

Region 10 MLRA Office

MLRA Soil Survey—Planning and Implementation

June 2009

Prepared by the Region 10 MLRA Office Staff in consultation with other MOs

Overview

This implementation plan was developed to provide guidance to Major Land Resource Area (MLRA) Soil Survey Offices in the West Central Glaciated Region in initiating the MLRA approach to the soil survey process. The plan will help MLRA Soil Survey Offices to become permanent clearinghouses for all soil-related data in their region. The long-term management of this data is vital to the Agency. The update approach for managing soil survey information here is separated into two distinct 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 specific project plans to address soil survey concerns are outlined in this document. Enhancement of soil survey data (both spatial and tabular) is achieved *only after a thorough evaluation* of what is needed to improve the existing product. This process is ongoing and iterative. Evaluations of existing data should continue to be part of soil survey activities along with improvement of the data.

A discussion of the importance of increasing cooperator involvement and improving communication among all soil survey entities also is included in this plan. The primary guidance document for this plan is the National Soil Survey Handbook (NSSH).

The National Cooperative Soil Survey (NCSS) in Region 10 faces the unique challenge of completing the initial soil survey for millions of acres in the region (including private, tribal, state, and Federal lands) while at the same time implementing the MLRA approach. Implementation of the MLRA approach will also benefit initial soil survey activities.

Introduction

The primary purpose of this document is to provide a framework to formalize discussion, input, and feedback from State Offices (SO), MLRA Soil Survey Offices (MLRA SSOs), and cooperators regarding priorities and structure of the reorganized soil survey program in MO 10 (West Central Glaciated Region).

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 current restructuring represents a major change in management of the soil survey program and how 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. For example, instead of waiting 5 to 10 years for a survey to be published, users can see improvements in the soil survey delivered via the Soil Data Mart or Web Soil Survey in a matter of weeks or months. In MO 10, "traditional" progressive soil survey activities will also benefit from the implementation of a physiographically based (e.g., MLRAs, Common Resource Areas, Land Type Associations and

“Geo” areas) approach to collection and management of soil survey data. This approach will enable progressive delivery of soil survey information for all soil survey products. The restructured soil survey program will allow individuals to emphasize the “science” in soil survey and refocus the program on details that were missed during the “project soil survey” era.

The NRCS National Strategic Plan and the Soil Survey Division have identified the following priorities, which have a direct impact on the soil survey program in our region:

- Enhance the Web Soil Survey (a continual process)
- Implement new technology
- Increase outreach and marketing
- Soil quality/health, dynamic soil properties, and soil ecosystem relationships
- Support erosion models, water quality models, and other models that use soil information
- Watershed approach (provide soils information to enable conservation on a watershed scale)
- Cooperative Conservation (increased cooperation and collaboration with partners)

Addressing these activities will help us meet the 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, the MLRA SSOs, and the 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 the responsibility for quality assurance remains with the MO, some of the correlation functions will now be retained at the field level within the MLRA SSO (see NSSH 609.01).¹ The MO views the MLRA SSOs as partners in achieving the final goal of delivering an accurate, reliable product to the Soil Data Mart. The MO will assist the MLRA SSOs in delivering a high quality final product in an efficient manner.

The MO role is evolving into one that supports the MLRA SSOs by:

- providing quality assurance through review of MLRA SSO plans, operations, products, and accomplishments
- developing processes and providing training and technical assistance
- providing assistance and expertise in developing MLRA long-range and project plans
- providing assistance and expertise in designing and completing projects
- coordinating projects and issues among MLRAs by facilitating meetings (e.g., committee meeting to resolve the use of phase terms among MLRAs)
- maintaining National Soil Information System (NASIS) data integrity
- implementing standards in legend management, data population, map unit naming conventions, and other issues
- providing editorial assistance in publications, open record files, etc.
- providing a clearinghouse for technical data (e.g., directory of PowerPoint presentations, photographs)
- providing coordination with the National Soil Survey Laboratory and assisting the field with planning and conducting investigations

¹ http://www.mo10.nrcs.usda.gov/restructuring/Documents/Map_unit_Correlation_flow.pdf

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, state, and Federal agencies in our program. As an important first step, MLRA SSOs should assemble a Technical Team and have regular communication to solicit cooperators' input and determine survey priorities. The MLRA SSOs should strive to reach out to all soil survey users, including new and nontraditional customers, to solicit their input on soil survey activities. Technical Teams should consider developing a customer survey to identify "user-driven" projects. MLRA projects must be designed to meet the needs of the users of soil survey information. Projects that are not geared towards user needs should be given low priority.

