@PETER L OKION
778001502/ 758795415

ECOLOGY

Ecology is the study of living organisms in relation to their environment i.e. the study of interactions between living things and their environment.

The organisms and the environment depend on each other for resources e.g. plants need carbon dioxide and water to manufacture food for animals to feed on.

There are *2 branches* of Ecology i.e. Autecology, which deals with the study of individual species of plants and animals & Synecology which deals with the study of communities (plants and animals living under similar conditions)

Terms used in ecology

Environment: This refers to the immediate surroundings of an organism.

Habitat: This is the place in the environment where an organism lives e.g. mammalian intestines are habitats of tapeworms

Biosphere: This is the surface of the earth where life exists e.g. forests, mountains

Ecological niche: This is the role/ status played by an organism within the community. This refers to the specific mode of life of an organism within its habitat.

Ecosystem: This is the natural unit consisting of biotic and abiotic components interacting to produce a stable system.

Biotic components are the living components while *abiotic components* are the non-living components.

Community: This refers to the populations of plants and animals living together in a common environment.

The individuals of the population within the community interact with each other and with the abiotic components of the environment.

Species: This is a group of organisms capable of interbreeding and producing viable offspring.

HABITAT

Classification of habitats:

These are classified into two; aquatic habitats and terrestrial habitats.

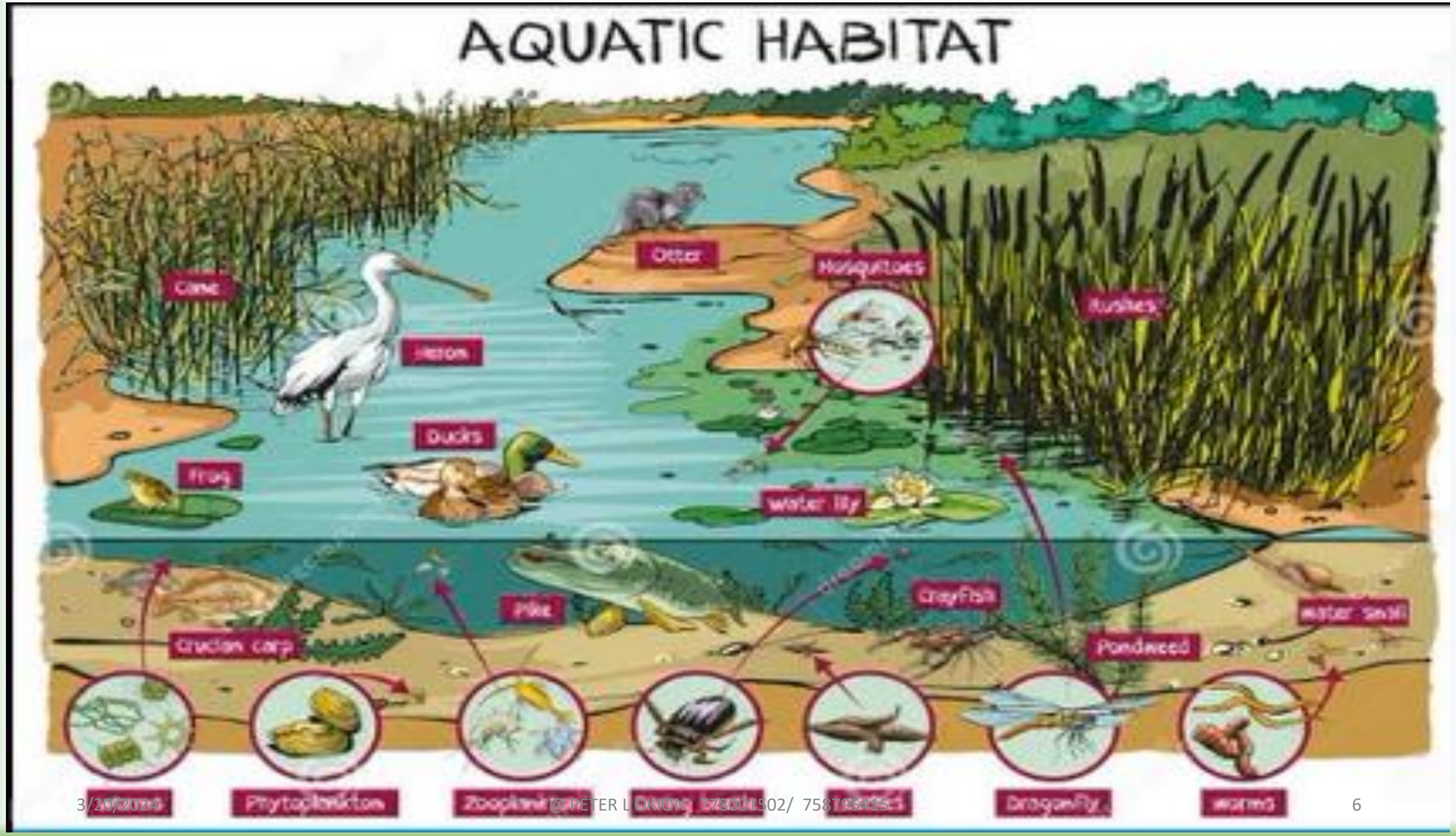
a) Aquatic habitats:

These are the habitats in *water*.

They include;

i) Fresh water habitats. These include rivers and lakes.
Inhabitants include *protozoans (amoeba), fish, aquatic plants such as algae and papyrus.*

ii) Marine (salty) water habitats. These are ones which are found in seas, oceans and swamps.
Inhabitants include *sea anemones, sea weeds, whales, fish*, etc.



b) Terrestrial habitats:

These are habitats on *land*.

They include;

i) *Forests* where the inhabitants are include birds, insects, fungi, monkeys, etc.

ii) *Savanna* where inhabitants include birds, grazers, insects, grasses, etc.

iii) *Desert* where the inhabitants include hardy droughts resistant species like xerophytes, cactus, euphorbia, camels, etc.

iv) *Underground* where inhabitants include termites, burrowing mammals, and earth worms, etc.

ENVIRONMENT

An organism in an environment is surrounded different things. Therefore, the environment is divided into two;

i) Physical environment

ii) Living environment

1. Physical environment (abiotic)

These include:)

i) Temperature Water (Rain fall)
ii) Humidity
iii) Light Wind and air currents
iv) Topography
v) Edaphic factors

These are factors associated with soil in terms of;

✓Soil pH
✓Drainage
✓Water retention
✓Humus content
✓Number of living organisms
✓Mineral salts, etc.

Living Environment (Biotic components)

The living components of the ecosystem consist of producers, consumers, predators, parasites, competitors and man.

1) ***Producers.***

   These are the green plants. They fix the sun's energy into the ecosystem in form of organic compounds made by photosynthesis. All other organisms depend on producers for food.

2) ***Consumers.***

   These are organisms which depend on other organisms for food i.e. they depend on producers, therefore feed heterotrophically

Levels of consumers:

i) ***Primary consumers:*** These are organisms that feed on green plants directly i.e. herbivores e.g. *grazers, grasshoppers,* etc.

ii) ***Secondary consumers:*** These are organisms which feed on herbivores (i.e. carnivores) e.g. members of the cat family feed on antelopes, birds, insects, etc.

iii) ***Tertiary consumers:*** These are organisms which feed on secondary consumers e.g. vultures on other birds.

iv) ***Decomposers:*** There organisms which feed on dead bodies of plants and animals e.g. bacteria and fungi.

Decomposers are important because they bring about decay in organisms which is essential for recycling of nutrients for reuse by the plants.

If decomposers are absent, materials would accumulate in the environment and no nutrients would be recycled

FEEDING RELATIONSHIPS

In nature, organisms depend on others for food.

Food Chain

These are *linear relationships* which show how members in an ecosystem depend on each other for food.

It involves the flow of energy from the sun to the producers through a series of organisms at different trophic levels.

A trophic level refers to a given feeding level of an organism in the food chain, i.e. *producer, primary consumer, secondary consumer and tertiary consumer.*

Examples of food chains

Grazers food chain:

These food chains have the first trophic level occupied by either green plants, or algae and the second level by herbivore.

i) Grass → Grasshopper → hen →human being

ii) Grass → grasshopper →lizard→ snake→ hawk

iii) Phytoplankton →zooplanktons →small fish →big fish →crocodile

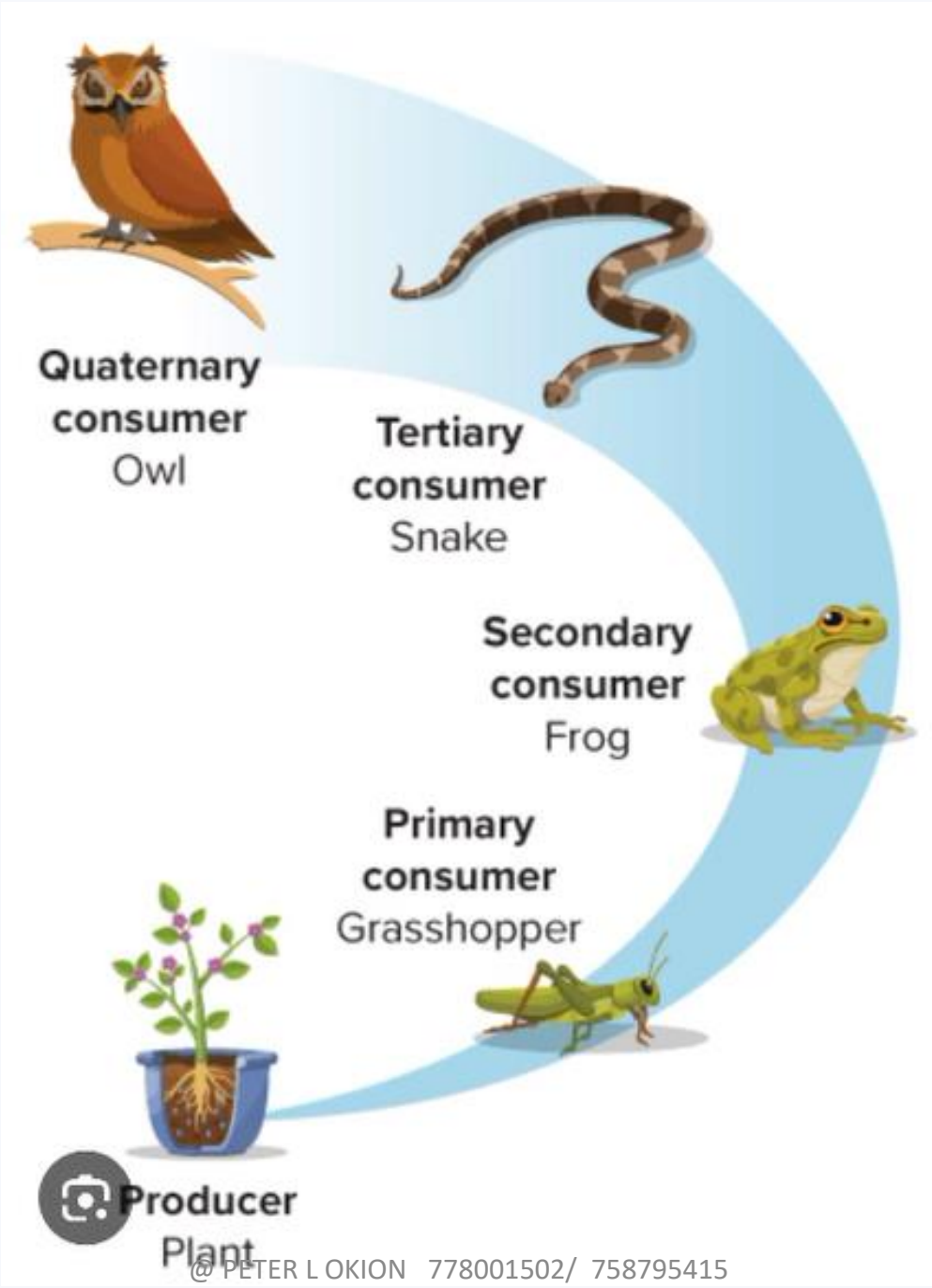
Detritus food chain:

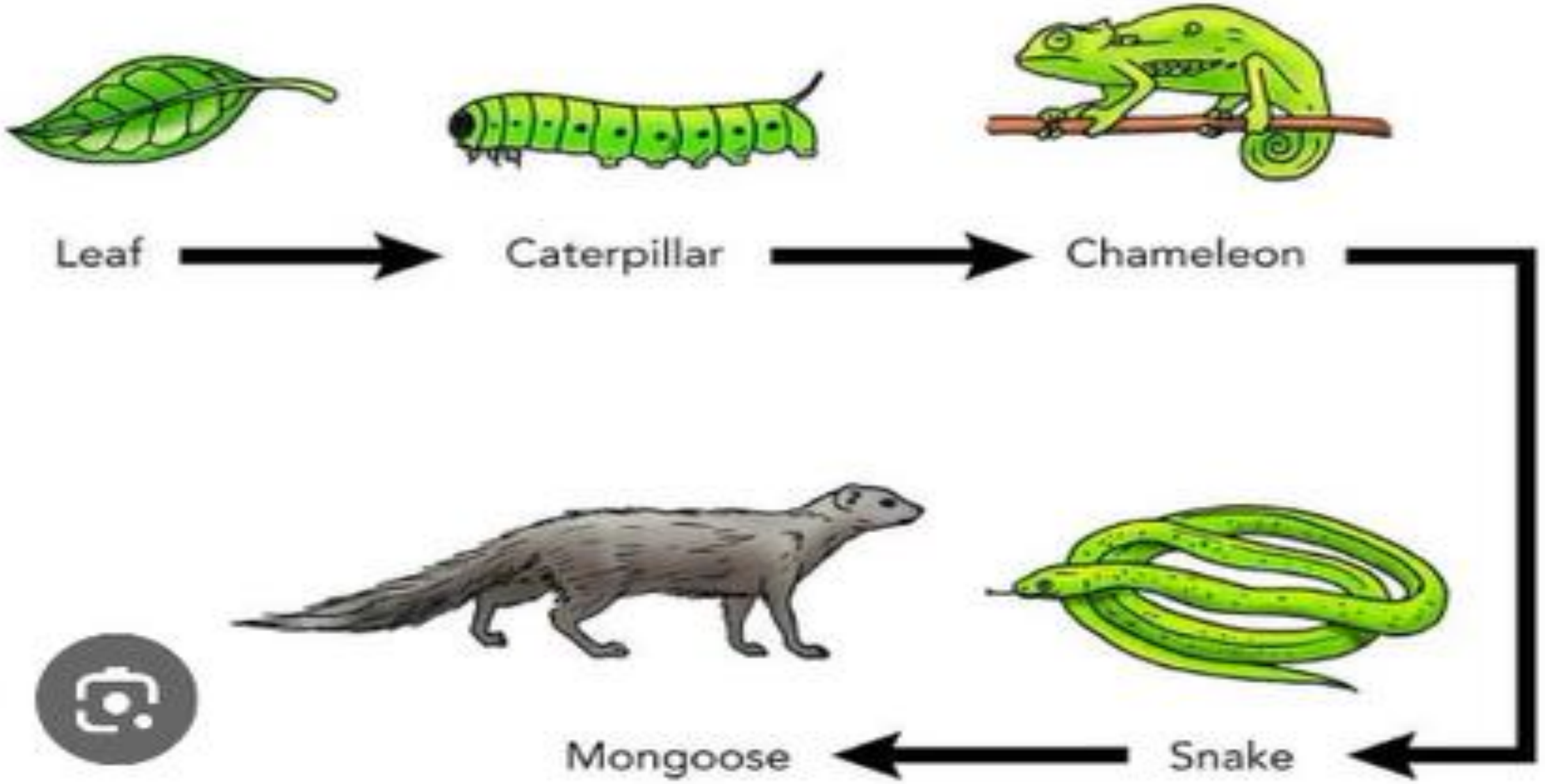
These types of food chain have their first trophic levels occupied by detritus

i) Leaf litter → earthworms→ birds → hawk

ii) Dead animal → blow fly maggots → frog → snake

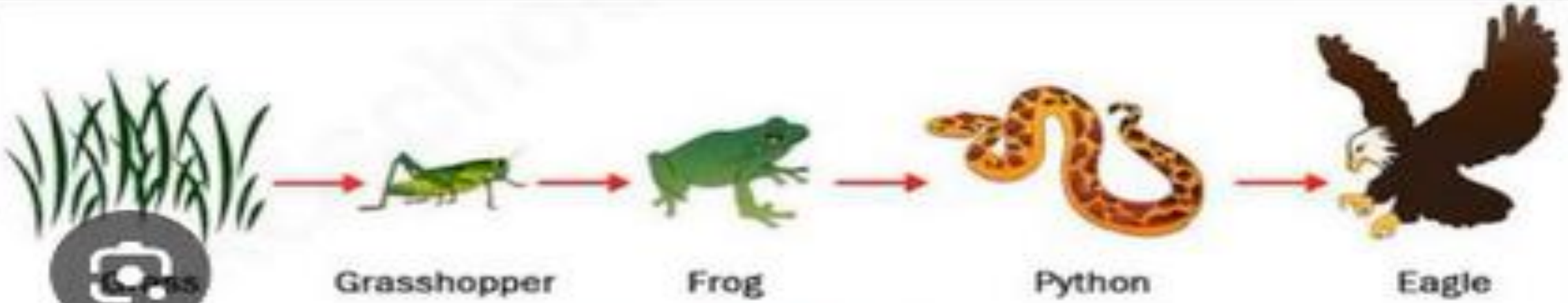

Grazing Food Chain
Owl
(consumer)
Flower
(producer)
Caterpillar
(consumer)
Frog
(consumer)
Snake
(consumer)

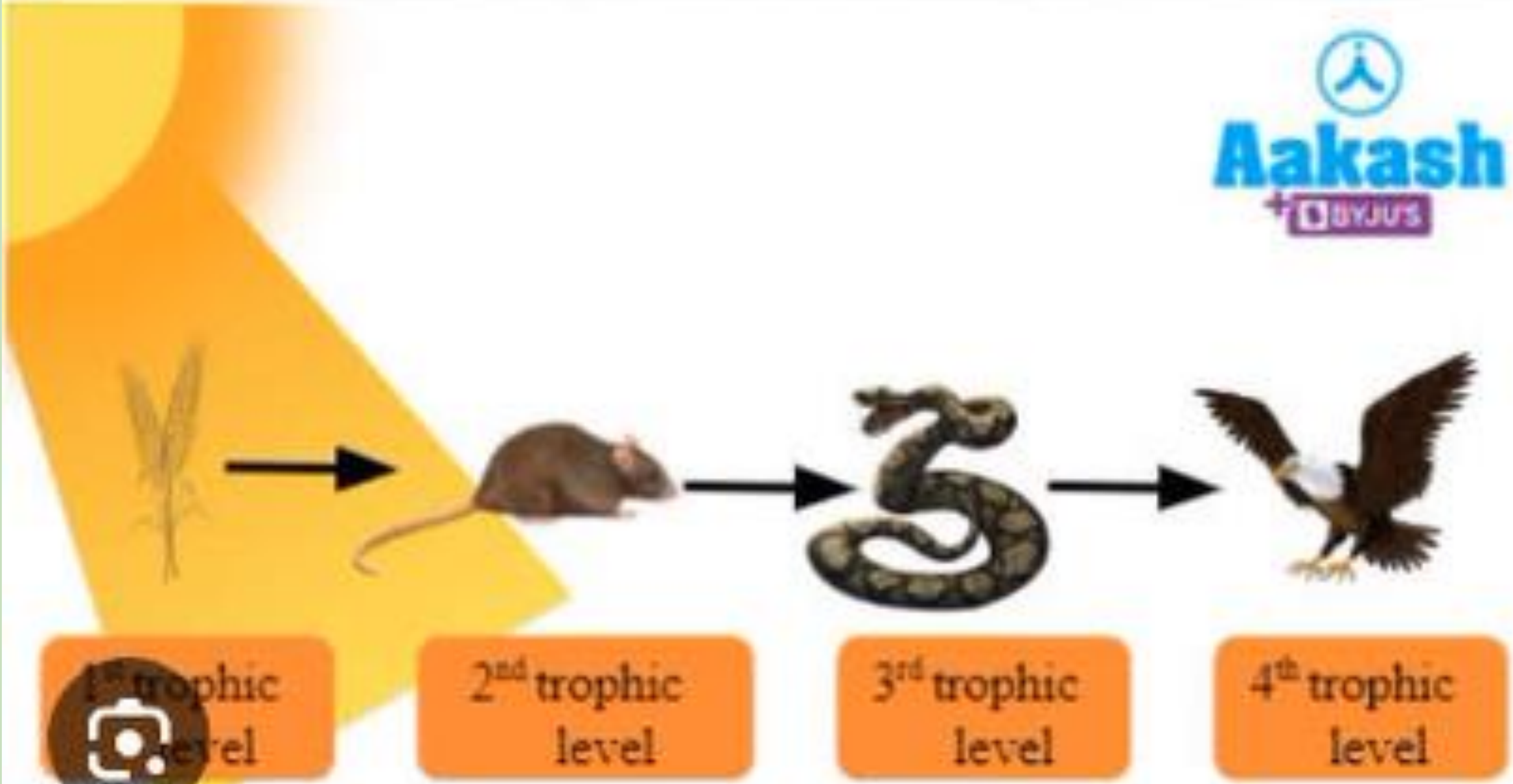

Quaternary consumer
Owl
Tertiary consumer
Snake
Secondary consumer
Frog
Primary consumer
Grasshopper
Producer
Plant


