# Chapter 1: Understanding NASIS

## What is NASIS?

The National Soil Information System (NASIS) is a specialized tool for managing soil survey data throughout all stages of soil survey, from collection of data to publication of information. It is adaptable to future changes in soil survey procedures and standards and allows users to create, manage, analyze, and interpret soil survey data. Sections address site-specific information, such as plant or soil profile descriptions, as well as map unit attributes. Spatial data and soil characterization data are maintained in other databases.

## Major Areas of NASIS

NASIS was envisioned to encompass the four major areas of soil survey plus operations and maintenance. Soil survey operations comprise an interaction of spatial data, map unit attributes, point or site attributes, and concept or aggregation criteria. NASIS includes objects and tables for database management, map unit attributes, and site and point attributes.

### Project Management

NASIS accommodates the management of map units through the use of soil survey projects. The Project Object is designed to enable soil scientists to develop and manage map units without affecting the official soil survey legends published to the Soil Data Mart.

### Map Unit Attributes

NASIS accommodates entry and maintenance of map unit data.

### Point and Site Attributes

NASIS has Site, Pedon, Transect, and Site Association Objects. Each object has several tables for the management of point and site attributes. Lessons in Chapters 9 and 10 focus specifically on site and point attributes.

### Concept and Aggregation Criteria

Long-term plans include the incorporation of principles and rules of soil survey operation into NASIS. Currently, tools within NASIS support the application of principles and rules by soil survey personnel but not the concept and aggregation criteria envisioned for later releases of NASIS. Existing tools provide calculated data elements, data validation, stored interpretations, interpretation generation capability, and choice lists for consistent selections.

### Spatial Data

Long-term plans include the integration of spatial data with the NASIS database. Spatial data include points, lines, and polygons on maps.

# NASIS Capabilities

The NASIS software provides tools and functionality for managing and editing data, querying the NASIS database, generating reports, creating soil interpretations, and exporting data.

With NASIS, data elements can be calculated, such as taxonomic classifications. NASIS can also be used to validate the completeness and integrity of the data. It provides functionality for managing the ownership and security of data.

A full-featured online help system offering keyword and full text search capabilities, hypertext links, navigation tools, print capabilities, and more than 4,000 help topics is available. As new objects, tables, or even major areas are added to NASIS, the online help system is expanded. The online help system fully integrates with the NASIS software and includes context-sensitive help for each table, column, and dialog box in NASIS.

## Management of Soil Survey Data

NASIS is used to create seamless soil surveys. Map units are correlated in ongoing surveys and between survey areas. Soil interpretations are generated and documented. The soil interpretation results are based on calculations performed within NASIS. Custom soil interpretations can be created using local interpretation criteria. Soil scientists use NASIS to generate standard soil reports and create specialized reports for manuscript publication. NASIS has the capability of exporting data into the Soil Survey Geographic (SSURGO) format and to the Staging Server, where tabular datasets are joined with the corresponding spatial data for archiving in the Soil Data Warehouse.

Table 1-1 lists the principal features of the NASIS software.

**Table 1-1. NASIS Software Features**

| | |
|---|---|
| Centralized database and server for data sharing | Ability to select records from multiple tables in a single process |
| Specialized queries for finding specific information in the database | Report manager for developing reports |
| Find function for searching columns and tables | Query editor for developing custom queries |
| Choice lists for data selection | Fully customizable data table editors with filtering capability and the ability to save a table layout for later reuse |
| Access choice list descriptions | |
| Cut, copy, and paste editing tools | Reports and online help topics displayed in a browser to provide linking and printing capability |
| Global editing functions | |
| Referential integrity | Ability to calculate data elements |
| Context-sensitive help on fields and tables | Data validations for checking completeness and integrity of data |
| A fully-integrated online help system of linked topics and robust search capabilities | Ability to export NASIS data in an ASCII pipe-delimited format |

Some NASIS capabilities are specific to one of the major areas of NASIS. NASIS capabilities for managing map unit attributes are shown in Table 1-2. NASIS capabilities for managing site and point attributes are listed in Table 1-3.

**Table 1-2. NASIS Map Unit Attributes Management Capabilities**

| | |
|---|---|
| Export NASIS tabular data into SSURGO format | Produce standard soils reports |
| Export tabular data to the Staging Server | Create specialized reports for manuscript publication |
| Join map units between survey areas to create seamless soil surveys | Generate soil interpretations |
| | Create custom interpretation criteria |
| Create and edit legends, map units, and map unit data | Manage soil survey projects and related progress data |
| Correlate map units in an ongoing survey | Maintain soil survey schedule data |
| Maintain complete correlation records for a survey area | |
| Maintain multiple map unit legends | |

**Table 1-3. NASIS Site and Point Attributes Management Capabilities**

| | |
|---|---|
| Enter site descriptions for multiple site usages | Link pedon data to component data |
| Define overlaps between sites and map units | Accept point or spatial representations of sites |
| Define overlaps between sites and areas | Associate transect stops with a pedon |
| Enter pedon description data | Associate multiple transect stops within a transect |
| Record other observation data | |

# Essential NASIS Concepts

- The survey area name is separated from the legend so that a survey area may have multiple legends.
- The survey area legend is separated from its map units so that a map unit may be linked to multiple legends. This allows the ownership of map unit records separate from that of the legend record.
- The legend and its map units are linked through the Legend Mapunit table.
- Soil survey progress is tracked by project, and each project is associated with a group of map units.
- Projects and map units are linked through a Project Mapunit table.
- Technical soil service activities are recorded in the Technical Soil Services table.
- The coincidence between soil survey areas and other area types can be recorded.
- Areas are organized by area type.
- The soil properties, qualities, and interpretations for map units are located in the Data Mapunit Object.

- Map units and data mapunits are linked via the Correlation table.

- Map units can have an unlimited number of components, and components can have an unlimited number of horizons.

- Annual flooding and ponding events are recorded in the Component Month table. Frequency is assigned to those months in which the annual event most commonly occurs.

- Water tables are indicated by the soil moisture state "wet" in the Soil Moisture table.

- Data elements with multiple entries have their own table. For example, Unified classification has its own table since it can have more than one class.

- Information about inactive map unit symbols (called "additional" symbols in NASIS) is retained in the database.

- Inclusions are "other components" in NASIS (not major components).

- Horizon nomenclature can be assigned to layers.

- Representative values (RVs) and high and low values are available for some data.

- Interpretations are generated from the actual data assigned to the soil component.

- Interpretations can deal with interactions, such as the interaction of slope and water table where, as slope increases, the limitations associated with water table decrease.

- Interpretations can deal with relative weights, such as when depth to bedrock may have more importance to the interpretation than slope.

- Interpretation results provide a complete gradation on the truthfulness (or falseness) of an interpretive statement.

