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PROGRESS REPORT

for
Collaborative Research Agreement

Plantation Performance in relation to varying Prescribed Fire Intensities compared with Mechanical Site Preparation

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Introduction

This report describes the progress made for the experiment described in Appendix A of the original Collaborative Research Agreement (CRA). The CRA was negotiated during the second year of the experiment, in 1991. At that time 40 plots had been clearcut with the slash left in place. There are an additional 40 uncut plots available at the Frontier Lake Experiment (FLE) for fire behavior work and as undisturbed controls for other studies not covered under this CRA.

Background

The objective of this experiment was to assess the effects of varying prescribed burning intensities with mechanical site preparation (disk trenching) and compare seedling performance, nutrient use efficiency, substrate impacts and competing vegetation between the treatments.

The last progress report (1992) described the burning (Table 1) and disk trenching treatments. Briefly, ten clearcut plots with slash left in place were burned in replicates of two on five different burning days during the summer. In the fall ten plots were disk trenched according to standard OMNR operating procedures. Ten plots were left as untreated controls.

Progress during 1992

In the spring 10 000 red and 10 000 white pine container stock seedlings were planted in a split plot design on all plots, regardless of whether they were part of the experiment or not. At three locations within the experimental installation data loggers were installed to record temperature at three depths, soil moisture, and photosynthetically active radiation (PAR) during the growing season. Soils were sampled at the time of planting and 15 seedlings were dried and separated into needles, wood, and roots to assess initial substrate and seedling nutrient status (time = 0). Chemical analyses for time = 0 samples are ongoing and to be reported in the next progress report.

First growing season results

As the summer progressed it became apparent that seedlings on the control treatment were suffering significant mortality, especially white pine (Fig.1). The reason for this is not quite clear at present. Soil temperature profiles on control plots are similar to the other treatments (Fig.2). Photosynthetically active radiation received by the seedlings (indicative of competition