Leaf
Caterpillar
Chameleon
Snake
Mongoose

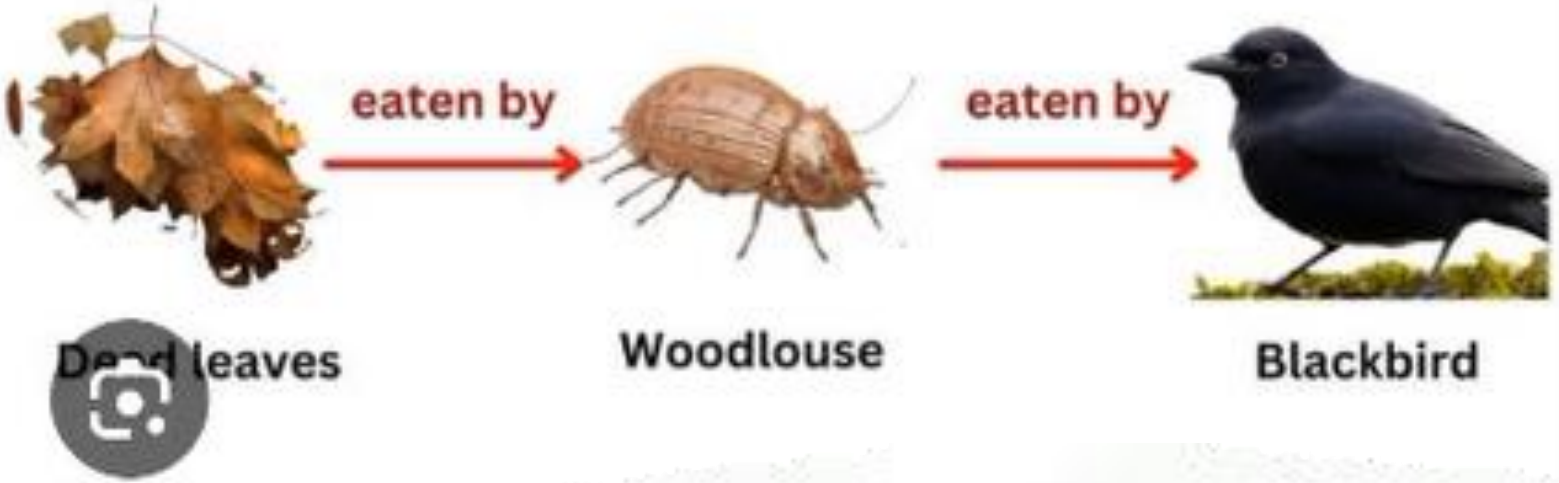
A three linked food chain

A four linked food chain




Aakash
BYJU'S
2nd trophic level
3rd trophic level
4th trophic level

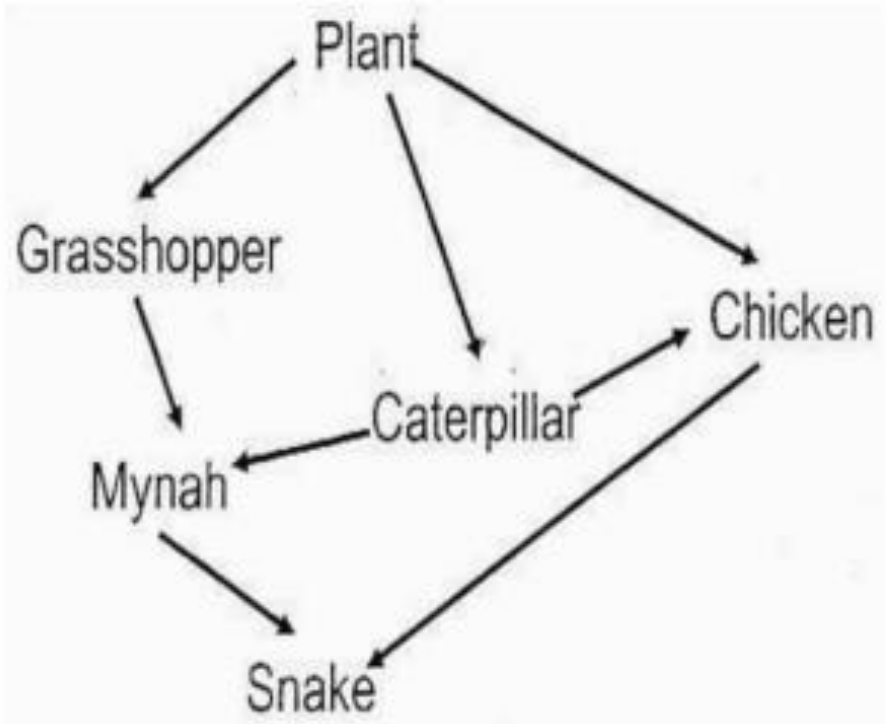
Detritus Food Chain

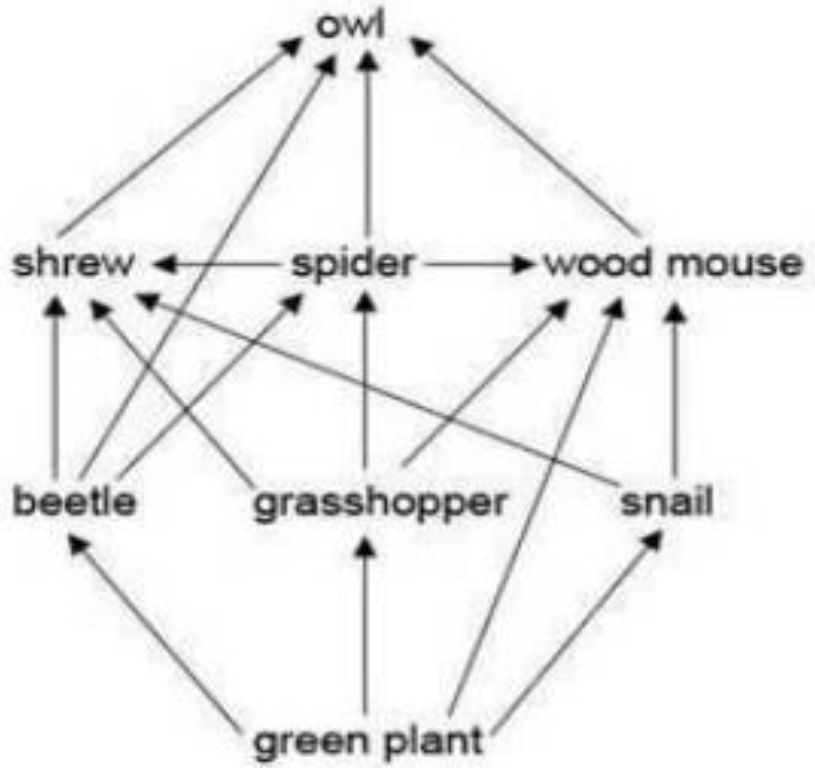


Food web

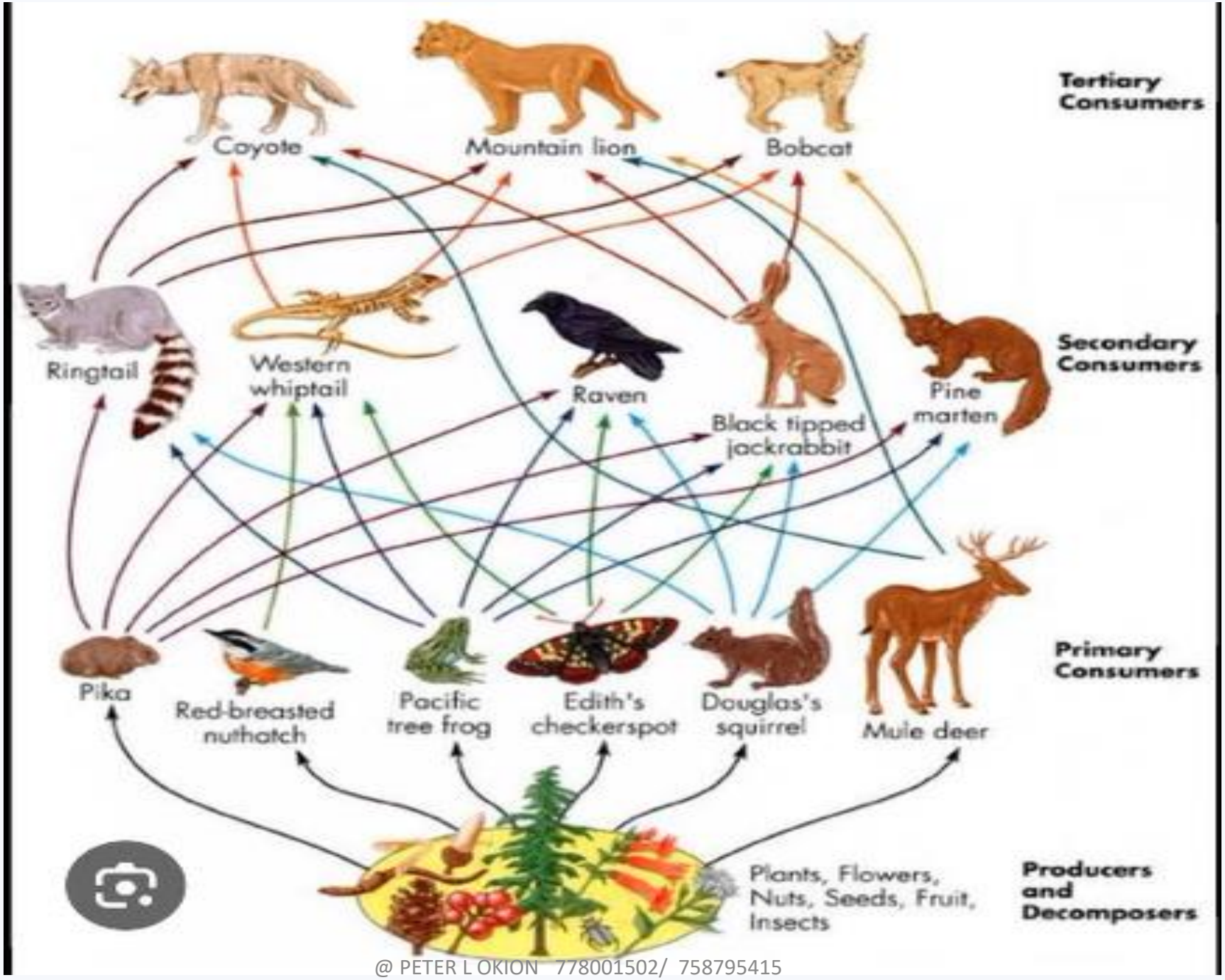
This is a complex nutritional interrelationship that illustrates alternative food sources and predator for each organism.

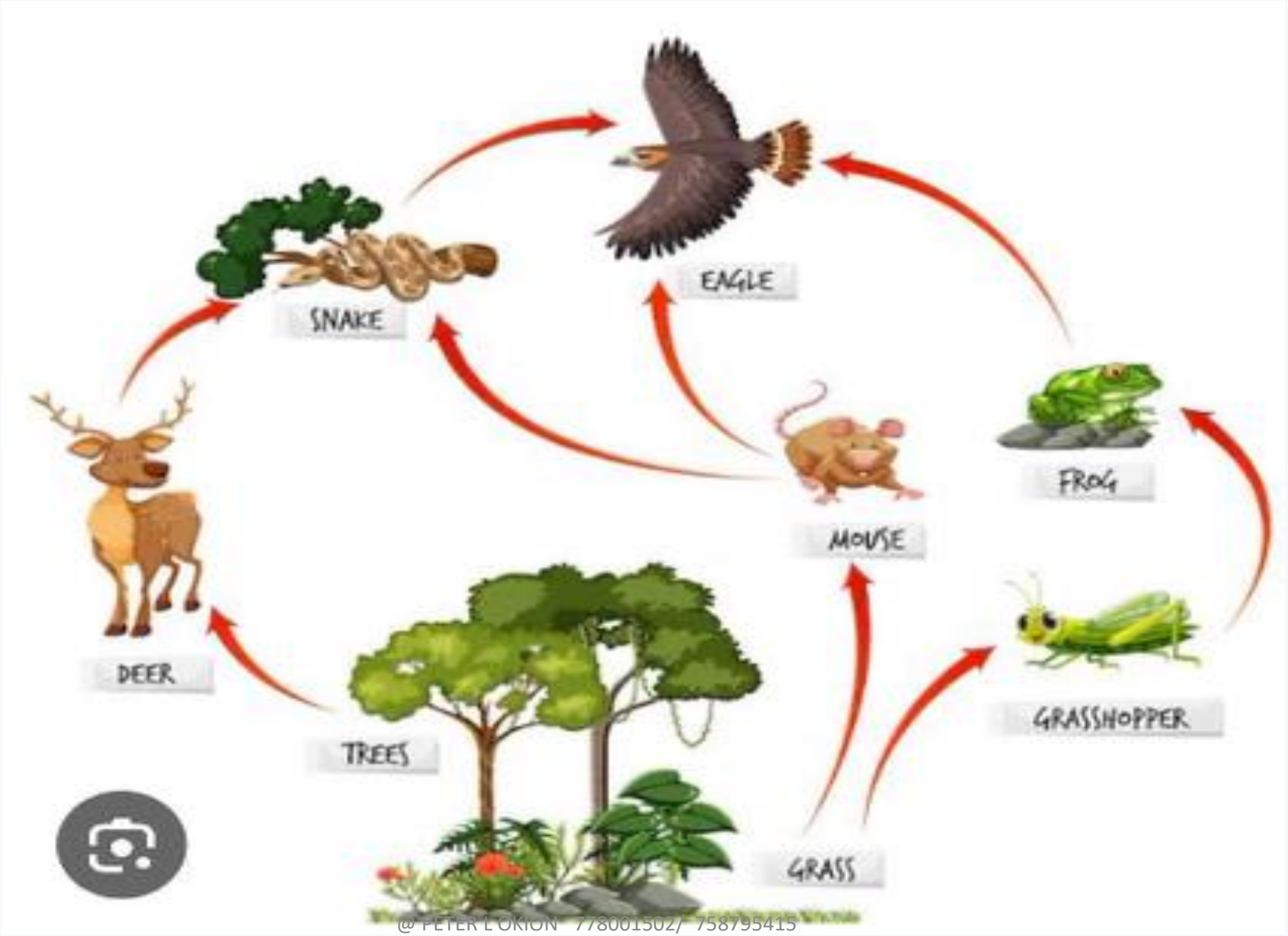
In a food web, there are *several food chains*.