- The interpretation logic is used to translate ranges of properties into a uniform basis.

- NASIS can handle any number of rating classes.

- NASIS interpretive results are always up-to-date between the data and criteria because an interpretive result is a function of running the soil property data through criteria.

- Interpretive results cannot be edited (no overrides). Instead, the physical and chemical soil properties or the criteria itself must be reviewed.

- Database security is accomplished through a concept called "owned objects" and the use of record locking and column protection.

- The role of the dataset manager is to manage the assignment of users to groups. In NASIS, data is owned by a group and users who are members of that group have authority to make changes to the data on behalf of the group.

# NASIS Communications

The National Soil Information System is needed so that everyone has access to nationally complete and up-to-date soil data at any time, from any location, and it guarantees the integrity and security of those data. NASIS communications refer to the software design, telecommunications, and network connectivity required to run NASIS at any location.

## NASIS Central Database

The NASIS central database is a computer server that stores all the soil survey tabular attribute data using Microsoft SQL Server database management software. The central database is the repository for all transactional data, making it available for viewing and editing.

## NASIS Client or Local Database

NASIS 6.1 implements the concept of a client or local database.  A client version of the NASIS software runs on the user's local computer.  A portion of the national database is selected and copied to the client computer for editing and management.  An upload process is utilized to move edited or new data from the client computer to the central database.

## NASIS Sites

NASIS sites exist to provide logical groupings of data for ownership.

## Creating and Editing Soil Data

Soil data are created, edited, and saved to the NASIS local database, and then saved to the national database. Users must belong to a group to create, edit, or delete NASIS data. When a soil scientist loads data for a soil survey area in NASIS, data are retrieved from the national database and placed in the local database. Data must then be loaded into a "selected set" from the local database.  Data can then be edited in the selected set.  Edits are then saved to the central database using an upload process.

## Running NASIS at a Soil Survey Office

NASIS users connect to the central server to run NASIS using Internet connections. Client computers can be disconnected from the network for a limited time and still run NASIS.  When reconnected to the network, the local database is synchronized with the central server.

Figure 1-1 depicts connections from the MLRA soil survey offices (SSO), MLRA Regional Offices (MO), and other locations to the NASIS central server at Kansas City.
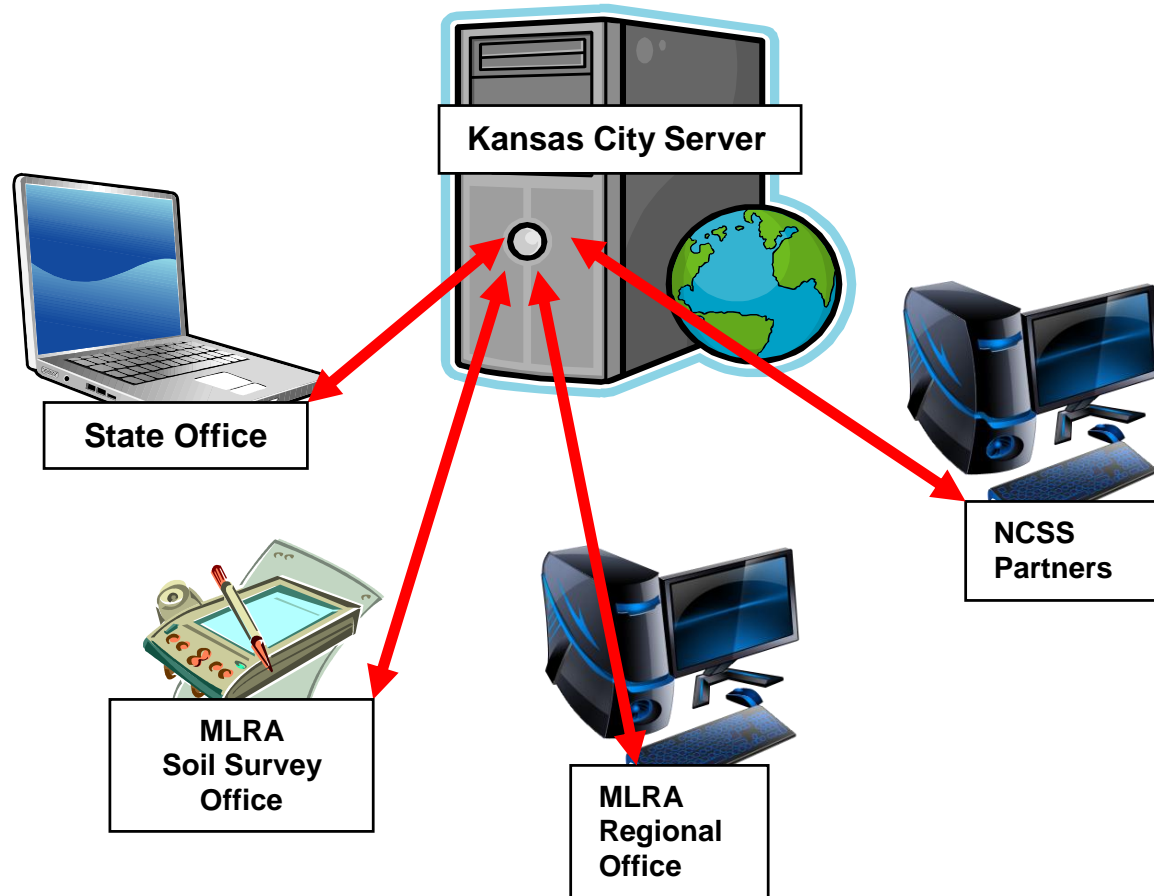
Figure 1-1. NASIS Connectivity

# Objects, Ownership, and Record Locking

NASIS divides data into owned database objects. These include the Area Type, Legend, Map Unit, Project, Data Mapunit, Site, Pedon, Site Association, Transect, Technical Soil Services, NASIS Management Sites, Geomorphic Feature Type, Plant, Ecological Site, Local Plant, Query, Report, Property, Evaluation, Rule, Project Data Type, Technical Soil Service Type, Milestone Type, and Edit Setup Objects. Each owned object is independent of the others but may contain links to others.

