Turning or turning back: The past, present, and future of the FIA Soil Indicator

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Begin with the end in mind…

Let's review the implementation of the FIA Soil indicator over the last 10 years and consider potential improvements.
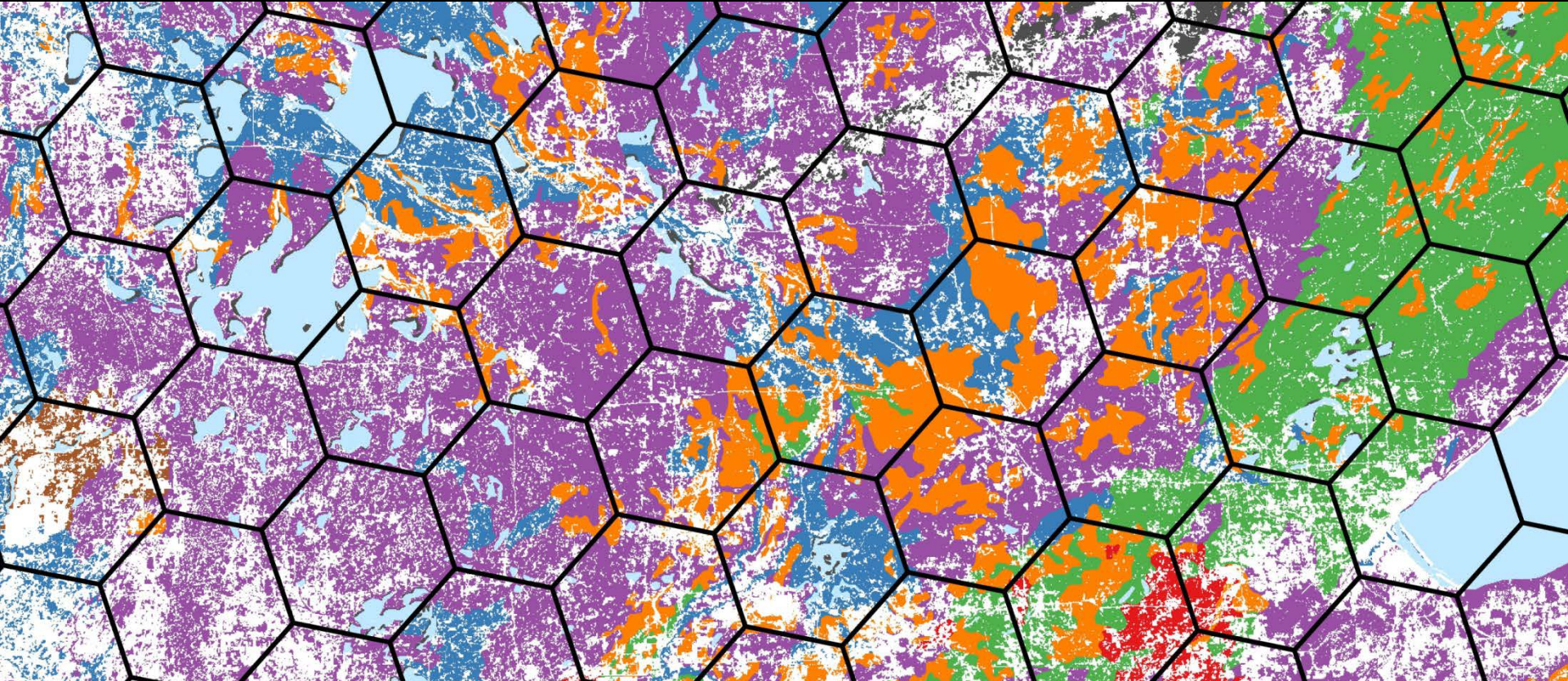
The FIA soil indicator is NOT:

- ✖ a soil survey,
- ✖ a soil mapping program, or
- ✖ a soil characterization program.

http://staffweb.wilkes.edu/brian.oram/soiltest...

The FIA Soil Indicator IS:

A statistically rigorous, strategic-level, stratified random sample of the nation's forest soils and their characteristics.
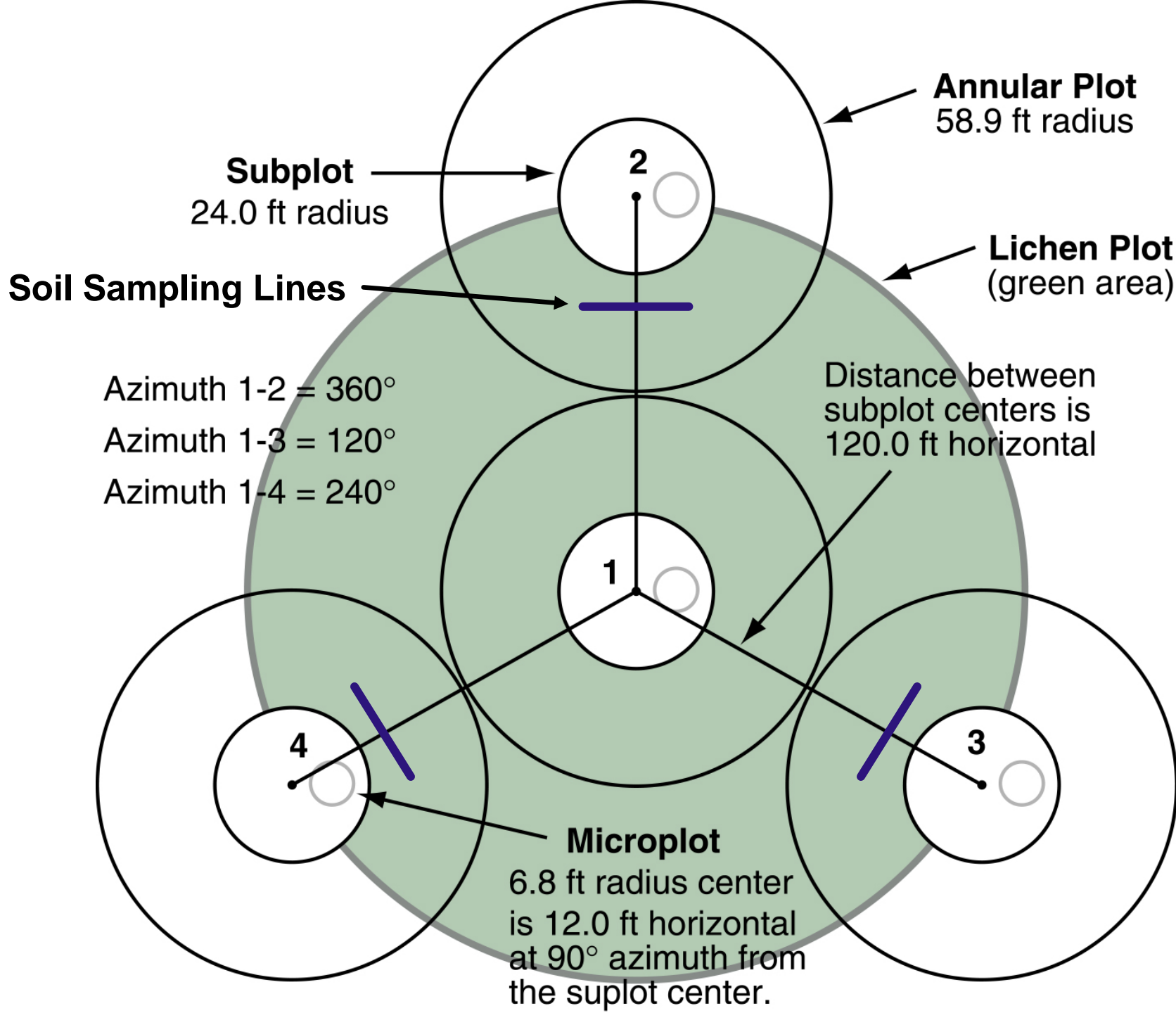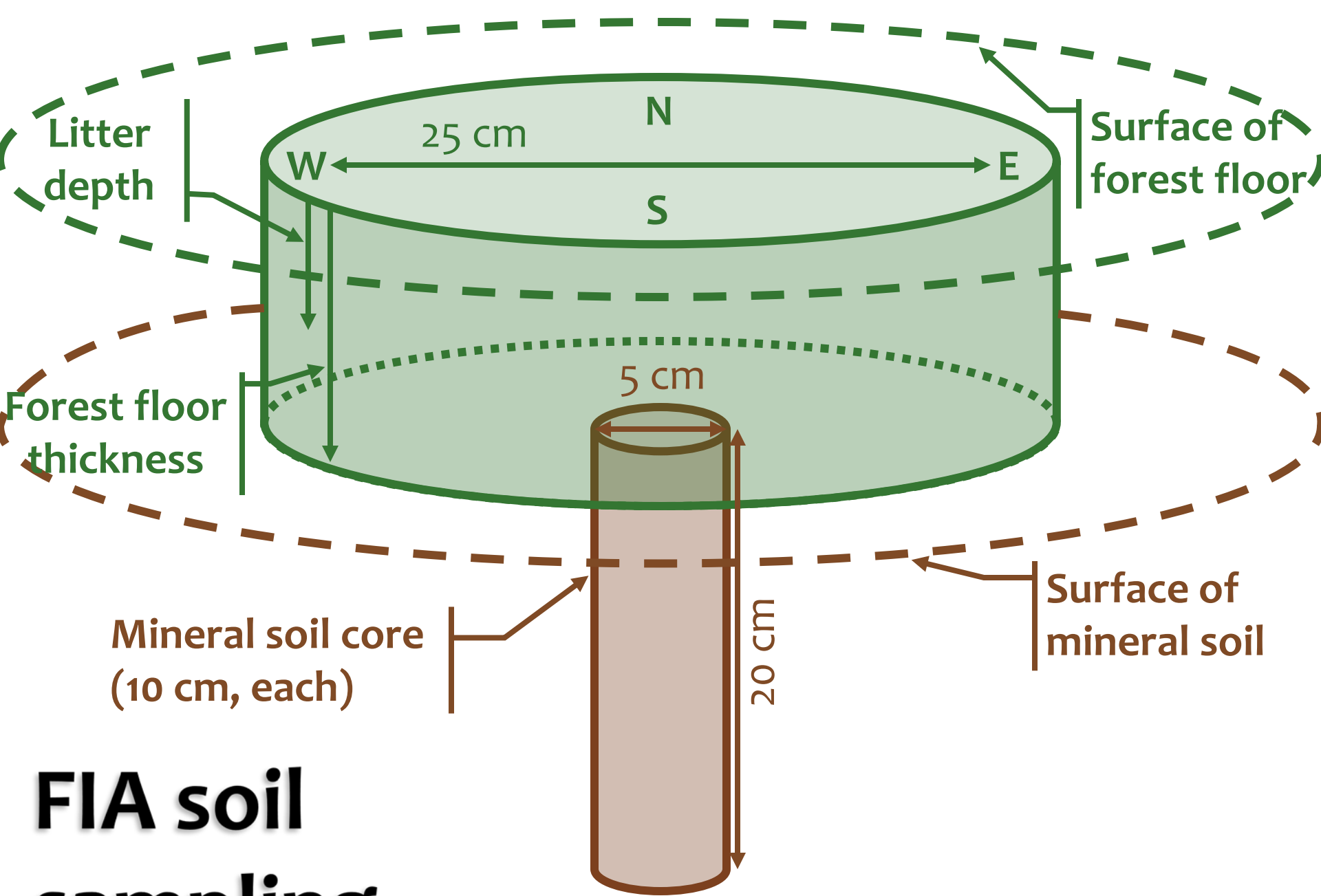
Erosion   Compaction   Chemistry

Annular Plot
58.9 ft radius

Subplot
24.0 ft radius

Lichen Plot
(green area)

Soil Sampling Lines

Azimuth 1-2 = 360°
Azimuth 1-3 = 120°
Azimuth 1-4 = 240°

Distance between
subplot centers is
120.0 ft horizontal

Microplot
6.8 ft radius center
is 12.0 ft horizontal
at 90° azimuth from
the suplot center.

