

Zoo Location

Indian rhino then Indomalaya Pavilion

Approximate time to complete

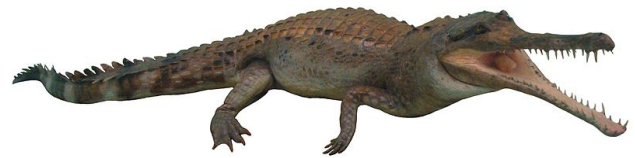
1 hour

Learning Goals

Students will identify abiotic and biotic factors in ecosystems. They will understand how different species interact with each other and how humans are affecting ecosystems.

Curriculum Expectations

- B1.2 assess the effectiveness of various ways of mitigating the negative and enhancing the positive impact of human activities on the environment
- B2.1 explain that an ecosystem is a network of interactions among living organisms and their environment
- B2.2 identify biotic and abiotic components in an ecosystem, and describe the interactions between them



- B2.1 explain that an ecosystem is a network of interactions among living organisms and their environment
- B2.2 identify biotic and abiotic components in an ecosystem, and describe the interactions between them
- B2.3 describe roles and relationships between producers, consumers, and decomposers within an ecosystem
- B2.4 describe the transfer of energy in a food chain, and explain the effects of altering any part of the chain
- B2.5 describe how matter is cycled within the environment, and explain how the cycling of matter promotes sustainability
- B2.8 describe how different approaches to agriculture and to harvesting food from the natural environment can impact an ecosystem, and identify strategies that can be used to maintain and/or restore balance to ecosystems

Materials

- Tour script notes
- Accompanying student worksheet if desired

After entering the Zoo you will see the carousel in front of you, take the path to the left and you will arrive at the Indian rhinos

Introduction	<ul style="list-style-type: none"> ● Definition of abiotic and biotic factors. Biotic factors are things that are living or were once living, and things they make. Abiotic factors are things like weather, water, soil, rocks, and salinity. ● Definition of ecosystem - an area where living things such as plants and animals, weather and landscapes work together to form a bubble of life. (Abiotic and biotic). ● Definition of community - a group of interacting species living in an environment.
<ul style="list-style-type: none"> ● Abiotic & biotic factors ● Ecosystem interactions 	Indian rhino <ul style="list-style-type: none"> ● Ask students “How does a rhino interact with abiotic factors in its environment?” <ul style="list-style-type: none"> ○ Uses water/mud to wallow in and cool off during the day. ○ Sun warms it up. ● Ask students “How does a rhino interact with biotic factors in its environment?” <ul style="list-style-type: none"> ○ Herbivore grazer that eats grass, leaves and aquatic plants. It has a prehensile lip (which can grasp) to help it eat plants. ○ Rhinos always poop in the same place called a midden (model of midden on wall in rhino house). These piles of poop are helpful for rhinos as they serve as a way for them to communicate with each other. By smelling another rhino’s midden, rhinos can tell which other rhinos are in the area, how old they are and if they are looking for a date! ○ The middens are also helpful for many other species. Undigested seeds from the rhino’s diet will benefit from being in a pile of rhino fertilizer; many plants grow here, and dung beetles even feed off rhino poo! ○ Mynah birds eat parasites off the rhino's skin. They also let out an alarm call if a predator approaches. This is an example of a symbiotic relationship where both animals benefit (mutualistic).
Head over the wooden bridge toward the Indomalaya Pavilion. As you do so, discuss commensalistic and parasitic symbiotic relationships	
<ul style="list-style-type: none"> ● Ecosystem interactions 	Moss <ul style="list-style-type: none"> ● Commensalism - is an example of a symbiotic relationship. One species benefits and the other species does not benefit or get harmed. E.g. moss growing on a tree (moss benefits from place to live, tree not affected).
<ul style="list-style-type: none"> ● Ecosystem interactions 	Human <ul style="list-style-type: none"> ● Parasitic is an example of a symbiotic relationship. One species benefits and one is affected negatively. E.g. lice, intestinal worms etc. living in humans. Plants and animals can get parasites.