An object is a record or group of hierarchically related records in the NASIS database. An owned object starts at a parent table, where ownership is assigned and from which all other tables (in that object) are accessed. Every record in NASIS is a member of an owned object. All records inherit the permissions of the owned object to which they belong. A component cannot be assigned from permissions different than those of the data mapunit to which it belongs. Data mapunits are owned objects that include all of the components for each map unit in addition to all the horizons for each component in that map unit. In Figure 1-2, DMU 2 is an object owned by the "correlators" group in the Oregon MO NASIS Site. Only users who are members of that group can edit the data mapunit, component, or horizon data for DMU 2.
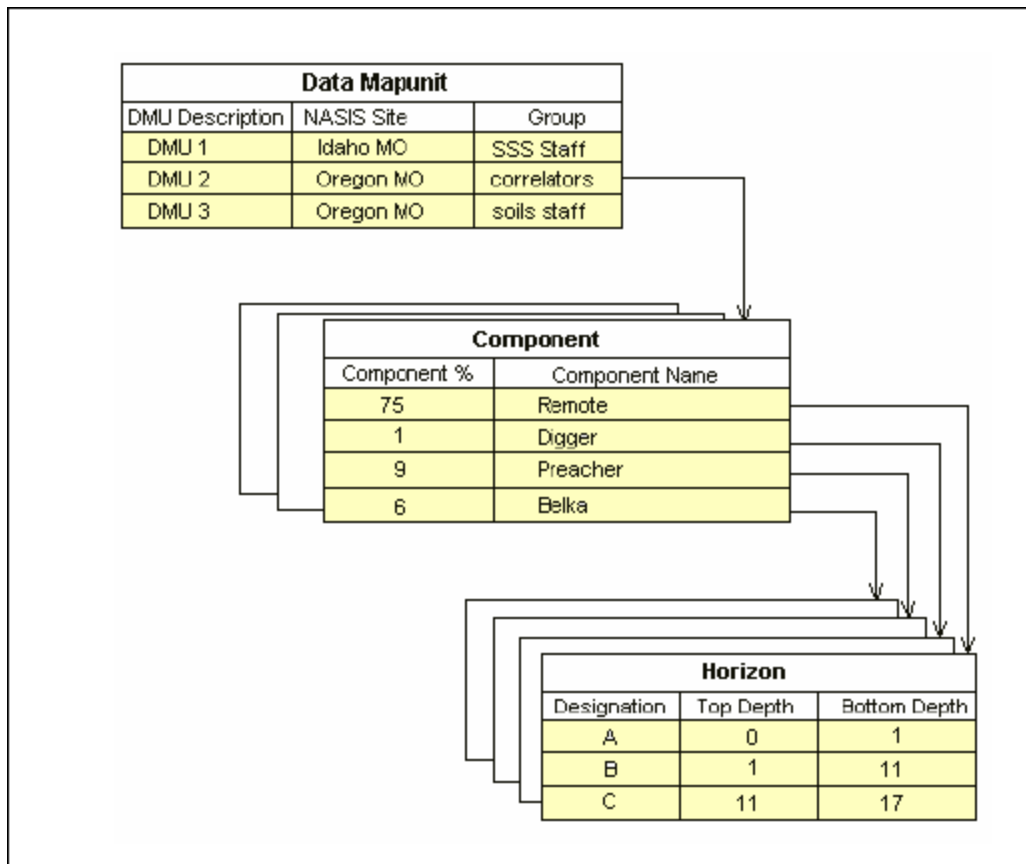
Figure 1-2. Example of Object Ownership

## What Does It Mean to Own an Object?

In NASIS, authorized users must be explicitly identified and assigned to particular groups. Data is owned by different groups, and group members have the authority to make changes to the data on behalf of the group. NASIS users may only edit objects owned by a group to which they belong. Users need no authority to *copy* an object because copying does not change the original data. The copied object is then owned by the group whose group member performed the copy and can be edited by any member of that group.

The tasks of managing users and groups are handled by the NASIS dataset manager who has the authority to edit the NASIS site tables.

## Multi-User System

Since NASIS is a multi-user system, provisions must be made to prevent two users from editing the same record at the same time. In NASIS versions 1.0 through 5.4, this was handled by locking records. Locks were placed on a record by the first user that brought the record into their selected set for viewing or editing.

With the release of NASIS 6.1, this process changed. In NASIS 6.1, multiple users can download copies of the same data records from the central server to their local database. Data stored in the local database is in a "read-only" mode. Data to be edited must be loaded into the selected set by executing a query or the "Load Related" function against the local database. The selected data is then "checked out" from the central server. At the time of "check-out," a

lock is placed at the central server allowing the user to edit the specific data. When editing is completed, the data is "checked in" to the central server and the edit lock is removed. A complete discussion of this process is in Chapter 6.

Row status indicates permission—whether the user has or does not have permissions to edit a particular data record. Row status is indicated by a letter to the left of the first column in any table. Users can only edit a record if they belong to the group that owns the record and check out the record from the national database. If data is checked out, the status will be "E" (editable). If data is checked out by another user, the status will be "L" (locked). Any user can view records owned by other groups but cannot edit them; the data will have a status of "P" (protected).

# The Local Database

In NASIS, the group of records selected from the central server and downloaded to the NASIS user's computer is called the local database.

**How the local database is created or changed**

The local database is populated by selecting data objects from the central server using a combination of queries and choice lists. The following rules govern the local database:

- When NASIS 6.1 is first installed, the local database is empty of soil survey data.

- All records from a number of data objects used as lookup tables are automatically downloaded to the local database. These include the Area Type, NASIS Site (database), Geomorphic Feature Type, Plant, Ecological Site, Local Plant, Query, Report, Property, Evaluation, Rule, Project Data Type, Technical Soil Service Type, Milestone Type, and Edit Setup Objects.

- Additional data object records can be added to the local database by running one or more queries on the national database.

- When a particular data object is selected for download from the national database, all associated records in other tables and objects are also downloaded. For example, if a legend is selected, all map units linked to that legend, all data mapunits linked to the map units, and all linked pedons and sites will be downloaded.

- The local database can be cleared using the "Clear Local Database" menu option or toolbar icon.

- New data records are added by entering them through the edit table grid.

- Edits to existing records of soil data are executed in the local database when the cursor is moved to another row of data in the selected set or the "End Edit" icon is used.

- Edits are copied from the local database to the national database by an upload and check-in process that can be accessed from the menu or toolbar.

A more detailed description of working with the local database is provided in succeeding chapters.

# The Selected Set

In NASIS, the "selected set" is the group of records selected from the local database for viewing in the Editor Panel or in reports. Some of the entire local database can be loaded into the user's "selected set."

**How the selected set is created or changed**

The selected set is built using a query or a combination of queries run against the local database or including records loaded using the "Load Related" function. The following rules govern the selected set:

- When NASIS is first started, the selected set is empty. After the selected set is built, it is retained when NASIS is closed and restarted.

- Rows of the NASIS Site table and some lookup tables are exceptions and can be viewed upon opening NASIS.

- A selected set is emptied when "Clear Selected Set" is chosen from the NASIS menu or the icon on the NASIS toolbar is chosen.

- Records are loaded into the selected set by running a query or by using the "Load Related" function. (Related records must be in the local database.)

