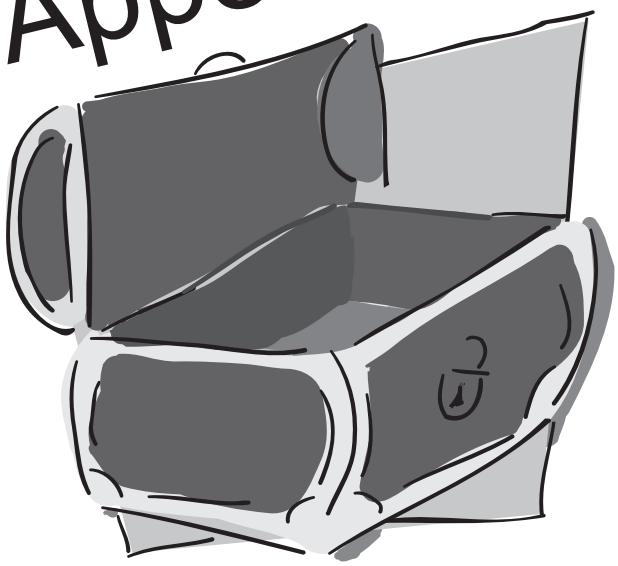
Appendix



Site Definition Sheet

Soil Characterization Data Sheet

Soil Temperature Data Sheet

Soil Moisture Site Definition Sheet

Soil Moisture - SMAP Site Definition Sheet

Soil Moisture Data Sheet – Star Pattern

Soil Moisture Data Sheet – Transect Pattern

Soil Moisture Data Sheet – Depth Profile

Soil Moisture Data Sheet - SMAP Block Pattern

Bulk Density Data Sheet

Soil Particle Density Data Sheet

Soil Particle Size Distribution Data Sheet

Soil pH Data Sheet

Soil Fertility Data Sheet

Digital Multi-Day Soil Thermometer Calibration and Reset Data Sheet

Digital Multi-Day Soil Thermometer Data Sheet

Daily Soil Moisture Sensor Data Sheet

Biannual Soil Moisture Sensor Calibration Data Sheet

Soil Infiltration Data Sheet

Textural Triangle

Glossary

Site Definition Sheet

*** Required Field**

School Name: _____ Site Name:_____
Choose a unique name based on location, e.g. "Grassy area - Front of School"

Names of students completing Site Definition Sheet: _____

Date: Year_____ Month_____ Day____ Check one: ❑ New Site ❑ Metadata Update

***Coordinates:** Latitude: _____˚ ❑ N or ❑ S Longitude: _____˚ ❑ E or ❑ W
Elevation: ___ meters

***Source of Location Data** (check one): ❑ GPS ❑ Other _____

Comments: _____

_____

Site Type (select all that apply based on intended measurements, then complete the necessary fields below): ❑ Atmosphere ❑ Surface Temperature ❑ Hydrology ❑ Land Cover ❑ Greening ❑ Soil Characteristics ❑ Soil Moisture and Temperature

Atmosphere

List any obstacles (Check one): ❑ No obstacles ❑ Obstacles (describe below)
(Obstacles are trees, buildings, etc. that appear above 14˚ elevation when viewed from the site)

Description:_____

_____

Buildings within 10 meters of instrument shelter (Check one):
❑ No buildings ❑ Buildings (describe below)

Description:_____

_____

Other Site Data:

Steepest Slope: _____ Compass Angle (facing up slope): _____

Rain Gauge Height [ ] cm Ozone Clip Height [ ] cm Thermometer Height [ ] cm

****Thermometer Type*** (Check one):
- ❑ Other, Soil or Air
- ❑ Liquid-filled Max/Min (U-tube)
- ❑ Liquid-filled, Current Temperature Only
- ❑ Digital Single-Day Min/Max
- ❑ Digital Multi-Day Min/Max
- ❑ Reset Digital Multi-Day Min/Max Thermometer

  Date: Year____ Month____ Day___ Universal Time (hour:min): _____

  Was this reset due to a battery change? ❑ Yes ❑ No
- ❑ AWS WeatherBug Station (Automated Station ID _____)
- ❑ Davis Instrument (Davis Thermometer Type _____)
- ❑ Data Logger (HOBO)
- ❑ Rainwise
- ❑ WeatherHawk
- ❑ No Thermometer

*** Required Field**

Surface Cover Description under instrument shelter (Check one): ❑ Pavement ❑ Bare ground ❑ Short grass (< 10 cm) ❑ Long grass (> 10 cm) ❑ Sand ❑ Roof (describe below) ❑ Other (describe below)

Description:_____

Overall comments on the site (metadata): _____

_____

Surface Temperature

Homogeneous site size (Select one): ❑ 90m x 90m ❑ 30m x 30m ❑ Smaller than 30 x 30m (specify size: __ m x __ m)

Cover type (Select one): ❑ Short grass (< 0.5m) ❑ Tall grass (> 0.5m) ❑ Barren land ❑ Shrubs ❑ Dwarf shrubs ❑ Concrete ❑ Asphalt ❑ Open water ❑ Other ❑ Land Cover site

Type of IRT Instrument: ❑ Raytech ST20 ❑ Other (specify instrument manufacturer and model) _____)

Overall comments on the site (metadata): _____

_____

Hydrology

***Name of Body of Water:** _____ (the name commonly used on maps; if the body of water does not have a common name, provide a description of the water body it comes from or flows into or both.)

