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Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Introduction to Water Management: Bog Restoration through NBS

Lecture (online)

Learning Unit 44

Credit: Offaly County Council, Trinity College Dublin

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Learning Objectives

- Understand **wetlands**, **bog formation** and **geological location** across Europe.
- Gain an insight into the **cause and effects of bog exploitation**. Highlight the **importance of bogs for carbon sequestration** and to understand the need to protect wetlands from further exploitation.
- Recognise the **types of NBS** which enable bog restoration and how it **connects to the broader ecosystem**
- Reflect on elements of **NBS** using **case study examples** of bog restoration worldwide.

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"Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience.

Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions."

NBS Definition – EU

Reference: European Commission

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Exploring NBS

What comes to mind when you think of a ‘Wetland’?

answer in the chat (or Miro Board)

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What is a Wetland?

- A wetland is an area of land that is saturated with water either permanently or seasonally, and where the water table is near or at the surface. “Wetlands” may vary considerably in visual appearance, owing in part to the setting in which they occur and the vegetation type(s) present.

Reference: Irish Ramsar Wetlands Committee 2018

What are wetlands?-WWT https://youtu.be/k9UbKlBc3W4

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The Ramsar Convention (2010) defines wetlands as

- ***“ areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.”***

The Ramsar Convention (2010)

Types of Wetlands

- Lakes, reservoirs and ponds
- Turloughs
- Rivers and canals
- **Peatlands (bogs)**
- Wet woodland
- Swamps and marshes
- Caves and cliffs
- Floodplains (permanently/periodically inundated with water)
- Salt Marshes
- Dune Slacks
- Transitional waters

Wet Woodland, Co Louth, Ireland

Bog Pool at Garriskill, Co Meath, Ireland

Peatland, Belgium

Peatland, Latvia

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What is Peat?

Peat is the organic layer of soil made of semi decomposed organic matter mainly from plant material

Conditions Favouring Peat Formation

- Waterlogged soils
- High levels of acidity
- Nutrient deficiency

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Peatland Bog Formation

Fun Fact
The word bog is derived from the Irish word **Bogach** which means soft!

Peat formation is the result of incomplete decomposition of the remains of plants growing in waterlogged conditions.
This may happen in standing water or under consistently high rainfall (upland or mountain regions).
As a result, partially decomposed plant remains accumulate and become compacted, forming peat.
This process is referred to as the ***hydrosere***.

Peatland Bog in Tropical Climates

- In the lowland humid tropics peat is derived from rainforest trees (leaves, branches ,trunks and roots) combined with the annual high temperatures.

Peatland Bog in Boreal and Temperate Climates

- In regions where the temperature is below freezing for long periods during winter – the rate of decomposition is reduced.
- Peat is formed from bryophytes such as sphagnum mosses, herbs, shrubs and small trees.

