



## HEALING PEATLANDS TO PROTECT OUR PLANET

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### YOUNG REVIEWERS:



EDNA

AGE: 10



JADE



SAKSHAMM

AGE: 13

### PEATLANDS

A land that consists largely of peat.

Peat is interesting; it is very wet and made from old plants and animals breaking down very slowly. Even though peatlands are just 3% of the land, they lock away 30% of Earth's carbon. But sometimes people mess things up by draining the peatlands and digging up the peat, which releases carbon into the atmosphere and contributes to the warming of our planet. But do not worry; we can save the day! We can put water back in the peatlands to bring them back to life so they can lock carbon again. *Sphagnum*—the Latin name of a peat moss—is the hero here! This special moss can support peat formation and be used for gardening and growing food. Ready to help save peatlands and protect the planet? Keep reading!

### PEATLANDS ARE CARBON STORAGE MARVELS

**Peatlands** are like wet wonderlands that come in different forms, like bogs (created by rainwater supply) and fens (created by groundwater supply). **Peatlands** can be hidden under forests, grasslands, or marshes,

### PEAT

Brown, soil-like material found in wet areas, formed as dead plants and animals partially break down.

### ECOSYSTEM SERVICES

Special things nature does to help us with, like trees giving us clean air and rivers giving us pure water.

#### Figure 1

Peatlands provide a number of important ecosystem services, which are benefits that humans receive from natural systems.

### GREENHOUSE GASES

Gases present in Earth's atmosphere that trap heat and contribute to the greenhouse effect. They include carbon dioxide, methane, and nitrous oxide.

or appear as open, treeless spaces [1]. As you can guess from the name, peatlands contain a spongy substance called **peat**. Peat is formed over many years (even thousands) from the remains of dead plants and animals. Peatlands do not contain much oxygen, which is necessary for the decay process, so the dead organisms pile up faster than they can break down. This creates peat layers that can be super thick—even more than 10 m!

Despite covering only around 3% of Earth's surface, peatlands are carbon storage champions, holding a massive amount of carbon—about **550 trillion metric tons**, which is twice the total of all the world's forests combined, and it means around 30% of global carbon [1–3]. Plants soak up carbon dioxide from the air and store it in their structures. With their wet environment and slow decay, peatlands ensure that carbon stays put and does not escape into the air, where it can contribute to global warming [1–3]. Peatlands do more than just store carbon—they also help purify water and provide a cozy home for **amazing creatures**, like cranes, snakes, and even flesh-eating plants [1]! These special things nature does to help us are called **ecosystem services** (Figure 1).

