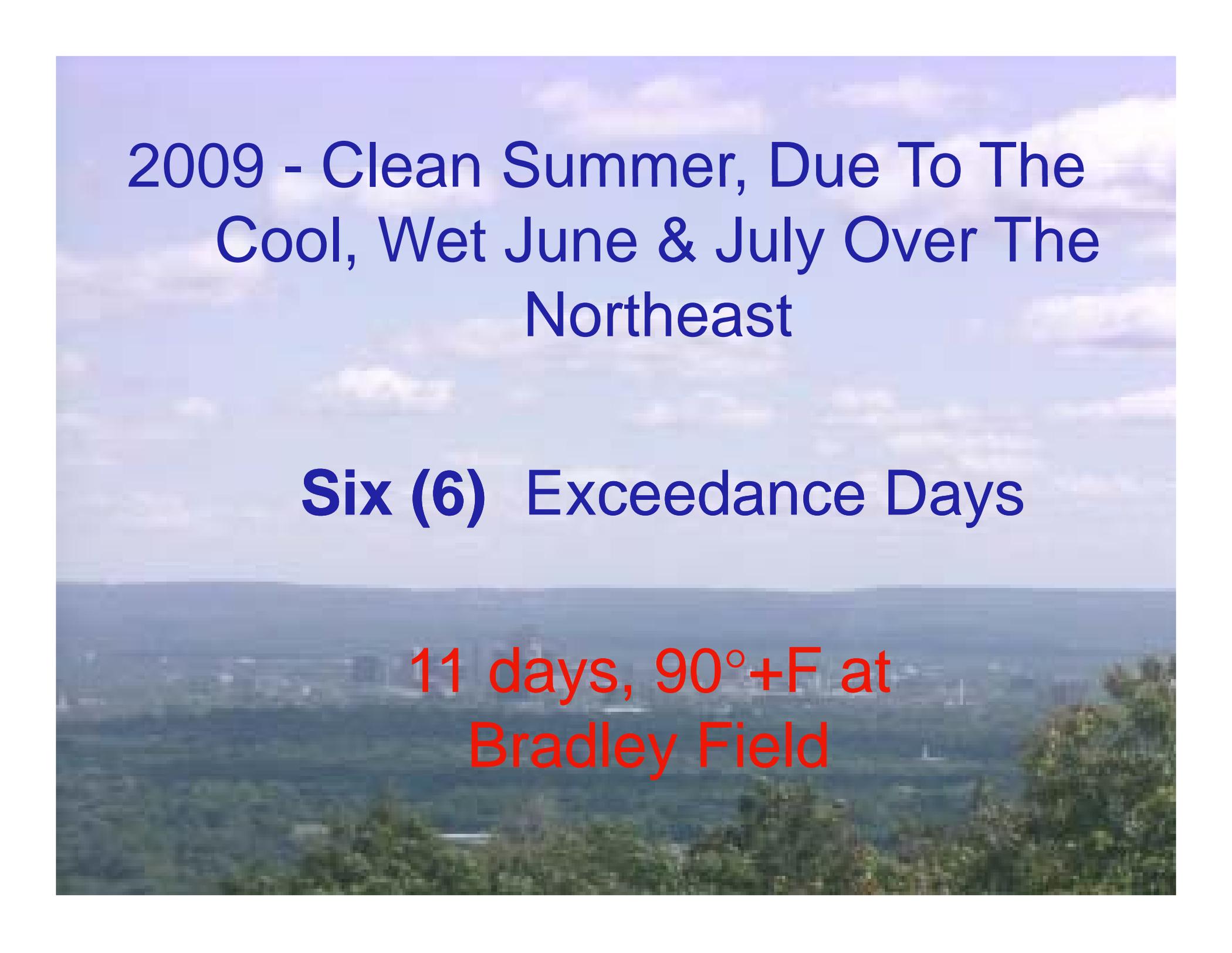


2009 Connecticut Ozone Season Forecasting Summary





2009 - Clean Summer, Due To The
Cool, Wet June & July Over The
Northeast

Six (6) Exceedance Days

11 days, 90°+F at
Bradley Field

How did we do this past year?

Actual Exceedance Days = 6

Forecast Exceedance Days = 9

Month	Actual Dates	Forecast Dates
April	28	27, 28
May	22	22
June	---	---
July	16	25, 28
August	15, 17, 18	4, 10, 17, 18
September	---	---
Total	6	9

Connecticut

4-28, 5-22, 7-16, 8-15
8-17, 8-18, 2009

Ozone Exceedance Events

Model
Performance

**Connecticut Department of Environmental Protection
8-Hour Ozone Daily Maximums*
May 2009**

Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Cornwall	38	M	M	40	43	46	40	54	46	38	42	43	56	40	56	M	M	40	51	65	70	74	40	49	48	M	29	18	34	45	51	
Danbury	28	40	33	24	37	34	29	50	45	42	44	37	54	42	53	35	44	39	51	66	69	83	38	47	48	39	29	13	27	49	56	
East Hartford	27	40	38	18	39	41	23	45	43	37	41	35	50	39	51	35	42	37	48	58	62	73	37	42	49	39	28	M	14	46	54	
Greenwich	31	42	37	41	34	40	28	49	44	41	43	43	55	47	50	28	44	42	44	59	55	61	40	46	49	39	36	31	24	52	56	
Groton	40	44	44	43	41	46	30	47	43	43	44	40	47	43	41	38	41	37	48	65	61	61	39	35	51	37	34	28	23	55	53	
Madison	38	41	41	43	39	44	29	42	44	43	46	41	49	45	45	34	43	41	51	61	M	55	37	40	51	36	36	32	29	55	54	
Middletown	35	42	42	33	42	44	29	51	43	39	41	32	46	40	41	32	40	32	44	57	59	67	30	39	43	33	26	18	13	44	54	
New Haven	27	36	M	35	37	36	17	36	44	43	35	32	52	38	29	35	44	39	29	49	46	60	39	43	47	37	34	17	19	42	49	
Stafford	37	44	42	33	43	45	38	52	50	39	44	41	53	45	55	50	36	38	53	66	72	81	38	41	48	42	31	21	20	45	56	
Stratford	36	41	45	46	42	42	29	51	45	44	45	44	56	49	43	34	46	44	47	62	57	58	42	45	48	40	39	34	32	53	53	
Westport	33	44	36	39	40	37	26	51	45	43	45	42	55	47	52	30	42	41	47	64	58	66	38	45	53	38	31	27	22	53	56	
# days > Federal Standard																						2										

Good (0-59 ppb)

Moderate (60-75 ppb)

Unhealthy for Sensitive Groups (76-95 ppb)

Unhealthy (96-115 ppb)

Very Unhealthy (116 > ppb)

Units - parts per billion (ppb)

Federal Standard = 75 ppb

M = missing data

* Data is preliminary and has not been quality assured

**Connecticut Department of Environmental Protection
8-Hour Ozone Daily Maximums*
June 2009**

Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Cornwall	43	48	39	M	38	44	72	49	35	30	28	35	36	32	36	36	36	36	33	39	30	28	28	25	35	42	33	42	43	58	
Danbury	43	60	34	41	33	44	70	57	24	26	24	34	33	33	35	35	38	33	30	34	31	24	26	23	41	46	36	47	48	67	
East Hartford	36	41	35	45	36	44	62	52	31	19	19	28	37	34	33	29	32	30	35	31	27	27	29	25	40	35	39	52	41	57	
Greenwich	40	66	40	40	47	54	61	46	36	28	31	30	32	38	32	35	32	37	42	37	33	28	34	29	40	M	M	M	M	M	
Groton	44	52	43	43	42	48	61	45	33	25	28	34	34	35	36	31	32	39	44	41	31	28	26	24	36	M	M	M	60	59	
Madison	45	54	44	49	44	54	63	42	35	26	32	36	33	39	34	32	32	36	46	39	28	27	27	M	38	52	52	49	63	57	
Middletown	35	40	33	37	31	47	60	44	25	15	22	24	27	26	27	22	27	28	28	26	24	26	27	18	32	37	34	44	46	49	
New Haven	34	37	34	27	39	49	58	46	29	28	26	24	35	35	31	32	32	35	32	38	26	26	32	24	24	30	40	45	47	61	
Stafford	39	51	33	50	38	47	57	45	36	21	24	30	36	31	35	31	33	36	35	32	26	25	24	23	42	39	42	47	42	62	
Stratford	43	61	41	43	48	58	57	46	42	32	35	35	35	42	38	38	34	40	44	38	32	30	38	32	39	46	43	52	64	65	
Westport	41	63	39	41	36	59	69	46	31	22	24	29	35	37	33	33	33	36	42	33	27	25	28	25	44	43	42	56	60	62	
# days > Federal Standard																															

Good (0-59 ppb)

Moderate (60-75 ppb)

Unhealthy for Sensitive Groups (76-95 ppb)

Unhealthy (96-115 ppb)

Very Unhealthy (116 > ppb)

Units - parts per billion (ppb)

Federal Standard = 75 ppb

M = missing data

* Data is preliminary and has not been quality assured

Connecticut Department of Environmental Protection
 8-Hour Ozone Daily Maximums*
 July 2009

Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Cornwall	45	41	31	31	36	46	40	28	35	44	54	36	34	33	42	60	52	M	M	M	32	47	49	44	61	43	M	61	42	36	39	
Danbury	51	57	33	33	37	49	41	28	35	50	52	39	38	37	48	76	58	44	31	58	25	62	49	45	67	57	64	71	40	44	37	
East Hartford	43	27	34	29	31	46	41	30	30	47	44	37	36	32	42	57	50	46	28	47	25	42	44	35	61	44	54	61	41	39	27	
Greenwich	M	53	39	35	38	63	43	38	35	45	49	41	45	45	57	73	63	48	44	57	31	59	50	53	56	54	56	60	38	50	46	
Groton	51	50	46	35	44	58	48	46	31	33	40	50	42	51	57	53	59	59	41	51	33	56	53	48	62	38	55	53	34	60	41	
Madison	47	50	46	35	47	60	50	43	31	35	42	50	45	51	60	53	57	57	46	47	33	52	53	49	60	37	55	54	35	56	40	
Middletown	35	28	28	28	26	49	34	28	24	36	39	36	40	32	47	49	41	42	34	41	23	36	38	31	55	39	47	53	37	39	31	
New Haven	50	53	42	33	37	46	49	30	30	42	42	42	35	35	M	55	65	42	44	56	30	53	53	38	58	43	57	61	36	43	35	
Stafford	46	31	37	30	32	50	46	36	30	45	50	38	36	31	47	63	50	47	29	47	34	40	46	38	64	45	59	60	44	41	36	
Stratford	57	61	47	36	45	66	55	39	36	44	48	44	49	47	65	64	66	57	46	56	38	57	58	56	62	57	58	71	43	57	45	
Westport	51	59	43	35	43	62	50	35	31	42	49	43	49	42	63	70	70	53	47	56	32	57	48	54	61	62	58	67	39	51	43	
# days > Federal Standard																3																

Good (0-59 ppb)

Moderate (60-75 ppb)

Unhealthy for Sensitive Groups (76-95 ppb)

Unhealthy (96-115 ppb)

Very Unhealthy (116 > ppb)

Units - parts per billion (ppb)

Federal Standard = 75 ppb

M = missing data

* Data is preliminary and has not been quality assured

Connecticut Department of Environmental Protection
8-Hour Ozone Daily Maximums*
August 2009

Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Cornwall	47	36	48	61	46	38	32	31	38	43	37	36	26	42	55	55	58	66	42	63	46	26	28	34	42	49	36	36	30	38	29	
Danbury	58	35	51	74	50	32	33	32	44	48	42	43	22	49	65	64	56	80	52	71	48	26	35	34	45	55	34	25	22	36	25	
East Hartford	58	34	47	66	48	38	32	30	30	42	42	36	20	49	55	66	56	71	43	62	41	23	30	33	41	49	35	27	23	35	24	
Greenwich	48	33	60	72	65	45	38	43	45	68	52	38	29	61	79	M	73	66	60	58	43	32	41	49	50	65	48	36	18	46	29	
Groton	48	43	51	69	61	38	38	M	M	69	52	40	25	50	75	71	73	83	61	58	25	M	M	47	53	74	47	34	27	24	26	
Madison	53	35	51	68	74	40	34	42	36	70	58	40	25	52	71	67	79	73	64	49	32	29	41	52	53	75	52	36	23	36	24	
Middletown	41	28	50	71	57	38	30	29	29	47	39	27	21	54	64	65	61	75	57	60	35	23	46	39	47	57	36	30	22	38	24	
New Haven	43	39	52	53	46	23	33	41	42	45	42	41	20	39	71	63	52	56	43	56	34	27	36	38	35	51	40	29	20	29	30	
Stafford	49	36	49	74	53	38	34	32	35	46	45	34	23	45	61	60	59	79	48	62	41	29	31	39	44	52	40	34	29	40	21	
Stratford	54	41	67	72	70	46	38	44	44	72	55	45	29	56	84	73	81	66	66	54	43	38	40	54	47	70	51	43	23	45	28	
Westport	51	33	58	72	64	39	36	42	42	69	50	38	25	57	82	73	85	67	56	60	45	32	40	45	39	62	48	28	19	43	24	
# days > Federal Standard															4		5	6														

Good (0-59 ppb)

Moderate (60-75 ppb)

Unhealthy for Sensitive Groups (76-95 ppb)

Unhealthy (96-115 ppb)

Very Unhealthy (116 > ppb)

Units - parts per billion (ppb)

