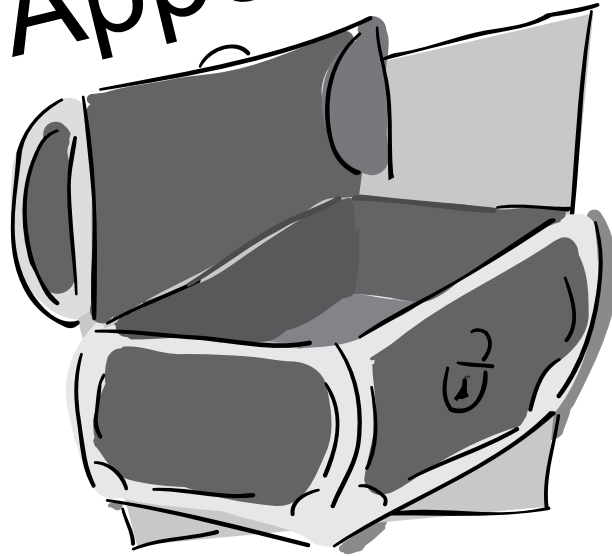


# Appendix



[\*Site Definition Sheet\*](#)

[\*Soil Temperature Data Sheet\*](#)

[\*Soil Moisture Data Sheet - SMAP Block Pattern\*](#)

[\*Soil Moisture Data Sheet – Star Pattern\*](#)

[\*Soil Moisture Data Sheet – Transect Pattern\*](#)

[\*Soil Moisture Data Sheet – Depth Profile\*](#)

[\*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 Data Sheet\*](#)

[\*Daily Soil Moisture Sensor Data Sheet\*](#)

[\*Soil Infiltration Data Sheet\*](#)

[\*Textural Triangle\*](#)

[\*Frost Tube Protocol Data Sheet\*](#)

[\*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  Hydrosphere  
 Biosphere Land Cover  Biosphere Greening  Biosphere Phenological Gardens  
 Biosphere Lilacs  Soil (Pedosphere) Characteristics  
 Soil (Pedosphere) Moisture and Temperature  Soil (Pedosphere) Frost Tube

**Cover type** (Select one):  Short grass (< 0.5m)  Tall grass (> 0.5m)  Barren land  
 Sand  Closed Forest (Trees interlocking)  Woodland (Trees not interlocking)  
 Shrubs  Dwarf Shrubs  Flowering Plants  Wetland  Cultivated Agricultural  
 Cultivated Recreational  Open Water  Bare Rock  Urban Residential  
 Urban Commercial  Asphalt  Concrete  Other  Land Cover site

**If you selected Closed Forest or Woodland, indicate the ground cover** (Select one):  
 Leaf Litter  Moss  Peat

---

## 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, Current Temperature Only
- Digital Single-Day Min/Max
- Digital Multi-Day Min/Max
- Reset Digital Multi-Day Min/Max Thermometer

**Note:** reset is required before data collection and entry, when batteries are changed or every 6 months

School Name: \_\_\_\_\_ Study Site: \_\_\_\_\_ Date: \_\_\_\_\_

Date: Year \_\_\_\_ Month \_\_\_\_ Day \_\_\_\_ Universal Time (hour:min): \_\_\_\_\_

Was this reset due to a battery change?  Yes  No

- Earth Networks Station (Automated Station ID \_\_\_\_\_)
- Davis Instrument (Davis Thermometer Type \_\_\_\_\_)
- Data Logger (HOBO)
- Rainwise
- WeatherHawk
- No Thermometer

**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)

Type of IRT Instrument:  Raytech ST20  Other (specify instrument manufacturer and model) \_\_\_\_\_

Overall comments on the site (metadata): \_\_\_\_\_

## Hydrosphere

**\*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<sup>2</sup>; Average Depth of Standing Water \_\_\_\_ m)
- Lake (Area of standing water \_\_\_\_ km<sup>2</sup>; Average Depth of Standing Water \_\_\_\_ m)
- Reservoir (Area of standing water \_\_\_\_ km<sup>2</sup>; Average Depth of Standing Water \_\_\_\_ m)
- Bay (Area of standing water \_\_\_\_ km<sup>2</sup>; Average Depth of Standing Water \_\_\_\_ m)
- Ditch (Area of standing water \_\_\_\_ km<sup>2</sup>; Average Depth of Standing Water \_\_\_\_ m)
- Ocean
- Estuary (Area of standing water \_\_\_\_ km<sup>2</sup>; Average Depth of Standing Water \_\_\_\_ m)
- Stream (Width of Moving water \_\_\_\_ m)
- River (Width of Moving water \_\_\_\_ m)
- Marsh/Swamp
- Agriculture