***Water Body Type** (Select one): ❑ Unknown ❑ Saltwater ❑ Freshwater ❑ Brackish

Water Body Source (Select one):

- ❑ Pond (Area of standing water ___ km^2; Average Depth of Standing Water ___ m)
- ❑ Lake (Area of standing water ___ km^2; Average Depth of Standing Water ___ m)
- ❑ Reservoir (Area of standing water ___ km^2; Average Depth of Standing Water ___ m)
- ❑ Bay (Area of standing water ___ km^2; Average Depth of Standing Water ___ m)
- ❑ Ditch (Area of standing water ___ km^2; Average Depth of Standing Water ___ m)
- ❑ Ocean
- ❑ Estuary (Area of standing water ___ km^2; Average Depth of Standing Water ___ m)
- ❑ Stream (Width of Moving water ___ m)
- ❑ River (Width of Moving water ___ m)
- ❑ Other (Width of Moving water ___ m; Area of standing water ___ km^2; Average Depth of Standing Water __ m)

*** Required Field**

Can you see the bottom? ❑ Yes ❑ No
Channel/Bank Material: ❑ Soil ❑ Rock ❑ Concrete ❑ Vegetated Bank
Bedrock: ❑ Granite ❑ Limestone ❑ Volcanics ❑ Mixed Sediments ❑ Unknown
Freshwater Habitats Present: ❑ Rocky Substrate ❑ Vegetated Banks ❑ Mud Substrate ❑ Sand Substrate ❑ Submersed Vegetation ❑ Logs
Saltwater Habitats Present: ❑ Rocky Shore ❑ Sandy Shore ❑ Mud Flats/Estuary

Overall comments on the site (metadata): _____
_____

Land Cover

MUC Description: Level 1: _____ Level 2: _____
Level 3: _____ Level 4: _____
Note: *Use the MUC Guide to determine the greatest level possible within the MUC system*

***MUC Code:** _____

Overall comments on the site (metadata): _____
_____

Greening

Are there multiple dominant species? ❑ Yes ❑ No

Primary Plant
Is this plant in the understory? ❑ Yes ❑ No

Vegetation Type (Select one): ❑ Grass Genus: _____
❑ Tree Genus: _____ Species: _____
❑ Shrub Genus: _____ Species: _____
Label: _____

Secondary Plant
Is this plant in the understory? ❑ Yes ❑ No

Vegetation Type (Select one): ❑ Grass Genus: _____
❑ Tree Genus: _____ Species: _____
❑ Shrub Genus: _____ Species: _____
Label: _____

*** Required Field**

Tertiary Plant

Is this plant in the understory? ❑ Yes ❑ No

Vegetation Type (Select one): ❑ Grass Genus: _____
❑ Tree Genus: _____ Species: _____
❑ Shrub Genus: _____ Species: _____

Label: _____

If additional plants will be monitored record the information on another sheet or in your Science Log.

Overall comments on the site (metadata): _____
_____

Soil Characteristics

Slope angle (North, Northeast, etc.): _____

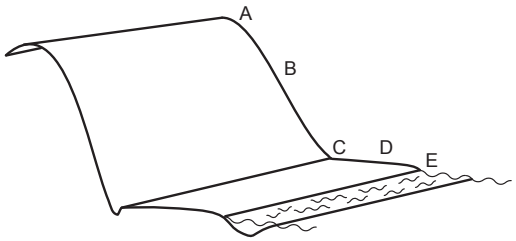
Method (select one): ❑ Soil Pit ❑ Auger Hole ❑ Near Surface ❑ Excavation ❑ Road Cut ❑ Erosion Cut

Soil Characterization Site Location (Select one): ❑ Off School Grounds ❑ On School Grounds

Land Use (Select one): ❑ Urban ❑ Agricultural ❑ Recreation ❑ Wilderness ❑ Other _____

Landscape Position (Select one):

❑ A. Summit
❑ B. Slope
❑ C. Depression
❑ D. Large Flat Area
❑ E. Stream Bank



Cover Type (Select one): ❑ Bare Soil ❑ Rocks ❑ Grass ❑ Shrubs ❑ Trees ❑ Other _____

Parent Material (Select one): ❑ Bedrock ❑ Organic Material ❑ Construction Material ❑ Marine Deposits ❑ Lake Deposits ❑ Stream Deposits (Alluvium) ❑ Wind Deposits (Loess) ❑ Glacial Deposits (Glacial Till) ❑ Volcanic Deposits ❑ Loose Materials on Slope (Colluvium) ❑ Don't Know ❑ Other _____

Distance from Major Features: _____

Soil Horizon Definitions

Horizon Number	**Date** (YYYY, MM, DD)	***Top Depth** (cm)	***Bottom Depth** (cm)	**Main color** (code from soil color book)	**Secondary Color** (code from soil color book)	**Moisture Estimate** (Select one: Unknown, Dry, Moist, Wet)	**Root Quantity Estimate** (Select one: Unknown, None, Few, Many)	**Rock Quantity Estimate** (Select one: Unknown, None, Few, Many)	**Texture Field Estimate** (Select one: Unknown, Sandy Clay, Sandy Clay Loam, Sandy Loam, Silty Clay, Silty Clay Loam, Silt Loam, Loamy Sand, Sand, Silt, Clay, Clay Loam, Loam, Organic)	**Consistence Estimate** (Select one: Extremely Firm, Firm, Friable, Loose, Unknown)	**Structure Estimate** (Select one: Unknown, Granular, Blocky, Platy, Prismatic, Columnar, Single Grained, Massive)	**Carbonates** (Select one: Unknown, None, Slight, Strong)

Note: The Top Depth of any horizon must be the same depth or lower than the Bottom Depth of the horizon above it; it cannot be higher that the bottom depth above it.

