

Ozone Transport Affecting Dallas/Fort Worth: Analysis with Rural O₃ Sites

Rapid Science Synthesis Question G&H

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Two Case Studies

- Aug. 16-18 – Continental transport
- Sept. 8-9 – Combined continental & inter-city (Houston to DFW) transport

Note Periodicity of Episodes

- [sep o3.xls](#)

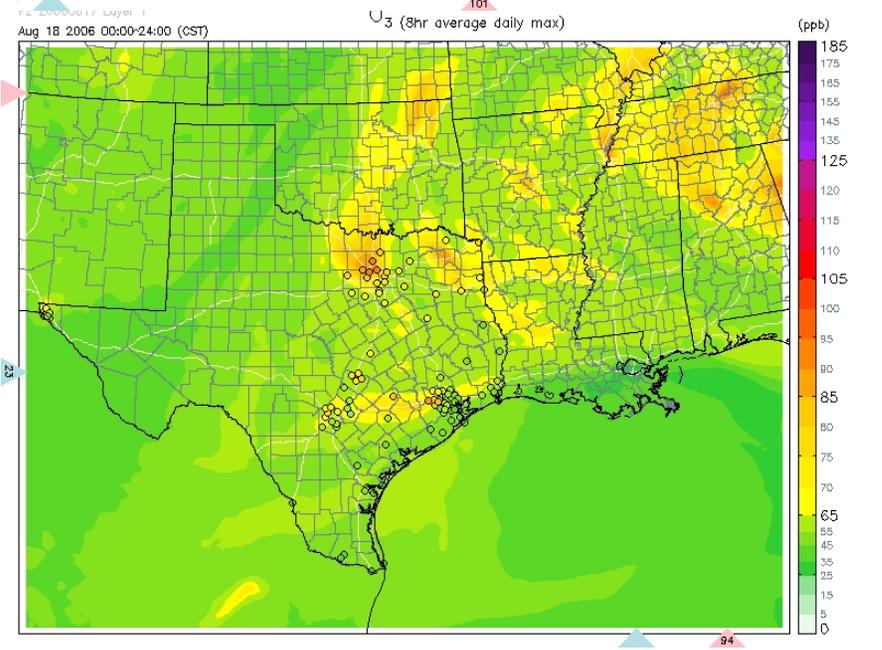
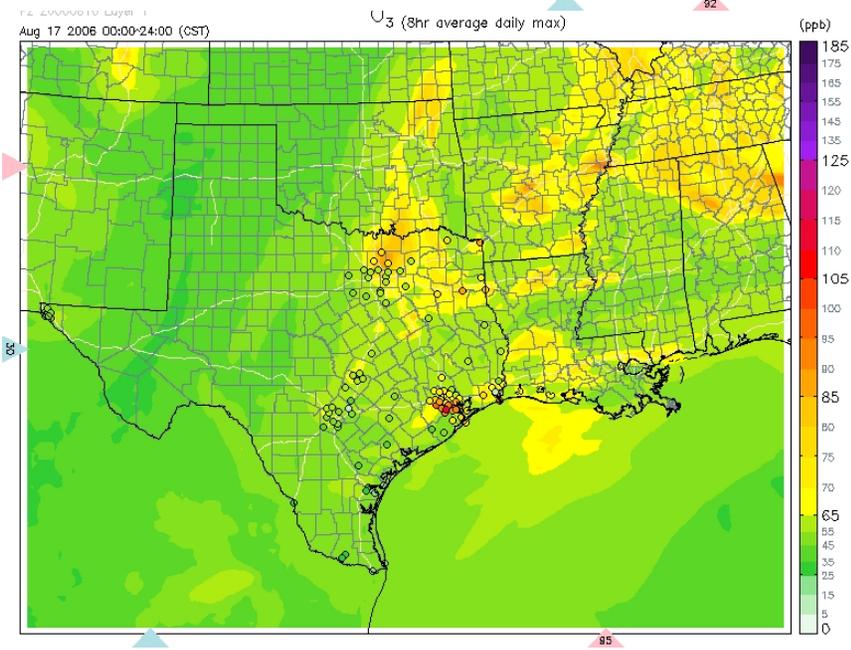
