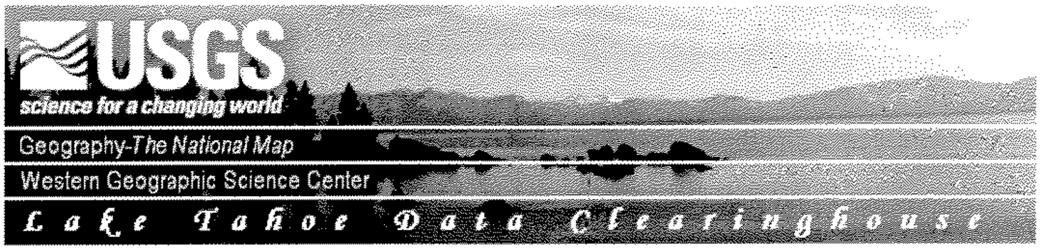
#515



Soil Data

Soil data for the Lake Tahoe area are now available online! The † Natural Resource Conservation Service (NRCS) soil maps are available from the † SSURGO database.

The following info files regarding soil data are from the NRCS website († http://www.ftw.nrcs.usda.gov):

- Readme
- † SSURGO users guide (pdf file)

Data Download

Soil data are in **UTM NAD27 zone 10 projection**. Raw (original) data are in the following projections: data east of 120 degrees longitude are in UTM zone 11 and data west of 120 degrees longitude are in UTM zone 10. It is not possible to combine different projections in Geographic Information System (GIS), therefore, all data have been reprojected into one standard projection, UTM NAD27 zone 10 projection, for the Lake Tahoe Basin.

The following soil data have been mosaicked together from the18 7.5-minute quadrangles that cover the Lake Tahoe Basin. The mosaicked files are more convenient for looking at areas throughout the basin or areas on the edge of two quadrangles.

The following SSURGO data are stored in three different file formats, each contain the same information:

soils_sdts.zip
(SDTS format, 2 MB compressed)

soils_e00.zip
(ARC/INFO export format, 3 MB compressed)

soils_shp.zip
(Shapefile format, 4 MB compressed)

Metadata

Also important to the digital soil survey is a set of tables. These tables are included in the ARC/INFO file but are also available seperately in the soil feature tables (a comma delimited text file).

The NRCS digital soil survey covers only the area within the Lake Tahoe Basin as shown in the image on the left.

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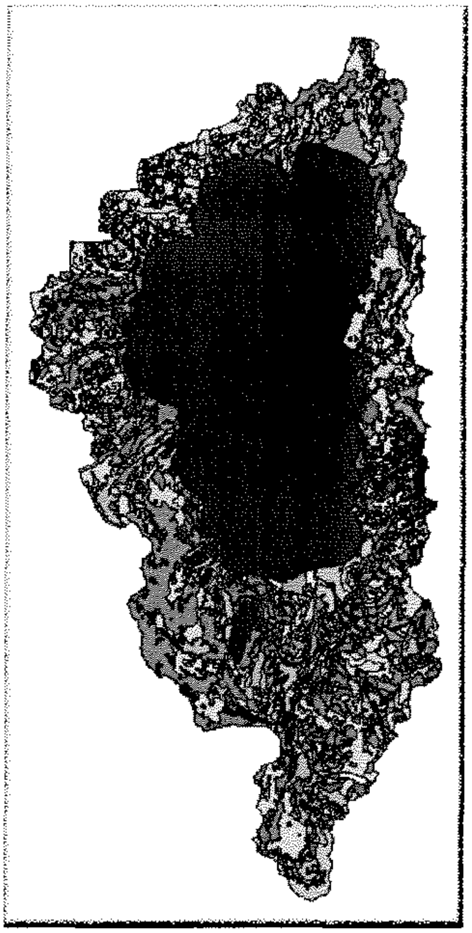

† Links open in a new window.

United States
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Agriculture

Natural
Resources
Conservation
Service

National
Soil Survey
Center

Miscellaneous
Publication
Number 1527

Soil Survey Geographic (SSURGO) Data Base

Data Use Information

For additional copies of this publication contact:
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January 1995

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Introduction

The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS), formerly Soil Conservation Service (SCS), leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining, and distributing soil survey information for privately owned lands in the United States.

Soil geographic data bases

Natural Resources Conservation Service has established three soil geographic data bases representing kinds of soil maps. The maps are produced from different intensities and scales of mapping. Each data base has a common link to an attribute data file for each map unit component.

The three soil geographic data bases are the Soil Survey Geographic (SSURGO) data base, the State Soil Geographic (STATSGO) data base, and the National Soil Geographic (NATSGO) data base. Components of map units in each data base are generally phases of soil series that enable the most precise interpretation. Interpretations are displayed differently for each geographic data base to be consistent with differing levels of detail.

The attribute data base contains physical and chemical soil properties for approximately 18,000 soil series recognized in the United States.

Data for each major layer of soil include:

- particle size distribution
- bulk density
- available water capacity
- soil reaction
- salinity
- organic matter

Data on each soil include:

- flooding
- water table depth
- depth to bedrock
- soil subsidence

Use and management data include:

- sanitary facilities
- building site development
- recreational development
- water management
- rangeland potential
- construction material
- crops
- woodland suitability
- wildlife habitat suitability

The SSURGO data base provides the most detailed level of information and was designed primarily for farm and ranch, landowner/user, township, county, or parish natural resource planning and management. Using the soil attributes, this data base serves as an excellent source for determining erodible areas and developing erosion control practices; reviewing site development proposals and land use potential; making land use assessments and chemical fate assessments; and identifying potential wetlands and sand and gravel aquifer areas.

Using NCSS mapping standards, soil maps in the SSURGO data base are made using field methods. Surveyors observe soils along delineation boundaries and determine map unit composition by field traverses and transects. Aerial photographs are interpreted and used as the field map base. Maps are made at scales ranging from 1:12,000 to 1:63,360. Typically scales are 1:15,840, 1:20,000, or 1:24,000. The maps, along with comprehensive descriptions, produce an attribute and spatial data base for NCSS publications.

Line segments (vectors) are digitized according to specifications and standards established by the Natural Resources Conservation Service for duplicating the original soil survey map. The mapping bases are normally orthophotoquads, and digitizing is performed by the Natural Resources Conservation Service, by contractors, or by cooperating Federal, state, and local government agencies. Data for SSURGO are collected and archived in 7.5-minute topographic quadrangle units and distributed as a complete coverage for a soil survey area usually consisting of 10 or more quadrangle units. The adjoining 7.5-minute units are matched within the survey areas.

The STATSGO data base was designed primarily for regional, multistate, river basin, state, and multicounty resource planning, management, and monitoring. STATSGO data are not detailed enough to make interpretations at a county level.

Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps. Where more detailed soil survey maps are not available, data on geology, topography, vegetation, and climate are assembled with Land Remote Sensing Satellite (LANDSAT) images. Soils of like areas are studied, and the probable classification and extent of the soils are determined.

Map unit composition for a STATSGO map is determined by transecting or sampling areas on the more detailed maps and expanding the data statistically to characterize the whole map unit.