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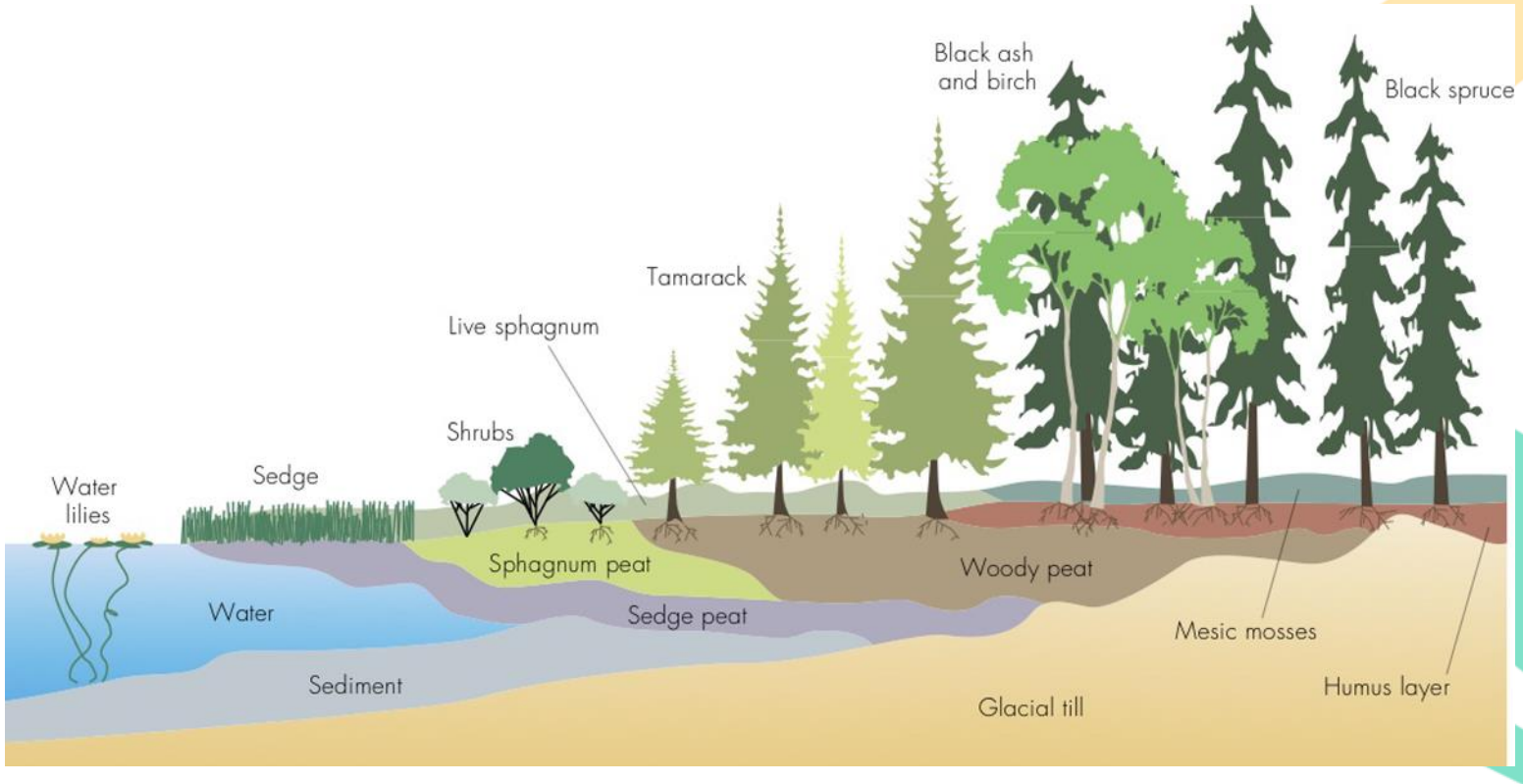
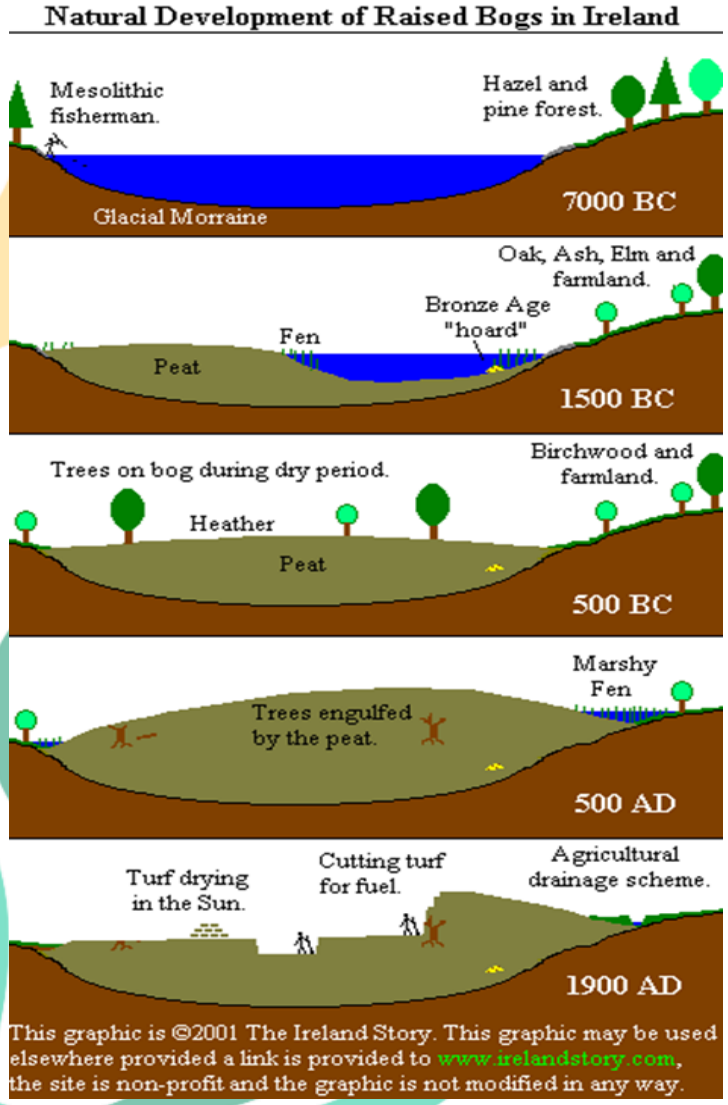
Peatland Bog Formation Diagram





