



The Northern Forestry Centre Research Greenhouse

When the Canadian Forest Service's (CFS) Northern Forestry Centre (NoFC) opened in 1971 in Edmonton, it included a 465-square meter (5000-square foot) greenhouse. Over the years, demand increased for greenhouse services for work related to forest research, such as tree, shrub, and plant seedling cultivation; consequently, a larger facility, constructed in 2001, replaced the original greenhouse.



Figure 1: External shot of the NoFC greenhouse. (Photo: Tod Ramsfield)

Colin Myrholm, Forest Pathology Technician at NoFC, states, "The current facility provides NoFC researchers and technicians with the space and technology they need to complete their research. The now 654 square meter (7,040 square foot) glass greenhouse divides into eight compartments, each with its own individually controlled environment. Environmental conditions, including lighting, humidity, temperature, air circulation and irrigation, are controlled and monitored through an integrated computerized system."

Researchers are able to perform research on topics and processes such as growth, nutrient uptake, and dormancy effects on trees and other plants. In an ongoing effort to maintain a high-quality and energy efficient research environment, LED lighting, installed in 2016, replaced less efficient high-pressure sodium lights. The LED lighting system now provides NoFC researchers the ability to manipulate the light spectrum to different wavelengths thereby expanding research capabilities to include how these different wavelengths affect the growth of various tree and plant species. Results from these types of research initiatives could be beneficial to greenhouse growers who supply seedlings for reforestation of managed forests.

The greenhouse can help address NoFC's four priority research areas: boreal ecosystem ecology, climate change and forests research, land reclamation, and wildland fire. For example, as part of a land reclamation project, researchers are examining the growth of native plants in soils collected from oil sands surface mining and in-situ oil sites. Other projects explore how wastewater from the oil sands process (tailings) affects growth rates of native tree species, and how beneficial microorganisms can enhance the growth of aspen on reclaimed sites. This is important work with far-reaching implications, which will improve industry's ability to restore land that was disturbed by oil and gas or mining projects.



Figure 2: Experiment to understand the effects of root associated fungi on aspen growth. (Photo: Tod Ramsfield)

In the greenhouse, NoFC researchers focusing on boreal system ecology are able to rear insects from jack pine and aspen in order to assemble a checklist of insects associated with those species in Canada's boreal forest. Studies are also underway to better understand the relationship between various tree disease pathogens and the mountain pine beetle (*Dendroctonus ponderosae*). This work could result in policy changes and industrial practices to help improve sustainable forest management.



Figure 3: Experiment to understand the potential of *dothistroma septosporum* impact on boreal pines under a changing climate. (Photo: Tod Ramsfield)

The CFS' virtual research centre, the Canadian Wood Fibre Centre (CWFC), relies on the NoFC greenhouse facility as a tree nursery to control ambient temperature, humidity and lighting, to quickly and efficiently raise controlled planting stock, for use in various research trials, such as fast growing hardwood seedlings (hybrid poplars and aspen). Once mature enough, the seedlings are transferred to outdoor experimental plots for use in afforestation, reforestation and revegetation initiatives, to explore potential ecological, economic, and social benefits.

"Collaborators and partners are also a key component in much of the research undertaken at NoFC", says Myrholm; "Facilities, such as the greenhouse, are a draw for collaborators and partners who may not possess or have access to such a facility themselves, or perhaps require additional greenhouse space for new or ongoing forest science research. Over the years, these partners have included provincial governments, private companies, universities, as well as other federal government departments." These collaborations benefit the CFS' research programs and provide valuable insights into sustainable land management.

As challenges and opportunities evolve in Canada's forests, facilities such as the NoFC greenhouse will continue to play an important role as NoFC researchers and their collaborators work to mitigate problems, adapt to changes, and seek innovative solutions for the forest sector - a benefit to all Canadians!

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Figure 4: NoFC Reclamation Technician, Ruth Errington (plaid shirt), provides a teaching moment to Lakeland College students, April 3, 2017. (Photo: Ray Darwent)