



The North American Soil Geochemical Landscapes Project

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The mission of the NASGLP is to:

- **Produce a soil geochemical data base, and its representation in map form, for the continent of North America (21 million km²)**
- **Interpret observed patterns in terms of process**
- **Establish an archive of soil samples for use by future investigators**

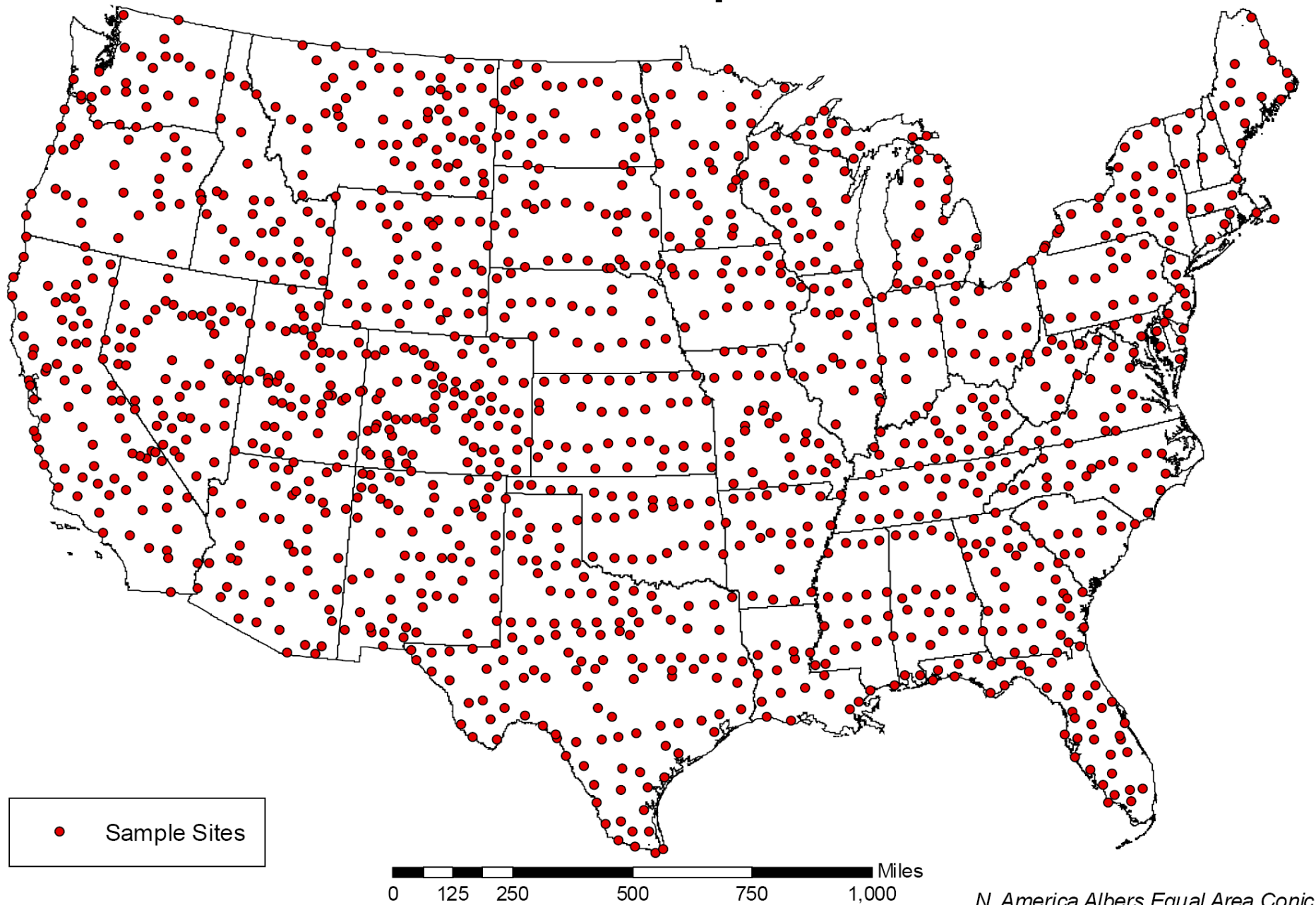
Customer base for NASGLP

- Anyone interested in “background” ranges of elements in soil
 - Risk-based assessment of contaminated land
 - Establishing soil clean-up or action levels (regional or national scale)
 - Soil pathways for chronic or acute exposure to toxic elements
 - Soil-borne pathogens (anthrax)

