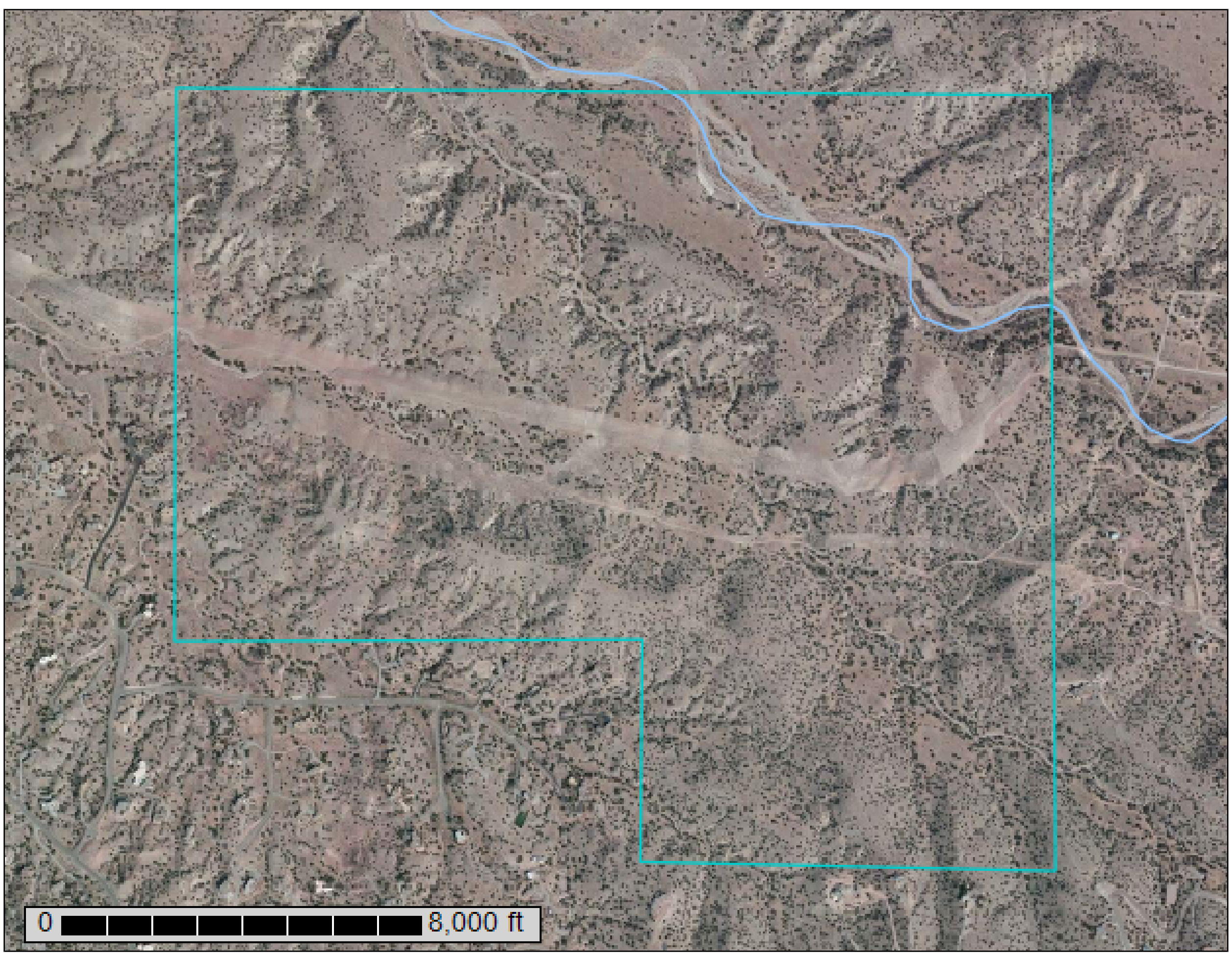
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties



