Soil Investigation
at a Glance

Protocols

Measurements taken at Soil Characterization Sites:
- top and bottom depths for each horizon in the soil profile
- structure, color, consistence, texture, and amounts of rocks, roots, and carbonates
- bulk density, particle density, particle size distribution, pH, and fertility (N, P, K) of samples taken from each horizon

Measurements taken at Soil Moisture or Atmosphere Sites:
- soil moisture monitored during annual campaigns, 12 times per year, or during SMAP satellite overpass
- soil temperature, daily or weekly, with diurnal variation 2 days every 3 months or monitored every 15 minutes

Suggested Sequence of Activities

Read the Introduction.
Read the Protocols to learn precisely what is to be measured and how.
Choose any Learning Activities that might support the Protocols.
Make copies of the Data Sheets in the Appendix.
Perform the Soil Characterization Protocols.
Perform the Soil Temperature Protocol.
Perform the Gravimetric and Volumetric Soil Moisture Protocol.
Perform the Bulk Density, Soil Particle Density, Particle Size Distribution, Soil pH, and Soil Fertility Protocols.
Visit the GLOBE Website with your students and review the data submission pages for Soils.
Submit your data to the GLOBE Student Data Archive using the Internet or email.

Special Notes

If you choose to dig a soil pit, you may require help with digging. It is also important to obtain permission from your local utility company to make sure that there is not a pipe or wire buried at that location.
# Table of Contents

## Introduction
- Why Investigate Soils? ..............................................Introduction 1
- The Big Picture .....................................................Introduction 2
- GLOBE Measurements ............................................Introduction 9
- Individual Measurements .......................................Introduction 9

## Protocols
- Selecting, Exposing and Describing a Soil Characterization Site
- Soil Characterization Protocol
- Soil Temperature Protocol
- Gravimetric and Volumetric Soil Moisture Protocol
- Bulk Density Protocol
- Soil Particle Density Protocol
- Particle Size Distribution Protocol
- Soil pH Protocol
- Soil Fertility Protocol
- Digital Multi-Day Max/Min/Current Air and Soil Temperature Protocol
  (see Atmosphere Chapter)
- Optional Digital Multi-Day Soil Temperatures Protocol*
- Optional Automated Soil and Air Temperature Monitoring Protocol*
- Optional Soil Moisture Sensor Protocol*
- Optional Water Infiltration Protocol*
- Optional Davis Soil Moisture and Temperature Station Protocol*

## Learning Activities
- Why do We Study Soil?*
- Just Passing Through - Beginners
- Just Passing Through
- Soil and my Backyard*
- A Field View of Soil - Digging Around*
- Soils as Sponges: How Much Water Does Soil Hold?*
- Soil: The Great Decomposer*
- The Data Game*

* See the full e-guide version of the Teacher's Guide available on the GLOBE Web site and CD-ROM.
Appendix

Soil Characterization Site Definition Sheet................. Appendix 2
Soil Characterization Data Sheet............................. Appendix 3
Soil Temperature Data Sheet..................................... Appendix 4
Soil Moisture Site Definition Sheet.......................... Appendix 5
Soil Moisture - SMAP Site Definition Sheet............... Appendix 7
Soil Moisture Data Sheet – Star Pattern..................... Appendix 9
Soil Moisture Data Sheet – Transect Pattern............... Appendix 10
Soil Moisture Data Sheet – Depth Profile.................... Appendix 11
Soil Moisture Data Sheet - SMAP Block Pattern.......... Appendix 12
Bulk Density Data Sheet........................................... Appendix 13
Soil Particle Density Data Sheet............................... Appendix 14
Soil Particle Size Distribution Data Sheet................ Appendix 15
Soil pH Data Sheet.................................................. Appendix 16
Soil Fertility Data Sheet......................................... Appendix 17
Digital Multi-Day Soil Thermometer Calibration and
    Reset Data Sheet................................................ Appendix 18
Digital Multi-Day Soil Thermometer Data Sheet........ Appendix 19
Daily Soil Moisture Sensor Data Sheet....................... Appendix 20
Biannual Soil Moisture Sensor Calibration
    Data Sheet........................................................ Appendix 21
Soil Infiltration Data Sheet..................................... Appendix 23
Textural Triangle.................................................. Appendix 24
Glossary................................................................ Appendix 25