1 Digital Data

Introduction

Many spatial data currently exist in digital forms. Roads, political boundaries, water bodies, land cover, soils, elevation, and a host of other features have been mapped and converted to digital spatial data for much of the World. Because these data are often distributed at low or no cost, these existing digital data are often the easiest, quickest, and least expensive source for many spatial data layers.

Digital data are often developed by governments because these data help provide basic public services such as safety, health, transportation, water, and energy. Spatial data are required for disaster planning and management, national defense, infrastructure development and maintenance, and other governmental functions. Many national, regional, and local governments have realized that once these data have been converted to digital formats for use within government, they may also be quite valuable for use outside government. Business, nonprofit, education, science, as well as governmental bodies may draw benefit from the digital spatial data, as these organizations benefited in prior times from government-produced paper maps. Although digital data are also available from private sources, governmental sources provide a diverse set of data over broader areas, often at low costs. Some data commonly available throughout the United States are described in this chapter.

Digital Soils Data

The Natural Resource Conservation Service (NRCS) of the United States Department of Agriculture has developed three digital soils data sets. These data sets differ in the scale of the source maps or data, and hence the spatial detail and extent of coverage. The National Soil Geography (NATSGO) data set is a highly generalized, national coverage soils map, developed from small scale maps. NATSGO data have limited use for most regional or more detailed analyses and will not be further discussed here. State Soil Geographic (STATSGO) data are intermediate in scale and resolution, and Soil Survey Geographic (SSURGO) data provide the most spatial and categorical detail.

SSURGO data are intended for use by land owners, farmers, and planners at the large farm to county level. SSURGO maps indicate the geographic location and extent of the soil map units within the soil survey area (Figure 1-1). Soil map units typically correspond to general grouping, called phases, of detailed soil mapping types. These detailed mapping types are called soil series. There are approximately 18,000 soil series in the United States, and several phases for most series, so there are potentially a large number of map units. Only a small subset is likely to occur in a mapped area, typically fewer than a few hundred soil series or series phases. A few to thousands of distinct polygons may occur.

SSURGO data are not intended for use at a site-specific level, such as crop yield predictions for an individual field or septic system location within a specific parcel. SSURGO data are more appropriate for broader-scale application, e.g., to identify areas most sensitive to erosion, or to plan land use and development. SSURGO data and the soil surveys on which they are based are the most detailed soils information available over most of the United States.

SSURGO data are developed from soil surveys. These surveys are produced using a combination of field and photo-based measurements. Trained soil surveyors conduct a series of field transects in an area to determine relationships between soil mapping units and terrain, vegetation, and land use. Aerial photographs at scales of 1:12,000 to 1:40,000 are used in the field to aid in location and navigation through the landscape. Soil map unit boundaries are then interpreted onto aerial photographs or corresponding orthophotographs or maps. Typical photo scales are 1:15,840, 1:20,000, or 1:24,000. These maps are then digitized in a manner that does not appreciably affect positional accuracy. Soil linework is joined and archived in tiles corresponding to USGS quadrangle maps. Soil surveys are often conducted on a county basis, so county mosaics of SSURGO data are common.

SSURGO data are reported to have positional accuracy no worse than that for 1:24,000-scale quadrangle maps. This corresponds to a positional error of less than 13 meters (40 feet) for approximately 90% of the well-defined points when SSURGO data are compiled at 1:24,000-scale. SSURGO data are provided using standard DLG formatting.

SSURGO data are linked to a Map Unit Interpretations Record (MUIR) attribute data base (Figure 1-2). Key fields are provided with the SSURGO data, including a unique identifier most often related to a soil map unit, known as the map unit identifier

