Ozone Interactions with Black Cherry and Milkweed Growth, Fecundity and Leaf Injury in the Lake States

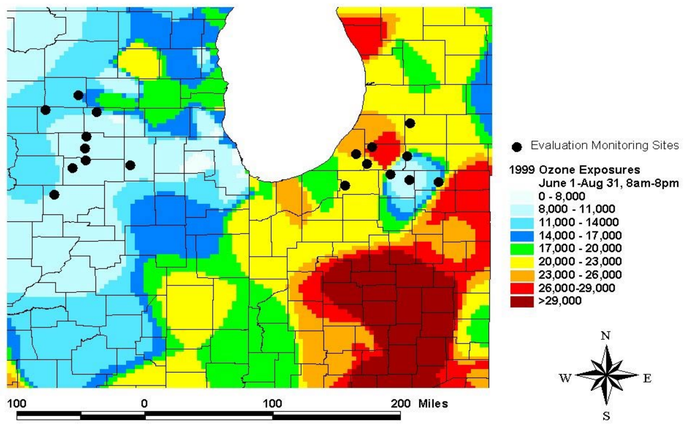
Field Year 2000 Progress Report Ed Jepsen (Wisconsin DNR) and Dr. Jim Bennett (US Geological Survey)

1999 - First Year Synopsis

Black cherry and common milkweed growth, foliar injury and seed production from a low ozone (<11,000 ppb-hrs SUM60) exposure region and a relatively high ozone exposure (>22,000 ppb-hrs SUM60) area were compared. Significantly less growth and seed production were observed in the high exposure area while ozone leaf injury was not different between regions. A complicating factor in the 1999 analysis was a moderate to severe drought in the high ozone area.

2000 Field Sampling Sites

Figure 1. Evaluation Monitoring Sites



Second Year Analysis

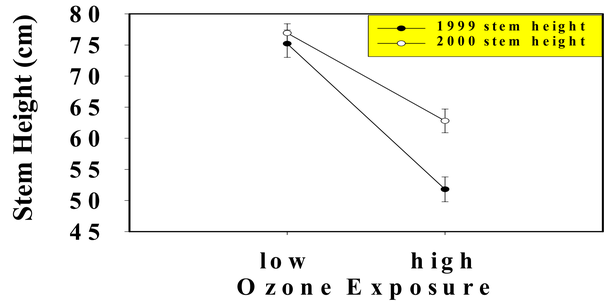
Milkweed stem height and black cherry branch elongation was substantially greater in the high exposure region in 2000. The increase is primarily attributed to recovery from the drought of 1999. In contrast, stem height and branch elongation in the low exposure region was similar for both years.

The amount and severity of ozone induced leaf injury (only amount graphed) was significantly higher in both species in the high exposure region.

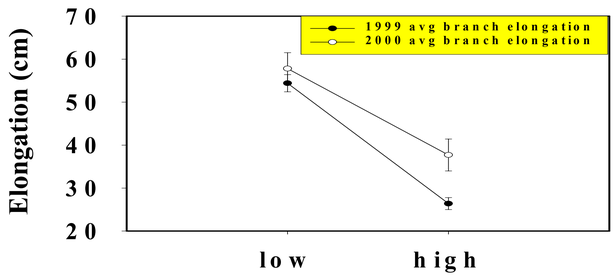
About 47% of the trees in the low exposure region had seeds compared to 15% in the high exposure region. Seed abundance on trees with seeds was similar regardless of ozone exposure.

Milkweed pod abundance was significantly higher in the low exposure region. Differences between years within a region were not significant.

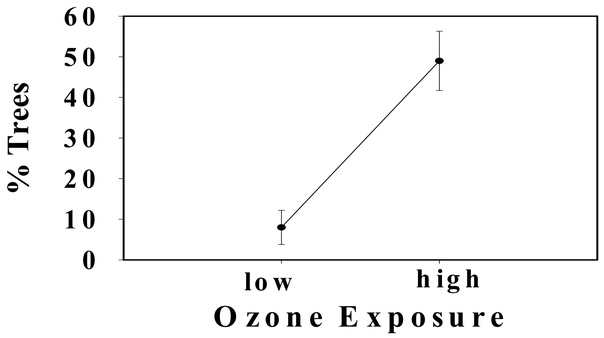
Milkweed Growth



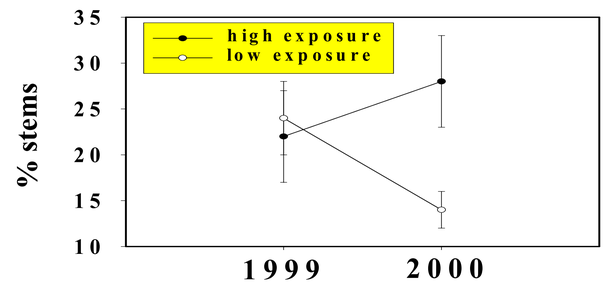
Cherry Branch Elongation



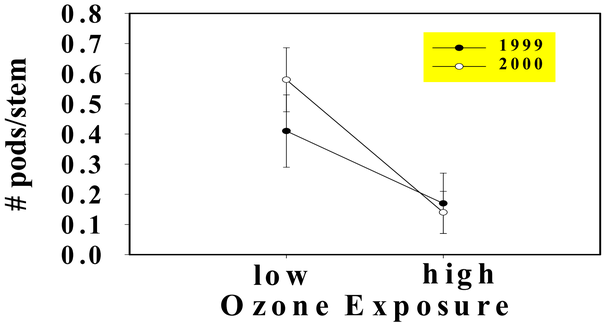
% Trees with Injured Foliage



% Stems with Injured Foliage



Pod Abundance



Foliar chemistry samples confirmed no significant differences exists between regions, but increased injury was correlated with decreasing nitrogen content.

P. serotina	Average leaf N %				
FHM Severity scale	0.00	1.00	2.00	3.00	Total
High O3 Exposure	1.78	1.39			1.58
Low O3 Exposure	1.92	1.44	1.22	1.20	1.52
Grand Total	1.84	1.41	1.22	1.20	1.55

A.syriaca	Average leaf N %				
FHM Severity scale	0.00	1.00	2.00	3.00	Total
High O3 Exposure	2.35	1.94	1.96	1.76	2.01
Low O3 Exposure	2.03	1.85	1.78	1.65	1.83
Grand Total	2.19	1.90	1.86	1.70	1.92

Preliminary 2000 Findings

• Branch elongation, stem height and seed/ pod production was significantly greater in the low ozone region for a second year. These measurements may have value as estimators of ozone exposure effects on bioindicator plants.

•Foliar injury (amount and severity) was significantly greater in the high ozone region for both bioindicators. The 1999 drought may have significantly affected the amount of foliar injury (see % stems with injured foliage graph).

•The 2000 results provide a measure of growth recovery from drought.

•Nitrogen content for non-injured leaves was similar between regions. Nitrogen content decreased with increasing injury for both species.

• Additional analysis on factors not reported in this poster indicate soils properties, such as fertility, texture and water holding capacity, were similar across regions. Rainfall was at or above seasonal norms in both regions. Temperatures were within long term seasonal averages. Insect and disease damage was similar across regions too.

• Ozone exposures could not be calculated for 2000 because EPA approved quality assured air quality data is not yet available.

Contacts
Ed Jepsen (jepsee@dnr.state.wi.us)
608-266-3538 fax 608-267-0560
Dr. Jim Bennett (jpbennet@facstaff.wisc.edu)
608-262-5489 fax 608-265-2993