Part 631 – Soil Survey Investigations

Subpart B – Exhibits

631.10 Research Work Plan Checklist

1. Statement of Problem
   - concise summary
   - questions that illustrate problem and should be answered by the study
   - operational, such as “need to know in order to” rather than just need to know

2. Justification
   - local importance, such as for county
   - implications for wider application, such as at State and regional levels
   - benefit(s) to the soil survey program

3. Background
   - setting, such as climate, geology, landscapes, or soils.
   - soil series and their classification
   - persons familiar with the problem, such as those in NRCS or at a university.
   - specific background work pertaining to the problem, such as fieldwork, reviews, preliminary data gathering

4. Information Needed
   - geomorphic assistance
   - literature review
   - evaluation of existing data
   - information to be gathered in present study

5. Actions and Assignments
   - projected time table
   - project coordinators such as the person in the state whom the National Soil Survey Center staff should contact
   - Kellogg Soil Survey Laboratory assistance needed:
     - analyses suggested, such as specific questions to be answered for each soil and or horizon
     (complete analyses are not necessarily needed for limited, specific problems)
     - persons involved, including when and for what, and any necessary travel, etc.
   - report responsibility
   - report review responsibility
   - distribution and application of data, such as within state or in other states.

6. Illustrations
   - diagrams and illustrations that define study area location, soil-landscape, and stratigraphic relationships.
631.11 Example Research Work Plan

INVESTIGATION OF THE SOILS IN
THE REGION OF GLACIAL LAKE KASKASKIA
IN MLRAs 113, 114, AND 115

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The Problem

(a) A significant portion of St. Clair County, and portions of Randolph, Monroe, Washington, Clinton, Bond, Fayette, and Marion Counties (Figure 1) are underlain by glaciofluvial and lacustrine deposits. These deposits can range in age from pre-Illinoian (formerly designated as Kansan or Nebraskan, and now grouped together as middle Pleistocene) to Woodfordian (mid to late Wisconsinan or late Pleistocene) or even to Holocene. The youngest of these deposits related to glacial activity is correlated with the Equality Formation (described by Willman and Frye, 1970). The fluvial deposits in the present flood plain area are correlated with the Cahokia Alluvium.

(b) The younger deposits in Glacial Lake Kaskaskia are part of the Equality Formation. Most of these areas are covered by Peoria Loess, except for the lowermost Woodfordian and possibly the early Holocene terrace level, which appears to have little or no loess cover (Figure 2). Extensive areas of Iva, Weir, Piasa, Herrick, Virden, and other similar soils were mapped on the other terraces along the Kaskaskia River. These soils typically formed in materials considered to be associated with upland positions.

(c) The original field sheets for the St. Clair County soil survey showed mapping units represented by tentative symbols, such as V308 (Alford), V453 (Muren), T16 (Rushville), V47 (Virden), T453B (Muren), and T454A (Iva). “V” was used for variant and “T” for terrace. These symbols were used to suggest differences in stratigraphy that do not traditionally occur in these upland soils. Documentation and correspondence during the survey also supported differences in stratigraphy. These differences were included in the “Formation of the Soils” section of the St. Clair County soil survey (Figure 3) (Wallace, 1978) but not included in the mapping and classification of the soils in the county. One of the main reasons for this exclusion was the emphasis in the 1978 survey on the description and classification of the soils to a depth of only 60 inches.

(d) More recently, the terrace/upland problem has been recognized in adjacent counties. During the recently completed Clinton County soil survey, soils formed in lacustrine deposits were mapped as T46 (Herrick), T47 (Virden), and 474 (Piasa). Soils mapped in mapping units T47 and 474 were eventually classified as a Montgomery taxajunct (a soil developed in lacustrine material), and a new soil series was developed in lieu of terraced-positioned Herrick soil mapped in map unit T46 to recognize the importance of the lacustrine parent material.

(e) Questions have arisen on the impact of these terrace soils and underlying materials on water availability for crops, crop yields, and water quality. The Iva (86 bu/ac), Herrick (89 bu/ac), and Virden (91 bu/ac) upland soils have relatively high corn yields listed in University of Illinois Circular 1156 (Fehrenbacher et al., 1978) compared to the listed yields of the traditional terrace soils, which include Okaw (47 bu/ac) and Hurst (52 bu/ac). Also, the yield on areas on the terrace mapped as Piasa is much higher than that listed for the Piasa (52 bu/ac) that is traditionally mapped as an upland soil. These discrepancies have been brought to light in recent tax appeals to the State Board of Review. Differences in observed yields suggest differences in soils and available moisture for crop growth. These differences
also suggest that the clayey substratum of the terrace soils influence the available water and the movement of the water through the soil.