Federal Standard = 75 ppb

M = missing data

* Data is preliminary and has not been quality assured

**Connecticut Department of Environmental Protection
8-Hour Ozone Daily Maximums*
September 2009**

Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Cornwall	36	40	M	42	36	27	34	34	33	34	24	21	28	26	28	22	22	M	M	M	60	26	34	30	22	28	26	40	27	19
Danbury	30	43	48	38	37	30	30	33	31	28	20	19	30	28	30	17	19	34	28	38	52	25	30	32	21	28	28	40	24	14
East Hartford	37	39	38	40	39	24	30	30	37	33	14	15	28	27	28	21	19	32	27	36	60	28	28	34	21	27	19	38	22	16
Greenwich	41	43	48	64	53	30	34	35	40	34	20	22	34	31	43	22	21	42	32	M	43	25	28	41	24	30	32	43	26	22
Groton	38	44	35	56	60	25	33	36	35	31	25	21	33	42	37	23	26	40	30	40	59	35	32	40	24	31	34	45	41	21
Madison	38	45	40	70	63	26	33	43	38	31	23	20	32	42	42	24	23	41	29	44	58	37	31	37	23	28	32	45	33	18
Middletown	37	39	42	48	42	24	35	35	36	31	21	15	30	32	30	22	22	36	27	42	66	36	33	33	23	28	28	43	30	17
New Haven	32	44	43	52	M	M	M	M	M	31	15	15	29	27	34	20	20	31	30	38	51	16	19	M	22	28	30	32	21	16
Stafford	36	43	45	38	32	27	30	32	36	32	21	20	27	29	27	20	23	33	24	40	68	33	35	34	20	31	29	45	34	18
Stratford	46	51	54	71	61	31	37	43	42	35	21	19	32	37	48	26	24	42	30	47	58	28	31	37	26	30	36	48	27	16
Westport	41	43	44	68	54	29	34	31	37	31	19	19	32	32	42	17	19	40	30	42	53	29	28	38	23	30	32	47	26	19
# days > Federal Standard																														

Good (0-59 ppb)

Moderate (60-75 ppb)

Unhealthy for Sensitive Groups (76-95 ppb)

Unhealthy (96-115 ppb)

Very Unhealthy (116 > ppb)

Units - parts per billion (ppb)

Federal Standard = 75 ppb

M = missing data

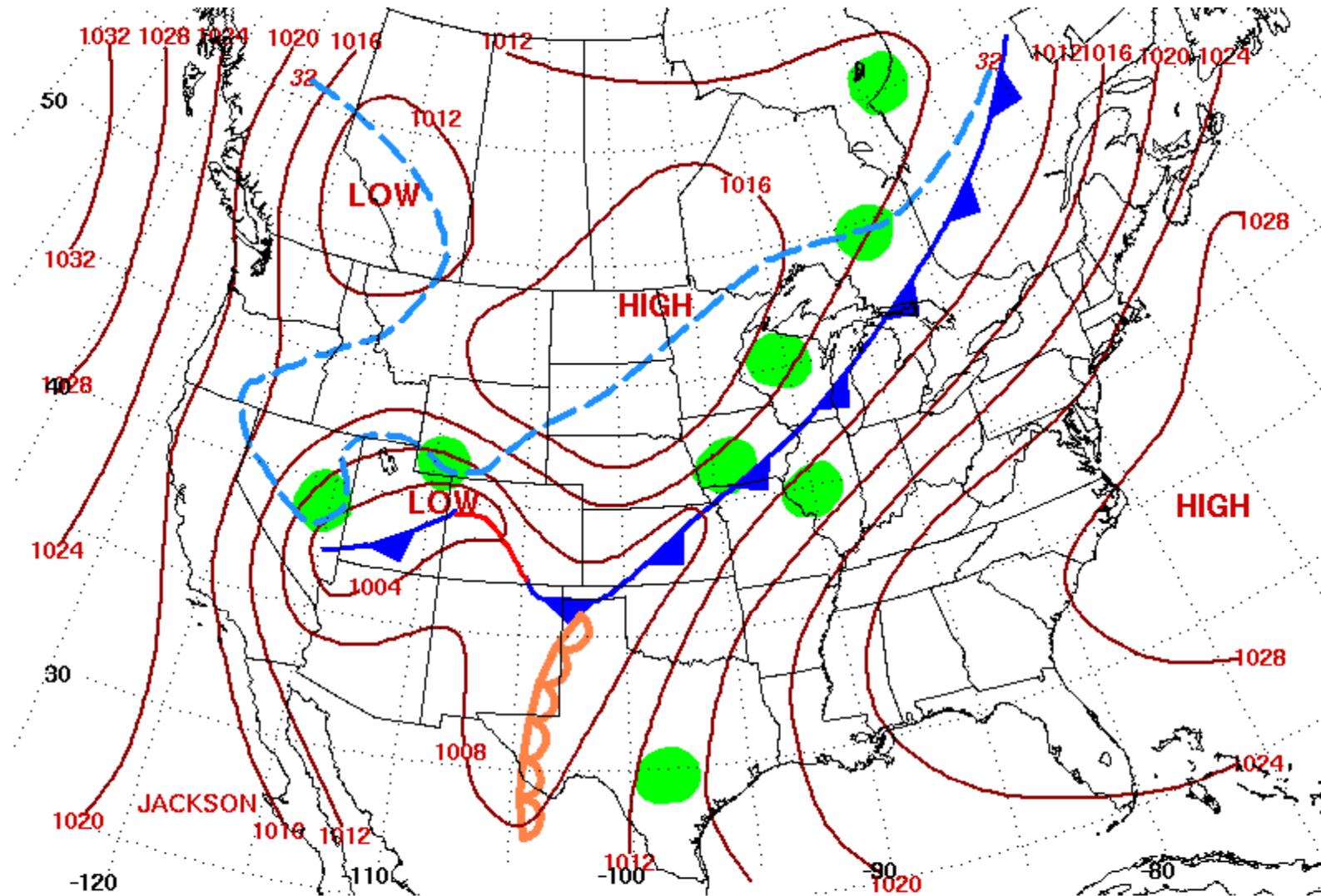
* Data is preliminary and has not been quality assured

April 28, 2009 First Ozone Event

- High Pressure Moves Off The East Coast
- Early (Temporary) Bermuda High Set-Up
- Temperatures In The Upper 80's-Low 90's

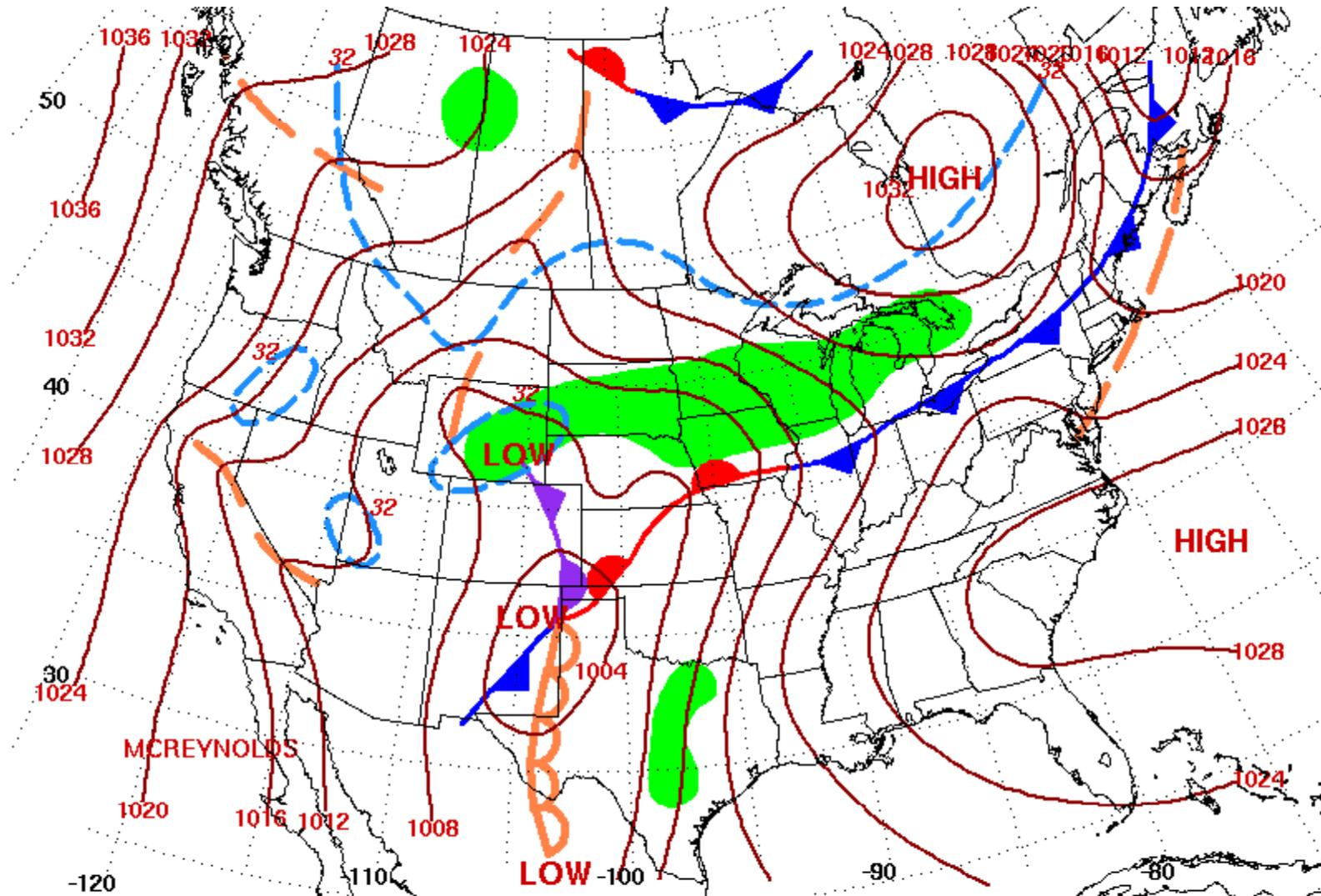
Temperatures at Hartford (BDL)		
	High	Low
4/25/2009	91	46
4/26/2009	88	62
4/27/2009	87	56
4/28/2009	94	59
4/29/2009	66	46

April 25th, 2009 12z



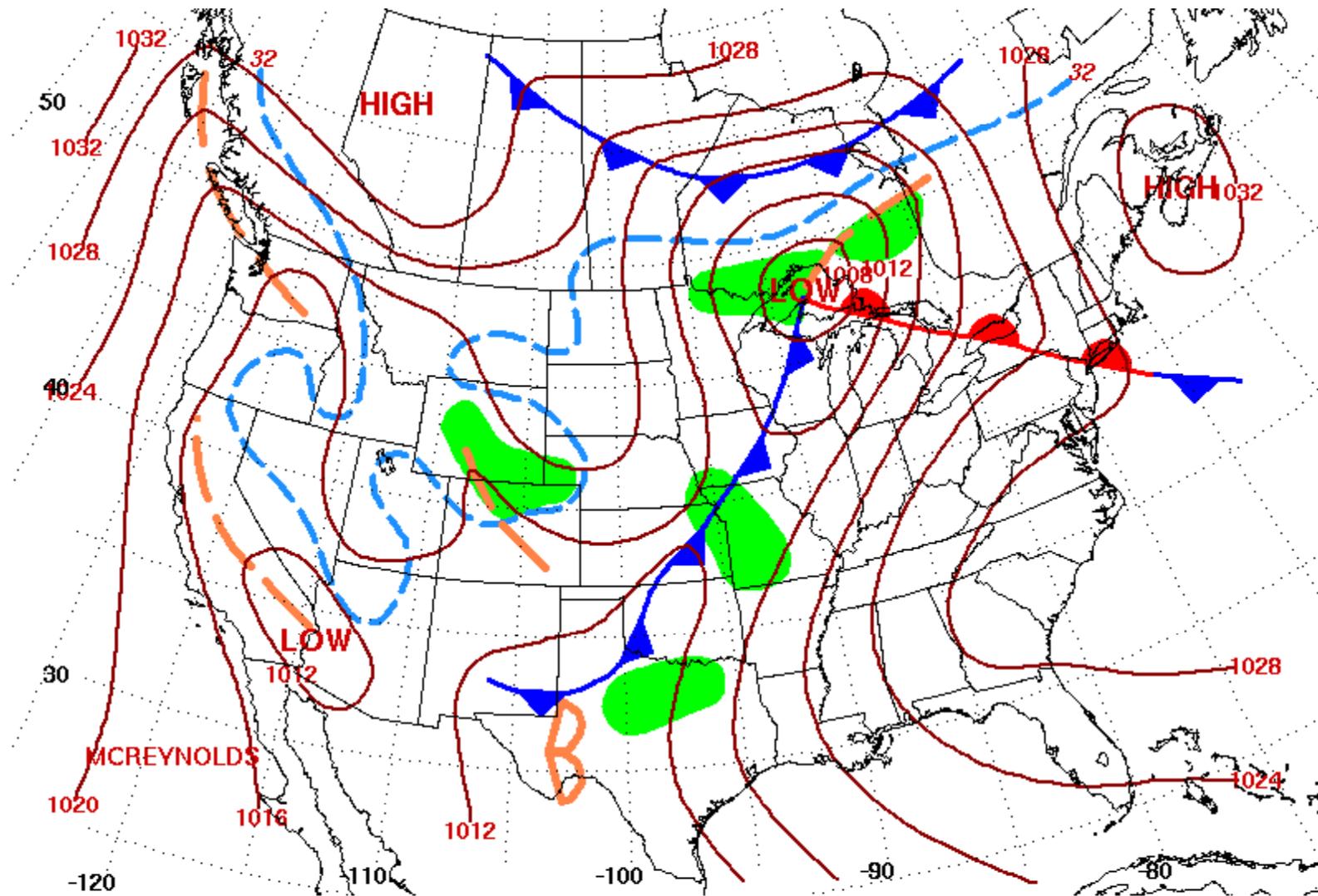
Surface Weather Map at 7:00 A.M. E.S.T.

