

# BIODIVERSITY AND THE DISTRIBUTION OF LIFE

Life on Earth National 5 biology  
Measuring abiotic factors

# MEASURING ABIOTIC FACTORS

By the end of these lessons you should be able to:

- ◉ Measure various abiotic factors and state sources of error and how they can be minimised.
- ◉ Analyse data to assess how abiotic factors can affect the distribution of organisms.

# WHAT ARE ABIOTIC FACTORS?

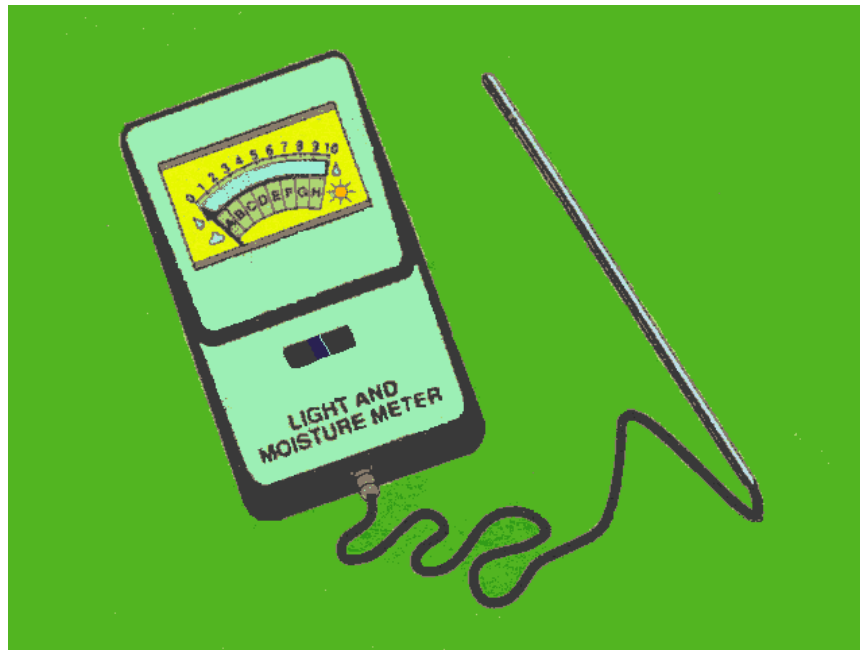
- ◉ Non living factors that affect organisms.
- ◉ Examples include temperature, rainfall, light intensity, salinity & pH.

# MEASURING ABIOTIC FACTORS

- Light meters can be used to measure light intensity.
- The meter is held at the soil surface and pointed in the direction of the maximum light intensity, then the meter is read.



- Soil moisture and soil pH meters are also available - both are used by simply pushing the probe into the soil and reading the meter.



- Thermometers can be used to measure air, soil and water temperatures.



# SOURCES OF ERROR

- ◉ accidentally shading the light meter,
- ◉ failing to clean the soil moisture or pH meter probes between readings,
- ◉ failing to push the moisture or pH probe into the ground,
- ◉ failing to give thermometers enough time for the alcohol to fully rise/fall,
- ◉ failing to allow meter needles to stop moving before taking a reading,
- ◉ failing to take enough samples.

# MINIMISING ERROR

- ◉ Allow thermometers and meters (pH, moisture, light etc.) to stabilise before taking a reading.
- ◉ Avoid casting a shadow over the light meter.
- ◉ Make sure that probes are pushed well into the ground.
- ◉ Clean probes between readings.
- ◉ As always the results can be made **more reliable** by taking **many samples**.



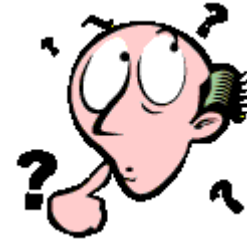
# THE EFFECT OF ABIOTIC FACTORS ON THE DISTRIBUTION OF ORGANISMS

- ◉ Abiotic factors can influence which community of plants and animals are found in particular habitat.
- ◉ For example, a population of Stonefly larvae can only live in a river with high concentrations of oxygen.
- ◉ Rat-tailed maggots can survive in river water with virtually no oxygen.

