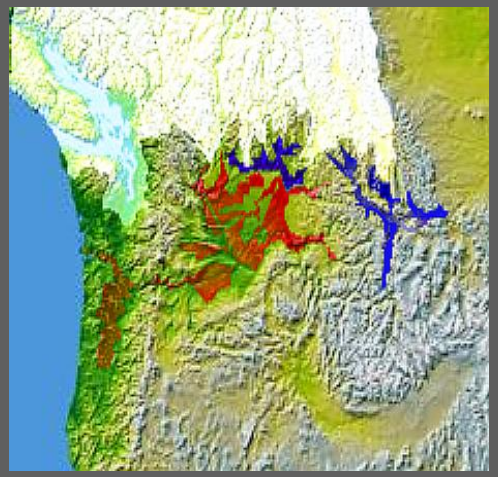
Management Effects on Dynamic Soil Properties of a Forested Soil in Northern Idaho: A Project Overview

Brian Gardner

NRCS



NRCS Natural Resources Conservation Service

What is soil quality?

Soil quality is defined as the capacity of a specific kind of soil to function to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation (Karlen et al., 1997).

Elements of Soil Quality

- Inherent, or use-invariant, soil properties
- Dynamic, or management dependent, soil properties

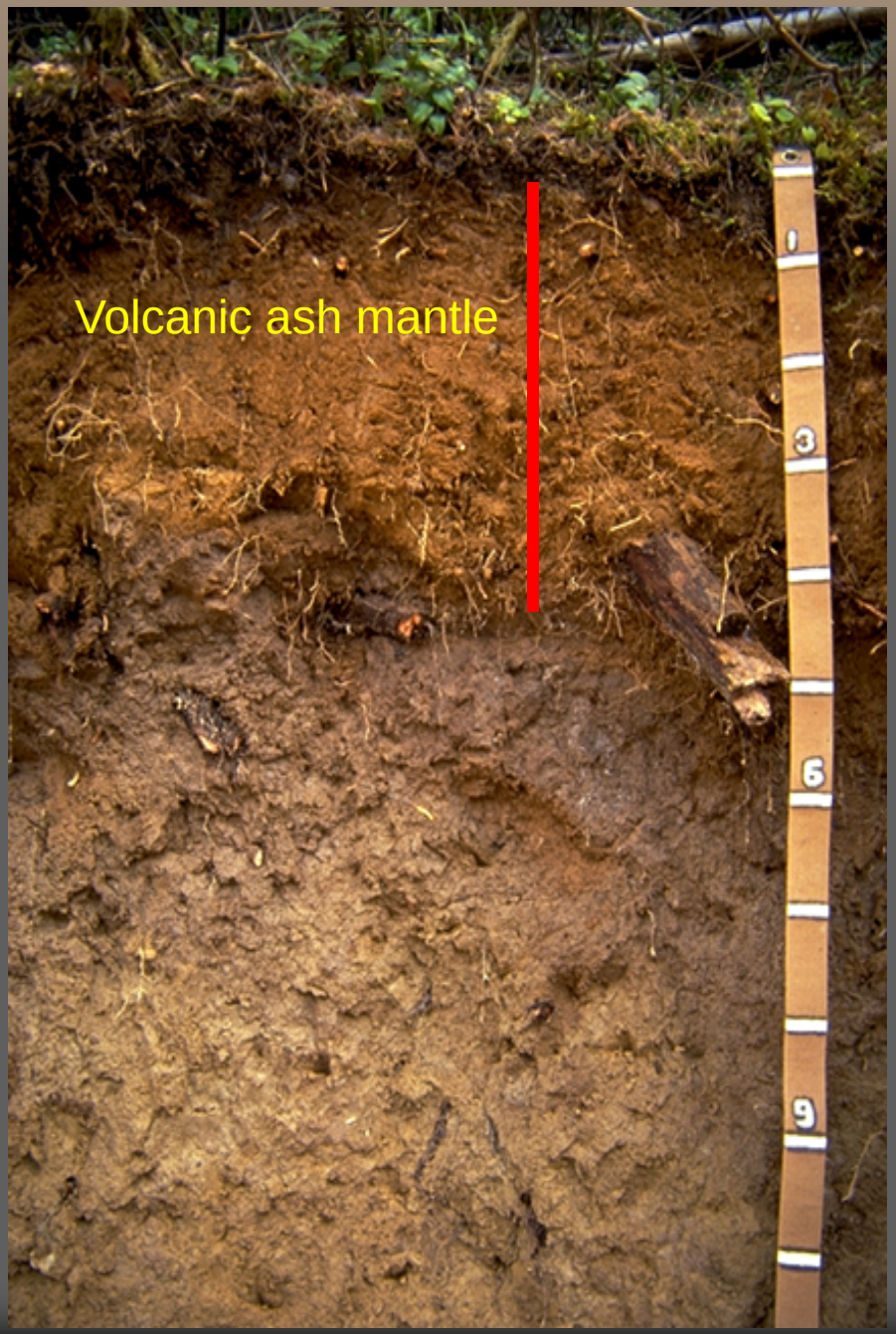
Dynamic, or management dependent, soil properties

