LIVING SYSTEMS

Stage 4 - Science

Outomes



WHAT TO EXPECT IN OUR ZOO WORKSHOP

SC4-LIV-01 - describes the role, structure and function of a range of living

SC4-WS-02 - Questioning and predicting: identifies questions and makes predictions to guide scientific investigations

SC4-WS-05 - Processing data and information: uses a variety of ways to process and represent data

SC4-WS-08 - Communicating: communicates scientific concepts and ideas using a range of communication forms

Investigate the key components of an ecosystem and how each organism plays a vital role in maintaining balance. Through guided discussions and hands-on activities, students develop a clear understanding of producers, consumers, decomposers and the physical conditions that influence survival of all organisms in a healthy ecosystem.

By putting what they have learnt into context, up their return to school, students can research what has led to the demise of a chosen native species and create action plans to improve the environment for its survival.

NSW GOVERNMENT

TARONGA ZOO

COMPONENTS OF ECOSYSTEMS

Identify the components that make up an ecosystem

VOCABULARY BUILDER

Ecosystem
A community of living things interact with each other and their environment

Ecosystems are everywhere! A garden, pond, park, or even a log in the school playground can be an ecosystem.

Sit outside and **draw** a local ecosystem in the space below. L**abel** all the different components including any animals, plants and non-living components such as water and sunlight.

SEE, THINK, WONDER

Based on the ecosystem you have drawn, complete the activity below to **identify** one thing you see, think and wonder about your chosen ecosystem.

SEE	THINK	WONDER
e.g. List the components you can **see** in your chosen ecosystem	e.g. **Think** about why a specific component is important	e.g. **Wonder** what would happen if a component were removed

ABIOTIC & BIOTIC FACTORS

Investigate the interactions of biotic and abiotic factors in an ecosystem

VOCABULARY BUILDER

Abiotic Factor
Non-living physical and chemical components of an ecosystem

Biotic Factor
Living components of an ecosystem

Observe the ecosystem below and **classify** each of the components as either abiotic or biotic.



spider, oxygen, possum, water, birds, wind, grass, lizard, temperature, snake, rocks, rainfall, fungi, carbon dioxide, soil, beetle, potoroo, eucalyptus trees, glider, sun, frog

ABIOTIC FACTORS	BIOTIC FACTORS

NSW GOVERNMENT

TARONGA ZOO

INTERACTIONS IN ECOSYSTEMS

Investigate the interactions of biotic and abiotic factors in an ecosystem

Using the image of the woodland ecosystem on the previous page, answer the questions below:

1. **Identify** one producer, one consumer and one decomposer.
   - **Producer:** _____
   - **Consumer:** _____
   - **Decomposer:** _____

2. **Identify** a predator and at least one animal that could be its prey.
   - **Predator:** _____
   - **Prey:** _____

3. **Identify** an organism that is both a predator and a prey animal in this ecosystem.

   _____

4. **Describe** the role of the fungi in the ecosystem.

   _____

   _____

5. **Explain** the importance of sunlight for the lizard and snake.

   _____

   _____

6. **Suggest** one resource in this ecosystem that two different organisms may compete for and **explain** why each of the organisms need that resource.

   _____

   _____

7. **Predict** what would happen if the water source dried up in this ecosystem.

   _____

   _____

8. **Predict** what would happen if all the birds disappeared from this ecosystem.

VOCABULARY BUILDER

Predator
An animal that hunts and eats other animals for food

Prey
An animal that is hunted and eaten by another animal for food

Competition
A relationship between organisms that strive for the same resources in the same place

Producer
An organism that makes it own food (energy)

Consumer
An organism that obtains energy by consuming the other organisms

Decomposer
An organism that breaks down dead plants, animals and waste products, recycling nutrients back into the soil

MATTER & ENERGY IN ECOSYSTEMS

Identify how matter and energy are cycled through an ecosystem

Using the word bank, complete the cloze passage below.

Word bank

Decomposer, return, eat, producers, lost, sun, heat, consumer, carbon, reused

VOCABULARY BUILDER

Matter

Any physical substance that has mass and takes up space

Energy

The ability to do work and change. The power that living things need to grow, move, and survive

Matter and energy are essential for the survival of all organisms in an ecosystem. Energy enters most ecosystems from the _____. Plants, known as _____, use sunlight to make their own food through photosynthesis. Animals, known as _____, obtain energy by eating plants or other animals. When organisms die, _____ such as fungi and bacteria break down their remains and obtain energy from this process. As energy moves through an ecosystem, some is _____, so less energy is available at each feeding level.

Matter includes substances such as water, _____, nutrients and minerals. Plants absorb water and nutrients from the environment, which are then passed to animals that _____ them. When animals produce waste or die, decomposers break down the material and _____ nutrients to the soil. These nutrients can then be _____ by plants, continuing the cycle. Therefore, energy flows in one direction through an ecosystem, while matter is continuously recycled.