Using the United States Geological Survey's (USGS) 1:250,000-scale, 1- by 2-degree quadrangle series as a map base, the soil data are digitized by line segment (vector) method to comply with national guidelines and standards.

Data for the STATSGO data base are collected in 1- by 2-degree topographic quadrangle units and merged and distributed as statewide coverages. Features are edge matched between states. The map unit composition and the proportionate extent of the map unit components also match between states.

The NATSGO data base is used primarily for national and regional resource appraisal, and planning. The boundaries of the major land resource areas (MLRA) and regions were used to form the NATSGO data base (*2*). The MLRA boundaries were developed primarily from state general soil maps.

Map unit composition for NATSGO was determined by sampling done as part of the 1982 National Resources Inventory (*5*). Sample data were expanded for the MLRA's, with sample design being statistically significant to state parts of the MLRA's.

The NATSGO map was compiled on a Natural Resources Conservation Service adapted version of the 1970 Bureau of Census automated state and county map data base. It was digitized from the USGS 1:5,000,000-scale U.S. base map.

This document describes the SSURGO data base. Another document describing the STATSGO data base is available from the Natural Resources Conservation Service.

Using soil maps

A soil map in a soil survey is a representation of soil patterns in a landscape. The scale of the map and the complexity of the soil patterns determine what can be shown on the soil map. In designing soil surveys, the projected uses of the survey and the complexity of the soil patterns largely determine the scale of the soil map (*4*).

When using soil maps, remember that scale, accuracy, and detail are not synonymous. Scale is the relationship between corresponding distance on a map and the actual distance on the ground. Accuracy is the degree or precision with which map information is obtained, measured, and recorded, and detail is the amount of information shown.

Map scale, accuracy, and detail are interrelated. A large-scale map is not necessarily more accurate than a small-scale map; however, a large-scale map generally shows more detail than a small-scale map. Soil maps are made by using field investigation methods. The accuracy of the maps is determined by many factors, including the complexity of the soils, design of the soil map units, intensity of field observations and data collection, and skills of the mapper.

A soil map at 1:250,000 scale should not be used to locate soils for intensive land uses, such as determining suitability for house lots. It is useful for understanding the soil resources and for planning broad use in a state or region. A soil map at 1:20,000 scale is useful in understanding and planning the soil resources of fields, farms, and communities, but it is not useful for planning small (less than 1 acre) research plots. In many places the pattern of soils is complex, and in some places soils grade imperceptibly to others. Because of this, soil delineations, even on large-scale maps, are not homogeneous or pure; thus, onsite investigations are needed to determine, for example, the suitability of a plot for a septic tank installation when using a soil map at scale of 1:20,000.

The common practice of enlarging soil maps does not result in more detailed or accurate maps. Soil survey maps enlarged to 1:12,000 scale from 1:20,000 scale are no more accurate or detailed than the original 1:20,000 map.

Many times the information on soil maps is transferred to other base maps at different scales, which diminishes the new map's accuracy, especially if the base map is not planimetrically correct.

Soil interpretive maps for specific uses are commonly made from the soil maps. These kinds of maps are single purpose and have the same credibility and limitations as the soil maps from which they are made.

Recognizing the different kinds of soil maps, knowing their merits and limitations, and understanding the relationship of map scale, accuracy, and detail are all important.

SSURGO data specifications

This section describes some of the requirements for digital soil data to be archived in the SSURGO data base. Detailed specifications are available in Part 647 Soil Geographic Data Development of the National Soil Survey Handbook (*3*).

(1) Characteristics of soil surveys

The following soil survey characteristics are required:

- Survey is defined in a memorandum of understanding.
- Survey is mapped at a scale ranging from 1:12,000 to 1:63,360. Scale for new surveys is 1:12,000 or 1:24,000, unless another scale is approved by the Director, Soil Survey Division, Natural Resources Conservation Service.
- Final soil classification and correlation document is approved and signed.
- Survey is defined as an order 2 or 3 survey.

(2) Base maps

Digital spatial data are digitized from maps that meet National Map Accuracy Standards or the proposed United States National Cartographic Standards for Spatial Accuracy. Base maps that meet these standards are the USGS 7.5-minute topographic quadrangles or the 1:12,000 or 1:24,000 orthophotoquads. Either base map series is on 0.005- to 0.007-inch (5- to 7-mil) stable-base mylar.

(3) Spatial data format

Spatial data are in the following format:

- Vector structure
- 7.5-minute quadrangle
- Universal Transverse Mercator reference system and projection
- Map units in meters
- No x- or y-coordinate shifts (offsets)

(4) Coordinate system

Coordinates are derived from the North American Datum of 1983 reference system that is based upon the Geodetic Reference System of 1980.

(5) Storage format

Spatial data storage format is Digital Line Graph optional format. The attribute table data are archived in ASCII table or INFORMIX table format.

(6) Digitizing standards and specifications

Spatial data meet NRCS standards and specifications for digitizing outlined in Section 647.0508 Digitizing specifications in Part 647 Soil Geographic Data Development of the National Soil Survey Handbook.

(7) State edit

A complete and detailed technical edit of the digitized data has been completed by the state and approved by the state soil scientist before being reviewed by the National Cartography and GIS Center.

(8) Digital data review
A digital data review has been completed by the National Cartography and GIS Center.

(9) Edge matching
Edge matching has been addressed in the editing process. Edge matching is defined to mean that all features crossing adjacent map sheets will have the same edge locations, attribute descriptions, and feature classes. Edge locations will not deviate from centerline to centerline by more than 0.01 inch (0.254 mm).

(10) Certification
The state soil scientist has certified that the data have passed a 100 percent state edit and that the digital data are an accurate representation of the published or revised soil survey. The state conservationist has certified that the data meet the SSURGO standard and are ready for archiving and distribution.

(11) Archiving
Digital data (spatial, attribute, and metadata) are archived at the National Cartography and GIS Center or are accessible from another facility.

Using SSURGO data

The SSURGO data base consists of digital georeferenced spatial data, attribute data, and metadata.

Spatial data

Georeferenced spatial data are spatial objects; polygons, lines, points, and nodes whose coordinates represent real locations on the Earth's surface in one of several coordinate systems. The data consist of:

- Soil survey area boundaries
- Water boundaries
- Soil boundaries
- Conventional and special soil features

Attribute data

The Map Unit Interpretations Record provides the attributes for the SSURGO data base. The data contain both estimated and measured data on the physical and chemical soil properties and soil interpretations for engineering, water management, recreation, agronomic, woodland, range, and wildlife uses of the soil.

