

Natural Ingression and Supplemental Planting for Revegetation of Reclaimed Wetlands

CONTEXT

Passive revegetation, also called natural ingression, can successfully revegetate sites with appropriate hydrologic and soil conditions, close seed sources, and time. Assuming the reclaimed site has similar conditions to that of the seed source, it can be a low-cost strategy for sites in which all these factors align. It has been widely used in mineral wetland reclamation, such as marshes and swamps. These communities are mainly dominated by a single vegetation layer, such as graminoids in marshes or trees in swamps.

Peatland communities, however, can be more complex, with a balance of mosses, herbs, graminoids, shrubs and trees all present. Colonization of all strata at a similar rate is not usually seen. Even with nearby propagule sources, moss recruitment can be stalled. Similarly, canopy establishment can be hindered by inherently slow tree growth rates in wetlands. Graminoid and herbaceous species are most likely to ingress first through rhizomes and seeds, but the speed will vary depending on the reclaimed sites' hydrologic and soil conditions.

NAIT has tested natural ingression targeting different species at two sites with various degrees of success. At a former airstrip reclaimed to a mineral surface and planted with sedge seedlings, spontaneous recruitment of additional emergent species from adjacent wetlands contributed to its success. Most importantly, five years post reclamation, some mosses have spontaneously established on microsites. At a former wood chip road reclaimed to a peat surface, both sedges and shrubs have naturally ingressed onsite. Nevertheless, despite adjacent seed sources, five years post reclamation, small pockets of moss and conifer seedlings have only recently begun to establish.



Desirable wetland sedge species ingressing from nearby areas through rhizomes onto a newly reclaimed peat surface.

WHEN TO USE NATURAL INGRESSION VERSUS SUPPLEMENTAL PLANTING IN PEATLAND RECLAMATION

1. **Successful natural ingression should restore all strata present offsite, including mosses, herbs, graminoids, shrubs and trees. It is a slow process and the rate of colonization depends on the species, proximity, and connectivity to seed sources.**
2. **Natural ingression alone is either too slow or inadequate** to establish all layers of vegetation in a multi-strata system. **It should not be used as the primary mechanisms of revegetation, especially under tight timeline constraints.**
3. **Successful natural ingression depends on the hydrologic and soil conditions of the reclaimed sites, which should resemble conditions of the nearby seed source areas.** If the site conditions are significantly different than those of the seed source, active revegetation with species appropriate for the onsite conditions should be considered.
4. **Stem height is not required for peatland reclamation certification**, therefore slow ingress and growth of woody stems may be enough to meet the criteria. However, targeted conifer species such as larch or black spruce should be planted to accelerate growth and to meet shorter timelines.

KEY FINDINGS

- Water sedge (through rhizomes) and Grey sedge (through its early maturation and high seed production) were the fastest colonizers on both sites.
- Willows colonized both sites but only arrived after about four years following reclamation.
- Moss did ingress under low density sedge cover in saturated, but not flooded, areas at both sites.
- Moss ingress is very slow compared to using an active revegetation strategy like the Moss Layer Transfer Technique (MLTT). Site's using natural moss ingress have a small fraction of the moss cover established at similar aged sites using MLTT.
- Conifer planting should wait 2-3 seasons post reclamation to allow the wetland surface to stabilize.

COST ANALYSIS

- Highly variable depending on what container species are commercially available from a seed zone in a given year.
- Planted stock could include trees (larch, black spruce), shrubs (dwarf or bog birch, heath shrubs), herbs (marsh cinquefoil, marsh marigold) or sedges.
- The Peatland Reclamation Criteria specifies one desirable tree species stem (larch or black spruce) per 10 m² for the disturbed assessment; therefore, the minimum planting density is 1,000 stems/ha.

PRACTICAL RECOMMENDATIONS

RECLAMATION GOAL

- A combination of both active and passive revegetation is recommended for most wetland trials.
- The use of passive versus active revegetation will depend on the final reclamation goal and timeframe. All strata should be targeted. Species selection will depend on which key species are missing if left to natural ingress. If tree height is the main objective in order to close access lines, consider planting large container stock.

NATURAL INGRESSION

- Ensure site preparation has created soil conditions conducive to the target species establishment.
- Minimally disturbed sites will have greater success using natural ingress than highly disturbed areas.
- Long narrow sites will be colonized faster than large, square sites (i.e., well-pads).

ACTIVE REVEGETATION

- Consider a strategy that introduces more than one plant strata, such as the Moss Layer Transfer Technique (MLTT). It introduces donor moss along with trapped herb, shrub, and tree diaspores.
- MLTT supplemented with low-density planting of conifers can enhance the establishment of a complex community compared to planting or natural ingress alone.
- Offsite species can be transplanted onsite. Sedge and shrub seeds can also be manually dispersed onsite during peak ripeness. Ripe but unopened black spruce cones can be directly spread onsite to open from the sun's heat.

SUPPLEMENTAL PLANTING SPECIES SELECTION

- If using supplemental planting, target species that are slow to ingress on their own. There is no need to plant willows or cattails, which are prolific colonizers on their own. Avoid planting wetland species that are not considered desirable if intending to certify under the Peatland Reclamation Criteria (i.e., balsam poplar or Alaskan birch).
- Consider planting larch in addition to, or instead of, black spruce for peatland sites, especially fens. It is full-sun tolerant and fast-growing.
- Wait for reclaimed wetland surfaces to stabilize 2-3 years before planting trees to decrease mortality rates. Saturated substrates need time to decompact and settle. The surface will stabilize and dry down somewhat as other vegetation establishes.
- Many peatland vascular species are not commercially available. Seed can be collected from adjacent areas for propagation if shrubs or herbaceous species are needed.



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The reclaimed peat surface one season after restoration. Seed sources are present on both sides of the road for natural ingression.



The same site, four growing seasons after restoration. Sedges have naturally ingressed onto the road.



Desirable wetland species ingressing from the road edges through underground rhizomes.



Black spruce germinant on the reclaimed surface, originating from seed rain from trees adjacent to the site, four years post reclamation.



Sedges that originally ingressed from rhizomes are now further seeding onto the site. The black spruce seedling present was planted in Year 2.



The reclaimed area in the middle is dominated by naturally ingressing sedges. In comparison, the off-site community on the left still has more shrubs and trees present.

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nait.ca/borealresearch
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CONTACT US

boreal@nait.ca
780.648.2600

AUTHORS

Melanie Bird and Bin Xu, Centre for Boreal Research, NAIT.
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