Chapter 3: Understanding NASIS Objects, Tables, and Elements

NASIS 6 is a client-server application. The NASIS 6 software and local database reside on personal computers. Data must be queried and retrieved from the national database to populate the local database. This chapter discusses the local database and the selected set. Queries are run against the national database to populate the local database. A query is run a second time to load data into the selected set. (Further information on building the selected set is available in Chapter 4.) This chapter explains the details of NASIS objects and the process of building the NASIS local database on the user's personal computer.

NASIS Data Structure

Chapter 1 introduced the concept of objects and tables in NASIS. NASIS provides the capability to manage two general categories of soil survey data, commonly referred to as the *aggregated data* and the *point data*.

The aggregated data structure includes a set of objects and related tables needed to publish the soil map units and components and associate the map units with a soil survey area legend. The Legend/Map Unit/Data Mapunit Data Structure Diagram shows the objects and tables that make up the aggregated data.

The point data structure includes the objects and tables needed to manage the pedon descriptions and related data collected in the field. The Site Association/Site Data Diagram and the Pedon/Transect Data Structure Diagram show the objects and tables associated with the point data.

The Project Data and Technical Soil Services (TSS) Data Structure includes the objects and tables necessary to manage and report soil management activities. The Project Object and tables are used to manage and report soil survey activities. The Technical Soil Services Object and tables manage TSS activities. The Project/Technical Soil Service Data Structure Diagram presents the objects and tables associated with managing and reporting data.

Downloadable versions of these data structure diagrams can be found on the NASIS website (http://soils.usda.gov/technical/nasis/documents/metadata/6_1/index.html). This chapter focuses on the Legend/Map Unit/Data Mapunit Data Structure of the NASIS aggregated data.

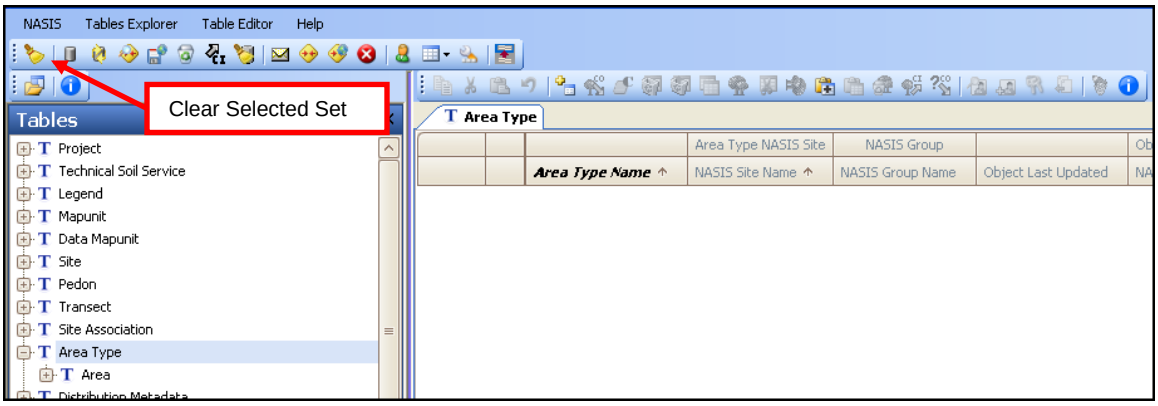
NASIS Aggregated Data

The objects of the aggregated data are the Area Type, Legend, Mapunit, and Data Mapunit. A new object was introduced with the release of NASIS 6.0. The Mapunit Object contains the Mapunit table that was previously contained within the Legend Object. The MLRA concept of updating soil surveys provided the impetus to move the Mapunit table into a new object, thereby allowing a map unit to be shared across multiple legends. This move facilitates the seamless join of map units across the country, using a unique national map unit symbol.

The Area Type Object

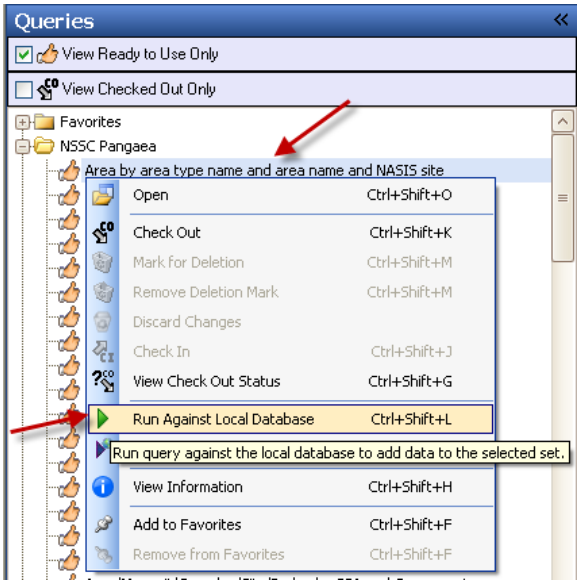
NASIS stores more than just traditional soil survey areas. Because there are several kinds of areas, they are organized by area type. The Area Type Object is the one object which has all of its data is stored in the local database. The Legend, Mapunit, and Data Mapunit Objects must be queried and retrieved from the national database.

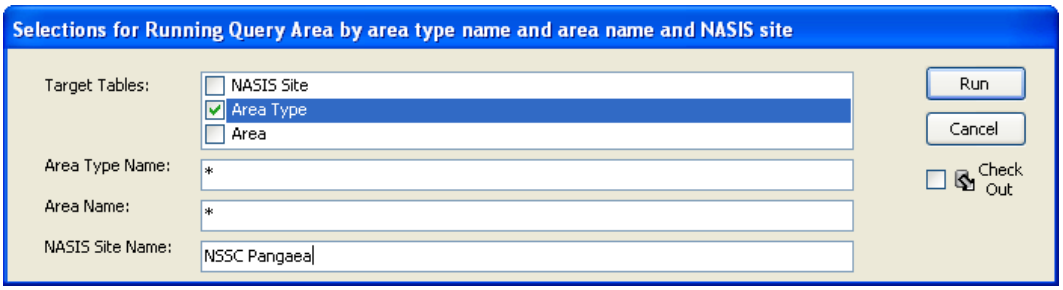
In the Tables Explorer, open the Area Type table by double clicking on the Area Type tab, highlighting the table, and choosing "Open" on the Explorer menu or by right clicking on the table and choosing "Open." The table should be empty. If is is not, clear the selected set using the whisk broom icon found on the NASIS Toolbar or choose "Clear Selected Set" from the NASIS Menu.



Querying Area Types

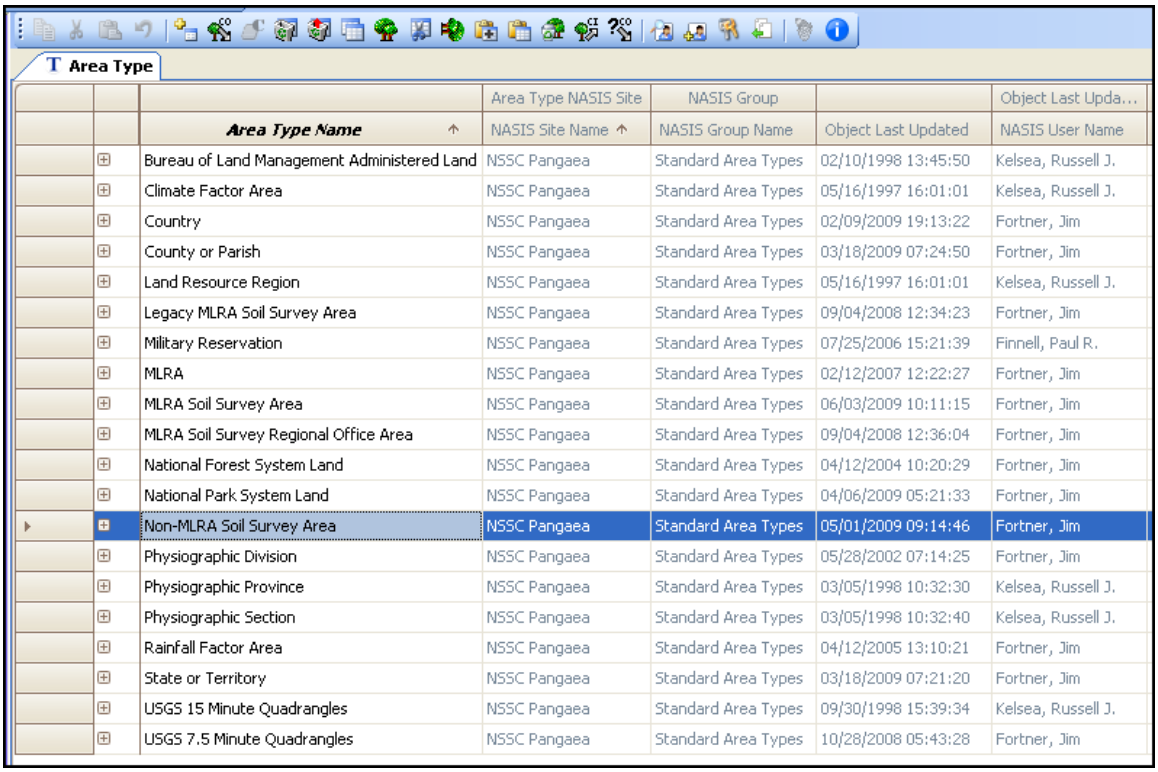
In the Query Explorer, right click on the national query named "Area by area type name and area name and NASIS site" and choose "Run Against Local Database."