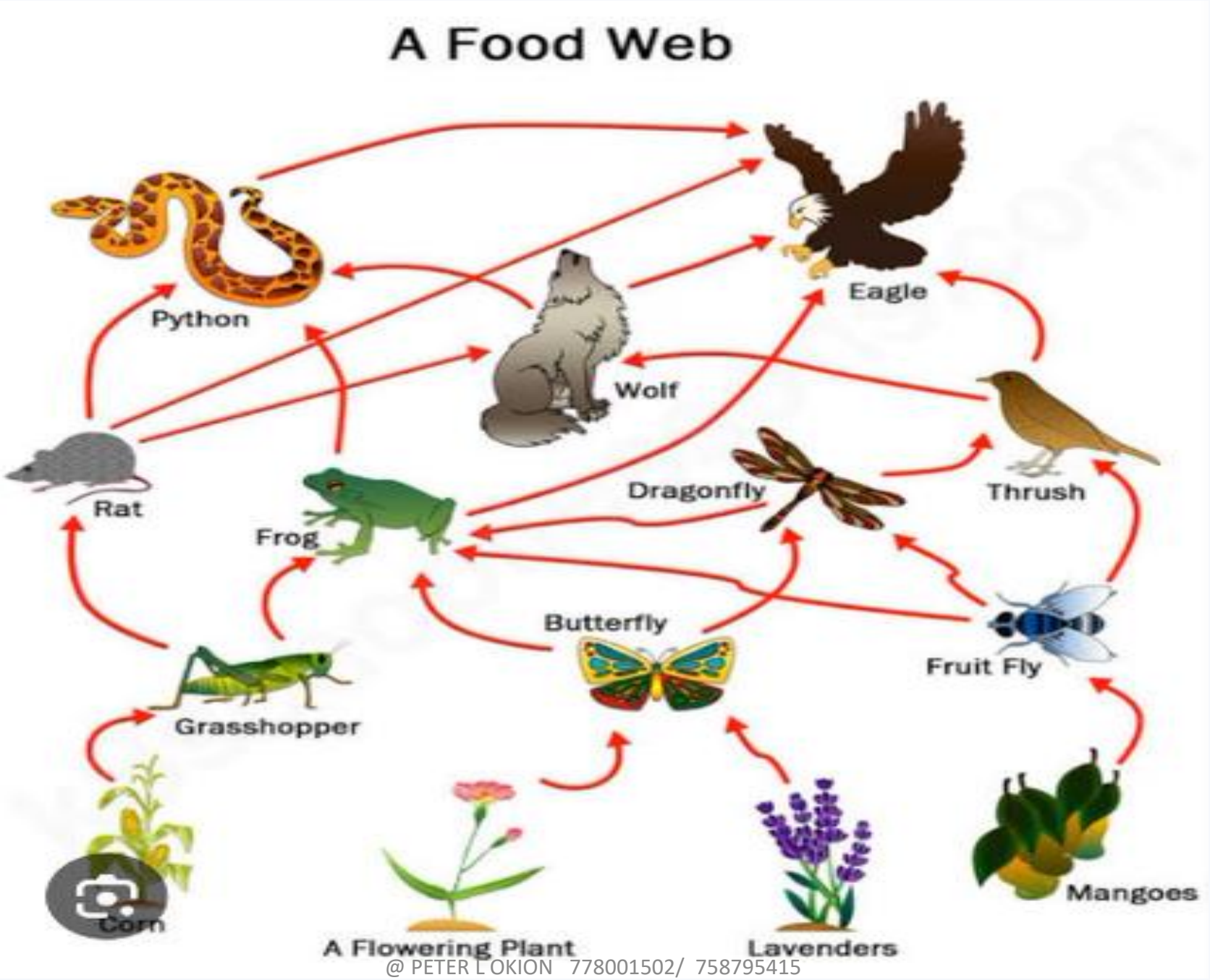


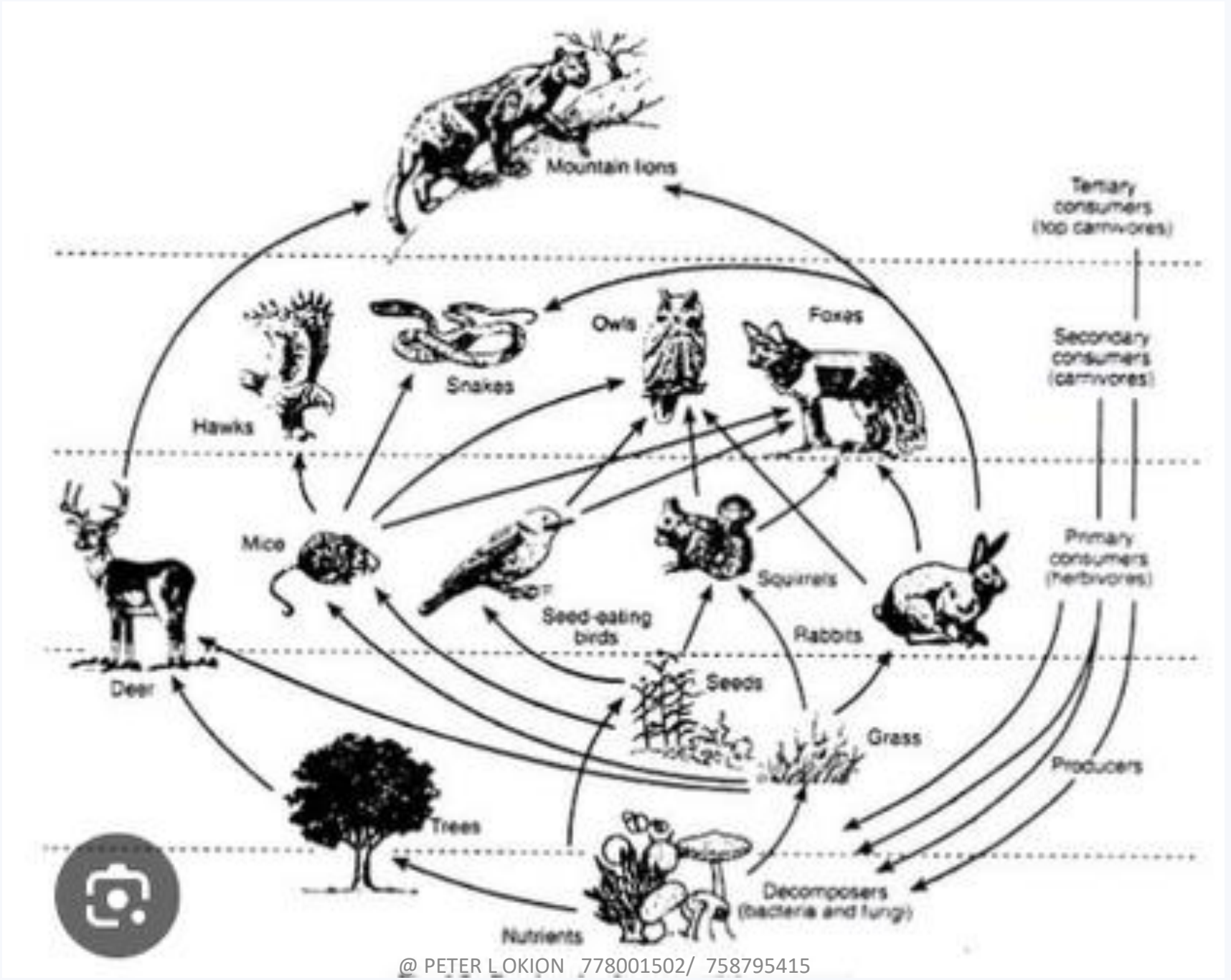



FOOD WEB
BYJU'S
Hawk
Snake
Fox
Owl
Bird
Frog
Rabbit
Grasshopper
Mouse
Grasses


Tertiary Consumers
Coyote
Mountain lion
Bobcat
Secondary Consumers
Ringtail
Western whiptail
Raven
Black tipped jackrabbit
Pine marten
Primary Consumers
Pika
Red-breasted nuthatch
Pacific tree frog
Edith's checkerspot
Douglas's squirrel
Mule deer
Producers and Decomposers
Plants, Flowers, Nuts, Seeds, Fruit, Insects


EAGLE
SNAKE
FROG
MOUSE
DEER
TREES
GRASSHOPPER
GRASS


A Food Web
Python
Eagle
Wolf
Rat
Frog
Dragonfly
Thrush
Butterfly
Fruit Fly
Grasshopper
Corn
A Flowering Plant
Lavenders
Mangoes


Mountain lions
Tertiary consumers (top carnivores)
Owls
Foxes
Snakes
Secondary consumers (carnivores)
Hawks
Mice
Squirrels
Primary consumers (herbivores)
Seed-eating birds
Rabbits
Deer
Seeds
Grass
Producers
Trees
Decomposers (bacteria and fungi)
Nutrients

Practice questions:

1) Construct a food web using the following organisms: phytoplanktons, mosquito larvae, small fish, large fish, and crocodiles.

2) (a) With reference to a named ecosystem, what is meant by the following terms;

i) Energy flow

ii) Trophic levels

iii) Food web.

(b). Discuss the interactions between the living and nonliving components of such an ecosystem.

(c) What is an ecosystem?

Ecological pyramids

An ecological pyramid is a graphical representation of food chains in an ecosystem.

An ecological pyramid is constructed from a food chain because it shows the different energy levels.

The producers are at the base then the successive trophic levels come one after another.

Types of ecological pyramids

i) Pyramid of numbers

ii) Pyramid of biomass

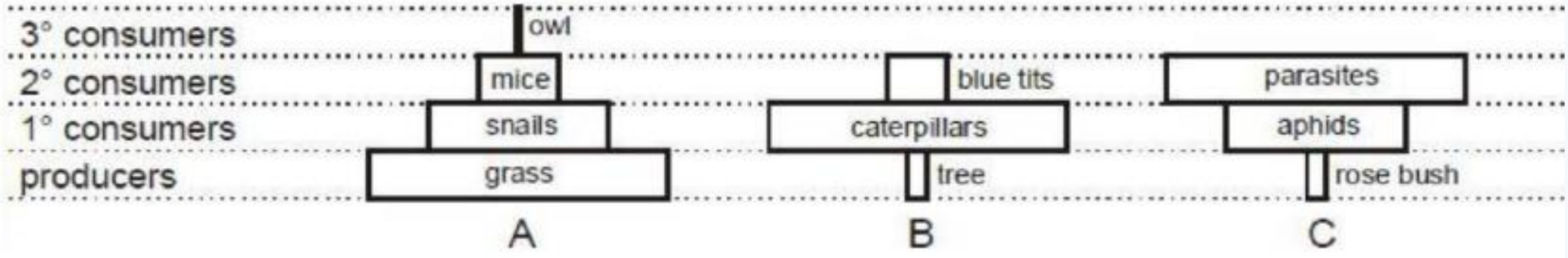
iii) Pyramid of energy

NB: Decomposers are excluded from an ecological pyramid because;

Pyramid of numbers:

This is a diagrammatic representation showing the number of organisms at different trophic levels in a food chain.

The length of the bars represents the relative abundance of organisms

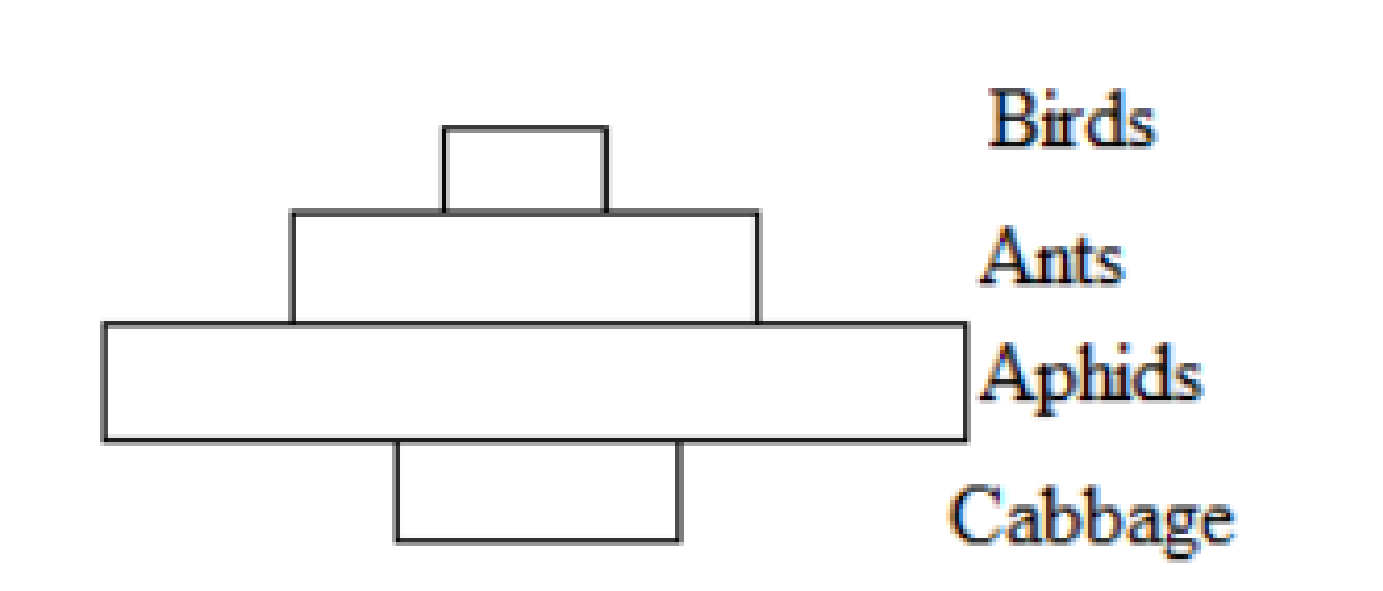


NB:

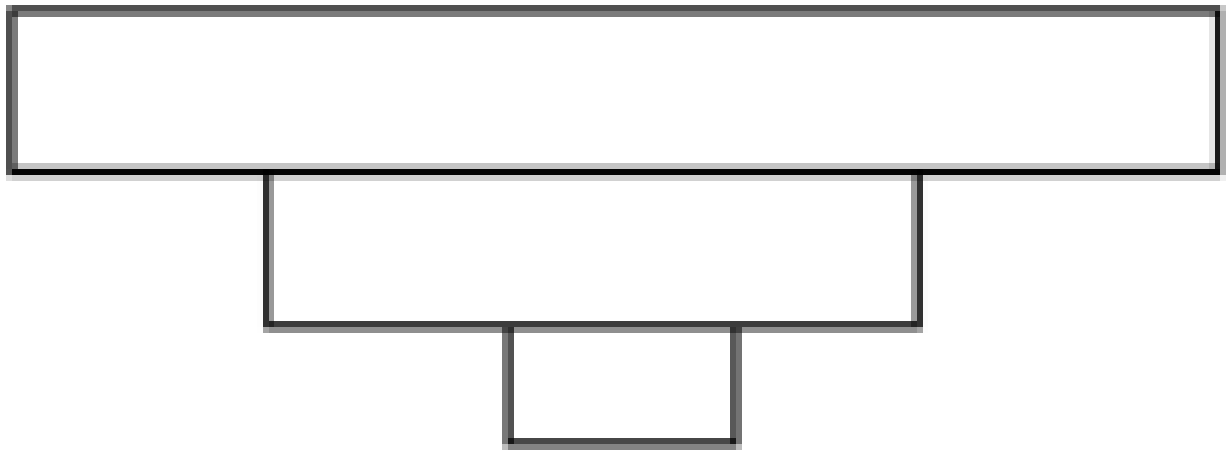
Most ecological pyramids of numbers are always upright.