Soil survey area Map Unit Interpretations Record data consist of the following relational tables:

- **codes** (data base codes) — stores information on all codes used in the data base
- **comp** (map unit component) — stores soil component information
- **compyld** (component crop yield) — stores crop yield information for soil components
- **forest** (forest understory) — stores information for plant cover as forest understory for soil components
- **helclass** (highly erodible lands class) — stores the highly erodible land classification for wind and water assigned to the soil map units
- **hydcomp** (hydric component information) — stores data related to the hydric classification, criteria, and landform
- **inclusn** (map unit inclusion) — stores the name of soils included in the soil map units
- **interp** (interpretation) — stores soil interpretation ratings (both limitation ratings and suitability ratings) for soil omponents
- **layer** (soil layer) — stores characteristics of soil layers for soil components
- **mapunit** (map unit) — stores information that applies to all components of a soil map unit
- **mucoacre** (map unit county acres) — stores the number of acres for the map unit within a county
- **muyld** (map unit yield) — stores crop yield information for the soil map unit
- **plantcom** (plant composition) — stores plant symbols and percent of plant composition associated with soil components
- **plantnm** (plant name) — stores the common and scientific names for plants listed in the data base
- **rangenm** (range name) — stores the range site names
- **rsprod** (range site production) — stores range site productivity information for soil components
- **ssacoac** (soil survey area county acreage) — stores the acreage for the county within the boundary of the soil survey area
- **ssarea** (soil survey area) — stores information that will apply to an entire soil survey

area

- **taxclass** (taxonomic classification) — stores the taxonomic classification for soil components
- **windbrk** (windbreak) — stores information on recommended windbreak plants for soil components
- **wlhabit** (wildlife habitat) — stores wildlife habitat information for soil components
- **woodland** (woodland) — stores information on common indicator trees for soil components
- **woodmgt** (woodland management) — stores woodland management information for soil components
- **yldunits** (yield units) — stores crop names and the units used to measure yield

The attributes that are included in the SSURGO data base are in appendix A. Codes used to populate the data base are in appendix B. The column types, lengths, precision values, and low and high value ranges for the attributes or table elements are in appendix C.

Metadata

Metadata, or data about data, describe the content, quality, condition, history, and other characteristics of data. The SSURGO metadata apply to the entire soil survey area with deviations for individual quadrangles noted. Some examples of metadata are:

- Data set identification
- Data quality
- Spatial reference
- Status information
- Lineage (processing steps)
- Entity and attribute information
- Distribution information
- Data use information
- Metadata reference information

Data base schema

The attributes for the spatial data are provided in relational tables that can be used in geographic information systems to address and solve complex resource and environmental concerns. The relational tables form the Map Unit Interpretations Record data base that consists of soil survey area tables, lookup tables, map unit tables, component tables, and a layer table. These tables are linked to the data dictionary tables for definition of their codes and elements. The schema for the SSURGO data base tables is shown in figure 1.

Figure 1. *SSURGO attribute relational data base schema*

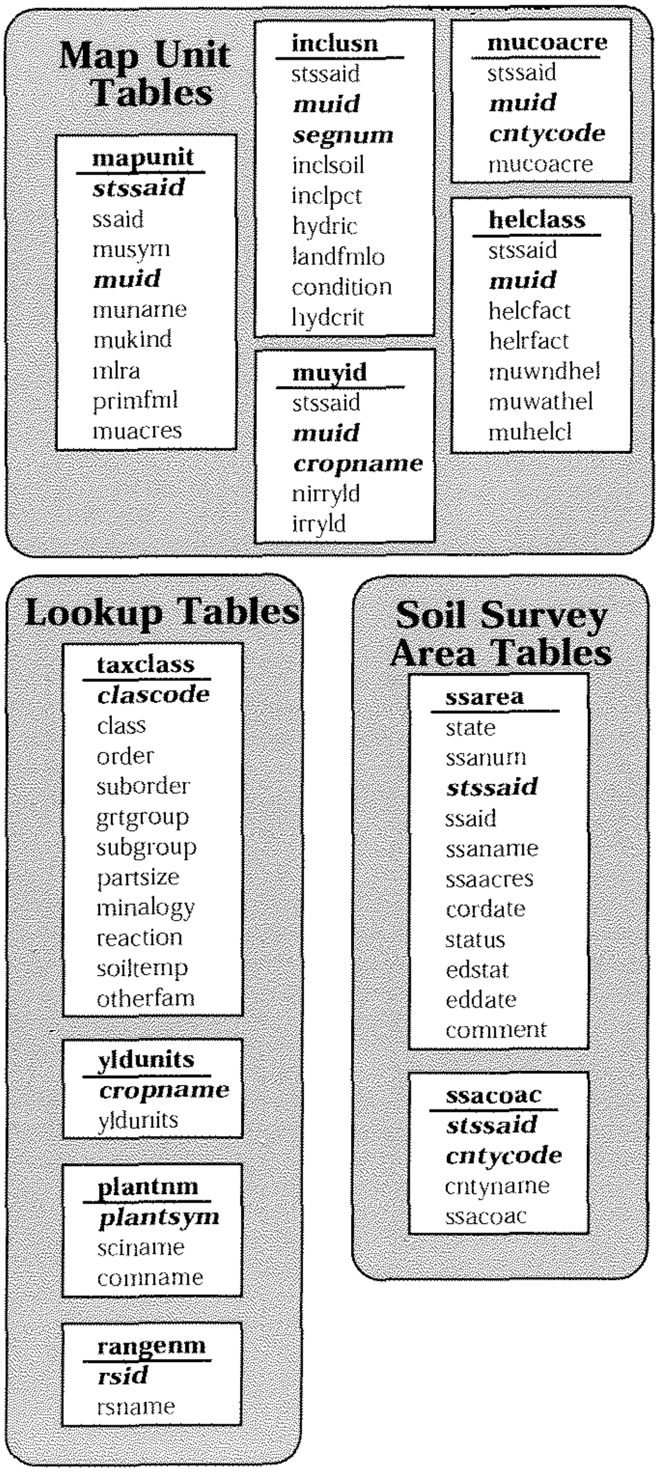


Figure 1. *SSURGO attribute relational data base schema*--Continued

Component Tables

comp
- stssaid
- ***muid***
- musym
- compname
- ***seqnum***
- s5id
- comppct
- slopel
- slopeh
- surftex
- otherph
- compkind
- compacre
- ***clascode***
- anflood
- anflodur
- anflobeg
- anfloend
- gsflood
- gsflodur
- gsflobeg
- gsfloend
- wtdepl
- wtdeph
- wtkind
- wtbeg
- wtend
- pnddepl
- pnddeph
- pnddur
- pndbeg
- pndend
- rockdepl
- rockdeph
- rockhard
- pandepl
- pandeph
- panhard
- subinitl
- subinith
- subtotl
- subtoth
- hydgrp
- frostact
- drainage
- hydric
- corcon
- corsteel
- clnirr
- clirr
- sclnirr
- sclirr

interp
- stssaid
- ***muid***
- ***seqnum***
- grpcode
- rating
- restct1
- restct2
- restct3

compyld
- stssaid
- ***muid***
- ***seqnum***
- ***cropname***
- nirryld
- irryld

woodland
- stssaid
- ***muid***
- ***seqnum***
- suitcode
- ***plantsym***
- sitind
- woodprod

woodmgt
- stssaid
- ***muid***
- ***seqnum***
- ordsym
- wderosn
- wdequip
- wdseed
- wdwind
- wdplant

forest
- stssaid
- ***muid***
- ***seqnum***
- ***plantsym***
- plantcov

windbrk
- stssaid
- ***muid***
- ***seqnum***
- ***plantsym***
- wndbrkht

wlhabit
- stssaid
- ***muid***
- ***seqnum***
- wlgrain
- wlgrass
- wlherb
- wlhard
- wlconif
- wlshrub
- wlwetplt
- wlopen
- wlwood
- wlwet
- wlrange