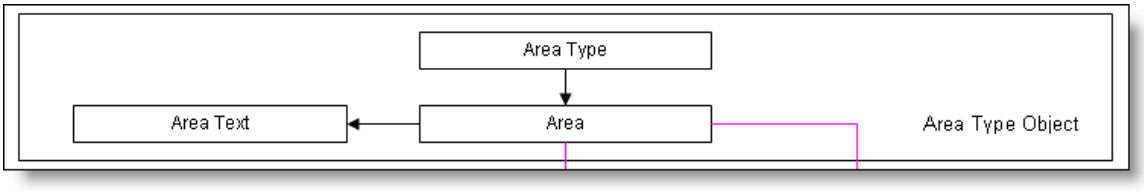
Enter the parameters as presented in the image above:
1. Choose “Area Type” as the target table,
2. Enter an asterisk (*) for the area type name,
3. Enter an asterisk (*) for the area name, and
4. Enter “NSSC Pangaea” (or “pan*”) as the NASIS site name.

The data within the Area Type Object is loaded into the local database at the time of initialization and is refreshed with changes when “Refresh Local Database” is chosen. It is not necessary to run this query against the national database. The result should be 20 rows of Area Type data.

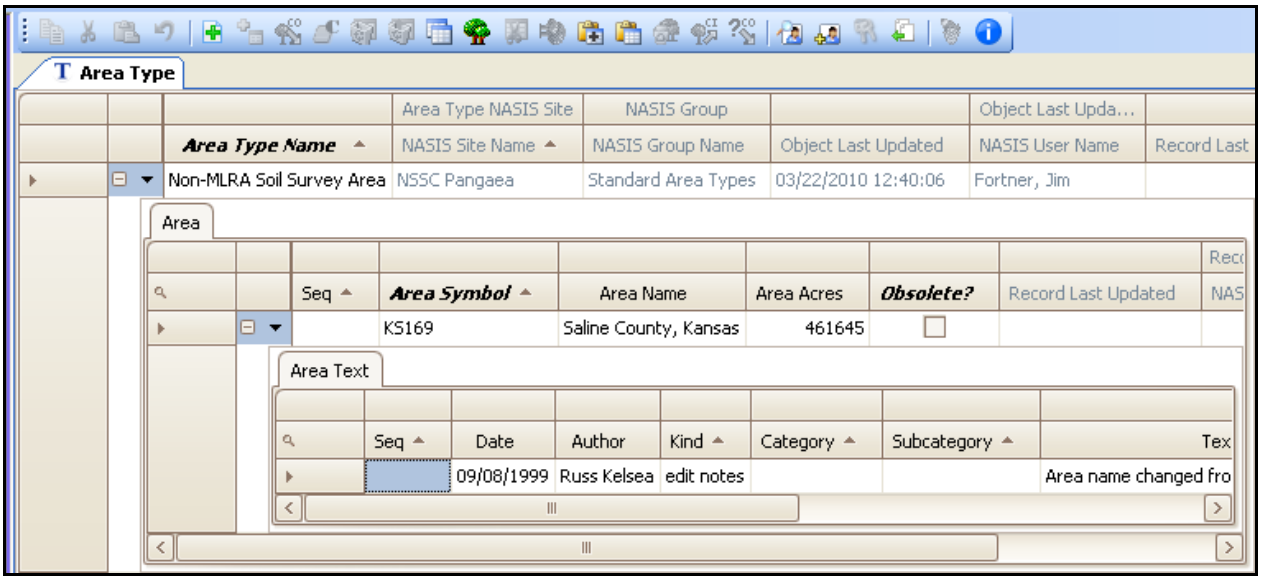

Area Type

	Area Type Name	Area Type NASIS Site	NASIS Group		Object Last Upda...
		NASIS Site Name	NASIS Group Name	Object Last Updated	NASIS User Name
⊞	Bureau of Land Management Administered Land	NSSC Pangaea	Standard Area Types	02/10/1998 13:45:50	Kelsea, Russell J.
⊞	Climate Factor Area	NSSC Pangaea	Standard Area Types	05/16/1997 16:01:01	Kelsea, Russell J.
⊞	Country	NSSC Pangaea	Standard Area Types	02/09/2009 19:13:22	Fortner, Jim
⊞	County or Parish	NSSC Pangaea	Standard Area Types	03/18/2009 07:24:50	Fortner, Jim
⊞	Land Resource Region	NSSC Pangaea	Standard Area Types	05/16/1997 16:01:01	Kelsea, Russell J.
⊞	Legacy MLRA Soil Survey Area	NSSC Pangaea	Standard Area Types	09/04/2008 12:34:23	Fortner, Jim
⊞	Military Reservation	NSSC Pangaea	Standard Area Types	07/25/2006 15:21:39	Finnell, Paul R.
⊞	MLRA	NSSC Pangaea	Standard Area Types	02/12/2007 12:22:27	Fortner, Jim
⊞	MLRA Soil Survey Area	NSSC Pangaea	Standard Area Types	06/03/2009 10:11:15	Fortner, Jim
⊞	MLRA Soil Survey Regional Office Area	NSSC Pangaea	Standard Area Types	09/04/2008 12:36:04	Fortner, Jim
⊞	National Forest System Land	NSSC Pangaea	Standard Area Types	04/12/2004 10:20:29	Fortner, Jim
⊞	National Park System Land	NSSC Pangaea	Standard Area Types	04/06/2009 05:21:33	Fortner, Jim
⊞	Non-MLRA Soil Survey Area	NSSC Pangaea	Standard Area Types	05/01/2009 09:14:46	Fortner, Jim
⊞	Physiographic Division	NSSC Pangaea	Standard Area Types	05/28/2002 07:14:25	Fortner, Jim
⊞	Physiographic Province	NSSC Pangaea	Standard Area Types	03/05/1998 10:32:30	Kelsea, Russell J.
⊞	Physiographic Section	NSSC Pangaea	Standard Area Types	03/05/1998 10:32:40	Kelsea, Russell J.
⊞	Rainfall Factor Area	NSSC Pangaea	Standard Area Types	04/12/2005 13:10:21	Fortner, Jim
⊞	State or Territory	NSSC Pangaea	Standard Area Types	03/18/2009 07:21:20	Fortner, Jim
⊞	USGS 15 Minute Quadrangles	NSSC Pangaea	Standard Area Types	09/30/1998 15:39:34	Kelsea, Russell J.
⊞	USGS 7.5 Minute Quadrangles	NSSC Pangaea	Standard Area Types	10/28/2008 05:43:28	Fortner, Jim

The area types stored in NASIS include National Park Service Lands, National Forest Lands, Military Reservations, Land Resource Regions, and many more. Notice that NASIS stores climate and rainfall factor areas and political and physiographic areas in addition to soil survey areas.



The Area Type Object is comprised of three tables: Area Type, Area, and Area Text tables. Navigate through the various area types to understand those contained in NASIS. Click on the plus sign (+) to the left of "Non-MLRA Soil Survey Area" to open the child tables and explore the various survey areas.

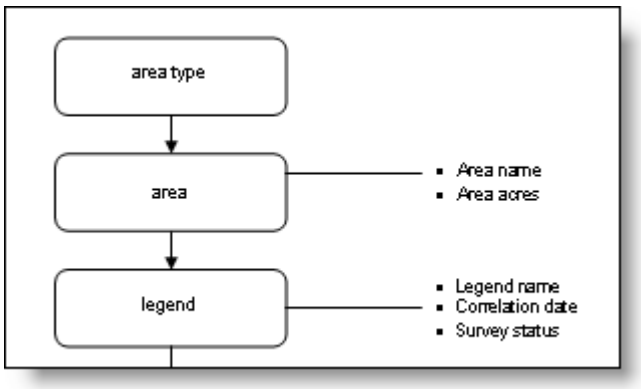


In the image above, the Area table and Area Text table are displayed. If the user scrolls to the right, the screen shows the various columns within the tables. It shows the record associated with the non-MLRA soil survey area type. Area Type is the parent table and Area is the child table. Also, the Area Text table is a child table to its parent Area table. These three tables create the Area Type Object.

Continue to investigate the various area types. *Do not, however, open the 7.5 and 15 min USGS Quadrangle Area Types.* These area types contain thousands of records and consequently take a very long time to load into the table.

The Legend Object

The soil survey area is independent from the legend. The following illustration provides a visual explanation of the separation of area from legend. The Legend Object is used to publish soil survey information.

