Global peatland restoration after 30 years: where are we in this mossy world?

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Abstract

As part of the Society of Ecological Restoration World Conference in 2015, we held a Global Peatland Restoration symposium, where we gave experts from around the world the mandate to provide an updated picture of peatland restoration in their part of the world and scan the horizon to identify challenges and opportunities to come. This special section was put together to make these valuable contributions available to all.

Implications

- Sharing knowledge and developing evidence-based best practice guidance is essential to improve our ability to restore peatlands efficiently
- With global climate change, peatland restoration will have to adapt, both conceptually and in practice

Keywords:

Bog, Ecological Restoration, Fen, Global change

Main text:

Research on the restoration of peatlands has emerged as an active scientific field in the last 30 years. The incentive to restore degraded peatlands was induced by the wider recognition of wetland values in the landscape along with the goods and ecological services they can provide to human (Turner 1991; Ghermandi et al. 2010). For centuries, peatlands have been used by humans (grazing, turf cutting for cooking or heating, small berries gathering, etc.), but the incentive to engage more strongly into ecological restoration of peatlands has arisen recently with the more extensive commercial and industrial uses of peatlands: drainage for agriculture and forestry, industrial impacts associated with ores and petrol extraction and their associated infrastructures (winter, temporary or access roads, seismic lines, power lines, pipelines, exploratory and extraction pads), wind energy development or commercial peat extraction activities for the production of energy or horticultural substrates.

In 2000, the Canadian-based PERG (Peatland Ecology Research Group) organised a symposium under the umbrella of *The Millenium Wetland Event* (Rochefort & Price 2003) where international researchers were invited to report their scientific advances of past 15 years on the management and restoration of *Sphagnum*-dominated peatlands. Since then, several large-scale restoration projects

have been carried out around the world. Fifteen years later, we wondered: Have these restored peatlands really become boggy, mossy places (Figure 1)? Has the most important characteristic of peatland ecosystem, the peat-accumulating function, been reinitiated again?

There is now a growing understanding that degraded peatlands bear a significant cost to society, and consequently a raising awareness of the possibilities to restore peatlands in a cost-effective way is developing. Given the important link between peatlands and global carbon cycle (Limpens et al. 2008), governments, regulators or simply good corporate citizen are pushing for the ecological restoration of industrial peatlands. Nowadays with the big industries and associated impacts on the landscape come big challenges. How can these challenges be overcome? Are there global trends in peatland restoration which can help us align our efforts and maximise our chances of success?

To answer these important questions, we have given leading experts from around the world the task to review the current evidence-base from peatlands under restoration and to bring all this knowledge together in a special section on Global Peatland Restoration. The objective of this exercise was two-fold: firstly, we wanted to revisit the advances made worldwide in bog restoration in the last fifteen years, including the techniques used, the methods developed, but also the monitoring and data collected to demonstrate how efficient peatland restoration has been. Secondly, we wanted to assess what lays ahead for peatland restoration, the gaps in knowledge that young researchers should aim to tackle and the problems that managers, scientists and other stakeholders need to resolve together.

Our effort focussed largely on *Sphagnum* peatlands and covers four key peatland regions around the world: North America, Western Europe, the Baltic Countries and Australasia. We deliberately didn't include the tropics as they have been the object of a number of reviews over the last few years (E.g. Page et al. 2009; Osaki and Tsuji 2016; Warren et al. 2016). We appreciate that many other areas of the world are managing and restoring bogs and that other peatland types need attention, and do not pretend to have covered them all. Nevertheless, we come to the conclusion that across the world, peatland managers, industries undertaking peatland restoration and peatland scientists share similar approaches, but also appear to be faced with the same questions: how should we measure the efficiency of peatland restoration actions? How can we prioritise areas for restoration if funding is restricted? How can restoration be more cost-effective? How will peatland restoration impact, and be impacted by global climate change?

Our ability to restore functional peatlands will increase with our understanding of the key interactions and feedback mechanisms linking hydrology, vegetation, climate and microbial communities together. While significant progress has been made in these past 30 years of peatland restoration, this is just a beginning. We firmly believe that long-term programmes of monitoring and research, coordinated between stakeholders, consistent across wider areas and disseminated more effectively including in the peer-reviewed literature, will keep improving our chances of bringing back the peat forming species, and the ecosystem services that functional peatlands deliver. To us, the future of peatland restoration seems full of challenges, but also full of promises.

Aknowledgements

We would like to dedicate this special section to all the researchers and practitioners who have contributed, and keep contributing to the field of peatland restoration.

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Figure 1. Restoration was undertaken in 1999 at the Bois-des-Bel peatland, a former peat extraction site in Eastern Quebec. The Peatland Research Ecology Group (PERG) led by Prof. Line Rochefort has been following the return of peat forming species and other functions since then. The picture taken in July 2015 (15 years after restoration) shows Prof. Rochefort looking at the *Sphagnum* carpet near one of the pools created as part of the restoration process.