NORTHERN FOREST RESEARCH CENTRE: 1979 STUDIES IN ALBERTA WITH CLIMATOLOGICAL INPUT

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Analysis and quality control of the climate data collected in the Hinton area continued in connection with the study of clearcut areas and the effect of the stand edge on microclimate conditions for pine and spruce seedling growth. For the study of climatic variation on boreal forest biomass production, tree ring disks were collected in the Lac La Biche and Swan Hills areas for dendroclimatological analysis. Sources of other proxy data for establishing the history of climatic variations in the boreal zone also were identified, as were climatological stations with long-term records that will be useful for future analysis.

Fifteen climatic parameters were used to characterize the climate for input to the biogeoclimatic ecosystem classification of Alberta. Data were only employed from the year-round recording stations, however, a start was made to generate winter data for summer-only stations to increase the available network, especially in the north and mountainous areas. Climatograms depicting representative climatic stations were developed for the different biogeoclimatic zones.

The collection and analysis of precipitation for pH and chemical levels continued through the growing season at the 13 biomonitoring sites in the Athabasca Oil Sands area to assist in the determination of pollutant deposition patterns. (Similar studies are being carried out

around the smelter plants at Flin Flon near the Saskatchewan/Manitoba border and at Thompson, Manitoba). This monitoring work has involved the development of a suitable precipitation collector for pollutant deposition studies in remote areas.

Two climate stations established 70 km south of Grande Prairie to monitor microclimate and seedling growth performance were operated again in 1979 from May to mid-October. Parameters measured included daily temperature, precipitation, wind recording, and air temperature near the ground.

Progress continued in forest fire research within the fire behavior program toward improvements in the Fire Weather Index System. This included studies on the microclimatic differences between forest stands and the open in terms of solar radiation, temperature, relative humidity, wind speed, and rainfall at the ground level; seasonal changes in moisture content, dry-weight content, and heat content within the living foliage of major conifer species; basic relationships between the weather and moisture content of various dead components of the forest phytomass under controlled (laboratory) and uncontrolled (forest) conditions; and fire behavior and fire effects in relation to a range of weather conditions and total phytomass within jack pine stands of variable density. This last study involved 12 experimental burns, 8 in 1978 and 4 in 1979.

Prescribed fire was also used in Elk Island National Park as an effective management tool for perpetuating plant species diversity, specifically to prevent encroachment of woody plant species onto selected

grassland communities. During the burn period, temperature, relative humidity and wind speed and direction were recorded approximately every 3 minutes to ensure that the burning prescription was met; the synoptic weather pattern had been ascertained earlier on the burn days.

At the James River forest hydrology site, 13 climatic stations measuring wind speed, air temperature, and relative humidity were established in clearings ranging in size from 1 to 20 tree heights. The wind and air temperature data for selected periods have been analysed, and a report regarding the modification of wind speed and thus evaporation potential in small clearings has been prepared for presentation at the 1980 Western Snow Conference. The report analyses wind speed and its three dimensional components measured at 2 m in 12 circular forest clearings ranging from 20 to 120 m in diameter. These were compared with similar observations above the canopy and in the center of a 400 x 400 m square clear-cut. One good observation period of 7 days with mean wind speeds above canopy of 24 km/hour occurred in April, 1979. Wind speed in the 400 m clear-cut was reduced to half that above the canopy to 1/10 that in the 120 m diameter circular clearing, and further to a mean of 0.24 km/h in 20 m diameter clearing. Vertical wind fluctuations in 80 and 120 m diameter clearings were about four times those in 20 and 40 m clearings, which were of the order of 0.1 m/sec.

Climate data collection continued on the Marmot Creek experimental basin, including snow course data in late March. Reports are being prepared on snow accumulation, soil moisture alteration, and increased spring flow on the Streeter basin watershed following the treatment to improve range quality for wildlife and domestic livestock.

A combined snowmelt-evapotranspiration model was adapted for local computer use, and routines were incorporated to include local snow accumulation and melt relationships derived from James River data. The watershed model was used for simulations on Tri-Creeks, Twin Creek of the Marmot Basin, and for a proposed watershed management pilot project that involved generating climatic variables needed by the hydrologic model.

PROCEEDINGS OF THE
1980 ANNUAL MEETING OF
THE ALBERTA CLIMATOLOGICAL ASSOCIATION

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