RESOURCE NOTES

SOILS/GEOLOGY

The Soils Suitability Extension (SSE)

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Background

The National Science & Technology Center (NSTC) has developed the Soil Suitability Extension or SSE, which is a customized ArcView GIS extension. Extensions are add-on programs that provide specialized GIS functionality. SSE allows someone with minimal ArcView skills and without a soils background, easy access to existing soils data. SSE provides the user with quick and easy access to the Natural Resources Conservation Service (NRCS) State Soil Geographic Database (STATSGO) and Soil Survey Geographic Database (SSURGO) data with a number of predefined queries.

The NRCS is responsible for collecting, storing, maintaining, and distributing soil survey information. Millions of acres of soil surveys have been completed, and many of these are on Public Lands. In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of soil. Data is collected on soil properties, erosion, drought, flooding, and other factors that affect various soil uses and management. Soils data is stored in tables that relate to the individual mapping unit.

Types of Soil Surveys

NRCS has established three geographic databases representing soil maps and related variables compiled at different scales. Table 1, NRCS Soil Geographic Databases, summarizes the primary uses, scales, and sources for each of the three databases. Each map unit is linked to attribute data files containing soil properties and interpretive information. The NRCS Soil Interpretations Record database contains the attribute information for each database.

STATSGO was compiled for each state and designed primarily for regional, multi-state, river basin, state and multi-county resource planning, management, and monitoring. STATSGO data is not sufficiently detailed to make interpretations at the county level. In most areas, STATSGO maps were compiled by generalizing more detailed SSURGO maps. Where more detailed soil survey maps were not available, data on geology, topography, vegetation, and climate were assembled, together with Land Remote Sensing Satellite (LANDSAT) images. Soil of like areas as studied and probable classification and extent of soils were determined. STATSGO map units are combinations of areas on the more detailed soil maps.

The SSURGO database provides the most detailed level of information. The typical map scales are 1:24,000. The line segments from the original soil survey maps are digitized by the NRCS. Data for SSURGO is collected and archived in 7.5-minute topographic quadrangle units and distributed as a complete coverage for a soil survey or as individual quadrangle units within the survey. The adjoining quadrangles are edge-matched with the soil survey.

Complexity of the Soils Data

Each STATSGO and SSURGO map unit can have multiple components, and each component can have multiple layers. Attributes of map units are statistical summaries of attributes from all the component soils used to characterize an entire map unit. Consequently, each map unit can have multiple components: SURGO a maximum of three, STATSGO a maximum of 21, and each component can have multiple layers (maximum of six). The Soil Component Attribute Table maintains 60 variables for each soil component. The Layer Table maintains 28 variables for each soil component layer. In addition to the soil tables (component and layer), there is interpretive data.

All STATSGO data is in a digital format; some of the SSURGO data is available in digital format. The challenge is using this data in GIS. Since the attribute data is in over 50 tables, the user must set up numerous links and relates, decide which layer to look at, figure out what the results mean, and then figure out how to use the results with their own data. SSE shields the user from the complexity of the soil database by the use of predefined queries.

Overview of SSE

SSE has four major components: General Soil Queries, Soils Queries to Support Rangeland Management, Save the Query Results, plus a download tool for SSURGO data from the NRCS ftp site. Once SSE has been added to the users ArcView project, there are just a few additions to the default ArcView project. There is one item, Soil Data, which is added to the menu bar and one tool that is added to the tool bar. The Soil Data menu contains the link to most of the extension. The user simply selects the function desired from the Soil Data menu.

