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and Forest Genetic Resources

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Program

9:30 Opening ceremony. Welcome by Cuauhtémoc Sáenz-Romero, organizer.

10:00 Global trends in forestry. Tim White, University of Florida and USDA Forest Service.

10:40 Potential climate change impacts on forests and forest genetic resources in Canada. Judy Loo[1] Jean Beaulieu[1], Barry Jaquish[2] y Hans Ottens[1]. [1]Canadian Forest Service, Natural Resources Canada, [2]British Columbia Ministry of Forests.

11:20 Recess.

11:40 Climate Change and the Fragmentation of the Arcto-Tertiary Forest. F. Thomas Ledig, Institute of Forest Genetics, USDA-Forest Service, California.

12:20 Global climate change and biodiversity in forests of the southern United States. Margaret Devall, Center for Bottomland Hardwood Research, Mississippi.

13:00 Potential effects of Global warming on Michoacan forest. The case of Uruapan region. Cuauhtémoc Sáenz-Romero[1] and Gerald E. Rehfeldt[2]. [1]Instituto de Investigaciones sobre los Recursos Naturales, UMSNH, Michoacán, México. [2]Rocky Mountain Research Experimental Station, USDA-Forest Service, Idaho.

Trends in Global Forests

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Approximately one-third of the world's land area is covered with forests and these forests provide countless social, economic and environmental values. The world's forests today represent approximately one-half of the forests that existed in the year 1066, and deforestation is still continuing in some areas today. In fact, in 1960 there were 1.2 ha of forests in the world for every living person. By 1995, that value dropped in half to 0.6 ha of forests per person as the joint result of deforestation and an increasing world population. Concomitantly with the decrease in forested area in the world, the demands on these forests are increasing. For example, the demand for wood products for both industrial and domestic uses is expected to increase by 40% in the next 20 years.

One way to meet this increasing world demand for forest products, and at the same time to foster conservation of natural forests, is to encourage wise, sustainable use of plantations. Plantations currently account for less than 5% of the world's forested area, but supply one-third of the world's industrial wood. Because forest plantations grow faster than native forests and can be located on non-forested lands near communities, they can reduce the need to harvest native forests. Plantations are equally important for producing wood for industrial areas as for domestic uses. In fact, countries such as China and India have started large community plantation programs to produce trees for local domestic uses.

Plantations are not appropriate for all regions or localities and they generally have lower biodiversity than native forests. However, plantations have an important role to play in meeting the social, environmental and economic demands on forests. There are many types of forests that are and will be important in the world: Natural old-growth forests, managed second growth forests, agroforests, urban forests and plantations. Forest scientists have a special opportunity to educate the general public about the wise use of all types of forests and the various roles that these forests serve in production and conservation.

Climate Change and the Fragmentation of the Arcto-Tertiary Forest

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The Arcto-Tertiary Forest was a wide-spread temperate forest of conifers and broad-leaved trees that occurred above 50°N latitude during the Eocene. As a result of the cooling climate in the late Eocene and Oligocene, the Arcto-Tertiary Forest migrated south to the area occupied by the current United States. Tectonic activity during the Miocene created the central Cordillera, enabling the Arcto-Tertiary Forest to migrate further southward into México. The rain shadow created to the east of the Central Cordillera split the mesophytic forest in two. Further orogeny raised the Olympic, Cascade, and Klamath Mountains, the Coastal Ranges of Oregon and California, and the Sierra Nevada, and resulted in an increasingly arid continental interior, hostile to the Arcto-Tertiary Forest. In the western United States, many species of the Arcto-Tertiary Forest went extinct. Forests resembling the Arcto-Tertiary Forests now exist only in the southeastern United States and eastern Asia. Some species survived in strongly zoned habitat, mostly in coastal California. Examples are *Sequoia sempervirens*, *Picea breweriana*, *Chamaecyparis lawsoniana*, and *Abies bracteata*. In México, Arcto-Tertiary species survived in pockets of mesophytic, montane forest in the Sierra Madre Oriental. Examples are *Fagus grandifolia* var. *mexicana*, *Liquidambar styraciflua*, and *Picea martínezii*. Some of these species now have low genetic diversity. Moreover, further warming will almost certainly eliminate many of them because they are already at high elevation and can neither retreat upward nor cross the arid gaps that separate mountain ranges. To preserve their genetic resources, *ex situ* protection probably will be necessary.

Global climate change and biodiversity in forests of the southern United States

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This presentation examines the effect of projected future climate change scenarios on biodiversity in the southern United States. Climate change could affect biodiversity at genetic, species, ecosystem, and landscape levels. Although the increased level of CO_2 could have beneficial effects on plants, climate change could affect the interactions of organisms with one another, for example causing plants to bloom before their pollinators are available, resulting in insects or fruits and seeds being available at the wrong time for migrating birds, and cause modifications that few scientists have considered. Certainly many ecological systems will be drastically changed by climate change. Large northward alterations in the range of species are expected, causing communities and ecosystems to change in composition, and extensive species extinctions are likely to occur.

Potential effects of Global warming on Michoacan forest. The case of Uruapan region.

Cuauhtémoc Sáenz-Romero[1] and Gerald E. Rehfeldt[2]

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Genetic variation among *P. oocarpa* populations for quantitative traits along an altitudinal gradient was investigated by establishing a provenance/progeny test from five populations collected along an altitudinal transect (1100 m to 1500 m) near Uruapan, Michoacán, Western México. We investigated also contemporary climate (temperature, precipitation, degree days > 5 ^{o}C and annual moisture index) and climates projected for 2030, 2060, and 2090 for the provenances and the test site. Estimates of future climates used output from the Canadian and Hadley General Circulation Models.

Results of field test juvenile growth (2.5 years old) suggest an altitudinal pattern of genetic differentiation among *P. oocarpa* populations. We suggest guidelines for seed and seedling transfer based on delimitation of three altitudinal seed zones of 200 m of elevation breadth. Predictions of future climate (year 2090) indicate an average annual temperature increase (3.8 °C), and an increase in aridity (26 % of an annual moisture index). Changes of this magnitude should create an adaptational lag as populations cease to inhabit their climatic optima. Mitigating these effects will require seeds to be transferred upwards in altitude.