History of St. Louis Air Pollution

December 2015
Oxygen in the air

hydrocarbon emissions + nitrogen oxide emissions = smog

ozone

strong sunlight
Ground Level Ozone

- Formed when volatile organic compounds (VOCs) and oxides of nitrogen (NOx) from car and truck exhaust and other industrial processes chemically react with oxygen in the lower atmosphere in the presence of strong sunshine, low wind speed and high temperatures.
Ozone Health Effects

- Affects children and the elderly
- High levels can cause –
  - Headaches, fatigue and eye, nose and respiratory tract irritation
- Prolonged exposure can aggravate –
  - Chronic heart disease and chronic respiratory ailments
<table>
<thead>
<tr>
<th>Year</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>Moderate Non-Attainment for 1979 1-Hour Ozone Standard</td>
</tr>
<tr>
<td>2002</td>
<td>Designated Attainment for 1979 1-Hour Ozone Standard</td>
</tr>
<tr>
<td>2004</td>
<td>Moderate Non-Attainment for 1997 8-Hour Ozone Standard, including Jersey County IL</td>
</tr>
<tr>
<td>June 2012</td>
<td>Illinois Counties Designated Attainment for 1997 8-Hour Ozone Standard</td>
</tr>
<tr>
<td>July 2012</td>
<td>Marginal Non-Attainment for 2008 8-Hour Ozone Standard</td>
</tr>
<tr>
<td>February 2015</td>
<td>Missouri Counties Designated Attainment for 1997 8-Hour Ozone Standard</td>
</tr>
</tbody>
</table>
Fine Particulate Matter (PM$_{2.5}$)

- PM$_{2.5}$ is mix of solid particles and liquid droplets suspended in the atmosphere.
- PM$_{2.5}$ is about 1/30 the width of a human hair.
- It can be emitted directly into the air from combustion or formed by the chemical reaction of gases in the atmosphere.
PM$_{2.5}$ Health Effects

- People most at risk from exposure include those with asthma, heart or lung disease, those who are active outdoors and children and the elderly.
- PM$_{2.5}$ is able to penetrate and lodge in deep areas of the lungs.
- Effects include:
  - Eye irritation, sore throat, coughing, chest tightness and shortness of breath.
<table>
<thead>
<tr>
<th>Year</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>Non-Attainment for 1997 Annual PM$_{2.5}$ Standard, including Baldwin Township, Randolph County IL (15 micrograms/cubic meter or ug/m$^3$ annual mean averaged over 3 years)</td>
</tr>
<tr>
<td>2009</td>
<td>Attainment 1997 24-Hour PM$_{2.5}$ Standard (25 ug/m$^3$, 98$^{th}$ percentile averaged over 3 years)</td>
</tr>
<tr>
<td>2015</td>
<td>Unclassifiable for 2012 Annual PM$_{2.5}$ Standard (12 ug/m$^3$ annual mean averaged over 3 years)</td>
</tr>
</tbody>
</table>
St. Louis (MO-IL) Non-Attainment Areas

Figure 1: St. Louis 2008 8-Hour Ozone Standard Non-Attainment Area Monitor Network

Figure 2: St. Louis PM2.5 Non-Attainment Area 1997 Annual PM2.5 Standard

2008 Ozone

1997 PM$_{2.5}$
2008 Ozone Standard

- 75 parts per billion (ppb)
- Exceedance is when an 8-hour average of values at a monitor is calculated to be > 75 ppb on any given day
- Violation is when a 3-year average of the 4th highest annual average at a monitor is calculated to be > 75 ppb
Ozone Data Sharing Project

- Ozone Season - April 1 to October 31
- East-West Gateway acts as a clearinghouse for ozone data
- Initial quality assurance screening
- Prepare reports for partner agencies and EWG website
- 2015 – Only 1 exceedance
  - July 24 at Orchard Farm monitor (78 ppb)
### Summer Weather Facts

<table>
<thead>
<tr>
<th>Days with Temperatures</th>
<th>Years</th>
<th></th>
<th></th>
<th></th>
<th>Average Number of Days per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2013</td>
<td>2014</td>
<td>2015</td>
<td></td>
</tr>
<tr>
<td>90° or greater</td>
<td>60</td>
<td>37</td>
<td>34</td>
<td>49</td>
<td>36</td>
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<tr>
<td>100° or greater</td>
<td>21</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

National Weather Service
3 Year Average 4th Highest 2008 8-Hr Ozone Average

3 Year Average

2008 Standard

2015 Standard
Daily Vehicle Miles Traveled (VMT)
St. Louis Region 1982-2014
Trends

- Moderate to Marginal classification July 2012
- 2015 ozone monitoring data to be quality assured
- Based on 2013-2015 data, anticipate area will be in attainment of 2008 ozone standard
2015 Ozone Standard

- October 1, 2015 – EPA strengthened standard to 70 ppb
- October 2016 – State submit boundary designation recommendations to EPA
- June 2017 – EPA proposes area designations
- October 2017 – EPA finalizes designations
- 2020-2021 – SIPs due
- 2020 – 2037 – Attainment year (depending on classification)
Then and Now

October 28, 1938 looking east along Pine from 200 block of N. Tucker
St. Louis Post-Dispatch

October 29, 2015 looking east from SSM St. Mary’s Health Center
in Richmond Heights
MDNR Visual Air Pollution Camera
For Additional Information

On-line Air Quality Resource Center

www.ewgateway.org/environment/aq/aq.htm

July 2015 AQI Calendar