However, in some cases, they may be inverted e.g.

a) *Where a cabbage plant is supporting a large number of aphids; which also support a few ants; which in turn support a few birds*



b) Where a single tree supports a number of herbivorous birds which in turn support numerous parasites e.g. bugs and lice

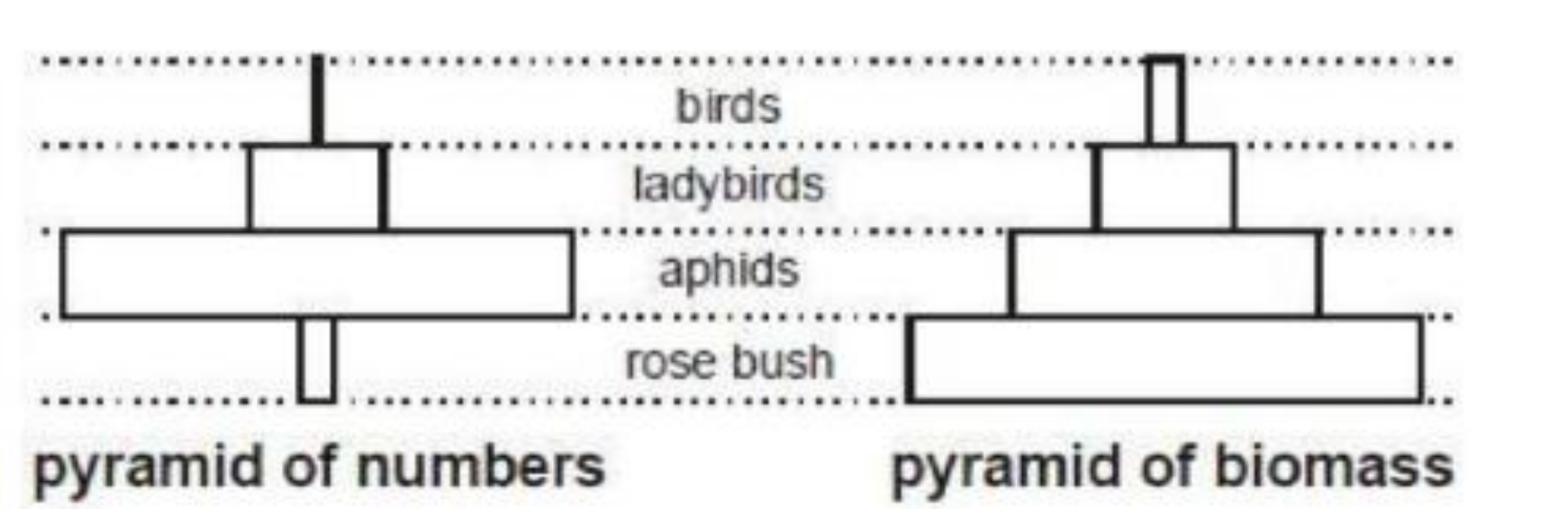


ii) Pyramid of biomass

This is a diagrammatic representation of the biomass of organisms at each trophic level at a particular time.

Biomass is the weight of the living matter in the organism measured by either living weight or dry mass

NB: The biomass increases at each successive trophic level.



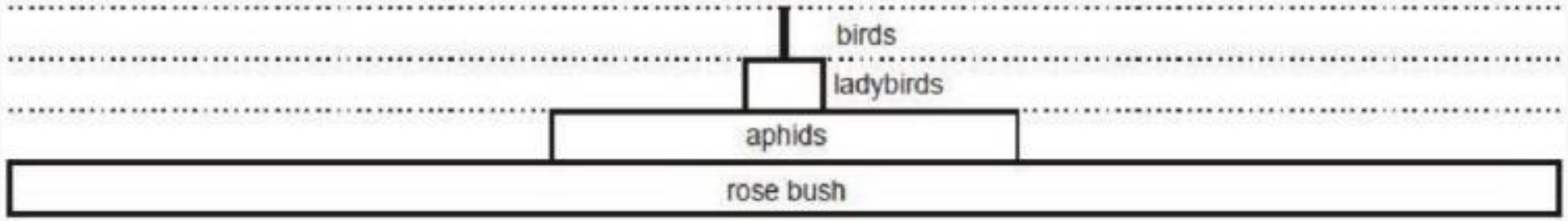
iii) Pyramid of energy

This is the best way of representing relationships and ecological productivity between organisms in different trophic levels.

It is a histogram showing the energy content of the organisms at each trophic level.

At each trophic level, the energy is lost as heat during;

- ✓ Respiration
- ✓ Egestion
- ✓ Death
- ✓ Decomposition



NB: The energy *decreases* as it is transferred from one trophic level to another. Therefore, the pyramid of energy is always upright

Cycling of materials

Carbon cycle describes the process in which carbon atoms continually travel from the atmosphere to the earth (into living and non living organisms) and then back into atmosphere.

The carbon cycle is a ***bio chemical cycle*** by which carbon is exchanged among the biosphere.

The availability of carbon in the environment is a crucial factor in the maintenance of plant and animal life.

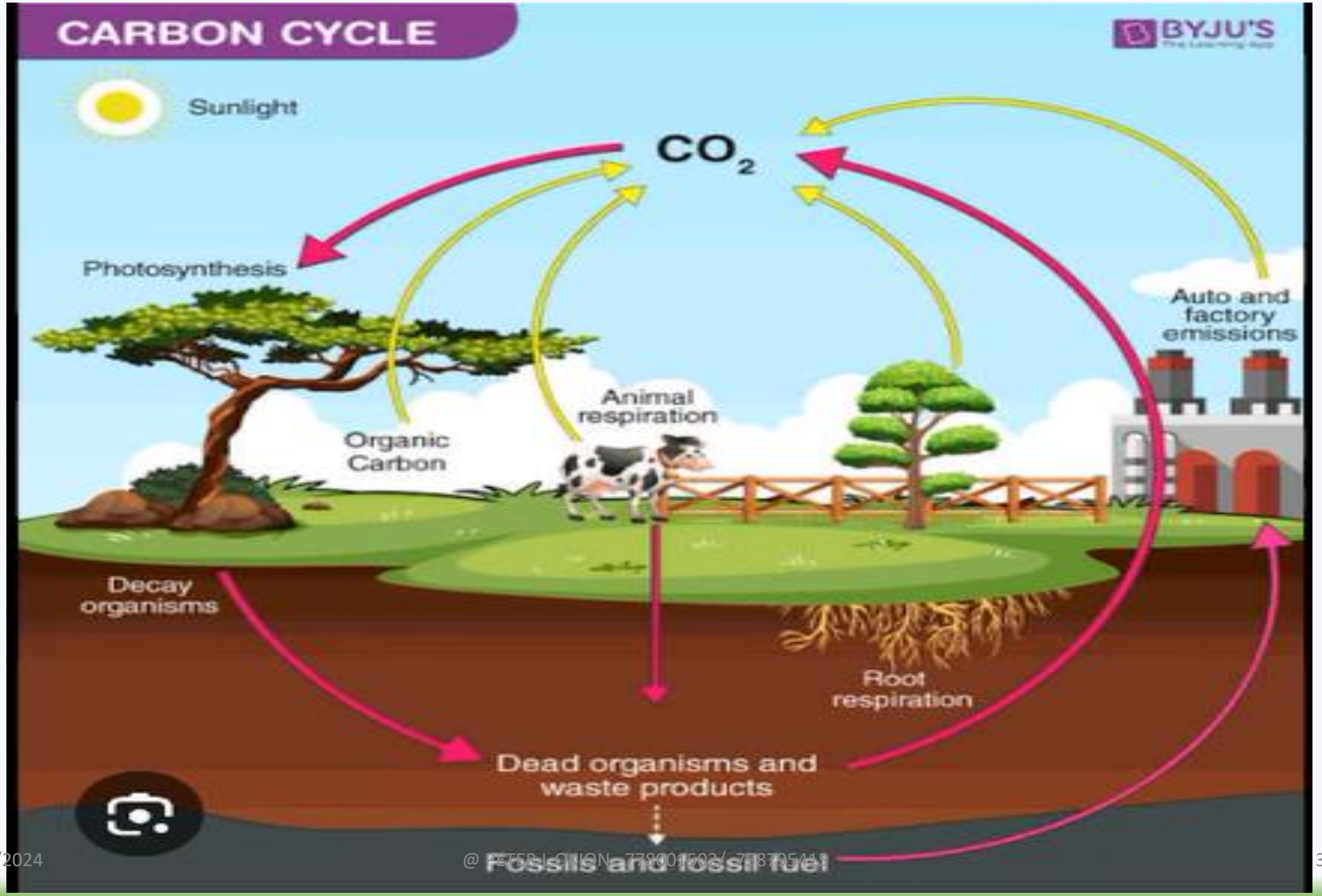
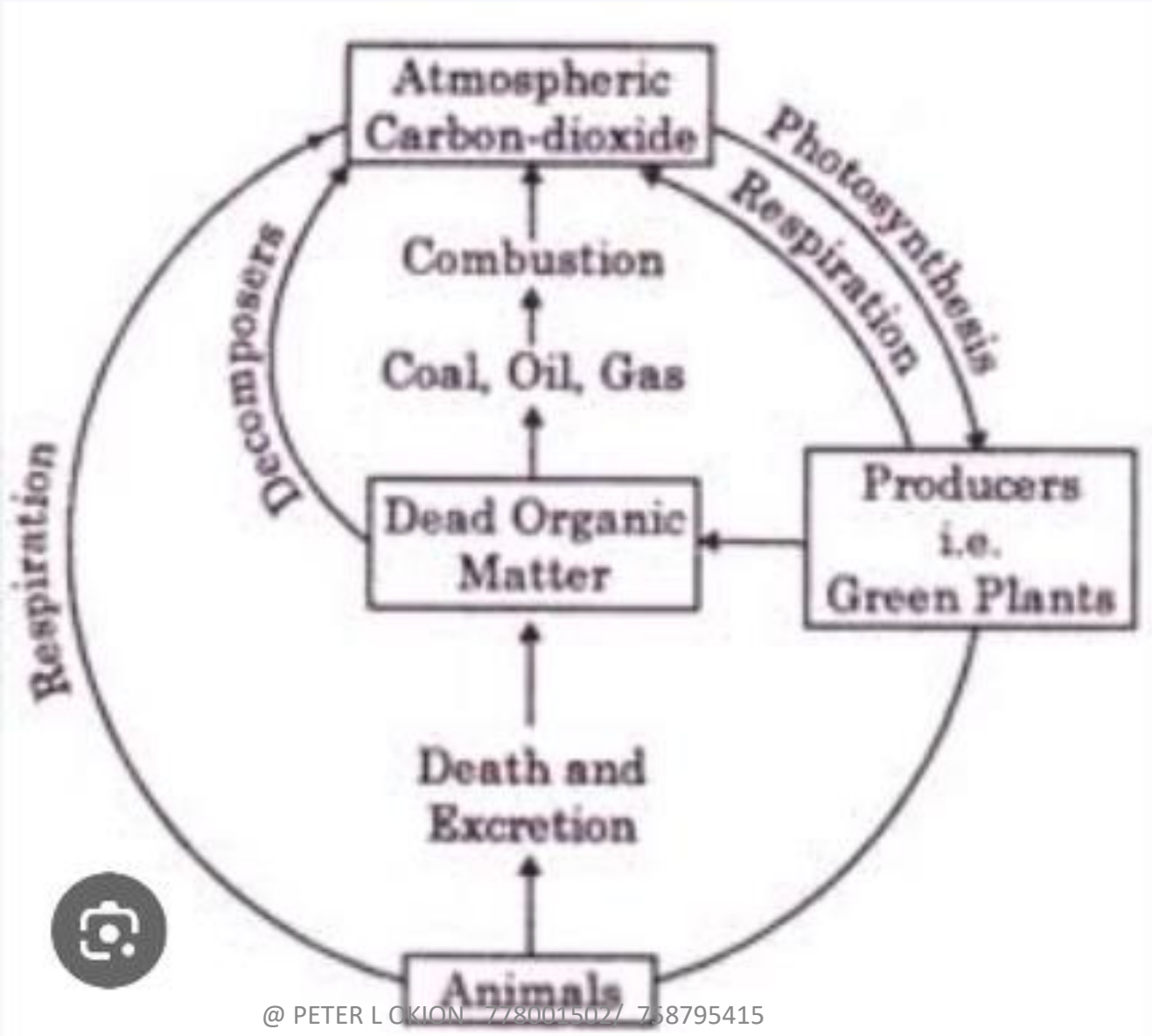


Diagram showing the Carbon cycle.



Key stages involved in the carbon cycle

1. Carbon ***enters*** the atmosphere as carbon dioxide
2. Carbon dioxide is ***absorbed*** by autotrophs such as *green plants*.
3. Animals **consume** plants, thereby, incorporating carbon into their system.
4. Animals and plants die, their bodies decompose and carbon is reabsorbed back into the atmosphere. **OR** Burning of carbon containing substances also adds carbon into the atmosphere.

Organisms and processes involved in the carbon cycle and their roles.

PLANTS: These absorb carbon from the environment during photosynthesis and release it back during respiration.

ANIMALS: These obtain their carbon by eating plants and release carbon in form of carbon dioxide into the atmosphere during respiration.

MICRO-ORGANISMS (e.g. fungi and bacteria)

These return carbon to the environment when they decompose dead plants and animals.

Carbon in inedible parts of plants can be released back into the atmosphere through: Decomposers break down the inedible parts of dead plants, thus returning the carbon in their bodies to the atmosphere as carbon dioxide by respiration.