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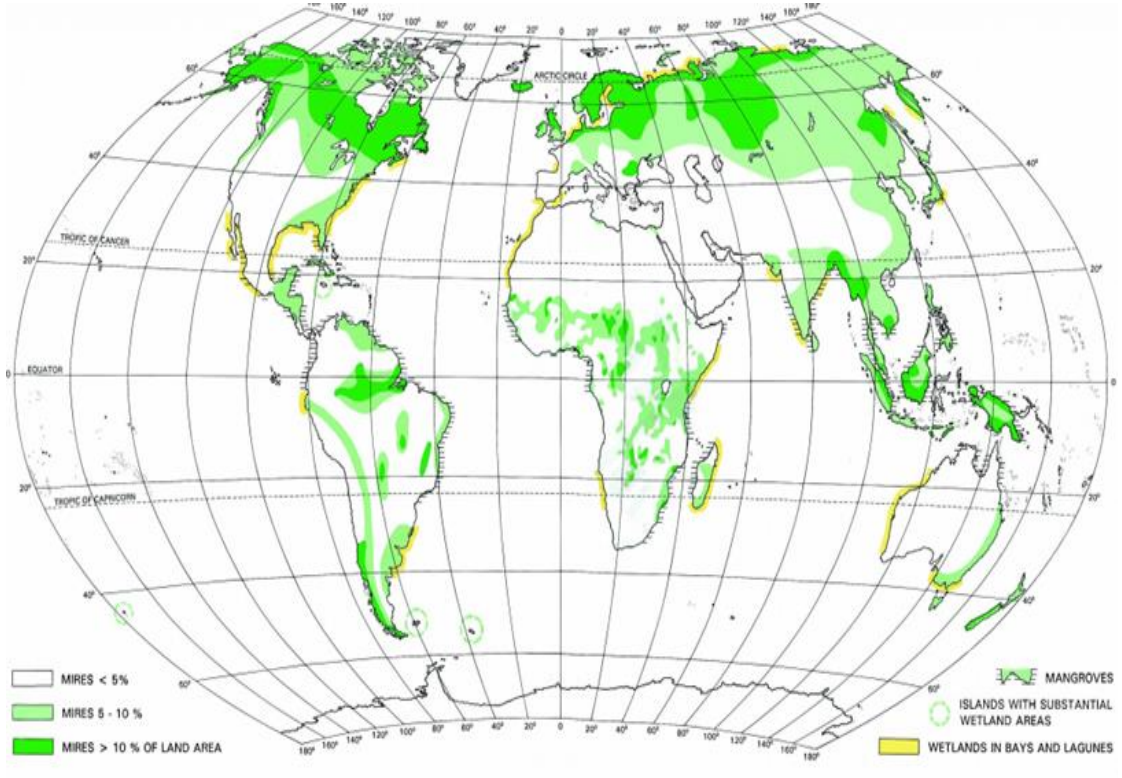
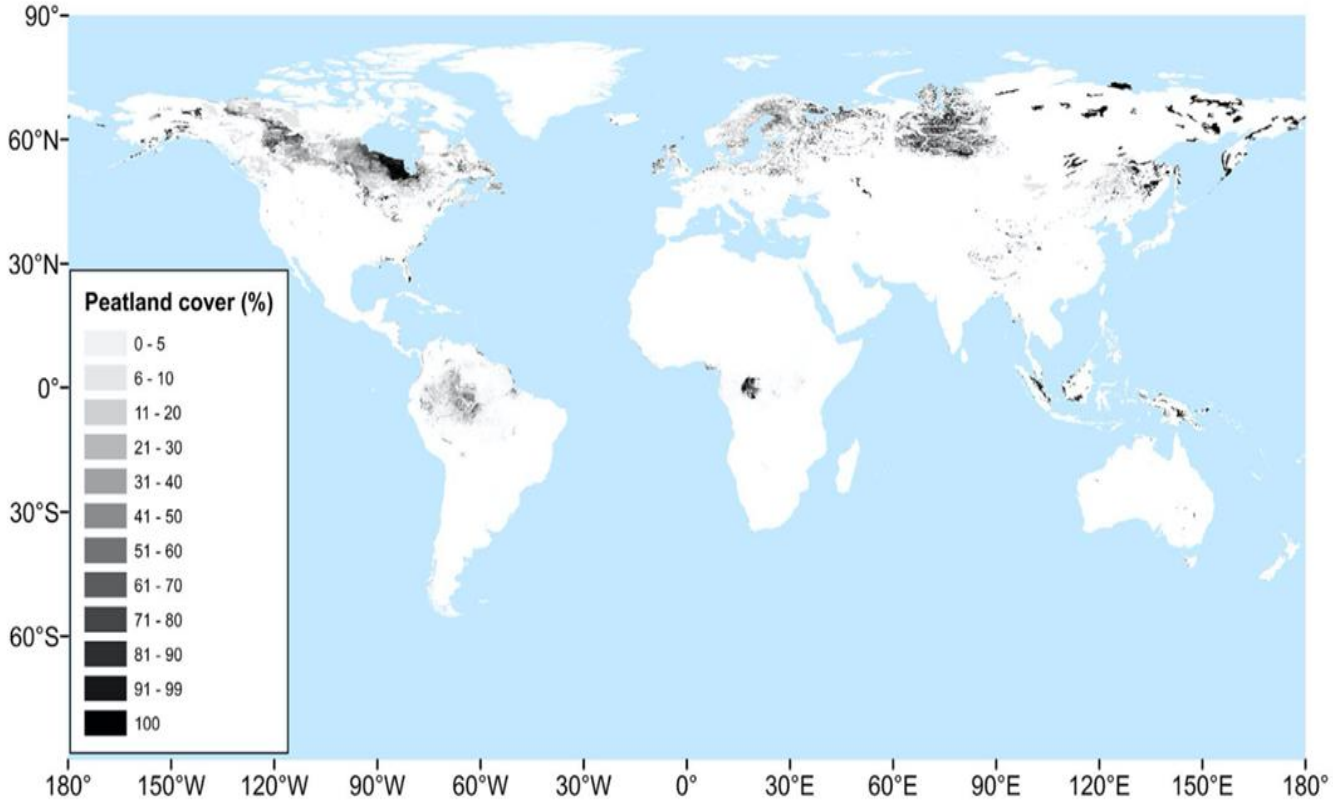
Where can Peatlands be found?



