



to challenge yourself...

SAVING OUR WORLD

Megafauna Expansion

Even more case studies with which
to explore conservation



UNIVERSITY OF
CAMBRIDGE

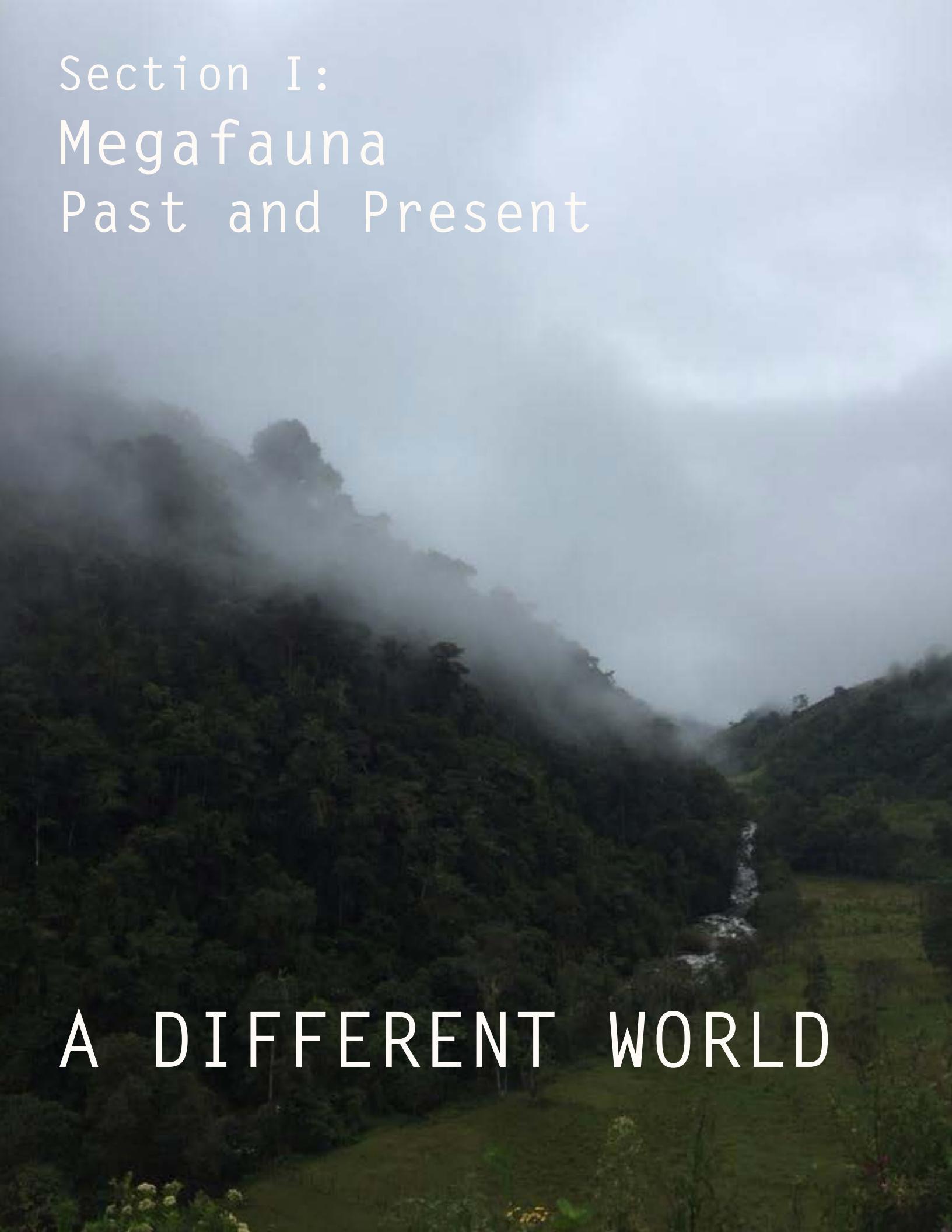


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HERITAGE
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Section I: Megafauna Past and Present

A photograph of a misty, forested mountain landscape. The foreground is dominated by dark green, dense vegetation. A narrow, light-colored path or stream bed winds its way through the center of the frame, disappearing into the misty background. The mountains in the distance are partially obscured by thick, low-hanging clouds or fog, creating a sense of depth and mystery. The overall atmosphere is cool and atmospheric.

A DIFFERENT WORLD

What are megafauna?

If you went back in time 50,000 years, you would see a very different world, filled with many more large organisms. We call these animals 'megafauna'; and are sometimes defined as species that weigh more than 45kg.

A chimpanzee is around 45kg. Any animal weighing more than this would be considered 'megafauna'.

How many animals can you think of that are bigger than a chimpanzee?

At the end of the Pleistocene (50,000 and 12,000 years ago) many of these megafauna disappeared.