April 26th, 2009 12z



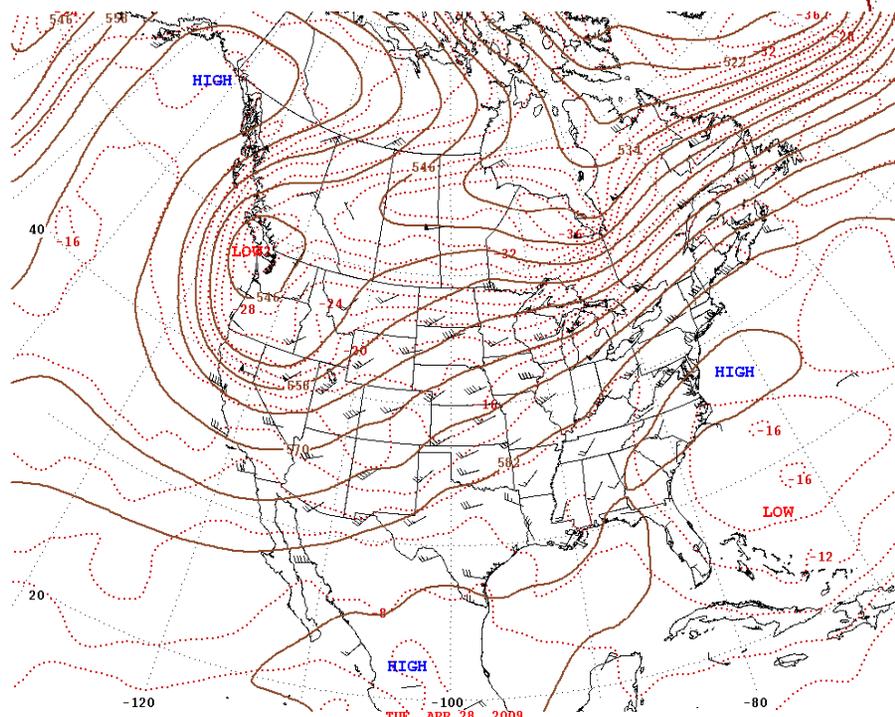
Surface Weather Map at 7:00 A.M. E.S.T.

April 27th, 2009 12z

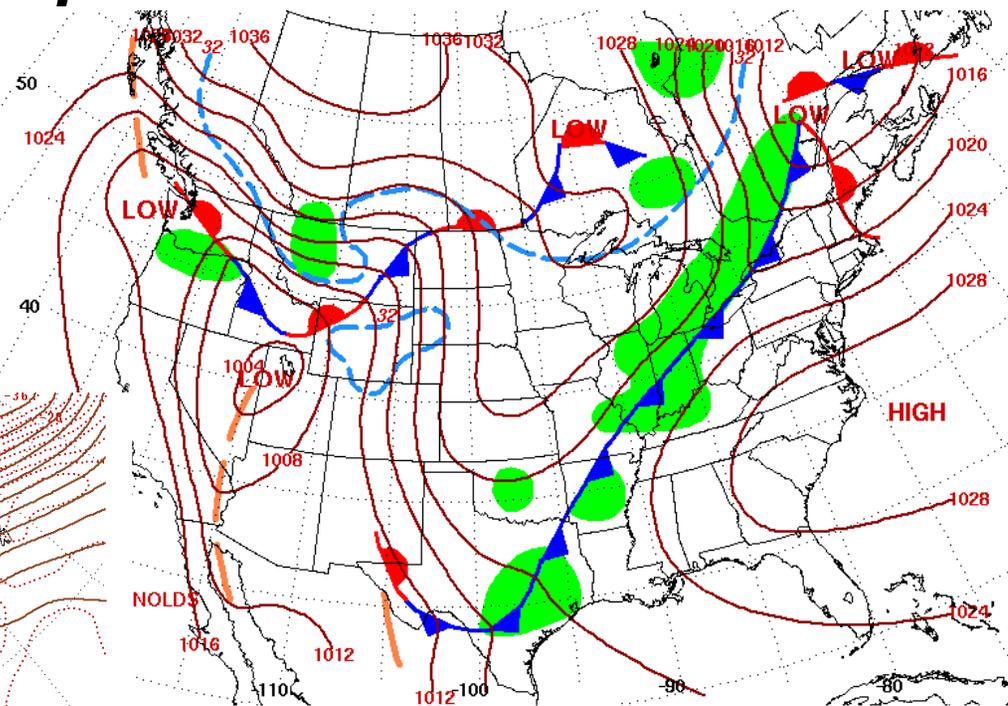


Surface Weather Map at 7:00 A.M. E.S.T.

April 28th, 2009 12z

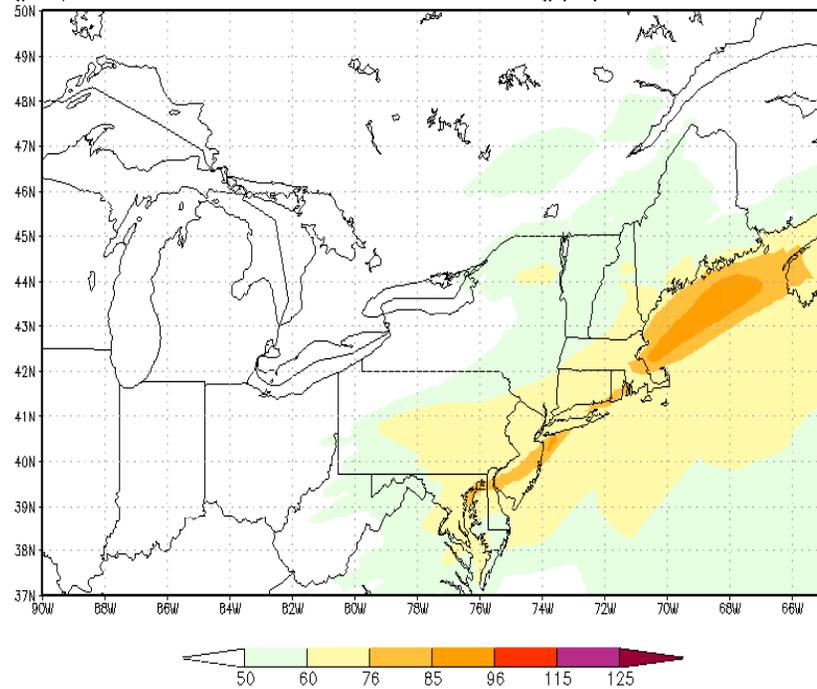


500-Millibar Height Contours at 7:00 A.M. E.S.T.



Surface Weather Map at 7:00 A.M. E.S.T.

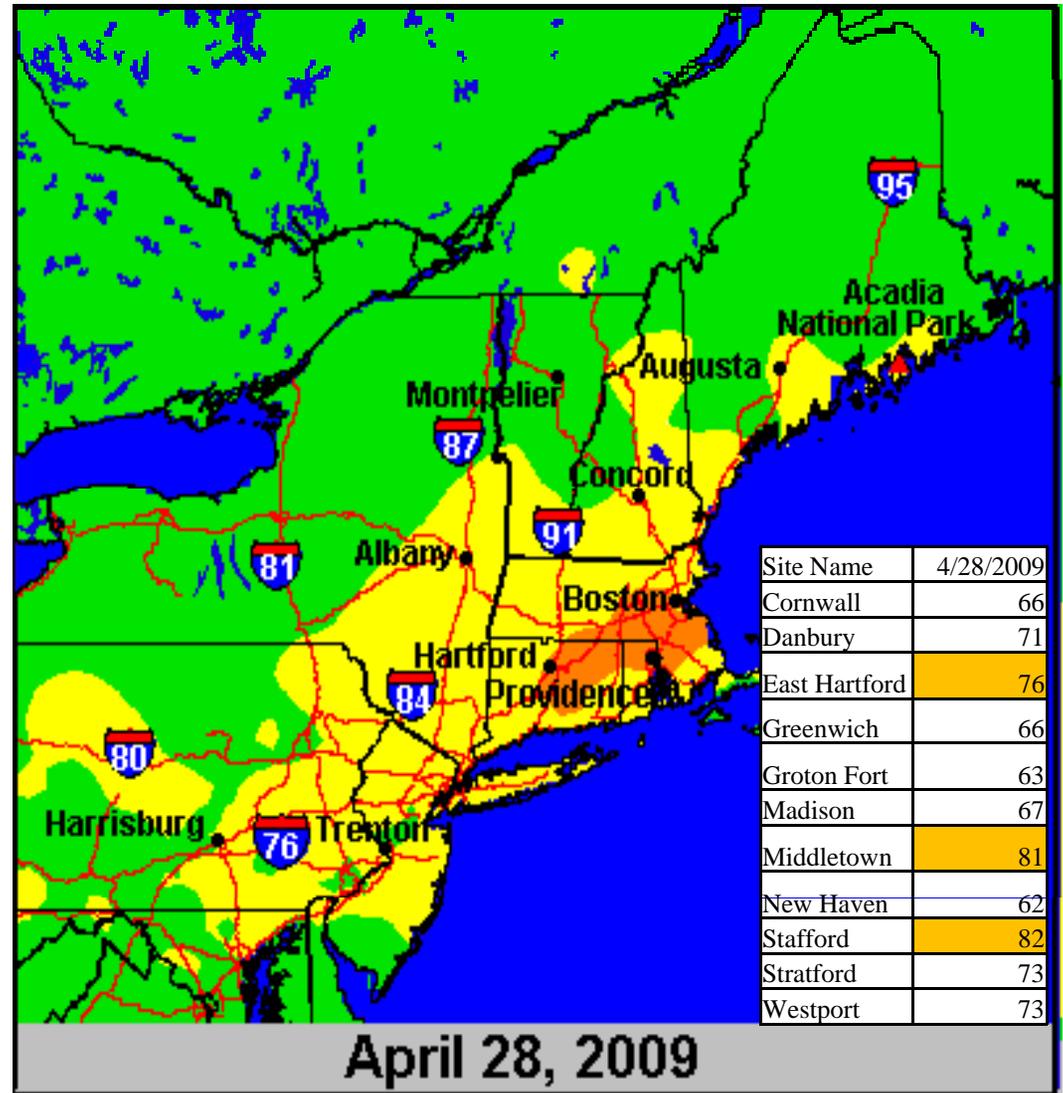
(prd) 06Z 7H-30H 1st d 8h max sf O3 (ppb) Valid 28 APR 2009



Modeled ozone plume predicted USG along Groton/New London due to southwest wind and hot air mass in place for several days. However, three (3) inland sites exceeded 76 ppb.

Forecasters predicted most sites Low USG (All sites except Cornwall ≥ 76 ppb).

Modeled ozone forecast verses observed data

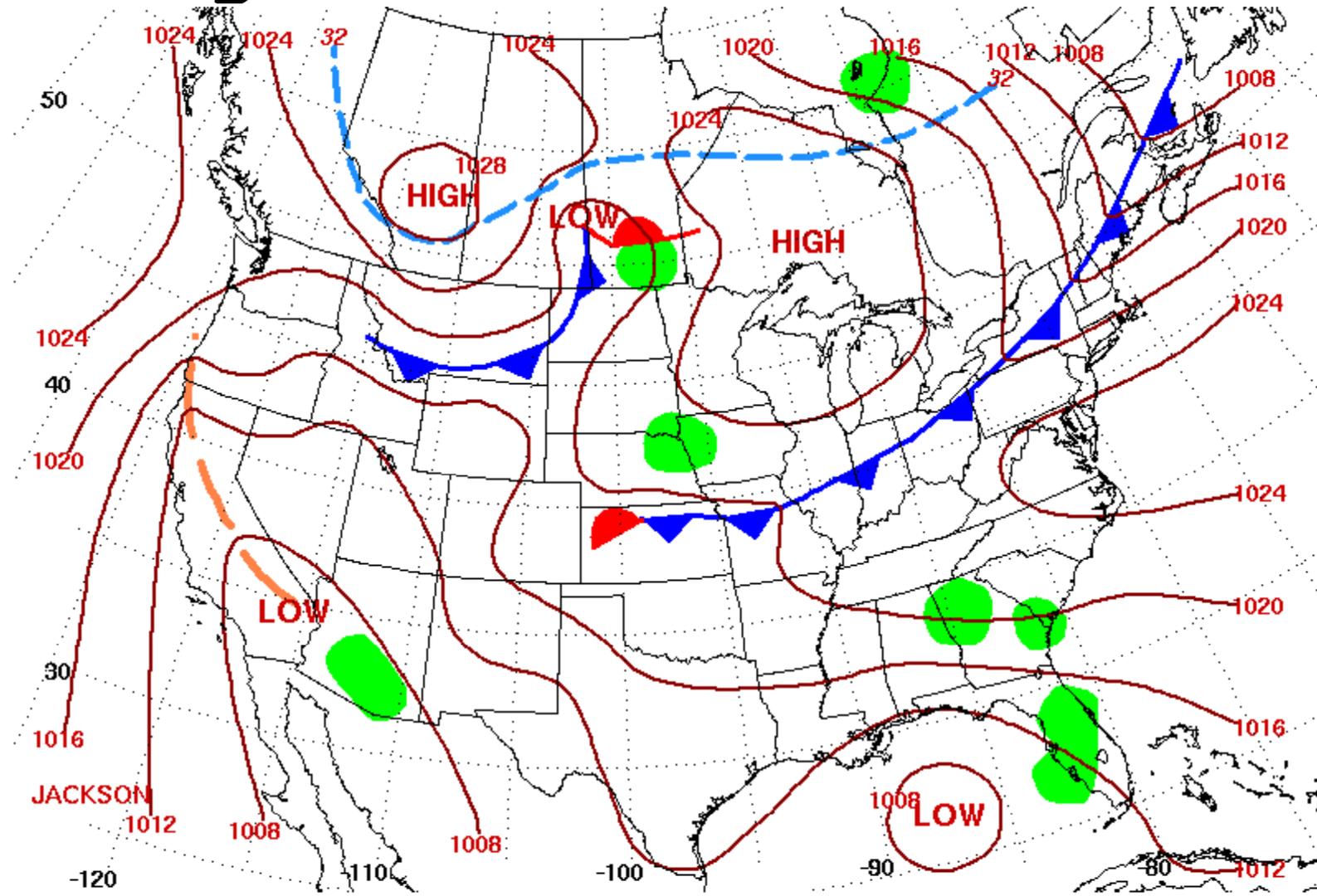


5 Ozone Events Rest Of Summer

- High Pressure Off the East Coast
- Bermuda High Set-Up - Southwest Winds
- Temperatures - 80's-Low 90's