Litter depth

Surface of forest floor

25 cm

N

W   E

S

5 cm

Forest floor thickness

Mineral soil core (10 cm, each)

20 cm

Surface of mineral soil

FIA soil sampling
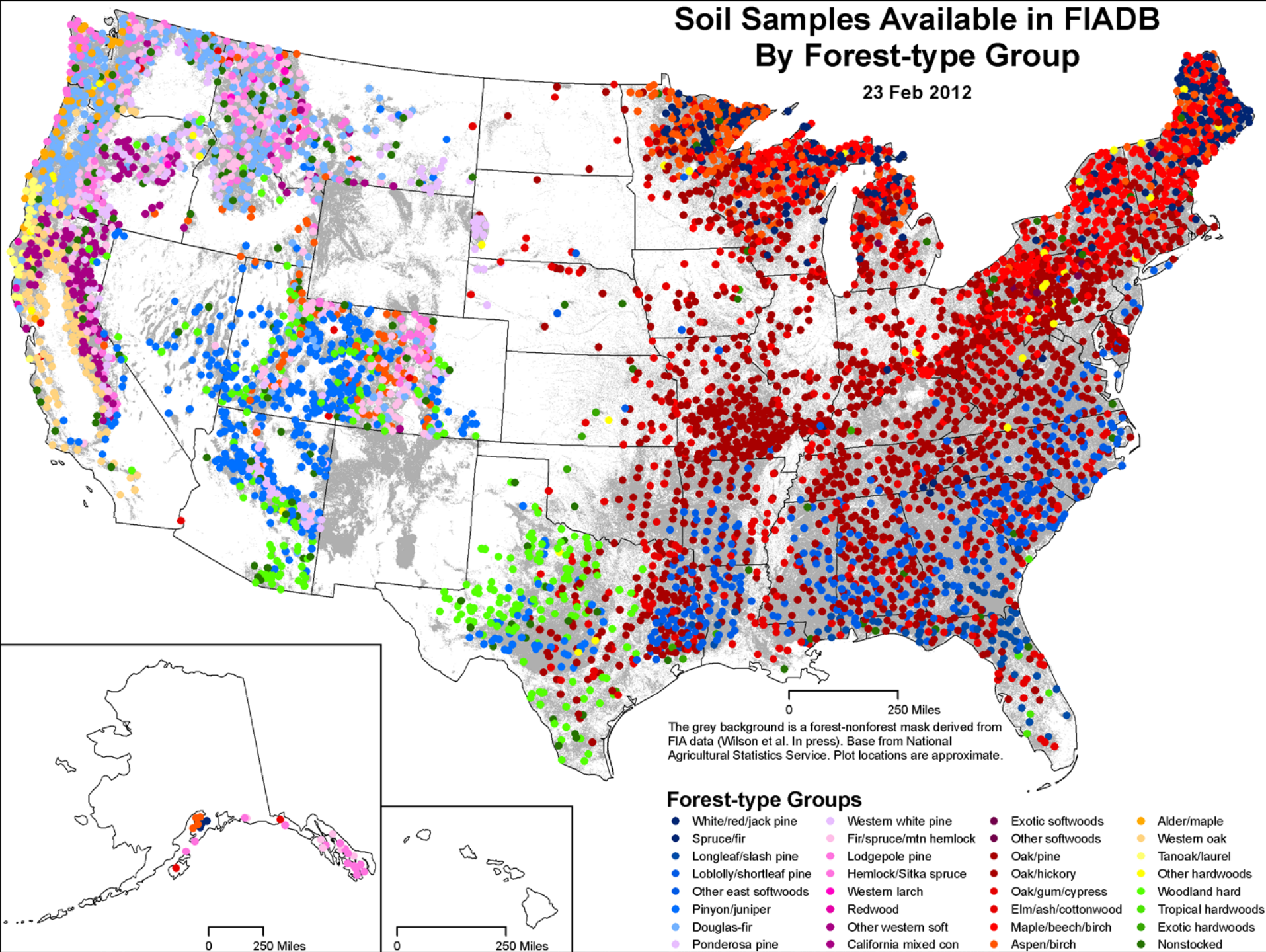
7,459 plots with lab samples

5,546 plots in FIADB

47 states (no Hawai'i, New Mexico, or Wyoming)

32 forest-type groups

Soil Samples Available in FIADB
By Forest-type Group
23 Feb 2012

The grey background is a forest-nonforest mask derived from FIA data (Wilson et al. In press). Base from National Agricultural Statistics Service. Plot locations are approximate.

0 ——— 250 Miles

Forest-type Groups

● White/red/jack pine	● Western white pine	● Exotic softwoods	● Alder/maple
● Spruce/fir	● Fir/spruce/mtn hemlock	● Other softwoods	● Western oak
● Longleaf/slash pine	● Lodgepole pine	● Oak/pine	● Tanoak/laurel
● Loblolly/shortleaf pine	● Hemlock/Sitka spruce	● Oak/hickory	● Other hardwoods
● Other east softwoods	● Western larch	● Oak/gum/cypress	● Woodland hard
● Pinyon/juniper	● Redwood	● Elm/ash/cottonwood	● Tropical hardwoods
● Douglas-fir	● Other western soft	● Maple/beech/birch	● Exotic hardwoods
● Ponderosa pine	● California mixed con	● Aspen/birch	● Nonstocked

0 ——— 250 Miles

0 ——— 250 Miles

Reporting Results of the Soil Quality Indicator

Missouri's Forests 1999-2003 Part A

Iowa's Forests 1999-2003 Part A

USDA
United States Department of Agriculture
National Report on Sustainable Forests — 2003

Minnesota's Forests 1999-2003 Part A
Resource Bulletin

Pennsylvania's Forests
Resource Bulletin NRS-20 ber 2007

The Forests of Maine: 2003

Forest Health Monitoring 2005 National Technical Report
Editors Mark J. Ambrose Barbara L. Conkling