- Multiple queries run against the local database are cumulative; that is, the newly selected records are appended to the selected set. Multiple "Load Related" actions are also cumulative.

- The command "Remove Selected Rows from Selected Set" removes one or more highlighted records and associated child records from the selected set but does not delete the rows from the database.

- New records are added by inserting rows of data.

- When a row is marked for deletion, it stays in the selected set and the deletion mark can later be removed. When the local database is uploaded and checked in to the central database, records marked for deletion are permanently deleted.

**Why NASIS users need to know the contents of the selected set**

Some of the actions performed on data affect the entire selected set and some affect only individual objects or rows. It is important to know what is in the selected set because reports are based on the whole selected set. Only part of the selected set is visible at any point during the edit session. For example, the query used to select data for the edit session may load only those data mapunits with a description of "015AcB." Because Data Mapunit is a root object, when it is loaded, all of its associated components and horizons are loaded even though they do not appear until those tables are opened.

# Multiple Users Sharing a Single Computer

Multiple users sharing a single computer must realize there is only one local database per computer. The local database must contain the information needed by all users. Data checked out by one user must be checked in at the end of the user session in order to be available for editing by other users.

# Target Tables

Target tables are used when querying data. Understanding the concept of target tables—what they are and how to use them—is fundamental to selecting and editing records.

**What is a target table?**

Simply put, the target table focuses the outcome of a particular query. The user can control the query so that it loads only the specific data the user wants to work on during an edit session. The target table can greatly restrict or expand the number of records returned by a particular query. To understand target tables, the user must understand the relationship between objects in the NASIS database (see "Objects, Ownership, and Record Locking," page 1-6, as well as the NASIS technical data model diagrams and the NASIS database structure diagrams available through the NASIS home page or online help).

**How target tables restrict the records returned by a query**

In an edit session, the user wants to limit work to only those components that are "series." The user chooses a query that loads components by *kind* and specifies *series* as the kind. Because a component is a child table of the Data Mapunit Object, the user could select either Component or Data Mapunit as the target table. *Whether or not the query restricts the selected set to only the series depends on the choice of target table.*

- If the Component table is selected as the target table, only components that are series are loaded.

- If the Data Mapunit table is selected as the target table, all data mapunits that have at least one component that is in the specified series are loaded. In addition, all other components in each of those data mapunits are loaded.

The target table must contain the data element being used to distinguish one record from another. In this case because "compkind" is a data element in the Component table, targeting the Component table will net the desired results. Targeting the Datamapunit table will fail to return the desired result because the "compkind" data element is not present in the Datamapunit table for the distiction to take place.

Only one table within an object is selected as a target table. NASIS does not allow the selection of more than one table in a single object.

**Selecting records from different objects**

Some queries are designed to select records from different database objects, for example, from the Mapunit Object and from the Data Mapunit Object. In these cases, the query is run with multiple target tables specified.

# Database Security

The ultimate goal of NASIS security is to maintain the integrity of data. NASIS security is based on a concept called "owned objects" (see page 1-7).

The task of adding users is handled by the NSSC Hotline in Lincoln, Nebraska.

The task of managing user groups is handled by a NASIS dataset manager who has the authority to edit the NASIS Site tables. The dataset manager assigns users to groups. Unless a user is assigned to a group, he or she will not have authority to edit or create soil data. Once assigned to a group(s), a user may only edit data that is owned by the group(s) to which he or she is assigned. An individual user may belong to any number of groups as needed. One group

is designated as an individual's "default" group. Any data object records created are owned by the user's default group. The NASIS Security Diagram is shown in Figure 1-3.
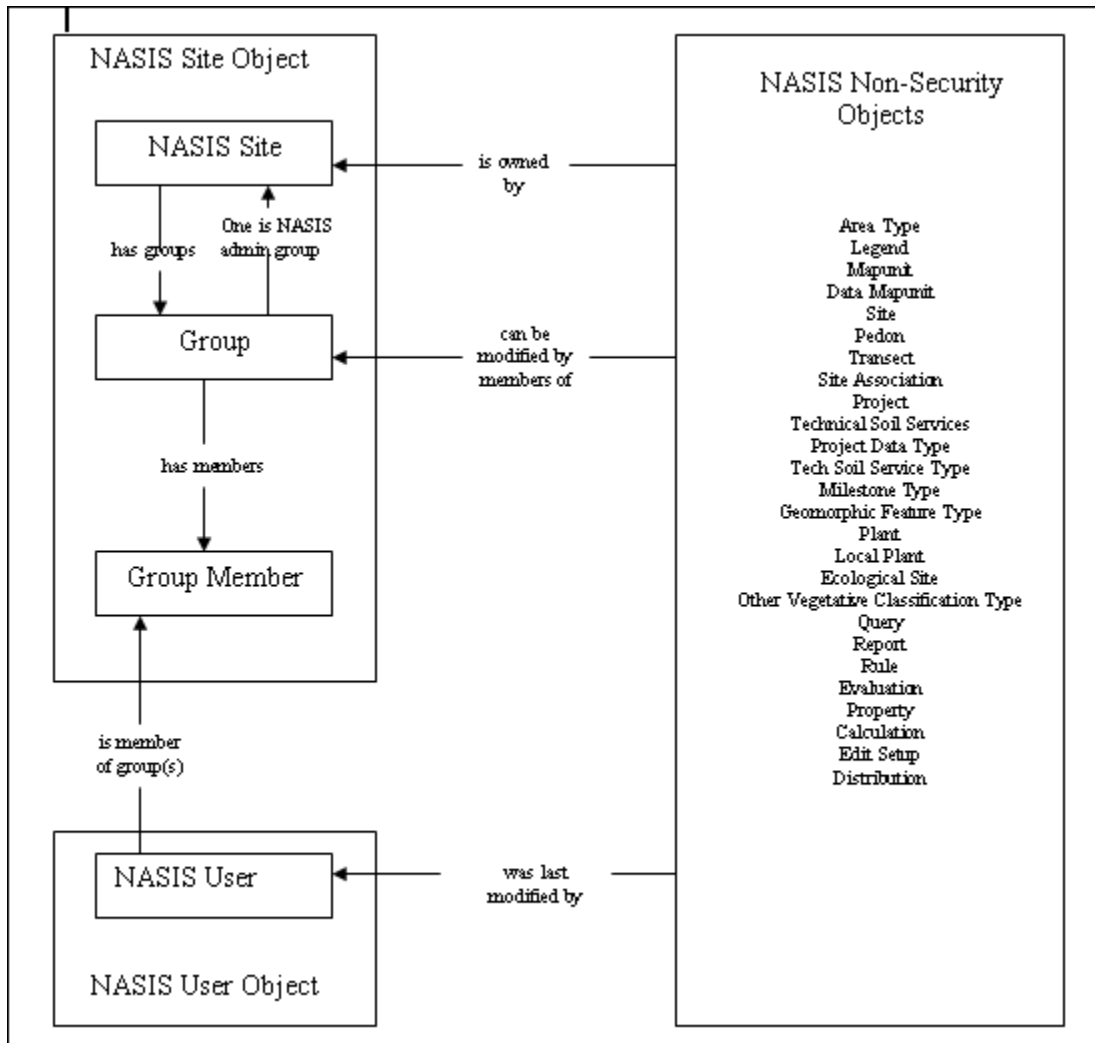


Figure 1-3. NASIS Security Diagram

Figure 1-3 shows the relationship between the NASIS Site Object and other owned objects. NASIS objects are owned by groups. Users are not required to belong to any group. However, a user cannot edit anything in an object unless the user belongs to a group with edit privileges for that object. Items within an object are owned by the creating group.

