

DIGITIZING THE SOIL SURVEY

During the late 1990's the digitizing of soil survey became a high priority of all cooperators of the Nebraska soil survey program. The Natural Resources Conservation Service, the Natural Resources Commission and the Conservation and Survey Division collectively worked together in accelerating this project. This section provides an early history in the state on the MIADS project. One of the significant objectives of this entire report was to document a few selected important processes in soil survey work. The history of soil map finishing is intended to document the general process in a pictorial manner that will serve to future soil generations the detail process of how the soil map finishing for published soil surveys and for digitized soil surveys was done. A map showing the current process of digitizing soil surveys in the state is presented.

MIADS – Soil and Interpretative Computer Maps

The first computer-generated soil maps and interpretative maps in Nebraska were prepared using the MIADS (Map Information and Display System). The MIADS system identifies the major soil for each grid cell area. Cuming County, Nebraska was coded on a 40-acre cell size by Steve Schaefer in 1980 using a procedure given to Jim Culver, State Soil Scientist, by Joe Nichols, Regional Soil Coordinator in Texas. Oklahoma had coded in several counties in cooperation with the Cartographic Unit at Ft. Worth, Texas. The Nebraska Natural Resources Commission staff under the direction of Dayle Williamson, Director and Manhel Benzel, Commission database coordinator, developed a computer program to input the coded soil data. Using this program, Steve Schaefer, SCS, coded the soils of Cuming County on a 40-acre cell basis. Using this coded data, Benzel formatted fields to produce an interpretative map on suitability for septic tank absorption fields. After the initial work, soils data for several published soil surveys were coded on a 20-acre cell size.

A major SCS and NRC effort was undertaken in 1983 to code soils data on 2-2/3 acre cell size for use in resource assessment and evaluation. The odd size was because of computer constraints that the cells were not square but rectangular in shape. Experience had shown the large cell sizes did not capture long, narrow soil delineations, which were commonly very significant in making soil interpretations for an area.

A cooperative agreement between the Soil Conservation Service and the Natural Resources Commission resulted in about 30 counties being coded in the MIADS system using the 2-2/3 acre cell size. Basically, the data was coded by SCS field staff and computer keyed into the database by the Natural Resources Commission staff.

The wide variety of interpretive maps produced was excellent in providing a good overview of resource evaluations and problems. One of the major problems with the MIADS system was the uncontrolled base, both in terms of the data presentation and the county highway road map on which the computer data was plotted. Some problems included not getting the data properly located on the map in reference to known points and the difficulties of joining data between adjacent counties.

Irrigation potential suitability maps were one of the significant legal tools used by the Little Blue Natural Resources Conservation District in requesting approval for irrigation projects from the State of Nebraska. MIADS soils data for about a six county area was used by lawyers during the debates. Jim Culver, State Soil Scientist, was requested to testify on the interpretations and quality of this data during the informal court hearings.

Not all of the initiatives, however, were always successful. The Natural Resources Commission (NRC) hired Tony Vrana, who retired from the SCS National Office, to head up their Planning Unit. The SCS National Cartographic staff was attempting to develop a new system to scan soil maps by rubber sheet, a system of joining data between two soil maps that never proved to be successful. A decision was made between SCS and the NRC to do a pilot research project to digitize Dawson County, Nebraska using this system. The NRC spent a significant amount of time doing the clean up, checking, and joining of data on this project. This project was eventually dropped because of the many problems encountered and that new digitizing technology that had been developed made this system impractical.

History of Soil Map Finishing (1975-1998)

Preparing soil surveys for publication includes three major phases. These are: 1) field soil scientists making the original soil maps, 2) preparing the field soil maps for publication – soil map finishing is one of the major phases in this process, and 3) preparing the manuscript describing soils and making interpretations for the soil survey. During the early 1970's the responsibility of doing soil map finishing was shifted from the Regional Cartographic Unit to each state. This was done in an effort to reduce the national backlog of soil map finishing and to attempt to reduce the total time required to published soil surveys from the time field work was completed. There was a Regional Cartographic Unit located in Lincoln, Nebraska which served the general Great Plains region.

