



OSAC Research Needs Assessment Form

Title of research need: Assessing Heterogeneity of Soils

Keywords: Soil, Heterogeneity, Interpretation, Comparison, Variability, Urban, Rural, Land Use

Submitting subcommittee(s): Geological Materials

Date Approved: 07/12/19

(If SAC review identifies additional subcommittees, add them to the box above.)

Background information:

1. Description of research need:

Research is needed to determine whether it is possible to anticipate scales of compositional heterogeneity of surface soils across a particular region. Specifically, research is needed to determine whether the scale of heterogeneity varies in soils from different types of land use (urban environment, suburban neighborhood, woodlot, meadow/ prairie), soils with different bedrock characteristics (igneous, metamorphic, clastic sediments, carbonate, glaciated), different soil formations, etc. This would provide insights into the anticipated variability associated with a particular setting.

2. Key bibliographic references relating to this research need:

Graham, R.C. and O'Geen, A.T. (2009) Soil mineralogy trends in California landscapes. *Geoderma*, doi:10.1016/j.geoderma.2009.05.018
Lark, R.M. and Rawlins, B.G. (2008) Can we predict the provenance of a soil sample for forensic purposes by reference to a spatial database? *European Journal of Soil Science*, 59: 1000–1006
Morrison, A.R. et al. (2009) Characterization and Discrimination of Urban Soils: Preliminary Results from the Soil Forensics University Network. In Ritz, K. et al. (Eds) *Criminal and Environmental Soil Forensics*, Springer.

3a. In what ways would the research results improve current laboratory capabilities?

This research would enable laboratories to better understand the significance of soil examination conclusions (associations, exclusions, inconclusive findings) for cases involving soil from different land use types and bedrock characteristics. Appropriate limiting statements could be inserted into reports, and findings could be qualified in court testimony in more rigorous ways than simply based on examiner experience. For example, if research demonstrates that soil tends to be more homogeneous across certain types of settings (i.e., prairie underlain by granitic bedrock), this would be important for a soil examiner to know as they evaluate the significance of a soil association in a case involving this type of setting.

3b. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

This research would provide the subcommittee with a better understand the significance of soil examination conclusions (associations, exclusions, inconclusive findings) for cases involving soil from different land use types and bedrock characteristics. It would also assist the subcommittee in developing a statistical approach to estimating population size for comparisons. This would enable the subcommittee to make informed interpretation and report writing recommendations to forensic practitioners in future standards and/or guidelines.

3c. In what ways would the research results improve services to the criminal justice system?

It would improve the assessment of the probative value of any particular soil comparison result. It would aid in appropriate testimony and reporting. This research is needed to address the strength of a comparison, assessment of inconclusive, or exclusion.

4. Status assessment (I, II, III, or IV):

I

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.

Subcommittee

Approval date:

07/12/2019

(Approval is by majority vote of subcommittee. Once approved, forward to SAC.)

SA

1. Does the SAC agree with the research need? Yes No

2. Does the SAC agree with the status assessment? Yes No

If no, what is the status assessment of the SAC:

Approval date:

(Approval is by majority vote of SAC. Once approved, forward to NIST for posting.)