USGS National-Scale Soil Data (Shacklette Data)

- 1,323 samples (1 per 6,000 sq. km.) collected from areas with native vegetation
- Collected from 1960s to late 1970s
- 40+ elements analyzed
- Still the most-often-quoted data for “background” values of trace elements in soil

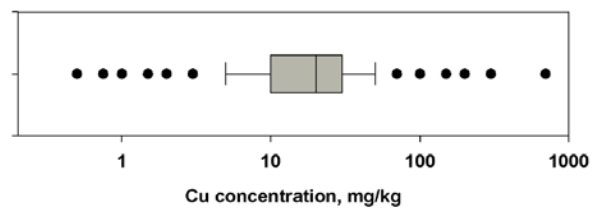
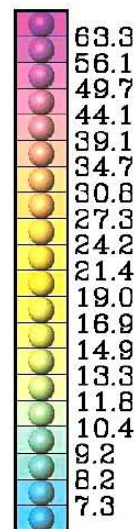
Shacklette sample sites



0 1,000 KILOMETERS

COPPER

PPM



NASGLP Timeline

- 2001 Directors of SGM, GSC, USGS identify soil geochemistry as subject of mutual concern
- 2002 Tri-national organizational workshop
- 2003 Soil Geochemistry Workshop (112 attendees)
- 2004 Pilot phase design workshop
- 2004 Pilot phase begins
- 2004 Letter of support from CDC/ATSDR
- 2006 Half-page news article on project in *Science*
- 2006 Workshop to address sample design
- 2007 Pilot phase ends; sampling begins for full continental-scale survey

NASGLP Timeline

- 2008 – 2010 Begin using soil science students for collection of samples
- 2009 Results of pilot phase published as 21 papers in special issue of *Applied Geochemistry*
- 2010 GSC drops out of project
- 2010 EPA provides \$150K
- 2010 Sampling completed in conterminous US; 65% of Mexico sampled, finish in 2012
- 2011-2012 Complete chemical and mineralogical analysis of US samples
- 2012-2013 Sampling and chemical/mineralogical analysis completed in Mexico

Outreach

Sessions convened:

- Int'l Conf. on Soils, Sediments, Water (2005)
- World Congress of Soil Science, (2006)
- GSA (2008)
- Int'l Applied Geochemistry Symposium (2009)
- Nat'l Environmental Public Health Conf. (2009)
- Nat'l Env. Monitoring Conf. (2011)

Invited lectures/briefings (selected):

EPRI (2003); AAAS (2003); AASG (2003, 2006); CLRN (2005); North American Commission on Env. Cooperation (2005); NRCS (2007, 2008); NEON (2008); EPA HQ (2008); Nat'l Academy of Sciences (2009); SME (2010); ICA (2010); FIU (2010)