Certain objects, such as the Geomorphic Feature Type, Plant, and Calculation Objects, contain data that are used by NASIS but copied from other databases or maintained by a limited group of personnel. Most users can view these data but cannot modify or add to the data.

## Soil Survey Areas and Map Units

In NASIS, the soil survey area is separated into two parts: the *area* and the *legend*. The area includes the soil survey area name and total acres for the soil survey area. The legend includes the legend description (for example, detailed soil map legend), survey status, and correlation

date. Legends are linked to survey areas, allowing multiple legends to be recorded for each soil survey area. Because there are several kinds of areas in NASIS, areas are organized by *area type* (explained in Chapter 7).

In NASIS 6.1, map units are separated from the legend. They are linked to the legend through the Legend Mapunit table. This allows a single map unit to be used in multiple legends. The *local* map unit symbol and map unit acres are maintained in the Legend Mapunit table.

The map unit is also separated into two parts: the *map unit* and the *data mapunit*. The map unit includes the *national* map unit symbol, map unit name, and correlation history. The data mapunit includes the map unit composition, physical and chemical properties, and various soil qualities. Data mapunits are linked to one or more map units through the Correlation table, allowing multiple map units to be linked to the same data. Conversely, map units are linked to one or more data mapunits allowing map units to be correlated and conversion legends to be produced.

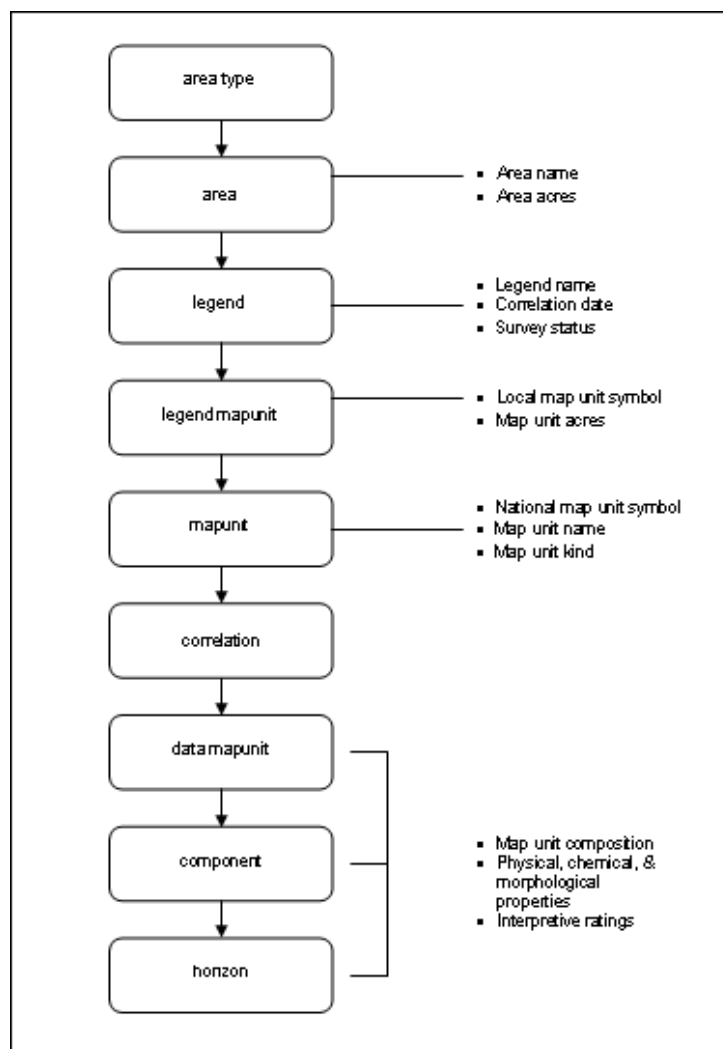Figure 1-4 shows the organization of NASIS tables.



Figure 1-4. NASIS Table Organization

## Multiple Legends, Coordinated Legends, and the Joining of Soil Survey Areas

In NASIS, a single survey area may have multiple legends. These legends could include a previous out-of-date legend and the current updated legend. In addition to multiple legends, a map unit may also be identified by symbols from different legends. These symbols could include a symbol from the soil survey area legend and a symbol from the statewide legend. Each of these symbols can be different yet fully coordinated in NASIS. In effect, the map unit can have many aliases, all sharing the exact same data (or data mapunit). This capability is especially useful when joining survey areas where two map units join exactly at the survey boundary and are identified by different symbols that are aliases for each other.

