many very fine and fine interstitial pores; 50 percent fine and medium gravel and 20 percent cobbles; moderately alkaline.

These soils are stratified with finer and coarser textured materials and are calcareous in some areas. The dark colored surface layer is more than 20 inches thick. Coarse fragments consist of cobbles and gravel in varying amounts and some stones.

The A horizon is grayish brown, brown, and dark grayish brown. It is cobbly fine sandy loam, gravelly loam, and very gravelly fine sandy loam. The C horizon is very gravelly fine sandy loam or gravelly loam.

Signal series

The Signal series consists of very deep, well drained soils that formed in alluvium mainly from igneous rock. Signal soils are on dissected alluvial fans and valley slopes. Slope is dominantly 4 to 15 percent but ranges from 2 to 30 percent. Average annual precipitation is about 14 inches, and average annual air temperature is 62 degrees F.

Signal soils are similar to Tubac and White House soils and are near Comoro, Grabe, Pima, Tubac, and White House soils. All of these soils, except Signal soils, do not have a mollic epipedon. Comoro and Grabe soils have a coarse-loamy control section. Pima soils have a fine-silty control section.

Typical pedon of Signal gravelly loam, in Graham County 2.5 miles west of U.S. Highway 666, 800 feet east and 2,600 feet north of SW corner sec. 33, T. 11 S., R. 26 E.:

A1—0 to 2 inches; dark grayish brown (10YR 4/2) gravelly loam, dark brown (7.5YR 3/2) moist; weak medium platy structure; slightly hard, friable, sticky and slightly plastic; many very fine and few medium roots; many very fine interstitial and few very fine tubular pores; 40 percent fine and medium gravel; medium acid; abrupt wavy boundary.

B21t—2 to 7 inches; dark brown (7.5YR 3/2) very gravelly clay loam, dark reddish brown (5YR 2/2) moist; weak very fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots;

B22t—7 to 13 inches; reddish brown (5YR 4/3) very gravelly clay, dark reddish brown (5YR 3/3) moist; moderate fine and very fine subangular blocky structure; very hard, friable, sticky and very plastic; many very fine roots; many very fine interstitial and few very fine tubular pores; 45 percent gravel and 5 percent cobbles; common moderately thick clay films on faces of peds; mildly alkaline; clear wavy boundary.

B23t—13 to 22 inches; reddish brown (5YR 4/4) very gravelly clay, dark reddish brown (5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; common very fine roots; many very fine interstitial pores; 40 percent gravel; common moderately thick clay films on faces of peds; mildly alkaline; abrupt wavy boundary.

B3tca—22 to 32 inches; reddish brown (5YR 5/4) very gravelly sandy clay, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; many very fine interstitial pores; common thin clay films on faces of peds; 60 percent fine gravel, slightly effervescent; few fine white (5YR 8/1) soft lime masses; moderately alkaline; abrupt wavy boundary.

IIC1ca—32 to 42 inches; brown (7.5YR 5/4) and pink (7.5YR 7/4) very gravelly sandy loam, brown (7.5YR 5/4) moist; massive; very hard, friable, nonsticky and nonplastic; few very fine tubular pores; 50 percent fine gravel; strongly effervescent; moderately alkaline; abrupt wavy boundary.

IIC2—42 to 60 inches; strong brown (7.5YR 5/6) very gravelly loamy sand, dark brown (7.5YR 4/4) moist; massive; hard, friable, nonsticky and nonplastic; few very fine tubular pores; 50 percent fine gravel; moderately alkaline.

Thickness of the solum is 15 to 36 inches. Thickness of the mollic epipedon is 12 inches or more. Coarse fragment content averages more than 35 percent.

The A horizon is dark grayish brown or brown. It is gravelly loam or cobbly loam. The B2t horizon is dark brown and reddish brown. It is very gravelly clay loam, very gravelly clay, and very gravelly sandy clay. The C1 horizon has a zone of lime accumulation and is weakly cemented in places.

Sonoita series

The Sonoita series consists of very deep, well drained soils that formed in alluvium derived from acid igneous rock. Sonoita soils are on alluvial fans and valley slopes. Slope ranges from 0 to 5 percent. Average annual pre-

Pima, Tres Hermanos, Tubac, Bucklebar, and Dona Ana

ly effervescent; common fine pink (5YR 7/3) lime

few very fine lime filaments; moderately alkaline; abrupt wavy boundary.

C1ca—19 to 25 inches; pink (5YR 8/3) and light reddish brown (5YR 6/3) gravelly loam, light reddish brown (5YR 6/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; 30 percent fine lime-coated gravel; violently effervescent; strongly alkaline; clear

B21t—6 to 13 inches; reddish brown (5YR 4/4) clay, reddish brown (5YR 4/3) moist; moderate fine prismatic structure parting to strong fine and medium angular blocky; hard and very hard, firm, sticky and very plastic; common very fine and fine roots; few very fine tubular and interstitial pores; many moderately thick clay films on faces of peds; nonefferves-cent; moderately alkaline; clear smooth boundary.

B22t—13 to 25 inches; reddish brown (5YR 4/4) clay,

House soils have more than 1 percent organic matter to [illegible] percent but, in places, ranges to 20 percent. Average

subangular blocky structure; hard, friable, sticky and plastic; many very fine interstitial pores; few fine pinkish white (5YR 8/2) lime masses, pink (5YR 7/4) moist; 35 percent fine and medium gravel; few thin clay films on faces of peds; slightly effervescent; moderately alkaline.

Thickness of the solum is 40 inches or more. Coarse fragment content ranges from a trace to 35 percent.

strongly influenced by materials derived from limestone. The Gothard and the Hondale soils formed in highly mixed materials. They contain evidence of the influence of poor drainage, probably reflecting the time when the lake was present in the area.

Climate

Because of the changes from Pleistocene to the pres-

a lush growth of vegetation. This brings about an accumulation of organic matter, thus creating soils that have a dark colored surface layer. Pima, Grabe, Comoro, and Santo Tomas soils are examples of these soils. Soils that are on uplands on fans lose some of the precipitation through runoff. Vegetation is less dense and is made up of desert shrubs and grasses. Less plant residue is produced, and decomposition is rapid. Soils under these conditions have a light colored surface layer. Anthony, Bucklebar, Continental, Sonoita, Tres Hermanos, Tubac, and Vekol soils are examples of soils under these conditions.

Precipitation is sufficient on the foothills and mountains to produce enough vegetation and organic matter to make a dark colored surface layer. Such soils as Atascosa, Chiricahua, Faraway, Graham, Kimbrough, Mabray, Mokiak, Signal, and White House are examples of this.

Small animals, earthworms, insects, and micro-organisms also influence the formation of soils. They mix organic matter into the soil and help break down the remains of plants. Rodents burrowing into the soil tend to mix the layers. Earthworms and other invertebrata feed on the organic matter in the upper few inches of the soil, especially in the dark colored soils. Bacteria, fungi, algae, actiomycetes, and other micro-organisms help decompose plant remains and hasten the weathering of rock. Also, the remains of the fauna tend to add to the organic-matter content of the soil.

Relief

Relief, through its effect on drainage, erosion, and sedimentation, has influenced soil formation in the survey area. Soils are finer textured along the axis of valley areas. Salts have accumulated in some soils, and in some soils carbonates are high. Also in these areas are soils that are subject to frequent flooding. Vegetation is lush where the soils are flooded. Where soils are saline and alkali, only plants that are tolerant of a high salt content or alkali condition exist.

On the fans and in slightly higher areas, the soils have

locating clay. Soil properties change only slowly with time under the present climatic regime. The great differences in the properties of the Tubac and Glendale soils would require great differences in time, if time alone were the difference. A combination of time and climate, however, could account for these differences. Tubac soils are assumed to have formed in pluvial periods of Wisconsin and Illinoian ages. Glendale soils, however, formed under the present climatic regime.

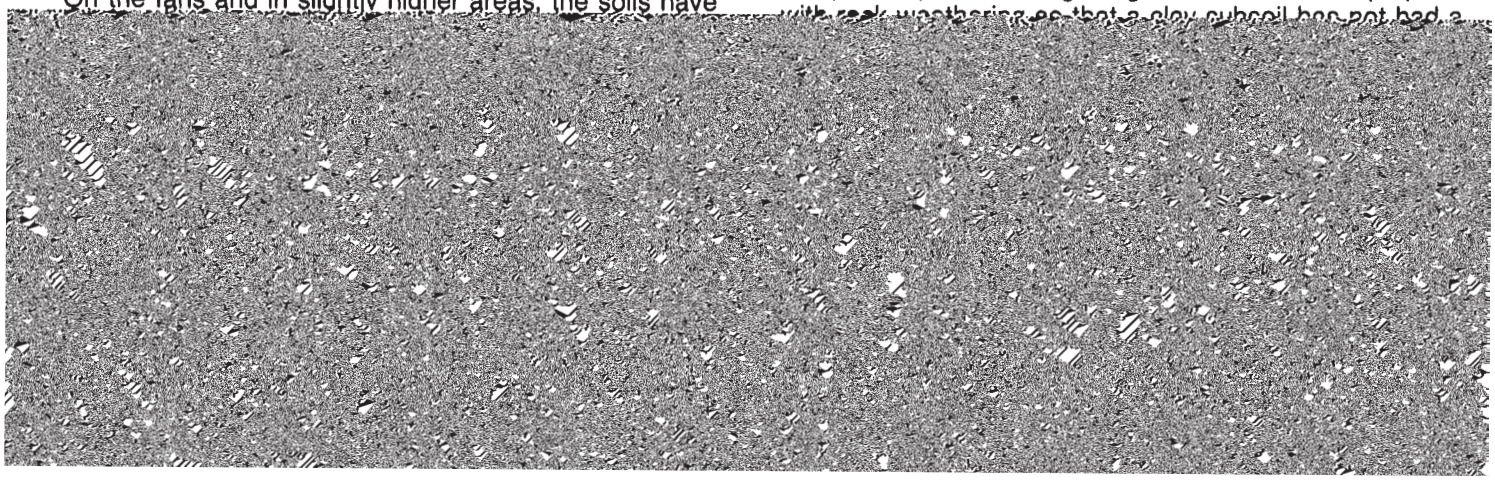
Morphology

Such soils as the Gothard and Hondale soils and Calciorthids and Torriorthents formed in lakelaid materials that probably were deposited at about the same time as the Lake Cochise deposits. Subsequent entrenchment and drainage and the overwash of sediment from neighboring mountains obscured this lake, leaving only the lacustrine deposit as evidence. The Bluepoint soils to the east of this lake area probably represent beach sands that have been moved to their present position by the prevailing winds.

Well developed soils are on the higher parts of the fans. These soils apparently formed during the pluvial period that produced the lake. The Signal, Eba, White House, Tubac, and Continental soils are good examples of such soils.

Intermediate on the fan slopes and in the fan materials that were laid in over the lakelaid sediments are such soils as the Anthony, Sonoita, Comoro, Pima, Grabe, Gila, and Glendale soils. These soils have only slight profile development and probably represent soils that formed since the last pluvial period under a climate regime much like the present one.

On the foothills and mountains are soils that show various stages of development. Most of these soils are shallow or very shallow. Some have a clay subsoil. Most of the soils that have a clay subsoil are old soils that probably formed during the last pluvial period. Shallow soils that do not have a clay subsoil are generally on the steeper slopes. Here, geologic removal has kept pace with rock weathering so that a clay subsoil has not had a



tains and runoff from summer showers in the mountains infiltrate the soils high on the fan. Moisture penetrates only to the top of the B horizon of the buried, developed soil and, then moves laterally down the fan slope toward the playa. Since the buried B horizon is essentially on the level, it eventually emerges to the surface and blends with the B horizon of the overlying profile. The perched water table has gleyed the B horizon of the overlying soil, thus producing the Pridham soils.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

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.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

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.

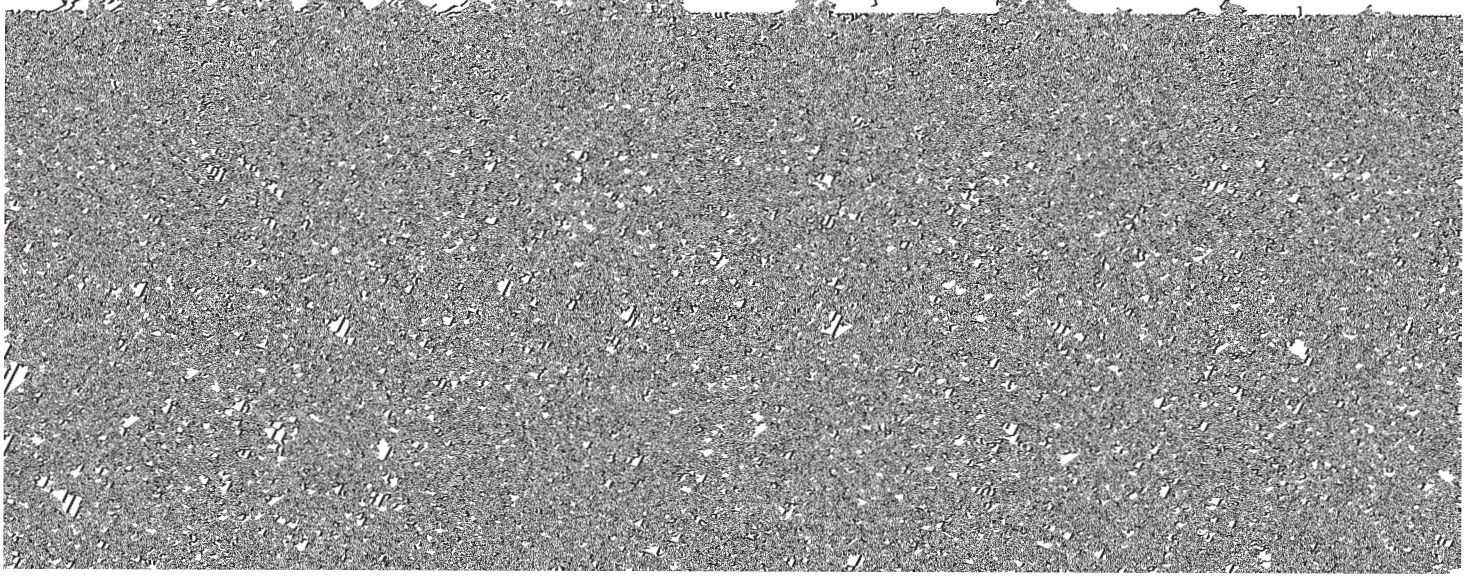
Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle 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



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 for 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

Erosion. The wearing away of the land surface by running 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 a bare surface.

Excess sodium. Excess exchangeable sodium. The resulting poor physical properties restrict the growth of plants.

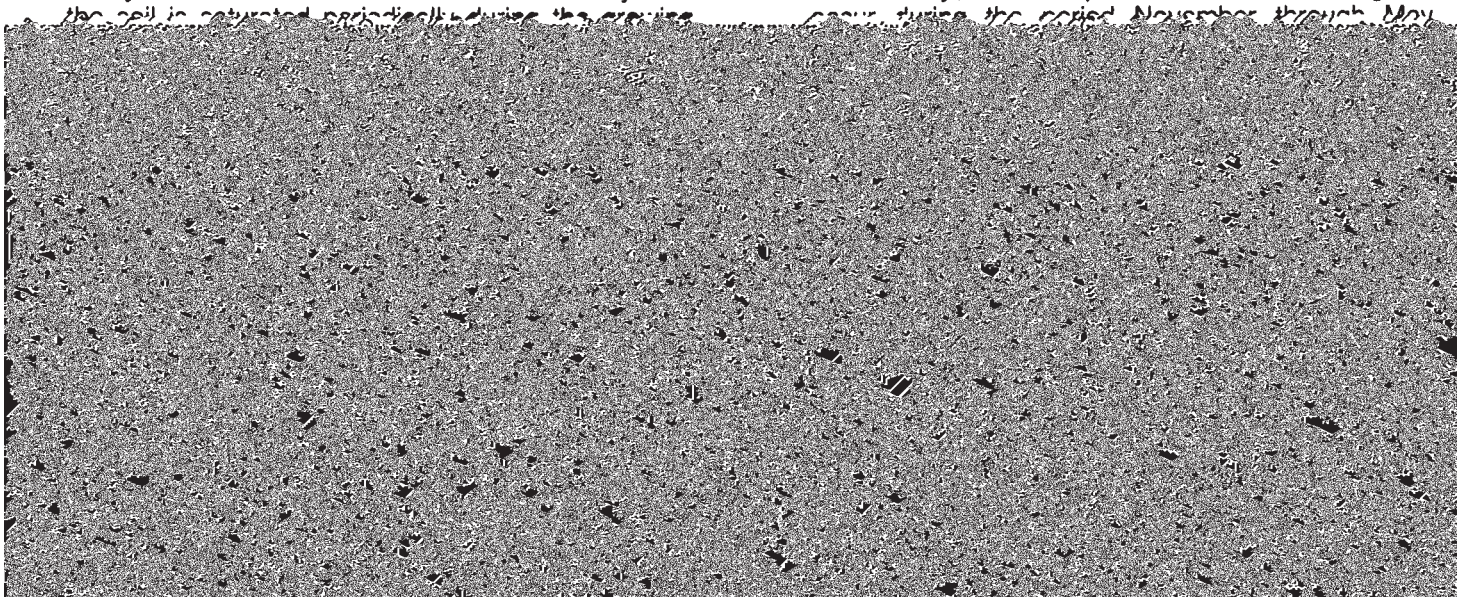
Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Excess salts. Excess water soluble salts. Excessive salts restrict the growth of most plants.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. 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 an average of once or less in 2 years; and *frequent* that it occurs on an average of 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; *November-May*, for example, means that flooding can occur during the period November through May.



material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

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 A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum, the

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

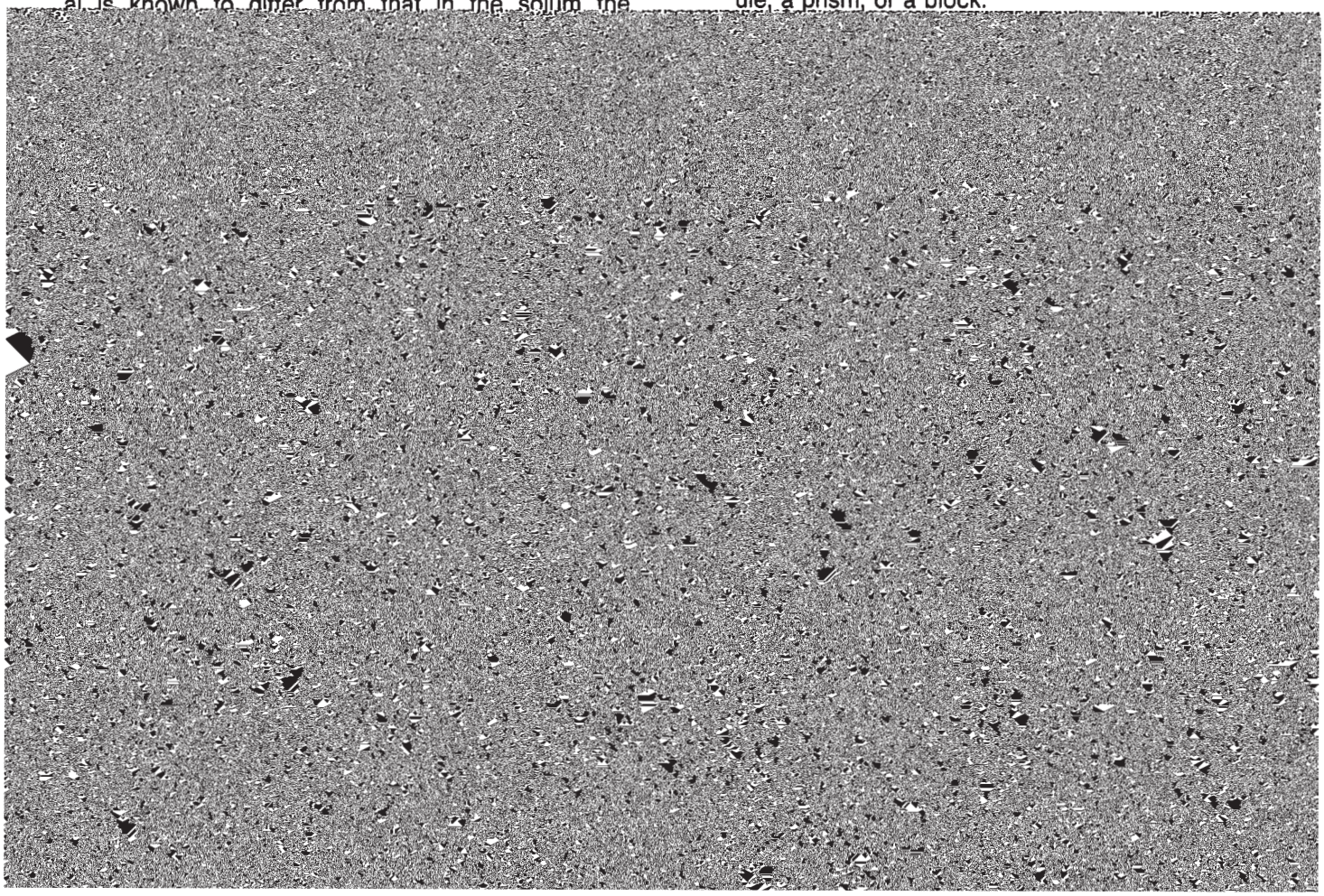
Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. Inadequate strength for supporting loads.

