Stuff you may want to know about…

NESCAUM Monitoring and Assessment Committee Meeting

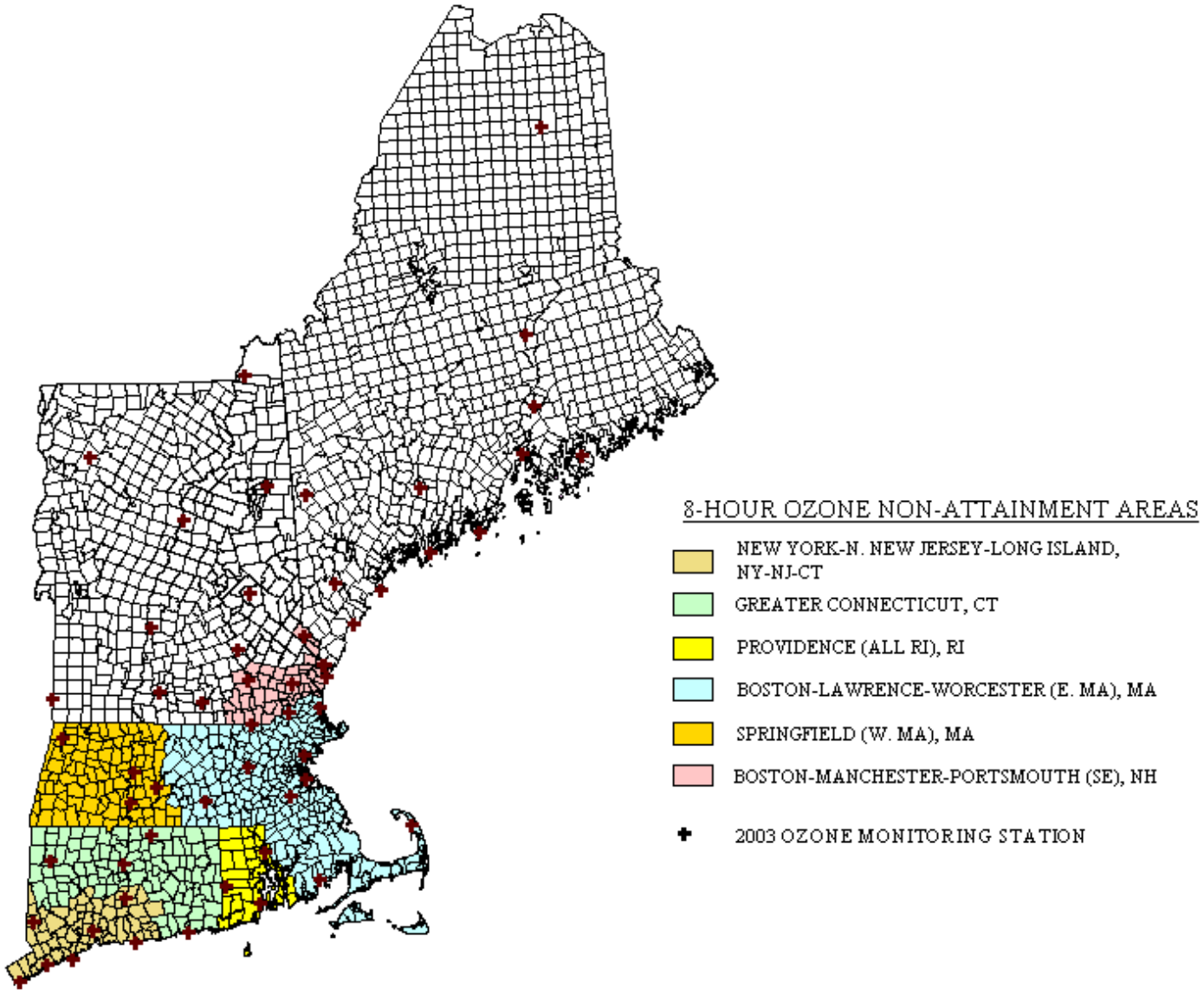
Chelmsford, MA

May 8, 2008

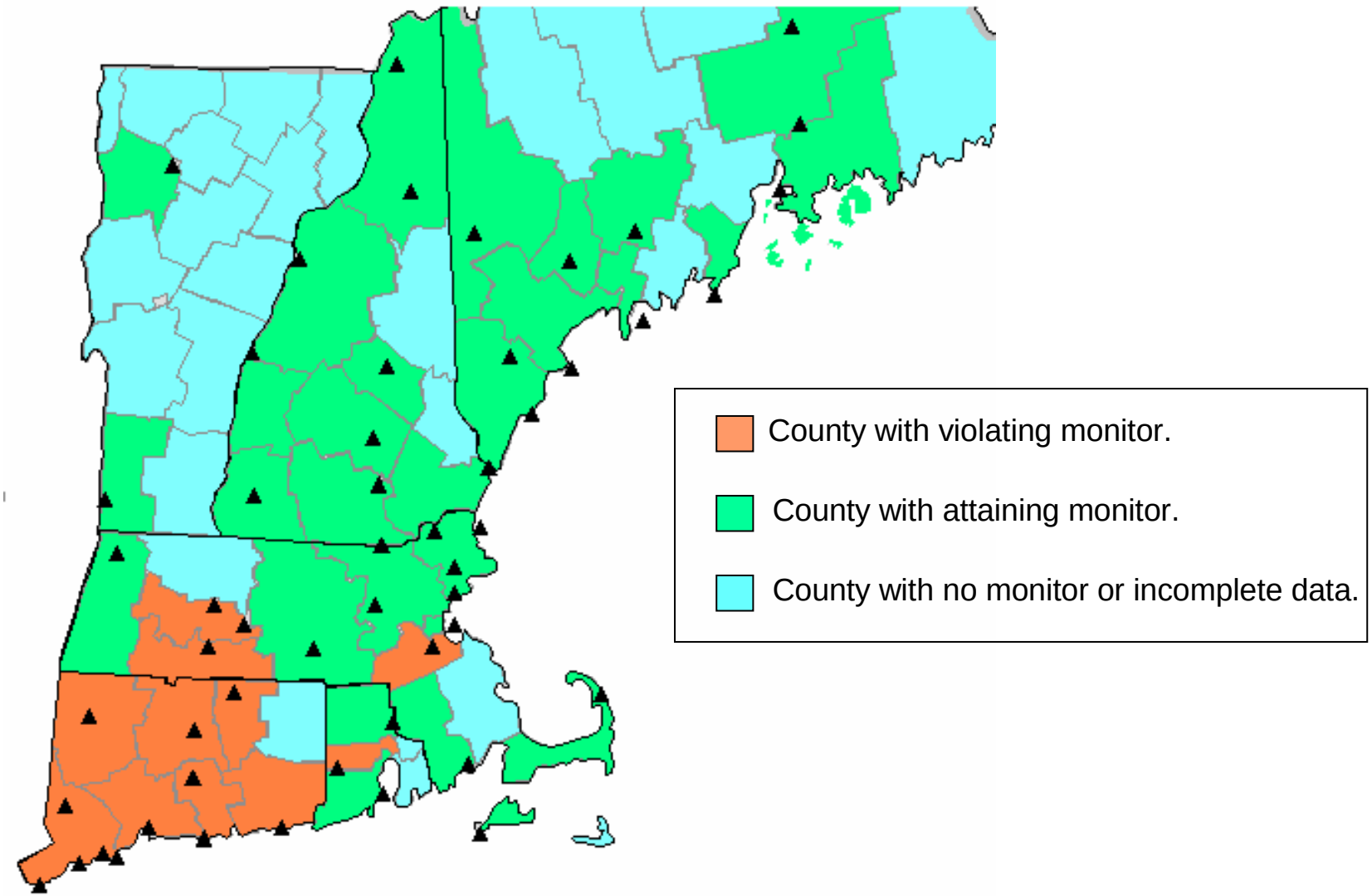
Impacts of the New 8-Hr Ozone Standard

- Increase in Ozone Non-attainment Areas.
- Increase in number of Ozone Exceedance Days.
- Lengthening of the Ozone Monitoring /Forecasting Season.

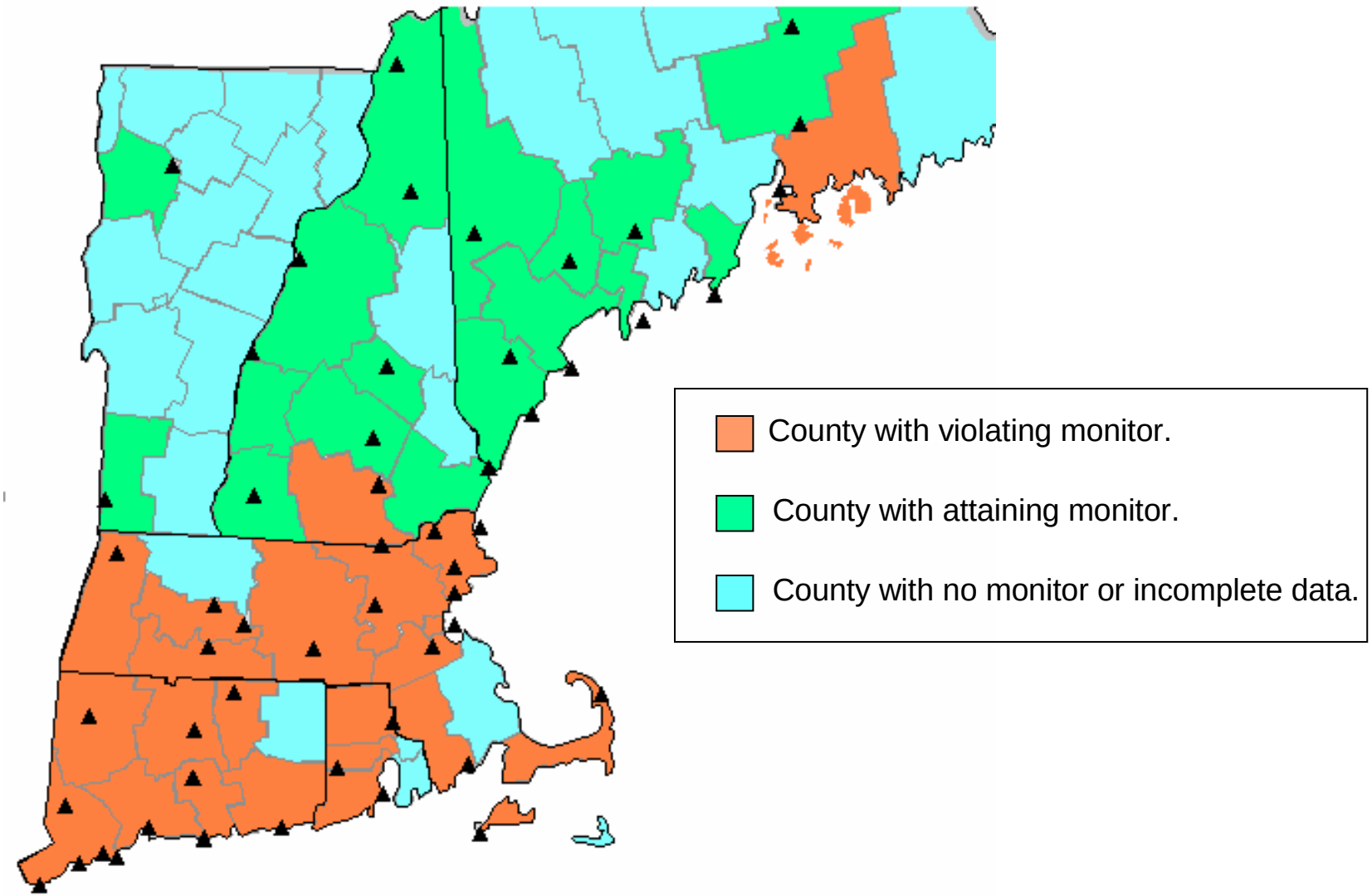
Areas Designated as Non-attainment under the 1997 8-Hr Ozone Standard (0.08 ppm)



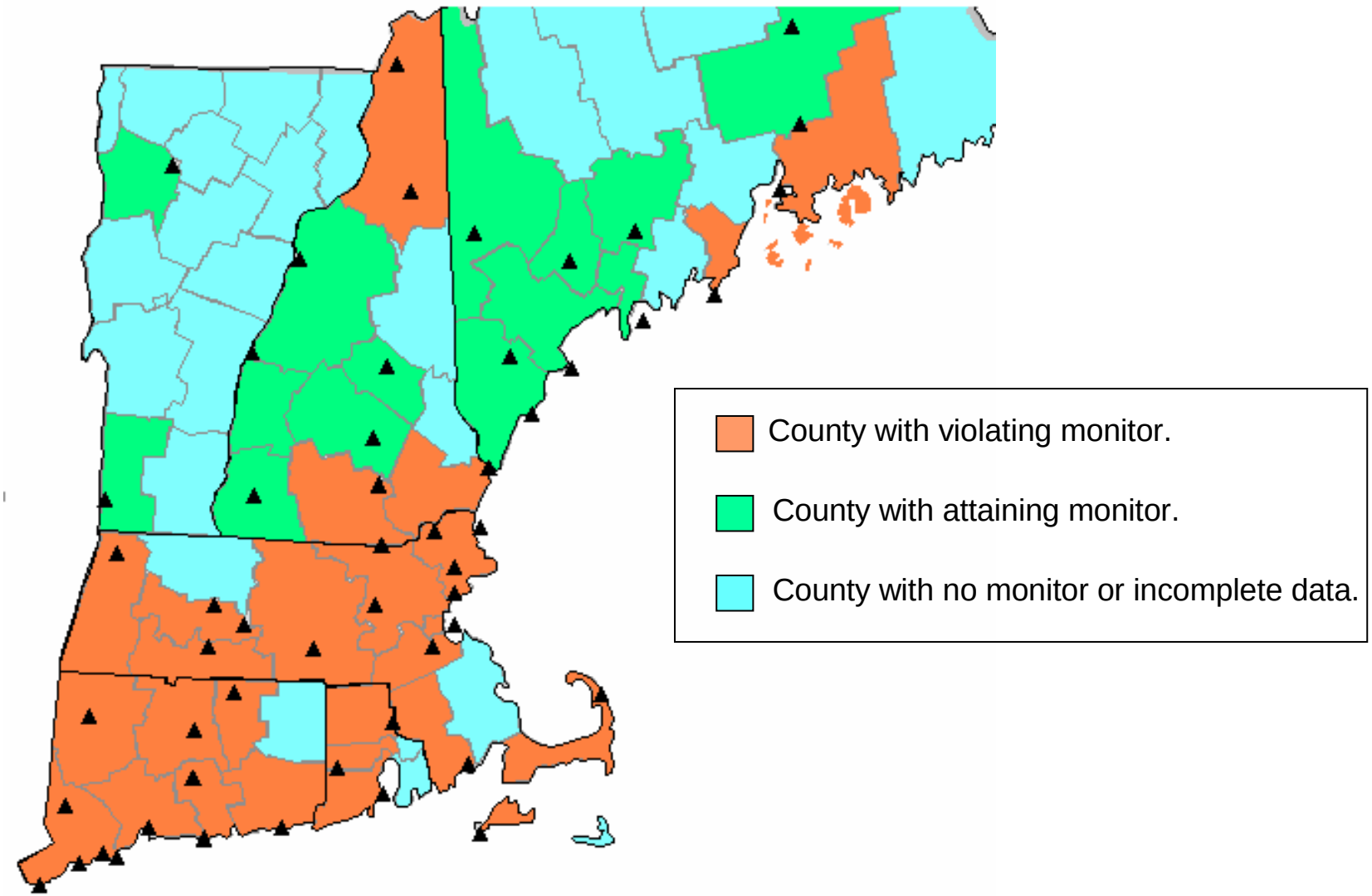
Status of Counties under the 1997 8-Hour Ozone Standard of 0.08 ppm based on 2005 – 2007 data.