Through the course of the progressive soil survey program, soil scientists have collected 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. As a result, many soil scientists are not aware of technology advances or data collection projects that could improve their operations. 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 technical seminars, workshops, net meetings, and teleconferences. For example, MO 10 plans to schedule a series of net meetings to provide training on MLRA data management, Official Series Description (OSD) processes, and other subjects. Regular teleconferences with the MLRA Management Teams also are planned. 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.

For the purposes of this document, the restructured soil survey program can generally be broken into two broad phases:

1. **Evaluation and Maintenance** of our current spatial and property database; and
2. **Enhancement** of our survey for future users.

Although much of our emphasis recently has been focused on the use of new technologies to improve our soil survey, evaluation, maintenance, and enhancement should be viewed concurrently. *Initially, over half of a project office's time should be spent maintaining and evaluating our current soil survey product.* The restructuring of the soil survey program was approved based on its being a most efficient organization. The initial evaluation phase of all information in an MLRA related to soils, landforms, geology, ecological sites, and other considerations is the key to building the roadmap for the future. 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 specific project plans along with appropriate workload analyses.

Phase I: Evaluation and Maintenance of Existing Soil Surveys "A Seven-Step Process"

This phase of the update soil survey program focuses on evaluating the status of our current survey (NSSH 610.03), 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 (NSSH Part 630), OSD revisions², taxonomy review, NASIS legend management³, soil properties, and organization of existing data.

Evaluation and Maintenance Step One: The Initial Evaluation (NSSH 610.02)

A. The Legend

Our current subset legends were developed over two generations of county soil survey correlations. As a result, there are inconsistencies in naming similar landscapes in adjacent surveys. Many inconsistencies in these legends can be resolved with a comprehensive review of MLRA subset legends. Managing legends in NASIS contributes to the overall goal of providing a seamless, high quality soil survey geographic database (SSURGO) for the nation. The MLRA soil survey area is the geographic area chosen as the basis for managing, updating, and upgrading soil survey information.

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” that will later be prioritized and addressed via project plans.

Other examples of legend issues needing evaluation include:

- a) use of series that are out of date or have had classification changes (e.g., Marshall and Nishna series)
- b) series that have had conceptual changes (e.g., change in depth of series control section)
- c) assigning soil series to specific landscapes (e.g., the Lagonda “SoLIM and GIS landform and slope modeling” project)
- d) undifferentiated map units that could be converted to better interpretive map units
- e) establishing new series vs. phasing existing series
- f) consistent use of miscellaneous areas (e.g., some miscellaneous land types are no longer approved/used)
- g) historically inconsistent use of the eroded phase
- h) consistent use of conventional and ad hoc symbols
- i) consistent use of slope groups within an MLRA (do not “lock into” historic slope classes; instead use field-measured slopes)
- j) consistent use of map unit symbols
- k) documentation of all changes in NASIS (use the Map Unit History and Legend Correlation tables in NASIS) and the Laboratory Information Management System (LIMS) by organizing all lab data

² <http://www.mo10.nrcs.usda.gov/references/osdguides/editingosds.pdf>

³ http://www.mo10.nrcs.usda.gov/restructuring/Documents/DMU_and_Legend_Management.pdf

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 criteria for similar soils were used or because new series were established since the correlation of one of the counties. The number of components in a data mapunit (DMU) also needs to be evaluated. Care should be taken not to add redundant components to the map unit that do not improve the map unit's interpretive capability. Consistent criteria for similar soils will need to be established by MLRA. Proper consideration of similar/dissimilar soils will often reduce the number of necessary components in a DMU to a manageable number (i.e., 3 to 6). The MO 10 similar/dissimilar guide is designed to be modified to fit an MLRA.⁴ Population of data for all components in a data mapunit should be undertaken as part of the MLRA long-range plan.