Munsell notation. A designation of color by degrees of the three single 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.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.



Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Rooting depth, observed. The depth to which the majority of the plant roots penetrate the soil; i.e., that depth where the number of roots observed changes from many or common to few.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters 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.

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.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

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.

and animal life characteristics of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining 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).

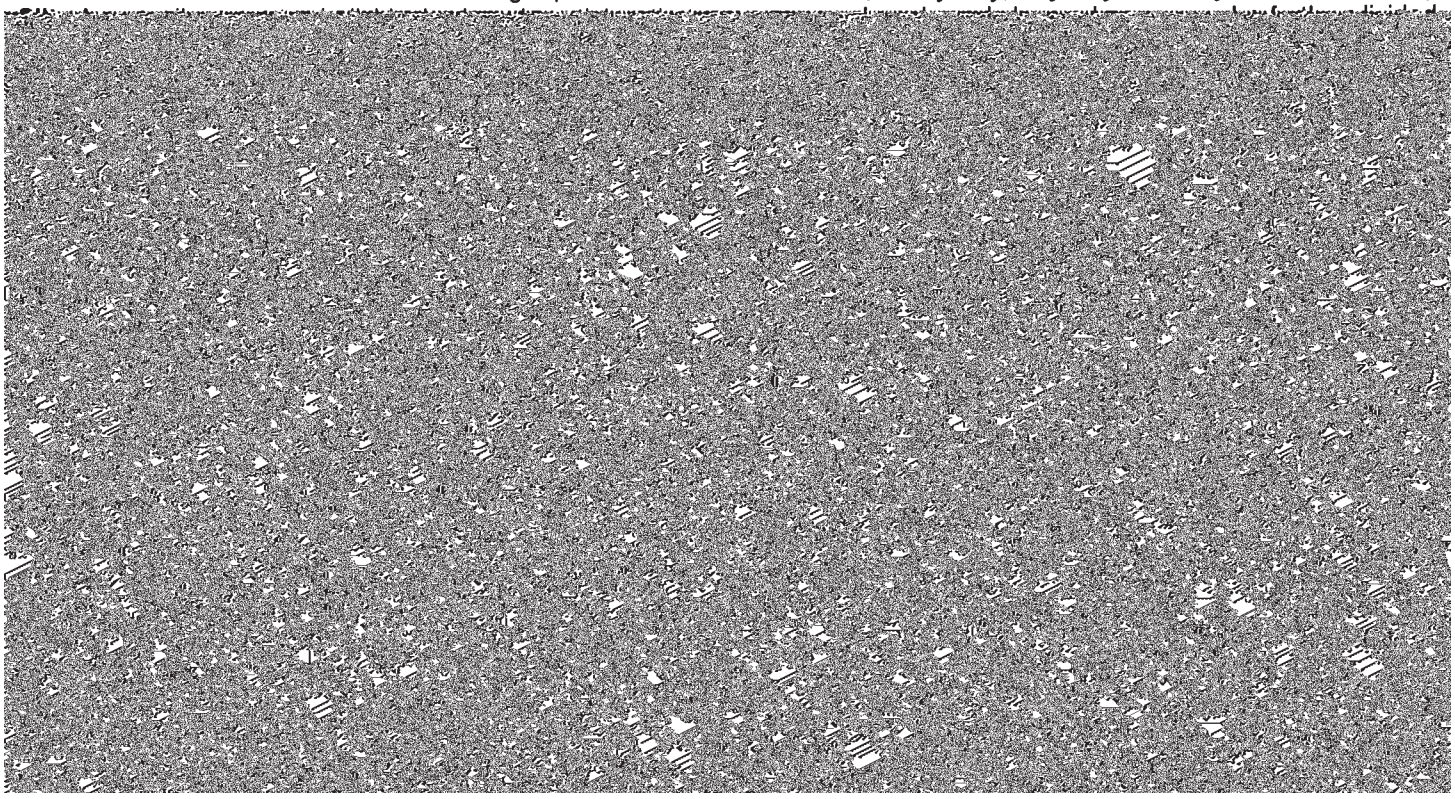
Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

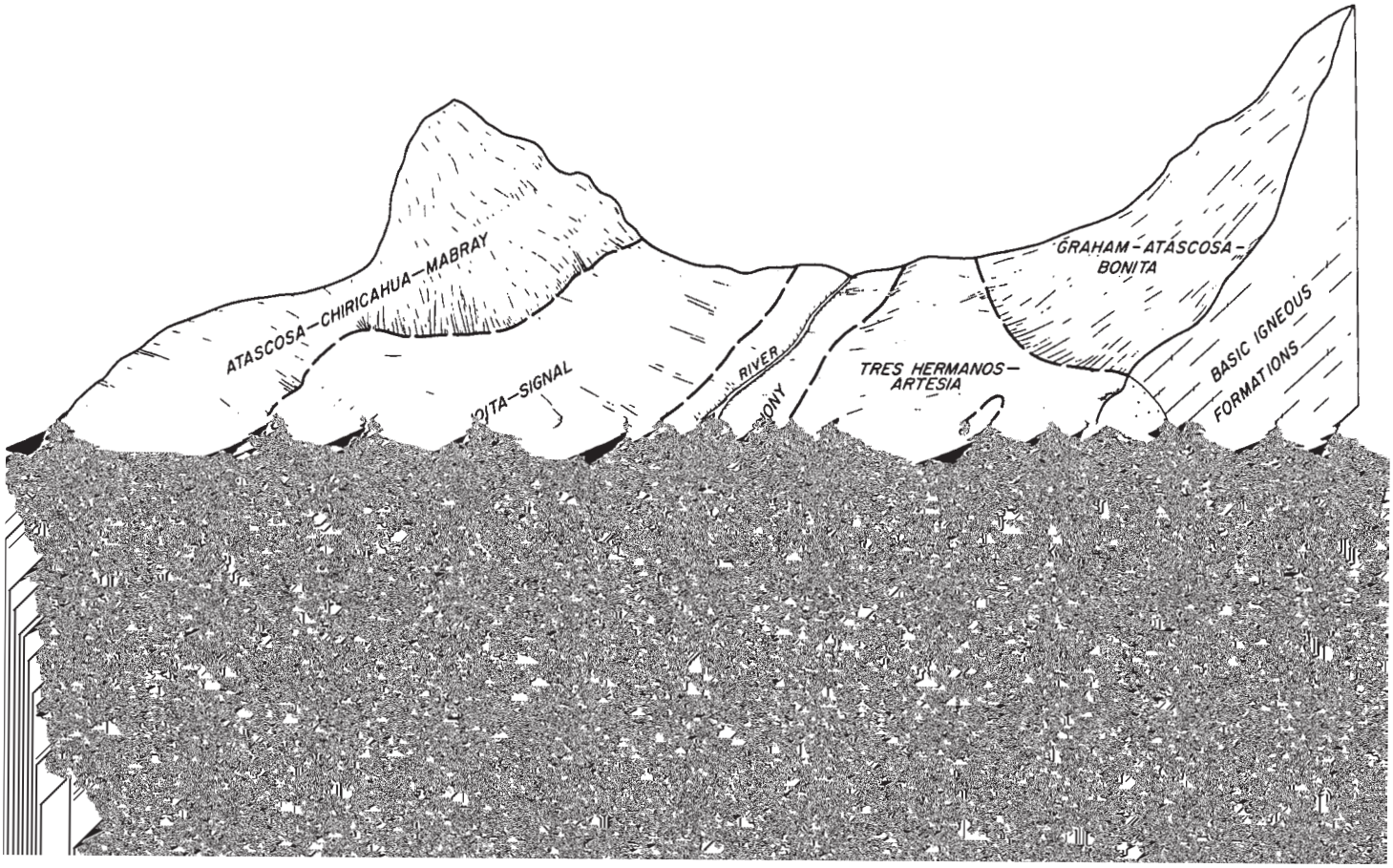
Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

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, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy



ILLUSTRATIONS


ATASCOSA—CHIRICAHUA—MABRAY
ITA—SIGNAL
RIVER
ONY
TRES HERMANOS—
ARTESIA
GRAHAM—ATASCOSA—
BONITA
BASIC IGNEOUS
FORMATIONS

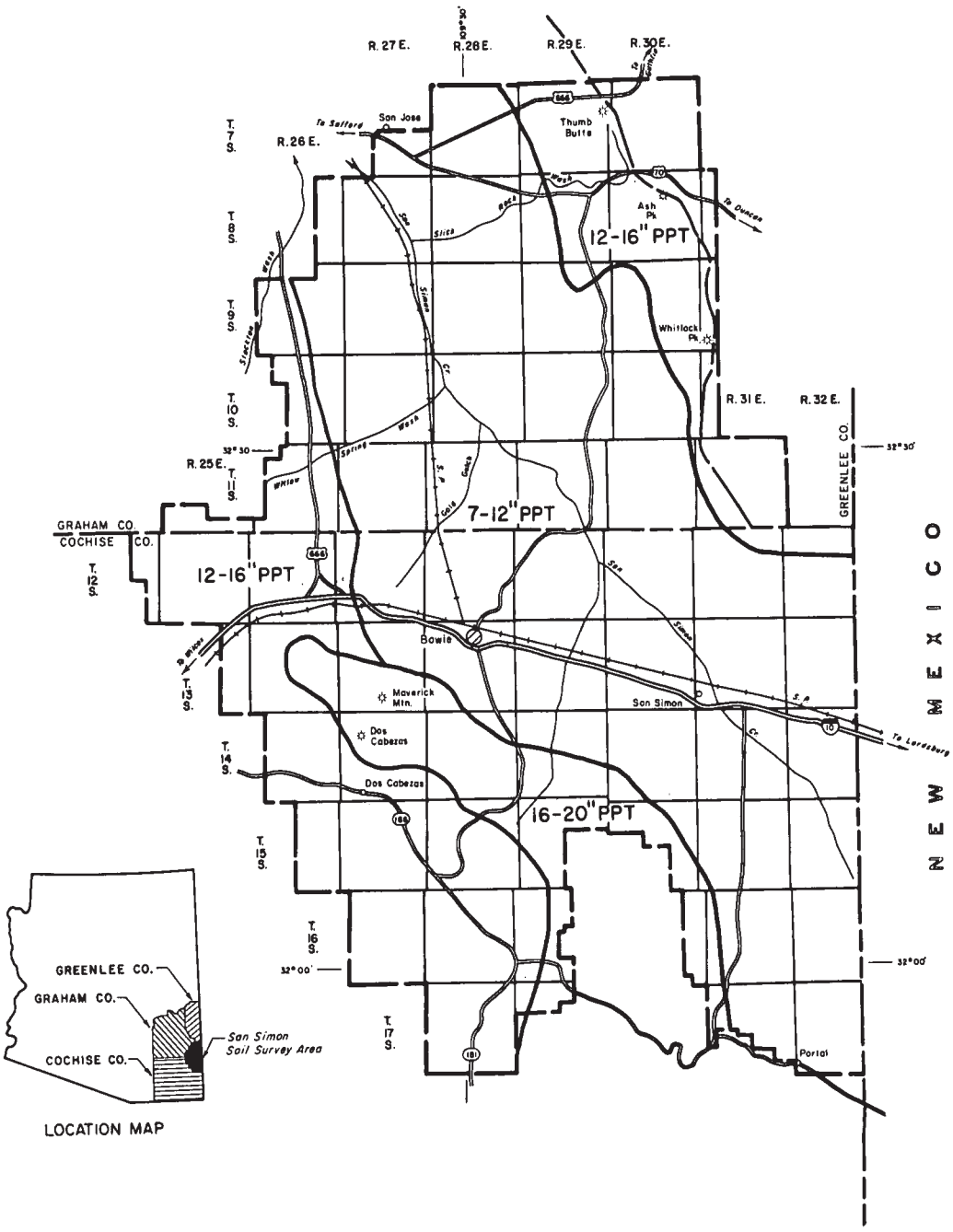


Figure 2.—Precipitation zones in the soil survey area.

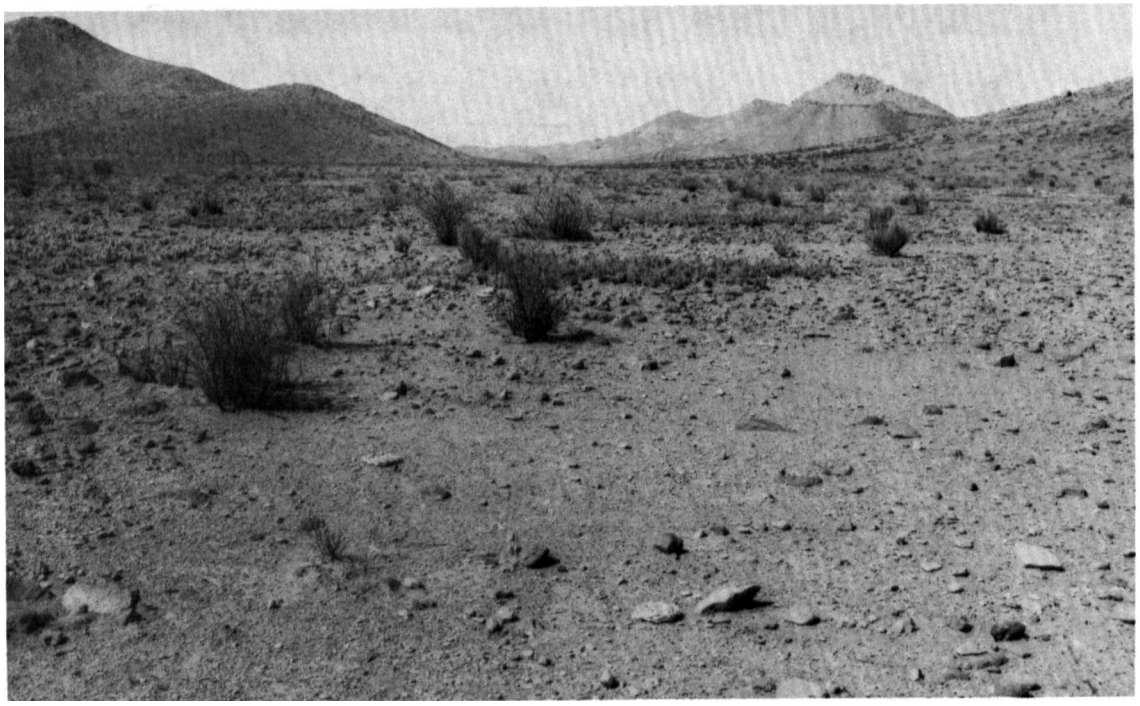


Figure 3.—An area of Artesia cobbly fine sandy loam in foreground. Graham-Rock outcrop complex is on hills in background.

Figure 4.—An area of Bluepoint-Gothard complex. Bluepoint loamy sand is on dunes, and Gothard fine sandy loam is in level areas.

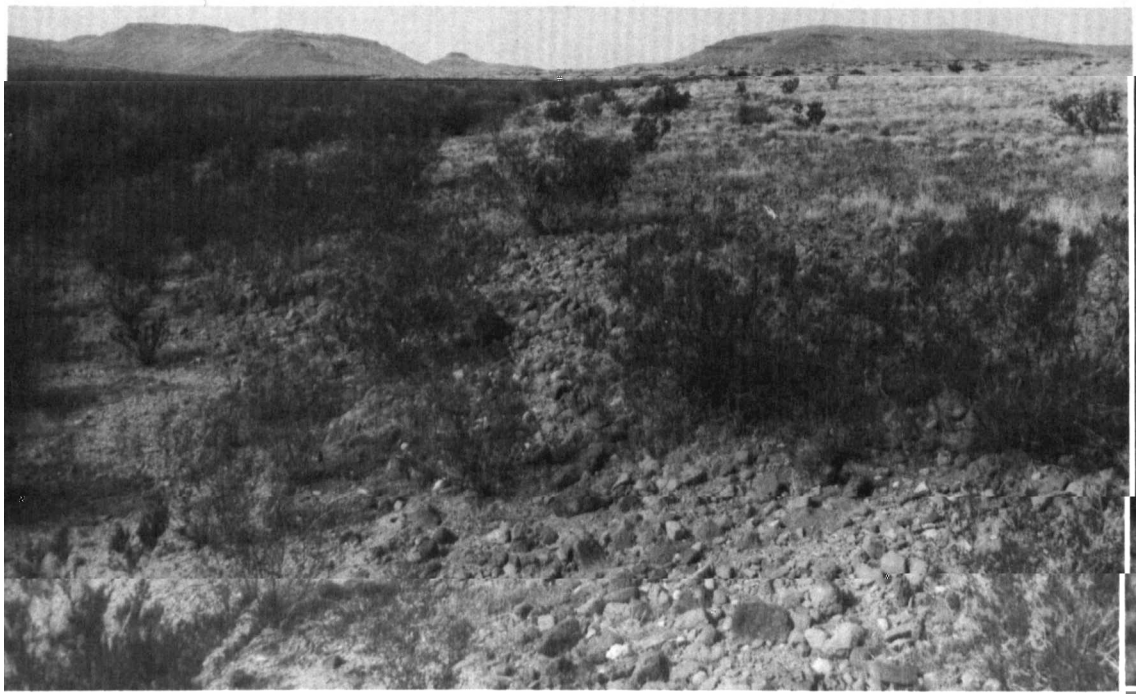


Figure 5.—Bonita cobbly silty clay under grass cover on the right and Cave-Durorthids complex under creosotebush cover on the left.