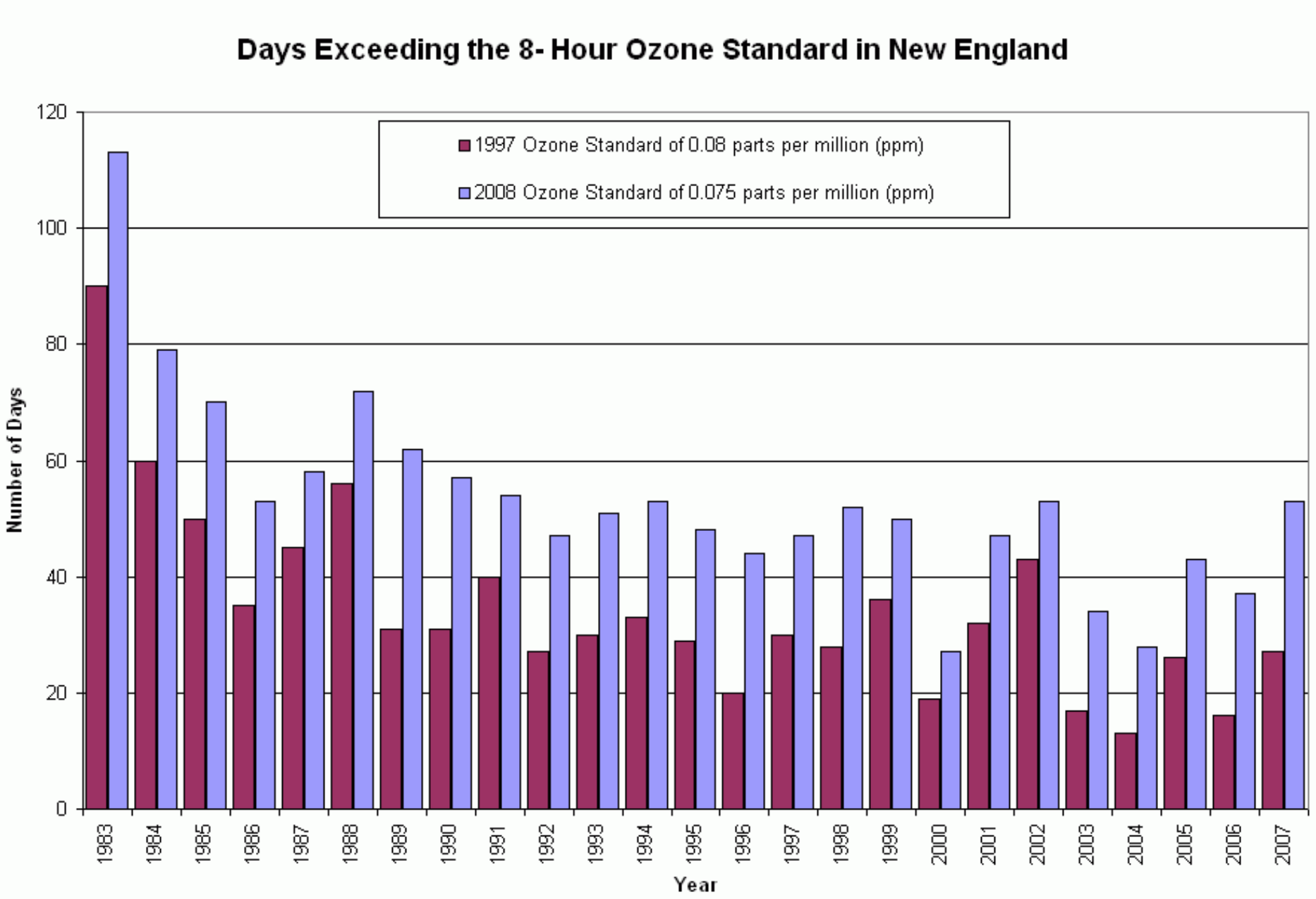


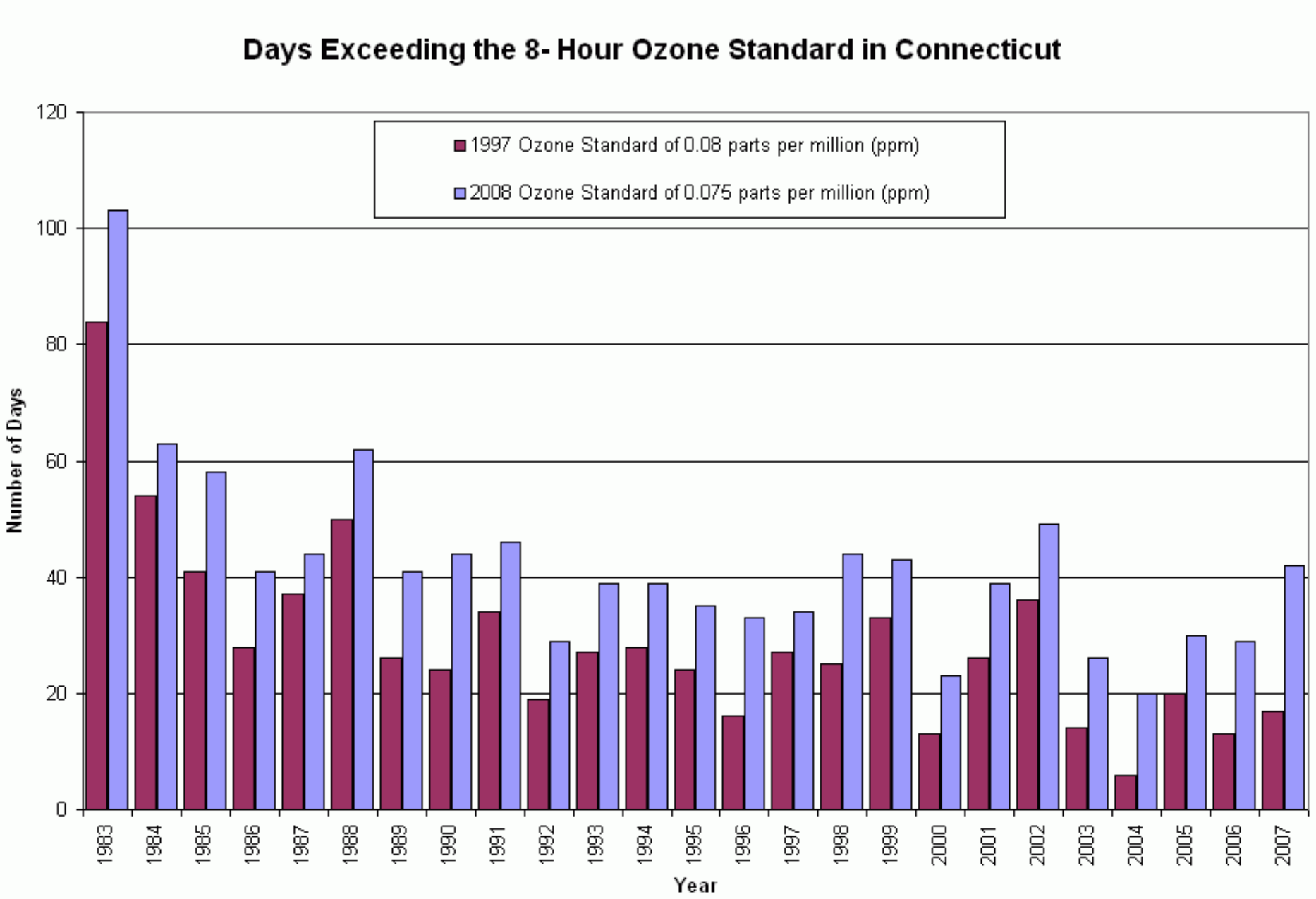
Status of Counties under the new 2008 8-Hour Ozone Standard of 0.075 ppm based on 2004 – 2006 data.



Status of Counties under the new 2008 8-Hour Ozone Standard of 0.075 ppm based on 2005 – 2007 data.




Days Exceeding the 8- Hour Ozone Standard in New England
1997 Ozone Standard of 0.08 parts per million (ppm)
2008 Ozone Standard of 0.075 parts per million (ppm)
Number of Days
0
20
40
60
80
100
120
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Year


Days Exceeding the 8- Hour Ozone Standard in Connecticut
1997 Ozone Standard of 0.08 parts per million (ppm)
2008 Ozone Standard of 0.075 parts per million (ppm)
Number of Days
0
20
40
60
80
100
120
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
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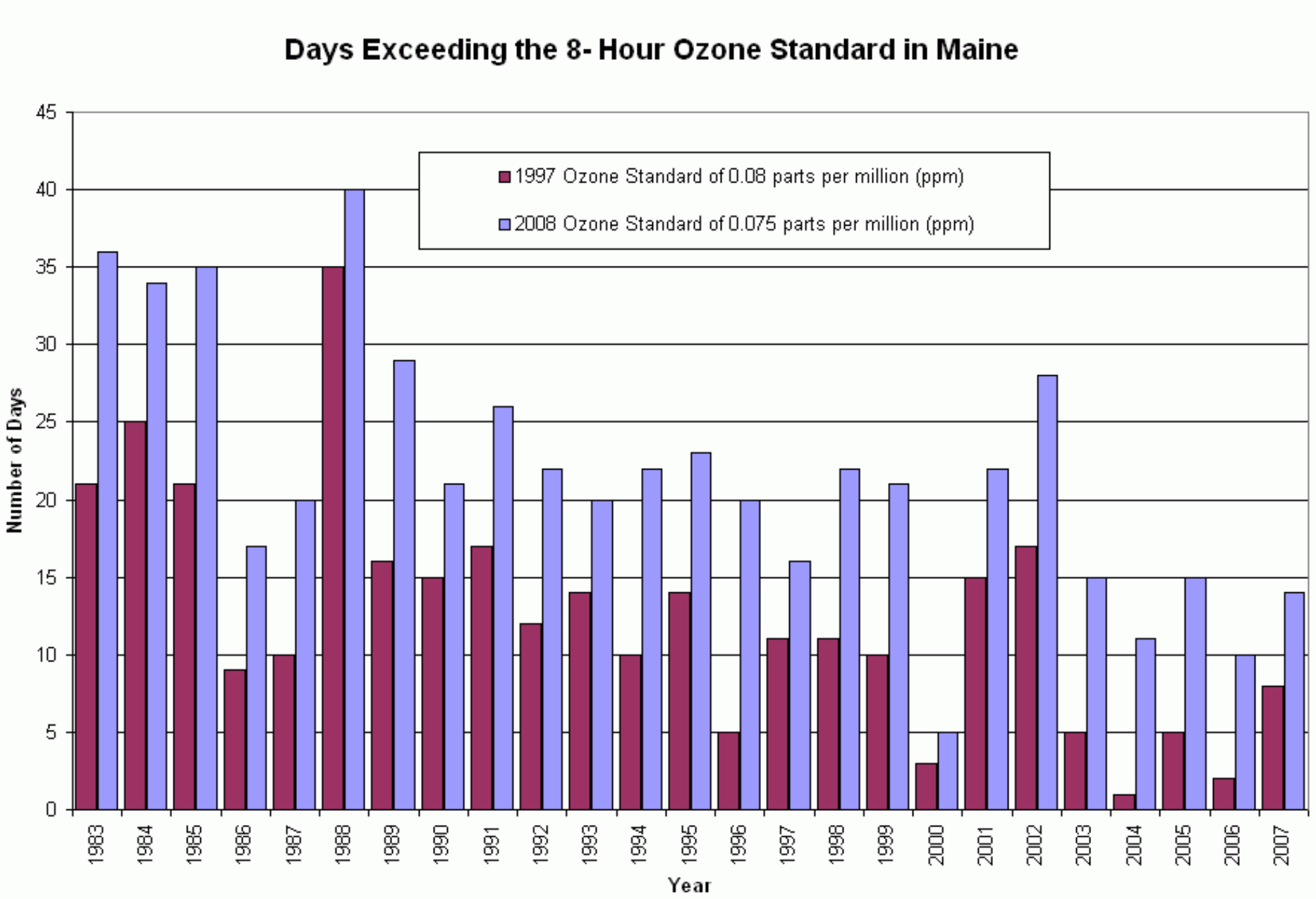
2006
2007
Year


Days Exceeding the 8- Hour Ozone Standard in Maine
1997 Ozone Standard of 0.08 parts per million (ppm)
2008 Ozone Standard of 0.075 parts per million (ppm)
Number of Days
Year
0
5
10
15
20
25
30
35
40
45
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
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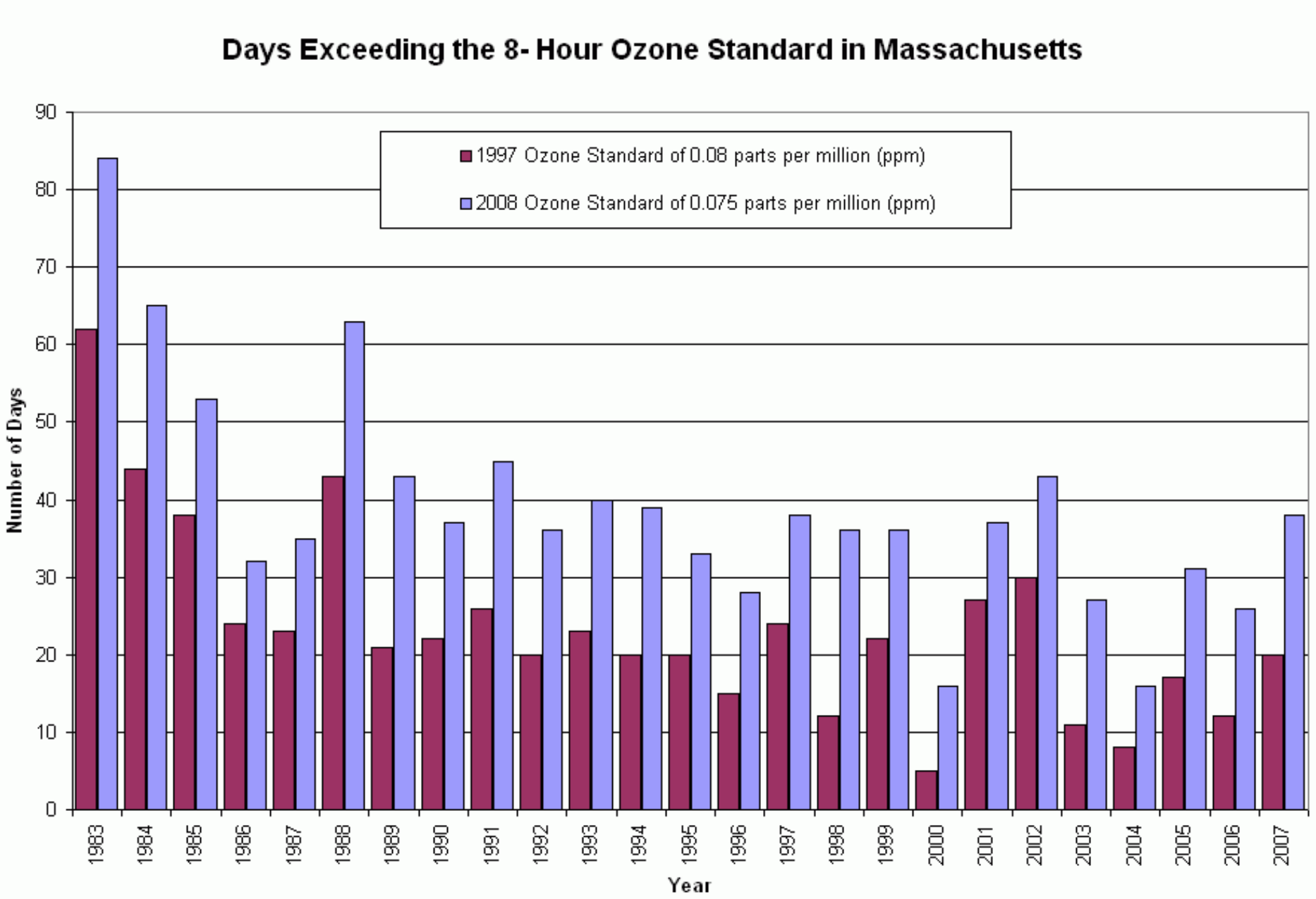
Days Exceeding the 8- Hour Ozone Standard in Massachusetts
1997 Ozone Standard of 0.08 parts per million (ppm)
2008 Ozone Standard of 0.075 parts per million (ppm)
Number of Days
0
10
20
30
40
50
60
70
80
90
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
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1997
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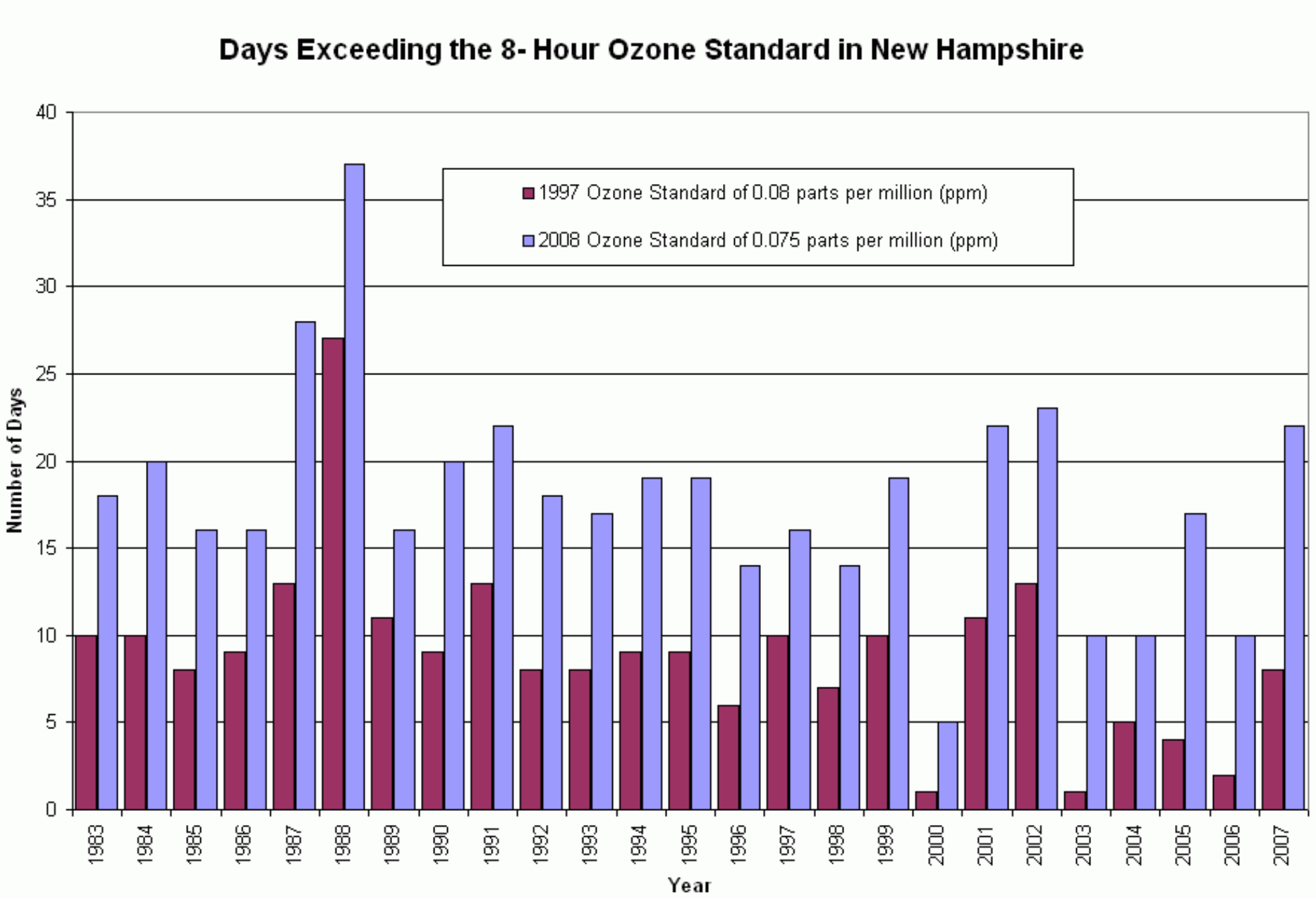
2006
2007
Year


