## Organisation of an Ecosystem

1. Biodiversity is the variety of all the different species of organisms on earth, or within an ecosystem.
2. An organism is any living thing.
3. Organisms of the same species living in the same area are called the population
4. Organisms of different species living in the same area are called the community
5. A community of organisms interact with the non-living parts of their environment to form an ecosystem
6. Ecosystems can be very small or very large
7. To survive and reproduce, organisms require materials from their surroundings
8. Organisms rely on each other to survive. This reliance is called interdependence
9. A great biodiversity ensures the stability of ecosystems by reducing the dependence of one species on another for food, shelter and the maintenance of the physical environment.
10. Species depend on other species for food, shelter, pollination and seed dispersal.
11. Organisms within a community compete for resources
12. Plants compete for sunlight, water, space and mineral ions from the soil
13. Animals compete for food, mates and territory
14. A stable community is one where all the species and environmental factors are in balance so that the population size remains fairly constant
15. Population sizes can change due to migration, birth and death

## Biotic and Abiotic Factors

16. *(SS Only) Plants can be damaged by a range of ion deficiency conditions:*

*• stunted growth caused by nitrate deficiency*

*• chlorosis caused by magnesium deficiency.*

17. An abiotic factor is a non-living part of the environment that can affect the community
18. Examples of abiotic factors include light intensity, temperature, moisture levels, soil pH, soil mineral content, wind intensity and direction, carbon dioxide levels (for plants), oxygen levels (for aquatic animals)

19. A biotic factor is a living part of the environment that can affect the community.
20. Examples of biotic factors include availability of food, new predators arriving, new pathogens, competition

21. Outcompeting occurs when one species increases in population size so much that other species are no longer able to breed

## Adaptations

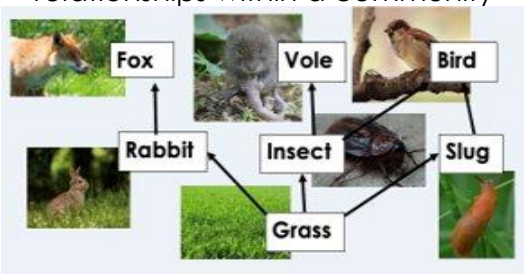
22. An adaptation is a feature of an organism that allows it to survive in its natural environment
23. Different organisms have different adaptions that enable them to survive in the conditions in which they normally live
24. A structural adaptation is a physical feature of an organism that helps it to survive. e.g large ears on desert animals

25. A behavioural adaptation is a change in an organism's behaviour that helps it to survive e.g hibernation of animals in winter
26. A functional adaptation is an internal process that allows an organism to

survive e.g. a sunflower head tracking the Sun across the sky
27. Many animals have adapted to be well camouflaged to reduce their chance of being seen by predator
28. Predators are often adapted to be fast and look dangerous
29. Extremophiles are organisms that living in harsh environments, e.g. high temperature, pressure or salt concentration. e.g. bacteria living in deep sea vents

## Food Chains and Food Webs

30. Biomass is the total dry mass of one species (animal or plant) in an ecosystem
31. A producer is a photosynthetic organism that makes biomass for an ecosystem
32. All life on Earth begins with biomass made my producers
33. Green plants and algae are examples of producers which make glucose during photosynthesis
34. Organisms within a community rely on each other to obtain new biomass
35. Food chains represent the feeding relationships within a community




36. All food chains begin with a producer which synthesises biomass
37. Producers are eaten by primary consumers
38. Primary consumers are herbivores
39. Primary consumers can be eaten by secondary consumers
40. Secondary consumers can be carnivores or omnivores
41. Secondary consumers can be eaten by tertiary consumers
42. Food chains rarely include more than four organisms
43. Food webs show the interactions between all living components of an ecosystem
44. Fertilisers can increase the rate of growth of producers, increasing the biomass available for the rest of the food chain
45. *(SS Only) Once an organism in a food chain or web dies, decomposers break down the biomass by secreting digestive enzymes into the environment.*
46. *(SS Only) Decomposers obtain the biomass they need through diffusion due to having a large surface area: volume ratio.*
47. *(SS Only) The small, soluble products of extracellular digestion are absorbed directly into the decomposer.*
48. *(SS Only) During decomposition, microorganisms respire. This releases energy from the organic material and releases carbon dioxide back into the atmosphere*