Nebraska's first experience in doing soil map finishing was farming this phase of the work to the local soil survey party, normally the survey party that did the field mapping. A combination of continuous training in soil map finishing, some soil scientists were not skilled in map finishing, and the need for the soil scientists to do their required work of making soils maps and preparing the text and data for the manuscript in the new accelerated soil survey program, resulted in all of the soil map finishing work being done in the state office in 1975.

A soil map finishing section in the State Office Soils Section was set up. Steve Schaefer who started the soil map finishing for Seward County, Nebraska worked in the SCS field office in Seward on an interim basis. Steve was employed by the SCS full-time and headed up the State Office soil map finishing work for the state of Nebraska. There were a large number of University of Nebraska students and others employed on a part-time basis during the years of the accelerated program. There were two to four people employed on a full-time basis. State funding was used to assist in paying for this and at times consisted of a large staff of 6 to 12 people. A few of the full-time people were Steve Brooks, Margaret Warner, Cathy Dolan, Les Howard, Alan Brown, and Donna Simpson. Some of the part-time students went on to work with the SCS in various capacities. Examples are: Susan Williamson, a District Conservationist in Kimball County, Cam Loerch, a MLRA/State Soil Scientist in Alabama and Colorado, and Josh Sanders, a soil scientist on the Northern Plains Soil Quality Team.

All of the soil boundary lines, drains showing the direction of water movement, special symbols such as houses and cemeteries, and roads shown on the publications from 1975 to the present were drafted by this staff using rapidograph pens to ink the lines, etc. The standard points of rapidograph pens would quickly wear out when inking on the acetate film positive unless jewel tip points were used on the pens. Keeping the rapidograph pens working properly often required a lot of personal attention to ensure the ink from the pens flowed evenly, resulting in the drafting of uniform high quality soil lines. After the drafting work and soil symbols were completed, high priority was given to color check each map to make sure all soil lines, symbols and other information was correctly transferred and compiled.

At the completion of the soil map finishing project for each county, a set of 100 advance soil maps were prepared. These advance maps were used in providing reports to the SCS field

offices, county assessor's offices, NRD offices, and other users of soil information before the published ones were printed. These advance maps did not have the quality of aerial photography background and some had a slight blue color look. The data was accurate and those requesting the advance soil information used the information.

Nebraska soon was recognized as one of the top soil map finishing operations in the nation. Several other states from time-to-time would send their people to Lincoln for Steve Schaefer to train them and to show them the tricks of the trade. The excellent work of this staff produced high quality looking products. This coupled with the excellent fieldwork by the soil scientists has enabled the quality of the published soil surveys in Nebraska to be among the highest in the United States and the National Cooperative Soil Survey Program.

History of Soil Map Finishing (1975-1998)

