Technical Support Document
for
Recommended Nonattainment Boundaries in Illinois
for the
2015 Ozone National Ambient Air Quality Standard

AQPSTR 16-09

September 29, 2016

Illinois Environmental Protection Agency
Division of Air Pollution Control
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Table of Contents

TABLES 3
FIGURES 4
INTRODUCTION 5
FEDERAL GUIDANCE 7
FIVE FACTOR ANALYSIS 11
Factor 1 – Air Quality Data 11
Factor 2 – Emissions and Emissions-Related Data 17
Emissions and Emission-Related Data: Chicago *17*
Emissions and Emission-Related Data: Metro-East *30*
Factor 3 – Meteorology 41
Chicago Trajectories *42*
Metro-East Trajectories *45*
Factor 4 – Geography/Topography 48
Factor 5 – Jurisdictional Boundaries 49
FIVE FACTOR CUMULATIVE EVALUATION AND RECOMMENDATIONS 50
Five Factor Cumulative Evaluation and Recommendation: Chicago 50
Five Factor Cumulative Evaluation and Recommendation: Metro-East 51
Five Factor Cumulative Evaluation and Recommendation: Remainder of Illinois 53
CONCLUSIONS 54
APPENDIX A. TRAJECTORIES FOR THE CHICAGO AREA 58
APPENDIX B. TRAJECTORIES FOR THE METRO-EAST AREA 73

TABLES

Table 1 Counties Included in the Chicago CSA and St. Louis CSA 8

Table 2 Counties Included in the Chicago MSA and St. Louis MSA 9

Table 3 2013-2015 8-Hour Ozone Design Values in Illinois (ppb)....13

Table 4 NOx Emissions by County in the Chicago MSA 18

Table 5 VOC Emissions by County in the Chicago MSA....19

Table 6 Population Data by County – Chicago MSA (Illinois Counties Only)....23

Table 7 2010-2014 Population Change by County for the Chicago MSA 27

Table 8 2014 IDOT Travel Statistics for the Chicago MSA 28

Table 9 Commuting Patterns in the Chicago MSA 29

Table 10 NOx Emissions by County in the Metro-East MSA....31

Table 11 VOC Emissions by County in the Metro-East MSA....32

Table 12 Population Data by County – Metro-East MSA and Adjacent Counties....35

Table 13 2010-2014 Population Change by County for the Metro-East MSA....38

Table 14 2014 IDOT Travel Statistics for the Metro-East MSA....39

Table 15 Commuting Patterns in the Metro-East MSA....40

Table 16 Recommended Designations in Illinois for the 2015 8-Hour Ozone NAAQS....55

Table 17 Ozone NAA Boundary Recommendation Data Sources 57

FIGURES

Figure 1 Illinois 8-Hour Ozone Design Values 2013-2015 14
Figure 2 Chicago Ozone Trend Compared to 1997, 2008, and 2015 Standards 15
Figure 3 Metro-East Ozone Trend Compared to 1997, 2008, and 2015 Standards....16
Figure 4 NOx Emissions by County in the Chicago MSA 18
Figure 5 VOC Emissions by County in the Chicago MSA 19
Figure 6 NOx Point Sources in the Chicago MSA 21
Figure 7 VOC (VOM) Point Sources in the Chicago MSA....22
Figure 8 Population density in the Chicago MSA 24
Figure 9 Urbanized Areas in the Chicago MSA 26
Figure 10 2014 AVMT – Percent by County in the Chicago MSA....28
Figure 11 Commuters by County in the Chicago MSA....29
Figure 12 NOx Emissions by County in the Metro-East MSA 31
Figure 13 VOC Emissions by County in the Metro-East MSA....32
Figure 14 NOx Point Sources in the Metro-East MSA....33
Figure 15 VOC (VOM) Point Sources in the Metro-East MSA 34
Figure 16 Population Density in the Metro-East MSA....36
Figure 17 Urbanized Areas in the Metro-East MSA 37
Figure 18 2014 AVMT – Percent by County in the Metro-East MSA 39
Figure 19 Commuters by County in the Metro-East MSA 40
Figure 20 Long Distance Transport Scenario into the Chicago MSA 43
Figure 21 Anticyclonic Curvature Transport Scenario into the Chicago MSA....44
Figure 22 Long Distance Transport Scenario into the Metro-East MSA 46
Figure 23 Anticyclonic Curvature Transport Scenario into the Metro-East MSA 47
Figure 24 Proposed 2015 8-Hour Ozone NAAQS Nonattainment Areas 56

Introduction

On October 26, 2015, the U.S. Environmental Protection Agency (U.S. EPA) revised the ozone National Ambient Air Quality Standard (NAAQS) in response to numerous studies which link the health effects associated with ozone exposure to increases in mortality, as well as cardiovascular and respiratory impairment. The primary ozone standard was strengthened from 0.075 parts per million (ppm), which was set in 2008, to a new level of 0.070 ppm (80 FR665291; October 26, 2015). U.S. EPA also strengthened the secondary ozone standard to provide increased protection against adverse public welfare effects including impacts on vegetation. This standard is identical to the primary standard (0.070 ppm).

Following the promulgation of a new or revised air quality standard, the Clean Air Act (CAA) requires the Governor to recommend initial designations of the attainment status for all areas of the State. Areas can be classified as ***nonattainment*** (does not meet, or contributes to a nearby area that does not meet the NAAQS), ***attainment*** (meets the NAAQS), or ***unclassifiable*** (cannot be classified based on available data). Starting with the 1997 ozone NAAQS, U.S. EPA has been using a designation category of ***unclassifiable/attainment*** for areas that are monitoring attainment and for areas that do not have monitors but for which they have reason to believe are likely attainment and are not contributing to nearby violations. Illinois is, therefore, required to provide recommendations for attainment/nonattainment area boundaries for the new ozone standard. The U.S. EPA will act on the State's recommendations by either affirming and promulgating the recommended designation boundaries, or by promulgating different designations. This report provides the basis for recommendations by the Illinois Environmental Protection Agency (Illinois EPA) for attainment/nonattainment designation boundaries for all areas in the State of Illinois for the 2015 ozone standard**.**

Based on the most recent three years of ambient monitoring data (2013-2015), only two counties in Illinois are currently violating the 2015 ozone NAAQS – Lake and Madison counties. Based on an analysis of the factors contained in federal guidance, the Illinois EPA is recommending that portions of the Chicago and Metro-East St. Louis metropolitan areas be designated as nonattainment for the 2015 ozone standard. The recommended boundaries also reflect U.S. EPA guidance "to show that: 1) violations are not occurring in the excluded portions of the recommended area and 2) the excluded portions do not contain emission sources that contribute to the observed violations." The remaining areas of Illinois should be classified as unclassifiable/attainment areas for the ozone standard.

Federal Guidance

Illinois EPA initially relied on guidance memorandums issued by U.S. EPA on March 28, 2000, April 1, 2003, and December 4, 2008, for developing past recommendations that established the geographic boundaries of nonattainment areas (NAA) for the ozone standard. In these guidance documents, U.S. EPA recommended that areas with air quality data showing violations of the NAAQS, and nearby areas that cause or contribute to NAAQS violations, be designated nonattainment. Due to the pervasive nature of ground level ozone and transport of ozone and its precursors over large geographic areas, U.S. EPA also recommends that Combined Statistical Areas (CSAs), as defined by the Office of Management and Budget (OMB), associated with the violating monitor(s) serve as the starting point or "presumptive" boundary of ozone NAAQS. However, a case can be made for starting with Core Based Statistical Areas (CBSAs) or Metropolitan Statistical Areas (MSAs) if the CSAs are too expansive. U.S. EPA's most recent published updated guidance was issued on February 25, 2016. This guidance follows the same conceptual approach as the previous guidance in that it recommends presumptive boundaries based on CSA and, if appropriate, CBSA or MSA defined statistical areas.

The proposed ozone nonattainment area boundaries are shown in Figure 24 and are included within the boundaries of the Chicago-Naperville, IL-IN-WI Combined Statistical Area (Chicago CSA) and St. Louis-St.Charles-Farmington MO-IL Combined Statistical Area (St. Louis CSA). For the purpose of this analysis, only Illinois counties are assessed. Also, the CSAs in both areas are too large spatially for the outlying counties to contribute in any meaningful way to the violation in each urban area. Therefore, Illinois EPA believes that the CBSAs (which are the same as the MSAs in both areas) are more reasonable starting points for evaluating nonattainment boundaries. A listing of the Illinois counties comprising the Chicago-Naperville, IL-IN-WI CSA and the St. Louis, St. Charles-Farmington, MO-IL CSA are included in Table 1. The counties comprising the Chicago-Naperville-Elgin, IL-IN-WI MSA and the St. Louis, MO-IL MSA are shown in Table 2. The counties in Table 2 are the counties in Illinois that are evaluated as part of this analysis.

Table 1. Counties Included in the Chicago CSA and St. Louis CSA

Chicago-Naperville, IL-IN-WI CSA	**St. Louis-St. Charles-Farmington, MO-IL CSA**
Bureau County, IL	Bond County, IL
Cook County, IL	Calhoun County, IL
DeKalb County, IL	Clinton County, IL
DuPage County, IL	Jersey County, IL
Grundy County, IL	Macoupin County, IL
Kane County, IL	Madison County, IL
Kankakee County, IL	Marion County, IL
Kendall County, IL	Monroe County, IL
Lake County, IL	St. Clair County, IL
LaSalle County, IL	Franklin County, MO
McHenry County, IL	Jefferson County, MO
Putnam County, IL	Lincoln County, MO
Will County, IL	St. Francois County, MO
Jasper County, IN	St. Charles County, MO
Lake County, IN	St. Louis City, MO
LaPorte County, IN	St. Louis County, MO
Newton County, IN	Warren County, MO
Porter County, IN	
Kenosha County, WI	

Table 2. Counties Included in the Chicago MSA and St. Louis MSA

Chicago-Naperville-Elgin, IL-IN-WI MSA	**St. Louis, MO-IL MSA**
Cook County, IL	Bond County, IL
DeKalb County, IL	Calhoun County, IL
DuPage County, IL	Clinton County, IL
Grundy County, IL	Jersey County, IL
Kane County, IL	Macoupin County, IL
Kendall County, IL	Madison County, IL
Lake County, IL	Monroe County, IL
McHenry County, IL	St. Clair County, IL
Will County, IL	Franklin County, MO
Jasper County, IN	Jefferson County, MO
Lake County, IN	Lincoln County, MO
Newton County, IN	St. Charles County, MO
Porter County, IN	St. Louis City, MO
Kenosha County, WI	St. Louis County, MO
	Warren County, MO
	Warren County, MO

States may request nonattainment area boundaries that are smaller than the existing CSA or CBSA (MSA) boundaries where counties or portions of counties are rural and do not contribute to nonattainment based on five factors. The five factors are listed below. The emission and emissions-related data factor is intended to address a wide scope of analyses, including population, population growth, and vehicle miles travelled, as data that informs the analysis of emissions data.

States may also request nonattainment area boundaries that are larger than the current CSA or CBSA/MSA to include adjacent counties when those counties contain emission sources, population, growth, commuting patterns, and other factors that may contribute to the nonattainment problem. The Illinois EPA's analysis of each of the five factors is provided in the following sections of this report.

Five Factor Analysis

U.S. EPA recommends that States and Tribes consider the following five factors in assessing whether to include an area in the designated nonattainment area boundary:

- Air quality data
- Emission and emissions-related data
- Meteorology (weather/transport patterns)
- Geography/topography
- Jurisdictional Boundaries

Factor 1 – Air Quality Data

The ozone design values (i.e., the average of the fourth highest values from each of three consecutive years of data at a given ambient monitor) derived from ozone measurements collected from Illinois EPA's ambient air monitoring network from the most recent three-year period of record (2013-2015) are summarized in Table 3 and Figure 1. As shown in Table 3 and Figure 1, Illinois EPA's monitoring data indicate that violations of the 2015 ozone standard have been measured in both the Chicago and Metro-East metropolitan areas. The rest of Illinois currently meets the standard, although occasional exceedances have been recorded at almost all monitoring sites statewide due to the pervasiveness of ozone transport. In the Chicago area, measured design values from the 2013-2015 period exceed the NAAQS at only one monitoring station, located in Lake County. In the Metro-East area, design values exceeding the NAAQS have been measured in Madison County during this three-year period. Ozone air quality data collected in Illinois, therefore, indicate that it is appropriate to designate at least portions of the Chicago and Metro-East metropolitan areas as nonattainment areas for the ozone standard. However, Figures 2 and 3 show that the design values for both Chicago and the Metro-East have been decreasing steadily over the last 30 years. The ozone nonattainment boundaries have also been virtually the same over that same 30 years. Clearly, Federal and State control programs within the historical nonattainment areas have done an excellent job of improving ozone air quality over the period. In both areas, ozone design values in violation of the 2015 8-hour ozone standard occur in adjacent areas of neighboring states.

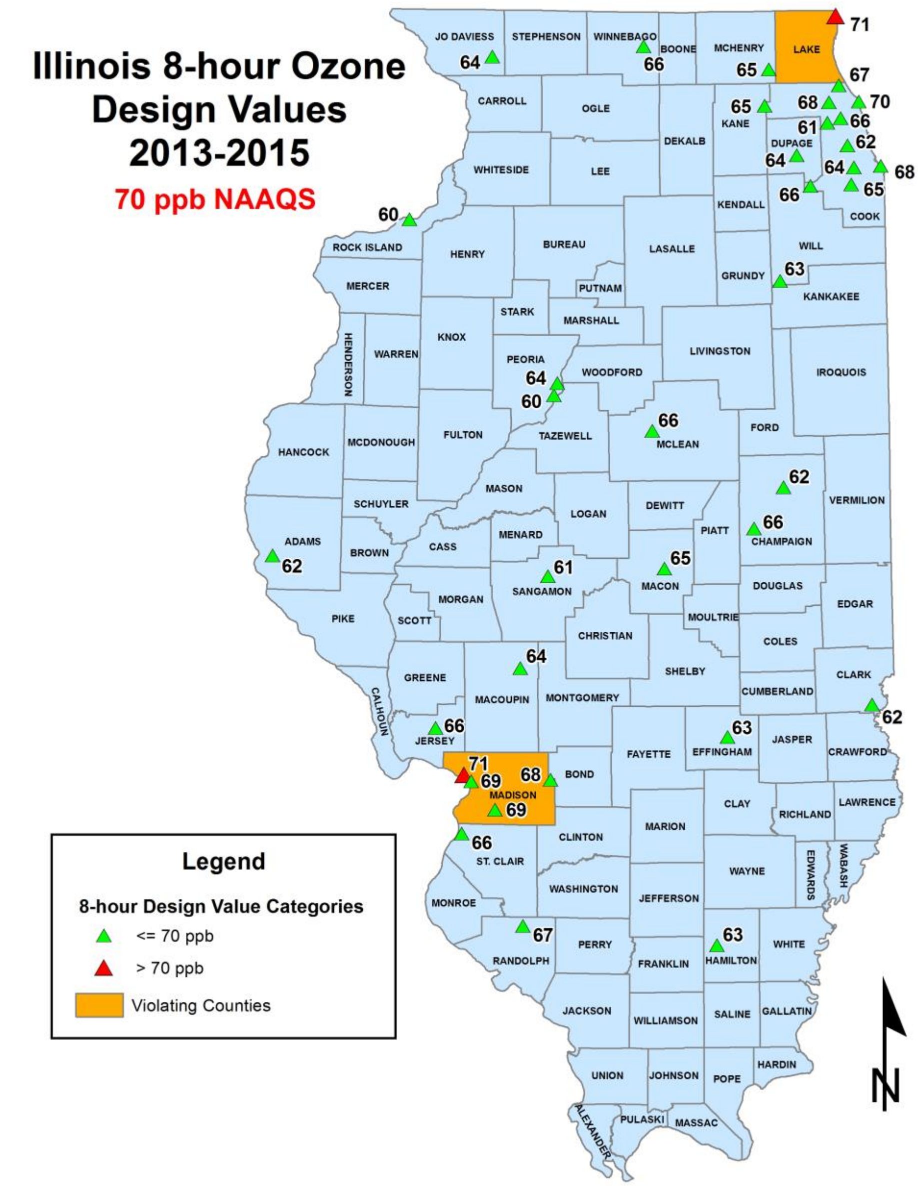
Table 3. 2013-2015 8-Hour Ozone Design Values in Illinois (ppb)

AQCR	County	Site	4th High 8-Hour Values 2013	2014	2015	2013-2015 8-hr Average
	Chicago Metropolitan Area					
67	Cook	Alsip	64	66	66	65
67	Cook	Chicago-ComEd	62	67	65	64
67	Cook	Chicago-SWFP	71	67	66	68
67	Cook	Chicago-Taft	66	65	68	66
67	Cook	Cicero	63	63	61	62
67	Cook	Des Plaines	67	69	68	68
67	Cook	Evanston	69	72	70	70
67	Cook	Lemont	64	70	66	66
67	Cook	Northbrook	69	65	68	67
67	Cook	Schiller Park	62	63	58	61
67	DuPage	Lisle	63	64	67	64
67	Kane	Elgin	64	66	65	65
67	Lake	Zion	72	73	70	71
67	McHenry	Cary	65	67	64	65
67	Will	Braidwood	61	64	64	63
	Metro-East					
70	Madison	Alhambra *	71	68	67	68
70	Madison	Alton	72	72	69	71
70	Madison	Maryville	75	70	64	69
70	Madison	Wood River	69	70	69	69
70	Randolph	Houston	65	71	65	67
70	St. Clair	East St. Louis	66	67	66	66
75	Jersey	Jerseyville	68	65	67	66
	Rest of Illinois					
65	Peoria	Peoria	58	64	60	60
65	Peoria	Peoria Heights	66	64	64	64
66	McLean	Normal	69	66	63	66
66	Champaign	Thomasboro	63	62	62	62
69	Rock Island	Rock Island	60	62	60	60
73	Winnebago	Loves Park	63	70	66	66
74	Effingham	Effingham	64	63	64	63
74	Hamilton	Knight Prairie	64	63	64	63
75	Adams	Quincy	63	61	64	62
75	Macon	Decatur	64	67	66	65
75	Macoupin	Nilwood	65	63	64	64
75	Sangamon	Springfield	62	59	64	61
66	Champaign	Bondville *	66	68	65	66
68	Jo Daviess	Stockton *	65	67	62	64
66	Wabash	West Union +	61	63	64	62

+ - Monitor operated by the Indiana Department of Environmental Management

* - Monitor operated by U.S.EPA

Figure 1. Illinois 8-Hour Ozone Design Values 2013-2015



Source: Illinois EPA - Final certified data.

Figure 2. Chicago Ozone Trend Compared to 1997, 2008, and 2015 Standards

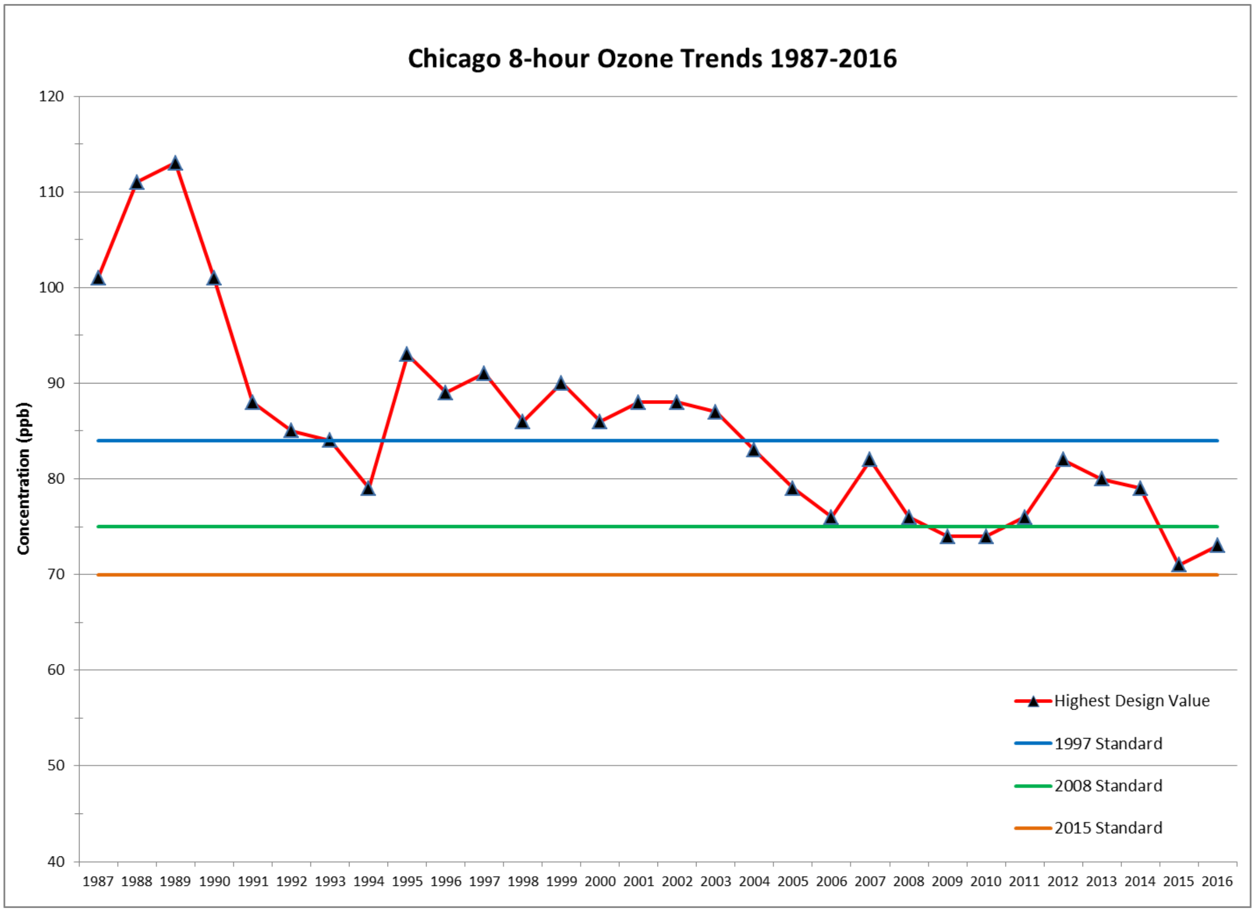
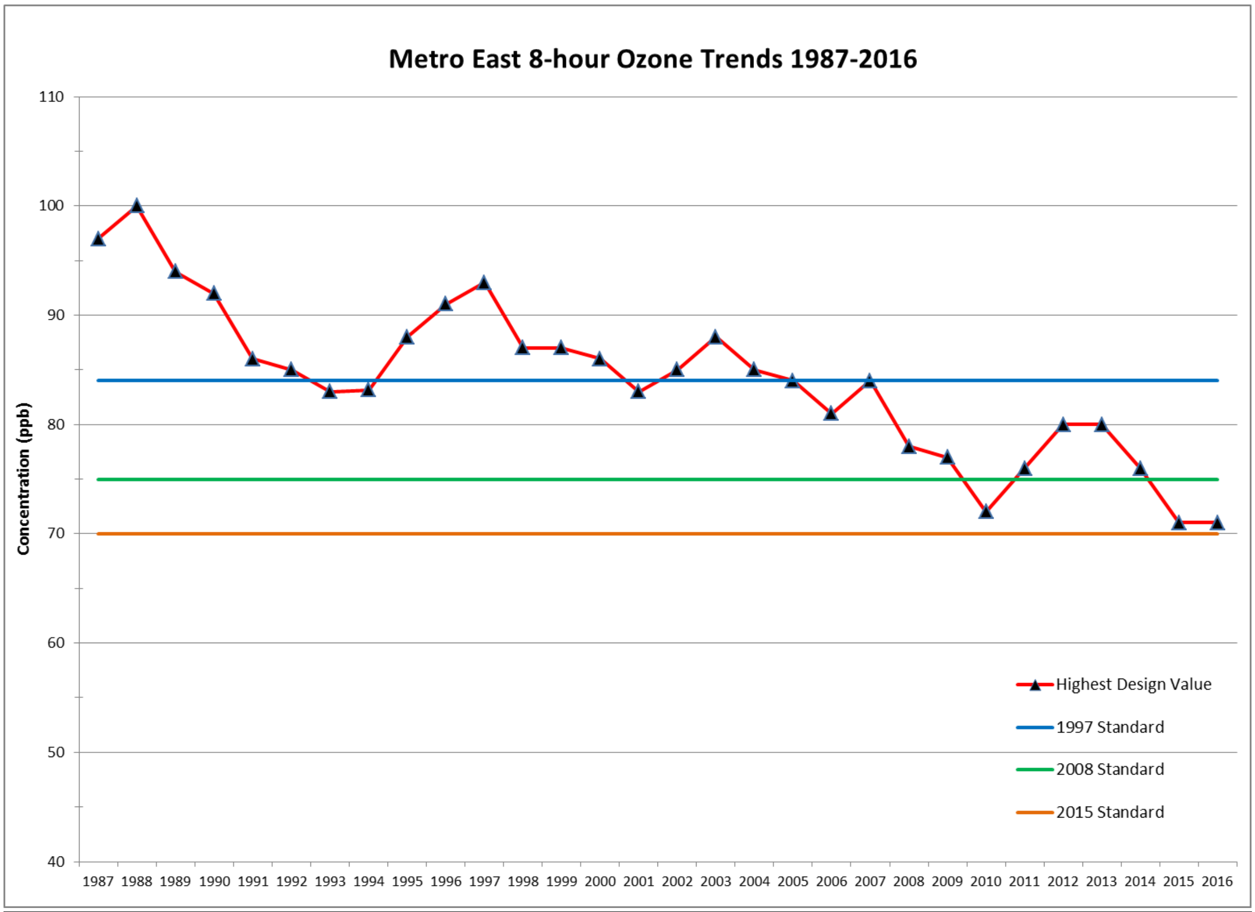


Figure 3. Metro-East Ozone Trend Compared to 1997, 2008, and 2015 Standards



Factor 2 – Emissions and Emissions-Related Data

U.S. EPA recommends that proposed nonattainment designations for the 2015 NAAQS reflect not only the areas of measured violations, but also the nearby areas that contribute to measured violations. Ozone is a secondary pollutant formed by chemical reactions from emissions of oxides of nitrogen (NOx) and volatile organic compounds (VOCs – also referred to as volatile organic materials, or VOMs, in Illinois regulations) that occur in the atmosphere in the presence of sunlight. These pollutants are referred to as precursors of ozone. U.S. EPA recommends using the 2011 National Emissions Inventory (NEI) version 2 emissions data for the initial nonattainment recommendations, but Illinois EPA has completed the 2014 NEI data compilation effort, so 2014 emissions will be used in this report. Illinois EPA emissions data for NOx and VOC for 2014 are summarized in descending order by county for point, area, non-road mobile, and on-road mobile source categories in Tables 4 through 7. A point source is defined as a source whose emissions are generally discharged through stacks. Area sources are defined as emissions that are spread over wide areas with no distinct discharge points (e.g., forest fires), or ones that are comprised of a large number of small point sources that are difficult to describe separately (e.g., residential fuel combustion). On-road mobile sources are classified as emissions from cars, trucks, buses, and motorcycles that are used for transportation of goods and passengers on streets and roads. Mobile non-road sources are characterized by emissions from other modes of powered transportation, such as airplanes, trains, ships, and off-highway motor vehicles.