Days Exceeding the 8- Hour Ozone Standard in New Hampshire
1997 Ozone Standard of 0.08 parts per million (ppm)
2008 Ozone Standard of 0.075 parts per million (ppm)
Number of Days
Year
0
5
10
15
20
25
30
35
40
1983
1984
1985
1986
1987
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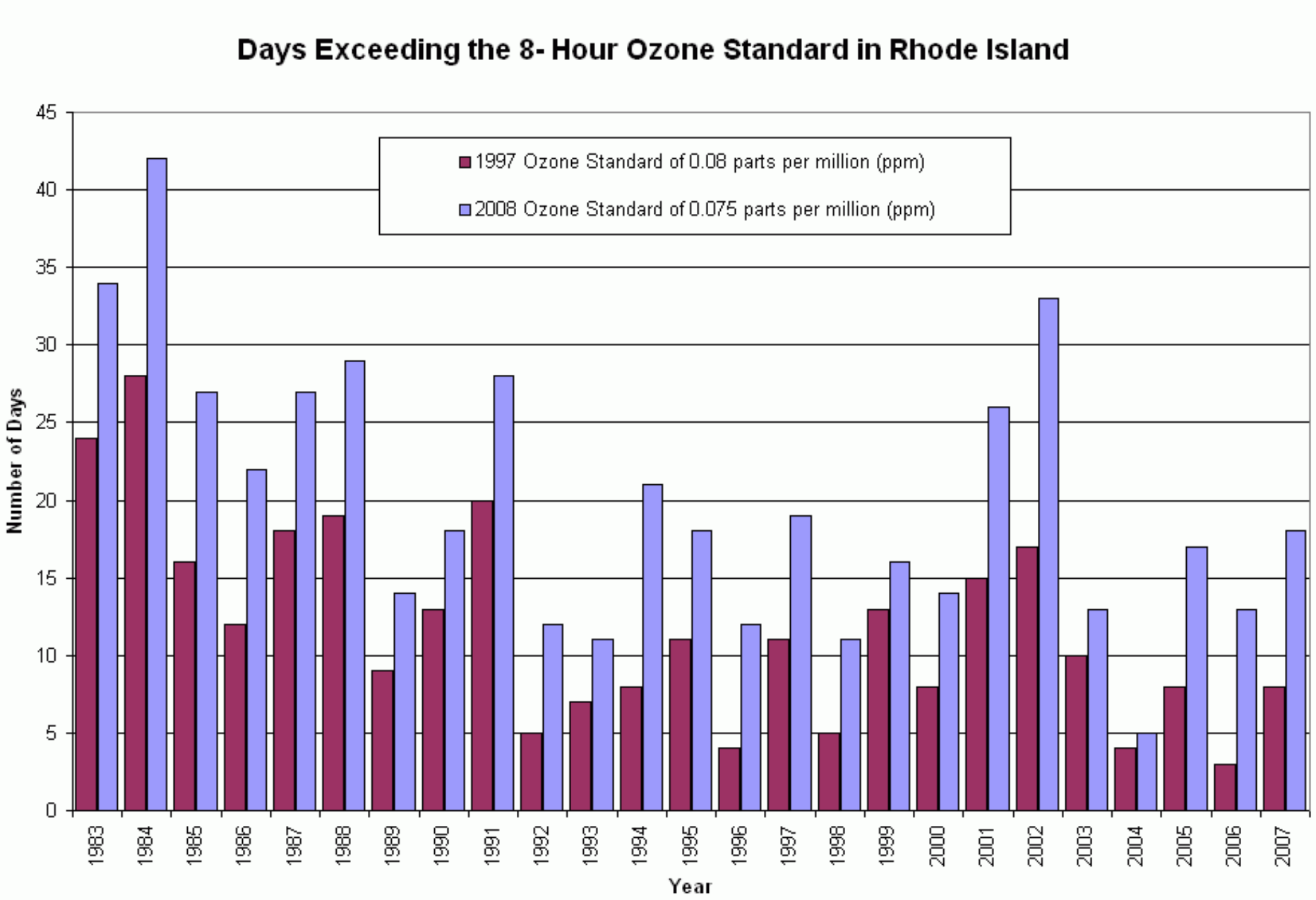
Days Exceeding the 8- Hour Ozone Standard in Rhode Island
1997 Ozone Standard of 0.08 parts per million (ppm)
2008 Ozone Standard of 0.075 parts per million (ppm)
Number of Days
Year
0
5
10
15
20
25
30
35
40
45
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
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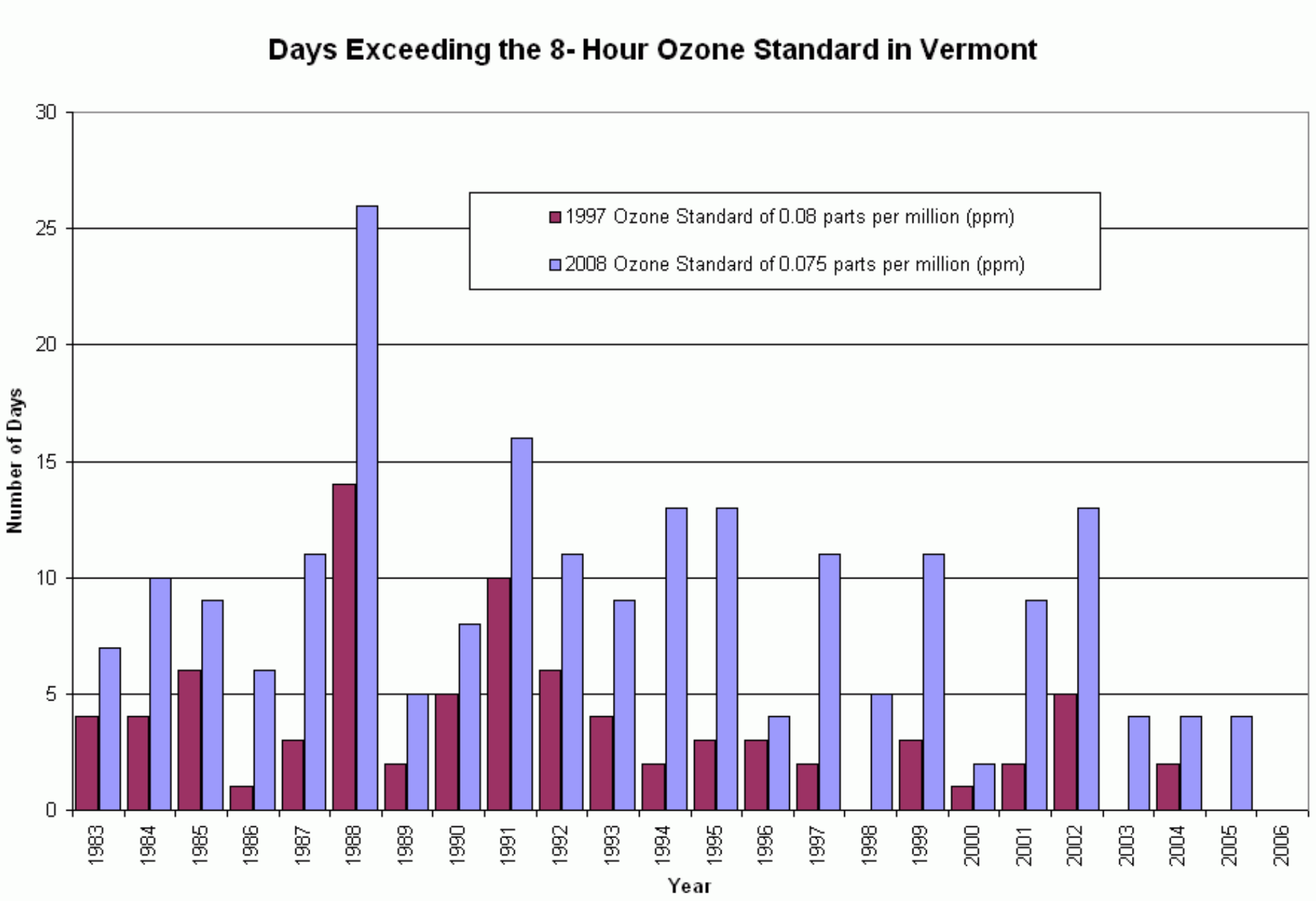
2003
2004
2005
2006
2007


Days Exceeding the 8- Hour Ozone Standard in Vermont
1997 Ozone Standard of 0.08 parts per million (ppm)
2008 Ozone Standard of 0.075 parts per million (ppm)
Number of Days
Year
0
5
10
15
20
25
30
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
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2005
2006

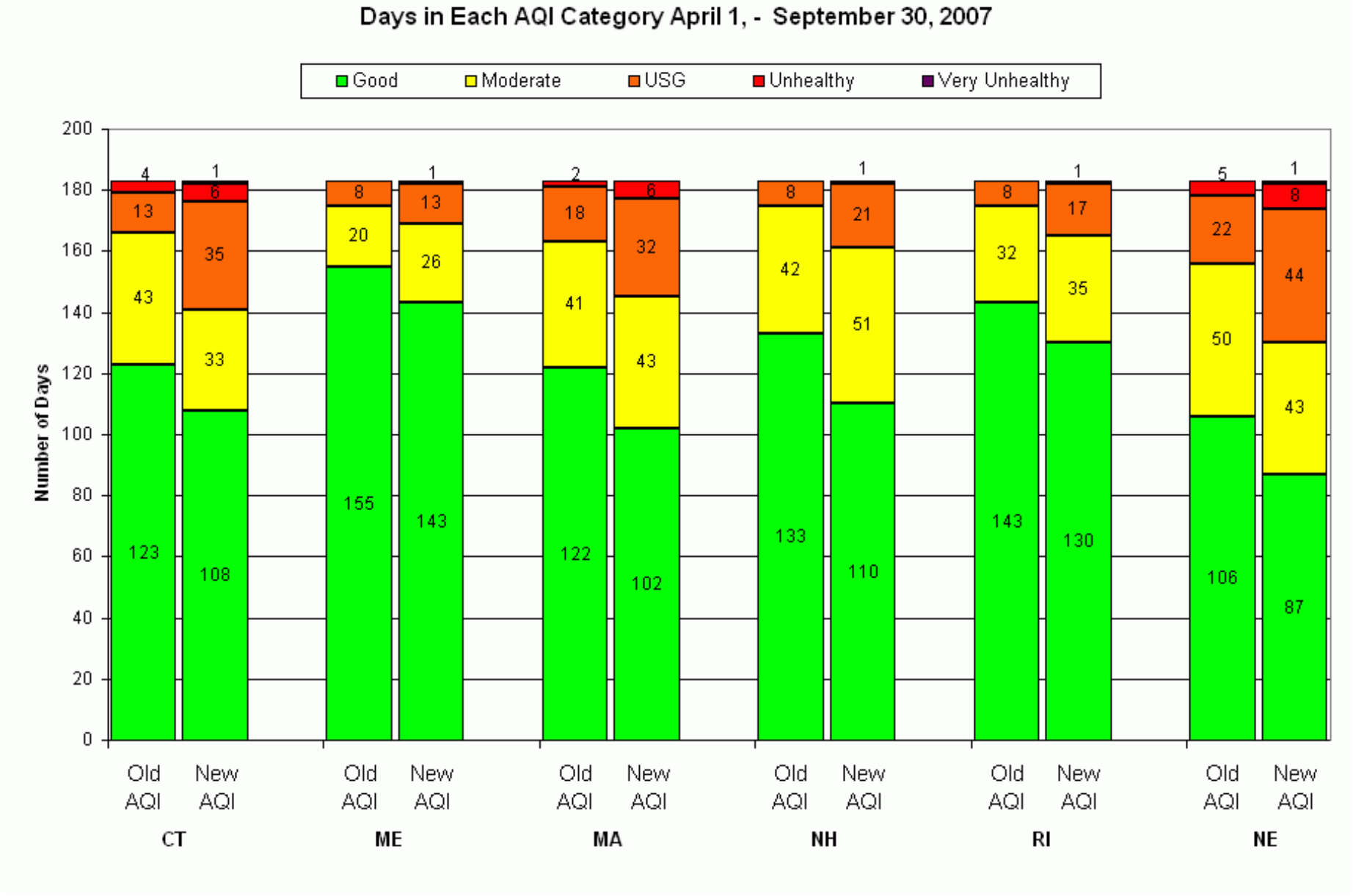
Revised Ozone AQI

- EPA is changing the Air Quality Index (AQI) to reflect the new primary standard
- EPA is adjusting the 100-level to equal the new 0.075 ppm standard, and making proportional changes to other AQI values
- EPA encourages the States to use the new AQI breakpoints for air quality forecasting by May 1, 2008

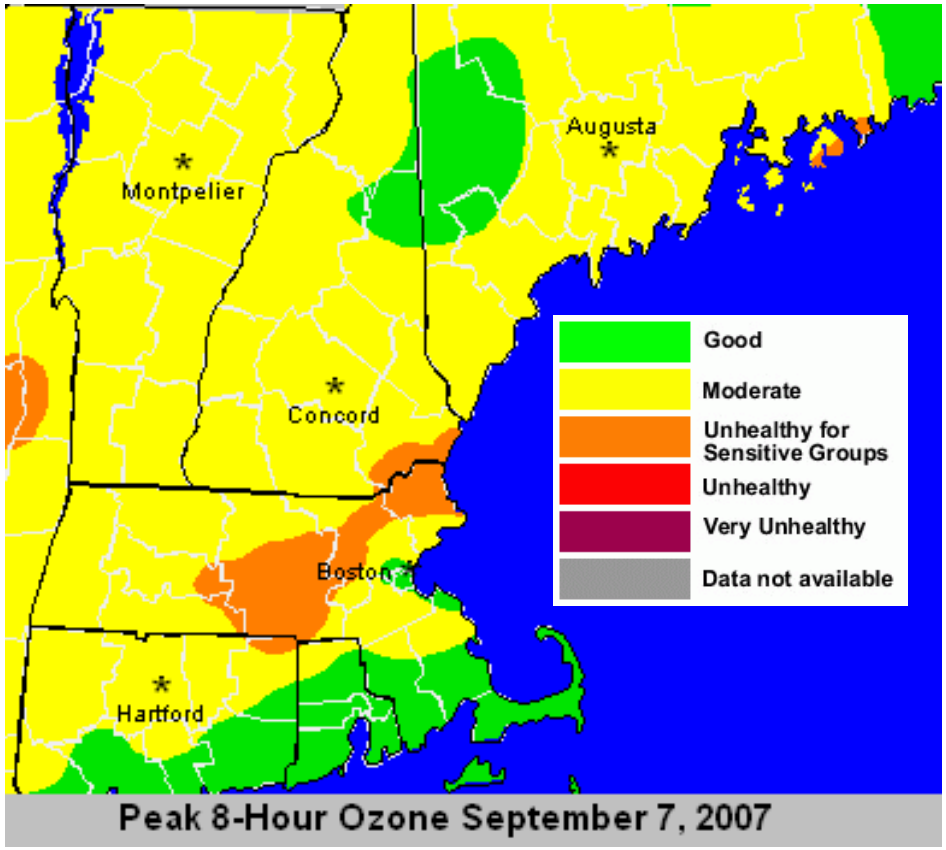
Air Quality Index for Ozone

Category	AQI Value	1997 8-hour (ppm)	2008 8-hour (ppm)
Good	0-50	0.000-0.064	0.000-0.059
Moderate	51-100	0.065-0.084	0.060-0.075
Unhealthy for Sensitive Groups	101-150	0.085-0.104	0.076-0.095
Unhealthy	151-200	0.105-0.124	0.096-0.115
Very Unhealthy	201-300	0.125-0.374	0.116-0.374
Hazardous	301-400	No Change	No Change
	401-500	No Change	No Change

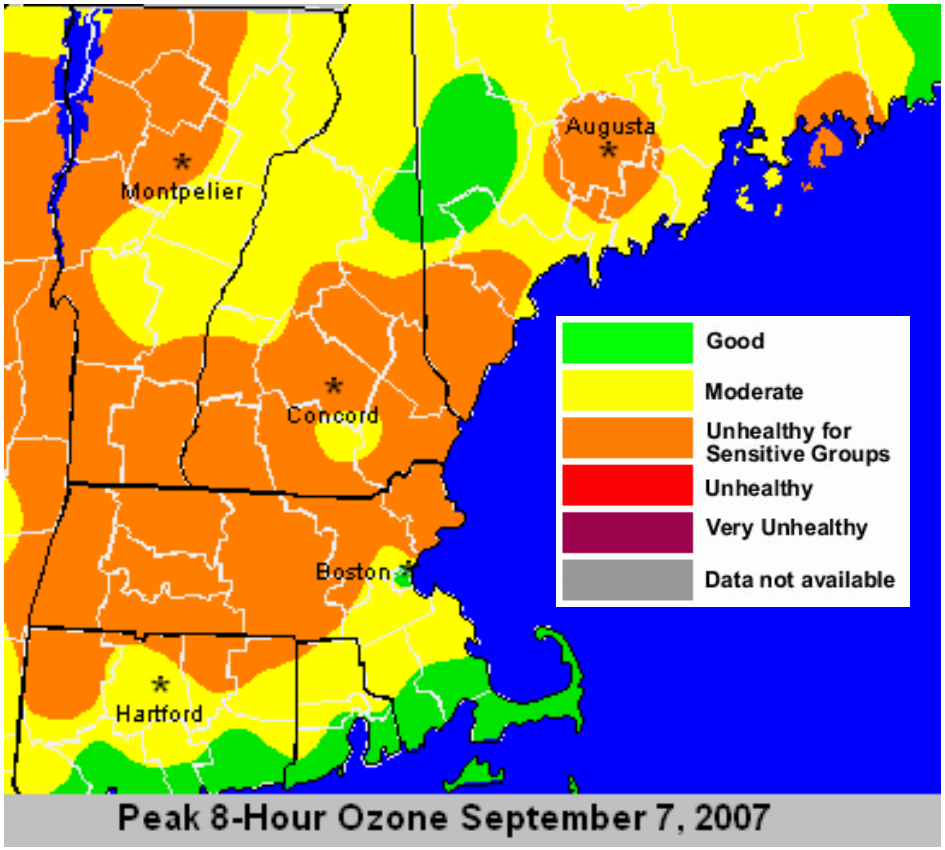
The new AQI will result in an increased number of unhealthy for sensitive groups and unhealthy days.