North America lost about 72% of its megafauna, and South America (83%) and Australia (88%) had even more extinctions.

It is still not clear whether these extinctions were because of human hunting or climate change, but it was probably a combination of the two:

<https://www.smithsonianmag.com/science-nature/what-happened-worlds-most-enormous-animals-180964255/>

These extinctions had a dramatic effect on global ecosystems. The average body size of South American animals (over 10kg) dropped from 843kg to 81kg. The loss of such large animals drove changes in their environment.

Ecosystem engineers

Lots of animals could be called ecosystem engineers. These are organisms or living things that play a significant role in changing their environment. For example:

Leafcutter ants mix soils and distribute nutrients.

They remove so many leaves from trees that they can change the amount of light and warmth entering the canopy above their nests



Giant armadillos make burrows that are used for shelter by at least 24 other species

Beavers make dams in rivers changing the flow of water. This makes streams wider and deeper so it floods the riverbanks.



Megafauna tend to have a greater impact on their environment than smaller species:

- They are able to move over longer distances than smaller animals and so have an impact over a wider area
- They eat more (by mass) than smaller species so have a greater effect on vegetation
- They tend to eat a larger variety of plants than smaller species
- They are less likely to be eaten by predators and live longer so they have an impact over a longer period of time
- Their large size means they make bigger gaps in vegetation as they move around

Not all of the world's megafauna went extinct at the end of the Pleistocene. Those that are still alive are incredibly important for conservation today.

Let's get thinking...

TASK: Create your own fact sheet, draw or copy an extinct megafauna species.

If you get stuck, try searching Megalania from North America, Toxodon or Gomphotherium online.

Around the edge of your illustration answer the following questions. You can use drawings, graphs and text:

- What did this animal eat?
- How big was it?
- Why is it extinct?
- What effects did it have on its environment?

Create a fact sheet for a species that is alive today. Look for tapirs or rhinos.

Section II:
CASE STUDY

GARDENERS OF
THE FOREST

Large modern herbivores

Gardeners of the forest

After the loss of giant Pleistocene mammals like the elephant-like gomphotheres, giant ground sloths and bizarre native ungulates, the largest mammals left in South and Central America today are the tapirs, weighing up to 400kg.



They are shy animals that spend most of their time in the rainforests and are absolutely vital to their ecosystems.

The lowland tapir transfers seeds from over 100 plant species over long distances. Read how tapirs could help to regenerate the rainforest here:

<https://news.mongabay.com/2019/03/tapirs-could-be-key-in-helping-amazon-forest-come-back/>



The two other South American tapir species similarly allow for dispersal of the seeds they consume.

Tapirs also snap off branches, which makes more food available for other herbivores, and create forest paths through their movement.

They spend a lot of time in degraded rainforests, spreading more seeds through their dung here, and therefore allowing for forest regrowth:

<https://www.sciencenews.org/article/tapirs-poop-may-be-key-reviving-amazon-rainforest>

This suggests that the tapirs of South America are likely to be important for natural forest regeneration and therefore reducing climate change by **locking carbon in the forest**.

Why should we care about carbon?

All living things contain carbon, which is released when they respire, as carbon dioxide. Carbon dioxide is a greenhouse gas that traps heat in the atmosphere.

Humans have been increasing the amount of carbon dioxide in the atmosphere which is causing changes in the climate. This is dangerous for lots of animals, especially if they are only able to live in certain conditions.

NASA uses visuals in an explanation here:

<https://climatekids.nasa.gov/greenhouse-effect/>

As plants do photosynthesis they take in carbon dioxide from the air and convert this into sugars in their cells. Larger plants contain more carbon than smaller plants and therefore are important for fighting climate change. Larger seeds produce some of the larger trees in the forest and this means that megafauna are really important for carbon storage in forests.

See how forests are key to taking carbon out of the atmosphere here:

<http://www.fao.org/3/ac836e/AC836E03.htm>

Reintroducing a species

The Malayan tapir in South East Asia has an important role in its ecosystem and some people think that it should be reintroduced to Borneo to help with conservation there:

<https://news.mongabay.com/2019/01/bringing-the-tapir-back-to-borneo/>

TASK: Once you have read the linked articles in this section, have a go at answering the questions below:

- Do you think that we should move tapirs to Borneo?
- Why do some people think the money might be better spent some other way?

A close-up photograph of a tapir's head. The tapir has dark, wrinkled skin. A small, dark fly is perched on its right eye. The tapir is looking slightly to the right. The background is blurred green foliage.