School Name: \_\_\_\_\_ Study Site: \_\_\_\_\_ Date: \_\_\_\_\_

- Puddles, animal and vehicle tracks
- Other (Width of Moving water \_\_\_ m; Area of standing water \_\_\_ km<sup>2</sup>;  
Average Depth of Standing Water \_\_\_ m)

**Water Sample Location:**  Outlet  Bank  Bridge  Boat  Inlet  Pier

**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): \_\_\_\_\_

## Biosphere

### Land Cover

**MUC Description:** Level 1: \_\_\_\_\_ Level 2: \_\_\_\_\_

Level 3: \_\_\_\_\_ Level 4: \_\_\_\_\_

**\*MUC Code:** \_\_\_\_\_ **Note:** Use the MUC Guide to determine the greatest level possible within the MUC system

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: \_\_\_\_\_

#### Tertiary Plant

Is this plant in the understory?  Yes  No

School Name: \_\_\_\_\_ Study Site: \_\_\_\_\_ Date: \_\_\_\_\_

**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): \_\_\_\_\_

**Phenological Gardens**

**Soil Texture** (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

**Soil pH:** \_\_\_\_\_; **pH Method:**  pH Maper  pH Meter

Shrub Name	Date Planted
Witch Hazel 'Jelena'	
Witch Hazel 'Genuine'	
Lilac	
Mock-Orange	

Shrub Name	Date Planted
Forsythia	
Heather 'Allegro'	
Heather 'Long White'	
Snowdrops	

**Cloned and Common Lilac**

Lilac Shrub Name	Cloned or Common	Date Planted/Died	Height (cm)

**Soil (Pedosphere)**

**Soil Characteristics**

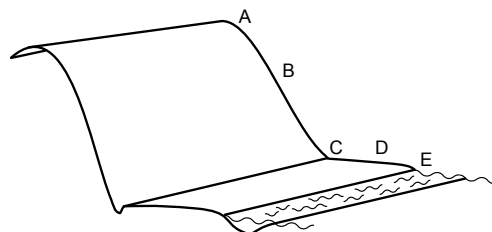
**Slope angle** (North, Northeast, etc.): \_\_\_\_\_

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

**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



School Name: \_\_\_\_\_ Study Site: \_\_\_\_\_ Date: \_\_\_\_\_

**Soil Horizon Definitions**

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

Comments on the site (metadata): \_\_\_\_\_

School Name: \_\_\_\_\_ Study Site: \_\_\_\_\_ Date: \_\_\_\_\_

**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 Moisture and Temperature**

**Surface State** (Select one):  Natural  Plowed  Graded  Backfill  Compacted  
 Other \_\_\_\_\_

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

Overall comments on the site (metadata): \_\_\_\_\_

**Frost Tube:**

*We recommend you also complete the atmosphere and surface temperature sections.*

**Date installed:** \_\_\_\_\_

Height above ground (cm): \_\_\_\_\_ Depth below ground (cm): \_\_\_\_\_ Total length (cm): \_\_\_\_\_