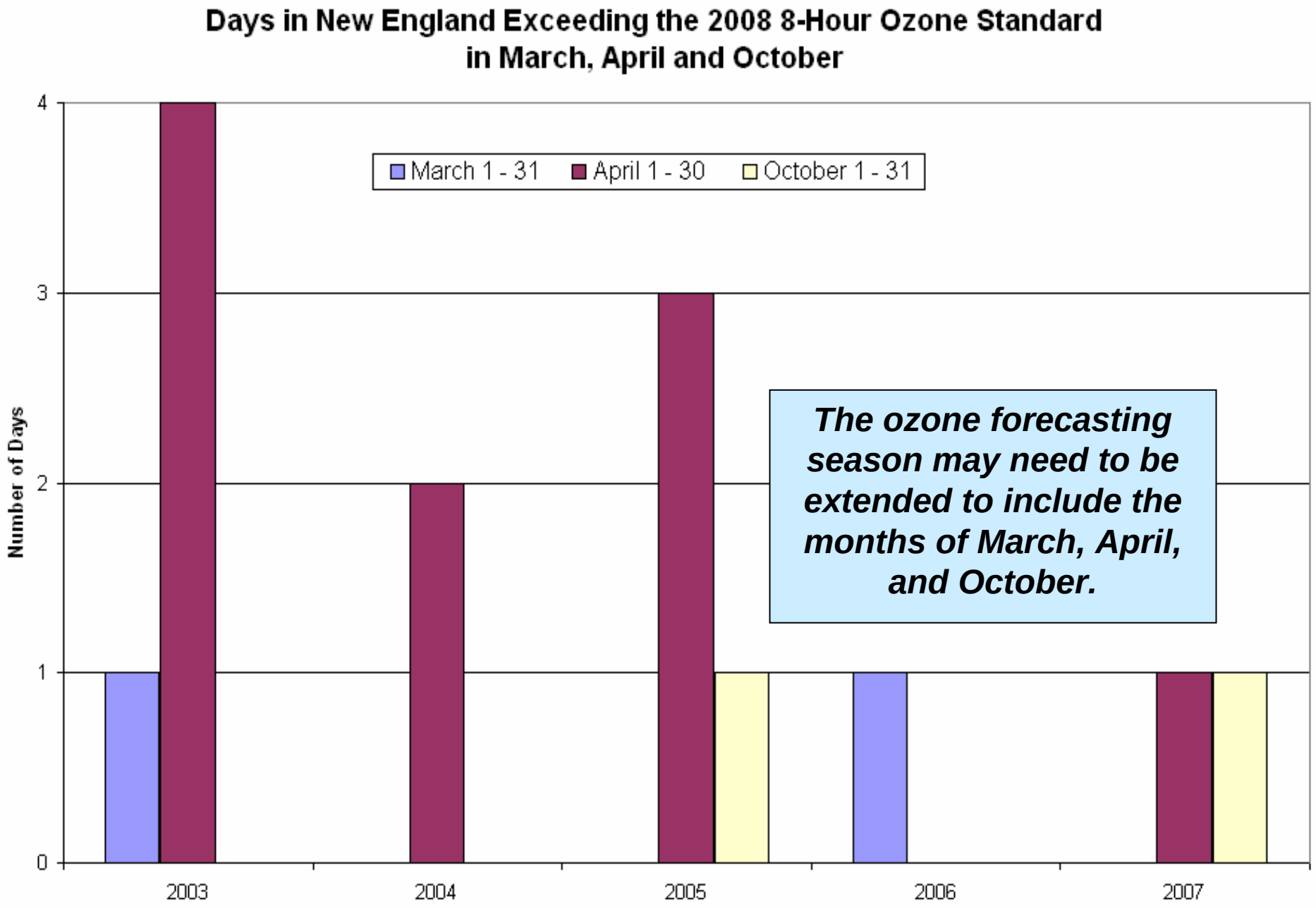
The revised AQI will depict more extensive areas of unhealthy air quality.



AQI based on 1997 ozone standard

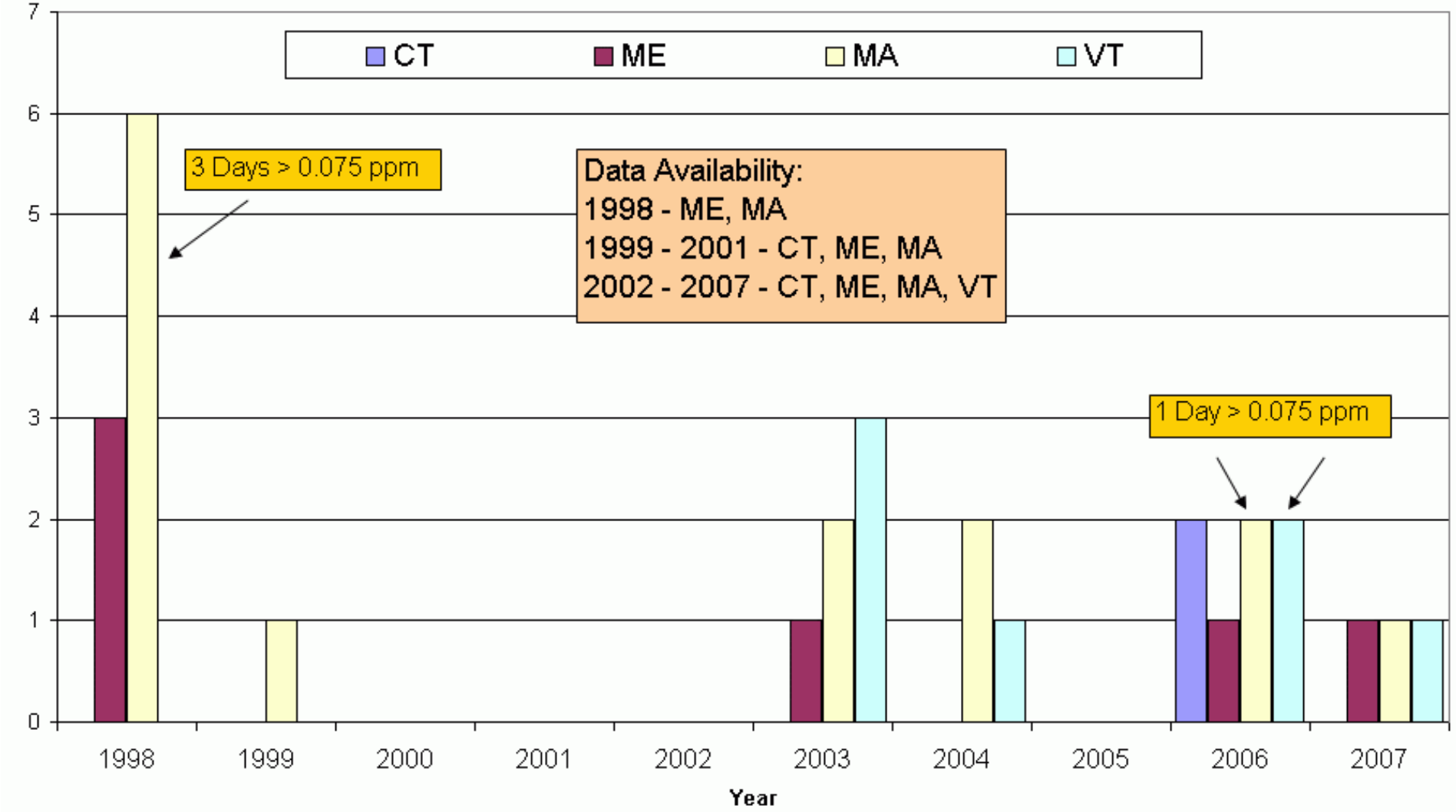


AQI based on 2008 ozone standard



Data from Airnow Tech

Number of Days with 8-hour Ozone Concentrations >0.060 ppm between January 1 - March 31



Data from AQS

Additional Information/NEXT STEPS

- Published in Federal Register: March 27, 2008.
- Rule Effective May 27, 2008.
- States Forecast using the new AQI: May 1, 2008
- Propose Implementation Rule: ~ Late Fall 2008
- States make designation attainment/nonattainment recommendations to EPA: March 2009

EnviroFlash

EPA has revamped EnviroFlash – air quality e-mail alert system

EnviroFlash
Your Environmental News Flash

EnviroFlash - Background

- Air quality information via email
- Free electronic service
- Launched May 2004
- Partnership between EPA and S/L/T agencies
- Uses AIRNow tech forecasts
- Subscribers receive e-mails

EnviroFlash
Your Environmental News Flash

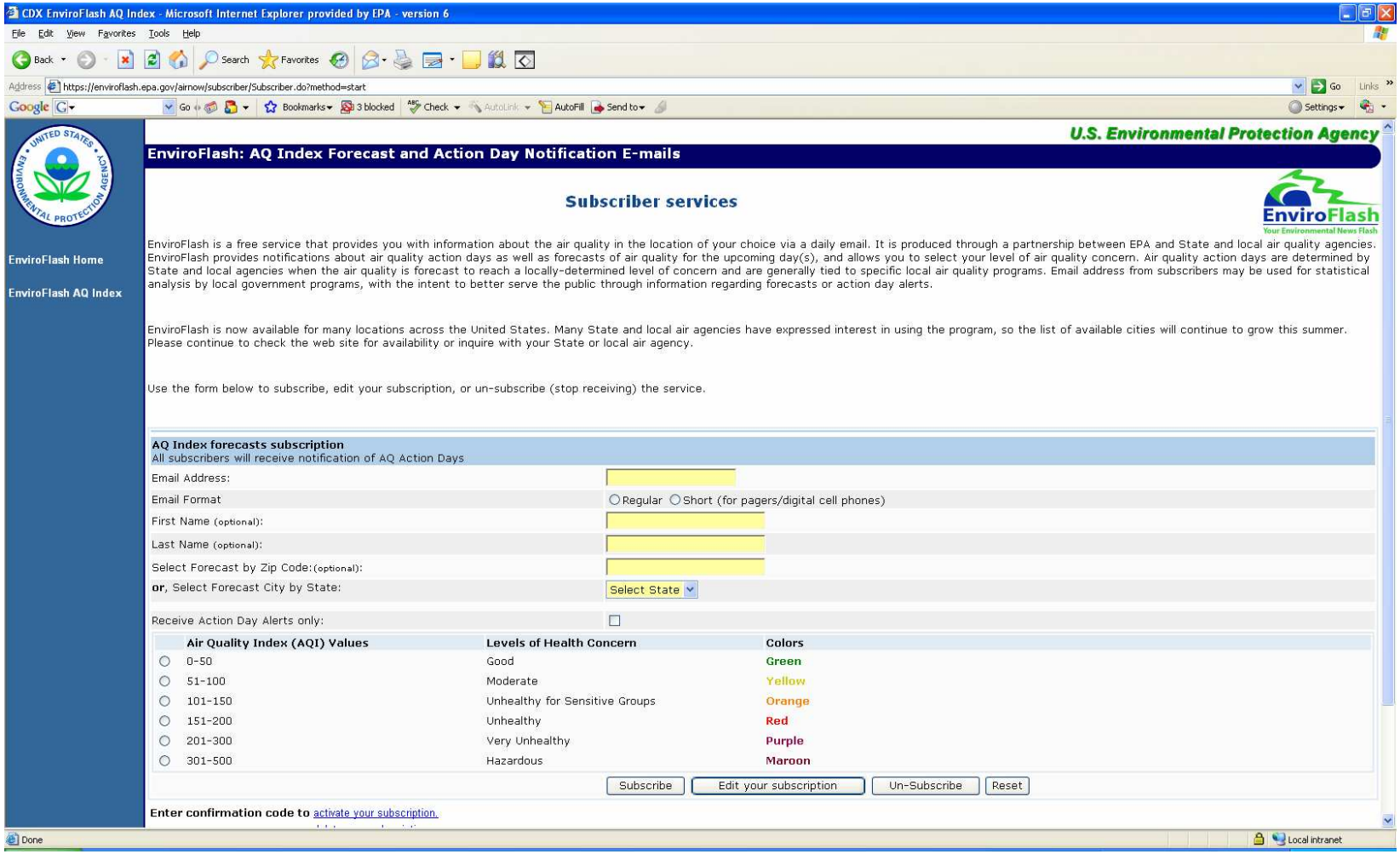
Feedback

- Want easier sign-up page
- Want local look and feel
- Make it pretty, short and sweet
- Want better bounce/auto reply handler
- Want text messaging
- Want to keep name “EnviroFlash”
- Like TV/radio promotion materials
- Need to track progress

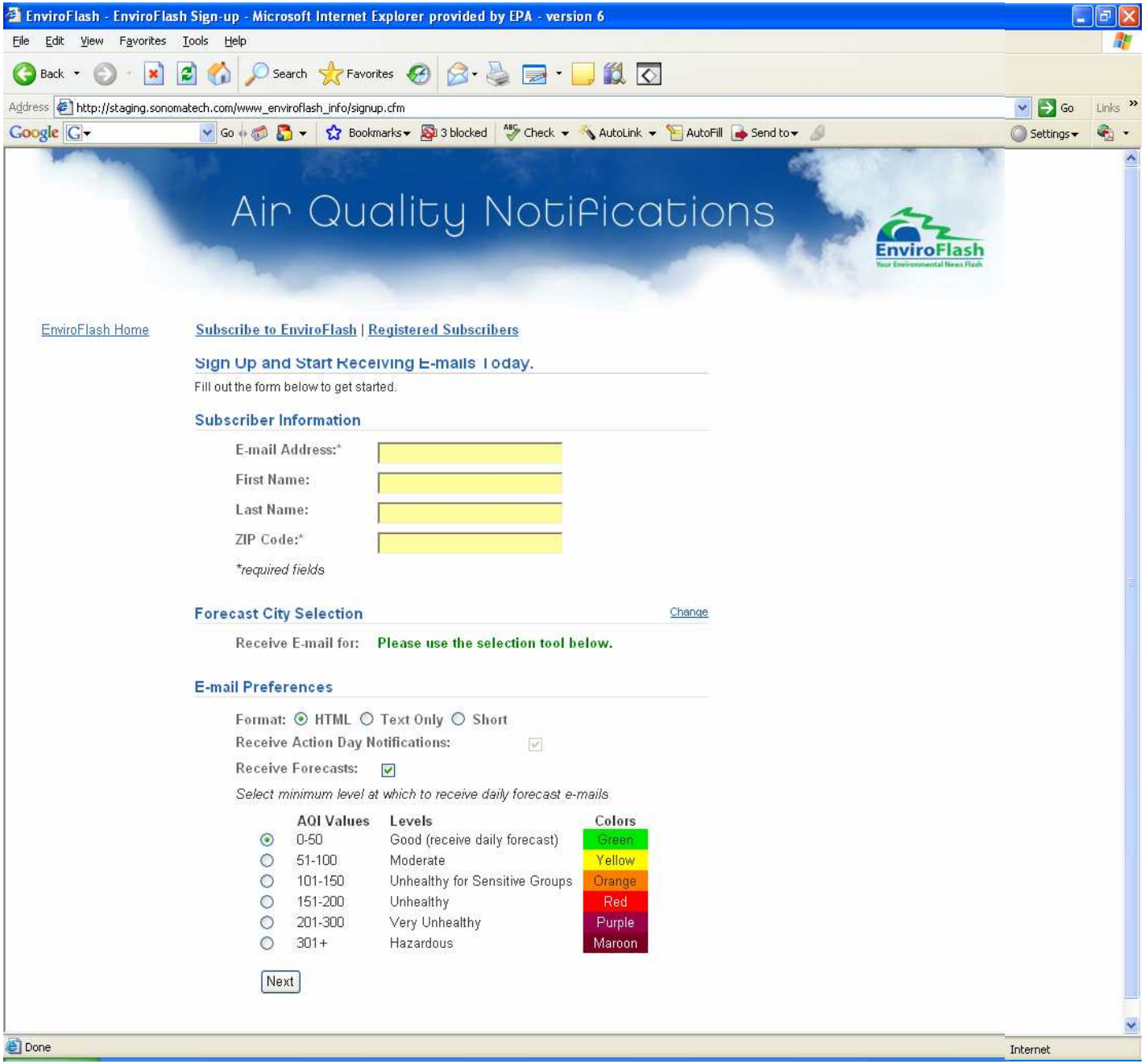
EnviroFlash
Your Environmental News Flash

"Want easier sign-up page"
"Make it pretty, short, and sweet"

Old Sign-Up Page:



New Sign-Up Page:

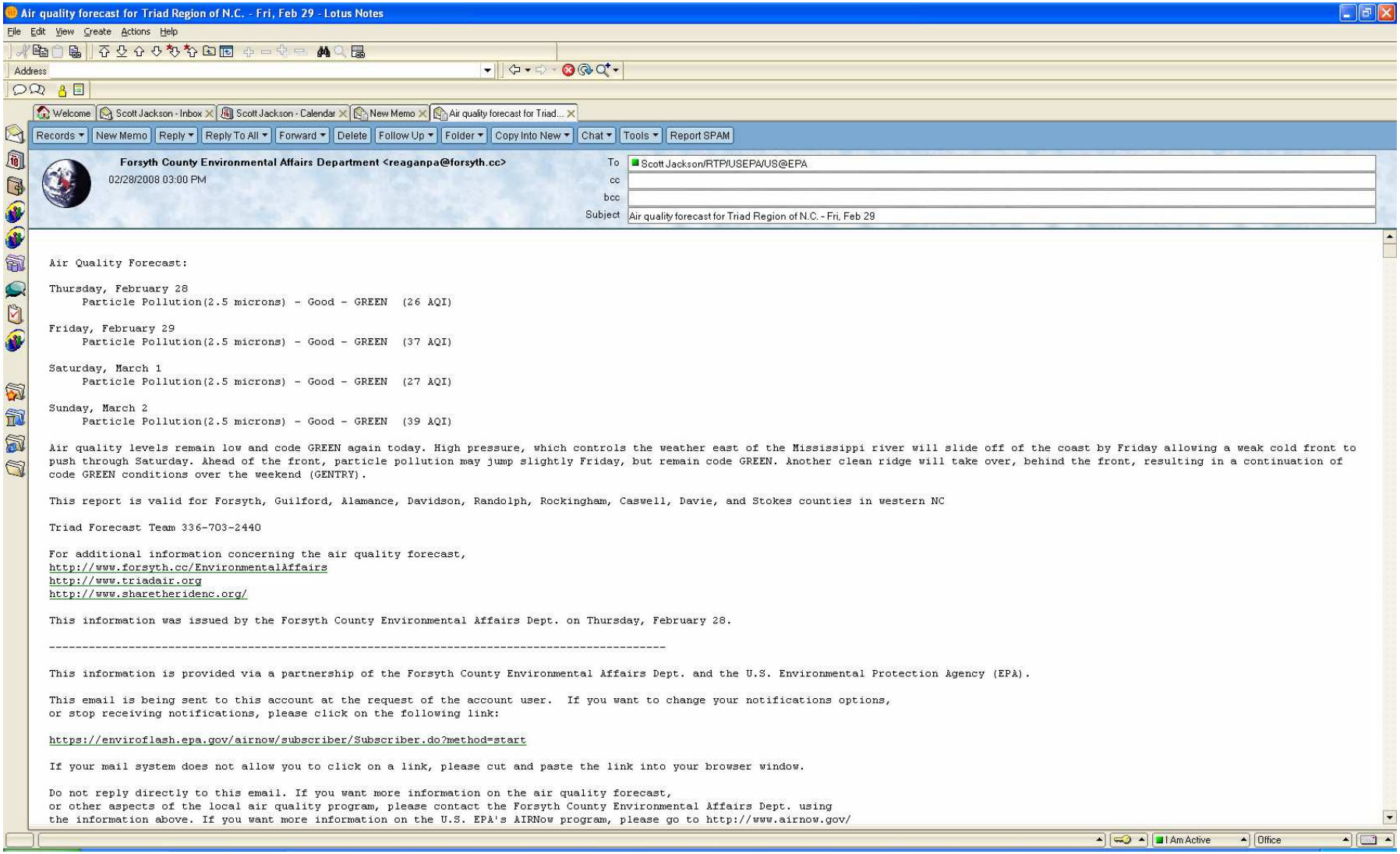


Features:

- **Auto zip code lookup**
- **Allows for email preview before subscribing**
- **Simpler for subscribers to manage their accounts**

“Make it pretty, short, and sweet”

Old E-mail:



Air quality forecast for Triad Region of N.C. - Fri, Feb 29 - Lotus Notes

File Edit View Create Actions Help

Address

Welcome | Scott Jackson - Inbox | Scott Jackson - Calendar | New Memo | Air quality forecast for Triad...