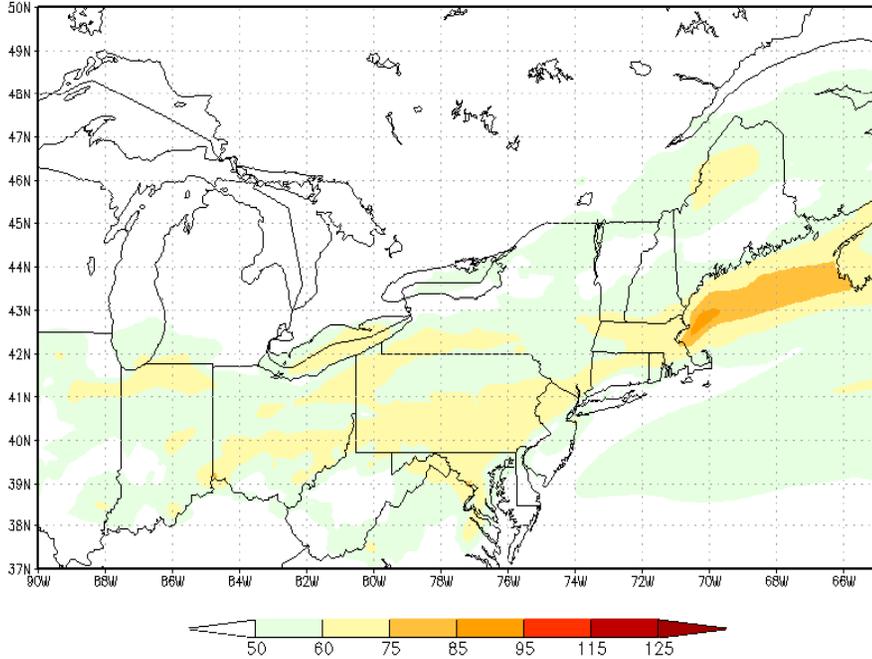
Temperatures at Hartford (BDL)		
Date	High	Low
5/22/2009	89	49
7/16/2009	82	64
8/15/2009	90	62
8/17/2009	94	69
8/18/2009	93	70

May 22nd, 2009 12z



Surface Weather Map at 7:00 A.M. E.S.T.

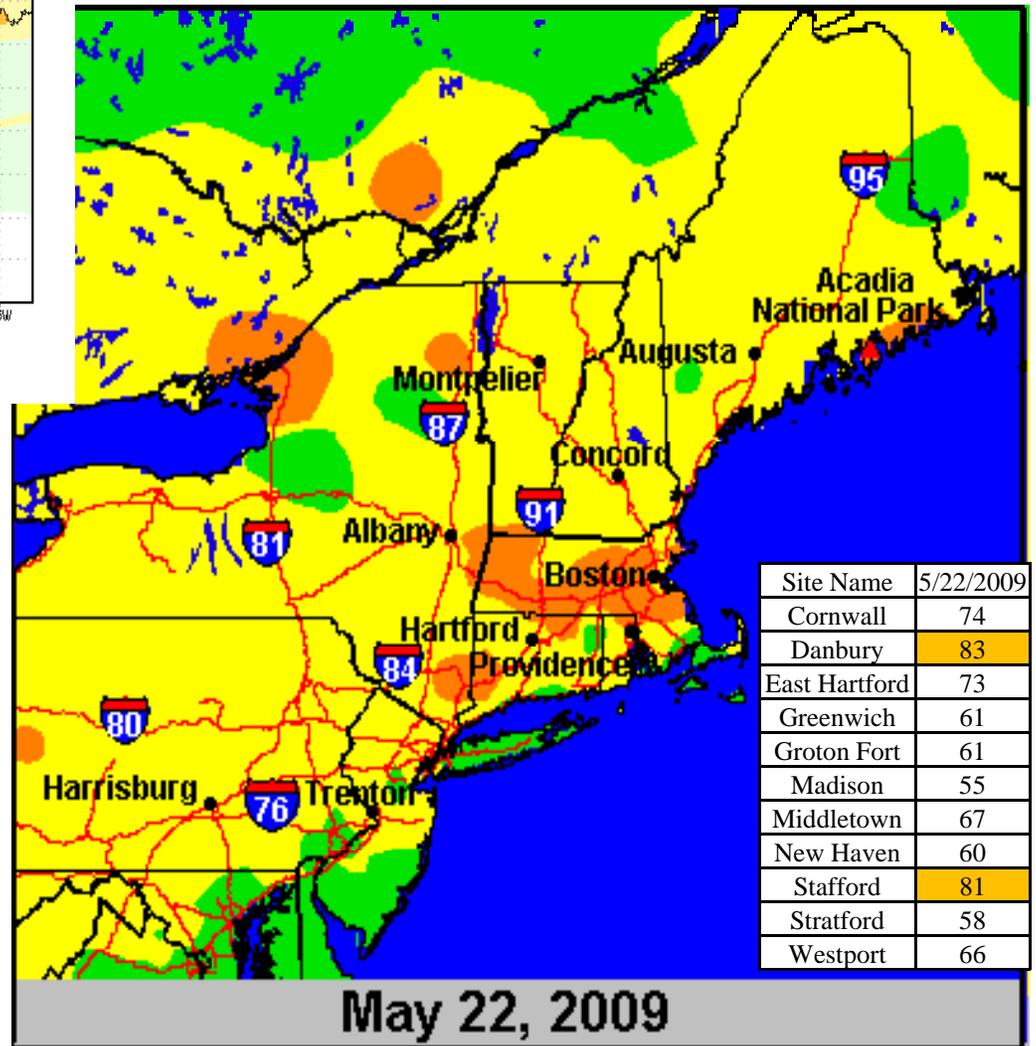
(prd) 12Z 25H-48H 2 day 8h max sf O3 (ppb) Valid 22 MAY 2009



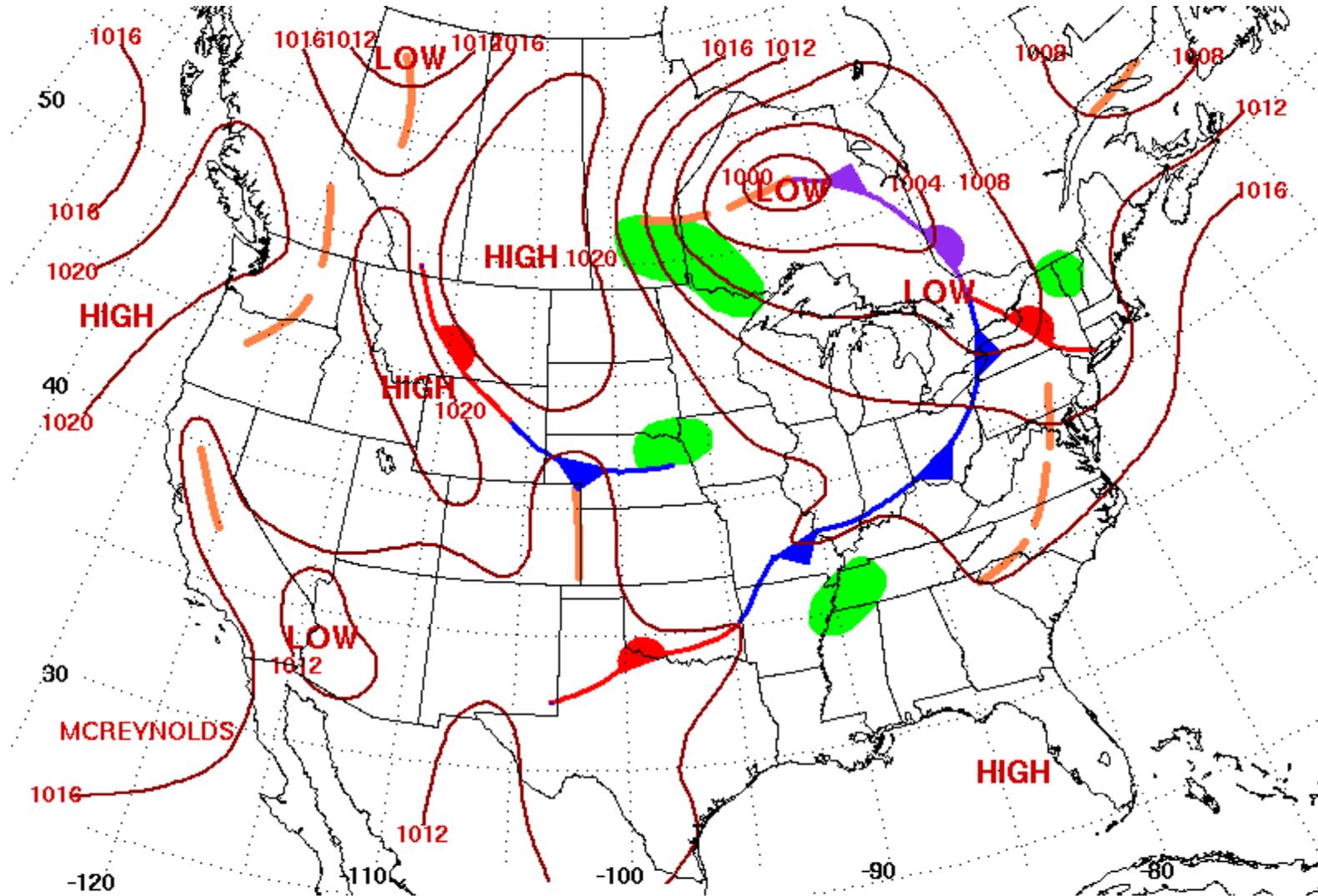
Modeled ozone forecast verses observed data

Modeled ozone plume increases off the New England coast, due to cold front pushing through the area.

Forecasters predicted coastal monitors code orange - front slowing down and NOT off shore until late evening.

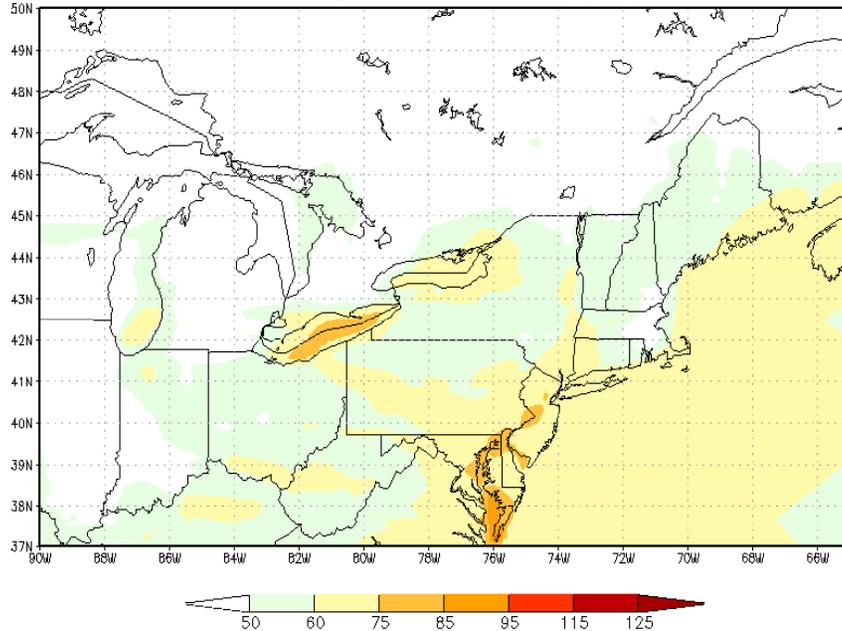


July 16th, 2009 12z



Surface Weather Map at 7:00 A.M. E.S.T.

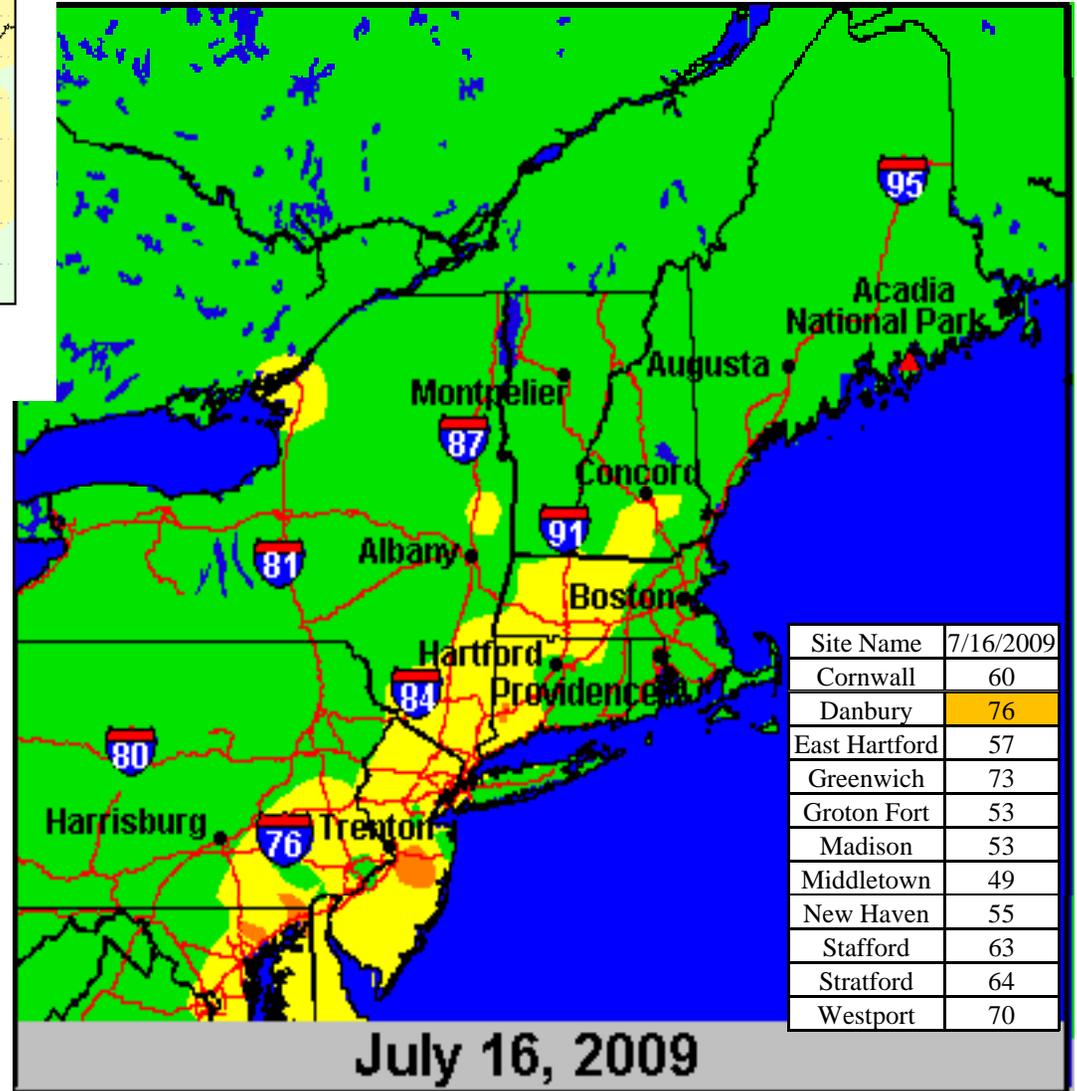
(exp) 12Z 25H-48H 2 day 8h max sf O3 (ppb) Valid 16 JUL 2009