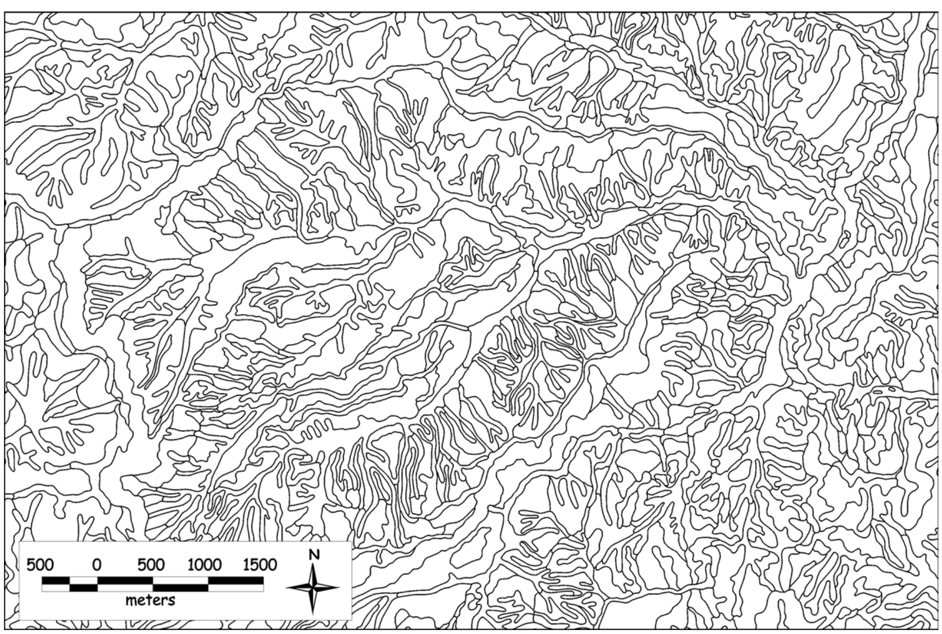

Figure 1-1: An example of SSURGO digital soils data available from the NRCS.

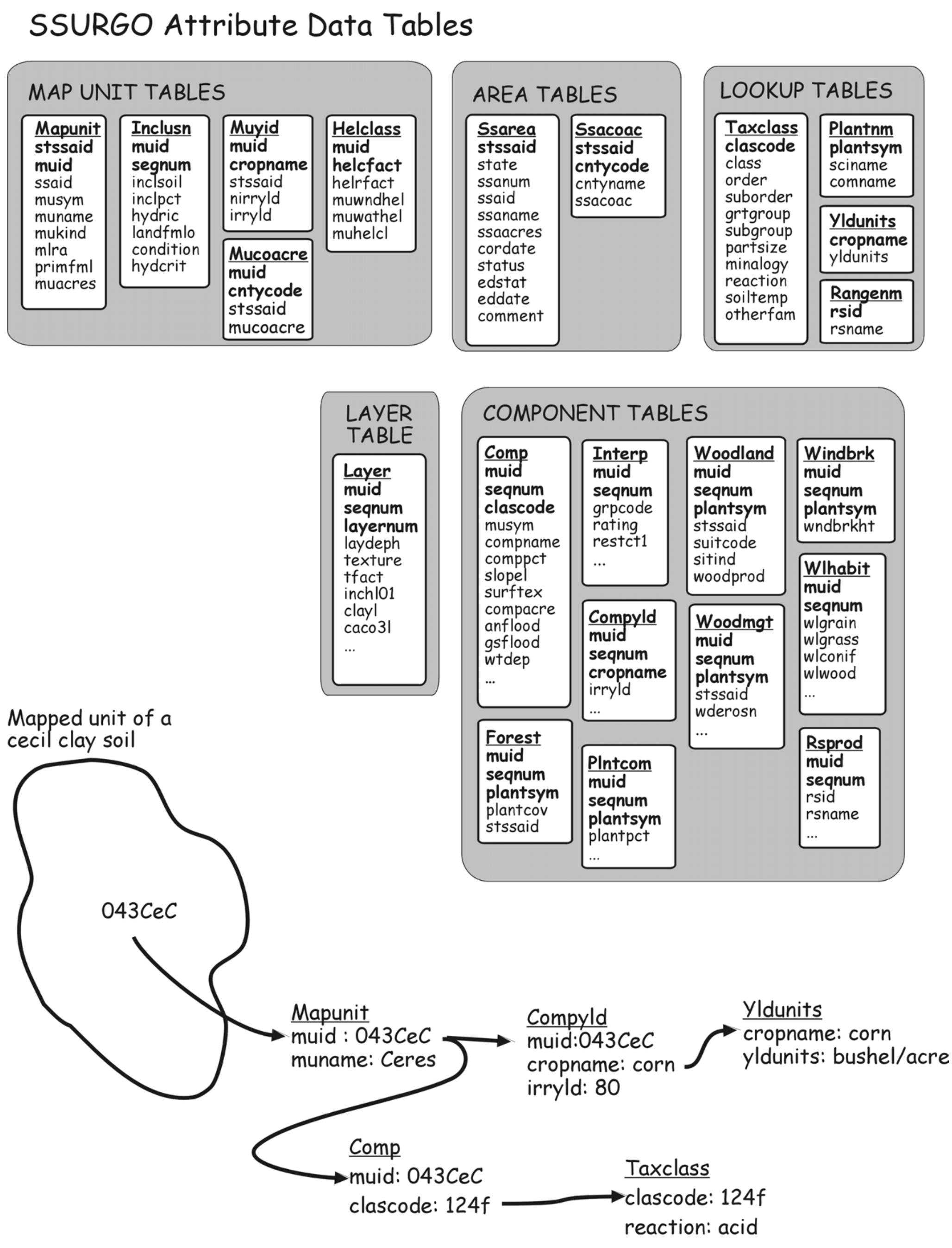

Figure 1-2: The database schema associated with the SSURGO digital soils data. Variables describing soil characteristics are provided in a set of relatable tables. Keys in each table, shown in bold, provide access to items of interest. Codes provided with the digital geographic data, e.g., the map unit identifier (muid), provide a link to these data tables. The relation of a mapped soil polygon to attribute data is shown in the example at the bottom. The muid is related from the MAPUNIT and COMP table, which in turn are used to access other variables through additional keys.