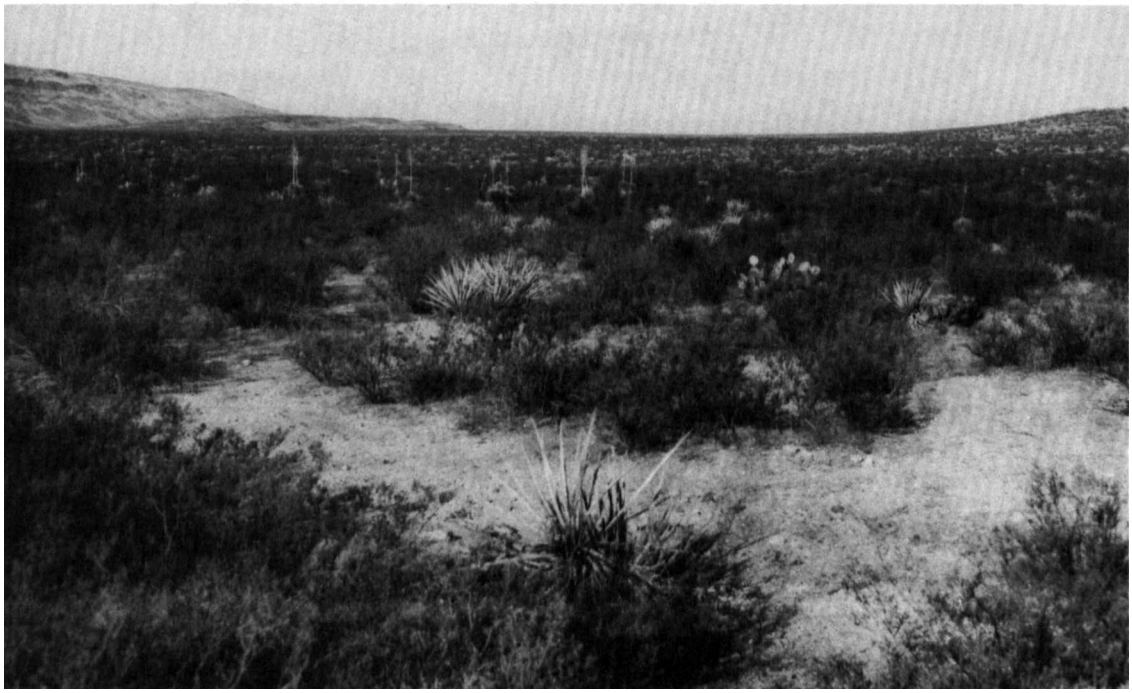


Figure 6.—An area of Cave-Durorthids complex under typical ground cover.

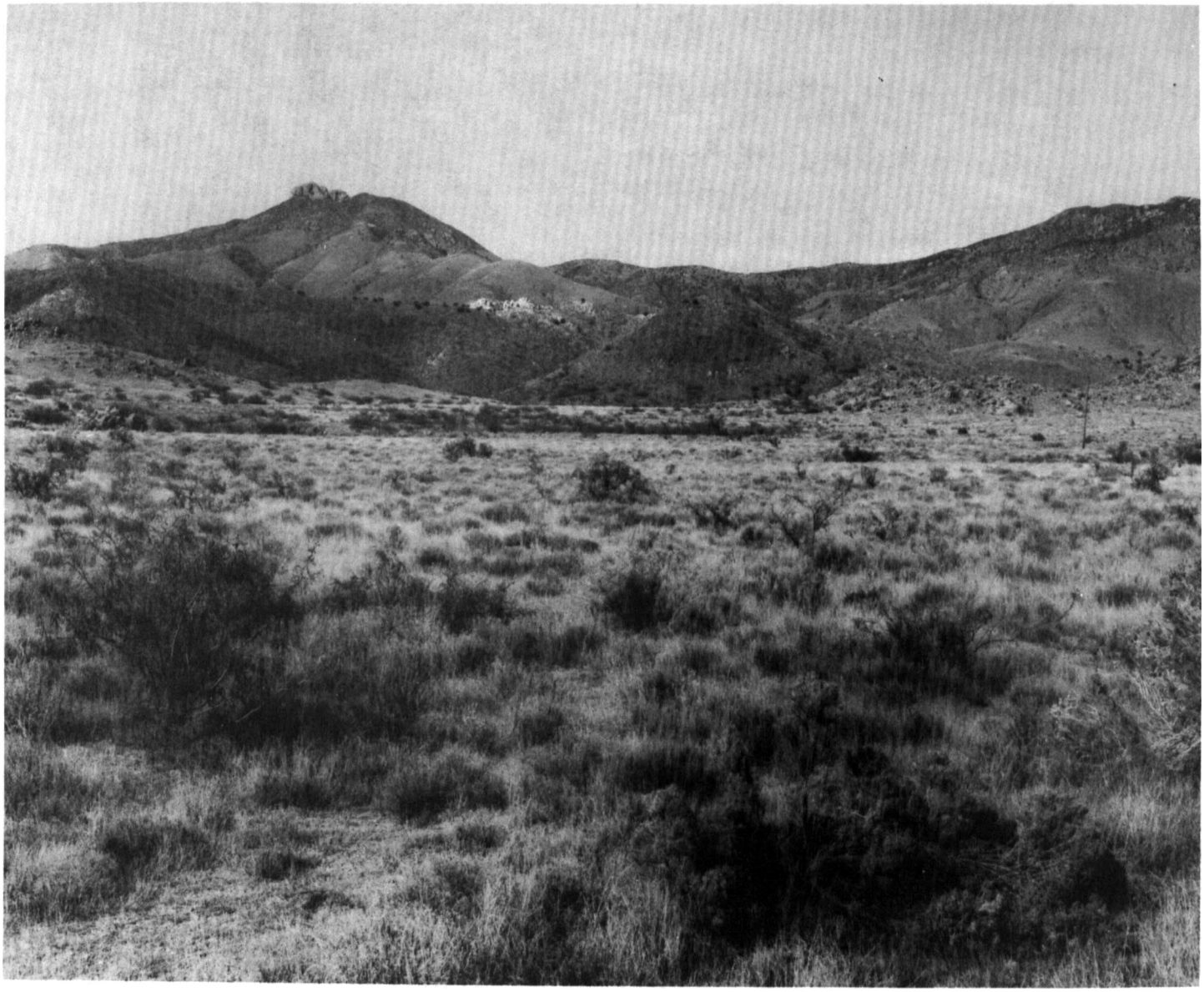


Figure 7.—An area of Comoro soils under good grass cover in foreground. Mokiak-Faraway-Rock outcrop complex is on hills in background.

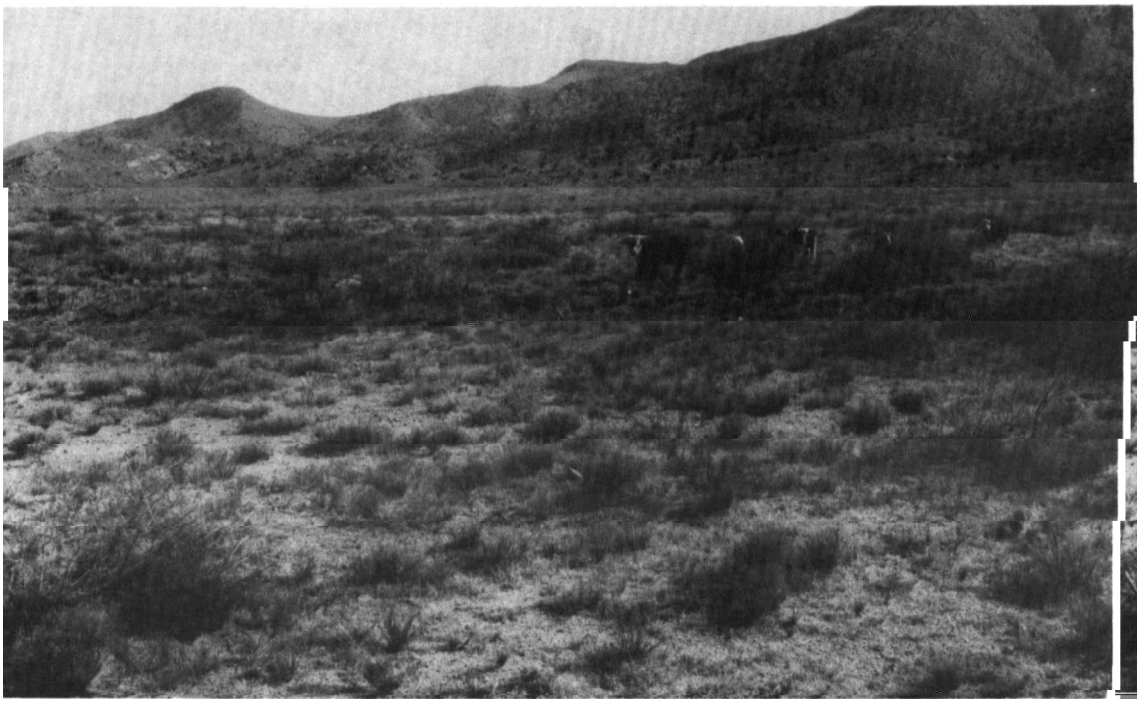


Figure 8.—An area of Eba gravelly sandy loam in foreground. Atascosa-Chiricahua-Rock outcrop complex is on hills in background.

Figure 9.—An area of Glendale-Gila complex, eroded. Cave-Durorthids complex is on terrace in center. Atascosa-Graham-Rock outcrop complex is on hills in background.

Figure 10.—An area of Glendale-Gila association, frequently flooded, under good grass cover.

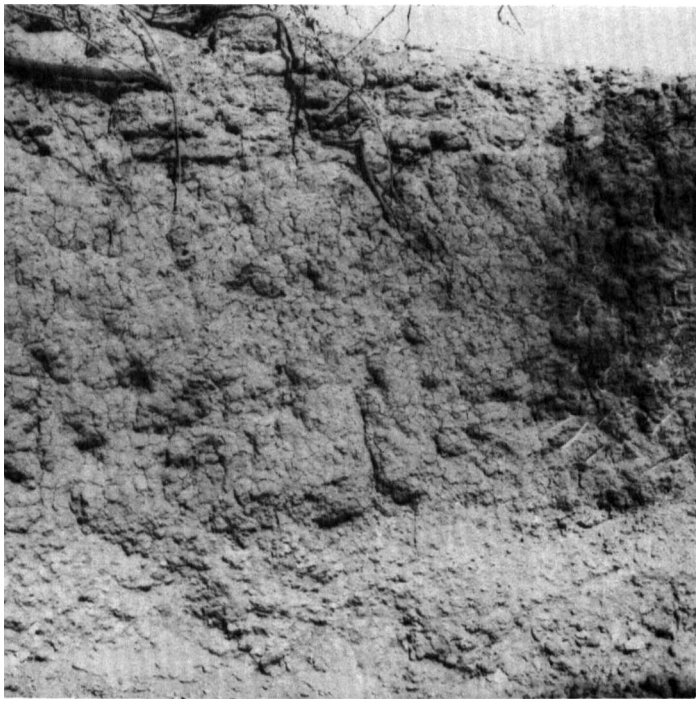


Figure 11.—Profile of Guest silty clay loam.

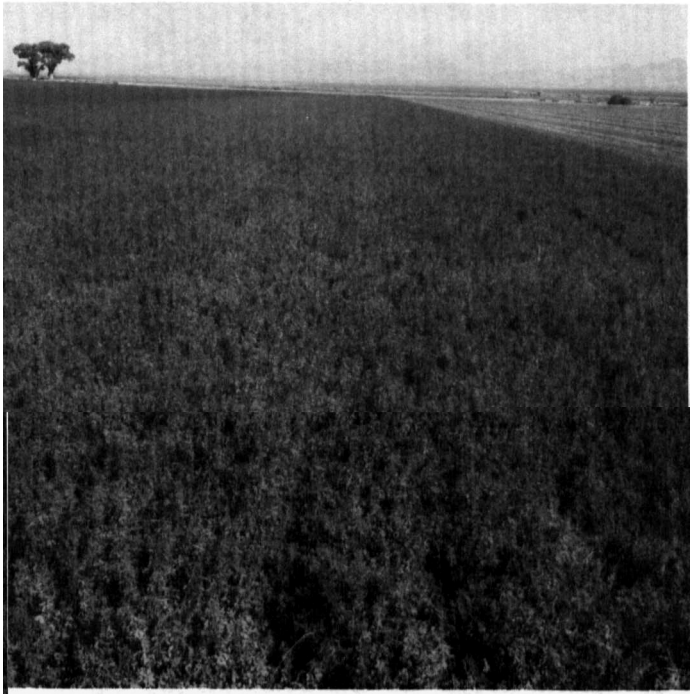


Figure 12.—Alfalfa in an area of Hondale silty clay loam.

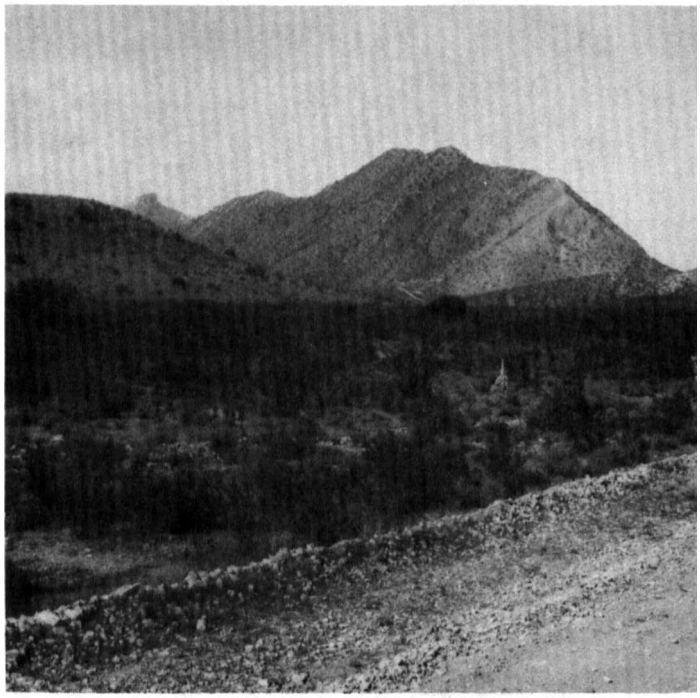


Figure 13.—Kimbrough gravelly fine sandy loam in foreground. Mabray-Rock outcrop complex on hills in background.

Figure 14.—Mabray Rock outcrop complex is on hills. Santo Tomas soils are along drainageways.

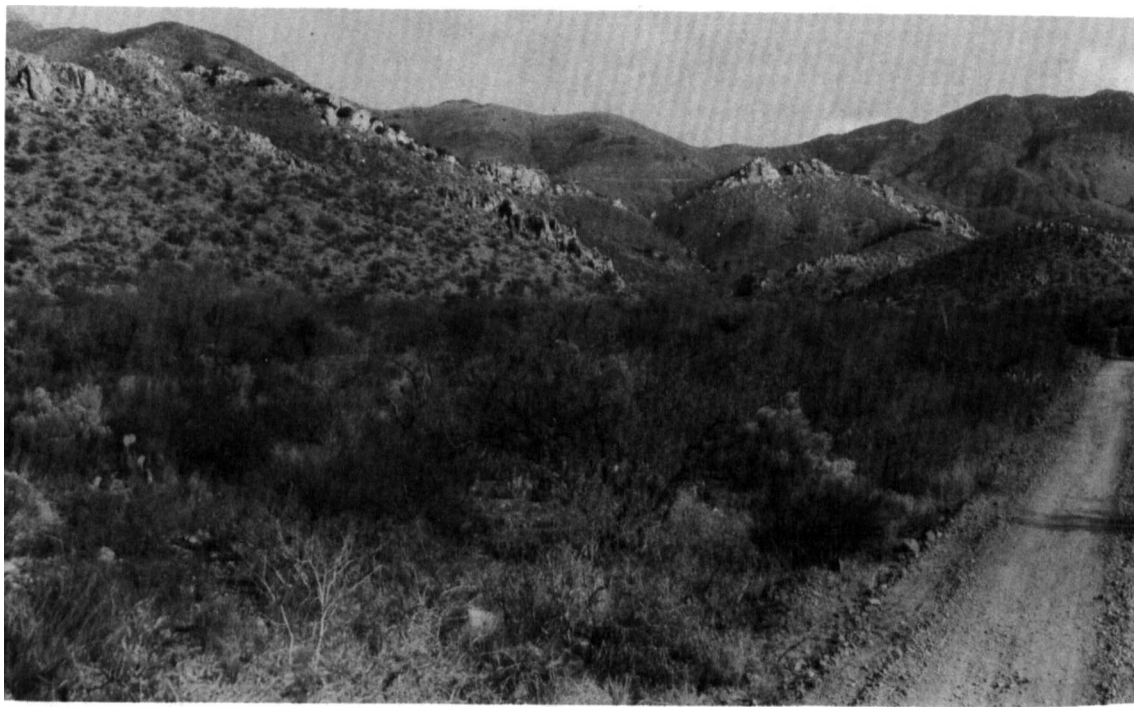


Figure 15.—Mokiak-Faraway-Rock outcrop complex is on hills. Santo Tomas soils are along drainageways.

Figure 16.—Peach orchard and cotton crop in an area of Pima-Grabe association.

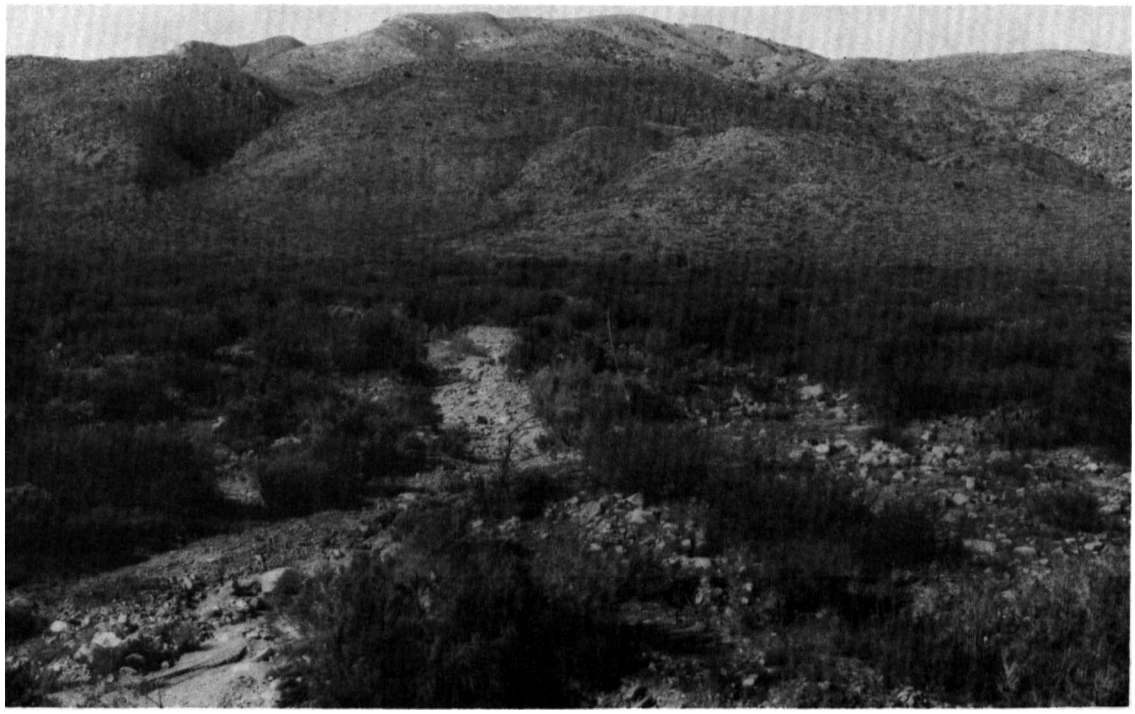


Figure 17.—An area of nearly level Santo Tomas soils on bottom land. Mokiak-Faraway-Rock outcrop complex is on mountains in background.