Frontier Lake Mortality Survey

First Growing Season

1992

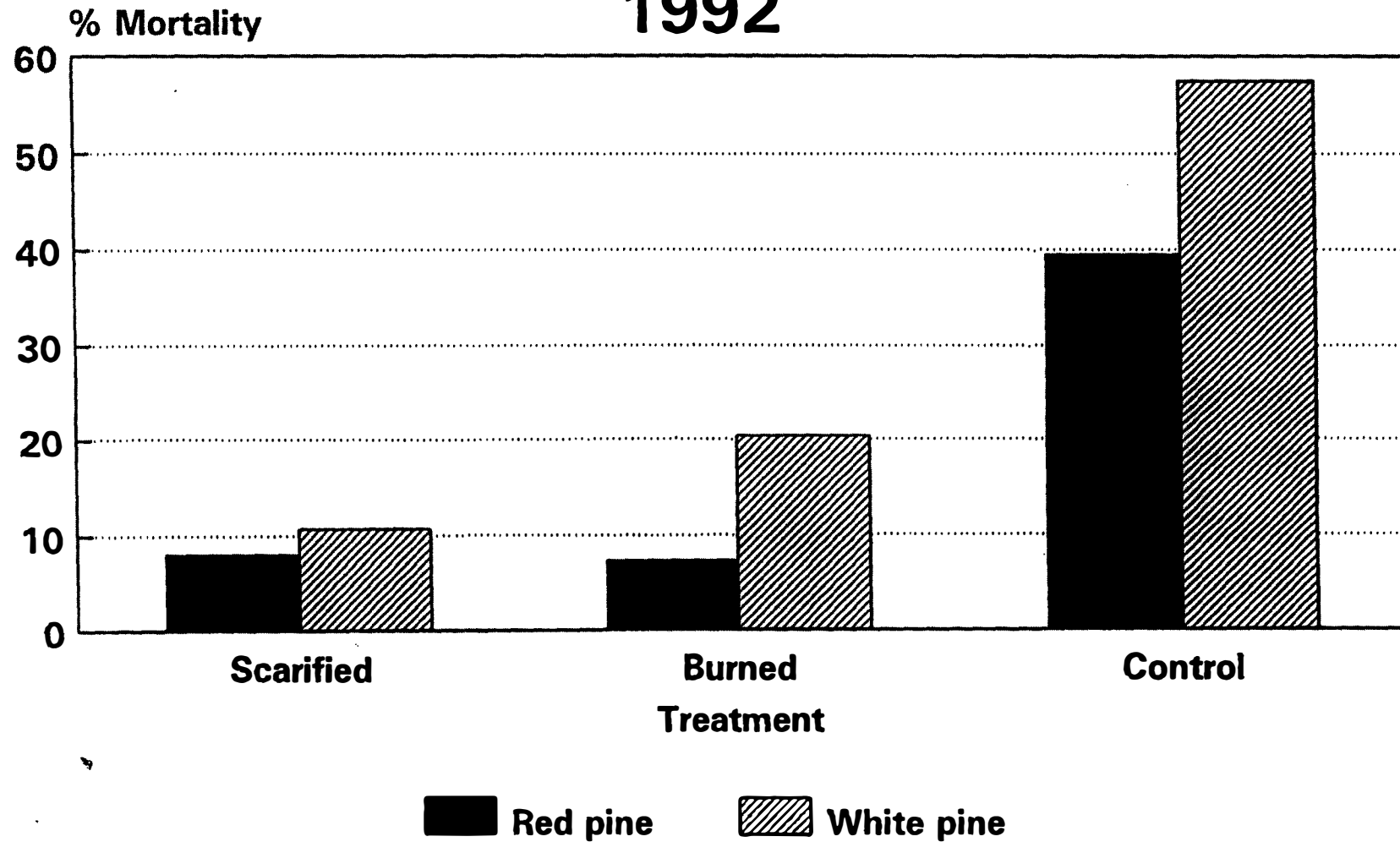
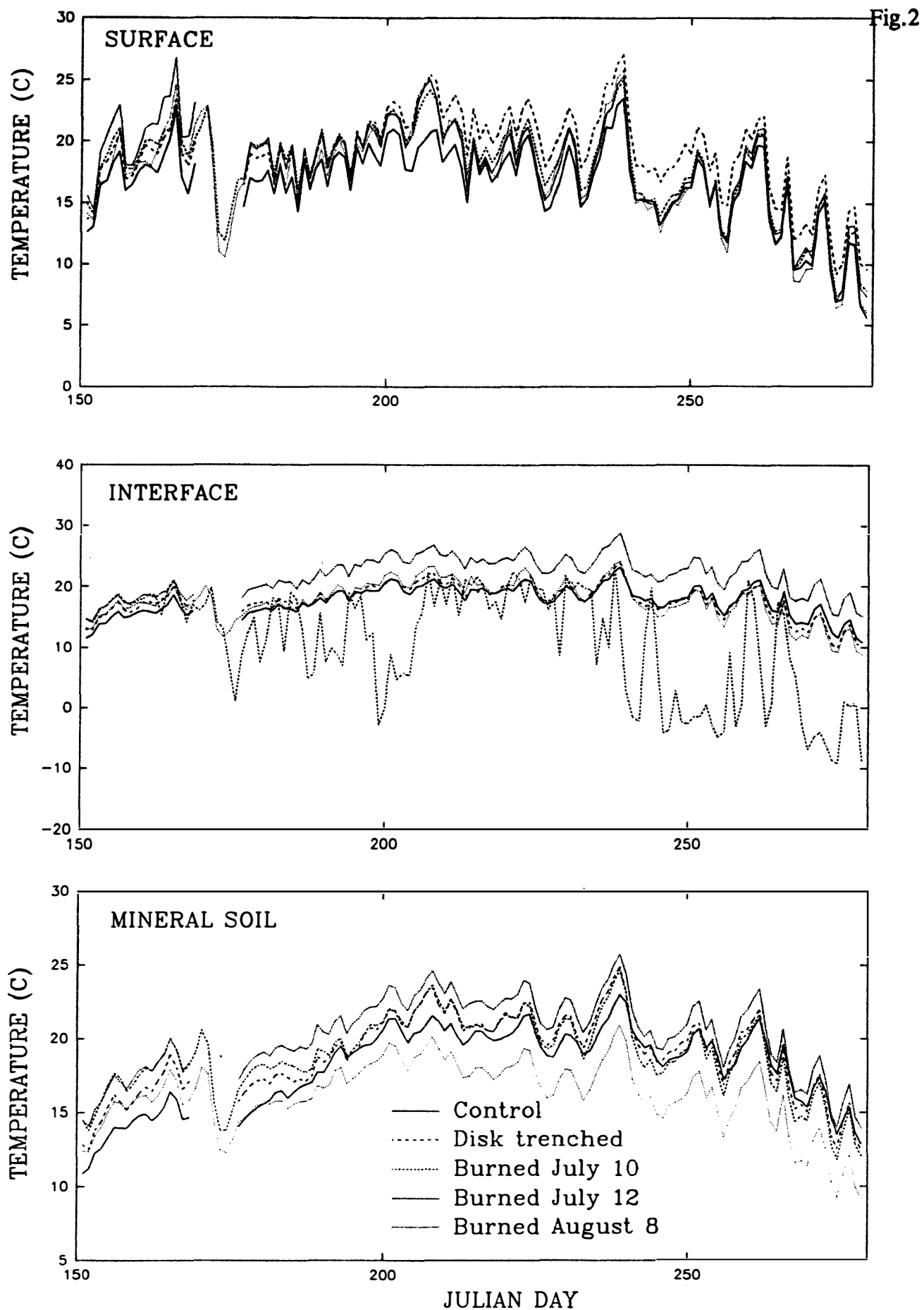