**Water body within 100m of site:**  No  Yes (complete below)

**Water body type** (Select one):  Unknown  Saltwater  Freshwater  Brackish

Direction to closest point of water:  N  NE  E  SE  S  SW  W  NW

**Landscape Position** (Choose one, see above in **Soil Characteristics**)

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 (Pedosphere) Investigation

## Soil Temperature Data Sheet

Study Site: \_\_\_\_\_

Name of Collector/Analyst/Recorder: \_\_\_\_\_

Date: \_\_\_\_\_

Soil Thermometer: Dial  Digital  Other \_\_\_\_\_

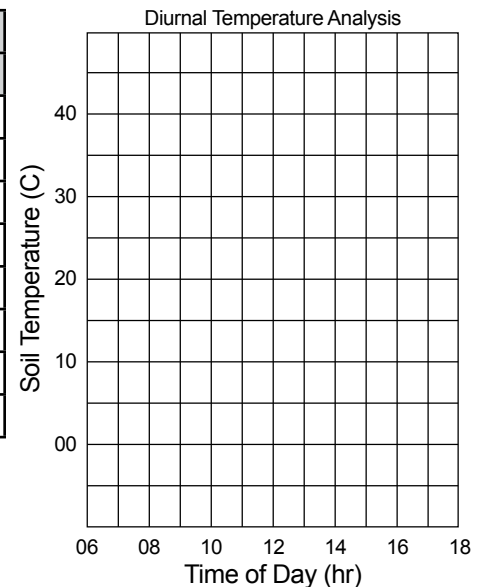
Has there been precipitation within the last 24 hours? Yes \_\_\_\_\_ No \_\_\_\_\_

### Daily/Weekly Measurements

Sample Time			Temperature (° C)		
No.	Hour	Minute	5 cm	10 cm	Air
1					
2					
3					

### Diurnal Cycle Measurements

Sample Time			Temperature (° C)		
No.	Hour	Minute	5 cm	10 cm	Air
1					
2					
3					
4					
5					
6					
7					
8					



Daily Metadata/Comments:

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# Soil (Pedosphere) 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 <i>(Calculated value by database)</i>	Empty Container Weight (d)	Dry Soil Weight (e) b - d = xx g <i>(Calculated value by database)</i>
Sample	<input type="text"/> g	<input type="text"/> g		<input type="text"/> g	
	Gravimetric Soil Moisture (f) c / e = xx g/g <i>(Calculated value by database)</i>				

### 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 ( $V_i - V_f$ ) <i>(Calculated value by database)</i>
Sample 1	<input type="text"/> mL	<input type="text"/> mL	
Sample 2	<input type="text"/> mL	<input type="text"/> mL	
Sample 3	<input type="text"/> mL	<input type="text"/> mL	

Average Container Volume will be calculated during data entry.

Additional observations: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

# Soil (Pedosphere) 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 (Pedosphere) 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:

Sample Number	Offset from end of Transect (m)	Container ID#	Container Volume (mL) (Optional)	A	B	C	(A-B)/B-C
				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 (Pedosphere) 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: \_\_\_\_\_

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### Depth Samples:

			A	B	C	(A-B)/(B-C)
Sample Depth	Container ID#	Container Volume (mL) <i>Optional</i>	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 (Pedosphere) 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)			
<b>I Mass of dry soil (g) = C-E</b>			
<b>J Volume of rocks (mL) = H-G</b>			
<b>K Bulk Density (g/mL) = <math>\frac{I-F}{D-J}</math></b>			

# Soil (Pedosphere) 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 (Pedosphere) 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 (Pedosphere) 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 (Pedosphere) Investigation

## Soil Fertility Data Sheet

Date of Sample Collection: \_\_\_\_\_ Study Site: \_\_\_\_\_

Horizon Number: \_\_\_\_\_ Horizon Depth: Top \_\_\_\_\_ cm Bottom \_\_\_\_\_ cm

### ***Sample Number 1***

**Nitrate (N):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Phosphorus (P):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Potassium (K):**

High\_\_ Med\_\_ Low\_\_ None\_\_

### ***Sample Number 2***

**Nitrate (N):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Phosphorus (P):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Potassium (K):**

High\_\_ Med\_\_ Low\_\_ None\_\_

### ***Sample Number 3***

**Nitrate (N):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Phosphorus (P):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Potassium (K):**

High\_\_ Med\_\_ Low\_\_ None\_\_

Date of Sample Collection: \_\_\_\_\_ Study Site: \_\_\_\_\_

Horizon Number: \_\_\_\_\_ Horizon Depth: Top \_\_\_\_\_ cm Bottom \_\_\_\_\_ cm

### ***Sample Number 1***

**Nitrate (N):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Phosphorus (P):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Potassium (K):**

High\_\_ Med\_\_ Low\_\_ None\_\_

### ***Sample Number 2***

**Nitrate (N):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Phosphorus (P):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Potassium (K):**

