

Sensitivity of seedlings of black cherry (*Prunus serotina* Ehrh.) to ozone in  
Great Smoky Mountains National Park. 1. Exposure-response curves for  
biomass

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article.

### Summary

The response of seedlings of black cherry (*Prunus serotina* Ehrh.) to ozone was evaluated in Great Smoky Mountains National Park using open-top chambers during the growing seasons of 1989 and 1992. Two separate sets of seedlings were each exposed to various concentrations of ozone (charcoal-filtered; 0.5 x (not used in 1989), 1.0 x, 1.5 x, and 2.0 x modified ambient) in two different seasons. Seasonal indices of exposure (SUM00, SUM06 and AOT40) for the 1.0 x treatments were 39.2, 1.9, and 1.62 ppm h respectively, in 1989, and 63.1, 0.9, and 0.78 ppm h, respectively, in 1992. No significant chamber effects were noted, except for reduced height growth in open plots compared with 1.0 x chambers in 1992. In both years, the 2.0 x treatment reduced total, leaf, root, and shoot + root biomass, although some of these changes were only marginally significant in 1992. Stem biomass was significantly reduced in 1989, but not 1992. Leaf area, count and weight were all highly correlated, and showed significant reductions in both years. The leaf area ratio (leaf area/total weight) was reduced in 1989, but not in 1992. Height was not affected by ozone, but diameter was reduced only in 1989. Chamber-to-chamber variation for biomass and leaf variation was greater in 1992, and as a result, significance levels were lower. Weibull functions were fitted to chamber means, and showed significant near-linear declines for most components when log-transformed data were plotted against the SUM06 and AOT40 indices. Individual Weibull models for the 1989 and 1992 data sets, and combined models over both years, were developed. Combined models were adequate for describing ozone responses for all biomass components, as determined by the likelihood ratio test. The data show that the two years of exposure produced similar, but not identical effects, despite large differences in initial size of the seedlings and in seasonal ozone dynamics. Leaf and root biomass were most sensitive to ozone (as determined by the slope of decrease with increasing SUM06), whereas stem biomass was least sensitive. Black cherry seedlings are shown to be among the

most sensitive to elevated ozone of the 21 tree species examined to date in Great Smoky Mountains National Park.

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### Notes to readers

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