Emissions and Emission-Related Data: Chicago

Emissions: Chicago

Tables 4 and 5 summarize Illinois EPA's 2014 estimated emissions from point, area, non-road mobile and on-road mobile sources in the Chicago MSA for NOx and VOCs. For the Chicago MSA Counties, NOx emissions are highest in Cook County with the greatest emissions from on-road sources. Cook County contributes about 50% of the total NOx emissions in the Chicago MSA counties. NOx emissions in Will, DuPage, and Lake Counties are also relatively high.

Kendall, Grundy, and DeKalb counties have relatively low emissions, which combined amount to just over 5% of the total NOx emissions in the Chicago MSA.

Table 4. NOx Emissions by County in the Chicago MSA

NOx					
COUNTY	**POINT**	**AREA**	**NONROAD**	**ONROAD**	**Total Tons/Yr**
Cook	4,924.61	19,507.17	20,846.49	50,321.16	95,599.43
DuPage	684.59	4,517.19	3,702.57	12,658.17	21,562.51
Kane	503.93	1,989.45	2,659.81	6,179.09	11,332.28
Lake	2,291.70	3,255.34	3,314.74	8,981.73	17,843.52
Will	8,937.18	1,850.91	3,681.34	9,172.26	23,641.69
McHenry	216.58	1,183.48	1,440.20	3,789.81	6,630.08
Kendall	606.85	354.86	713.62	1,266.92	2,942.26
Grundy	1,034.69	168.17	1,295.64	1,078.91	3,577.41
Dekalb	123.72	296.41	1,285.97	1,546.83	3,252.94
Kankakee	733.52	354.42	1,150.88	1,719.27	3,958.08

Figure 4. NOx Emissions by County in the Chicago MSA

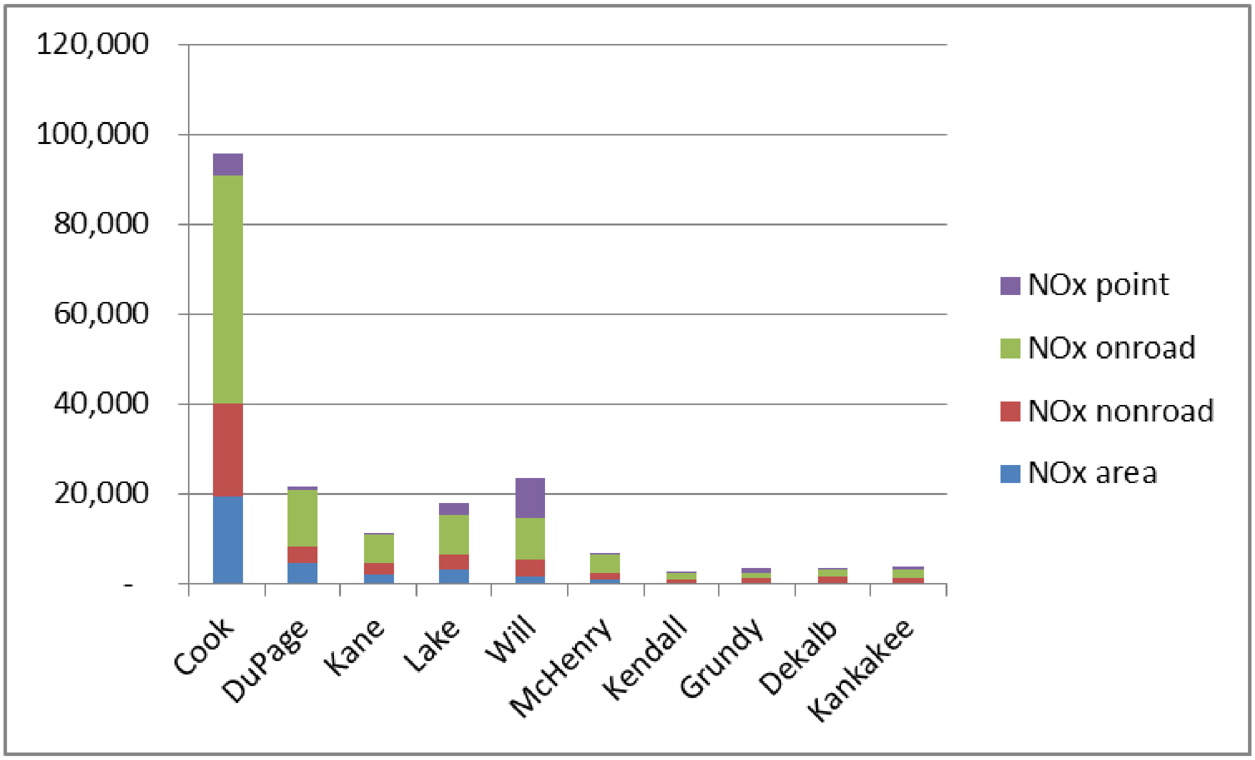


Table 5. VOC Emissions by County in the Chicago MSA

VOC					
COUNTY	**POINT**	**AREA**	**NONROAD**	**ONROAD**	**Total Tons/Yr**
Cook	6,961.51	42,123.09	11,741.98	22,587.95	83,414.53
DuPage	1,126.18	9,053.99	3,127.68	5,299.95	18,607.80
Kane	894.90	4,684.37	1,591.85	2,742.55	9,913.67
Lake	443.88	6,455.85	3,826.92	3,904.71	14,631.36
Will	2,390.18	6,018.82	2,006.46	3,712.42	14,127.89
McHenry	252.69	2,795.11	1,156.64	1,773.17	5,977.61
Kendall	215.07	1,131.42	1,389.78	622.23	3,358.50
Grundy	533.21	732.01	547.78	383.00	2,196.00
Dekalb	223.78	1,397.49	811.43	66.09	3,098.78
Kankakee	903.41	1,541.44	856.38	762.27	4,063.50

Figure 5. VOC Emissions by County in the Chicago MSA

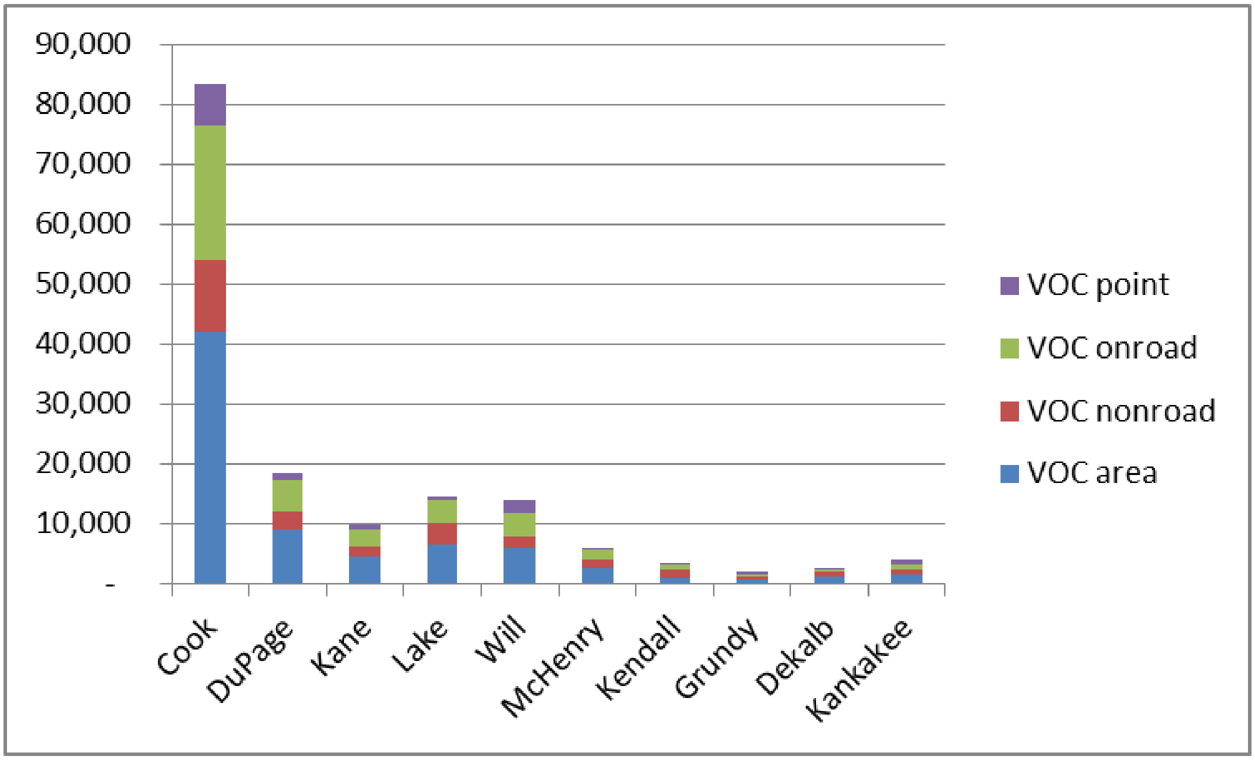


Table 5 summarizes the VOC emissions in the Chicago MSA. VOC emissions are highest in Cook County, with the greatest emissions coming from area sources. VOC emissions from Cook County are approximately 52% of the total VOC emissions in the area. DuPage, Lake, and Will counties also have relatively high VOC emissions. VOC emissions are lowest in DeKalb, Kendall, and Grundy counties; these counties combined contribute approximately 5% of the total VOC emissions in the area.

Figures 6 and 7 depict both the locations and emission rates of major point sources in the current Chicago MSA for NOx and VOCs, respectively. Emission totals are based on Illinois EPA reported emissions for 2014. The orange areas in the figures represent the areas being recommended as nonattainment for the 2015 ozone standard; counties bordered in bold black lines represent counties included in the MSA where emission sources are evaluated as to whether or not they contribute to nonattainment.

Figure 6. NOx Point Sources in the Chicago MSA

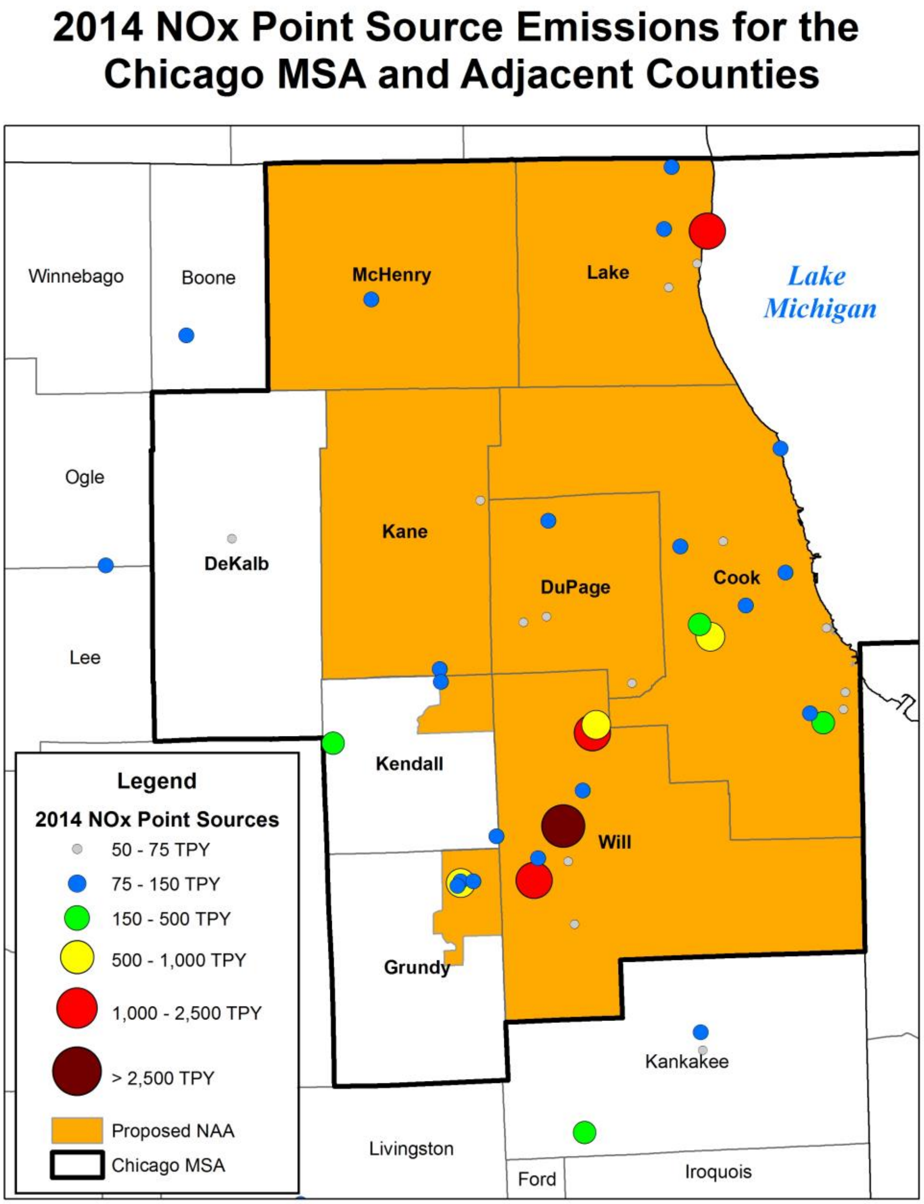
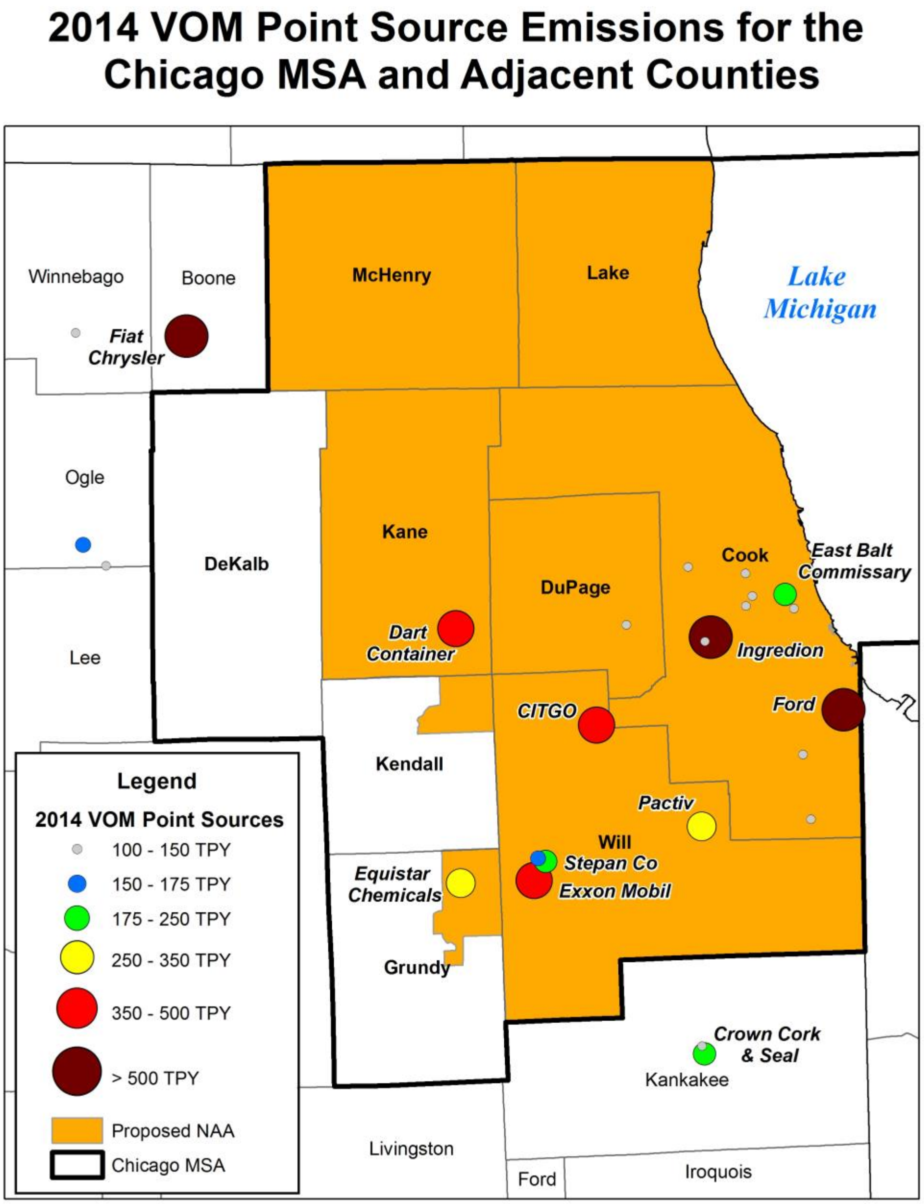


Figure 7. VOC (VOM) Point Sources in the Chicago MSA



For the Chicago MSA, the largest point sources for NOx are located in Will County. Cook and Lake Counties also contain major point sources contributing NOx emissions. In comparison, Kankakee, Kendall, DeKalb, and Grundy counties have relatively few point sources emitting NOx with contributions only representing approximately 8% of the total NOx emissions. Both the largest size and greatest number of VOC point sources occur in Cook, Will, and Grundy counties. In comparison, DeKalb, Kankakee, and Kendall counties have relatively few VOC point sources.

Emission-Related Data – Population and Urbanization: Chicago

Population and urbanization are factors that supplement and help to inform the analysis of emissions data. Table 6 lists the population of each of the counties contained in the Chicago MSA, as well as land areas and population densities based on U.S. Census Bureau estimates for 2014. Figure 8 graphically depicts population densities in the Chicago MSA. For the Chicago area, Cook, DuPage, Lake, and Will Counties have the largest populations and highest population densities, while DeKalb and Grundy Counties have the lowest.

Table 6. Population Data by County – Chicago MSA (Illinois Counties Only)

County	2014 Population	Land Area (Square Mile)	Population Density (Persons per Sq. Mile)
Cook	5,248,704	945.68	5,550
DuPage	933,769	333.61	2,799
Lake	704,149	447.56	1,573
Kane	527,501	520.44	1,014
Will	685,621	836.94	819
McHenry	306,975	603.51	509
Kendall	121,816	320.58	380
Kankakee	111,473	676.75	165
DeKalb	104,693	634.16	165
Grundy	50,433	419.90	120

Figure 8. Population Density in the Chicago MSA

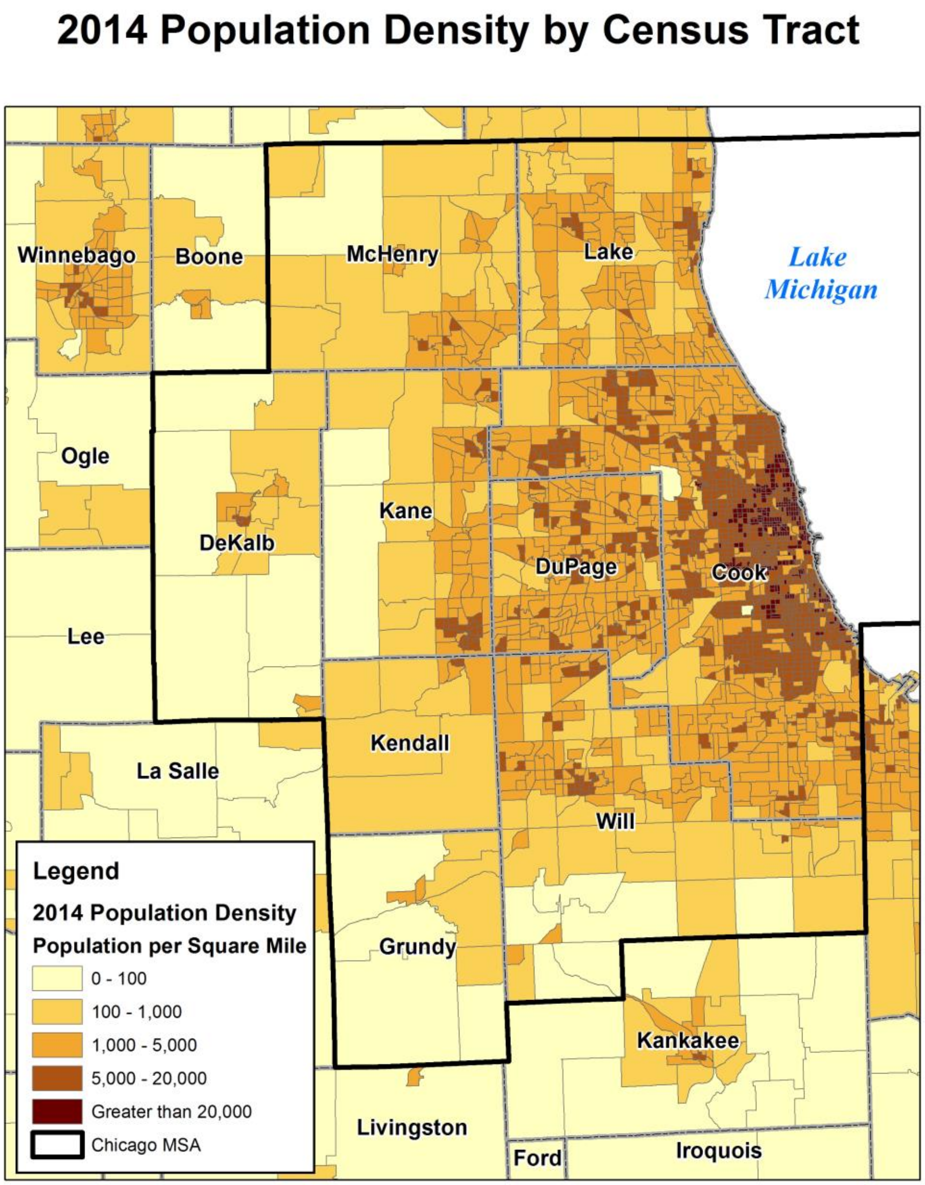
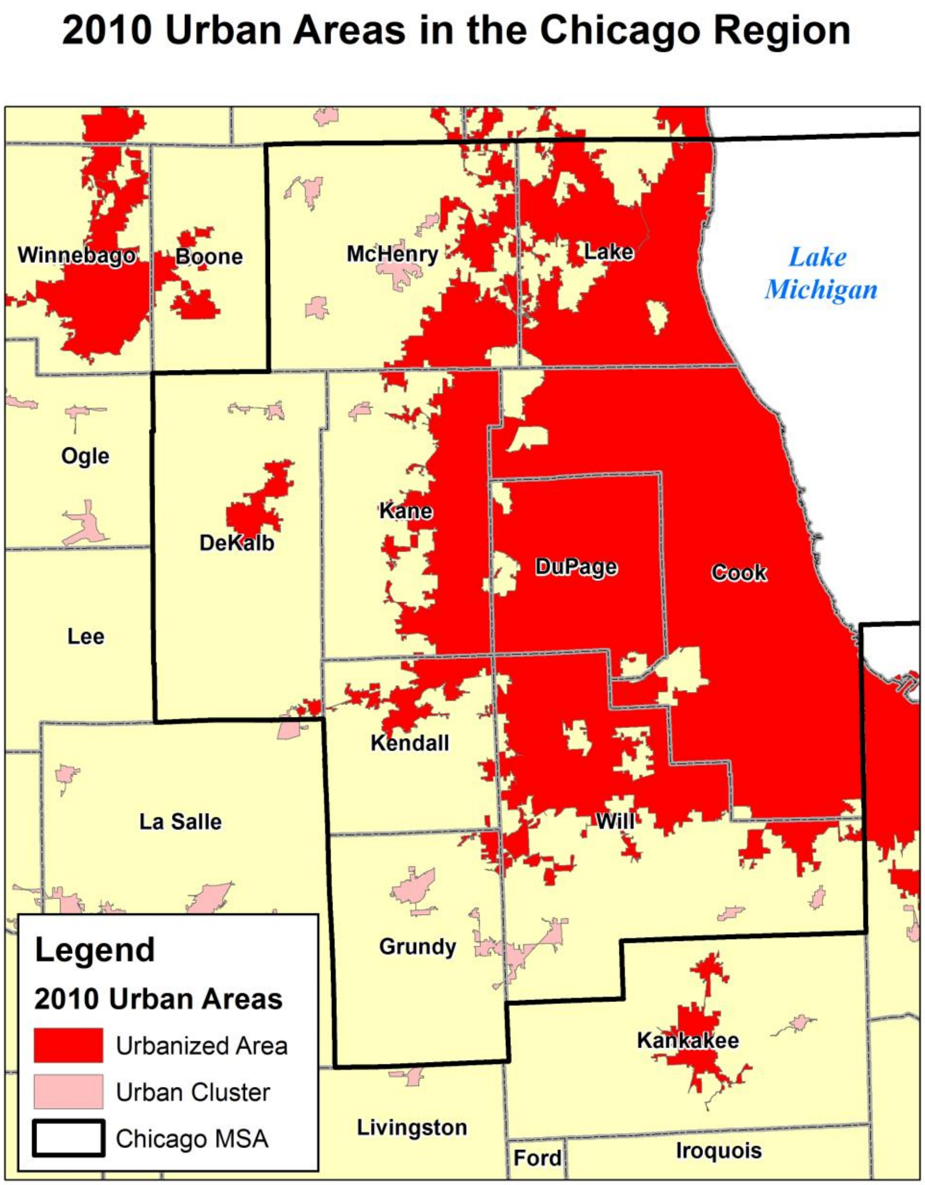


Figure 9 illustrates the extent of the urbanized area within the Chicago MSA. According to the U.S. Census Bureau, MSA boundaries are dependent on a central urbanized area or contiguous area of relatively high population density. Outlying counties are included in MSAs if they exhibit strong social and economic ties to this core area, often measured by commuting and economic patterns. Therefore, it is logical to conclude that the urbanized areas in Winnebago, Boone, and Kankakee Counties are not directly influencing emissions in the Chicago MSA. A pattern of fragmented urban development and commuting is also apparent in DeKalb, Kankakee, and parts of Grundy counties. The urban extents in these counties are not contiguous with the core urbanized area of the Chicago MSA.