Comments on the site (metadata): _____ _____

* Required Field

*** Required Field**

Soil Moisture and Temperature

Surface State (Select one): ❑ Natural ❑ Plowed ❑ Graded ❑ Backfill ❑ Compacted ❑ Other _____

Surface Cover (Select one): ❑ Bare Ground ❑ Short Grass (Under 10 cm) ❑ Long Grass (Over 10 cm)

Canopy Cover (Select one): ❑ Open ❑ Some Trees (within 30m) ❑ Canopy Overhead

SMAP Site Metadata

Distance to nearest rain gauge or instrument shelter: _____ m; Direction _____

Distance to nearest Soil Characterization Site: _____ m; Direction _____

Overall comments on the site (metadata): _____

_____

Site Photos

(record the appropriate photo number for easy identification during data entry)

North	South	East	West
Photo number _____	Photo number _____	Photo number _____	Photo number _____

Overall comments on the site (metadata): _____

_____

Soil Investigation

Soil Temperature Data Sheet

Study Site: _____

Name of Collector/Analyst/Recorder: _____

Date: _____

Soil Thermometer: Dial _____ Digital _____ Other _____

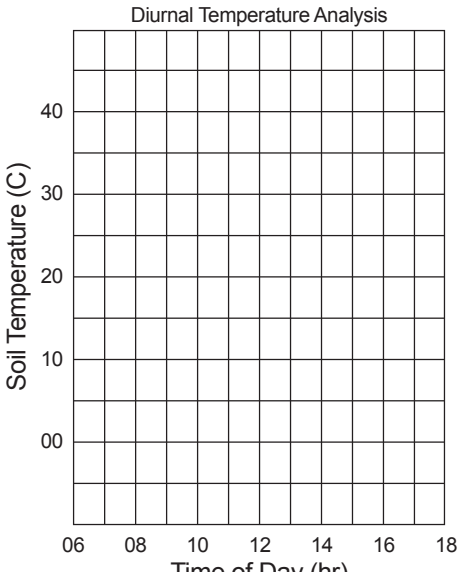
Has there been precipitation within the last 24 hours? Yes _____ No _____

Daily/Weekly Measurements

	SampleTime		Temperature		
No.	(hr)	(min)	5 cm (˚ C)	10 cm (˚ C)	Air (˚ C)
1	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____

Diurnal Cycle Measurements

	SampleTime		Temperature		
No.	(hr)	(min)	5 cm (˚ C)	10 cm (˚ C)	Air (˚ C)
1	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____
5	_____	_____	_____	_____	_____
6	_____	_____	_____	_____	_____
7	_____	_____	_____	_____	_____
8	_____	_____	_____	_____	_____



Daily Metadata/Comments:

_____

_____

_____

_____

Soil Investigation

Soil Moisture Data Sheet - Star Pattern

Study Site: _____

Observer names: _____

Date samples collected: Year: _____ Month: _____ Day: _____

Local Time: ____:___ (Hours:Min) UT: ___:____ (Hours:Min)

Current Conditions: Is surface soil saturated? ❒ Yes ❒ No

Drying Method: (check one) ❒ 95-105˚ C oven ❒ 75-95˚ C oven ❒ other _____

Average drying time: Hours/minutes_____

Bearing from Star Center (optional): _____ Distance from Star Center: _____

Observations:_____

_____

_____

_____

Near-Surface Samples:

			A	B	C	(A-B)/(B-C)
0-5 cm	Container ID#	Container Volume (mL) *(Optional)*	Mass of wet soil and container (wet mass) (g)	Mass of dry soil and container (dry mass) (g)	Mass of empty container (g)	Soil Water Content (from calculations) (g/g)
Sample 1						
Sample 2						
Sample 3						

			A	B	C	(A-B)/(B-C)
10 cm	Container ID#	Container Volume (mL) *(Optional)*	Mass of wet soil and container (wet mass) (g)	Mass of dry soil and container (dry mass) (g)	Mass of empty container (g)	Soil Water Content (from calculations) (g/g)
Sample 1						
Sample 2						
Sample 3						

Soil Investigation

Soil Moisture Data Sheet - Transect Pattern

Study Site: _____

Observer names: _____

Date samples collected: Year: _____ Month: _____ Day: _____

Local Time: ____:___ (Hours:Min) UT: ___:____ (Hours:Min)

Current conditions: Is soil saturated? ❒ Yes ❒ No

Drying method: (check one) ❒ 95-105˚ C oven ❒ 75-95˚ C oven ❒ other _____

Average drying time: Hours/minutes _____

Daily Metadata: (optional)

Length of Line: _____ m Compass Bearing: _____ Station Spacing: _____ m

Directions:

Transects should be 50 m long, located in an open field. Measurements are made 12 times/yr. during a regular interval of your choice. Enter the data for your samples collected between 0-5 cm (10 single samples plus 1 triple sample):

Observations:

				A	B	C	(A-B)/B-C)
Sample Number	Offset from end of Transect (m)	Container ID#	Container Volume (mL) *(Optional)*	Mass of wet soil and container (wet mass) (g)	Mass of dry soil and container (dry mass) (g)	Mass of empty container (g)	Soil Water Content (from calculations) (g/g)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							

Soil Investigation

Soil Moisture Data Sheet - Depth Profile

Study Site: _____

Observer names: _____

Date samples collected: Year: _____ Month: _____ Day: _____

Local Time: ____:___ (Hours:Min) UT: ___:____ (Hours:Min)

Current Conditions: Is surface soil saturated? ❒ Yes ❒ No

Drying Method: (check one) ❒ 95-105˚ C oven ❒ 75-95˚ C oven ❒ other _____

Average drying time: Hours/minutes _____

Bearing from Star Center (optional): _____ Distance from Star Center: _____

Observations:_____

_____

_____

_____

Depth Samples:

			A	B	C	(A-B/(B-C)
Sample Depth	Container ID#	Container Volume (mL) *Optional*	Mass of wet soil and container (wet mass) (g)	Mass of dry soil and container (dry mass) (g)	Mass of empty container (g)	Soil Water Content (from calculations) (g/g)
0-5 cm						
10 cm						
30 cm						
60 cm						
90 cm						

