MLRA Office -7
Soil Survey Update Implementation Plan
7/07

Synopsis- This implementation plan was developed to give guidance to MLRA Soil Survey Offices in the Northern Great Plains initiating the update process. MLRA Soil Survey Offices will become permanent clearinghouses for all soil-related data in their region. The long-term management of this data will become very important. The update approach for managing this soil survey information is separated into two phases: **1) Evaluation and Maintenance** and **2) Enhancement**. The importance of a thorough evaluation of our existing product, establishing priorities, and developing long-range, annual, and project plans to address soil survey concerns are discussed. NASIS activities are grouped into database integrity/management and soil properties. A discussion on the importance of increasing cooperator involvement and better communications between all soil survey entities are also included in the plan.

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Introduction

The primary objective of this document is to present a **framework** to organize discussion, input, and feedback from State Offices (SO), MLRA Soil Survey Offices (SSO), and Cooperators regarding priorities and structure of the reorganized soil survey program in MO-7 (Northern Great Plains).

The reorganized soil survey program is an exciting opportunity for today's generation of soil scientists to make significant improvements in the soil survey by utilizing new technology. The reorganization represents a major change in management of the soil survey program and how survey priorities are determined. This is a fundamental change from progressive soil survey and will reward proactive soil scientists with a sense of accomplishment and achievement. Instead of waiting 5 to 10 years for a survey to be published, improvements in the soil survey can be delivered to users via the Soil Data Mart or Web Soil Survey in a matter of months. The restructured soil survey program will allow individuals to emphasize the "science" in soil survey.

The National Office has identified the following priorities which have a direct impact on the soil survey program in our region:

- Soil quality/health (OM, salinity), dynamic soil properties
- Support erosion models; water quality models
- Precision farming/conservation
- Irrigation
- Watershed approach to applications
- Cooperation and collaboration with partners
- Enhancing web soil survey
- Implementing new technology
- Outreach and marketing.

Addressing these activities will help us meet our agency's strategic goals and assist MLRA SSOs in planning and management.

Another objective of this document is to **clarify** the responsibilities of the MO, MLRA SSOs and SOs and to discuss how these new roles will be implemented (responsibilities are detailed in the NSSH, Part 608). In the past, the MO was responsible for quality assurance and correlation. Although quality assurance remains with the MO, many of the correlation functions will be retained at the MLRA SSO. The MO views the SSOs as partners in achieving the final goal of delivering an **accurate, reliable product to the Soil Data Mart**. The MOs will assist the SSOs in delivering a high quality final product in an efficient manner.

The MO sees its role evolving into one that supports the SSOs by:

- providing quality assurance through review of MLRA SSOs operations, products, and accomplishments
- developing processes, training, technical assistance
- providing assistance and expertise in designing and completing projects
- coordinating projects and issues among MLRAs

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- facilitating meetings (e.g. committee meeting to resolve the use of phase terms among MLRAs)
- maintaining NASIS data integrity
- implementing standards in data population, map unit naming conventions, etc.
- providing editorial assistance in publications, open record files, etc.
- providing a clearing house for technical data (directory of power point presentations, photographs, etc.).

A major goal of restructuring the soil survey program is **strengthening the relationships with our cooperators**. The MO will explore ways to further the involvement of University, tribal, state and federal agencies in our program. As an important first step, many MLRA SSOs have held Technical Team meetings to solicit cooperators' input and determine survey priorities.

Examples of ongoing cooperative efforts in the Northern Great Plains:

i. NDSU has an extensive irrigation project in MLRA 55A (Devils Lake area). They have collected characterization and water state data on numerous soils. The MLRA SSO could capture this information and utilize it in data population.

ii. NRCS soil scientists have identified a suite of low-activity clay soils in MLRA 54. The Extension Service could utilize this information in designing field studies to ameliorate fertility problems.

iii. NRCS soil scientists in South Dakota have collected dynamic soil property data to support Soil Quality and Extension Service programs.

Through the course of the progressive soil survey program, soil scientists have and continue to collect a large amount of soil property and interpretive data. Although much of this information is available through published soil surveys and other sources, a considerable amount is not. The result is that many **soil scientists are not aware of technology advances or data collection projects** that could improve their operations (e.g. Bruce Kunze's saturation data on well-drained till soils; Bill Drummond's evaluation of CEC activity classes; Dave Pott's evaluation of dense till soils).

This lack of timely communication has been identified as one of the major issues affecting the success of update soil surveys. The MO hopes to strengthen communication lines by hosting a newsletter and technical seminars and workshops. For example, a technical workshop on soil salinity and sodicity, with involvement by the ARS-National Salinity Laboratory, is planned for the spring of 2008. Each MLRA SSO will be asked to contribute to these activities. Such actions should also enhance the soil survey program's outreach and marketing activities.

To facilitate discussion, the **update soil survey program** can generally be broken into two broad phases: **evaluation** and **maintenance** of our current spatial and property data base and **enhancement** of our survey for future users. Although much of our emphasis recently has been towards the use of new technologies to improve our update soil survey; evaluation, maintenance, and enhancement should be viewed concurrently. A simple analogy would be the Dept. of Transportation maintaining its current highway system (i.e. fixing potholes) while doing research and development on new products or procedures to build a better highway. Both Missouri (Young et al., *Soil Survey Horizons*, Vol. 48, 2007) and Nebraska (Loerch, personal communications) have successfully taken this two phase approach towards soil survey updates.

Initially over half of a project office's time could be spent maintaining and evaluating our current soil survey product. Management of the update survey will be through the MLRA SSO planning process, as outlined in the National Soil Survey Handbook (NSSH 608, 610). The planning process consists of long range, annual, and project plans, with appropriate workload analyses (see attachments for examples).

Phase I
Evaluation and Maintenance of Existing Soil Surveys

This phase of the update soil survey program will focus on evaluating the status of our current survey, developing a list of soil survey concerns, and maintaining existing survey data. These projects will have an immediate impact on soil survey users via the Web Soil Survey. Items emphasized in this phase will be evaluation of subset legends, map unit geographic distribution, and minor spatial changes for joining. Also discussed are issues related to Benchmark soils, OSD revisions, Taxonomy review, NASIS legend management, soil properties, and organization of existing data**.**

I. Initial Evaluation

A. Legends
Our current subset legends were developed over two generations of county soil survey correlations. This has resulted in inconsistencies in naming similar landscapes in adjacent surveys (e.g. Svea-Buse vs Barnes-Buse; Absher vs Rhoades). Many inconsistencies in these legends could be resolved with a comprehensive review of an MLRA's subset legends.

The MO recommends that all MLRA Soil Survey Leaders undertake a **thorough review of their subset legends** to identify problem map units, landscapes, or data. This evaluation will create an **inventory of "soil survey issues"** (Attachment 2, appendix C) that will later be prioritized and addressed via project plans.

> *For example, a review of the legends in MLRA 56 identified the use of loam surface textures on fine-silty lacustrine soils. The project office developed a project plan, investigated, and determined the loam surfaces were associated with lake margins, outwash, and till. The silt loam surfaces were associated with low energy, lake-center deposits. The original surveys had correlated surface textures based on what was dominant in their counties. The update survey was improved by correlating by physiographic areas.*

Other examples of legend issues needing evaluation include:

a) use of series that are out-date or have had classification changes (e.g. Valentine series used in the frigid regime)

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b) series that have had conceptual changes (e.g. Tansem vs Farnuf on elevated lake plains)
c) assigning soil series to specific landscapes (e.g. Lowe vs Colvin soils in fluvial situations).
d) undifferentiated map units that could be converted to better interpreting units (e.g. Vallers and Hamerly, saline soils)
e) establishing new series vs phasing existing series (e.g. granitic Marysland vs. a shaly substratum phase of Marysland)
f) consistent use of miscellaneous areas
g) consistent use of the "channel" phase
h) consistent use of conventional and ad hoc symbols
i) consistent use of slopes groups within a MLRA
j) consistent use of map unit symbols
k) documentation of all changes in NASIS

Correlation includes not only the map unit name but also the map unit composition and data. The legend evaluation should also review which minor map unit components are assigned to a map unit. In some instances, similar map units in adjoining counties have different components because different similar soil criteria were used or new series were established since correlation of one of the counties. The number of data map unit components also needs to be evaluated. Care should be taken not to add redundant components to the map unit that do not improve the map units' interpretive capability. **Consistent similar soil criteria will need to be established by MLRA.**

The MO supports the development of a **MLRA-wide legend** to provide the framework for a comprehensive subset legend evaluation. A MLRA-wide legend will promote consistency in map unit naming and symbolization among counties/states. MLRA legends will enhance multicounty analyses for watersheds, common resource areas, etc. and will help joining between subsets. All of this will eliminate a major complaint from external customers and eventually provide seamless applications across county and state boundaries.

There are several viable approaches for developing MLRA-wide legends. Dividing MLRAs or subsets into physiographic regions (e.g. terrace units) or "soil groups" (e.g. coarse-loamy sodium-affected soils), developing legends for these areas, and aggregating them into a composite MLRA legend is a recommended method for developing MLRA legends (see Attachment 1 for an example workplan). Use of expert analyses, Delphi surveys (see MO-7 Field Guide), review of existing documentation, etc. also may be useful in obtaining information about map unit design.

The MO also supports facilitating **consistent naming conventions** within and among MLRAs. Although the NSSH gives guidance for naming map units, in some cases, clarification is needed.

> *For example, in MLRA 56 a three named map unit exists with components having different flooding phases. The option exists to phase each component (i.e. Cashel, occasionally flooded-Lallie frequently flooded-Wahpeton, rarely flooded); phase the map unit with the most limiting flooding (i.e. Cashel-Lallie-Wahpeton …, frequently flooded); or add the generic term "flooded" to the map unit (i.e. Cashel-Lallie-*

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Wahpeton …, flooded). To reduce confusion for the user, MLRA 56 decided to reduce the length of the map unit name by using the generic term. Similar issues occur with other phase terms such as salinity and stoniness.

Most routine correlation amendments will be managed via populating the data base with the map unit history notes and running the appropriate reports. **The MO plans on establishing regional committees to make recommendations related to map unit naming conventions, use of ad hoc/spot symbols, and similar and dissimilar soils.**

B. Soil Geography

Along with the legend evaluation, the MO encourages MLRA SSOs to undertake a **systematic evaluation of the extent and location of subset map units** using SSURGO. Such a review may highlight trends, anomalies, landform/soil correlations, or other issues that may impact the validity of map units. It is recommended this review be done by physiographic area.

For example, a review of the soil geography of the Colvin map units in MLRA 55B indicated it was mapped on broad lacustrine deposits used for intensive agriculture and in narrow uncultivated outwash channels. Both landscapes were being interpreted as Land Capability Class 2w. The solution was to retain the Colvin mapped on lacustrine deposits and recorrelate the outwash channels to Lowe, a series developed in fluvial deposits.

Issues and problems identified through this process can be added to the Soil Survey Concerns list (Attachment 2, appendix C) and incorporated into the SSO Long Range Plan. Figure 1, 2 and 3 show examples of use of SSURGO data to evaluate existing soil surveys.

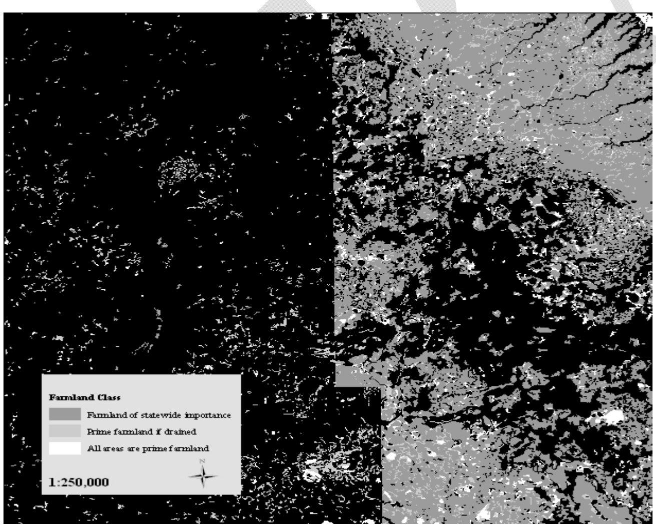

Figure 1. Inconsistencies in data identified using SSURGO.

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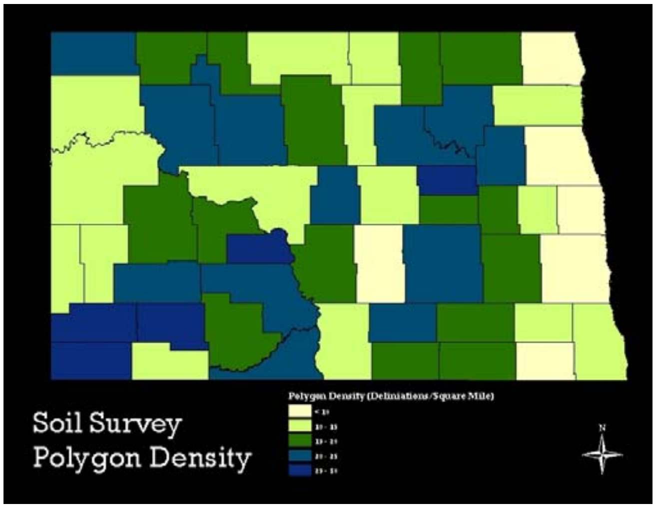

Figure 2. Evaluation of SSURGO line density by county for North Dakota.

