Foreword

Northern forest management issues

In British Columbia, our northern forest ecosystems are under increasing developmental and utilisation pressures. Some of the more urgent current issues include the following:

1. The more temperate forest ecosystems have been heavily harvested and the timber supplies in coastal and southern-interior British Columbia are being decreased. Northern British Columbia forests comprise an escalating proportion of the province’s Annual Allowable Cut, and extensive silviculture investments are being made to accelerate the growth of northern managed forests.

2. There is a growing interest, among northern communities, in community-based management of local forest ecosystems on a sustainable basis, so that a greater portion of forest-resource-based revenues can be dedicated to community economic and social stability/sustainability.

3. In view of aggressive wildfire management in British Columbia, many of our older forest ecosystems are experiencing increasing incidence of other forest renewal agents, e.g. insects and disease, on a growing portion of the land-base. Management of these large-scale disturbances (i.e. salvage harvesting) often will result in very large (hundreds of hectares in size) cutblocks which create unique ecological conditions and substantial challenges for ecosystem restoration.

4. Our northern forests are experiencing greater utilisation by other stakeholders and recreational users. Also, many of British Columbia’s northern forest ecosystems exist in or near areas considered pristine wilderness, and there is increasing societal pressure to preserve greater area of undisturbed northern forest ecosystems.

These forest management issues are not unique to British Columbia or Canada. Many countries in the northern hemisphere are facing or have faced similar pressures on their forest resources.

Northern forest ecosystems

Northern forest ecosystems have several important features which challenge forest-management programmes intent on maximising timber productivity from such ecosystems. In many northern forest ecosystems, these features include:

- long, cold winters, and shorter growing seasons;
- slower organic decomposition rates, and accumulating forest floors;
- slower-growing trees;
- frequent large-scale natural disturbances;
- a mosaic of microclimate conditions throughout the stands;
- a high level of horizontal and vertical ecological diversity;
- a high incidence of pests and disease in older stands
- very pronounced and often lengthy (60–100 years) seral stages;
- very prolific and rapidly-growing herbaceous and shrubby vegetation in the earlier seral stages;
- a large variety of mixed-species forests, particularly mixes of broadleaf and coniferous species, and a complex mosaic of tree ages and seral stages.

The knowledge and experience we have accumulated in northern forest management in British Columbia tell us that forest management practices, which work in more temperate climates, are not necessarily the best practices for northern ecosystems. Some of our conclusions from the ‘School of Hard Knocks’ include:

1. most northern forest ecosystems are not amenable to intensive plantation forestry as practiced in warmer areas; while northern forest ecosystems
are generally very productive ecologically, site-specific conditions (e.g. terrain, accessibility, site topography, variable soil types and textures, and microclimate) and the shorter growing season (i.e. longer rotation length to harvest) make it difficult to justify the higher levels of investment for intensive plantation forestry in the north;

2. converting mixedwood or broadleaf stands to pure coniferous stands is operationally difficult and expensive; such conversions can require practices which involve extensive (and expensive) soil disturbance and/or repeated vegetation-control treatments;

3. even-aged management practices are not the most ecologically acceptable in many of our northern stands which have a diversity of tree species, age classes, horizontal and vertical ecological conditions, and microclimates;

4. the thicker northern forest floors can tolerate greater levels of in situ disturbance; many soils actually require greater levels of in situ disturbance (site preparation) in order for successful re-planting; and

5. the forest floor in northern forest ecosystems must not be displaced because it represents the regenerative capability of these ecosystems.

Ecology and management of northern forest soils

Forest managers have recognised that forest soil organic matter represents the capability of forest ecosystems to regenerate and sustain the necessary processes to facilitate aboveground productivity. We have also recognised that the level of biological diversity is high in northern forest soils. Because of the increasing pressures being faced by northern forest ecosystems, forest soil scientists believe that there is a pressing need for:

- greater understanding of the ecology of northern hemisphere soils;
- a greater awareness of the ecological impacts of forest management on northern forest soils;
- an evaluation of the effectiveness of soil conservation guidelines, in terms of ecosystem sustainability, from different jurisdictions around the northern hemisphere;
- an identification of the shifts/changes in direction required for soil management guidelines and the information and operational needs to accomplish this change;
- identification and understanding of the requirements for the ecological restoration of degraded soils in northern climates.

A conference entitled, ‘Ecology & Management of Northern Forest Soils’, was held at Prince George, British Columbia, Canada, on 13–18 June 1998, to address the ecology and management of soils and forest floors in boreal, sub-boreal and montane ecosystems throughout the northern hemisphere. In conjunction with this conference, a pre-conference workshop, ‘Methods of Studying Soil Organisms and Processes’, and several field tours to forest management research and operations sites were also held. Forest soil researchers (including many graduate students) from Canada (British Columbia, Alberta, and Ontario), Finland, and Sweden delivered nearly 75 oral and poster presentations covering the following themes:

- ecology of northern hemisphere forest soils, i.e. forest floor structure and variability, the diversity and biology of soil organisms, microbial-faunal interactions, symbiotic and antagonistic associations, organism activity in forest soils, biological activities during the winter months, the diversity of ecosystem processes within the forest floor, and the effects of environmental factors on forest floor processes;
- methods of studying and characterising soil organisms, particularly mycorrhizae, rhizosphere bacteria, and Protozoa;
- methods of determining soil organism responses to ecological factors;
- ecological impacts of forest management, i.e. the short- and long-term impacts on the abundance and diversity of soil organisms, on seedling-mycorrhizal associations, on seedling root development, on the structure and dynamics of the forest floor, on forest floor microclimate, and on the biological processes in the forest floor; and
- impacts of rehabilitation treatments on soil structure and processes, nutritional status, and seedling survival and growth in northern climates.

A selection of the presentations comprises this special issue.

An important discussion point at the conference was that, while there is a diversity of forest soil ecology research underway throughout the northern hemi-
sphere, there are too few opportunities for soil researchers and forest managers to share that information and to apply it to operational plans and problems. It is the intent of this special issue to demonstrate that there is meaningful and applicable forest soil management research being done in northern forest ecosystems, and that the sustainable management of these northern ecosystems requires such research to improve our understanding of northern forest soils and the management practices required.

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