Figure 9. Urbanized Areas in the Chicago MSA



Population growth is an important indicator of potential emission increases in an area. Table 7 outlines percent change in population between 2010 and 2014 by county for the Chicago MSA. This data was provided by the U.S. Census Bureau and is based on estimates dated July 1, 2015. According to the data, Kendall County has experienced the greatest percent increase in population at 6.2%; however, its total population is among the smaller counties at 1.4% of the overall study area. Cook County has experienced only an estimated 1.0% increase in population; however, its total population for 2014 represents just over 60% of the total population within the Chicago MSA.

Table 7. 2010-2014 Population Change by County for the Chicago MSA

County	2010 Population	2014 Population	Change (%)
Kendall	114,736	121,816	6.2%
Kane	515,269	527,501	2.4%
DuPage	916,924	933,769	1.8%
Will	677,560	685,621	1.2%
Cook	5,194,675	5,248,704	1.0%
Grundy	50,063	50,433	0.7%
Lake	703,462	704,149	0.1%
DeKalb	105,160	104,693	-0.4%
McHenry	308,760	306,975	-0.6%

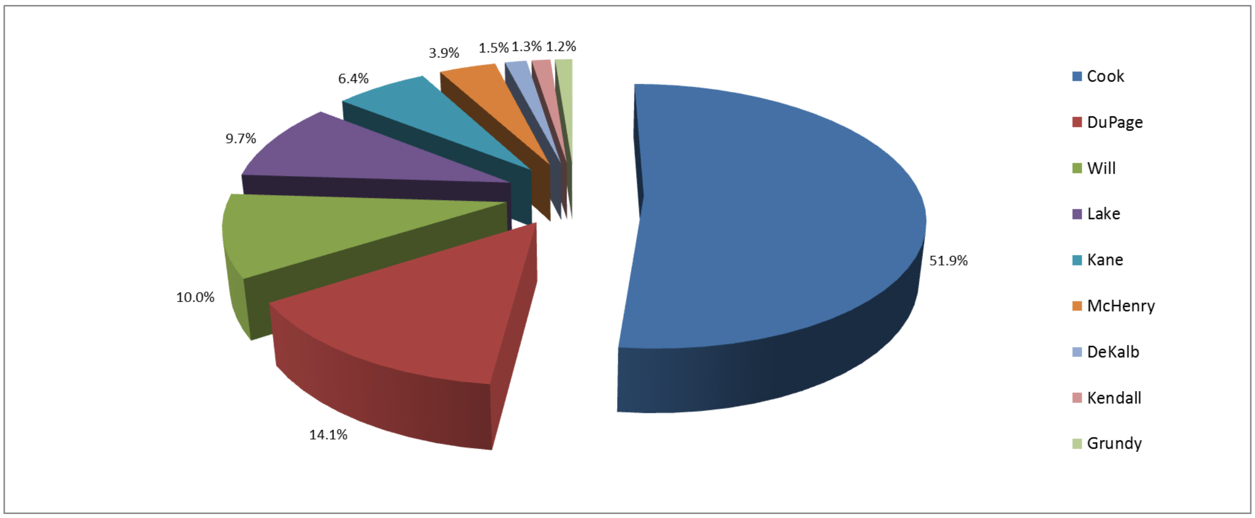
Emission-Related Data – Traffic and Commuting Patterns: Chicago

Table 8 summarizes the Illinois Department of Transportation (IDOT) estimates of Annual Vehicle Miles Travelled (AVMT) for 2014, as calculated by IDOT's Highway Information System for the Chicago MSA counties. Figure 10 presents the same data in a pie chart format. According to IDOT traffic statistics for 2014, Cook County has by far the highest level of AVMT in the Chicago MSA, contributing over half in the MSA. DuPage, Kane, Lake, Will, and McHenry have moderate levels of AVMT in comparison. DeKalb, Grundy, and Kendall Counties have the lowest amounts of AVMT, with 1.5% or less of the total for the MSA per county.

Table 8. 2014 IDOT Travel Statistics for the Chicago MSA

Chicago Metropolitan Statistical Area	Annual Vehicle Miles Traveled
Cook	30,968,482,692
DuPage	8,431,530,656
Will	5,990,879,258
Lake	5,773,254,658
Kane	3,825,411,032
McHenry	2,344,600,079
Dekalb	899,047,166
Kendall	776,942,781
Grundy	710,642,429

Figure 10. 2014 AVMT – Percent by County in the Chicago MSA

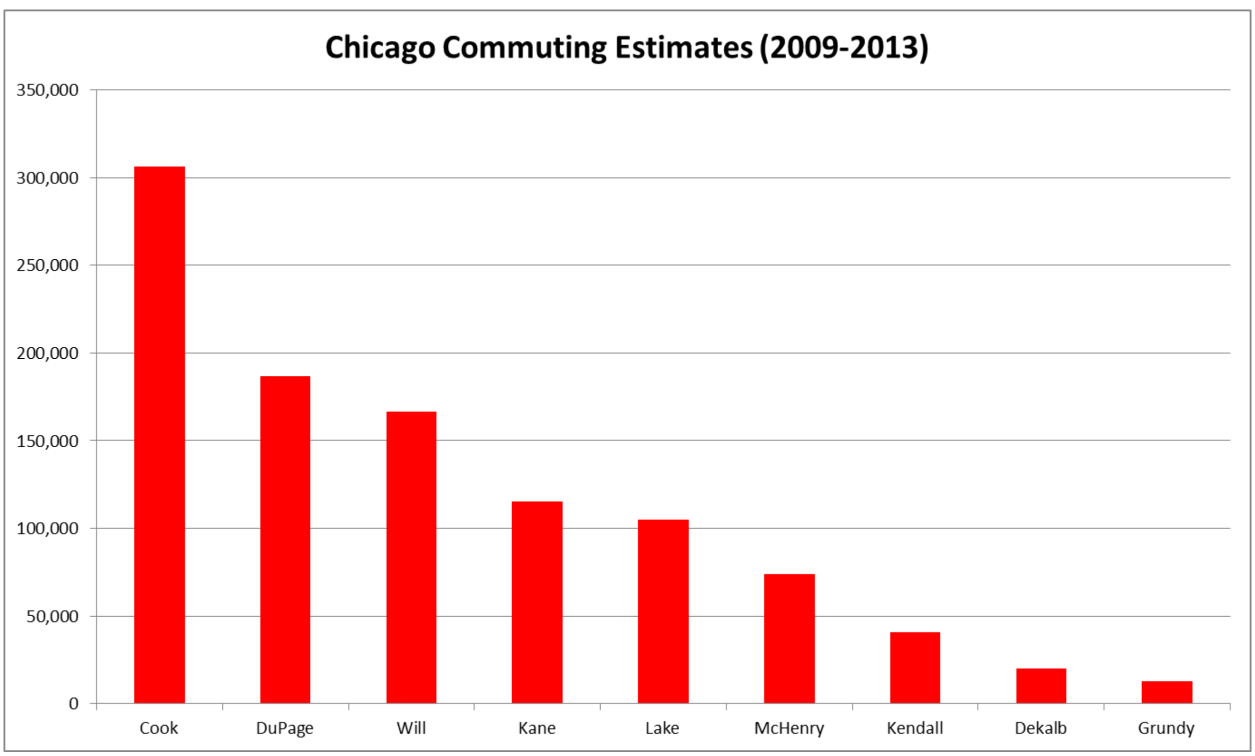


The U.S. Census Bureau has compiled statistics from 2009-2013 American Community Survey data that quantify commuting patterns both between counties and in and out of the state. Table 9 and Figure 11 show counties within the Chicago area and their respective commuting patterns. Within most of the Chicago MSA, a higher percentage of people stay in the counties in which they reside for work; however, commuting patterns within Kendall and Grundy Counties show a higher percentage of workers commuting to other counties within the area. However, the number of commuters in the Chicago MSA is overwhelmed by the number of Cook County commuters (about 60% of all of the commuters in the MSA). And 87% of the commuters in Cook County remain in Cook County for work.

Table 9. Commuting Patterns in the Chicago MSA

County of Residence	Workers	Staying in County	Commuting	Percent Staying	Percent Commuting
Cook	2,364,074	2,057,967	306,107	87.05%	12.95%
DuPage	461,643	274,956	186,687	59.56%	40.44%
Will	316,970	150,329	166,641	47.43%	52.57%
Kane	242,560	127,424	115,136	52.53%	47.47%
Lake	337,985	233,253	104,732	69.01%	30.99%
McHenry	150,887	77,111	73,776	51.11%	48.89%
Kendall	56,825	16,135	40,690	28.39%	71.61%
Dekalb	49,655	29,714	19,941	59.84%	40.16%
Grundy	22,556	9,785	12,771	43.38%	56.62%

Figure 11. Commuters by County in the Chicago MSA



Emissions and Emission-Related Data: Metro-East

Emissions: Metro-East

Tables 10 and 11 and Figures 12 and 13 summarize Illinois EPA's 2014 estimated emissions from point, area, non-road mobile, and on-road mobile sources in the St. Louis MSA, including the adjacent counties of Randolph, Montgomery, and Washington.

For the St. Louis MSA and adjacent counties, NOx emissions are highest in Madison, St. Clair, and Randolph counties. Combined NOx emissions from Madison, St. Clair, and Randolph counties contribute about 58% of the total NOx emissions within the area. The greatest source contributors to the total NOx emissions for Madison and Randolph counties are point sources, whereas the greatest contributions in St. Clair County comes from on-road sources. Greene, Bond, Jersey, and Calhoun counties have relatively low emissions; combined they contribute to about 8% of the total NOx emissions.

VOC emissions are highest in Madison and St. Clair counties, and account for nearly 51% of the total VOC emissions. In contrast, Clinton, Macoupin, Randolph, Montgomery, and Monroe VOC emissions contribute to only 33% of the total VOC emissions for the area. Area sources are the major contributor towards total VOC emissions for 2014. VOC emissions are lowest in Jersey, Greene, Calhoun, and Bond counties, with combined emissions contributing around 13% of the total VOC emissions.

For the St. Louis MSA (Figure 14), the largest point sources for NOx are located in Madison, Montgomery, and Randolph counties. Madison and St. Clair counties have the largest number of NOx emitting point sources, most emitting less than 100 tons per year. Adjacent counties have relatively few point sources emitting NOx. The largest emitting and greatest number of point sources emitting VOC's (Figure 15) are located in Madison and St. Clair counties. Adjacent counties have relatively few point sources emitting VOCs.

Table 10. NOx Emissions by County in the Metro-East MSA

NOx					
COUNTY	POINT	AREA	NONROAD	ONROAD	Total Tons/Yr
Madison	6,868.15	859.66	2,124.40	4,904.63	14,756.84
Randolph*	4,730.09	171.19	2,319.66	531.20	7,752.14
St. Clair	360.12	701.43	1,682.40	4,620.29	7,364.25
Clinton	3,196.28	272.53	776.54	695.82	4,941.17
Washington*	2,817.03	234.69	525.94	653.02	4,230.68
Montgomery*	1,888.98	115.84	810.25	889.34	3,704.41
Monroe	5.91	120.99	1,921.50	607.59	2,655.99
Macoupin	8.02	179.41	701.91	797.49	1,686.82
Calhoun	0.75	19.85	1,053.50	74.41	1,148.51
Bond	15.06	81.78	446.89	523.44	1,067.17
Jersey	0.00	76.13	561.68	374.12	1,011.93
Greene	0.00	48.91	579.98	229.84	858.74

Figure 12. NOx emissions by County in the Metro-East MSA

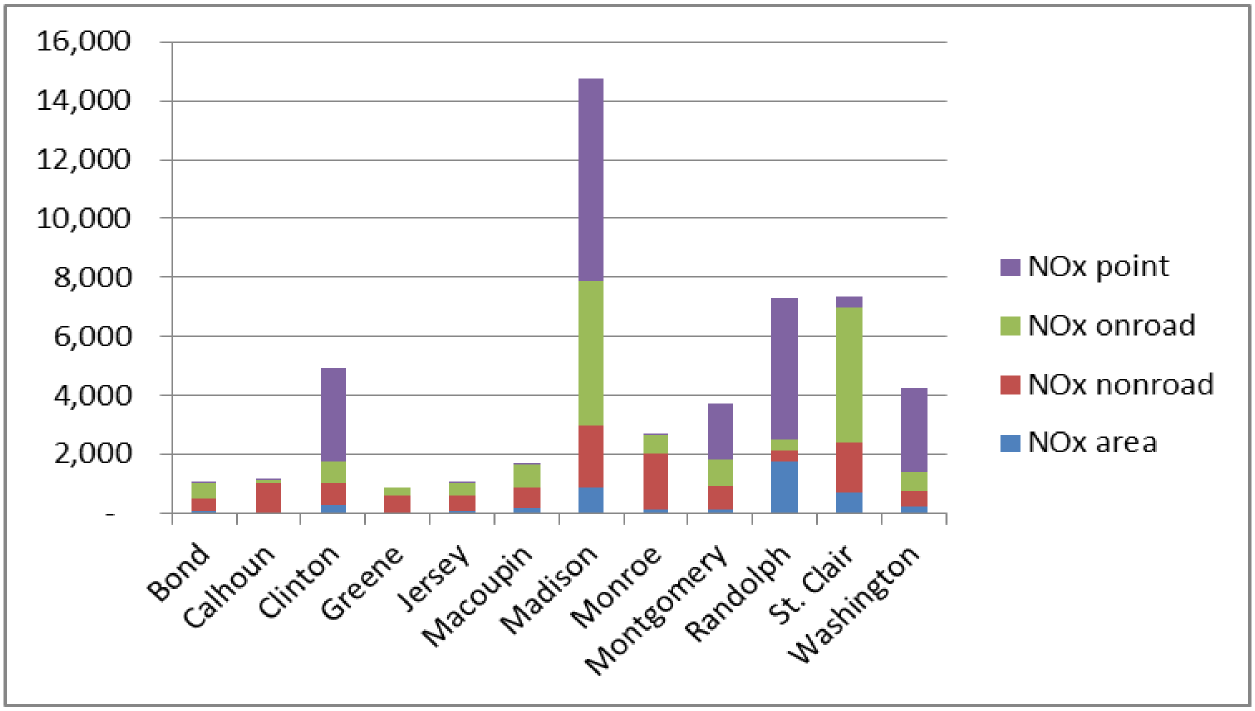


Table 11. VOC emissions by County in the Metro-East MSA

VOC					
COUNTY	**POINT**	**AREA**	**NONROAD**	**ONROAD**	**Total Tons/Yr**
Madison	2,555.26	3,178.41	1,239.88	1,788.35	8,761.90
St. Clair	522.33	2,706.06	795.31	1,704.04	5,727.73
Clinton	185.97	1,079.45	929.19	274.79	2,469.41
Randolph*	327.90	671.05	703.40	255.10	1,957.46
Macoupin	5.29	958.78	295.86	381.98	1,641.91
Montgomery*	145.16	729.45	331.46	299.60	1,505.67
Washington*	88.17	1,000.82	124.71	196.49	1,410.19
Monroe	17.37	582.91	363.18	234.11	1,197.56
Calhoun	0.11	199.71	794.21	40.34	1,034.36
Jersey	10.34	418.46	333.43	168.82	931.05
Bond	24.13	456.51	195.81	173.29	849.74
Greene*	0.40	431.82	219.68	115.57	767.47

Figure 13. VOC emissions by County in the Metro-East MSA

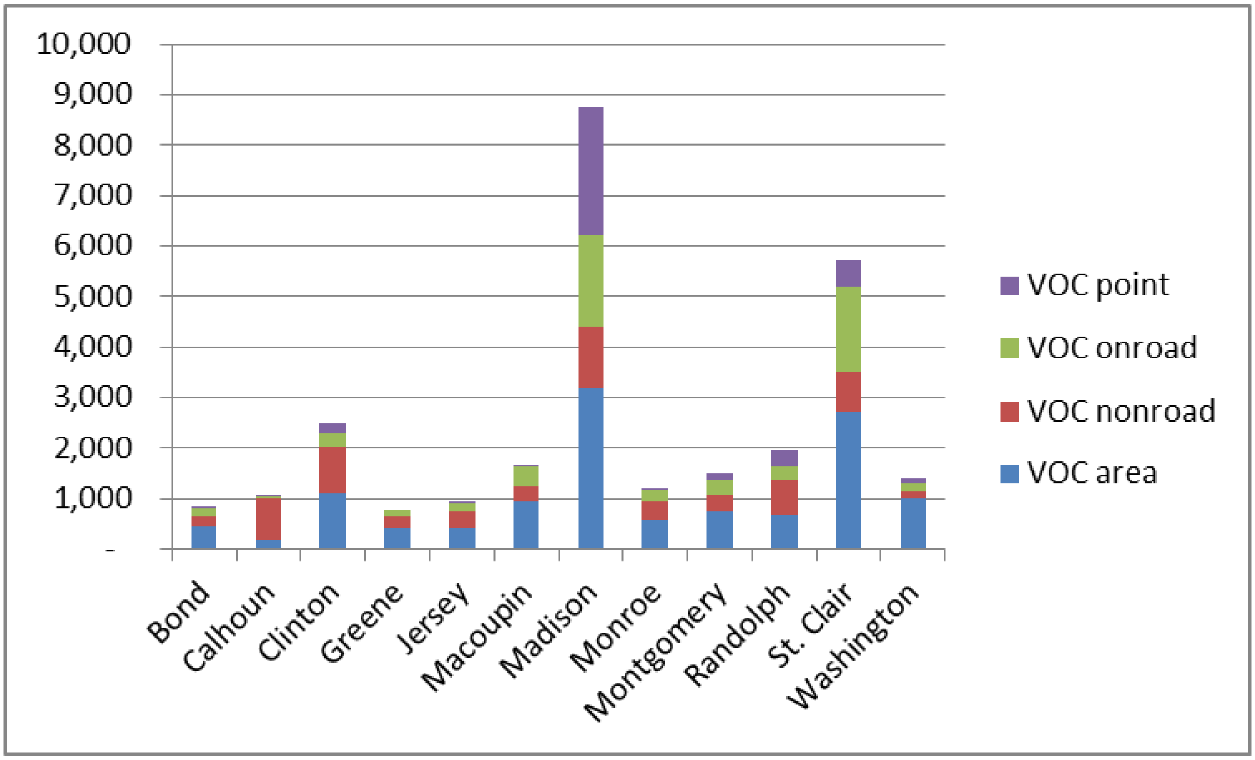


Figure 14. NOx Point Sources in the Metro-East MSA

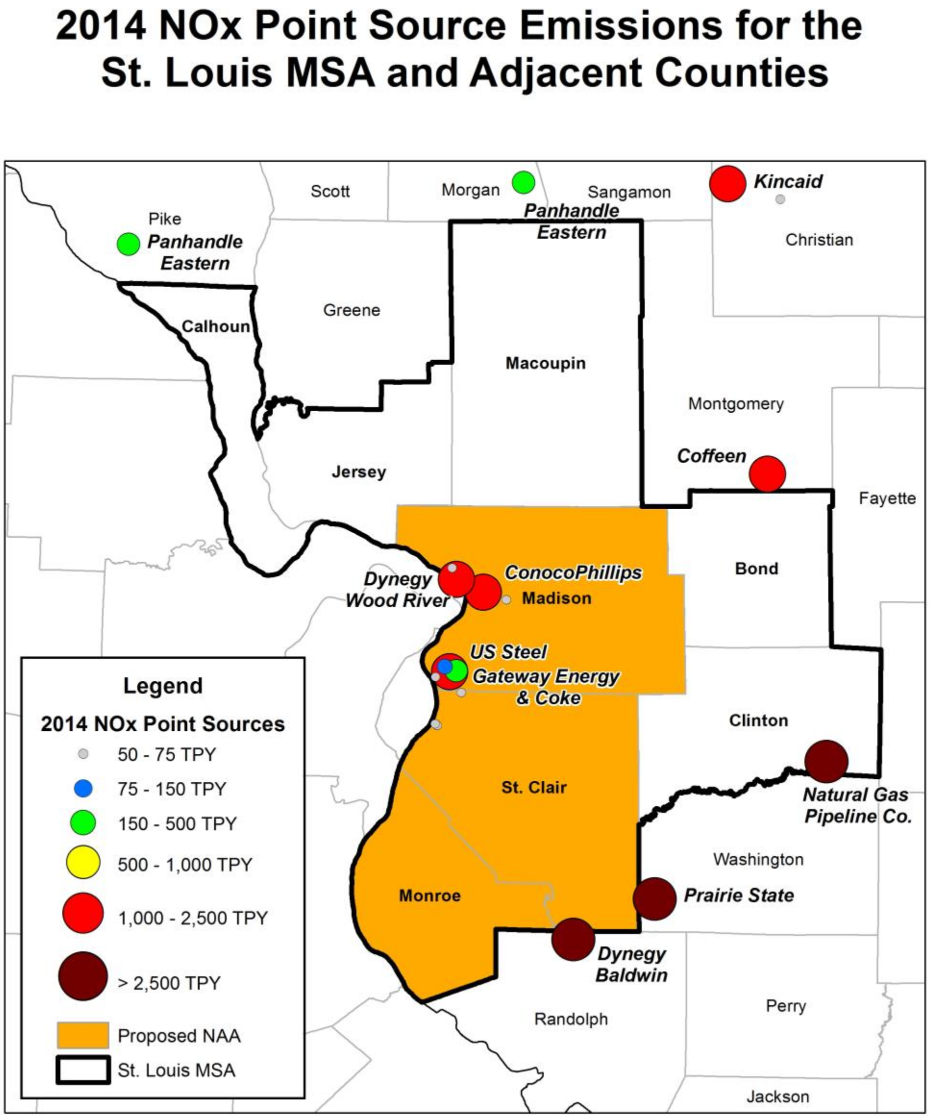
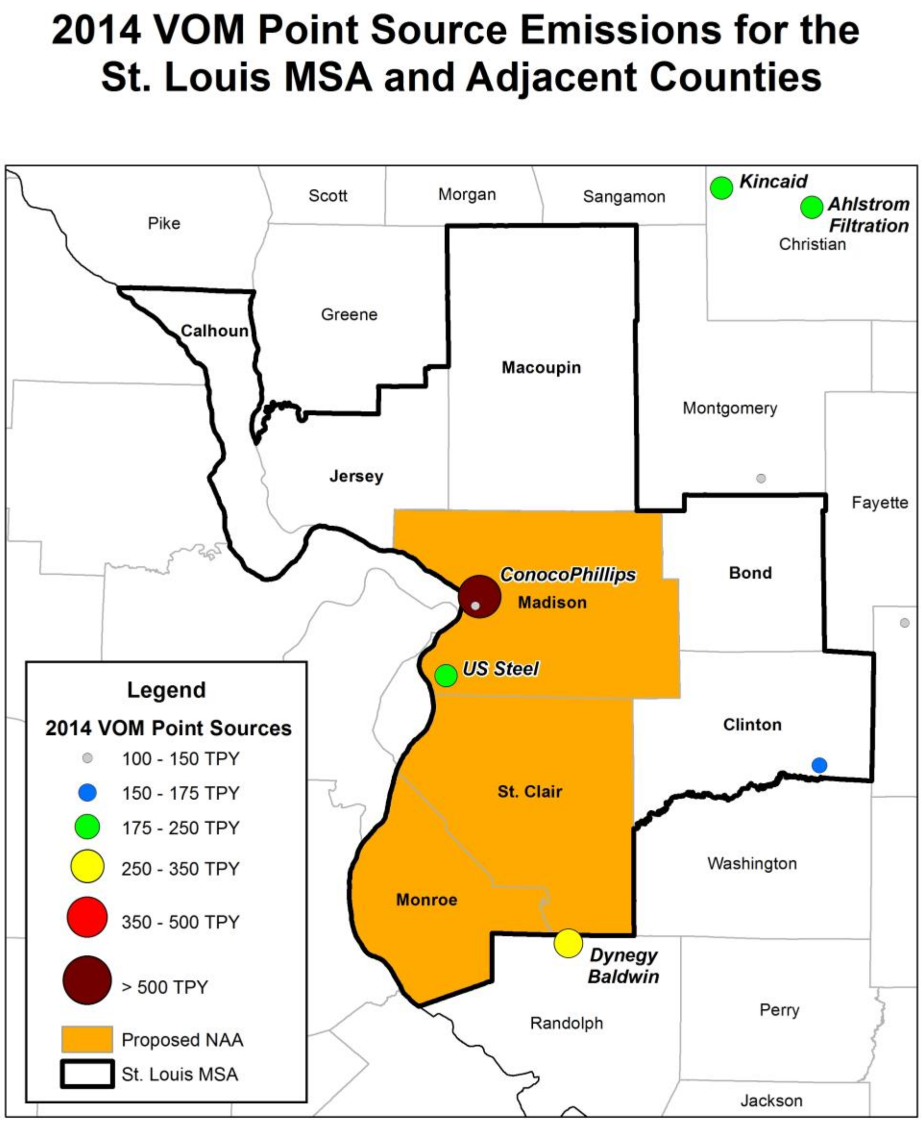