The MLRA Legend. The MLRA soil survey area is the geographic area chosen as the basis for managing, updating, and upgrading soil survey information. The soil survey legend is a tool for the MLRA Soil Survey Office Leader to use in evaluating, managing, correlating, updating, and upgrading the soil survey information within the geographic area of responsibility (NSSH 610.05). The MO supports the evaluation of all map units that have been used in an MLRA. Development of an MLRA-wide legend can provide a snapshot of the MLRA and can also provide the framework for a comprehensive subset legend evaluation. An MLRA-wide legend will promote consistency in map unit naming and symbolization among counties and states. MLRA legends will enhance multi-county analyses for watersheds, common resource areas, etc., and will improve 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" by developing legends for these areas and then aggregating them into a composite MLRA legend is a one method for developing MLRA legends.

NASIS 6.0 will enable easier management of one map unit and linking it to many subsets. The new Map Unit Object will likely be the methodology that enables a soil scientist to manage the soil properties and qualities data one time, assuring that consistent data can be delivered to the soil data mart.

The MO also supports facilitating consistent naming conventions within and among MLRAs (NSSH 627.05).

Most routine correlation amendments will be managed via populating the database with the map unit history notes and running the appropriate reports.

B. Soil Geography

⁴ <http://www.mo10.nrcs.usda.gov/references/documents/simdiss7.doc>

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 that this review be done by physiographic area. MO 10 believes that the first step in laying the foundation for the seamless soil survey is to evaluate, develop, manage/maintain, and enhance soil survey information by smaller physiographic regions within an MLRA.

C. Cultural and Ad Hoc Symbols

It is recommended that each MLRA SSO evaluate the 37A for each subset (SSURGO and published) and that 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, and other issues.⁵

D. Spatial Data

Our SSURGO-certified soil survey is an established product that has specific development protocols. *The MO discourages any project that emphasizes the revision of SSURGO using traditional survey procedures* (i.e., re-mapping). 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 that have serious problems with the existing mapping (e.g., watershed project). Any project requiring extensive line change should have MO review and the appropriate State Soil Scientist (SSS) approval. *Approval for extensive revision must be obtained from the Director of the Soil Survey Division.*

The MO concurs with the NSSH (NSSH 609.03) 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 DMUs along subset boundaries. This perfect join may require substantial field and database work. However, during the interim, improving the join by any means possible (matching line work, revising map unit names, or utilizing similar component properties) is encouraged as a first step. An improved join would enhance GIS products and reduce interpretive discrepancies among subsets. Improving the join by “any means possible” may require field verified data before many re-correlation decisions can be made. Creating this join is a continuation of the legend evaluation process and may identify issues needing further evaluation (i.e., Soil Survey Concerns list). Soil Survey Leaders are expected to fully explore all methods to achieve an exact join (see NSSH Exhibit 609-2) or, if an exact join is not achieved, to provide adequate documentation regarding the reasons as part of their quality control responsibilities. The MLRA Region 10 Office will examine this documentation as part of its quality assurance activities.

⁵ http://www.mo10.nrcs.usda.gov/restructuring/Documents/MO10_37A.pdf

E. Evaluation of SSURGO Developed From Topographic Base Maps (no photo image)

In the initial development of SSURGO for subsets in the late 1990s, a limited number of counties lacked orthophoto coverage. Topographic maps were used as a base map in lieu of a photo image base. The MO recommends that MLRA SSOs evaluate the line work of these SSURGO subsets and make appropriate recommendations as potential projects.

Evaluation and Maintenance Step Two: The Benchmark Soil Review

The 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 list of benchmark soils.⁶ The NCSS Newsletter (issue 41, page 7⁷) has an excellent discussion of benchmark soil evaluation written by David Hammer. Most evaluations will extend the concept of benchmark soils to the landscape catena and will include comprehensive data mining to compile information related to the benchmark and associated soils.