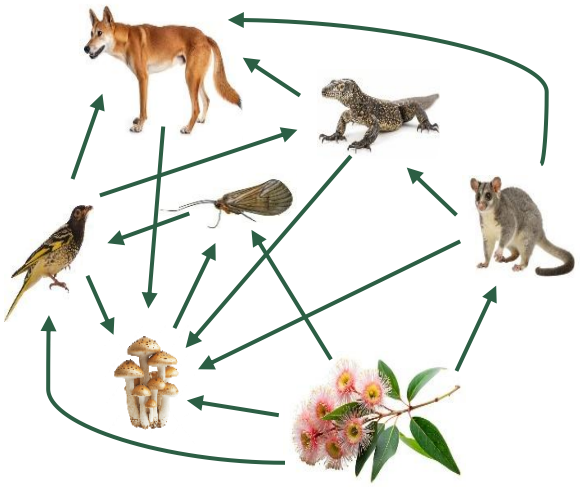
Complete table below to **determine** if the statement is an example of **energy, matter or both.**

Mostly enters ecosystems from the sun	Energy
Include water, carbon and nutrients	
Is lost as heat at each feeding level	
Is transferred through food webs	
Can be returned to the soil by decomposers	
Makes up the bodies of organisms	
Is used by organisms for growth, movement and reproduction	
Is captured by producers during photosynthesis	
Moves from plants to animals through feeding relationships	

MATTER & ENERGY IN FOOD WEBS

Create a food web and ecological energy pyramid based on local area observations to describe how matter and energy move through an ecosystem

Food webs are made up of many interconnected food chains and demonstrate how energy is transferred from one organism to another. The arrows in a food web show the direction of energy flow, moving from the organism being eaten to the organism that consumes it. Food webs help scientists and students understand how organisms depend on one another and how changes to one species can affect the entire ecosystem.



Construct a food web for a local ecosystem. Include producers, consumers and decomposers, and use arrows to show the direction of energy flow between organisms.

Choose one organism in your food web. **Explain** the impact on the other organisms in your food web if that organism were removed.

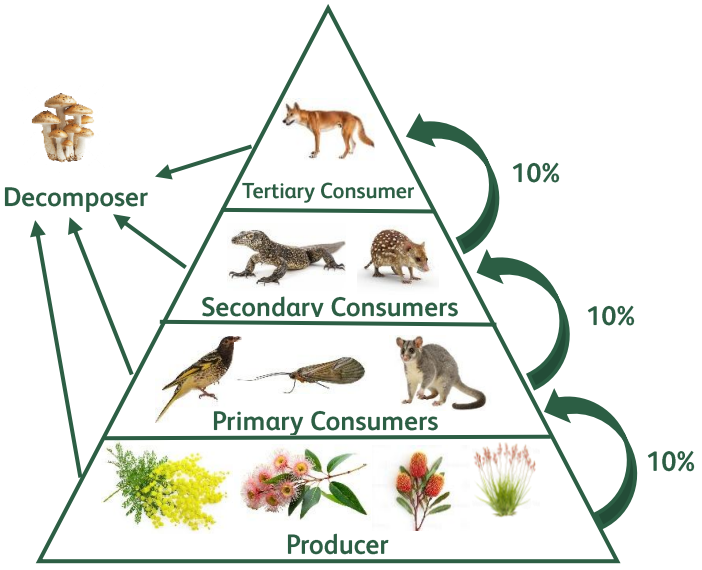
ENERGY PYRAMIDS

Create a food web and ecological energy pyramid based on local area observations to describe how matter and energy move through an ecosystem

VOCABULARY BUILDER

Trophic level
An organism's specific step or feeding position in a food chain or food web

An energy pyramid is a model that shows the amount of energy available at each trophic level in an ecosystem. Producers form the first trophic level and contain the most energy. Primary, secondary and tertiary consumers make up the higher trophic levels. As energy is transferred between trophic levels, only about 10 % of the energy is passed on to the next level, while the remaining energy is used for life processes or lost as heat. As a result, less energy is available at each trophic level, which is why the pyramid becomes narrower towards the top.



Construct an energy pyramid for a local ecosystem. Label each trophic level as producer, primary consumer, secondary consumer, tertiary consumer and so on.

Assume there is 70000 kcal of energy in the primary producer trophic level of your energy pyramid. **Calculate** the amount of energy that would be present in the top trophic level of your energy pyramid using the 10 % rule. Show your working.

ENERGY PYRAMIDS

Create written texts to explain how energy pyramids show the amount of energy or matter at each trophic level

Complete the scaffold to **explain** how the energy pyramid you constructed on the previous page shows the amount of energy and matter at each trophic level.

