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Capture of roots of neighbouring trees via root grafts in lodgepole pine.

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Root grafts commonly connect lodgepole pine trees in dense stands. This allows transfer of water and carbohydrates between grafted trees.

It is not clear if this sharing of resources continues after one of the trees dies either by natural causes or from cutting. In this study we investigated whether the surviving tree will capture the root system of its dead partner and if so, does it influence tree growth?

Part 1. We studied grafted pairs of lodgepole pine, where one of the trees had died of natural causes, in 48 year-old stands near Hinton AB. We estimated stem growth of the surviving tree and time of mortality by tree ring analysis. Part 2**.** In 20 year old stands near Swan Hills, AB, we artificially cut trees from grafted clumps, leaving one residual tree per clump. We examined root carbohydrates and stem growth of the residual trees two years later.

Findings: Part 1. Initially the surviving tree was able to capture part of the root system of the dead neighbour; surviving roots were more likely on the graft side of the stump connected to the living tree. Some roots remained alive up to 15 years. Grafts with a large phloem connection maintained a higher number of live roots of the dead tree than grafts with small connections.

When one of the grafted roots died, the graft broke down along the line of the original root tissues (see above arrow).

Part 2. Two years after cutting, most of the roots on the cut stumps grafted to a living tree were still alive; for isolated trees cut two years earlier, roots were dead. However, the starch reserves on the roots from cut stumps were lower than control trees. The residual trees grafted to stumps grew faster after the cutting. Also, tree ring index in the living trees significantly increased following manual thinning, but was unaffected when the grafted partner died naturally.

Implications: Residual trees can capture most of the root system of dead or cut neighbours, but the connections gradually break down over time. Large grafts can retain some grafted roots for up to 15 years, but roots on the opposite side of stumps are lost earlier. Residual trees may have a temporary benefit in growth when connected to a cut tree.

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Further Information:

Fraser, E.C., Lieffers, V.J. and Landhäusser, S.M. 2007. The persistence and function of living roots on lodgepole pine snags and stumps grafted to living trees. Ann. For Sci. In Press.

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