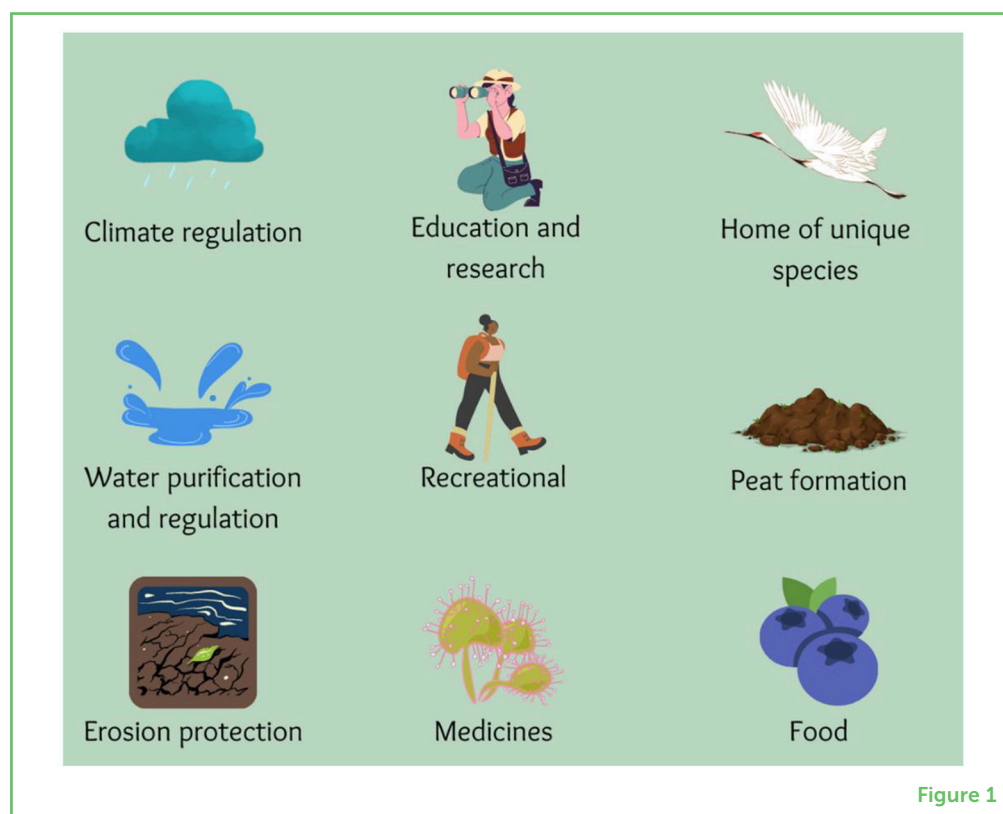


Figure 1

But human activities are causing problems for these ecosystems. When we dry out peatlands for farming or to harvest the peat for other uses, this releases a lot of carbon dioxide back into the atmosphere—roughly **6% of all the harmful greenhouse gases** that humans produce. Greenhouse gases in the atmosphere make the

## BIODIVERSITY

All the different living things on Earth, like plants, animals, and microorganisms.

Earth hotter, leading to problems like fires and pollution. Additionally, when peatlands are drained, the water disappears, and **biodiversity** suffers too—many unique plants and animals that rely on wet conditions cannot survive in the dry environment after draining. We must protect peatlands, keep carbon locked up, and keep our planet safe.

## MEET THE SUPERSTAR: SPHAGNUM

Meet the peat mosses, also known by their Latin name, *Sphagnum*. Imagine a group of mosses hanging out, each with its unique style, shape, and color (Figure 2).

### Figure 2

*Sphagnum* mosses in our field site in the Hankhauser Moor (Lower Saxony, NW Germany), including a top view of a *Sphagnum* field being harvested (photo credit: Sarian Kosten, Gabrielle Quadra, and Ralph Temmink).



Figure 2

These mosses are the stars of peatlands. While other mosses live in peatlands too—like *Hypnum* and *Polytrichum*—the unique traits of *Sphagnum* make it the top player in these ecosystems, especially peatlands far from the equator. It is mind-blowing that tiny mosses can make entire peatlands [1] (Figure 3). They are like powerful sponges that can suck up lots of water. Mosses also lower the pH of the water

around them, further slowing down the decay of dead plants and animals [1]. They are even happy in spots with little food because they are like food catchers—grabbing whatever bits of food come their way. This makes it hard for other plants to live next to *Sphagnum*, allowing it to grow in fluffy carpets.

### Figure 3

Landscapes created by *Sphagnum* at Isla Grande de Tierra del Fuego (South America; photo credit: Christian Fritz).



Figure 3

## HELPING PEATLANDS TO HEAL

Because degraded peatlands are emitting a lot of carbon back into the atmosphere, researchers and authorities are working hard to fix the problem. They want to make peatlands healthy again. One idea is to put water back into them, a process called **rewetting**. But while rewetting the land is good for nature, it is not so good for farmers who use the land to grow crops. We need a solution that works for everyone.

And guess what can help? *Sphagnum*! There is a new idea called **paludiculture**, which means growing plants like *Sphagnum* on peat that is made wet again—by rewetting—, and it is a win-win situation (Figure 2). Therefore, first, you need to rewet the peatland, and then, start growing plants that survive well in wet conditions. Investing in *Sphagnum* paludiculture generates many benefits. From an economic perspective, *Sphagnum* can be sold for growing plants, which is probably the most **sustainable** use, but it can also be used for burning to generate fuel and heating, or used for decoration and staying warm, and even treating sewage!

Our research group is trying to discover which *Sphagnum* is the best for paludiculture. We still have so much to learn. For example, some *Sphagnum* species grow fast, while others grow slow but are more resistant to changes in climate. Which one is better? We are also trying to figure out how we can make the land just right for *Sphagnum*,

### REWETTING

In the context of peatlands refers to the intentional reintroduction of water into these ecosystems.

### PALUDICULTURE

Crop production in wet soils.

### SUSTAINABLE

Involving practices and actions that meet current human needs without compromising the ability of future generations to meet their needs.

especially in terms of the amount of water and what other plants that can be grown with it.

Finally, we need to find good ways of telling people about the benefits of growing *Sphagnum*. This is pretty important because we still see resistance from farmers. Sometimes, farmers do not have enough money to start new ways of farming, or the weather or rules in some places make growing *Sphagnum* hard to do. Other times, farmers just do not know about *Sphagnum* or do not want to change. So, we are working hard to help our planet, make peatlands happy, and help people who use the land.

Besides *Sphagnum* paludiculture, restored peatlands can be used for nature-based tourism—people can enjoy the beauty of peatlands and learn about these unique ecosystems. Also, peatlands can be left alone to continue their natural role as carbon storage and biodiversity hotspots. By protecting them, we ensure their important services for the planet.

