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New tool predicts ecosystem restoration success

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Contact:
edusargas@hotmail.com

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A new approach to predicting whether a degraded ecosystem can be successfully restored is presented in a recent study. The researchers who developed it show how it works with the case of peatland restoration. Their method uses a computer model to link restoration success or failure with plant species and management techniques on the sites.

Ecological restoration aims to 'repair' damaged [ecosystems](#). The authors of this study believe that new tools are needed to predict whether ecological restoration projects will achieve their aims. The prediction needs to be made shortly after a project has finished using information on the site's development so far, they suggest. If required, conservation managers can then intervene early to help ensure that the site is restored as planned.

The researchers tested their approach by predicting the success of projects conducted on peatland bogs in Canada. Peat had previously been taken from the study sites for horticulture. The aim of the restoration had been to re-establish a carpet of *Sphagnum* moss and associated species assemblages, which would eventually help the land accumulate peat again. The restoration method used various techniques, including spreading *Sphagnum* moss fragments, using straw to protect moss fragments, blocking drainage ditches and adding fertiliser.

They evaluated the restoration at a total of 152 plots across 41 peatland bogs. This involved monitoring each plot at least twice over a 4-11 year period (the period varied by site) for different features, which included plant species, weather conditions and management techniques. The first survey took place in the third year after the restoration.

Through these assessments, the researchers identified which sites had been successfully restored during the last survey. Nearly half (66) of the plots were dominated by *Sphagnum*, but the others were either bare or dominated by another moss species, *Polytrichum strictum*. The question was: could their computer model have predicted these outcomes, based on the data at the time of the first survey?

The model analysed the early data on the sites' features and matched combinations of these with likely restoration outcomes. It also minimised the effect of the different monitoring periods for the different sites.

It correctly predicted the outcome for 71% of the sites, using several indicators of success. For example, certain plant species recorded at the first survey were very strong indicators of each site's future development. These were: *Sphagnum*, cottongrass (*Eriophorum vaginatum*), lichens, *P. strictum* and leatherleaf (*Chamaedaphne calyculata*).

High summer temperatures during the first year post-restoration were likely to lead to bare sites. Deliberate – and extensive – blocking of drainage ditches to help keep soil wet increased the chances of sites being dominated by *Sphagnum.* If the restoration project had taken place in the spring, the site was more likely to be dominated by *P. strictum.* Remedial actions for sites predicted to fail could include re-applying moss or straw, but more carefully, or constructing small dams to improve ground conditions for *Sphagnum.*

The study's authors say that their model can help restoration practitioners understand their sites' future development without expert knowledge or complicated analysis of several coinciding indicators. The approach can be used with any restoration project which has a clear definition of 'success', provided that the model is adapted to local environmental conditions and indicators, they say.