General Soil Queries

Once the user selects one of the General Soil Queries (either Erodibility,

SOIL DATABASE	PRIMARY USE	SCALE	SOURCE
SSURGO – Soil Survey Geographic	Farm, landowner, and county natural resource planning and management.	1:12,000 to 1:63,360	Field methods
STATSGO- State Soil Geographic	Regional, State, river basin, and multi-county resource planning, monitoring and management.	1:250,000	Generalized from more detailed soil maps, transects, LANDSAT images
NATSGO- National Soil Geographic	National and regional appraisal, planning, and monitoring.	1:5,000,000	1982 National Resources Inventory

Table 1. NRSC Soil Geographic Databases

Composition, Slope, Soil Water Characteristics, Stability, or Chemistry), there are a series of easy-to-use menu boxes that appear. The user simply clicks the check box to the left of the menu option, and the query is executed. The results are displayed in the users current View where the user is given the option with each specific menu whether to use STATSGO or SSURGO data to execute that query. The user simply clicks the appropriate box.
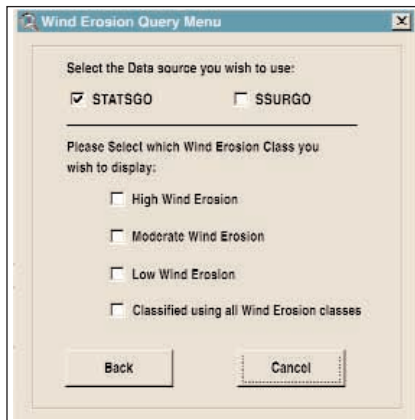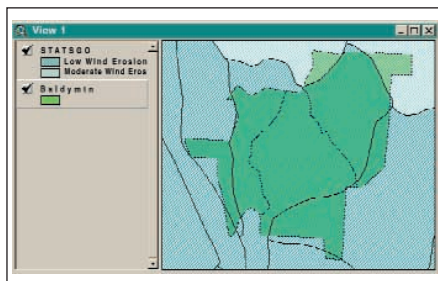

Table 2. Wind Erosion Query Menu

Table 3. Results from the Wind Query Menu, Baldy Mountain Allotment

An Example
Under Erodibility the user has two options, Wind Erosion or Water Erosion. If Wind Erosion is selected, a menu appears (see Table 2, Wind Erosion Query Menu). The user then clicks on the box for which wind erosion class s/he wishes to query, the query will run, and the results will be displayed in graphic form (see Table 3, Results from the Wind Query Menu, Baldy Mountain Allotment).

Rangeland Management Soil Queries
From the Soil Data menu, if the user selects the Soils Queries to Support Rangeland Management, a new menu will appear. This menu works a little differently from the General Soils Queries menu, in that with this menu the user may select multiple queries to run at the same time. The user clicks the box next to the query s/he wishes to run then clicks on the Accept button and those queries execute. Range queries have predefined choices; for example, which layer to use, which soil characteristics to use, depth, etc. A modified query button is provided so the user can customize the query.

Help Along the Way
Help is available with this extension in two ways: (1) a yellow text box display whenever the mouse crosses some text on a menu and (2) the on line Users Guide. The on-line Users Guide is available from the Internet and from within ArcView. The Users Guide is also provided when the extension is downloaded. It is available in either Adobe PDF or MS Word.

Saving the Results
Whenever a query is run, the results are displayed in the users current View. The results are temporary and are deleted once the ArcView project is closed. The user may save the results very easily with the Save Query Results option from the Soil Data menu. The user simply selects the query results s/he wishes to save from the Table of Contents and the selects the Save Query Results from the menu. The user is asked for a file name, although a default name is provided, and the user may choose the location where to save the file. Results are the available for other uses.

Download SSURGO Data
An easy-to-use download tool has also been developed with this extension. There are two ways in which to use this tool: spatially or alphanumerically. The difference between the two is whether or not the user knows the State Soils Survey Area ID (STSSAID) of the soil survey needed. If the STSSAID is not known, the spatial method of download presents the user with a number of graphics displays depicting the states, counties, and finally the soil survey boundaries. The user simply selects the appropriate responses from the graphics displays. If the selected soil survey does exist, the download will start. Not all soil surveys are available. If the user knows the STSSAID of the soil survey needed, the alphanumeric download option is available. The user simply enters the STSSAID and clicks the OK button, and the download will start.

More Information
More information about SSE is available from the NSTC GIS web page, http://www.blm.gov/gis/narsc/soils/soils.html. The extension documentation and download are also available from this web site.

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