The MO recommends that each MLRA SSO evaluate its 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” (DCI) as described by Tom Reedy and others (Reedy, Reinsch, and Waltman) and soil-landform correlations as described by David Hammer. The benchmark soils list will be managed by the MLRA SSO and coordinated by the MO on an MLRA basis; the SSS (and others) can suggest revisions to the list. As of this draft (June 2009), a NCSS sub-committee on Benchmark Soils has proposed changes to the Benchmark Soils section (630) of the NSSH. Check the NSSH for more up-to-date guidance.

Evaluation and Maintenance Step Three: Review of The Official Series Descriptions (OSDs)

The revision and maintenance of OSDs is now 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 ongoing MLRA work. Each MLRA SSO should develop an OSD maintenance plan as part of the long-range plan. This plan should include the review of a specific number of series annually. MO 10 will assign series responsibility to individual MLRA SSOs. The OSD workload can be surprisingly time-consuming. MLRASS Leaders and their Supervisors will need to incorporate this workload into their plans-of-operation.

⁶ http://www.mo10.nrcs.usda.gov/restructuring/Documents/SSS_2005_Benchmark_Soils.pdf

⁷ <http://www.mo10.nrcs.usda.gov/restructuring/Documents/issue41.pdf>

At a minimum, the following items should be addressed (see NSSH 614.06 for additional guidance):

- a) determine whether 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 the distribution and extent
- g) review the type location to ensure that it is properly located and is a major component
- h) review remarks section; add statements concerning any diagnostic features
- i) update to 2 meters (if possible)
- j) convert to metric

The national OSD Check Program will be installed and used 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 or 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 “Series History” file.
- c) MO submits the OSD file to the national Soil Classification File and maintains the “Series History” file locally.

At this time the MO will continue to maintain the OSD and OSD history files. These files can be checked out by MLRA 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, an MO-wide decision needs to be made about the amount of soil property information that will be included and maintained in the OSD (vs. maintained in NASIS).⁸

The MO supports a review of existing data, and data population effort for Ecological Site Descriptions be included as part of the OSD update and revision process. The development of Ecological Site Descriptions should be part of the MLRA SS Offices long-range plan.

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

Evaluation and Maintenance Step Four: Applying Soil Taxonomy

MLRA Soil Survey Offices have the responsibility for evaluating soil taxonomy. We realize that soil taxonomy is fairly stable in the Region; however, MLRA SSOs need to identify any issues

⁸ <http://www.mo10.nrcs.usda.gov/references/osdguides/editingosds.pdf>

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 change in soils
 - erosion
 - mine-land reclamation
 - drainage
 - urban land
 - cut-and-fill
- b) CEC activity class
- c) soil moisture and temperature regimes
- d) horizon criteria, including the usefulness of subgroups
- e) use of Pachic and Cumulic subgroups of Mollisols
- f) mineralogy classes (e.g., isotic vs. mixed)

Evaluation and Maintenance Step Five: The Database

Database activities have been separated into two distinct categories:

1. Integrity and management of site and legend objects, and
2. Properties and interpretations (the update of soil property and interpretive data).

Two articles concerning NASIS were recently published in *Soil Survey Horizons* by David Livingston (2006)⁹ and Sam Indorante (2007)¹⁰. These articles bring up considerations about the long-term maintenance of NASIS and are recommended reading for all soil scientists.

A. Integrity and Management of Site and Legend Objects

Management of NASIS **MUST be coordinated** with state database 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 from 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, MLRA SSOs managing an MLRA Legend **must** populate and maintain a set of non-MLRA soil survey area overlap tables under the MLRA legend.