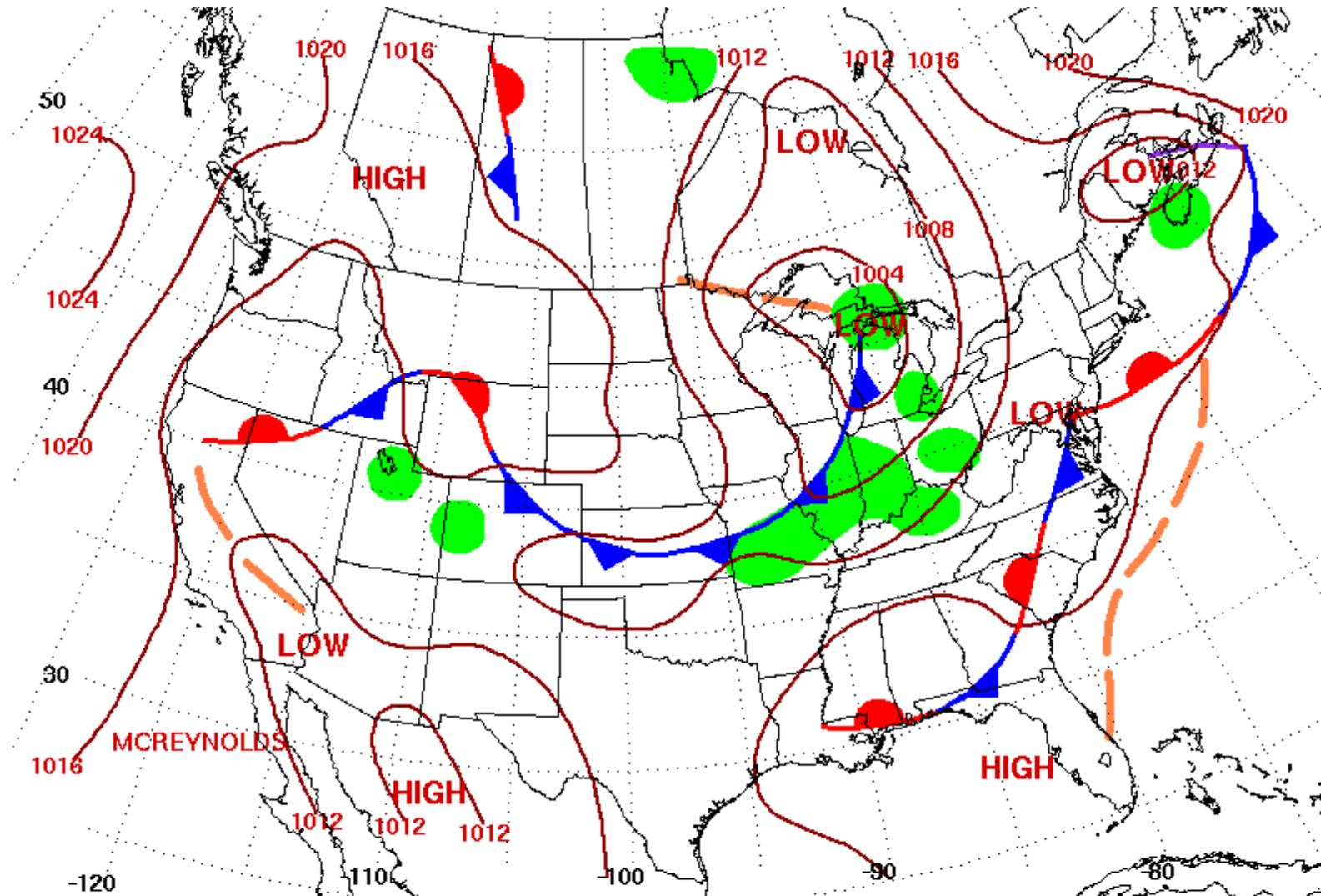
Modeled ozone forecast verses observed data

Modeled ozone plume GOOD to MODERATE across Connecticut. One exceedence observed at Danbury, associated with warm southwesterly transport and slow passage of cold front.

Forecasters predicted GOOD inland to MODERATE along the coast. Went with forecast models.

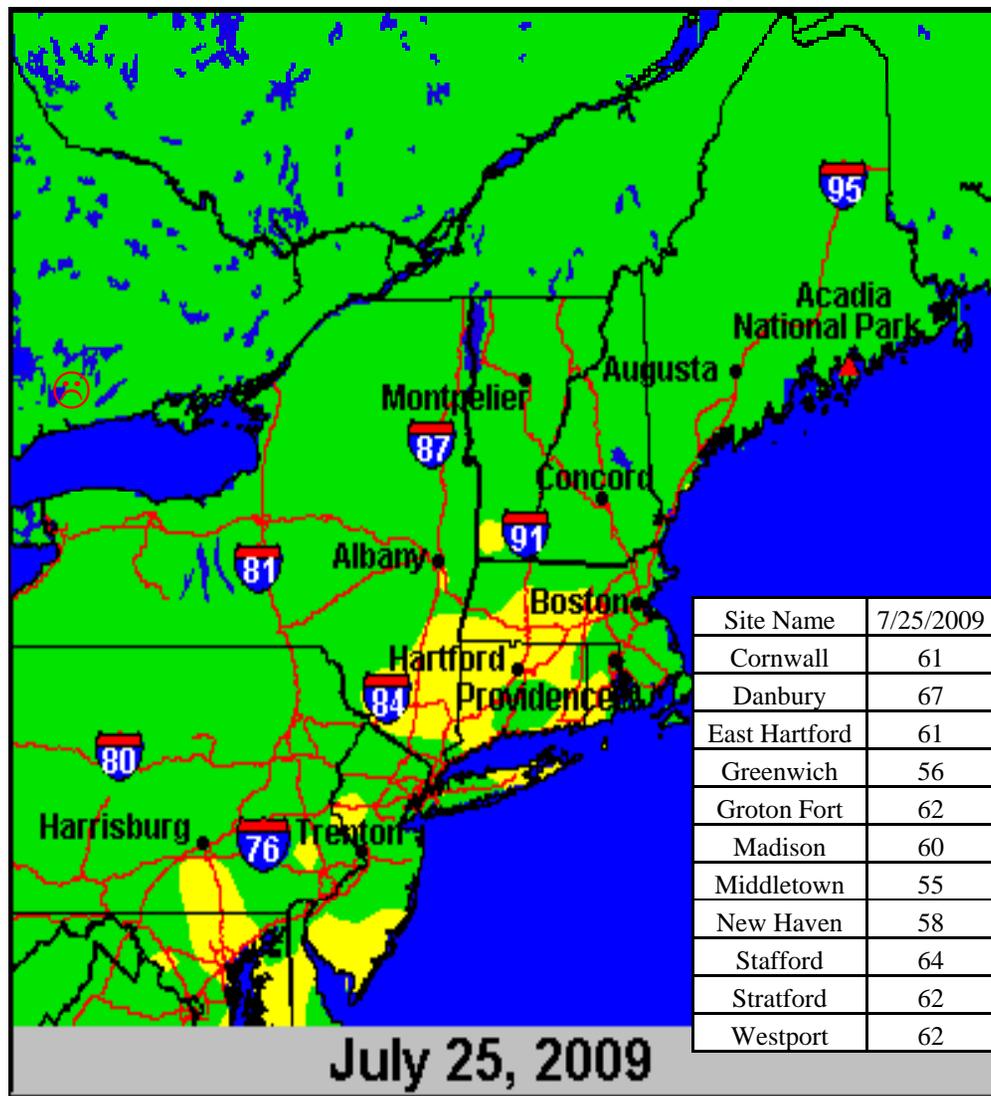
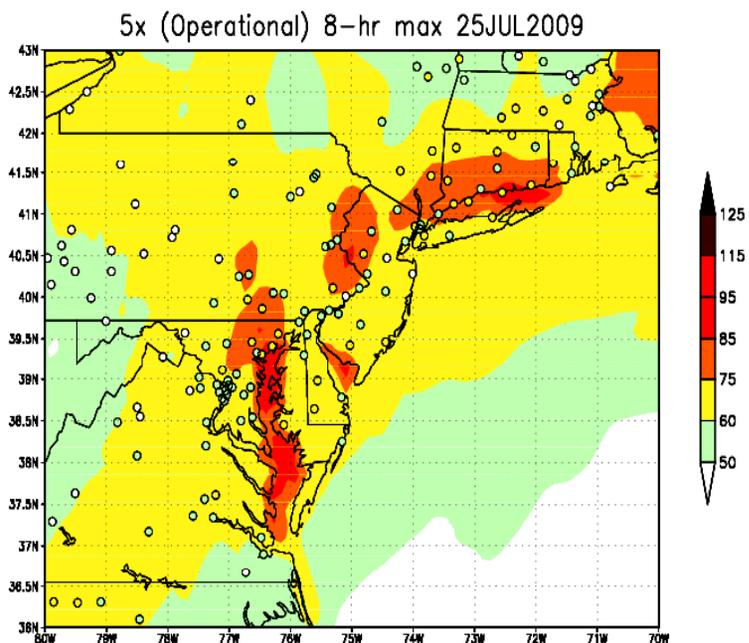


July 25th, 2009 12z



Surface Weather Map at 7:00 A.M. E.S.T.

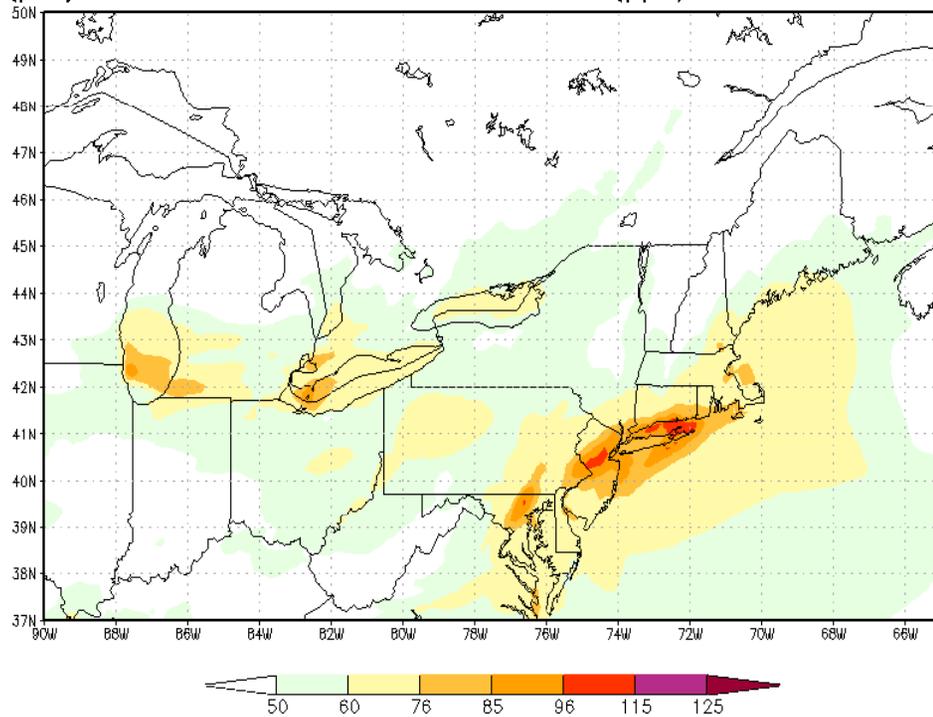
Modeled ozone forecast verses observed data



Modeled ozone plume code orange across of Connecticut. Observed data remained in the GOOD to MODERATE levels.

Forecasters went with the modeled predicted USG, due to southwest flow and warm & humid conditions.