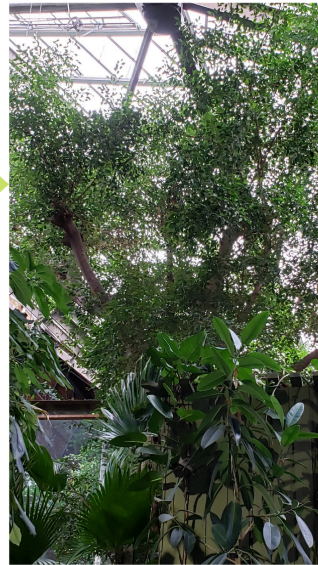
Enter the Indomalaya Pavilion, look to the right above the green shed- the tall tree is a fig tree

- Ecosystem interactions

Fig tree

- **Mutualistic** - is an example of a symbiotic relationship. Both species benefit. E.g. plant and pollinator. Fig trees require a certain wasp species to pollinate it. If the wasp species died out so would the fig species.
- Fig trees are a **keystone species** in Indomalayan forests. They provide food for birds, mammals and monkeys. A keystone species means that if they are lost from the ecosystem it would look very different, or may even collapse.

Fig tree



Walk forwards and you will see a tank with turtles and a tomistoma crocodile (do not head through the doors)

- Food chains
- Decomposers

Tomistoma and turtles

- Tomistoma live in freshwater.
- Ask students for a food chain of the tomistoma. The food chain of a tomistoma could be; grass (producer) → rabbit (consumer) → tomistoma (consumer).
- The tomistoma swallows food whole, but if a predator left bones/hair/skin behind what would happen to them? Decomposers would take care of it!
- Decomposers are fungi, bacteria and invertebrates.
- Decomposers break down the organic matter and turn it into nutrients that producers (plants) use to grow.

Pick any plant in the pavilion and discuss the below

- Abiotic & biotic factors
- Ecosystem interactions
- Roles in ecosystem

Plant

- The growth of a plant depends on the **abiotic factors** of water, carbon dioxide, temperature and light. When length of daylight decreases, deciduous trees lose their leaves.
- The growth of plants depends on **biotic factors** such as who is eating them, who is spreading its seeds/pollen and who is fertilizing them with poop.
- Plants are **producers**.

Head through the wooden doors towards the “Big, Bad & Ugly” fish cave

- Humans affect ecosystems

Carp

- In the study of ecology we use the acronym **HIPPO** to remember the negative effects that humans are having on the Earth’s biodiversity.
- We will start by looking at “I” for **Invasive species**.
- The carp in this exhibit are originally from Asia, they are now an invasive species in the United States (not yet in Canada, hopefully, it will stay this way).
- They were brought into the States as a way to control algae growth on fish farms. Some of them escaped and bred and now are heading north towards Canada.
- An invasive species is when a species, not originally from that ecosystem, get released into the ecosystem, either accidentally or on purpose, and then thrives in the new ecosystem.
- Invasive species are a threat to biodiversity as they usually have no natural predators in the new ecosystem so their population numbers explode.
- They then compete with native species for resources.
- Invasive species are a big threat to biodiversity planet-wide.
- Some invasive species found in Ontario are; the red-eared slider turtle, long-horned beetle, zebra mussels, garlic mustard, and dog strangling vine.

Continue along the path to the turtles and tortoise exhibit which will be on your left

- Humans affect ecosystems

Tortoises and turtles

- The first “P” in HIPPO stands for **pollution**.
- Sea Turtles can eat plastic bags thinking they are jellyfish.
- Frogs are known as **indicator species**. As their skin can absorb oxygen it can also absorb pollutants in the environment. Frogs are often one of the first species to be affected if an ecosystem is polluted. Because of this, they are known as “indicator species”, if they are becoming sick it is an indication something is not right.
- **Ask students - can humans be affected by pollution?** Yes - Asthma, mercury poisoning etc.