rsprod
- stssaid
- ***muid***
- ***seqnum***
- ***rsid***
- rsname
- prodfav
- prodnorm
- produnfv

plantcom
- stssaid
- ***muid***
- ***seqnum***
- ***plantsym***
- plantpct

Layer Table

layer
- stssaid
- ***muid***
- ***seqnum***
- s5id
- ***layernum***
- layerid
- laydepl
- laydeph
- texture
- kfact
- kffact
- tfact
- weg
- inch10l
- inch10h
- inch3l
- inch3h
- no4l
- no4h
- no10l
- no10h
- no40l
- no40h
- no200l
- no200h
- clayl
- clayh
- lll
- llh
- pil
- pih
- unified
- aashto
- aashind
- awcl
- awch
- bdl
- bdh
- oml
- omh
- phl
- phh
- salinl
- salinh
- sarl
- sarh
- cecl
- cech
- caco3l
- caco3h
- gypsuml
- gysumh
- perml
- permh
- shrinksw

Map features

The fundamental graphic feature in SSURGO is the map unit. Each map unit is designated as a separate polygon. The unique designation of a soil map unit is the map unit identifier, muid, which links the graphic feature to attribute data in the Map Unit Interpretations Record (fig. 1). Some features are too small to be delineated at the scale of mapping. These graphic features are represented as points and lines called conventional and special features that are uniquely identified, but have no attributes other than a concise definition.

Each map unit represents an area dominated by one to three kinds of soil. However, there are no graphic delineations for the locations of the components within a map unit. The extent of a component is represented as a percent of the delineation, map unit, in the component table.

Map legends

In a SSURGO soil map, each map unit is usually represented by a single soil component, typically a soil series phase (*1*). Some SSURGO map units have up to three named components. However, an interpretive map is commonly made by classifying each map unit according to the set of soil properties for a single dominant component. The map legend classes are the class or value for a property, multiple properties, or interpretation. For example, an interpretive map generated for septic tank absorption fields would have a map legend consisting of the interpretive class ratings of slight, moderate, and severe.

Table relationships

SSURGO map units have up to three named components, and each component has up to six layers (soil horizons). The relationship among map units, components, and soil properties is in figure 2. Because of these one-to-many relationships, analysis must begin at the lowest level in the schema and work back to the highest level.

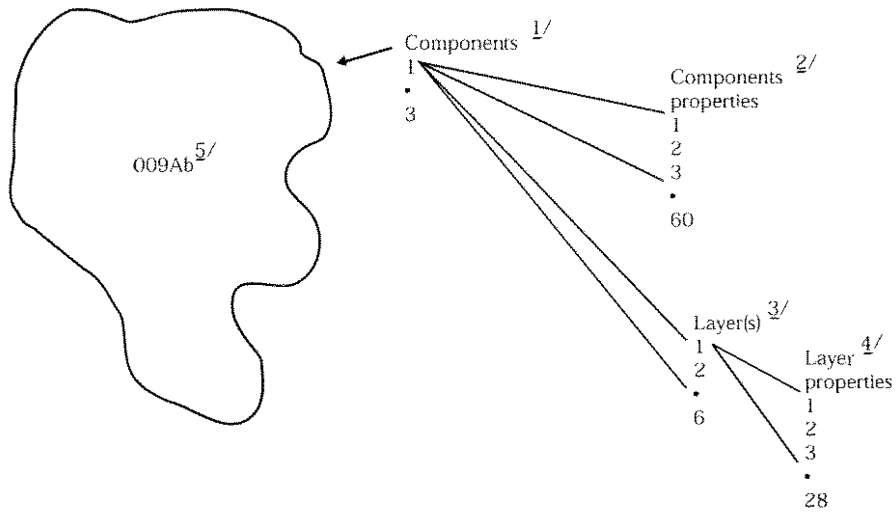
The order of tables from the bottom to the top of the schema is layer, comp (component), and mapunit (fig. 3). The linkage of records among tables usually requires a composite join that consists of the muid (map unit identifier) and the seqnum (sequential number). The mapunit table is related to the spatial data by muid.

The seqnum is an Arabic number that uniquely identifies each component. This relationship exists between the layer table and the comp table and among the comp table and the other tables that are extensions of the comp table. The comp table is related to the mapunit table by muid.

Data relationships

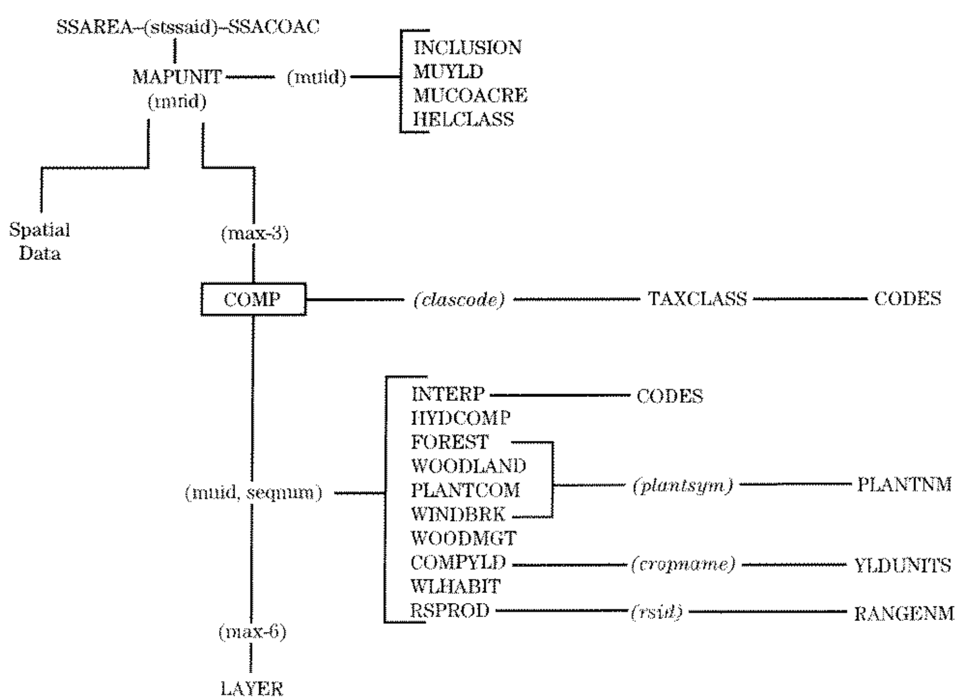
A one-to-many relationship exists between data records in the comp and layer tables since there are typically several layers in the layer table for a component. This relationship must be reduced to one-to-one. Methods include selecting for the presence or absence of a property, selecting a specific layer, or aggregating the data by calculating a weighted average or the sum of the weighted average. For organic matter, the surface layer can be selected and the low and high values can be averaged. A weighted average can be calculated for clay. The low and high values can be averaged and multiplied by the layer thickness and then divided by the total thickness. The sum of the weighted average can be calculated for available water capacity. Again, the low and high values can be averaged, multiplied by the layer thickness, and then summed.