⁹ http://www.mo10.nrcs.usda.gov/restructuring/Documents/Truthiness_and_NASIS.pdf

¹⁰ http://www.mo10.nrcs.usda.gov/restructuring/Documents/Foundational_Soil_Survey_Data.pdf

- d) Management of MLRA 102A East—A joint MO 7/10 plan needs to be developed that documents the separation of 102A East from 102A West, and these changes need to be incorporated into NASIS.
- e) Other MLRAs that were split for the reorganization include 57, 88, 90A, 90B, and 91A. Joint plans will need to be developed by the MLRA offices with these geographic responsibilities.
- f) report-writing assistance
- g) site data/site data quality—The MO recommends that 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 (e.g., duplicate pedons entered, data transcription errors).
- h) track changes to the database—Implement a system to track changes to the database
- i) automate the population of side records—Several stand-alone datasets exist that need to be updated with changes in NASIS. Methods of updating these datasets automatically will be evaluated.

B. Database—Properties, Qualities, and Interpretations

The preliminary objective in data evaluation and maintenance is maintaining our existing data, improving consistency among similar soils, and eliminating discrepancies between adjacent counties. Projects to enhance the database 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 qualities and interpretations. Modal pedons selected to represent both major and minor components in DMUs need review to ensure that they represent the component in that specific map unit and/or landscape.

For example:

Significantly different typical pedons may have been selected in adjacent counties for a component on similar landscapes/landforms (e.g., modal pedons might have depth to gravel of 38 inches in one county and 42 inches in an adjacent county on the same terrace landform). The selection of typical pedons that “cross” interpretive criteria may result in discrepancies for T and other values important to the implementation of conservation programs.

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 series on ground moraines and end moraines). In many cases, this review can be combined with evaluation of the OSDs (see above).

There is a concern about interpretations presently being run on the “thickest” layer versus the 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 differences, such as color change).

- b) Soil property data in DMUs that meet the minimum data requirements of National Bulletin 435-5-7 can be certified. **Any DMUs that do not meet the minimum data requirements need to be populated completely as per the National Bulletin.** There are inconsistencies in data population standards, guides, use of calculations, data validations, etc. The MO recommends that the next step in data population involve evaluation of population standards throughout the MLRAs. The MO will continue to develop and update data population guides on the MO 10 Web site.¹¹

Better data population of primary soil properties will lead to better interpretations for 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:

o The MO will work with MLRA SSOs to evaluate standard calculations and algorithms and make recommendations for their use (e.g., populate CEC from algorithm vs. criteria).

o Existing data guides will be reviewed and summarized (e.g., AWC reduction for salinity and stones; K factor guides). A formal revision and distribution procedure will be developed, and the MO will continue to update and revise its Web page to provide easy access to all guides, criteria, and other such documents.¹²

o Data population criteria will be evaluated to facilitate population of:

- Organic horizons
- Cd, Cr, and R horizons / layers
- Miscellaneous land types
- AWC (recently updated for sandy materials)
- Other

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

- Land capability class
- Ecological sites
- Forage suitability groups
- Important farmland and prime farmland
- Productivity indexes
- Other

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

¹¹ <http://www.mo10.nrcs.usda.gov/references/>

¹² <http://www.mo10.nrcs.usda.gov/references/>

Work is being done on the national level to facilitate quality control of SSURGO downloads.

Evaluation and Maintenance Step Six: Organization of Existing Data

The establishment of MLRA SSOs in the restructured soil survey program has created the opportunity for these offices to become clearinghouses for all soil survey information for their assigned MLRAs. The result should be the consolidation and compilation of soil survey data that are 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 that data libraries be established for:

- County subset 30-year records
- Map unit transects and notes
- Series descriptions
- OSD files
- Survey evaluations
- Laboratory data (NSSL, universities, state highway departments, etc.)
- Water table data
- Old soil survey reports
- Photographs
- Geology reports
- Research reports
- Other

It is important to maintain an effective record-keeping system. MLRA SSOs will become permanent locations and will need to archive files for future reference. Record-keeping systems will need to correspond to the Records Guide GM-120-408¹³. Applicable historic records (e.g., historic correlation documents, OSD files) located in the MO will be scanned and electronically delivered to each MLRA office.