Records | New Memo | Reply | Reply To All | Forward | Delete | Follow Up | Folder | Copy Into New | Chat | Tools | Report SPAM

Forsyth County Environmental Affairs Department <reaganpa@forsyth.cc>
02/28/2008 03:00 PM

To: Scott Jackson/RTP/USEPA/US@EPA
cc:
bcc:
Subject: Air quality forecast for Triad Region of N.C. - Fri, Feb 29

Air Quality Forecast:

Thursday, February 28
Particle Pollution(2.5 microns) - Good - GREEN (26 AQI)

Friday, February 29
Particle Pollution(2.5 microns) - Good - GREEN (37 AQI)

Saturday, March 1
Particle Pollution(2.5 microns) - Good - GREEN (27 AQI)

Sunday, March 2
Particle Pollution(2.5 microns) - Good - GREEN (39 AQI)

Air quality levels remain low and code GREEN again today. High pressure, which controls the weather east of the Mississippi river will slide off of the coast by Friday allowing a weak cold front to push through Saturday. Ahead of the front, particle pollution may jump slightly Friday, but remain code GREEN. Another clean ridge will take over, behind the front, resulting in a continuation of code GREEN conditions over the weekend (GENTRY).

This report is valid for Forsyth, Guilford, Alamance, Davidson, Randolph, Rockingham, Caswell, Davie, and Stokes counties in western NC

Triad Forecast Team 336-703-2440

For additional information concerning the air quality forecast,
http://www.forsyth.cc/EnvironmentalAffairs
http://www.triadair.org
http://www.sharetheridenc.org/

This information was issued by the Forsyth County Environmental Affairs Dept. on Thursday, February 28.

This information is provided via a partnership of the Forsyth County Environmental Affairs Dept. and the U.S. Environmental Protection Agency (EPA).

This email is being sent to this account at the request of the account user. If you want to change your notifications options, or stop receiving notifications, please click on the following link:

https://enviroflash.epa.gov/airnow/subscriber/Subscriber.do?method=start

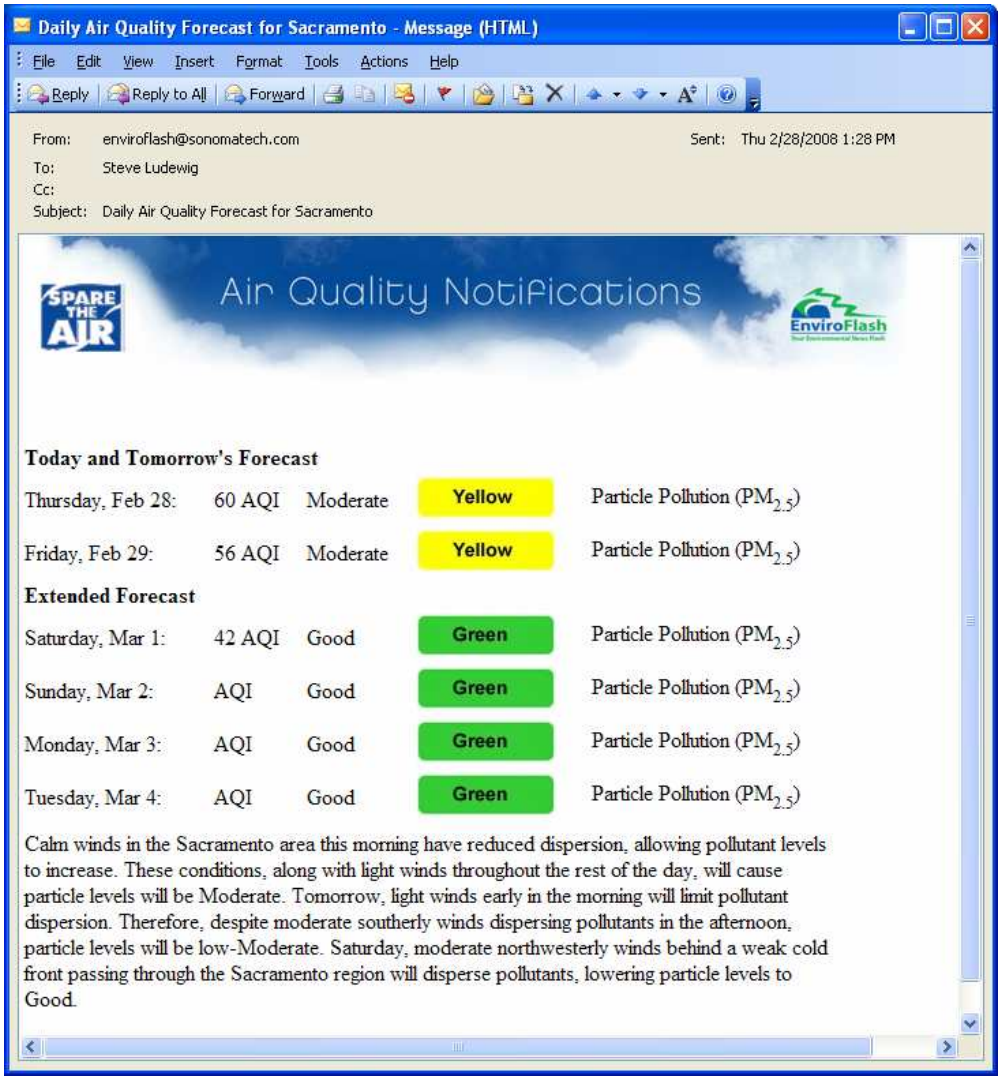
If your mail system does not allow you to click on a link, please cut and paste the link into your browser window.

Do not reply directly to this email. If you want more information on the air quality forecast, or other aspects of the local air quality program, please contact the Forsyth County Environmental Affairs Dept. using the information above. If you want more information on the U.S. EPA's AIRNow program, please go to http://www.airnow.gov/

I Am Active | Office

“Make it pretty, short, and sweet”

New E-mail:



Features:

- **HTML enabled**
- **Agency logo**
- **Simpler and easier to understand**

“Want local look and feel”/ “Need ability to track progress”

More Customization Available:

- Can add Agency logo to emails
- Can add Agency logo to sign-up page
- Sign-up page can be city.enviroflash.info
- Agencies can track how many people sign up

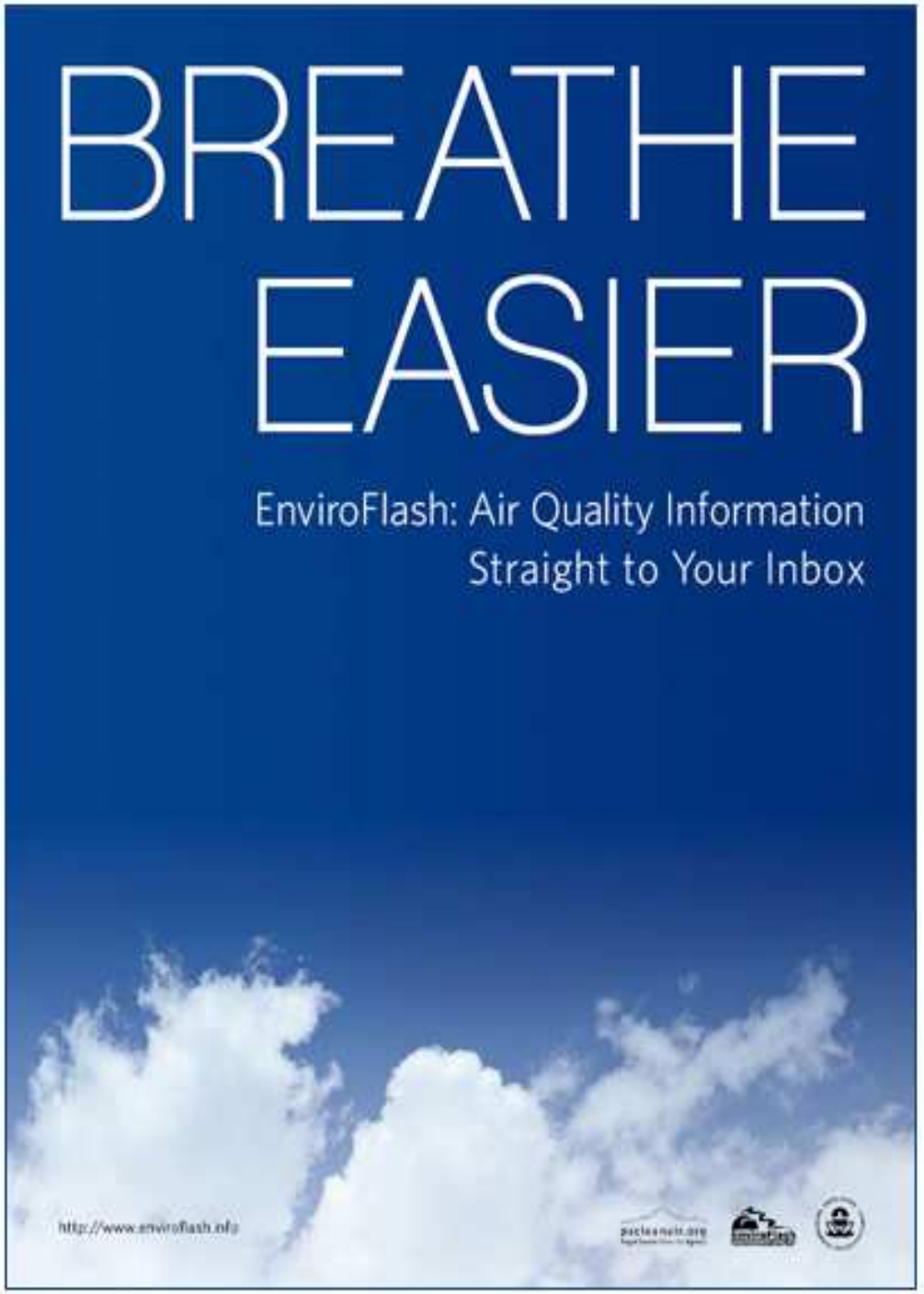
EnviroFlash
Your Environmental News Flash

New Design
New Materials

- New design

- New toolkit to market EnviroFlash

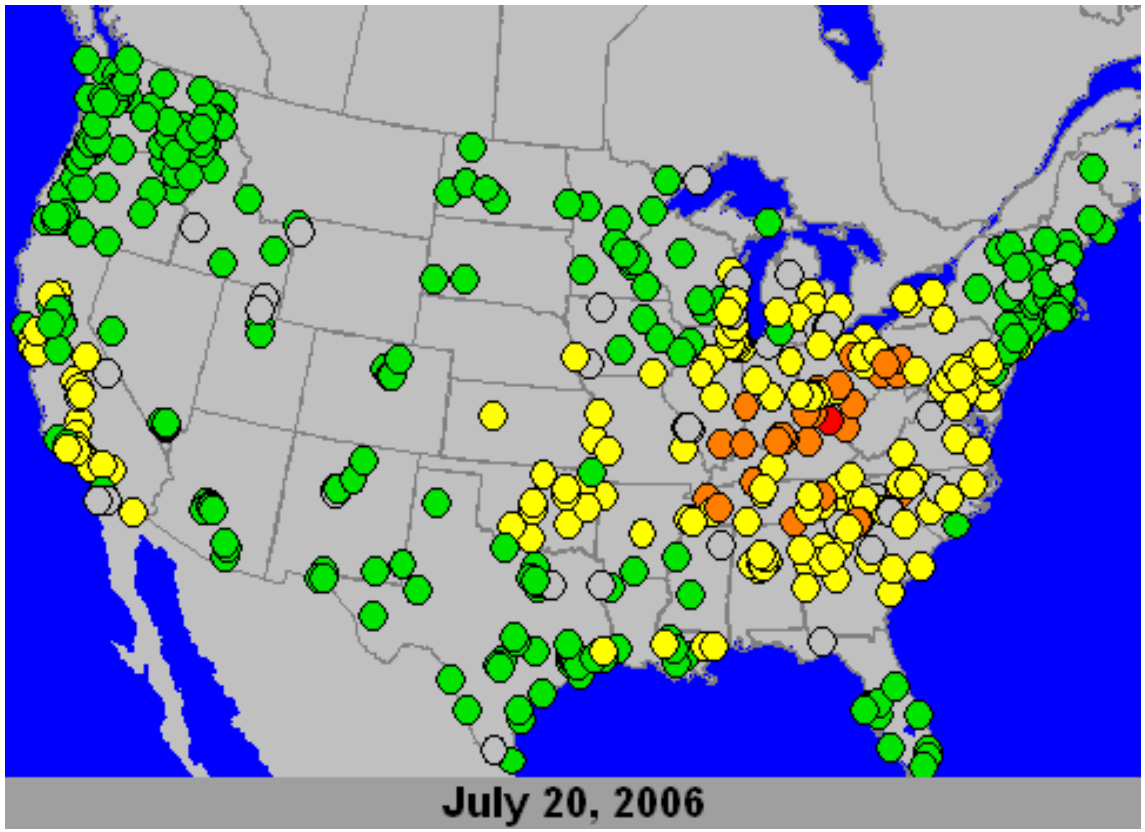
Allows you to place your Agency's logo on all marketing materials