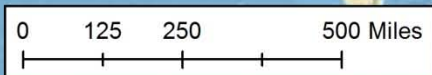
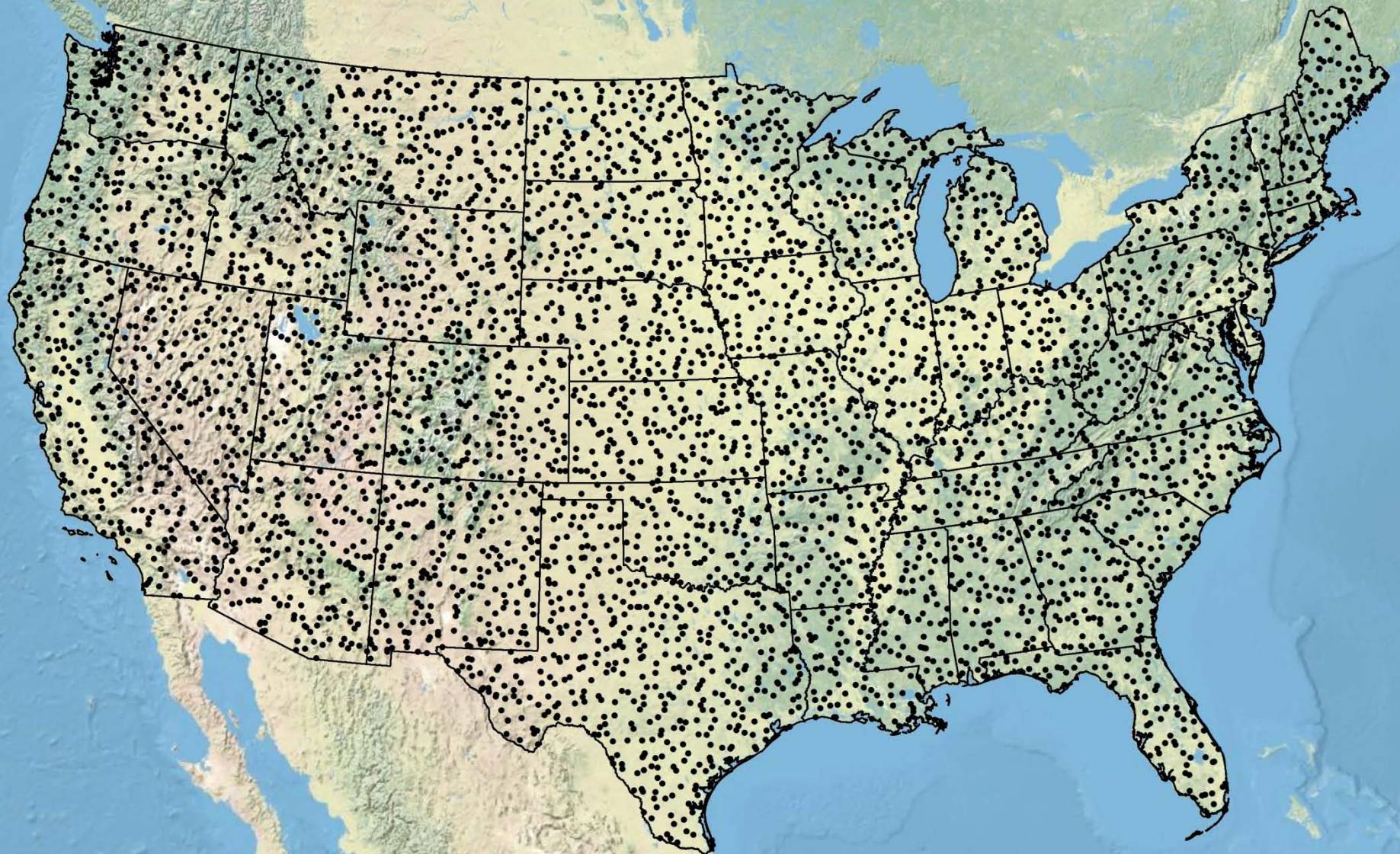
Sample Design

- **Objective:** Determine the unbiased geochemical status of all North American soils.
- **Target Population:** All soils of the continent.