(f) The problem involves not only accurately mapping and classifying the surface soils but also accurately identifying and mapping the underlying materials, which influence the genesis, classification, and management of these soils. The objective of this study is to accurately identify soils, parent materials, and stratigraphy in the Glacial Lake Kaskaskia area. The hypothesis is that soils in the Glacial Lake Kaskaskia area differ from the upland soils, and that this difference is reflected in stratigraphy, physical and chemical soil properties, water status, and crop yields. Studying these soils in detail will provide more accurate interpretations for agricultural and urban uses in the Glacial Lake area and the adjoining upland areas.

Justification

The Kaskaskia River glaciofluvial and lacustrine deposits occur in eight counties. The drainage basin of the Kaskaskia River covers 3,712,640 acres. The importance of the surficial and subsurficial materials in the Kaskaskia River Basin to agriculture and to the ground-water quality of the area is evident. Rapid urban growth is occurring in St. Clair, Randolph, and Monroe Counties, and therefore, more urban and agricultural demands are being made on water that is supplied by the Kaskaskia River Basin. St. Clair County is currently being updated as part of the Major Land Resource Area Soil Survey Update program in Illinois. Not only will the update in St. Clair County benefit from this study, all updates of the other counties within MLRAs 113, 114, and 115 that have glaciofluvial and lacustrine deposits will also benefit. The information gained in this study will improve the credibility of the soil survey by supplying the survey users with more accurate and precise soil maps and interpretations. We will also be gathering soils and geology information at greater depths.

Background

(a) Most of the soils in the study area are the types that occur on uplands. The uplands consist mainly of the Illinoian glacial till plain or glacial outwash plain that is covered by loess. The total thickness of the Peoria Loess and Roxana Silt ranges from 100 feet in the western part of the area to 4 or 5 feet in the eastern part. Soils on the terraces formed in loess less than 60 inches thick overlying clayey material or in the clayey material. There are also extensive areas of alluvial lands and bottomlands that drain to the Kaskaskia River, which drains into the Mississippi River.

(b) The focus of this study is to determine the boundary between the upland areas, represented primarily by soils formed in loess over glacial till, and the areas represented primarily by soils formed in glaciofluvial and lacustrine deposits. The difficulty in determining this boundary was well documented by the former soil survey leader of the 1978 St. Clair County soil survey and his primary survey members. Historical correspondence between the soil survey party, the Illinois State Geological Survey, and the MLRA staff shows the difficulty and importance of making this determination. Unfortunately, the separations made by the soil survey party were dropped during correlation and final publication. This action was due to the emphasis on studying the soil to a depth of only 60 inches and to the emphasis on the taxonomic placement of pedons. The MLRA update surveys will include more detailed descriptions at greater depths in order to meet the demands of modern agriculture and urbanization.

Information Needed

A soil-geomorphic/soil-stratigraphy study would be appropriate to determine the characteristics and extent of the glacial lake and to examine the relationship of these deposits to the distribution of soils across the landscape. From this study we could expand our knowledge of geomorphology and pedogenesis and gain a greater understanding of the geologic history of the Kaskaskia River Basin.

Action and Assignments

(a) The MLRA update office requests the assistance of the staff at the National Soil Survey Center in Lincoln, NE. The Illinois Soil Survey Laboratory liaison is familiar with the area. He has expressed interest in working on this problem and would be of great assistance in determining the soil-geomorphic/soil-stratigraphy relationships.

(b) The coordinators for the study will be the MLRA project coordinator, the area soil scientist at Carbondale, IL, and the Illinois State soil scientist. I will be the contact person. Other participants will be personnel from the Illinois State University and soil scientists in MLRAs 113, 114, and 115.

(c) Deep cores taken with a hydraulic probe and pits will be used to describe soils and sediments and to collect samples for appropriate chemical, physical, and mineralogical analyses.

