Hughie Jones – Dec 2011

Douglas-fir
Pseudotsuga menziesii
The Past and Today

Long before Archibald Menzies described this tree and David Douglas collected its seeds, it had received a number of names by the First Nations. One of these names was ‘original tree’.

Humans have occupied the northern Pacific coastal region for thousands of years. The archaeological record of settlements indicates the presence of people around the time of the retreat of the last glaciers, 10,000 to 14,000 years ago.

But the fossil history of the Douglas-fir in this area goes back to the Tertiary period about 50 million years. The cones, seeds and needles of the modern genus *Pseudotsuga* can hardly be distinguished from those of its ancestors. The fossil records also show that during the Tertiary period, Douglas fir was a minor component of the forests of Western North America, unlike today.

This began to change during inter-glacial periods. It is thought that during glacial periods the repeated growth and waning of ice sheets caused large fluctuation in the range of Douglas-fir. During the post glacial period, Douglas-fir emerged as the dominant element in the coniferous forest of Western North America.

About 10,000 years ago, Douglas-fir began to migrate from glacial refugia into the range it occupies today. It established itself on the west coast 7000 years ago. The Douglas-fir had several thousand years of history for the First Nations before the cedar came. Perhaps that’s why Douglas-fir was called ‘original tree’. Western redcedar, which is so central to the northwest coast cultures of the present, was apparently uncommon until about 4,000 years ago. It took that long after the last ice age to build up enough organic material on the coastal forest floor to set the stage for cedar to be well established.

Today the Douglas-fir is undergoing research at UBC. Dr. Suzanne Simard is a professor with the Faculty of Forestry. She researches the role of mycorrhizae and mycorrhizal networks in trees species. In these networks the tree supplies the fungus with carbohydrate energy in return for water and nutrients the fungal mycelia gather from the soil.

Dr. Simard feels that Darwin’s survival of the fittest doesn’t fit the function of mycorrhizal networks. In these networks, plants don’t compete. In fact, they help each other survive. Trees send down carbon into the fungi and the mycorrhizal network shuffles carbon and nitrogen back and forth. Even dying trees pass on resources to living ones – in Dr. Simard’s words, ‘passing on the wand from generation to generation’.

One of her graduate students, Kevin Beiler, has found that all trees in dry interior Douglas-fir forests are interconnected, with the largest, oldest trees serving as hubs, much like the hub of a spoked wheel. The younger trees establish within the mycorrhizal network of the old trees.

Another of her graduate students, Francois Teste, determined the survival of these establishing trees was greatly enhanced when they were linked into the network of the old trees. The increased survival was associated with belowground transfer of carbon, nitrogen and water from the old trees. Maintaining forest resilience is dependent on conserving mycorrhizal links. Removing the hub trees could unravel the network.

This beneficial transfer can take place between different species too. In wetter, mixed-species interior Douglas-fir forests, graduate student Brendan Twieg discovered that Douglas-fir and paper birch (*Betula papyrifera*) trees can be linked by mycorrhizal networks. Carbon is transferred from the nutrient-rich deciduous trees to nearby regenerating Douglas-fir seedlings. This transfer was enhanced when the seedlings were shaded in mid-summer, providing a supplement that may be important in Douglas-fir survival and growth.

It is not one-way though. Another graduate student, Leanne Phillip, discovered that Douglas-fir supported their birch neighbours in the spring and fall by sending back some of this carbon when the birch was leafless. This back-and-forth exchange of resources according to need may be one process that maintains forest diversity and stability.

Dr. Simard believes that what her research team found out in studying these networks confirms the feelings people have always had - the importance of the mother tree (the hub) and all life being connected.

Sources: Plants of Coastal British Columbia – Pojar & Mackinnon; The Forests of British Columbia – Young, Herger, Marx, Seabrook; http://www.royalbcmuseum.bc.ca/Natural_History/Plants.aspx?id=976 - Hebda; VanDusen lecture by Dr. Simard on mycorrhizal networks on Dec 1/2011; www.unilibrium.net/MycorrhizalNetworks.php

Douglas-fir more than a thousand years old in upper Elaho Vallley, BC

I always think that Douglas-fir is our tree, the tree of the Pacific Northwest. I can't imagine other species near or far. But there are two more in North America: Bigcone Douglas-fir in southern California *(Pseudotsuga macrocarpa*) and Mexican Douglas-fir (*Pseudotsuga lindleyana*).

In Asia there are two species: Chinese Douglas-fir *(Pseudotsuga sinensis*) and Japanese Douglas-fir (*Pseudotsuga japonica*). Unfortunately, the Chinese Douglas-fir is IUCN listed as vulnerable from habitat loss due to logging and agriculture.