Sample Design

- Generalized Random Tessellation Stratified (GRTS) design (US)
- GRN (Mexico)
- Mixture (Canada)
- 13,496 sites for North America (about 1 per 1,600 km²)
 - US = 5,813; Canada = 6,183; Mexico = 1,500

4,800 sites; 14,400 samples



Samples collected from each site

TYPICAL SOIL PROFILE

O horizon

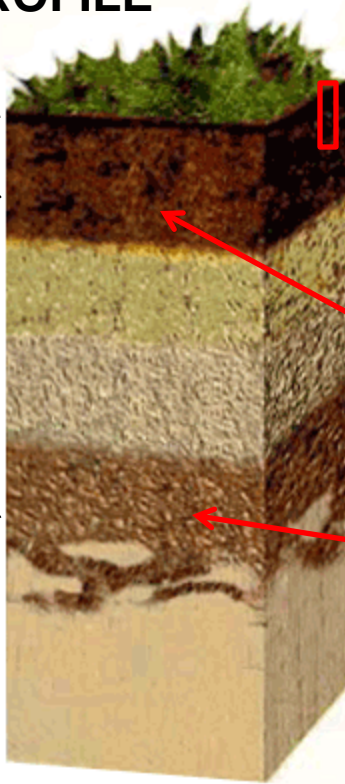
decayed organic matter

A horizon

mineral soil mixed with some organic matter

C horizon

partly altered parent material



1: 0 to 5 cm depth
(regardless of horizons) for
geochemistry and soil
pathogens

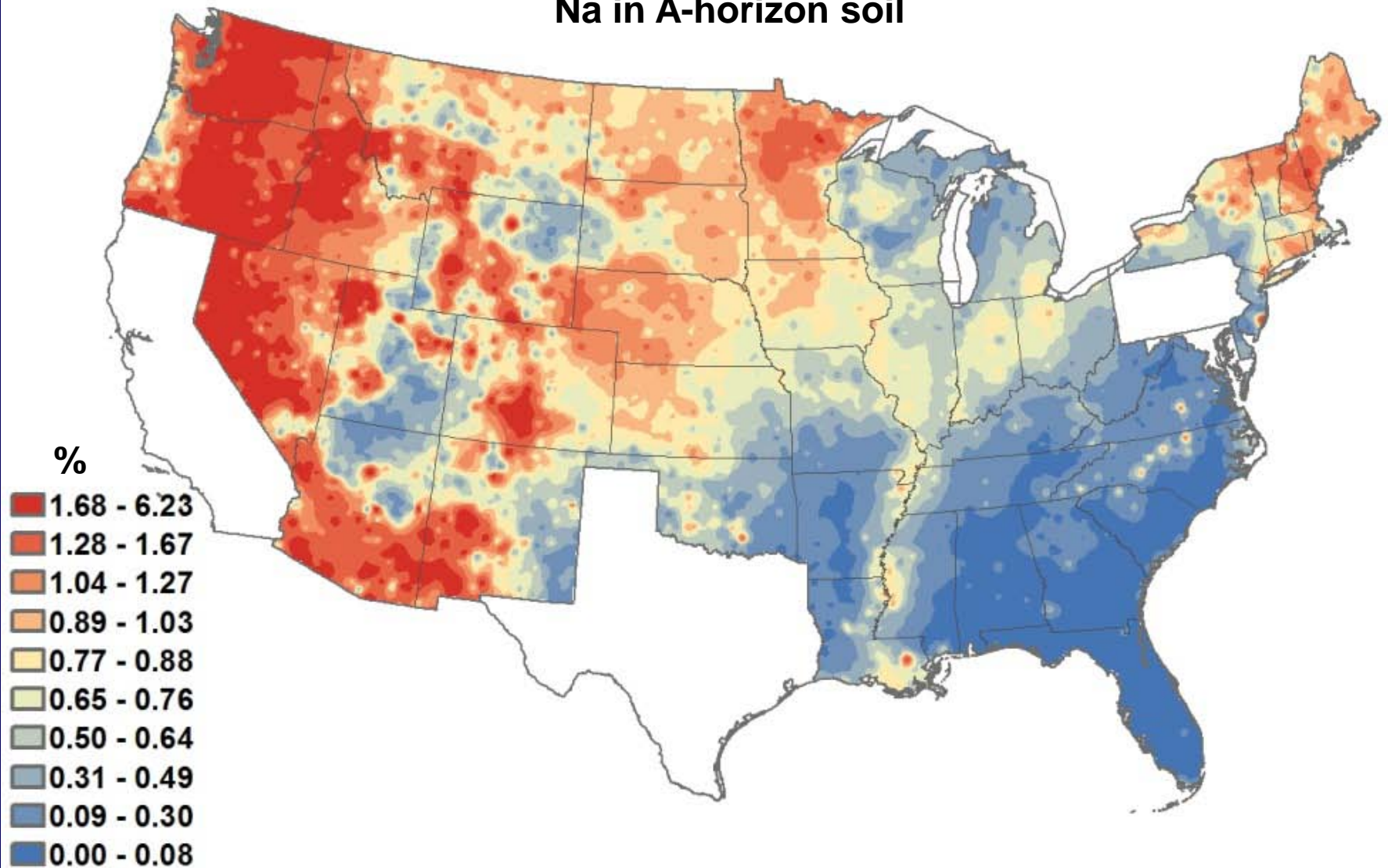
2: A horizon

3: C horizon (or deepest
accessible depth ≤ 1 m)