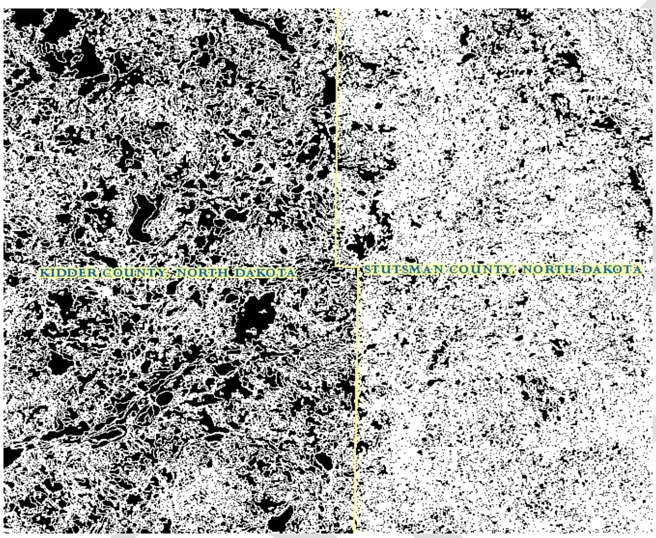

Figure 3. Evalutation of SSURGO line density for two adjacent counties in North Dakota.

C. Cultural and Ad hoc Symbols
It is recommended that each MLRA SSO evaluate the 37A for each subset (SSURGO and published) and a standard set of symbols and definitions be developed for the MLRA. The goal is to use spot symbols in a consistent manner throughout the MLRA, taking into consideration past use, map unit minor components, etc.

D. Spatial Data
Our SSURGO certified soil survey is an established product that has withstood the test of time. The MO **discourages any project that emphasizes the revision of SSURGO using traditional survey procedures**. The MO will require a cost/benefit analysis before approving an update project relying on traditional methods. Cost-effective and efficient soil landscape modeling techniques are or will be available to assist in making necessary changes. This philosophy could be modified for areas of small extent with serious problems

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with the existing mapping (e.g. watershed project). Any project requiring extensive line change should have MO review and the appropriate State Soil Scientist approval.
The MO concurs with the NSSH and strongly supports creating the **best join possible** among subsets and encourages MLRA SSOs to include such work in their long range plan. Ultimately a **seamless join** would involve matching landscapes, map unit names, and data map units along subset boundaries. This perfect join may require substantial field and data base work. However, during the interim, improving the join by any means possible (matching line work, revising map unit names, utilizing similar component properties) is encouraged as a first step. An improved join would enhance GIS products and reduce interpretive discrepancies among subsets. Creating this join is a continuation of the of the legend evaluation process and may identify issues needing further evaluation (i.e. Soil Survey Concerns list). Figures 4 and 5 show an example of improving interpretations after completing some fairly simple evaluation and joining procedures (Productivity Index is the map theme). Additional improvement would occur after project evaluations are complete.

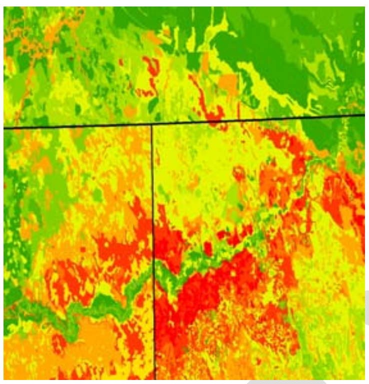

Figure 4. Three-county join before MLRA Legend evaluation.

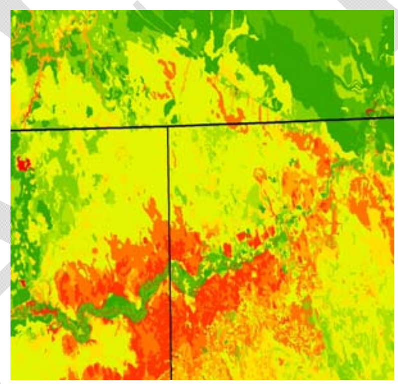

Figure 5. Three-county join after MLRA Legend evaluation

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E. Evaluation of SSURGO developed from Topo Maps
In the initial development of SSURGO for subsets in the late 1990s, a limited number of counties lacked orthophotograph coverage. Topographic maps were used as a base map in lieu of ortho. The MO recommends SSOs evaluate the line work of these SSURGO subsets and make appropriate recommendations.

II. Benchmark Soil Review
Review and evaluation of Benchmark soils is a National and MO priority. Guidance has been provided by the NSSC on processes to review the current Benchmark soil list (issue paper, Tom Reedy and others). The NCSS Newsletter (Issue 41, page 7) has an excellent discussion of Benchmark soil evaluation by David Hammer. Most evaluations will extend the concept of benchmark soils to the

catena and will include comprehensive data mining to compile information related to the benchmark and associated soils.

The MO recommends each MLRA SSO evaluate their current Benchmark soils and make recommendations for changes. The MO will coordinate efforts among MLRA SSOs. This review should include an evaluation of a "data completeness index" as described by Tom Reedy (Tom Reinsch) and landform-soil correlations as described by David Hammer.

III. Official Series Descriptions (OSD)

Revision and maintenance of OSDs is primarily the responsibility of MLRA SSOs. We urge all SSOs to initiate a plan to systematically review and revise the OSDs in their MLRA(s). This review should prioritize the OSDs and work should begin on benchmark and extensive series or soils involved in on-going MLRA projects. **It is recommended that each SSO develop an OSD maintenance plan as part of their long range plan. This should include the review of a specific number of series annually.** The MO-7 will assign series responsibility to individual MLRA SSOs.

At a minimum the following items should be addressed (see NSSH for additional guidance):

a) review if the pedon is representative for that series (high importance)
b) review the Range in Characteristics
c) review the Competing Series (update this section in the competing series also)
d) review the Associated Series (update this section in the associated series also)
e) review the Geographic Setting
f) review Remarks Section; add statements concerning any diagnostic features
g) update to 2 meters (if possible)
h) convert to metric

The **national OSD Check Program will be installed in each SSO**. The following procedure is suggested for revising OSDs:

a) SSO submits draft changes and justification/documentation to review groups (as appropriate) and the MO. Any change in OSD classification, location, or significant change in morphology needs to be reviewed by a knowledgeable peer group.
b) SSO incorporates final changes and submits to MO; along with additions to the ".a" file.
c) MO submits the OSD file to the national Soil Classification File and maintains the ".a" file locally.

At this time the MO will continue to maintain the OSD and ".a" files. These files can be checked out by SSOs for series they are working with. A link between the OSD and series property data in NASIS is eventually planned. Until this link is established, a MO-wide decision needs to be made about the amount of soil property information that will be included and maintained in the OSD (versus maintained in NASIS).

The MO supports the development of Soil Monographs as both an outreach activity and as a means of summarizing available property, laboratory, and landscape data.

IV. Soil Taxonomy

MLRA Soil Survey Offices have the **responsibility for evaluating** Soil Taxonomy. We realize that Soil Taxonomy is fairly stable in the Northern Great Plains; however, SSOs need to identify any issues

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affecting Soil Taxonomy and help collect appropriate documentation to support revisions. Several issues affecting soils in the MO have been identified, including:

a) recognizing anthropogenic induced change in soils
    - erosion
    - mine-land reclamation
    - irrigation
    - drainage
b) CEC activity class
c) soil moisture and temperature regimes
d) natric horizon criteria; including the usefulness of leptic subgroups
e) mollic depth criteria
f) mollic subgroups of Haplustalfs
g) "prairie alfisols"
h) additional subgroups of Inceptisols to reflect gypsic horizons.

Additionally, CJ Heidt maintained a list of series affected by changes in Soil Taxonomy (e.g. vertic subgroups, activity class) over the last decade. This document gives the rationale for his recommended changes and series that needed review. The MO will distribute this material.

> *For example, the need to document the change in classification of the Heil series from a Mollisol to a Vertisol.*

V. Data Base

Data base activities have been separated into:

> Data Base -- Integrity and management of site and legend objects and
>
> Data Base -- Properties and interpretations (the update of soil property and interpretive data).

Two excellent articles concerning NASIS were recently published in Soil Survey Horizons by David Livingston (2006) and Sam Indorante (2007). These articles bring up considerations about the long-term maintenance of NASIS and are recommended reading.

A. Data Base - Integrity and management of site and legend objects

Management of the NASIS will have to be coordinated with state data base managers.

Potential issues:

a) group membership
b) legend management and group organization
c) MLRA vs. Non-MLRA legends -- Presently it is a challenge managing groups when our delivery mechanism (Non-MLRA) is different than our management mechanism (MLRA). This results in potential security issues when adjacent MLRA SSO leaders are included in groups to allow permissions for soil survey areas that are along MLRA management area boundaries. To help resolve these issues, SSOs managing an MLRA Legend need to populate and maintain a set of Non-MLRA soil survey area overlap tables.
d) management of 102A West -- A joint MO-7/10 plan needs to be developed that justifies and documents the separation of 102A east from 102A west and incorporate these changes into NASIS.
e) a similar issue occurs with the proposed separation of the southern portion of MLRA 54 into MLRA 54B.

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f) effective organization of reports and queries – This task is slated for the MO data base manager (Wade Bott). Wade will evaluate NASIS for duplicate queries and reports in an effort to reduce the volume and facilitate efficiency in using the desired report or query.
g) report writing assistance
h) site data/site data quality – The MO recommends resources be allocated towards an effort to populate archived site data (OSDs, lab, typical pedon, and other pedon descriptions, transects, field notes) in the NASIS database. There is also a need to evaluate the quality of the site data currently in the NASIS and LIMS databases. (duplicate pedons entered, data transcription errors, etc.)
i) track changes to data base – Implement a system, such as the one used in SD, to track changes to the data base.
j) automate the population of side records – Several stand alone data sets exist that need to be updated with changes in NASIS. Methods of updating these data sets automatically will be evaluated.

B. Data Base – Properties, qualities, and interpretations
The preliminary objective in data evaluation and maintenance is maintaining our existing data, improving consistency among similar soils, and eliminating discrepancy among adjacent counties. Projects to enhance the data base through survey projects will be discussed later.

a) Typical or modal pedons. The primary purpose of modal pedons in NASIS is to structure the associated chemical and physical data and provide depths and thicknesses for interpretations. Modal pedons selected to represent both major and minor components in data map units need review to ensure they represent the component in that specific map unit and/or landscape.

For example:

- *an OSD with surface carbonates should not represent a non-calcareous phase of that series*
- *significantly different typical pedons were selected in adjacent counties for a component on similar landscapes (e.g. a modal pedon for the series Arvilla had a depth of gravel of 16 inches in one county and 25 inches in an adjacent county.) In this case the selection of these typical pedons resulted in discrepancies for T and other values important to the implementation of conservation programs.*
- *it may be appropriate to modify the properties of a typical pedon to better represent the map unit/landscape. (e.g. increasing the SAR and EC in Fargo soils mapped in complex with natric soils; adding a gravelly substratum to Shambo on terraces).*

Modal pedons should be evaluated and chosen based on natural physiographic units. In some cases little significant difference in major soil properties occurs among physiographic units and the similar modal pedons can be used on several surfaces (e.g. use of the same modal pedon for Buse on ground moraines and end moraines). In many cases, this review can be combined with evaluation of the OSDs (see above).

A concern exists between interpretations presently being run on "thickest" layer and use of soil horizons in NASIS. The MO recommends that layers be replaced with significant horizons (i.e. separate horizons with significant differences and combine horizons with minor difference, e.g. color change).

b) Soil property data for DMUs throughout the MO all have been certified and meet the minimum data requirements of National Bulletin 435-5-7. However, there are inconsistencies in data

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population standards, guides, use of calculations, data validations, etc. The MO recommends the next step in data population involve evaluation of population standards throughout the MLRAs. Better data population of primary soil properties will lead to better interpretations for all users. The evaluation of data will require:

- agreement and coordination of criteria among MLRAs and states
- deriving data from soil properties where possible (e.g. derive K from soil properties).

The following steps are envisioned:

- The MO will work with MLRA SSOs to evaluate standard calculations and algorithms and make recommendations for their use (i.e. populate CEC from algorithm vs. state criteria).
- Existing Data Guides will be reviewed and summarized (e.g. AWC reduction for salinity and stones; SD's K factor guide). A formal revision and distribution procedure will be developed (similar to the present "Data Population Notes") and the MO will revise its web page to provide easy access to all guides, criteria, etc. (modeled after MO10).
- Data population criteria will be evaluated to facilitate population of:
  - Organic horizons
  - Cd, Cr, and R horizons
  - Miscellaneous land types
  - Other

Criteria and reports will be developed or reviewed to derive or generate interpretations from soil data. This will impact interpretations such as:

- Land capability class
- Conservation tree and shrub groups
- Ecosites
- Forage suitability groups
- Irrigation groups
- Important and Prime farmland
- Productivity Indexes (Storie Index, Fertility Capability Classification, NCCPI, etc.)
- Other

"Local and State" data and interpretive criteria will need to be identified to avoid impacting these data elements.

The MO will develop a standard data validation routine consisting of existing reports and validations to run before any SSURGO data downloads. Work is being done on the national level to facilitate quality control of SSURGO downloads.

VI. Organization of Existing Data

The establishment of MLRA SSOs in the reorganized soil survey program has created the opportunity for these offices to become **clearinghouses** for all soil survey information for their assigned MLRAs. This can lead to the consolidation and compilation of soil survey data currently housed at various locations. Centralizing this information will leave a legacy the next generation of soil scientists will appreciate. This data will also make positive contributions and improve the efficiency of projects. The **MO recommends data libraries are established** for:

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- County subset 30 year records
- Map unit transects and notes
- Series descriptions
- OSD files
- Survey evaluations
- Laboratory data
- Water table data
- Old soil survey reports
- Photographs
- Geology reports
- Research reports
- Other

South Dakota has initiated a program to scan older documents to create a searchable data base. Search engines can enhance and speed up internet searches. Such literature reviews can provide information to improve our soil property population.