Continue along the path, you will arrive at the reticulated python (snake) exhibit on the right

- Food chains
- Roles in ecosystem
- Abiotic & biotic factors

Reticulated python

- **Ask students - who can suggest a food chain including a snake?**
- Snakes play role of predator and prey. They help control populations of small mammals in check and provide food for birds of prey, other snakes and some mammals.
- They have a series of heat-sensing pits on their upper lip that allows them to hunt at night; they can find warm-blooded mammals.
- **Abiotic** - as snakes are cold-blooded (ectothermic) they need to bask in the sun to speed up digestion.
- **Biotic** - use leaves to camouflage.

Continue to the orangutans	
<ul style="list-style-type: none"> • Ecosystem interactions • Human's effects on ecosystems 	<p>Orangutan</p> <ul style="list-style-type: none"> • World's largest arboreal (tree-dwelling) mammal. Needs trees to provide food and water (slurps water from holes in trees), makes nests in trees to sleep in. • How might it help its environment? - Seed disperser, poop returned to earth. • Intelligent - use sticks to eat termites. Termites are important decomposers of plant material. • If orangutans disappeared so would several tree species, especially those with larger seeds (as they are the only eater of some large-seeded fruit). • The "H" in HIPPO stands for habitat destruction. • Populations of orangutans are declining due to logging and palm oil plantations. • In order to plant palm oil, forests are cut down and orangutan habitat is lost. • Palm oil is found in many everyday products such as chocolate, cookies, shampoo etc. • We can help save orangutans by purchasing products made with sustainable palm oil (many companies state on websites). We can also write to companies who do not use sustainable palm oil and ask them to do so.
Continue down the path - next, you will either come to the white-handed gibbons and Hamilton pond turtle exhibit	
<ul style="list-style-type: none"> • Abiotic & biotic factors • Human's effects on ecosystems 	<p>Hamilton pond turtle</p> <ul style="list-style-type: none"> • Also known as the spotted pond turtle due to the spots on its face, legs and tail. • As they are reptiles they use the sun to regulate their body temperature - abiotic. • They use floating vegetation as basking sites - biotic. • Endangered as they are harvested for the pet trade and for food. • The "O" in HIPPO stands for overharvesting. When humans remove species from an ecosystem in non-sustainable numbers. This could be for food, pets, body parts etc.
<ul style="list-style-type: none"> • Ecosystem interactions 	<p>White-handed gibbon</p> <ul style="list-style-type: none"> • 65% of food is fruit; important seed dispersers. They also eat young leaves, and some insects and spiders. • Prey species of eagles and leopards. • Whooping call - to communicate with others in the population. • Sleep in trees huddled together. • Can spend up to 10 hours a day grooming each other. • Bonded pairs sing duets together to strengthen their relationship and to signal territorial boundaries. • They are endangered due to habitat loss and the illegal pet trade.

Continue until you see the Sumatran tiger on the left	
<ul style="list-style-type: none"> Ecosystem interactions 	<p>Sumatran tiger</p> <ul style="list-style-type: none"> Biotic - Top predator. Helps keep herbivore population in check, which helps to keep the balance between herbivores and plant species. Biotic - Camouflage with grasses. Abiotic - uses water to catch prey - chases prey into water, one of the few cat species that doesn't mind water! Has the roughest tongue in the world - like sandpaper. To scrape feathers, skin, fur off prey. Endangered due to habitat destruction, trade in body parts.
The concave casqued hornbill will be on the right just before you exit the pavilion	
<ul style="list-style-type: none"> Ecosystem interactions 	<p>Hornbill</p> <ul style="list-style-type: none"> Hornbills (and rhinos) are important seed dispersers for figs in the Indomalayan region. We mentioned figs are a keystone species. What would happen if we lost hornbills from the ecosystem? (Less/no figs, affect monkeys, mammals other birds etc. as the food chain collapses). The second "P" in HIPPO stands for human population growth. The increasing number of humans on the planet is a root cause of the other HIPPO threats.

Inquiry

What would happen if there were no decomposers in an ecosystem? How would mammals be affected?