Figure 15. VOC (VOM) Point Sources in the Metro-East MSA



Emission-Related Data – Population and Urbanization: Metro-East

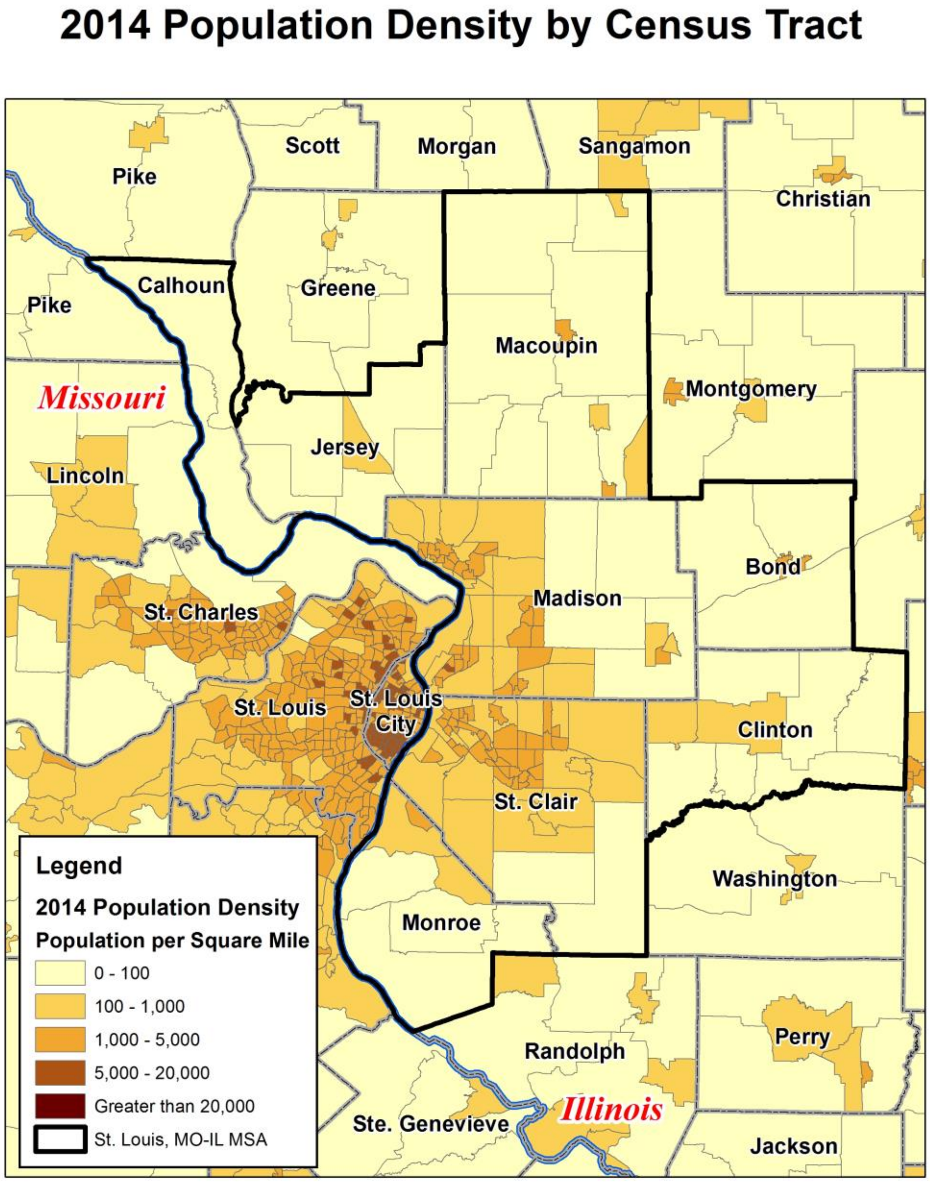
Population and urbanization are factors that supplement and help to inform the analysis of emissions data. Table 12 lists the population of each of the counties contained in the St. Louis MSA, as well as land areas and population densities based on U.S. Census Bureau estimates for 2014. Figure 16 graphically depict population densities in the St. Louis MSA. Madison and St. Clair counties contain the majority of the Metro-East population, while Bond, Washington, and Calhoun counties are considerably less populated.

Table 12. Population Data by County - Metro-East MSA and Adjacent Counties

County	2014 Population	Land Area (Square Mile)	Population Density (Persons per Sq. Mile)
St. Clair	265,552	663.81	400
Madison	266,635	725.02	368
Clinton	37,802	472.23	80
Monroe	33,695	388.29	87
Jersey	22,552	369.16	61
Randolph*	33,048	578.42	57
Macoupin	46,354	863.57	54
Bond	17,124	380.2	45
Montgomery*	29,058	703.8	41
Washington*	14,394	562.61	26
Calhoun	4,963	263.62	19

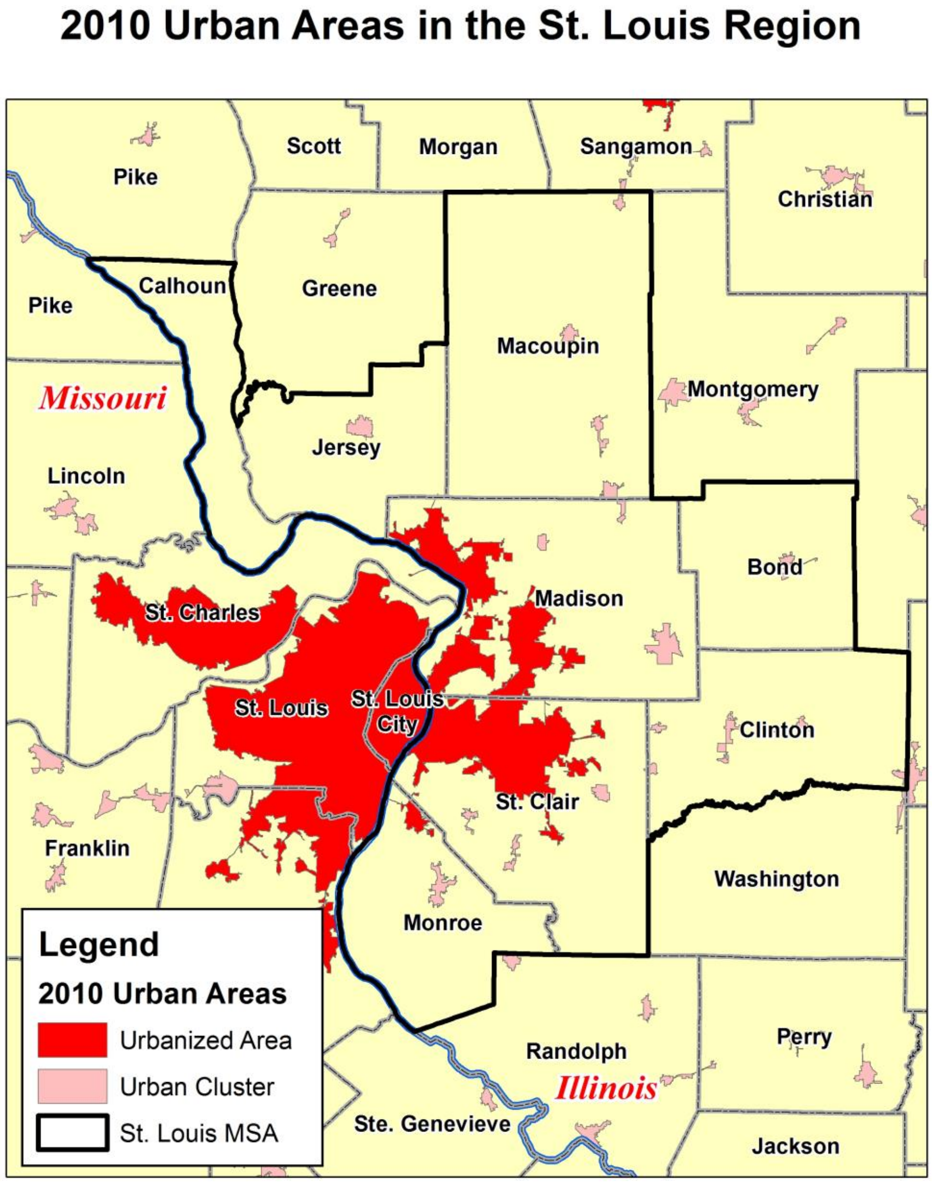
*Counties not included in St. Louis MO-IL MSA

Figure 16. Population Density in the Metro-East MSA



In the St. Louis MSA and adjacent county areas, urbanization is not as pronounced as seen in the Chicago MSA (Figure 17). Madison and St. Clair counties are the most urbanized of the counties in the Metro-East portion of the St. Louis MSA. Adjacent counties such as Washington, Montgomery, and Randolph are not included in the St. Louis MSA and contain population centers disconnected from the Metro-East urban core. Based on the non-contiguous pattern of urbanization, it is logical to conclude that Washington, Montgomery, and Randolph counties are not influencing emissions related to social, economic, and population growth in the Metro-East region.

Figure 17. Urbanized Areas in the Metro-East MSA



Population growth is an important indicator of potential emission increases in an area. Table13 outlines percent change in population between 2010 and 2014 by county for the Metro-East MSA. This data was provided by the U.S. Census Bureau and is based on estimates dated July 1, 2015. According to the data, only Monroe County has experienced modest population growth. Clinton County's population is essentially unchanged, while the other counties in the MSA have decreased by at least 1.0 % over the four years. The two most populated counties, Madison and St. Clair, have both experienced decreases in population.

Table 13. 2010-2014 Population Change by County for the Metro-East MSA

County	2010 Population	2014 Population	Change (%)
Monroe	32,957	33,695	2.2%
Clinton	37,762	37,802	0.1%
Madison	269,282	266,635	-1.0%
Randolph	33,476	33,048	-1.3%
St. Clair	270,056	265,552	-1.7%
Jersey	22,985	22,552	-1.9%
Calhoun	5,089	4,963	-2.5%
Macoupin	47,765	46,354	-3.0%
Bond	17,768	17,124	-3.6%

Emission-Related Data – Traffic and Commuting Patterns: Metro-East

Table 14 summarizes IDOT's estimates of AVMT for 2014, as calculated by IDOT's Highway Information System for the Metro-East Study Area. Figure 18 presents the same data in a pie chart format. According to IDOT traffic statistics for 2014, Madison and St. Clair Counties have the highest level of AVMT in the St. Louis Study Area. Both counties together account for almost three-fourths of the AVMT in the MSA. The other counties have relatively minor AVMT in comparison, with Calhoun County having less than 0.5 % of the total for the MSA.

Table 14. 2014 IDOT Travel Statistics for the Metro-East MSA

St. Louis Metropolitan Statistical Area (MSA)	Annual Vehicle Miles Traveled (AVMT)
Madison	2,935,477,274
St. Clair	2,748,986,955
Macoupin	406,175,818
Clinton	391,161,309
Monroe	368,211,460
Bond	291,596,540
Randolph*	269,049,614
Jersey	196,211,404
Calhoun	35,735,522
* Randolph County is not part of the MSA	

Figure 18. 2014 AVMT - Percent by County in the Metro-East MSA

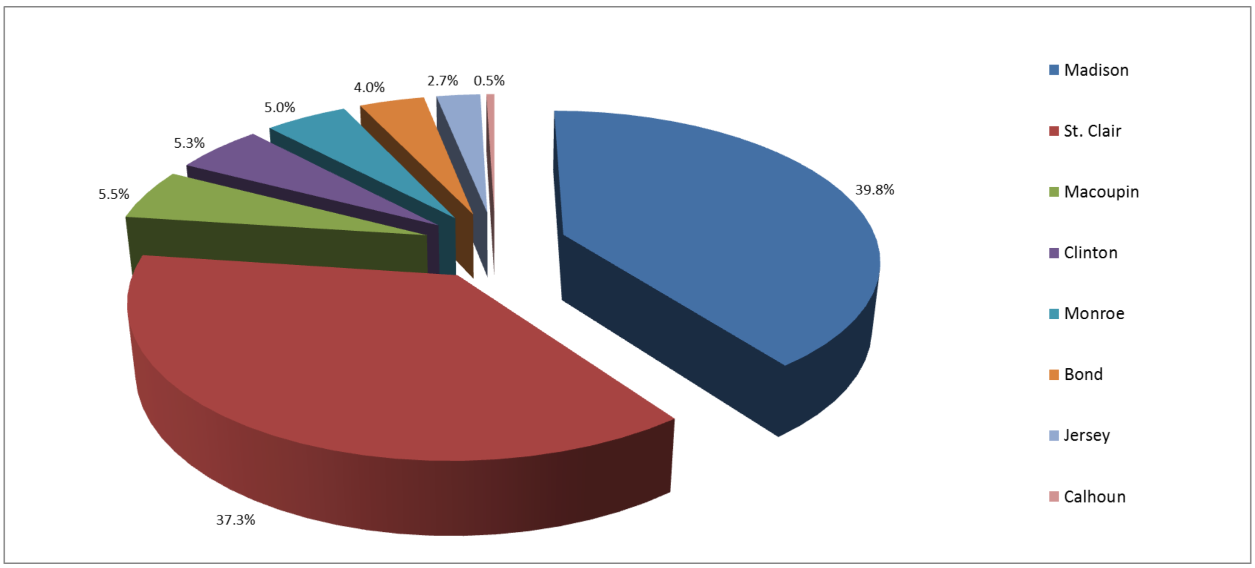
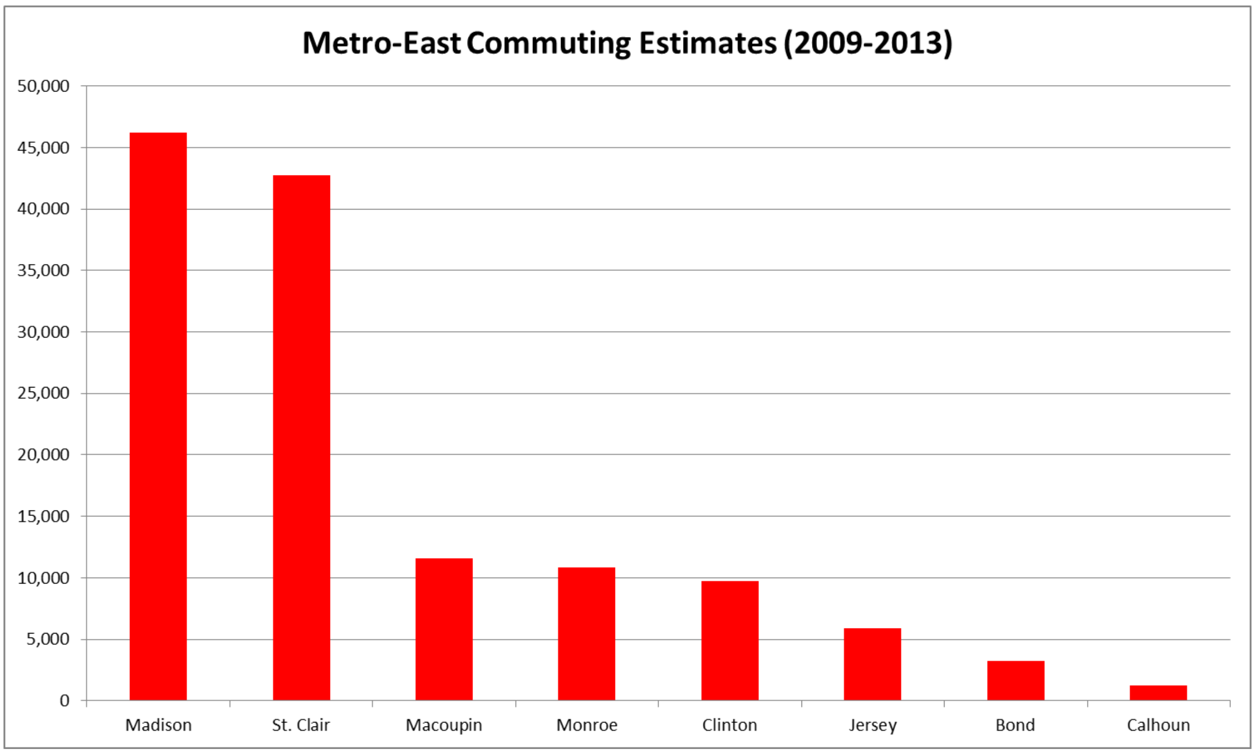


Table 15 and Figure 19 show counties within the Metro-East Study Area and their respective commuting patterns. Within the Metro-East Study Area, a higher percentage of people stay in the counties in which they reside for work, especially in Madison and St. Clair Counties, where the large majority of commuters live. Jersey, Calhoun, Clinton, and Monroe Counties show a greater percentage of workers commuting to other counties within the MSA, but the percentage of workers commuting from these counties to other counties is just over 10% of all workers in the MSA.

Table 15. Commuting Patterns in the Metro-East MSA

County of Residence	Workers	Staying in County	Commuting	Percent Staying	Percent Commuting
Madison	122,193	76,006	46,187	62.20%	37.80%
St. Clair	119,278	76,525	42,753	64.16%	35.84%
Macoupin	21,342	9,763	11,579	45.75%	54.25%
Monroe	16,184	5,317	10,867	32.85%	67.15%
Clinton	18,547	8,802	9,745	47.46%	52.54%
Jersey	10,062	4,138	5,924	41.13%	58.87%
Bond	7,508	4,239	3,269	56.46%	43.54%
Calhoun	2,154	904	1,250	41.97%	58.03%

Figure 19. Commuters by County in the Metro-East MSA



Factor 3 – Meteorology

Meteorological data analysis provides additional insight into the transport of emissions. The most simplistic approach is to evaluate wind direction and speed from a fixed location, such as a National Weather Service meteorological data site. However, it is often difficult to assess where the air mass was, even an hour or two before the measurement was taken.

A more sophisticated analysis can be done by use of a back trajectory model. This type of model starts with a user-supplied location and time and tracks the air mass backwards using output from a meteorological model. This method produces a path that the air mass has taken to get to the desired final location and time, for as long of a period as 48 hours prior. Since nonattainment areas are relatively small and air mass residence time over the nonattainment area is short, a back trajectory model is an important tool in determining from where ozone and precursors are being transported.

The HYSPLIT (Hybrid Single-Particle Lagrangian Integrated Trajectory) modeling system produces trajectories that indicate the path air parcels travel over a given time. The modeling system uses meteorological data and topography to simulate atmospheric transport. In this analysis, days were chosen that had two or more monitors in the nonattainment areas that exceeded the 70 ppb standard. A total of ten days met this criteria in the Metro-East over the period 2013-2015, while 14 days met the criteria for the Chicago area. The endpoint of the HYSPLIT trajectories was in northwestern Madison County, which represents a central location for the highest design values in the Metro-East MSA. O'Hare Airport was the endpoint representing the areas of highest design values in the Chicago MSA.

These trajectories were generated following EPA's Designation Guidance Memorandum, including using the EDAS 40 km meteorological data, calculating trajectories at three different heights above the endpoint (100 m, 500 m, and 1000 m), and using an end time of 0000 Universal Coordinated Time (UTC), which is equivalent to 7 PM central daylight time. The end time of 7 PM almost always lies within the 8-hour period comprising the maximum ozone concentration on high ozone days. The trajectories go back 48 hours in time, accounting for the two previous days of loading ozone and precursors into the air mass.

Chicago Trajectories:

Individual trajectories for all 14 days are in Appendix A. In the Chicago area, there are generally two types of transport scenarios: a stronger wind scenario with transport across long distances (over 500 km; Figure 20), and shorter transport trajectories that have strong anticyclonic curvature (Figure 21).

The difference in the transport on high ozone days in Chicago is that stagnation conditions and the overall large size of the urban area can keep the air mass over the Chicago area for up to twelve hours. A caveat is that meteorological models struggle with simulating a land/lake breeze circulation; therefore, the trajectories derived from the models also likely won't accurately reflect lake-induced circulations. On days where lake breeze circulations are suspected, counties adjacent to Lake Michigan will have a more significant emissions contribution. However, using a photochemical modeling domain that covers much of North America, and the use of an entire ozone season worth of meteorology in ozone simulations, minimizes the risk that a dominant meteorological scenario for high ozone will not be represented in control strategy assessment.

Figure 20. Long distance transport scenario into the Chicago MSA

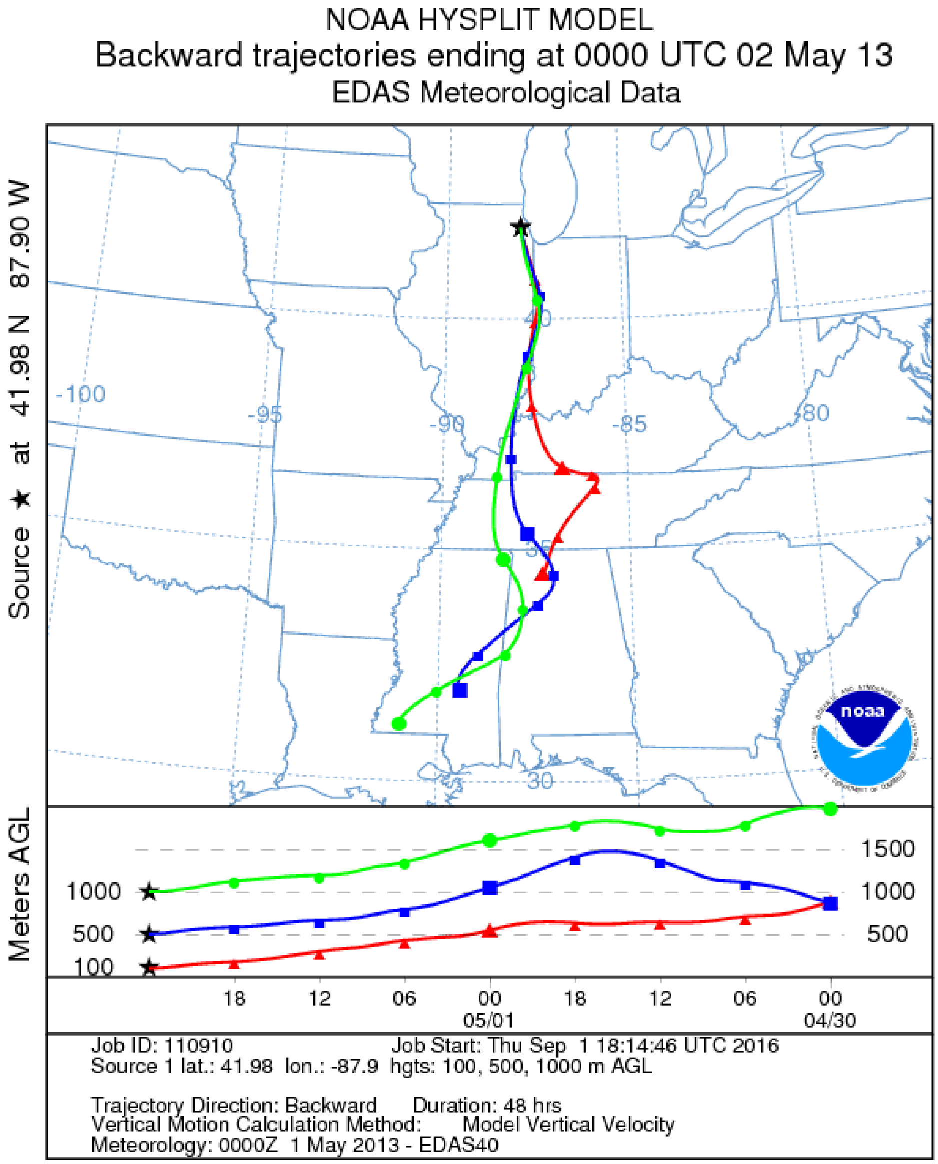
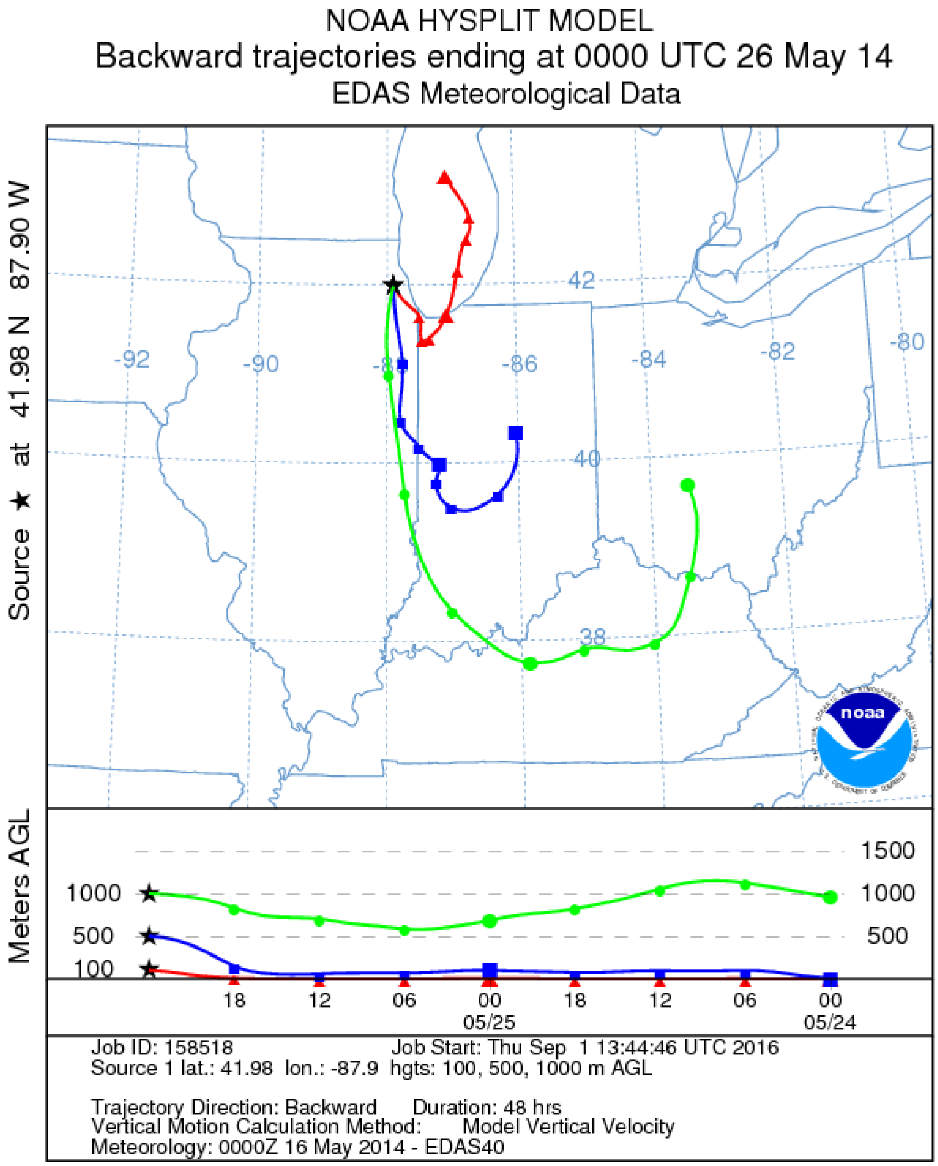


Figure 21. Anticyclonic curvature transport scenario into the Chicago MSA



Metro-East Trajectories

Individual trajectories for all ten days are in Appendix B. The trajectories generally represent two scenarios; the first is a stronger flow pattern, where transport over 48 hours can exceed 1,000 km (Figure 22), and the second is a relatively stagnant wind flow, where trajectories are much shorter and usually have a pronounced anticyclonic (clockwise) curvature, indicating circulation around a surface high pressure center (Figure 23). In both cases, residence time over the nonattainment area is short, though especially light winds can lead to 6-12 hours of residence time. However, using a photochemical modeling domain that covers much of North America, and the use of an entire ozone season worth of meteorology in ozone simulations, minimizes the risk that a dominant meteorological scenario for high ozone will not be represented in control strategy assessment.

