

# MEASUREMENT OF ENVIRONMENTAL AND POLLUTANT GRADIENTS IN THE FOREST CANOPY

1995

Carl Waite and Tim Scherbatskoy  
School of Natural Resources  
University of Vermont

## Cooperators

Deane Wang and Joanne Cummings, UVM School of Natural Resources  
David Ellsworth, Brookhaven National Laboratory, Upton, L.I., NY

## ABSTRACT

From January to December 1995 meteorology and ozone ( $O_3$ ) data were continuously collected at five elevations (0.5, 7.5, 12, 16, and 24 m above the ground) from the VMC research tower at the Proctor Maple Research Center in Underhill, VT. In 1995, we did few new analyses of meteorological data and have no new results to report. We hope to examine these data more thoroughly in 1996 and report new results at that time. Examination of  $O_3$  data for 1995 revealed a similar pattern to that observed in 1992-94. As in previous years,  $O_3$  concentrations generally increase with height in the canopy, but the largest and only significant difference occurred between 0.5 m (just above the forest floor) and all other elevations, with  $O_3$  levels being lowest at 0.5 m. On average, over the entire sampling season (mid April-mid September),  $O_3$  concentrations were 26% lower at 0.5 than at 24 m, compared to 23% and 21% lower in 1994 and 1993, respectively. This reduction in  $O_3$  concentration just above the forest floor may result from inadequate mixing of air due to a boundary layer effect and lower air velocities at this level or the physical or chemical destruction of  $O_3$ . Number of hours of  $O_3$  exposure at threshold concentrations of  $\geq 60$ ,  $\geq 70$ ,  $\geq 80$ ,  $\geq 90$ , and  $\geq 100$  ppb during June, July, and August were tabulated for 1995, as previously done in 1993 and 1994. As in 1994, it was found that the total number of hours of exposure at the two lower concentrations ( $\geq 60$ , and  $\geq 70$  ppb) continued to decrease from the previous year, averaging a 24% reduction in number of hours of exposure at the four upper elevations (7.5, 12, 16, and 24 m). The number of hours of exposure at  $\geq 80$  ppb increased by an average of 12 hours at the four upper elevations in 1995 from 1994, but remained 55% lower than 1993 numbers. When averaged over the entire season,  $O_3$  concentrations in 1995 were similar to those in 1993 at all elevations. However, 1994 concentrations were 10% lower than those in 1993 and 1995, and this reduction was consistent across all canopy heights. Examination of average seasonal diurnal patterns for 1995 revealed that  $O_3$  concentrations reached a daily low in early morning (around 7:00 AM) and maximum levels from midday to early afternoon and again shortly before midnight.