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# MOSS LAYER TRANSFER TECHNIQUE: FROM BOG TO FEN RESTORATION

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## SUMMARY

The moss layer transfer technique (MLTT), a relatively simple restoration technique, consists OF transferring mosses and plant fragments collected FROM a donor site to a contoured and rewetted abandoned peatland surface. Several harvested bogs have been successfully restored according to this method in the last 20 years in Canada by the Peatland Ecology Research Group (PERG). However, during the extraction process, some peatlands are harvested to a deeper layer of peat. The residual peat characteristics are therefore similar to minerotrophic conditions. For the first time in North America, a fen restoration project to an ecosystem level was initiated in 2009 by the PERG. That will provide useful information about what concerns have to be taken into consideration when transferring the MTLL to fen restoration projects.

KEYWORDS: fen restoration, moss layer transfer technique, contouring, donor site, fen vegetation.

## INTRODUCTION AND SITE DESCRIPTION

The Bic-St-Fabien peatland is located in Eastern Québec, Canada (Fig. 1). In 2009, the site was restored using the moss layer transfer technique (MLTT) developed by the Peatland Ecology Research Group (PERG). An area of 14 was first partly contoured: approximately 2 km of bunds were created to improve water circulation and retention. In addition, all drainage ditches were blocked and filled to rewet the site. Main ditches were kept active but dammed to allow a slow water circulation around the peatland. Plant material to be reintroduced was collected in a nearby drained lake colonized with typical fen vegetation (Fig. 2) in November 2009. The moss and plant fragments were then rapidly spread on the frozen surface (an area of 1.4 hectares) of the peatland and covered with straw mulch. All actions were done with the help of machinery. Small sections of the peatland were also restored without adding mulch (an area of 0.4 ha) and by hand (an area of 0.1 ha, in 2010) as experimental trials.

Fig. 1. The Bic-St-Fabien peatland: PERG's fen restoration project at the ecosystem scale. Photo: M.-C. LeBlanc

The general short-term goals of this fen restoration project are the return of typical fen hydrological patterns and vegetation. With time, that should contribute to re-establish an important function of peatland, namely the carbon sequestration. We hypothesized that the MLTT would be suitable for fen restoration and allow reaching these goals. Each step of the MLTT will be carefully examined in order to determine which issues should be considered with particular attention when applied to fen restoration. In the context of this extended abstract, we will focus on preliminary results concerning hydrology and vegetation.

## METHODS AND PRELIMINARY RESULTS

### Hydrology

In order to determine if the first goal of the Bic-St-Fabien peatland restoration (the return of typical fen hydrological patterns) was reached and the success of the restoration technique (MLTT) on the hydrology of the peatland, wells have been installed in the contoured and un-contoured sections of the site. Water levels have been monitored before (2008-2009) and after restoration (2010-2011) for 50 days each year. Comparison between wells located in contoured and un-contoured sections as well as data comparing water levels before and after contouring showed that contouring considerably increased water levels and diminished intra-seasonal water level fluctuations. Bund construction in fens is therefore an efficient method for ensuring rewetting in local areas of the site.

Fig. 2. The donor site, a former drained lake where material was collected for Bic-St-Fabien peatland restoration. Photo: Maryse Gendron.

## Vegetation

*Vegetation reintroduction success*

In 2011, vegetation surveys were conducted to evaluate the success of plant reintroduction in 24 plots of 1m x 1m installed on representative areas of each restored sections. Vegetation percent cover (total cover and cover of each species) was estimated in each plot. Results show that the restored sections of the peatland present a mean total vegetation cover reaching 30%. Mean moss cover was 10%, reaching 65% in certain sections of the site. Traditionally, vegetation surveys are conducted on restored sites three years after restoration. These results obtained in fens after only two growing season cannot therefore be compared to bog restoration data, but still offer a first glance for the trajectory of plant recolonization.

*Donor site recovery*

Another issue concerning vegetation that should be addresses while examining the MLTT in a fen restoration perspective is the return of the vegetation in the donor site. In order to evaluate if the donor site had recovered from collecting the vegetation 2 years before, vegetation surveys were also conducted in this peatland. Eighteen plots were installed in the areas harvested in 2009 and in adjacent un-harvested sections. The data obtained were compared to surveys conducted on 15 plots in 2009 before harvesting. The results show that the mean vegetation cover in harvested sectors is 24%, compared to 59% in 2009 (before harvesting)

and 94% in surrounding areas (in 2011). In addition, the vegetation cover is mainly composed of vascular plants: mean bryophyte cover is 39% in the surrounding un-harvested sections compared to only 2% in the harvested ones. On the other hand, all vascular species present in the un-harvested and 2009 surveys of harvested sectors are back in the harvested sections. If the return is unequal depending on the species, some *Carex* and *Schoenoplectus* species already show a similar percent cover in all sections. The result suggest that the vascular plants rapidly recover after harvesting, but that some species (especially bryophytes) may be longer to return. More monitoring is needed to know if fen mosses will eventually recover to a pre-harvesting level, as it is the case for bog restoration donor sites.

## CONCLUSION

A preliminary evaluation of the Bic-St-Fabien restoration project already indicates that the MLTT might be an adequate method for fen restoration to ensure the return of typical fen hydrology and vegetation. The contouring method used for bog restoration was proven efficient to raise the water level in fens and should be applied to guarantee local rewetting and water retention. The vegetation spreading also showed good results. Even if further surveys have to be done, preliminary results showed that material spreading and reintroduction is well adapted to minerotrophic environments. The donor site vegetation also shows evidence of rapid recovery, at least for vascular plants. However, future attention is needed to monitor moss re-establishment in the donor site. Hydrology and vegetation (including donor site) monitoring is essential in the first years following restoration to assess the trajectory of peatland recovery. Long-term monitoring is also needed to ensure that short and long term restoration goals are reached and that necessary corrections can be implemented if necessary.