Peatlands distribution according to Lappalainen, 1996



Global Peatland distribution according to PEATMAP (Xu et al. 2018)

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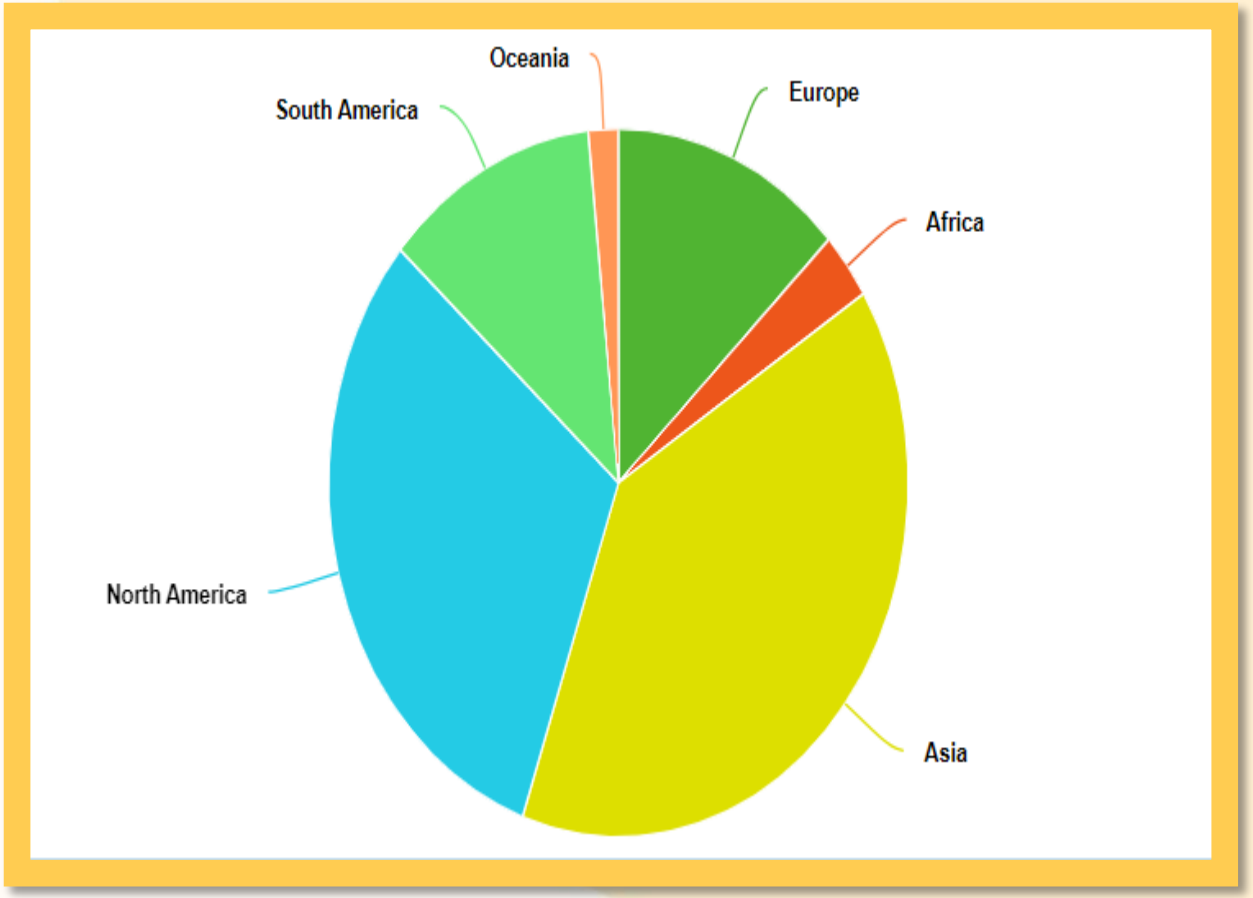
Where can Peatlands be found?

- Peatlands occur in every climatic zone.
- 2.83% of the earths land surface is covered by peatland.
- 38.4% of the world's peatlands are situated in Asia.
- 31.6% are in North America (Canada and Alaska).
- Europe(12.5%), South America(11.5%), Africa(4.4%), Oceania(1.6%).



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Reflection Point

- *‘What comes to mind when you hear of a Wetland’?*

Is the definition of a Wetland what you expected?

Was it different? The same?

