

# **THE FOREST MANAGEMENT UNDER THE NEW CLIMATIC CHANGE**

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## **Introduction**

Numerous investigations have indicated that the climate change will impact strongly on forest growth and composition. We have only a hazy picture of what climate changes may occur and an even less clear understanding of their impacts on forests.

Forest management decisions made now will affect forests many decades into the future. Thus, it is important for managers to take account of how forests may respond to future climatic conditions.

Unfortunately, the picture of what the climate will be at specific locations and times in the future is not clear. Even less clear is the picture of how organisms will respond. Consequently, management actions to address climate change must be flexible. further

Actions will be further complicated by differing values placed on forests by society, disagreement on whether impacts of climate change are positive or negative, and the priority of governments for addressing other impacts.

Information on past climates and associated vegetation communities (paleoclimatology and paleobotany) and computer simulations have been used to predict impacts of future climate change on forests. However,

- different variables are driving future climate change, and there is a much different landscape (e.g., disturbance regime) than existed centuries ago.
- Also, much of the work, modelling the response of vegetation to climate change, is inadequate. A major concern is that most models are not physically or physiologically based.

Spittlehouse (1996) note the need to assess sensitivity to changes in climate. Sensitivity will vary with species, ecosystem and climate variable.

### **Actions must be done**

- To adapt managed forests to changing environmental conditions it may be necessary to modify traditional forest management strategies.
- We need to improve our knowledge of the sensitivity of species and ecosystems to climate, to continue provenance trials in different climatic regimes, and to develop adaptive management strategies.
- Planning for the unknown is not as daunting as it may seem. The first step requires policy makers and resource managers to accept that change is probable and that responses can be developed.

### **Incorporating responses into forest management planning requires:**

- A clear definition the problem, that is, the level of change at which action is needed.
- The determination of the sensitivity of forest organisms to changing climate.
- The development of management responses to be implemented when the changes occur, and actions needed now.
- Monitoring of forests to assess if and when changes are occurring.

Public policy has to consider more than just climate impacts. Population changes, economic growth, health, education and safety have the highest priority. Society has a large financial and social investment in the status quo and may view the cost of “doing nothing” as less than the cost of responding. Whether the climatic changes are positive or negative depends on society's values.

### **Some possible problems will be arisen from the future climate change, to warmer and drier conditions**

#### **Fire frequency**

*Problems:* Warmer and drier conditions may increase the frequency of fires.

*Actions should be done:* We already have an extensive fire monitoring network. We should increase fire-safety consciousness in rural areas. There may be opportunities to improve the utilization of wood salvaged after fires. Changing stand structure and species mix may make the forest less vulnerable to extensive fires.

#### **Changes in growth and yield of forests**

*Problem:* Warmer and drier conditions may result in reduced growth rates of existing forests. This will affect timber availability, and may also affect international sales through greater competition from countries where tree growth has increased.

*Actions should be done:* Determine climatic regimes of various ecotypes and compare growth capabilities under a range of climates, e.g., provenance testing program. Develop growth and yield models that explicitly assess the effect of climate on tree growth.

### **Reforestation problems**

*Problem:* Warmer and drier conditions may result in poor survival and growth of seedlings in certain areas.

*Actions should be done:* Development of drought tolerant stock. Review provenance trials for drought tolerance of ecotypes. Application of site preparation techniques that already developed for dry environments. Consider planting alternate species.

### **Wildlife, non-commercial plant species, wilderness areas and parks**

*Problem:* Forest habitats will change as the forests adjust to the new climate. Intervention through intense disturbances and reforestation is not a normal activity in wilderness areas and parks.

*Actions should be done:* Leave migration corridors in managed areas. Maintain healthy and diverse managed forest ecosystems. We should not rely on only protected areas to maintain biodiversity. Seeding with non-commercial species in areas where the climate has become suitable.

## **Conclusions**

- It is possible to develop forest management responses to future unknown climates. This does not mean that we will be able to manage for all negative impacts, or take full advantage of any positive impacts.
- Responses include deciding the degree of change in the forest that constitutes a problem, determining possible solutions, and initiating monitoring programs to determine when intervention is required.
- Research is needed to identify species and forest ecosystems at greatest risk, and to better quantify the ecoclimatic limits and sensitivity of commercial species.
- Impact analyses should be done using physiologically based models with short time steps, and should determine the impact of changes in intensity and frequency of extreme climatic events.
- Management to ensure sustainable forestry, maintain biodiversity, reduce fragmentation and preserve habitat will help to adaptation for climate change.
- The most difficult adjustment will be society's need to revise expectations of, and demands on, forests.