S2 Biology Peebles High School

booklet number

always take the booklet with your number on it

you are responsible for this booklet in class

Ecosystems

Pupil Booklet

  read information  think

  mini white board activity work sheet

 work in your jotter group work

 Highlight

Underlined Headings should be written into your jotter with the date

  ICT Homework

Components of an ecosystem

on a mini white board write down what you think the following words mean

Habitat

Population

Community

Ecosystem

What resources could you use to find out the Biological meanings?

Use these resources and add the words to your glossary.

Copy the following note

An ecosystem is made up of a community of living things and their habitats. The community consists of several populations which interact with one another and their non-living environment.

Highlight the four key words in your note

Food Chains

 Below are 4 examples of food chains

1.

ladybird

thrush

roses

aphid

2.



3. 

4.

  

algae

bass

sunfish

clam

Look at the food chains above.

What do they all have in common?

What do you think the arrows mean?

Can you make your own food chain(s) from your existing knowledge?

Share your ideas with others near you.

Show your teacher.

Collect the Food Chain cards. In pairs make 4 food chains, each with a plant and 2 animals.

FOOD CHAINS Continued

Animals and plants need energy to grow and carry out other processes. Plants get this energy from the sun and turn it into food. They make their own food in a process called photosynthesis (you will learn about this in another unit). Animals must eat food in order to get energy. Some animals eat plants only (HERBIVORES), some eat animals only (CARNIVORES) and some eat plants and animals (OMNIVORES).

A food chain is a way of representing the feeding relationships between organisms. A food chain always begins with a green plant. This is because green plants can make their own food and are therefore called PRODUCERS. All the other organisms in a food chain are animals. They get their energy by eating the plants or other animals. Arrows connect them and show the direction of energy flow. The animals are CONSUMERS as they eat ‘ready made’ food. The first animal in a food chain is the PRIMARY CONSUMER the second animal is called the SECONDARY CONSUMER.

Use the food chains on the previous page and the information above to answer the following questions in FULL SENTENCES in your jotter

1. Name the producers in the four food chains.

2. Why are plants at the start of every food chain?

3. What is the source of energy for all plants?

4. Why are animals called consumers?

5. What is the difference between primary & secondary consumers?

6. Name the primary consumer in food chains 2 & 3.

7. What other word could be used for a primary consumer?

8. What other word could be used for a secondary consumer?

9. Name the secondary consumers in food chains 1 & 3.

10. What is the final consumer in food chain 4?

11. What do the arrows in a food chain show?

Now update your glossary using the words in CAPITAL LETTERS above.

Food Webs

In Nature food chains rarely occur in isolation. A producer is usually food for several animals. Primary consumers provide food for several secondary consumers. Usually many food chains interconnect. Food webs are made up of interconnected food chains. The same rules apply to food chains and food webs.

Copy into your jotter

Food Chain & Food Web RULES

– always start with a green plant (producer)

- arrows show the direction of energy flow

-first animal is the primary consumer

- second animal is the secondary consumer

Create your own food web on a mini whiteboard

Organisms to put on your web: (write each one only once)

MOUSE, CORN, BLUEBIRD, KING SNAKE, HAWK, CAT, CRICKET

* Mice and crickets feed on corn
* Bluebirds eat crickets
* Cats eat mice
* King Snakes eat mice
* Hawks will eat mice, blue birds, snakes and cats

Get it checked then copy it into your jotter

In pairs collect Food Web Diagram 1 OR 2

Make up questions about this food web for another pair to answer. 

e.g.

How many primary consumers are there?

Is the butterfly a secondary consumer?

How many different animals does the eagle eat?

etc

Groups then swap diagrams and answer the other group’s questions.

More practice with Food Webs

Using the table below, construct a food web on a mini white board.

|  |  |
| --- | --- |
| **Organism** | **Food** |
| Grasshopper | Grass, wheat |
| Lizard | Grasshoppers |
| Hawk | Rabbits, lizards, sparrows, grass snakes |
| Mouse | Grass, wheat |
| Rabbit | Grass |
| Fox | Rabbits |
| Sparrow | Grasshoppers |
| Grass Snake | Lizards, mice |

Get it checked then copy it into your jotter.

Under your FOOD WEB give two examples of food chains from the web.