October 17, 2014

Preface

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

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

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

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

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

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

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

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

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

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

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

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

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

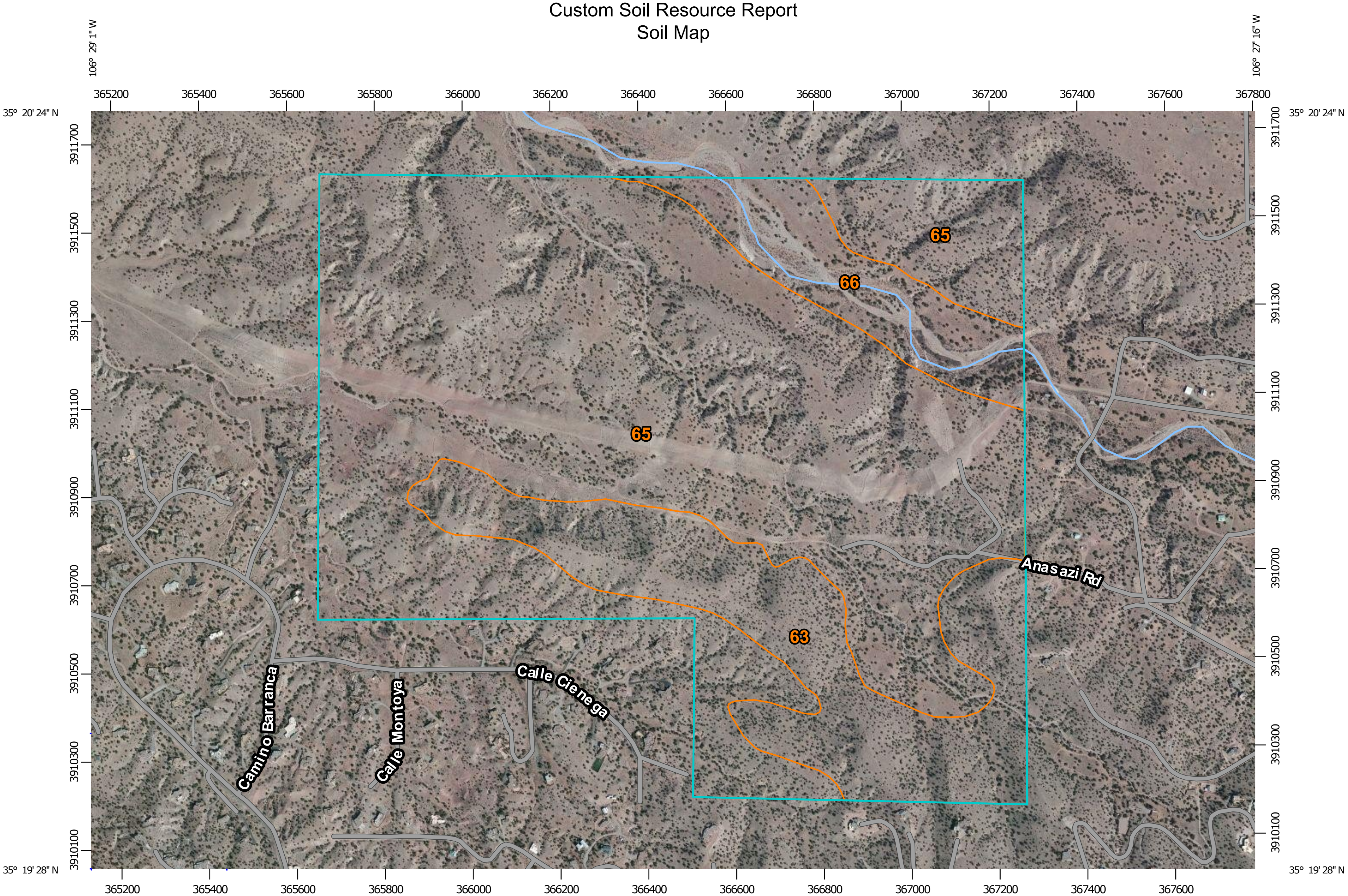
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree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