Figure 22. Long distance transport scenario into the Metro-East MSA

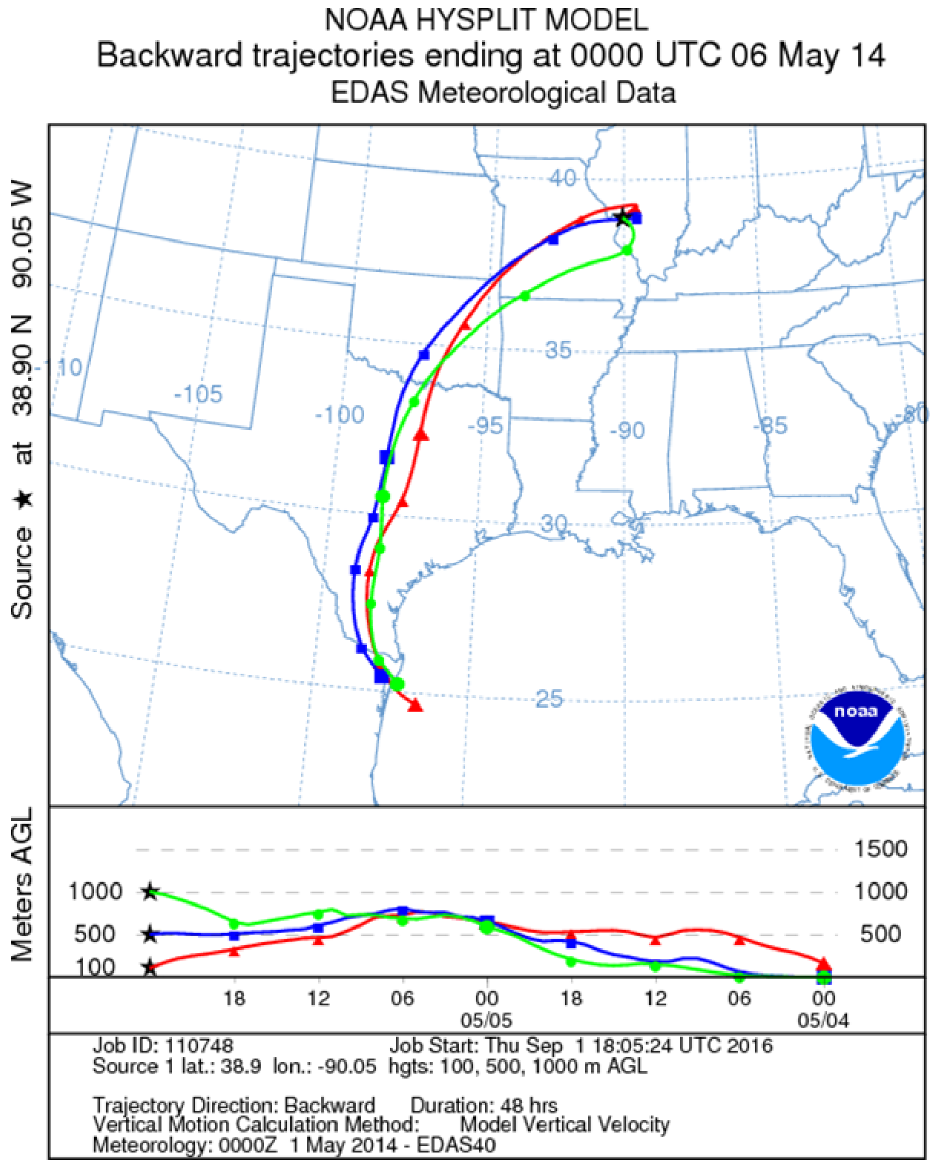
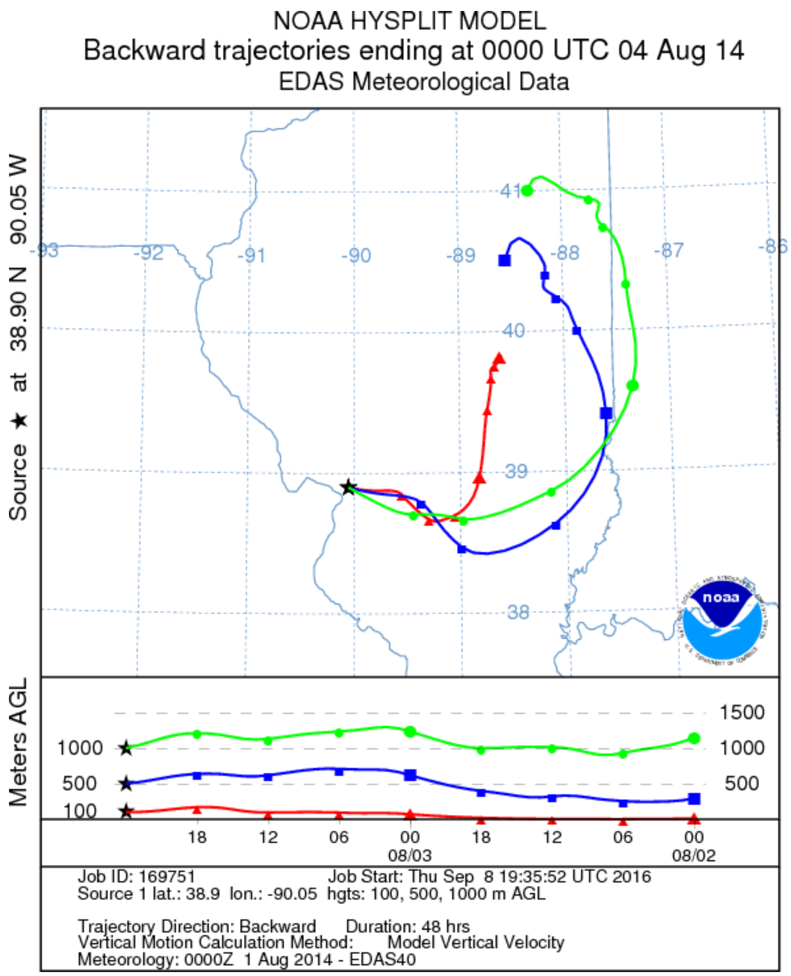


Figure 23. Anticyclonic curvature transport scenario into the Metro-East MSA



Factor 4 – Geography/Topography

Illinois is typified by flat to gently rolling terrain, with the exception of the Driftless Area in the northwest corner of the state and the Ozark Plateau in southern portion of the state. Illinois occupies a land mass of approximately 55,584 square miles. The average elevation of the state is approximately 600 feet (183 m) above sea level. Charles Mound, located in Jo Davies County, is the highest point in the state with an elevation of 1,235 feet (376 m) above sea level. The lowest point in the state is 279 feet (85 m) above sea level along the Mississippi River in Alexander County. Total topographic relief across the state is less than 1,000 feet, demonstrating the general flatness of the terrain. Therefore, topography is generally not a factor in affecting pollutant transport in Illinois, and is not considered a significant issue in defining the boundaries of the 8-hour ozone nonattainment areas.

Factor 5 – Jurisdictional Boundaries

The Illinois EPA is responsible for air quality regulatory programs for every county in the state. Jurisdictional boundaries considered in this analysis are consistent with recommended geographic boundaries definitions, outlined in U.S. EPA's guidance documentation. Township Boundaries in this study reflect the 2009 political township boundaries provided by the Property Tax Division of the Illinois Department of Revenue. Based on the geographic location of the Chicago and Metro-East areas and the individual sources, it is expected that the coordination of planning activities required to address the nonattainment designation can be carried out in a cohesive manner.

Five Factor Cumulative Evaluation and Recommendations

Chicago Area

Cook County. Cook County has high levels of precursor emissions, and generally has the highest emissions of any of the nine counties in the Chicago Study Area. Demographically, Cook County has the highest population, the highest population density, and the highest level of AVMT of all the counties in the Chicago Study Area. Therefore, Cook County should be included in the Chicago nonattainment area for the 2015 ozone standard.

DuPage and Will Counties. DuPage and Will Counties have high levels of precursor emissions. DuPage County is second only to Cook County in total population, population density, vehicular traffic, and total urban land cover. Similarly, Will County has a relatively high population, population density, population growth, and traffic level. The Illinois EPA therefore recommends that DuPage and Will Counties be included in the Chicago nonattainment area for the 2015 ozone standard.

Lake County. Lake County contains the one nonattainment monitor in the MSA, as well as high levels of precursor emissions, relatively high total population and population density, and moderately high levels of vehicular traffic. The Illinois EPA therefore recommends that Lake County be included in the Chicago nonattainment area for the 2015 ozone standard.

Kane and McHenry Counties. Kane and McHenry Counties are on the western fringe of the metropolitan area with the eastern portions of these counties having an urban/suburban character, while the western portions are basically rural. These counties have moderate levels of precursor emissions relative to Cook, DuPage, Lake, and Will Counties, and the total population and population density in these counties are also relatively moderate. McHenry and Kane counties are experiencing minor population growth. The Illinois EPA therefore recommends that McHenry and Kane counties be included in the Chicago nonattainment area for the 2015 ozone standard.

Kendall and Grundy Counties. Due to their primarily rural character, most of Kendall and Grundy Counties were not included in the 1997 or the 2008 ozone nonattainment areas. Precursor emission levels in these counties are low, as is the total population, population density, and traffic volumes. However, due to the presence of emission sources located in parts of the counties, the Illinois EPA recommends that Oswego Township in Kendall County and Goose Lake and Aux Sable Townships in Grundy County be included in the Chicago nonattainment area for the 2015 ozone standard. The remainder of these two counties should retain their current designation as unclassifiable/attainment.

DeKalb County. The U.S. Census Bureau added DeKalb County to the Chicago MSA in 1998. DeKalb County has not been included in any ozone nonattainment area to date. This county is primarily rural, as shown by its low 2015 population totals and population densities, and is not contiguous with the Chicago urbanized area. Current precursor emission levels in this county are also low, compared to the other counties in the MSA. For these reasons, the Illinois EPA recommends that DeKalb County be designated unclassifiable/attainment for the 2015 ozone standard.

Metro-East St. Louis Area

Madison County. Madison County is designated as part of the nonattainment area for the 2008 ozone standard. Current air quality data (2013-2015) at one monitor in Madison County does not meet the 2015 ozone standard. In terms of precursor emissions, Madison County has the highest amounts of both NOx and VOCs in the Metro-East portion of the MSA. Demographically, Madison County has the highest population and the second highest population density. The Illinois EPA recommends that Madison County be included in the Metro-East nonattainment area for the 2015 ozone standard.

St. Clair County. St. Clair County is designated as part of the nonattainment area for the 2008 ozone standard. Current air quality data (2013-2015) at the monitor in St. Clair County shows that it is attaining the 2015 ozone standard. St. Clair County is one of the three highest emitting counties of both NOx and VOC in the Metro-East. St. Clair County has the highest population density and the second highest total population. St. Clair County also ranks second in AVMT within the study area. The Illinois EPA recommends that St. Clair County be included in the Metro-East nonattainment area for the 2015 ozone standard.

Monroe County. Monroe County is on the southern fringe of the Metro-East area with the northern portions of the county having an urban/suburban character, while the southern and eastern portions of the county are basically rural. It is currently designated as nonattainment for the 2008 ozone standard. Additionally, Monroe County has a relatively high commuting percentage. Due to these reasons, the Illinois EPA recommends that Monroe County be included in the Metro-East nonattainment area for the 2015 ozone standard.

Jersey County. Jersey County is a rural county located to the north of St. Louis, and is designated as unclassifiable/attainment for the 2008 ozone standard. Jersey County has low levels of precursor emissions, low population and population density, and low total population growth rates. For these reasons, the Illinois EPA recommends that Jersey County be designated as unclassifiable/attainment for the 2015 ozone standard.

***Clinton Count*y**. Clinton County was first included in the St. Louis MO-IL MSA by the U.S. Census Bureau in 2003. This county is primarily rural, with low 2014 population totals and population densities compared to other counties in the Metro-East study area. Current NOx emissions in Clinton County are ranked fourth in the Metro-East, primarily due to a single source in the far southeastern portion of the county, well away from the current nonattainment counties of Madison and St. Clair. Clinton County is a distant third in VOC emissions in the Metro-East. Population growth is stagnant and total population is low. For these reasons, the Illinois EPA recommends that Clinton County be designated as unclassifiable/attainment for the 2015 ozone standard.

Randolph County**.** As defined by the U.S. Census Bureau, Randolph County is not part of the St. Louis MO-IL MSA. This rural county has low population, population density, and population growth rates. While Randolph County has higher NOx emissions, these are primarily due to a single power plant, which is well-controlled . For these reasons, the Illinois EPA recommends that Randolph County be designated unclassifiable/attainment for the 2015 ozone standard.

Macoupin, Bond, and Calhoun Counties**.** Bond, Calhoun, and Macoupin Counties were first added to the St. Louis MO-IL MSA by the U.S. Census Bureau in 2003. None of these three counties are included in the 2008 ozone nonattainment area. These counties are primarily rural, with low 2015 population totals and population densities. Current precursor emission levels in Macoupin, Bond, and Calhoun Counties are low, as are AVMT. For these reasons, the Illinois EPA recommends that Macoupin, Bond, and Calhoun Counties be designated unclassifiable/attainment for the 2015 ozone standard.

Montgomery County**.** Montgomery County is also not in the 2008 ozone nonattainment area, nor is it part of the St. Louis MO-IL MSA. The county is not contiguous with the Metro-East urbanized area and was therefore not evaluated based on emissions and emissions-related data or other factors for this study. Montgomery County does have a large EGU, but it is approximately 50 miles away from the violating monitor in Madison County, and is downwind from the Metro-East area. For these reasons, the Illinois EPA recommends that Montgomery County be designated as unclassifiable/attainment for the 2015 ozone standard.

Washington County**.** Washington County is not included in the 2008 ozone nonattainment area, nor is it part of the St. Louis MO-IL MSA. Washington County is considered adjacent to St. Clair County, however the county is not contiguous with the Metro-East urbanized area and was therefore not evaluated based on emission and emissions-related data influences or other factors for this study. For these reasons, the Illinois EPA recommends that Washington County be designated as unclassifiable/attainment for the 2015 ozone standard.

Remainder of Illinois

Areas of the state that are not part of the Chicago or Metro-East St. Louis metropolitan areas are in attainment with the 2015 ozone standard, and it is recommended that all remaining counties be designated as unclassifiable/attainment.

Conclusions

Illinois EPA's recommendations for attainment/nonattainment boundary designations in Illinois for the 2015 ozone NAAQS are contained in Table 15. The location of Illinois EPA's recommended ozone nonattainment areas for the State of Illinois are shown in Figure 24.

The Clean Air Act does not specify the geographic boundaries, size, or the extent to which source contributions would require that an area be designated as nonattainment for the 2015 ozone standard, nor has U.S. EPA promulgated rules prescribing such. Illinois EPA's recommendations are consistent with the guidance memorandum provided by U.S. EPA and are based on an evaluation of current air quality, the location and magnitude of ozone precursor emission sources, and other factors. The Illinois EPA recognizes that each of the factors considered in this evaluation, when evaluated individually, are not necessarily conclusive. Rather, Illinois EPA's recommendations are based on consideration of all of the factors taken together. It is expected that the coordination of planning activities required to address the nonattainment designations can be carried out in a cohesive manner. The data sources utilized in the preparation of this report are summarized in Table 16.

However, this recommendation is being made at the start of October, according to U.S. EPA requirements. Current trends do not indicate a change in recommended nonattainment counties when 2016 data is included. However, Illinois EPA intends to review 2016 monitoring data when it becomes certified and, if warranted, will request that U.S. EPA consider 2014-2016 data at that time.

Table 16. Recommended Attainment/Nonattainment Designations in Illinois for the 2015 Ozone National Ambient Air Quality Standard

County	Designation	Name of Area
Cook	Nonattainment	Chicago
DuPage	Nonattainment	Chicago
Kane	Nonattainment	Chicago
Lake	Nonattainment	Chicago
Will	Nonattainment	Chicago
McHenry	Nonattainment	Chicago
Kendall:		
Oswego Township	Nonattainment	Chicago
All Other Townships	Unclassifiable/Attainment	
Grundy:		
Aux Sable Township	Nonattainment	Chicago
Goose Lake Township	Nonattainment	
All Other Townships	Unclassifiable/Attainment	
Madison	Nonattainment	Metro-East
Monroe	Nonattainment	Metro-East
St. Clair	Nonattainment	Metro-East
All Other Counties	Unclassifiable/Attainment	

Figure 24. Proposed 2015 8-Hour Ozone NAAQS Nonattainment Areas

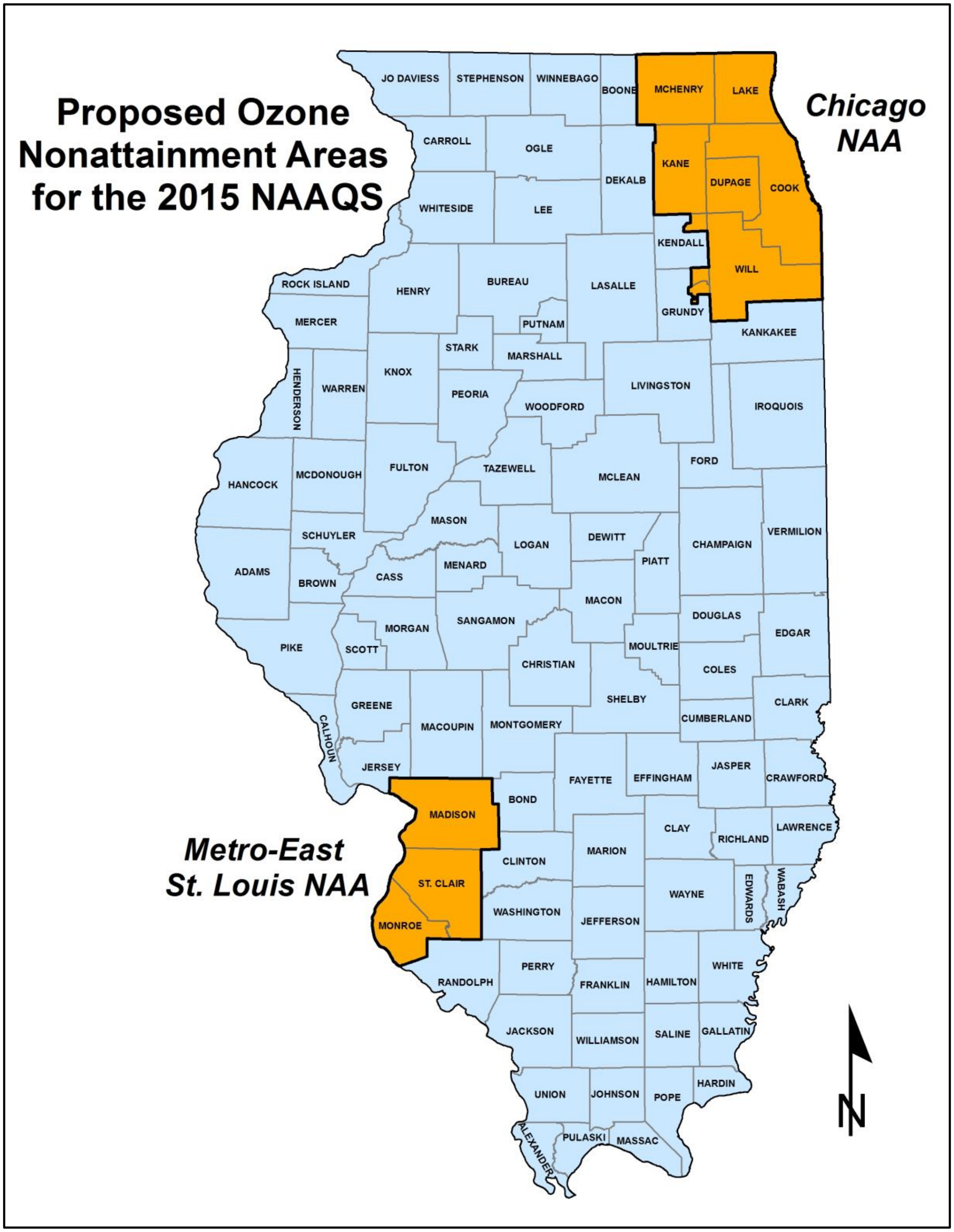
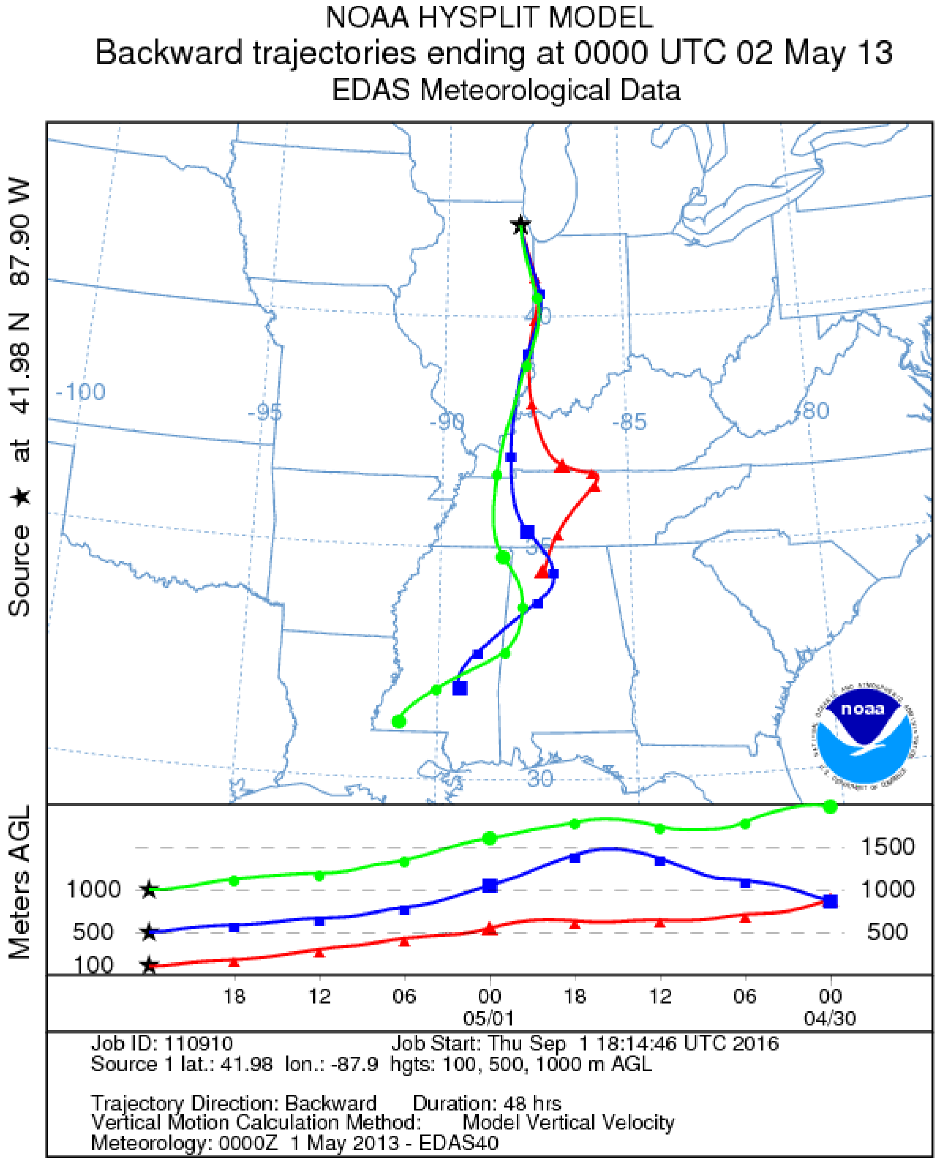


