Ozone Biomonitoring - Looking to the Future

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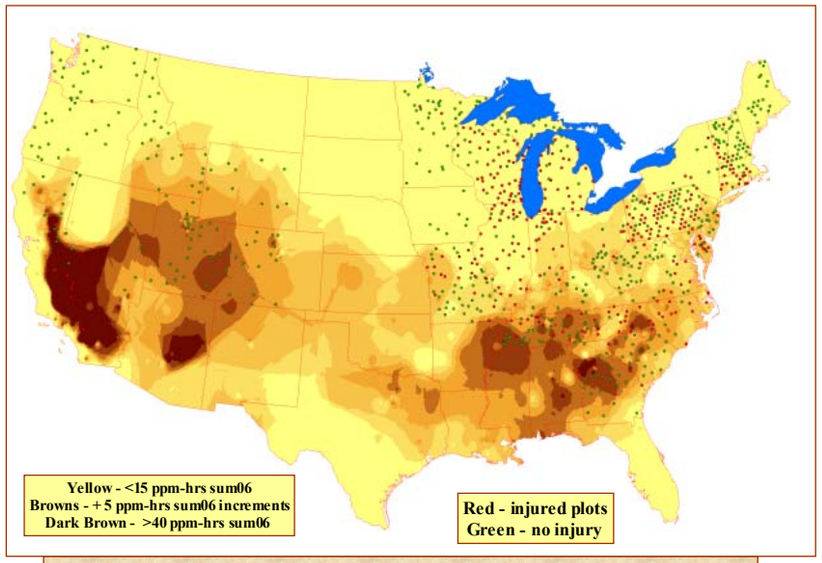


Grid Implementation

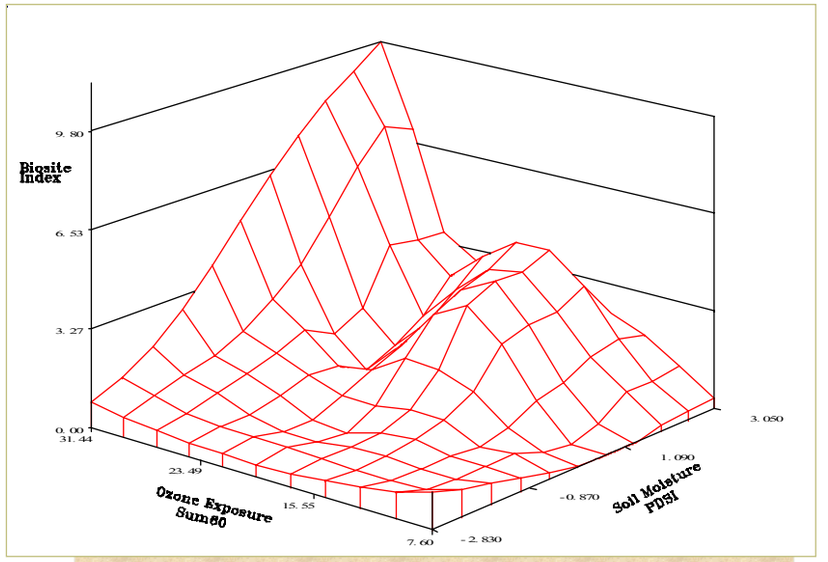
The new national ozone grid spans the country encompassing nearly all major forest ecosystems, climate zones and ozone exposure regimes. A minimum of 938 plots located in 866 of the authorized total 1228 polygons nationwide were surveyed in 2002 (tan color in the map below).

Polygons not surveyed in 2002 (red) often had minimal forests, significant crop areas, deserts, wetlands and/or major urban areas.

The light blue polygons indicate states not on the annual inventory, but will be added as funding permits.

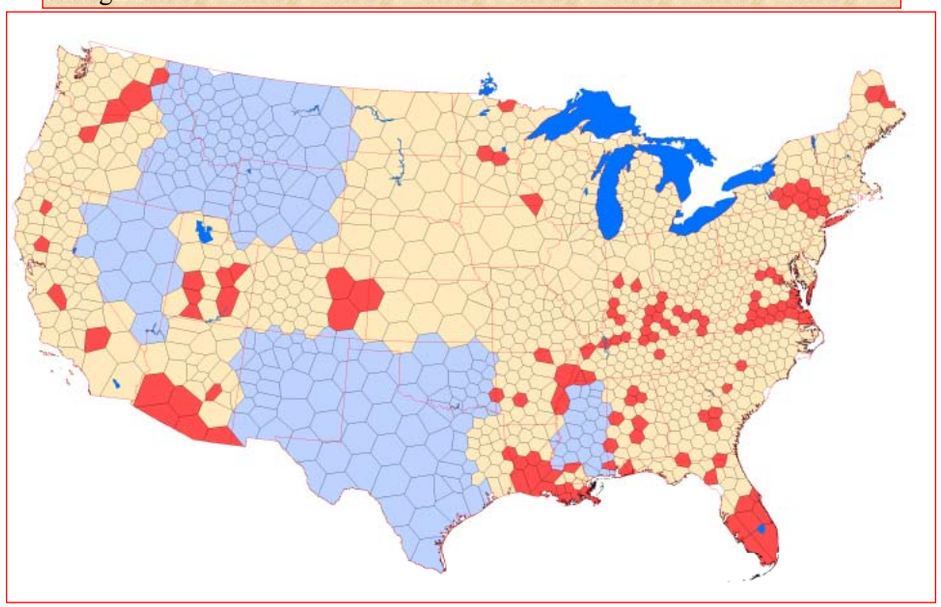
Limited data is available for several of the non-annualized states because plots had been established under the old sampling paradigm.