Figure 18.—Cotton on Sonoita fine sandy loam.

Figure 19.—Typical ground cover in an area of Tres Hermanos gravelly loam.

Figure 20.—Profile of Tres Hermanos gravelly loam.

Figure 21.—Typical vegetation in an area of Tubac-Sonoita complex.

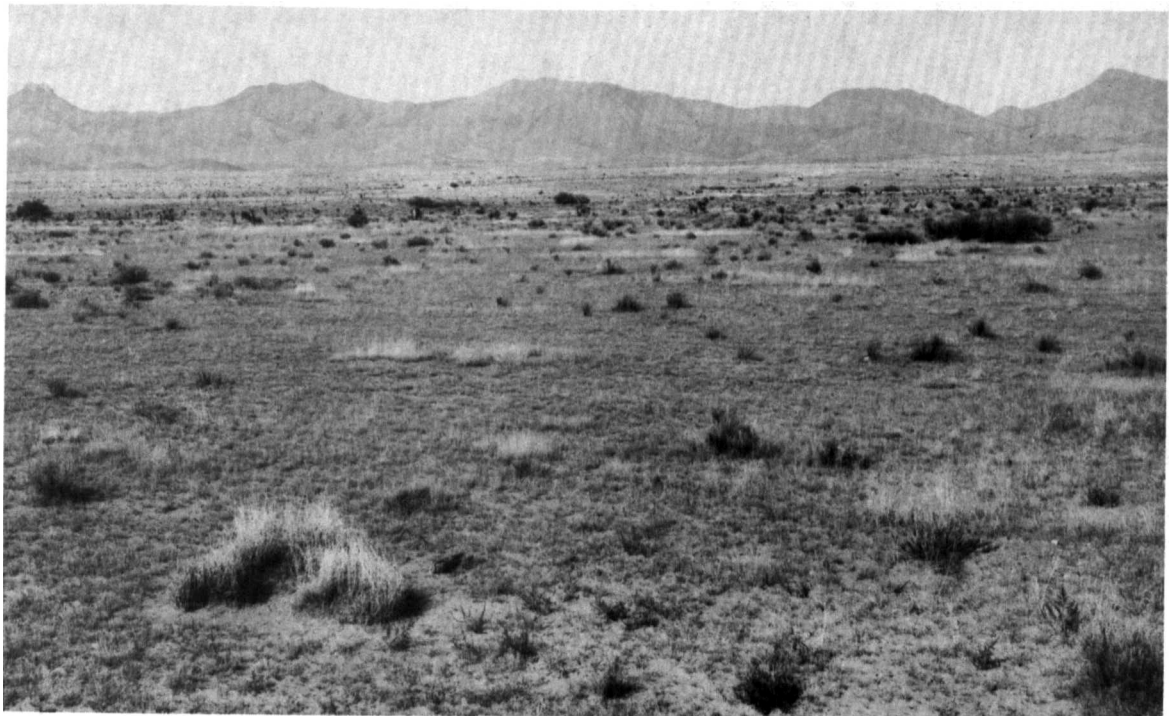


Figure 22.—Typical ground cover in an area of White House-Forrest association. Mokiak-Faraway-Rock outcrop complex is on hills in background.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION AT SAFFORD

Month	Temperature*						Precipitation*				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days**	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	59.8	27.3	43.6	74	13	13	.53	.09	.85	2	.2
February---	64.4	30.0	47.2	81	14	67	.49	.08	.79	1	.3
March------	70.1	35.8	53.0	88	19	147	.60	.07	1.00	2	.3
April------	79.1	42.2	60.7	94	28	321	.18	.00	.31	1	.0
May--------	88.3	49.8	69.1	101	33	592	.09	.00	.16	0	.0
June-------	97.4	59.5	78.5	108	44	855	.27	.00	.46	1	.0
July-------	98.3	67.3	82.8	109	56	1,017	1.86	1.13	2.50	4	.0
August-----	95.0	65.4	80.2	105	55	936	1.76	.70	2.61	4	.0
September--	91.6	57.7	74.7	102	42	741	1.02	.07	1.73	2	.0
October----	82.0	46.2	64.1	95	28	437	.84	.00	1.42	2	.0
November---	68.7	34.8	51.8	84	20	111	.38	.05	.63	1	.1
December---	59.7	28.2	44.0	75	13	12	.77	.15	1.25	2	1.0
Year-----	79.5	45.4	62.5	109	10	5,249	8.79	6.79	10.63	22	1.9

*Recorded in the period 1951-74 at Safford, Ariz.

**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 (50° F).

TABLE 2.--TEMPERATURE AND PRECIPITATION AT WILLCOX

Month	Temperature*						Precipitation*				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days**	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	59.1	24.4	41.8	75	7	11	.67	.13	1.09	2	1.2
February---	63.1	25.6	44.3	81	8	39	.53	.08	.88	2	.6
March------	68.7	30.4	49.6	86	12	95	.64	.08	1.07	2	.7
April------	77.2	35.6	56.4	92	21	213	.26	.00	.46	1	.1
May--------	86.2	42.6	64.3	100	26	443	.15	.00	.25	0	.0
June-------	95.1	52.7	73.9	106	35	717	.45	.03	.76	1	.0
July-------	95.3	62.9	79.1	106	52	902	2.83	1.60	3.83	6	.0
August-----	92.0	60.1	76.0	102	48	806	2.66	1.15	3.87	6	.0
September--	89.3	53.1	71.2	99	36	636	1.05	.12	1.75	3	.0
October----	79.8	40.8	60.3	93	23	323	.76	.07	1.27	2	.0
November---	67.3	30.1	48.7	83	15	43	.43	.07	.70	1	.2
December---	58.9	24.6	41.8	75	8	0	.97	.09	1.61	3	1.5
Year-----	77.7	40.2	59.0	107	5	4,228	11.40	8.92	13.71	29	4.3

*Recorded in the period 1951-74 at Willcox, Ariz.

**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 (50° F).

TABLE 3.--FREEZE DATES IN SPRING AND FALL AT SAFFORD

Probability	Temperature*		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 23	April 16	May 3
2 years in 10 later than--	March 16	April 8	April 27
5 years in 10 later than--	March 3	March 24	April 14
First freezing temperature in fall:			
1 year in 10 earlier than--	November 4	November 2	October 18
2 years in 10 earlier than--	November 12	November 7	October 22
5 years in 10 earlier than--	November 27	November 16	October 31

*Recorded in the period 1951-74 at Safford, Ariz.

TABLE 4.--FREEZE DATES IN SPRING AND FALL AT WILLCOX

Probability	Temperature*		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 3	May 17	June 1
2 years in 10 later than--	April 23	May 9	May 23
5 years in 10 later than--	April 4	April 23	May 7
First freezing temperature in fall:			
1 year in 10 earlier than--	October 24	October 16	October 4
2 years in 10 earlier than--	October 29	October 20	October 9
5 years in 10 earlier than--	November 9	October 28	October 20

*Recorded in the period 1951-74 at Wilcox, Ariz.

TABLE 5.--GROWING SEASON LENGTH AT SAFFORD

Probability	Daily minimum temperature during growing season*		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	237	206	176
8 years in 10	248	216	184
5 years in 10	269	236	199
2 years in 10	290	256	214
1 year in 10	300	266	221

*Recorded in the period 1951-74 at Safford, Ariz.

TABLE 6.--GROWING SEASON LENGTH AT WILLCOX

Probability	Daily minimum temperature during growing season*		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	180	156	131
8 years in 10	193	167	143
5 years in 10	218	188	165
2 years in 10	243	209	187
1 year in 10	256	219	199

*Recorded in the period 1951-74 at Wilcox, Ariz.

TABLE 7.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Anthony-Gila complex	28,332	2.3
2	Arizo soils	5,806	0.5
3	Artesia cobbly fine sandy loam	32,543	2.7
4	Atascosa-Chiricahua-Rock outcrop complex	72,272	5.9
5	Atascosa-Graham-Rock outcrop complex	105,873	8.7
6	Bluepoint loamy sand	15,244	1.2
7	Bluepoint-Gothard complex	24,306	2.0
8	Bonita cobbly silty clay	18,102	1.5
9	Bucklebar fine sandy loam	13,091	1.1
10	Calciorthids and Torriorthents, eroded	22,708	1.9
11	Cave-Durorthids complex	23,231	1.9
12	Comoro soils	39,723	3.3
13	Continental-Tubac complex	58,677	4.8
14	Dona Ana fine sandy loam, 0 to 2 percent slopes	8,266	0.7
15	Dona Ana fine sandy loam, 0 to 5 percent slopes	14,866	1.2
16	Eba gravelly sandy loam	46,213	3.8
17	Eba gravelly fine sandy loam	4,240	0.3
18	Faraway-Rock outcrop complex	15,140	1.2
19	Forrest-White House-Kimbrough complex	8,038	0.7
20	Gila loam	14,190	1.2
21	Gila-Anthony-Bluepoint complex	6,721	0.6
22	Glendale-Gila complex	2,878	0.2
23	Glendale-Gila complex, eroded	29,655	2.4
24	Glendale-Gila association, frequently flooded	6,491	0.5
25	Graham-Rock outcrop complex	66,202	5.4
26	Guest silty clay loam	6,135	0.5
27	Guest and Hantz soils	16,599	1.4
28	Hondale silty clay loam	12,068	1.0
29	Hondale complex	29,694	2.4
30	Kimbrough gravelly fine sandy loam	9,704	0.8
31	Mabray-Rock outcrop complex	12,534	1.0
32	Mokiak-Faraway-Rock outcrop complex	28,455	2.3
33	Pima-Grabe silt loams	19,873	1.6
34	Pima-Grabe association	49,705	4.1
35	Pridham silty clay loam	861	0.1
36	Santo Tomas soils	20,480	1.7
37	Signal gravelly loam	29,760	2.4
38	Sonoita gravelly sandy loam	50,829	4.2
39	Sonoita fine sandy loam	4,619	0.4
40	Tres Hermanos gravelly loam	115,337	9.3
41	Tubac sandy clay loam, 0 to 2 percent slopes	8,022	0.7
42	Tubac soils, 0 to 5 percent slopes	49,344	4.0
43	Tubac-Sonoita complex	27,788	2.3
44	Vekol loam	7,522	0.6
45	White House-Forrest association	38,859	3.2
	Total	1,220,996	100.0

TABLE 8.--YIELDS PER ACRE OF IRRIGATED CROPS

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Cotton lint	Alfalfa hay	Wheat	Grain sorghum	Barley
	Lb	Ton	Bu	Bu	Bu
1 Anthony-Gila	---	---	---	---	---
2 Arizo, Arizo and Arizo	---	---	---	---	---
3 Artesia	---	---	---	---	---
4 Atascosa-Chiricahua-Rock outcrop	---	---	---	---	---
5 Atascosa-Graham-Rock outcrop	---	---	---	---	---
6* Bluepoint	---	---	---	---	---
7* Bluepoint-Gothard	---	---	---	---	---
8 Bonita	---	---	---	---	---
9 Bucklebar	1,100	8	80	120	105
10 Calciorthids and Torriorthents	---	---	---	---	---
11 Cave-Durorthids	---	---	---	---	---
12 Comoro, Comoro and Comoro	837	7	58	101	68
13 Continental-Tubac	---	---	---	---	---
14 Dona Ana	1,300	8	---	115	110
15 Dona Ana	---	---	---	---	---
16 Eba	---	---	---	---	---
17 Eba	---	6	---	---	---
18 Faraway-Rock outcrop	---	---	---	---	---
19 Forrest-White House-Kimbrough	---	---	---	---	---
20 Gila	---	---	---	---	---

See footnotes at end of table.

TABLE 8.--YIELDS PER ACRE OF IRRIGATED CROPS--Continued

Soil name and map symbol	Cotton lint	Alfalfa hay	Wheat	Grain sorghum	Barley
	Lb	Ton	Bu	Bu	Bu
21*---------- Gila-Anthony-Bluepoint	---	---	---	---	---
22---------- Glendale-Gila	1,300	9	80	115	110
23, 24**:					
Glendale----------	---	---	---	---	---
Gila----------	---	---	---	---	---
25---------- Graham-Rock outcrop	---	---	---	---	---
26---------- Guest	900	6.5	95	105	100
27---------- Guest and Hantz	---	---	---	---	77
28---------- Hondale	750	6	55	80	60
29---------- Hondale-Hondale-Hondale	---	---	---	---	---
30---------- Kimbrough	---	---	---	---	---
31---------- Mabray-Rock outcrop	---	---	---	---	---
32---------- Mokiak-Faraway-Rock outcrop	---	---	---	---	---
33---------- Pima-Grabe	1,190	8	67	125	110
34**:					

TABLE 8.--YIELDS PER ACRE OF IRRIGATED CROPS--Continued

Soil name and map symbol	Cotton lint	Alfalfa hay	Wheat	Grain sorghum	Barley
	Lb	Ton	Bu	Bu	Bu
43---------- Tubac-Sonoita	---	---	---	---	---
44---------- Vekol	1,100	8	75	100	80
45**:					
White House----------	---	---	---	---	---
Forrest----------	---	---	---	---	---

* Yields are for areas protected from flooding.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--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	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
1*:					
Anthony	Sand Bottom, 7- to 12-inch Precipitation Zone.	Favorable	3,000	Alkali sacaton	50
		Normal	2,000	Plains bristlegrass	10
		Unfavorable	300	Vine-mesquite	10
				Sideoats grama	10
				Twoflower trichloris	5
				Black grama	5
				Bush muhly	5
Gila	Loam Bottom, 7- to 12-inch Precipitation Zone.	Favorable	3,000	Giant sacaton	30
		Normal	2,000	Sideoats grama	10
		Unfavorable	1,000	Tobosa	10
				Vine-mesquite	10
				Cane bluestem	5
				Green sprangletop	5
				Plains bristlegrass	5
				Alkali sacaton	5
				Bottlebrush squirreltail	5
				Bush muhly	5
				Black grama	5
				Plains lovegrass	5
2*:					
Arizo	Sand Bottom, 7- to 12-inch Precipitation Zone.	Favorable	3,000	Giant sacaton	20
		Normal	2,000	Sideoats grama	15
		Unfavorable	300	Arizona cottontop	10
				Apacheplume	7
				Green sprangletop	5
				Vine-mesquite	5
				Plains bristlegrass	5
				Plains lovegrass	5
				Bottlebrush squirreltail	5
3 Artesia	Clay Loam Upland, 7- to 12-inch Precipitation Zone.	Favorable	1,000	Tobosa	25
		Normal	500	Arizona cottontop	15
		Unfavorable	300	Black grama	10
				Bush muhly	10
				Sideoats grama	10
				Vine-mesquite	5
				Green sprangletop	5
				Plains bristlegrass	5
				Cane bluestem	5
				Fourwing saltbush	5
4*:					
Atascosa	Granitic Hills, 12- to 16-inch Precipitation Zone.	Favorable	1,500	Sideoats grama	20
		Normal	1,000	Plains lovegrass	10
		Unfavorable	600	Cane bluestem	10
				Black grama	10
				Hairy grama	10
				Threeawn	5
				Slender grama	5
				Bullgrass	5
				Arizona cottontop	5
				False-mesquite	5
				Skunkbush sumac	5
				Plains bristlegrass	5
				Wooly bunchgrass	5

See footnote at end of table.

TABLE 9.--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
4*:					
Chiricahua	Granitic Hills, 12- to 16-inch Precipitation Zone.	Favorable	1,250	Sideoats grama	20
		Normal	900	Hairy grama	10
		Unfavorable	600	Black grama	10
				Cane bluestem	10
				Plains lovegrass	10
				Slender grama	5
				Threeawn	5
				Bullgrass	5
				Plains bristlegrass	5
				Wooly bunchgrass	5
				Arizona cottontop	5
				False-mesquite	5
				Skunkbush sumac	5
Rock outcrop.					
5*:					
Atascosa	Volcanic Hills, 12- to 16-inch Precipitation Zone.	Favorable	1,250	Plains lovegrass	25
		Normal	900	Sideoats grama	25
		Unfavorable	650	Cane bluestem	15
				Black grama	10
				Tanglehead	10
				Hairy grama	5
				Threeawn	5
				Bush muhly	5
Graham	Basalt Hills, 12- to 16-inch Precipitation Zone.	Favorable	1,000	Black grama	30
		Normal	800	Sideoats grama	20
		Unfavorable	500	Cane bluestem	10
				Arizona cottontop	5
				Curlymesquite	5
				Threeawn	5

TABLE 9.--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
8---------- Bonita	Clay Upland, 12- to 16-inch Precipitation Zone.	Favorable	1,300	Tobosa----------	40
		Normal	1,000	Sideoats grama----------	20
		Unfavorable	800	Vine-mesquite----------	15
				Cane bluestem----------	10
				Plains bristlegrass----------	10
				Rothrock grama----------	5
9---------- Bucklebar	Sandy Loam Upland, 12- to 16-inch Precipitation Zone.	Favorable	650	Black grama----------	25
		Normal	400	Bush muhly----------	25
		Unfavorable	300	Plains bristlegrass----------	5
				Hairy grama----------	5
				Sideoats grama----------	5
				Arizona cottontop----------	5
				Cane bluestem----------	5
				Twoflower trichloris----------	5
				Threeawn----------	5
				Sand dropseed----------	5
				Rothrock grama----------	5
11*:					
Cave----------	Limy Upland, 12- to 16-inch Precipitation Zone.	Favorable	400	Bush muhly----------	30
		Normal	250	Creosotebush----------	30
		Unfavorable	100	Black grama----------	10
				Slim tridens----------	10
				Whitethorn----------	10
				Desert zinnia----------	5
Durorthids.					
12*:					
Comoro----------	Sandy Loam Upland, 12- to 16-inch Precipitation Zone.	Favorable	1,000	Bush muhly----------	40
		Normal	700	Black grama----------	20
		Unfavorable	500	Plains bristlegrass----------	10
				Hairy grama----------	5
				Sideoats grama----------	5
				Arizona cottontop----------	5
Comoro----------	Sandy Loam Upland, 12- to 16-inch Precipitation Zone.	Favorable	1,000	Bush muhly----------	40
		Normal	700	Black grama----------	20
		Unfavorable	500	Plains bristlegrass----------	10
				Hairy grama----------	5
				Sideoats grama----------	5
				Arizona cottontop----------	5
Comoro----------	Sandy Loam Upland, 12- to 16-inch Precipitation Zone.	Favorable	1,000	Bush muhly----------	40
		Normal	700	Black grama----------	20
		Unfavorable	500	Plains bristlegrass----------	10
				Hairy grama----------	5
				Sideoats grama----------	5
				Arizona cottontop----------	5
13*:					
Continental-------	Loamy Upland, 12- to 16-inch Precipitation Zone.	Favorable	1,000	Black grama----------	20
		Normal	800	Bush muhly----------	20
		Unfavorable	550	Tobosa----------	20
				Sideoats grama----------	15
				Blue grama----------	10
				Plains bristlegrass----------	5
				Arizona cottontop----------	5
Tubac----------	Loamy Upland, 12- to 16-inch Precipitation Zone.	Favorable	1,000	Black grama----------	20
		Normal	800	Bush muhly----------	20
		Unfavorable	550	Tobosa----------	20
				Sideoats grama----------	15
				Blue grama----------	10
				Plains bristlegrass----------	5
				Arizona cottontop----------	5

See footnote at end of table.