Discuss/Type your response in the chat

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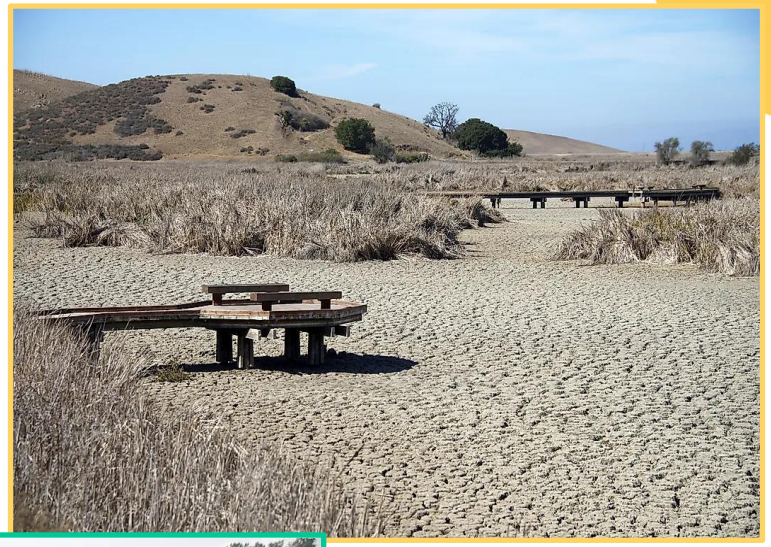
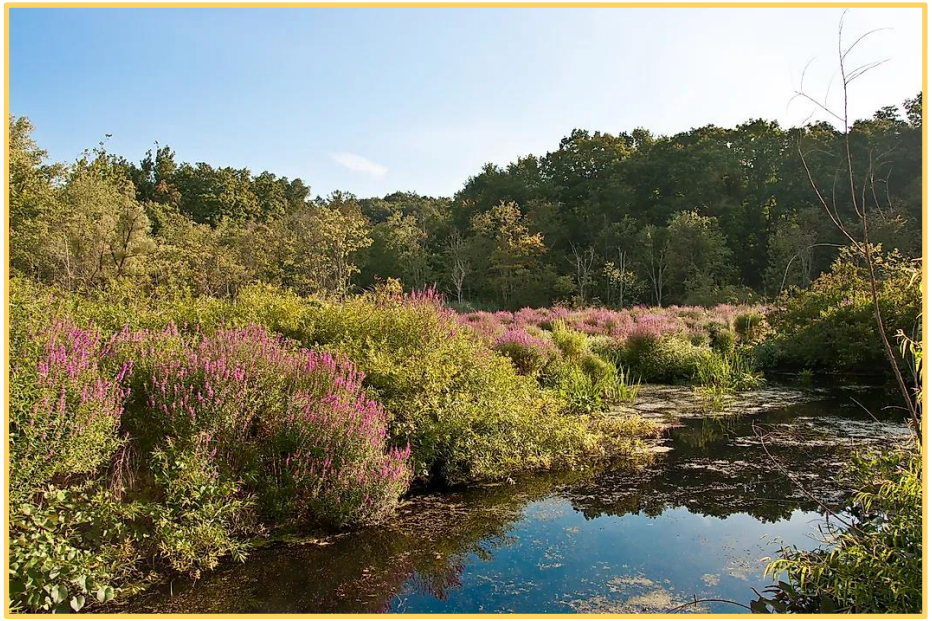
Threats to Wetlands Globally

- Wetlands are being drained for agriculture and construction activities
- The introduction of invasive species can damage the wetland ecosystem
- Water pollution is affecting the flora and fauna of the wetlands
- Climate change is destroying wetland habitats





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Threats to Irish Peatlands

Raised Bogs

Turf Cutting

Since the 17th Century turf has been used to heat Irish homes. It was common for each family to own a turf bank. The turf was cut using a sleán.

After a bog is cut, water drains away from the surface. The bog then dries and shrinks making it inhabitable to native bog biodiversity.

Industrial Extraction Peat

Bord na Mona has extracted peat primarily from raised bogs since 1940.

The peat is milled and burned to produce electricity or compressed into briquettes and sold as domestic heating fuel.

Within 65 years Bord na Mona exploited 80,000ha of bog land.