Evaluation and Maintenance Step Seven: Our Family of Maps—GIS Applications

Along with compiling existing hard copy data, an inventory of existing digital/GIS data will be essential for these new survey offices. The MO, in cooperation with the NCGC, will provide a digital “basic cartographic set” that includes SSURGO, roads, hydrography, geology, and other data layers. MO 10 strongly recommends that each MLRA SSO query GIS sources to develop an inventory of existing data, such as ground water, aquifers, land use, geology, STATSGO, and lab data locations. Because digital data files can be large, many SOs have developed protocols for storage. It is important that a formal structure is used so that data can be easily accessed, updated, and protected.

¹³ <http://policy.nrcs.usda.gov/RollupViewer.aspx?hid=17003>

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 erosion and water erosion
- major soils
- aquifers
- drought potential

The MO is developing region-wide resource maps that will help each MLRA to consider the “bigger picture” on such issues as soil moisture and temperature, physiography, and geology.

Phase II: Soil Survey Enhancement

“A Six-Step Process”

Soil Survey Enhancement Step One: The 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 by 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. “Quality up front” is our goal; effective communication and proper strategic planning will enable efficient quality control and quality assurance in the future.

The soil survey update planning process, as outlined in the NSSH, consists of the long-range, annual, and specific project plans. MO 10 would like to add an MLRA SSO annual status report that would summarize achievements for the year and be a focal point for feedback, for quality assurance activities, and for preparing an annual “state of the MO” report for the Board of Directors. All of these documents contribute to 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 that is 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 single MLRA SSO for 5 years, well designed and documented work plans would seem to be essential.*

A. Long-Range Plan

The long-range plan should address activities in the MLRA SSO for a minimum period of 5 years. Many MLRA plans originate with a list of soil survey concerns in an MLRA; these issues may take decades to complete. The initial long-range plan may actually be a 20- to 30-year plan that will require periodic updates throughout the years. The plan 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 the SSO through the evaluation process completed in Phase I. Survey concerns should be sorted by topic (e.g., correlation needs, classification needs, database issues, and landscape issues). The soil survey concern list is a

dynamic document that will be revised as update work progresses. See NSSH Part 608 Exhibit 608-8.¹⁴

The long-range plan should also include a general workload analysis that briefly describes how staff time will be allocated. The long-range plan should be approved and signed by the MLRA Management Team. The plan should be updated annually and submitted to the appropriate supervisor by early September.

B. Specific Project Plans (See NSSH Part 608 Exhibit 5)

Project plans discuss a project in detail, including objectives, time frame, reportable items, and deliverable, measurable products. All project plans should be peer reviewed and approved by the MLRA Management Team. 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 must include provisions for quality control and quality assurance. Project plans need to be approved and signed by the MLRA Management Team. They may be submitted at any time.

The MO 10 Project Proposal Template¹⁵ outlines a recommended process for developing and revising a project plan. It includes a template for developing project plans. Examples of completed project plans are included¹⁶. Some projects will lend themselves to publications, such as *Soil Survey Horizons* and the NSSC newsletter, or to oral or poster presentations at professional meetings. Where appropriate, the MO recommends that project plans be implemented with publication as a consideration. Senior employees at the MO 10 office have experience as Editors and reviewers for *Soil Survey Horizons*, *Wetlands*, and the *Soil Science Society of America Journal*. Personnel at the NSSC are also willing to help work on scientific documents.

Prioritizing Projects. Although seemingly straightforward, prioritizing projects is a delicate balancing of local concerns with national, state, and regional issues. The objective is to create an efficient survey program by “weaving” together a variety of projects with various time frames that will efficiently utilize SSO staff, account for adverse weather, and allow the reporting of annual accomplishments.

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

The soil survey concerns list, developed in the evaluation phase of the update, along with input from Technical Team meetings and cooperators, will help to determine local priorities. These local issues will be merged with national office priorities and 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. The State Soil Scientist and MO Leader (i.e., the MLRA Management

¹⁴ http://www.mo10.nrcs.usda.gov/restructuring/Documents/Long_Range_Plan_Example.pdf

¹⁵ <http://www.mo10.nrcs.usda.gov/restructuring/Documents/ProjectProposalTemplate.pdf>

¹⁶ http://www.mo10.nrcs.usda.gov/restructuring/Documents/FINAL_MLRA133B_SW_BusinessPlan_2008.pdf
http://www.mo10.nrcs.usda.gov/restructuring/Documents/MLRA55A_Eroded_Project_Plan5.pdf

Team) should approve the issues included in the soil survey long-range plan. These priorities will then be presented to the regional Board of Directors for review and comment.