Soil Investigation

Soil Moisture Data Sheet - SMAP Block Pattern

Study Site: _____

Observer names: _____

Date samples collected: Date (Year-Month-Day): _____
Local Time: ____:____ (Hours:Min) UT: ____:____ (Hours:Min)

Drying

Is the soil saturated? ❒ Yes ❒ No

Drying Method (oven and temperature range) _____ Drying time (hrs:min): _____

Weight Measurements

	Container with sample before drying (a)	Container with sample after drying (b)	Water Weight (c) a - b = xx g *(Calculated value by database)*	Empty Container Weight (d)	Dry Soil Weight (e) b - d = xx g *(Calculated value by database)*
Sample	____ g	____ g		____ g	

Gravimetric Soil Moisture (f)
c / e = xx g/g
(Calculated value by database)

Container Volume Measurements

Container volume measurements are required at least once out of every 10 weight measurements, but can be repeated more frequently if desired. Below is your most recently measured Average Sample Volume:

Measure the Initial and Final volume of your measuring cylinder 3 times; container volume and average container volume will be calculated during data entry.

	Initial Volume (V_i)	Final Volume (V_f)	Container Volume (V_i - V_f) *(Calculated value by database)*
Sample 1	____ mL	____ mL	
Sample 2	____ mL	____ mL	
Sample 3	____ mL	____ mL	

Average Container Volume will be calculated during data entry.

Additional observations: _____

_____

_____

Soil Investigation

Bulk Density Data Sheet

Note: All measurements are done without the can lid!!

Date of sample collection: Year _____ Month _____ Day _____

Study Site: _____

Horizon Number: _____, Horizon Depth: Top _____cm, Bottom _____cm

		Sample Number		
		1	**2**	**3**
A	Container #			
B	Wet mass of soil and container (g)			
C	Dry mass of soil and container (g)			
D	Container volume (mL)			
E	Container mass (g)			
F	Mass of rocks (g)			
G	Volume of water without rocks (mL)			
H	Volume of water with rocks (mL)			
I	**Mass of dry soil (g) = C-E**			
J	**Volume of rocks (mL) = H-G**			
K	**Bulk Density (g/mL) =** $\frac{\text{I-F}}{\text{D-J}}$			

Soil Investigation

Soil Particle Density Data Sheet

Note: All measurements should be made without the stopper/cap!!

Date soil is mixed with water: year _____ month _____ day _____

Study Site: _____

Horizon number: _____

How has the soil been stored since it came out of the oven? _____

Length of time since the soil was dried in the oven: _____

Other comments: _____

	Sample Number		
	1	**2**	**3**
Mass of empty flask (g) (B below)			
Mass of soil + empty flask (g) (A below)			
Mass of water + soil + flask (g) (D below)			
Water temperature (°C) (F below)			

Calculation Worksheet

	Sample Number		
	1	2	3
A Mass of soil + empty flask (g)			
B Mass of empty flask (g)			
C Mass of soil (g) (A - B)			
D Mass of water + soil + flask (g)			
E Mass of water (g) (D - A)			
F Temperature of water (°C)			
G Density of water (g/mL) (approximately 1.0)			
H Volume of water (mL) (E/G)			
I Volume of soil (mL) (100 mL - H)			
J Soil particle density (g/mL) (C/I)			

Soil Investigation

Soil Particle Size Distribution Data Sheet

Date of sample collection: Year _____ Month _____ Day _____

Study Site:_____

Horizon Number: _____ Horizon Depth: Top _____cm Bottom _____cm

Sample Number 1

Distance from 500 mL mark to base of graduated cylinder: _____cm

Hydrometer Calibration Temperature: _____˚C

A. 2 minute hydrometer reading: _____ C. 24 hour hydrometer reading: _____

B. 2 minute temperature: _____˚C D. 24 hour temperature: _____˚C

Sample Number 2

Distance from 500 mL mark to base of graduated cylinder: _____cm

Hydrometer Calibration Temperature: _____˚C

A. 2 minute hydrometer reading: _____ C. 24 hour hydrometer reading: _____

B. 2 minute temperature: _____˚C D. 24 hour temperature: _____˚C

Sample Number 3

Distance from 500 mL mark to base of graduated cylinder: _____cm

Hydrometer Calibration Temperature: _____˚C

A. 2 minute hydrometer reading: _____ C. 24 hour hydrometer reading: _____

B. 2 minute temperature: _____˚C D. 24 hour temperature: _____˚C

Soil Investigation
Soil pH Data Sheet

Date of sample collection: ________________ Study Site: _________________________

Horizon Number: ___________ Horizon Depth: Top _____cm, Bottom _____cm

Sample Number 1 – *pH Measurement method (check one):* ❒ *paper* ❒ *meter*

pH of soil and water mixture _____

Sample Number 2 – *pH Measurement method (check one):* ❒ *paper* ❒ *meter*

pH of soil and water mixture _____

Sample Number 3 - *pH Measurement method (check one):* ❒ *paper* ❒ *meter*

pH of soil and water mixture _____

Horizon Number: ___________ Horizon Depth: Top _____cm, Bottom _____cm

Sample Number 1 – *pH Measurement method (check one):* ❒ *paper* ❒ *meter*

pH of soil and water mixture _____

Sample Number 2 – *pH Measurement method (check one):* ❒ *paper* ❒ *meter*

pH of soil and water mixture _____

Sample Number 3 - *pH Measurement method (check one):* ❒ *paper* ❒ *meter*

pH of soil and water mixture _____

Horizon Number: ___________ Horizon Depth: Top _____cm, Bottom _____cm

Sample Number 1 – *pH Measurement method (check one):* ❒ *paper* ❒ *meter*

pH of soil and water mixture _____

Sample Number 2 – *pH Measurement method (check one):* ❒ *paper* ❒ *meter*

pH of soil and water mixture _____

Sample Number 3 - *pH Measurement method (check one):* ❒ *paper* ❒ *meter*

pH of soil and water mixture _____

Soil Investigation
Soil Fertility Data Sheet

Date of Sample Collection: __________ Study Site:____________________________________