- ? **State Responsible for Map Finishing Publications
From 1975 to present**

61 counties completed 1975-1998

32 counties were completed prior to 1975

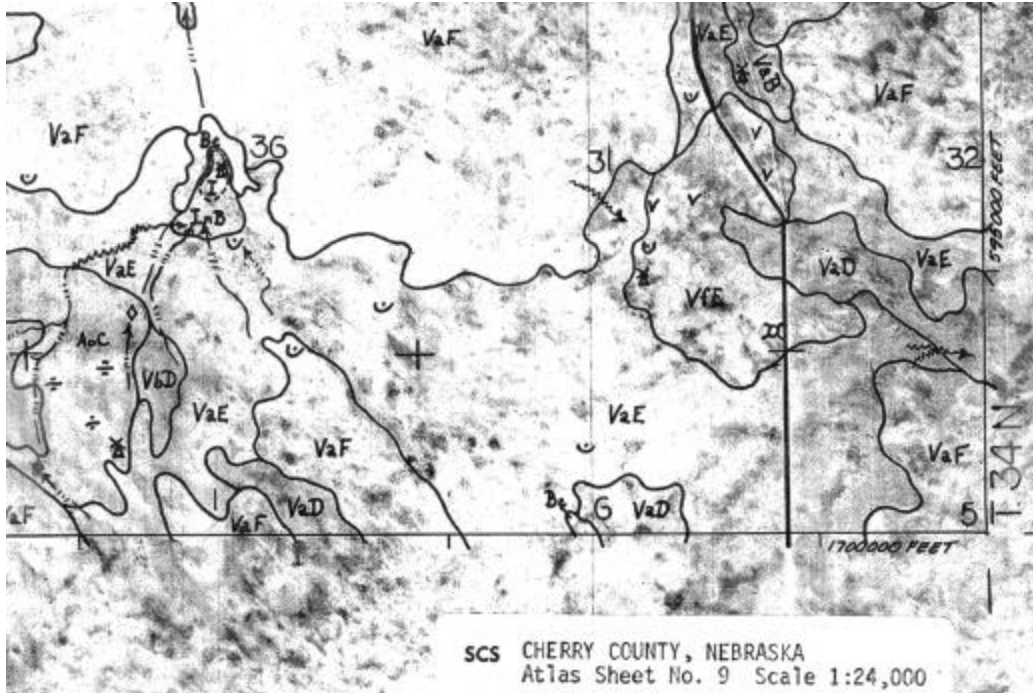
- ? **First County - Dawson 1975**

- ? **Last County - Cherry 1998**

- ? **Steps of Soil Map Finishing 1975-1998**



Steve Schaefer completing soil map finishing work for a published soil survey. Lincoln, NE.



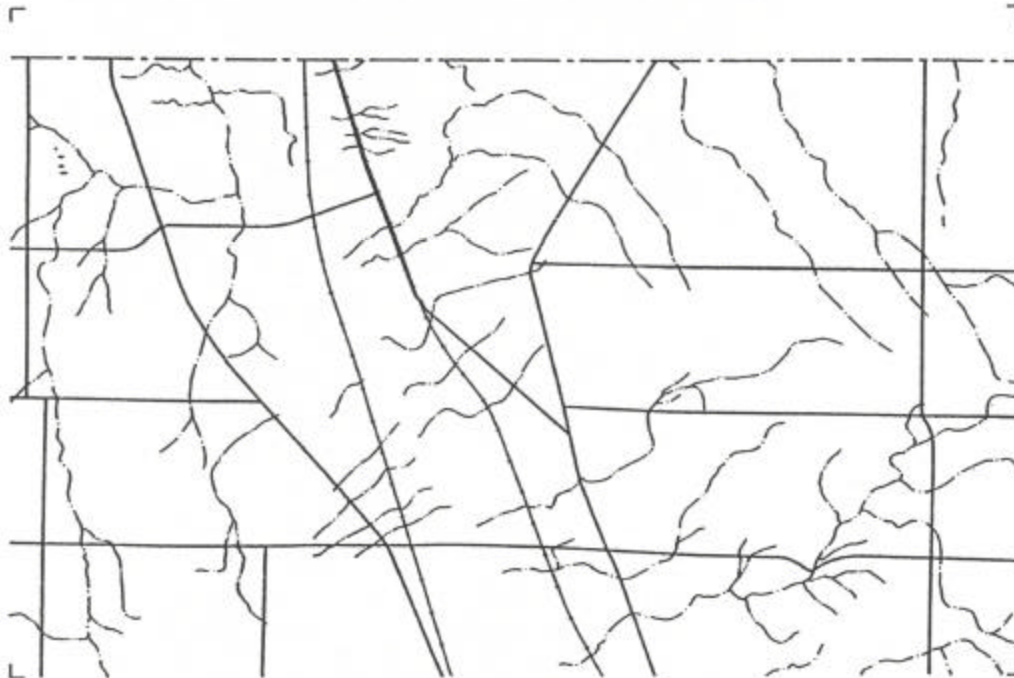
Soil Map Compilation Manuscript

This sheet is obtained by the accurate transfer of map information from soil survey field sheet imagery to publication imagery. Use of standard compilation techniques ensure that soil survey field sheet information is correctly transferred to the approved map base for map finishing.