TABLE 9.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

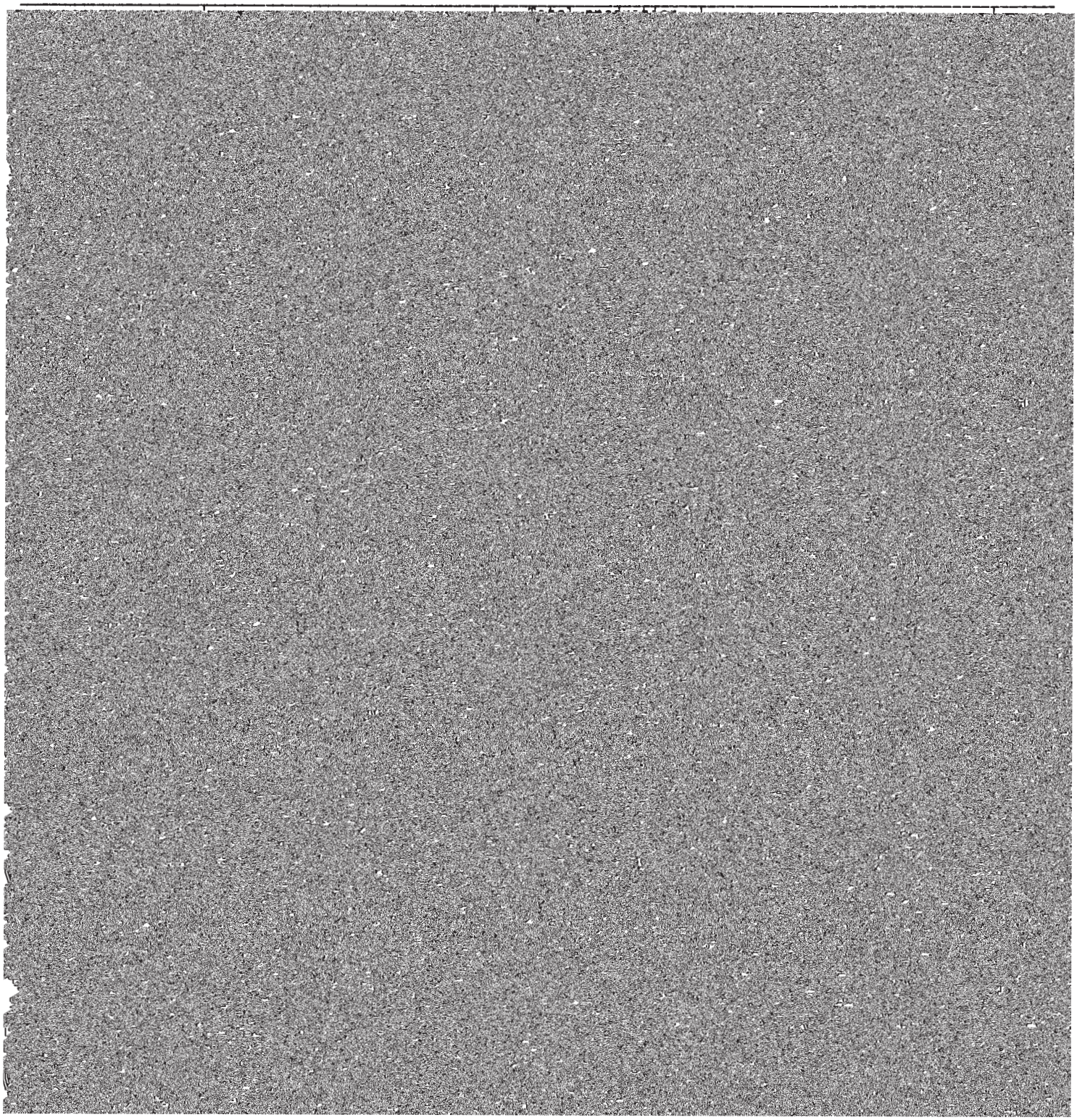


TABLE 9.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
20---------- Gila	Loamy Upland, 7- to 12-inch Precipitation Zone.	Favorable	800	Bush muhly----------	40
		Normal	700	Giant sacaton----------	10
		Unfavorable	500	Alkali sacaton----------	10
				Tobosa----------	10
				Arizona cottontop----------	10
				Creosotebush----------	10
				Soaptree yucca----------	5
				Crucifixion-thorn----------	5
21*:					
Gila----------	Loamy Upland, 7- to 12-inch Precipitation Zone.	Favorable	800	Bush muhly----------	40
		Normal	700	Giant sacaton----------	10
		Unfavorable	500	Alkali sacaton----------	10
				Tobosa----------	10
				Arizona cottontop----------	10
				Creosotebush----------	10
				Soaptree yucca----------	5
				Crucifixion-thorn----------	5
Anthony----------	Sandy Loam Upland, 7- to 12-inch Precipitation Zone.	Favorable	650	Bush muhly----------	40
		Normal	500	Black grama----------	20
		Unfavorable	450	Plains bristlegrass----------	10
				Arizona cottontop----------	5
				Threeawn----------	5
				Hairy grama----------	5
				Sideoats grama----------	5
				Spike dropseed----------	5
Bluepoint---------	Deep Sand, 7- to 12-inch Precipitation Zone.	Favorable	500	Spike dropseed----------	15
		Normal	400	Mesa dropseed----------	15
		Unfavorable	300	Bush muhly----------	10

TABLE 9.--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
23*:					
Gila	Loamy Upland, 7- to 12-inch Precipitation Zone.	Favorable	800	Bush muhly	40
		Normal	700	Giant sacaton	10
		Unfavorable	500	Alkali sacaton	10
				Tobosa	10
				Arizona cottontop	10
				Creosotebush	10
				Soaptree yucca	5
				Crucifixion-thorn	5
24*:					
Glendale	Loam Bottom, 7- to 12-inch Precipitation Zone.	Favorable	3,000	Giant sacaton	30
		Normal	2,000	Sideoats grama	10
		Unfavorable	1,000	Tobosa	10
				Vine-mesquite	10
				Cane bluestem	5
				Green sprangletop	5
				Plains bristlegrass	5
				Alkali sacaton	5
				Bottlebrush squirreltail	5
				Bush muhly	5
				Black grama	5
				Plains lovegrass	5
Gila	Loam Bottom, 7- to 12-inch Precipitation Zone.	Favorable	3,000	Giant sacaton	30
		Normal	2,000	Sideoats grama	10
		Unfavorable	1,000	Tobosa	10
				Vine-mesquite	10
				Cane bluestem	5
				Green sprangletop	5
				Plains bristlegrass	5
				Alkali sacaton	5
				Bottlebrush squirreltail	5
				Bush muhly	5
				Black grama	5
				Plains lovegrass	5
25*:					
Graham	Basalt Hills, 12- to 16-inch Precipitation Zone.	Favorable	1,000	Black grama	30
		Normal	800	Sideoats grama	20
		Unfavorable	500	Cane bluestem	10
				Arizona cottontop	5
				Curlymesquite	5
				Threeawn	5
				Tanglehead	5
				Green sprangletop	5
				False-mesquite	5
				Yerba-de-pasmo	5
Rock outcrop.					
26 Guest	Clay Bottom, 7- to 12-inch Precipitation Zone.	Favorable	1,000	Tobosa	50
		Normal	600	Vine-mesquite	25
		Unfavorable	100	Cane bluestem	5
				Twoflower trichloris	5
				Plains bristlegrass	5
				Sideoats grama	5
27*:					
Guest	Clay Bottom, 7- to 12-inch Precipitation Zone.	Favorable	1,000	Tobosa	50
		Normal	600	Vine-mesquite	25
		Unfavorable	100	Cane bluestem	5
				Twoflower trichloris	5
				Plains bristlegrass	5
				Sideoats grama	5

See footnote at end of table.

TABLE 9.--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
27*:					
Hantz	Clay Bottom, 7- to 12-inch Precipitation Zone.	Favorable	1,000	Tobosa	50
		Normal	600	Vine-mesquite	25
		Unfavorable	100	Cane bluestem	5
				Twoflower trichloris	5
				Plains bristlegrass	5
				Sideoats grama	5
28 Hondale	Saline, 7- to 12-inch Precipitation Zone.	Favorable	1,050	Alkali sacaton	30
		Normal	800	Inland saltgrass	15
		Unfavorable	350	Tobosa	10
				Giant sacaton	10
				Fourwing saltbush	5
29*:					
Hondale	Saline, 7- to 12-inch Precipitation Zone.	Favorable	1,050	Alkali sacaton	30
		Normal	800	Inland saltgrass	15
		Unfavorable	350	Tobosa	10
				Giant sacaton	10
				Fourwing saltbush	5
30 Kimbrough	Limy Slopes, 12- to 16-inch Precipitation Zone.	Favorable	1,200	Black grama	20
		Normal	800	Sideoats grama	20
		Unfavorable	500	Threeawn	10
				Tridens	10
				Hairy grama	10
				Cane bluestem	10
				Fluffgrass	5
31*:					
Mabray	Limestone Hills, 12- to 16-inch Precipitation Zone.	Favorable	1,600	Sideoats grama	20
		Normal	900	Black grama	10
		Unfavorable	300	Cane bluestem	10
				Slim tridens	10
				Plains bristlegrass	10
				Threeawn	5
				Green sprangletop	5
				Bush muhly	5
				Arizona cottontop	5
				Ratany	5
				Mariola	5
				Sacahuista	5
				Ocotillo	5
Rock outcrop.					
32*:					
Mokiak	Granitic Hills, 12- to 16-inch Precipitation Zone.	Favorable	1,500	Sideoats grama	20
		Normal	1,000	Black grama	10
		Unfavorable	600	Threeawn	5
Faraway	Volcanic Hills, 12- to 16-inch Precipitation Zone.	Favorable	1,500	Plains lovegrass	30
		Normal	1,100	Sideoats grama	20
		Unfavorable	600	Crinkleawn	15
				Wooly bunchgrass	5

TABLE 9.--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
33*:					
Pima	Loam Bottom, 7- to 12-inch Precipitation Zone.	Favorable	1,000	Bush muhly	40
		Normal	750	Black grama	20
		Unfavorable	550	Plains bristlegrass	10
				Sideoats grama	5
				Hairy grama	5
				Arizona cottontop	5
Grabe	Sandy Loam Upland, 7- to 12-inch Precipitation Zone.	Favorable	650	Bush muhly	40
		Normal	500	Black grama	20
		Unfavorable	450	Plains bristlegrass	10
				Sideoats grama	5
				Hairy grama	5
				Arizona cottontop	5
34*:					
Pima	Loam Bottom, 7- to 12-inch Precipitation Zone.	Favorable	3,000	Giant sacaton	30
		Normal	2,000	Sideoats grama	10
		Unfavorable	1,000	Tobosa	10
				Vine-mesquite	10
				Cane bluestem	5
				Green sprangletop	5
				Plains bristlegrass	5
				Alkali sacaton	5
				Bottlebrush squirreltail	5
				Bush muhly	5
				Black grama	5
				Plains lovegrass	5
Grabe	Loam Bottom, 7- to 12-inch Precipitation Zone.	Favorable	3,000	Giant sacaton	30
		Normal	2,000	Sideoats grama	10
		Unfavorable	1,000	Tobosa	10
				Vine-mesquite	10
				Cane bluestem	5
				Green sprangletop	5
				Plains bristlegrass	5
				Alkali sacaton	5
				Bottlebrush squirreltail	5
				Bush muhly	5
				Black grama	5
				Plains lovegrass	5
35 Pridham	Seepland, 12- to 16-inch Precipitation Zone.	Favorable	1,500	Alkali sacaton	25
		Normal	1,000	Tobosa	10
		Unfavorable	700	Bush muhly	10
				Vine-mesquite	10
				Giant sacaton	5
				Inland saltgrass	5
				Black grama	5
				Plains bristlegrass	5
				Sideoats grama	5
				Blue grama	5
				Torrey seapweed	5
36*:					
Santo Tomas	Sand Bottom, 7- to 12-inch Precipitation Zone.	Favorable	3,000	Sideoats grama	15
		Normal	1,800	Arizona cottontop	10
		Unfavorable	300	Giant sacaton	10
				Bottlebrush squirreltail	10
				Vine-mesquite	5
				Plains bristlegrass	5
				Plains lovegrass	5
				Cane bluestem	5
				Bush muhly	5
				Green sprangletop	5
				Threeawn	5
Santo Tomas.					

See footnote at end of table.

TABLE 9.--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
37---------- Signal	Clay Hills, 12- to 16-inch Precipitation Zone.	Favorable	2,350	Sideoats grama----------	30
		Normal	1,200	Black grama----------	10
		Unfavorable	800	Tobosa----------	10
				Cane bluestem----------	10
				Vine-mesquite----------	5
				Curlymesquite----------	5
				Green sprangletop----------	5
				Bush muhly----------	5
				Hairy grama----------	5
				Plains bristlegrass----------	5
38, 39---------- Sonoita	Sandy Loam Upland, 7- to 12-inch Precipitation Zone.	Favorable	1,000	Bush muhly----------	40
		Normal	800	Black grama----------	20
		Unfavorable	550	Plains bristlegrass----------	10
				Sideoats grama----------	5
				Hairy grama----------	5
				Arizona cottontop----------	5
40---------- Tres Hermanos	Limy Upland, 7- to 12-inch Precipitation Zone.	Favorable	400	Bush muhly----------	30
		Normal	250	Creosotebush----------	30
		Unfavorable	100	Black grama----------	10
				Slim tridens----------	10
				Mescat acacia----------	10
				Desert zinnia----------	5
41---------- Tubac	Loamy Upland, 7- to 12-inch Precipitation Zone.	Favorable	1,000	Bush muhly----------	40
		Normal	750	Black grama----------	20
		Unfavorable	500	Plains bristlegrass----------	10
				Sideoats grama----------	5
				Hairy grama----------	5
				Arizona cottontop----------	5
42*:					
Tubac----------	Loamy Upland, 7- to 12-inch Precipitation Zone.	Favorable	1,000	Bush muhly----------	40
		Normal	750	Black grama----------	20
		Unfavorable	500	Plains bristlegrass----------	10
				Sideoats grama----------	5
				Hairy grama----------	5
				Arizona cottontop----------	5
43*:					
Tubac----------	Sandy Loam Upland, 7- to 12-inch Precipitation Zone.	Favorable	1,000	Bush muhly----------	40
		Normal	750	Black grama----------	20
		Unfavorable	500	Plains bristlegrass----------	10
				Sideoats grama----------	5
				Hairy grama----------	5
				Arizona cottontop----------	5
Sonoita----------	Sandy Loam Upland, 7- to 12-inch Precipitation Zone.	Favorable	1,000	Bush muhly----------	40
		Normal	800	Black grama----------	20
		Unfavorable	550	Plains bristlegrass----------	10
				Sideoats grama----------	5
				Hairy grama----------	5
				Arizona cottontop----------	5
44---------- Vekol	Loamy Upland, 7- to 12-inch Precipitation Zone.	Favorable	1,000	Black grama----------	20
		Normal	800	Bush muhly----------	20
		Unfavorable	500	Tobosa----------	20
				Sideoats grama----------	15
				Blue grama----------	10
				Plains bristlegrass----------	5
				Arizona cottontop----------	5
				False-mesquite----------	5

See footnote at end of table.

TABLE 9.--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
45*:					
White House	Loamy Upland, 7- to 12-inch Precipitation Zone.	Favorable	1,300	Sideoats grama	20
		Normal	1,000	Blue grama	15
		Unfavorable	600	Black grama	10
				Cane bluestem	10

TABLE 10.--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]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
1*:					
Anthony	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Gila	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
2*:					
Arizo (Fine sandy loam)	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Arizo (Gravelly sandy loam)	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Arizo (Gravelly loamy sand)	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
3 Artesia	Severe: cemented pan.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.
4*:					
Atascosa	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Chiricahua	Severe: depth to rock, slope.	Severe: shrink-swell, slope, low strength,	Severe: depth to rock, slope, shrink-swell,	Severe: slope, low strength, shrink-swell,	Severe: slope, shrink-swell, low strength,

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
10*:					
Calciorthids.					
Torriorthents.					
11*:					
Cave	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
Durorthids.					
12*:					
Comoro (Fine sandy loam)	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Comoro (Gravelly sandy loam)	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Comoro (Sandy loam)	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
13*:					
Continental	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.
Tubac	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
14, 15 Dona Ana	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.
16 Eba	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: shrink-swell.
17 Eba	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.
18*:					
Faraway	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Rock outcrop.					
19*:					
Forrest	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
White House	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
Kimbrough	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
20 Gila	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.
21*:					
Gila	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
21*:					
Anthony	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Bluepoint	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
22*, 23*:					
Glendale	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.
Gila	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.
24*:					
Glendale	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.
Gila	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
25*:					
Graham	Severe: depth to rock, slope.	Severe: depth to rock, shrink-swell, slope.	Severe: depth to rock, shrink-swell, slope.	Severe: depth to rock, shrink-swell, slope.	Severe: depth to rock, shrink-swell, slope.
Rock outcrop.					
26 Guest	Moderate: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.
27*:					
Guest	Moderate: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.
Hantz	Moderate: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.
28 Hondale	Moderate: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.
29*:					
Hondale (Loam)	Moderate: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.
Hondale (Fine sandy loam)	Moderate: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.
Hondale (Silt loam)	Moderate: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
30---------- Kimbrough	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
31*:					
Mabray----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

[illegible]	[illegible]	Dwellings	Dwellings	Small	Local roads
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1*:					
Anthony	Severe: floods.	Severe: seepage, floods.	Severe: floods.	Severe: floods.	Good.
Gila	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
2*:					
Arizo (Fine sandy loam)	Severe: floods.	Severe: floods, seepage.	Severe: floods, too sandy.	Severe: floods.	Poor: small stones, too sandy, seepage.
Arizo (Gravelly sandy loam)	Severe: floods.	Severe: floods, seepage.	Severe: floods, too sandy.	Severe: floods.	Poor: small stones, too sandy, seepage.
Arizo (Gravelly loamy sand)	Severe: floods.	Severe: floods, seepage.	Severe: floods, too sandy.	Severe: floods.	Poor: small stones, too sandy, seepage.
3 Artesia	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Slight	Poor: small stones, too clayey.
4*:					
Atascosa	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Poor: slope, small stones, area reclaim.
Chiricahua	Severe: depth to rock, slope, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: slope, area reclaim.
Rock outcrop.					
5*:					
Atascosa	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Poor: slope, small stones, area reclaim.
Graham	Severe: depth to rock, slope, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, slope.
Rock outcrop.					
6 Bluepoint	Slight	Severe: slope, seepage.	Moderate: too sandy.	Slight	Fair: too sandy.
7*:					
Bluepoint	Slight	Severe: slope, seepage.	Moderate: too sandy.	Slight	Fair: too sandy.