Figure 2. *SSURGO map unit*



[1] SSURGO map units consist of one to three components.
[2] For each component, there are 60 properties and interpretations in 84 different data elements (component tables), for example, flooding.
[3] For each component, one to six soil layers are possible.
[4] For each layer, 28 soil properties are possible; for example, percent clay.
[5] A symbol created by the concatenation of the soil survey area symbol (ssaid) and the map unit symbol (musym). It uniquely identifies a map unit within a soil survey area.

Figure 3. *SSURGO table relationships*



Using SSURGO data with appropriate other data

The SSURGO data base serves as one of the principal data layers for use in geographic information systems. It is also the main component in the National Digital Soils data base, which is part of the National Geographic Data System.

The SSURGO data base is not designed for use as a primary regulatory tool in permitting or citing decisions, but may be used as a reference source. The data base is public information and may be interpreted by organizations, agencies, units of government, or others based on needs; however, they are responsible for the appropriate application.

Photographic or digital enlargement of SSURGO maps to scales greater than the scales at which they were originally mapped can lead to misinterpretation of the data. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale. The depicted soil boundaries, interpretations, and analyses derived from them do not eliminate the need on onsite sampling, testing, and detailed study of specific sites for intensive uses. Thus, these data and their interpretations are intended for planning purposes only.

When SSURGO data are used with other data layers of higher or lower resolution or smaller or larger scale, users are responsible for the appropriate application. The quality of the interpretations derived from the integration of the layers in a geographical information system is only as good as the most limiting layer.

SSURGO data can be used with other data layers, such as streams, roads, geology, land use, administrative boundaries, vegetation, elevation, and slope, in a geographic information system for solving complex problems using spatial analysis.

Visual orientation can be provided by using additional data files. For SSURGO interpretive maps and many other natural resource purposes, a shaded relief background can provide visual reference of the topography that is easily understood. An example is the shaded relief background image from USGS Digital Elevation Model data, which is formatted in 1:24,000-scale, 1- by 1-degree quadrangles. Other data types, such as USGS Digital Line Graph for transportation or hydrography, can help orient a reader to a map. If transportation or hydrography data need to be incorporated into an analysis, it may be desirable to create a buffer zone around the linear feature and then use an overlay operation to intersect the resulting corridor area with the interpreted soil map.

Complex models can be constructed using the soil attribute data in conjunction with other data sources. The model output can be displayed in map form using a geographic information system. Examples include soil erosion, soil leaching potential, and land use suitability models. Calculations are typically made on each component phase. For example, in an erosion model, the slope and erodibility (k-factor) are extracted for each soil phase. The results of the calculation for each component can then be displayed in map form using the percentage composition techniques discussed earlier.

Some of the appropriate other data are:

- digital elevation models
- geographic names
- planimetric
- land use and land cover
- satellite imagery
- orthophotography

Digital elevation models (DEM) are records of terrain elevations at regularly spaced horizontal intervals. The USGS 7.5-minute DEM data generally correspond to the USGS 7.5-minute topographic maps. DEM data can be used to generate graphics displaying slope, aspect, and terrain profiles. SSURGO soil delineations can be draped over the DEM data to study the placement of soil boundaries to landform features in the landscape and to create 3-dimensional landscape models.

National Geographic Names Data Base provides primary information for all known places, features, and areas in the United States that are identified by proper names. The National Geographic Names Data Base is one of three data bases in the USGS Geographic Names Information System. The other two are the USGS Topographic Map Names Data Base and the Reference Data Base. The USGS Topographic Map Names Data Base is the official inventory of all topographic maps planned or published by the USGS. The data base includes current and historical map names, geographic coordinates of a reference corner for each map, map scale, and state codes. The Reference Data Base catalogs every type of feature encountered in compiling the National Geographic Names Data Base. These data bases can be used with SSURGO data as a source of reference annotation and text when plotting thematic maps.

USGS Digital line graphs (DLG) are planimetric data and are the digital representation of the cartographic line information usually portrayed on a map. The digital line graph consists of five data categories:

- U.S. Public Land Survey System
- Boundaries
- Transportation
- Hydrography
- Hypsography

DLG data can be combined with SSURGO data to produce thematic maps for natural resource planning. The data can be used to plot maps that show selected combinations of categories of data, such as national forest lands or rivers. The 7.5-minute digital line graph provides a planimetric correct base for compiling and digitizing SSURGO data.

Land use and land cover (LULC) digital data provide information on urban or built-up land, agricultural land, rangeland, forest land, water, wetlands, barren land, tundra, and perennial snow or ice. Associated maps display information on five data categories:

- Political units
- Hydrologic units
- Census county subdivisions
- Federal land ownership
- State land ownership

The LULC and associated map data can be used with SSURGO data to locate areas with similar or different characteristics, to plot maps, and for area analysis. For example, the data could be used to determine the acres of cropland and pastureland in a SSURGO map unit.

Satellite imagery, such as SPOT and LANDSAT, can be stratified with SSURGO data for analysis. SPOT imagery in quadrangle format also provides a satisfactory mapping base.

Orthophotography is a photo-map prepared from an aerial photograph in which the displacement of images caused by camera tilt and terrain relief are removed. Orthophotography in a quadrangle or quarter-quadrangle format provides a planimetric correct base for mapping, compiling, and digitizing SSURGO data. Scanned orthophotography produces a geographically correct digital image with the same accuracy as conventional orthophotos. The digital orthophoto data can be overlaid with SSURGO data and manipulated, displayed, and plotted.

SSURGO map development

Data aggregation

Layer data aggregation and map development are illustrated in the following example. The comp table shares a one-to-many relationship with the layer table. This relationship is reduced to one-to-one relationship by calculating the sums of the weighted averages for the available water capacity. The attributes required for this example are in the mapunit, comp, and layer tables. Analysis begins at the layer table that is at the lowest level in the schema. The results of the data aggregation are moved to the comp table. The dominant component is selected from the comp table to reduce any one-to-many relationships that exist between the mapunit and comp tables. The following steps are for map development for available water capacity.

(1) Calculate weighted averages

The data elements needed to generate a map for available water capacity are shown in example 1. Only the records for the first (dominant) components were selected. The available water capacity is calculated for the entire profile as total inches of water. The laydepl and the laydeph are the low and high values of the range for the layer depth reported in inches. The awcl and awch are the low and high values of the range for the available water capacity reported in inches of water per inch of soil. The column, wtavg in example 1, was added to selected layer table attributes to hold the weighted averages of the available water capacity calculated as follows:

$$\text{wtavg} = (\text{laydeph} - \text{laydepl}) \times \frac{(\text{awcl} \times \text{awch})}{2}$$

The wtavg is the total inches of available water in each soil layer (horizon). The laydepl and laydeph are the beginning and ending depths in inches of the soil layer measured from the soil surface. The awcl and awch are the low and high values for the range in the available water capacity reported in inches of water per inch of soil.