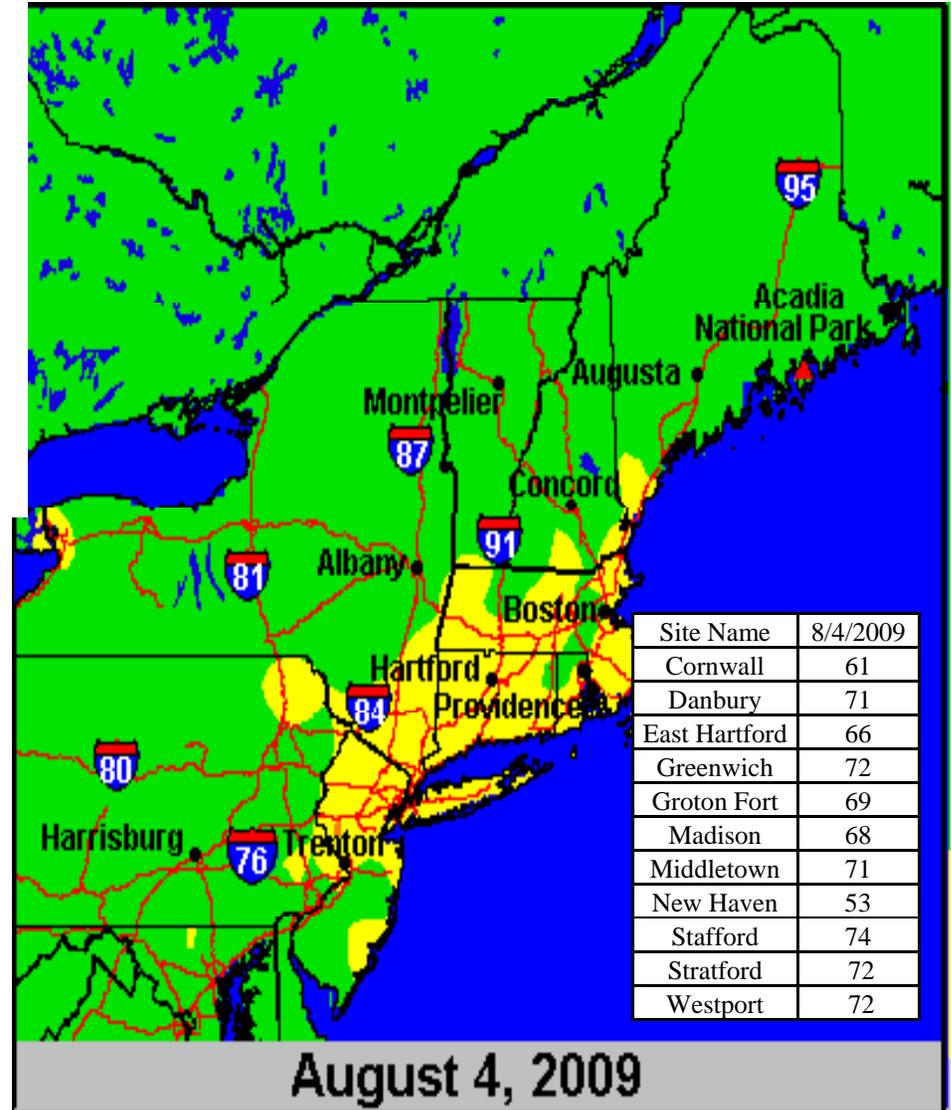
(prd) 12Z 1H-24H 1st d 8h max sf 03 (ppb) Valid 04 AUG 2009



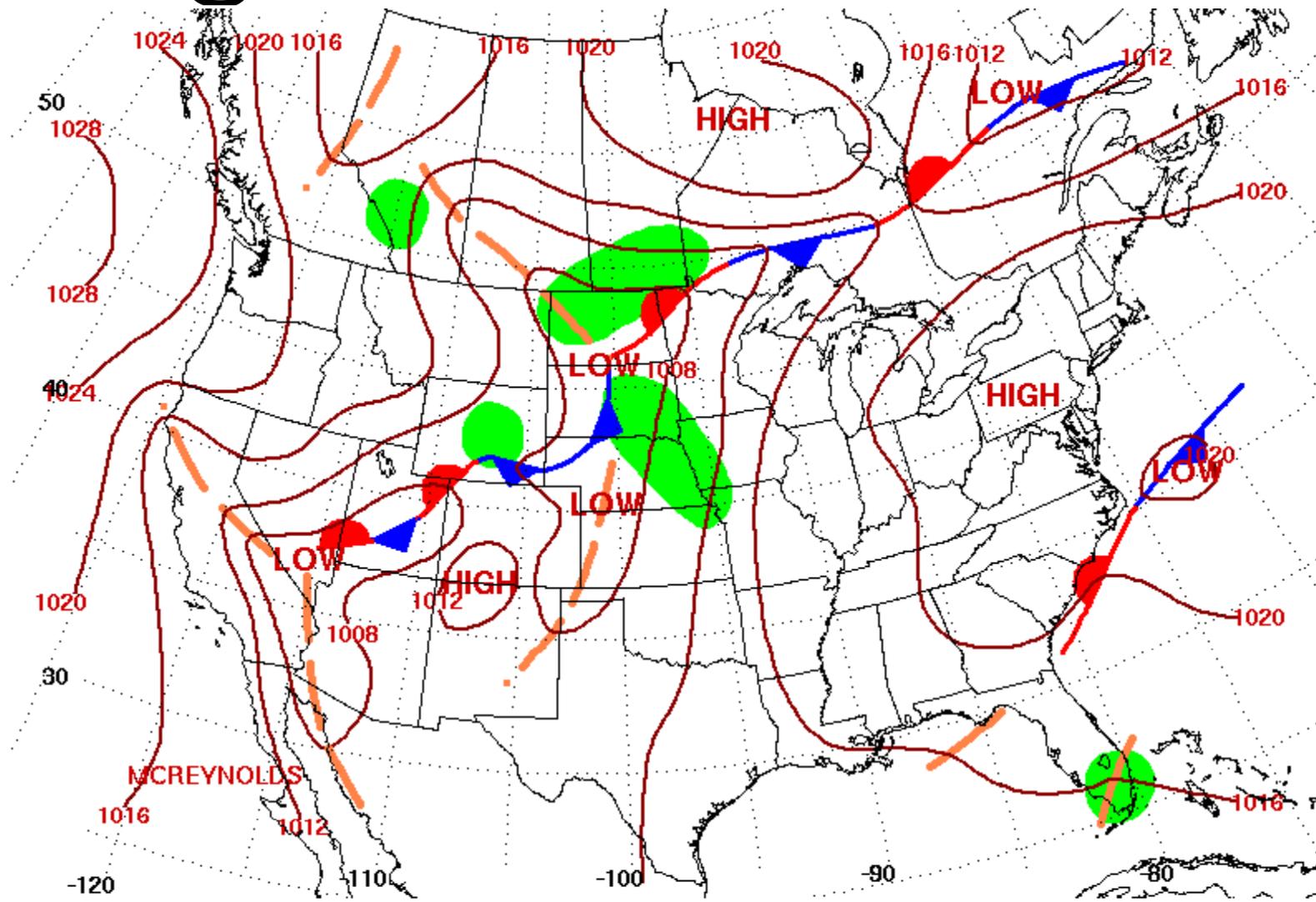
Modeled ozone plume transported and intensified to Code Orange along I-95 Corridor. No sites exceeded 76ppb.

Forecasters take into account modeled over-prediction bias. However, we still predicted coastal sites' exceedances, to code orange.

Modeled ozone forecast verses observed data

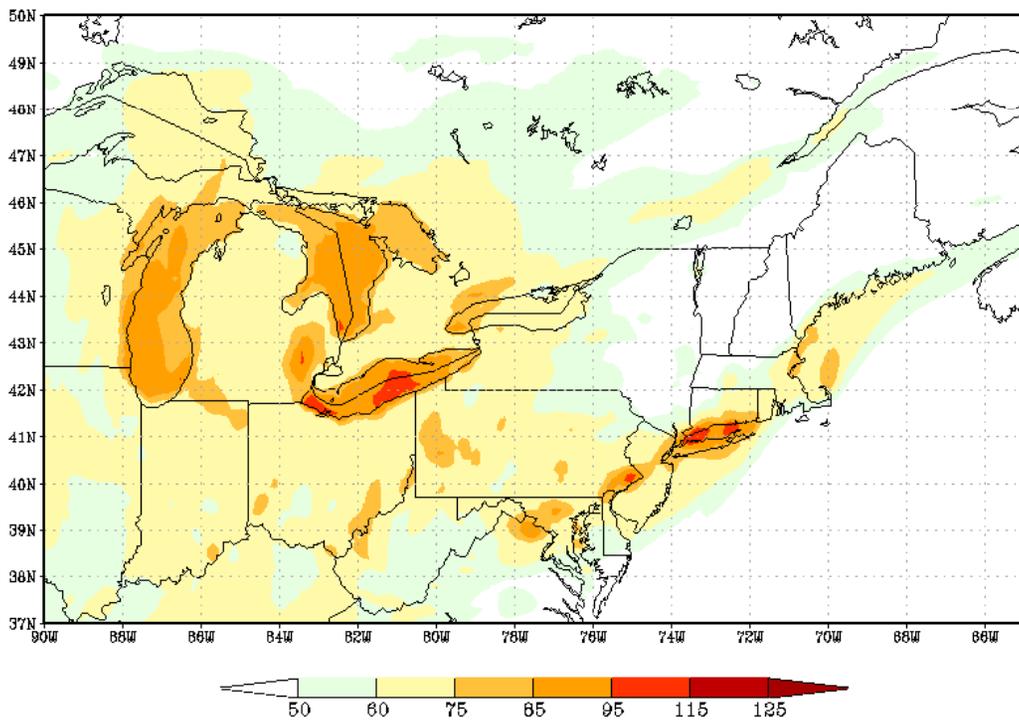


August 15th, 2009



Surface Weather Map at 7:00 A.M. E.S.T.

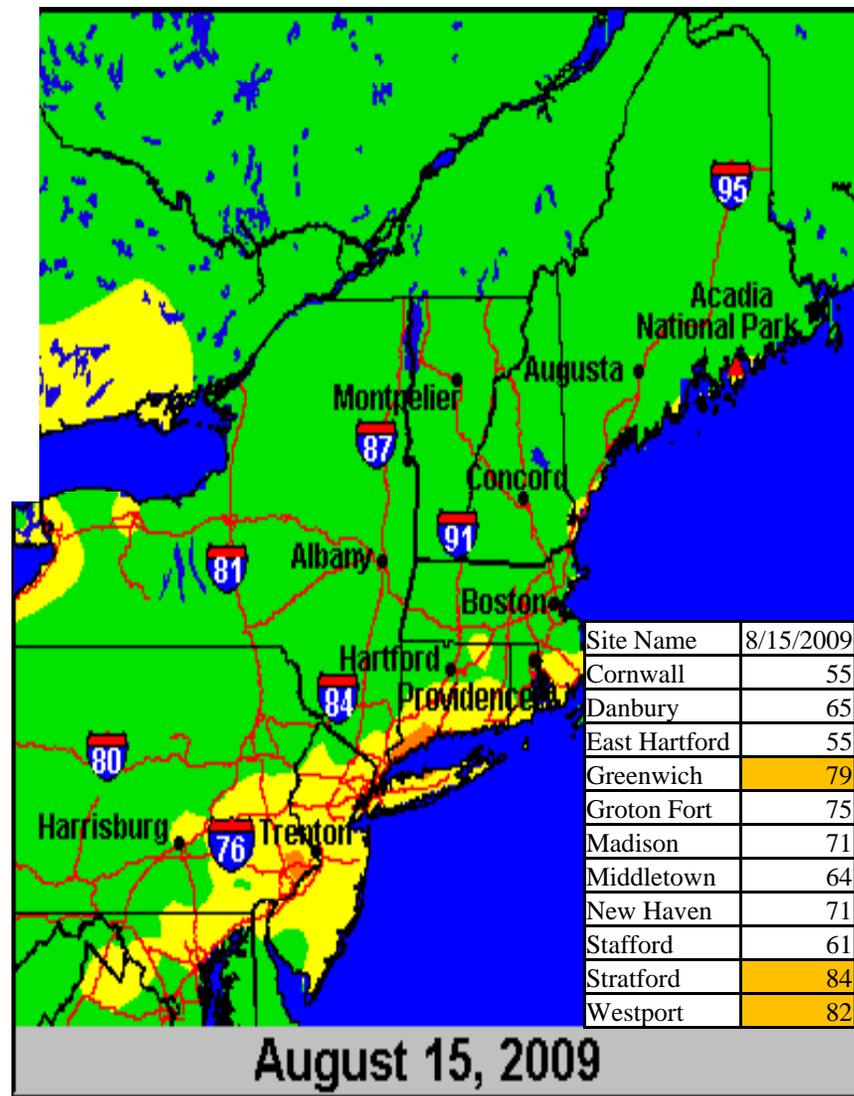
(prd) 12Z 25H-48H 2 day 8h max sf O₃ (ppbv) Valid 15 AUG 2009