Improvements to Airnow Mapper

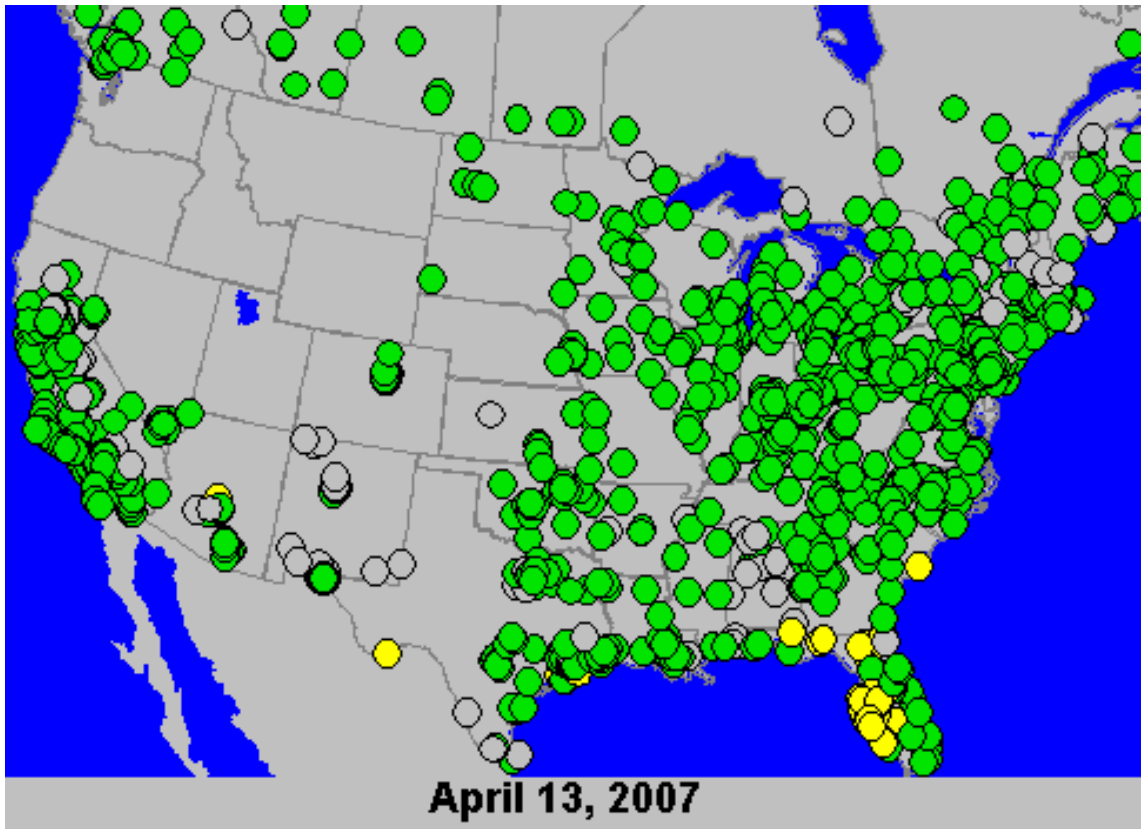
Historical Mapping Methods

- $PM_{2.5}$ maps



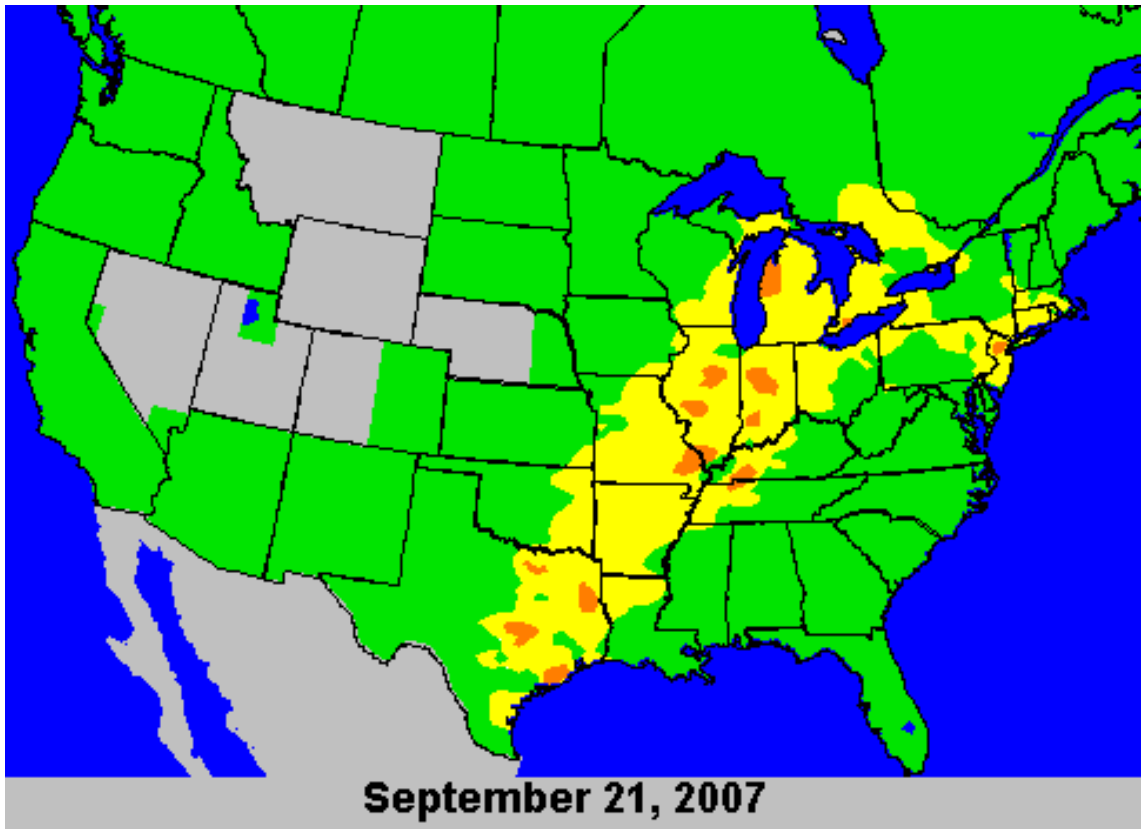
Historical Mapping Methods

- Ozone maps — winter



Historical Mapping Methods

- Ozone maps — summer

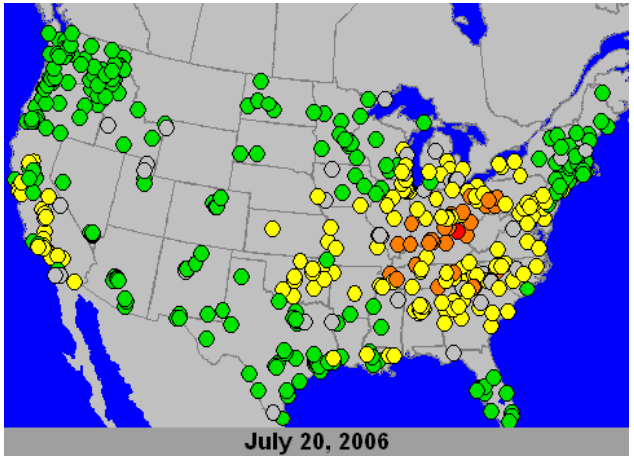


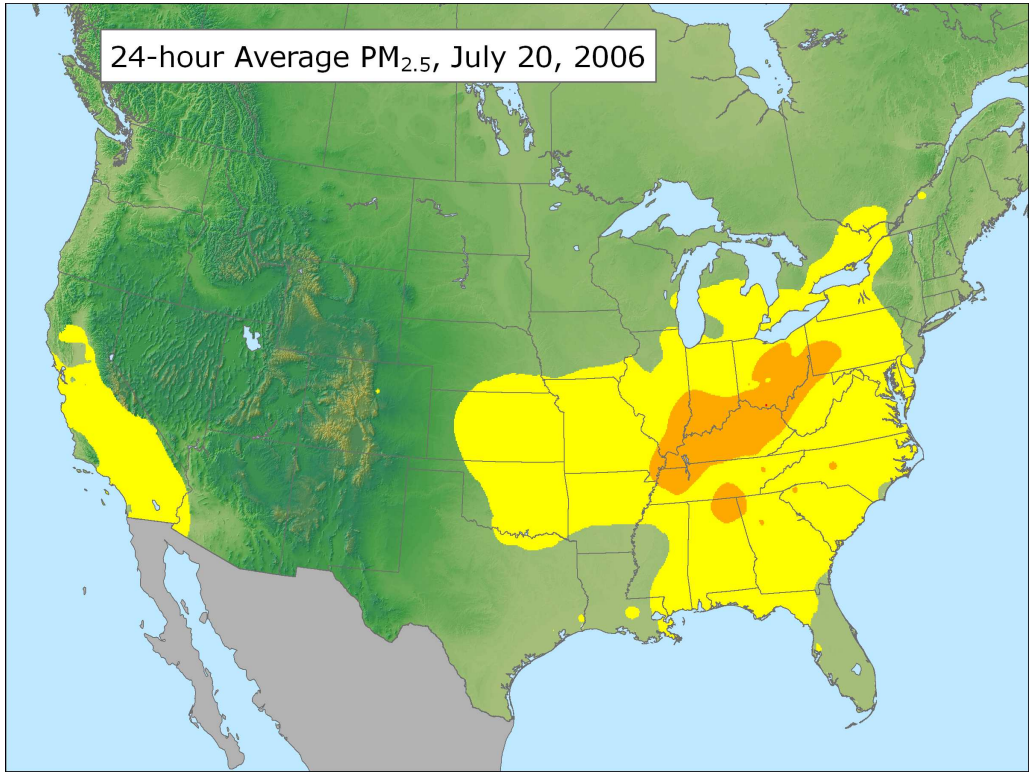
Historical Mapping Methods

- Issues with current maps
  - Bubble maps – no information where there are no monitors ($PM_{2.5}$ and wintertime ozone)
  - Ozone summer maps
    - Inconsistent interpolation techniques for different maps
    - Accuracy not verified
    - Masking technique primitive
  - No combined AQI maps

New Maps

- Interpolate between observations for both ozone *and* $PM_{2.5}$





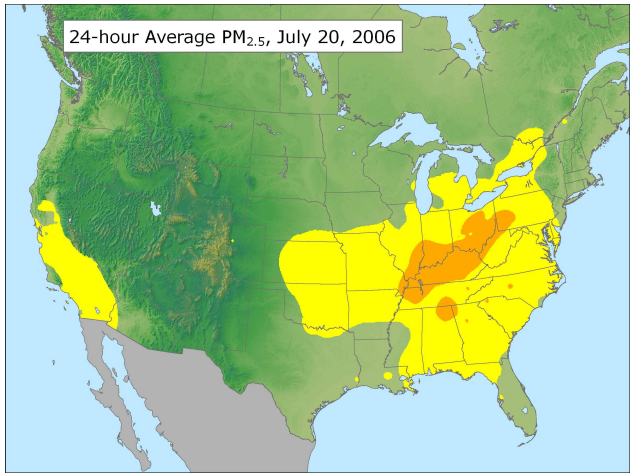
- Old $PM_{2.5}$ map

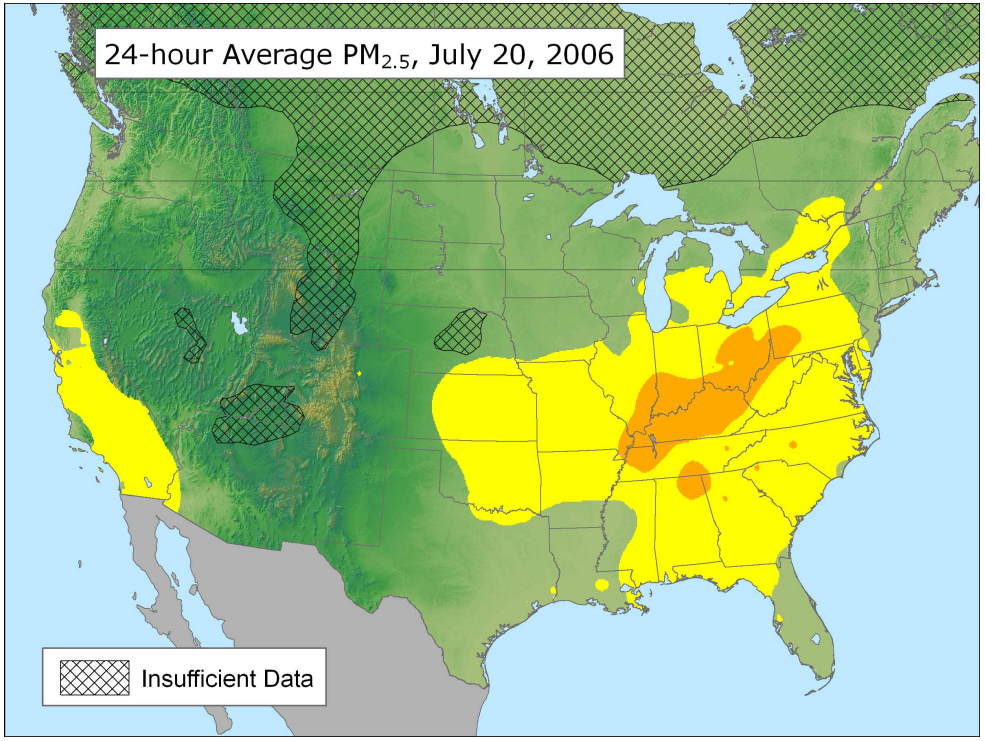
map

New $PM_{2.5}$

New Maps

- Use a statistical technique to mask off areas with sparse measurements





- New $PM_{2.5}$ map

New $PM_{2.5}$ map with masking

Method for Developing New Maps

- Goal: *Accurate* maps that are easy to read and modify
- Accuracy
  - Match observations
  - Capture the peaks
  - Represent AQI in areas void of monitors
- Process
  - Identify mapping techniques
  - Develop accuracy measures
  - Fine-tune each technique
  - Compare fine-tuned techniques

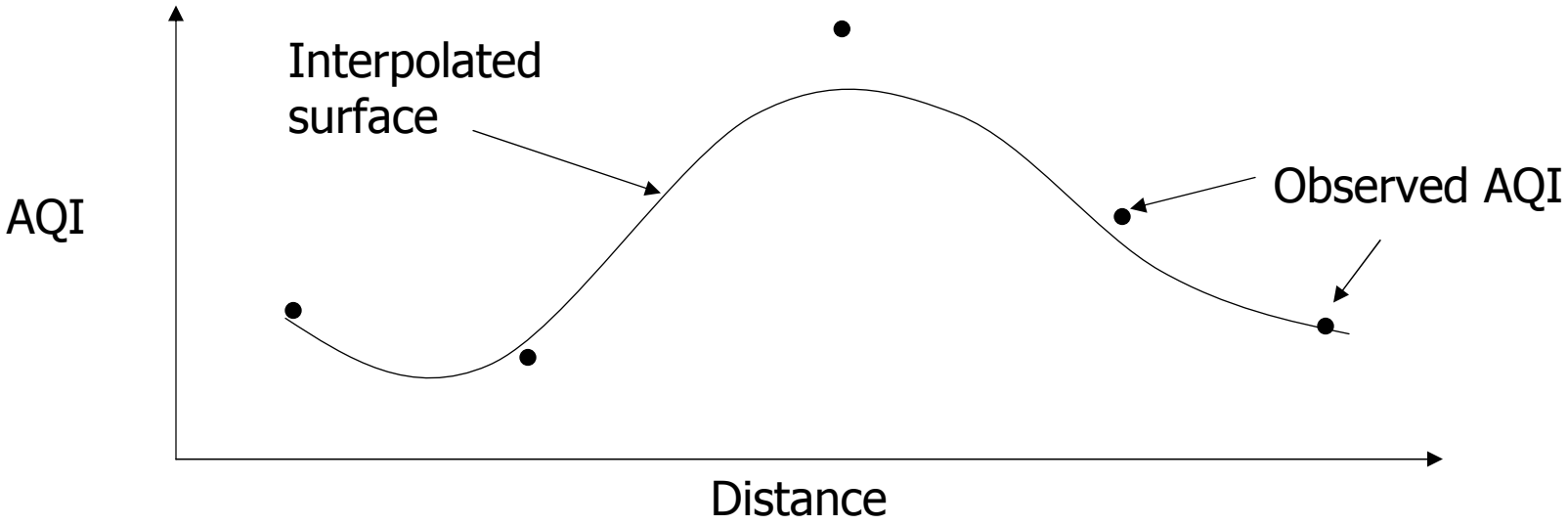
Interpolation Techniques

- Inverse Distance Weighting (IDW)
- Regularized Spline
- Tension Spline
- Kriging
- Constrained Kriging – modified to match (or nearly match) observations

Evaluating Map Accuracy: Point-removal Technique

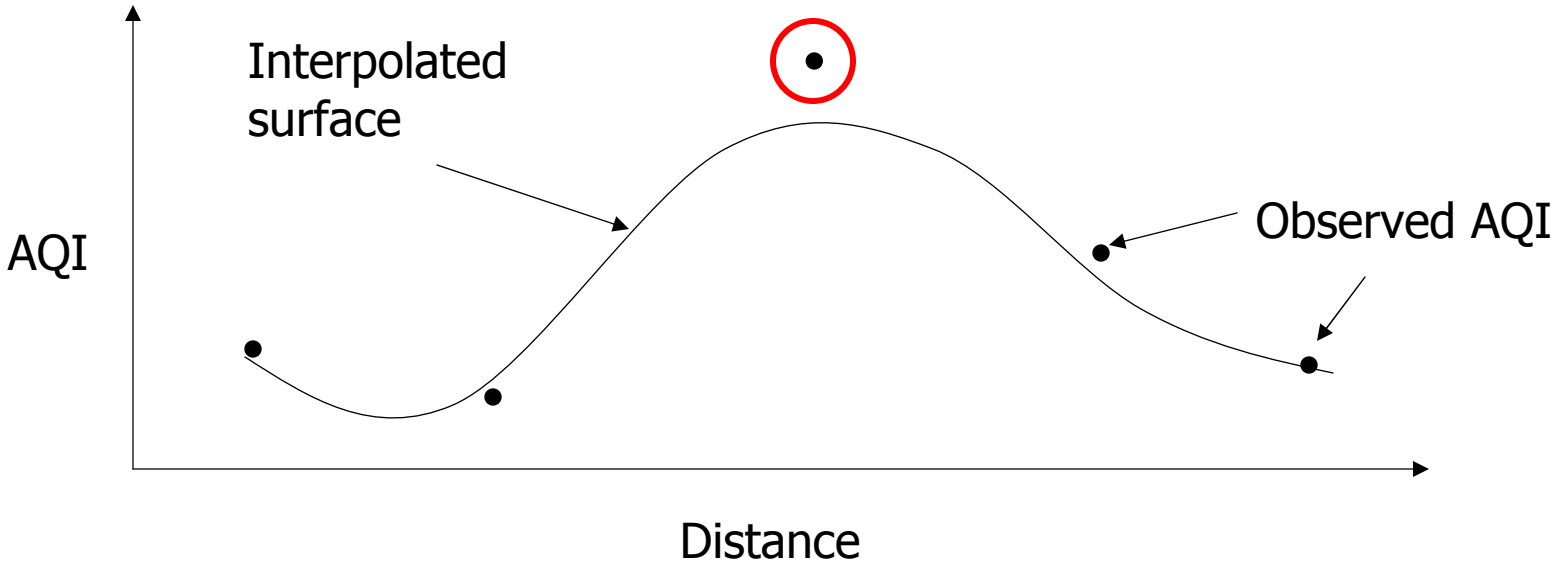
- *Prediction error* quantifies accuracy of maps in areas void of monitors

Calculate interpolated surface based on observations



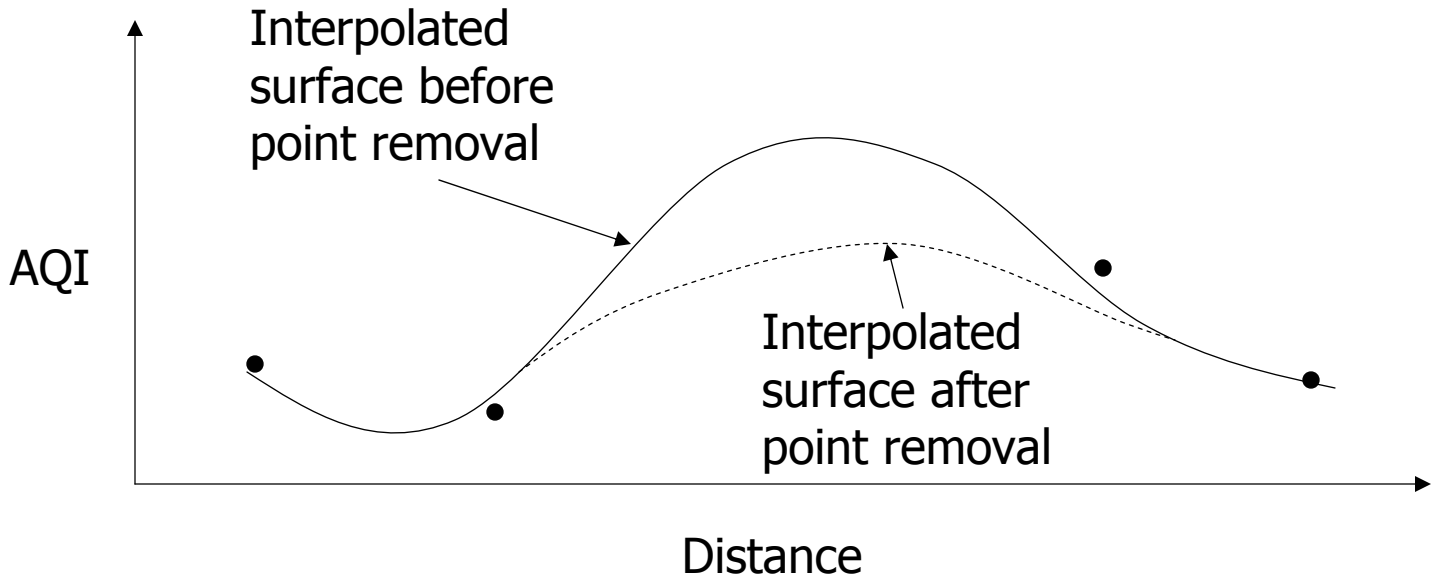
Evaluating Map Accuracy: Point-removal Technique