Horizon Number:________ Horizon Depth: Top______cm Bottom________cm

Sample Number 1	***Sample Number 2***	***Sample Number 3***
Nitrate (N):	**Nitrate (N):**	**Nitrate (N):**
High__ Med__ Low__ None__	High__ Med__ Low__ None__	High__ Med__ Low__ None__
Phosphorus (P):	**Phosphorus (P):**	**Phosphorus (P):**
High__ Med__ Low__ None__	High__ Med__ Low__ None__	High__ Med__ Low__ None__
Potassium (K):	**Potassium (K):**	**Potassium (K):**
High__ Med__ Low__ None__	High__ Med__ Low__ None__	High__ Med__ Low__ None__

Date of Sample Collection: __________ Study Site:____________________________________

Horizon Number:________ Horizon Depth: Top______cm Bottom________cm

Sample Number 1	***Sample Number 2***	***Sample Number 3***
Nitrate (N):	**Nitrate (N):**	**Nitrate (N):**
High__ Med__ Low__ None__	High__ Med__ Low__ None__	High__ Med__ Low__ None__
Phosphorus (P):	**Phosphorus (P):**	**Phosphorus (P):**
High__ Med__ Low__ None__	High__ Med__ Low__ None__	High__ Med__ Low__ None__
Potassium (K):	**Potassium (K):**	**Potassium (K):**
High__ Med__ Low__ None__	High__ Med__ Low__ None__	High__ Med__ Low__ None__

Date of Sample Collection: __________ Study Site:____________________________________

Horizon Number:________ Horizon Depth: Top______cm Bottom________cm

Sample Number 1	***Sample Number 2***	***Sample Number 3***
Nitrate (N):	**Nitrate (N):**	**Nitrate (N):**
High__ Med__ Low__ None__	High__ Med__ Low__ None__	High__ Med__ Low__ None__
Phosphorus (P):	**Phosphorus (P):**	**Phosphorus (P):**
High__ Med__ Low__ None__	High__ Med__ Low__ None__	High__ Med__ Low__ None__
Potassium (K):	**Potassium (K):**	**Potassium (K):**
High__ Med__ Low__ None__	High__ Med__ Low__ None__	High__ Med__ Low__ None__

Soil Investgation

Digital Multi-Day Soil Thermometer Calibration and Reset Data Sheet

School Name: _____ Study Site: _____

Observer Names: _____

_____

Calibration

Thermometer Readings						
Reading Number	**Date (yy/mm/dd)**	**Local Time (hour:min)**	**Universal Time (hour:min)**	**Calibration Thermometer Readings (°C)**	**Digital 5 cm sensor Readings (°C)**	**Digital 50 cm Sensor Readings (°C)**
1						
2						
3						
4						
5						

Time of Reset

Note: The thermometer should be reset only when it is first setup, after the battery is changed, or if the time of local solar noon drifts to more than one hour from your *time of reset*.

Date: _____ Local time (Hour:Min) _____ Universal time (Hour:Min) _____

Was the reset due to a battery change?_____

5 cm Sensor Check

Thermometer Readings					
Reading Number	**Date (yy/mm/dd)**	**Local Time (hour:min)**	**Universal Time (hour:min)**	**Soil Probe Thermometer Readings at 5 cm (°C)**	**Digital 5 cm Sensor Readings (°C)**
1					
2					
3					
4					
5					

Soil Investigation

Digital Multi-Day Soil Thermometer Data Sheet

School Name: _____ Study Site: _____

Observer Names: _____

_____

Date: Year _____ Month _____ Day _____

Local time (Hour:Min)_____ Universal time (Hour:Min) _____

Your *Time of Reset* in universal time (Hour:Min): _____

Current Temperatures

5 cm soil temperature (˚C): _____

50 cm soil temperature (˚C): _____

Maximum, Minimum Temperatures

Do not read the thermometer within 5 minutes of your *time of reset*.

	Label on Digital Display Screen					
	D1	D2	D3	D4	D5	D6
Maximum 5 cm Temperature (°C)						
Minimum 5 cm Temperature (°C)						
Maximum 50 cm Temperature (°C)						
Minimum 50 cm Temperature (°C)						
If you are reading thermometer AFTER your *time of reset*: Corresponding to 24-hour Period Ending:	Today	Yesterday	Two days ago	Three days ago	Four days ago	Five days ago
If you are reading thermometer BEFORE your *time of reset*: Corresponding to 24-hour Period Ending:	Yesterday	Two days ago	Three days ago	Four days ago	Five days ago	Six days ago

Soil Investigation

Daily Soil Moisture Sensor Data Sheet

School Name: _____

Study Site:_____

Date you started to use this SWC calibration curve: _____

Type of Sensor: ❒ Watermark Block/Delmhorst meter ❒ Watermark Block/Irrometer Watermark meter