> *For example, Curtis Talbot, NSSC Range Specialist, recently distributed an internet search of several range journals that included the name of the series in the investigation.*

On a more mundane level, it is important to maintain an effective record keeping system. **MLRA Soil Survey Offices have become permanent locations** and will need to archive files for future reference. Record keeping systems will need to stand the test of time

> *For example, Jim Millar recently located imagery and yield data for a deep tillage study on sodium affected soils from the 1960s; the MO has complete records on a loess study in ND and SD from the early 1960s, etc.).*

Wade Bott has developed a recommended filing system that mirrors the General Manual. It is very effective at organizing information and correspondence. It is flexible enough to handle emerging issues. **The MO recommends that all SSOs adopt this system**.

VII. Family of Maps – GIS Applications

Along with compiling existing hard copy data, an inventory of existing digital/GIS data will be essential for future survey projects. The MO strongly recommends that each SSO query GIS sources to develop an inventory of existing data such as ground water, aquifers, land use, geology, STATSGO, etc. Because digital data files can be large, usually SOs have developed protocol for storage. It is important that a formal structure is used so data can be easily accessed, updated, protected.

Potential sources of data include:

- *State agency clearinghouses such as the North Dakota GIS Hub that distributes digital resource data.*
- *Individual state agencies e.g. the North Dakota State Water Commission maintains a digital file on all well logs; the North Dakota Geological Survey has all county geology reports digitized.*
- *Larry Strong with the USGS has detailed land cover data for areas in ND and SD. This data is available at http://www.npwrc.usgs.gov/projects/ndgap/.*
- *DEMs, LiDAR, IFSAR, 10m/30m*

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- *Other*

The MO recommends that a series of resource maps be developed for each MLRA. These maps could highlight conservation or resource issues such as:

- wind and water erosion
- salinity and sodicity
- major soils
- aquifer
- irrigation potential.

The MO GIS Specialist (Joe Brennan) is developing a MO-Wide GIS plan that will identify key personnel, digital resources, job aids, and training needs. He will disseminate information and assist MLRA SSOs implement GIS into update processes.

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Phase II
Soil Survey Enhancement

I. Planning process

Improving the current soil survey spatial, property, and interpretive data in an efficient and cost effective manner is the main goal of the update soil survey. Most update work will be centered on the planning process as outlined in the NSSH (608). Priorities will be determined by input at local technical team meetings and national, SO, MO, and MLRA SSO objectives. Detailed project plans will describe objectives, procedures and impacts on the survey. The MO will provide any needed assistance in the planning process.

The soil survey update planning process, as outlined in the NSSH, consists of the long range, annual, and project plans. MO-7 would like to add an MLRA SSO annual status report that would summarize achievements for the year and be a focal point for quality assurance activities. All of these documents contribute towards organizing, prioritizing, and documenting survey activities. These plans, field visit reports, and associated final reports will constitute the **long-term record of the survey office** (in lieu of field review reports). They should be maintained in an "open record" format, accessible, and well organized.

Although the writing of technical documents to guide the management of a survey office may seem like the antithesis of traditional field soil survey activities, planning has always been a part of the NSSH guidelines. When one considers that over **$1 million dollars of public funds can easily be expended to support a MLRA SSO for 5 years,** well-designed and documented work plans seem a minor but essential requisite.

A) Long Range Plan

The Long Range Plan should address activities in the MLRA SSO for up to a five year period (**Attachment 2**). It should identify long-term equipment, personnel, and other needs. The Long Range Plan should include a **Soil Survey Concerns List which is an inventory of needs, issues, and concerns** identified by SSO through the evaluation process completed in Phase I (Attachment 2, Appendix C). Survey concerns should be sorted by topic (e.g. correlation needs, classification needs, data base issues, landscape issues, etc.). The Soil Survey Concern List is a dynamic document that will be revised as update work progresses.

Prioritizing Projects

Although seemingly straightforward, prioritizing projects is a delicate balancing of local concerns with national, state, and MO issues. The objective is to create an efficient survey program by **"weaving"** together a variety of projects with various timeframes that will efficiently utilize SSO staff, account for adverse weather, and allow annual accomplishments to be reported.

Prioritizing projects must consider benefits/cost ratios, easily accomplished projects (i.e. low hanging fruit), importance, acres impacted, staff capabilities, etc. The NSSH recommends analyzing the cost of the revision (project) in comparison to the anticipated gain of additional information.

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The Soil Survey Concerns List, developed in the evaluation phase of the update, along with input from Technical Team meetings (Attachment 2, Appendix B) and cooperators will help determine local priorities. These local issues will be merged with national office, MO, and SO priorities identified at regional and state work planning conferences to create a list of priorities that will be addressed by the soil survey long range plan (5 year). The State Soil Scientist and MO Leader should approve the issues included in the soil survey long range plan. These priorities will be presented to the regional Board of Directors for review and comment.

Both Missouri and Iowa have developed processes for ranking projects. The Missouri approach is to numerically rank projects based on the following criteria (see Attachment 3):

- Scientific merit
- External merit
- Internal merit
- Financial/Partnership inputs
- Synergy
- Efficiency
- County Soil Survey Deficiencies

Iowa ranks projects based on a numerical scale that ranks 14 parameters. They consider such issues as relevance to agency programs, number of acres affected, interpretive issues, etc.(see Attachment 4)

There is merit to implementing some type of process to evaluate the need and importance of individual projects, especially projects that will require substantial resources. The MO will investigate ranking projects to determine priorities further. MLRA SSOs are urged to review these ranking procedures to assure they are addressing important issues. In the mean-time, we will rely on peer review comments to evaluate the significance of projects.

The Long Range Plan should also include a general workload analyses that briefly describes how staff time is allocated (Attachment 2, appendix A). The Long Range Plan should be approved and signed by the SSS and MO Leader. The plan should be updated annually and submitted to the appropriate supervisor by early September.

B. Annual Plan

The Annual Plan outlines activity for the current year. It identifies reportable items, current priority projects, requests for assistance, and needed resources. It includes a workload analyses, detailing project time, training, annual leave, etc. The Annual Plan is approved and signed by the SSS and/or MO Leader. The plan should be developed annually and submitted to the appropriate supervisor by early September. **Attachment 5** is an example of an Annual Plan.

C. Project plan

Project plans discuss a project in detail; including objectives, timeframe, reportable items, products, etc. All project plans should be peer reviewed and approved by the SSS and MO Leader. They should be coordinated with other MLRA SSOs as appropriate. As with the other types of plans, a formal file system should be created that includes the project plan, field visits, correspondence, final report, and future work needs. All project plans should be dated and numbered systematically. They should include provisions for **quality control/assurance**. Project plans need to be approved and signed by the SSS and MO Leader. They may be submitted at any time.

Attachment 6 outlines a recommended process for developing and reviewing a project plan. It includes a template for developing project plans. **Attachment 7** is an example of a completed project plan. Arlene Tugel recently presented a very thorough project plan template for collecting dynamic soil properties. This project plan could easily be modified for routine soil survey. Some projects will lend themselves to publications (e.g. Soil Survey Horizons, NSSC Newsletter) or presentations at professional meetings (oral or poster). Where appropriate, the MO recommends project plans be implemented with publication as a consideration.

Some projects, such as evaluating dynamic soil properties or salinity, may be broader than individual MLRAs and may originate at State Offices or the MO.

D. Annual Status Report

The MO requests a summary report from each MLRA SSO annually. The objective of this document is not to record reportable items but rather a summary of activities, accomplishments, and suggestions for improvements. These reports will allow the MO to consolidate quality assurance activities. These reports should be submitted to the SSS and/or MLRA Leader by the end of December.

II. Revising Spatial Data

Results from projects may lead to the need to revise spatial data. Spatial revisions can be updated by traditional means, GIS Assisted Editing, and GIS derived Soil-Landscape Modeling. The MO does not support traditional means of updating soil survey unless the project is approved by the SO. GIS Assisted Editing relies on the use of simple GIS tools (ArcMap) to display SSURGO, DEMs, etc. to assist implementing map unit design changes.

For example, Earnie Jensen, in MLRA 55, has used GIS Assisted mapping to:
- separate slope breaks (e.g. a 6 to15% unit into 6-9% and 9 to 15% units)
- delineate eroded, wooded, and dissected areas
- delineate consistent fluvial units between subsets (flooding duration and frequency). Jim Westerman, in MLRA 62, has used a similar process to update a portion of MLRA 62 in the northern Black Hills.

Sophisticated Soil-Landscape Modeling is the probable future of any terrain analyses, including soil survey. The implementation of this technology can be considered the 3rd generation of soil survey. Besides delineating soil boundaries, Landscape Modeling has potential to statistically evaluate soil variability and correlate soil properties to landscape position. It may provide resource maps for precision farming or precision conservation that could be aggregated into Order 2 soil surveys.

III. Revising Existing Soil Properties, Qualities, Interpretations

Soil survey projects designed to revise and quantify existing soil properties will allow representative data values and ranges to be determined statistically, with confidence levels assigned. This will assist in risk analyses and understanding specific property variance.

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For example, assigning confidence levels to our Ksat values may persuade designers of septic system to consider other alternatives.

Evaluating data elements should be prioritized by importance, similar to the work Kansas has done in identifying the "Magnificent 7' data elements (OM, pH, CEC, AWC, PSA, dB, Ksat). Evaluating existing characterization and other sources of hard data (university/ARS research), calculating "data completeness indexes" and identifying data voids are all part of the evaluation process.

Once data voids or needs are identified, field data collection, sampling, amoozemeter, EM-38, and hach kits all can be utilized to quantify properties. Work should initiate on benchmark soils or suites of similar soils (benchmark landscapes).

IV. New Data Elements

Several new data soil properties, not currently supported in NASIS and related to dynamic soil properties or geochemical data, are being considered for data evaluation. These properties, such as infiltration, POM, aggregate stability, and trace metals will address emerging resource concerns. Soil Quality Specialists in ND and SD (Susan Liebig and Rick Bednarek) are developing multistate plans to implement the collection of dynamic soil properties and geochemical data into routine soil survey.

Recent Web soil survey summary statistics for ND and SD indicate that information about crop productivity, yields, and land capability are the most sought after information. The MO will be organizing a committee to review options related to documenting this type of information

For example, use of yield monitor data; quantifying salinity/sodicity response; crop correlations; range PI, wind break heights.

V. New Interpretations

Several recommendations for new or revised interpretations are being considered by the MO. MLRA SSOs will be requested to assist in testing any new or revised reports.

Examples include: source of secondary road material, compaction rating for forestry, animal waste, septic systems, Ksat calculations, range PIs, road construction/reclamation on steep areas, wildlife.

VI. Miscellaneous Issues

Several miscellaneous issues need additional consideration:

1. Managing MLRA 102A-west
2. Managing and revising STATSGO
3. Effective outreach and marketing
4. 01 activities
5. Training new soil scientists
6. Sharing job aids
7. Establishing long-term monitoring sites
8. MO business plan

Attachment 1. Project Plan to Develop a MLRA Legend

P-08-055B-01 12/5/07

Completion of the MLRA 55B Legend
North Dakota and South Dakota

Objectives:

1. Create a MLRA legend to efficiently manage subset legends throughout the MLRA.
2. Create an initial seamless join between the remaining counties within the MLRA.
3. Evaluate remaining subset legends to identify soil survey concerns
4. Develop consistent legend and symbols among subset legends.
5. Provide updated soils information for agency and public use.

Justification: This project continues the update process started with the Devils Lake Basin and the 9-county project surrounding the Devils Lake Basin. Upon completion, map unit symbols will be consistent among counties and states. An initial perfect join will be completed to enhance GIS applications. All, or part, of the counties included are Barnes, Dickey, Lamoure, McHenry, McLean, Ransom, Sheridan, Stutsman, Trail, and Ward County in North Dakota and Brown, Clark, Day, McPherson, Marshall, and Spink County South Dakota. This area covers about 5.5 million acres. With the completion of this project, a perfect join with consistent data and symbols will be available to users for the entire area. Landscape and interpretive joins will be greatly improved with minimal time invested.

Background: Current county legends were developed over a period 30+ years and resulted in inconsistencies in naming similar landscapes in adjacent surveys (e.g., Barnes-Buse vs Svea-Buse). This project continues the update process started with the Devils Lake Basin and the 9-county project surrounding the Devils Lake Basin. Upon completion of the MLRA legend, the remainder of the MLRA will be brought up to the standard of the Devils Lake Basin. Project plans will be developed at a later date to address additional items impacting the legend, such as pothole and wooded map units.

Procedure: County subset legends were previously incorporated into existing physiographic area legends. These are used to assist with a comprehensive evaluation of the original design and composition of the county subset map units. After the evaluation, map units remaining on the physiographic area legends are merged into the MLRA Legend and MLRA symbols are assigned to the spatial data. Soil concerns will be identified on a spatial layer (if appropriate) or they will be added to the MLRA Soil Survey Concern List for future consideration. Subset map units, that are unique, problematic, or have remaining questions, will be identified and added to the MLRA legend. Overlap tables will be created or updated before county downloads are completed.

Needs: Assistance from Joe Brennan and South Dakota SO to do final check of spatial data before downloading. Review of MLRA legend and correlation by personnel from South Dakota.