(muid). Tables in the MUIR data base are linked via the muid, and other key fields. Most tables contain the muid field, so a link may be created between the muid value for a polygon and the muid value in another table, e.g, the Compyld table (Figure 1-2). This creates an expanded table that may be further linked through cropname, clascode, or other key fields. These table structures and linkages are discussed more generally in Chapter 8.

Tables are linked via keys, so that the specific variables of interest may be accessed for each soil type. Variables include an extensive set of soil physical and chemical properties. Data are reported for water capacity, soil pH, salinity, depth to bedrock, building suitability, and most appropriate crops or other uses. Most MUIR data report a range of values for each soil property. Ranges are determined from representative field-collected samples for each map unit, or from data collected from similar map units. Samples are analyzed using standardized chemical and physical methods.

STATSGO digital soil maps are smaller scale and cover broader areas than SSURGO soil data. STATSGO data are typically created by generalizing SSURGO data. If SSURGO data are not available, STASGO data may be generated from a combination of topographic, geologic, vegetation, land use, and climate data. Relationships between these factors and general soil groups are used to create STATSGO maps. STASTGO map units are larger, more generalized, and do not necessarily follow the same boundaries as SSURGO map units (Figure 1-3). In addition, STATSGO polygons contain from one to over 20 different SSURGO detailed map units. A SSURGO map unit type is a standard soil type used in mapping. It is often a phase of a map series. Each STATSGO map unit may be made up of thousands of these more detailed SSURGO polygons, with over 20 different SSURGO map unit types represented within a STATSGO polygon. STATSGO data provide information on some of this variability. Data and properties on multiple components are preserved for each STATSGO map unit.

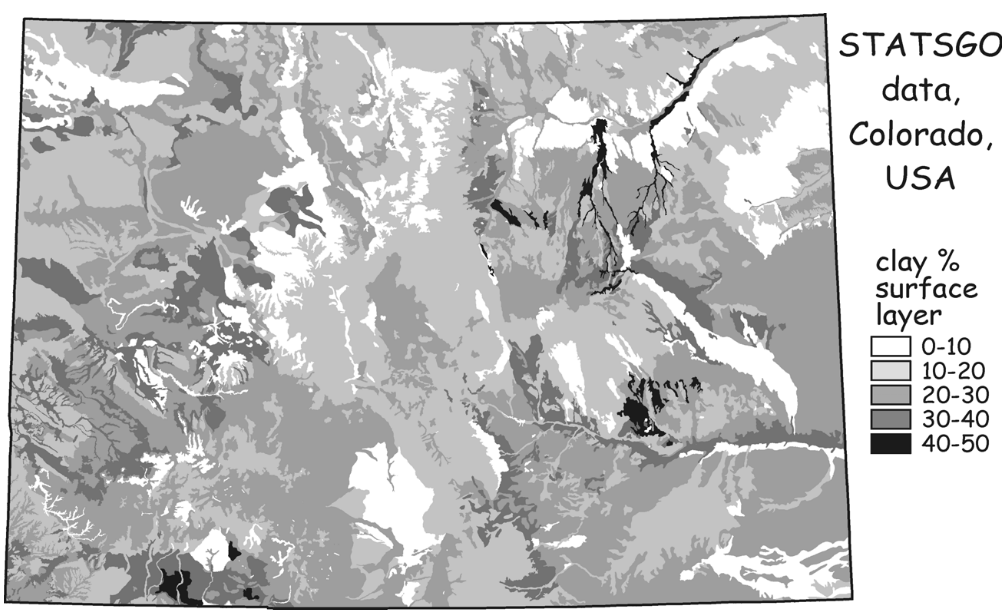

Figure 1-3: An example of STATSGO data for Colorado, USA.

STASGO data are developed via a redrafting of more detailed data onto 1:250,000-scale base maps. These data may be existing county soil surveys that form the basis for SSURGO data, or a combination of these and other materials such as previously published statewide soil maps, satellite imagery, or other statewide resource maps. Soil map units are drafted onto mylar sheets overlain on 1:250,000-scale maps. A minimum mapping unit of 625 hectares is specified, and map unit boundaries are edgematched across adjoining 1:250,000-scale maps. These features are then digitized to produce digital soils data for each 1:250,000-scale map. Data may then be joined into a statewide soils layer. Geographic data are then attached to appropriate attributes. Data are most often digitized in a local zone UTM coordinate system, and converted to a common Alber's equal area projection. STATSGO data are provided in a USGS DLG format.