Disturbing a Food Web

Food webs are balanced but if the balance is disrupted, e.g. a species is removed from the web, this can have an effect on several other organisms in the chain.

**Example 1**

Fox Bird of prey

Lamb Rabbit

Grass tree seedling

A disease called myxomatosis can kill rabbits. If this virus infected the hillside ecosystems and all the rabbits in the area died there could be several results.

Can you suggest three possible effects of the death of all the rabbits?

Possible effects….

* A decrease in the numbers of birds of prey and or foxes as food sources are scarcer.
* A decrease in the number of lambs as more are being eaten by the birds of prey and foxes.
* As there are less food sources, there may be less predators, so the number of lambs might increase.
* Increased number of grass and tree seedlings.

**Question 1**

The diagram below shows part of a food web in a freshwater pond.



What do Mayfly larvae eat? What eats Mayfly larvae?

If pollution was introduced it would affect the pond ecosystem.

For example the Mayfly larvae could die out, **if this happened….**

**Predict ….**

1. ….what would happen to the population of Damsel fly larvae?
2. …. what would happen to the population of Duckweed?
3. …… what would happen to the population of Copepods?

**Question 2**

 The Diagram below shows part of a woodland food web



Use the words *increase, decrease or stays the same* to describe the effect on the populations of greenflies and stoats if all the mice were killed by a disease.

Give a reason for each answer.

Copy into your jotter

An ecosystem will be able to withstand disturbances if it is stable. The more links in a food web the more stable it is.

Stick the “Stable or Unstable” diagram into your jotter and answer the 2 questions below in your jotter.

1. In Monkton wood what would happen to the grass snakes if all the lizards were wiped out by disease?

2. In Braehead wood what would happen to the grass snakes if all the lizards were wiped out by disease?

You may get the chance to do some interactive food web activities

Try these websites ….

<http://coolclassroom.org/cool_windows/home.html>

<http://www.ecokids.ca/pub/eco_info/topics/frogs/chain_reaction/play_chainreaction.cfm>

<http://www.sheppardsoftware.com/content/animals/kidscorner/games/foodchaingame.htm>

<http://www.bbc.co.uk/schools/scienceclips/ages/10_11/interdependence_fs.shtml>

**Reintroduction of Wolves in Yellowstone National Park**

Yellowstone National Park is in the north western states of Wyoming, Montana and Idaho in the USA. It was established by the US government on March 1, 1872. Yellowstone, widely held to be the first national park in the world, is known for its wildlife and its many geothermal features. It has many types of ecosystem the subalpine forest is most abundant.

The gray wolf was present in Yellowstone when the park was established in 1872.

An intensive survey in the 1970s found no evidence of a wolf population in Yellowstone

In June 1994, after several years it was decided to reintroduce gray wolves to Yellowstone National Park and central Idaho.

This is great example of the impact of one species on an ecosystem.

Your Teacher may show you this short film to show the impact of this reintroduction.

<http://youtube/ysa5OBhXz-Q>

Try to make a food web of the organisms mentioned in the film

 Update your glossary and try to learn the news words so far.

 Homework

Collect the Question Sheet – Food chains and food webs

Measurement in an Ecosystem

|  |  |
| --- | --- |
| biotic factors | abiotic factors |
| availability of foodnumber of predatorsincidence of disease | light intensitytemperatureair humiditypH |

The places where animals and plants are found is influenced by a number of factors. Some of these factors are living – BIOTIC factors. Some of these factors are non-living – ABIOTIC factors.

You will learn how to measure some of the abiotic factors

A Soil Moisture Meter



A soil **moisture meter** can be used to measure the moisture content of soil. The moisture meter is carefully pushed into the soil and the meter read.

**2 sources of error when using a moisture meter**

1. The probe may not have been **dried** before use.
2. When comparing moisture content in different areas errors will occur if the moisture measurements in all the areas are not made at **the same soil depth.**

**A Light Meter**

**A** **light meter** can be used to measure **light intensity** at the surface of the soil (or other area). The meter is held at the soil and pointed in the direction of maximum light and the meter read.

**2 sources of error when using a light meter.**

1. You or your partner may **shade** the meter when taking a reading
2. When comparing light intensity in 2 areas errors will occur if the light intensity measurements in the 2 areas are not made at **the same time of day.**

**pH meter**  How to use it - Break up and crumble the soil to a depth of 5".

Thoroughly wet the soil with water (preferably distilled) to a mud consistency.