See footnote at end of table.

TABLE 11.--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
7*:					

TABLE 11.--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
19*:					
Kimbrough	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight	Poor: thin layer, area reclaim.
20 Gila	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
21*:					
Gila	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
Anthony	Moderate: floods.	Severe: seepage, floods.	Moderate: floods.	Moderate: floods.	Good.
Bluepoint	Slight	Severe: seepage.	Moderate: too sandy.	Slight	Fair: too sandy.
22*, 23*:					
Glendale	Severe: percs slowly.	Severe: floods.	Moderate: floods, too clayey.	Moderate: floods.	Fair: too clayey.
Gila	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
24*:					
Glendale	Severe: floods, percs slowly.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
Gila	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
25*:					
Graham	Severe: depth to rock, slope, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, slope.
Rock outcrop.					
26 Guest	Severe: percs slowly.	Severe: floods.	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
27*:					
Guest	Severe: percs slowly.	Severe: floods.	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
Hantz	Severe: percs slowly.	Severe: floods.	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
28 Hondale	Severe: percs slowly.	Severe: floods.	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
29*:					
Hondale (Loam)	Severe: percs slowly.	Severe: floods.	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
Hondale (Fine sandy loam)	Severe: percs slowly.	Severe: floods.	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
Hondale (Silt loam)	Severe: percs slowly.	Severe: floods.	Severe: too clayey.	Moderate: floods.	Poor: too clayey.

See footnote at end of table.

TABLE 11.--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
30---------- Kimbrough	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight----------	Poor: thin layer, area reclaim.
31*:					
Mabray----------	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Poor: slope, thin layer

TABLE 11.--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
41 Tubac	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
42*:					
Tubac	Severe:	Moderate:	Severe:	Slight	Poor:

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1*:				
Anthony	Good	Poor: excess fines.	Unsuited	Fair: small stones.
Gila	Fair: low strength.	Unsuited	Unsuited	Good.
2*:				
Arizo (Fine sandy loam)	Good	Unsuited	Good	Poor: small stones, too sandy.
Arizo	Good	Unsuited	Good	Poor:

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
8 Bonita	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
9 Bucklebar	Fair: shrink-swell, low-strength.	Unsuited	Unsuited	Fair: too clayey.
10*:				
Calciorthids.				
Torriorthents.				
11*:				
Cave	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: small stones, area reclaim, thin layer.
Durorthids.				
12*:				
Comoro (Fine sandy loam)	Good	Poor: excess fines.	Poor: excess fines.	Fair: small stones.
Comoro (Gravelly sandy loam)	Good	Poor: excess fines.	Poor: excess fines.	Poor: small stones.
Comoro (Sandy loam)	Good	Poor: excess fines.	Poor: excess fines.	Fair: small stones.
13*:				
Continental	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: small stones, too clayey.
Tubac	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: small stones.
14, 15 Dona Ana	Fair: low strength, shrink-swell.	Unsuited	Unsuited	Fair: too clayey.
16, 17 Eba	Fair: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey, small stones.
18*:				
Faraway	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, small stones, area reclaim.
Rock outcrop.				
19*:				
Forrest	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
White House	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: too clayey.
Kimbrough	Poor: area reclaim, thin layer.	Unsuited	Unsuited	Poor: area reclaim, small stones.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
20 Gila	Fair: low strength.	Poor: excess fines.	Unsuited	Good.
21*:				
Gila	Fair: low strength.	Poor: excess fines.	Unsuited	Good.
Anthony	Good	Poor: excess fines.	Poor: excess fines.	Good.
Bluepoint	Good	Poor: excess fines.	Unsuited	Fair: too sandy, excess salt.
22*, 23*:				
Glendale	Poor: low strength.	Unsuited	Unsuited	Fair: too clayey.
Gila	Fair: low strength.	Poor: excess fines.	Unsuited	Good.
24*:				
Glendale	Poor: low strength.	Unsuited	Unsuited	Fair: too clayey.
Gila	Fair: low strength.	Unsuited	Unsuited	Good.
25*:				
Graham	Poor: thin layer, low strength, slope.	Unsuited	Unsuited	Poor: slope, too clayey, large stones.
Rock outcrop.				
26 Guest	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
27*:				
Guest	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Hantz	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
28 Hondale	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: excess salt, too clayey.
29*:				
Hondale (Loam)	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: excess salt, too clayey.
Hondale (Fine sandy loam)	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: excess salt, too clayey.
Hondale (Silt loam)	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: excess salt, too clayey.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
30 Kimbrough	Poor: area reclaim, thin layer.	Unsuited	Unsuited	Poor: area reclaim, small stones.
31*:				
Mabray	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, small stones, area reclaim.
Rock outcrop.				
32*:				
Mokiak	Poor: slope, thin layer, large stones.	Unsuited	Unsuited	Poor: slope, small stones.
Faraway	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, small stones, area reclaim.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
42*:				
Tubac (Gravelly loam)	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: small stones.
Tubac (Gravelly sandy loam)	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: small stones.
43*:				
Tubac	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Good.
Sonoita	Good	Unsuited	Unsuited	Poor: small stones.
44 Vekol	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: too clayey.
45*:				
White House	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: too clayey.
Forrest	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.

* 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. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
*:						
Anthony	Seepage	Piping, seepage.	No water	Floods, soil blowing.	Floods	Soil blowing.
Gila	Seepage	Piping	No water	Floods	Floods	Erodes easily.
*:						
Arizo (Fine sandy loam)	Seepage, slope.	Seepage	No water	Slope, floods.	Slope, floods, droughty.	Too sandy, soil blowing.
Arizo (Gravelly sandy loam)	Seepage, slope.	Seepage	No water	Slope, floods.	Slope, floods, droughty.	Too sandy, soil blowing.
Arizo (Gravelly loamy sand)	Seepage, slope.	Seepage	No water	Slope, floods.	Slope, floods, droughty.	Too sandy, soil blowing.
Artesia	Cemented pan	Thin layer	No water	Slope, cemented pan.	Slope, droughty, rooting depth.	Cemented pan, soil blowing.
*:						
Atascosa	Depth to rock, slope.	Thin layer, large stones.	No water	Depth to rock, slope.	Large stones, slope, rooting depth.	Slope, depth to rock, large stones.
Chiricahua	Depth to rock, slope.	Thin layer, hard to pack.	No water	Slope, percs slowly, depth to rock.	Slope, percs slowly, rooting depth.	Slope, depth to rock, percs slowly.
Rock outcrop.						
*:						
Atascosa	Depth to rock, slope.	Thin layer, large stones.	No water	Depth to rock, slope.	Large stones, slope, rooting depth.	Slope, depth to rock, large stones.
Graham	Slope, depth to rock.	Thin layer, hard to pack.	No water	Slope, depth to rock, percs slowly.	Slope, rooting depth, percs slowly.	Depth to rock, slope, percs slowly.
Rock outcrop.						
Bluepoint	Seepage, slope.	Piping	No water	Slope	Droughty, slope, too sandy.	Too sandy, soil blowing.
*:						
Bluepoint	Seepage, slope.	Piping	No water	Slope	Droughty, slope, too sandy.	Too sandy, soil blowing.
Gothard	Seepage	Excess sodium, excess salt.	No water	Percs slowly, excess salt, excess sodium.	Excess sodium, percs slowly, excess salt.	Percs slowly, soil blowing, erodes easily.
Bonita	Slope	Hard to pack	No water	Percs slowly, slope.	Slope, percs slowly, too clayey.	Percs slowly.
Bucklebar	Seepage	Favorable	No water	Favorable	Soil blowing	Soil blowing.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
21*:						
Bluepoint	Seepage	Piping	No water	Favorable	Droughty, too sandy, soil blowing.	Too sandy, soil blowing.
22*, 23*:						
Glendale	Favorable	Favorable	No water	Favorable	Favorable	Favorable.
Gila	Seepage	Piping	No water	Favorable	Favorable	Favorable.
24*:						
Glendale	Favorable	Favorable	No water	Floods	Floods	Favorable.
Gila	Seepage	Piping	No water	Floods	Floods	Favorable.
25*:						
Graham	Slope, depth to rock.	Thin layer, hard to pack.	No water	Slope, depth to rock, percs slowly.	Slope, rooting depth, large stones.	Depth to rock, slope, percs slowly.
Rock outcrop.						
26 Guest	Favorable	Hard to pack	No water	Percs slowly	Percs slowly	Percs slowly.
27*:						
Guest	Favorable	Hard to pack	No water	Percs slowly	Percs slowly, too clayey.	Percs slowly.
Hantz	Favorable	Hard to pack	No water	Percs slowly	Percs slowly	Percs slowly.
28 Hondale	Favorable	Excess salt, hard to pack.	No water	Percs slowly, excess salt.	Percs slowly, excess salt.	Percs slowly.
29*:						
Hondale (Loam)	Favorable	Excess salt, hard to pack.	No water	Percs slowly, excess salt.	Percs slowly, excess salt.	Percs slowly.
Hondale (Fine sandy loam)	Favorable	Excess salt, hard to pack.	No water	Percs slowly, excess salt.	Percs slowly, excess salt, soil blowing.	Percs slowly, soil blowing.
Hondale (Silt loam)	Favorable	Excess salt, hard to pack.	No water	Percs slowly, excess salt.	Percs slowly, excess salt.	Percs slowly.
30 Kimbrough	Cemented pan, slope.	Thin layer	No water	Cemented pan, slope.	Slope, rooting depth.	Cemented pan, slope.
31*:						
Mabray	Depth to rock, slope.	Thin layer	No water	Depth to rock, slope.	Slope, rooting depth, droughty.	Slope, depth to rock.
Rock outcrop.						
32*:						
Mokiak	Slope	Thin layer	No water	Slope	Slope	Slope

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and

TABLE 14.--RECREATIONAL 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]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
1*:				
Anthony	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
Gila	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
2*:				
Arizo (Fine sandy loam)	Severe: floods.	Slight	Moderate: floods, slope, small stones.	Slight.
Arizo (Gravelly sandy loam)	Severe: floods.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
Arizo (Gravelly loamy sand)	Severe: floods.	Moderate: small stones, too sandy.	Severe: small stones.	Moderate: small stones, too sandy.
3 Artesia	Moderate: percs slowly, large stones.	Moderate: large stones.	Severe: large stones.	Moderate: large stones.
4*:				
Atascosa	Severe: slope, large stones, depth to rock.	Severe: slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, large stones.
Chiricahua	Severe: slope.	Severe: slope.	Severe: small stones, slope, depth to rock.	Moderate: slope, small stones.
Rock outcrop.				
5*:				
Atascosa	Severe: slope, large stones, depth to rock.	Severe: slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, large stones.
Graham	Severe: slope, large stones, depth to rock.	Severe: slope, large stones.	Severe: slope, large stones, depth to rock.	Severe: slope, large stones.
Rock outcrop.				
6 Bluepoint	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.
7*:				
Bluepoint	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.
Gothard	Slight	Slight	Slight	Slight.
8 Bonita	Severe: too clayey, large stones.	Severe: too clayey, large stones.	Severe: too clayey, large stones.	Severe: too clayey, large stones.

See footnote at end of table.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
9 Bucklebar	Slight	Slight	Slight	Slight.
10*:				
Calciorthids.				
Torriorthents.				
11*:				
Cave	Moderate: small stones.	Moderate: small stones.	Severe: slope, cemented pan, small stones.	Moderate: small stones.
Durorthids.				
12*:				
Comoro (Fine sandy loam)	Severe: floods.	Slight	Moderate: slope.	Slight.
Comoro (Gravelly sandy loam)	Severe: floods.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
Comoro (Sandy loam)	Severe: floods.	Slight	Moderate: slope.	Slight.
13*:				
Continental	Moderate: small stones, slope.	Moderate: small stones, slope.	Severe: slope, small stones.	Moderate: small stones.
Tubac	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
14 Dona Ana	Slight	Slight	Slight	Slight.
15 Dona Ana	Slight	Slight	Moderate: slope.	Slight.
16, 17 Eba	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
18*:				
Faraway	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: large stones, depth to rock, slope.	Severe: slope, large stones.
Rock outcrop.				
19*:				
Forrest	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
White House	Moderate: small stones.	Moderate: small stones.	Severe: slope	Moderate: small stones

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
21*:				
Anthony	Severe: floods.	Slight	Moderate: slope.	Slight.
Bluepoint	Severe: floods.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.
22*, 23*:				
Glendale	Severe: floods.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
Gila	Severe: floods.	Slight	Slight	Slight.
24*:				
Glendale	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
Gila	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
25*:				
Graham	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: slope, large stones.
Rock outcrop.				
26 Guest	Severe: floods.	Moderate: percs slowly.	Moderate: too clayey.	Slight.
27*:				
Guest	Severe: floods.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
Hantz	Severe: floods.	Moderate: dusty, percs slowly.	Moderate: percs slowly, dusty.	Moderate: dusty.
28 Hondale	Severe: floods.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
29*:				
Hondale (Loam)	Severe: floods.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
Hondale (Fine sandy loam)	Severe: floods.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
Hondale (Silt loam)	Severe: floods.	Moderate: dusty, percs slowly.	Moderate: dusty, percs slowly.	Moderate: dusty.
30 Kimbrough	Moderate: small stones.	Moderate: small stones.	Severe: cemented pan, small stones.	Moderate: small stones.
31*:				
Mabray	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, depth to rock, small stones.	Severe: slope, depth to rock, small stones.
Rock outcrop.				

See footnote at end of table.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
32*:				
Mokiak	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
Faraway	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: large stones, depth to rock, slope.	Severe: slope, large stones.
Rock outcrop.				
33*:				
Pima	Severe:	Moderate:	Moderate:	Moderate:

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
43*:				
Sonoita	Slight	Slight	Slight	Slight.
44 Vekol	Severe: floods.	Slight	Slight	Slight.
45*:				
White House	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
Forrest	Slight	Slight	Moderate: slope.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1*:												
Anthony	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Gila	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
2*:												
Arizo (Fine sandy loam)	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Arizo (Gravelly sandy loam)	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Arizo (Gravelly loamy sand)	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
3 Artesia	Poor	Poor	Fair	---	---	Poor	Poor	Very poor	Poor	---	Very poor	Poor
4*:												
Atascosa	Very poor	Very poor	Poor	Very poor	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Chiricahua	Poor	Poor	Fair	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
Rock outcrop.												
5*:												
Atascosa	Very poor	Very poor	Poor	Very poor	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Graham	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Very poor	---	Very poor	Fair
Rock outcrop.												
6 Bluepoint	Fair	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Fair
7*:												
Bluepoint	Fair	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Fair
Gothard	Very poor	Very poor	Very poor	---	---	Very poor	Very poor	Very poor	Very poor	---	Very poor	---
8 Bonita	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
9 Bucklebar	Good	Good	Good	---	---	Good	Very poor	Very poor	Good	---	Very poor	Poor
10*:												
Calciorthids.												
Torriorthents.												
11*:												
Cave	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor

See footnote at end of table.

TABLE 15.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
11*:												
Durorthids.												
12*:												
Comoro (Fine sandy loam)	Poor	Poor	Poor	---	---	Poor	Very poor	Very poor	Poor	---	Very poor	Poor
Comoro (Gravelly sandy loam)	Poor	Poor	Poor	---	---	Poor	Very poor	Very poor	Poor	---	Very poor	Poor
Comoro (Sandy loam)	Poor	Poor	Poor	---	---	Poor	Very poor	Very poor	Poor	---	Very poor	Poor
13*:												
Continental	Poor	Poor	Fair	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
Tubac	Poor	Poor	Fair	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
14 Dona Ana	Good	Good	Poor	---	---	Poor	Poor	Very poor	Fair	---	Very poor	---
15 Dona Ana	Very poor	Very poor	Poor	---	---	Poor	Poor	Very poor	Very poor	---	Very poor	Poor
16 Eba	Poor	Poor	Poor	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
17 Eba	Fair	Fair	Fair	---	---	Fair	Fair	Poor	Fair	---	Poor	Fair
18*:												
Faraway	Very poor	Very poor	Fair	Poor	---	Fair	Very poor	Very poor	Very poor	Poor	---	Fair
Rock outcrop.												
19*:												
Forrest	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Very poor	---	Very poor	Fair
White House	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Very poor	---	Very poor	Fair
Kimbrough	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Very poor	---	Very poor	Fair
20 Gila	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
21*:												
Gila	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Anthony	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Bluepoint	Fair	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Fair
22*:												
Glendale	Good	Good	Fair	---	---	Fair	Good	Fair	Good	---	Good	Fair
Gila	Good	Good	Fair	---	---	Fair	Good	Fair	Good	---	Good	Fair

See footnote at end of table.