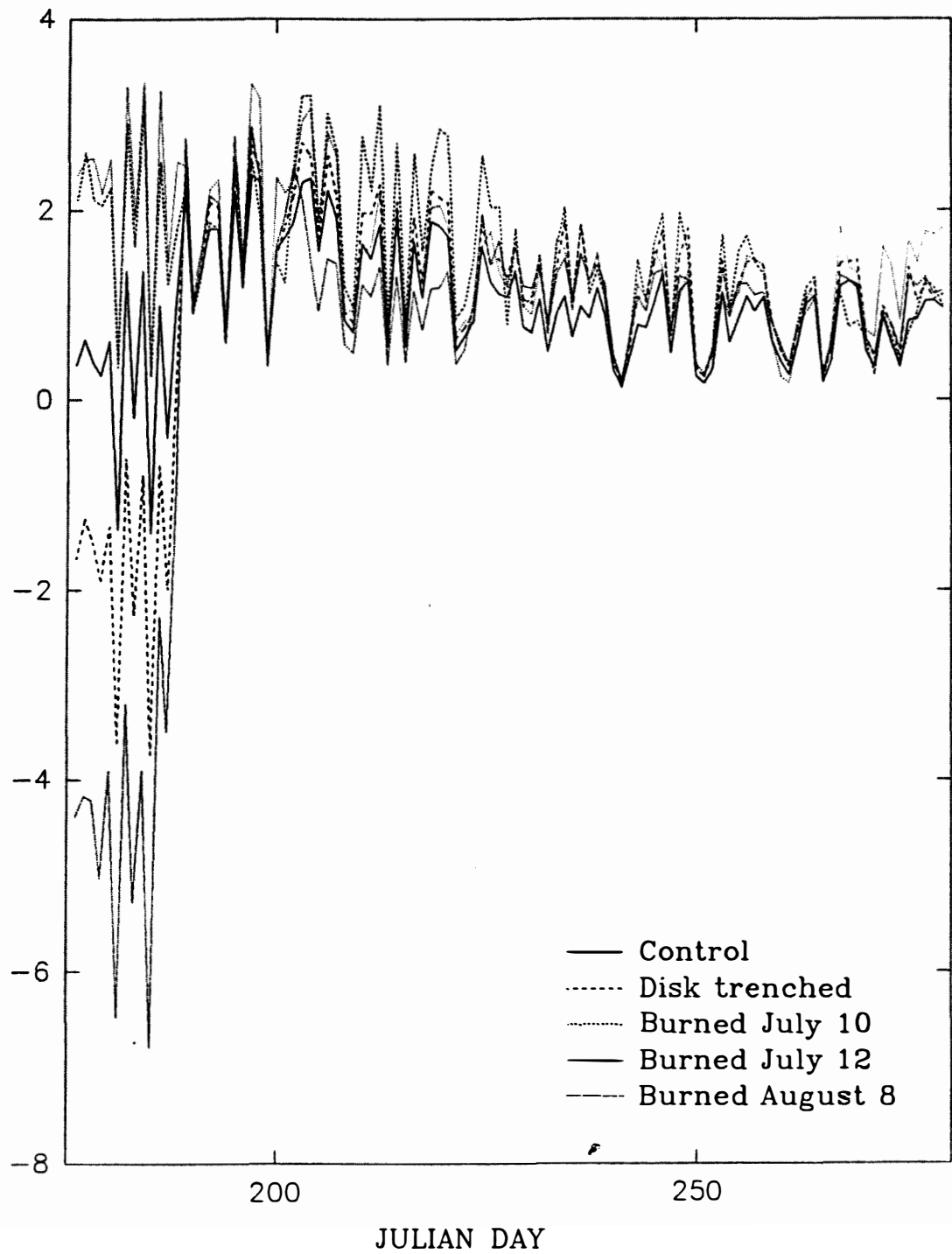
Fig. 1

FRONTIER LAKE EXPERIMENT AVERAGE DAILY TEMPERATURES



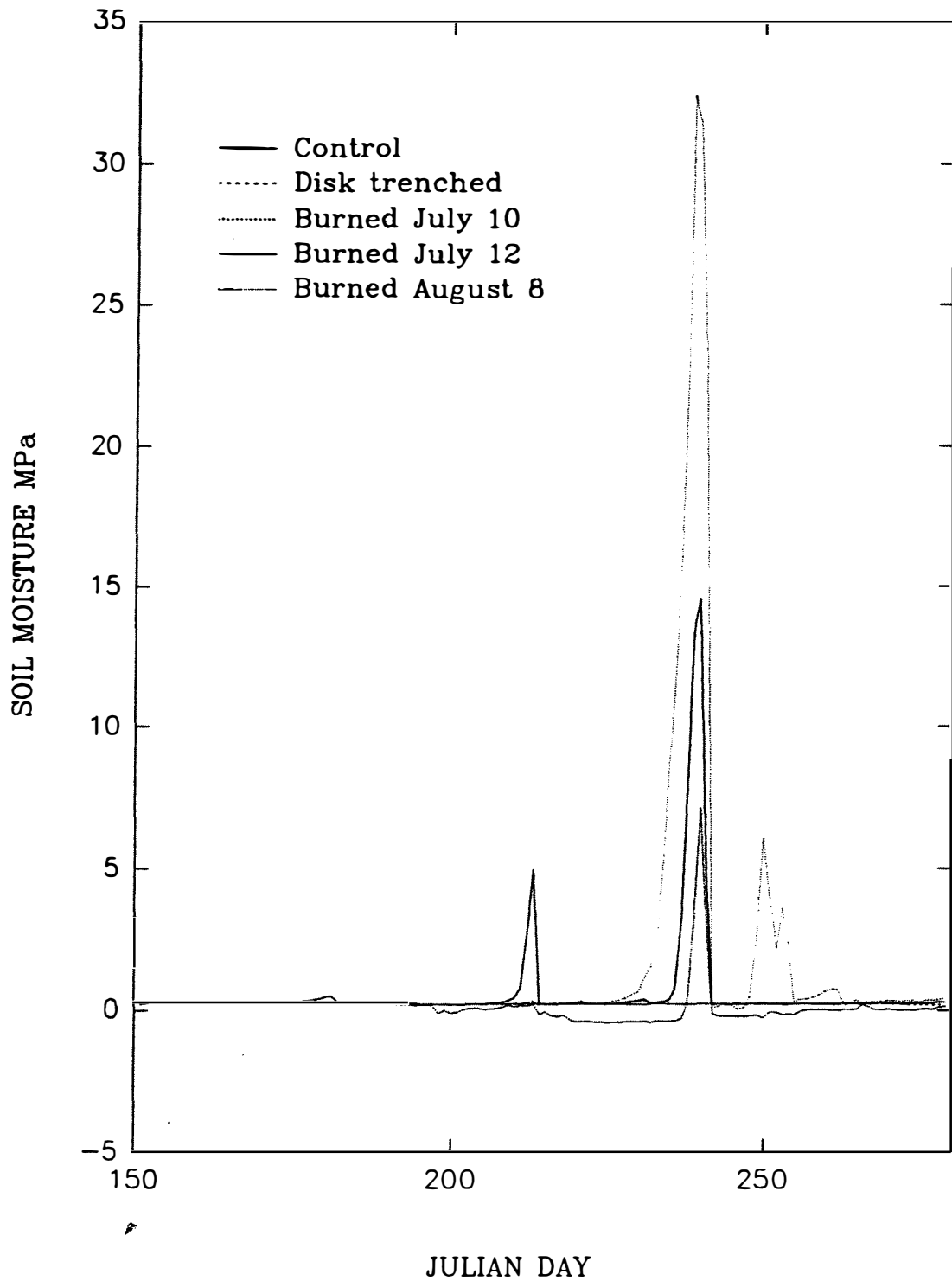
FRONTIER LAKE EXPERIMENT
AVERAGE DAILY QUANTUM SENSOR READINGS

Fig.3



FRONTIER LAKE EXPERIMENT
AVERAGE DAILY MOISTURE MEASUREMENTS

Fig.4



for light from non-crop species) is similar as well (Fig.3). Soil moisture readings are inconclusive (Fig.4). Substrate nutrient analyses, currently underway may shed some light on the mortality question. As can be seen from Fig.3 and Fig.4, initially, after data logger and sensor installation, there seemed to have been some malfunction with the equipment because readings were quite erratic. Data logger results from the first growing season should therefore be regarded with caution.

At the end of the first growing season seedlings were sampled destructively in replicates of three and separated into roots, stemwood, needles, and terminal buds. Both species produced more total biomass on the burning and disk trenching treatments than on the controls (Figs. 5 and 6). The differences may not be statistically significant, but trends are obvious. As well, the high fire intensity burns, carried out at the beginning of the summer and the disk trenching produced best results generally. Treatment differences were not expected to be dramatic after only one growing season. After the 1993 growing season, when the planting shock has been overcome, and in subsequent years, treatment differences can be expected to be more pronounced.

In 1991 and 1992 mineral soils were sampled for soil bulk density determination to ascertain whether any of the treatments, especially disk trenching, caused soil compaction. As can be seen from Fig.7 bulk density values did not appear to be affected by any of the treatments, including disk trenching. Differences are marginal and well within the limits of natural variability.