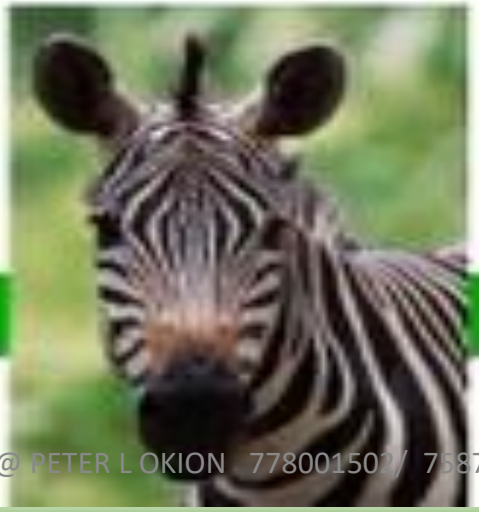
The plant and animal materials may then be available as fossil fuels for combustion in the future.

In summary, processes involved include: *photosynthesis, respiration, decomposition and combustion.*



INTERACTIONS AMONG ORGANISMS




ASSOCIATIONS AMONG ORGANISMS

In nature, organisms tend to relate in their ecosystems.

Types of feeding associations

They are mainly two;

i) Intraspecific associations

ii) Interspecific associations

Intraspecific associations

These are associations among organisms of the same species.

Examples include;

- ✓ Social insects (termites, bees, etc.)
- ✓ Territoriality e.g. in Uganda Kob where males defend others in the territory

Interspecific associations

These are associations among organisms of different species and they include;

i) Predation.

ii) Symbiosis

Competition

Competition is an interaction between organisms or species in which both (organisms or species) require a resource that is in limited supply, hence, organisms compete for it.

Such resources usually include: food, water, shelter and mates

Biological significance of competition to organisms

Competition plays a very important role in ecology and evolution

1. Competition leads to the evolution of better adaptations within a species.
   the best competitors are the ones who survive and get to pass on their genes. Hence, their offspring will have an increased chance of survival because their parents out-competed their conspecifics.
2. As regards competition's effect to ecology, it leads to species diversity. In a short run, competition cause a reduction in the number of species living within an area, preventing very similar species from co-occurring.

Predation

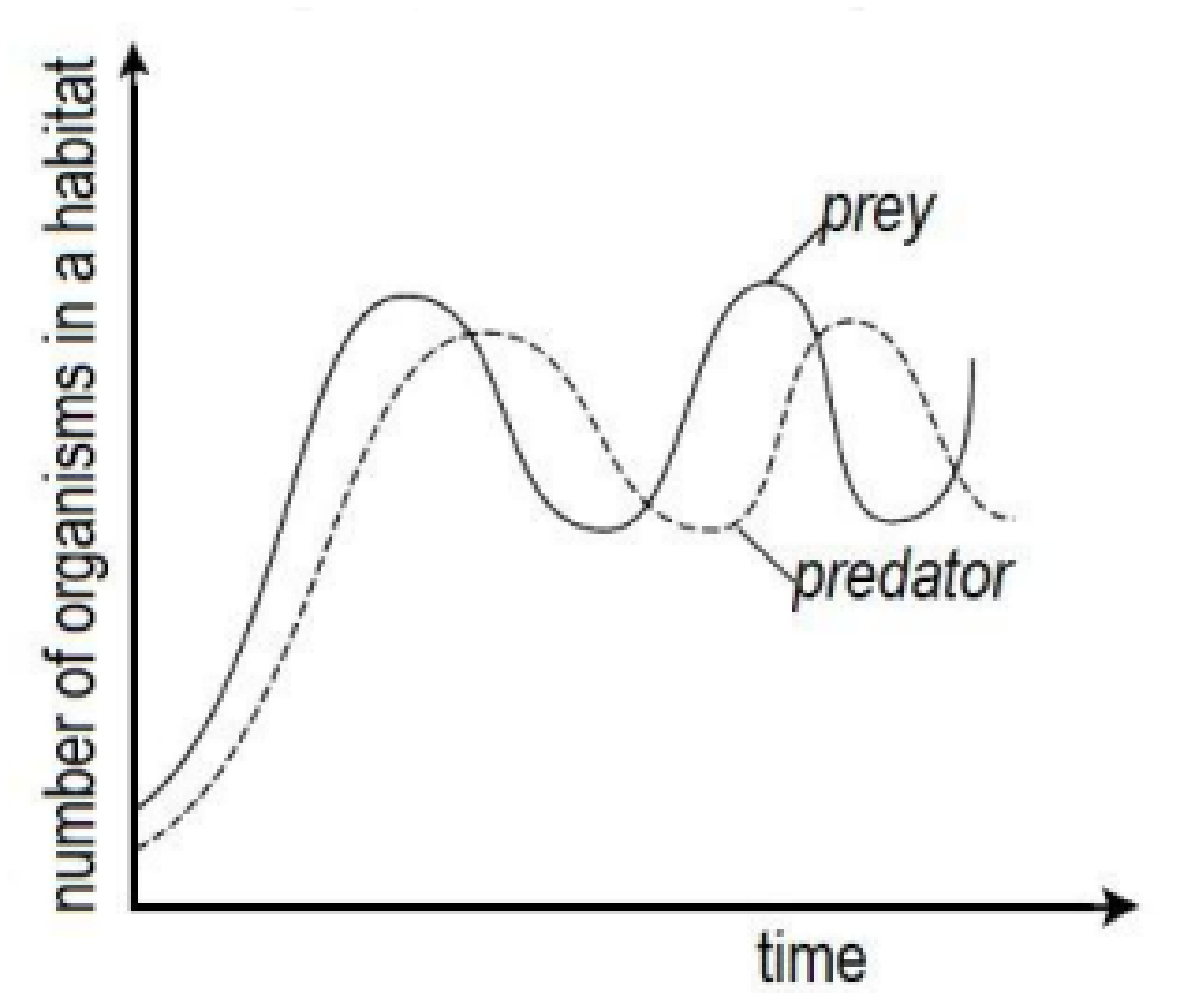
This is a relationship whereby members of one species (the predator) feed on all or part of a living organism of another species (the *prey*).

Therefore, predators are only found where there is prey e.g. herbivores are found where there is suitable plant material.

A predator is *an animal that feeds on another live organism.*

A prey is the *live organism that is fed on by the predator*

The graph showing the predator-prey relationship



Description:

Initially, the population of the prey is higher that the population of the predator.

Within a short time, both populations of prey and predator increase rapidly.

The population of the prey reaches a maximum earlier than the predator population.

As the prey population decreases rapidly, the predator population continues to increase gradually for a short time to a maximum after which it decreases rapidly.

As the predator population continues to decrease, the prey population starts to increase rapidly, followed by a rapid increase in predator population.

The cycle is ***repeated***

Explanation:

At the beginning, there are more prey than predator to provide food to the predators.

When the predator population is low, they get enough food and few preys are eaten so they both increase rapidly.

The large number of preys provides food to predators, so they reproduce fast and increase in numbers.

The increased predator population eats many preys and the prey population crashes.

The decrease in prey numbers causes the predators to starve and even their reproduction reduces, so the predator numbers crash.

Finally, the very low number of predators allows the prey population to recover, causing the cycle to start again.

How predators are suited for capturing prey

- ✓ They have keen eyes for locating prey e.g. wolves, African lions hunt in groups.
- ✓ Praying mantis, chameleon have cryptic coloration/camouflage that enable them to walk to prey unnoticed.
- ✓ Nocturnal predators e.g. bats have highly developed sense for detecting sound made by prey.
- ✓ Some snakes which have glands to secrete poison (venom) which the fangs inject into prey to immobilize it (prey).
- ✓ Web-spinning spiders use their silky cob webs to catch small sized ground walking or flying insects.
- ✓ Some have soft pads at the bottom of their feet so that they are not easily detected as they walk towards prey
- ✓ Some have stinging cells which paralyze their prey e.g. sea anemones
- ✓ Have long and sharp canines which pierce and kill prey
- ✓ Well-developed limbs which increase the speed of locomotion to chase and capture prey

Significance of Predation

i) Determines distribution and abundance of the prey because:
   * An increase in the number of predators results into decrease in the number of prey.
   * Predators will always be found in places of their potential prey.

ii) Predation leads to dispersal of animals which reduces competition since it involves movement of animals from place to place.

iii) Predation is a biological control method.

How prey species are suited to avoid predation

- ✓ Ability to run, swim or fly faster.
- ✓ Possession of highly developed sense of sight or smell alerting the presence of predators.
- ✓ Possession of protective shells e.g. in tortoise and snails for rolling into armor-plated ball.
- ✓ Possession of spines like in porcupines or thorns (cacti and rose-bushes) for pricking predators.
- ✓ In some lizards tails break off when attacked, giving the animal enough time to escape.
- ✓ Other preys gain some protection by living in large groups e.g. schools of fish, herd of antelope, flocks of birds.
- ✓ Some prey scare predators by puffing up e.g. blowfish, or spreading wings e.g. peacock.

- ✓ The flesh of some slow-moving fish is poisonous e.g. porcupine fish.
- ✓ Some preys secrete poisonous or repellant substances e.g. scorpions, caterpillars, some grasshoppers and Culex mosquito eggs
- ✓ The electric fish Malapterurus (a cat fish) produces high voltage discharge that shocks any predator that makes contact with it.
- ✓ Other preys employ alarm signals and calls e.g. ants, various fish, small birds and mammals.
- ✓ Group defense occurring among those that live and feed in herds like the Buffalos.
- ✓ Some prey species discourage predators by secreting chemicals that are poisonous (e.g. oleander plants), irritating (e.g. bombardier beetles), foul smelling (e.g. stinkbugs and skunk cabbages) or bad tasting (e.g. monarch butterflies and buttercups).
- ✓ Some species gain protection to avoid predation by mimicking (looking and acting like) other species that are distasteful to the predator.

Symbiosis

Symbiosis (from Greek, sumbíōsis, "living together", from sún, "together", and bíōsis, "living") is any type of a close and long-term biological interaction between two different biological organisms, be it mutualistic, commensalistic, or parasitic.

The organisms, each termed a symbiont, may be of the same or of different species.

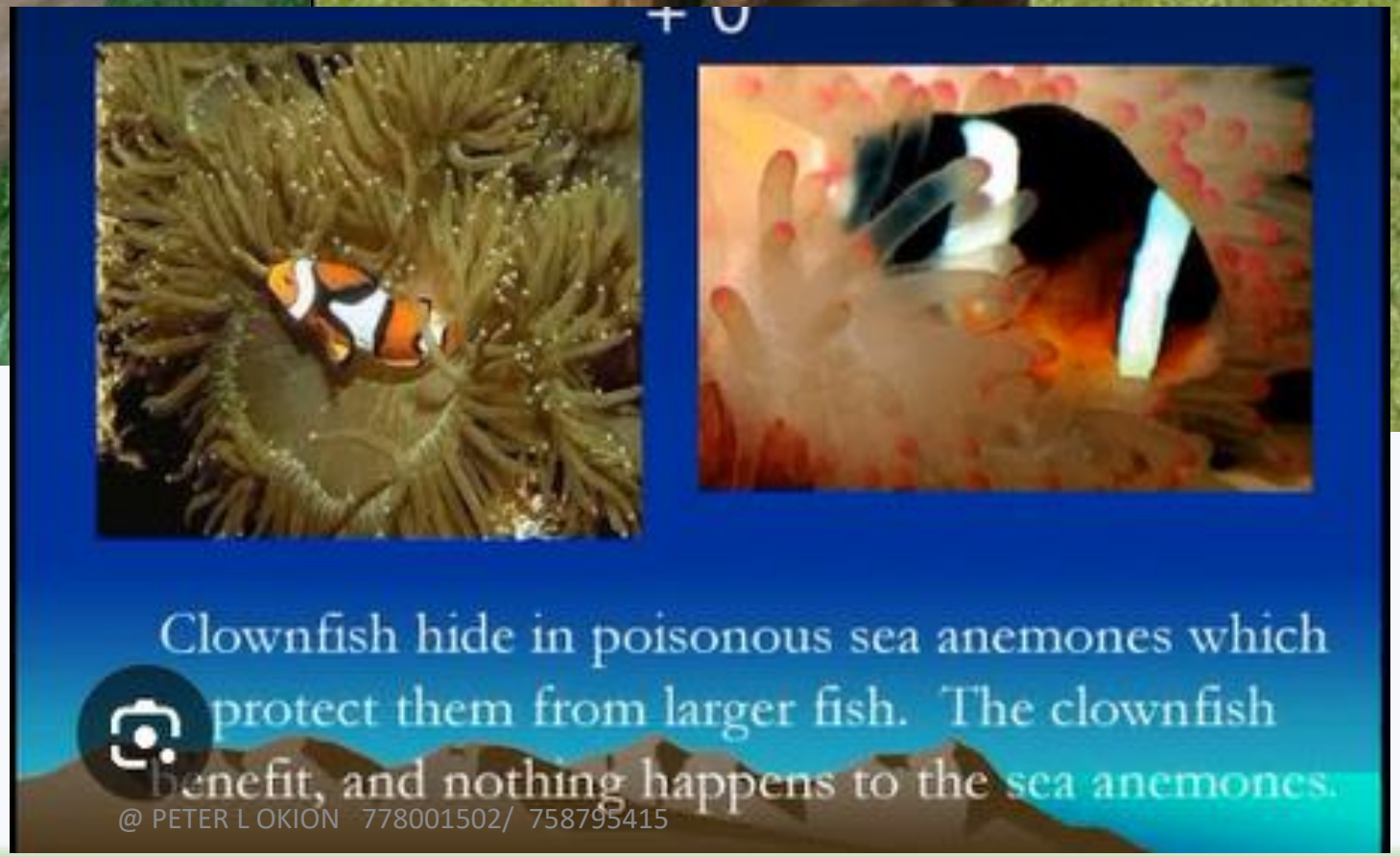
Symbiosis can be obligatory; which means that one or more of the symbionts entirely depend on each other for survival, or facultative (optional); when they can generally live independently.