Wisconsin's Forests 2004

Indiana's Forests 1999-2003 Part A

An Inventory of Carbon Storage in Forest Soil and Down Woody Material of the United States

Charles H. Perry and Christopher W. Woodall

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Resource Bulletin NRS-23

A recent example

The Forests of Southern New England, 2007

A Report on the Forest Resources of Connecticut, Massachusetts, and Rhode Island

Resource Bulletin
NRS-55

USDA United States Department of Agriculture

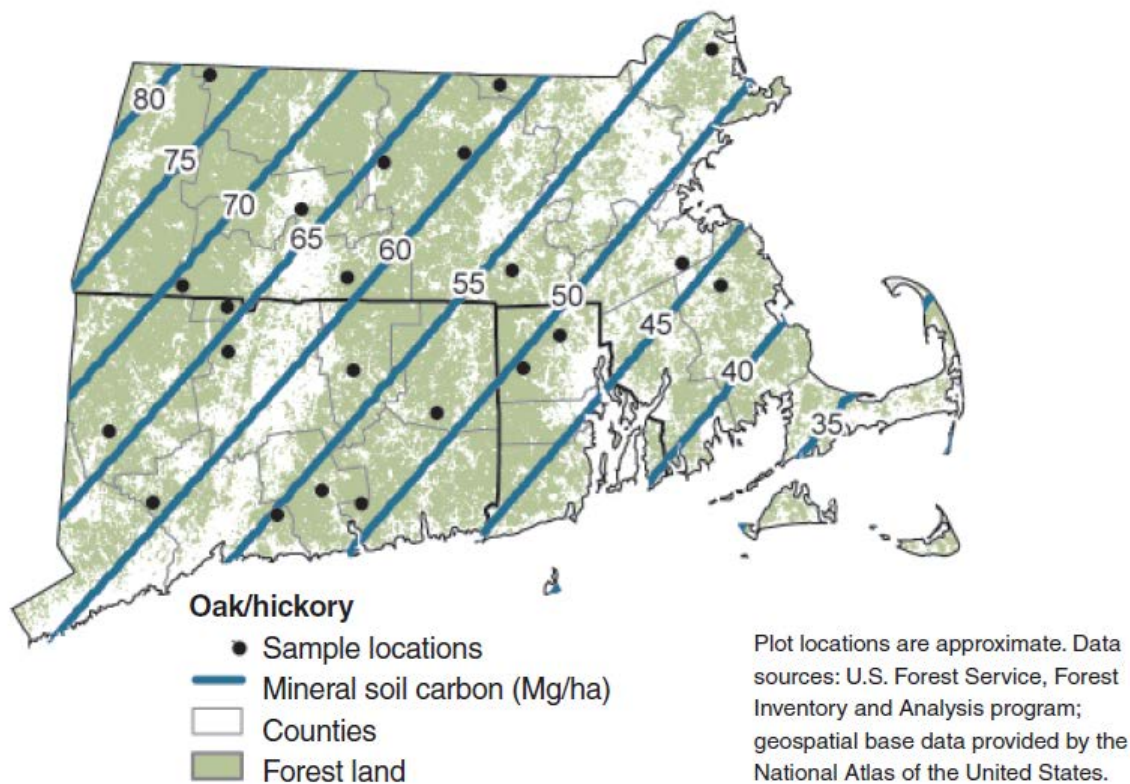Forest Service

Northern Research Station