Wipe the probe clean. Push the probe vertically into the moistened soil to a depth of 4"–5". If it does not slip into the ground fairly easily select a new position. Never force the probe. Twist to ensure that damp soil is well distributed over the surface of the probe. Wait for 60 seconds to acclimatise the probe and note the reading.

**2 sources of error when using a pH meter**

1. The probe may not have been **wiped** before use.
2. Not waiting long enough before taking the reading.

**Thermometer**

You may want to find out the temperature at different times of day, in shade or sunny areas or in different parts of a habitat. Outdoor thermometers are usually set into a plastic casing with the scale on the side.

**2 sources of error when using a thermometer**

1. holding the bulb of the thermometer in your hand

2. not waiting until the reading has stopped changing before recording the result

For each technique you must record (copy table below / support sheet available)

* The equipment used to make the measurement
* Possible sources of error when using the equipment
* Ways the errors can be reduced

|  |  |  |  |
| --- | --- | --- | --- |
| abiotic factor | equipment used | possible errors | ways to reduce the errors |
| Temperature |  |  |  |
| pH |  |  |  |
| Light intensity |  |  |  |
| Moisture |  |  |  |

Now update your glossary.

Sampling Techniques

It is rarely possible to count all the plants and animals in an ecosystem because this would take too long and may cause permanent damage to the ecosystem. But it is often necessary to find out how many plants or animals there are in an ecosystem. This can be done by taking small samples to represent the ecosystem. From the samples an estimate of the organism’s abundance for the whole ecosystem can be calculated.

Different types of organism require different sampling techniques.

 Make notes in you jotter. For each of the following techniques

Quadrat, Pitfall trap, Tullgren funnel, Tree beating, Sweep net

* Include a diagram of the technique
* explain how it is used
* what are the possible sources of error when using it
* how the errors may be reduced

### A **QUADRAT** is a square frame used to sample plants. You can use it to estimate the number or abundance of plants in an area.

 **What errors might I make?**

1. If not placed at random the sample may not be representative of the area
2. Even if placed at random the sample may still not be representative.
3. The plants within the quadrat may be wrongly identified or counted.

To estimate the number of plants in an area you must know

* the area of each quadrat
* the area that you are sampling
* the average number of daisies per quadrat

Estimated number of plants **=** average number of plants per quadrat **X** number of quadrats that would fit in the are being sampled

A PITFALL TRAP is used to obtain a sample of small invertebrates living on the ground surface. Leaf or stone can be used to make a lid to disguise the trap.

**What Errors might I make?**

1. If badly set it will not catch many organisms and so estimate will not be accurate.
2. Some samples may escape or be eaten by other animals caught in the trap.
3. If only 1 or 2 traps are set, the samples are not representative.

A Tullgren Funnel is used to obtain a sample of the tiny animals that live in the air spaces in the soil. They move away from the hot, dry, bright conditions created by the light bulb and fall through the sieve.

 **What Errors might I make?**

1. sieve mesh may be too fine and some animals may not fall through

2. soil sample may be too thick and may retain some of the organisms

Tree Beating is used to sample small animals that live on the branches of trees. A stick is used to give the branch of a tree a few sharp taps. Small animals will drop onto the tray held beneath the branch.



**What Errors might I make?**

1. some animals may miss the tray of escape before being recorded.

2. some animals may not be dislodged by beating.

A Sweep net is used to catch animals in pond or river water. Move the net rapidly through the water and transfer contents to a screw-top jar containing some of the sample water.



**What Errors might I make?**

1. mesh in the net might be too fine to collect all aquatic animals

NB For each Sampling technique the higher the number of samples you are able to measure the more representative your results will be of the ecosystem as a whole.



You may be able to **try some of these techniques** to investigate an ecosystem.

You may have the opportunity to **investigate** areas in the school grounds

e.g. Can you find out if differences in the use/treatment of a grass area can affect the number of daisies found on it?

Compare part of a sports pitch with the grassy area between the staff car park and the Technical department. Think of the difference in how the two areas are treated and used. Plan how you would find out the effect of this on the number of daisies found in each area.

The quadrat calculations on the next page will help you process your results.