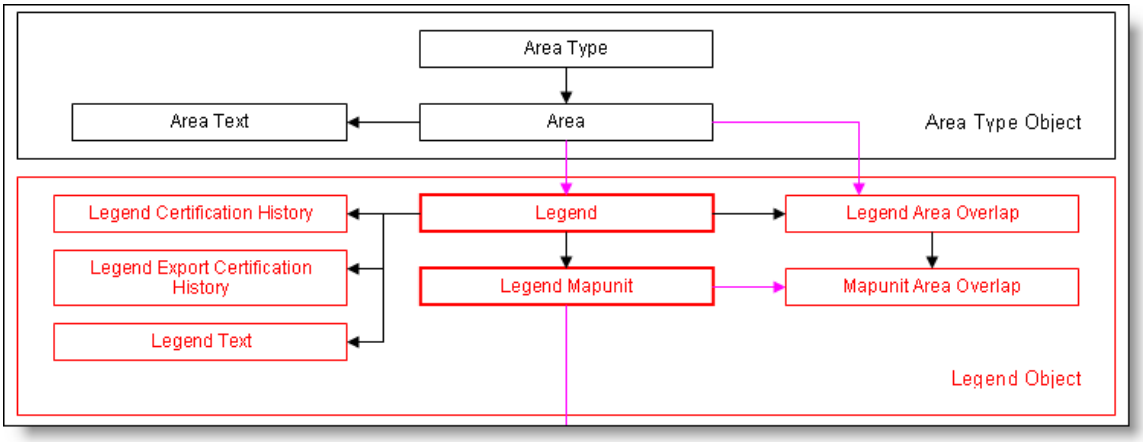


Separation of Soil Survey Area and Legend

One area can have multiple legends (one to many relationships). For example, Pike County, Illinois can have both an out-of-date legend and an update legend. Each legend, however, can be part of only one survey area (Pike County, Illinois). There are only two national area types that are used to create legends: "Non-MLRA Soil Survey Area**"** and "MLRA Soil Survey Area."

Because the Area Type Object and the Legend Object are independent, navigating to the legend for a particular survey area requires a leap across object boundaries, from the Area table to the Legend table, as shown in the figure below.

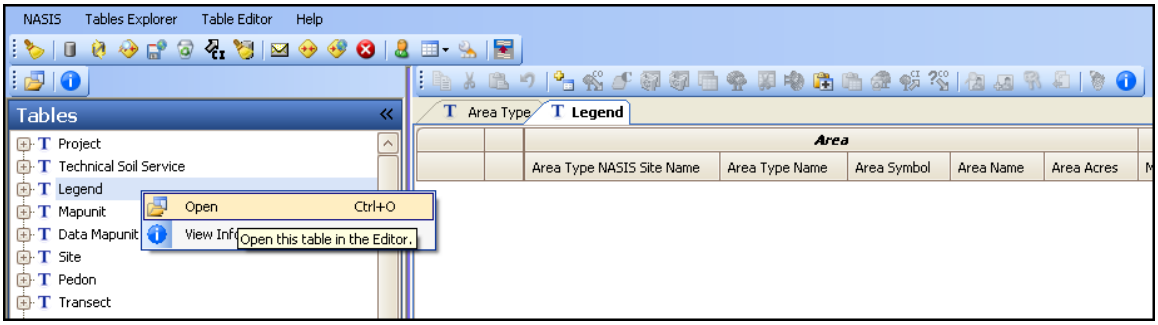
The figure presents both the Area Type and the Legend Objects. Object boundaries are marked by the larger black line and larger red line rectangles. The arrows between tables in the two objects indicate the relationship between one object (Area Type) and another (Legend).



The Legend table is linked to the Area table to identify the Non-MLRA Soil Survey Area Legend. The Legend Area Overlap table contains the various areas contained within the legend (MLRA, State, RFactor, etc.).

Locating Object Boundaries

In the Tables Explorer, open the Legend table**.**



The table is empty because (earlier in this chapter) data was specifically loaded into the Area Type Object but not into the Legend Object. The query was run against the local database to load the 20 national area types into the selected set. As discussed earlier, data for the Legend, Mapunit, and Data Mapunit Objects must be queried and retrieved from the national database.

Since areas are independent of the Legend Objects, the legends must be queried from the national database to populate the local database. Then the local database must be queried to load data into the selected set. This is necessary to view data in the Legend table.

The following exercise, which takes about 30 minutes, is required to load the local database with data before proceeding with this chapter.

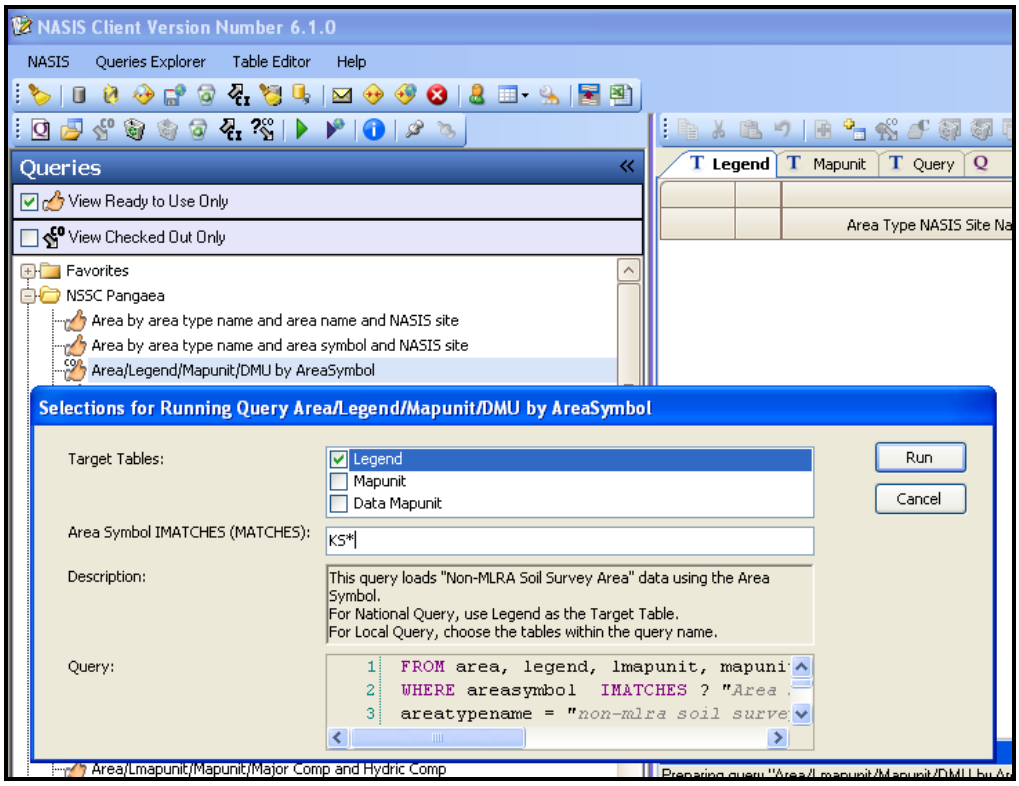
Using a Query to Load Data from the National Database

Select the national query “Area/Legend/Mapunit/Datamapunit by Area Symbol.” This query is run using the option “Run Against National Database.”

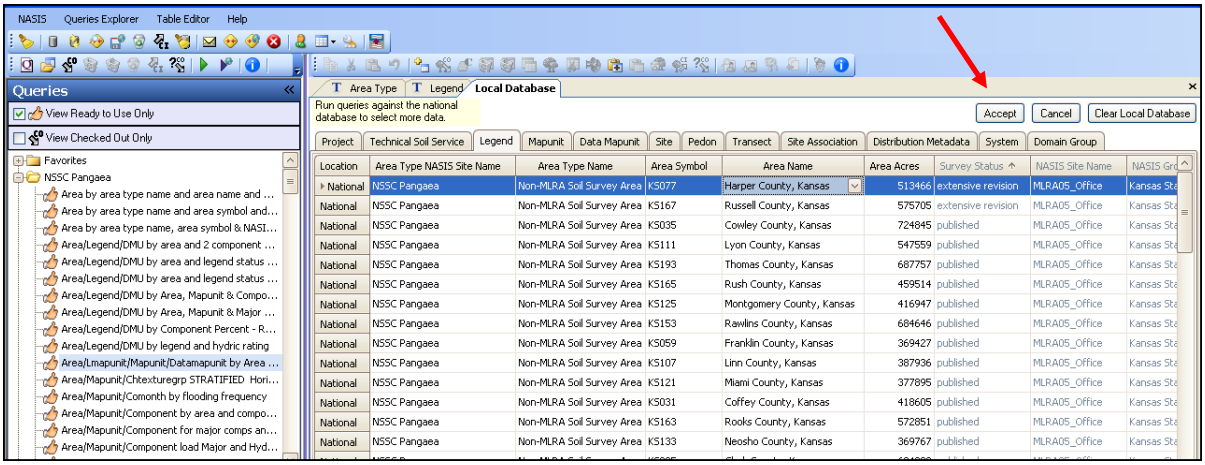
Notice in NASIS 6.1 that the query description and query are now displayed in the query parameter box.

Only one target table is allowed for the national queries. Choose “Legend” as the target table. “Area Type” is not an option since the Area Type Object is preloaded into the local database.

Select the State of interest. In this example, all of the legends in Kansas are loaded using the two character State code with a wildcard (KS*). Choose any State.