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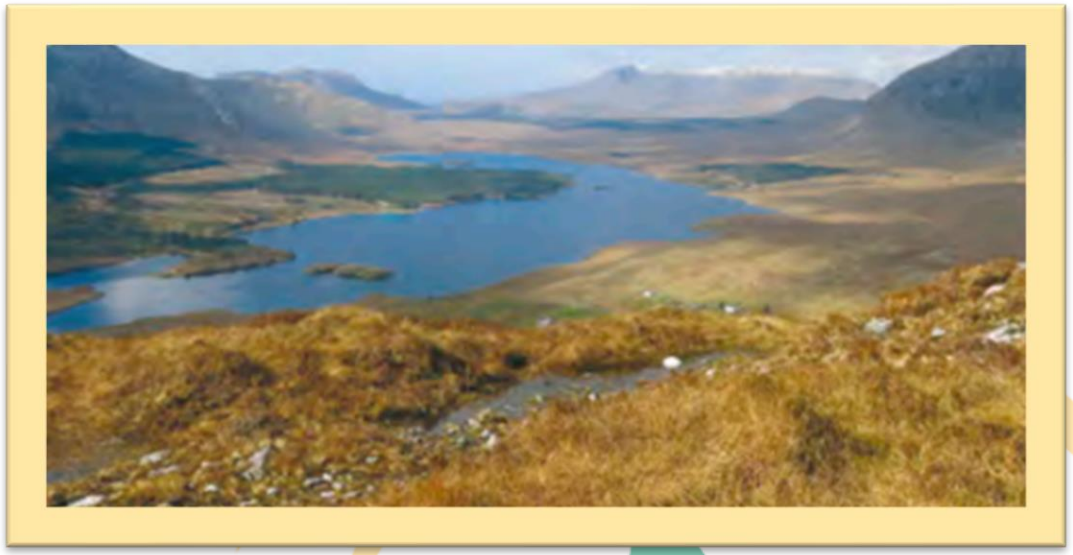
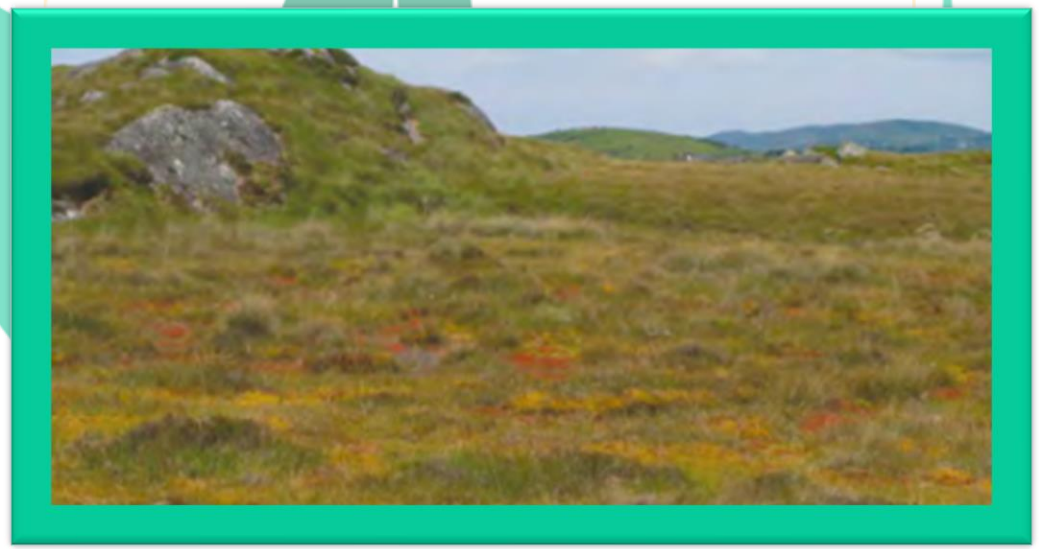
Threats to Irish Peatlands

Blanket Bogs

- Turf Cutting
- Over-stocking
- Burning
- Afforestation
- Construction of Wind Farms
- Landslides or ‘Bog Bursts’



Upland and lowland blanket bog, Connemara, Co. Galway



Sphagnum carpets, lowland blanket bog, Roundstone, Co. Galway

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Peat Fires in Indonesia

- In 2015 massive peat fires burned through Indonesia sending thick smoke as far as Thailand.
- The peat fires released more carbon dioxide into the atmosphere each day than all U.S economic activity.
- The fires were caused by a change in land use. The peatlands were drained to plant acres of crops that demand drier soil.
- Healthy Peatlands are quite fire resistant due to their soggy state, Over the last few decades, the country has drained many of its peatlands to grow oil palms and other crops. Now, the country is seeing the worst-case scenario of what can happen when peatlands are disrupted and exploited.

Peatland fires in Riau Province, Indonesia 2016

The streets of Palangka Raya, Indonesia, are obscured by smoke from peat fires

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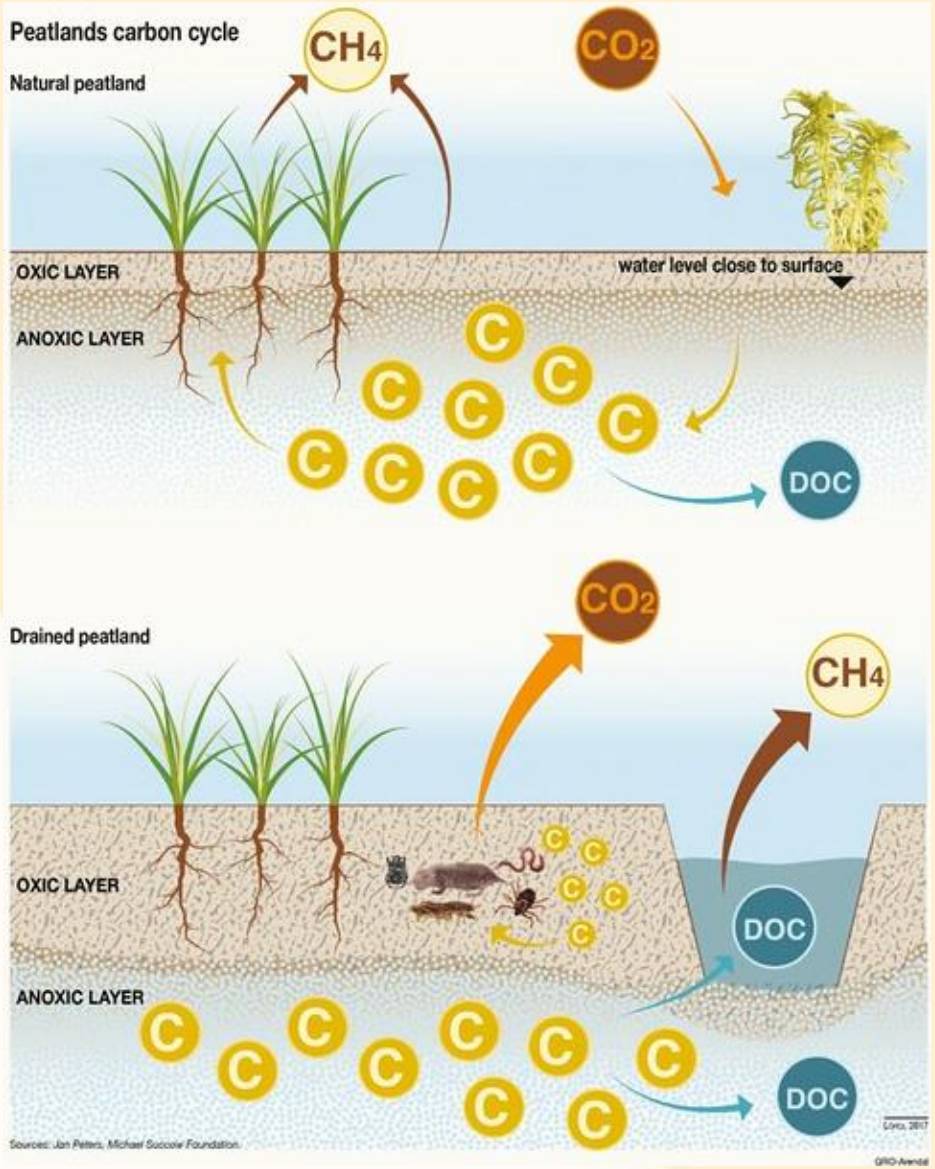
Carbon Sequestration

