

# CENTRE FOR ENHANCED FOREST MANAGEMENT



## ADVANCES IN FORESTRY RESEARCH

DEPARTMENT OF RENEWABLE RESOURCES

EFM RESEARCH NOTE 06/2011



### Nitrate ( $\text{NO}_3^-$ ) stimulates root suckering in aspen

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There has been considerable work showing that the vegetative regeneration of aspen through root suckering is controlled by disturbances that kill the parent tree, thereby reducing the hormones that suppress the sprouting of the shoots (suckering) from the root system. The sprouting response; however, may also be regulated by site factors that are associated with disturbances. In mature undisturbed boreal forests ammonium ( $\text{NH}_4^+$ ) is the dominant form of mineral nitrogen, but following a disturbance, particularly fire, a pulse of nitrate ( $\text{NO}_3^-$ ) is produced. In this work, we proposed that  $\text{NO}_3^-$  can function as a stimulant for the initiation of root suckers in aspen root systems by testing different concentrations and ratios of  $\text{NO}_3^-$  and  $\text{NH}_4^+$  in solutions around aspen root systems.

**Methods:** To obtain large aspen root systems, we grew aspen seedlings for two years in clean silica sand in large pots. After the aspen seedlings had their tops cut off and the sand was flushed free of nutrients using distilled water, we applied nutrient solutions with different concentrations and ratios of  $\text{NO}_3^-$  or  $\text{NH}_4^+$ .



After that the roots systems were allowed to sucker for three weeks. We then determined the number of suckers initiated and their growth rates.

**Results:** Pure  $\text{NO}_3^-$  at moderate concentration produced about twice as many suckers as either solutions of pure  $\text{NH}_4^+$  or combinations of  $\text{NH}_4^+$  and  $\text{NO}_3^-$ .

At high concentrations pure  $\text{NH}_4^+$  appeared to suppress the growth of aspen suckers while the combination of  $\text{NH}_4^+$  and  $\text{NO}_3^-$  produced the greatest amount of sucker growth.

**Implications:** Disturbances such as fire, and to a lesser extent logging, that disturbs the soil and stimulate mineralization, will promote the release of  $\text{NO}_3^-$ . This  $\text{NO}_3^-$  signal increases the initiation of suckers and can explain the higher levels of suckering being observed following disturbance such as fire. It is possible that addition of  $\text{NO}_3^-$  might be a useful treatment for the stimulation of suckering in propagation treatments in nurseries or could even be used in field sites.



Aspen sucker regeneration after a fire, which is known to stimulate  $\text{NO}_3^-$  release.

**Funding** was provided by the Natural Sciences and Engineering Research Council of Canada (NSERC), Ainsworth Lumber Inc., Alberta Pacific Forest Industries Inc., Alberta Plywood Ltd., Daishowa-Marubeni International Ltd., Footner Forest Products, Louisiana Pacific Corp., Millar Western Industries Ltd., and Weyerhaeuser Company Ltd.

**Further Information:**

Landhäuser, S.M., Wan, X., Lieffers, V.J. and Chow, P. 2011. Nitrate stimulates root suckering in trembling aspen (*Populus tremuloides*). Can. J. For. Res. 40: 1962–1969.

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