## YOU CAN HELP SAVE PEATLANDS!

Did you know that you hold the key to making our planet healthier? It all starts with being conscientious and caring for our precious peatlands. But how can you make a difference?

Most importantly, talking about environmental issues with your friends and family is like planting seeds of change. There are other actions you can take, too. For example, have you ever heard of palm oil? It might be in some of your favorite snacks and everyday products... but did you know that its production can harm peatlands? In places like Southeast Asia, peatland forests are being damaged because of the palm oil industry. [Indonesia](#), for example, supplies over half of the global palm oil used in processed snacks, such as instant noodles, cookies, ice cream, and chocolate, as well as shampoos, cosmetics, and detergents. By checking product labels and choosing palm oil-free options, you are saying “no” to harming peatlands and “yes” to helping them thrive! You can also check [here](#) to see which companies are committed to a responsible palm oil future.

But that is not all—you can also make a difference by choosing products that do not use peat. For example, in the Netherlands, some of the delicious Dutch cheese comes from drained peatlands. But there are better ways to make cheese that does not harm the environment. Choosing peat-free alternatives is like giving Mother Nature a high-five. This small change might seem like a tiny step, but it is actually a giant leap for peatland protection!

So, young eco-warriors, remember this—every choice you make matters. By being aware, making smart choices, and supporting peatland-friendly products, you are using your power to create a brighter, greener future for everyone. You are not just changing products, you are changing the world!

## ACKNOWLEDGMENTS

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## YOUNG REVIEWERS



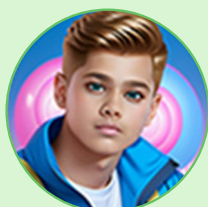
### EDNA, AGE: 10

Edna is a bright and curious 10-year-old. Her curiosity drives her to explore the wonders of nature, and she constantly brainstorms about ways to make the world a better place. Edna is also passionate about helping others. Her sociable nature brings joy to everyone she encounters. In addition to her passion for baking, she also plays piano and enjoys gymnastics.



### JADE

Jade is a teenager old who enjoys reading about history, art, cooking, and martial arts. She wants to study physics and have a career in academia.



### SAKSHAMM, AGE: 13

Some of my favorite subjects are maths, science, and humanities. My interests keep growing in these subjects over the years, and I have received various best awards for performing exceptionally in these subjects. I received the scholastic historian award in Grade 7. Also Best Student award in biology. I love to do new things in different fields, and my hobbies are cooking, watching/playing sports, and reading as well. Apart from my academics, I am also a student councilor, and I love taking part in social activities. I am fond of taking part in debates in humanities, and I am a top scorer in many subjects.

## AUTHORS



### GABRIELLE R. QUADRA

I have always been fuelled by curiosity about living things, which led me to choose biology as my path. As a Brazilian ecologist now living in the Netherlands, I am diving into the world of these intriguing mosses called *Sphagnum*. My background in environmental pollution has taken an exciting turn, and I am currently focused on optimizing *Sphagnum* paludiculture. We aim to make it super sustainable, finding that perfect harmony between the environment and society. It is like being part of a big puzzle in which every piece counts, and I love every moment!  
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### SANNIMARI KÄÄRMELAHTI

Born and raised in Finland, the land of peatlands, it seemed like a natural path for me to end up working with peat. However, it was not until I moved to the Netherlands to do my internship in the field of wetland ecology, when I found the tools to really cultivate my peat passion. My work as a junior researcher focuses on optimization of *Sphagnum* paludiculture. I am also involved in research that investigates greenhouse gas emissions from agricultural peat meadows.



### **CHRISTIAN FRITZ**

As early as high school, I became involved in projects concerning water management and restoration of peatlands that are characteristic of the lowlands surrounding Güstrow (in Germany, where I was born). In November 2005, I went for the first time to Tierra del Fuego in Argentina to take field measurements, forming the base of my Ph.D. research. Currently, I am a senior researcher at Radboud University (in the Netherlands), where I have been investigating more sustainable alternatives for traditional agriculture, such as the use of rewetted peatlands and the simultaneous restoration of ecosystem services.



### **RALPH J. M. TEMMINK**

I am an ecologist who enjoys studying wet ecosystems, such as peatlands. I would rather be dirty and knee-deep in the peat than walking on a paved road! My work focuses on the development of novel approaches to restore damaged or lost ecosystems. I also study coastal ecosystems, including salt marshes, seagrass meadows, and mussel beds. Furthermore, I truly enjoy sharing my knowledge with students at Utrecht University, where I am employed as an assistant professor. Maybe I will see you in one of my lectures or in the field! How great would that be?