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

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:12,100 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties
Survey Area Data: Version 9, Sep 25, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 23, 2011—May 4, 2011

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

Map Unit Legend

Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties (NM656)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
63	Placitas gravelly loam, 8 to 40 percent slopes	89.6	18.8%
65	Ildefonso-Harvey association, 10 to 35 percent slopes	350.5	73.5%
66	Zia sandy loam, 3 to 6 percent slopes	37.0	7.8%
Totals for Area of Interest		**477.1**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

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

Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties

63—Placitas gravelly loam, 8 to 40 percent slopes

Map Unit Setting

National map unit symbol: 1wr3
Elevation: 5,700 to 6,300 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 120 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Placitas and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Placitas

Setting

Landform: Fan remnants
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fan alluvium derived from conglomerate

Typical profile

A - 0 to 5 inches: gravelly loam
Bw - 5 to 10 inches: very gravelly sandy loam
Bk - 10 to 27 inches: very gravelly sandy loam
R - 27 to 60 inches: bedrock

Properties and qualities

Slope: 8 to 40 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 25 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: Gravelly (R070CY119NM)

65—Ildefonso-Harvey association, 10 to 35 percent slopes

Map Unit Setting

National map unit symbol: 1wr5
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 13 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 120 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Ildefonso and similar soils: 50 percent
Harvey and similar soils: 30 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ildefonso

Setting

Landform: Fan remnants, mesas
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fan alluvium over colluvium derived from igneous and sedimentary rock

Typical profile

A - 0 to 6 inches: very gravelly sandy loam
Bw - 6 to 38 inches: very gravelly sandy loam
Bk - 38 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 10 to 35 percent
Percent of area covered with surface fragments: 2.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 20 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Breaks (R070CY115NM)

Description of Harvey

Setting

Landform: Mesas, bajadas, plateaus
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Eolian deposits over slope alluvium derived from igneous and sedimentary rock

Typical profile

A - 0 to 4 inches: loam
Bk1 - 4 to 23 inches: loam
Bk2 - 23 to 36 inches: loam
C - 36 to 60 inches: sandy loam

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 20 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Limy (R070CY108NM)

Minor Components

Riverwash

Percent of map unit: 5 percent
Landform: Channels, streams
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear

66—Zia sandy loam, 3 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1wr6
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 13 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 120 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Zia and similar soils: 85 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zia

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits over fan alluvium derived from sandstone

Typical profile

A - 0 to 4 inches: sandy loam
C - 4 to 60 inches: sandy loam

Properties and qualities

Slope: 3 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: A
Ecological site: Sandy (R035XA113NM)

Minor Components

Riverwash

Percent of map unit: 5 percent
Landform: Channels, streams
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear

Soil Information for All Uses

Ecological Site Assessment

Individual soil map unit components can be correlated to a particular ecological site. The Ecological Site Assessment section includes ecological site descriptions, plant growth curves, state and transition models, and selected National Plants database information.

Ecological Site Information for: R035XA113NM — Sandy (Sandy historic)

Overview

The Sandy Ecological Site typically occurs on upland plains, adjacent to or in a mosaic with Deep Sand or Loamy Ecological Sites. The reference plant community of the Sandy site has a grassland aspect characterized by warm- and cool-season grasses, scattered shrubs, and forbs. Blue grama is the dominant grass species accompanied by subdominant western wheatgrass. Fourwing saltbush and winterfat are the dominant shrubs. This site is susceptible to juniper invasion and shrub encroachment. Loss of grass cover and lack of fire may facilitate the transition to the Juniper State. Decreased grass cover due to overgrazing and drought in conjunction with resource competition may cause the transition to the Shrub-dominated State.