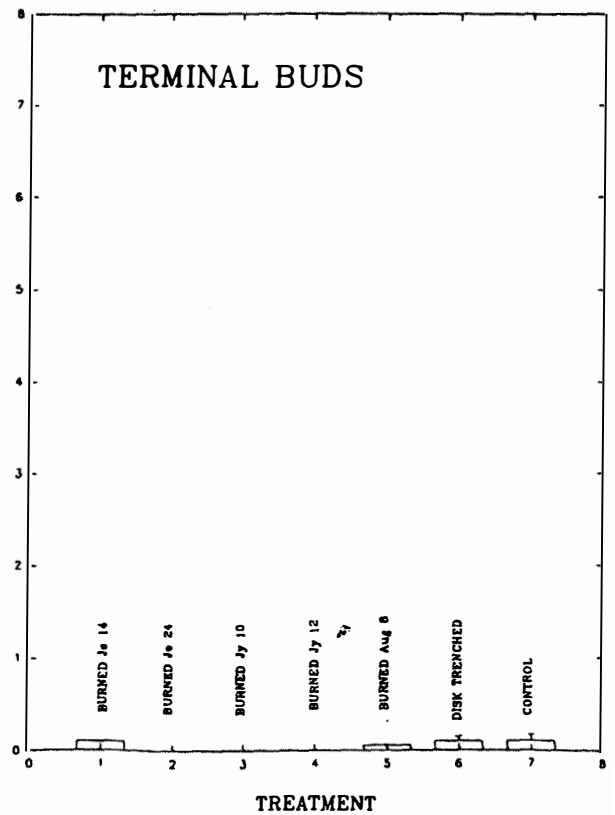
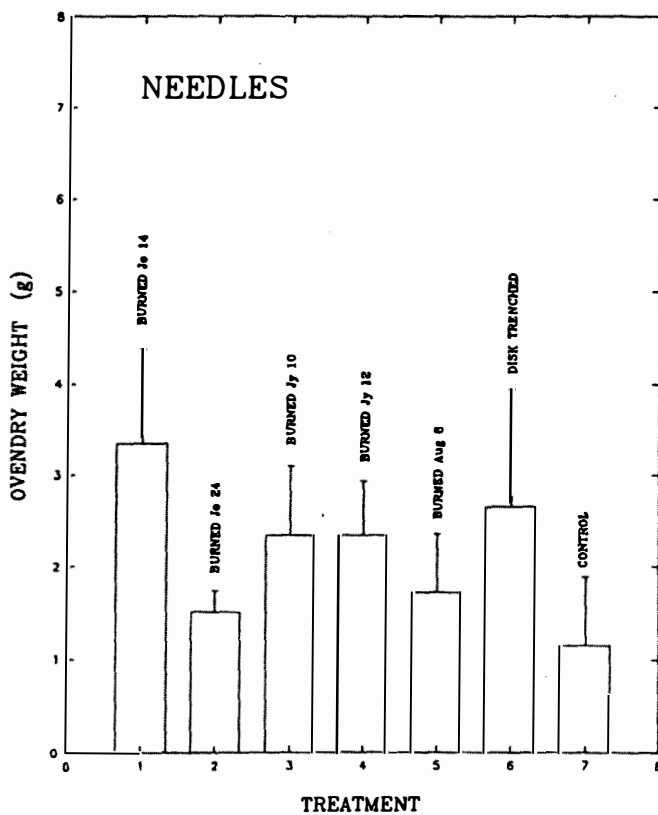
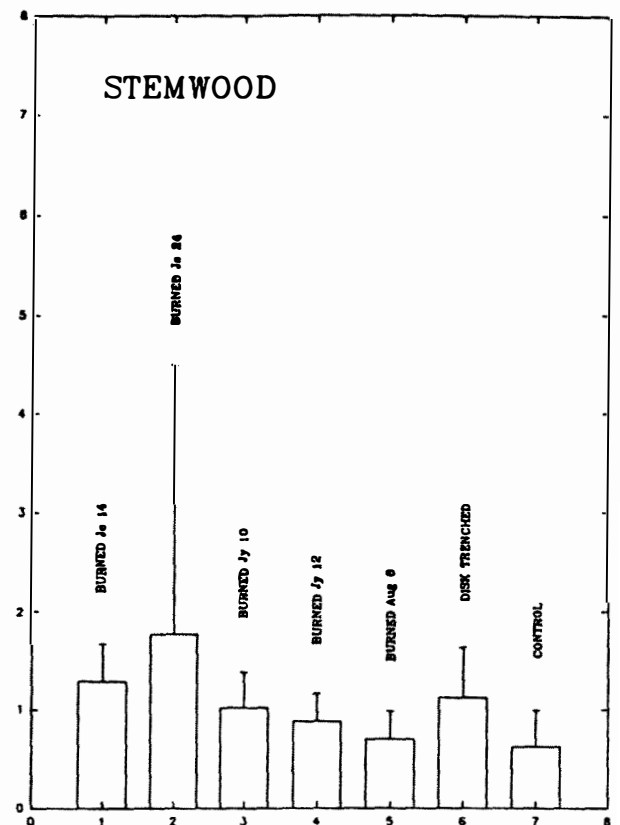
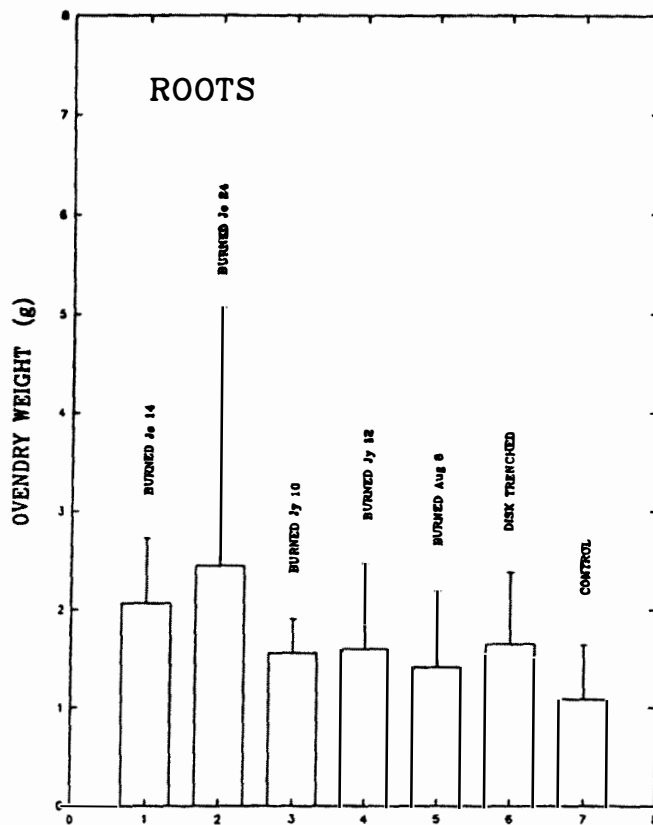
Outlook for 1993