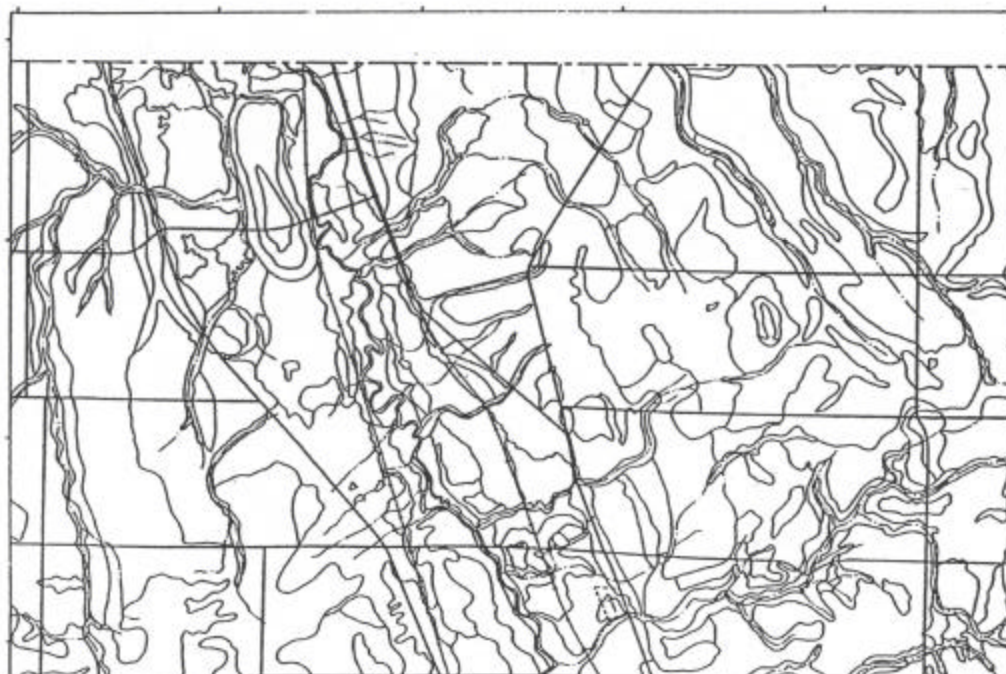
Culture Overlay

This overlay contains the following data: roads, railroads, county or state lines and section corners. This data is transferred from the soil map Compilation manuscript sheet.



Culture and Drainage Overlay

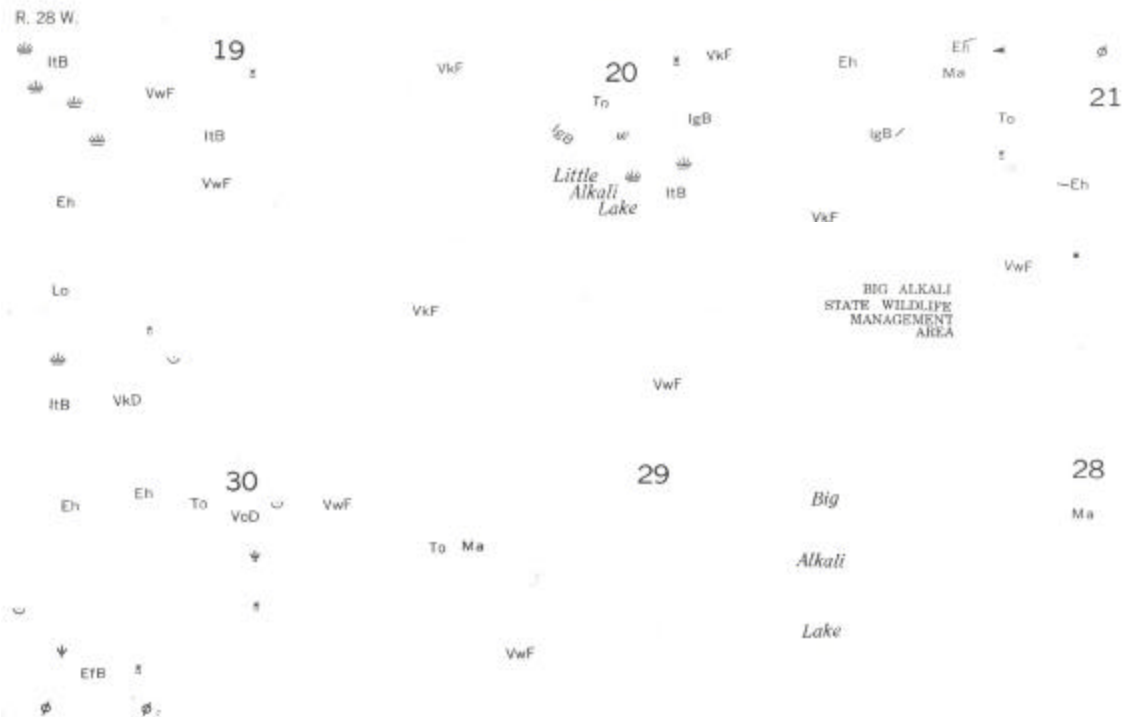
This is the same overlay as the culture overlay with the drainage added from the soil map compilation manuscript sheet. This data is transferred from the soil map compilation manuscript sheet.



