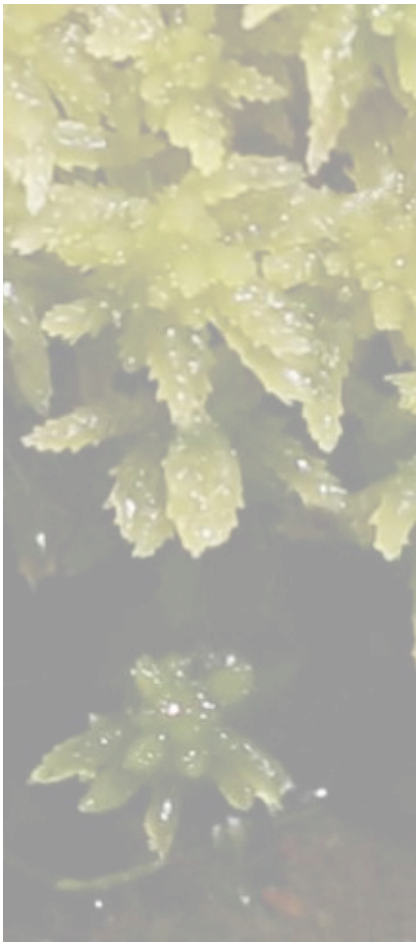
Alpine Peatlands

Watch

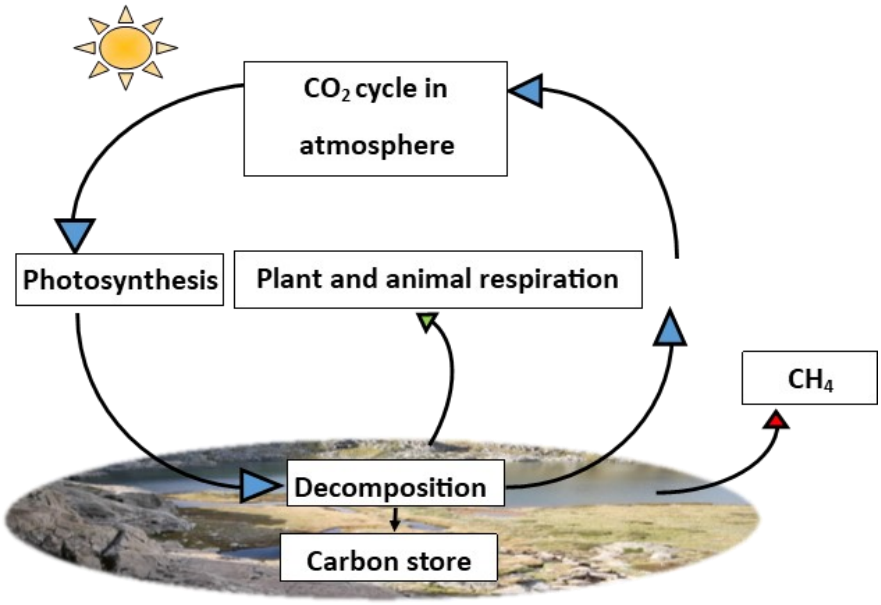
Watch the video about alpine peatlands available at

www.fallscreek.com.au/environment

The carbon cycle



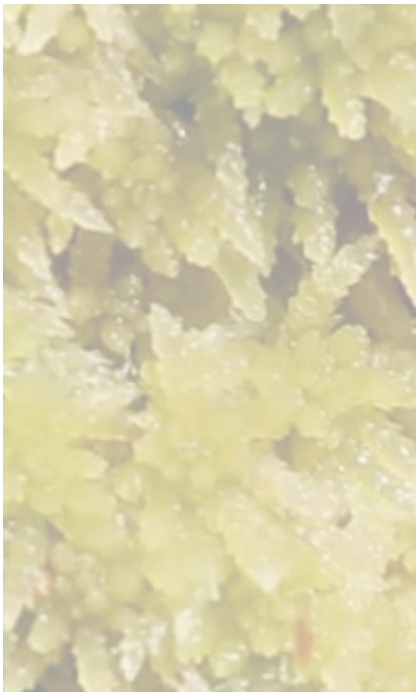
Carbon is an essential element for life on earth. It can be found in different forms throughout the air, oceans, rocks, soil and it is the building block of all living organisms.



