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ENVIRONMENTAL FACTORS

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I. OBJECTIVE:

To investigate and compare differences in light intensity, temperature, humidity, wind velocity, etc. in various ecosystems.

II. BACKGROUND:

Light intensity will be measured with a light meter. Read the light meter by aiming it generally upward. Note that it has three settings and three scales for low, medium, and high range. To avoid possible damage to the meter, always try first to read the meter on the top (high) scale. If there is not enough light, then move to the next level down. The units used on the meter are foot-candles. One foot-candle is equal to 1.076 milliphot (10.76 lux) (**milli** = one thousand; **phot** = light) in the metric system.

Air temperature (°C) is read with a sling psychrometer (**psychro** = cold, **meter** = to measure). Use one of the small rubberbands to fasten a wick onto one of the thermometer bulbs and moisten it with water. Making sure that you're not going to hit anything, whirl the psychrometer for several minutes until the temperatures are constant. Immediately, read both thermometers. The accompanying chart which came with the psychrometers may be used to determine relative humidity (%). Alternatively, relative humidity may be calculated using the sliding scales on the side of the psychrometer.

Soil temperature is determined by inserting the soil thermometer's probe into the ground, waiting for it to equilibrate, and taking a reading. Read the centigrade (**centi** = one hundred) scale on the thermometer.

Wind velocity is determined by holding the instrument right-side up and taking a reading. The instrument uses wind blowing across the top of the tube to create a partial vacuum (**vacu** = empty) and "suck" the little ball up to indicate wind speed. The scale is calibrated in miles per hour, which needs to be converted to cm per sec. (1 mph = 44.7 cm/sec). Caution: do not let the inside of the meter get wet and be careful not to lose the little white ball.

These factors vary considerably in different environments on the same day. Thus, to compare various ecosystems, you are asked to obtain these readings in several successional areas such as: parking lot or bare soil, mowed field, old "overgrown" field, juniper/*Lycopodium* area, West Woods (trail vs. deeper in?), other wooded areas, etc.

III. MATERIALS NEEDED:

light meter
sling psychrometer
squeeze bottle of water
soil thermometer
wind speed meter

IV. PROCEDURE:

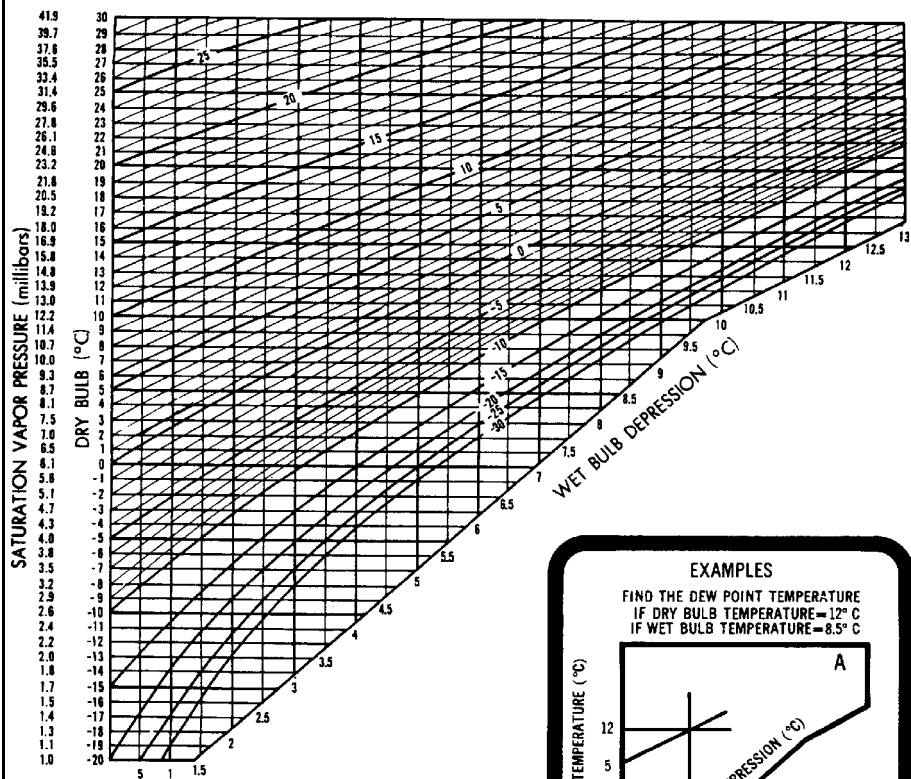
Measure these factors in a number of varying locations as suggested. Each student should get a chance to use/read each piece of equipment. Record data on the accompanying sheet and perform any necessary calculations. Measure light intensity in three places in each community: where the intensity is obviously high (bright), where it is obviously low (shade), and a medium-looking place. Measure wind velocity twice: at about head-height and about a foot or so off the ground.

V. DATA:

Record data in the accompanying table, and submit those data via the Web. For each of the factors measured, prepare a graph with the various communities (listed in successional order) on the x-axis and the factor in question on the y-axis. This could optionally be done by entering the data from the table into a spreadsheet and having the PC make the graphs.

Location							
Date							
Time							
Sky Condition							
Light Intensity (foot-candles)	High						
	Medium						
	Low						
Light Intensity (lux or milliphot)	High						
	Medium						
	Low						
Air Temperature (°C)	Dry Bulb						
	Wet Bulb						
Relative Humidity (%)							
Soil Temperature (°C)							
Wind Velocity (mph)	Head Height						
	Ground Height						
Wind Velocity (cm/sec)	Head Height						
	Ground Height						

PSYCHROMETER



1. To find dew-point temperature (See Example A): Find the dry-bulb temperature along the left side of the chart (12°C). Follow horizontal line to the vertical line for the wet-bulb depression (difference between dry-bulb and wet-bulb temperatures, or 3.5°C). Read the dew-point temperature from sloping line at this intersection (5°C).
2. To find the relative humidity (See Example B): Read the value of the saturation vapor pressure for the dry-bulb temperature at left side of chart. (13.9 mb is saturation vapor pressure for air at 12°C.) Read the value of saturation vapor pressure for dew-point temperature also at left side of chart (8.7 mb is saturation vapor pressure for air at 5°C.) Divide the second value (8.7) by the first (13.9) and multiply by 100. Answer: 63%.

EXAMPLES

FIND THE DEW POINT TEMPERATURE
IF DRY BULB TEMPERATURE = 12° C
IF WET BULB TEMPERATURE = 8.5° C

A

ANSWER: DEW POINT TEMPERATURE = 5° C

FIND THE RELATIVE HUMIDITY

B

ANSWER
R.H. = $\frac{8.7}{13.9} \times 100 = 63\%$