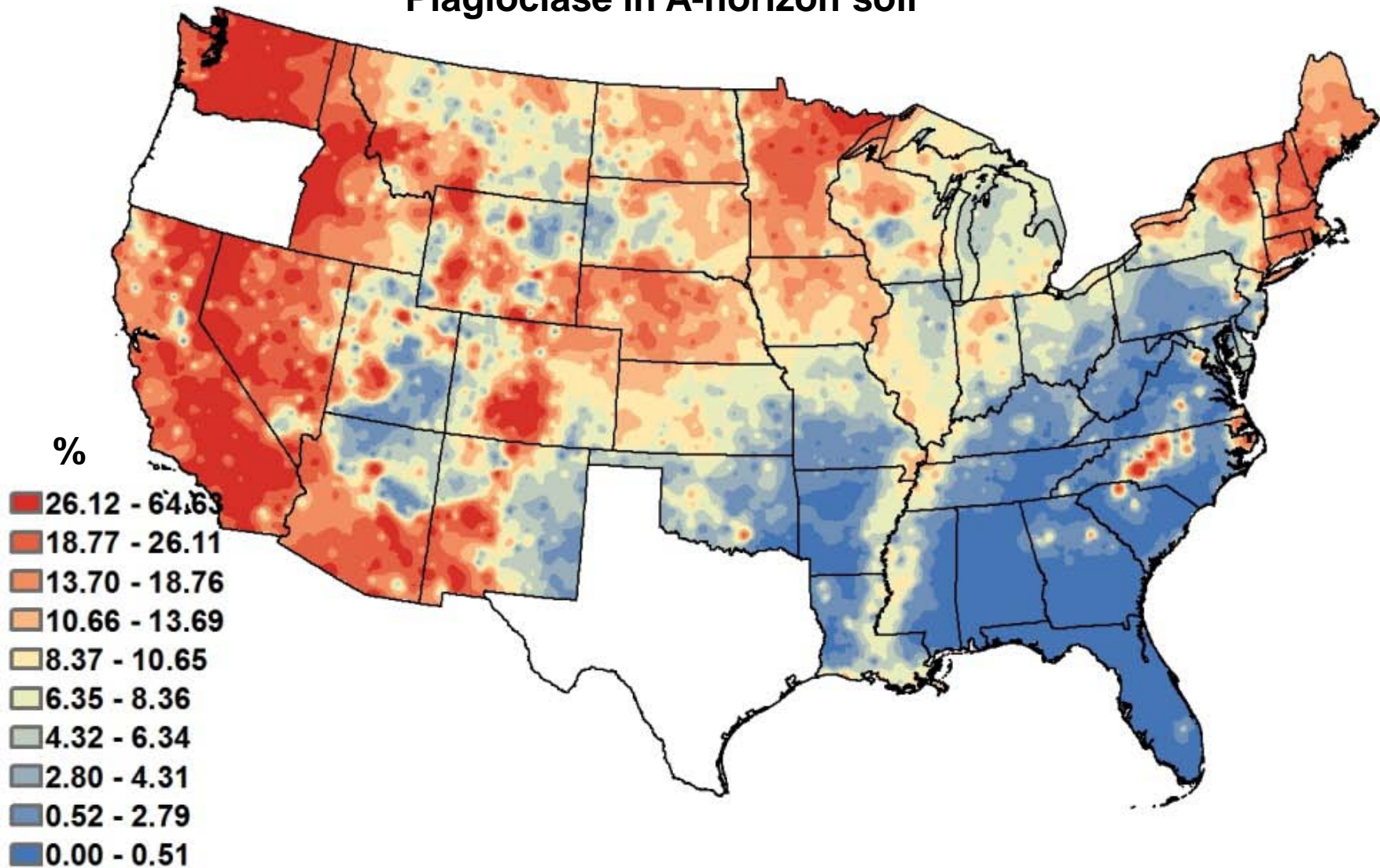
Sample Analysis

- ~45 major and trace elements
- Quantitative mineralogy by XRD
- Determinations of soil pathogens: *Bacillus anthracis* (anthrax); *Yersinia pestis* (plague); *Francisella tularensis* (tularemia or rabbit fever)

Na in A-horizon soil

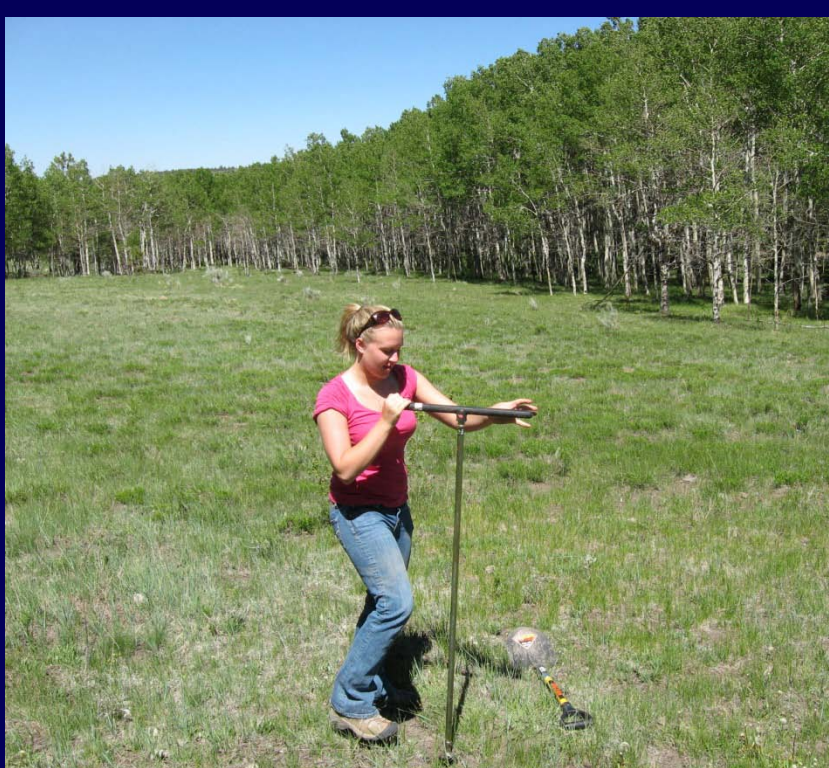


Plagioclase in A-horizon soil



Future

- Data for U.S. released to public, late 2012 or early 2013
- 34th IGC, August 2012 (3 presentations)
- Research products—2013 and beyond (limited only by our imagination)



**Thank you for your
attention.**

The background features a dark blue field with abstract geometric patterns. On the left, there are several thin, parallel yellow lines radiating from a point. On the right, there is a larger, more complex pattern of blue and yellow rectangular blocks arranged in a grid-like structure that appears to be receding into the distance.