TABLE 15.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
23*:												
Glendale	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Gila	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
24*:												
Glendale	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Gila	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
25*:												
Graham	Very poor	Very poor	Fair	Poor	---	Fair	Very poor	Very poor	Very poor	Poor	Very poor	Fair
Rock outcrop.												
26 Guest	Good	Good	Good	---	---	Fair	Good	Good	Good	---	Good	Poor
27*:												
Guest	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Very poor	---	Very poor	Fair
Hantz	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Very poor	---	Very poor	Fair
28 Hondale	Poor	Poor	Fair	---	---	Poor	Fair	Fair	Fair	---	Fair	Poor
29*:												
Hondale (Loam)	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Hondale (Fine sandy loam)	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Hondale (Silt loam)	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
30 Kimbrough	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Very poor	---	Very poor	Fair
31*:												
Mabray	Very	Very	Poor	Very	---	Poor	Very	Very	Very	---	Very	Poor

TABLE 15.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
34*:												
Pima	Poor	Poor	Fair	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
Grabe	Poor	Poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
35 Pridham	Very poor	Very poor	Very poor	---	---	Very poor	Fair	Fair	Very poor	---	Fair	Very poor
36*:												
Santo Tomas (Cobbly fine sandy loam)	Poor	Poor	Poor	---	---	Poor	Poor	Very poor	Poor	---	Very poor	Poor
Santo Tomas (Very gravelly loam)	Poor	Poor	Poor	---	---	Poor	Poor	Very poor	Poor	---	Very poor	Poor
37 Signal	Very poor	Poor	Fair	---	---	Fair	Very poor	Very poor	Very poor	---	Very poor	Fair
38 Sonoita	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
39 Sonoita	Good	Good	Good	---	---	Poor	Very poor	Very poor	Good	---	Very poor	Good
40 Tres Hermanos	Very poor	Very poor	Poor	---	---	Fair	Poor	Very poor	Very poor	---	Very poor	Fair
41 Tubac	Fair	Fair	Fair	---	---	Fair	Good	Good	Fair	---	Good	---
42*:												
Tubac (Gravelly loam)	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Very poor	---	Very poor	Fair
Tubac (Gravelly sandy loam)	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Very poor	---	Very poor	Fair
43*:												
Tubac	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Very poor	---	Very poor	Fair
Sonoita	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
44 Vekol	Good	Good	Good	---	---	Poor	Good	Good	Good	---	Good	Poor
45*:												
White House	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Very poor	---	Very poor	Fair
Forrest	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Very poor	---	Very poor	Fair

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[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: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
1*:											
Anthony----------	0-4	Sandy loam------	SM	A-2, A-4	0	90-100	90-100	60-70	30-40	---	NP
	4-60	Stratified loam to gravelly sandy loam.	SM	A-1, A-2	0	85-100	60-95	35-60	15-35	---	NP
Gila----------	0-4	Loam----------	ML	A-4	0	95-100	90-100	70-80	50-60	30-40	NP-10
	4-60	Stratified silt loam to gravelly sandy loam.	ML, SM	A-2, A-4	0	80-100	70-100	50-95	30-75	20-30	NP-5
2*:											
Arizo----------	0-3	Fine sandy loam	SM	A-2, A-4	0	80-100	75-95	45-85	25-45	---	NP
	3-60	Very gravelly loamy sand, very gravelly sand.	GP-GM, GP	A-1	0	30-40	20-30	10-20	0-10	---	NP
Arizo----------	0-3	Gravelly sandy loam.	SM, GM	A-2, A-4	0	70-80	65-75	45-70	25-45	---	NP
	3-60	Very gravelly loamy sand, very gravelly sand.	GP-GM, GP	A-1	0	30-40	20-30	10-20	0-10	---	NP
Arizo----------	0-3	Gravelly loamy sand.	SM	A-1	0	75-85	60-70	30-50	10-20	---	NP
	3-60	Very gravelly loamy sand, very gravelly sand.	GP-GM, GP	A-1	0	30-40	20-30	10-20	0-10	---	NP
3---------- Artesia	0-3	Cobbly fine sandy loam.	SM-SC	A-2, A-4	15-30	70-90	60-80	50-60	30-40	20-25	5-10
	3-25	Very gravelly clay loam, very gravelly clay.	GC	A-2, A-6	0-10	40-50	35-50	30-50	15-40	30-35	15-20
	25	Cemented--------	---	---	---	---	---	---	---	---	---
4*:											
Atascosa----------	0-2	Stony sandy loam	ML	A-4	15-40	80-90	80-85	60-70	50-60	25-35	NP-10
	2-7	Very gravelly sandy clay loam, very gravelly clay loam.	GC	A-2	20-30	50-60	40-50	30-45	15-30	25-35	10-15
	7	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Chiricahua--------	0-2	Gravelly sandy loam.	GM, SM	A-1, A-2	0-10	55-75	50-75	35-55	15-35	---	NP
	2-18	Gravelly clay, gravelly clay loam.	CH	A-7	0-15	80-90	55-70	50-60	50-55	60-70	40-50
	18-27	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
5*:											
Atascosa	0-2	Cobbly loam	ML	A-4	15-40	80-90	80-85	60-70	50-60	25-35	NP-10
	2-10	Very gravelly sandy clay loam, very gravelly clay loam.	GC	A-2	20-30	50-60	40-50	30-45	15-30	25-35	10-15
	10	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Graham	0-2	Cobbly clay loam	CH	A-7	20-30	75-85	75-85	60-85	50-70	60-80	40-60
	2-13	Gravelly clay, gravelly clay loam.	CH	A-7	0-20	70-90	60-75	50-70	50-70	60-80	40-60
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
6 Bluepoint	0-2	Loamy sand	SM	A-2	0	90-100	90-100	75-85	20-35	---	NP
	2-60	Stratified loamy fine sand to loamy sand.	SM	A-2	0	90-100	90-100	70-80	15-25	---	NP
7*:											
Bluepoint	0-2	Loamy sand	SM	A-2	0	90-100	90-100	75-85	20-35	---	NP
	2-60	Stratified loamy fine sand to loamy sand.	SM	A-2	0	90-100	90-100	70-80	15-25	---	NP
Gothard	0-2	Fine sandy loam	SM	A-2, A-4	0	100	100	60-75	30-45	15-25	NP-5
	2-22	Clay loam, sandy clay loam.	SC, CL	A-6	0	100	100	80-90	45-55	30-40	10-20
	22-60	Stratified clay loam to loamy sand.	SM, SM-SC	A-1, A-2	0	100	75-100	30-70	10-30	15-30	NP-10
8 Bonita	0-3	Cobbly silty clay.	CH	A-7	10-30	90-100	80-90	80-90	80-90	55-65	40-50
	3-38	Silty clay, clay	CH	A-7	0-5	90-100	90-100	90-100	80-90	55-65	40-50
	38-55	Gravelly clay, very gravelly clay.	GC	A-2, A-7	0-5	20-65	20-65	15-65	15-50	55-65	40-50
9 Bucklebar	0-1	Fine sandy loam	SM, ML	A-2, A-4	0	95-100	95-100	60-85	30-55	<25	NP-5
	1-38	Sandy clay loam, clay loam.	SM-SC, SC, CL-ML, CL	A-6, A-4	0-5	90-100	90-100	60-85	40-60	25-35	5-15
	38-52	Silty clay loam, loam, sandy loam.	CL-ML, CL	A-4, A-6	0-5	95-100	95-100	85-100	60-90	25-40	5-15
10*:											
Calciorthids.											
Torriorthents.											
11*:											
Cave	0-11	Gravelly loam	SM-SC	A-4	0-5	70-90	60-75	40-65	35-50	25-30	5-10
	11-14	Indurated	---	---	---	---	---	---	---	---	---
	14-48	Gravelly loamy sand, very gravelly sandy loam.	GM, SM	A-1, A-2	0-5	35-75	30-60	20-35	10-30	---	NP
Durorthids.											

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
12*:											
Comoro----------	0-10	Fine sandy loam	SM, ML	A-4	0	95-100	95-100	60-70	40-60	30-40	NP-10
	10-60	Stratified silt loam to gravelly loamy sand.	GM, SM	A-2, A-4	0-5	55-100	50-75	30-70	25-40	15-25	NP-5
Comoro----------	0-10	Gravelly sandy loam.	SM, GM	A-1, A-2	0-5	55-85	50-75	30-65	20-30	15-25	NP-5
	10-60	Stratified silt loam to gravelly loamy sand.	GM, SM	A-2, A-4	0-5	55-100	50-75	30-70	25-40	15-25	NP-5
Comoro----------	0-10	Sandy loam------	SM	A-2, A-4	0	95-100	95-100	60-70	30-40	30-40	NP-10
	10-60	Stratified silt loam to gravelly loamy sand.	GM, SM	A-2, A-4	0-5	55-100	50-75	30-70	25-40	15-25	NP-5
13*:											
Continental-------	0-4	Gravelly sandy loam.	SM	A-2	0-10	70-80	50-75	40-50	25-35	---	NP
	4-35	Clay, gravelly clay, gravelly sandy clay.	CL, SC	A-7	0-5	80-95	50-90	50-70	35-65	40-50	20-30
	35-60	Gravelly sandy clay loam, gravelly fine sandy loam.	SM-SC	A-2	5-15	70-80	50-75	50-60	10-30	20-30	5-10
Tubac----------	0-4	Gravelly sandy loam.	SM, GM	A-2, A-4	0-5	65-85	65-70	40-60	30-40	---	NP
	4-12	Gravelly loam---	SC	A-6	0-5	75-90	65-75	45-55	40-50	20-30	10-15
	12-36	Clay----------	CH	A-7	0	95-100	90-100	80-95	70-85	60-70	30-40
	36-60	Clay loam-------	CL	A-7	0	90-100	85-100	80-90	60-70	40-50	25-35
14*:											
[illegible]	0-3	Fine sandy loam	SM	A-4, A-2	0	95-100	90-100	60-85	30-50	<25	NP-4

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
19*:											
Forrest	0-2	Gravelly loam	SM, SM-SC, SC	A-4, A-6	0-5	85-100	70-75	50-65	35-50	15-30	NP-15
	2-38	Clay, gravelly clay.	CH	A-7	0-5	95-100	70-100	65-90	50-75	55-65	30-40
	38-54	Gravelly clay loam, loam, clay loam.	SC, CL	A-6	0-5	85-95	70-85	60-75	40-60	25-35	10-20
White House	0-2	Gravelly loam	CL, SC	A-6	0-10	80-95	70-75	50-70	40-65	25-40	15-25
	2-28	Clay, clay loam	CH	A-7	0-5	90-100	80-95	70-90	60-90	50-60	30-40
	28-50	Gravelly sandy clay loam, gravelly clay.	SC, GC	A-6, A-2	0-10	55-75	50-70	40-50	20-40	30-40	15-25
Kimbrough	0-14	Gravelly loam	GM, ML, CL-ML, GM-GC	A-2, A-4, A-1	0-10	55-80	55-75	40-70	30-55	20-30	NP-10
	14	Indurated	---	---	---	---	---	---	---	---	---
20 Gila	0-4	Loam	ML, CL-ML	A-4	0	95-100	95-100	80-90	60-75	20-30	NP-10
	4-60	Stratified silt loam to gravelly sandy loam.	ML, SM	A-2, A-4	0	80-100	70-100	50-95	30-75	---	NP
21*:											
Gila	0-4	Loam	ML, CL-ML	A-4	0	95-100	95-100	80-90	60-75	20-30	NP-10
	4-60	Stratified silt loam to gravelly sandy loam.	ML, SM	A-2, A-4	0	80-100	70-100	50-95	30-75	---	NP
Anthony	0-4	Sandy loam	SM, ML	A-4	0	95-100	90-100	55-85	35-65	20-30	NP-5
	4-60	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	95-100	90-100	50-85	30-50	20-30	NP-5
Bluepoint	0-2	Loamy sand	SM	A-2	0	90-100	90-100	75-85	20-35	---	NP
	2-60	Stratified loamy fine sand to loamy sand.	SM	A-2	0	90-100	90-100	70-80	15-25	---	NP
22*, 23*:											
Glendale	0-2	Silty clay loam	CL	A-6	0	100	100	95-100	80-90	30-40	15-25
	2-60	Silt loam, clay loam, silty clay loam.	CL	A-6	0	100	100	95-100	75-90	30-40	15-25
Gila	0-4	Loam	ML, CL-ML	A-4	0	95-100	95-100	80-90	60-75	20-30	NP-10
	4-60	Stratified silt	ML, SM	A-2, A-4	0	80-100	70-100	50-95	30-75	---	NP

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
25*:											
Graham	0-2	Cobbly clay loam	CH	A-7	20-30	75-85	75-85	60-85	50-70	60-80	40-60
	2-13	Gravelly clay, gravelly clay loam.	CH	A-7	0-10	70-90	60-75	50-70	50-70	60-80	40-60
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
26 Guest	0-7	Silty clay loam	CL, CH	A-7	0	95-100	95-100	90-100	70-90	35-45	15-20
	7-60	Clay, clay loam, silty clay.	CL, CH	A-7	0	90-100	90-100	80-100	60-80	40-50	20-40
27*:											
Guest	0-7	Silty clay	CH	A-7	0	95-100	95-100	90-100	75-95	50-60	30-40
	7-60	Clay, clay loam, silty clay.	CL, CH	A-7	0	90-100	90-100	80-100	60-80	40-50	20-40
Hantz	0-4	Silt loam	CL	A-6	0-5	80-100	80-100	70-90	60-80	30-40	15-20
	4-41	Silty clay, clay	CH	A-7	0-5	90-100	80-100	70-100	60-90	50-60	30-40
	41-60	Gravelly silt loam.	GM-GC, CL-ML	A-4	0-5	55-75	55-75	45-70	35-60	20-30	5-10
28 Hondale	0-12	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	12-35	Clay, clay loam, silty clay.	CL, CH	A-7	0	100	100	90-100	75-95	40-55	20-30
	35-60	Clay loam, loam, silty clay loam.	ML	A-4, A-6	0	100	100	80-100	50-80	30-40	5-15
29*:											
Hondale	0-12	Loam	ML, CL-ML	A-4	0	100	100	85-100	60-90	20-30	NP-10
	12-35	Clay, clay loam, silty clay.	CL, CH	A-7	0	100	100	90-100	75-95	40-55	20-30
	35-60	Clay loam, loam, silty clay loam.	ML	A-4, A-6	0	100	100	80-100	50-80	30-40	5-15
Hondale	0-12	Fine sandy loam	SM	A-2, A-4	0	100	100	50-75	20-40	---	NP
	12-35	Clay, clay loam, silty clay.	CL, CH	A-7	0	100	100	90-100	75-95	40-55	20-30
	35-60	Clay loam, loam, silty clay loam.	ML	A-4, A-6	0	100	100	80-100	50-80	30-40	5-15
Hondale	0-12	Silt loam	ML, CL-ML	A-4	0	100	100	85-100	60-90	20-30	NP-10
	12-35	Clay, clay loam, silty clay.	CL, CH	A-7	0	100	100	90-100	75-95	40-55	20-30
	35-60	Clay loam, loam, silty clay loam.	ML	A-4, A-6	0	100	100	80-100	50-80	30-40	5-15
30 Kimbrough	0-3	Gravelly fine sandy loam.	GM, SM	A-2, A-4, A-1	0-10	55-80	55-75	35-65	20-45	15-25	NP-5
	3-14	Gravelly fine sandy loam, loam, gravelly loam.	GM, SM, ML, CL-ML	A-2, A-4, A-1	0-10	55-90	55-85	35-80	20-65	15-30	NP-10
	14	Indurated	---	---	---	---	---	---	---	---	---
31*:											
Mabray	0-12	Very gravelly loam.	GM-GC, GC	A-1, A-2	0-5	30-40	25-35	20-30	15-25	20-30	5-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
32*:											
Mokiak----------	0-4	Cobbly sandy clay loam.	SM-SC, SM	A-2	20-35	70-80	60-75	50-60	25-35	25-35	5-10
	4-26	Very cobbly sandy clay loam.	GM-GC, GC	A-2	50-60	30-50	25-45	20-35	10-25	25-35	5-10
	26	Unweathered bedrock.	GM-GC, GC	A-2	---	---	---	---	---	---	---
Earraway----------	0-10	Very cobbly loam	GM, GM-GC	A-2	30-55	40-65	35-60	25-50	20-40	20-30	NP-10

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
37---------- Signal	0-2	Gravelly loam---	GM	A-4	0-10	55-65	50-60	45-55	30-50	25-35	5-10
	2-32	Very gravelly clay, very gravelly clay loam, very gravelly sandy clay.	GC	A-2, A-7	0-15	30-60	25-55	20-55	10-45	40-60	20-30
	32-60	Very gravelly sandy loam, very gravelly loamy sand, very gravelly sandy clay loam.	GP-GM, GM	A-1	10-20	30-45	25-40	15-35	5-25	15-25	NP-5
38---------- Sonoita	0-3	Gravelly sandy loam.	SM-SC	A-1, A-2	0-5	70-75	65-75	40-60	20-30	15-25	5-10
	3-43	Gravelly sandy loam, fine sandy loam, sandy loam.	SC	A-1, A-2	0-5	70-95	65-95	40-65	20-35	20-30	10-15
	43-60	Gravelly sandy clay loam.	SC	A-2, A-4	0-5	70-80	65-75	30-60	20-50	20-30	10-15
39---------- Sonoita	0-5	Fine sandy loam	SM-SC	A-2, A-4	0-5	80-100	75-95	50-75	25-45	15-25	5-10
	5-60	Gravelly sandy loam, fine sandy loam, sandy loam.	SC	A-1, A-2	0-5	70-95	65-95	40-65	20-35	20-30	10-15
40---------- Tres Hermanos	0-3	Gravelly loam---	SM, ML, SM-SC, CL-ML	A-2, A-4	0-5	65-90	60-75	50-70	30-60	<30	NP-10
	3-19	Gravelly loam, gravelly clay loam, clay loam.	SC, CL	A-6, A-7	0-5	75-100	60-100	50-90	40-75	30-45	10-20
	19-60	Gravelly loam, gravelly sandy clay loam, gravelly sandy loam.	SM	A-1, A-2, A-4	0-10	65-95	60-75	40-65	20-50	<30	NP-5
41---------- Tubac	0-10	Sandy clay loam	SC	A-6	0	90-100	85-95	75-85	35-50	30-40	15-25
	10-36	Clay, clay loam	CH	A-7	0	95-100	90-100	80-95	70-85	60-70	35-45
	36-60	Gravelly sandy clay loam, clay loam.	SC, CL	A-2, A-6	0-5	75-100	60-100	50-85	40-75	30-40	10-20
42*:											
Tubac----------	0-7	Gravelly loam---	SM	A-2	0-5	60-80	50-75	40-60	35-50	20-30	NP-5
	7-37	Clay, clay loam	CH	A-7	0	95-100	90-100	80-95	70-85	60-70	35-45
	37-60	Gravelly sandy clay loam, clay loam.	SC, CL	A-2, A-6	0-5	75-100	60-100	50-85	40-75	30-40	10-20
Tubac----------	0-6	Gravelly sandy loam.	SM	A-2	0-5	60-80	50-75	40-60	35-50	20-30	NP-5
	6-36	Clay, clay loam	CH	A-7	0	95-100	90-100	80-95	70-85	60-70	35-45
	36-60	Gravelly sandy clay loam, clay loam.	SC, CL	A-2, A-6	0-5	75-100	60-100	50-85	40-75	30-40	10-20
43*:											
Tubac----------	0-8	Sandy loam------	CL	A-6	0-5	80-100	75-100	60-90	50-70	25-35	10-15
	8-38	Clay, clay loam	CH	A-7	0	95-100	90-100	80-95	70-85	60-70	35-45
	38-60	Gravelly sandy	SC, CL	A-2, A-6	0-5	75-100	60-100	50-85	40-75	30-40	10-20