Example 1. *Layer table attributes and weighted averages*

muid	laydepl	laydeph	awcl	awch	wtavg
027AbB	0	8	0.16	0.20	1.44
027AbB	8	21	0.10	0.14	1.56
027AbB	21	60	0.04	0.08	2.34
027AbC	0	8	0.16	0.20	1.44
027AbC	8	21	0.10	0.14	1.56
027AbC	21	60	0.04	0.08	2.34
027AcB	0	8	0.14	0.18	1.28
027AcB	8	21	0.10	0.14	1.56
027AcB	21	60	0.04	0.08	2.34

.
.
.
(printout continues)
.
.

Example 1. *Layer table attributes and weighted averages*—Continued

027Ty	14	18	0.16	0.20	0.72
027Ty	18	59	0.04	0.12	3.28
027Ty	59	70	0.04	0.12	0.88
027UmB	0	8	0.10	0.16	1.504
027UmB	8	40	0.10	0.14	3.84
027UmB	40	54	0.06	0.12	1.26
027UmB	54	58			0
027UmC	0	8	0.10	0.16	1.04
027UmC	8	40	0.10	0.14	3.84
027UmC	40	54	0.06	0.12	1.26
027UmC	54	58			0
027UmD	0	8	0.10	0.16	1.04
027UmD	8	40	0.10	0.14	3.84
027UmD	40	54	0.06	0.12	1.26
027UmD	54	58			0
027UnB	0	8	0.10	0.18	1.12
027UnB	8	40	0.10	0.14	3.84
027UnB	40	54	0.06	0.12	1.26
027UnB	54	58			0
027UnD	0	8	0.10	0.18	1.12
027UnD	8	40	0.10	0.14	3.84
027UnD	40	54	0.06	0.12	1.26
027UnD	54	58			0
027VaC	0	21	0.08	0.12	2.1
027VaC	21	68	0.06	0.10	3.76
027VaC	68	76	0.04	0.10	0.56
027WeC	0	7	0.08	0.14	0.77
027WeC	7	18	0.04	0.08	0.66
027WeC	18	22			0
027WeD	0	7	0.08	0.14	0.77
027WeD	7	18	0.04	0.08	0.66
027WeD	18	22			0
027WhA	0	9	0.16	0.20	1.62
027WhA	9	46	0.12	0.16	5.18
027WhA	46	69	0.08	0.12	2.3
027WhA	69	73			0
027WhB	0	9	0.16	0.20	1.62
027WhB	9	46	0.12	0.16	5.18
027WhB	46	69	0.08	0.12	2.3
027WhB	69	73			0
027WhC	0	9	0.16	0.20	1.62
027WhC	9	46	0.12	0.16	5.18
027WhC	46	69	0.08	0.12	2.3
027WhC	69	73			0
027WyA	0	7	0.06	0.14	0.7
027WyA	7	25	0.06	0.09	1.35
027WyA	25	60	0.02	0.04	1.05

(2) Calculate the sums of weighted averages

The weighted averages of the available water for the soil layers are summed for the dominant map unit components in the comp table in example 2. The comp and layer tables are related by muid and seqnum. The summation of the weighted averages (sum_wtavg) is the total inches of water available in the soil profile and is computed as follows:

$$sum\_wtavg = \sum wtavg$$

The summation is also an aggregation of the data that reduces the one-to-many relationships between the layer and comp table to one-to-one relationships.

Example 2. *Comp table attributes and sums of weighted averages*

```
muid        sum_wtavg
------      ---------
027AbB         5.34
027AbC         5.34
027AcB         5.18
.
.
.
(printout    continues)
.
.
.
027Ty          7.68
027UmB         6.14
027UmC         6.14
027UmD         6.14
027UnB         6.22
027UnD         6.22
027VaC         6.42
027WeC         1.43
027WeD         1.43
027WhA         9.10
027WhB         9.10
027WhC         9.10
027WyA         3.10
```

(3) Define legend classes

The legend class codes for the available water capacity map are shown in example 3. The column AWC (available water capacity) is the total inches of water in the soil profile. The codes are used to group the data records into legend classes for display and statistics. The legend class "Water" is not present in the data shown. Map units that do not have available water capacity values are placed in the legend class "Not Rated."

Example 3. *Legend classes*

Legend class label	**AWC (in)**	**Legend class code**
Very low	< 0 - 3	1
Low	3.1 - 6	2
Moderate	6.1 - 9	3
High	9.1 - 12	4
Very high	>12	5
Water		6
Not rated		7

(4) Assign legend class codes

The results in example 2 are moved to the mapunit table and a column is added to hold the legend class codes from example 3. The records in example 4 are coded with legend class codes based on the available water capacity classes defined in example 3.

Example 4. *Mapunit table attributes and legend class codes*

```
muid        sum_wtavg        legend
------      ---------        ------
027AbB         5.34             2
027AbC         5.34             2
027AcB         5.18             2
.
.
.
(printout      continues)
.
.
.
027Ty          7.68             3
027UmB         6.14             3
027UmC         6.14             3
027UmD         6.14             3
027UnB         6.22             3
027UnD         6.22             3
027VaC         6.42             3
027WeC         1.43             1
027WeD         1.43             1
027WhA         9.10             4
027WhB         9.10             4
027WhC         9.10             4
```

027WyA	3.10	2

(5) Assign legend class labels

The label column is added to the mapunit table and is populated with the legend class labels that are based on the sums of the weighted averages of the available water capacity and legend class codes. The legend class codes are linked to the spatial (map) data by muid and to a color lookup table for polygon shading on the map.

Example 5. *Mapunit table attributes and legend classes and labels*

```
muid      sum_wtavg     legend    label
------    ----------    ------    -----
027AbB       5.34          2      Low
027AbC       5.34          2      Low
027AcB       5.18          2      Low
.
.
(printout   continues)
.
.
027Ty        7.68          3      Moderate
027UmB       6.14          3      Moderate
027UmC       6.14          3      Moderate
027UmD       6.14          3      Moderate
027UnB       6.22          3      Moderate
027UnD       6.22          3      Moderate
027VaC       6.42          3      Moderate
027WeC       1.43          1      Very Low
027WeD       1.43          1      Very Low
027WhA       9.10          4      High
027WhB       9.10          4      High
027WhC       9.10          4      High
027WyA       3.10          2      Low
```

Conclusion

This is a brief description of how one attribute in the layer table is handled. Even though the logic is similar, the process becomes more complicated when several attributes from different tables are being evaluated. An example would be pesticide leaching potential that involves organic matter and surface layer thickness from the layer table and

Data collection

How soil surveys are made

hydrologic groups from the comp table.

A soil survey provides information about the soils. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observe the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dig many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in 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 is associated with a particular kind of landscape or a segment of the landscape. By observing the soils in a survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

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

Soil scientists record the characteristics of the soil profiles that they study. They note 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 soil. After describing the soils in the survey area and determining their properties, the soil scientists assign the soils to taxonomic classes (units) (*1*). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classify and name the soils in the survey area, they compare the individual soils with similar soils in the same taxonomic class in other areas so that they can confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples generally are collected for laboratory analyses and 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 the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and 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 assure that a high water table will always be at a specific level in the soil on a specific date. After soil scientists locate and identify the significant natural bodies of soil in the survey area, they draw the boundaries of these bodies on aerial photographs and identify each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map unit composition

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

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

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

Data structure

investigation is needed to plan for intensive uses in small areas.