- Peatlands act as a carbon sink
- They account for 21% of the global soil organic carbon stock.
- Anthropogenic activities result in net C02 emissions.
- 46% of Europe's peatlands are no longer actively forming peat.
- Peatland restoration is needed to tackle climate change



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"Peatlands are among the most valuable ecosystems on Earth and a stark example of how important our natural environment is to our wellbeing. Occupying just 3% of the Earth's land surface, peatlands are our largest carbon store on land. They are places where people derive clean water and food, and can act as buffers for environmental disasters, such as flooding. They are also of global significance for biodiversity with the majority of peatland species and habitats rare, threatened or declining."

IUCN
The World Conservation Union

Inger Anderson, Director of the IUCN

The Importance of Protecting Peatlands

Biodiversity

Peatlands play an important role in conserving a wide range of plant and animal species.
The acidic, low-nutrient conditions found in many peatlands have led to unique adaptations in species that are not found anywhere else.

Sphagnum Moss

Sphagnum moss can store 16-26 times their dry weight in water. This can help mitigate against flooding and drought by slowing the flow water through a landscape.

Human Activity

Human Activity is damaging Sphagnum-rich peatlands, compromising complex environment. Invasions by species adapted to drier conditions results in the decline and loss of specialist peatlands species.

Sphagnum Moss

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The Importance of Protecting Peatlands

Climate Regulation

Petland's are a unique ecosystem as they provide a long-term storage of carbon therefore playing a key role in climate regulation.

Human Activity

Decades of unsuitable land management practices has led to peatlands no longer storing or sequestering carbon.

Preventing further damage to peatlands through bog restoration practices can play an important role in climate regulation.

"From a climate perspective, peatlands are the most essential terrestrial ecosystem."

Tim Christophersen, Senior Program Officer, Forests and Climate, United Nations Environment Programme

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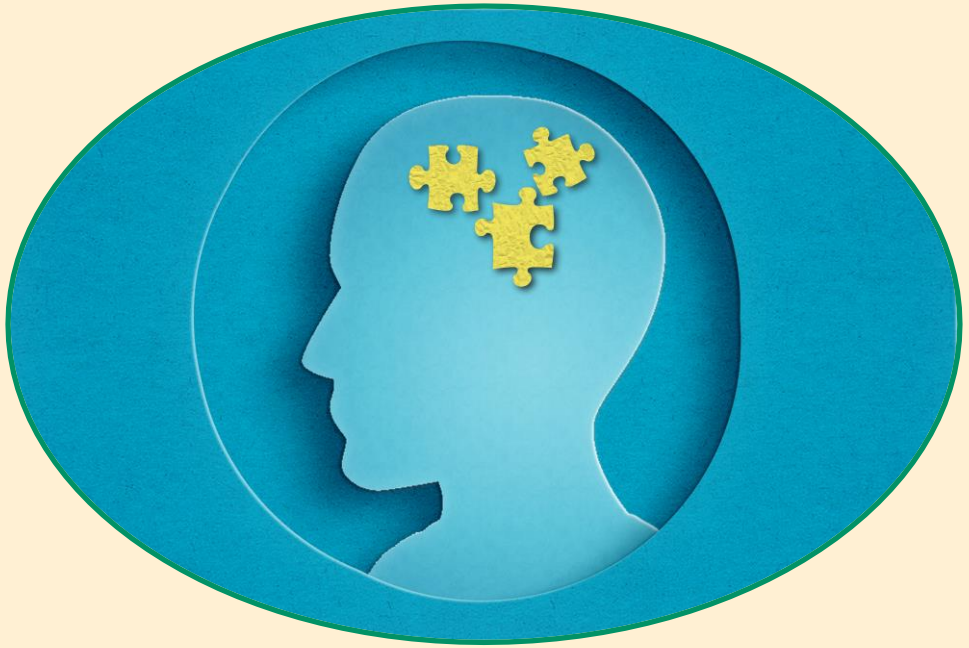
- Unique Archive of our Cultural Past
- Form a part of historic landscape
- Provide people with a ‘sense of place’

