UNDERSTANDING EROSION PROCESSES IN BLANKET PEATLANDS

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An eroding blanket peat erosion site (Fleet Moss) in Northern England

RESEARCH SUMMARY

Peat erosion is driven by a number of processes and while these have been investigated for more than 50 years some are still poorly understood. The result is that strategies aimed at reducing the risks associated with peat erosion may not be as effective as they could be. In addition to direct erosion and loss of carbon from peatlands, downstream consequences of peat erosion are varied and include smothering of aquatic habitats and fish spawning gravels, sedimentation of reservoirs and costs to remove carbon during water treatment. Prevention and control of peat erosion risk relies on designing and applying appropriate conservation strategies and management techniques. In order to make these as effective as possible, both in terms of cost and benefit, we need to better understand the processes driving peat erosion and how erosion rates vary though space and time. Research by experts in Peatland science at the University of Leeds has identified how some of the key processes driving peat erosion vary over time and interact with each other. This improved knowledge will enable practitioners and land managers to better understand how strategically planned intervention measures can help minimise the risk of peat erosion.

PROJECT DETAILS

Organic-rich soil accumulates slowly over thousands of years in peatlands capturing considerable amounts of carbon (close to half of the world's soil carbon). Therefore, they are an important carbon store (like the way we relate to the rainforests, only much larger!) and the quantification of carbon fluxes from these systems is vital to fully understand global carbon cycling. Human actions, both past and present, that cause peatland erosion can damage this balance, with action required to prevent any future losses being needed sooner rather than later.

Blanket peatlands (as seen in the picture above) are common in the Northern UK, they are rain-fed and usually occur on sloping terrain which makes them vulnerable to water erosion. Many blanket peatlands have experienced severe erosion due to historic air pollution or excessive vegetation removal and are under increasing erosion risk from future climate change. The erosion of peat will enhance losses of terrestrial carbon in many regions.

This four-year project coupled laboratory-based experiments with field monitoring data collected at Fleet Moss (Northern England). Results allowed a better understanding of the processes that make peat susceptible to erosion and the processes that then drive this erosion.

Some key findings are:

- Both raindrop impact and the interaction between rainfall and flow driven erosion processes were important in affecting peat overland flow and erosion processes for gentle slopes and shallow overland flow conditions.
- Needle-ice processes dramatically increased peat erodibility and reduced peat stability, and significantly reduced the surface flow velocity mainly through increased hydraulic roughness and changed surface microtopographic features, with micro-rills and headcuts developing.
- Repeated SfM surveys captured main topographic changes during events (intense rainfall, flow wash, needle ice production or surface desiccation) which is beneficial for understanding longer-term peat erosion dynamics.
- The greatest sediment and particulate organic carbon losses from a 1.7ha study catchment were found during the autumn and much of the available sediment appeared to be derived from weathering during dry weather earlier in the year.
- Bare peat surfaces are much more susceptible to erosion after being subjected to needle ice processes and desiccation. The weathered peat is subsequently detached by raindrops for transport by raindrop-impacted saturation-excess overland flow, ultimately leads to a range of spatially distributed surface erosion processes including interrill erosion, rill erosion and gully development.

The findings of this project have practical implications relating to upland erosion control in terms of:

a) Understanding carbon fluxes within rivers that result from actively eroding peatlands in headwater catchments
b) Providing important information which assesses effects of restoration projects
c) Improving computational models that look at how peatlands will respond to future climate change and land management practices.

WHAT'S NEXT?

There are still many questions that need to be understand before we can fully understand the complex processes that contribute to erosion in peatlands. The use of sophisticated monitoring techniques will allow more accurate data to be collected that will in turn help us to explore the complex interactions that exist between the internal and external factors driving peat erosion. As well as seeking to better understand erosion within peatlands interdisciplinary peatland scientists across The University of Leeds are seeking to better understand peatlands as a whole given their importance globally, and are continually exploring opportunities to achieve this.

This briefing is based on peer-reviewed research articles which can be accessed here:

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