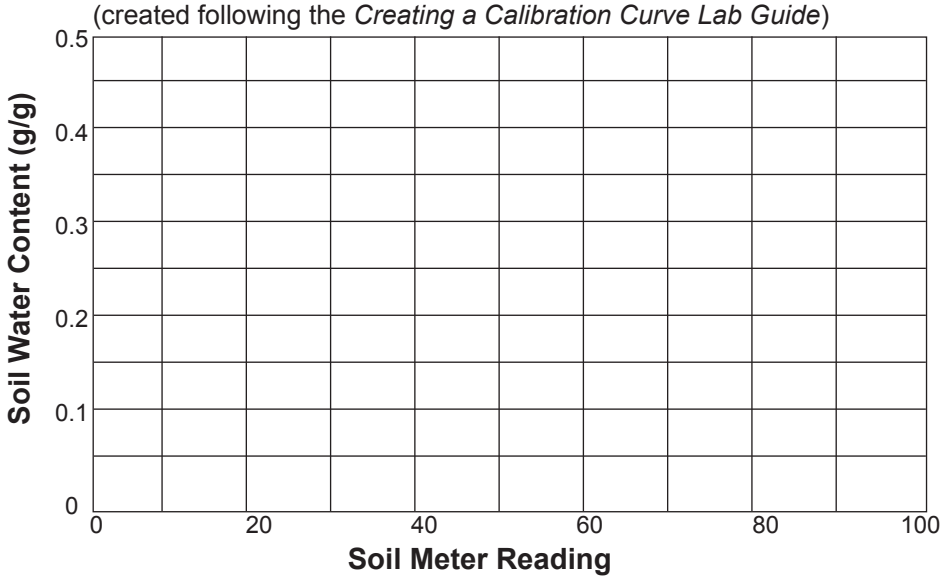
❒ Watermark Block/Spectrum Watchdog (logger) ❒ Other

Observations:

Measurement					Soil Moisture Meter Readings (cm)				SWC from Calibration Curve (cm)			
#	Date	Time (UT)	Is the soil saturated? (Yes or No)	Observers' Names	10	30	60	90	10	30	60	90
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

Calibration Curve

(created following the *Creating a Calibration Curve Lab Guide*)



Soil Investigation

Biannual Soil Moisture Sensor Calibration Data Sheet

School Name: _____

Study Site:_____

Drying Method (check one): 95-105 °C oven ___; 75-95 °C oven ___; other____

Average Drying Time: _____ (hours or minutes)

Depth (Check one): ❑ 10 cm ❑ 30 cm ❑ 60 cm ❑ 90 cm

Observations:

Measurements					Data and Calculations						
#	Date	Local Time (Hour:min)	Time (UT)	Observers' Names	A. Wet Mass (g)	B. Dry Mass (g)	C. Water Mass (A-B)	D. Can Mass (g)	E. Dry Soil Mass (B-D)	F. Soil Water Content (C/E) Reading	G. Soil Moisture Meter Reading
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

Soil Investigation

Biannual Soil Moisture Sensor Calibration Data Sheet – Continued

School Name: _____

Study Site:_____

Depth (Check one): ❑ 10 cm ❑ 30 cm ❑ 60 cm ❑ 90 cm

Observations:

Measurements					Data and Calculations						
#	Date	Local Time (Hour:min)	Time (UT)	Observers' Names	A. Wet Mass (g)	B. Dry Mass (g)	C. Water Mass (A-B)	D. Can Mass (g)	E. Dry Soil Mass (B-D)	F. Soil Water Content (C/E) Reading	G. Soil Moisture Meter Reading
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Soil Investigation

Soil Infiltration Data Sheet

Site Name: _____

Name of Collector/Analyst/Recorder: _____

Sample collection

- date: _____
- time: _____ (hours and minutes) check one: UT____ Local ____

Distance to Soil Moisture Site _____ m

Sample Set number: _____ Width of your reference band: _____mm

Diameter: Inner Ring: _____ cm Outer Ring: _____ cm

Heights of reference band above ground level: Upper : _____ mm Lower : _____ mm

Directions:

Take 3 sets of infiltration rate measurements within a 5 m diameter area. Use a different data work sheet for each set. Each set consists of multiple timings of the same water level drop or change until the flow rate becomes constant or 45 minutes is up. Record your data below for one set of infiltration measurements you take.

The form below is setup to help you calculate the flow rate.

For data analysis, plot the Flow Rate (F) vs. Midpoint time (D).

Observations:

	A. Start (min) (sec)	B. End (min) (sec)	C. Interval (min) (B-A)	D. Midpoint (min) (A+C/2)	E. Water Level Change (mm)	F. Flow Rate (mm/min) (E/C)
1	___ ___	___ ___	_____	_____	_____	_____
2	___ ___	___ ___	_____	_____	_____	_____
3	___ ___	___ ___	_____	_____	_____	_____
4	___ ___	___ ___	_____	_____	_____	_____
5	___ ___	___ ___	_____	_____	_____	_____
6	___ ___	___ ___	_____	_____	_____	_____
7	___ ___	___ ___	_____	_____	_____	_____
8	___ ___	___ ___	_____	_____	_____	_____
9	___ ___	___ ___	_____	_____	_____	_____

Saturated Soil Water Content below infiltrometer after the experiment:

A. Wet Weight: _____ g B. Dry Weight: _____ g C. Water Weight (A-B): _____ g

D. Container Weight: _____ g E. Dry Soil Weight (B-D): _____ g

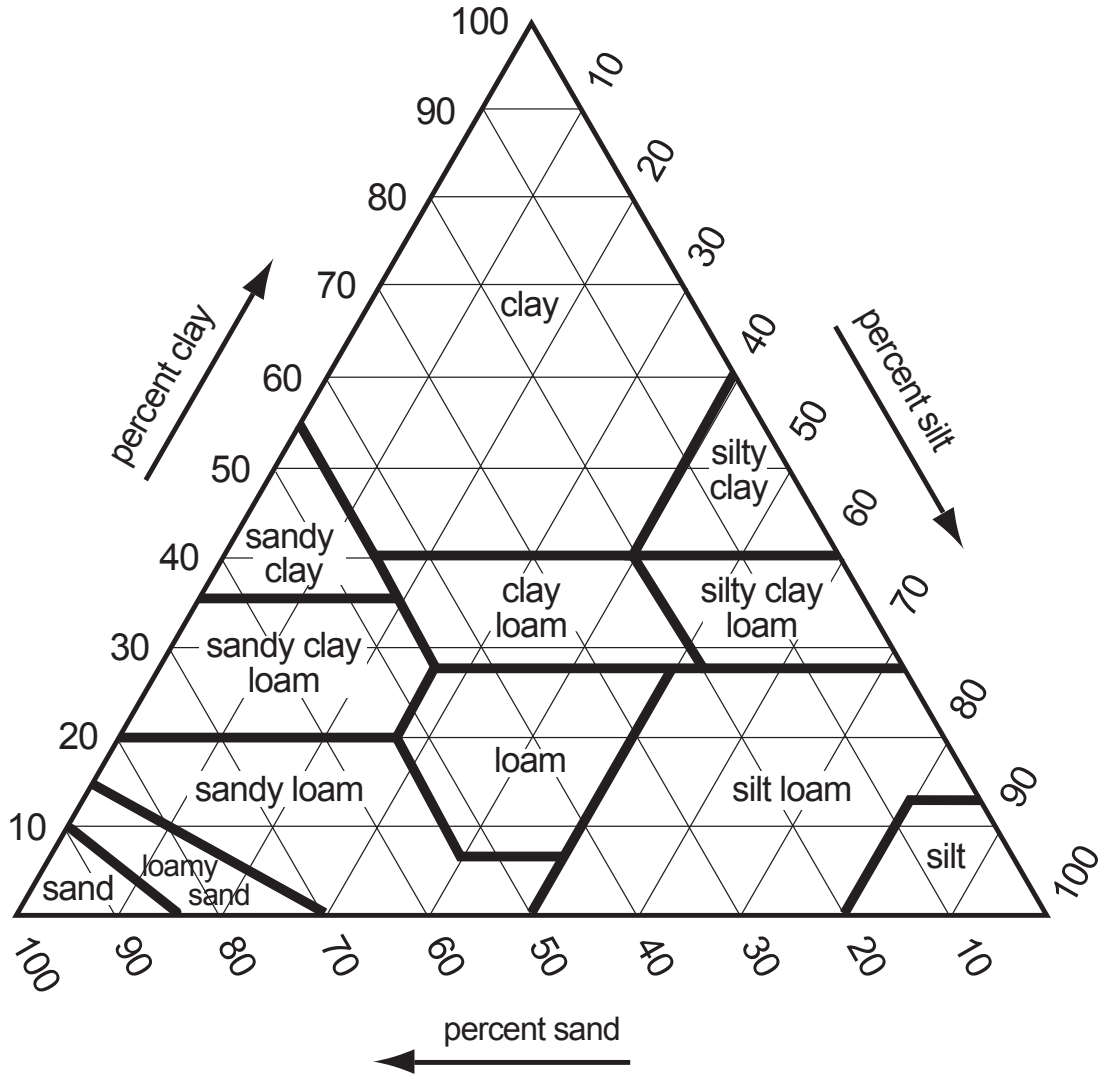
F. Soil Water Content (C/E) _____

Daily Metadata/Comments: (optional) _____

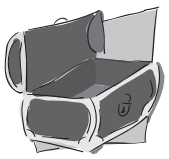
_____

Soil Investigation

Textural Triangle 3



Glossary



Acid Soil
A soil that contains more hydrogen ions than hydroxide ions and therefore has a pH less than 7.0

Alluvium
Sediment transported by flowing water (e.g. a stream)

Anomaly
Something irregular or abnormal

Basic Soil
A soil that contains more hydroxide ions than hydrogen ions and therefore has a pH greater than 7.0

Blocky Structure
Irregular block-like soil peds that are usually 0.5 cm to 5.0 cm in diameter

Bulk Density
Mass of dry soil per unit volume (expressed in GLOBE as grams per cubic centimeter)

Chroma
When referenced to hue, the level of saturation of a color

Clay
A mineral particle <.002 mm in size that has a "sticky and dense" feel when moistened and rubbed between the fingers

Columnar Structure
A type of soil structure where the soil peds (or chunks) are in the shape of a column with a rounded top. Columnar structure is found in arid regions and generally ranges between 1 and 10 cm long.

Concretion
A cemented mass of a chemical compound, such as iron oxide or calcium carbonate, that can be removed intact from the soil

Consistence
How easy or hard it is for a soil ped to break apart when it is squeezed

Crytoturbation
Process of freezing, thawing, and churning of a soil

Diurnal cycle
A daily cycle, a basic repetition period of 24 hours. All processes that are dominated by the sun are diurnal. Tides, in contrast, repeat cycles twice daily.

Effervescence
The bubbling action that occurs as a gas comes out of a liquid such as when carbon dioxide gas is produced by the reaction of carbonate coatings on soil being treated with an acid like vinegar

Eluviation
The removal of materials from one horizon which are then "illuviated" or deposited into a lower horizon

Erosion
The removal and movement of soil materials by water, wind, ice, or gravity as well as by human activities such as agriculture or construction

Evaporation
Water on Earth's surface or in the soil absorbs heat from the sun to the point that it changes from a liquid to a gas and moves into the atmosphere

Extremely Firm
A type of soil consistence in which soil peds require extreme pressure, requiring the use of a tool (e.g., a hammer), to break

Face
The way an exposed section of soil or soil profile appears

Fertility
The ability of a soil to supply the elements and compounds needed for plant growth

Fill
Soil, rock, or other material that has been added to a site for construction purposes usually to bring the surface to a certain level