Catalog of states and community pathways

Reference State

Reference Plant Community: In the reference plant community, blue grama is the dominant grass species accompanied by subdominant western wheatgrass. Other species that occur in significant numbers include Indian ricegrass, sand dropseed, and spike dropseed. In addition to western wheatgrass and Indian ricegrass, other species such as needle and thread, bottlebrush squirreltail, and New Mexico feathergrass contribute to an important cool-season grass component on this site.

Principal shrubs include fourwing saltbush, winterfat, and sand sagebrush. Rocky Mountain beeplant is often the most noticeable forb. Continuous heavy grazing will cause a decrease in cool-season grasses, especially western wheatgrass. The Warm-season Grass Community, dominated by blue grama with subdominant dropseeds, threeawns, and galleta, may result. Western wheatgrass is adapted to fine- to medium-textured soils, and may be naturally less dominant on coarser textured soils (7). Conversely, dropseeds are adapted to coarse- to medium-textured soils and may be naturally more dominant on soils with loamy sand surface textures (7). The Sod-bound Blue Grama Community may occur in response to increased fall/spring moisture following drought (2, 5) or continuous heavy grazing.

Diagnosis: Grass cover is relatively uniform; however, bare ground makes up a large percent of the total ground cover, and grass production during unfavorable years may only average 250 pounds per acre. Shrubs are scattered with canopy cover averaging 5%. Evidence of erosion such as rills and gullies is infrequent.

Additional States:

Shrub-Dominated State: This state is characterized by the predominance of shrubs, especially sand sagebrush, horsebrush, or rabbitbrush. Perennial grasses are subordinate. The grass component is typically a low-vigor, blue grama community with more threeawns, dropseeds, ring muhly, sandhill muhly, and bare ground than in the Reference State.

Diagnosis: Grass cover is patchy, usually dominated by low-vigor blue grama. Shrub cover averages 20% or more. Evidence of wind erosion, such as pedestalling of plants, blowouts, and soil deposition, may be common.

Transition to the Shrub-Dominated State (T1A). Loss of grass cover due to overgrazing or extended drought may facilitate the transition to the Shrub-Dominated State.

Key indicators of approach to transition:

—Loss of cool season grasses

—Decrease in grass and litter cover

—Increases in cover of bare ground

—Increases in shrub seedlings

Restoration Pathway to the Reference State (R2A). Brush control is necessary to reduce the competitive influence of shrubs and reestablish grass dominance. Chemical control or mowing for 2 consecutive years is effective in controlling sand sagebrush. Root plowing and other mechanical control methods that sever the plant below the sprouting zone may reduce horsebrush and rabbitbrush densities. Some positive results have been reported in controlling rabbitbrush with herbicides (1, 8). Follow-up spraying after the initial treatment is necessary to control horsebrush (9). Single treatments may actually increase horsebrush densities. Complete shrub removal should be attempted only after erosion hazard is evaluated. Seeding may be necessary if adequate seed source is not present. Rest from grazing followed by prescribed grazing afterward will help ensure grass establishment.

Juniper-invaded State. This state is characterized by the presence of juniper. Blue grama, dropseeds, galleta, Indian ricegrass, and threeawns are the primary grass species. Western wheatgrass may be present.

Diagnosis: Juniper is present. Grass cover is variable, ranging from relatively uniform to patchy with large, interconnected bare areas.