Soils Overlay

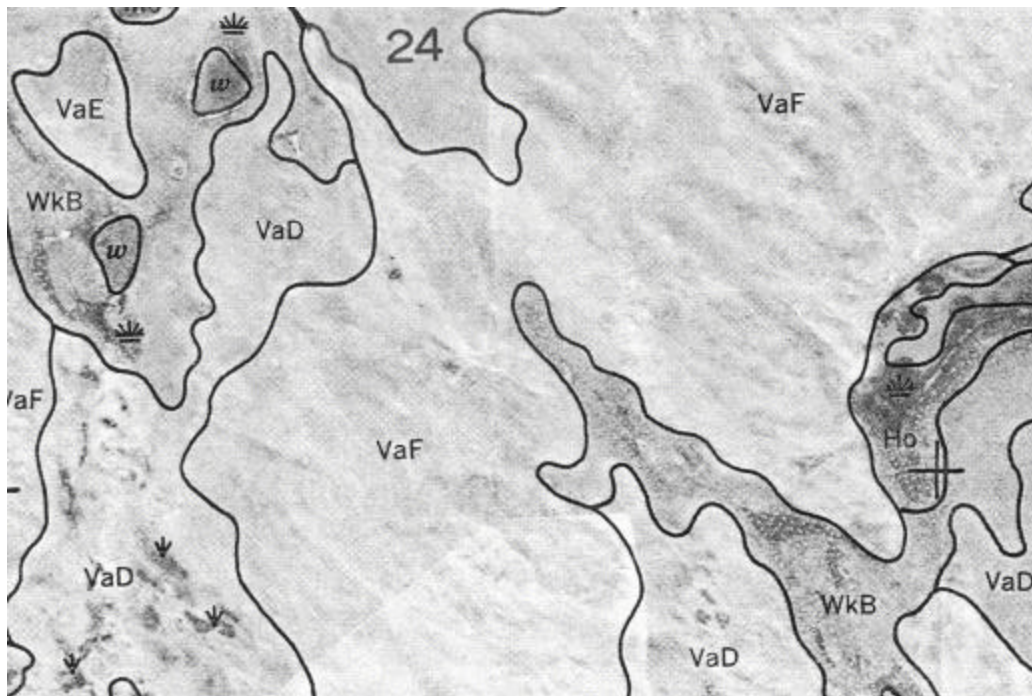
This overlay is combined with the culture and drainage overlay, but with soil lines drafted from the soil map compilation manuscript sheet.

SOIL MAP OF CHERRY COUNTY, NEBRASKA — SHEET NUMBER 138



Type Positive Symbols Overlay

This overlay contains all labels; soil symbols, proper names of cultural features, hydro-graphic features, and special symbols transferred from the soil map compilation manuscript sheet.



Soil Map Sheet Manuscript

This overlay is a combination of all previously shown overlays. The press negative will be made from this soil map sheet for publication.

