RESPONSE OF A FOREST ECOTONE TO IONIZING RADIATION

Progress Report

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Abstract

Compositional and structural characteristics of three forest types, including aspen dominated, maple-birch dominated, and an intervening ecotone, were studied before and after irradiation in northern Wisconsin. Preirradiation findings are reported in papers by Murphy and Sharitz (1974) and Murphy, Sharitz, and Murphy (1974). A detailed analysis of the results obtained up to the present time (July, 1975) is presented in Summary Report No. C00-2283-6.

Irradiation occurred during the summer of 1972. By the summer of 1973 the density of viable tree seedlings at 10 m from the radiation source was substantially reduced in all three areas relative to the preirradiation densities of 1971. Re-establishment of tree seedlings has, as of June 1975, been prevented by the vigorous development of ground vegetation. At 20 m, the density of seedlings in the three areas increased during the period between 1971 and 1973 in response to the partially opened canopy. The overall density of seedlings of Populus tremuloides and Acer rubrum increased markedly in the three areas and P. tremuloides invaded some areas in which it had not been found prior to irradiation. By 1974 many of the seedlings at 20 m had reached the sapling size-class. Viable trees greater than 2.5 cm, dbh were eliminated at 10 m in all three areas by June 1974 and were reduced in density of 20 m.

Leaf litter production was reduced by up to 94% at 10 m and 64% at 20 m during the period between 1971 and 1973 in the irradiated areas. The reduction was greatest in the aspen area. Leaf litter reduction in the ecotone and maple-birch areas was less severe, averaging 56% at 10 m and 27% at 20 m. The rate and compositional characteristics of succession in the ecotone relative to aspen and maple-birch forest types is presently under study.

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Preface

The investigations discussed herein were originally undertaken as a cooperative research effort with the Radiobiology of Northern Forest Communities Project of the Institute of Forest Genetics at Rhinelander, Wisconsin. While that project has been terminated, this study has continued as originally planned.

Approximately 15% of my time (Principal Investigator) has been devoted to the project since the beginning of the current term of the agreement. At least 15% of my time will be devoted to the project during the remainder of the current term. Dr. Rebecca Sharitz (Co-Investigator) has devoted approximately 15% of her time to the project and expects to devote a similar proportion of her time to the project during the remainder of the current term.

Activities for 1974 - 1975

Two sampling trips to the Enterprise Radiation Forest have already been made during the current contract period and one additional trip to collect leaf litter samples is scheduled for October, 1975. All sampling proposed in the 1974-75 renewal proposal has, therefore, been completed or is on schedule.

A detailed discussion and analysis of the data collected from the beginning of the project to July, 1975 can be found in the Summary Report (C00-2283-6) submitted with this progress report. As the Summary Report includes measurements made during the present contract period, that discussion will not be repeated here. Appended to the Summary Report are two reprints of publications concerning the preirradiation studies.

An oral presentation of the findings of this study was made in May, 1975 at the Fourth National Symposium on Radioecology at Corvallis, Oregon.

Future Sampling

We are interested in continuing observations on the influence of the opened forest canopy on the rate and compositional characteristics of succession, especially the interaction between ground vegetation and tree seedlings. We also wish to determine the rate at which leaf litter production and leaf area index returns to original preirradiation levels. We hope to continue these observations over a period of several years. The overall impact of the radiation stress will obviously depend upon the rate at which forest succession proceeds in the damaged areas. Information on succession in disturbed northern forest types is virtually non-existent.

References

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