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Which plants would be best to lower water tables on wet-cold sites?

SIMON M. LANDHÄUSSER, VICTOR J. LIEFFERS, AND ULDIS SILINS

Some of Alberta's most productive white spruce stands occur on subhygric to hygric sites which in the later



stages of succession tend to have a thick insulating organic layer. After cutting, these sites tend to water-up, producing waterlogged soil conditions. Watering-up occurs because most of the transpiring leaf area of the previous stand has been removed; thus water accumulates in the soil. Most boreal tree species are poorly

adapted to grow in waterlogged soils. Since these sites are also rich in nutrients, significant grass and shrub competition develops after harvesting. Currently, only expensive options such as the creation of large mounds and treating the competing vegetation with broadcast herbicides are considered viable treatment options available to managers to establish trees in these wet locations. The objective was to determine if pioneering shrubs and grass species could be used as nurse crops to possibly lower the water table on sites prone to watering-up.



Willow (*Salix planifolia*), green alder (*Alnus crispa*) and Marsh reed grass (*Calamagrostis canadensis*) were established in special pots which can maintain the soil water table at either 12 or 25 cm below the soil surface. As many wet sites also have also cold soil conditions, plants were grown at 5, 10 or 25 °C soil temperature. Transpiration rates and growth were assessed 6 to 8 weeks later.



As we expected all species grew better in warm soil conditions; however, at 20°C and with high water table, the grass grew best and had the highest transpiration rates per leaf area. Willow; however, grew better at the 25 cm water table depth, but surprisingly had its highest rates of transpiration per leaf area at 5° C soil temperature.

Implications: Pioneer species could be used to control the water table on sites that are prone to watering-up. This research suggests that the maintenance of these species on the site could have significant benefits to the future productivity of the stand and therefore a complete removal of these species on these sites can not be recommended. Since the grass is known for its competitive effects the promotion of shrub species such as willow should be considered. Tall shrubs will suppress grass but will allow for the establishment and growth of the shade tolerant white spruce. However this type of management would only be feasible where regeneration lags are acceptable in terms of allowable cut and secondly in terms of regeneration standards policy.

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Further Information:

Landhäusser, S.M., Lieffers, V.J. and Silins, U. 2004. Utilizing pioneer species as a hydrological nurse crop to lower water table for reforestation of poorly drained boreal sites. *Ann. For Sci.* 60: 741-748.

Landhäusser, S.M., Silins, U., Lieffers, V.J. and Liu, W. 2003. Response of *Populus tremuloides*, *Populus balsamifera*, *Betula papyrifera*, and *Picea glauca* seedling to low soil temperature and waterlogged soil conditions. *Scand. J. For. Res.* 18: 391-400.

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Centre for Enhanced Forest Management, Dept. of Renewable Resources, U. of A., Edmonton, AB T6G 2H1

Simon.Landhausser@ualberta.ca

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