Figure 54.—Gradient of shallow mineral soil (0-20 cm) carbon storage (Mg/ha) for the oak/hickory forest-type group, Southern New England, 2007.
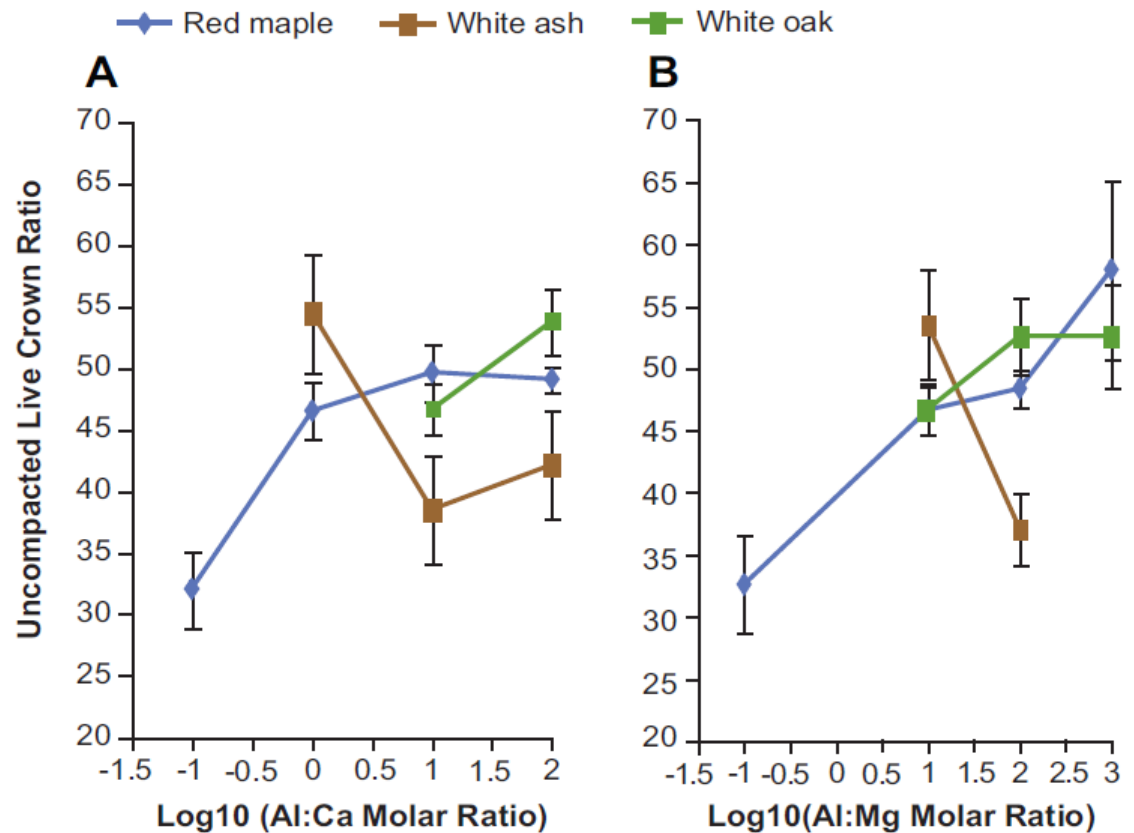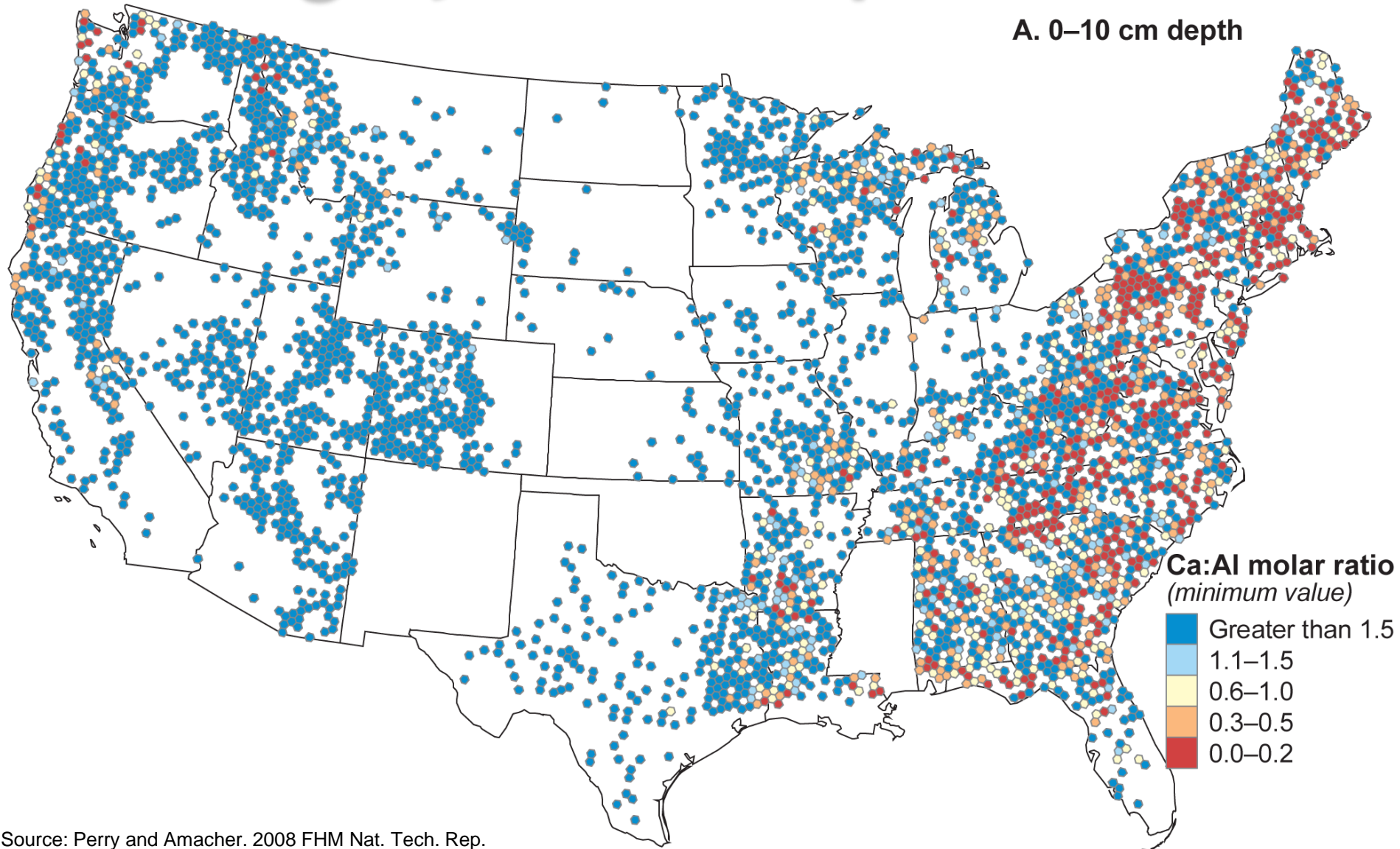
Presenting data in maps

# Presenting data in graphs

Figure 55.—Relationships between (A) Al:Ca and (B) Al:Mg and selected tree species, Southern New England, 2007. Error bars represent a 68 percent confidence interval around the mean.

Research on the legacy of acid deposition

A. 0–10 cm depth

Ca:Al molar ratio
(minimum value)