Transition to Juniper-invaded State (T1B). Loss of grass cover, resource competition, and lack of fire are believed to facilitate juniper invasion. Climatic periods of mild winters and wet summers may produce conditions favorable to juniper establishment, and result in episodic events of juniper expansion (6). Seed dispersal by wildlife and livestock may contribute to the spread of juniper. Birds, rodents, deer and other small mammals may eat the fruits of juniper and aid in spreading juniper seed (3). Sheep and goats may browse juniper and can act as dispersal agents in some areas. Overgrazing and competition for resources in conjunction with drought may favor juniper invasion. During years of limited rainfall, good grass cover may suppress juniper seedling survival by competing directly for soil moisture. Resource competition is more important during juniper seedling establishment when their roots are in the same zone as the grasses (3). Overgrazing may facilitate the establishment of juniper seedlings by providing competition-free areas, but livestock exclusion alone would not prevent juniper establishment. During wet years, competition for available soil moisture is reduced, and juniper seedlings may even establish in good stands of grass (3). Additionally, the natural spatial variability of ground cover may allow woody species to establish on bare areas within good grass stands when adequate moisture is available (4). Where fire was historically important in the development of plant communities on Sandy Ecological Sites by suppressing juniper seedlings, then overgrazing and fire suppression can disrupt natural fire frequencies and may facilitate juniper invasion.

Key indicators of approach to transition

—Decrease or change in composition or distribution of grass cover

—Increase in size and frequency of bare patches

—Increase in amount of juniper seedlings

Restoration Pathway to the Reference State (R3A). Mechanical or chemical brush control can be used to remove juniper and facilitate grass recovery. After brush control, rest from grazing followed by prescribed grazing will assist in grass reestablishment and persistence.

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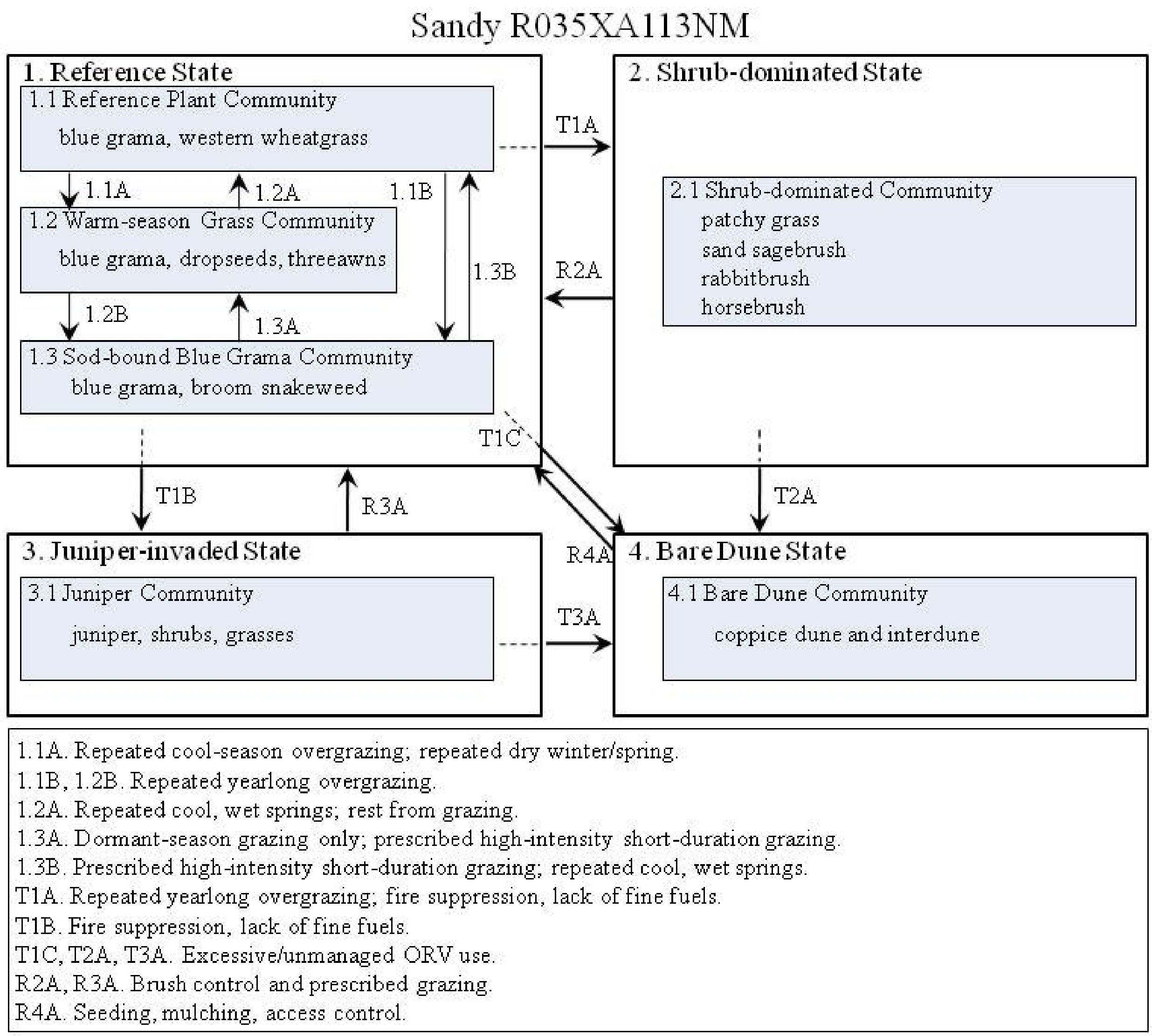
State Transition Diagram— R035XA113NM — Sandy (Sandy historic)