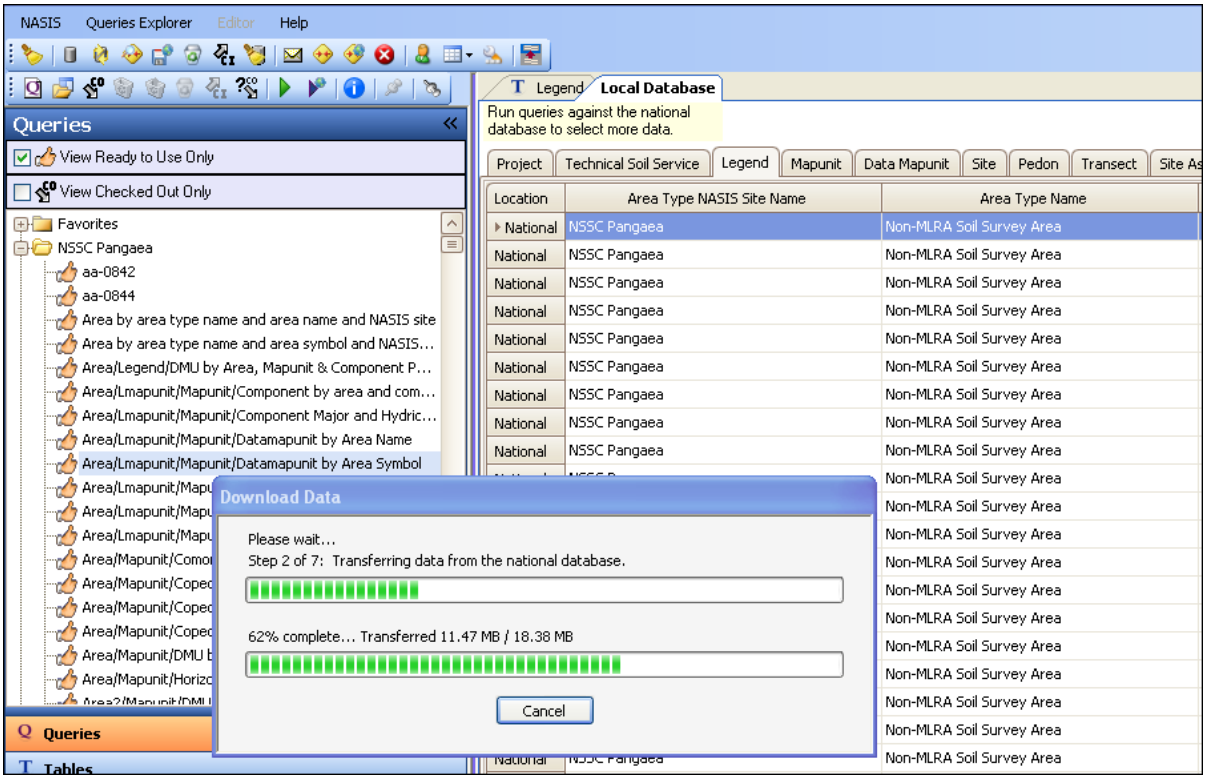


It takes approximately 2 minutes to run the query and display the selected surveys in the Local Database setup.

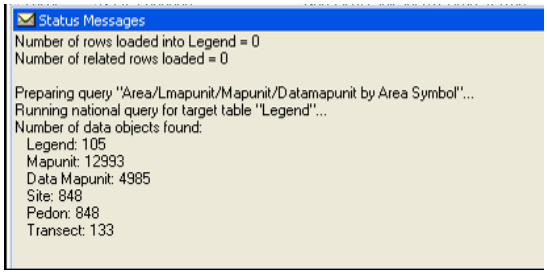


Click on the “Accept” button to choose the queried data and download to the local database. This may take 30 minutes (for about 25 MB) or more to download the data, depending on the size of the dataset and the speed of the Internet connection. This query retrieves all the legends, map units, data mapunits, linked pedons, and linked sites for the selected State.

Although a significant amount of time is used to download large datasets, the intent is to download this data once. The local database is subsequently refreshed on a regular basis to retrieve any edits posted to the national database by other users.

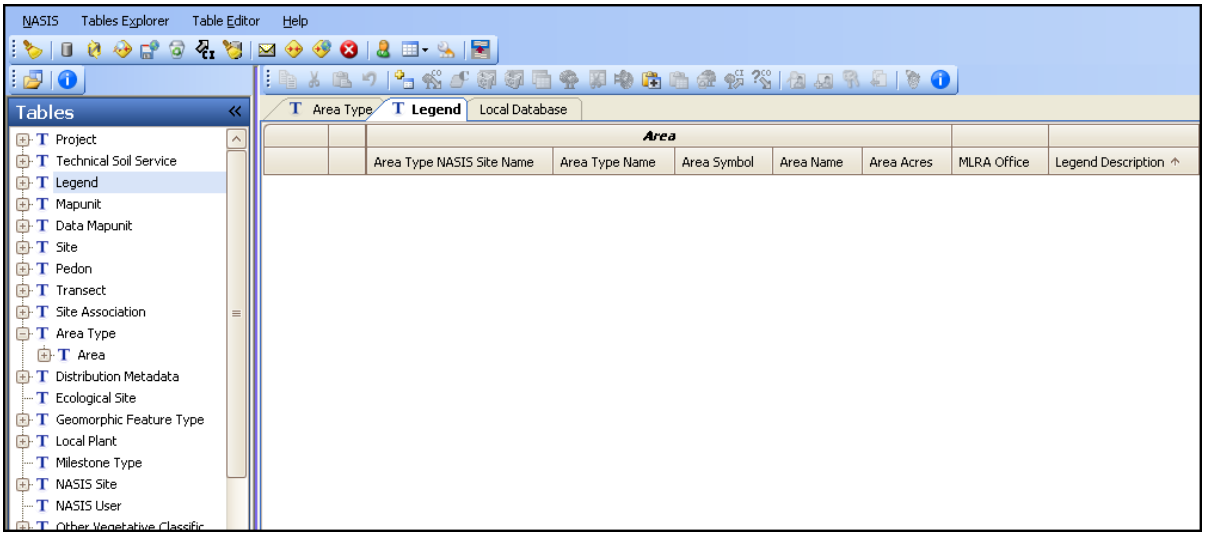


Upon completion, the Status Messages Panel identifies the data downloaded from the national database. The object tabs can be reviewed for data loaded into the local database.



Loading the "Selected Set" Legend Table

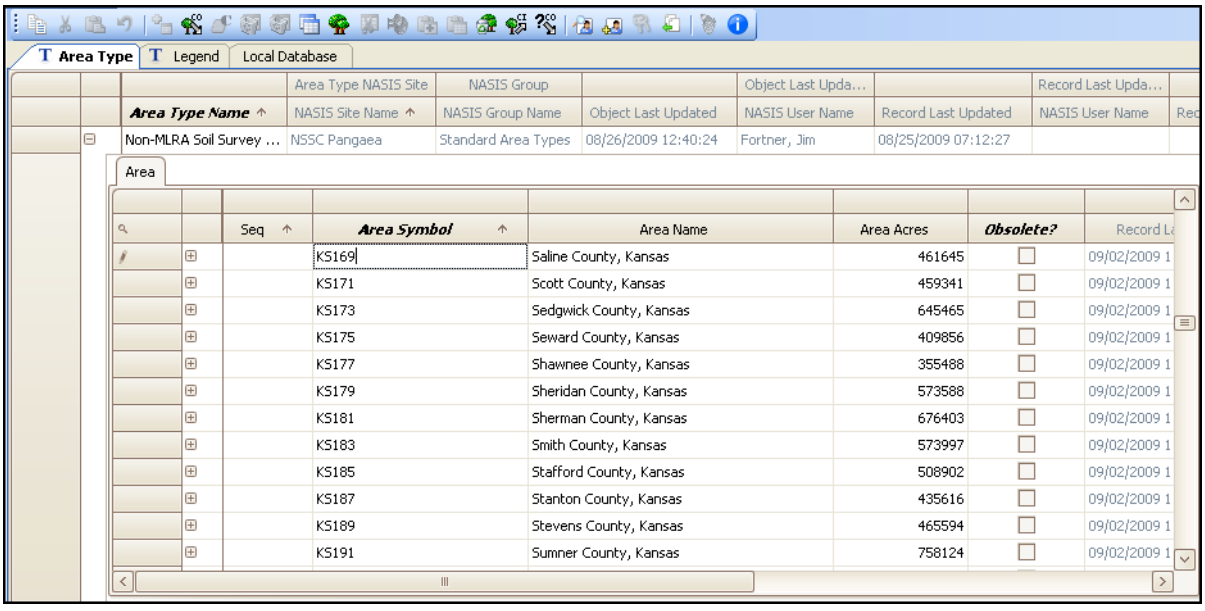
Now that the local database contains data, return to the Legend table. The local database must now be queried to populate the selected set—the Legend table.



There are two methods of populating data for the Legend table—using the "Load Related" option or querying the local database.

To use the "Load Related" option, return to the Area Type tab and select an area from the list within the non-MLRA soil survey area. For this exercise to work properly, the user must select an area that was downloaded from the previous national query and is available in the local database.

For this example, Saline County, Kansas has been selected.