High\_\_ Med\_\_ Low\_\_ None\_\_

### ***Sample Number 3***

**Nitrate (N):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Phosphorus (P):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Potassium (K):**

High\_\_ Med\_\_ Low\_\_ None\_\_

Date of Sample Collection: \_\_\_\_\_ Study Site: \_\_\_\_\_

Horizon Number: \_\_\_\_\_ Horizon Depth: Top \_\_\_\_\_ cm Bottom \_\_\_\_\_ cm

### ***Sample Number 1***

**Nitrate (N):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Phosphorus (P):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Potassium (K):**

High\_\_ Med\_\_ Low\_\_ None\_\_

### ***Sample Number 2***

**Nitrate (N):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Phosphorus (P):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Potassium (K):**

High\_\_ Med\_\_ Low\_\_ None\_\_

### ***Sample Number 3***

**Nitrate (N):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Phosphorus (P):**

High\_\_ Med\_\_ Low\_\_ None\_\_

**Potassium (K):**

High\_\_ Med\_\_ Low\_\_ None\_\_

# Soil (Pedosphere) 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 <i>time of reset</i> : 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 <i>time of reset</i> : Corresponding to 24-hour Period Ending:	Yesterday	Two days ago	Three days ago	Four days ago	Five days ago	Six days ago

# Soil (Pedosphere) Investigation

## Daily Soil Moisture Sensor Data Sheet

School Name: \_\_\_\_\_

Study Site: \_\_\_\_\_

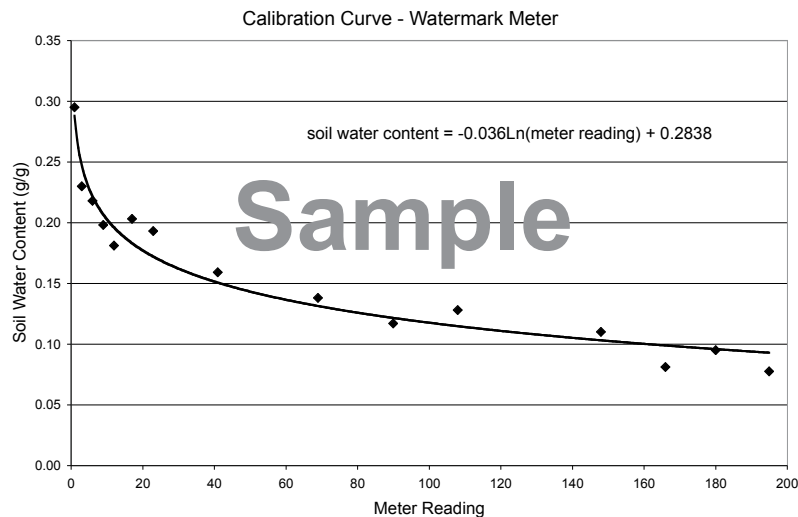
Date you started to use this SWC calibration curve: \_\_\_\_\_

Type of Sensor:  Watermark Block/Delmerhorst meter  Watermark Block/Irrrometer Watermark meter  
 Watermark Block/Spectrum Watchdog (logger)  Other

### Observations:

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

### Sample Calibration Curve created following the Creating a Calibration Curve Lab Guide



# Soil (Pedosphere) 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		B. End		C. Interval	D. Midpoint	E. Water Level Change	F. Flow Rate
	(min)	(sec)	(min)	(sec)	(min) (B-A)	(min) (A+C/2)	(mm)	(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