See Figure 1-5 for an example of the joining of map units. MLRA Soil Survey Area map symbol 247, Soil Survey Area A map symbol Ha, and Soil Survey Area B map symbol 12 are all linked to national map unit 2h9a, which is linked to data mapunit 1234. All symbols share the same map unit data. The join between Soil Survey Area A and Soil Survey Area B is a perfect join.
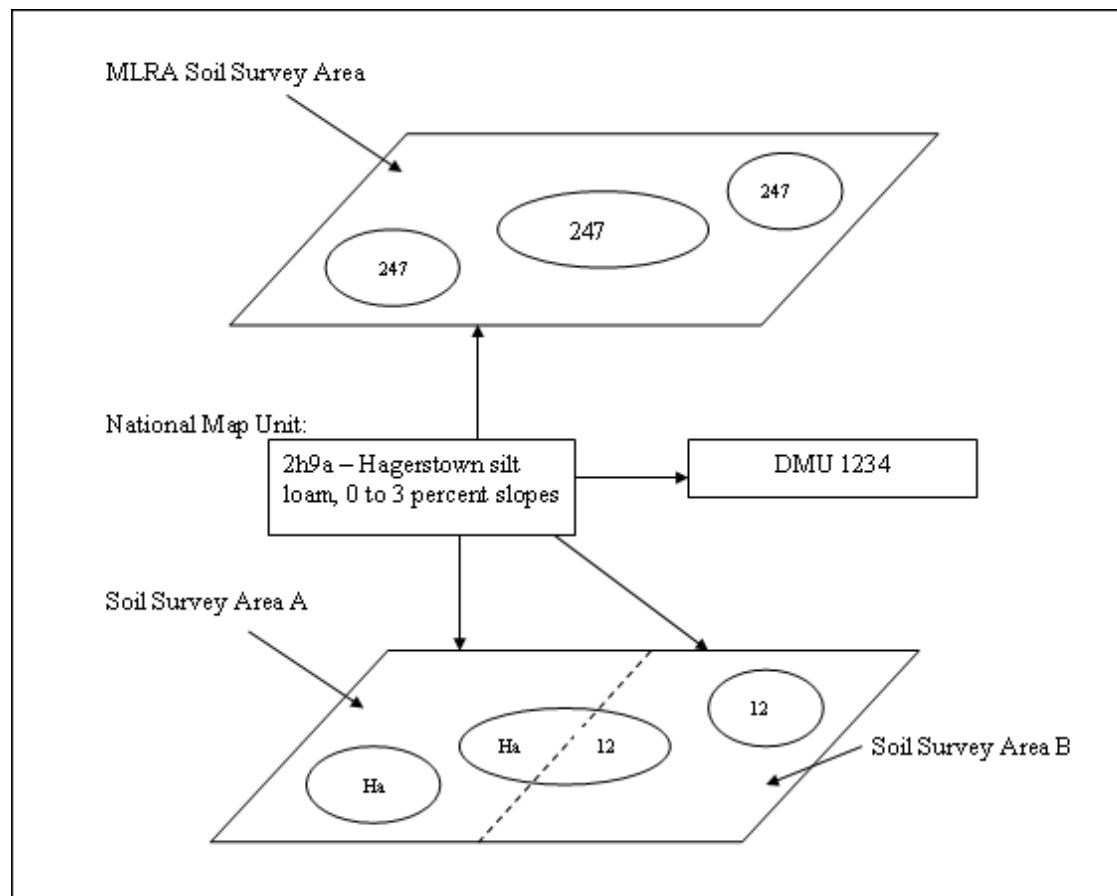


Figure 1-5. Example of Coordinated Legends and the Joining of Soil Survey Areas

# Legend and Map Unit Area Overlap

NASIS stores information about many kinds of areas, including soil survey areas. These areas include MLRAs, States, counties, climate factor areas, and rainfall factor areas. They are used to construct an "overlap" (or coincidence) with soil survey area legends and map units. The concept of an overlap is analogous to a "theme" added to a map created in GIS software, such as ArcMap.

Figure 1-6 is an example of an overlap. In this example, the Mariposa and Bell Counties Detailed Soil Map Legend is a two-county soil survey area. The legend is "overlapped" with the Bell County area to produce the Bell County Legend Overlap. This overlap records both the extent of the soil survey area in Bell County and the map units that occur in Bell County.
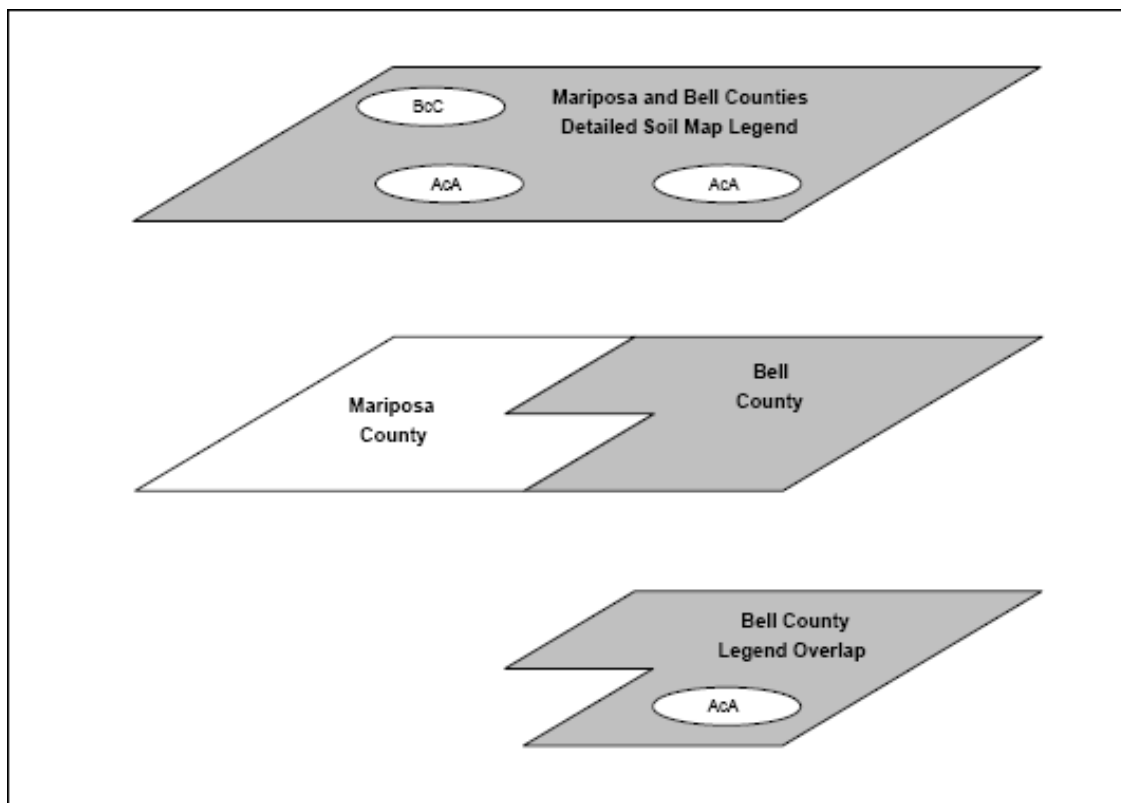


Figure 1-6. Example of a Legend and Map Unit Area Overlap

# Export of NASIS Data in the SSURGO Format

NASIS provides the capability of exporting NASIS data in the SSURGO Version 2 format. Exported data is distributed in an ASCII pipe-delimited format. It can be used with common software packages, such as Microsoft Access.

National as well as State-specific database templates (available at http://soildatamart.nrcs.usda.gov/Templates.aspx) can be used to convert the export file into a Microsoft Access database. The templates also contain some standard queries and reports.

The SSURGO export delivers data by legend. An export can contain data for one or more legends. Although the number of legends is not limited by the program, it is best to export a limited number (one to three) because the export process is resource intensive. The selected legend(s) are loaded into the selected set in NASIS prior to export. The map units, data mapunits, and components included in the export can be selected in two ways—by using standard criteria or by using the selected set.