Snow depth and soil temperatures were monitored all through the winter at the Frontier Lake Installation. Snow disappearance during spring breakup will also be monitored on all plots in case there are treatment differences. Micrometeorological measurements will be continued and the second set of destructive sampling is planned for October 1993. Chemical analyses of backlogged samples will be carried out throughout the year here at the Newfoundland and Labrador establishment of Forestry Canada.

St. John's, N.F.
March 1993

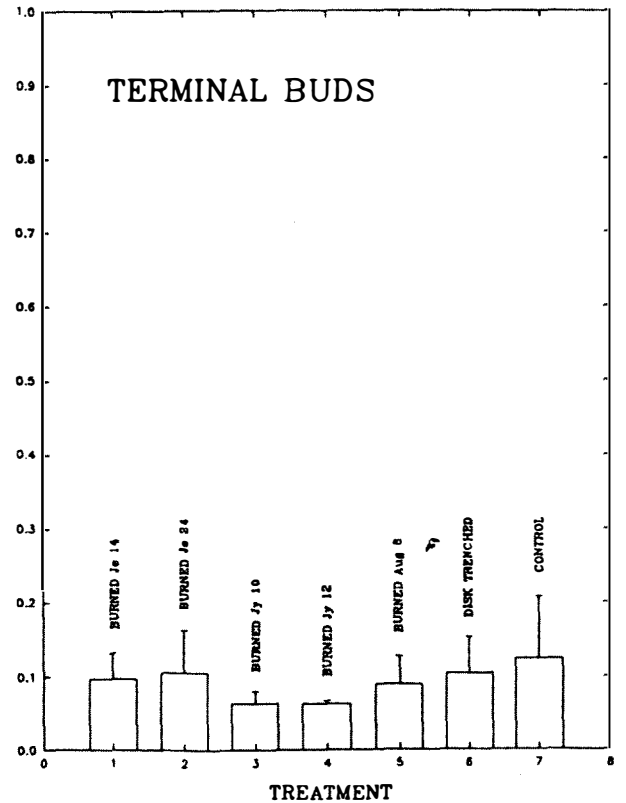
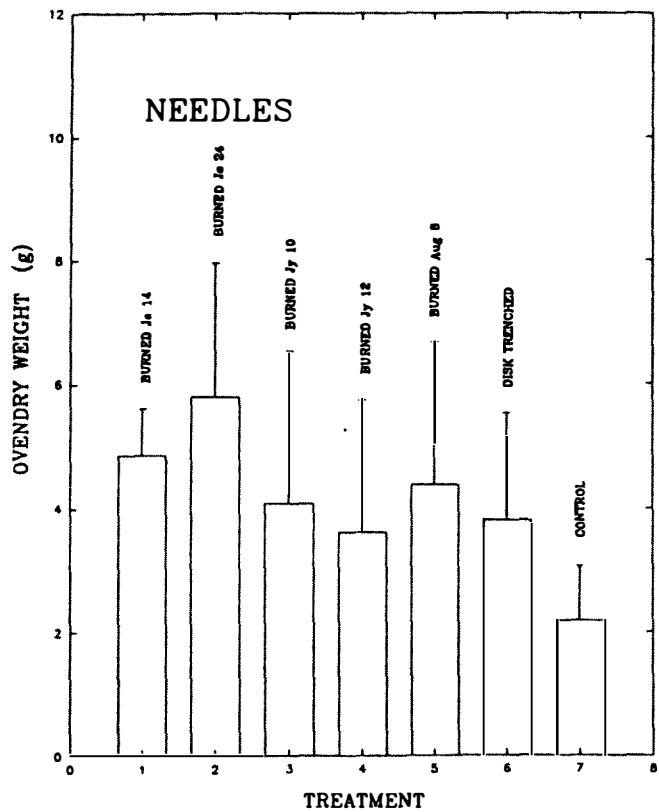
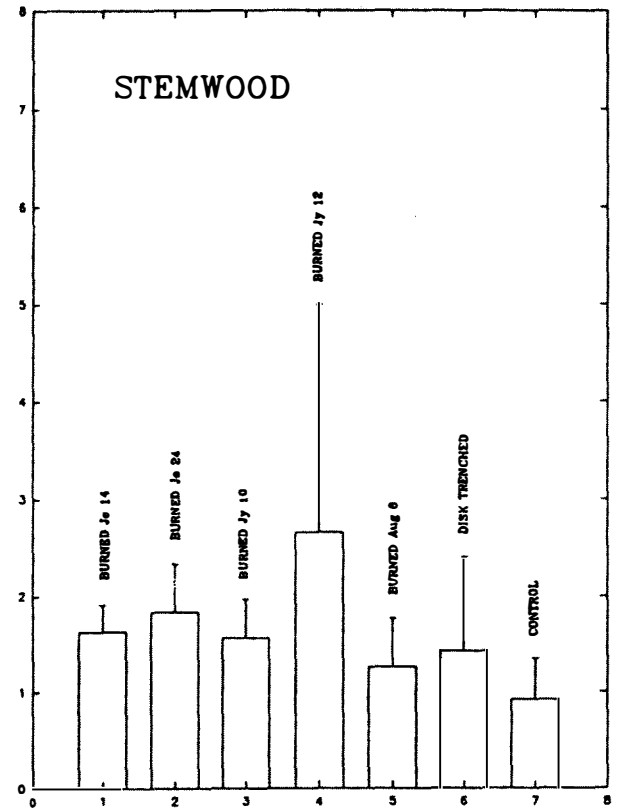
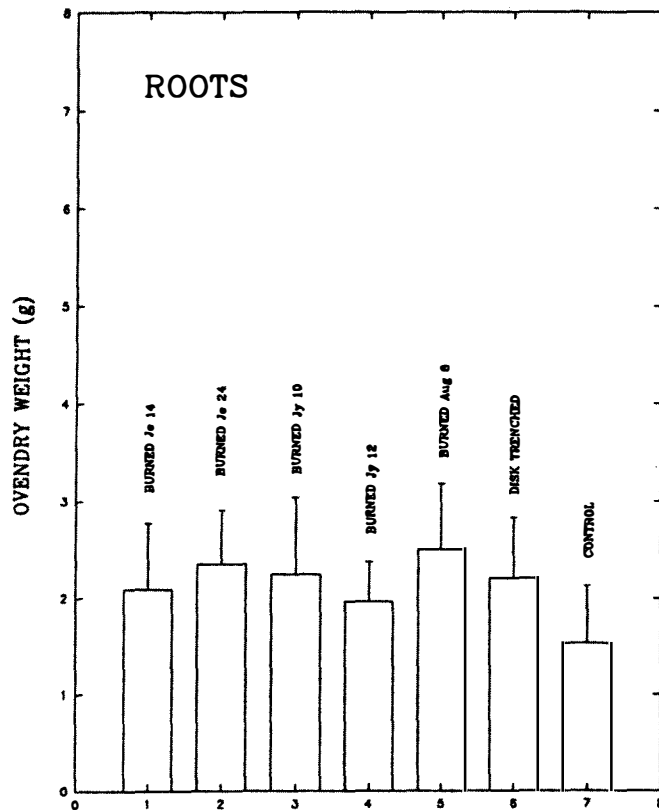
FRONTIER LAKE EXPERIMENT
BIOMASS DATA
WHITE PINE

Fig.5



FRONTIER LAKE EXPERIMENT
BIOMASS DATA
RED PINE

Fig.6



FRONTIER LAKE EXPERIMENT
SOIL BULK DENSITY DATA

Fig.7