Duration: Completed by August 2008

Personnel: Earnie Jensen (MLRA Coordinator), Lance Duey (Project Member), Kyle Thomson (project member), Jerry Schaar (SD State Soil Scientist), and Mike Ulmer (Senior Regional Soil Scientist)

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Other Agency or Department Involvement: None

End Product: Updated spatial and tabular data provided to agency and for public use

Reportable Acres: 2% of acres effected = 106,000 (see attached spreadsheet for county subset acres)

Contact Person: Earnie Jensen
USDA-NRCS
706 8th Ave. SE, Suite #1
MLRA Soil Survey Leader
Devils Lake, ND 58301-3749
Tele: (701) 662-6283 ext. 135
earnie.jensen@nd.usdsa.gov

Signatures:

MLRA Soil Survey Leader	Date
SD State Soil Scientist	Date
MO Leader	Date

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Detailed Procedure

1. Update MLRA legend
    A. Physiographic area subset legends are used to assist with a comprehensive evaluation of original county map unit design and composition
    B. Expert knowledge and any existing data will be used in MU evaluation.
    C. Consult with SD on county legend evaluations
    D. Acreage and spatial extent are also taken into consideration
    E. Evaluate existing Non-MLRA legend for map units identical to those map units in the MLRA legend
    F. Unique or problematic MUs will not be combined at this time, but will be added to the MLRA legend
    G. Assign new MLRA symbols to the map units added to the MLRA legend
    H. Create new DMUs for the map units added to the MLRA legend
    I. Add appropriate issues to the MLRA Soil Survey Concern List and (if appropriate) create a GIS layer flagging issues encountered that need to be investigated or resolved in future projects (joins, salinity, slopes, etc.)
    J. Any major concerns identified will be addressed with a project plan
    K. Amend the MLRA legend correlation

    Who: Devils Lake MLRA Staff, Schaar
    When: December 2007
    Quality control: Jensen, Schaar
    Quality assurance: MO7 Staff

2. Legend management (See Appendix A)
    A. The MLRA legend will be managed in NASIS along with the data map units using reference components (where appropriate) or existing component information
    B. Copy the map units from the MLRA legend related to the survey area and place them into the MLRA Legend Area Overlap table
    C. Populate acreage in the map unit area overlap table. Acreage will be obtained from the new spatial maps
    D. Populate DMU text notes

    Who: Devils Lake MLRA Staff
    When: January, 2008
    Quality control: Jensen, Schaar
    Quality assurance: MO7 Staff

3. Assign MLRA symbols on spatial data for each county subset in MLRA 55A.
    A. Determine the MLRA boundary if the survey area is separated by two or more MLRAs
    B. Reattribute the spatial data with new MLRA symbols by using queries and globally assigning the symbols

    Who: Devils Lake MLRA Staff
    When: January, 2008
    Quality control: Jensen, Schaar
    Quality assurance: MO7 Staff

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4. Create an initial seamless join between the remaining counties within the MLRA
    A. Consultation with SD on county and state joins

Who: Devils Lake MLRA Staff
When: February, 2008
Quality control: Jensen, Schaar
Quality assurance: MO7 Staff

5. Do a SSURGO download

Who: Sieler, South Dakota SO
When: To be determined

Subset acres reportable for the project area

Project Title	Total Acres to be claimed in FY 2008	ND003	ND021	ND045	ND049	ND055	ND073	ND083	ND093	ND097	ND101	SD013	SD025	SD037	SD089	SD091	SD115
Completion of 55B Legend	106,000	20,000	10,000	10,000	10,000	1,000	10,000	10,000	20,000			5,000				5,000	5,000

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Appendix A

MLRA Legend Management

A. Using two NASIS windows. Begin with the MLRA Soil Survey Area Legend (SS055B) in one window and the Non-MLRA Soil Survey Area Legend (SD013) to be incorporated into your MLRA legend in your other window.

B. Evaluate the existing Non-MLRA legend for map units identical to map units in the MLRA legend. (A thorough evaluation process should be used to determine if a map unit is identical and can be correlated into one MLRA unit. Map units that appear to be unique should not be combined until an evaluation is completed.)

C. DESELECT similar existing MLRA map units from the Non-MLRA survey legend.

D. Enter unique survey area map units into the MLRA legend (If the map units are copied and pasted from the Non-MLRA legend and you wish to track the old DMU in the correlation table, be certain to change the Rep DMU to NO)

E. Assign new MLRA symbols to the unique map units

F. Create new DMUs for the unique MLRA map units. Portions of survey areas (map units or physiographic areas) may be evaluated during different times or stages of updating. Data MapUnits evaluated and updated will be certified at a higher level, than those to be evaluated later. MLRA data map units not being evaluated should use a COPY of the old county DMU as the representative DMU.

G. If the subset survey area is separated by two or more MLRAs, determine the MLRA boundary line. This should be done first or in conjunction with the evaluation and development of the legend

H. Copy the map units from the MLRA legend related to the survey area to a Non-MLRA legend (Area Type Name) in the MLRA Legend Area Overlap table.

I. Populate acreage in the map unit area overlap table. New acreage should be obtained from new spatial maps

J. **Do a file new to clear the selected set**

K. Load the original Non-MLRA legend into the selected set.

L. Change the status of the original map unit in the Non-MLRA survey area from correlated to additional

M. **Do a file new to clear the selected set**

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N. Use the query "Legend by MLRA for Mapunits in Single Soil Survey Area" (MO-7,) to load a single survey legend from the overlap table and into the MLRA Soil Survey Area legend.

O. Copy the survey area map units from the above MLRA selected set to the Non-MLRA survey area.

P. Make the correlation link between the old survey area units (additional) and the new MLRA map units.

Information such as recorrelation date, recertification date for SSURGO and other information maintained in the Legend table will need to be maintained in the Non-MLRA legend until the establishment of a MLRA Soil Survey Area. A History of the surveys will be kept in the Legend text. Documentation related to changes made to individual map units will be kept in the Map Unit History table.

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Attachment 2. Example of a Long-Range MLRA Plan

9/28/07

Devils Lake SSO 5-Year Work Plan
FY 2008 - 2012

The following is a long range plan to update the soil survey within MLRA 55A and 55B. This includes parts or all of Barnes, Benson, Burke, Bottineau, Cass, Cavalier, Dickey, Eddy, Grand Forks, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Ransom, Renville, Richand, Rolette, Sargent, Sheridan, Stutsman, Towner, Traill, Walsh, Ward, and Wells County in North Dakota and Brown, Clark, Day, Marshall, McPherson, and Spink County in South Dakota.

The initial soil surveys in this resource area were completed over a period of more than 40 years at the scale 1:20,000 or 1:24,000. As a result there is inconsistency in the quality and detail of the soil survey product from county to county. During this time period concepts in soil classification, soil interpretations, and map unit design were in a state of development. In addition, technological advances have greatly improved and broadened the tools used in soil survey investigation. There is also a need to fill data gaps and provide more soils information for land owners and managers, and others interested in maintaining a sustainable soil resource. The purpose of this long range plan is to identify and prioritize the soil survey improvements needed and to ensure that soil survey information is consistent across the MLRAs, along with a seamless join between counties.

Description of MLRA 55A

MLRA 55A (Northern Black Glaciated Plains) makes up about 12,765 square miles (about 8,169,600 acres). The cities of Devils Lake, Minot, and Rugby are in this MLRA. The Red River Valley is at the eastern edge of this area and the Missouri Coteau is part of the western boundary. All of the Turtle Mountain Band of Chippewa and the northern part of the Spirit Lake Nation Indian Reservations are in this MLRA.

The Northern Black Glaciated Plains has a nearly level to steep topography. This area lies within the Great Plains province of the Interior Plains. It is characterized by a surface of nearly level to gently rolling topography that is steep on the moraines and smoother on ground moraines and outwash plains. Surficial deposits are chiefly till and outwash, but proglacial and postglacial lake sediments, colluvium, dune sand, and recent alluvium are also present. The major physiographic regions in the MLRA are outwash plain, coarse-loamy glacial till plain, fine-loamy glacial till plain, lacustrine, flood plain, colluvium, and sand plains. Elevation ranges from 1,200 feet (365 meters) to about 2,500 feet (760 meters). Maximum local relief is about 200 feet (656 meters), but relief is considerably lower in most of the area. The major watersheds in the MLRA are the Mouse River, Des Lacs River, Devils Lake Basin, and Pembina River.

This MLRA is in north-central North Dakota, high on the eastern flank of the Williston Basin. It is underlain by Paleozoic and Mesozoic rocks that dip gently to the west. The uppermost formation, the cretaceous Pierre Shale, lies directly beneath the glacial drift and crops out in the valley of the Pembina River. Glacial drift that covers the area averages about 150 feet thick, but in certain buried valleys it is as much as 400 feet thick.

The average annual precipitation in the MLRA ranges from 15 to 19 inches (380 to 485 millimeters). About half of the annual precipitation occurs as snow in winter. Most of the rainfall occurs as thunderstorms during the growing season. The average annual temperature is 37 to 39 degrees F (3 to 4 degrees C). The average frost-free period is 110 to 120 days.

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The soils have a frigid temperature regime, a udic or aquic moisture regime, and mixed or smectitic mineralogy. Well and moderately well drained Hapludolls and Natrudolls are on nearly level and undulating areas. Well drained Hapludolls are on rolling to steep areas. Somewhat poorly, poorly, and very poorly drained Epiaquolls, Endoaquolls, Argiaquolls, Natraquolls, and Calciaquolls are on level and nearly level areas and in depressions. Udipsamments and Psammaquents are on outwash plains, and sand plains.

Nearly all of MLRA 55A is in farms and ranches and about 80 percent is cropland. The cropland is used for cash crops, feed grains, and forage for cattle. Primary crops grown are wheat, barley, oats, alfalfa, and sunflower. About 20 percent of the MLRA is rangeland and some native woodland. Cropland is extensive on the level to gently rolling soils on the glacial till plain and outwash plain. Native grasses are extensive on rolling to steep areas of the glacial till plain and on soils that formed in sandy deposits on outwash plains. Native woodland occurs in Turtle Mountains and is confined to narrow bands along streams and on some floodplains.

Native areas support natural prairie vegetation characterized by western wheatgrass, needleandthread, green needlegrass, and blue grama. Little bluestem, prairie sandreed and sideoats grama are important species on shallow soils. Prairie rose, leadplant, and patches of silverberry are interspersed throughout the area. Green ash, chokecherry, and burr oak are found in some areas.

Description of MLRA 55B

MLRA 55B (Central Black Glaciated Plains) makes up about 17,155 square miles (about 10,979,200 acres). The cities of Aberdeen and Jamestown are in this MLRA. The Red River Valley and the Prairie Coteau are at the eastern edge of this area and the Missouri Coteau is part of the western boundary. Part of the Spirit Lake Nation Indian Reservation is in this MLRA.

The Central Black Glaciated Plains has a nearly level to steep topography. This area lies within the Great Plains province of the Interior Plains. It is characterized by a surface of nearly level to gently rolling topography that is steep on the moraines and smoother on ground moraines and outwash plains. Surficial deposits are chiefly till and outwash, but proglacial and postglacial lake sediments, colluvium, dune sand, and recent alluvium are also present. The major physiographic regions in the MLRA are outwash plain, coarse-loamy glacial till plain, fine-loamy glacial till plain, lacustrine, flood plain, colluvium, and sand plains. Elevation ranges from 1,000 feet (305 meters) to about 2,050 feet (625 meters). Maximum local relief is about 200 feet (656 meters), but relief is considerably lower in most of the area. The major watersheds in the MLRA are the James and Sheyenne Rivers.

This MLRA is in east-central North Dakota and north central South Dakota, high on the eastern flank of the Williston Basin. It is underlain by Paleozoic and Mesozoic rocks that dip gently to the west. The uppermost formation, the cretaceous Pierre Shale, lies directly beneath the glacial drift and crops out in the valley of the James and Sheyenne Rivers. Glacial drift that covers the area averages about 150 feet thick, but in certain buried valleys it is as much as 400 feet thick.

The average annual precipitation in the MLRA ranges from 16 to 20 inches (406 to 508 millimeters). About half of the annual precipitation occurs as snow in winter. Most of the rainfall occurs as thunderstorms during the growing season. The average annual temperature is 39 to 45 degrees F (4 to 7 degrees C). The average frost-free period is 120 to 140 days.

The soils have a frigid temperature regime, a udic or aquic moisture regime, and mixed or smectitic mineralogy. Well and moderately well drained Hapludolls and Natrudolls are on nearly level and undulating areas. Well drained Hapludolls are on rolling to steep areas. Somewhat poorly, poorly, and very poorly drained Epiaquolls, Endoaquolls, Argiaquolls, Natraquolls, and Calciaquolls are on

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level and nearly level areas and in depressions. Udipsamments and Psammaquents are on outwash plains, and sand plains.

Nearly all of MLRA 55B is in farms and ranches and about 80 percent is cropland. The cropland is used for cash crops, feed grains, and forage for cattle. Primary crops grown are wheat, barley, oats, alfalfa, and sunflower. About 20 percent of the MLRA is rangeland and some native woodland. Cropland is extensive on the level to gently rolling soils on the glacial till plain and outwash plain. Native grasses are extensive on rolling to steep areas of the glacial till plain and on soils that formed in sandy deposits on outwash plains. Native woodland occurs along major drains and is generally confined to narrow bands along streams and on some floodplains.