When one organism lives on the surface of another, *such as head lice on humans*, it is called ectosymbiosis;

when one partner lives inside the tissues of another, such as Symbiodinium within coral, it is termed endosymbiosis.

Forms of symbiotic relationships

i) Commensalism: This is an association between organisms of different species in which one benefits while the other neither benefits nor harmed.
E.g. cow and white egrets, *epiphytes and host plant*, etc.


Clownfish hide in poisonous sea anemones which
protect them from larger fish. The clownfish
benefit, and nothing happens to the sea anemones.

These mollusks cling for safety on the turtles back. The turtle is not harmed or helped.

This fish hides under the the shark for protection. The shark is not harmed helped in this situation.

Examples

- Remoras hitch a ride and feed on scraps of food left by sharks. The remoras benefit from this relationship while sharks are unaffected.

ii) Mutualism:

This is an interspecific association in which both organisms benefit.

Examples include.

- ✓ ***Cellulose digesting bacteria in the gut of ruminants*** such as goats, cattle and sheep. Ruminants obtain sugars and amino acids while bacteria obtains shelter and food.
- ✓ ***Leguminous plants*** e.g. clover and ***nitrogen fixing bacteria*** (rhizobium). The plants obtain nitrates while bacteria obtains shelter, sugars and vitamins.
- ✓ ***Mycorrhiza*** (fungus and root of higher plants) .
- ✓ ***Lichens;*** algae and fungus. Algae carries out photosynthesis providing nutrients to the fungus while the algae is protected by the fungi from intense sunlight and desiccation, minerals absorbed by the fungus are also passed onto the algae.

iii) Parasitism:

An organism called parasite obtains part or all its nutrients from the body of another organism of different species called *host*.

The parasite is usually smaller than its host in size.

Parasites do not usually kill their hosts, but the host suffers harm.

Many parasites live permanently on (*Ectoparasites*) or in their hosts (*Endo parasite*) while some visit their hosts only to feed.

Some parasites are **facultative**, live on or in the host for some time e.g. Pythium (a fungus) that causes damping of seedlings, on killing the seedlings, lives as a saprophyte on their dead remains and others are **obligate** (live on or in the host for their entire lives

Characteristics of parasitism

- ✓ The parasite and the host are of different species
- ✓ Parasites are usually smaller than their hosts
- ✓ The host suffers harm from the association
- ✓ The parasite gains both nourishment and protection from the host

Feeding methods of parasites

i) Sucking:

* This is employed by parasites that depend on body fluids like blood and tissue fluid.
* They include ticks, lice, tape worms, etc.

ii) Absorption:

* These feed on nutrients from digested food
* Absorption occurs over the body surface of parasites
* They include ascaris, liver flukes, etc.

Adaptations of parasites for their life

For a parasite to be successful in its way of life, it needs adaptations to overcome challenges;

Challenge	Nature of parasite	Adaptation
Finding/ reaching the host	Endo and ectoparasites	• Use of vectors to find and reach the host • Occupying strategic places where they can be picked up by vectors or hosts e.g. in food
Attaching on to the host	Ecto and endoparasites	• The ecto parasites have claws and teeth for attachment • The endo parasites have suckers and hooks for attaching inside organs
Entering the host	Endoparasites	• Piercing organs and cutting plates such as in hook worms
Protection from the host	Endo and ecto parasites	• Camouflage through resembling the body color of the host by ecto parasites • Production of mucus to protect themselves against digestion by enzymes secreted by host in endoparasites

Reproduction	Endo and ecto parasites	• Most have short life cycles • Produce very many offspring • Use of both sexual and asexual reproduction by some parasites
Surviving adverse conditions	Endo and ecto parasites	• Most are able to suspend development for some time when the conditions are not favorable e.g. bladder worms in taenia, cysts in bacteria and protozoans.

Examples of parasites (research adaptations of each to its mode of life)

i) Tape worm(Taenia spp)
ii) Plasmodium
iii) Schistosoma (the blood fluke)
iv) The tick:

Summary of adaptations of parasites

- ✓ Some parasites have hooks for attachment to the host e.g. the tape worm.
- ✓ Some have suckers for attachment to the host e.g. the blood fluke and the tape worm.
- ✓ Some ectoparasites have claws for attachment to the host e.g. the tick
- ✓ Some ectoparasites like the tick have body color resembling that of the host for camouflage
- ✓ Some parasites secrete mucus to protect them against digestion by the host's enzymes.
- ✓ Some parasites secrete substances to neutralize the hosts
- ✓ Some parasites have dorsal ventrally flattened bodies in order to reduce the distance across which materials diffuse.

- ✓ Some parasites have body surfaces that are permeable to nutrients.
- ✓ Some have long, folded bodies to increase surface area for diffusion of nutrients.
- ✓ Some parasites have more than one host to increase chances of survival
- ✓ Some produce many young ones thus increasing their chances of survival.
- ✓ Many are able to suspend development for some time when conditions are not favorable e.g. as bladder worms in tape worm.
- ✓ Some parasites are hermaphroditic and can carry out self-fertilization.
- ✓ Some are adapted to live in conditions of low oxygen supply e.g. the tape worm.
- ✓ Some blood feeding parasites like the mosquito can produce anti-coagulants.

HUMANS AND THE NATURAL ENVIRONMENT

Human impact on the environment includes changes to biophysical environments, ecosystems, biodiversity and natural resources caused directly or indirectly by man.

Food for thought

The natural environment has proven to be friendly to human survival, **but are we being friendly to it?**

How are humans impacting nature?

Sustainability of natural resources

Sustainability consists of fulfilling the needs of current generations without compromising the needs of future generations.

Sustainability is not just an environmental care concern but also constitutes concerns for social well-being and economic development.

Sustainable Development Goals (SDGs)

This is a collection of **17** interlinked global goals designed to be a blueprint for peace and prosperity for people and the planet, now and into the future.

The SDGs were set up in 2015 by the United Nations General Assembly and are intended to be achieved by the year 2030.

There is international commitment to countries that are working together to transform the world by 2030.

These countries include: *Finland, Denmark, Sweden, Norway, Austria, Germany, France, Switzerland etc.*

The scope and importance of SDGs

The SDGs call to action to end poverty and inequality, protect the planet and to ensure that all people enjoy health, justice and prosperity.

This encounters;

- ✓Planning of economic growth to ensure least environmental impact
- ✓Meeting current economic needs without compromising global environmental conditions for the generations to follow.
- ✓Making the earth a better environment for its prolonged sustainance .

IMPORTANCE OF SDGs

They play a role in combating the urgent environmental, political and economic challenges facing the world.

identify the sdgS represented by the following symbols.

GOAL NO.	SDG	GOAL NO.	SDG
1	No poverty	10	Reduced inequality.
2	Zero hunger	11	Sustainable cities and communities.
3	Good health and well-being	12	Responsible consumption and production.
4	Quality education.	13	Climate action .
5	Gender equality.	14	Life below water.
6	Clean water and sanitation.	15	Life on land.
7	Affordable and clean energy.	16	Peace and justice strong institutions.
8	Decent work and economic growth.	17	Partnerships to achieve the goal.
9	Industry ,innovation and infrastructure.		

HOW GOALS 1,4 AND 8 ARE BEING MET IN UGANDA.

Goal 1-No poverty.

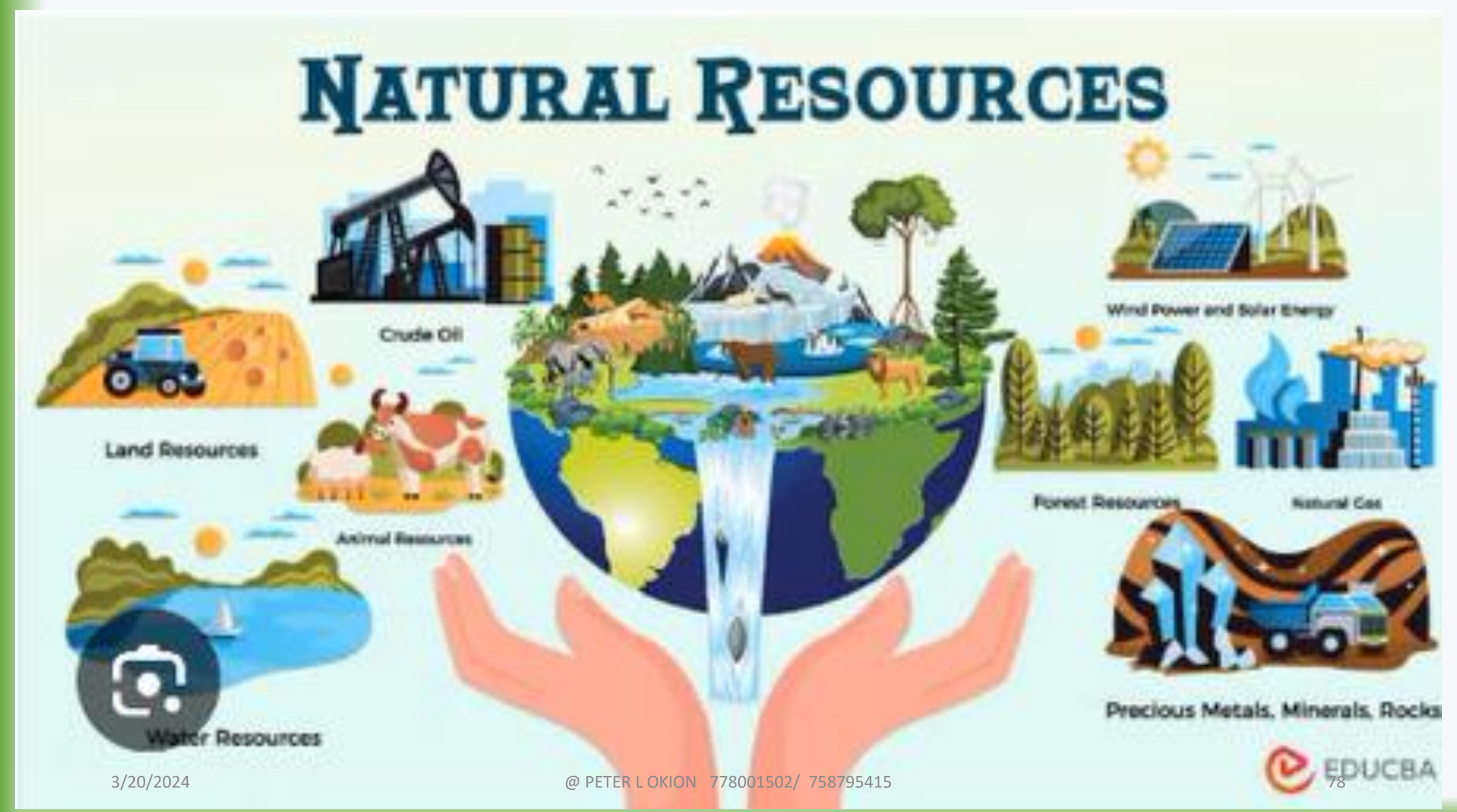
- ❖Modernization of agriculture to increase income earned.
- ❖Promoting employment outside agriculture by micro-finance, advisory services and vocational training .
- ❖Promoting sustainable resource use by raising awareness ,including the encouragement of communal initiatives to protect common property resources such as swamps ,forests etc.

GOAL 4-QUALITY EDUCATION .

- Creating an enabling environment in each district through building the capacity of district officials ,resolving key challenges to access quality education ,and helping plan and coordinate education delivery at district and regional levels.
- Improving education governance through mentorship and other approaches being used to strengthen local accountability and collaborative partnership between schools ,parents and communities
- Supporting teachers' competencies through regular supervision and assessment by head teachers.
- Strengthening the effectiveness of primary schools through regular school performance review leading to the development and revision of schools improvement plans.

GOAL 8-DECENT WORK AND ECONOMIC GROWTH.

- Encouraging entrepreneurship and job creation ,as effective measures to eradicate forced labor ,slavery and human trafficking .
- Promoting socio development programs like the Uganda Women Entrepreneurship programme (UWEP) to equip and empower women with skills and financial services to encourage enterprise growth ,value addition ,economic empowerment and decent work.
- Promoting socio economic empowerment of the youth through the youth livelihood programme(YLP)
- Putting in place laws against human trafficking and salary in the name of employment opportunities abroad and against child labor.


NATURAL RESOURCES
Crude Oil
Wind Power and Solar Energy
Land Resources
Animal Resources
Forest Resources
Natural Gas
Water Resources
Precious Metals, Minerals, Rocks
EDUCBA

Natural resources

Natural resources are materials or things that people use from the earth or its atmosphere.

