

Appendix F

Ozone Exceedance Probability across Southeastern Wisconsin: Methodology and Results

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This appendix contains analysis details and results that depict the spatial extent of lake breeze impacts on ozone exceedance probabilities across Southeast Wisconsin.

Methodology

For all monitors located in Wisconsin and Illinois, certified 8-hour ozone data was acquired from the U.S. EPA's Air Quality System (AQS) for all ozone season days spanning 2020-2025. This analysis excludes data from 2023, as ozone values were substantially influenced by widespread wildfire smoke events. For each monitor on each applicable ozone season day, the maximum daily 8-hour average (MDA8) was identified. A total count of valid MDA8s was determined for each monitor, as well as a total count of valid MDA8s that reached or surpassed 71 ppb across the 5-year dataset. An exceedance percentage (and by extension, probability) was then calculated by dividing the number of exceedances by the total number of MDA8s at each respective monitor. For Wisconsin sites, total valid MDA8 counts ranged from 798 (Milwaukee-UPark) to 1225 (Kenosha-Water Tower).

The probability percentages were then fed into a Radial Basis Function (RBF) interpolator algorithm in Python that creates a smooth and continuous surface that fits through scattered data. This interpolation method is useful for monitors along the Lake Michigan shoreline due to its ability to process data with irregular spacing. Using a 'thin_plate_spline' kernel with additional smoothing set to zero, the RBF interpolator generated an 'exact' interpolation of exceedance probabilities between monitoring sites across the entire Wisconsin and Illinois monitoring networks.

Output from the RBF interpolation was plotted using Python, focusing on Southeast Wisconsin. Monitoring sites are shown as circles, with colors representative of the calculated exceedance percentages that were passed to the RBF function. Values over Lake Michigan were masked and all data were projected onto a Lambert Conformal coordinate system. The resulting map and underlying data table for Wisconsin sites are provided on the following pages.

**Probability of MDA8 Ozone $\geq$ 71 ppb During Ozone Season
Based on All Ozone-Season MDA8s from 2020-2025 (Excluding 2023)**

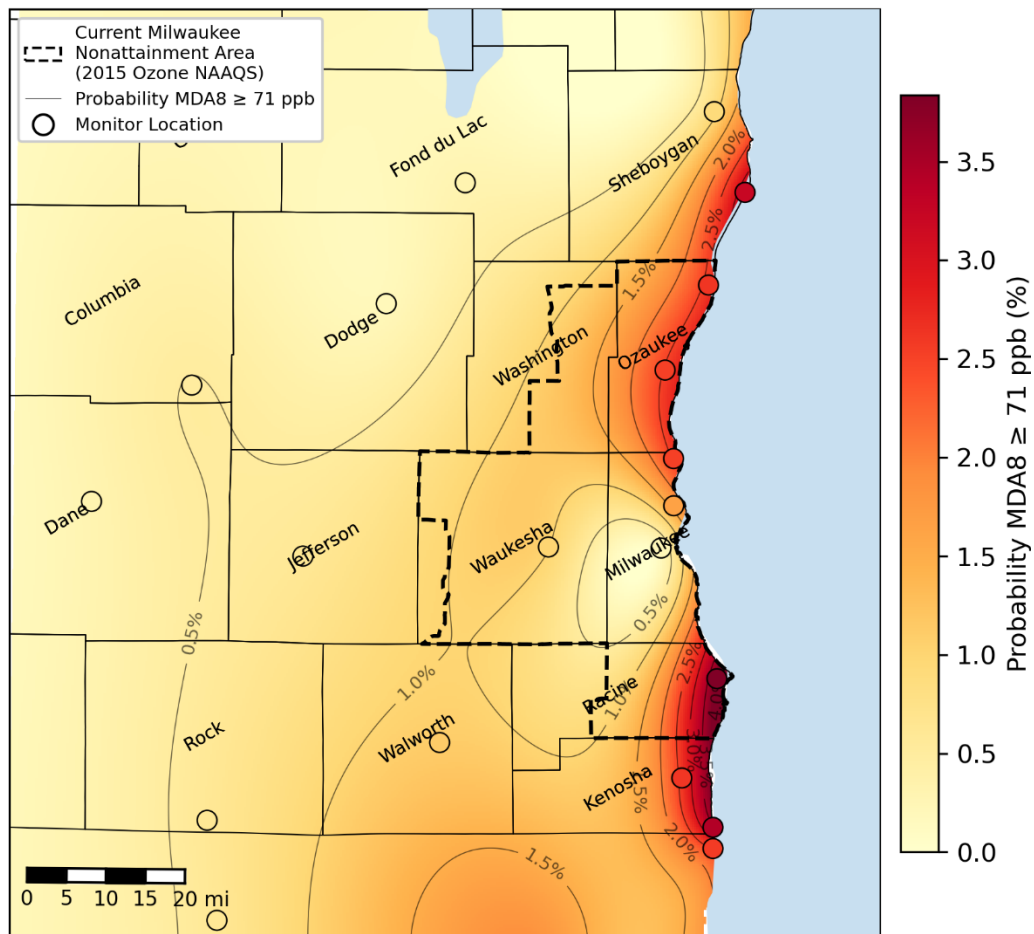


Table F-1: Air quality data used to generate the probability graphic described in this appendix.

Monitor Name	AQS ID	MDA8 Count	MDA8 71+ Count	MDA8 71+ Percent
Racine	551010020	990	38	3.838
Chiwaukee Prairie	550590019	1221	42	3.440
Sheboygan-Kohler Andrae	551170006	990	32	3.232
Harrington Beach	550890009	989	26	2.629
Kenosha-Water Tower	550590025	1225	32	2.612
Bayside	550790085	987	25	2.533
Grafton	550890008	987	25	2.533
Manitowoc	550710007	983	19	1.933
Milwaukee-UPark	550790068	789	13	1.648
Newport	550290004	988	15	1.518
Elkhorn	551270006	989	11	1.112
Waukesha	551330027	989	10	1.011
Sheboygan-Haven	551170009	990	9	0.909
Kewaunee	550610002	988	8	0.810
Beloit	551050030	989	6	0.607
Jefferson	550550009	990	6	0.606
Columbus	550210015	987	5	0.507
Fond Du Lac	550390006	987	3	0.304
Appleton	550870009	989	3	0.303
Green Bay-UW	550090026	990	3	0.303
Madison-East	550250041	990	3	0.303
Milwaukee-16th St	550790010	891	2	0.224
Bad River	550030010	987	2	0.203
Horicon	550270001	989	2	0.202
Devils Lake	551110007	987	1	0.101
Trout Lake	551250001	989	1	0.101
Eau Claire	550350014	987	0	0
Potawatomi	550410007	939	0	0
La Crosse	550630012	990	0	0
Lake DuBay	550730012	973	0	0