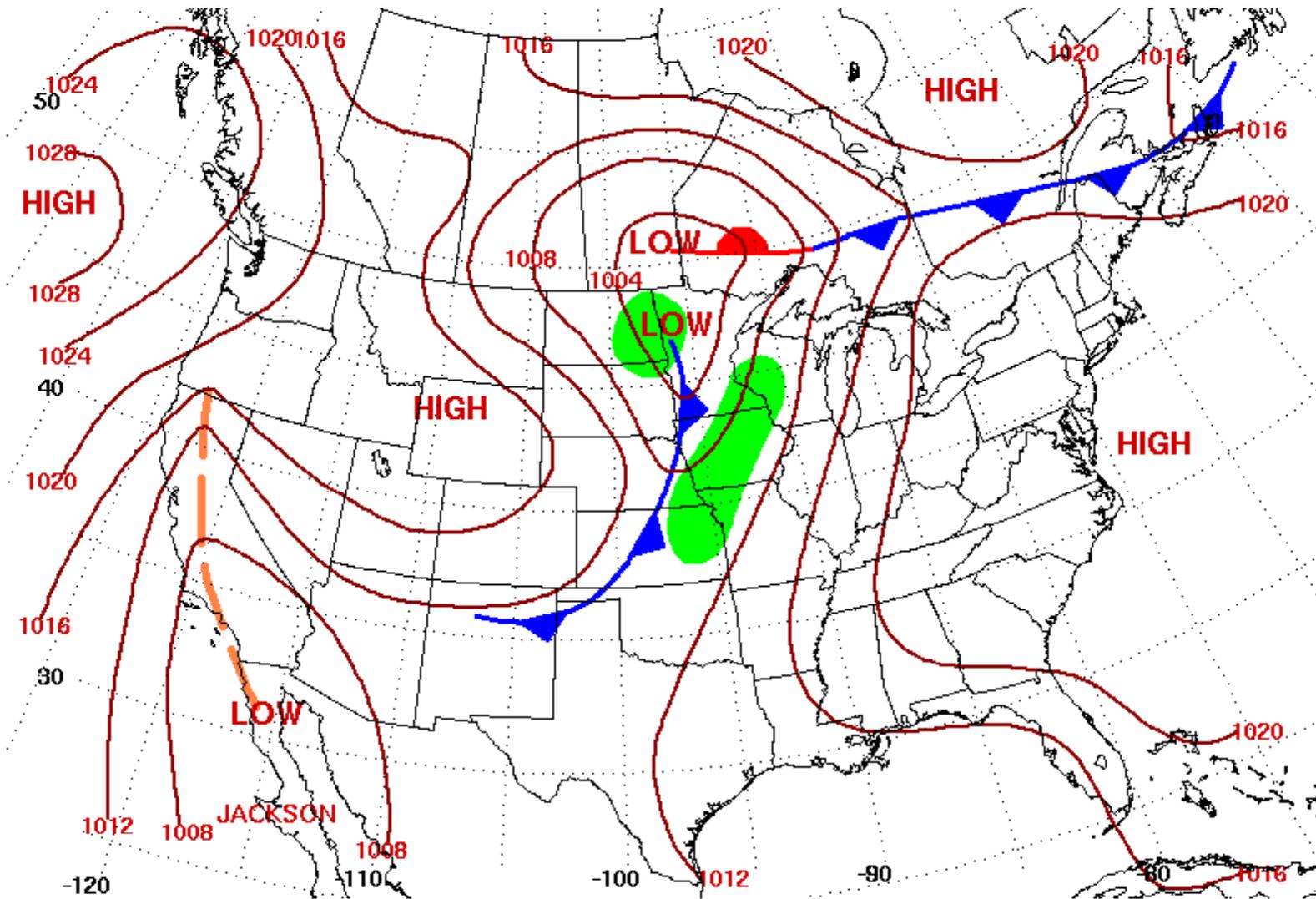
Modeled ozone forecast verses observed data

Modeled ozone plume transported Code Orange along I-95 Corridor. Model performed well with three (3) coastal sites ≥ 76 ppb.

Forecasters predicted high moderate levels along the coast due to less emissions during the weekend.

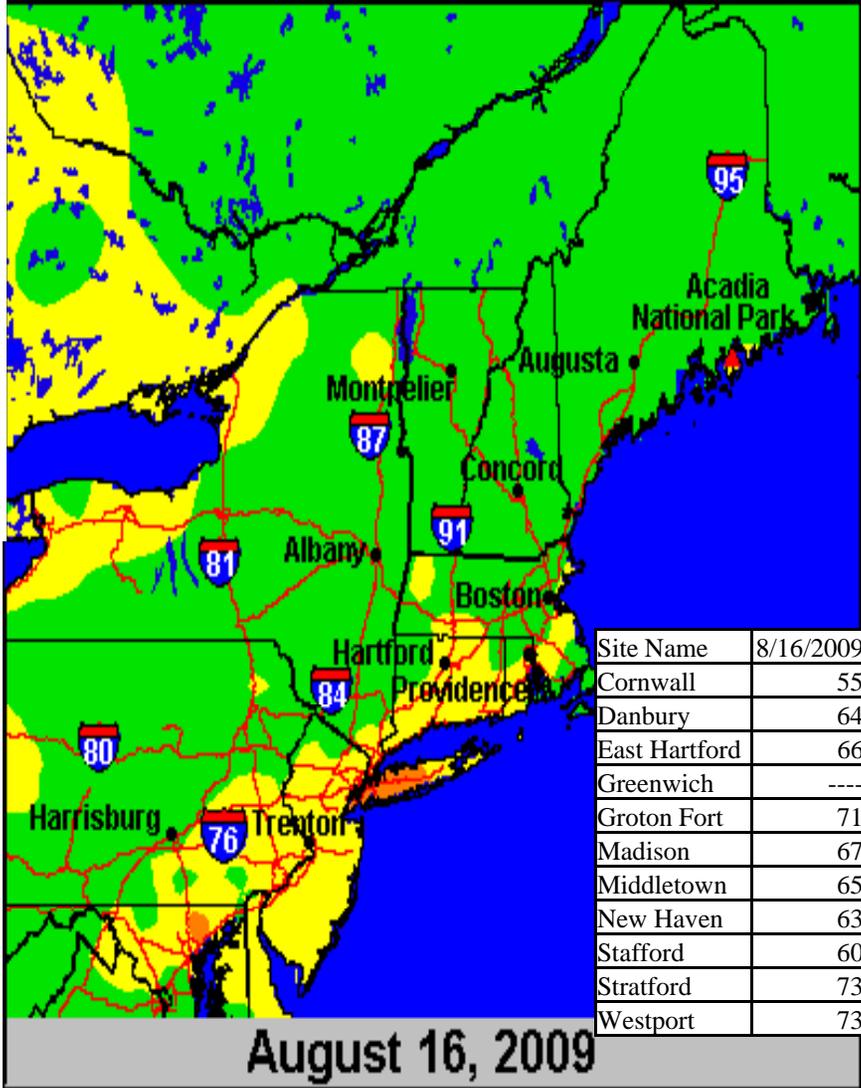
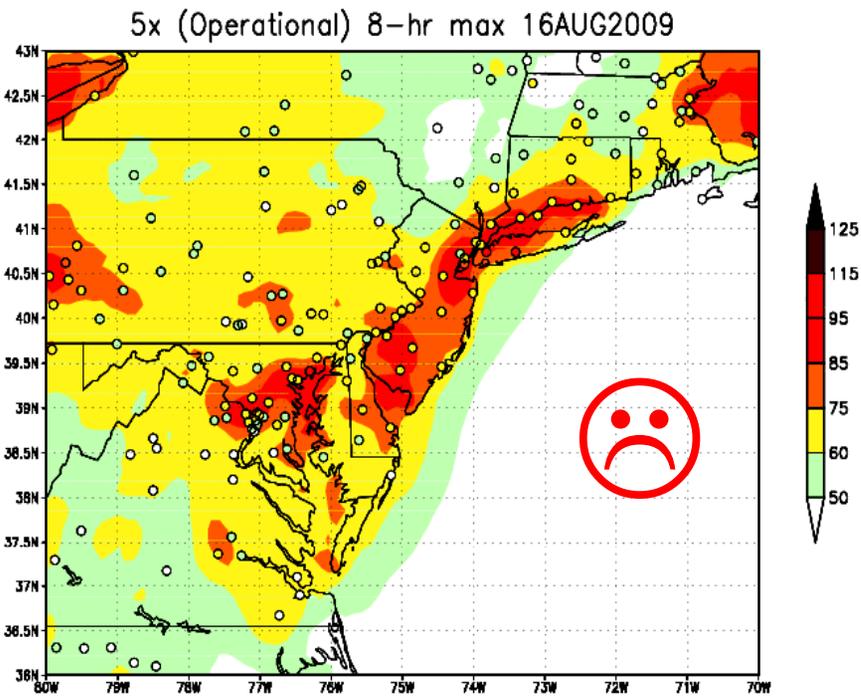


August 16th, 2009 12z



Surface Weather Map at 7:00 A.M. E.S.T.

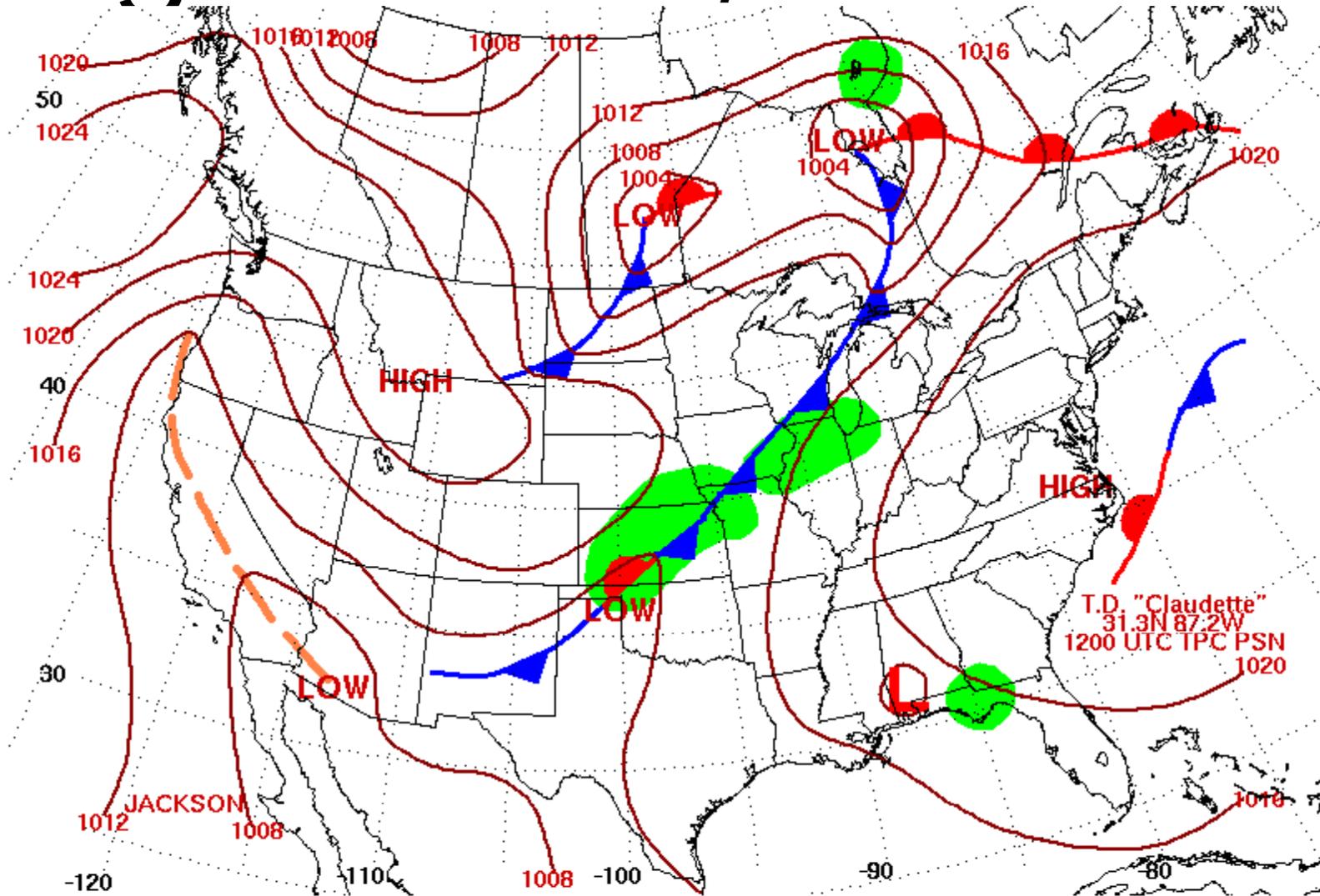
Modeled ozone forecast verses observed data



Modeled ozone plume transported Code Red along I-95 corridor & further inland. Model performed poorly by over-predicting by a factor of 10-20 ppbs.