Many states have developed criteria for ranking update and maintenance work. The current Missouri approach is to numerically rank projects based on the following criteria:

- Scientific merit
- External merit
- Internal merit
- Financial/partnership inputs
- Efficiency
- County soil survey deficiencies

See ¹⁷ for examples of project ranking processes. There is merit in implementing some type of process to evaluate the need and importance of individual projects, especially projects that will require substantial resources. MLRA SSOs are urged to review these ranking procedures to ensure that they are addressing important issues. MLRA project rankings will be peer reviewed as an additional component of the ranking procedure. Any ranking process used should be MLRA specific and include input from all involved parties irrespective of political subdivisions.

Some projects, such as evaluating dynamic soil properties, may be broader than individual MLRAs and may originate at National Headquarters or state offices.

C. The Annual Plan (See NSSH Part 608 Exhibit 608-11)

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 analysis that details 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.¹⁸

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 and to prepare an annual report for the Board of Directors. These reports should be submitted to the SSS and/or MLRA Leader by the end of December.

Soil Survey Enhancement Step Two: Revising Spatial Data

¹⁷ http://www.mo10.nrcs.usda.gov/restructuring/Documents/NSSH_608_4.pdf
http://www.mo10.nrcs.usda.gov/restructuring/Documents/MLRA_10_7_Project_Evaluation.pdf

¹⁸ http://www.mo10.nrcs.usda.gov/restructuring/Documents/NSSH_608_6.pdf

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 and the Director of the Soil Survey Division.*** GIS-assisted editing relies on the use of simple GIS tools (ArcMap) to display SSURGO, DEMs, and other data to assist in implementing map unit design changes.

For example, GIS-assisted mapping has been used to:

- separate slope breaks (e.g., separate one unit with slopes of 6 to 15 percent into units having slopes of 6 to 9 percent and 9 to 15 percent)
- delineate eroded, wooded, and dissected areas
- delineate consistent fluvial units between subsets (flooding duration and frequency).

Sophisticated soil-landscape modeling is the probable future of any terrain analyses, including soil survey. The implementation of this technology can be considered the third 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. MLRA SSOs are encouraged to contact local university natural resource departments to investigate soil-landscape modeling for geographic areas in their MLRAs.

Soil Survey Enhancement Step Three: Revising Existing Soil Properties, Qualities, and 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 analysis and understanding specific property variance.

For example, assigning confidence levels to our Ksat values may persuade designers of septic systems to consider other alternatives. The evaluation of data elements should be prioritized by importance, as was done in Kansas in identifying the “Magnificent 7” data elements (OM, pH, CEC, AWC, PSA, bulk density, 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. The results of those important evaluations will be used to prioritize field data collection and laboratory analysis.

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 be initiated on benchmark soils or suites of similar soils (benchmark landscapes).

Soil Survey Enhancement Step Four: 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. NRCS Soil Quality Specialists are developing multi-state plans to implement the collection of dynamic soil properties and geochemical data into routine soil survey.

Soil Survey Enhancement Step Five: New Interpretations

Several recommendations for new or revised interpretations are being considered in the region. Although soil interpretations are a state function, MO 10 can serve as a communication clearinghouse in an attempt to develop regional interpretations whenever possible. MLRA SSOs will be requested to assist in testing any new or revised reports. Examples include ecological sites, compaction rating for mining and forestry, animal waste, septic systems, Ksat calculations, and wildlife.

Step Six: Miscellaneous Issues

Several miscellaneous issues need additional consideration:

1. Managing and revising STATSGO/USGSM
2. Effective outreach and marketing
3. 01 activities
4. Training new soil scientists, mapping details
5. Sharing job aids
6. Establishing long-term monitoring sites
7. MO business plan (annual)

####END###