Using geophysical surveying to inform peatland management

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Introduction

Dinsdale Moorland Services (DMS) specialises in peatland and moorland regeneration and has over 25 years of experience in working on upland projects in the UK. This experience has helped DMS evolve to meet the needs of moorland owners and managers. DMS has teamed up with the University of Leeds through a Knowledge Transfer Partnership (KTP). Research is being undertaken to validate and develop new restoration strategies and to establish efficient use of geophysical techniques for examining internal peat properties and carbon resources. This research will also inform practical methods employed by DMS and suitable locations for moorland management, in order to maximise carbon capture and minimise carbon losses in peatland environments.

![Figure 1](image1.png)

The Kubota designed for minimum disturbance of peatlands is used to tow the GPR antenna, with the RTK GPS system this provides accurate and rapid 3D mapping of peatland environments

Geophysical Surveying

There has been a recent increase in restoration work to protect the UK’s vulnerable, yet highly valuable, peatland environments. This has led to the rapid development of restoration techniques available to practitioners. However, the success of restoration work is often dependent upon the practitioner’s knowledge of the characteristics of individual peatlands. At present, techniques to conceptualise peatland environments, for characteristics such as depth, carbon storage and erosion rates, involve much manual labour and are consequently time consuming and expensive. This restricts moorland managers in their ability to target and monitor remediation effectively. If standardised techniques for accurately surveying peatlands in an efficient and practicable way could be developed, these knowledge gaps could be filled.

There have been a number of successful attempts to use geophysical techniques to survey peatlands such as Holden et al (2002), Sass et al (2010) and Comas et al (2005). Through these studies the potential of geophysics to not only conceptualise peatlands spatially, but also three dimensionally, in a non destructive, efficient and accurate way has been demonstrated. This research aims to further investigate how new and emerging geophysical techniques, such as Ground Penetrating Radar (GPR) and Time Domain Reflectometry (TDR) can be used in conceptualising peatland environments. The research seeks to produce output such as accurate, high resolution carbon inventories, mapping of water table level and quantification of erosion rates amongst others things. The output will be provided using new visualisation techniques in a user friendly format. In doing so DMS will be able to provide practitioners with the information they require to appropriately restore and monitor peatland value and condition.

Case Study – Peat Depth, Four Stones Estate, Lancashire

In February 2010 Dinsdale Moorland Services investigated the use of Ground Penetrating Radar (GPR) for mapping peat depth on Four Stones Estate, Lancashire. A Mala RFA GPR at 100 MHz was towed behind the Kubota, a light weight tracked vehicle designed for minimum disturbance on peatlands (Figure 1). A Real Time Kinematic (RTK) differential GPS system was used for accurate geo-referencing of both positioning and elevation. The surveying was successful and a large amount of GPR data was obtained, allowing peat depth to be identified (Figure 2). A 3D map of peat depth was produced, using both the RTK and GPR data (Figure 3). Depth maps such as these can be used as part of a peatland carbon inventory.

The investigation into using GPR on the Four Stones Estate proved very promising; there is substantial potential for using GPR to generate full, accurate and rapid surveys of blanket peatlands. Much of the work of the KTP will involve refining the techniques further to detect other subsurface properties of peatlands.

![Figure 2](image2.png)

Example GPR output from the 100MHz antennas, this data was used to map peat depth

Remediation

DMS have successfully developed several new and innovative methodologies for restoring peatlands, such as stone dams, gully re-profiling and the peat pan stabilisation. These methodologies have been developed by the experience and observation of the skilled workforce at DMS. However, DMS now seeks to assess past restoration practices using scientifically validated methodologies, thereby allowing DMS to develop new and improved protocols and methodologies for the restoration of peat. As part of the KTP research will be carried out to develop new restoration techniques and assess the success of current practices. DMS will adapt and make new techniques available, as the project progresses.

![Figure 3](image3.png)

Mapping of peat depth using the results of GPR surveying. Surveying methods such as this will help to identify areas that require restoration and in future this kind of data will be used to generate carbon inventories

![Figure 4](image4.png)

Example of successful gully re-profiling work carried out by Dinsdale Moorland Services

References