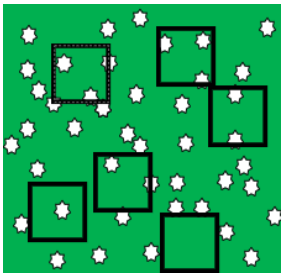
## Predator-Prey Relationships

49. Animals that kill and eat other animals are called predators
50. Animals that are eaten by other animals are called prey
51. In a stable community, the number of predators and prey rise and fall in cycles
52. A predator-prey relationship can be represented on a graph
53. When predators eat prey, the number of prey will decrease. This eventually causes the numbers of predators to decrease as there is less food available
54. When the number of predators in a community decrease, the number of prey increase because there are fewer predators to eat them so there is a greater chance of them reproducing
55. The time difference between the number of predators decreasing and the number of prey increasing is called the lag time

## RP: Investigating Species Distribution

56. Studying the distribution and abundance of different species in an ecosystem allows ecologists to understand how stable the community is.
57. Ecologists may study the population size of a common species in a habitat to understand how different factors affect the distribution of a species, including human activity
58. Ecologists may choose to use the data gathered to develop conservation plans to maintain or increase biodiversity
59. A sample is a section of a whole
60. Ecologists take samples and use these to draw conclusions about the area
61. Samples are used in ecology because the areas to be investigated are often very large so it would take too long to count every organism
62. A representative sample is one that represents the entire area under investigation. To make a sample representative, many repeats should be taken across a long period of time. This makes the investigation more valid.
63. A quadrat is a square frame divided into sections. It can be used to count a sample of plants or slow-moving organisms

64. A quadrat can also be used to determine the percentage cover of an organism (e.g. grass)
65. A transect is a line between two points. Samples can be taken along the transect to investigate a change between two points
66. There are two types of sampling: random and systematic
67. Random sampling uses a grid and random number generator to identify particular areas of an ecosystem to sample.
68. In random sampling, a quadrat is placed down in a coordinate determined by the random number generator. This reduces bias
69. In random sampling, many repeat counts should be done. Anomalies should be discarded and a mean calculated to ensure the results are accurate



70. Systematic sampling uses a transect and a quadrat placed at regular intervals
71. Many transects should be used to gather repeat data. Anomalies should be discarded and a mean calculating to ensure the results are accurate
72. When monitoring the biodiversity of an ecosystem, repeat samples should be taken across the year to account for seasonal changes

## Estimating Population Size

73. Ecologists can only make estimates of population sizes because:

a) Population sizes constantly change due to migration, birth and death
b) It is not always possible to track every individual of a population

74. To estimate the **number** of plant species in an area ecologists use random sampling. To estimate the total number of a particular species, ecologists:

1. Record the total area to be sampled
2. Calculate the area of one quadrat
3. Divide the total area to be sampled by the area of one quadrat to find the number of quadrats that would fit in the total area
4. Use random sampling to count the number of organisms in one quadrat

5. Gather many repeats, remove anomalies and calculate an average
6. Multiply the average by the total number of quadrats that would fit in the total area

75. To estimate the total **area** cover of a particular species, ecologists:

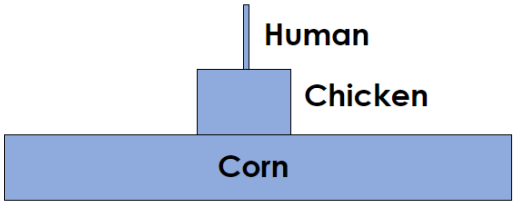
1. Record the total area to be sampled
2. Calculate the area of one quadrat
3. Use random sampling to measure the percentage cover of one quadrat
4. Gather many repeats and remove anomalies
5. Calculate the average percentage cover of one quadrat
6. Apply the average percentage cover to the total area to find the area covered

## *(SS Only) Taking it Further: Impact of Environmental Change*

76. *Changes to an environment impact the distribution of species in an ecosystem*
77. *Changes can be seasonal, geographic, or caused by human interaction*
78. *Changes can include temperature change, availability of water, composition of atmospheric gases*
79. *Temperature change can affect the migration patterns of birds. If birds arrive to their breeding grounds later or earlier, this can affect their ability to find food, shelter and breeding partners*
80. *Temperature increase can result in habitat loss (e.g. polar ice caps). This reduces the territory of a species, affecting their ability to find food, shelter and mates*
81. *Water availability can affect plant growth. Less water can result in a slower rate of photosynthesis. This reduces the amount of biomass available for the rest of the food chain*