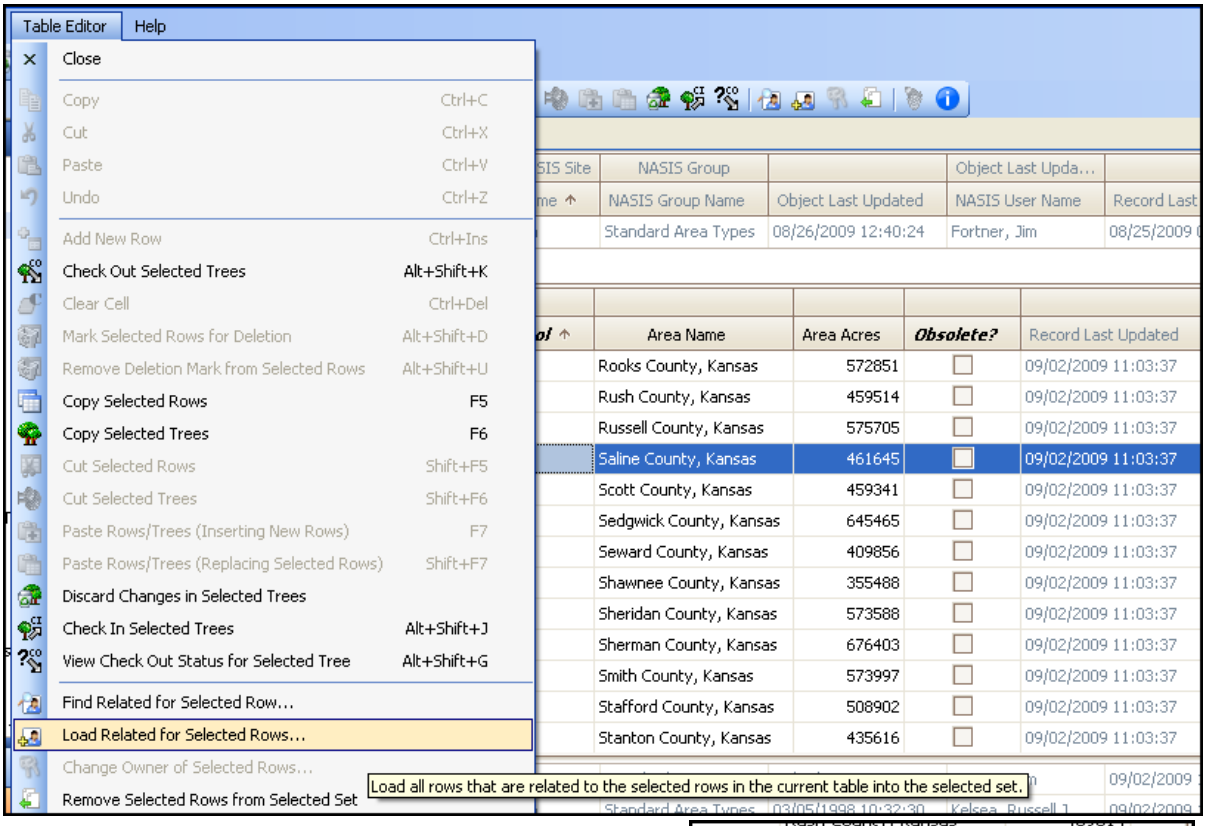


Crossing from Area Table to Legend Table

The next step is to populate the selected set. Remember, there are two methods of loading the legend data for the Saline County, Kansas non-MLRA soil survey area:

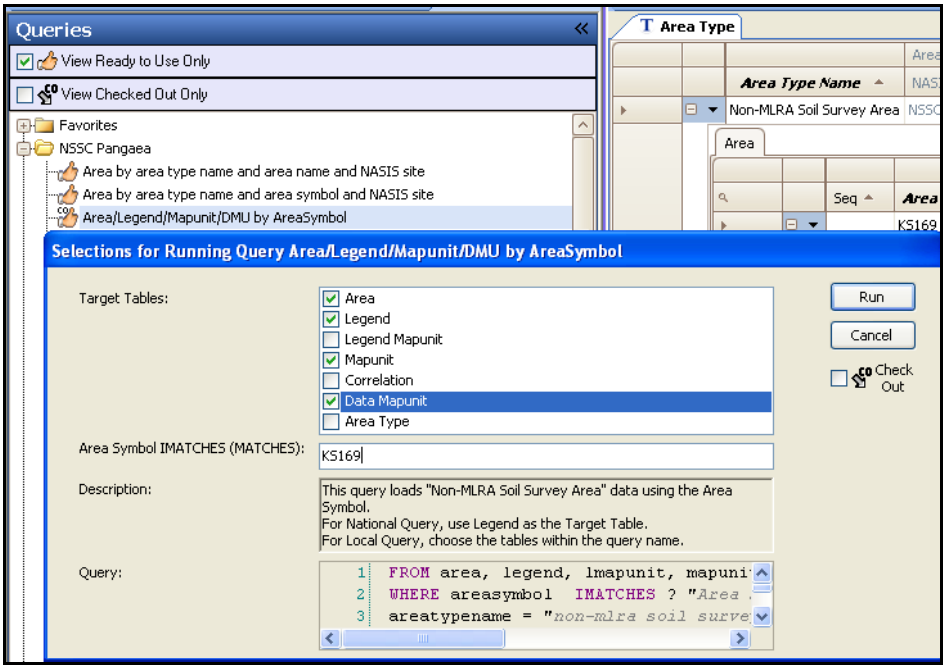
1. Using the "Load Related for Selected Rows" option, or
2. Running the query "Run Against the Local Database."

In this example, the first method is used. The KS169 "Saline County, Kansas" row is highlighted and "Load Related for Selected Rows" is chosen from the Table Editor Menu.



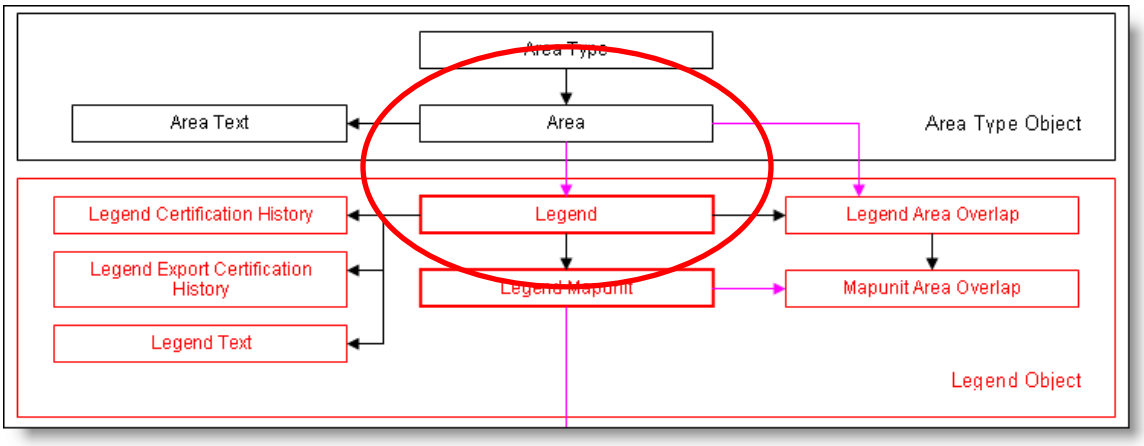
A choice list box appears containing those tables that are related to the Area table. For this example, choose the Legend table.

The second method—using a query—allows the user to load multiple objects. When the query is run against the local database, multiple tables in the query can be used to populate the selected set. National queries are named to specify the target tables to be used. Target tables are discussed in Chapter 1.

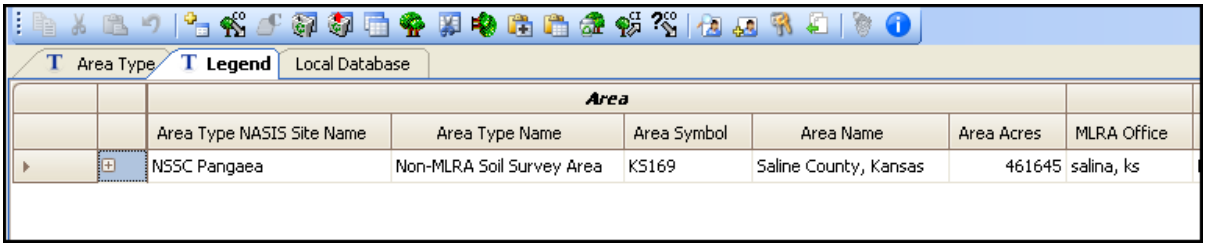


For review, in this example of populating the local database:

