EFFECTS OF OZONE AND CO₂ ON THE GROWTH AND PHYSIOLOGY OF ASPEN

D. F. Karnosky¹, Z. Gagnon², R. E. Dickson³, P. Pechter¹, M. Coleman⁵, Olevi Kull⁶, Anu Sober⁷, and J. G. Isebrands³

During the past three years, we have examined the effects of ozone (O₃) and carbon dioxide (CO₂), alone and in combination, on the growth and physiology of trembling aspen (Populus tremuloides Michx.). We have conducted several single growing season exposures of potted plants and a three growing season exposure with trees planted in the ground. All studies have been conducted in open-top chambers. Our research demonstrated that aspen is highly sensitive to ozone and that there are strong genotypic differences in response to ozone. Seasonal exposures of 70 to 100 ppm-h have a significant negative impact on height, diameter, leaf and branch retention, and above ground biomass. The O₃ sensitivity appears stable as aspen trees reach flowering age. CO₂ administered at 150 ppm above background levels did not compensate for the adverse ozone effects. Photosynthesis measurements over all growing seasons and with multiple genotypes suggest that CO₂ may increase the O₃ sensitivity of otherwise tolerant aspen clones. We are currently developing an unchambered O₃ exposure system to more closely simulate forest conditions.

¹Michigan Technological University, School of Forestry and Wood Products, Houghton, MI 49931.
²University of Minnesota, Duluth, MN.
³North Central Forest Experiment Station, Forestry Sciences Laboratory, Rhinelander, WI 54501.
⁴Estonia Academy of Science, Institute of Ecology/Marine Research, Tartu, Estonia.