**Using standard criteria to identify data for export**

Once the legend(s) have been loaded into the selected set, associated map units, data mapunits, and components can be selected through a dialog without loading them into the selected set.

Map units in the local database tables are selected by status ("provisional," "approved," "correlated," or "additional"). Any or all of the status types can be selected. When additional map units are selected, the user can choose between exporting the representative data mapunit for the active map unit or the one that was/is representative for the additional map unit.

NOTE: When exporting data to the Staging Server for an official SSURGO export, additional map units are not exported. The capability to export additional map units exists so that the users can export and review ongoing project data.

Data mapunits in the local database tables are selected by certification status ("not for distribution," "not certified," "partly certified," or "certified"). Any or all of the certification status types can be selected (including data mapunits not assigned a certification status).

Components in the local database tables are selected by all components, major components, or percent of composition.

Users can choose text kinds to be included in an export. Text kinds associated with any export data can be included.

**Using the selected set to identify data for export**

When the selected set is used, the map units, data mapunits, and components, as well as the legend, are loaded into the selected set. When the selected set is complete, the dialog in the NASIS export is marked to use the selected set rather than the above criteria.

(When the selected set is used, all rows in the tables are included regardless of their status. The export process does not check row status.)

**Running interpretations on selected data**

The export process provides the option of running interpretations on the data being exported. After criteria or selected set options are marked, the "Select/View Interps" tab can be selected from the export editor. National or local interpretations can be applied to the export data. Interpretation results are added to the export file.

**Tracking SSURGO exports in the distribution metadata object**

The export writes information about the selection criteria used and the data exported into permanent tables in NASIS. The permanent tables provide an export history and reference for subsequent exports.

# Interpretations in NASIS

**How NASIS generates interpretations**

Data in the component and horizon tables are filtered through national or local interpretive criteria stored in NASIS. In this way, new interpretations are generated based on current data and on calculations automatically performed by NASIS.

**Advantages of NASIS interpretation criteria**

- Interpretations are based on *actual* properties of the component.
- Interpretations can deal with interactions, such as the interaction of slope and water table where, as slope increases, the limitations of the water table decrease.
- Interpretations can deal with relative weights, such as when slope may have more importance to the interpretation than depth to water table.
- Users can get a complete gradation of how true (or false) an interpretive statement is. Fuzzy logic can be used to avoid bounding conditions where interpretive results change dramatically with only a minor change in soil properties.
- Users are not constrained by crisp rating classes, such as slight, moderate, and severe. NASIS can handle any number of rating classes.
- Interpretive results are always up-to-date with the data and criteria. If the data or criteria change, the result can change.
- If the interpretive result is incorrect, users can edit either the physical and chemical soil properties or the criteria hemselves. This allows NASIS to automatically document the interpretive result.
- Users can create local or regional interpretations based on local criteria.
- Users can convert their property (data element) values to fuzzy numbers with a graphing tool called the Evaluation Editor.
- The NASIS interpretation report gives users the ability to easily identify data voids (NULL or missing data).

**Summary of interpretive criteria**

Properties, evaluations, subrules, and rules are the basic interpretation elements that work together to form the interpretive criteria.

Properties are SQL statements that retrieve data from the database.

Evaluations take the data resulting from the property and evaluate according to the criteria's truth or membership function. They are used in interpretations to make statements about the property's effect on the specific interpretative application.

Subrules are used to identify the restriction value and assign the property restriction class.

Rules are used to group and manipulate the subrules to provide a final interpretive rating value and to assign a rating class.

Figure 1-7 provides a high level view of interpretive criteria. It is not the process flow used when creating interpretive criteria.
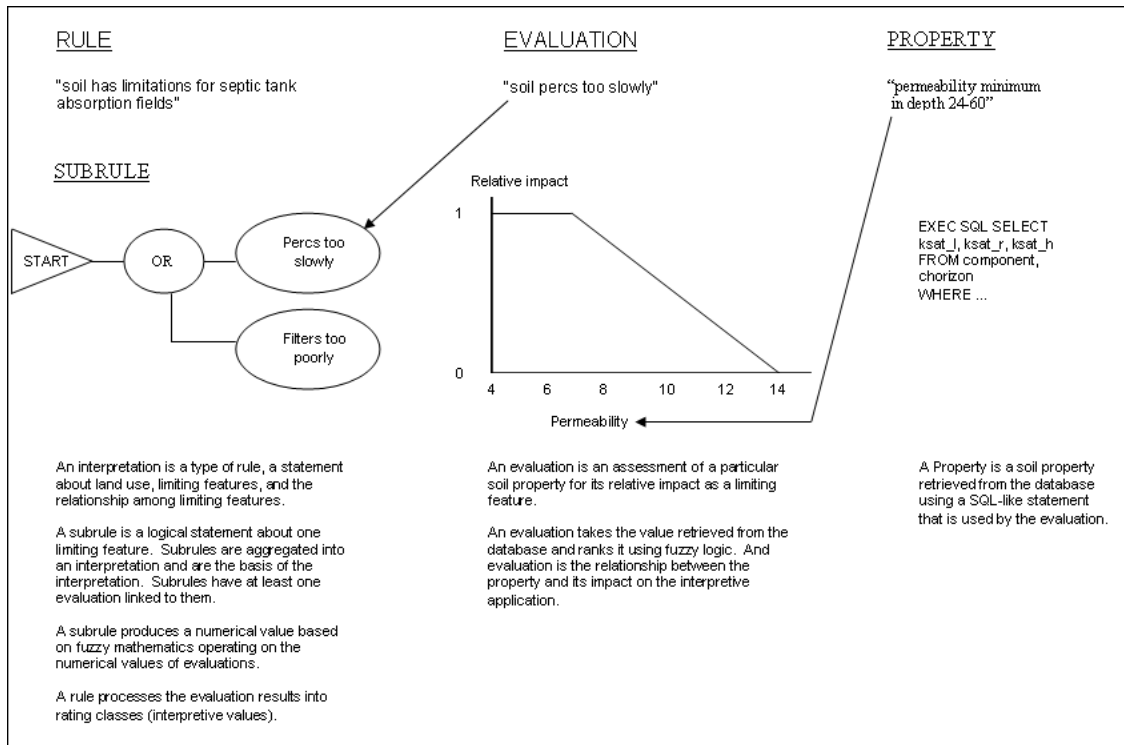
Figure 1-7. A Graphical View of Interpretive Criteria

For simplicity, Figure 1-7 shows an evaluation for percolation only.

Starting on the right of the diagram, the property being evaluated is minimum saturated hydraulic conductivity values for horizons at a depth of 24 to 60 inches (60 to 150 centimeters). This value is retrieved from the database using a query-like statement (Property).