Projection and coordinate information

SSURGO data are distributed in a Universal Transverse Mercator projection with meter coordinate values. The data are in the appropriate UTM zones. The reference system for the SSURGO data is the North American Datum of 1983. This system is based upon the Geodetic Reference System of 1980, which is geocentric and uses an ellipsoid approximating the entire Earth. The projection, zone, unit, and datum information are in the header of the Digital Line Graph, which is the spatial data distribution format.

Spatial data distribution format

The spatial component of the SSURGO data base is archived and distributed in a modified Digital Line Graph optional format (DLG-3) (6). The SSURGO data set consists of area features (soil delineations) and special features (point and line features) which are archived and distributed as separate Digital Line Graph files. Point features are represented as degenerate lines. The Digital Line Graph contains header records and data records consisting of node identification records, area identification records, and line identification records. The Digital Line Graphs have encoded attributes (major/minor code pairs) for each SSURGO feature. Example 6 shows an example of a modified

Digital Line Graph optional format for area features.

Example 6. *Example of Digital Line Graph file for area features*

```
USDA-NRCS  DLG DATA - CHARACTER FORMAT - 5-3-94 VERSION
BROOKER, FL                                        1993      24000
USDA/NRCS SSURGO DATA; NAD83
       3    1     17         2  2.40000000000D+01         4         0         4         1
0.000000000000000D+00     0.000000000000000D+00     0.000000000000000D+00
0.000000000000000D+00     0.000000000000000D+00     0.000000000000000D+00
0.000000000000000D+00     0.000000000000000D+00     0.000000000000000D+00
0.000000000000000D+00     0.000000000000000D+00     0.000000000000000D+00
0.000000000000000D+00     0.000000000000000D+00     0.000000000000000D+00
 1.00000000000D+00 0.00000000000D+00 0.00000000000D+00 0.00000000000D+00
SW         29.875000    -82.375000       367212.08  3305728.21
NW         30.000000    -82.375000       367378.02  3319581.11
NE         30.000000    -82.250000       379435.57  3319442.98
SE         29.875000    -82.250000       379284.73  3305590.43
SOILS                         0      51      51  01        26      26  010       75        75     1
N      1     367378.02    3319581.00        0         2         0       0
     -3          1
N      2     379435.55    3319443.00        0         2         0       0
     74         -1
N      3     368057.68    3306292.77        0         3         0       0
     -5          2          4
.
.
.
(printout     continues)
.
.
.
A      1     366211.97    3304589.92        0       23   1    0 0        0
     -1        -3      -35      -39      -41      -43      -45      -47    -49     -51       -53
   -57    -59  -61      -63  -65    -67    -69    -71  -73     -75     -74
    0          0
A       2373337.83   3313488.78        0      12      10       0          0
     1       7475   -72    -29      -11     -25 -12     -16      -4          -53
  999         1
A       3367487.64   3306052.01       0          8   1      00           0
     2  8     -10     -24  -38      39       35   5
  999     3
A      4   368310.77    3306288.77    0         4         10        0          0
   - 2     4      -6     -7
  999     2
.
.
.
(printout     continues)
.
```

Example 6. *Example of Digital Line Graph file for area features*—Continued

```
L       1     1     2     0     1                          0     0
     367378.02   3319581.00 379435.55   3319443.00
L       2     3     4     3     2                          20    0
     368057.68   3306292.77 368078.59   3306283.77    368091.403306283.77
     368101.74   3306283.02 368112.68   3306281.77    368124.273306281.52
     368136.46   3306281.27 368146.81   3306281.27    368161.463306281.77
     368173.65   3306281.52 368182.84   3306282.02    368191.933306280.77
     368202.31   3306281.27 368215.12   3306281.02    368224.743306276.77
     368233.90   3306272.27 368242.99   3306265.52    368250.243306258.27
     368262.90   3306244.02 368266.99   3306233.02
L       3     5     1     0     1                    2     0     0
     367217.48   3306190.26 367378.02   3319581.00

(printout     continues)

L       7       55        1  379284.55    3305590.25    2371229.333305682.25
```

Digital Line Graph companion attribute file

Map unit symbols and special features' labels are not carried within the modified Digital Line Graph file; however, they are made available in a companion attribute file. The companion attribute file links the minor codes in the Digital Line Graph file to the feature labels. Similar map unit symbols or special features' labels will have the same minor code. Example 7 shows the format and contents of an area feature companion attribute file. The columns are tab delimited and are from left to right sequential record number, major code, minor code, and attribute label.

Example 7. *Attribute file*

1	0	0	UNIV
2	999	1	87
3	999	3	81
4	999	2	82
5	999	5	80
6	999	4	28
7	999	8	19
8	999	7	50
9	999	7	50
10	999	11	8
11	999	12	21
12	999	9	37
13	999	6	14
14	999	2	82
15	999	10	71
16	999	11	8
17	999	7	50
18	999	13	3
19	999	15	20
20	999	11	8
21	999	14	51
22	999	3	81
23	999	4	28
24	999	4	28
25	999	7	50
26	999	2	82

Attribute (tabular) data distribution format

The attribute (tabular) data are distributed as simple ASCII text files. The first two lines of a table are called the header lines. The first line contains the names of each column, and the second line contains at least one dash underneath each column name. Tabs separate the column names and the dashes. A new line character is at the end of each of these lines. Each subsequent line (row) is also delimited by a new line character and forms a record in the table. A row consists of tab-separated fields (columns). Each row has the same number of columns as the table header. If a column is empty, two consecutive tabs indicate that the column is present.

Data voids

Attribute data for some data elements may be incomplete or missing for certain data elements. For example, data were not available for forest and range productivity for some SSURGO map units on U.S. Department of Agriculture, Forest Service lands in some Western States.

Map hard copy production

Maps that use NRCS SSURGO data must show the source and date. The maps should also contain the following notation:

> This Soil Survey Geographic (SSURGO) data base was produced by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies for the Soil Survey of _______ County, _________. The soils were mapped at a scale of ______ with a _______ acre minimum size delineation. Enlargement of these maps to scales greater than that at which they were originally mapped can cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soil that could have been shown at a larger scale. The depicted soil boundaries and interpretations derived from them do not eliminate the need of onsite sampling, testing, and detailed study of specific sites for intensive uses. Thus, this map and its interpretations are intended for planning purposes only. Digital data files are periodically updated. Files are dated, and users are responsible for obtaining the latest version of the data.