Organism	Abiotic factor	Effect
Blowfly maggots	light	Move away from light
Paramecium	pH	Move towards slightly acidic water



# CAN YOU.....



- ◉ Measure pH, temperature, moisture and light intensity?
- ◉ Describe sources of error when measuring light intensity and moisture levels?
- ◉ Describe how these sources of error can be minimised?
- ◉ Analyse data on how abiotic factors affect the distribution of organisms?

# SAMPLING PLANTS AND ANIMALS

By the end of these lessons you should be able to:

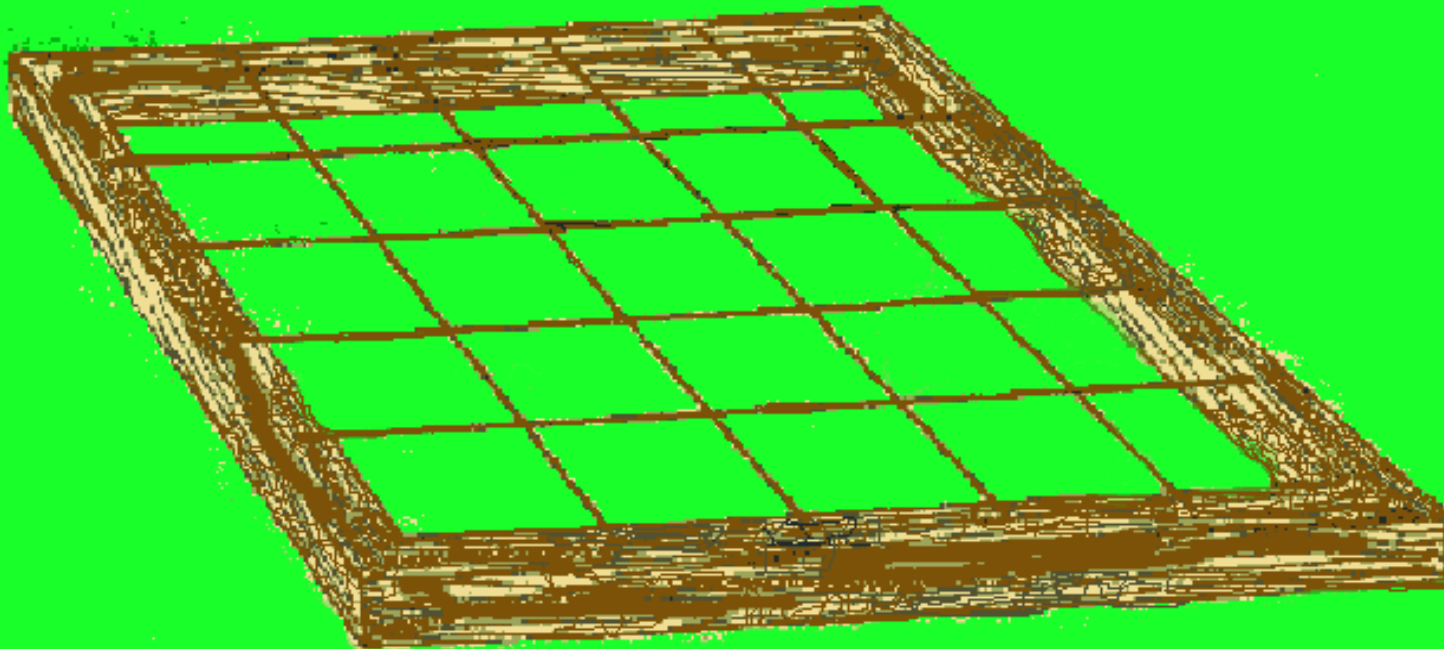
- ◉ Sample organisms using quadrats and pitfall traps.
- ◉ Describe the limitations and sources of error when using these sampling techniques.
- ◉ Use and construct paired statement keys to identify organisms

# SAMPLING

- It would be nearly impossible to find out exactly the organisms present in an ecosystem.
- All organisms would need to be counted - very time consuming.
- Instead we can take a sample of the organisms present.

# QUADRATS

- A quadrat is used to sample plants and slow moving animals.



- A quadrat marks off a small piece of ground of known area so that different plants present within this sample can be identified and counted or their area of cover estimated.
- This sample gives us an idea of the number and kind of organism present in the whole area.