Remove an individual observation from the data set



Evaluating Map Accuracy: Point-removal Technique

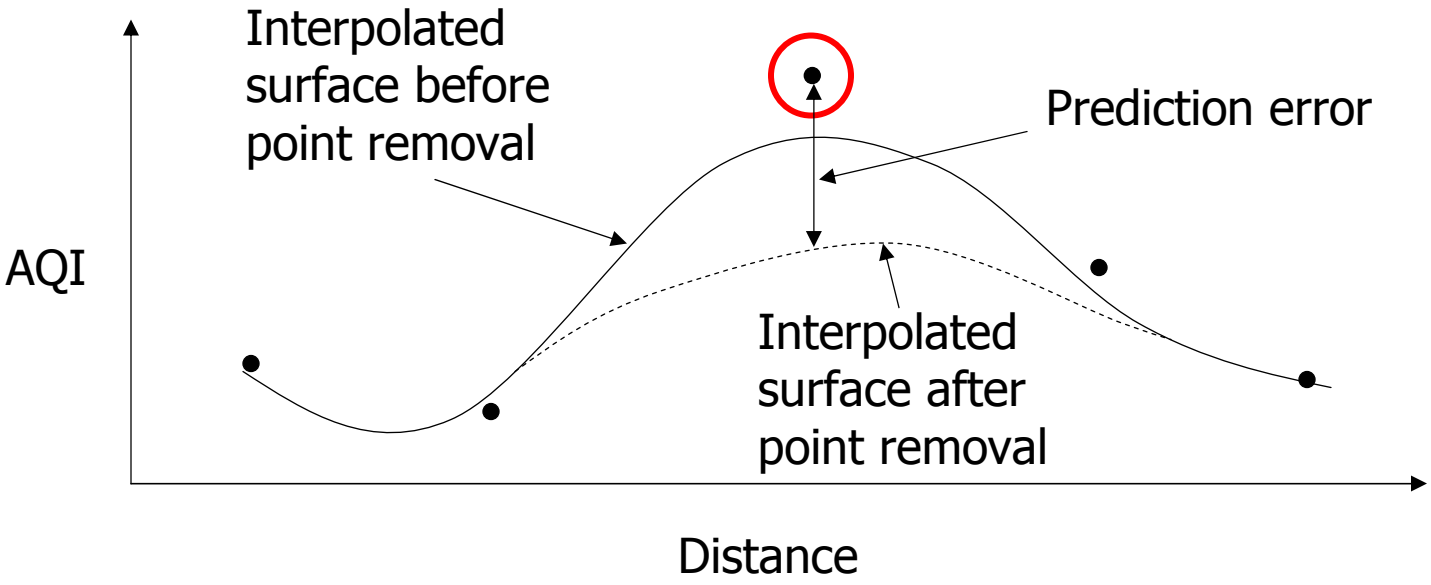
Re-calculate interpolation with point removed



Evaluating Map Accuracy: Point-removal Technique

Calculate the difference between the observation and the new interpolated surface

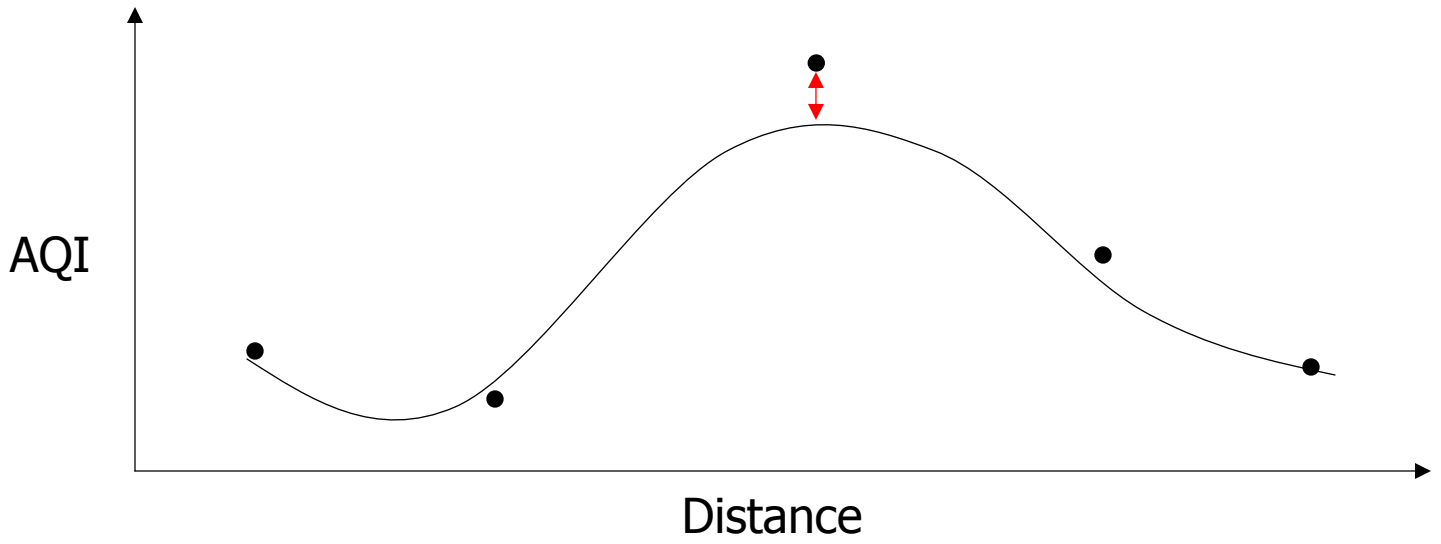
- Usually around 5-10 AQI units
- Little variation between interpolation techniques



Evaluating Map Accuracy: Without Point Removal

•*Interpolation Error* (IE): Quantifies accuracy of maps at monitor locations

- Anywhere from 0-10 AQI units
- Varies drastically between interpolation techniques



Method of Analysis

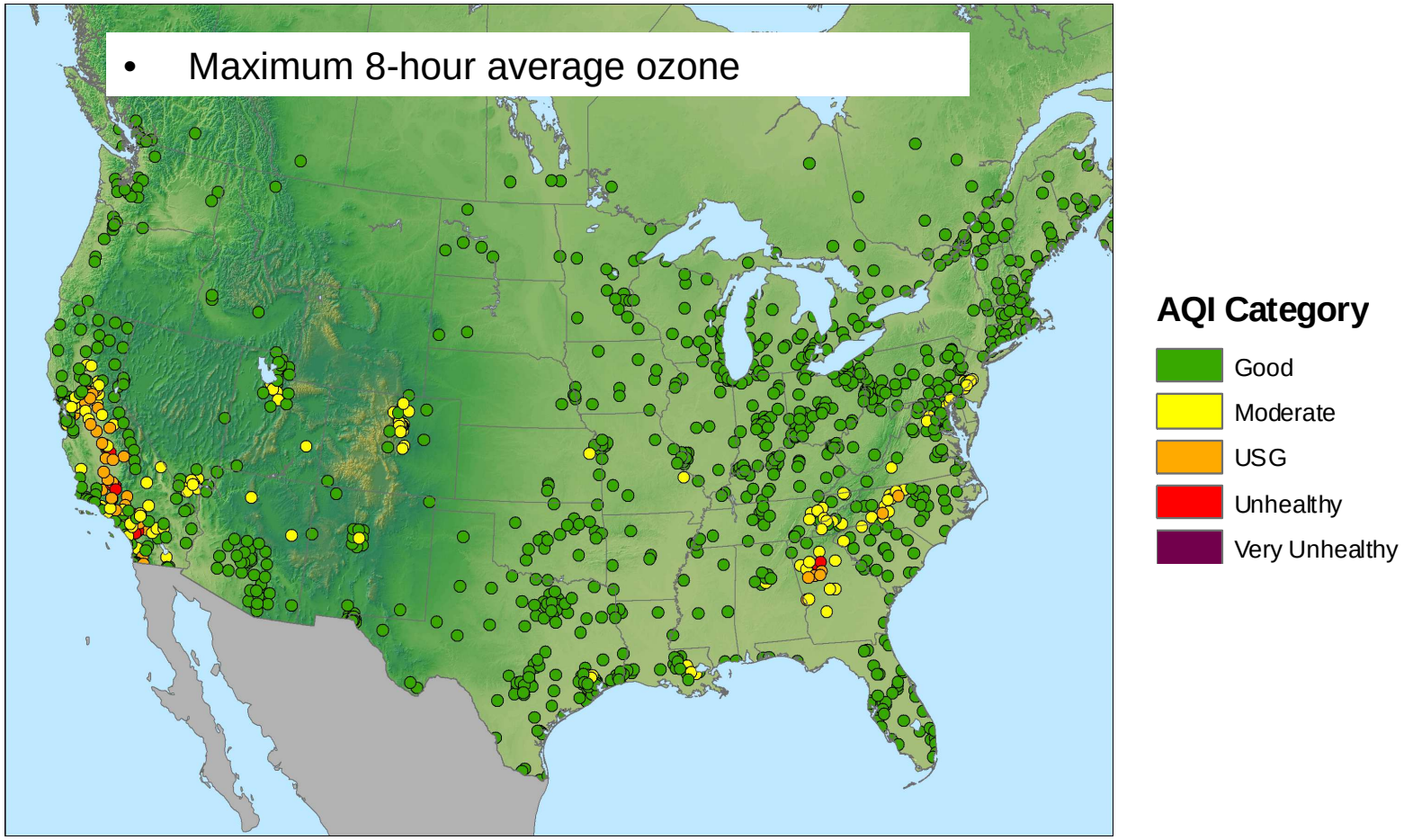
- Data: selection of days over the past two years
- 30 Cases
  - ozone (summer)
  - $PM_{2.5}$ (summer)
  - $PM_{2.5}$ (winter)
- Interpolations using ESRI ArcGIS Geostatistical Analyst
  - Analysis and production
  - Maps look good
  - Easy to validate and modify in the future

Method of Analysis

- Fine-tuned each interpolation technique
  - Minimizing error values
  - Visually appealing maps
- Compared techniques
  - Statistical measures
    - Bias
    - Root-mean-square (RMS) – weighted absolute error
  - Visual appeal and conceptual consistency

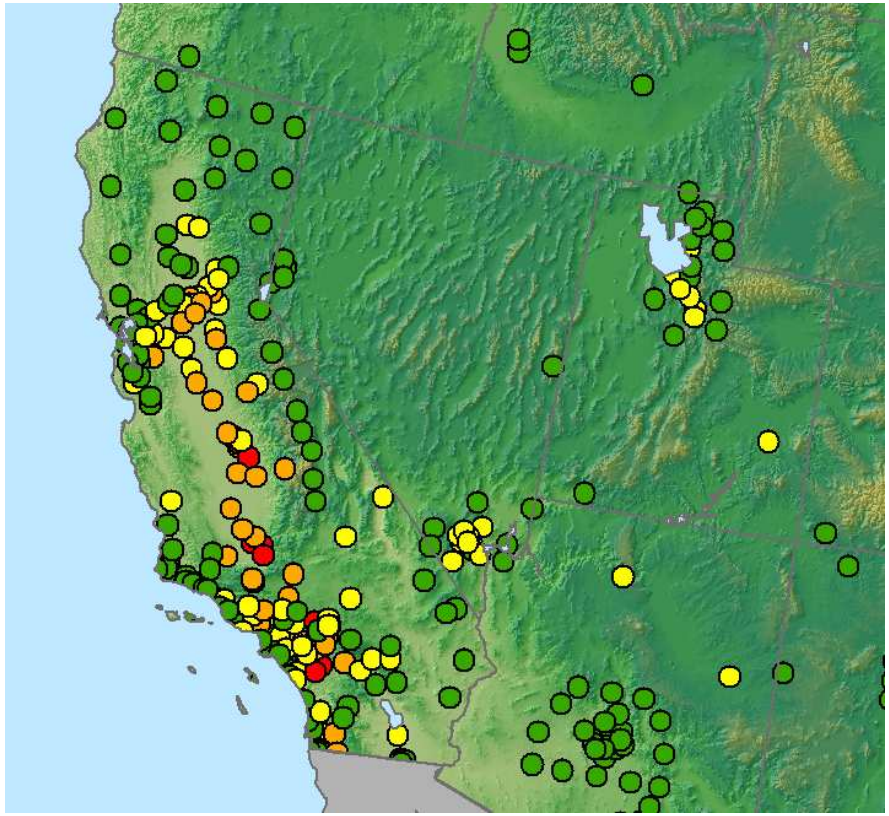
Results of Map Analysis: Ozone

June 23, 2006



Results of Map Analysis: Ozone

- June 23, 2006



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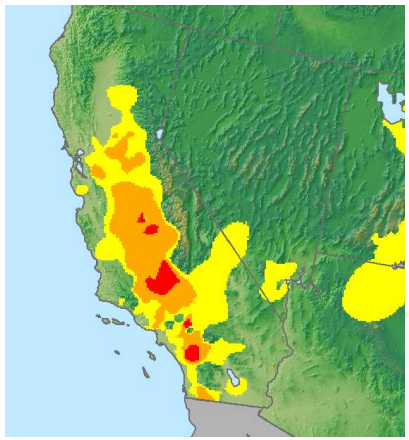
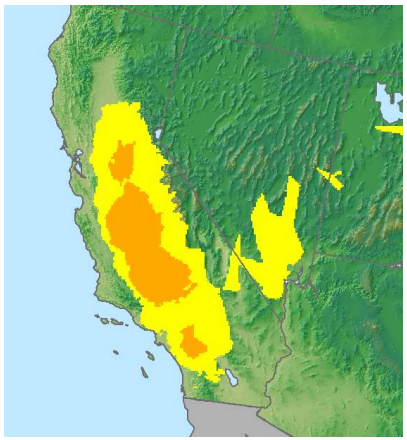
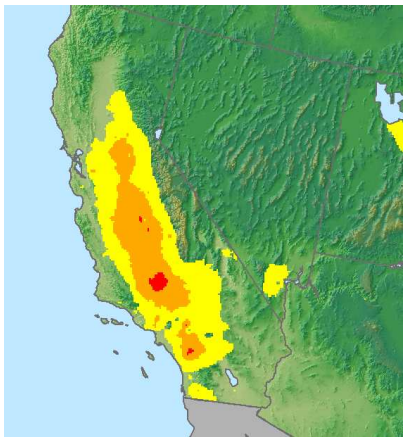
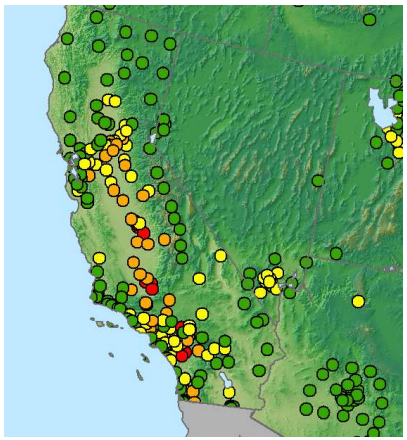
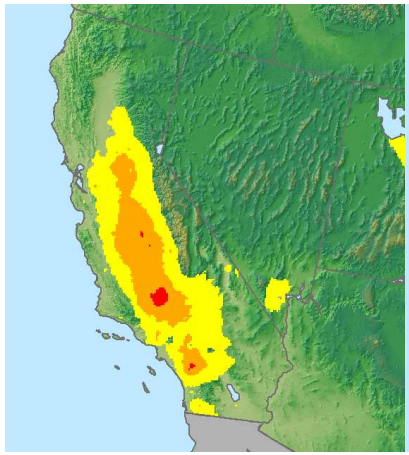
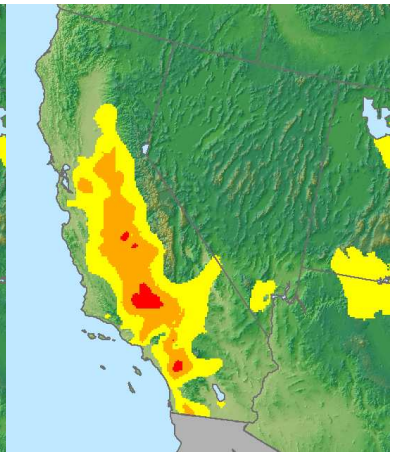





- IDW Kriging Regularized Spline

- Tension Spline Constrained Kriging

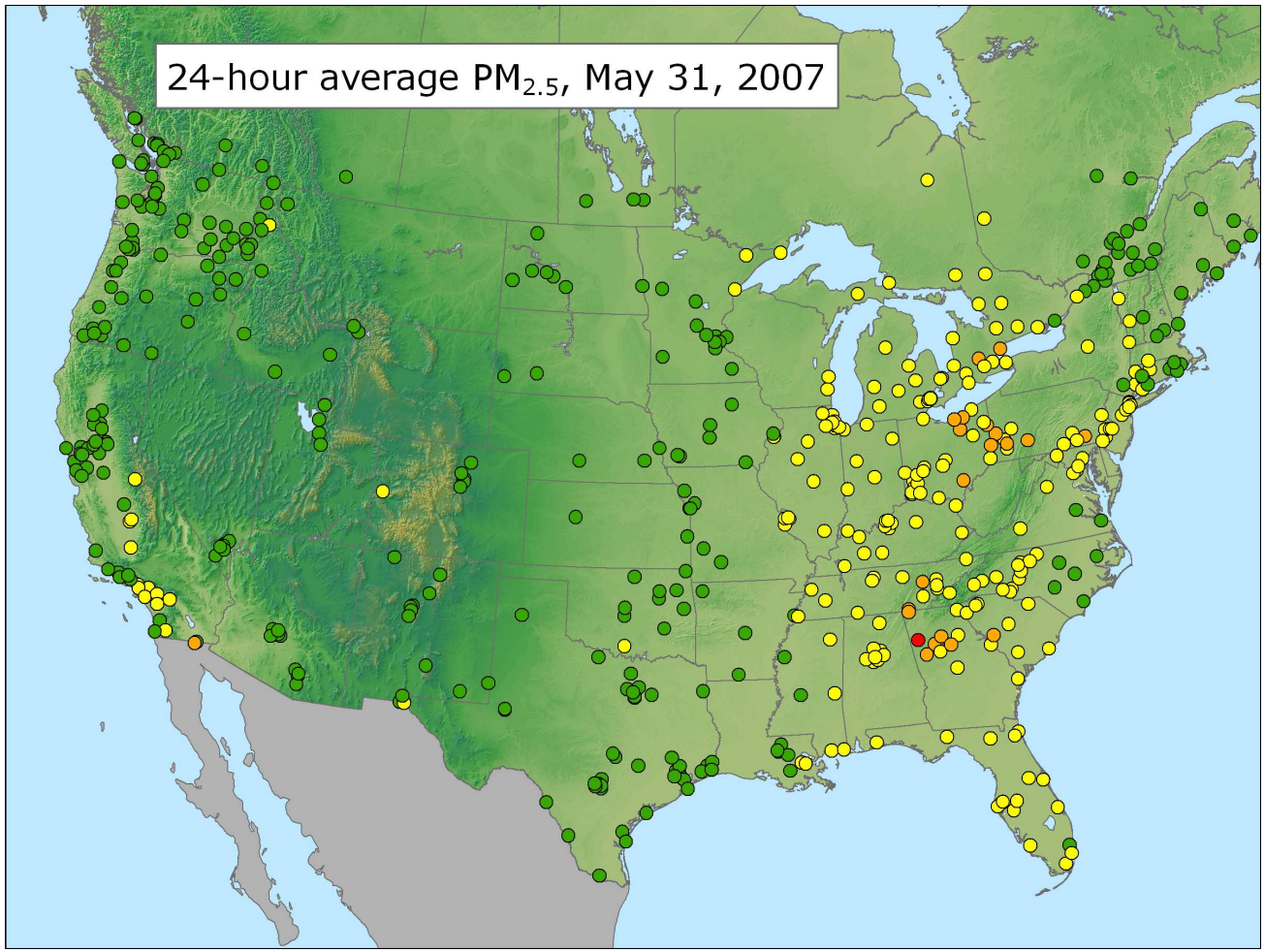
Summary for all ozone cases

Method	RMS Error	Std. Dev.
IDW	1.56	0.28
Kriging	6.56	1.64
Reg. Spline	5.24	2.20
Tension Spline	2.27	0.29
Constr. Kriging	1.77	0.29

