Soil Change Guide: Procedures for Soil Survey and Resource Inventory

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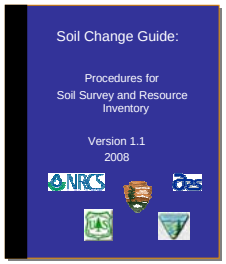
Producers and land managers need information about soil and ecosystem change in order to plan for long-term productivity, conduct monitoring and assessments and predict management effects on soil function. Data collection procedures have been developed by NRCS and the Agricultural Research Service Jornada Experimental Range in cooperation with National Park Service, Forest Service and Bureau of Land Management. The dynamic soil property procedures for soil survey updates are described in this poster. Procedures tested and developed during four pilot projects: Big Bend NP, TX (2003, 2004), Arches NP, Utah (2005), Springfield Plateau, Missouri (2006), and Northern Idaho (2007).



The Guide

- For soil survey updates.
- Provides instructions to conduct comparison studies.
- Integrates soil and vegetation data collection.
- Emphasizes functionally important properties, field methods and efficiency.

Purpose of a Comparison Study: ***To measure dynamic soil properties for two or more management systems (state phases) at or near study state conditions and interpret how the changes and departure from inherent or reference conditions affect soil function, resilience and sustainability.***

Perennial grass/shrub community (Reference state phase)

Annual grass (cheatgrass) invaded community

Six Project Steps

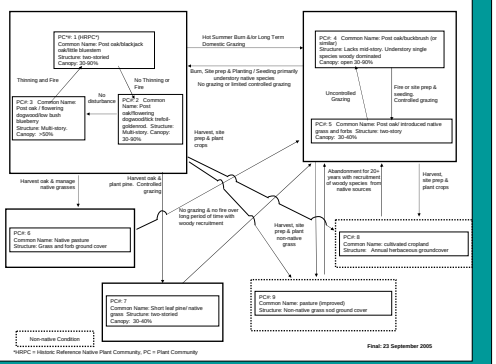
Step 1. Project Planning

Establish project objectives; invite cooperators; select soils and ecological sites or crop management zones to sample.

Step 2. Sampling Design

Establish project details, including 1) selected management systems (2 or 3 state phases from a conceptual model, Figure 1) and soil map unit components to be compared and 2) soil and vegetation properties to be measured.

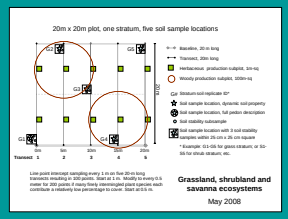
Figure 1. Missouri Ecological Site-Upland Flatwoods (common name):
Post oak/blackjack oak/little bluestem
Distribution: Ozark Highlands Section - Springfield Plain and Central Plateau subsections

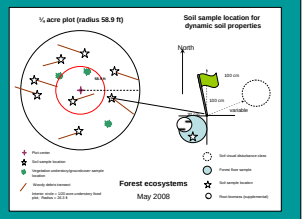


State and transition model prepared by Doug Wallace, Jim Robinson, Bruce Wight, and Mark Kennedy for the Missouri Pilot.

Step 3. Sampling Requirements

Determine 1) plot configuration based on standard methods for vegetation. and 2) number of plots and soil samples per plot that are required to detect functionally important differences.

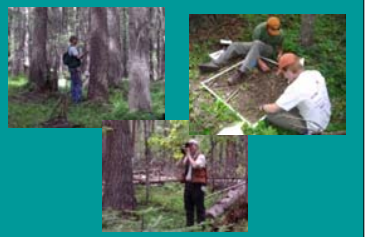




Step 4. Field Work

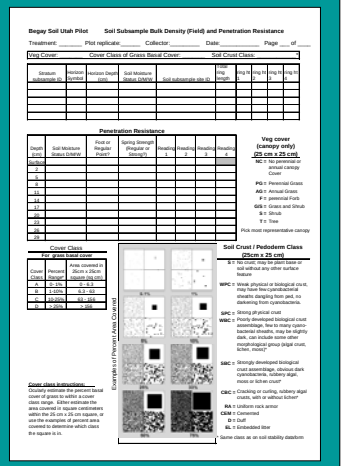
Locate plots (minimum of 5 per management system); verify soil and state phase or management system; collect data and management information.

Vegetation measures (forest examples)



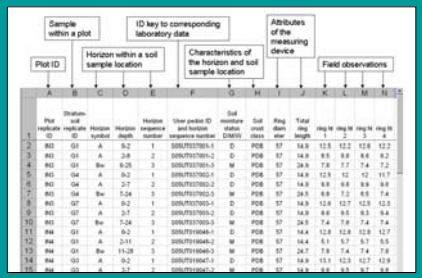
Minimum data set (dynamic soil properties)

- Organic carbon
- pH
- EC
- Bulk density/soil porosity
- Structure and macropores
- Aggregate stability
- Total N (for C:N ratio
- Soil aggregate stability (field)



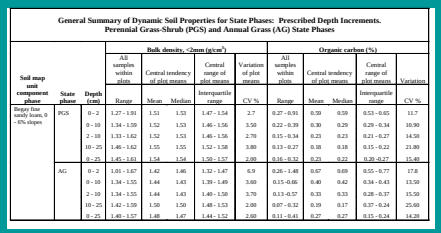
Step 5. Data Preparation

Enter and error check field data (interim storage in spreadsheet or database); merge field and laboratory data; make calculations.

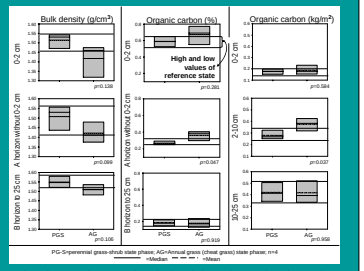


Step 6. Data Analysis and Reports

Summarize and evaluate the data; evaluate sampling sufficiency; test for differences using statistical tests; develop reports.



Horizontal lines across each chart (marked by a bracket and arrow) represent high (maximum) and low (minimum) plot means of the reference state phase. The upper and lower values of the shaded box represent the central range of values (75th and 25th quartiles).



The box plot at the left side of each chart is the reference state phase.

Getting ready to conduct projects in your MLRA Soil Survey Area

Dynamic soil property data will be collected in soil survey updates and benchmark soil studies. Strategic preparation will ensure efficiency and lower costs. Work with other disciplines and cooperators to get ready:

1. Identify resource issues related to management-induced changes in soil properties.
2. Update benchmark soil lists and identify benchmark ecological sites to help set priorities for projects.
3. Add comparison studies to MLRA soil survey long-range plans.
4. Get training in soil change and comparison studies (Soil Quality will be a prerequisite).