Digital Soil Map Finishing – 1998

Published Soil Survey

? **Compiled to Quarter or Full Orthophoto Quad
Stable Base**

2 Overlays

(a) Soil Symbols

(b) Soil Lines

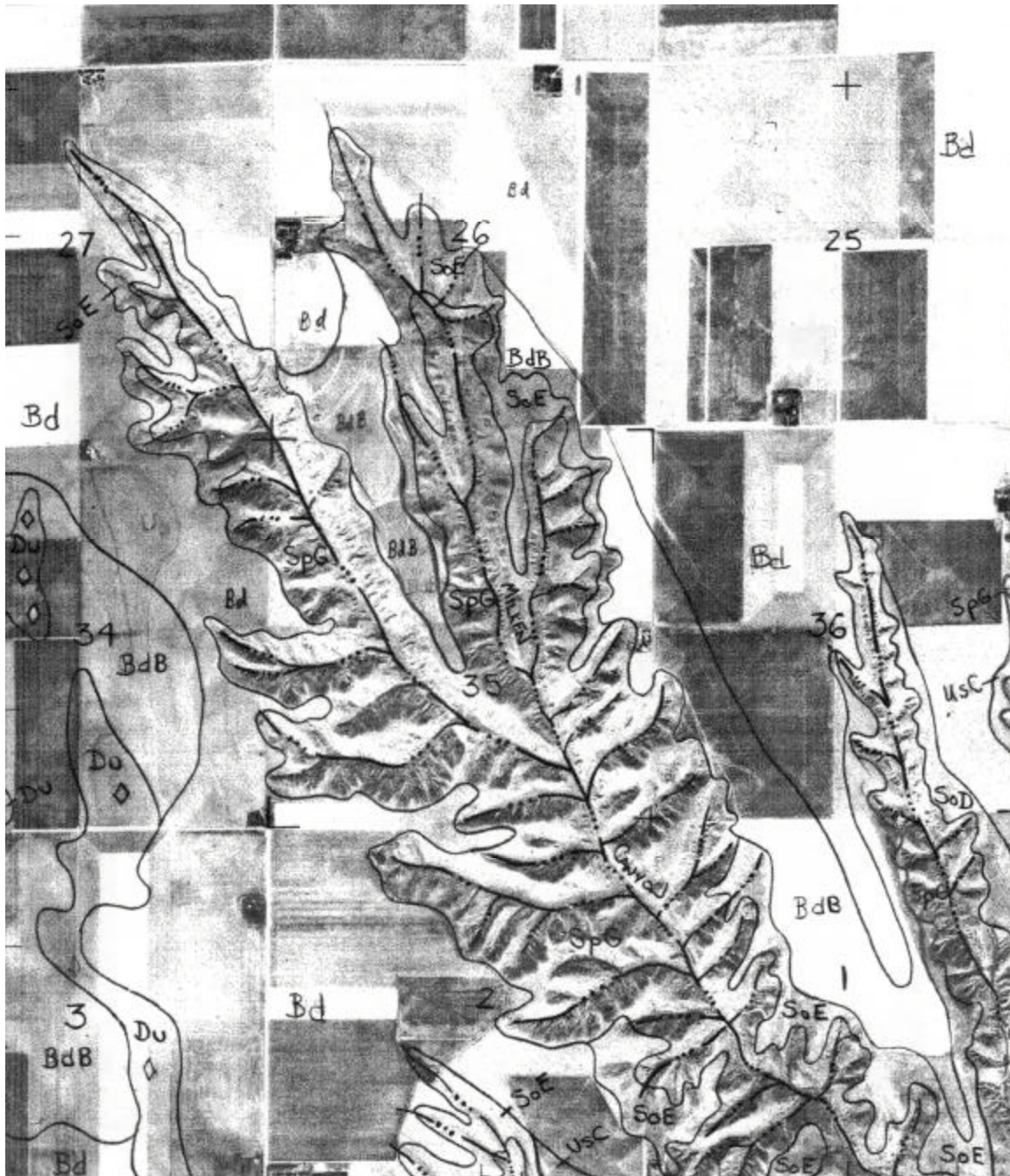
? **Scanned**

? **Matched up to Digital Orthophoto Quad in Computer**

? **New Publication**



Steve Brooks preparing soil map finishing information for digitizing of soil survey. Lincoln, NE



This soil map compilation manuscript is prepared by accurate transfer of soil boundary lines and symbols from the original soil map to this mylar control base imagery map for digitizing. Original information for beginning of SSURGO.



