Session 6. Silviculture and production of wood and non-wood forest goods

Summary report

Presentations and discussions in this session identified the following examples of past and present changes in forests that could be attributed to climate change.

- Lichens comprise up to 80 percent of winter reindeer diet in boreal forests. Forest management affects lichen availability in many ways. Current conditions of young dense forests have reduced arboreal lichens; logging residues make ground lichens unavailable. Growing seasons have increased in northern Sweden in the last decade which is expected to affect lichen abundance.
- Scots pine in the Czech Republic has greatly increased in recent years. They are often stressed by growing on poor desiccated sandy soils. Moreover, climate trends continue to become drier and warmer.
- A potential source of clean energy is an increasing consideration under climate change conditions. In the US, many forests are densely stocked owing to fire suppression practices. Much of this low quality wood would be suitable for biofuel production if economically viable. Economics of forest biomass utilization is often related to proximity to a processing plant.
- Windstorms that uproot trees often provide microsites allowing natural forest regeneration in Eastern Europe. Spruce is more vulnerable to storm events than hardwoods and even-aged stands are more susceptible than uneven-aged stands.
- Norway spruce is an important species in German forests. Thinning following the extreme drought (hot/dry) events of 1976, 1992, and 2003 showed that the resistance against drought stress cannot be significantly improved by thinning. However, the resilience, as measured by the recovery of basal area growth, was more rapid in trees from heavily thinned stands.
- Foresters are being asked to quantify the impacts of harvesting and thinning on carbon dynamics (net carbon exchange with the atmosphere). In Canada, balsam fir ecosystems recover photosynthetic uptake relatively quickly after thinning by a variety of means and this response offsets additional ecosystem respiration due to decomposition of logging residues. It is estimated that a clear cut and unplanted site in the balsam fir ecosystem will become a net sink for carbon in year 6 after harvest.
- The focus of silviculture has been fast-growing trees. As a result the robustness of natural stands has been reduced with modern silvicultural practices. Foresters need to work with ecologists and geneticists to restore the vigour of diverse natural stands even when non-native tree species are included in the mix. There is a need to identify the tree traits that should be emphasized to provide forest ecosystem stability under the stresses of changing climate.

Some of the future impacts of climate change on forests and on people and institutions that were identified by participants include the following.

- Predicted longer snow-free seasons, increased ice crust, and increased tree productivity are expected to decrease accessibility to lichens by reindeer. Increased forest practices such as clear-cutting, fertilization, decreased rotation time, and road creation will also negatively affect lichen availability to reindeer. Conversely, the positive effects of warming and associated increased forest management may provide forage other than lichens to reindeer.
- Severe storm events are expected to increase in Europe causing more wind damage to forests, are even-aged stands especially at risk.
- Excess woody debris in US forests that is not suitable for other wood markets potentially offer a promising source of biofuels while effectively reducing the risk of stand replacing wildfires.

- Employing silvicultural actions on forests affected by climate change will influence non-wood forest products and ecosystem services.
- Some research found that large, fast-growing, dominant trees may be more susceptible to drought perhaps because they have large crown to root ratios.
- Creative silvicultural techniques will be needed to manage the transition of stands and landscapes where one or more species is beginning to die out and the establishment of a new suite of species.
- Managing native species that are well adapted to a site should become higher priority.
- Developing a market for wood biomass in local forest communities may provide an economic boost to local economies that are suffering from a depressed lumber economy.
- Non-wood forest products will be increasingly important in the future but little effort has been given to planning for their sustainability in climate change scenarios.
- Meetings such as this Forest Adaptation conference need to held in developing countries to allow a maximum number professionals from the region attend. Educating young professionals from developing countries (now) to deal with forest adaptation processes is important. IUFRO is sponsoring a Special Program for Developing Countries (SPDC) that can promote this interaction but additional sponsorship is needed for this program.
- The full economics of using wood biomass should be calculated to encompass all costs, for example the reduction of firefighting costs.

Participants discussed potential management actions and identified the following options. Sustainable development of reindeer husbandry can be improved with long-term joint planning between forestry and herders to sustain lichens. Scots pine monocultures in Czech Republic can be thinned to support climate change adaptation of young trees by reducing competition for water. Promoting uneven-aged stands with a mix of naturally regenerated hardwoods will provide more climate change resistant stands. Silvicultural treatments that include biomass utilization strategies may accomplish socially and economically acceptable restoration techniques for forests affected by stresses from climate change. As forest conditions evolve under climate change we will be continually redesigning silvicultural systems to address future questions. Maintaining the flexibility needed to applying adaptive management will be critical.

Existing silvicultural data, for example tree ring data or existing long term trials, can be used by scientists today to help answer climate change related questions without initiating new studies. In order to get answers soon we need to be "data mining" the rich resource of existing information. Here IUFRO's Global Forest Information Service (www.gfis.net) may be of help.

Participants noted that more research is needed on the relations of non-timber forest products and services in climate change scenarios. Funding opportunities also need to be made available. Institutions need to make data available for sharing. Again IUFRO's Global Forest Information Service (www.gfis.net) could be of help. Existing provenance studies will be valuable to create new studies in climate change conditions. New trials are also critical as many questions have no historical basis. Enhanced cooperation among institutions will be increasingly important. Initiating trials that require moving tree species into new areas may require a new set of transport regulations to allow research on species shifts into new areas while assuring safe introduction that will gain public approval.