Connecticut, Delaware, Michigan, Vermont and Wisconsin exceeded minimum plot establishment requirements thus effectively intensifying the base grid.



Ozone Injury and Exposure Relationships

- Generally good agreement between injured plots and elevated ozone exposures using 2000 data (graphic above).
- Better correlation anticipated with the implementation of the new grid (graphic to the right).
- Implementation will increase indicator species (min 3) and plants (30 per species/plot) to provide more robust sample.
- Standardizing species and plant count to enhance inter-plot comparisons is desired.
- Graphics on right of poster demonstrate foliar injury and ozone exposure relationships are not linear.
- Environmental factors, such as drought, mediate injury expression and may account for uninjured plots in the 2000 data.
- Species vary in their sensitivity to ozone as the data in the tables below indicate. The distribution of the species and plants per plot vary between regions in the older data.



	2000 plots	injured plots	% injured	Species/plot
NE	269	109	41	3
NC	291	55	19	3
South	178	61	34	2.4
RM	58	0	0	1.5
PNW	70	7	10	1.8

species	Total # plots	# plots injured	# plants injured	Total plants
milkweed	403	162	837	10,351
blackberry	409	102	890	9,343
black cherry	362	108	467	7,877
dogbane	230	25	111	5,236
white ash	233	34	169	5,104
sassafras	144	19	71	3,051
sweetgum	110	22	129	2,647
yellow poplar	120	27	142	2,526
Mtn. snowberry	81	0	0	2,299
Trembling aspen	62	0	0	1,754
Ponderosa pine	54	5	52	1,542
Big leaf aster	46	2	4	1,189
Scoulers willow	22	0	0	593
Pin cherry	23	1	10	519
ninebark	15	0	0	407
Huckleberry	15	0	0	357
Red Alder	13	0	0	327
Red elderberry	12	0	0	319
Blue elderberry	12	2	31	284
Jeffery pine	7	2	9	192
mugwort	4	1	13	120
Western wormwood	4	0	0	120
skunkbush	2	0	0	47
California Black oak	2	0	0	47

Future Directions for Ozone Biomonitoring

- **Integrate ozone elements into ISM and urban studies**
- **Promote regional ozone stress studies for evaluation monitoring projects**
- **Conduct fumigation studies to increase the number of bioindicator species**
- **Improve field data and post season verification through additional QA testing**
- **Increase injury analysis for state/national publications and scientific articles**
- **Use web based tools for dissemination of data and analytical products**

For More Information about the Ozone Biomonitoring program contact
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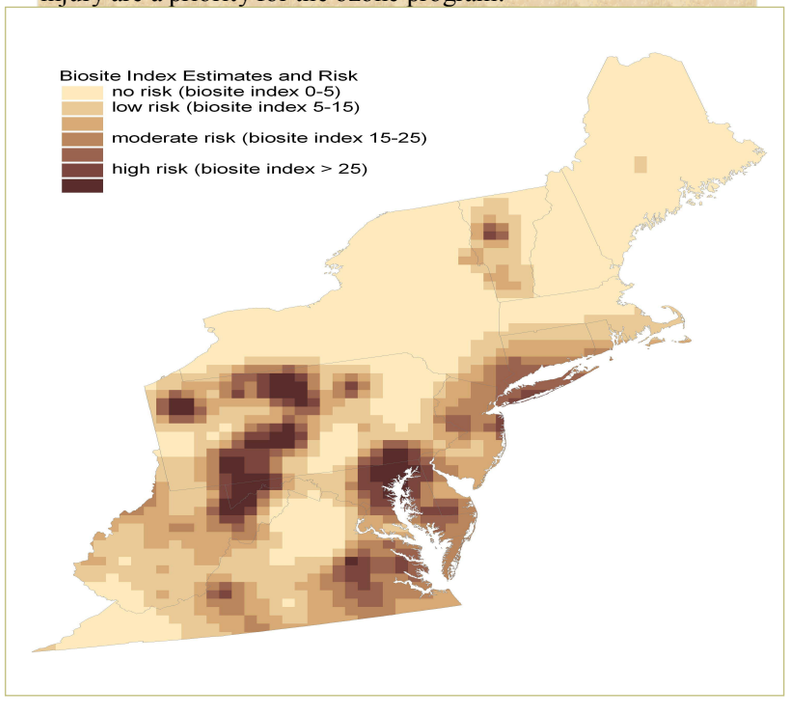
Recent Accomplishments of the Ozone Indicator

- Enhanced our understanding of the relationship between ozone exposure, drought stress and foliar injury. The graphic above clearly demonstrates environmental stress factors, such as drought stress, can significantly affect foliar injury.
- Identified forest communities have a higher incidence of foliar injury and thus are at risk of adverse health affects. The graphic below identifies regions in the NE where ozone sensitive species are providing a clear injury signal. Forest plots inside of these areas could be assessed to determine if growth and damage variables differ substantially from plots outside of the injury zones.
- Trends detection has been the basis for two evaluation monitoring projects to more broadly assess the relationships between foliar injury and productivity within forest communities. Specific studies to look at soil and moisture relationships with injury are a priority for the ozone program.



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