There are 2 types of natural resources; renewable and non-renewable natural resources.

Renewable natural resources are called so, because they can grow again or never run out.

Non-renewable natural resources are things that can run out or be used up. They usually come from the ground.

Uganda is rich in many of these resources, ranging from those that are over exploited to those that are under utilized.

Identifying the natural resources in Uganda and how they are affected by Human activities.

Natural resources shown in the pictures above

Picture	Natural resource	Renewable / non-renewable resource	Uses to man
a)	Sun/sunlight energy/solar energy	Renewable	✓ Generating solar electricity ✓ Supports growth of plants ✓ Drying crops like maize for long time storage
b)	Water	Renewable	➢ Generating hydro electricity ➢ Raw material in some factories ➢ Used in domestic activities e.g. cooking, washing etc.
c)	Wood/trees/forests	Non-renewable	○ Provide fuel for cooking ○ Used in construction ○ Raw material for many factories e.g. paper manufacturing.
d)	Minerals (gold)	Non-renewable	❖ Is a natural currency. ❖ For teeth replacement. ❖ For manufacture of jewelry e.g. watches, necklaces, ear pins, rings, etc.

Renewable and non-renewable natural resources in Uganda

Renewable natural resources	Non-renewable natural resources
Climate (rainfall, sunlight, wind, etc.) Forests Lakes Rivers	Land Oil reserves Minerals e.g. copper, gold, limestone, cobalt, iron Salt Glass Cement, lime

How human activities affect natural resources

Human activities e.g. *overpopulation, pollution, burning fossil fuels and deforestation* have triggered *climate change, soil erosion, poor air quality and undrinkable water*, hence, over exploitation of the natural resources to their degradation and exhaustion.

Ways of conserving the natural resources in Uganda for future use

✓*Practice recycling of materials*

This can be controlled by promoting use of ceramic, metal or glassware instead of water bottles, plastic cups or plates. To encourage use of fabric grocery bags rather than plastic bags. Therefore, re-using items is a great way to reduce waste and keep excess trash out of landfills

✓Volunteer for clean ups in our communities

✓Use renewable energy-with efficient lights such as solar lights, energy saving bulbs and conserve energy(fuels) instead of cutting down trees.

- ✓Conserve water used in homes and industries. i.e. turn off the water when not in use.
- ✓Walk short distances, or use bikes, cars are one of the biggest contributors of depleting fossil fuels and producing gas emissions in air. So try to find alternative modes of transportation whenever possible.

Factors affecting the natural environment

Some of these factors occur in nature (natural factors) while others originate from human activities.

Natural factors	*Man-made factors*
✓Earth quakes ✓Volcanic eruption ✓Wild fires ✓Droughts ✓Algal blooms	✓Deforestation ✓Overpopulation ✓Pollution ✓Burning fossil fuels ✓Improper disposal of wastes

Pollution

It is the release of substances or energy into the external environment in such quantities and for such duration that may cause harm to living organisms or their environment.

Pollutants include; noise, heat and radiation as different forms of energy, many chemical compounds and elements and excretory products.

The parts of external environment affected include air, water and land.

Types of pollution

They are: Air pollution, Water pollution, Thermal pollution, soil pollution and sound pollution.

AIR POLLUTION

Pollutant	Source(s)	Effects/ consequences	Control measures
1. Carbon monoxide	Motor vehicle exhausts, Incomplete combustion of fossil fuels, tobacco smoking, etc.	• Prevents oxygen usage by blood by forming carboxy-haemoglobin, which may cause death. • Small concentrations cause dizziness and headache	• Efficient combustion of fuels in industry and homes. • Avoid smoking. • Vehicle exhausts gas control.
2. Sulphur dioxide	Combustion of Sulphur containing fuels, oil and coal gas	✓ Causes lung diseases, irritation of eye surface, and asthma resulting into death if in high concentrations. ✓ Forms acid rain which increases soil PH. ✓ Reduces growth of plants and kills lichens.	✓ Use of Sulphur free fuel e.g. natural gas. ✓ Installation of Sulphur dioxide extraction units in industrial chimneys.

Pollutant	Source(s)	Effects/ consequences	Control measures
3. Smoke	✓ House smoke and soot. ✓ Motor vehicle exhausts. ✓ Tobacco smocking. ✓ Incomplete combustion of refuse in incinerators and bonfires.	✓ Causes lung diseases when inhaled. ✓ Sunlight barrier hence reducing photosynthesis. ✓ Stomatal blockage hence reducing photosynthesis. ✓ Damages clothes, cars and buildings hence costly to clean.	✓ Usage of smokeless fuels ✓ Efficient combustion ✓ No smoking ✓ Vehicle exhausts gas control
4. Dust	Solid fuel ash, soil, quarrying, mining, etc.	Lung diseases, stomatal blockage, stunted growth of plants and smog. Smog forms when temperature inversion occurs (layer of warm air traps cool air containing dust and smoke close to the earth's surface)	• Installation of dust precipitators in industrial chimneys. • Efficient combustion. • Wearing of face masks by factory workers.

5. Carbon dioxide:	Motor vehicle exhausts and combustion of fossil fuels	Increased carbon dioxide causes greenhouse effect (the warming up of the earth's atmosphere as a result of the blanket of carbon dioxide, preventing escape of solar radiation higher into space).	Planting more green plants, reduction in combustion of fossil fuels by relying on alternative sources of energy e.g. solar energy.
6. Noise:	Discos, road traffic, running engines, machines, aero planes, firearms, etc.	• Hearing impairment • Total deafness. • Nervous disorders	• Effect laws against excessive noise. • Put on ear muffs and plugs while in very noisy areas.
7. Radioactive leakage.	Nuclear weapons and nuclear power fuels.	Ionizing radiation causes cancer	Nuclear power controls

Water pollution

Sewage discharge into rivers Sewage is liquid waste (composed of faeces, urine, water, detergents and other substances) from industries and/or homes carried through pipes called sewers.

Effects of untreated sewage discharge into rivers

Discharge of untreated sewage into a river has an immediate effect on the aquatic environment, causing many changes in both the abiotic and biotic components.

Some of these changes are due to specific chemical pollutants (e.g. heavy metals such as cadmium from industrial processes, and pesticides from agriculture) with the effects varying according to the chemicals present in the discharge.

Addition of inorganic chemicals, plant nutrients and sediments into lakes.

Pollutant	Examples	Main sources	Harmful effects
Plant nutrients	Nitrate (NO_3^-), phosphate (PO_43-) and ammonium (NH_4^+) ions. The nutrient enrichment of water bodies is termed ***eutrophication***	• Raw sewage discharge, detergents and other chemical release from industries. • Leaching of inorganic fertilizers e.g. NPK from farmland.	• Rapid growth of algae and green protists (algal bloom). • Reduces light penetration in water leading to death and decay of algae, which depletes water of dissolved oxygen, killing fish and other aerobic animals. • Excessive levels of NO_3^- if drank in water lowers the oxygen carrying capacity of blood and kill unborn children and infants **("blue baby syndrome").**

Sediment	Soil and silt	Land erosion	✓ Can cause turbidity/cloudiness in water; light penetration is reduced therefore reduce photosynthesis. ✓ Settle and destroy feeding and spawning grounds of fish. ✓ Clog and fill water bodies, shortening their lifespan. ✓ Disrupt aquatic ecosystems. ✓ Carry pesticides, bacteria and other harmful substances into water.
Inorganic chemicals	• Acids. • Compounds of toxic metals like lead (Pb), mercury (Hg), arsenic (As) and selenium (Se). • Salts e.g. NaCl in ocean water	Surface runoff, industrial effluents and household cleaners	• Drinking water becomes unusable for drinking and irrigation • Lead and Arsenic damage the nervous system, liver and kidneys • They harm fish and other aquatic life • They lower crop yields • They accelerate corrosion of metals exposed to such water.

How eutrophication occurs and its effects

Eutrophication occurs when nutrients accumulate in water bodies.

This can be as a result of *fertilizers being washed from fields into the water* ways by ruining rain water. This brings an excess of nutrients into water bodies.

The nutrients cause plants to **grow rapidly** and there is an **algae bloom** across the water surface. This (**algae bloom**) covers the surface of the water, preventing **sunlight** from passing through. Hence, aquatic plants cannot photosynthesize, less oxygen is released into the water.

The dead plants are broken down by decomposers which uses up the remaining oxygen from the water. As a result other aquatic organisms e.g. **fish, frogs begin to die and decompose.**

This contaminates the water, making it **murky** and **smelly**.


EUTROPHICATION

Eutrophication effects on human health

A lot of diseases result from drinking or being in contact with contaminated water, such as *diarrhea, cholera, typhoid, dysentery or skin infections.*

In zones where there is no available drinking water, the main risk is dehydration.


Anthropogenic
Pollution

Soil pollution

Soil pollution can occur due to various direct and indirect ways which include:

- ✓ Dumping of industrial wastes.
- ✓ Excess use of agrochemicals in the form of pesticides and fertilizers.
- ✓ Dumping of discarded wastes like paper, food and plastics.
- ✓ By air pollution like acid rain.
- ✓ By water pollution like pollutants finding their way to soil.

Soil pollutants and their effects

Pollutants	Effect
Pesticides, herbicides and fertilizers	• Cause death of microorganisms, animals and certain plants. • Affect soil fertility. • Several non-biodegradable by-products find their way to animals and man through food chain and have serious long term damaging effects. Some may be cancerous.
Excretory products of organisms and digested sewage sludge used as manure.	Number of pathogens present in the wastes contaminate the soil. Cause health hazards for man and domestic animals.
Salts of iron, lead, copper, mercury, arsenic.	Toxic to both plants and animals.
Discarded food, paper, carcasses, Aluminium and plastics.	Damage the landscape and also affect the flora and fauna.

Control of soil pollution

i) Construction of transfer stations at different points in a city for bulk transfer of refuse to discharge sites to speed up removal.

ii) Materials like paper, glass and plastics should be recycled to decrease the volume of refuse and to conserve the natural resources.

iii) Use of chemical fertilizers should be reduced. Bio fertilizers and manure should be used in their place.

iv) Instead of pesticides, biological control of pests be used where possible.

Environment conservation

It is important to reduce the negative impacts that humans have on the environment to conserve the biodiversity of eco systems.

This means increasing the sustainability of resources and manufacturing.

Sustainable resources are those which can be taken from the environment without the risk of them running out. They can be produced naturally as quickly as they are harvested.

Resources such as **coal and oil** are **not** sustainable as fossil fuels are non renewable while others such as wood and fish can be harvested sustainably.

WAYS OF CONSERVING THE NATURAL ENVIRONMENT.

- ✓Cutting down an amount of garbage by recycling and reusing materials. This conserves natural resources and land fill space
- ✓Volunteering for clean ups in the community .
- ✓Through educating oneself and other people to understand the importance and value of natural resources.
- ✓Through treatment of sewage and waste air before releasing it to the environment.

- ✓Buy less plastic and using reusable or biodegradable shopping bags.
- ✓Through using long lasting electric bulbs as a way of reducing green house gas emissions.
- ✓Through planting trees which provide food and oxygen.

These also act as wind breakers as well as protecting the soil from erosion.

- ✓Through use of alternative sources of energy such as **bio gas** other charcoal to prevent cutting down of trees.
- ✓Through increased use of bikes and less of cars in order to cut on both amount of fuel used and air pollution due to exhaust fumes.

SOLID WASTE MANAGEMENT IN UGANDA.

Solid waste management is one of the major environmental problems faced especially in urban areas in Uganda today.

In Kampala city, like other urban centers and in most developing countries, this important service is based on the local government's centralized collection, transportation and disposal strategy. For example KCCA in Kampala

How Different Categories Of Garbage Can Be Reused Or Recycled In Uganda.

Reuseable waste can be used by recycling them which reduces the pollution caused by them.

Under solid waste management, plastic , paper, cardboard, metals, and glass get recycled by melting or grinding, after that it's molded in another form which makes it reusable.

Explain How Effectively Recycling Of Garbage Is Taking Place In Uganda?

After collection, recyclables are sent to a recovery facility to be sorted, cleaned, and processed into materials that can be used in manufacturing.

- ✓More and more of today's products are being manufactured with recycled content. Common house hold items that contain recycled items include newspapers and paper towels etc.
- ✓Purchasing new products made from recycled materials

RECYCLING BASED PRACTICES.

- Separate biodegradable from non biodegradable materials.
- Recycle bottles, cans, paper and cardboard.
- Keep food and liquid out of your recycling.
- No loose plastic bags and no bagged recyclables. Grocery bags dissolve into potentially harmful micro plastics and in the case of ingestion or entanglement, hurt and kill animals.
- Avoid recycling small items because they can jam the recycling equipment.
- Ensuring that recyclables are clean, empty and dry.
- Avoid buying non recyclable materials that cant be separated.
- Avoid wish-cycling, which is the act of putting items that can not be recycled in recycling bins.
- Compelling manufacturers print recycling guides in local languages.

END

BIOLOGY IS LIFE

SLIDES PREPARED BY TR. PETER L OKION