Recognising Archaeology during Peatland Restoration

Culture and History

The Importance of Protecting Peatlands

(Part 3) *Reflection Point*



1. *Why are Peatlands a unique ecosystem?*
2. *What are the main threats to Peatlands?*
3. *Why should we protect peatlands*

Type your answer using Jam board

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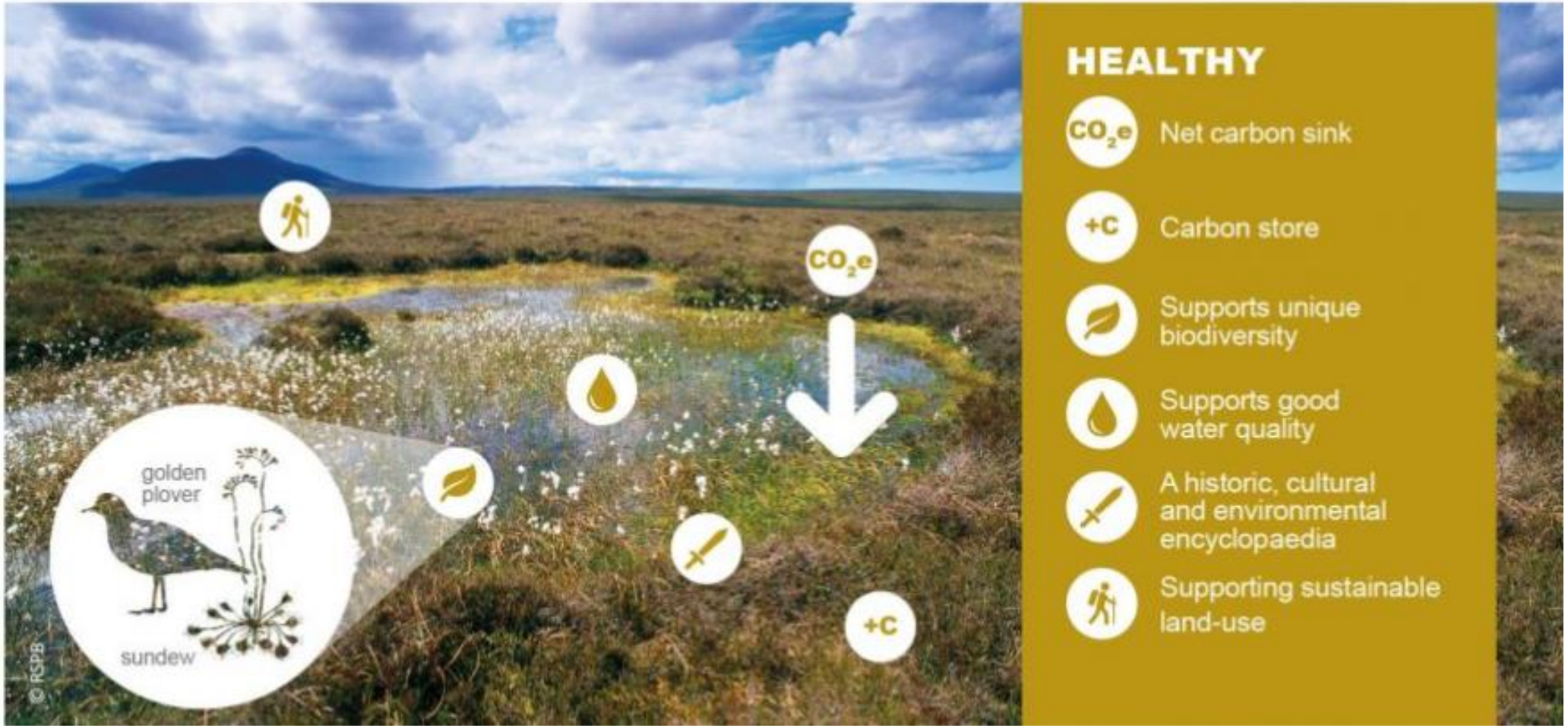
ECOSYSTEM SERVICES IN A HEALTHY PEATLAND



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IMPACT ON ECOSYSTEM SERVICES IN A DAMAGED PEATLAND

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[Conbeale More Peatland Conservation Project 2024]

[Implementing the Conservation Plan 2024]

Clonbeale Peatland Conservation Group YouTube Updates

- Andriesse, J. (1988) Nature and Management of Tropical Peat Soils. Food and Agriculture Organization (FAO) of United Nations, Rome.
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- Pajunen, H., 1985. The mires in the Akanyaru Valley in Burundi. Proceedings of the Symposium: Tropical Peat Resources – Prospects and Potential. February 25–March 1, 1985, Kingston, Jamaica. pp. 186–197. International Peat Society, Helsinki, Finland.
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Further Reading

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