Native areas support natural prairie vegetation characterized by western wheatgrass, needleandthread, green needlegrass, and blue grama. Little bluestem, prairie sandreed and sideoats grama are important species on shallow soils. Prairie rose, leadplant, and patches of silverberry are interspersed throughout the area. Green ash, chokecherry, and burr oak are found in some areas.

Specifications for Work

Update work done in MLRA 55A and 55B will meet standards of the National Cooperative Soil Survey, as specified in the Soil Survey Manual and the National Soil Survey Handbook. More detailed guidance in the MO7 Soil Survey Field Guide and MO7 Database Guide will be used for specific guidance and to evaluate compliance with national standards.

The implementation of this long range plan will begin during FY 2008. The MLRA Soil Survey Project Office is located in Devils Lake, North Dakota, with a staff of one MLRA Soil Survey Leader and two soil scientists. This staff may be detailed to other locations throughout the MLRA on specific projects.

The MLRA Soil Survey Leader will hold an annual Technical Team meeting. District conservationists, RC&D coordinators, SCD representatives, and city, county, state, federal, and tribal government representatives, and other interested customers will be invited to provide input on the soil survey update. An annual update of spatial and attribute data will be posted on the Soil Data Mart after review by the MO-7 Staff. The survey area is MLRA 55A and 55B, however not all areas of the MLRAs will be field investigated. Field work will be done only in those areas necessary to carry out the objectives of the individual project plans or to field verify remotely predicted soil properties. Further specifications on field work will be available in the individual project plans.

The updated soil survey spatial data will be maintained at the scale of 1:20,000. Technological advances in GIS applications have potential to greatly influence soil survey procedures in the near future and may eventually affect map unit design, slope breaks, and use of soil survey maps. Field activities will be limited to tasks that cannot reasonably be expected to be handled remotely through GIS analysis. Some soil survey update procedures will be minimized for the present and would be supplanted by future GIS analysis (i.e., relying on GIS techniques to assist in delineating slopes versus on-site slope evaluation). Soil landscape relationships will be described in detail for later use in a landscape knowledge data base. All field data collected will be geo-referenced.

Imagery

Digital color and black and white aerial photography is available for most of the MLRAs. In addition, existing NAPP photography and other older aerial photography may be useful in identifying changes in wetness and salinity.

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Resources Needed

LiDAR imagery is needed for all of the MLRAs and if that is not feasible IFSAR imagery would be needed. Infra-Red imagery would also be very useful. Water monitoring instruments should be obtained to monitor water table fluctuations at the hydric sites.

Maintenance Projects (listed in priority order) See Appendix A for work load analysis

1. **55A, 53A, & 53B MLRA Boundary:** Burke, McHenry, Mountrail, and Ward Counties will need to have a definitive MLRA line placed. This would require the evaluation of the MLRA boundary between 55A and 53A & B. The MLRA line placement will affect the legends in both MLRAs.
   (Approximately 100,000 acres impacted)

2. **55B & 53B MLRA Boundary:** Brown, Dickey, Lamoure, McHenry, McLean, McPherson, Sheridan, Spink, Stutsman, and Ward Counties will need to have a definitive MLRA line placed. This would require the evaluation of the MLRA boundary between 55B & 53B. The MLRA line placement will affect the legends in both MLRAs.
   (Approximately 150,000 acres impacted)

3. **55B & 102A MLRA Boundary:** Clark, Day, Marshall, and Sargent Counties will need to have a definitive MLRA line placed. This would require the evaluation of the MLRA boundary between 55B & 102A. The MLRA line placement will affect the legends in both MLRAs.
   (Approximately 50,000 acres impacted)

4. **Seamless Join:** A seamless join needs to be completed between the remaining counties in the MLRAs.

5. **Official Series Descriptions:** Visit the type locations of all series which have their OSD in MLRA 55A. Describe each type location to a depth of 80 inches. Determine if a new site needs to be selected.

6. **Database maintenance:** Maintenance is needed on the present reference components to work towards more consistency within soil properties and soil materials (e.g., till, outwash, etc.). This would be done initially with predetermined important properties

7. **Lab Data Evaluation:** The present lab data needs to be evaluated and data voids identified.

8. **STATSGO:** Update the general soils map for the MLRAs
   (Approximately 8,000,000 acres impacted)

9. **Other:** Organization of existing data (e.g., computer and GIS files, research reports, county subset 30 year records, survey evaluations, etc.)

Enhancement Projects (listed in priority order)

1. **Evaluate benchmark soils:** Most evaluation and study of the soils should be started with the identified bench mark soils.

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2. **Salinity inventory:** An inventory will be done of all existing identified areas within both MLRAs. There will also be some adjustments done in the database for certain map units to better reflect the salinity of some of the components within the data map units.
   (Approximately 1,000,000 acres impacted)

3. **MLRA Legend:** The completion of the initial MLRA legends is needed and associated data base.
   (Approximately 4,000,000 acres impacted)

4. **Geochemical sampling:** Assist USGS in geochemical sampling on about 20 sites in ND

5. **Glacial till physiographic area evaluation:** Continue the concepts of creating concentrated pothole, wooded, non-wooded, and dissected map units in the remaining counties and associated data base.
   (Approximately 2,000,000 acres impacted)

6. **Study of eroded B slope glacial till map unit**: A study of this map unit is being done as needed, as well as satisfying a requirement related to a soil correlation course taken by one of the soil scientist on the soil survey update team.
   (Approximately 500,000 acres impacted)

7. **Revise soil properties, qualities, and interpretation:** The database (reference components) need to be updated using lab data and other information sources such as the geochemical sampling and other projects (e.g., Devils Lake Irrigation Project).

8. **Till plain landscape analysis model** (possibly by watershed)**:** This is an on-going project, as time permits, to create a computer model to predict soil series on specific positions on the landscape.
   (Approximately 2,000,000 acres impacted)

9. **Evaluation of PIs:** It will be evaluated to see if yield data from cooperating producers can be used. The study would be initiated on benchmark soil series.

10. **Soil quality data collection:** Data will be collected for use dependent properties as time permits.

11. **Surface textures:** Evaluate the surface textures of problem areas such as the coarse-silty lacustrine areas and adjust associated data base as needed.

12. **Special investigations:** Continue collecting and summarizing data from existing special studies (e.g., ponding, water table). Other special investigations may be initiated (e.g., study of different glacial till advances.

Other Projects (listed in priority order)

1. **Marketing the soil survey:** On-going as time permits or as opportunities arise (e.g., tech team meeting, eco-ed camps, attending SCD meetings, glacial powerpoint)

2. **Canadian Soils Data:** Collect any data from Canada that may be pertinent for use in MLRA 55A.

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MLRA manuscript: Develop a MLRA publication with general information of the area and include block diagrams of the landscapes, other pertinent diagrams, landscape and soil profile photos, general geology, etc.

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MLRA Soil Survey Leader

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State Soil Scientist

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MO Leader

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Appendix A - Part I **Devils Lake SSO (FY - 2008-2012) Work Load Analysis**

Available resources
Workdays/staff/year = 260

	MLRA Soil Survey Leader	GS 9/11	GS 5/7	Total days Per Year	Total days for 5 Years
Annual leave	26	20	13		
Holiday	10	10	10		
Training	10	15	15		
Meetings	10	10	10		
Supervision & management	50				
Days for projects (reportable)	154	205	212	571	2855
Total days	260	260	260	780	3900

2855 days available for projects divided by 15 staff years = average of 190 days per staff year
Using average of 100,000 acres per staff year
Annual goal for the project office = 300,000 acres

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Appendix A - Part II **Devils Lake SSO (FY - 2008-2012) Work Load Analysis**

Number of days/project/FY
Average reportable acres/staff year of 100,000

	2008			2009			2010			2011			2012		
	Staff Days	Staff Years	Acres	Staff Days	Staff Years	Acres	Staff Days	Staff Years	Acres	Staff Days	Staff Years	Acres	Staff Days	Staff Years	Acres
Maintenance Projects															
MLRA boundary	50	0.26	26316												
Seamless join	50	0.26	26316												
OSD (3 days each)	15	0.08	7895	15			15			15			15		
Lab data evaluation	50	0.26	26316												
STATSGO		0.00	0												
Evaluate benchmark soils	30	0.16	15789												
Salinity inventory	25	0.13	13158												
MLRA Legend	70	0.37	36842												
Glacial till plain phys area evaluation		0.00	0												
Study of eroded B slope glacial till map unit	20	0.11	10526												
Revise soil properties, qualities, & interps	70	0.37	36842												
Till plain landscape analysis model	20	0.11	10526												
Evaluation of PIs		0.00	0												
Soil Quality data collection	10	0.05	5263												
Surface texture	40	0.21	21053												
Special investigations	40	0.21	21053												
Other Projects															
Preparing work plan and work load analysis	5	0.03	2632												
Marketing the soil survey	20	0.11	10526												

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Canadian soils data		0.00	0												
MLRA manuscript		0.00	0												
Miscellaneous	55	0.29	28947												
Total	570	3.00	30000 0	15	0.00	0	15	0.00	0	15	0.00	0	15	0.00	0

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Appendix B

Soil Survey Concerns Identified at the Technical Team Meetings

1. Salinity inventory
2. MLRA Legend Development and seamless joins
3. Landscape analysis on Cropland vs. Rangeland
4. Marketing the soil survey
5. Soil Quality data collection
6. Evaluation of PIs (other crop PIs)

Appendix C

Soil Survey Concerns for MLRA 55A and 55B

Correlation Needs

I. Potential New Series

1. Non-mollic Sioux and Coe analogous to Langhei and Sisseton
2. Moderately well drained phases of Sioux and Coe
3. Shaly Divide, Marysland, and Wyrene
4. A phase of Wyard for coarse-loamy till areas
5. Series for shaly sands (e.g., shaly Hecla, Hamar, Venlo)
6. Two-story series for coarse-loamy till (e.g., Dickey, Towner, Swenoda, Lanona)
7. Colluvial soil analogous to Darnen for the coarse-loamy till
8. Other variants and out of date series

II. Classification Issues

1. Hapludoll vs Calciudoll
    - a. Binford
    - b. Brantford
    - c. Sverdrup
2. Aquic or Oxyaquic
    - a. Clontarf
3. Describe OSDs to 2 meters
4. Evaluate the use of spot symbols throughout the MLRA
5. Evaluate sandy-skeletal soils for loamy skeletal and sandy substratums
6. Evaluate the need for a fine textured Manfred
7. Out-of-date series

Soil-Landscape Issues

1. Evaluate use of upland sodium affected soils (e.g., Aberdeen) on floodplains
2. Evaluate use of Southam, Parnell, and Tonka on outwash plains
3. Evaluate use of Southam, Parnell, and Tonka on coarse loamy till plains

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4. Evaluate use of Lindaas and Perella in depressions in lacustrine areas
5. Evaluate the use and develop mapping criteria for separating drainage phases of Maddock and Hecla
6. Evaluate the use and develop mapping criteria for separating drainage phases of Dickey, Towner, and Foldahl
7. Evaluate the need for separating till and lacustrine substratums (Towner, Swenoda, etc.)
8. Evaluate well drained outwash map units such as Renshaw and Brantford for correct drainage
9. Evaluate Barnes-Hamerly map units (Towner and Rolette Counties)
10. Evaluate Barnes-Buse and Svea-Buse map units in Cavalier and other counties
11. Evaluate selected map units in Lamoure County for proper drainage
12. Evaluate high terrace map units along the Sheyenne River in Ransom County to determine if they are till or outwash
13. Evaluate Edgeley map units in Lamoure and Dickey Counties
14. Evaluate the surface texture of Walsh in the Sheyenne River Valley
15. Evaluate the use and develop mapping criteria for separating Falsen and Lohnes
16. Define relevant slope groups for specific landscapes
17. Evaluate doughnut topography (composition, hydric soils, etc.)
18. Evaluate dissected topography (composition, etc.)
19. Evaluate high density pothole landscapes (composition, hydric soils, etc.)
20. Evaluate low-relief eroded landscapes (composition)
21. Evaluate small lake plains (upland soils) on till plain
22. Evaluate use of poorly and very poorly drained lacustrine soils (Fargo, Grano) in potholes on the till plain
23. Evaluate the potential of a till substratum under lacustrine soils in Ramsey and Towner Counties
24. Evaluate use of till substratum phases of Divide, Marysland, and Wyrene
25. Evaluate wooded map units (composition, components, O horizon)
26. Evaluate fluvial systems (consistent use of channeled map units, continuity of flood plains, frequency of flooding etc.)
27. Evaluate textures and drainage (somewhat poorly) in the Sheyenne River Valley
28. Evaluate stony phases (percent surface fragments, stony areas in Barnes County)
29. Evaluate the design of sand mantled till map units
30. Evaluate the design of till-outwash map units
31. Evaluate the need for identifying various till lobes/members (shaly till, fine till)
    - evaluate the near surface stratigraphy (loam surface, clay loam parent material)
    - evaluate possible lacustrine influence on natric soils
32. Evaluate linear, esker-like surface features to determine composition
33. Evaluate the spatial distribution of sodium affected soils (relationship with depth to shale, lacustrine soils)

<u>Soil Data/Interpretation Issues</u>

1. Document saturation/water tables on sands
2. Evaluate salinity levels (Vallers, saline-Parnell, etc.)
3. Evaluate saline undifferentiated map units (Vallers and Hamerly)

4. Establish reference components for land use (range versus crop, drained versus undrained)
5. Summarize ponding duration investigation
6. Summarize hydric soil investigation
7. WSG for sandy soils
8. Determine surface textures for coarse-loamy till
9. Evaluate soil lengths for MLRA map units
10. Document PIs
11. Evaluate eco-site for Stirum

<u>Miscellaneous</u>

1. MLRA manuscript
2. Complete the development of MLRA legends
3. Complete the placement of MLRA lines on SSURGO product
4. Complete the development of a seamless (perfect) join among counties
5. Update STATSGO for MLRA 55A and 55B

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Attachment 3. Missouri's Project Evaluation Process.