Quadrat Calculations

**Remember Estimated number of plants = average number of plants per quadrat X number of quadrats that would fit in the area being sampled**

Worked Example calculation

Quadrats of 0.5m by 0.5m were used to sample a lawn 20m wide by 30m long

Area of quadrat = 0.5m X 0.5m = 0.25m2

Area of lawn= 20m X 30m = 600m2

Number of quadrats that fit in the lawn = 600m2 ÷ 0.25m2 = 2400 quadrats

|  |  |
| --- | --- |
| quadrat number  | number of dandelions |
| 1 | 1 |
| 2 | 0 |
| 3 | 1 |
| 4 | 2 |
| 5 | 3 |
| 6 | 0 |
| 7 | 4 |
| 8 | 2 |
| 9 | 1 |
| 10 | 3 |
| average | 1.7 |

Estimated number of dandelions

= average number of dandelions per quadrat X number of quadrats that fit in the lawn

 = 2400 X 1.7 = 4080 dandelions in the lawn

Do the following problems in your jotter. Show all your workings.

Question 1. Look at the results below and estimate the number of thistles in each field.

The quadrats used were all 1m2. Field 1 was 50m x 10m. Field 2 was 60m x15m. Field 3 was 25m x 25m.

|  |  |
| --- | --- |
|  | number of thistles in each quadrat (Q) |
| Field | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 |
| 1 | 1 | 0 | 1 | 2 | 0 | 0 | 3 | 0 | 2 |
| 2 | 1 | 2 | 1 | 1 | 4 | 3 | 3 | 3 | 0 |
| 3 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 2 | 2 |

Question 2. Three groups got the following results when trying to estimate the number of plantain in the front and back lawn of a house. The front lawn had been treated with a weed killer. The quadrats were 0.5m wide and 0.5m long. The front lawn had an area of 25m2 and the back lawn had an area of 10m2.

Use the information to decide whether it would be worthwhile treating the back lawn too.

|  |  |  |
| --- | --- | --- |
| quadrat | number of plantain in each quadrat in the front lawn | number of plantain in each quadrat in the back lawn |
| 1 | 2 | 0 |
| 2 | 0 | 2 |
| 3 | 1 | 4 |
| 4 | 4 | 4 |
| 5 | 0 | 1 |
| 6 | 0 | 1 |
| 7 | 0 | 2 |

Question 3. For each of the two examples above state how the results could be made more reliable.

 Homework - Collect the Question Sheet – Measurement in Ecosystems

Biomes

Biomes are very large ecological areas on the Earth’s surface, with fauna and flora (animals and plants) adapting to their environment. Biomes are often defined by abiotic factors such as temperature and rainfall.

There are various ways of dividing up the Earth into Biomes; here is one that shows the distribution of 6 of the terrestrial (land) Biomes.



Diagram from

<http://www.next.cc/journey/discovery/biomes#activity-1>

Work in small groups to research ONE of these biomes. 

You task is to produce a poster OR leaflet **and** present it to the rest of the class. You must include information on

* climate (temperature and rainfall),
* plants and animals that live there
* and distribution on Earth.

Some suggested websites are shown below -

<http://kids.nceas.ucsb.edu/biomes/>

<http://www.blueplanetbiomes.org/world_biomes.htm>

<http://www.ucmp.berkeley.edu/glossary/gloss5/biome/>

After the presentations you should have enough information to complete the Biome table on the worksheet.

Adaptations for Survival

 You may have noticed in the Biome activity that the animals and plants that live in each biome have adapted so that they can survive there.

Use the Adaptation Activity Cards

Match each animal with the features it has.

For each feature suggest how that feature helps the animal to survive.

Check your answers.

 Write about one of the animals in your jotter.

 You may be asked to do some further research on another animal or plant of your choice.

Now update your glossary.

**TIME TO DO SOME REVSION….**

Highlight the key words in your Learning Outcome Checklist

**Revision / Extension Work**

* Use the Standard Grade Biology Text Book
* Read p10-13 Answer the questions on page 13
* Page 43 answer questions 1, 2, 3
* Test Question Practice Booklet available
* Use a variety of **study techniques** to revise for the test e.g.
	+ Flashcards – look on http://www.hns.org.uk/bio/
	+ Make a mind map of the learning outcomes.
	+ Get someone at home to test you on the learning outcomes.