The soil lines are transferred and inked from the soil map compilation manuscript shown on the previous page. This soil boundary line on the overlay will be scanned for digitizing.

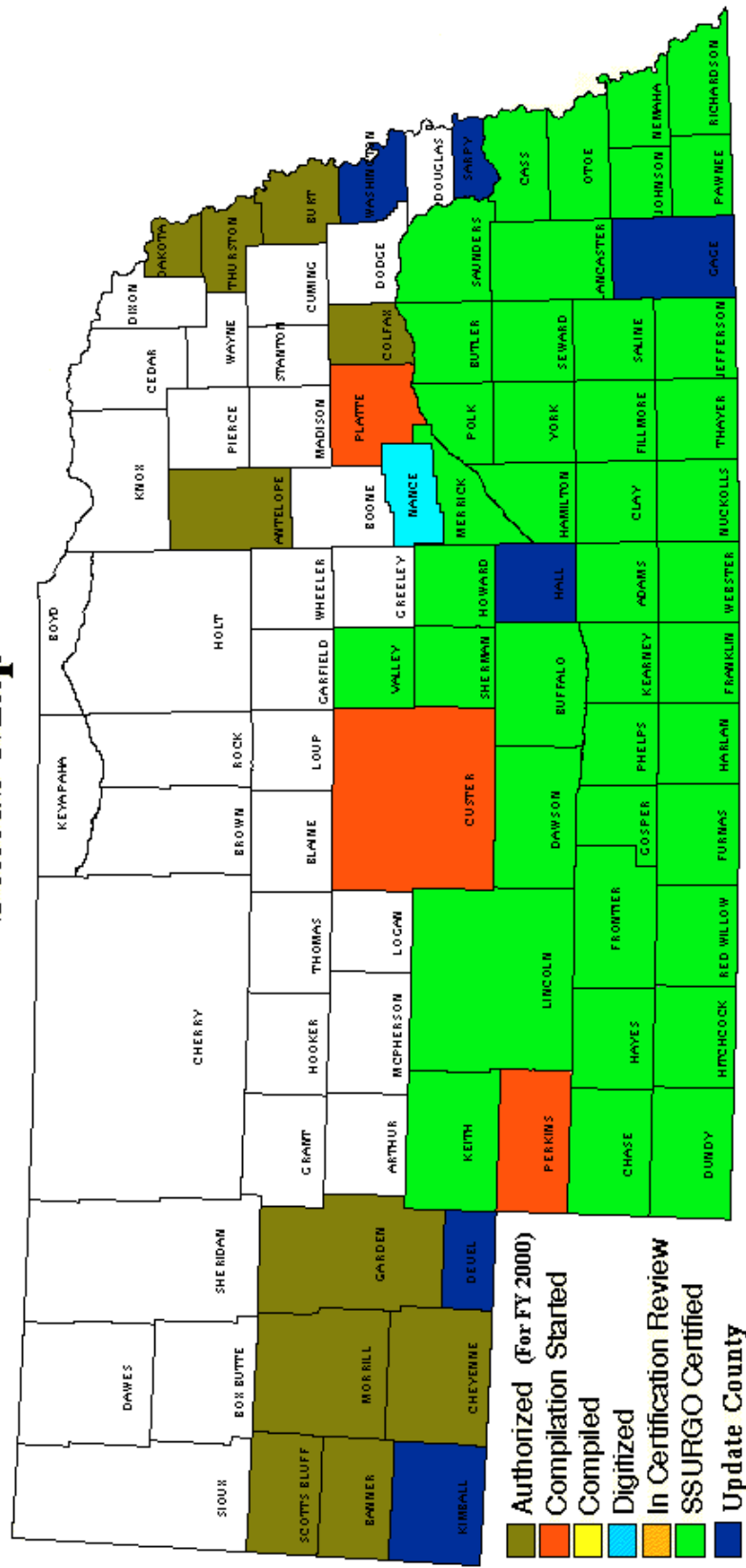


Symbols overlay on mylar material is one of the data layer used for digitized publication. This overlay has been prepared from the SSURGO data.



This overlay is made by consolidating the overlay on soil boundary lines and symbols overlays. This overlay of digitized soil information will be checked for final review prior to publication of the soil map in the Soil Survey Report.