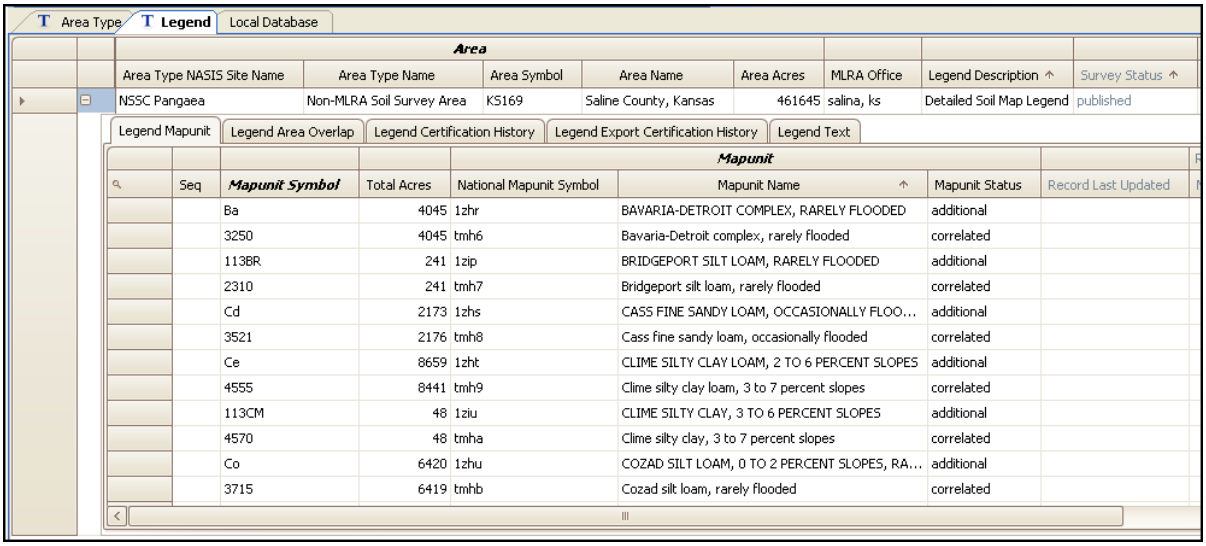
1. The data in the Area Type Object was preloaded into the local database at the time of the database initialization.
2. A query was run against the local database to load the national area types into the selected set.
3. A query was run against the national database to download a State dataset to populate the local database.
4. Returning to the Area Type table, the Non-MLRA Soil Survey Area record was opened and a survey from the list was highlighted. From the Table Editor Menu, the "Load Related for Selected Rows" command was used to load the legend related to the selected area.
5. A second method of populating the selected set would have been to run the same query using "Run Against Local Database" to populate legend data.
6. This example crosses the Area Type Object and the Legend Object by loading the legend(s) for the selected area.



Return to the Legend table tab. The Legend table is now populated with the Saline County, Kansas Non-MLRA Soil Survey Area (or whichever legend the user has chosen). The Area Type Object and the Legend Object have been "crossed." Notice that the area information is included in the Legend table as information to the user.



Open the Legend child tables by clicking on the plus sign (+) on the left side of the row in the Legend table or by double clicking on the space to the left of the plus sign.



Area Type | Legend | Local Database

Area

Area Type NASIS Site Name	Area Type Name	Area Symbol	Area Name	Area Acres	MLRA Office	Legend Description	Survey Status
NSSC Pangaea	Non-MLRA Soil Survey Area	KS169	Saline County, Kansas	461645	salina, ks	Detailed Soil Map Legend	published

Legend Mapunit | Legend Area Overlap | Legend Certification History | Legend Export Certification History | Legend Text

Mapunit

Seq	Mapunit Symbol	Total Acres	National Mapunit Symbol	Mapunit Name	Mapunit Status	Record Last Updated
	Ba	4045	1zhr	BAVARIA-DETROIT COMPLEX, RARELY FLOODED	additional	
	3250	4045	tmh6	Bavaria-Detroit complex, rarely flooded	correlated	
	113BR	241	1zip	BRIDGEPORT SILT LOAM, RARELY FLOODED	additional	
	2310	241	tmh7	Bridgeport silt loam, rarely flooded	correlated	
	Cd	2173	1zhs	CASS FINE SANDY LOAM, OCCASIONALLY FLOO...	additional	
	3521	2176	tmh8	Cass fine sandy loam, occasionally flooded	correlated	
	Ce	8659	1zht	CLIME SILTY CLAY LOAM, 2 TO 6 PERCENT SLOPES	additional	
	4555	8441	tmh9	Clime silty clay loam, 3 to 7 percent slopes	correlated	
	113CM	48	1ziu	CLIME SILTY CLAY, 3 TO 6 PERCENT SLOPES	additional	
	4570	48	tmha	Clime silty clay, 3 to 7 percent slopes	correlated	
	Co	6420	1zhu	COZAD SILT LOAM, 0 TO 2 PERCENT SLOPES, RA...	additional	
	3715	6419	tmhb	Cozad silt loam, rarely flooded	correlated	

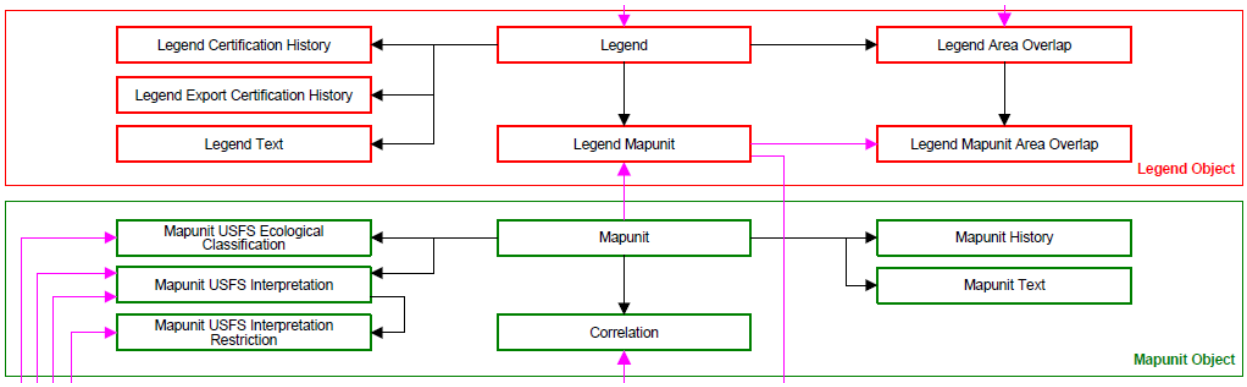
The Legend Object, displayed above, contains the child tables used to manage the map units within the specific soil survey area legend. The Legend Mapunit table is a new table in NASIS 6.0 used that identifies the map units used within the specific legend. The Mapunit "band" contains information that is stored in the Mapunit Object but made visible in the Legend Mapunit table. In Chapter 7, the columns of the Legend Object tables are examined. This lesson focuses exclusively on navigating objects and understanding the NASIS structure.

Examine each column in the Legend table, scrolling to the right to view all columns. The Legend table stores the legend description, geographic applicability, and certification status. Use the "View Information" button to obtain information about any table or data element. The two fields "survey status" and "correlation date" are now obsolete fields and no longer available for editing. The update of soil surveys focuses on the status of legends rather than on the status of map units.

The Mapunit Object

The Area Type Object has been loaded and reviewed.
The Legend Object has had a survey loaded and reviewed.

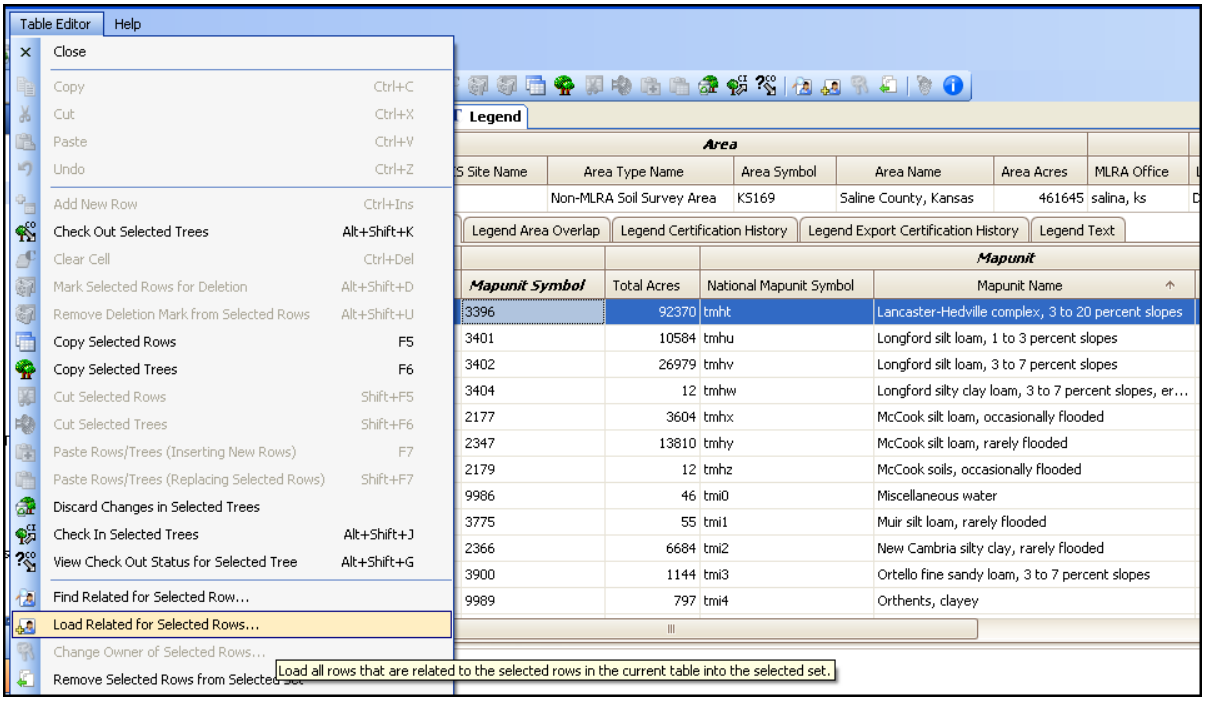
The Mapunit Object is a new object in NASIS 6.0. This object was created to allow a map unit to be used in multiple soil survey legends. The boundaries between these independent objects are crossed using the “Load Related” command to load data into the Mapunit Object.