(d) The study will be carried out in stages. The first stage will begin in November in St. Clair County. Transects will be made across three major valleys in St. Clair County: the Kaskaskia, Silver Creek, and Richland Creek valleys. Deep cores (at depths > 20 feet) will be taken in transects perpendicular to each valley. A minimum of four cores will be taken in each transect; and each transect will begin in the upland and continue down an interfluve to the predicted terrace level, across the river channel to the terrace level on the other side, and again up an interfluve to the upland. Transect and core locations will be determined from topographic data and existing core data. We will determine the geomorphic and stratigraphic relationships with emphasis on identifying the presence or absence of the Sangamon Geosol. The Sangamon Geosol is a key marker in identifying upland positions.

(e) Tracing the Sangamon towards the streams will reveal where the Sangamon has been eroded out of the valley. At the erosional boundary we expect the surface to be covered by Wisconsinan deposits, and in places it may be lacustrine (slack water deposits). Therefore, we need to examine the water regime characteristics at this geologic boundary to determine its influence on the distribution of modern soils (especially “problem” soils, such as Natraqualfs).

(f) In places the development of the present soils in loess over the Pearl Formation with a Sangamon Geosol is different than that of the soils in loess over the Sangamon Geosol in till. The soils in the Pearl Formation are commonly developed to a greater depth and in places are better agronomic soils. This relationship may, in part, explain the higher yields of the Piasa mapped on the terrace as compared to the yields for the Piasa mapped on the upland.

(g) The results from the first stage of this study will be used to guide the investigations in other counties that contain Kaskaskia glaciofluvial and lacustrine sediments. After determining the soil geomorphic and soil stratigraphic relationships in St. Clair County, the next portion of the study will take place downstream in Monroe and Randolph Counties and upstream in Washington, Clinton, Fayette, Bond, and Marion Counties. We hope to begin this portion of the study in the spring of 1992. The goal is to map the areal distribution of glaciofluvial and lacustrine sediments in the eight-county study area and eventually throughout Southern Illinois and to determine the influence of these sediments on the genesis, morphology, classification, and management of the modern soils. The results of this study will be published and distributed to states that have extensive glaciofluvial and lacustrine sediments.

Summary of Plan of Action

(a) The MLRA project coordinator in conjunction with the Illinois State Geological Survey (ISGS) will perform a literature review. (Completed 11/91).

(b) The details of the experimental design and laboratory needs will be determined by the MLRA project coordinator, the area soil scientist, the liaison for the National Soil Survey Center, and the Illinois State Geological Survey. At this time we will determine what water table, hydraulic conductivity, and yield data are needed for the study. (Completed 11/91).
(c) The fieldwork for the study will begin with 1 or 2 weeks of fieldwork in 11/91 and with cooperation between the Illinois NRCS, ISGS, and the National Soil Survey Center.

(d) Information gathered from the first three steps will guide the direction of the next portion of the fieldwork that is to be carried out in 3/92.

(e) It is envisioned that the study will take 3 to 4 years to ensure sufficient collection of soils, yield, and water table data.

References


### 631.12 Example of a Soil Characterization Work Plan

#### SOIL CHARACTERIZATION WORK PLAN

**Identification:**
- **State:** Kansas
- **Date:** September 15, 1990
- **Investigation project name:** Brown County Study
- **County (Counties):** Brown

**MLRA:**
- **Plan prepared by:** Name Jim Jones
- **In-state contact(s):** Name Jim Jones

**Actively cooperating agencies:** Kansas Agricultural Exp. Sta.

Give the area or region of sampling, if appropriate, or the name(s) of soil survey area(s) if they are different from the county (counties) identified above.

**Reason for Investigations Project:**
- **Underscore the number for the primary reason(s) for the project.**
  1. Needs of initial soil survey
  2. Survey update or modernization
  3. Interpretations problem
  4. Regional recorrelation or redefinition of series.
  5. Study of genetic factors, processes, relationships
  6. Support of other activity (such as an agronomic study)
  7. Other (specify)

**Intended Use of Project Information:**
- **Underscore the number for the primary uses.**
  1. Characterize series or phase
  2. Document experimental or study site(s)
  3. Determine classification
  4. Support correlation
  5. Test Soil Taxonomy
  6. Study soil relationships
  7. Included in the published soil survey report
  8. Other (specify)