- Greater than 1.5
- 1.1–1.5
- 0.6–1.0
- 0.3–0.5
- 0.0–0.2

Linking dead trees to soils presents a challenge.
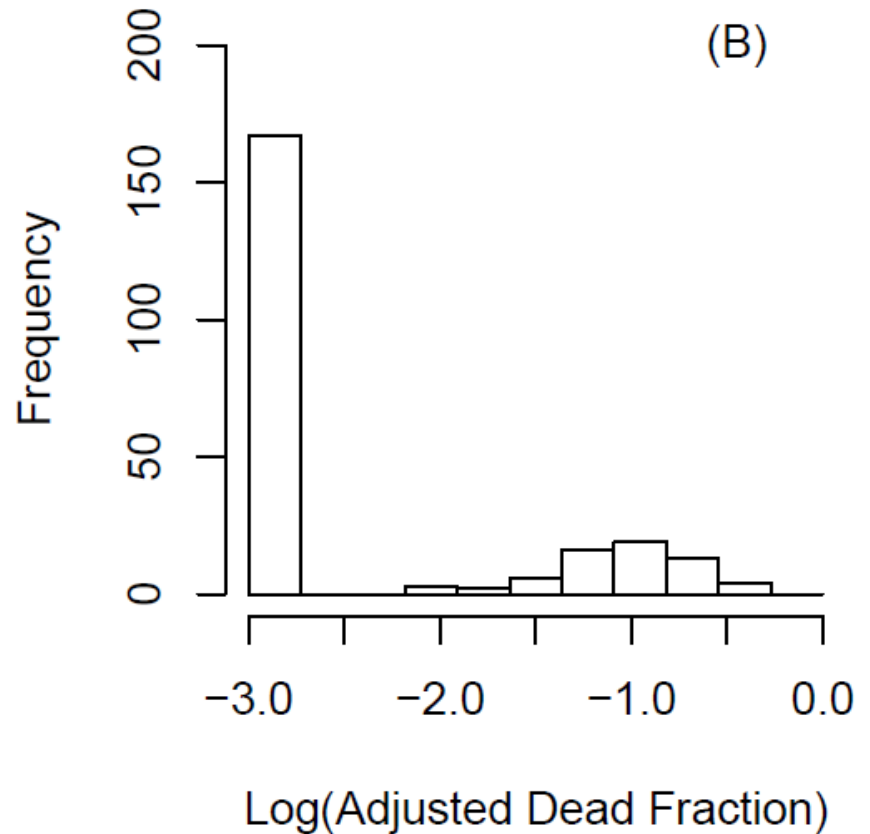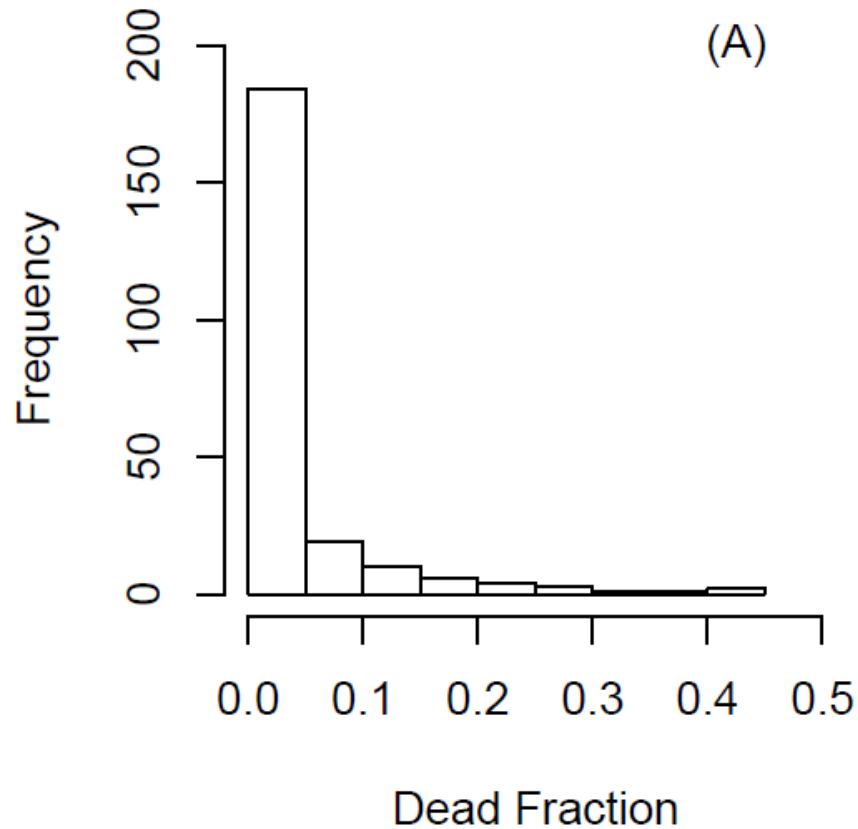
Parameters under consideration

Site characteristics	Soil characteristics
Latitude, Longitude	pH
Drought index	ECEC (square root transform)
Ecoprovince	Ca:Al ratio
Forest type group	Mg:Al ratio
Basal area	Mg:Mn ratio
Stand age	Exchg. K percentage (ekp)
Stand size class	Exchg. Na percentage (esp)
Site class	Exchg. Ca percentage (ecp)
Slope	Exchg. Mg percentage (emp)
Aspect	Exchg. Al percentage (eap)
Disturbance	
Geology	

The simple storyline on dead BA
(distilled from logistic regression)…

basal area	102%
Mg:Mn	55%
Till landscape	50%
Non-glacial	10%

FIA's
Strategic Review of P3

Turning, or turning back?

A review is desired by Units and clients.

This review should be science-based.

This review should be based
upon clearly defined objectives.

Suggested changes to the program should reflect budget realities.

Improvements?
Soil compaction methods

Surface Compaction Estimates and Soil Sensitivity in Aspen Stands of the Great Lakes States