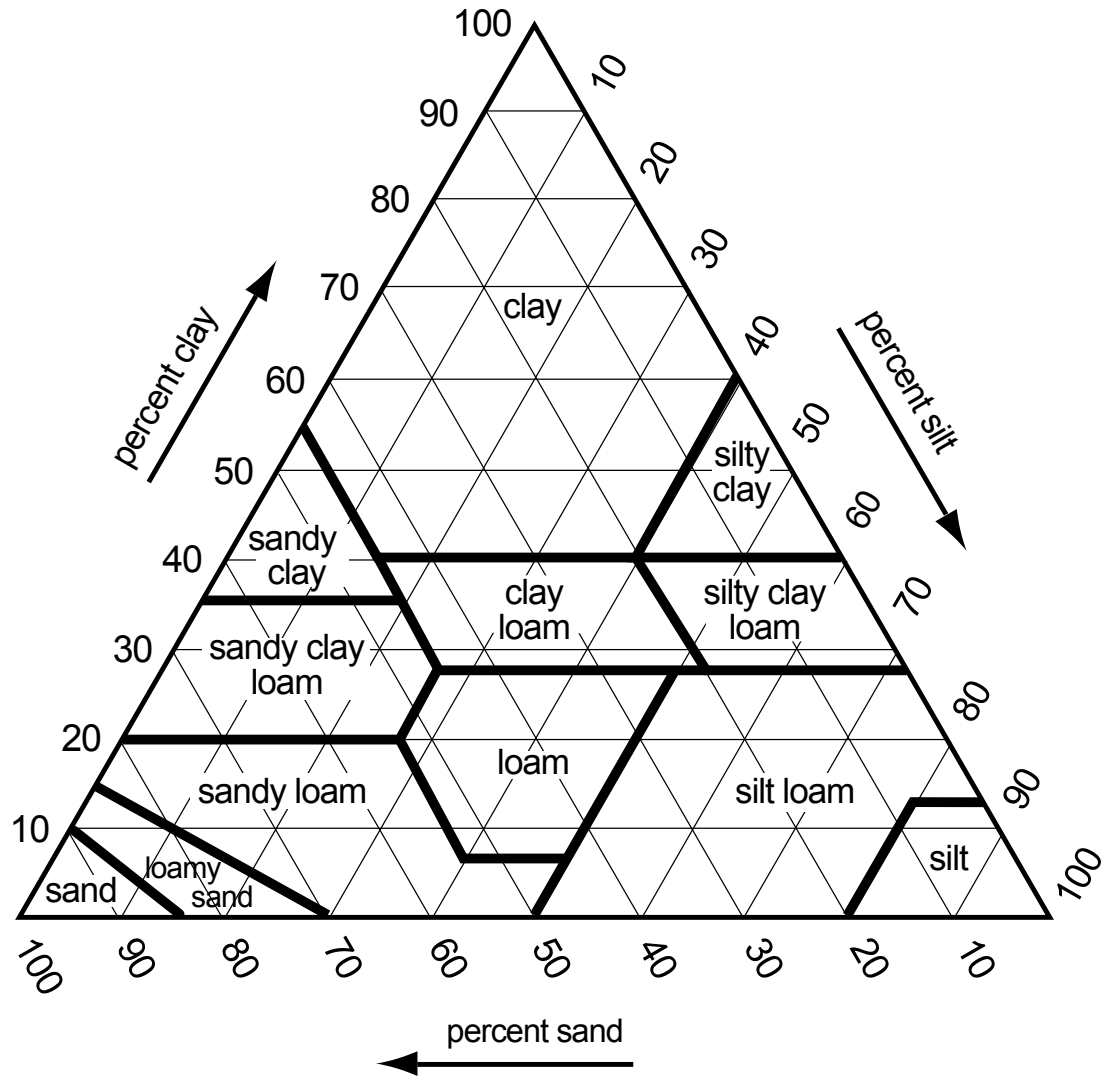
D. Container Weight: \_\_\_\_\_ g      E. Dry Soil Weight (B-D): \_\_\_\_\_ g

F. Soil Water Content (C/E) \_\_\_\_\_

Daily Metadata/Comments: (optional) \_\_\_\_\_

# Soil (Pedosphere) Investigation

## Textural Triangle 3



# Frost Tube Protocol

## Data Sheet

School Name: \_\_\_\_\_ Class or Group Name: \_\_\_\_\_

Site name (give your site a unique name): \_\_\_\_\_

Date	Depth of freezing (cm)	Air Temp (°C) optional	Surface Temp (°C) optional	Snowpack depth (cm) optional				Observer Names
				1	2	3	Ave	

Comments/ metadata (date each comment):

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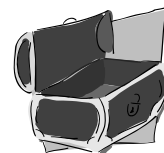
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# Glossary



## 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

## Cryptoturbation

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