Table 17. Ozone NAA Boundary Recommendation Data Sources

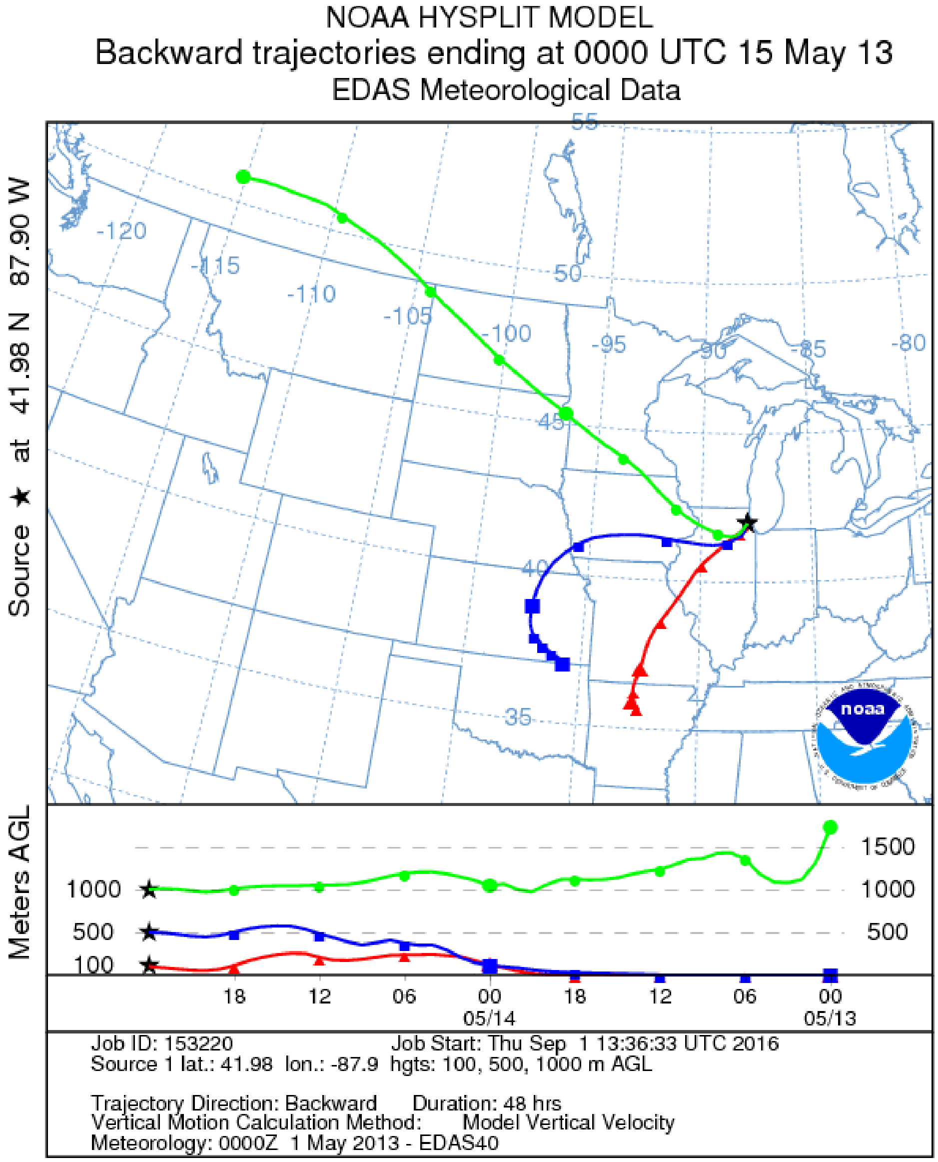
Factor	Data Analysis	Data Source	Date of Study
1. Air Quality Data	8-hour ozone 2013-2015 Design Values	Illinois EPA	2013-2015
2. Emissions	Emission inventory information for pollutants: NO_x and VOC within the Chicago and St. Louis MSA's and adjacent counties. Emission totals (tons/year) are summarized by county for point, area, on-road/mobile, and non-road and animal sectors	Illinois EPA's 2014 submittal to the National Emissions Inventory (NEI)	2014
	Source locations and reported emissions in MSA's and adjacent counties	Illinois EPA	2014
2 Population Density and Urbanization	Annual Estimates of the Population in Illinois. Total population and population density estimates*	Table1:Annual Estimates of the Resident Population : April 1, 2010 to July1,2015, U.S. Census Bureau Population Division	2015
	Urbanized area boundaries and population density by census tract	ESRI Maps and Data	2010, 2014
2. Traffic and Commuting Patterns	Annual VMT tables for 2014	Illinois Department of Transportation, Travel Statistics 2014	2014
	Resident County to Workplace County Flows files table	American Community Survey - U.S. Census Bureau	2009-2013
3. Meteorology	Interactive HYSPLIT backward trajectories	Air Resources Laboratory/ NOAA	2013-2015
4. Geography/Topography	The National Elevation Dataset (NED) for Illinois	U.S. Geological Survey	2007
5. Jurisdictional Boundaries	MSA/CBSA/CSA Boundaries	Office of Management and Budget	February 2013
	2008 ozone NAA Boundaries	Illinois EPA	2012

