

Abstract for Oral Presentation at Air Pollution Workshop, Portland, OR June 2013

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Seedlings of tree species native to Great Smoky Mountains National Park were exposed to ozone in open-top chambers for one or two growing seasons. Species used were red maple (*Acer rubrum*), chestnut oak (*Quercus prinus*), black locust (*Robinia pseudoacacia*), winged sumac (*Rhus copallina*), yellow buckeye (*Aesculus octandra*), sycamore (*Platanus occidentalis*), sweetgum (*Liquidambar styraciflua*), yellow poplar (*Liriodendron tulipifera*), Virginia pine (*Pinus virginiana*), eastern hemlock (*Tsuga canadensis*) and Table Mountain pine (*Pinus pungens*). Foliar stipple was measured on two or more leaves/needles per plant and at the end of the exposure period plants were harvested for dry mass. Synthesized diurnal exposure profiles were used in 1988, and modified ambient profiles were used from 1989-1992, with 2.0x ambient being the highest exposures used. Exposure-response curves for biomass were developed using the Weibull function and SUM06 index. Species responses ranged from totally insensitive (no biomass or foliar effects) in Table Mountain pine, hemlock and chestnut oak, to no biomass responses, but elevated foliar stipple in above ambient treatments for Virginia pine, sycamore, and black locust, to both biomass reductions and elevated stipple in above ambient treatments for the remaining species. Ozone exposures in the Park rose sharply from 1988 to 1999, but have fallen since then, with occasional high ozone years interspersed among low ozone years. Using the exposure-response curves for biomass in this study, we estimate which species could potentially be negatively affected by ozone for each year from 1988-2012. Among the species in this study, responses range from sensitive to moderately sensitive to totally insensitive. With elevation, seasonal exposures increase and diurnal patterns become flatter, potentially changing species responses. The risk to species was maximal when ozone peaked in the late 1990s, but has dropped dramatically in recent years. However, predictions extrapolated from potted seedlings to mature adult trees should be viewed with caution.