In alpine bogs, the process of ***decomposition*** is often blocked or slowed down due to their waterlogged soils and the absence of oxygen. Partially decomposed organic material accumulates and compresses, trapping carbon. Over very long time periods peatland soils accumulate carbon, acting as an important carbon store.

This process of carbon storage can be quickly disrupted and even reversed (more carbon is released than is stored) in peatlands that have been physically disturbed by feral animals or people, burnt by wildfire, or had their natural hydrology disturbed through a changing climate.

Measuring peatlands

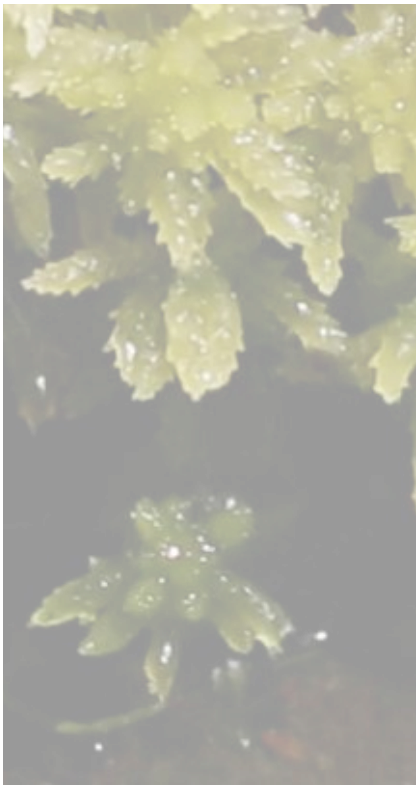


Measurements taken using the Eddy Covariant Flux tower enables investigations of the exchange of water and carbon between the peatland soils, the plants and the atmosphere. To do this the tower measures turbulent or circular fluxes of wind (an eddy) moving vertically up from the peatland.

The tower and some complex mathematics measures how much of a molecule of interest (such as carbon dioxide) moves vertically up and down in these eddies (Burba & Anderson, 2010). The net flow of molecules can determine if an alpine peatland is acting as a source or sink of that molecule which helps researchers better understand ecosystem carbon and water cycles.

The Eddy Covariant Flux tower situated in Falls Creek is one of many contributing to an international project providing continuous, long-term micrometeorological measurements to monitor the state of ecosystems globally. Consistent collection of data across many ecosystems has many uses, including increasing our understanding of global climate change.

Fauna



Fauna that live in alpine peatlands may be rare or threatened due to their limited distribution and the pressures on their survival.

The Alpine Water Skink is critically endangered in Victoria. The species can be found basking on sphagnum moss and will dive into the peatland pools or fens when startled. The skink digs burrow systems into and under the sphagnum moss which provide a winter refuge when the area is covered in snow. Like many Australian reptiles, this skink is 'viviparous' - giving birth to live young.

Other threatened species often found associated with alpine peatlands areas include: Alpine Stoneflies, Mountain Galaxias and Broad-toothed Rat.

When trying to protect these species, land managers need to consider direct threats such as predation and competition, as well as threats to their habitat.

Threats

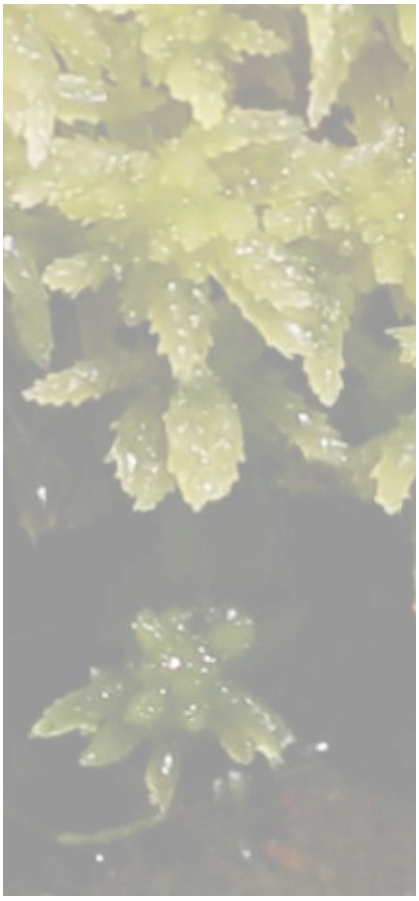
Threats to alpine peatlands include deer, horses, people, vehicles, weeds and climate change. Alpine peatlands are recognised as being Endangered under the Environment Protection and Biodiversity Conservation Act (1999) and are included in the Alpine Sphagnum Bogs and Associated Fens Ecological Community.