Aaron Steber, Ken Brooks, Charles H. Perry, and Randy Kolka

ABSTRACT

Aspen forests in the Great Lakes States support much of the regional timber industry. Management-induced soil compaction is a concern because it affects forest health and productivity and soil erosion. Soil compaction increases bulk density and soil strength and can also decrease air and water movement into and through the soil profile. Currently, most inventories, and specifically the Forest Inventory and Analysis program, use qualitative estimates of soil compaction. This study compared qualitative estimates with quantitative measurements on aspen clearcuts in five national forests in the Great Lakes States. Research sites were stratified into classes of high and low potential for soil compaction on the basis of soil texture. Qualitative visual assessments of compaction were made according to Forest Inventory and Analysis (FIA) phase 3 protocols and compared with physical measurements of bulk density, soil compression strength, and saturated hydraulic conductivity. No differences in compaction between high- and low-risk soils were detected using visual assessments, but quantitative measurements in high-risk, fine-textured soils indicated greater compaction than low-risk, coarse-textured soils. These results illustrate shortcomings in qualitative estimates of compaction made according to FIA phase 3 field protocols. Inexpensive quantitative measurements, such as those taken with a pocket penetrometer, may be sufficient to quantify compaction levels within the plots.
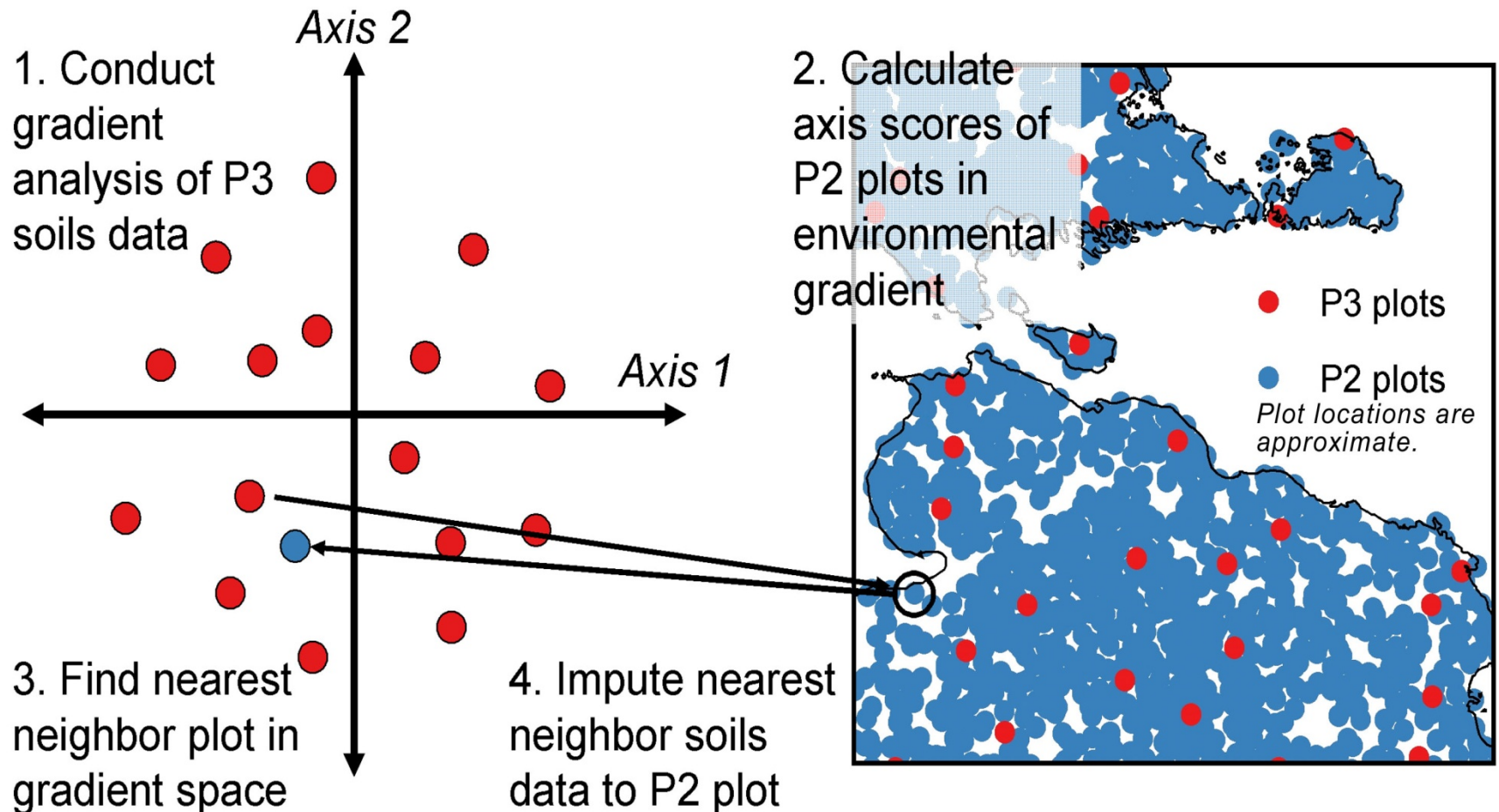
Keywords: soil compaction, aspen clearcut, visual assessment, forest inventory, pocket penetrometer
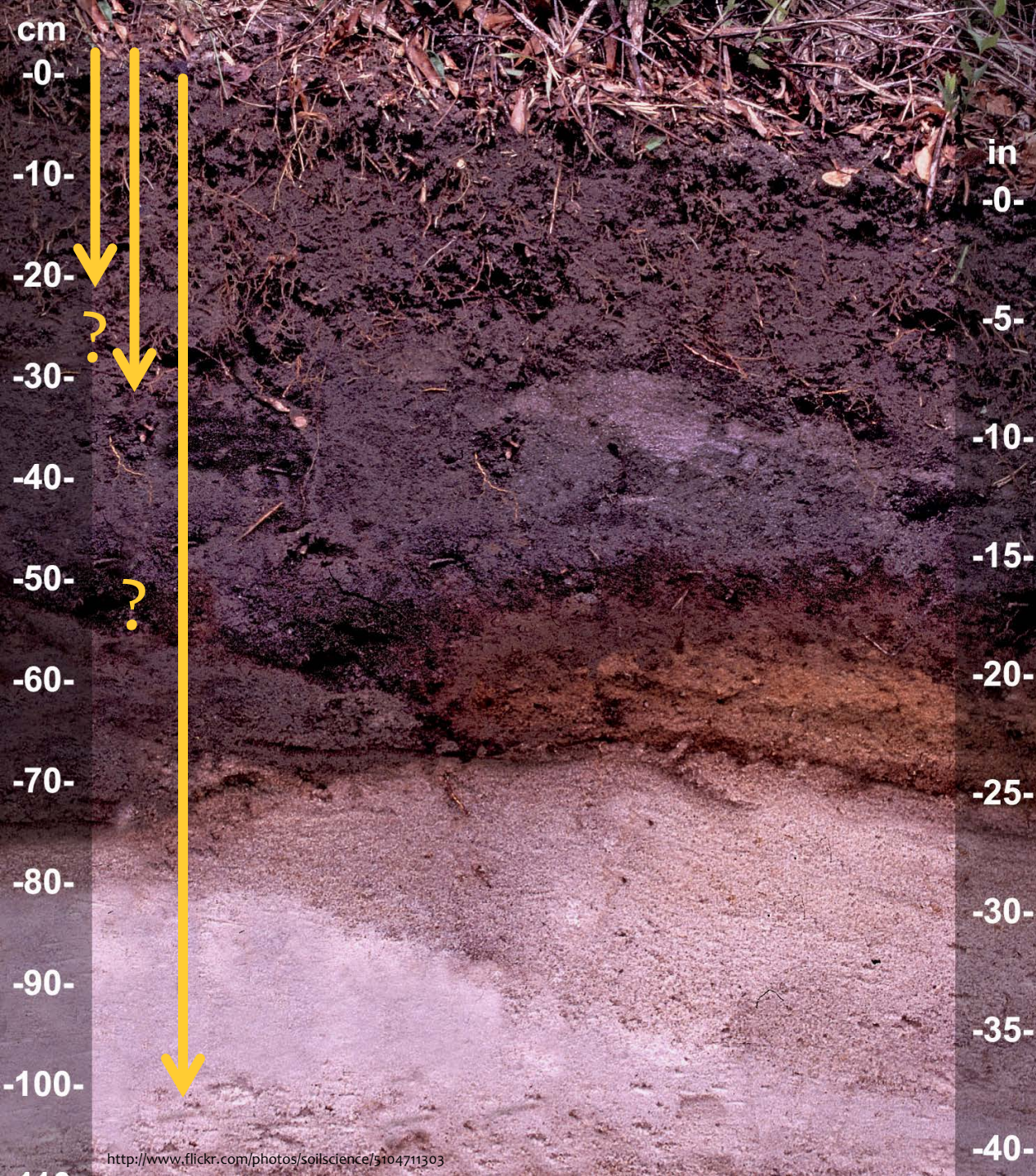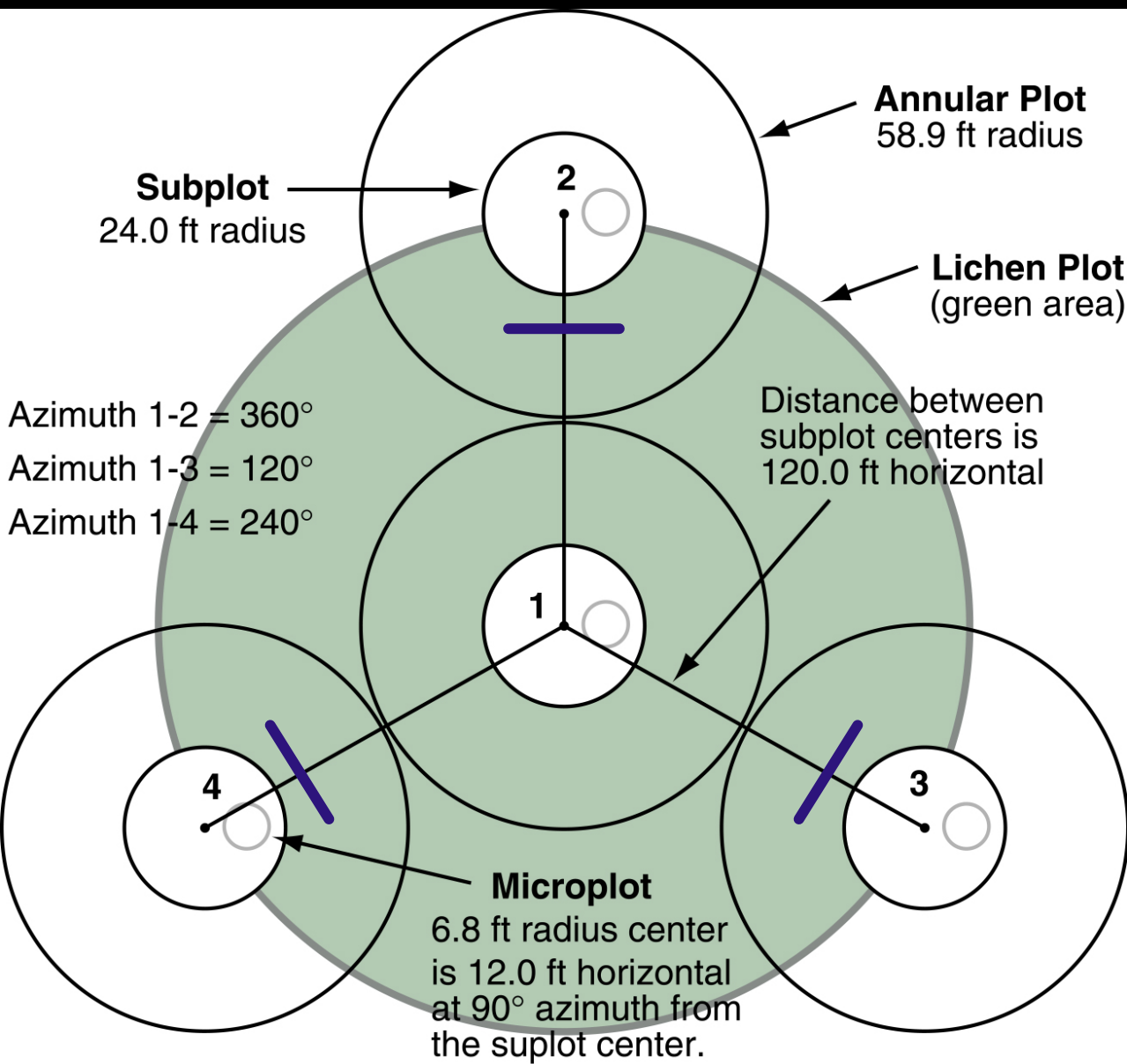
Improvements?
Peatland sampling studies

Suggestions:
Sample 30 cm (or more?)

Annular Plot
58.9 ft radius

Subplot
24.0 ft radius

Lichen Plot
(green area)

2

Azimuth 1-2 = 360°

Azimuth 1-3 = 120°

Azimuth 1-4 = 240°

Distance between
subplot centers is
120.0 ft horizontal

1

4

3

Microplot
6.8 ft radius center
is 12.0 ft horizontal
at 90° azimuth from
the suplot center.

Suggestions:
Sample more subplots

Suggestions:
Sample every year

What does the future hold?

In part, it depends upon you.

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