Appendix A. Trajectories for the Chicago Area

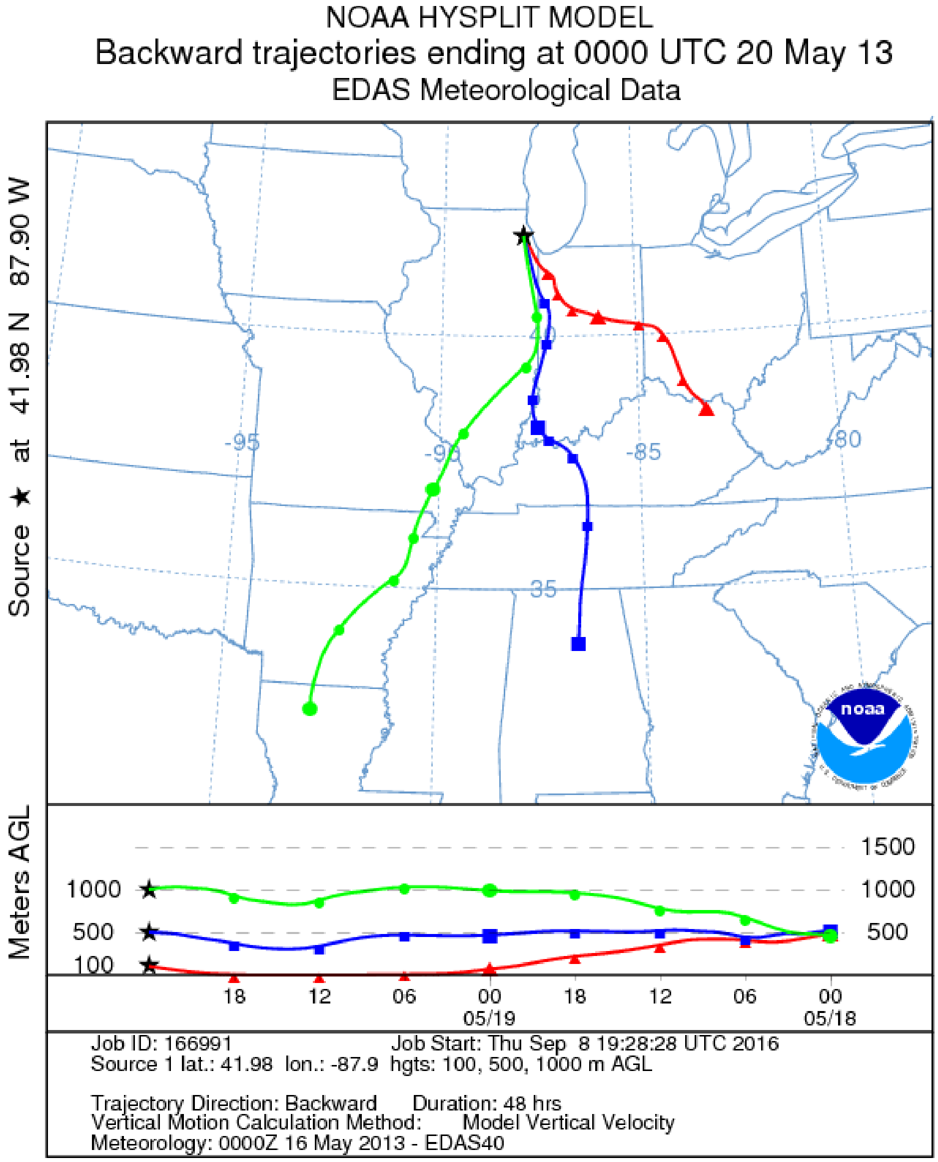
May 1, 2013, Trajectory



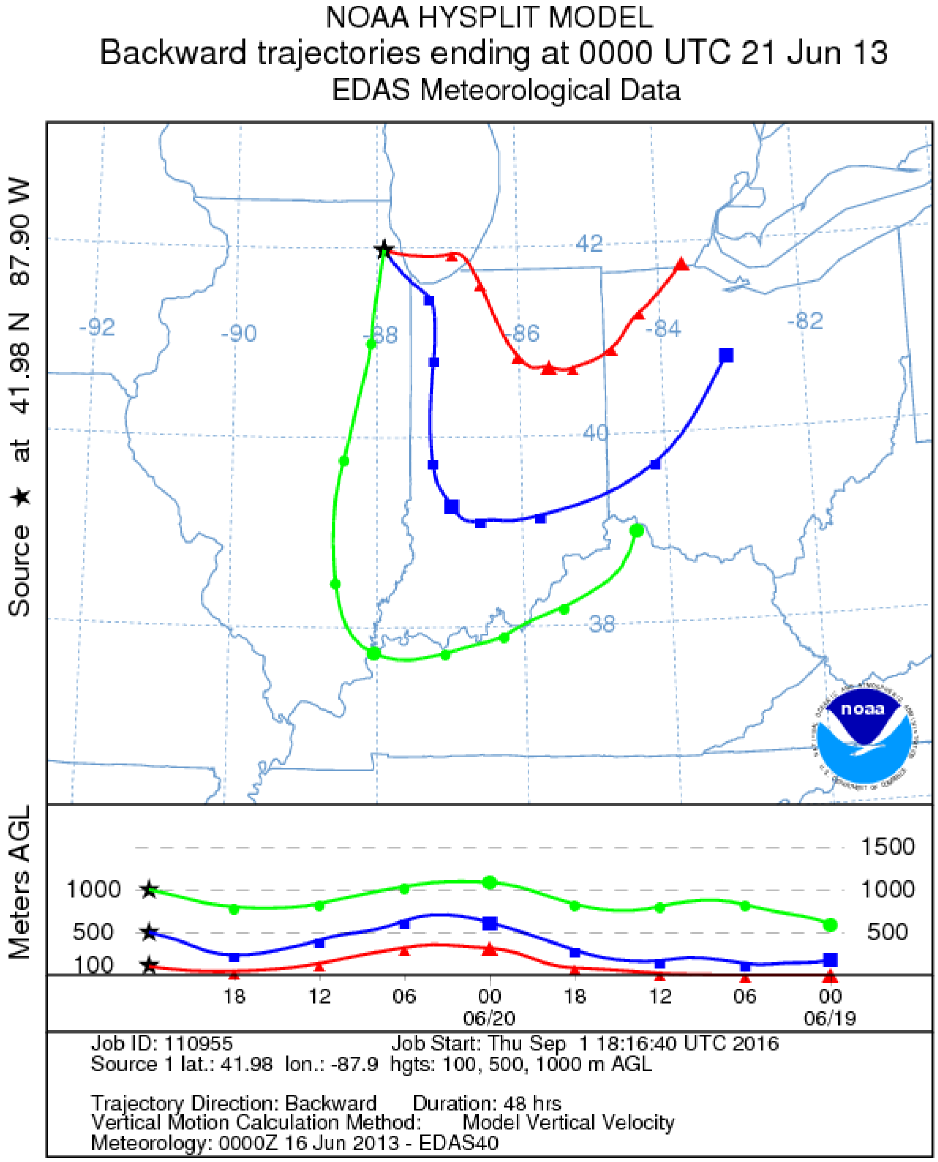
May 14, 2013, Trajectory



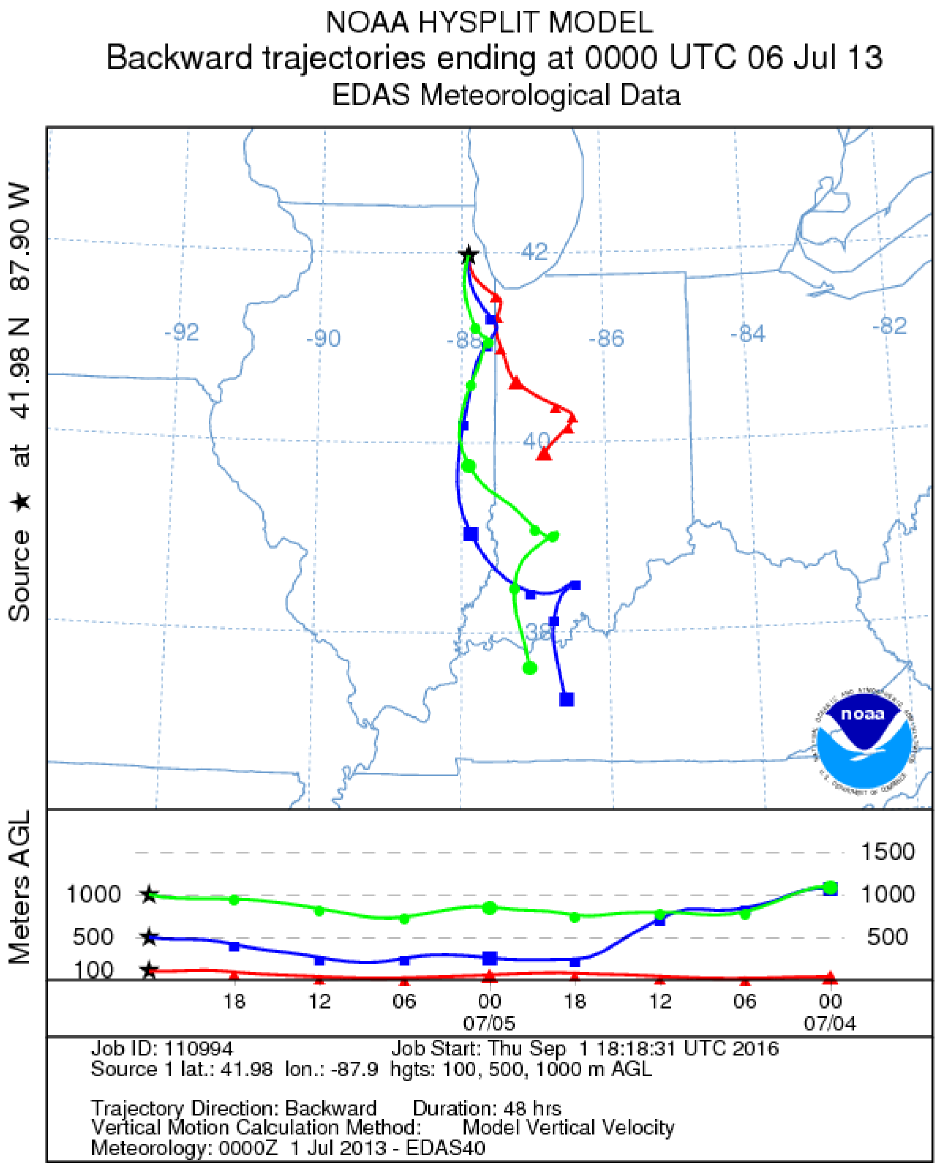
May 19, 2013, Trajectory



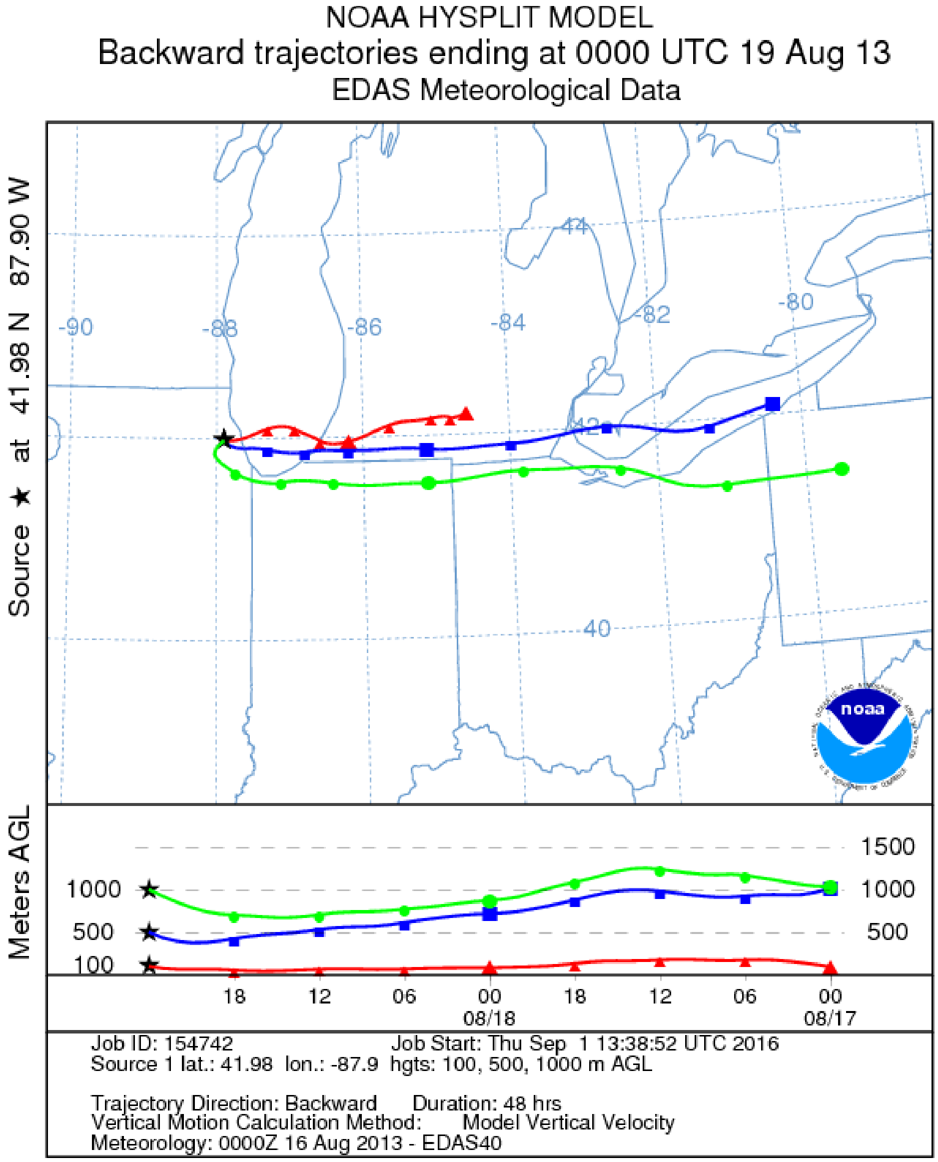
June 20, 2013, Trajectory



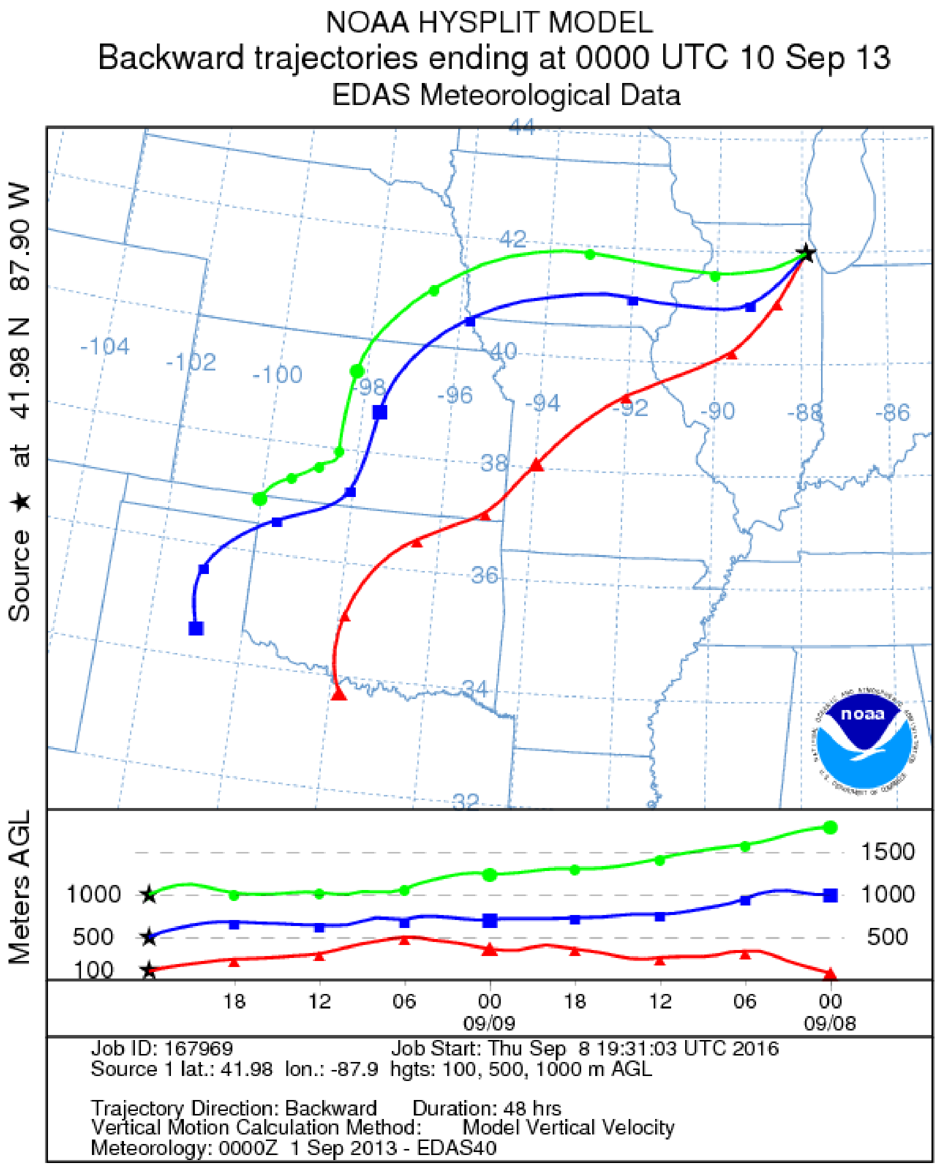
July 5, 2013, Trajectory



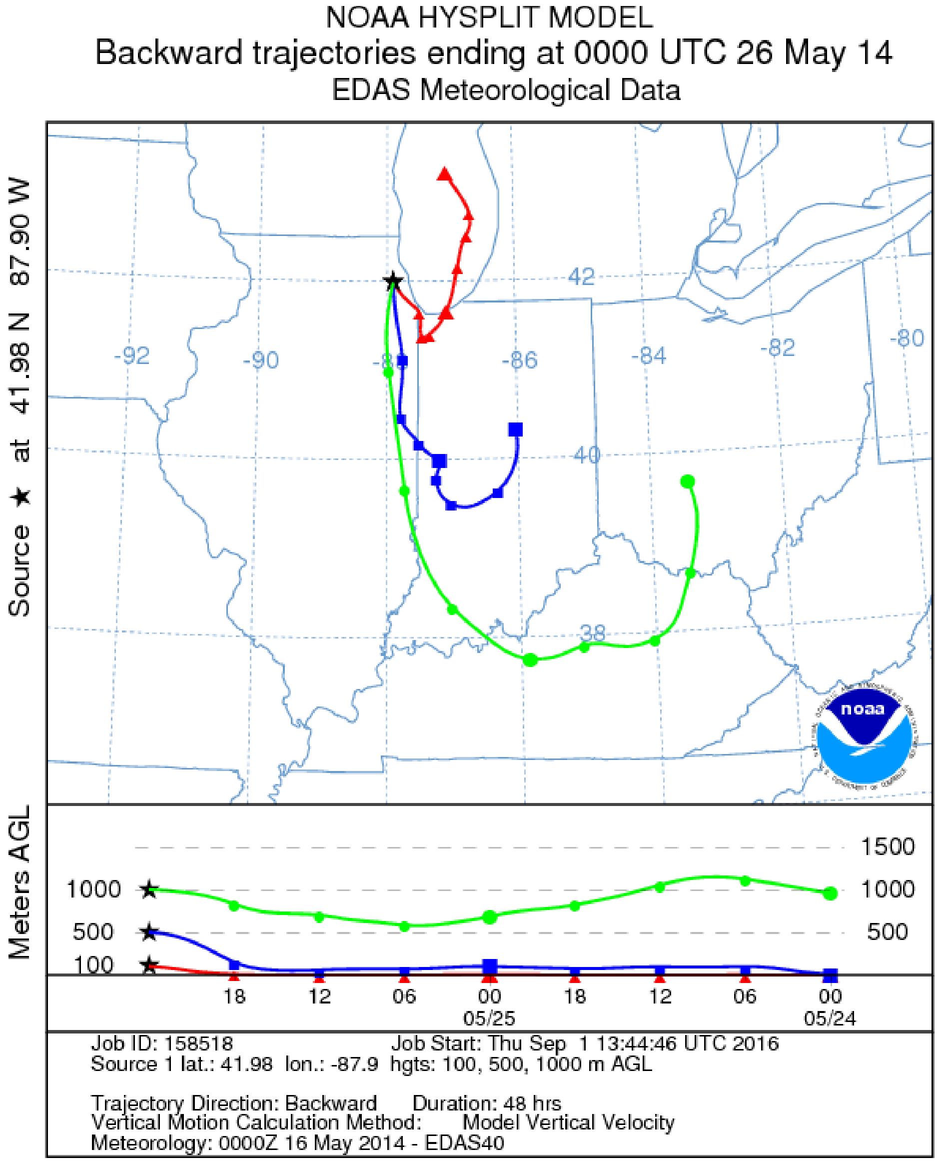
August 18, 2013, Trajectory



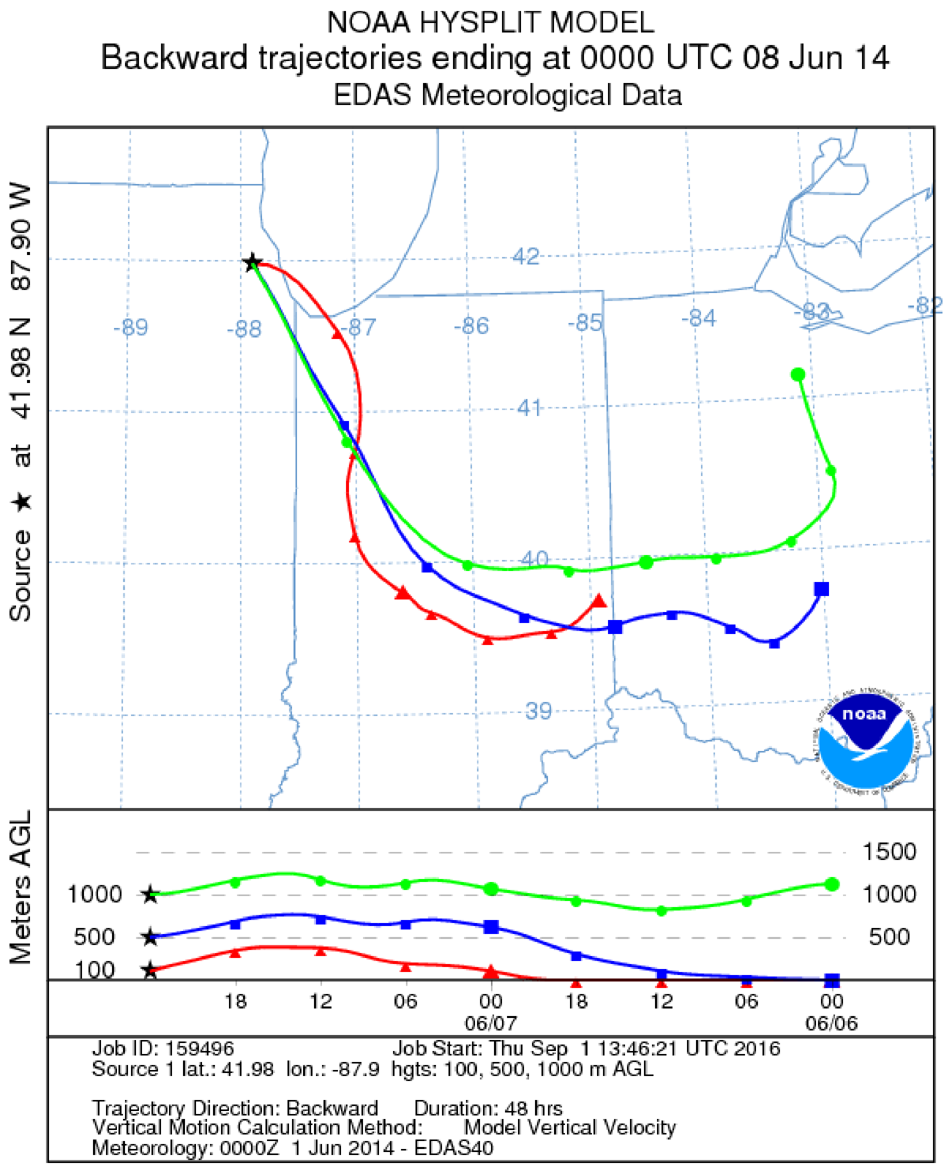
September 9, 2013, Trajectory



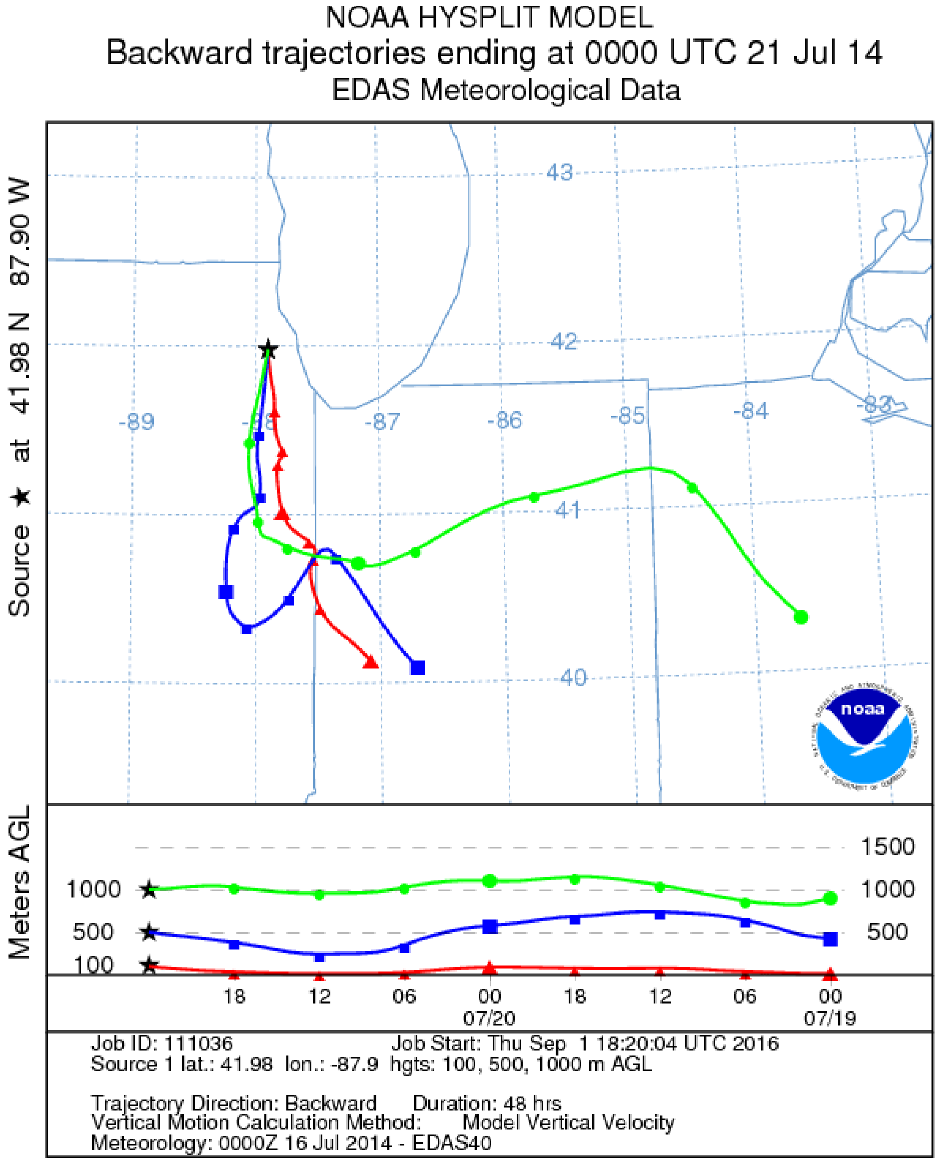
May 25, 2014, Trajectory



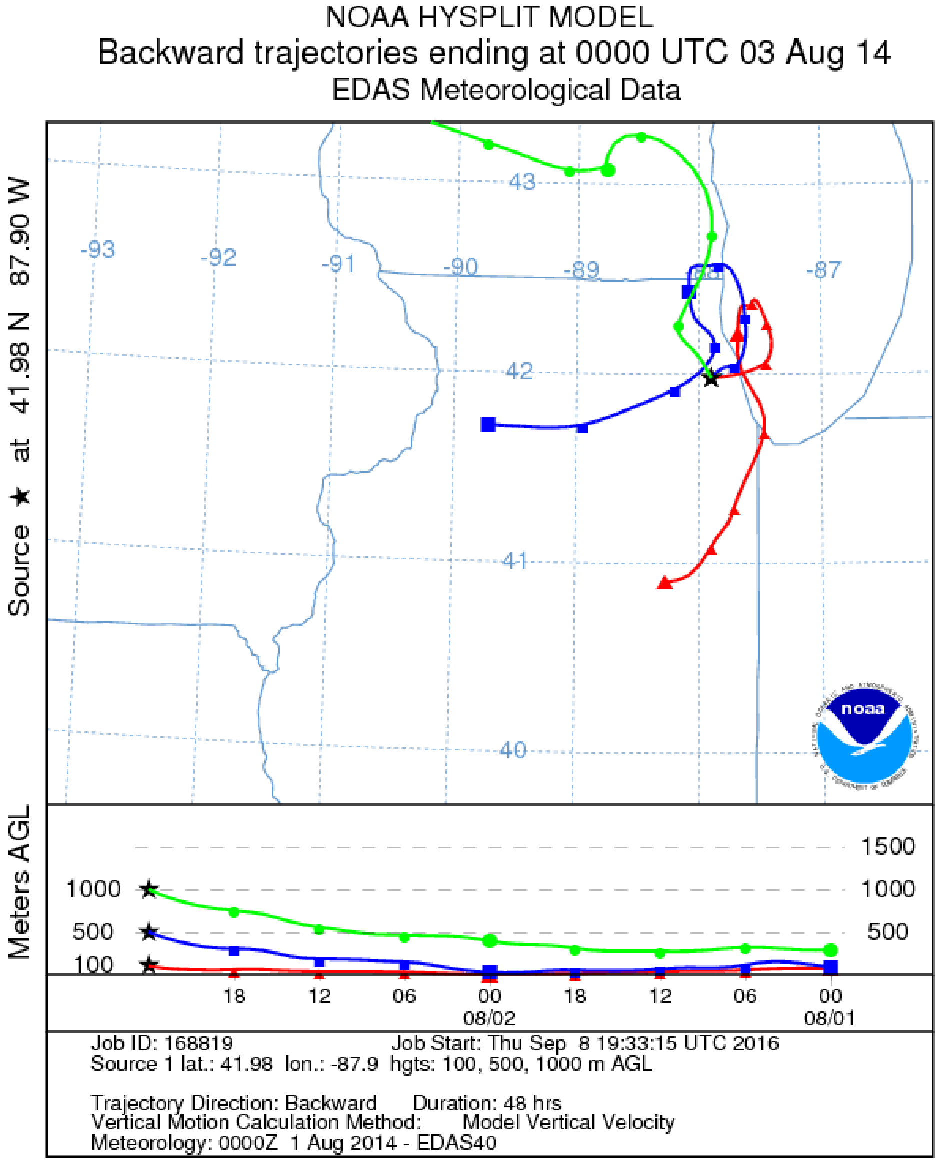
June 7, 2014, Trajectory



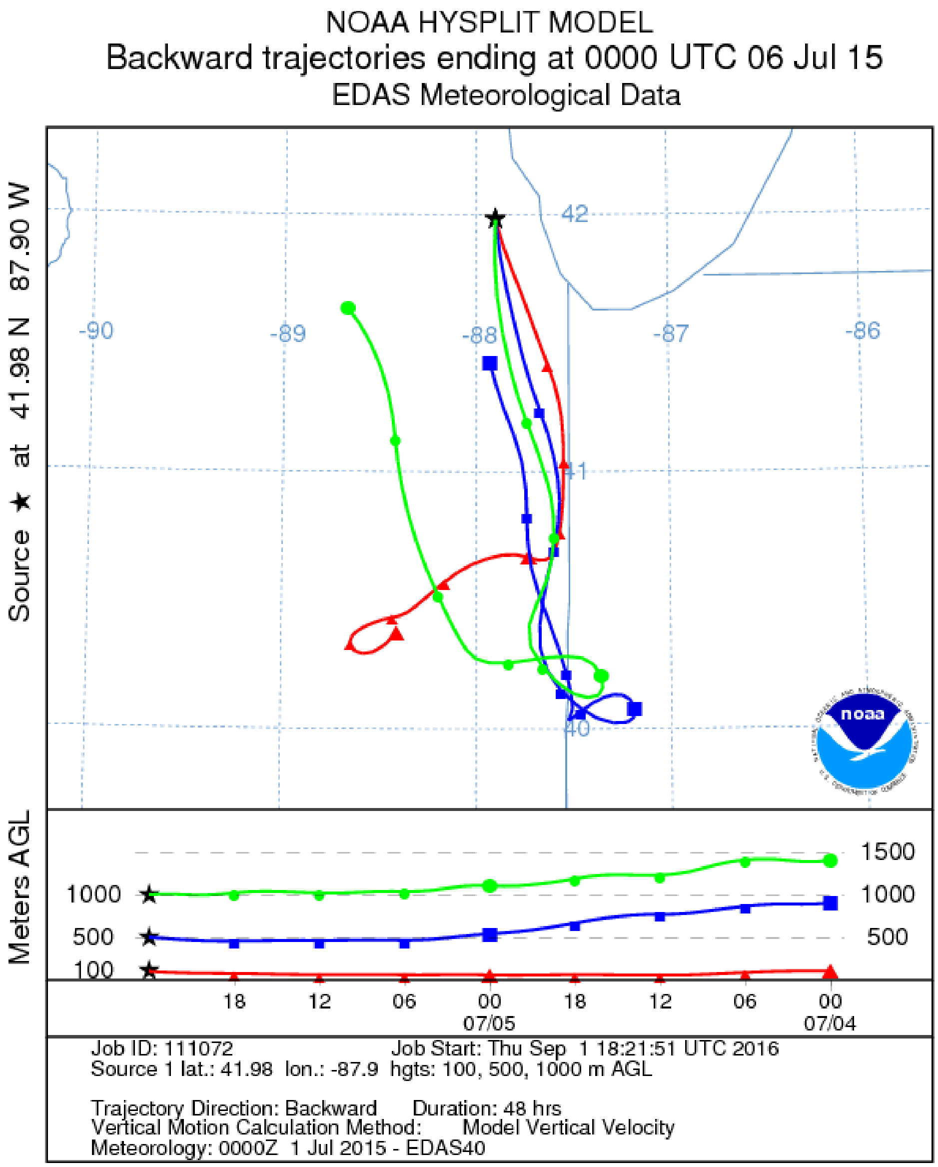
July 20, 2014, Trajectory



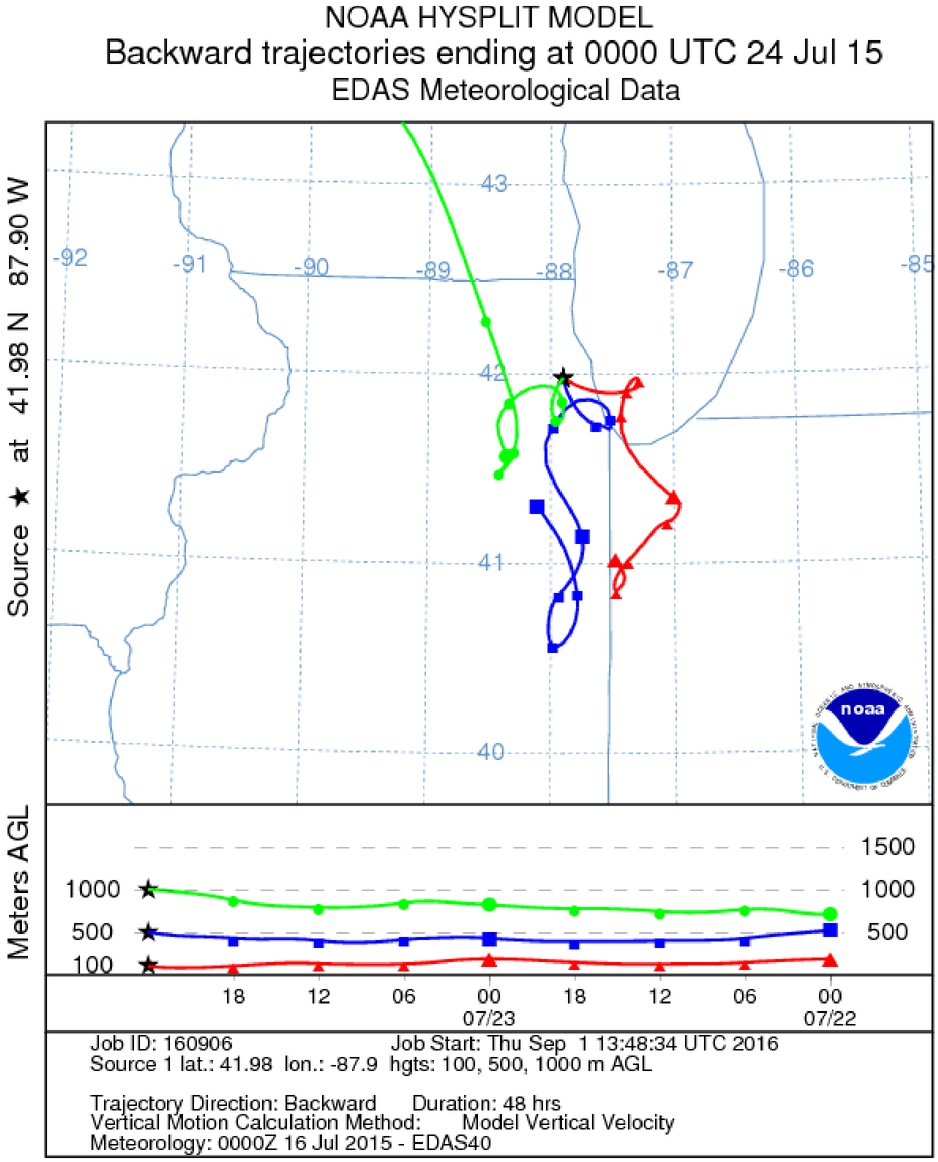
August 2, 2014, Trajectory