- Interpolation Error (ppb)

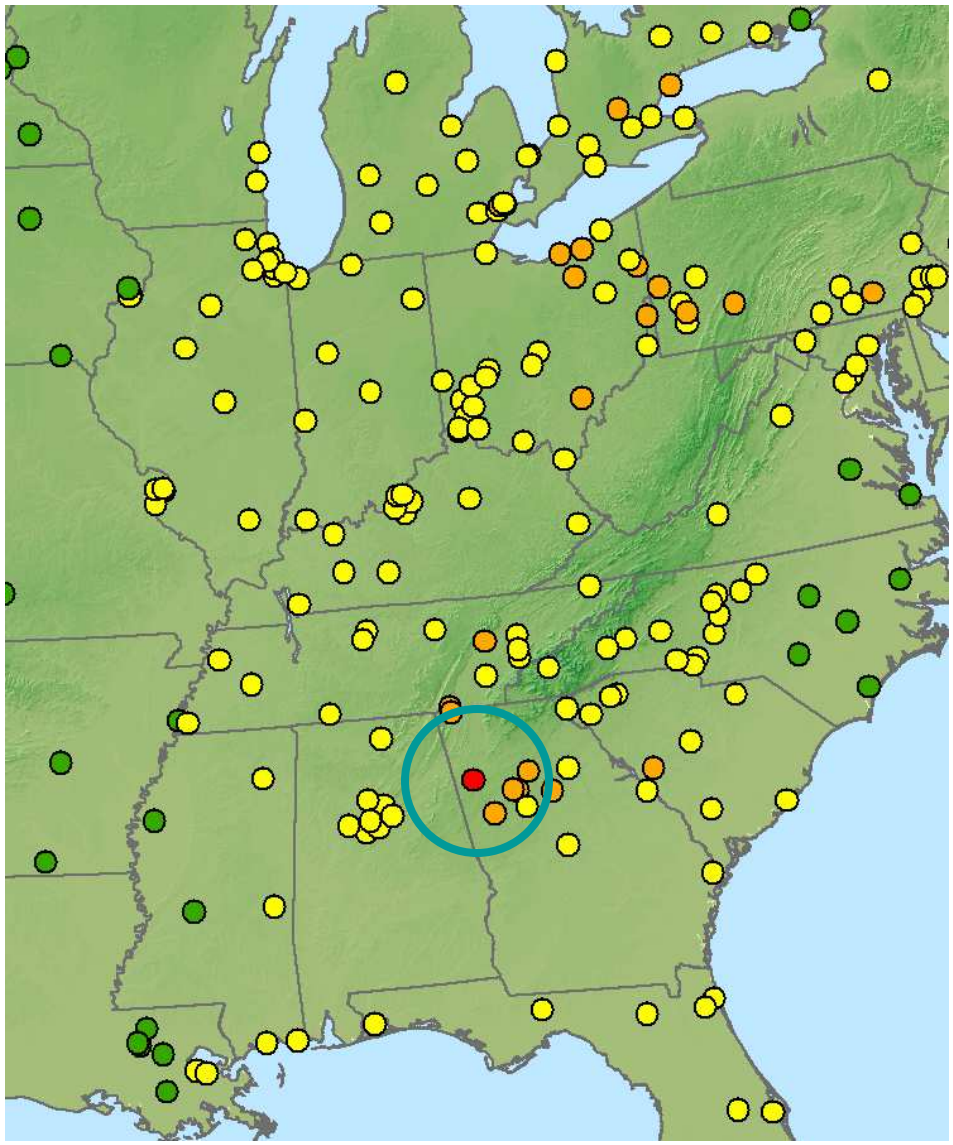
Results of Map Analysis: $PM_{2.5}$ – Summer

- May 31, 2007

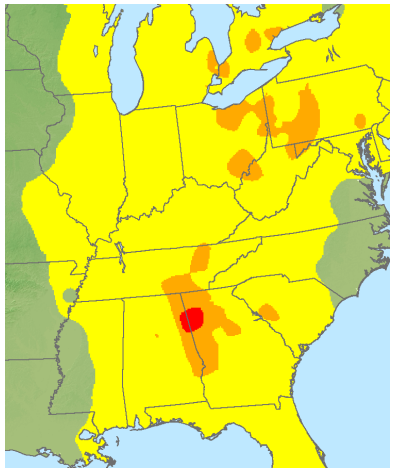
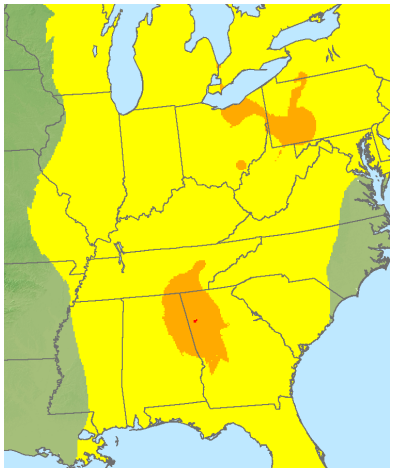
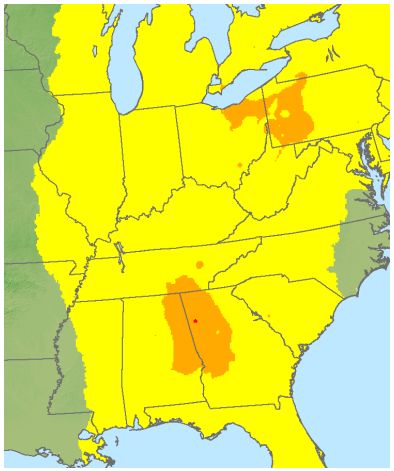
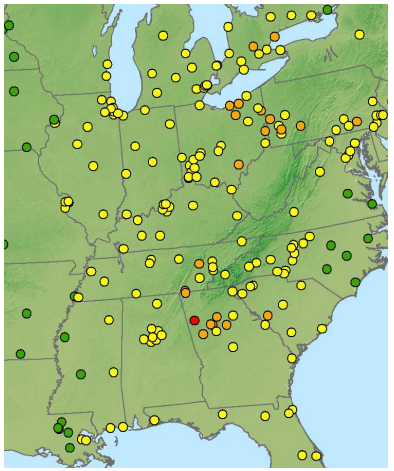


Results of Map Analysis: $PM_{2.5}$ – Summer

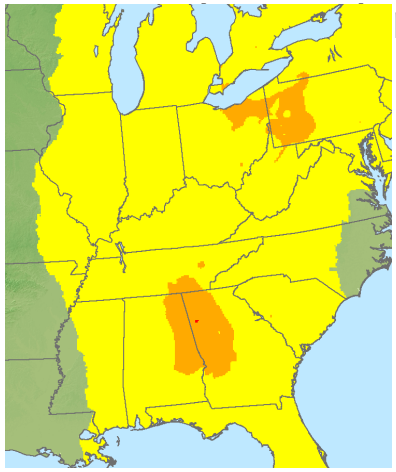
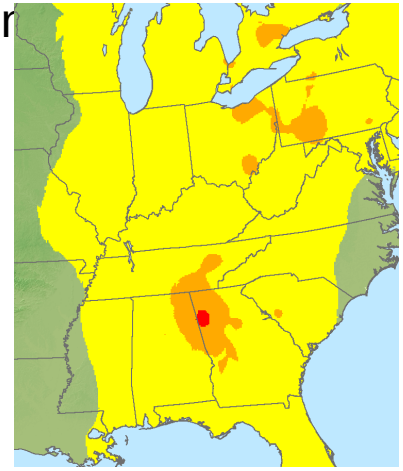
- May 31, 2007



Results of Map Analysis: $PM_{2.5}$ – Summer

- IDW Kriging Regularized Spline

- Tension Spline Constrained Kriging

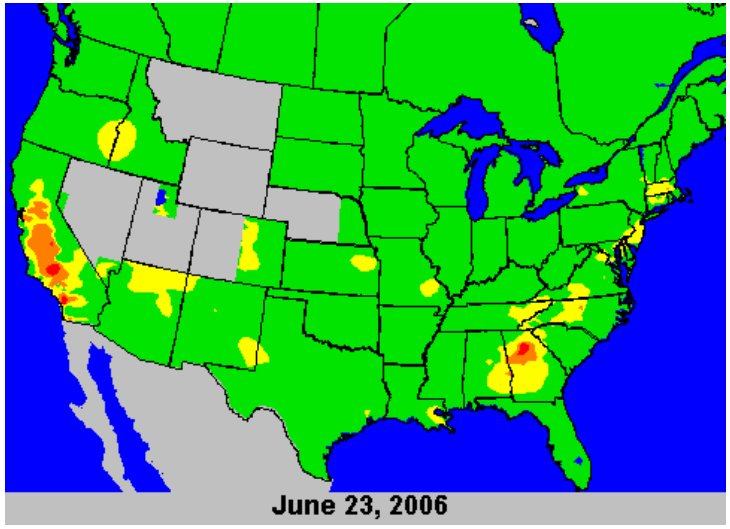
Summary for all $PM_{2.5}$ summer cases

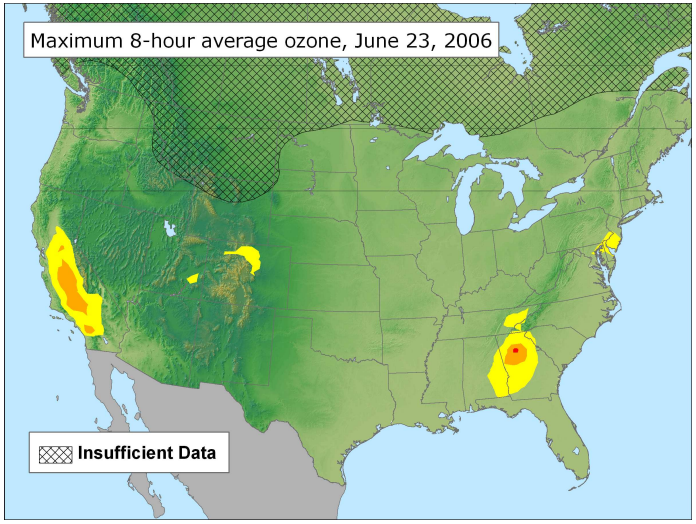
Method	RMS IE	Std. Dev.
IDW	0.70	0.24
Kriging	2.69	1.33
Reg. Spline	1.13	0.24
Tension Spline	1.16	0.16
Constr. Kriging	0.85	0.22

- Interpolation Error ($\mu g/m^3$)

Masking

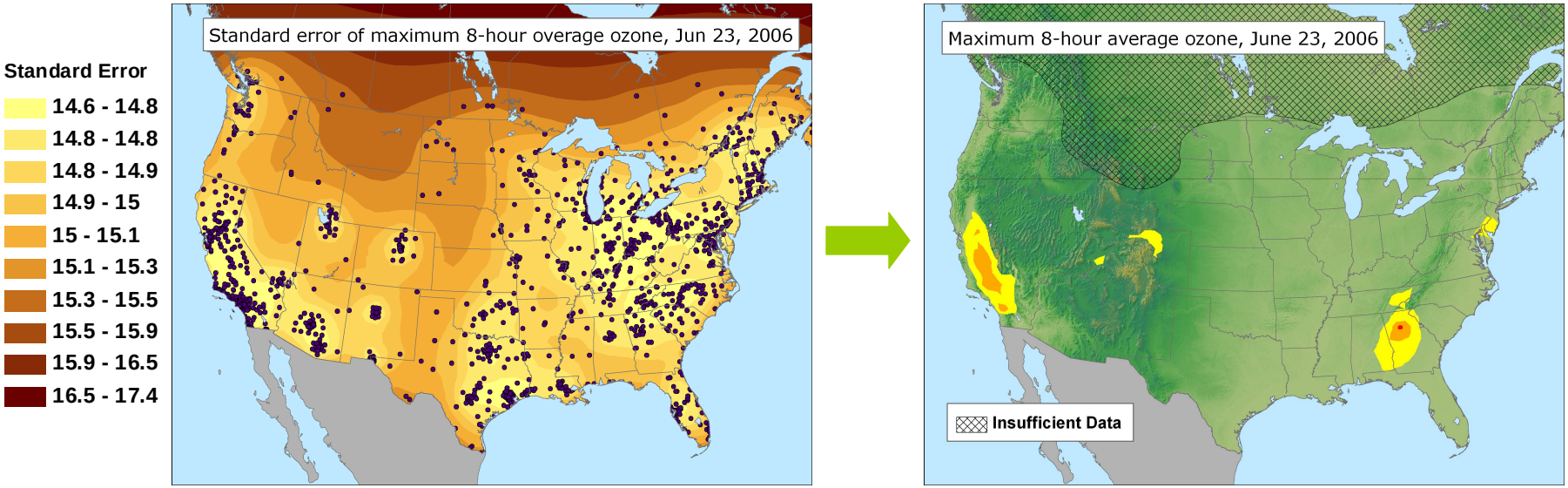
- Q: How do we deal with areas that have sparse monitoring networks?
- A: Historically, we manually blank out entire states when monitor data
- are unavailable.
- New method: use a statistical measure to determine where we
- should not plot AQI using *standard error*





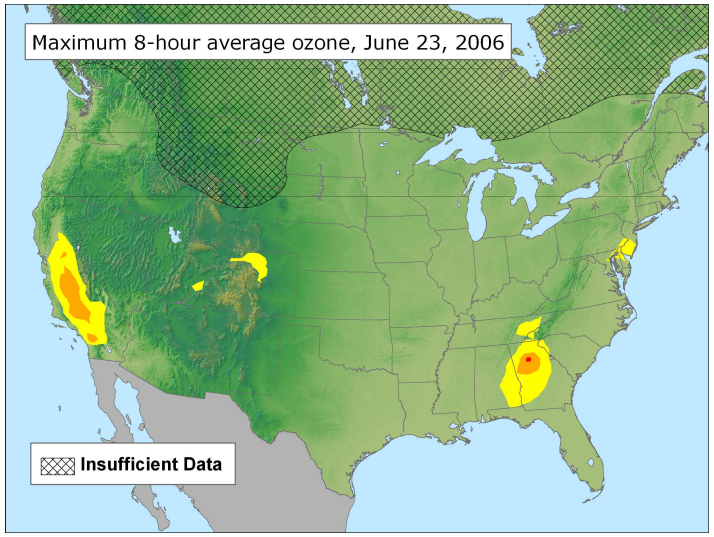
Masking

- *Standard error* – measure of the uncertainty of AQI
- Where observations are sparse, standard error is large (uncertainty
- in the interpolated AQI is high)
- Set a threshold for standard error, above which we apply a mask to
- prevent AQI from being displayed



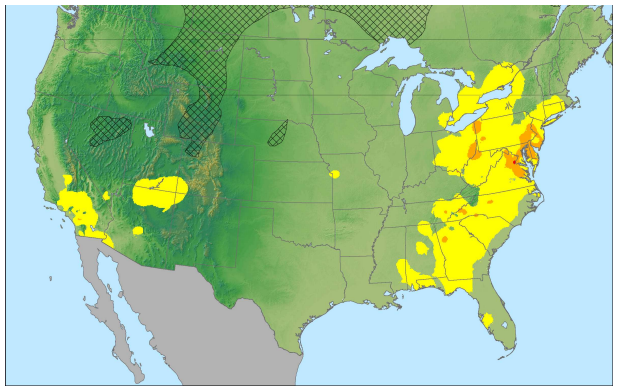
Masking

- Advantages of using a standard error mask
  - Carried out automatically by the mapping system
  - Can be static in time, or updated daily or seasonally as monitors come in and out of the network

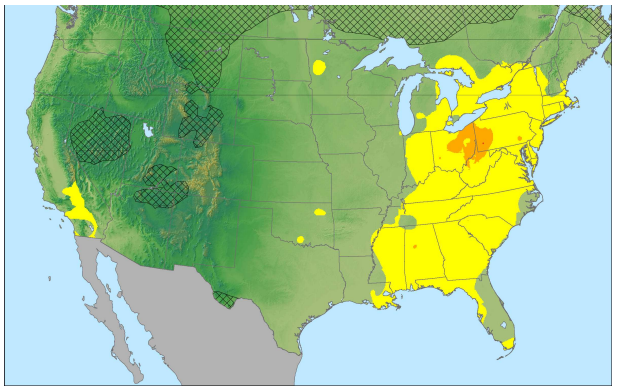


Combined AQI Maps – $PM_{2.5}$ and Ozone

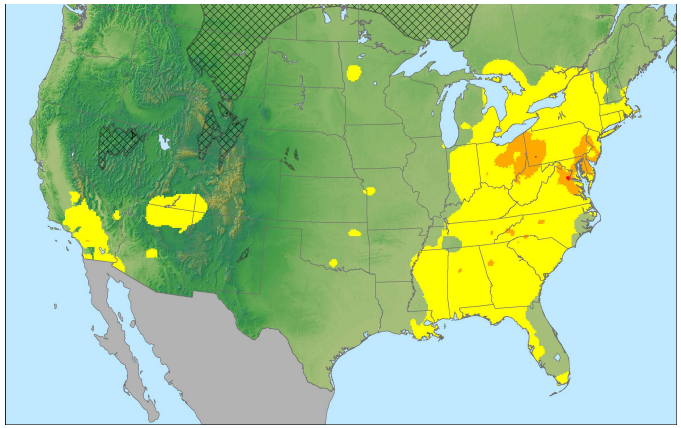
- Select maximum AQI for each location
- Produce AQI values for areas that are masked out for one parameter, but not for another



Ozone with mask



$PM_{2.5}$ with mask



Combined AQI with mask