## *(SS Only) Taking it Further: Pyramids of Biomass*

82. *Organisms are classified into trophic levels*
83. *A trophic level represents the feeding position of an organism in a food chain or food web*
84. *Producers are classified into trophic level 1*
85. *Herbivores ore classified into trophic level 2*
86. *Carnivores are classified into trophic level 3*
87. *Carnivores that eat other carnivores are classified into trophic level 4*
88. *A carnivore that has no predators is known as an Apex predator*
89. *Pyramids of biomass can be constructed to represent the relative amount of biomass in each level of a food chain.*




90. *Trophic level 1 is at the bottom of the pyramid. Trophic level 2 sits atop trophic level 1*
91. *In a pyramid of biomass, the bars must all be the same height*
92. *The bars decrease in width with each trophic level*
93. *Pyramids of biomass can be sketched or drawn to scale*
94. *When drawn to scale, the total biomass is divided into two then represented on two sides of a central, vertical line*
95. *Biomass is lost between the different trophic levels*
96. *Decomposers are not classified into a trophic level because they remove energy from a food chain*
97. *Trophic level 1, producers, transfer about 1 % of the incident energy from light for photosynthesis into new plant biomass*
98. *Incident energy is the light that hits the leaves. Most wavelengths of light are reflected or do not get absorbed by chlorophyll molecules*

99. *Only approximately 10 % of the biomass from each trophic level is transferred to the level above it*
100. *Losses of biomass are due to:*

*- Material being egested as faeces*
*- Material lost as waste, e.g carbon dioxide and water in respiration, water and urea in urine*

101. *Large amounts of glucose is used in respiration. Lots of the energy released during respiration is used for muscle contraction (movement) and homeostasis (including keeping warm). This energy is not transferred to the next trophic level*
102. *The efficiency of energy transfer can be calculated using the following equation: (Energy transferred / total energy in previous trophic level) x 100*

## *(SS Only) Taking it Further: Farming, Biotechnology and Food Security*

103. *Food security is having enough food to feed a population*
104. *Biological factors that threaten food security are:*

*• the increasing birth rate has threatened food security in some countries*
*• changing diets in developed countries means scarce food resources are transported around the world*
*• new pests and pathogens that affect farming*
*• environmental changes that affect food production, such as widespread famine occurring in some countries if rains fail*
*• the cost of agricultural inputs*
*• conflicts that have arisen in some parts of the world which affect the availability of water or food.*

105. *Sustainable methods of feeding people must be found which do not threaten food security for future generations*
106. *Fish stocks in the ocean are declining, meaning there are fewer organisms to breed and maintain population sizes*
107. *Sustainable fishing techniques include increasing the size of holes in nets and limiting the number of fish that can be caught (quotas) to ensure a breeding population of fish remains in the wild so they can reproduce*
108. *To increase the efficiency of food production from livestock, energy transfer from food animals to the environment is minimised*
109. *Farmers limit movement and control the temperature of animal surroundings to reduce energy loss and increase biomass*

110. *To maintain a warm environment for livestock fossil fuels are burnt. This is expensive for farmers and results in the production of carbon dioxide which contributes to global warming*
111. *Animals are fed high protein foods to increase growth*
112. *Animals are injected with antibiotics to reduce the risk of infection and poor health*
113. *Intensive farming techniques are developed to maximise yield and improve food security*
114. *Restricting animal movement can be considered inhumane and unethical by some people*
115. *Diseases can spread more rapidly in livestock that is intensively farmed*
116. *Injecting antibiotics into animals can increase the chance of antibiotic resistant strains of bacteria evolving*
117. *Biotechnology uses scientific advancement to enable large quantities of microorganisms to be cultured for food*
118. *The fungus Fusarium is useful for producing mycoprotein, a protein-rich food suitable as an alternative to meat*

119. *To produce Fusarium, Fusarium and glucose syrup are added to a large fermenter. Oxygen is bubbled through the mixture to maintain aerobic conditions for growth*
120. *A fermenter should be sterilised before use so that other micro-organisms or pathogens do not outcompete the Fusarium for resources*
121. *Temperature sensors can be used instead of thermometers during Fusarium production so that data on temperature can be collected continuously.*
122. *The fermenter can get very hot. A cooling jacket is used to maintain a temperature that is optimum for Fusarium enzyme activity*
123. *Fermenters are designed to allow for batch growth, with an outlet for the product and an inlet to add more nutrients, steam and air in.*
124. *Fermenters have stirring paddles to ensure the nutrients, oxygen and Fusarium are equally distributed*
125. *Producing Fusarium to provide protein is more efficient that using traditional farming techniques*