Introduction Define an energy pyramid. State its scientific purpose. Outline the 10 % rule and the conservation of matter.	
Body Paragraph 1 - Producers Energy conversion and biomass creation Explain why the bottom level is the largest in terms of both energy and matter, link this to photosynthesis, solar energy conversion and biomass creation.	
Body Paragraph 2 - Consumers Upwards transfer of energy and energy loss Explain why energy decreases at each subsequent trophic level using the 10 % rule, link this to metabolic heat loss and cellular respiration.	
Body Paragraph 3 - Decomposer Movement and conservation of matter Explain how matter decreases in biomass, but cycles through the system, link this to excretion, undigested materials and decomposers.	
Conclusion Summarise the key points. State the significance of the pyramids shape.	

FACTORS THAT CHANGE POPULATIONS

Examine secondary-source data on the factors that change populations, including the introduction of a new species to an ecosystem, to identify trends, patterns and relationships, and draw conclusions

---

The graph below shows the stomach contents of culled wild foxes on a property in central Australia over 70 years. In 1950 the CSIRO released a virus called myxomatosis to control the wild rabbit population.

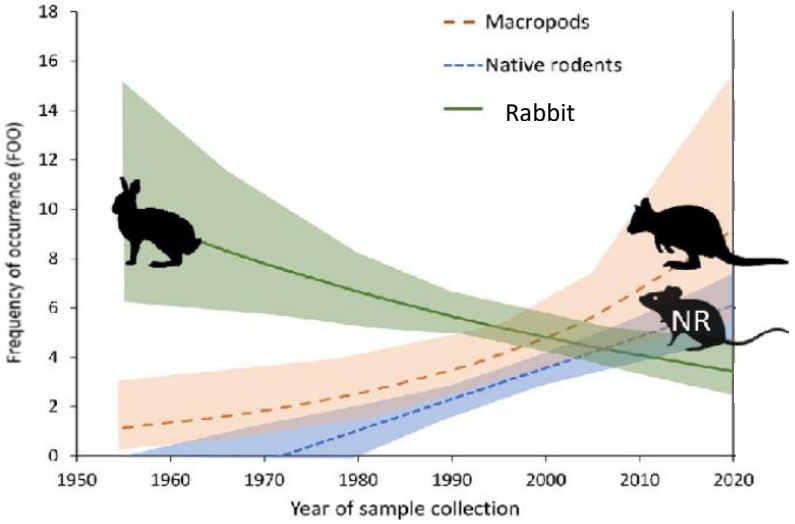
1. Using the graph, **identify** the trend in occurrence of rabbits consumed by foxes over the past 70 years.

_____

_____

_____

Consumption of rabbits, macropods and native rodents by foxes 1950-2020



2. Based on the trend of all animals consumed by foxes, **infer** what this means for each of their populations.

Rabbits: _____

Macropods: _____

Native Rodents: _____

13 Rabbits were introduced to Australia in 1859, foxes were also introduced around this time. By 1966 hunters captured 14000 rabbits on one estate alone.

3. Use the above information and the image to **determine** the relationship between foxes, rabbits, native rodents and macropods, matching the left and right columns with the left to complete the sentences.

Foxes	outcompeted native animals for food
Rabbits	increased rapidly
The new animals in the ecosystem caused the native rodent and macropod population to	hunted native rodents, macropods and rabbits
When rabbits were introduced into the wild released into the wild the population	rabbit population decreased
When Myxomatosis was released in 1950	increased
The decrease of the rabbit population meant less competition for resources, as a result the population of native rodents and macropods	decreased

Using the developed topic sentences use the space provided on the next page to develop a written text.

Creating Written texts that support learning

Use the sentences developed in the table on the previous page to **create** a piece of writing that explains how populations of rabbits, macropods and native rodents have changed over time. **Explain** how one species can impact an ecosystem and draw a conclusion about the effectiveness of introducing a virus into the rabbit population and what it meant for the macropods and native rodent population.

LIVING SYSTEMS IN CONTEXT

Investigate factors that lead to a species becoming endangered or extinct to explain why Australia has some of the world's highest rates of species population decline and extinction

Choose an extinct group of native Australian organisms: plants, mammals, reptiles, amphibians, birds, fish or invertebrates and conduct research to determine what led to their demise. Research a vulnerable, endangered or critically endangered organism that comes from the same class and shares similar habitat to the extinct group you researched. Identify measures that humans could put in place to have a positive impact on the wild population of this organism.



Create:

A written report explaining what you have learnt and identify what led to its decline over time.

A behaviour change campaign that will have positive outcomes for the organism of your choosing.

An educational video that explains the demise of species and what needs to be done to improve the prospects of chosen organisms.

