Knowledge Gaps and Future Research

Research to date has focused on gaining an empirical understanding of the effects of restoration on a range of ecosystem services at the plot scale. Our findings so far, described in this document, inevitably lead to further questions that would benefit from scientific insight, for example:

- Peatland hydrology, dissolved organic carbon production and greenhouse gas emissions are strongly linked to vegetation composition, in particular *Sphagnum* recolonization. Changes in vegetation communities can be slow i.e. over decadal timescales. It would therefore, be beneficial to return to restored sites 10-years following restoration to see if, given more time, the effects of restoration have changed or are more pronounced.
- Previous work has quantified the effects of restoration during higher water flows, to understand changes in flood risk and the inputs to water treatment systems. However, peatland restoration may also increase river baseflows between rainfall events, providing other important ecosystem services and ecological benefits. Quantifying changes in baseflow would enable a fuller understanding of the effects of restoration on river flows from these restored peatlands.
- As ditch blocking in shallow peat has not universally brought about the change in vegetation required to alter dissolved organic carbon production or greenhouse gas emissions, different methods of *Sphagnum* reintroduction are being piloted. The costs and effects of these different methods could be assessed over the next few years to ascertain their differing effectiveness.
- Vegetation surveys have indicated that ditch blocking in shallow peat is more successful in some areas than others, as yet we do not understand why some areas respond better to ditch blocking than others. An improved understanding of this would enable restoration resources to be more effectively targeted in the future.

Moorland Scale Effects of Restoration

Further work is also required to combine the ground based empirical understanding with landscape

extent remote sensing data to extrapolate this understanding to the moorland scale. For example, we have observed an average increase in deep water storage of 7.3 cm at Flat Tor Pan (see Dartmoor Deep Peat Hydrology). Given that an area of 6 km^2 was mapped as ecohydrologically affected by comparable peatland features (eroding peat pans, see Dartmoor Deep Peat Extent and Condition Mapping) we can already make broad assumptions as to the potential water storage Dartmoor could provide. In this example, assuming the peat has bulk density of 50 % (as a conservative estimate) and that this area was similarly restored, an additional 219 million litres of water would be stored within the peatlands of Dartmoor if they were restored. Future work could expand and improve such estimations, and better contextualise the effects of restoration across the landscape. Examples of opportunities include:

- Peat cuttings, unlike other types of degradation, do not always result in a change in vegetation cover and loss of peatland functioning. This may be because they are lower than the surrounding peat, act as a hydrological sink and therefore maintain locally high and stable water tables. A better understanding of which peat cuttings (type and location) require restoration and which do not would enable restoration resources to be more effectively targeted in the future.
- Current peatland mapping work has enabled us to understand where peat is degraded within Dartmoor National Park. Initial work using remote sensing data to optimise the restoration of complex degraded peatland systems has been invaluable to planning restoration. Extending and developing this preliminary work across larger extents and encompassing a wider range of degradation types (and restoration techniques) could provide a novel and detailed ability to optimise restoration across multiple landscapes.