For items 4, 5, 6, or 7, list questions to be answered.
Assistance Requested:
Which year(s): 1990
Lab analyses from: KSSL Only x KSSL and:
If data needed in less than one year, when needed?
Consultation before sampling? yes no
Field study before sampling? yes no
Reference samples to guide site selection? yes no
Help with sampling? yes no
Sampling equipment from KSSL? yes no

Number of pedons: 5-7
Approximate number of samples: 50-55
Ship to: Name

Natural Resources Conservation Service
Address
Town, State ZIP

Proposed date for sampling: May 7-11, 1990
Alternative date(s):

Status of Site Selection:
1. Sample sites have been identified
   a. specific pedons? yes no
   b. specific area (within 500 feet)? yes no
   c. general area (within a mile or two)? yes no
2. Transect information available yes no
3. If 1a is no, when will pedons be selected?

Persons or Agencies Responsible:
Site selection: Project office
Excavation of pits: Local NRCS
Tools, equipment, materials: KSSL
Descriptions and classification: State Personnel
Sample shipment: Kansas State Office
Analyses, other than KSSL: none
Other:

Other Pertinent Information:
(may be supplied by attachments, such as official series descriptions, if applicable)

Pedon 5: Amego soil does not have free carbonates in the solum.
The soils mapped in Brown County do.

Complete Table 1 for all projects; list alternatives if purpose is to check classification. Complete other tables insofar as information is readily available.
### Table 1  Classification of Pedons to be Sampled.

<table>
<thead>
<tr>
<th>Pedon Number</th>
<th>Classification to Family</th>
<th>Series (and phase, if important)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Typic Hapludolls</td>
<td>Marshall*</td>
</tr>
<tr>
<td></td>
<td>fine-silty, mixed, superactive, mesic</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Aquertic Argiudolls</td>
<td>Mayberry</td>
</tr>
<tr>
<td></td>
<td>fine, smectitic, mesic</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Aquertic Argiudolls</td>
<td>Chase</td>
</tr>
<tr>
<td></td>
<td>fine, smectitic, mesic</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Typic Hapludolls</td>
<td>Vinland</td>
</tr>
<tr>
<td></td>
<td>loamy, mixed, superactive, mesic, shallow</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Typic Argiudolls</td>
<td>Wamego*</td>
</tr>
<tr>
<td></td>
<td>fine, mixed, superactive, mesic</td>
<td></td>
</tr>
</tbody>
</table>

* Pedons to be sampled may not be representative of the named series but may become new series.

### Table 2  Extent of Series or Other Class Represented.

<table>
<thead>
<tr>
<th>Pedon Number</th>
<th>Estimated Extent, acres</th>
<th>This Survey Area</th>
<th>State</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>173,000</td>
<td></td>
<td>1,600,000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2,000</td>
<td></td>
<td>111,000</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>97,000</td>
<td></td>
<td>97,000</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>132,000</td>
<td></td>
<td>132,000</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>39,000</td>
<td></td>
<td>39,000</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3  Genetic Factors of Soils.

(Attach block diagrams, geologic cross section, etc., if available)

<table>
<thead>
<tr>
<th>Pedon Number</th>
<th>Parent Material</th>
<th>Landscape Position</th>
<th>Drainage Class</th>
<th>Vegetation (Site)</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Loess</td>
<td>Upland ridge</td>
<td>W</td>
<td>Corn</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Till</td>
<td>Convex summit</td>
<td>MW</td>
<td>Wheat</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Alluvium</td>
<td>Low terrace</td>
<td>SP</td>
<td>Soybeans</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Shale</td>
<td>Steep upland</td>
<td>E</td>
<td>Pasture</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Shale, ss</td>
<td>Narrow ridge</td>
<td>W</td>
<td>Native grass</td>
<td></td>
</tr>
</tbody>
</table>

### Table 4  Useful Data Available for These or Similar Soils.

(Use lines as needed for each pedon to be sampled)

<table>
<thead>
<tr>
<th>Pedon Number</th>
<th>Year &amp; State</th>
<th>County</th>
<th>NRCS Lab or other</th>
<th>Same Series Family</th>
<th>Other Similar</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>KS1983</td>
<td>Morris</td>
<td>KSSL</td>
<td>Series</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>KS1987</td>
<td>Wabaunsee</td>
<td>KSSL</td>
<td>Series</td>
<td></td>
</tr>
</tbody>
</table>