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Peatland Restoration - Harvest and Transfer of Donor Material

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Introduction

The increasing number of well sites and associated facilities constructed on peatlands along with the requirement to return these sites to equivalent land capability has recently triggered numerous peatland restoration studies in Alberta. The majority of these studies are focused on restoring the plant communities and hydrology. Vegetation cover along with suitable water levels/flows are believed to be the most likely to restore peatland ecosystem functions in the long term (Rochefort et al. 2003). Peatland vegetative covers are typically dominated by Bryophytes, and as such vegetative transfer techniques that successfully re-establish the Bryophyte communities play a critical role in the efforts to restore disturbed peatland back to its native state. Of these transfer techniques, the *North American Approach*, developed in eastern Canada, has been shown to be is successful in restoring peatland communities following severe disturbances particularly after peat extraction. The success of this technique has prompted us to experiment with this approach as a model to restore the vegetative cover on peatland wellsites in northwestern Alberta.

The objective of this technical note is to present the harvest and transfer technique of donor material used by the NAIT Boreal research Institute to restore a wellsite constructed in a peatland.

Donor site

A donor site is a natural peatland where diaspores are harvested for the re-vegetation of a disturbed peatland. Diaspores are any part of a plant (seeds, roots, spores, leaves, stems etc.) with the capacity to regenerate a new individual.

The identification of the donor site is an important part of restoration planning. Knowing upfront the source of vegetative material is best practice in peatland land restoration. The criteria behind the choice of a donor site should include the following:

- **Species composition**: The donor site should be a peatland dominated by bryophytes, mainly *Sphagnum* species. Peatland shrubs, sedges and forbs are desirable species. Treed sites and sites where lichens are abundant should be avoided. The plant communities should correspond to the targeted ecosystem established in the restoration plan.

- **Chemistry:** Few indicators should be considered while choosing a donor site. Water pH and electric conductivity (EC) are good indicators of the overall site conditions. Water pH and EC should be comparable to the restored site.

- **Accessibility**: Cutlines o\in peatlands provide easy access to donor sites. Cutlines are usually built and operated under frozen conditions, which protects ground vegetation (moss carpet) during winter traffic. They are free of large trees and offer easy access to peatland plants such as moss and shrubs (see figure 1).

Figure1: Donor site on cutline

- **Distance to the wellsite**: It is recommended to choose a donor site close to the reclaimed wellsite to:
    - Ensure the transferred donor material is similar to the pre-disturbance vegetation of the reclaimed site.
    - Ensure the transferred donor material is in the same seed zone as the wellsite.
    - Reduce transportation footprints on the landscape and cost.

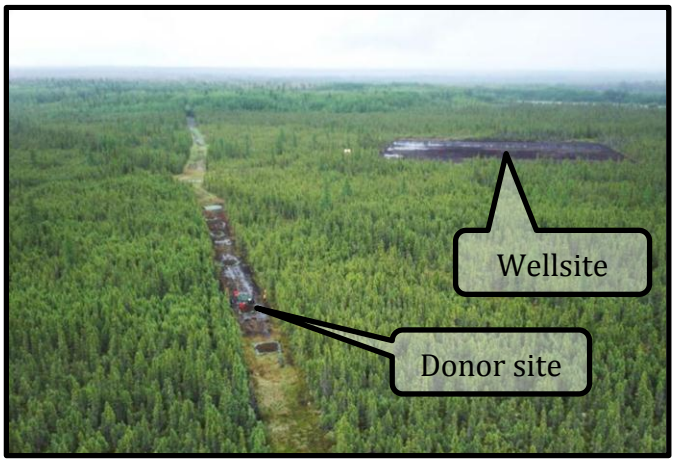

Figure 2: Locations of the donor site and reclaimed site

Harvesting of Donor Material

Several types of equipment can be used to harvest the donor site material. The choice of equipment depends on the season and the site conditions. The ideal donor material is composed of loose moss fragments and small chunks. A Rototiller works well but other pieces of equipment can also give good results. See Quinty ? Rochefort 2003.

The best season for moss harvesting is late fall or early spring, as practitioners can capitalize on frozen ground to operate heavy equipment for harvesting and hauling vegetative material. Working under summer conditions is an option but requires the use of light machinery.

Small and light equipment such as a rototiller attached to an Argo can be used to rip the top 10 centimeters of the moss carpet (See figure 3). After ripping the moss carpet, the material should be stock piled to allow water drainage and reduce the weight of the load before transport (See figure 4). The donor material can be stock piled from a few months up to a year, depending on site conditions and the size of the piles. However, the regeneration capacity of the material will decrease with time so it is recommended to work with fresh material. Under frozen conditions, a dozer or bobcat can be used to remove the top 10 cm of the ground vegetation (Bryophytes). The advantage of using heavy equipment is to avoid manual labor and reduce the time required in the harvest, piling and transportation of the donor material.

Figure 3: Light equipment for donor material harvesting

Transport/Transfer of Donor Material

Depending on the season and the distance between the donor and the reclaimed sites, the transfer/transport of the donor material can be accomplished by air or by ground.
Under wet conditions (summer), equipment with a low compaction effect such as an Argo is recommended for the transport of donor material. If the donor and reclaimed sites are a significant distance apart, air lifting the vegetative material is a recommended option although it implies higher cost.

Under frozen conditions, heavy and medium size equipment (e.g. dozers and bobcat) can be used to transfer the donor material. It is recommended that clay pad removal and moss transfer be coordinated simultaneously if possible to increase efficiency. Conducting these activities simultaneously can significantly reduce the total cost of restoration since:

- Practitioners take advantage of the presence of heavy equipment on site to harvest and transport the moss.

Capitilizing on frozen ground to disseminate the chunks of propagules and bring on-site straw or other cover/insulation material that will be used to protect the moss from desiccation during the growing season

Regeneration of the Donor Site

Donor sites regenerate on their own following harvest of the top 10 cm. An abundant seed bank remains on site for the self-regeneration of the donor site. Experiments in eastern Canada have shown that:

1) Harvested donor sites regenerate on their own and no restoration technique is required to improve the recovery of Sphagnum species.

2) Harvested donor sites will recover both the diversity and species composition within five years and will be comparable to undisturbed peatland.

Figure 5 shows the regeneration of donor site two months after harvesting. Once a donor site has fully recovered, it could potentially be reused for the restoration of other disturbed sites.

Figure 5: Regeneration of a donor site following harvesting (left) and two months after harvesting (right)