Soil Survey Geographic Database Status Map



December 20, 1999

History of Cooperative SSURGO Effort Between NRC, UNL-CSD and NRCS

In April of 1997, Nebraska Natural Resources Commission (NNRC), University of Nebraska-Conservation and Survey Division (CSD), and the Natural Resources Conservation Service (NRCS) entered into an agreement to digitize published Soil Surveys in Nebraska. Funding for the project was divided between the cooperative agencies.

There were NRCS field Soil Scientists, part-time students from UNL and NRCS cartography staff with the responsibility of compiling published soil maps and symbols onto two separate stable base mylars for scanning. NRCS cartography staff had responsibility for supervising the compilation process. Among personnel that made up the compilation team were: Steve Schaefer (NRCS cartographer and head of compilation), Steve Brooks (NRCS cartographer), Angie Schaecher (NRCS Soil Scientist), Jodi Herz (student trainee), John Vidlak (UNL student trainee), Jacob Bliven (UNL student trainee), Amy McCaleb (UNL student trainee), Anna Bodie (UNL student trainee), Margaret Warner (CSD), Steve Hartung (CSD Soil Scientist), Frances Belohlavy, (CSD Soil Scientist), Steve Schienost (NRCS Soil Scientist), Tyler Labenz (NRCS Soil Scientist), Mark Willoughby (NRCS Soil Scientist), Bob Rayer (NRCS Soil Scientist), Casey Latta (NRCS Soil Scientist), Charles Markley (CSD Soil Scientist), Jay Wilson (NRCS Soil Scientist), Gary McCoy (NRCS Soil Scientist), and Phil Young (CSD Soil Scientist).

Since digital orthophotography (DOQ's) are needed as a base in compiling soil maps, NNRC agreed to create the files for the 1993 orthophotography and submit files to the National Cartographic & Geospatial Center in Fort Worth, Texas for hard copy production. The orthos were then sent to NRCS State Office cartography staff for use in the compilation process.

This process involved ratioing the published soil maps to a scale of 1:12,000 on a copy machine to produce an annotated overlay at 1:12,000 and then match the 1:12,000 DOQ's from Fort Worth, and finally drafting the lines and symbols onto a stable base mylar. A separate mylar for lines and a separate mylar for symbols were produced.

After the soil lines and symbols were compiled, mylars were hand delivered to the Nebraska Natural Resources Commission for scanning and digitizing. Employees from each of the cooperative agencies (NNRC, CSD, and NRCS) were responsible for the scanning and digitizing process. Darcy Boellstorf from CSD, Josh Lear from the Nebraska Natural Resources Commission, and Wayne Vanek from the Natural Resources Conservation Service made up the scanning and digitizing team. The NRCS staff member was to be a Soil Scientist with the authority to make soil mapping related decisions in the event that such decisions were needed. This position was considered a liaison position to the NNRC.

The overall project goal was to develop a Digital Soils Database of the State of Nebraska. This would be accomplished by digitizing all 93 counties in Nebraska and also incorporating updated surveys, as they became available. Updated surveys are: Deuel, Gage, Hall, Kimball, Sarpy, and

Washington counties. Time frame for the project was proposed to be 5 years with completion set in September 30, 2002.

Lancaster County was to be the pilot county for the project beginning in the summer of 1997. Digitizing progressed from southeastern Nebraska counties to the western counties. This was determined by availability of DOQ's as produced by NNRC.

As of December 1999, 41 counties are certified: Adams, Butler, Buffalo, Cass, Chase, Clay, Dawson, Dundy, Fillmore, Franklin, Frontier, Furnas, Gosper, Hamilton, Harlan, Hayes, Hitchcock, Howard, Jefferson, Johnson, Kearney, Keith, Lancaster, Lincoln, Merrick, Nemaha, Nuckolls, Otoe, Pawnee, Phelps, Polk, Red Willow, Richardson, Saline, Saunders, Sherman, Seward, Thayer, Webster, Valley, and York. Dundy and Saunders were completed prior to the cooperative agreement. One county (Nance) is in review and waiting certification.