- affected by human management and natural disturbances over the human time scale

- examples are organic matter content, biological activity, aggregate stability, infiltration, soil fertility, and soil reaction

Dynamic Soil Properties in NRCS

- Pilot Projects to measure DSP had been conducted in range environments in Texas and Utah
- Project conducted on forest converted to pasture in Missouri
- Project needed looking at forest management without land use conversion
- Incorporates concept of soil change into soil survey



Andisols of North Idaho: Soils that have been greatly influenced by the deposition of volcanic ash

Cooperators:

- NRCS
  - Idaho Soil Science Staff
  - Tech Center
  - NSSL
- US Forest Service
  - Rocky Mountain Research Station
  - Clearwater NF
  - Idaho Panhandle NF
- University of Idaho
- IFTNC

Objectives

- NRCS
  - Soil Survey
    - Evaluate impacts of logging activities on ash capped soils
    - Increase available data on fragipan soils formed in loess and reworked loess
    - Begin ESD process for forested soils
  - National (Technology Development)
    - Develop protocols for DSP sampling of forest soils
    - Write handbook for future DSP projects

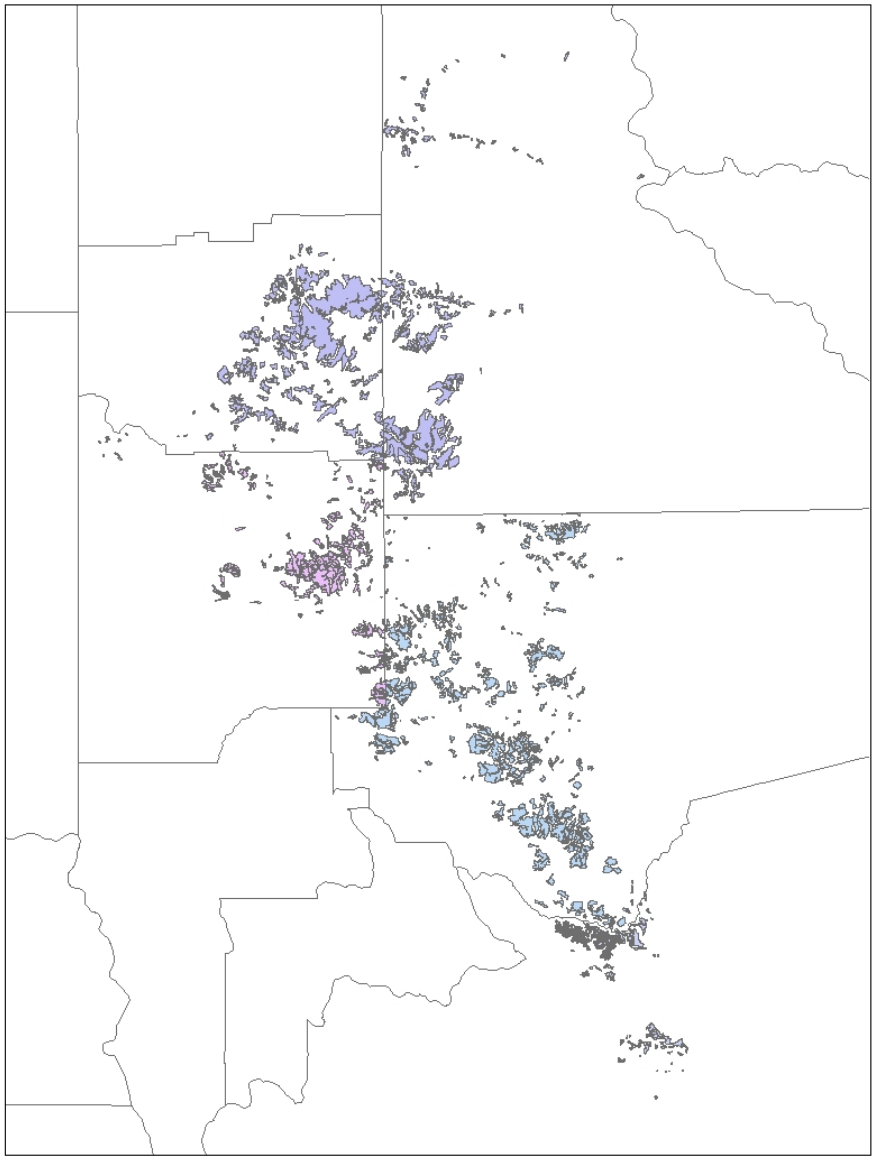
Objectives (continued)