Ecological Site Information for: R070CY115NM — Breaks (Breaks historic)

The Breaks ecological site is characterized by several mountain shrub community potentials due to variability in elevation, soil depth and texture, aspect, and topography. Plant communities include a sotol with scattered wavyleaf oak, mountain mahogany dominated community, and a wavyleaf oak dominated community.

All communities tend to occur within one very stable state. The most influential driver affecting plant community dynamics is fire. Vegetation on this site, also referred to as chaparral, experiences stand-replacing fires measured in decades (Wright 1990; Paysen et al. 2000). The buildup of litter and dry conditions following a fire will take at least 10-15 years the area is ready to burn again (Wright 1990). Since chaparral tends to replace chaparral after fire, species composition can change depending on post-fire seed bank composition, individual species morphology, and severity of the fire (NPS 2005). Generally, the dynamic is from a more closed or dense shrubland to an open shrubland phase and vice versa within a stable state.

Other disturbances such as prolonged droughts will negatively affect annual productivity. Grazing and/or browsing by domestic sheep and goats probably does not influence the site enough to cause significant phase changes because of the long and near vertical escarpments with abundant rocks outcrops protecting vegetation and the long distance to water. Historically, desert bighorn sheep and mule deer were probably the major grazers/browsers. Mule deer still occur on the site and bighorn sheep are being reintroduced in nearby areas.

The following diagram suggests general pathways that the vegetation on this site might follow. There are other plant communities and states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances; it does not mean that this would happen the same way in every instance. Local professional guidance should always be sought before pursuing a treatment scenario.

All Plant Community Photos— R070CY115NM — Breaks (Breaks historic)

