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Foresters bring light to bear on sickly seedlings

Forestry researchers in British Columbia and Ontario have devised ways of ensuring the health of new forests by measuring the vitality of seedlings. Light detectors developed by Simon Fraser University at Burnaby and a series of diagnostic tests developed by the Ontario government are meant to remedy the ongoing problem of seedlings that look healthy before they are planted but are actually diseased.

"The auto companies don't want to ship faulty cars. We don't want to ship defective trees," says Stephen Colombo, lead scientist for the Ontario Forest Research Institute's stock quality-assessment program. The institute is run by the Ontario Ministry of Natural Resources.

You can't always tell a seedling by its appearance, Mr. Colombo says. Nurseries have found that frozen seedlings are less prone to damage in storage and shipment so they typically remain frigid until planting.

But much as a head of lettuce looks fine when frozen but will rapidly deteriorate when thawed, so tree seedlings that are green when frozen might later prove to be badly damaged or dead, Unfortunately, their condition may not be revealed until weeks after they are planted.

Hundreds of millions of pines and spruces are planted in Canada each year. If more than 10 per cent of seedlings die in each plot, large gaps will result and replacement can cost more than the original planting.

Ontario's quality-assessment program has developed sophisticated equipment to measure tree energy and growth potential to head off problems. The program's equipment and diagnostic tests were presented by scientists from the Ontario Forest Research Institute at a conference in Sault Ste. Marie this week.

An Ontario study found that testing a random sample of as few as 150 seedlings from a batch of 350,000 gives a representative indication of the health of the entire group.

The most impressive of the tests on seedlings used an ultra-sensitive meter developed at Simon Fraser to measure an effect called chlorophyll fluorescence. When light is absorbed by the pigment of a tree, not all of it can be used by the chlorophyll during photosynthesis and as much as 5 per cent of it is released from the needles as a fluorescent glow not visible to the eye.

In the B.C. system, built by a now-inactive company called Pacific Fluorotec, a seedling is placed in a globe about 20 centimetres in diameter in a dark room and an ordinary light bulb is turned on and off. An array of miniature sensors around the sphere measures the light emitted by the needles, in patterns that Mr. Colombo likens to lines on an electrocardiogram. A high spike of light from the young tree represents vigour and a flat line means a dead or failing tree.

One of the simplest warnings of trouble is a high number of dead cells in a seedling. The Ontario institute found it can easily measure this by putting a tree shoot in water for 24 hours and testing the water's electrical conductivity. A pencil-sized meter passes a small current through the water. A higher conductivity shows there are more dead cells in a tree, perhaps from heat stress or freezing. Another simple diagnostic trick developed at the centre involves pot- ting seedlings in a climate-and-light-controlled room. After a week, the number of new roots is counted. One seedling may only have 10 new roots, while another has 100. The researchers are now trying to determine how much of that difference is genetic and how much is due to fertilizers.

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