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF 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 <2mm	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
1*:												
Anthony---------	0-4	8-12	1.65-1.70	2.0-6.0	0.07-0.13	7.9-8.4	<4	Low--------	0.20	5	3	.2-.6
	4-60	8-12	1.65-1.70	2.0-6.0	0.07-0.13	7.9-8.4	<4	Low--------	0.20			
Gila----------	0-4	10-20	1.50-1.60	0.6-2.0	0.13-0.18	7.9-8.4	<4	Low--------	0.49	5	4L	.5-1
	4-60	10-25	1.30-1.60	0.6-2.0	0.18-0.20	7.9-8.4	<4	Low--------	0.32			
2*:												
Arizo---------- (Fine sandy loam)	0-3	8-12	---	0.6-2.0	0.12-0.15	7.4-9.0	<2	Low--------	0.37	5	3	---
	3-60	2-8	---	>20	0.01-0.04	7.4-9.0	<2	Low--------	0.10			
Arizo---------- (Gravelly sandy loam)	0-3	8-12	---	0.6-2.0	0.12-0.14	7.4-9.0	<2	Low--------	0.37	5	3	---
	3-60	2-8	---	>20	0.01-0.04	7.4-9.0	<2	Low--------	0.10			
Arizo---------- (Gravelly loamy sand)	0-3	5-8	---	6.0-20	0.03-0.06	7.4-9.0	<2	Low--------	0.20	5	2	---
	3-60	2-8	---	>20	0.01-0.04	7.4-9.0	<2	Low--------	0.10			
3---------- Artesia	0-3	10-15	---	0.6-2.0	0.08-0.10	6.6-7.3	<2	Low--------	0.17	2	3	---
	3-25	35-45	---	0.2-0.6	0.08-0.10	7.4-8.4	<2	Moderate	0.24			
	25	---	---	---	---	---	---	----------	----			
4*:												
Atascosa--------	0-2	10-20	---	0.6-2.0	0.08-0.14	6.1-7.8	<2	Low--------	0.32	1	8	---
	2-7	25-30	---	0.6-2.0	0.08-0.11	7.4-7.8	<2	Low--------	0.28			
	7	---	---	---	---	---	---	----------	----			
Chiricahua------	0-2	10-15	1.45-1.55	2.0-6.0	0.08-0.10	5.6-7.3	<2	Low--------	0.20	1	8	---
	2-18	35-45	1.20-1.30	0.06-0.2	0.08-0.10	6.1-7.8	<2	High-------	0.24			
	18-27	---	---	---	---	---	---	----------	----			
	27	---	---	---	---	---	---	----------	----			
Rock outcrop.												
5*:												
Atascosa--------	0-2	10-20	---	0.6-2.0	0.08-0.14	6.1-7.8	<2	Low--------	0.32	1	8	---
	2-10	25-30	---	0.6-2.0	0.08-0.11	7.4-7.8	<2	Low--------	0.28			
	10	---	---	---	---	---	---	----------	----			
Graham----------	0-2	35-55	1.20-1.30	0.06-0.2	0.10-0.14	6.6-7.8	<2	High-------	0.20	1	4	---
	2-13	35-55	1.20-1.30	0.06-0.2	0.10-0.14	7.4-8.4	<2	High-------	0.20			
	13	---	---	---	---	---	---	----------	----			
Rock outcrop.												
6---------- Bluepoint	0-2	5-8	---	6.0-20	0.06-0.10	7.9-9.0	<8	Low--------	0.15	5	2	---
	2-60	5-8	---	6.0-20	0.06-0.10	7.9-9.0	<8	Low--------	0.15			
7*:												
Bluepoint-------	0-2	5-8	---	6.0-20	0.06-0.10	7.9-9.0	<8	Low--------	0.15	5	2	---
	2-60	5-8	---	6.0-20	0.06-0.10	7.9-9.0	<8	Low--------	0.15			
Gothard---------	0-2	8-12	1.50-1.60	0.6-2.0	0.07-0.09	>7.8	>8	Low--------	0.28	5	3	.5-1
	2-22	30-35	1.25-1.35	0.06-0.2	0.05-0.10	>8.4	>8	Moderate	0.43			
	22-60	5-35	1.20-1.65	0.06-2.0	0.02-0.08	>8.4	>8	Low--------	0.17			
8---------- Bonita	0-3	40-50	1.25-1.30	<0.06	0.14-0.17	7.9-8.4	<2	High-------	0.28	3	8	---
	3-38	40-50	1.25-1.30	<0.06	0.11-0.13	7.9-8.4	<2	High-------	0.28			
	38-55	35-50	1.25-1.30	<0.06	0.14-0.16	7.9-8.4	<2	High-------	0.28			
9---------- Bucklebar	0-1	10-18	---	2.0-6.0	0.08-0.13	7.4-8.4	<2	Low--------	0.24	5	3	.5-1
	1-38	20-35	---	0.6-2.0	0.13-0.17	7.4-8.4	<2	Moderate	0.32			
	38-52	20-35	---	0.6-2.0	0.13-0.19	7.9-8.4	<2	Moderate	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
10*:												
Calciorthids.												
Torriorthents.												
11*:												
Cave----------	0-11	8-14	1.20-1.40	0.6-2.0	0.07-0.12	7.9-8.4	2-4	Low--------	0.28	1	4L	---
	11-14											

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
21*:												
Bluepoint--------	0-2	5-8	---	6.0-20	0.06-0.10	7.9-9.0	<8	Low--------	0.15	5	2	---
	2-60	5-8	---	6.0-20	0.06-0.10	7.9-9.0	<8	Low--------	0.15			
22*, 23*:												
Glendale---------	0-2	25-35	1.40-1.50	0.2-0.6	0.16-0.21	7.9-8.4	2-4	Moderate	0.37	5	4L	.5-1
	2-60	25-35	1.40-1.50	0.2-0.6	0.16-0.21	7.9-8.4	2-4	Moderate	----			
Gila----------	0-4	12-18	---	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low--------	0.37	5	4L	.5-1
	4-60	8-18	---	0.6-2.0	0.17-0.19	7.9-8.4	<4	Low--------	0.49			
24*:												
Glendale---------	0-2	30-35	1.25-1.35	0.2-0.6	0.16-0.21	7.9-8.4	2-4	Moderate	0.37	5	4L	.5-1
	2-60	25-35	1.25-1.35	0.2-0.6	0.16-0.21	7.9-8.4	2-4	Moderate	0.28			
Gila----------	0-4	10-20	1.50-1.60	0.6-2.0	0.13-0.18	7.9-8.4	<4	Low--------	0.49	5	4L	.5-1
	4-60	10-25	1.30-1.60	0.6-2.0	0.18-0.20	7.9-8.4	<4	Low--------	0.32			
25*:												
Graham----------	0-2	35-55	1.20-1.30	0.06-0.2	0.10-0.14	6.6-7.8	<2	High-------	0.20	1	4	---
	2-13	35-55	1.20-1.30	0.06-0.2	0.10-0.14	7.4-8.4	<2	High-------	0.20			

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/In	pH	Mmhos/cm					Pct
32*:												
Faraway---------	0-10	10-20	1.30-1.45	0.6-2.0	0.03-0.07	5.6-7.3	<2	Low--------	0.32	1	8	---
	10	---	---	---	---	---	---	----------	----			
Rock outcrop.												
33*:												
Pima----------	0-31	15-25	1.50-1.60	0.6-2.0	0.16-0.21	7.4-8.4	<2	Low--------	0.37	5	4L	1-2
	31-60	25-30	1.20-1.35	0.2-0.6	0.19-0.21	7.4-8.4	<4	Moderate	0.32			
Grabe----------	0-24	10-18	1.30-1.55	0.6-2.0	0.08-0.15	7.4-8.4	2-4	Low--------	0.24	5	4L	1-2
	24-60	15-18	1.30-1.40	0.6-2.0	0.12-0.21	7.4-8.4	2-4	Low--------	0.49			
34*:												
Pima----------	0-8	15-25	1.50-1.60	0.6-2.0	0.16-0.21	7.4-8.4	<2	Low--------	0.37	5	4L	1-2
	8-60	25-30	1.20-1.35	0.2-0.6	0.19-0.21	7.4-8.4	<4	Moderate	0.32			
Grabe----------	0-40	18-22	1.30-1.35	0.6-2.0	0.12-0.15	7.9-8.4	2-4	Low--------	0.32	5	4L	1-2
	40-60	5-10	1.25-1.35	2.0-6.0	0.08-0.10	7.9-8.4	2-4	Low--------	0.37			
35---------- Pridham	0-1	30-35	---	0.2-0.6	0.19-0.21	6.6-9.0	<2	Moderate	0.37	5	4	---
	1-29	35-55	---	0.06-0.2	0.14-0.16	7.9-9.0	4-16	High-------	0.24			
	29-60	25-45	---	0.2-0.6	0.19-0.21	7.9-9.0	4-16	Moderate	0.37			
36*:												
Santo Tomas----- (Cobbly fine sandy loam)	0-2	10-15	---	2.0-6.0	0.07-0.10	6.6-8.4	<2	Low--------	0.24	5	---	---
	2-60	10-15	---	2.0-6.0	0.04-0.06	7.4-8.4	<2	Low--------	0.20			
Santo Tomas----- (Very gravelly loam)	0-2	10-20	---	2.0-6.0	0.07-0.10	6.6-8.4	<2	Low--------	0.24	5	---	---
	2-60	10-15	---	0.6-2.0	0.04-0.06	7.4-8.4	<2	Low--------	0.20			
37---------- Signal	0-2	18-25	---	0.6-2.0	0.10-0.14	6.6-7.3	<2	Low--------	0.37	5	5	---
	2-32	35-55	---	0.06-0.2	0.07-0.12	6.6-8.4	<2	Moderate	0.32			
	32-60	5-25	---	6.0-20	0.02-0.08	7.9-8.4	<2	Low--------	0.17			
38---------- Sonoita	0-3	5-15	1.55-1.65	2.0-6.0	0.07-0.11	6.1-7.3	<2	Low--------	0.17	---	---	.5-1
	3-43	10-18	1.55-1.65	2.0-6.0	0.07-0.13	7.4-8.4	<2	Low--------	0.17			
	43-60	20-30	1.50-1.60	2.0-6.0	0.10-0.15	7.4-8.4	<2	Low--------	0.20			
39---------- Sonoita	0-5	10-15	1.50-1.60	0.6-2.0	0.13-0.15	6.1-7.3	<2	Low--------	0.20	5	3	.5-1
	5-60	10-18	1.55-1.65	2.0-6.0	0.07-0.13	7.4-8.4	<2	Low--------	0.17			
40---------- Tres Hermanos	0-3	20-30	---	0.6-2.0	0.10-0.17	7.4-8.4	<2	Low--------	0.24	3	5	.5-1
	3-19	20-30	---	0.2-0.6	0.10-0.17	7.4-8.4	2-4	Moderate	0.24			
	19-60	15-25	---	0.6-2.0	0.07-0.10	7.9-8.4	2-4	Low--------	0.24			
41---------- Tubac	0-10	20-30	1.40-1.50	0.2-0.6	0.14-0.16	6.1-7.3	<2	Moderate	0.37	5	5	.5-1
	10-36	35-60	1.20-1.60	0.06-0.2	0.14-0.16	7.4-8.4	2-4	High-------	0.32			
	36-60	20-30	1.40-1.60	0.2-0.6	0.08-0.12	7.4-8.4	2-4	Moderate	0.28			
42*:												
Tubac---------- (Gravelly loam)	0-7	20-25	1.50-1.60	0.6-2.0	0.12-0.18	6.1-7.3	<2	Moderate	0.37	5	5	.5-1
	7-37	35-60	1.20-1.60	0.06-0.2	0.14-0.16	7.4-8.4	2-4	High-------	0.32			
	37-60	20-30	1.40-1.60	0.2-0.6	0.08-0.12	7.4-8.4	2-4	Moderate	0.28			
Tubac---------- (Gravelly sandy loam)	0-6	20-25	1.50-1.60	2.0-6.0	0.12-0.18	6.1-7.3	<2	Moderate	0.37	5	5	.5-1
	6-36	35-60	1.20-1.60	0.06-0.2	0.14-0.16	7.4-8.4	2-4	High-------	0.32			
	36-60	20-30	1.40-1.60	0.2-0.6	0.08-0.12	7.4-8.4	2-4	Moderate	0.28			
43*:												
Tubac----------	0-8	20-25	1.40-1.50	2.0-6.0	0.12-0.18	6.1-7.3	<2	Moderate	0.37	5	5	.5-1
	8-38	35-60	1.20-1.60	0.06-0.2	0.14-0.16	7.4-8.4	2-4	High-------	0.32			
	38-60	20-30	1.40-1.60	0.2-0.6	0.08-0.12	7.4-8.4	2-4	Moderate	0.28			
Sonoita---------	0-4	10-15	1.50-1.60	0.6-2.0	0.13-0.15	6.1-7.3	<2	Low--------	0.20	5	3	.5-1
	4-34	10-18	1.55-1.65	2.0-6.0	0.07-0.13	7.4-8.4	<2	Low--------	0.17			
	34-60	20-30	1.50-1.60	2.0-6.0	0.10-0.15	7.4-8.4	<2	Low--------	0.20			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
44---------- Vekol	0-10	20-25	1.25-1.30	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low--------	0.43	5	4L	.3-1
	10-47	35-50	1.20-1.50	0.06-0.2	0.14-0.21	7.4-9.0	2-4	High-------	0.28			
	47-54	15-30	1.25-1.45	0.6-2.0	0.08-0.19	7.4-9.0	2-4	Low--------	0.28			
45*:												
White House-----	0-2	20-30	1.30-1.40	0.6-2.0	0.12-0.19	5.6-6.5	<2	Moderate	0.37	5	6	1-2
	2-28	35-60	1.20-1.30	0.06-0.2	0.14-0.16	6.6-8.4	<2	High-------	0.32			
	28-50	30-45	1.30-1.40	0.2-0.6	0.10-0.14	7.9-8.4	<2	Moderate	0.37			
Forrest---------	0-2	10-20	1.40-1.65	0.6-2.0	0.07-0.14	5.6-7.3	<2	Low--------	0.37	5	3	1-2
	2-38	40-50	1.50-1.60	0.06-0.2	0.14-0.16	7.4-8.4	<2	High-------	0.28			
	38-54	25-35	1.40-1.55	0.2-0.6	0.10-0.16	7.4-9.0	2-4	Moderate	0.32			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
					Ft			In		In			
1*:													
Anthony	B	Frequent	Brief	Jul-Sep	>6.0	---	---	>60	---	---	---	High	Low.
Gila	B	Frequent	Brief	Jul-Sep	>6.0	---	---	>60	---	---	---	High	Low.
2*:													
Arizo (Fine sandy loam)	A	Occasional	Very brief	Mar-Sep	>6.0	---	---	>60	---	---	---	High	Low.
Arizo (Gravelly sandy loam)	A	Occasional	Very brief	Mar-Sep	>6.0	---	---	>60	---	---	---	High	Low.
Arizo (Gravelly loamy sand)	A	Occasional	Very brief	Mar-Sep	>6.0	---	---	>60	---	---	---	High	Low.
3 Artesia	D	None	---	---	>6.0	---	---	>60	---	20-40	Rippable	Moderate	Low.
4*:													
Atascosa	D	None	---	---	>6.0	---	---	4-20	Rippable	---	---	High	Low.
Chiricahua	D	None	---	---	>6.0	---	---	10-20	Rippable	---	---	Moderate	Low.
Rock outcrop.													
5*:													
Atascosa	D	None	---	---	>6.0	---	---	4-20	Rippable	---	---	High	Low.
Graham	D	None	---	---	>6.0	---	---	8-20	Hard	---	---	High	Low.
Rock outcrop.													
6 Bluepoint	A	Rare	---	---	>6.0	---	---	>60	---	---	---	High	High.
7*:													
Bluepoint	A	Rare	---	---	>6.0	---	---	>60	---	---	---	High	High.
Gothard	D	None	---	---	>6.0	---	---	>60	---	---	---	High	High.
8 Bonita	D	None	---	---	>6.0	---	---	>60	---	---	---	High	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Depth	Hardness	Uncoated steel	Concrete
					Ft			In		In			
9---------- Bucklebar	B	None---------	---	---	>6.0	---	---	>60	---	---	---	Moderate	Low.
10*:													
Calciorthids.													
Torriorthents.													
11*:													
Cave----------	D	None---------	---	---	>6.0	---	---	>60	---	4-20	Hard	High-----	Low.
Durorthids.													
12*:													
Comoro---------- (Fine sandy loam)	B	Rare---------	---	---	>6.0	---	---	>60	---	---	---	Moderate	Low.
Comoro---------- (Gravelly sandy loam)	B	Rare---------	---	---	>6.0	---	---	>60	---	---	---	Moderate	Low.
Comoro---------- (Sandy loam)	B	Rare---------	---	---	>6.0	---	---	>60	---	---	---	Moderate	Low.
13*:													
Continental------	C	None---------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.
Tubac----------	C	None---------	---	---	>6.0	---	---	>60	---	---	---	Moderate	Low.
14, 15---------- Dona Ana	B	None---------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.
16, 17---------- Eba	C	None---------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.
18*:													
Faraway----------	D	None---------	---	---	>6.0	---	---	5-20	Hard	---	---	Moderate	Low.
Rock outcrop.													
19*:													
Forrest----------	C	None---------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.
White House------	C	None---------	---	---	>6.0	---	---	>60	---	---	---	High-----	Moderate
Kimbrough--------	D	None---------	---	---	>6.0	---	---	>60	---	4-20	Hard	Moderate	Low.
20---------- Gila	B	Rare---------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
					Ft			In		In			
21*:													
Gila	B	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Low.
Anthony	B	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Low.
Bluepoint	A	Rare	---	---	>6.0	---	---	>60	---	---	---	High	High.
22*, 23*:													
Glendale	B	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Low.
Gila	B	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Low.
24*:													
Glendale	B	Frequent	Brief	Jul-Sep	>6.0	---	---	>60	---	---	---	High	Low.
Gila	B	Frequent	Brief	Jul-Sep	>6.0	---	---	>60	---	---	---	High	Low.
25*:													
Graham	D	None	---	---	>6.0	---	---	8-20	Hard	---	---	High	Low.
Rock outcrop.													
26 Guest	D	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Low.
27*:													
Guest	D	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Low.
Hantz	D	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Moderate
28 Hondale	D	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Moderate
29*:													
Hondale (Loam)	D	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Moderate
Hondale (Fine sandy loam)	D	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Moderate
Hondale (Silt loam)	D	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Moderate
30 Kimbrough	D	None	---	---	>6.0	---	---	>60	---	4-20	Hard	Moderate	Low.
31*:													
Mabray	D	None	---	---	>6.0	---	---	4-20	Hard	---	---	Moderate	Low.
Rock outcrop.													

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
					Ft			In		In			
32*:													
Mokiak	B	None	---	---	>6.0	---	---	30-40	Hard	---	---	High	Low.
Faraway	D	None	---	---	>6.0	---	---	5-20	Hard	---	---	Moderate	Low.
Rock outcrop.													
33*:													
Pima	B	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Low.
Grabe	B	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Low.
34*:													
Pima	B	Frequent	Brief	Jul-Sep	>6.0	---	---	>60	---	---	---	High	Low.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
					Ft			In		In			
43*:													
Sonoita	B	None	---	---	>6.0	---	---	>60	---	---	---	High	Low.
44 Vekol	D	Rare	---	---	>6.0	---	---	>60	---	---	---	High	Low.
45*:													
White House	C	None	---	---	>6.0	---	---	>60	---	---	---	High	Moderate
Forrest	C	None	---	---	>6.0	---	---	>60	---	---	---	High	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Anthony	Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents
Arizo	Sandy-skeletal, mixed, thermic Typic Torriorthents
Artesia	Clayey-skeletal, mixed, thermic Haplic Durargids
[illegible]	[illegible]

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