Physical disturbance by deer, horses and humans is a problem to alpine peatlands as Sphagnum moss is easily crushed and broken up by trampling and wallowing. Cattle hoof prints from grazing are especially enduring in Sphagnum moss at the edges of pools and streams. Once the Sphagnum cover is lost, alpine soils and peat environments are very susceptible to desiccation, incision and soil erosion.

Although intact alpine bog sites appear quite resistant to weed establishment, those already compromised by fire or other impacts such as grazing and trampling become very susceptible to weed invasion by non-native species.

Even a small increase in mean ambient temperature is likely to result in the loss of more bogs and fens due to changes in snowfall and snowmelt regimes, which will in turn affect groundwater movement.

Climate change



Climate change modelling is a complex science due in part to the presence of potential feedback loops. Climate change feedback loops are processes that have the ability to amplify or diminish a climate related process. Alpine peatlands provide an example of a potential positive feedback loop. This means that they have the ability to amplify climate change. The ability for a peatland to store carbon is directly linked to its hydrology which may be altered by changes in temperature and precipitation with global climate change.

Two potential feedback loops exist:

- Changes to precipitation (the timing and amount of precipitation received and the balance of rain and snowfall) may change the hydrology of peatlands. As peatlands dry out they start to decompose and release the carbon they were previously storing.
- Warmer/ drier climate may increase fire frequency and intensity in the Australian Alps. Changes in fire behaviour combined with potential changes in peatland hydrology are likely to increase the changes of peatlands burning. Wildfires in peatlands 'burn' the carbon stored in the peat soils, releasing it as carbon dioxide.

Activities

LEVEL ONE:
Watch the film Alpine Peatlands and complete these sentences:

1) 40-__% of the base flow of the Murray Darling Basin comes from the Australian Alps.
2) The Eddy Covariance Flux Tower is measuring the exchange of _____ and water between the peatland soil, plants and the _____.
3) Information collected by the Eddy Covariance Flux Tower contributes to an international project on global_____ _____.
4) The stream outlet in the film provides enough water to fill ____ Olympic sized swimming pools a year.
5) Ewen's research explores whether _____is critically important in recharging groundwater.
6) Sam's research has aged peatlands soils in the alps up to _____years old.
7) Water that emerges underground to feed some of the alps peatlands fell from the sky ___ years ago.
8) Peatlands are the worlds largest ____ carbon store.

LEVEL TWO:
Watch the film Alpine Peatlands, read the information supplied and answer the following short response questions:

1) What could data collected from the Eddy Covariance Flux Tower be used for? What could it help us learn?
2) Explain why Alpine Peatlands are considered to be carbon sinks.
3) Explain one mechanism by which alpine peatlands may amplify climate change.
4) Why are horses and deer a threat to alpine peatlands?

LEVEL THREE:
Watch the film Alpine Peatlands and read the information supplied. Reflecting on the issue of global warming and the influence of human behaviours, answer the following questions:

1) List three things you could do as an individual to reduce your carbon foot print.
2) List three things your school could do to reduce its carbon foot.
3) List three things you could do as a land manager such as a Parks Victoria Ranger to protect or restore an alpine peatland.

LEVEL FOUR:
Watch the film Alpine Peatlands, read the information supplied and conduct your own research to answer the questions:

1) Pretend you are creating a short film about an environmental issue of your choice. What is your environmental issue? What are the three key messages you want to teach people about your issue? What techniques would you use to try and convince people of your message?
2) Research and describe a climate change feedback model of your choice. Examples include permafrost thaw or the ice-albedo effect.
3) Do some more research into the different uses and users of water from the Murray river. If it was your decision how would you determine how to allocate water amongst different users?

References

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