- USFS
  - Evaluate visual disturbance classes
  - Achieve compliance with legal and regulatory requirements

Threebear soils

- Have volcanic ash cap (true Andisols)
- Are developed in loess and reworked loess and have a fragipan
- Are in the udic/frigid forest zone and have high forest productivity

Distribution of ash capped, loess derived soils in North Central Idaho



-251,240 acres of map units with appropriate composition

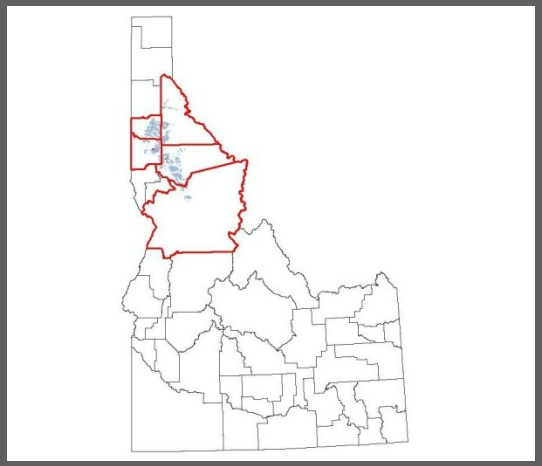
-About 188,400 acres of Threebear and similar soils

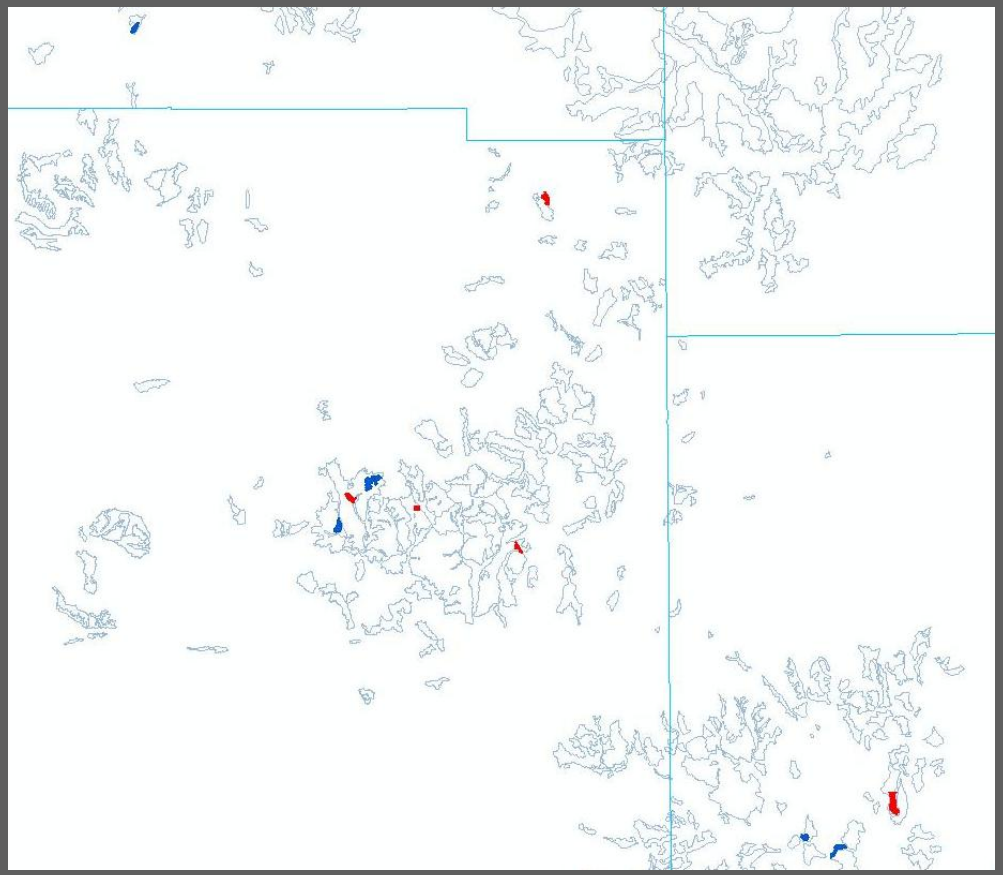
Stand Selection Criteria

- Old growth (Green et al)
- “Stepped down” Old Growth
- Cut/Pile/Burn/Plant (1965-1975)