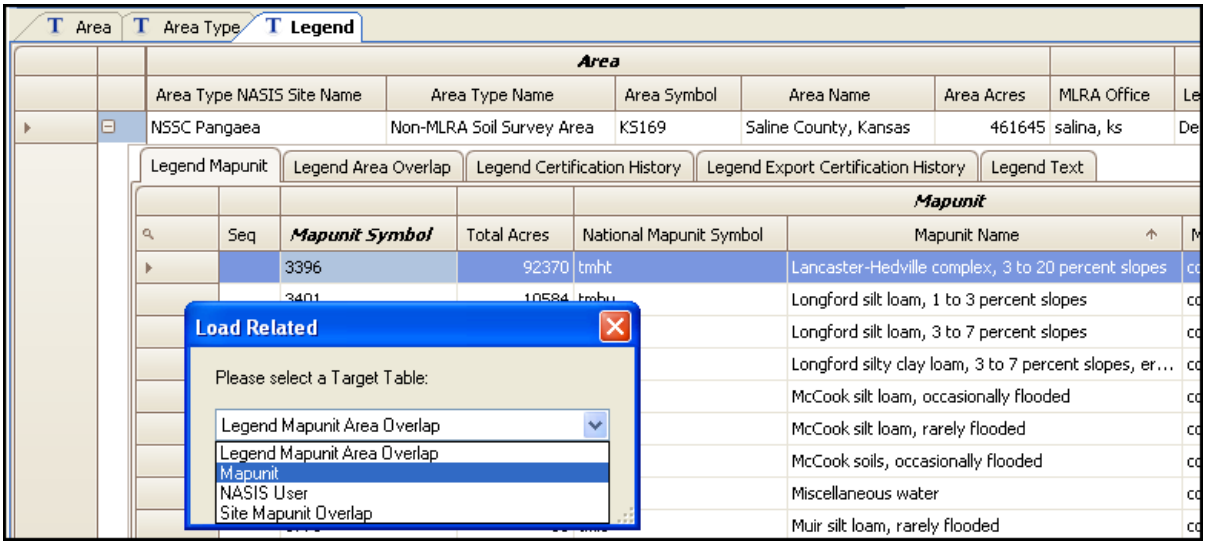
Crossing Between Legend, Mapunit, and Data Mapunit Objects

The Mapunit Object provides the map unit documentation and the link to the map unit’s data. Return to NASIS to load data into the Mapunit Object from a selection in the Legend Object.

In this step, in the Legend Mapunit table, the “Lancaster-Hedville complex, 3 to 20 percent slopes” map unit is highlighted and “Load Related for Selected Rows” is chosen from the Table Editor menu.

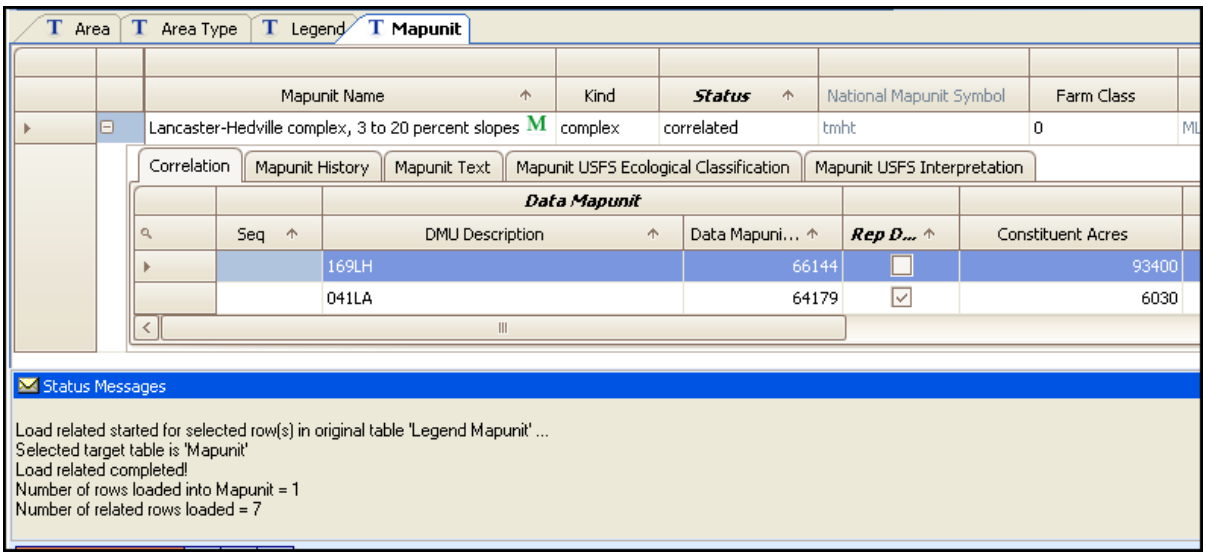


The Mapunit table is chosen from the parameter choice list.



This loads the specific map unit into the selected set.

The next step is to view the map unit. The Mapunit table is opened from the Explorer Menu and the Mapunit Object (parent and child tables) is viewed beginning with the Mapunit table.



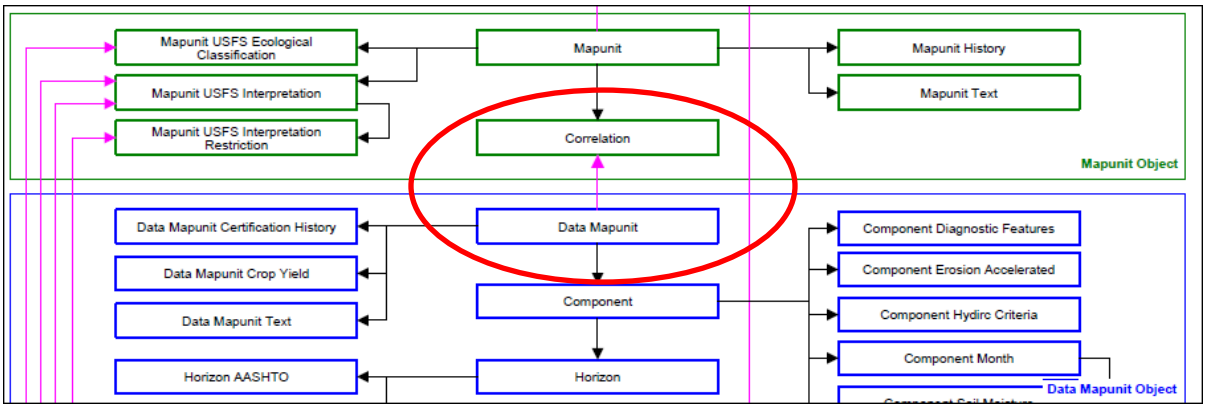
Review the data contained within the Mapunit table and its various child tables. There are five child tables:

- The Correlation table, which contains the links to the map unit's data.
- The Mapunit History table, which documents the map unit's correlation events.
- The Mapunit Text table, which stores documentation on the map unit.
- Two USFS tables, which are designed for future use when U.S. Forest Service data will be imported into NASIS.

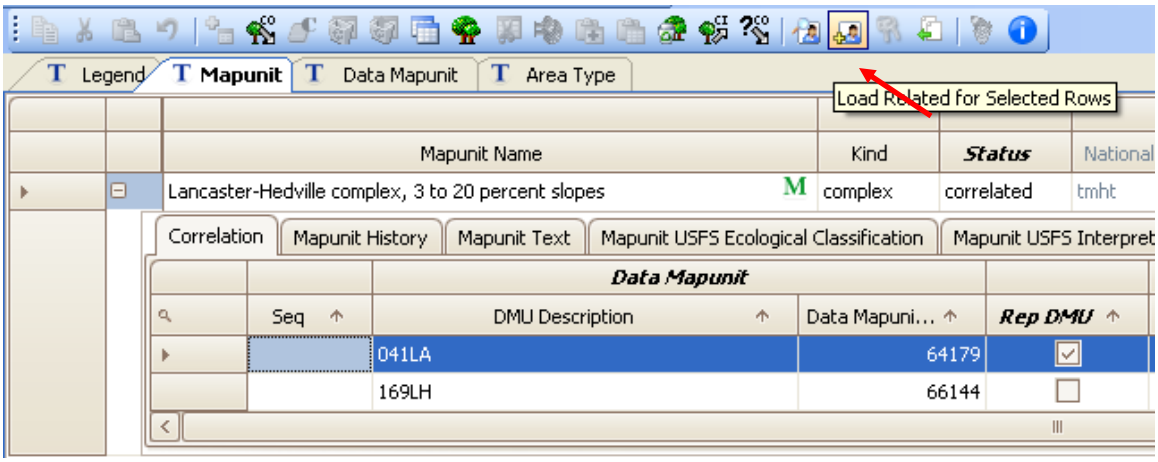
The Data Mapunit Object

The Area Type Object has been loaded and reviewed.
The Legend Object has had a survey loaded and reviewed.
The Mapunit Object has had a map unit loaded and reviewed.