# USING A QUADRAT

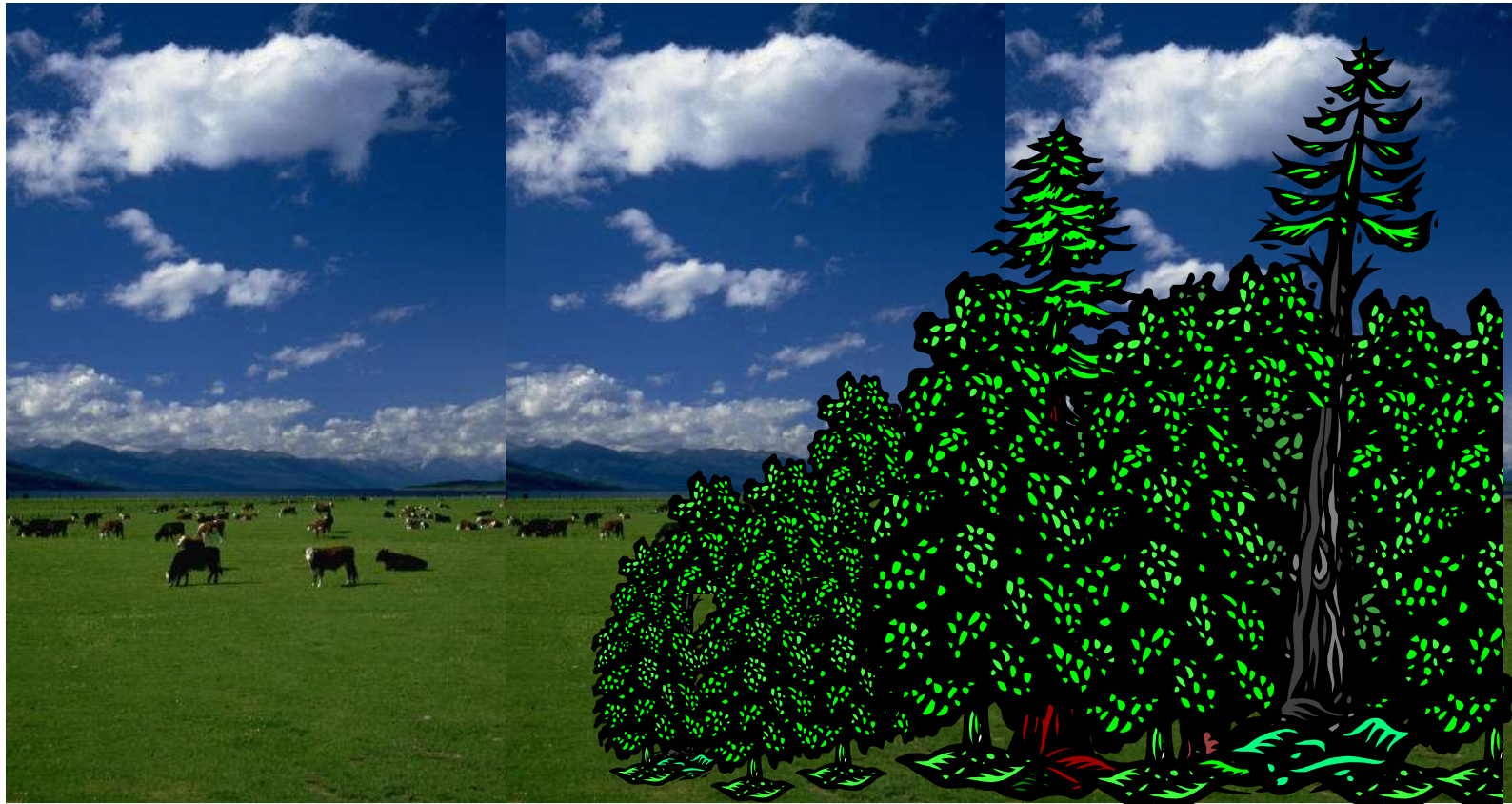




# MINIMISING ERRORS

- ◉ Quadrats should be placed randomly so that a representative sample is taken.
- ◉ You should look at the results from several quadrats in an area to reduce the effect of an unusual distribution.
- ◉ The results are more **reliable** when you look at the results from **many quadrats**.
- ◉ Count only the animals and plants which are at least half inside the quadrat square.