Dense Shrub Community

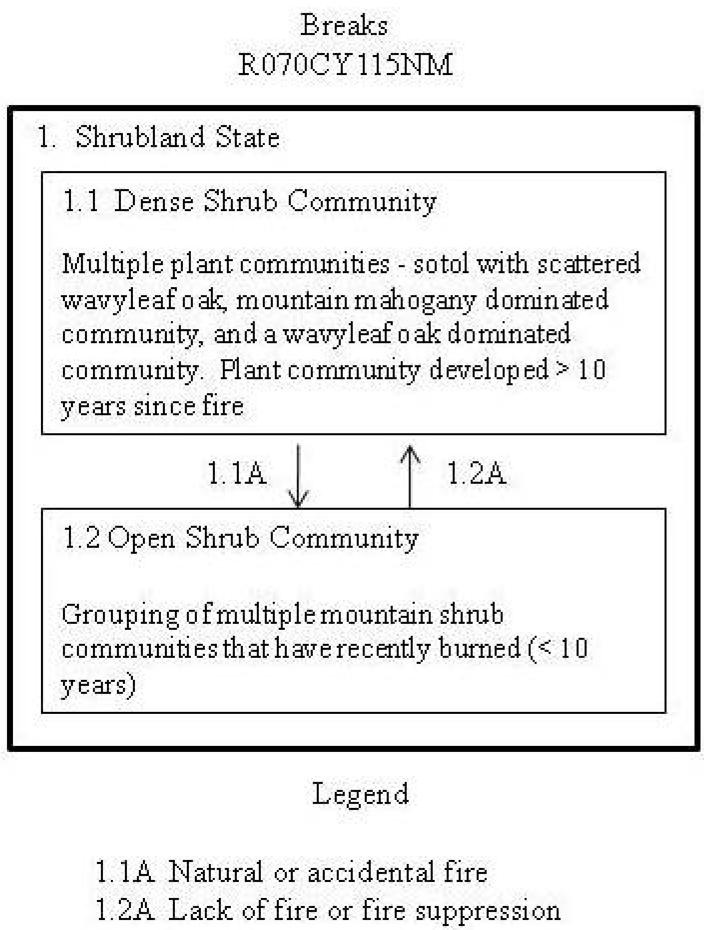
Dense Shrub Community

Dense Shrub Community

Dense Shrub Community

Open Shrub Community

State Transition Diagram— R070CY115NM — Breaks (Breaks historic)



R070CY115NM — Breaks— Open Shrub Community (Breaks open shrub historic)

The Open Shrub Community Phase 1.2 is a grouping of multiple mountain shrub communities that have recently burned (< 10 years). Species composition, relative percentages of grasses and shrubs will differ due to variations in local environments (soils, topography, elevation, and aspect). In general, these communities will have a lower canopy cover of shrubs when comparing similar environments that have not burned. Individual plant morphology, local seed bank, and the severity of the fire will dictate species composition in the years following a fire.

In a fire study within the Guadalupe Mountains, skeletonleaf goldeneye was more frequent on burned than on unburned sites (Ahlstrand, 1978). Also, sotol, lechuguilla, and sacahuista suffered losses in excess of 50% on burned sites (Ahlstrand, 1978). The ability of sotol and other plants to survive fire is dependent upon individual plant morphology and the frequency and severity of fire. Mature sotol can contribute to fire travel since they can burn for hours and can spread fire by falling and rolling downhill (USFS). Desert ceanothus plants are usually killed by fire (Keeley et al. 1978; Zammit, 1992), but they are fire dependent because ceanothus seeds need heat stimulation from fire to germinate (Zammit, 1992). Wavyleaf oak, on the other hand, sprouts prolifically following top-kill by fire and has the potential to return to its pre-fire phase in one year with favorable rainfall and minimal herbivory. Other communities with mixed shrubs will have varying responses following a fire.

Plant Community Photos— R070CY115NM — Breaks (Breaks open shrub historic)

Open Shrub Community

Ecological Site Information for: R070CY119NM — Gravelly

R070CY119NM — Gravelly— Historic Climax Plant Community (Gravelly historic)

This site is characterized by mid- and short grasses with scattered shrubs and half-shrubs also quite prevalent. Scattered oneseed juniper and occasional pinyon are also found on this site, increasing in density with increase in elevation.

Other grasses that can appear on this site include: threeawn, pinyon and littleseed ricegrass, sand dropseed, little bluestem, curlyleaf muhly, cane and silver bluestem, scribner needlegrass, and bush muhly.

Other shrubs can include:

fourwing saltbush, Bigelow sagebrush, sagewort spp., fringed sage, wolfberry, sacahuista, broom snakeweed.

Other forbs can include:

soft groundcherry, wooly Indianwheat, and fleabane.