The Data Mapunit Object is designed to capture the soil properties, qualities, and interpretations for each component. The boundaries between these independent objects are crossed using the "Load Related" command to load data into the Data Mapunit Object.

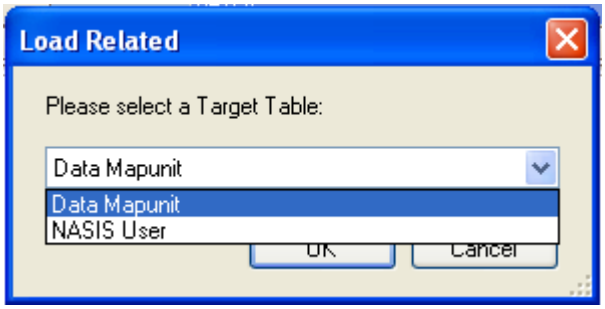


Returning to NASIS, in the Correlation table, notice that only one record (041LA) is designated as the representative data mapunit (Rep DMU). The second, older data set (169LH) is not representative, designated by the lack of a check mark in the Rep DMU column.

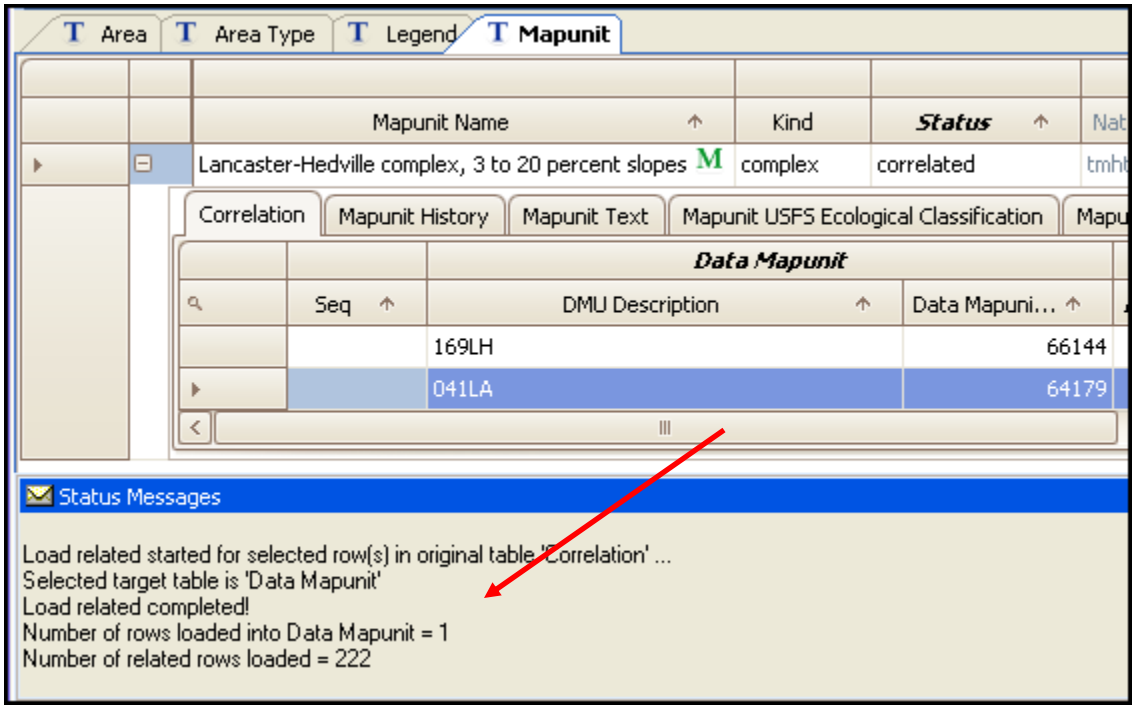


Highlight the row designated as the representative data mapunit.
Choose the Editor Toolbar icon "Load Related for Selected Rows" or use the Table Editor Menu.

The choice list appears. Select “Data Mapunit.”

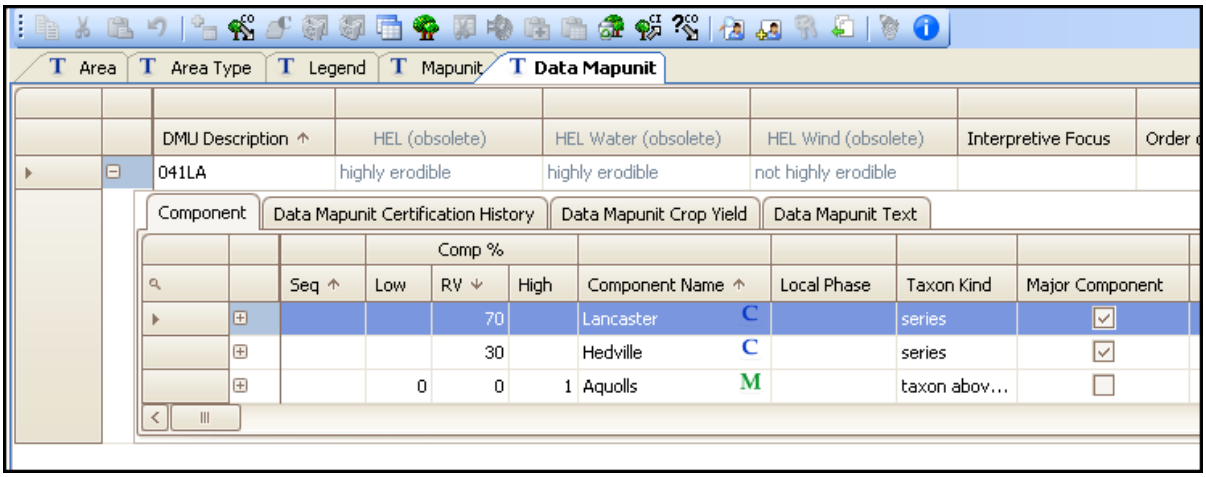


A message appears in the Status Messages Panel indicating that one row was added to the selected set. An additional 222 related rows are also added to the selected set.

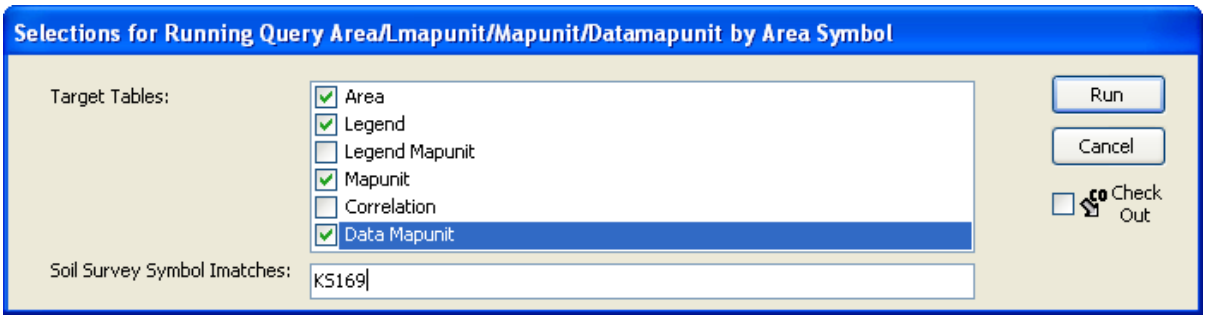


This process loads the specific data mapunit (DMU) into the selected set. The data is now available to be viewed.

To view the data, open the Data Mapunit table from the Tables Explorer. Review the child tables associated with the Data Mapunit Object.



NOTE: This entire exercise could have been completed by loading all data using a single query and choosing the appropriate target tables.



Using this query would load all data associated with the specific survey area. The purpose of this exercise was to show the method of using the “Load Related” command. “Load Related” allowed the loading of specific rows of data.

Summary

The database manages tables using “objects,” which group tables with similar data. There is independence between the database objects. This independence allows objects to be linked to one another.

- A data mapunit stores the soil properties, qualities, and interpretations for a given map unit concept.
- A data mapunit can be linked to multiple map units (or a single map unit).
- A map unit can be linked to multiple legends (or a single legend).
- A legend is linked to only one area.

The information in the Area Type Object is downloaded to the local database upon database initialization.

The national database must be queried to populate the local database with the legend, map unit, and data mapunit information.

The local database is then queried to populate the selected set.

The selected set is used to view, analyze, edit, and report soil information.

The “Load Related” command on either the Table Editor Menu or the icon on the Table Toolbar can be used to load data from one database object into another database object.