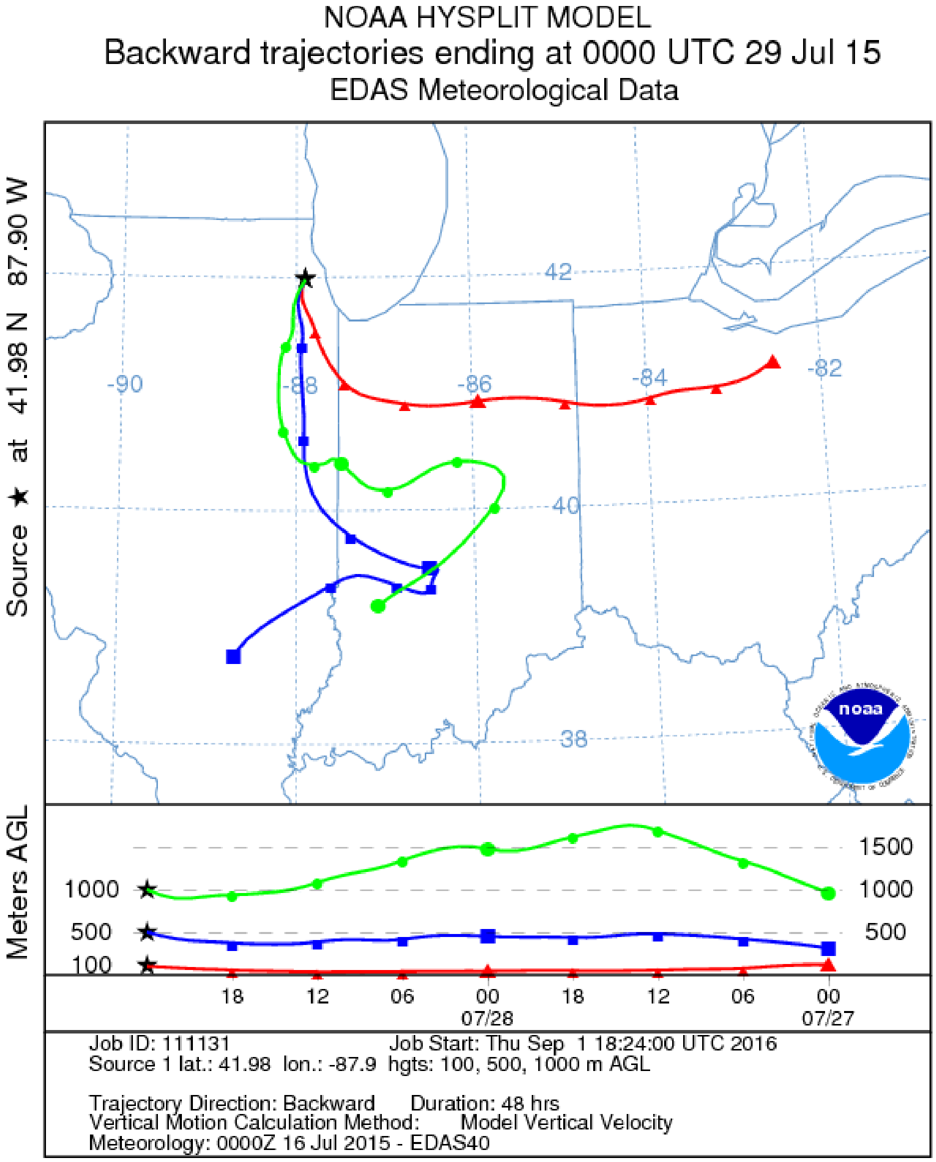
July 5, 2014, Trajectory



July 23, 2015, Trajectory

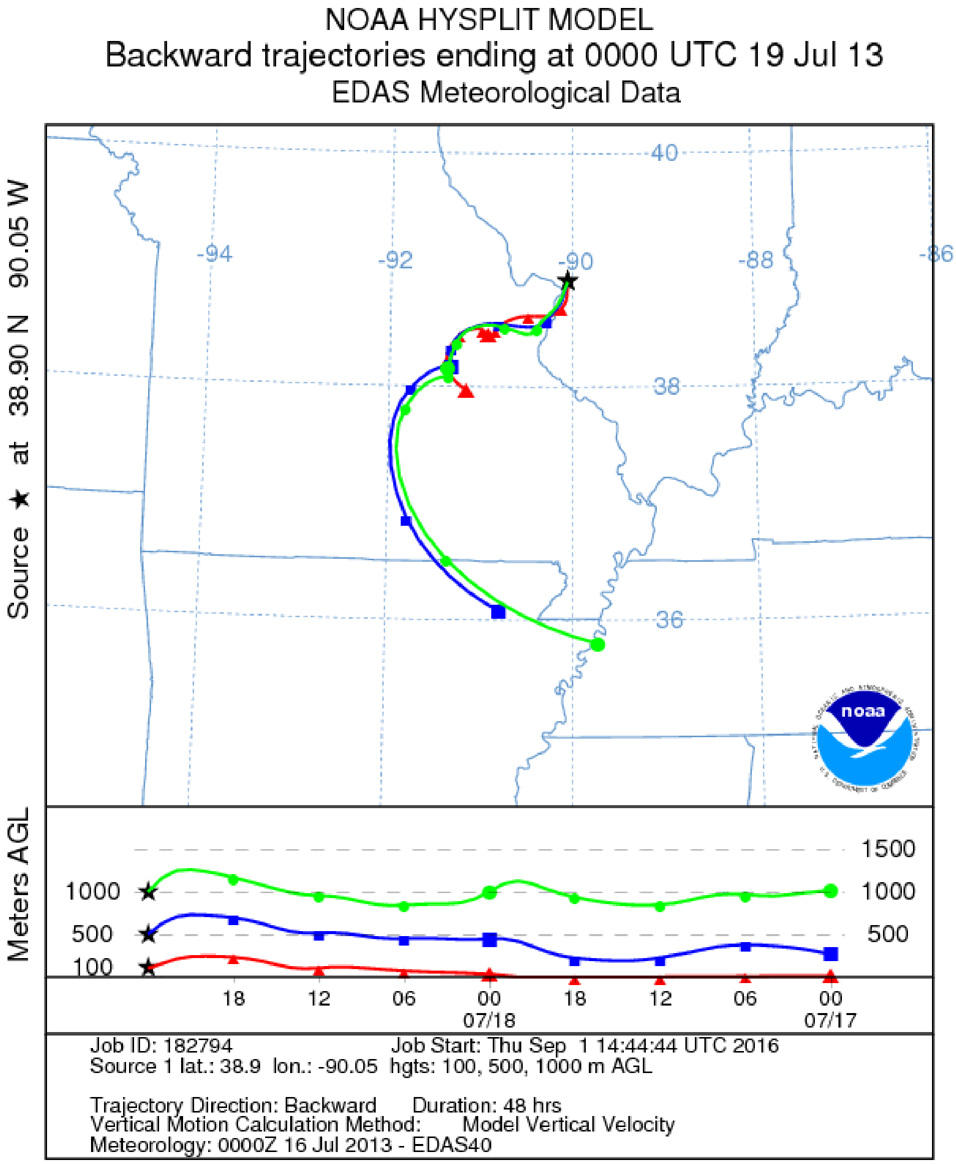


July 28, 2015, Trajectory

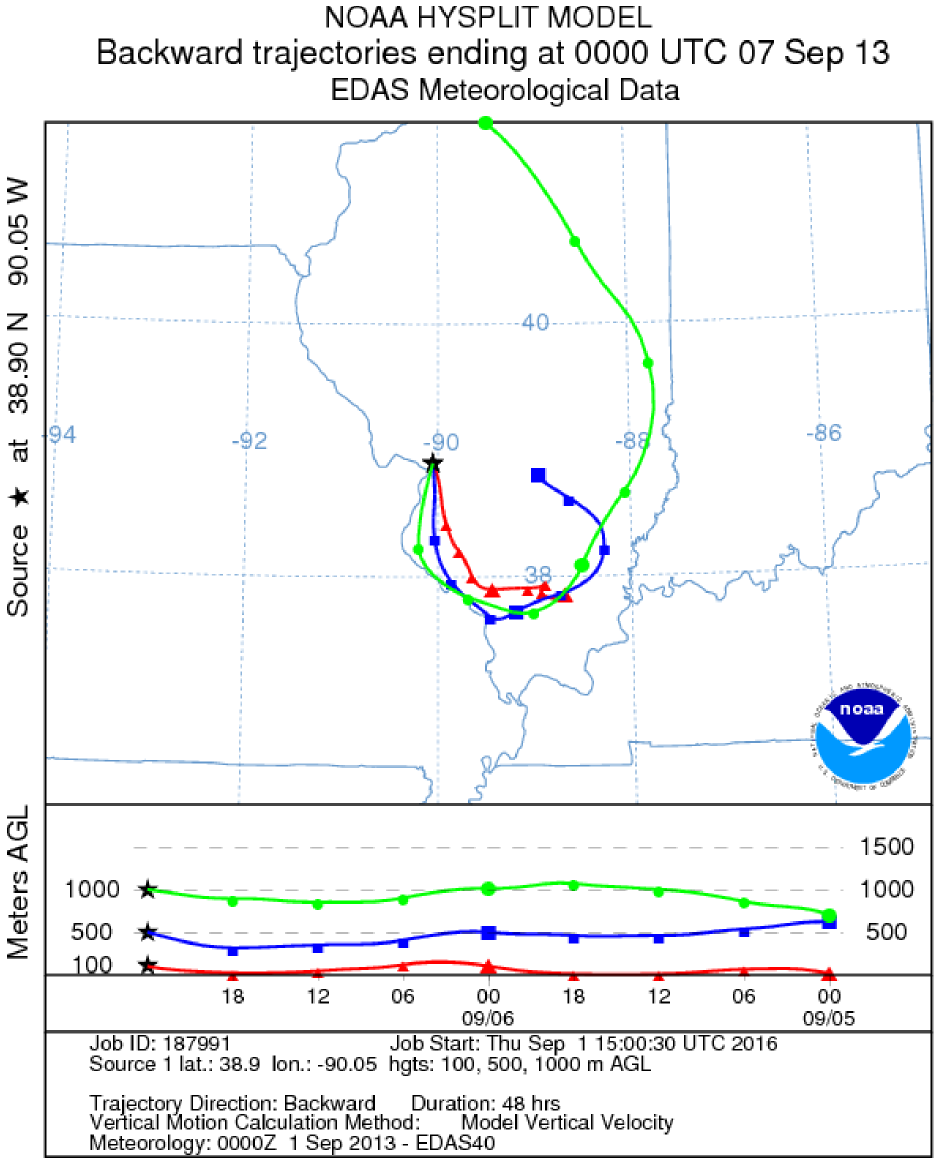


Appendix B. Trajectories for the Metro-East Area

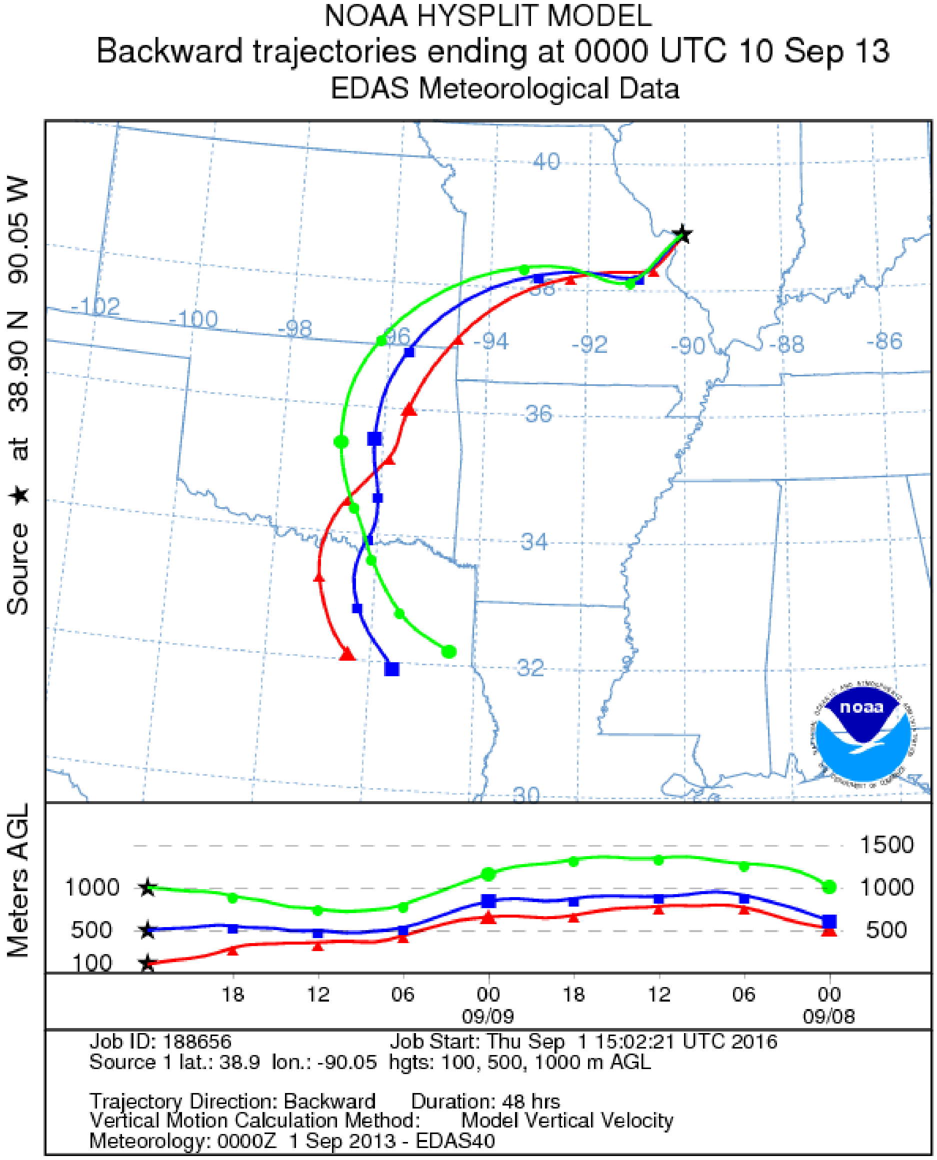
July 18, 2013, Trajectory



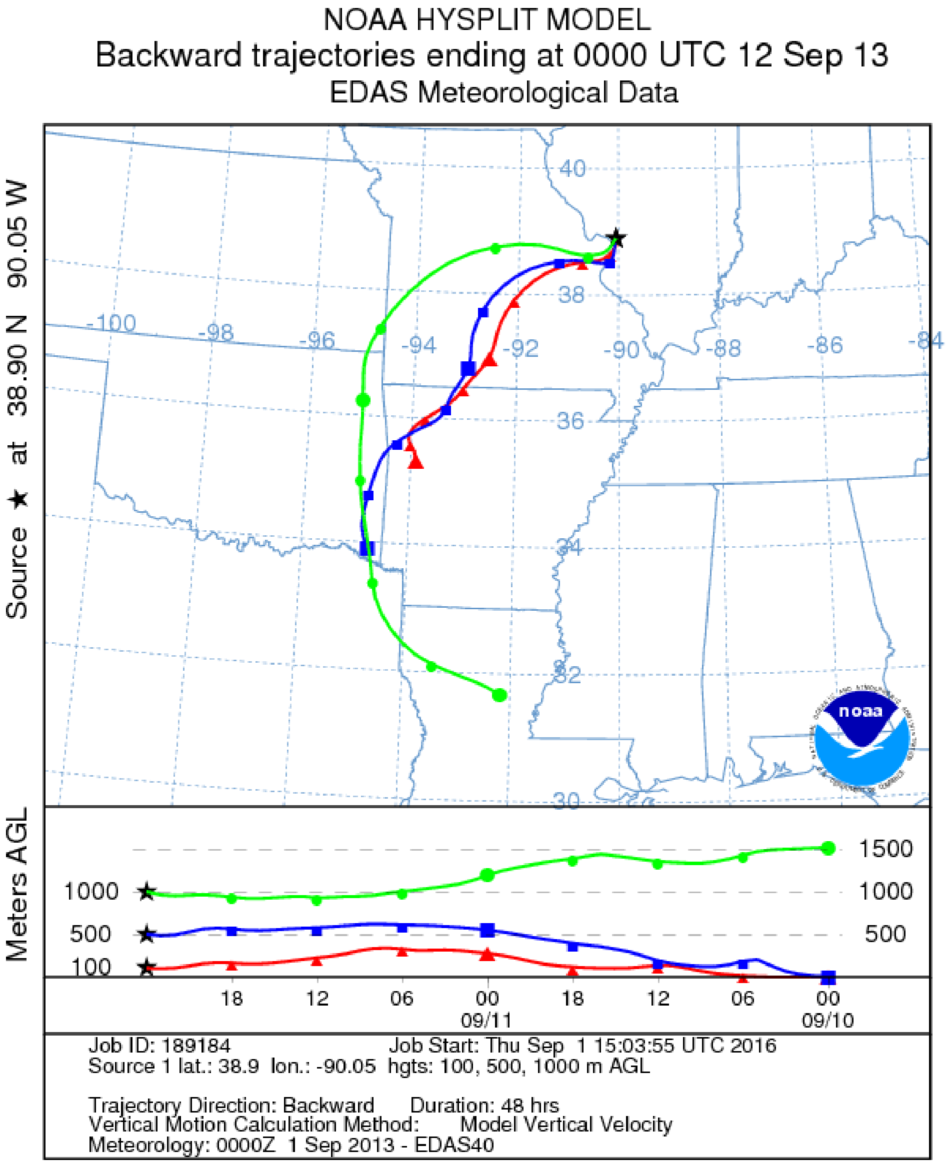
September 6, 2013, Trajectory



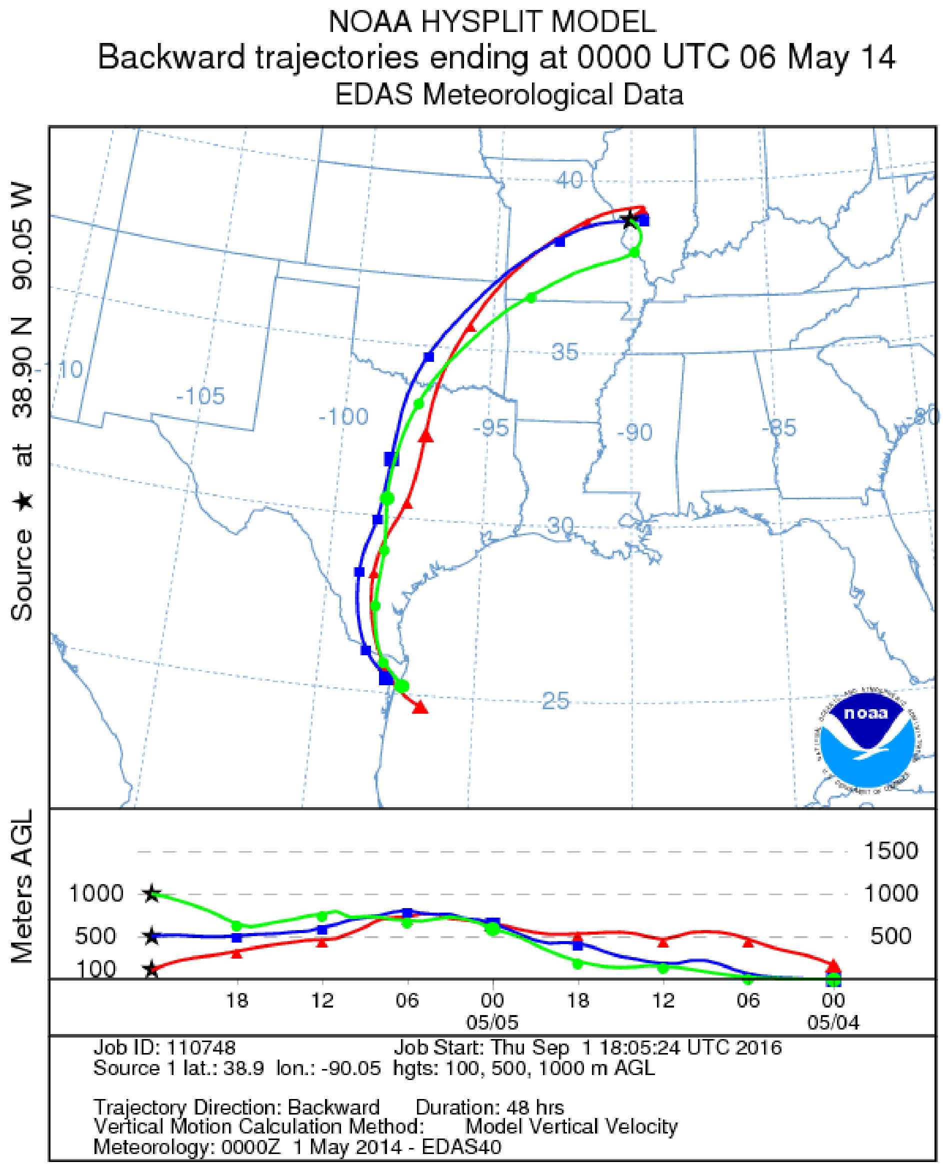
September 9, 2013, Trajectory



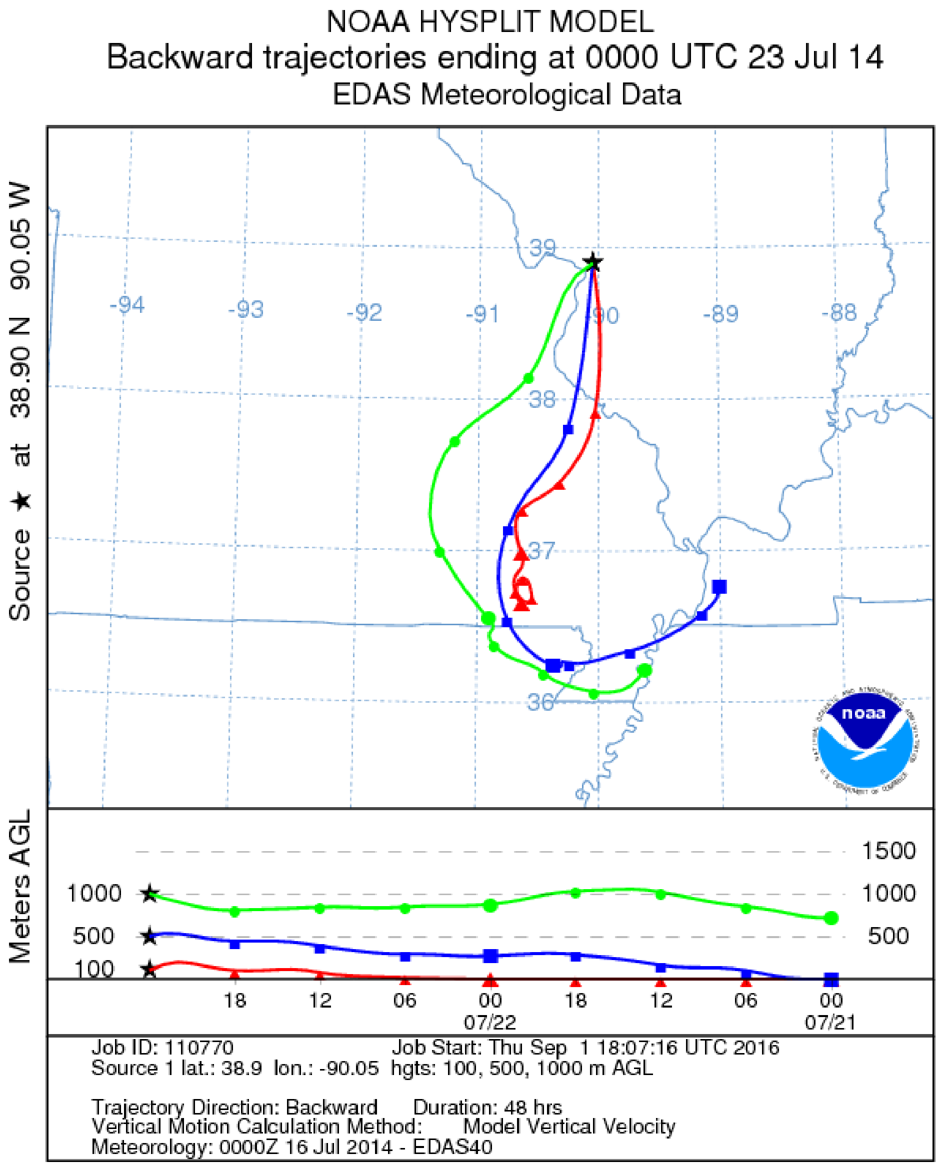
September 11, 2013, Trajectory



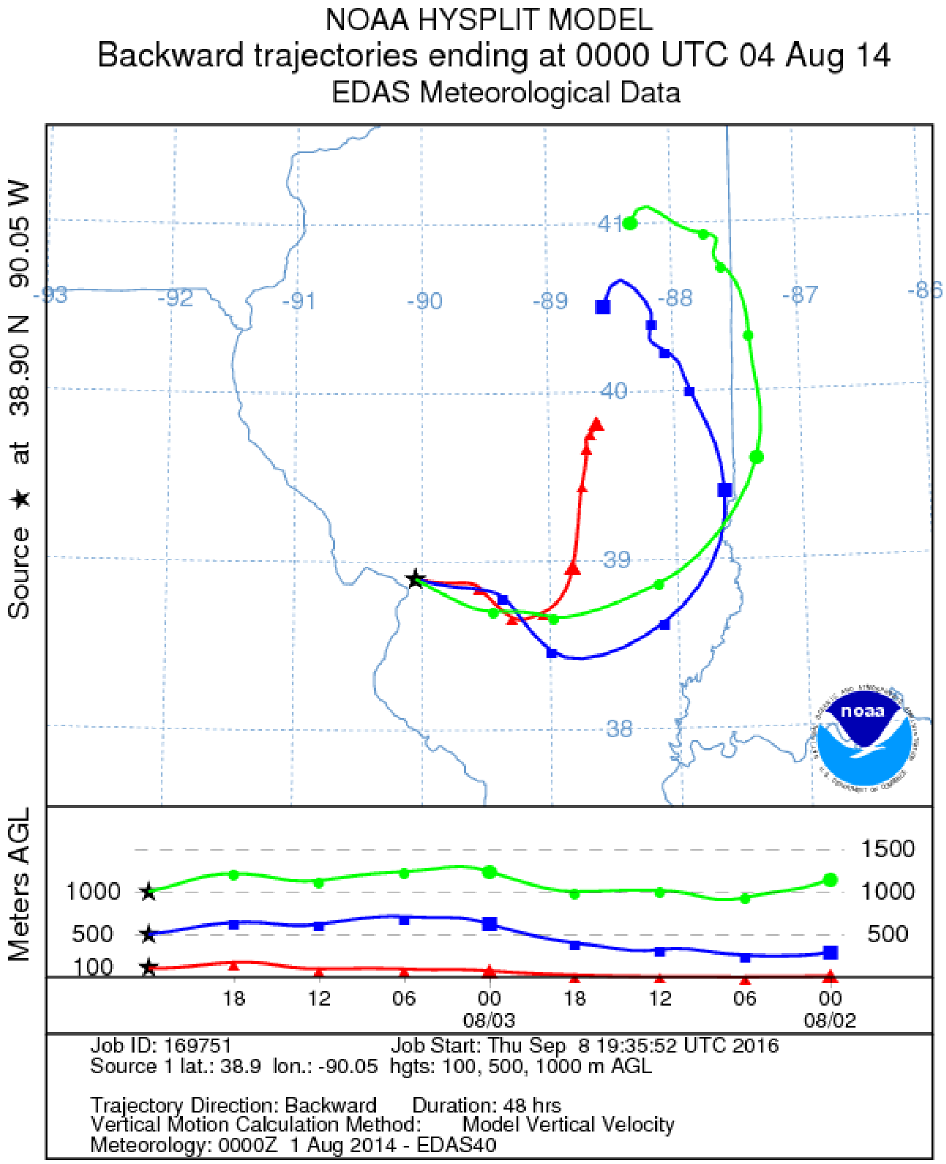
May 5, 2014, Trajectory



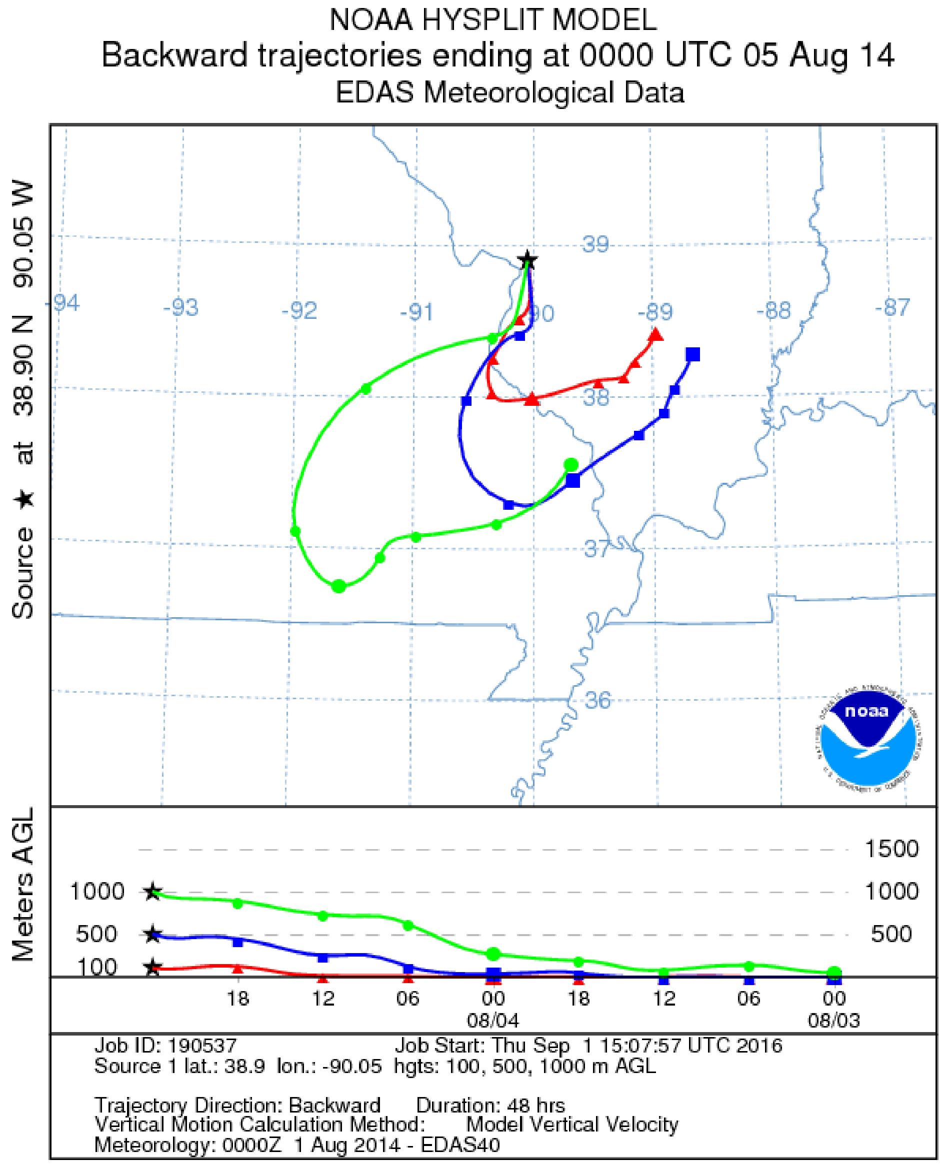
July 22, 2014, Trajectory



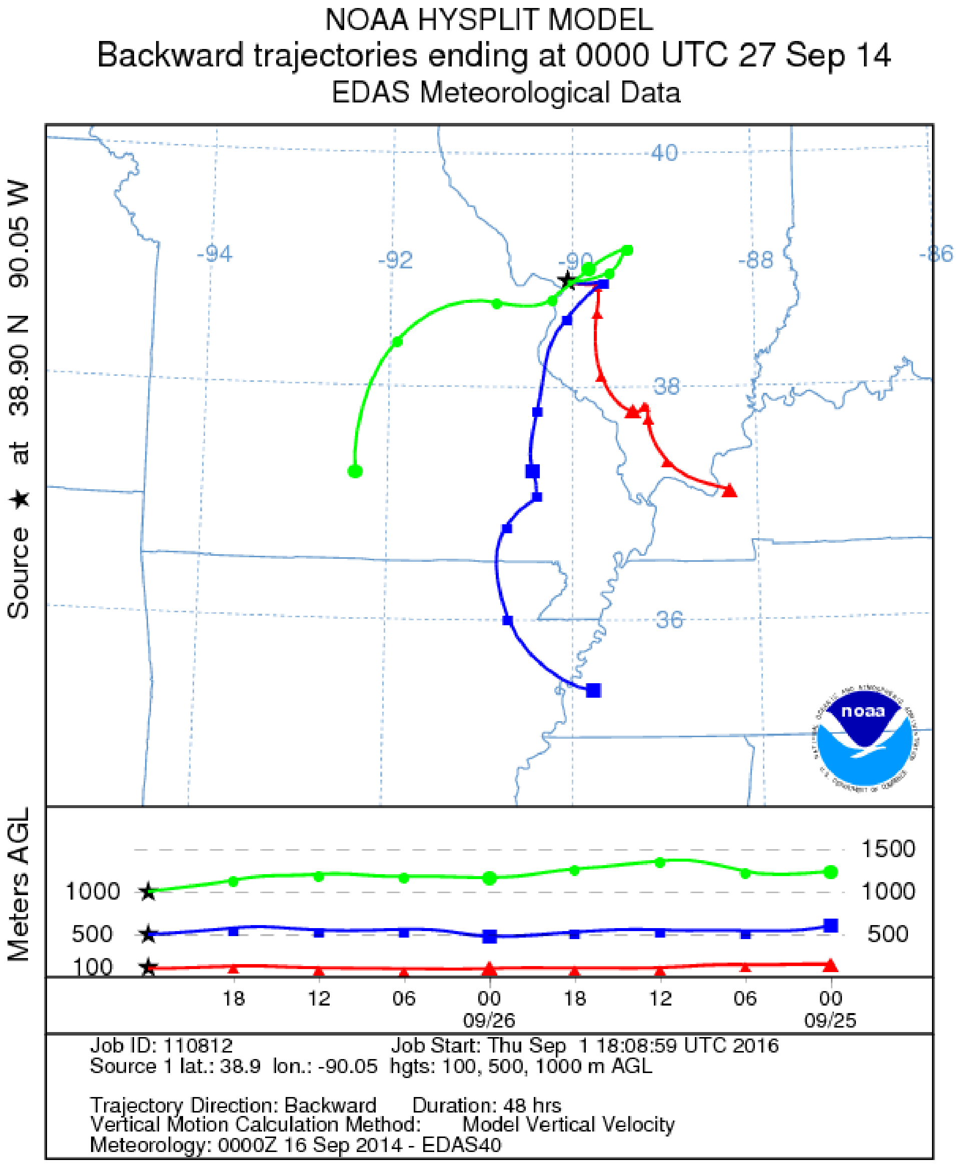
August 3, 2014, Trajectory



August 4, 2014, Trajectory



September 26, 2014, Trajectory



August 14, 2015, Trajectory