To evaluate percolation, the user must decide at what value a soil percolates "definitely too slowly" (e.g., if it percolates at less than 0.6 inch per hour or 4 micrometers per second).

To complete the evaluation, the user must decide at what value the soil percolates "definitely not too slowly" (e.g., if it percolates at more than 2.0 inches per hour or 14 micrometers per second). Thus, for any given soil, the user can assess (evaluate) the relative truthfulness of the statement "soil percolates too slowly."

Finally, on the left of the diagram, the subrule focuses on one limiting feature and must be linked to at least one evaluation. Because subrules say nothing about the land use, they can be used in different interpretations. Subrules are aggregated into an interpretation and are considered the basis, or building blocks, of an interpretation. Subsequent chapters discuss understanding, reporting, and developing interpretive criteria in detail.

Figure 1-8 summarizes the relationship between rules (including subrules), evaluations, and properties. Using an interpretation for septic tank absorption fields, the interpretation identifies whether or not a soil has limitations for septic tank absorption fields because it percolates too slowly or filters too poorly.
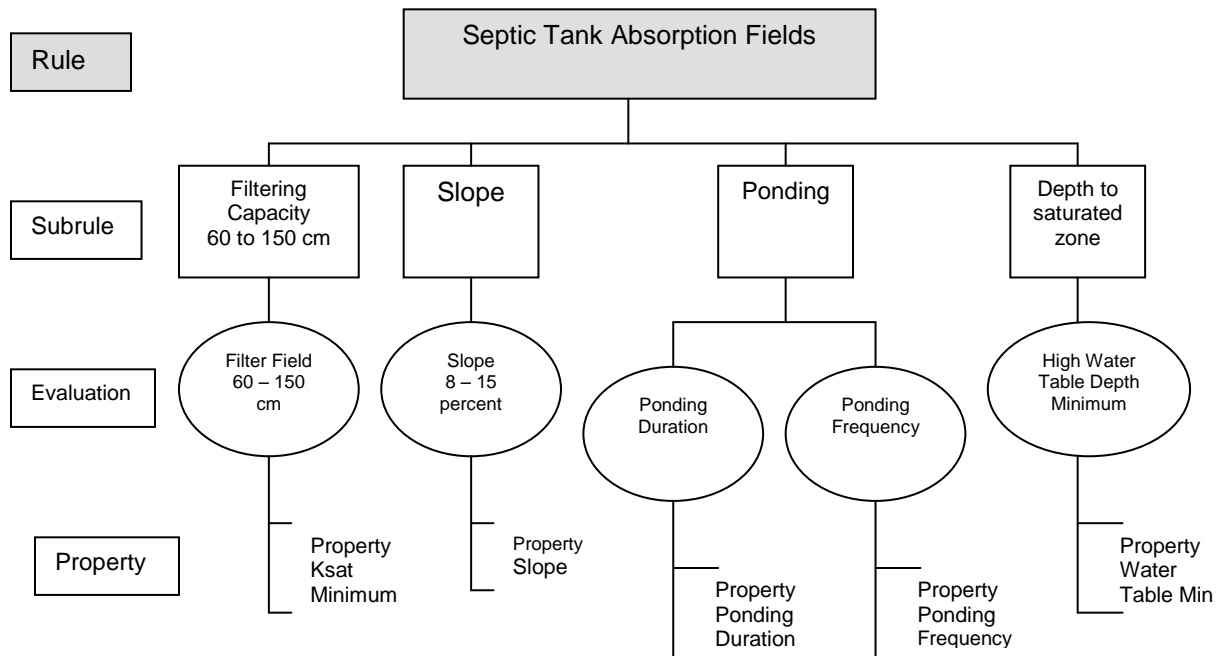
Figure 1-8. Relationships Among Interpretive Criteria

# Site and Point Attributes in NASIS

Site and point attributes represent the second major area of NASIS. NASIS contains four objects for managing site and point attribute data. The Site, Pedon, Transect, and Site Association Objects each contain several tables. These tables allow entry and maintenance of site descriptions and soil profile descriptions; the relationship between sites, such as satellite samples; and the relationship between pedons, such as transects. Data collected through monitoring projects, such as soil moisture content and soil temperature, can also be recorded.

As with any objects in NASIS, the Site, Pedon, Transect, and Site Association Objects are independent. Links between these objects and to objects within the other major areas of NASIS can be established.

Pedon PC is a separate software package available for recording pedon description and transect data. Pedon PC records the data in an Access database that is imported into the NASIS database for storage.

# Soil Survey Goals and Progress

Prior to NASIS 6.1, the Legend Object in NASIS contained several data elements and tables for entering soil survey mapping goals and recording progress against those goals. In NASIS 6.1, these data are moved to a new Project Object. Each legend that is linked to a non-MLRA soil survey area will have a corresponding project. The new Project Object can be used to manage soil survey projects, track progress, and manage other soil survey schedule data.

Update soil survey projects are managed, and their progress is tracked, by groups of map units. They are generally designed to update either a specific subset of map unit properties for a

subset of geographically or conceptually related map units. A map unit record is linked to a project through the Project Mapunit table. Any individual map unit that is part of an ongoing update project can later be included in another project targeting a different subset of properties.

Initial soil survey projects will continue to be managed by non-MLRA soil survey areas.

A new object—the Technical Soil Services Object—has been added to the NASIS database. Resource soil scientists and others can record technical soil service activities and results in the Technical Soil Services Object.

The Performance Results System (PRS) will mine data in the Technical Soil Services Object to facilitate and simplify accurate progress reporting for Conservation Technical Assistance.

# NASIS 6 Design

NASIS 6 is built and deployed around a server-client model. The national database, the server side, is deployed within the NRCS Enterprise Data Center (EDC). The user interface and a copy of the database, the client side, are installed on a user's local computer. The client-side software can be installed on both USDA CCE (Common Computing Environment) computers as well as on cooperators' non-CCE computers. Because the national database resides behind the USDA firewall in the EDC, an eAuthentication username and password are required for access.

The user interface connects to the national database over the Internet. A NASIS user downloads a subset of data from the national database to his/her local database for viewing and editing. Changes and additions to the data are later uploaded back to the national database.

The national database has been built using Microsoft SQL Server database management software. The local database uses Microsoft SQL Server Express, a companion piece of software to the server. The user interface is built using Microsoft .Net technology. The server-client model using Microsoft SQL Server and .Net enable a number of significant capabilities not available in previous versions of NASIS. These technologies allow a user to view data, run reports, and perform limited other functions against the data in their local database while disconnected from the network. Users can also connect to his/her local database as a read-only user with external applications, like Microsoft Access, to analyze data. Results can be joined to a corresponding subset of spatial data and viewed in ArcGIS. These capabilities will be more fully explored and developed with future versions.