Firm
A type of soil consistence in which the soil peds require significant pressure before breaking

Floury
Having the feel of finely ground flour – smooth and powdery

Free Carbonates
Carbonate materials that form coatings on soil that react with an acid, such as vinegar, to form carbon dioxide gas

Freeze-thaw
The mechanical break up of rock caused by the expansion of freezing water in cracks and crevices

Friable
A type of soil consistence in which the soil ped breaks easily when squeezed between the thumb and fore finger with a small amount of pressure

Glacial Till
Sediment deposited from a glacier

Granular Structure
Roundish soil peds with an appearance like “cookie crumbs” that are usually less than 1.0 cm in diameter

Gravimetric
Analysis of soil moisture that depends on weighing the soil in a moist and dry state and determining the difference

Ground Water
Water stored underground in a saturated zone of rock, sand, gravel or other material

Heat Capacity
The ratio of the heat required to raise the temperature of a unit volume of soil by one degree

Horizon
An individual layer within the soil which has its own unique characteristics (such as color, structure, texture, or other properties) that make it different from the other layers in the soil profile

Hue
A particular color as distinguished from other colors on the color wheel

Humus
The part of the soil profile that is composed of decomposed organic matter from dead and decaying plants and animals and is usually dark colored

Hydrometer
An instrument based on the principles of buoyancy used to measure the specific gravity of a liquid containing suspended soil particles in relation to the specific gravity of pure water at a specified temperature

Illuviation
The deposit of materials carried by water from one horizon into another within the soil (such as clay or nutrients)

Infiltration
Downward entry of water into the soil

In situ
Location at a particular site

Leaching
Removal of soluble material in solution from the soil by the movement of water through the soil

Lithosphere
The outer layer of soil and rock on a planet is called the “lithosphere” after the Greek word “lithos” meaning “stone.”

Litter
Leaves, needles, twigs, branches, stems, or fruits covering the soil from the surrounding trees in a forest

Loam
Soil that contains an approximately equal amount of sand, silt, and clay particles.

Loess
Fine sediment transported by wind

Loose
A type of soil consistence in which the soil grains do not stick to one another (i.e. structure is single grained).

Massive Structure
A structureless soil in which all soil particles are stuck together and there are no distinct peds

Metadata
Data about data. Soil moisture data requires metadata describing the vegetation cover and possible sources of water in order to be interpreted properly.

Mottles
Streaks of spots of different colors in a soil interspersed with the dominant soil color, usually indicating poor drainage

Organic Matter
Decomposed animal or plant material that is added to the soil and becomes a part of the soil profile. When it is fully decomposed and incorporated into the soil, organic matter becomes a dark, moist, nutrient rich substance called humus and the plant and animal material from which it formed can no longer be recognized

Particle Density
The mass per unit volume of soil particles, excluding pore space

Particle Size Distribution
The amount (percent) of each of sand, silt, and clay in a soil sample

Ped
An individual unit of natural soil structure or aggregation (such as granular, blocky, columnar, prismatic, or platy)

Pedosphere
The thin outer layer of the Earth which is made up of soil. The pedosphere acts as an integrator between the atmosphere, biosphere, lithosphere, and hydrosphere of the Earth.

Permafrost
A continuously frozen soil horizon

pH
Measure of the acidity of a soil

Platy Structure
Flat, plate-like soil peds

Porosity
Percentage of soil volume not occupied by solid material

Prismatic Structure
A type of soil structure in which the soil ped is in the shape of a prism, generally ranging from 1.0 – 10.0 cm

Profile
The "face" of a soil when it has been cut vertically that shows the individual horizons and soil properties with depth

Runoff
Water that falls on the land surface but does not infiltrate and therefore flows across the land surface

Sand
A mineral particle between 0.05 and 2.0 mm in size that has a "gritty" feel when moistened and rubbed between the fingers

Saturation
When the pores of a soil are completely filled with water

Single Grained Structure
A structureless soil in which each soil grain is individual and loose in the soil (i.e. there are no peds)

Silt
A mineral particle between 0.002 and 0.05 mm in size that has a "floury, smooth" feel when moistened and rubbed between the fingers

Soil Profile
The "face" of a soil when it has been cut vertically that shows the individual horizons and soil properties with depth

Soil Water Content (SWC)
A measure of how much water is present in the pores of a soil, specifically, the ratio of the mass of water to the mass of dry soil.

Structure
The shape of soil units (peds) that occur naturally in a soil horizon. Some possible soil structures are granular, blocky, prismatic, columnar, or platy. Soils can also be structureless if they do not form into peds. In this case, they may be a consolidated mass (massive) or stay as individual particles (single grained).

Subsoil
The common term for the layers beneath the topsoil

Supernatant
When soil particles are suspended and allowed to settle, the liquid above the settled soil is cleaner than the soil below

Texture
The way soil "feels" when it is squeezed between the fingers or in the hand. The texture depends on the amount of sand, silt, and clay in the sample (particle size distribution), as well as other factors (how wet it is, how much organic matter is in the sample, the kind of clay, etc.)

Topsoil
The common term for the top layer of soil

Transect
In any field (outdoor) study, a transect consists of a line of study, often divided into intervals where observations or samples are collected.

Transpiration
The transfer of water as a gas from plant leaves to the atmosphere through the stomates

Uniform
This term is used in its traditional sense when characteristics display similar properties. Two related words are homogeneous (distributed evenly) and normal (distributed about a central mean value and described by a statistical equation).

Value
When referenced to hue, an indication of the lightness of a color

Volatilization
Evaporation of water vapor or other gases from the soil

Water Erosion
The wearing away of the land surface by water creating the detachment and movement of soil from one location to another.

Wind Erosion
The wearing away of the land surface by wind creating the detachment and movement of soil from one location to another