Final Plot Locations

Locator Map





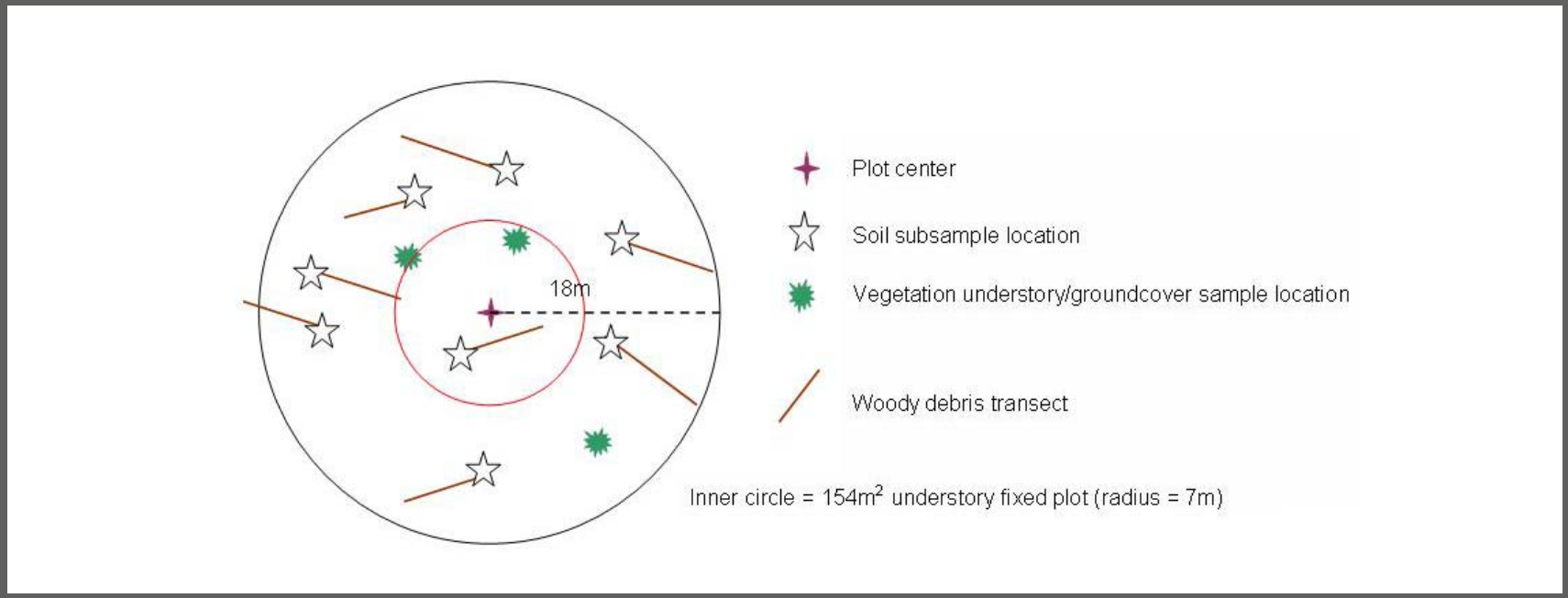
Properties to Measure

- Soil
  - Physical
  - Chemical
  - Biological
- Vegetation
  - Overstory
  - High understory
  - Low understory