Ranking Procedure

Draft 4/26/05 Ranking_Procedure.doc fjy

Rank each factor from one to three, with one being low and three being high. Determine the overall priority ranking from the Key.

A. Scientific Merit. How important is the Project for soil science and the soil resource inventory? Examples: updating or investigating taxonomic classifications; revising series concepts; updating or correcting pedon descriptions; sampling to fill data voids for series.

Score	Criteria
1	Little or no scientific merit.
2	Some merit; minor changes to benchmark soils; changes to soils of small extent, etc.
3	High merit; major advances in scientific knowledge about benchmark soils.

B. Agency Merit. How important is the Project for NRCS or DNR (Soil and Water Conservation) programs? Included here are all the Farm Bill programs, conservation planning, state cost-share including SALT projects, etc. Examples: K factors (affects HEL and CRP), hydric soils (wetlands), prime farmland issues, suitability groups.

Score	Criteria
1	Little or no effect on NRCS or DNR programs.
2	Minor or incidental effects on some properties or areas of concern to NRCS or DNR; affects one or more program in a minor way.
3	Significant revision to properties of benchmark soils used in NRCS and DNR programs, or areas of significant concern to NRCS and DNR conservation efforts; affects several programs, or has a major impact on one or more programs.

C. External Merit. How important is the Project for external customers, either government or private? Examples: soil-ELT correlations (MDC, Forest Service), productivity/suitability indexes (farmers, planners).

Score	Criteria
1	Little or no interest from external customers.
2	Some effect on soil survey users or agencies; one user group impacted.
3	Major impact on land use planning, interpretations, or agency programs or lands; more than one user group impacted.

D. Financial/Partnership Inputs. Are there inputs from other sources or partners, such as funding, staffing, equipment, or technical support?

Score	Criteria
1	Little or no partnership involvement.
2	Some commitment of staff time, equipment, and/or technical support; one partner involved.
3	Major commitment of staff time and equipment, and/or **financial support**; more than one partner involved; strong support or guidance of NRCS or DNR administration.

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E. Synergy. Does the Project serve or support another project or proposal?

Score	Criteria
1	No.
2	Some advantage to another Project.
3	Closely related to another Project; significantly improves the efficiency of both Projects.

F. County Soil Survey Deficiencies. Does the Project address deficiencies identified in the county soil survey evaluations and/or digital flags?

Score	Criteria
1	No deficiencies previously noted; affects newer surveys with 5-digit numbers.
2	Minor deficiencies are addressed; affects published surveys with mnemonic symbols (e.g., 27B, MeB).
3	Significant deficiencies in the existing soil surveys are addressed; affects “out-of-date” surveys.

G. Efficiency. How much “bang for the buck” is in this project? Evaluate, in part, on the ratio of acreage affected to time required to complete.

Score	Criteria
1	Low. Lots of work for a few acres; e.g., < 300 acres / person-day. Or, few and minor NASIS changes per person-day.
2	Moderate. Reasonable return for the labor; 300 to 1000 acres / person-day, numerous NASIS changes per person-day, etc.
3	High. Big changes with little effort; >1000 acres / person-day, major NASIS revisions per person-day, etc.

Key:

1) (G = 3);
   (D = 3) *and* (two or more of A or B or C or F = 3)
   OR
   Score = 3 on three of A, B, C, or F
   High Priority

2) (D = 1) *and* (G = 1) *and* (none = 3) *and* (composite score < 11)
   Low Priority

3) All other possibilities
   Medium Priority

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Attachment 4. Iowa's Project Evaluation Process.

Evaluation of MLRA Projects - Meeting in Waverly, IA
October 24, 2007

==

Priority Criteria to Evaluate Projects

Top 6 Priority Items score 0 to 10 points each (0 = Non-Issue)
Bottom Priority Items score 0 to 5 points each (0 = Non-Issue)

Priority	**Item**
1	Program Relevance (Subjective based on programmatic needs, rank as [1] = low importance to [10] = high importance) - Prime Farmland, FRPP, Hydric, HEL, CSP, Slope length, Yields, K, T, CRP, LESA - Information does not meet user needs [10]
2	Interpretative Issues (Differences in layer depths, restrictive features, Depth to saturated zone, Map unit composition, flooding frequency of components) - Inconsistencies between survey areas are rare [1] - Inconsistencies between survey areas are common [5] - Inconsistencies between survey areas are frequent [10]
3	Acres affected (MLRA basis) - <10,000 [2] - 10,000-30,000 [5] - 30,000-50,000 [7] - >50,000 [10]
4	Data errors/Frequency of Complaints or Appeals/Feedback - Complaints/Comments occur rarely (1 or 2 times annually) [1] - Complaints/Comments occur occasionally (2 to 5 times annually) [5] - Complaints/Comments occur frequently (>5 times annually) [10]
5	Joins/Legend Issues - Differences between states - Historical Bias - Phases (surface texture, slope, erosion, flooding, depositional, etc.)
6	Map unit kind (Phases/Variants/taxadjuncts, misc. units) - Could be classified to the series level
7	Data consistency/ NASIS data validation (Regional Consistency - i.e. Flooding Frequency) - Passes Soil Datamart Export validation [1] - Does not pass Soil Datamart Export validation [5]
8	Series Age Concept/Classification Issues - Series Control Section change - Classification/Concept change - Inactive series - Property overlap

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9	Line Placement/Landscape Model Issues (Subjective) - Identifying landforms (Stream terraces) - Mixing Biomes
10	Lab data availability/voids (Full characterization to depth of at least 150 cm) - No data available [5] - Data available from 1 or 2 pedons, with limited spatial extent [4] - Data available from 3 to 9 pedons, with moderate spatial extent [3] - Data available from 10 to 19 pedons, with wide spatial extent [2] - Data available from more than 20 pedons, with wide spatial extent [1]
11	Stakeholder Contribution/Cost Share - No interest (0) [1] - Moderate interest ($) [3] -Intense interest ($$$) [5]
12	Benchmark Status - Soil is benchmark [5] - Soil is not a benchmark [1]
13	Age of survey - More than 40 years old [5] - 30 to 39 years old [4] - 20 to 29 years old [3] - 5 to 19 years old [2] - 0 to 4 years old [1]
14	Whodunit & How (Subjective, rank as 5 = very poor quality, 4 = poor quality, 3 = somewhat okay, 2 = moderately good quality, 1 = good quality) - Project took 10 or more years to complete - Project was compilation of different age and quality of maps - Extensive use of detailees and trainees - Idiot factor

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Sample Evaluation of FY 2008 Projects

Lawler Depth Phase Analysis Project

Score	Priority	Item
3	1	Program Relevance (Subjective based on programmatic needs, rank as [1] = low importance to [10] = high importance) - Prime Farmland, FRPP, Hydric, HEL, CSP, Slope length, Yields, K, T, CRP, LESA - Information does not meet user needs **Affects crop rental rates, yield estimates for RUSLE 2**
10	2	Interpretative Issues (Differences in layer depths, restrictive features, Depth to saturated zone, Map unit composition, flooding frequency of components) - Inconsistencies between survey areas are rare [1] - Inconsistencies between survey areas are common [5] **- Inconsistencies between survey areas are frequent [10]**
10	3	Acres affected (MLRA base) - <10,000 [2] - 10,000-30,000 [5] - 30,000-50,000 [7] **- >50,000 [10] (91,240 acres in Iowa)**
1	4	Data errors/Frequency of Complaints or Appeals/Feedback **- Complaints/Comments occur rarely (1 or 2 times annually) [1]** - Complaints/Comments occur occasionally (2 to 5 times annually) [5] - Complaints/Comments occur frequently (>5 times annually) [10]
10	5	Joins/Legend Issues **- Differences between states** **- Historical Bias** **- Phases (surface texture, slope, erosion, flooding, depositional, etc.)**
0	6	Map unit kind (Phases/Variants/taxadjuncts, misc. units) - Could be classified to the series level **Non-issue**
1	7	Data consistency/ NASIS data validation (Regional Consistency - Flooding Frequency) **- Passes Soil Datamart Export validation [1]** - Does not pass Soil Datamart Export validation [5]
0	8	Series Age Concept/Classification Issues - Series Control Section change - Classification/Concept change - Inactive series - Property overlap **Non-issue**
1	9	Line Placement/Landscape Model Issues - Identifying landforms (Stream terraces) - Mixing Biomes **Spatial editing will be needed, position on landform is basically correct**

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5	10	Lab data availability/voids (Full characterization to depth of at least 150 cm) **- No data available [5]** - Data available from 1 or 2 pedons, with limited spatial extent [4] - Data available from 3 to 9 pedons, with moderate spatial extent [3] - Data available from 10 to 19 pedons, with wide spatial extent [2] - Data available from more than 20 pedons, with wide spatial extent [1]
1	11	Stakeholder Contribution/Cost Share - **No interest (0) [1]** - Moderate interest ($) [3] -Intense interest ($$$) [5]
1	12	Benchmark Status - Soil is benchmark [5] **- Soil is not a benchmark [1]**
3	13	Age of survey - More than 40 years old [5] - 30 to 39 years old [4] **- 20 to 29 years old [3]** - 5 to 19 years old [2] - 0 to 4 years old [1]
2	14	Whodunit & How (Subjective, rank as 5 = very poor quality, 4 = poor quality, 3 = somewhat okay, 2 = moderately good quality, 1 = good quality) - Project took 10 or more years to complete - Project was compilation of different age and quality of maps - Extensive use of detailees and trainees - Idiot factor
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Channeled Phase Project

Score	Priority	Item
10	1	Program Relevance (Subjective based on programmatic needs, rank as [1] = low importance to [10] = high importance) - Prime Farmland, FRPP, Hydric, HEL, CSP, Slope length, Yields, K, T, CRP, LESA - Information does not meet user needs **Affects crop rental rates, yield estimates for RUSLE 2**
10	2	Interpretative Issues (Differences in layer depths, restrictive features, Depth to saturated zone, Map unit composition, flooding frequency of components) - Inconsistencies between survey areas are rare [1] - Inconsistencies between survey areas are common [5] **- Inconsistencies between survey areas are frequent [10]**
10	3	Acres affected (MLRA base) - <10,000 [2] - 10,000-30,000 [5] - 30,000-50,000 [7] **- >50,000 [10] (57,000 acres in Iowa)**
10	4	Data errors/Frequency of Complaints or Appeals/Feedback - Complaints/Comments occur rarely (1 or 2 times annually) [1] - Complaints/Comments occur occasionally (2 to 5 times annually) [5] **- Complaints/Comments occur frequently (>5 times annually) [10]**
10	5	Joins/Legend Issues **- Differences between states** **- Historical Bias** **- Phases (surface texture, slope, erosion, flooding, depositional, etc.)**
10	6	Map unit kind (Phases/Variants/taxadjuncts, misc. units) - Could be classified to the series level **Primary purpose of project. Some miscellaneous units will be changed.**
5	7	Data consistency/ NASIS data validation (Regional Consistency - Flooding Frequency) - Passes Soil Datamart Export validation [1] - **Does not pass Soil Datamart Export validation [5]**
5	8	Series Age Concept/Classification Issues - Series Control Section change - Classification/Concept change - Inactive series - Property overlap **Map unit concept change. Land use change.**
5	9	Line Placement/Landscape Model Issues - Identifying landforms (Stream terraces) - Mixing Biomes **Spatial editing will be needed, position on landform is basically correct**

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5	10	Lab data availability/voids (Full characterization to depth of at least 150 cm) **- No data available [5]** - Data available from 1 or 2 pedons, with limited spatial extent [4] - Data available from 3 to 9 pedons, with moderate spatial extent [3] - Data available from 10 to 19 pedons, with wide spatial extent [2] - Data available from more than 20 pedons, with wide spatial extent [1]
1	11	Stakeholder Contribution/Cost Share - **No interest (0) [1]** - Moderate interest ($) [3] -Intense interest ($$$) [5]
1	12	Benchmark Status - Soil is benchmark [2] **- Soil is not a benchmark [1]**
3	13	Age of survey - More than 40 years old [5] - 30 to 39 years old [4] **- 20 to 29 years old [3]** - 5 to 19 years old [2] - 0 to 4 years old [1]
3	14	Whodunit & How (Subjective, rank as 5 = very poor quality, 4 = poor quality, 3 = somewhat okay, 2 = moderately good quality, 1 = good quality) - Project took 10 or more years to complete - Project was compilation of different age and quality of maps - Extensive use of detailees and trainees - Idiot factor
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Attachment 5. Example of a MLRA Annual Work Plan

Devils Lake SSO FY-08 Annual Work Plan
9/28/07

Summary

Maintenance projects will focus on MLRA boundaries 55/53, seamless joins, OSDs, and lab data evaluation. The main projects will be:

1. Placement of the 55/53 MLRA boundaries on map unit boundaries.

2. Continue with seamless joins between the remaining counties in the MLRAs.

3. Evaluation of about 3 OSDs within the MLRAs.

4. Evaluation of fine-loamy till plain lab data from the MLRAs.

Enhancement projects will focus on benchmark soils and properties, salinity, MLRA legend, soil quality, surface textures, and special investigations. The main projects will be:

1. Evaluate benchmark soils of the fine-loamy till plain.

2. Create an inventory of saline and potential saline areas.

3. Continue the development of the MLRA legends.

4. Study of the eroded B slope glacial till map unit.

5. Revise soil properties, qualities, and interpretation of benchmark fine-loamy till series.

6. Evaluation of LIDAR imagery in Walsh County for potential use in routine soil survey updating. LIDAR has been obtained by NRCS for potions of Walsh and surrounding counties. This digital product will be evaluated on different landscapes (e.g., till, lacustrine) to determine its effectiveness as a soil survey maintenance tool.