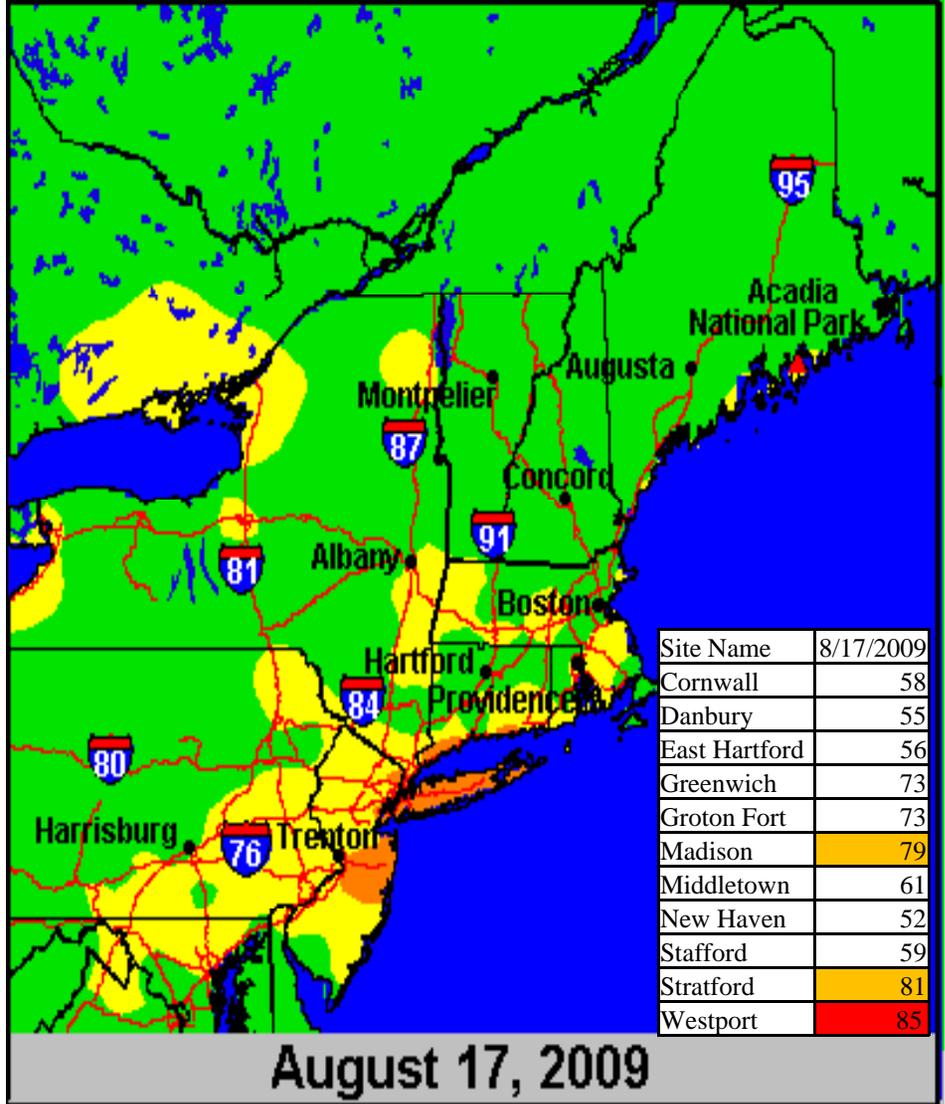
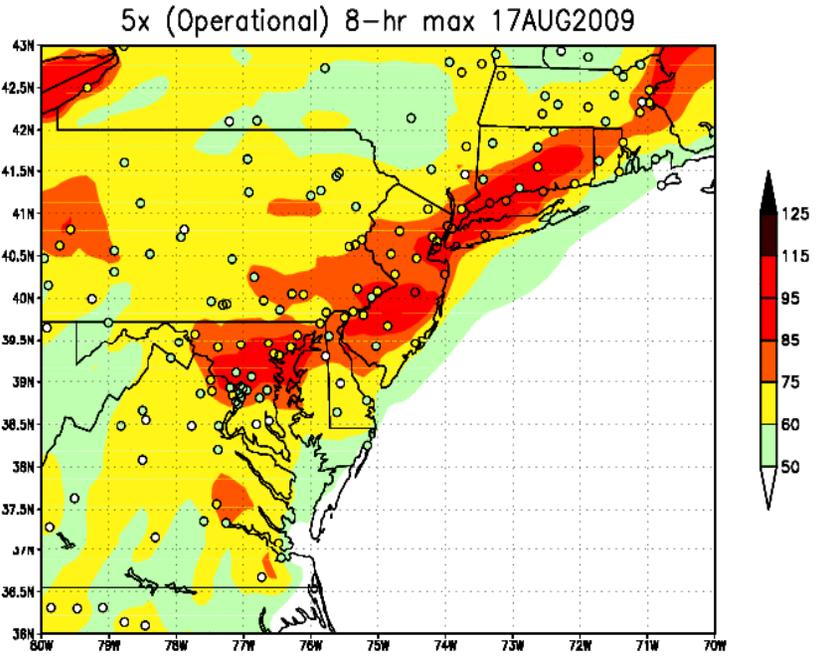
Forecasters predicted high moderates along the coast due modeled over prediction bias and less emissions during the weekend.

August 17th, 2009



Surface Weather Map at 7:00 A.M. E.S.T.

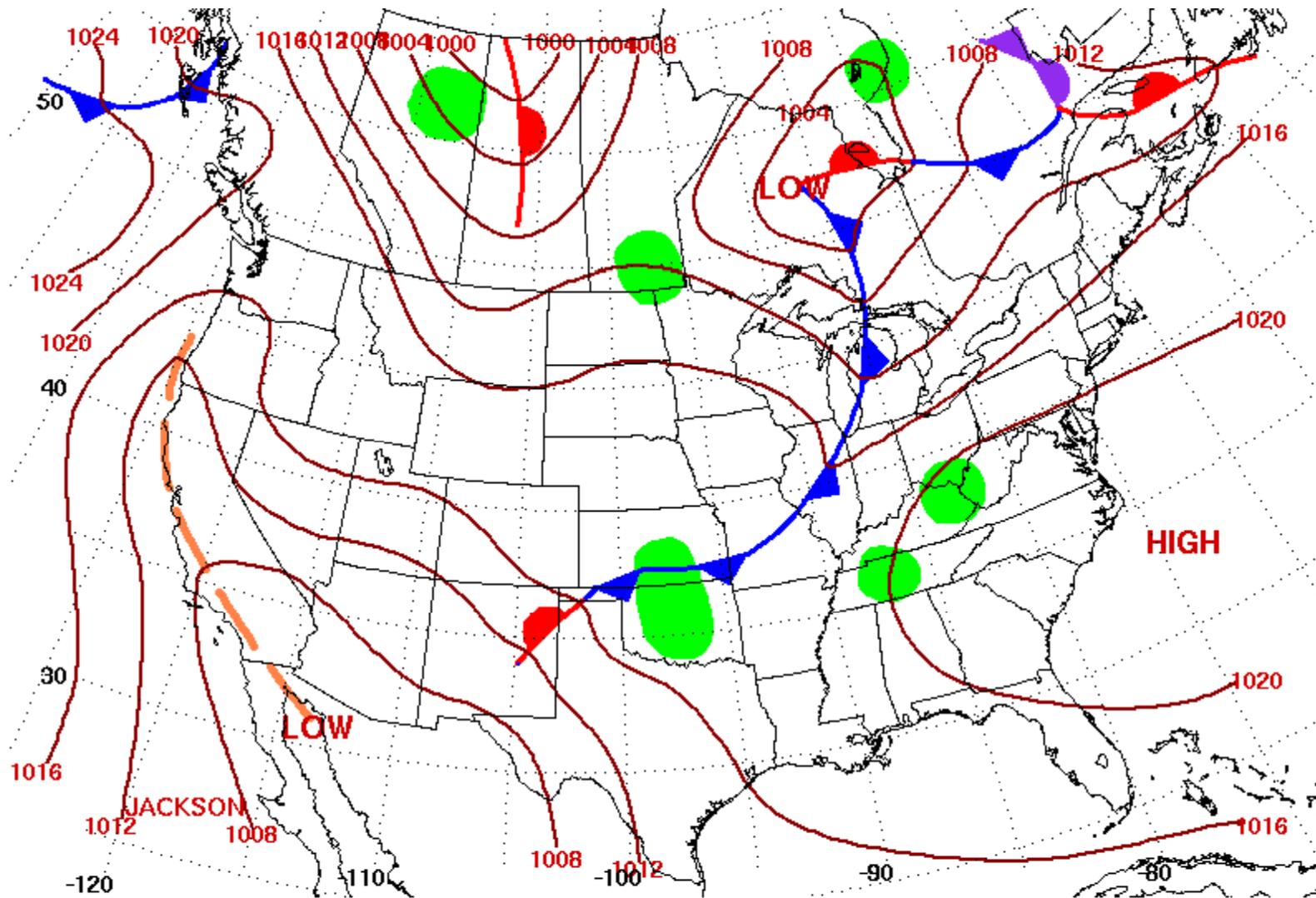
Modeled ozone forecast verses observed data



Modeled ozone plume transported and intensified to Code Red along Southwest Ct. Three sites exceeded to code orange. Over-predicted by 10 ppbs.

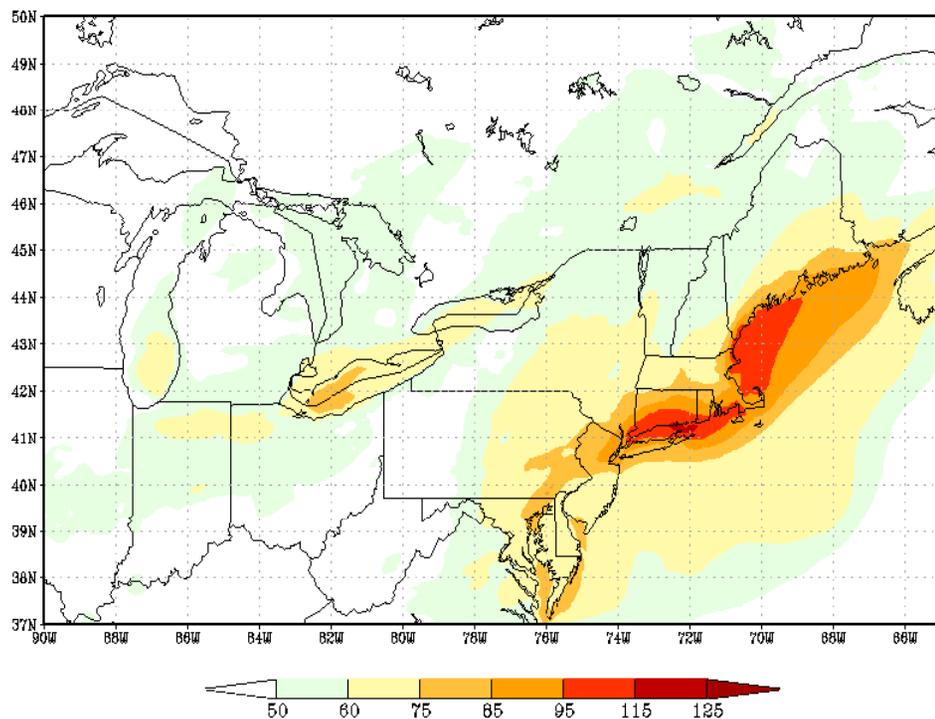
Forecasters take into account heat build-up with classic Bermuda High set-up and southwest wind transport. Predicted coastal sites exceedances, to code orange.

August 18th, 2009



Surface Weather Map at 7:00 A.M. E.S.T.

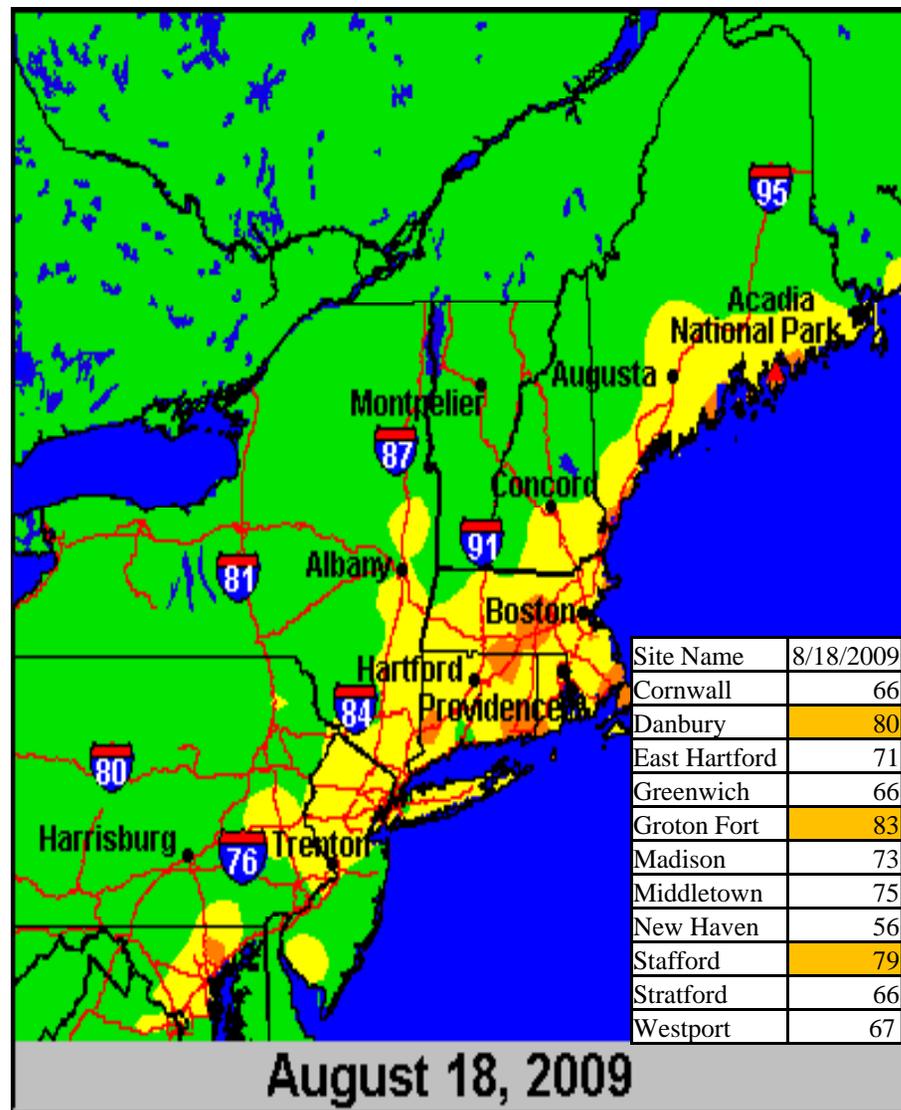
(prd) 12Z 25H-48H 2 day 8h max sf O₃ (ppbv) Valid 18 AUG 2009



Modeled ozone forecast verses observed data

Modeled ozone plume transported and intensified to Code Red along the I-95 Corridor in Connecticut. Code orange across all of Ct.

Forecasters take into account modeled over-prediction by a factor of 10 ppb this year, therefore predicted exceedances, to code orange.



Summary

Fewer exceedance days in 2009 (6) vs 2008 (22) with the standard of 75ppb.

Persistent upper level trough across Great Lakes & New England caused an unusually wet & cool June and July.

August heat-wave responsible for 4 of 6 USG events.

Lower Emissions Due To The Recession & NO_x Controls?

Just nine (9) days of operating restrictions on emergency engines.

DO NOT EXPECT THE SAME NEXT YEAR!

What's Next?

EPA reconsiders the 8-Hour Ozone standard of 75ppb.

The Agency will propose any new revisions by Dec. 2009; and then it will become final by August 2010.

The AQI Index will remain unchanged through 2010 regardless of any proposed new standard.

Same ozone season - May 1 through September 30, 2010

SEE YOU IN 2010!

NCEP EMC verification

NOAA Model Ozone Exceedance Days (previous day 12z)	
Month	Dates (18 days)
June	7,26
July	11,17,18,25,27,28
August	1,4,5,15,16,17,18,19,20,26

- Under predicted April/ May events
- Over predicted June-August events
- August events nearly 20 ppb over predicted

Maps of Model predictions

vs.

AirNow Observed

- Second day 12z verification maps largest differences:
- ☹️ July 11,18,25,28
- ☹️ August 4,15,16,17,18,26