Section III:

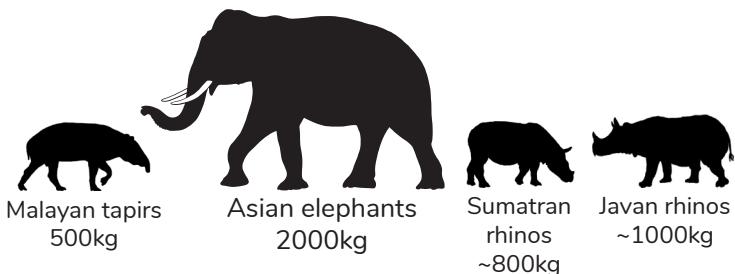
EVEN BIGGER THAN TAPIRS

Who eats the largest seeds?

Megaflora in South East Asia

In South America, the tapirs are the largest native herbivores, so they have the biggest role in spreading seeds.

Malayan tapirs of South East Asia on the other hand, weighing up to 500kg, are much smaller than their neighbouring native megafauna like:



Whilst tapirs here are still important for seed dispersal, they can't eat the largest seeds, which turn into the largest trees; this role is done by the larger species.

Bigger than Tapirs

The rhinos that once spread across SE Asia would have done this job well, as they also wander large distances through the forest.



These rhino species eat the leaves of roughly 100 plant species and like tapirs they eat shoots, which forces regeneration and more uptake of carbon.

Because of their size and role in their ecosystems, these rhinos play a vital role in the upkeep of their forests.

As a result of habitat loss for agriculture and human hunting, there are now fewer than 100 Sumatran and Javan rhino individuals remaining in the wild.

Unsurprisingly, forests are suffering from the loss of their natural 'gardeners'.

To protect them and the forests they take care of, we need to restore the forest habitat across the whole of South East Asia.

Using the resource links below, have a go at answering these questions:

- What are some similarities and differences between the megafauna alive today and those that went extinct?
- How have human perspectives on megafauna changed over time?
- What is being done to conserve megafauna that are alive today?

Malayan Tapir Specimen:

<https://animalbytescambridge.wordpress.com/2020/04/27/malayan-tapir-tapirus-indicus/>

About Rhinos of South East Asia:

[https://www.mammalogy.org/uploads/Groves%20and%20Leslie%202011%20-%20MS%2043\(887\).%20190-208_0.pdf](https://www.mammalogy.org/uploads/Groves%20and%20Leslie%202011%20-%20MS%2043(887).%20190-208_0.pdf)

Why The Extinction Of All Rhinos Could Be Catastrophic:

<https://www.businessinsider.com/rhino-extinction-could-be-catastrophic-2014-10>

For more information about the five rhino species:

<https://museumofzoologyblog.com/2020/05/15/rhinos-in-art/>

GLOSSARY OF TERMS

Glossary of terms

Ecosystem: A community of interacting organisms (plants and animals) and their physical environment (soil, temperature, humidity etc.).

Organism: An individual living thing. For example: a single plant, animal or fungus.

Species: A group of organisms sharing common characteristics that are capable of mating with one another to produce fertile offspring.

Habitat: The area or environment in which a species normally lives.

Impact: a noticeable effect, influence or change. For example, if someone describes the 'impact' of humans on the natural world they would be describing how humans have changed it.

Loss: The reduction or extinction of species. A reduction could mean a reduced population size or reduced size of the area lived in by the species.

Population: A group of organisms of one species that live in the same place at the same time.

Pest species: A species that has a negative impact on humans, for example by destroying their crops and reducing available food.

Crop: A plant grown on a large scale for human use, such as for food.

Natural process: A process existing in or produced by nature, rather than by the action of human beings. For example, pollination of flowers by insects.

Ecosystem services: the benefits provided by healthy ecosystems that contribute to improving human life. These include resources we use for food and shelter, natural processes such as insects pollinating crops and improved wellbeing from spending time in nature.

From Megafauna Expansion pack

Carbon storage: Removing carbon from the atmosphere, usually as carbon dioxide and keeping it elsewhere, often in the ocean, rocks or plants.

Megafauna: A large animal, often weighing more than 45kg.

Reintroduced: Bringing back an organism that has gone extinct in a certain area.

Pleistocene: Period of time lasting from 2.58 million years ago to 11,700 years ago.

Ecosystem engineer: An organism that has a significant impact on the environment around it and so affects the other organisms it lives with.

Herbivore: An animal that is adapted for only eating plants.

Native species: An animal which has always lived in a certain area and has not been brought by humans.

~: This symbol is used when you mean 'roughly'. E.g. "Sumatran rhinos weigh ~800kg" means that a Sumatran rhino weighs roughly 800kg.

>: This symbol means 'more than'. E.g. "megafauna weigh >45kg" means that megafauna weigh more than 45kg.

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Armadillo image: Museum of Zoology collection (c) University of Cambridge

Beaver dam image: Credit (with permission) [Donna \(bratli\)](#)

Lowland tapir image: Credit [Tracey Gill \(CC BY-NC 2.0\)](#)

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