Experimental Design

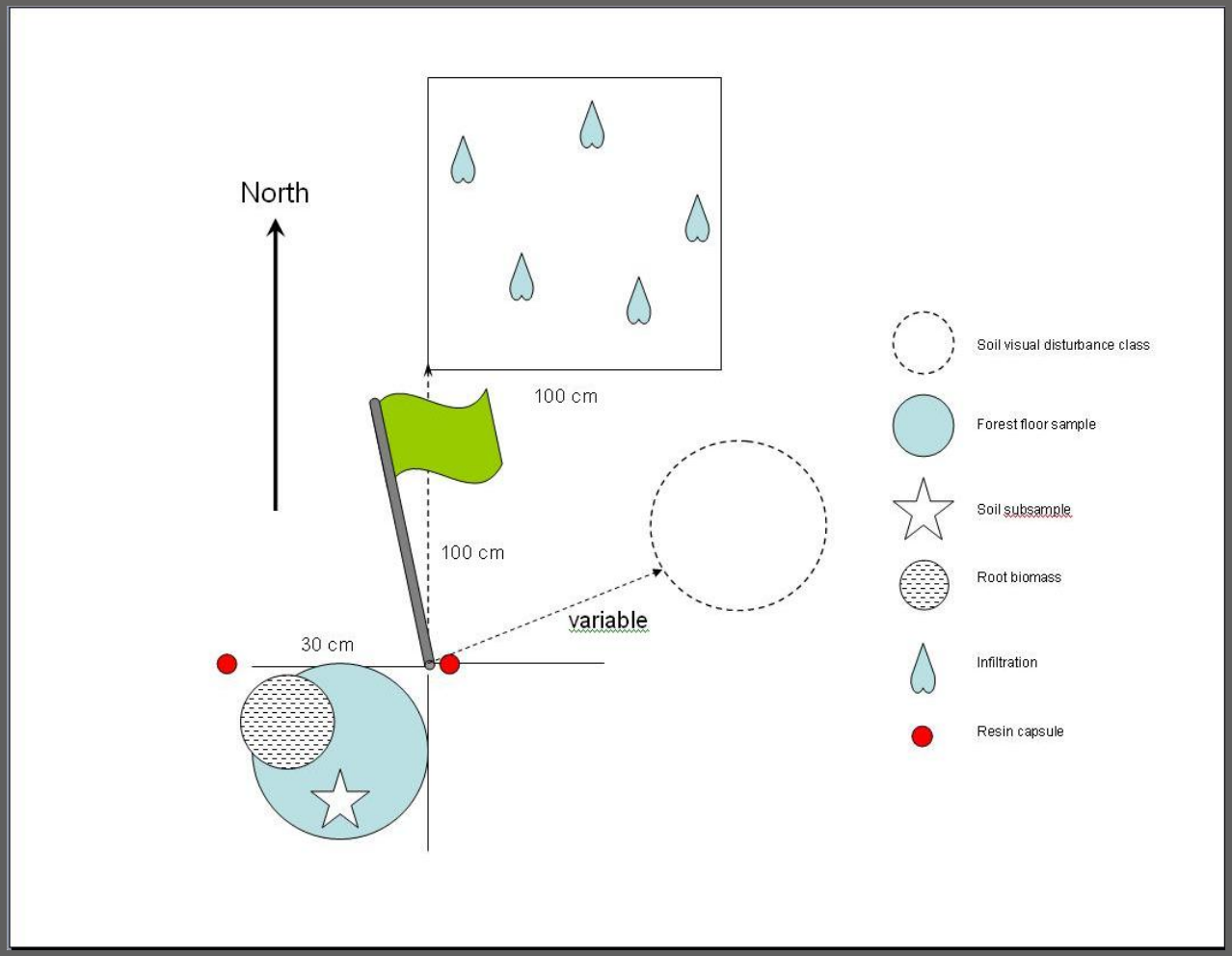
- Two ‘treatments’
- 5 sample plots (separate stands) per treatment
- 8 soil sample points per plot
- 1 variable radius plot, 1 fixed radius understory plot and three $1m^2$ clip plots per sample plot

Diagram of Plot Layout



Eight sample points per plot were described and sampled to a depth of 40 cm below the mineral soil surface

Sample Point Layout




CPS H
07 ID-35018-2
A 2-15 cm
bulk density
Bw 13-30 cm

Current Status

- NSSL lab analyses completed
- USFS lab analyses largely complete
- IFTNC resin caps and foliage samples collected
- Vegetation info yet to be analyzed
- Statistical analysis initiated