Plant Community Tables— R070CY119NM — Gravelly— Historic Climax Plant Community (Gravelly historic)

Annual Production (Lbs/Acre)			
Plant Type	**Low**	**Representative Value**	**High**
Grass/Grasslike	292	548	803
Forb	32	60	88
Tree	60	113	165
Totals	**384**	**721**	**1,056**

Plant Species Composition (Lbs/Acre)				
Grass/Grasslike				
Group	**Plant Common Name**	**Plant Scientific Name**	**Annual Production Pounds Per Acre**	
			Low	**High**
1			113	225
	black grama	Bouteloua eriopoda	113	225
2			75	150
	blue grama	Bouteloua gracilis	75	150
	hairy grama	Bouteloua hirsuta	75	150
3			75	225
	sideoats grama	Bouteloua curtipendula	75	225
4			113	225
	needleandthread	Hesperostipa comata	113	225
	new mexico feathergrass	Hesperostipa neomexicana	113	225
5			38	75
	wolftail	Lycurus phleoides	38	75
6			38	60
	plains lovegrass	Eragrostis intermedia	38	60
	plains bristlegrass	Setaria vulpiseta	38	60
7			23	38
	bottlebrush squirreltail	Elymus elymoides	23	38
8			0	38
	vine-mesquite	Panicum obtusum	0	38
	pubescent wheatgrass	Pascopyrum smithii	0	38
9			23	38
	perennial threeawn spp.	Aristida	23	38
10			8	38
	galleta	Pleuraphis jamesii	8	38
11			8	38

Plant Species Composition (Lbs/Acre)				
Forb				
Group	Plant Common Name	Plant Scientific Name	Annual Production Pounds Per Acre	
			Low	High
12			8	23
	penstemon spp. (beard tongue)	Penstemon	8	23
13			8	23
	scarlet globemallow	Sphaeralcea coccinea	8	23
14			8	23
	scarlet Indian paintbrush	Castilleja coccinea	8	23
15			4	23
	threadleaf groundsel	Senecio flaccidus var. flaccidus	4	23
16			4	15

Plant Species Composition (Lbs/Acre)				
Shrub/Vine				
Group	Plant Common Name	Plant Scientific Name	Annual Production Pounds Per Acre	
			Low	High
18			8	38
	apacheplume	Fallugia paradoxa	8	38
19			8	38
	littleleaf sumac	Rhus microphylla	8	38
	skunkbush sumac	Rhus trilobata	8	38
20			38	75
	winterfat	Krascheninnikovia lanata	38	75
21			8	23
	mormon-tea	Ephedra viridis	8	23
22			15	38
	yucca spp.	Yucca	15	38
23			8	23
	algerita	Mahonia trifoliolata	8	23
24			8	38

Plant Species Composition (Lbs/Acre)				
Tree				
Group	Plant Common Name	Plant Scientific Name	Annual Production Pounds Per Acre	
			Low	High
17			15	38
	juniper spp.	Juniperus	15	38
	pinon pine	Pinus edulis	15	38

Plant Growth Curve											
Growth Curve Name R070CY119NM Gravelly Reference State											
Growth Curve Description R070CY119NM Gravelly Reference State Mixed short/mid-grassland w/ major shrub component and scattered oneseed juniper and pinyon.											
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
0%	0%	5%	7%	10%	15%	25%	25%	8%	5%	0%	0%

Ground Cover		
Vegetative Cover Type	**Minimum**	**Maximum**
Grass/grasslike	—	—
Forb	—	—
Shrub/vine/liana	3.000%	5.000%
Tree	3.000%	5.000%
Non-vascular plants	—	—
Biological crust	—	—
Non-Vegetative Cover Type	**Minimum**	**Maximum**
Litter	5.000%	10.000%
Surface fragments > 0.25" and <= 3"	—	—
Surface fragments > 3"	—	—
Bedrock	—	—
Water	—	—
Bare ground	20.000%	35.000%
Down wood, fine-small	—	—
Down wood, fine-medium	—	—
Down wood, fine-large	—	—
Down wood, coarse-small	—	—
Down wood, coarse-large	—	—
Tree snags	—	—
Hard snags	—	—
Soft snags	—	—

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