

FOREST INK: Dr. Suzanne Simard pioneers work on tree communication

04 August 2019



I became familiar with Dr. Simard's work through a TED talk where she described her work at UBC which is centered on understanding the vital relationships between plants, microbes, soils, carbon, nutrients and, in particular, how fungus reacts with tree roots.

A mycorrhizal (fungus) network is a series of below-ground mutualistic connections via fungal hyphae (fine roots) and root systems of a plant community.

The role of mycorrhizal association are wide reaching including resource acquisition and sharing, as well as acting as signalling pathways, potentially for individual (genetic) recognition between individual plants. She described how she determined the exchange of gases like CO2 and other nutrients using radioactive isotopes and a Geiger counter. Some of her graduate students have gone on to show kin recognition/selection in Interior Douglas-fir and the role mycorrhizal networks play in that interaction.

Another post graduate student is working on Kin-selected defence-signalling through mycorrhizal networks in interior Douglas-fir. Water, sugar, and nutrients move through the mycorrhizal network and recent work has demonstrated that defence signals can also travel through fine root networks between pine and Douglas-fir.

Work is ongoing to determine whether related trees might send signals preferentially to those they are more related to (kin selection). Ongoing research aims to determine whether transfer occurs in response to herbivory (organisms feeding on plants) and whether that transfer is shared equally with all networked trees, hypothesizing that more herbivory warning signals may be sent to kin over strangers.

Other research has shown Ectomycorrhizal fungi bonds to the root systems of trees is a mutually beneficial relationship: the fungus gains access to atmospheric carbon through the tree, and the tree gains access to water and nutrients in small interspaces that the roots are usually too large for. The selectivity between tree genera was most interesting where fir and birch were exchanging nutrients while fir did not exchange material with cedar. Other work showed the exchange with birch was beneficial with fir because of some medicinal protection features.

While much of the research is of scientific interest there are some important concepts that are useful for forest management.

The Simard researchers have proposed some changes to the way we manage forests based on the centre's results. For example, leaving some old trees is proposed to give the next forest a better start because of the assistance extended to the younger trees. In addition the mutual exchange of materials between conifers and deciduous indicates the advantages of leaving the broad leaf trees in the mix rather than promoting monocultures.

Research is ongoing to determine the critical amount of old growth and deciduous trees that should be retained to give the successive stands the best chance for establishment and superior forest growth.

Many forest ecosystems are experiencing increased drought stress due to changing patterns of aridity, due to both climate change and human land-use activities. Mycorrhizal fungi are known to provide their hosts with increased drought resistance in many circumstances either through improved resource acquisition, direct uptake of water or translocation of water obtained by their hosts.

Source: <u>https://www.wltribune.com/opinion/forest-ink-dr-suzanne-simard-pioneers-work-on-tree-communication/</u>