7. Soil Quality data collection will be initiated.

8. Initiate a study of the surface textures (loam vs. silt loam) on lacustrine map units on the till plain.

9. Continue with the special investigations of the hydric sites and ponding sites.

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Project Office Needs for 2008:

- IFSAR/LiDAR data for the rest of MLRA 55A
- Tablet
- Ten meter DEMs for project areas (specific quad names will be determined)
- GIS specialist assistance
- MO/SO assistance with characterization sampling

Work Load Analyses for 2008: see attached spread sheet

Project plans for the above projects will be developed by 11/30/07

Acres to be reported by Quarter

1st Quarter	74,000
2nd Quarter	74,000
3rd Quarter	77,000
4th Quarter	75,000
Total for FY-08	300,000

____
MLRA Soil Survey Leader

____
State Soil Scientist

____
MO Leader

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Appendix A - Part I **Devils Lake SSO Annual Work Load Analysis (FY 2008)**

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Staff of 3 at average of 100,000 acre goal each
3 x 260 days per year = 780 days per year
570 total days for projects/3 = 190 days

	Quarters (days) 1	2	3	4	Total Days	Adjust. Staff Year	Acres
Maintenance Projects							
MLRA boundaries	20	10	10	10	50	0.263	26316
Seamless join	30	5	2	13	50	0.263	26316
OSDs			10	5	15	0.079	7895
Lab data evaluation		15	15	20	50	0.263	26316
Enhancement Projects							
Evaluate benchmark soils		10	10	10	30	0.158	15789
Salinity inventory		10	15		25	0.132	13158
MLRA Legends	25	25	20		70	0.368	36842
Study of eroded B slope glacial till map unit	20				20	0.105	10526
Revise soil properties, qualities, & interps	10	30	10	20	70	0.368	36842
Till plain landscape analysis model	10			10	20	0.105	10526
Soil Quality data collection		5	5		10	0.053	5263
Surface texture			20	20	40	0.211	21053
Special investigations	10	10	10	10	40	0.211	21053
Other Projects							
Preparing work plan and work load analysis				5	5	0.026	2632
Marketing the soil survey	5	5	5	5	20	0.105	10526
Miscellaneous	10	15	15	15	55	0.289	28947
Other							
Training	10	10	10	10	40		
Meetings	7	7	8	8	30		
Supervision & management	12	14	12	12	50		
Annual leave	14	15	15	15	59		
Holidays	12	9	3	6	30		

Total per quarter	195	195	195	194	779	3	300000
Total per year				779			
Total days reportable	140	140	147	143			
Adjusted staff year	0.737	0.737	0.774	0.753			
Total reportable acres/quarter	73684	73684	77368	75263			300000

Adjusted staff years is the time spent on reportable items (project days divided by 190)
25 to 27% of our time is spent on non-reportable items

Attachment 6.

MO-7 Project Plan Review Process

11/07

Appendix A - Part II **Devils Lake SSO Annual Work Load Analysis (FY 2008)**

Acreage Goal by County

	Acres	005 Ac	009 Ac	013 Ac	019 Ac	035 Ac	049 Ac	061 Ac	063 Ac	067 Ac	069 Ac	071 Ac	075 Ac	079 Ac	095 Ac	099 Ac	101 Ac	Total Acres
Maintenance Projects																		
MLRA boundaries	26316			4000				10000									12000	26000
Seamless join	26316																	0
OSDs	7895																	0
Lab data evaluation	26316																	0
Enhancement Projects	0																	0
Evaluate benchmark soils	15789																	
Salinity inventory	13158																	0
MLRA Legends	36842			5000				2000					20000				10000	37000
Study of eroded B slope glacial till MU	10526																	0
Revise soil properties, qualities, & interps	36842																	0
Till plain landscape analysis model	10526																	0
Soil Quality data collection	5263																	0
Surface texture	21053																	0
Special investigations	21053																	0
Other Projects	0																	0
Preparing work plan & work load analysis	2632																	0
Marketing the soil survey	10526																	0
Miscellaneous	28947																	0
	300000																	63000

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Project plans can be submitted at any time; however, all project plans must be approved (signed by SSS/MO Leader) prior to claiming any acres from the project. Ideally, all project plans impacting reporting for the upcoming fiscal year would be approved prior to that fiscal year. Appropriate quality control/assurance must be completed (in most cases a report to the SSS/MO Leader) prior to reporting. It is recommended, the project plan be approved before initiating any substantial work on the project.

1. Write project plan using standard outline (see Appendix 1). Make sure to include project number, acres by subset, and quality control process. (Project numbering protocol: e.g. P07-056-01; 2007, MLRA 56, project 1)

2. Add project to MLRA Soil Survey Office Project Status Spreadsheet (see Appendix 2 as an example).

3. Create paper and electronic filing system.

4. Submit to Peer Group for review. The core Peer Group will include SO and MO personnel and adjoining MLRA SSLs. Depending on the project, other MLRA SSLs, SOs, and impacted or interested groups (NRCS ES staff, University, state agency, etc.) can be included, Request response in a reasonable timeframe (a 30 day review period is recommended).

   It is recommended to submit projects to the Project Office Shared Directory. This will give everyone read access to the documents and enable the author access to the document. Follow-up with an email informing the peer group the project plan has been submitted.

5. Review and summarize Peer Group comments. Revise project plan as appropriate. Add comments to project file. Address the reason for comments not being incorporated into the project plan.

6. Resubmit to SSS/MO Leader for approval and signature

7. SSS/MO Leader returns signed plan to MLRA SSL.

8. MLRA SSL updates Project Status Spreadsheet and files.

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Appendix A.

MO-7 NRCS-Soil Survey Staff
Project Proposal (11/07)

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Project Title: A brief, clear, specific designation of the subject of the investigation. The title should give a good indication of what the project is about. Add standard numbering protocol.

Objectives: Clear, complete, and logically arranged statement of the specific objectives or accomplishments of the project. Do not confuse this with procedures.

Justification: Present (1) the importance of the problem in relationship to NRCS or soil survey programs (i.e., soil taxonomy, interpretations, etc.), (2) the benefits for doing the project, and (3) ways in which NRCS or soil survey programs will be enhanced. Determine if the project has local or regional implications.

Background: A brief discussion of previous work (if any), related literature, knowledgeable people, setting (geology, soils, landuse, etc.), summary of your preliminary work.

Procedure: A concise statement of the essential procedures used to attain each objective. Location of work and facilities needed. How results may be incorporated into NRCS or soil survey programs may be mentioned. (For complex projects, add a detailed procedure as an appendix.)

Needs: Discuss any equipment or personnel needs e.g. Giddings probe for 1 month; Jim Doolittle for 1 week.

Duration A timetable for the project with an ending date is required for each phase of the project.

Personnel: A list of the people that would be involved in the project and their responsibilities. If known, mention the dates needed. e.g. GIS support in June; characterization sampling in August.

Other Agency or Department Involvement: A statement as to the involvement of agencies or personnel outside the state or MO NRCS soil survey staff. e.g. NDSU Soil Science involvement

End Product: A brief description of the end product e.g. A summary report and data incorporated into NASIS.

Reportable Acres: Reportable acres by subset (see example, attached)

Contact Person: Self explanatory

Signature Page: MLRA SSL, State Soil Scientist, MO-Leader

Project Title	Total Acres to be claimed in FY 2008	ND009	ND013	ND049	ND061	ND067	ND075	ND079	ND101
Completion of 55A Legend	76,000	20,000		15,000	1,000		10,000	15,000	15,000
	0								
	76,000	20,000	0	10,000	1,000	0	10,000	15,000	15,000

Appendix B. Example of a MLRA Soil Survey Plan Status Spreadsheet

MLRA Soil Survey Office:

Project Title	Project Number	Date Submitted to Peer Group	Project File Established	Date Submitted for SSS/MO Approval	Date Plan Approved	Quality Control/Assurance

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Attachment 7. Example of a Project Plan.

Evaluation of MLRA 55A Map Unit F144B

Objective

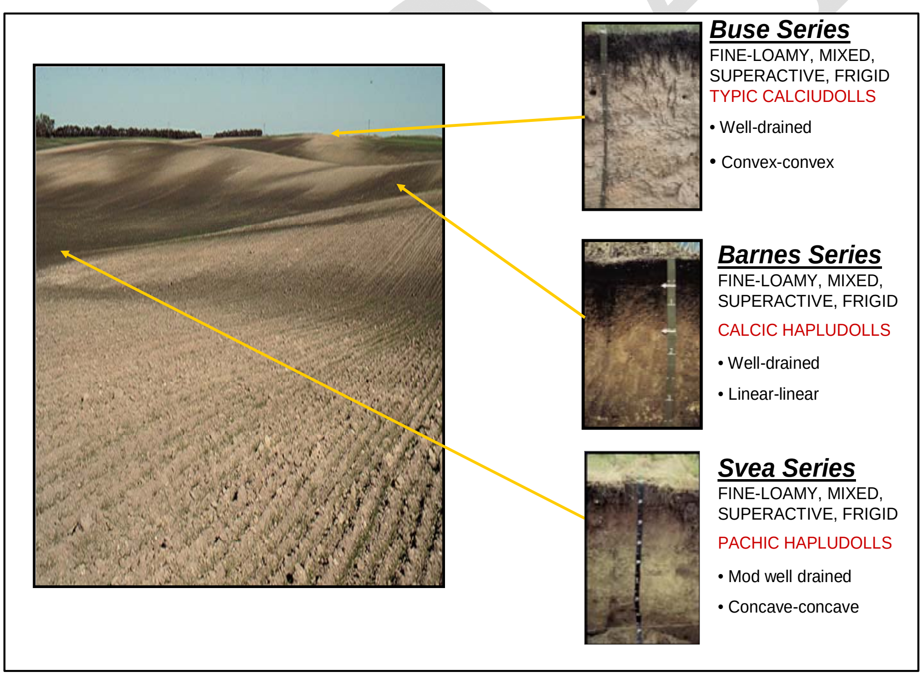
Evaluate map unit composition of eroded fine-loamy glacial till found on 3-6 percent slopes in cropland. From determined composition percentages, a map unit name will be developed and an MLRA Symbol assigned. A new map unit will potentially be correlated across MLRA 55A.

Justification and Significance

The eroded fine-loamy till landscape on 3 to 6 percent slopes is a common feature throughout MLRA 55A ***(see figure 1)***. Two map units have been used to identify this terrain in the past. These map units are Barnes-Buse 3-6% slopes and Svea-Buse 3-6% slopes. Experience in the field suggests that these two map units may not correctly represent the terrain and further study is needed.   This correlation is significant as the above map units exist in thirteen of sixteen counties in MLRA 55A. These map units encompass a total of 580,000 acres (85% on cropland) across MLRA 55A and include the Benchmark soils such as the Barnes Series and Svea Series. These soils are among the most productive in the state and are extremely important to conservation planning (e.g. RUSLE II, wind erosion). Future work will potentially include additional investigations on other map units related to the eroded study, the progression of erosion to the landscape, the impact of erosion on the North Dakota Soil Productivity Index, and the impact on MLRA 55B.

Potential Reportable Acres: 25,000 acres

Figure 1: Landscape of Barnes-Buse loams, 3-6% slopes



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Background
Anthropogenic influences, most commonly traditional cultivation practices in the last 50 years, have had a negative impact to the fine-loamy till landscapes found on 3 to 6 percent slopes located across MLRA 55A. Continuous tillage to cropland has accelerated machine, water and wind erosion and progressively altered dynamic soil properties commonly found on undisturbed landscapes. In addition to eroding the tops of rises, the deposition of calcareous material has affected the down slope portion of productive agricultural lands. Erosion has noticeably affected cropped landscapes to a point where past soil correlations may no longer be correct. An investigation on these types of landscapes and associated map units is needed in order to truly represent what is happening on the ground.

Benefits
Completion of this project will end in better identifying a soil-landscape relationship found extensively throughout MLRA 55A. Soils found on this landscape include Benchmark Soils such as the Barnes Series and Svea Series. Spatial and tabular data available to users will be updated. Updated soil interpretations for these cropped landscapes can lead to better conservation practices being implemented in MLRA 55A.

General Procedure
Locate the eroded fine-loamy till landscapes found on 3 to 6 percent slopes in cropland across MLRA 55A and identify map units used. Choose representative map units to investigate. Complete detailed transects of the eroded landscape, focusing on eroded areas and depositional areas. Select random transects to input into TRANSWIN. Determine composition percentages and develop map unit name and assign MLRA Symbol. Identify map unit trends across MLRA 55A. Correlate the map unit across MLRA 55A.