# LINE TRANSECT



↑ 1    ↑ 2    ↑ 3    ↑ 4    ↑ 5    ↑ 6    ↑ 7    ↑ 8    ↑ 9    ↑ 10

**Sample sites**



# CAN YOU.....

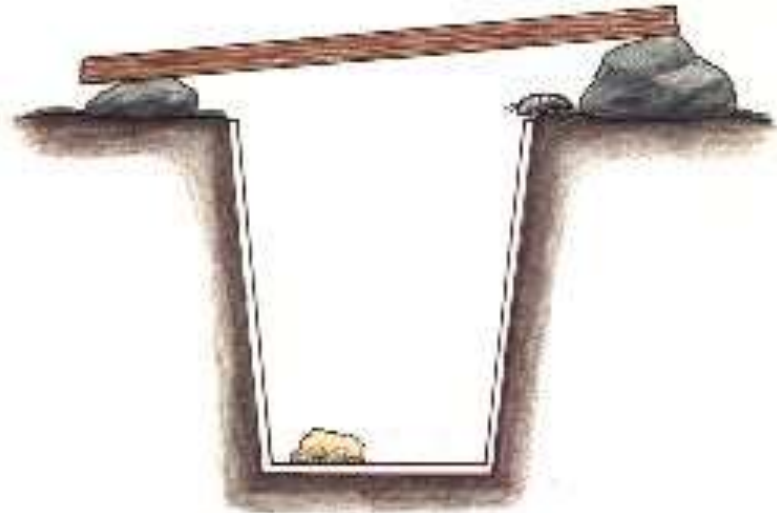
- ◉ Sample organisms using quadrats and pitfall traps?
- ◉ Describe sources of error when sampling organisms?
- ◉ State how these sources of error can be minimised?



# PITFALL TRAPS



- **Pitfall traps** are often used to sample the small invertebrates living on the ground.



- You are likely to trap beetles and other insects, as well as spiders and slugs.

# MINIMISING ERRORS

- The top of the yoghurt carton should be level with the soil surface - to allow creatures to fall in.
- Cover the trap with a stone or piece of wood to keep out the rain and stop birds eating your catch.
- Mark all animals caught before releasing them to the wild again - so they're not counted twice.

- The traps must be checked often to avoid the animals escaping or being eaten before they are counted.
- As with most methods a **large number** of traps makes results more **reliable** and minimises the effects of unusual results.



# PAIRED STATEMENT KEYS

- ◉ In order to identify unfamiliar organisms we use a key.
- ◉ We will be using paired statement keys.
- ◉ As the name suggests statements are arranged in pairs.
- ◉ Starting at number one (usually) you ask yourself the question and follow the instructions for your answer.

- Your teacher will show you a Power Point on using a paired statement key to identify tree leaves.
- Try building your own keys for the following organisms.

**This table shows information about four migrant insect eating birds.**

<b>Common name</b>	<b>Tail</b>	<b>Face</b>	<b>Back</b>	<b>Belly</b>
<b>House martin</b>	<b>triangular</b>	<b>black</b>	<b>black</b>	<b>white</b>
<b>Sand martin</b>	<b>small fork</b>	<b>brown</b>	<b>brown</b>	<b>white</b>
<b>Swallow</b>	<b>deep fork</b>	<b>red</b>	<b>black</b>	<b>buff</b>
<b>Alpine swift</b>	<b>small fork</b>	<b>brown</b>	<b>brown</b>	<b>white</b>

**The paired-statement key for these birds begins with:**

- 1. Triangular tail ..... House martin**  
**Forked tail ..... go to 2**

This table shows information about 4 woodland toadstools.

Common name	Habitat	Stem colour	Cap colour	Gill colour
Poached egg fungus	tree trunk	white	white	white
Fly agaric	ground	white	red	white
Death cap	ground	white	yellow	white
Golden pholiota	tree trunk	yellow	yellow	yellow

The paired-statement key for the toadstools begins with:

1. *Grows on tree trunk* ..... go to 2  
*Grows on ground* ..... go to 3

# CAN YOU.....

- ◉ Use paired statement keys to identify organisms?
- ◉ Construct a paired statement key?