User support

The user should be knowledgeable of soil data. If you need assistance, contact an NRCS soil scientist for help. The following is a list of addresses and telephone numbers of NRCS state soil scientists:

665 Opelika Rd.
P.O. Box 311
Auburn, AL 36830
(205) 887-4540

949 East 36th Avenue
Anchorage, AK 99508-4302
(907) 271-2424

Suite 800
3003 No. Central Ave.
Phoenix, AZ 85012-2945
(602) 280-8808

Federal Office Bldg.
Room 5404
700 West Capitol Ave.
Little Rock, AR 72201
(501) 324-5410

2121-C Second Street
Davis, CA 95616
(916) 757-8270

655 Parfet Street, Rm. E200C
Lakewood, CO 80215-5517
(303) 236-2910

16 Professional Park Rd.
Storrs, CT 06268-1299
(203) 487-4047

1203 College Park Drive
Dover, DE 19901-7377
(302) 678-4179

Federal Bldg., Room 248
401 S.E. 1st Ave.
Gainesville, FL 32601
(904) 377-1092

Federal Bldg., Box 13
355 East Hancock Ave.
Athens, GA 30601
(404) 546-2278

Pacific Basin Office
Suite 602, CGIC Bldg.
414 W. Soledad Ave.
Agana, GU 96910
(700) 550-7490

300 Ala Moana Blvd.
Room 4316
P.O. Box 50004
Honolulu, HI 96850
(808) 541-2605

3244 Elder Street
Room 124
Boise, ID 83705
(208) 334-1348

1902 Fox Drive
Champaign, IL 61820
(217) 398-5286

6013 Lakeside Blvd.
Indianapolis, IN 46278
(317) 290-3203

693 Federal Bldg.
210 Walnut Street
Des Moines, IA 50309
(515) 284-4353

760 South Broadway
Salina, KS 67401
(913) 823-4558

771 Corporate Drive
Lexington, KY 40503
(606) 224-7358

3737 Government Street
Alexandria, LA 71302
(318) 473-7787

5 Godfrey Drive
Orono, ME 04473
(207) 866-7245

Busch's Frontage Road
Annapolis, MD 21401
(410) 757-2872

451 West Street
Amherst, MA 01002
(413) 253-4370

Room 101
1405 S. Harrison Road
East Lansing, MI 48823-5202
(517) 337-6701, Ext. 1205

375 Jackson Street, Rm 600
St. Paul, MN 55101-1854
(612) 290-3679

Federal Bldg, Suite 1321
100 West Capitol Street
Jackson, MS 39269
(601) 965-5193

601 Business Loop 80 West
Columbia, MO 65203
(314) 876-0907

Federal Bldg., Room 443
10 East Babcock Street
Bozeman, MT 59715-4704
(406) 587-6818

Federal Building, Room 152
100 Centennial Mall North
Lincoln, NE 68508-3866
(402) 437-5322

5301 Longley Lane
Reno, NV 89511
(702) 784-5875

Federal Building
Durham, NH 03824
(603) 868-7581

1370 Hamilton Street
Somerset, NJ 08873
(908) 246-4110, Ext. 170

Room 3301
517 Gold Avenue, SW
Albuquerque, NM 87102
(505) 766-3277

Suite 354
441 So. Salina Street
Syracuse, NY 13202-2450
(315) 477-6504

Suite 205
4405 Bland Rd.
Raleigh, NC 27609
(919) 790-2905

200 E. Rosser Avenue
Bismarck, ND 58502-1458
(701) 250-4435

200 North High Street
Columbus, OH 43215
(614) 469-6914

USDA Agricultural
Center Bldg.
Stillwater, OK 74074
(405) 624-4448

Federal Bldg, Room 1640
1220 S.W. Third Avenue
Portland, OR 97204
(503) 326-2794

One Credit Union Place
Suite 340
Harrisburg, PA 17710-2993
(717) 782-3889

150 Carlos A. Chardon Avenue
Hato Rey, PR 00918-7013
(809) 766-5206

60 Quaker Lane
West Warwick, RI 02886
(401) 828-1300

1835 Assembly Street Room 950
Strom Thurmond Federal Bldg.
Columbia, SC 29201
(803) 253-3896

Federal Building
200 4th Street S.W.
Huron, SD 57350-2475
(603) 353-1810

675 Estes Kefauver, FB-USCH
801 Broadway
Nashville, TN 37203
(615) 736-5476

W. R. Poage Federal Bldg.
101 S. Main Street
Temple, TX 76501-7682
(817) 774-1261

Wallace F. Bennett
Federal Bldg., Room 4402
125 So. State Street
Salt Lake City, UT 84138
(801) 524-5064

69 Union Street
Winooski, VT 05404
(802) 951-6795

Federal Building, Rm. 9201
400 North 8th Street
Richmond, VA 23240-9999
(804) 771-2463

Rock Pointe Tower II, Suite 450
W. 316 Boone Avenue
Spokane, WA 99201-2348
(509) 353-2339

75 High Street, Room 301
Morgantown, WV 26505
(304) 291-4484

6515 Watts Road, Suite 200
Madison, WI 53719-2726
(608) 264-5589

Federal Office Bldg., Rm. 3124
100 East B Street
Casper, WY 82601
(307) 261-5208

Distribution

Source

The Soil Survey Geographic (SSURGO) data base is archived and distributed from the NRCS National Cartography and GIS Center in Fort Worth, Texas. Information and data requests may be directed to the following address:

National Cartography and GIS Center
U.S. Department of Agriculture
Natural Resources Conservation Service
501 Felix Street, Building 23
Fort Worth, TX 76115-3495
or
P.O. Box 6567
Fort Worth, TX 76115-0567

Phone: (800) 672-5559
FAX: (817) 334-5469

Order requests are to be directed to:
Phone: (800) 672-5559
FAX: (817) 334-5559

Format

The SSURGO spatial data are available in USGS Digital Line Graph (DLG-3) optional format. Map unit symbols, such as Abc, are not normally carried within the DLG-3 optional formatted data; however, these map symbols are made available as a separate and unique ASCII file.

The SSURGO attribute data are stored in a relational data base format that is a nonfixed-length, tab-delimited ASCII file. The Natural Resources Conservation Service, National Cartography and GIS Center (NCG) operates a Geographic Resource Analysis Support System (GRASS) Geographic Information System (GIS) and an ARC/INFO GIS. NRCS-GRASS and other formats may be made available by mutual agreement.

The SSURGO spatial and attribute data are distributed as a data set, stored by USGS 7.5-minute quadrangle units, and distributed for a full soil survey area.

Media

The distribution media for spatial and attribute data are normally 8 mm tape or 1/4-inch cartridge tape. However, data may be available on CD-ROM or other media. Please call the National Cartography and GIS Center for pricing and data format information.

Ordering information

Before ordering SSURGO data, users need to identify the soil survey area of interest and may wish to consult a USGS index to the 7.5-minute base map series to ensure coverage. Additional information and costs may be obtained from the National Cartography and GIS Center.

The SSURGO data are periodically updated, data files are dated, and users are responsible for obtaining the latest version.

References

(1) U.S. Department of Agriculture. 1975. Soil Taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436.

(2) U.S. Department of Agriculture. 1981. Land resource regions and major land resource areas of the United States. U.S. Dep. Agric. Handb. 296.

(3) U.S. Department of Agriculture. 1993. National Soil Survey Handbook, Title 430-VI. Soil Surv. Staff, Soil Conserv. Serv.

(4) U.S. Department of Agriculture. 1993. Soil Survey Manual. U.S. Dep. Agric. Handb. 18.

(5) U.S. Department of Agriculture and Iowa State University Statistical Laboratory. 1987. Basic Statistics 1982 National Resources Inventory. Stat. Bul. No. 756.

(6) U.S. Geological Survey. 1986. Digital line graphs from 1:24,000-scale maps. Data Users Guide 1. Reston, VA.