Needs
Equipment used for this project will include:

- ATV
- Bucket auger
- ArcMap GIS 9.2
- LE 1600 Tablet PC
- Transect forms
- TRANSWIN

Duration

Procedure	***Time Table***
Office Preparation & Investigation	10 days
Field Investigation	25 days
Summary of Field Work	5 days
Correlation Process	10 days
SSURGO Download of MLRA 55A	2 days
Total	**52 days**

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Personnel

Lance Duey (Soil Scientist): Conducting Field Investigation and Summary
Earnie Jensen (MLRA Soil Survey Leader): Quality Control
Joe Brennan (Soil Scientist/GIS): Assisting in GIS Applications/Use/Training
Mike Ulmer (Senior Regional Soil Scientist): Quality Assurance
County Field Offices: District Conservationists will be contacted prior to working in a county

Contact Person

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I. Office Preparation and Investigation

A. *Reviewing Existing Correlation Documentation*

1. Historical transect data will be evaluated using TRANSWIN (North Dakota NRCS Soil Transect Program)
2. Review correlation decisions of the eroded fine-loamy till, 3-6% slopes in MLRA 55A.
3. Choose map units which will be investigated during the project.

B. *Review of Spatial Data*

1. Evaluate the existing MLRA Legend, and non-updated County Legends. Choose map units to be queried using GIS ***(see chart 1)***

Chart 1: MLRA 55A Eroded B-slope Fine-loamy till Map Units

MLRA 55A Eroded B-Slope Fine-loamy till Map Units

County Symbol	***MLRA Symbol***	***Existing Correlated Map Unit Name***	***County***	***Total Acres***	***Total Acres Cropland***
118	*F144B*	*Barnes-Buse loams, 3-6% slopes*	*Towner*	*134,715*	*118,093*
11B	*F144B*	*Barnes-Buse loams, 3-6% slopes*	*Nelson*	*49,396*	*37,547*
12B *11B*	*F144B* *F154B*	*Barnes-Buse loams, 3-6% slopes* *Svea-Buse loams 3-6% slopes*	*Cavalier*	*120,058*	*107,278*
130B	*F144B*	*Barnes-Buse loams, 3-6% slopes*	*Grand Forks*	*2,006*	*1,746*
140B	*F144B*	*Barnes-Buse loams, 3-6% slopes*	*Benson*	*51,012*	*43,998*
19B	*F144B*	*Barnes-Buse loams, 3-6% slopes*	*Ramsey*	*74,840*	*64,427*
53B	*F144B*	*Barnes-Buse loams, 3-6% slopes*	*Pierce*	*2,471*	*2,308*
BkB2	*F144B*	*Barnes-Buse loams, 3-6% slopes*	*Walsh*	*41,174*	*28,256*
118		*Barnes-Buse loams, 3-6% slopes*	*Rolette*	*75,787*	*63,373*
24B		*Barnes-Buse loams, 3-6% slopes*	*McHenry*	*22,744*	*19,477*
BbB		*Barnes-Buse loams, undulating*	*Ward*	*3,210*	*2,985*
BdB		*Barnes-Buse loams, 3-6% slopes*	*Renville*	*3,023*	*2,695*
Total Acres				***580,436***	***492,183***

2. Using ArcMap GIS 9.2, query the eroded fine-loamy till map units, 3-6% slopes and develop a physiographic map of MLRA 55A ***(see figure 2)***
3. Review spatial distribution for trends such as map unit clustering and voids.
   i. Map units are heavily populated in the Eastern half of MLRA 55A because Eastern counties have had MLRA Legend updates
   ii. Map units are thinly populated in the Western half of MLRA 55A because Western counties have not been updated to a MLRA Legend

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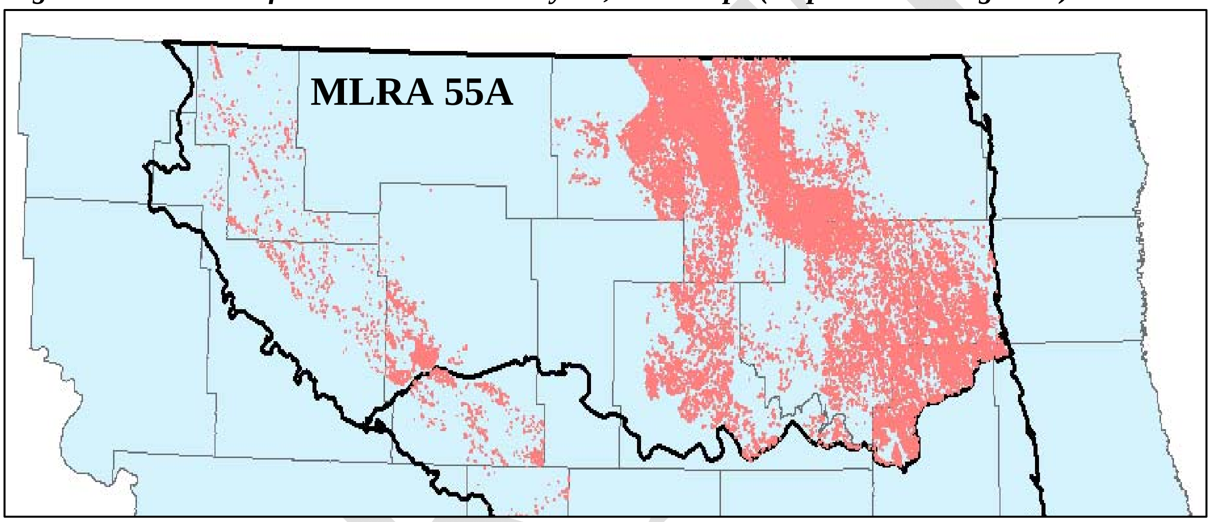
iii. Bottineau County and Pierce County are void of eroded, fine-loamy till 3 to 6 percent slope map units because Bottineau County did not recognize an eroded fine-loamy till map unit on 3 to 6 percent slopes. The eroded fine-loamy till map unit was correlated on 3 to 9 percent slopes. Additional investigation needs to be conducted in Pierce County

4. Identify map units that exist only on cropland.
5. Choose map units in cropland across MLRA 55A that correctly represent the landscape and investigate each using techniques outlined in the project plan.

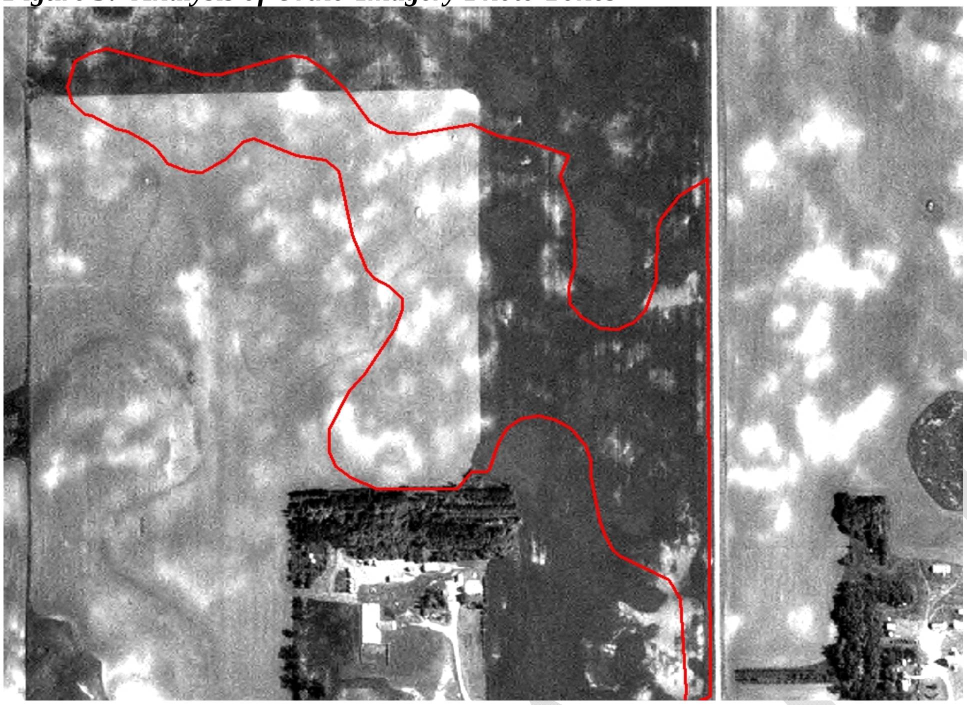
Figure 2: Locations of All Eroded Fine-loamy till, 3-6% slope (cropland and rangeland)



C. *Office Evaluation of Ortho-Imagery Photo Tones* ***(see figure 3)***

1. Analyze photo tones of selected map units and choose areas for transecting.
2. Conclude that three photo tones influence the landscape
    a. Black = Possible zones of wetness or potholes
    b. Grey tones = Possible zones of deposition and other
    c. White tones = Possible zones of erosion

Figure 3: Analysis of Ortho-Imagery Photo Tones



3. Determining Photo-Tone Coverage
   a. What percentage of the map units are white tones?
   b. What percentage of the map units are black tones?

Who: Duey, Jensen, Brennan
When: Spring 2007
Quality Control: Jensen
Quality Assurance: MO-7 Staff

II. Field Investigation

A. *Transecting* ***(see figure 4)***

1. Choose 10 representative map units and investigate black, grey, and white photo tones
2. Determine areas to transect
3. Identify soil series and record stops on TRANSWIN Field Form (MO-7 SSFG, Part D-2 Appendix B – Version 3.0 4/01)
4. Example of data collected:

- Bk depth and thickness
- Bt depth
- Bw depth
- E depth and thickness
- C depth and texture
- 2C depth and texture
- Depth to redox
- Color of redox features
- Percent redox
- Color of soil matrix
- Landscape position
- Soil Series
- Slope shape & percent
- Surface texture
- Surface carbonates depth & thickness
- Mollic epipedon thickness
- Surface carbonate thickne

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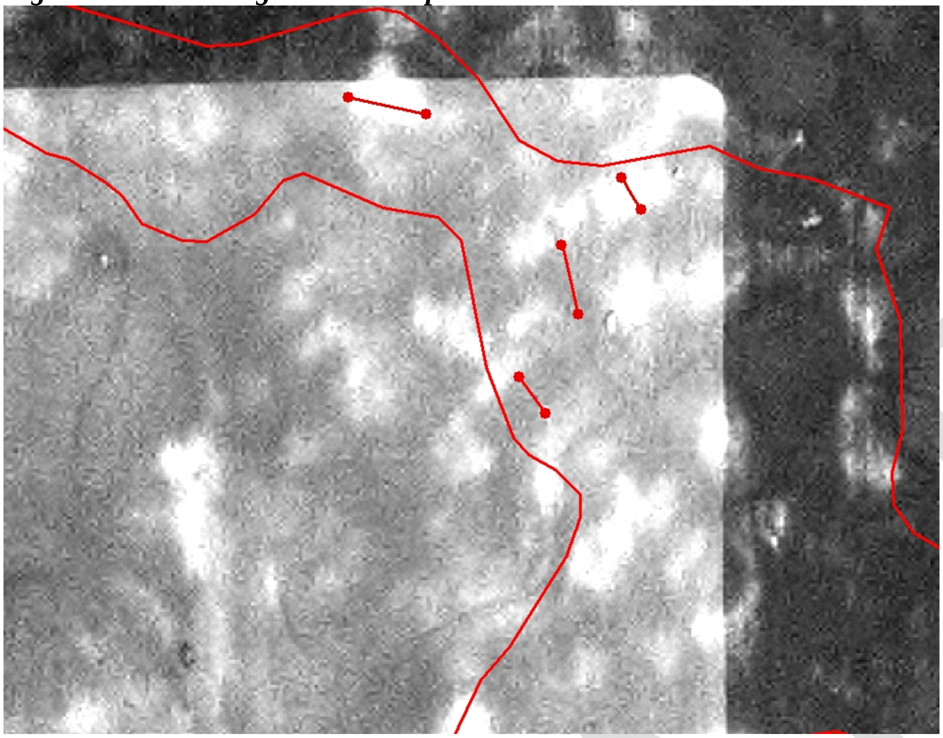
Figure 4: Transecting the Landscape



Who: Duey
When: Summer/Fall 2007, Spring 2008
Quality Control: Jensen
Quality Assurance: MO-7 Staff

III. Summary of Field Investigation

A. Review data collected in the field

1. Check for inconsistencies, patterns, and/or voids in collected data
2. Collect additional data if needed

B. Review Ortho-Imagery

1. Review transects determine if black, grey, and white areas were represented in all 10 sites.
2. Compare identified Soil Series to ortho-imagery photo tone.

Who: Duey
When: Fall 2007
Quality Control: Jensen
Quality Assurance: MO-7 Staff

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IV. Additional Field Investigation

A. Application of Transects to Photo-Tone

1. Select 20 additional sites across the MLRA and apply knowledge gained from landscape transects.
2. Using photo tone of the Ortho-imagery to identify the soil series

Who: Duey
When: Spring/Summer 2008
Quality Control: Jensen
Quality Assurance: MO-7 Staff

V. Correlation Process

A. Component Determination using TRANSWIN

1. Major Component(s)
2. Minor Component(s)

B. Assigning Map Unit Name and Symbol

1. Revise or create new Reference Components
    a. Changes to WEG (e.g., 5 changes to 4L)
2. Select a new map unit name if needed
3. Select a new MLRA Symbol if needed
4. Add the new MLRA map unit to the MLRA Legend
5. Spatially assign MLRA Symbol to counties where the eroded, fine-loamy till on 3 to 6 percent slopes landscape occur

C. Component Data will be entered in NASIS at Level II

1. Populate Data Map unit(s) at Level II
2. Validate Data Map unit(s)

Who: Duey, Jensen
When: Winter/Spring 2008-2009
Quality Control: Jensen
Quality Assurance: MO-7 Staff

VI. SSURGO Download

A. Download map unit changes to SSURGO

Who: MO-7 Staff
When: Winter 2008

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MLRA Soil Survey Leader Signature

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MO-7 Leader Signature

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