Soil Change Guide: Procedures for Soil Survey and Resource Inventory

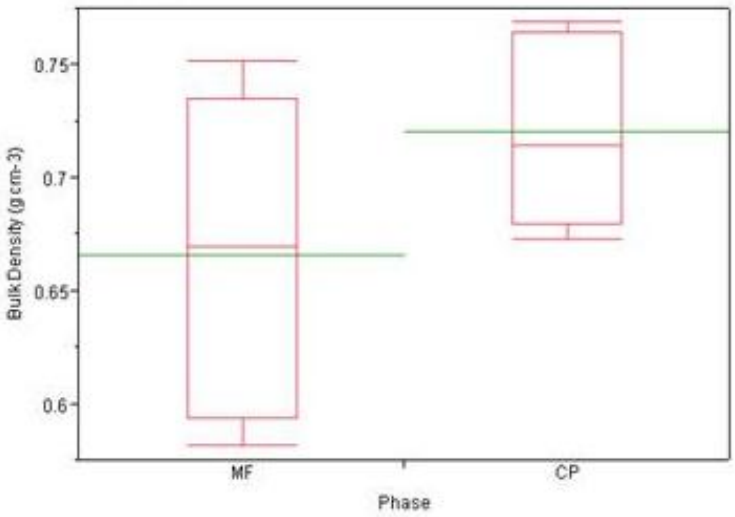
Version 1.1, 2008

By
Arlene J. Tugel
Skye A. Wills
Jeffrey E. Herrick

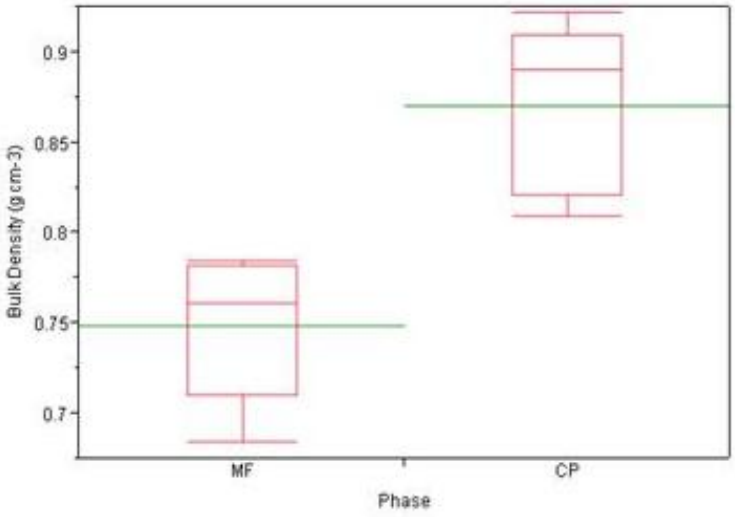
With contributions from:
Susan Andrews, Brandon T. Bestelmeyer, Pete Biggam, Karl W. Hipple, Marta D. Remmenga, Judy P. Ward, and Larry West

Meeting customer needs:
Producers, land managers, and decision-makers need information about soil and ecosystem change in order to assess and monitor the soil resource, predict management effects on soil, and plan for long-term productivity and sustainability.

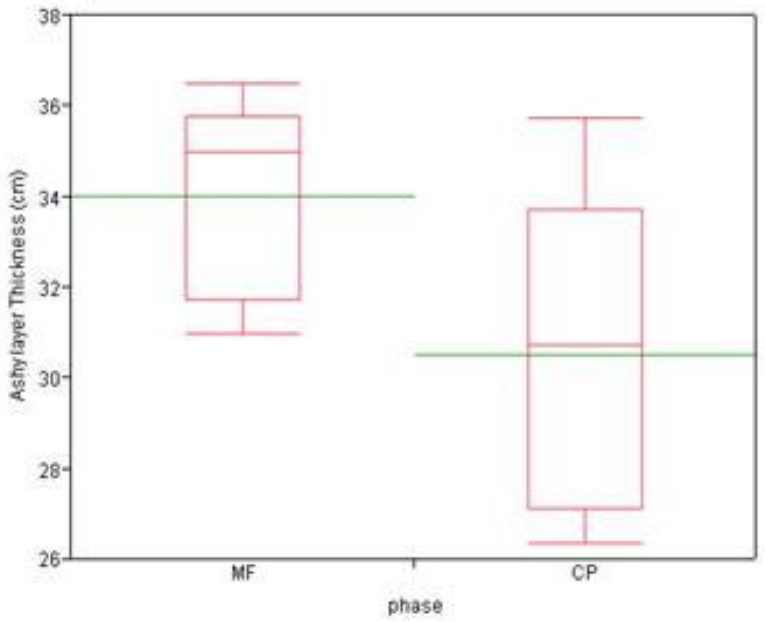
Bulk Density, layer=2



Bulk Density, layer=3



Ashy layer thickness



Observations

- Ash material has significantly better physical and chemical properties than subsoil material
- Harvested sites appear to be shifted to drier habitat types
- Large impacts on soil quality derive from physical displacement and/or compaction of ashy soil material
- Large impacts expected from changes in carbon dynamics

The End