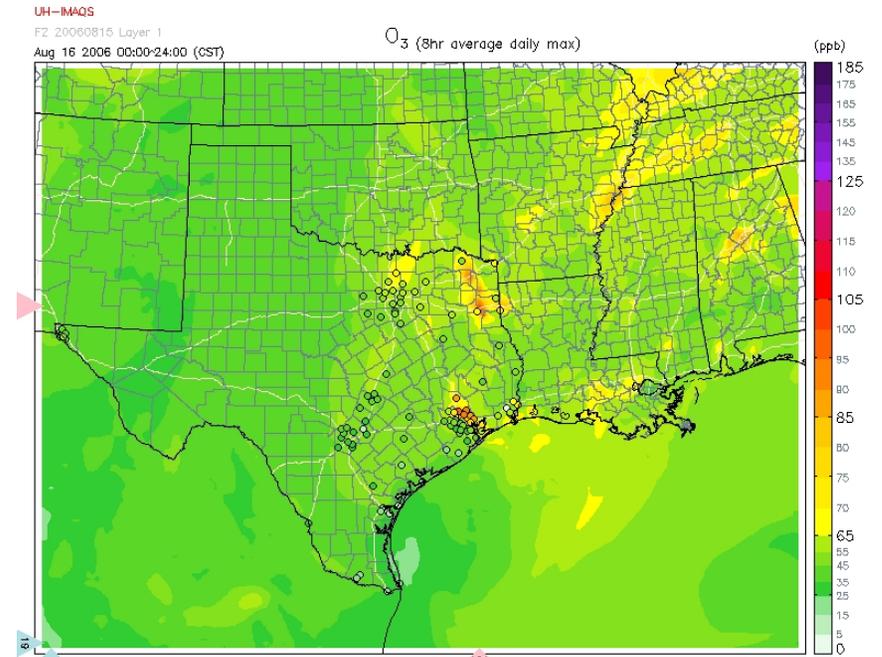
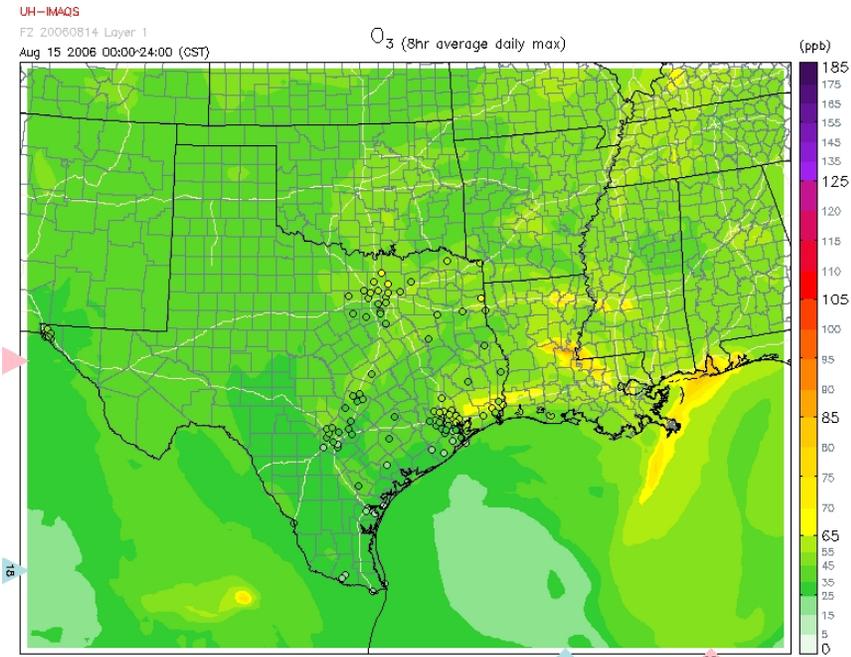
First Case: Onset of High O3 8/16

- First O3 Exceedances Since July 23 hit on Aug. 16 (Houston area).
 - Right on time, based on historical data!
- On Aug. 17, East TX had exceedances:
 - Wamba, Longview in NE TX
 - Sabine Pass, Port Arthur in SE TX
 - Houston area (of course)
- On Aug. 18, DFW had exceedances.

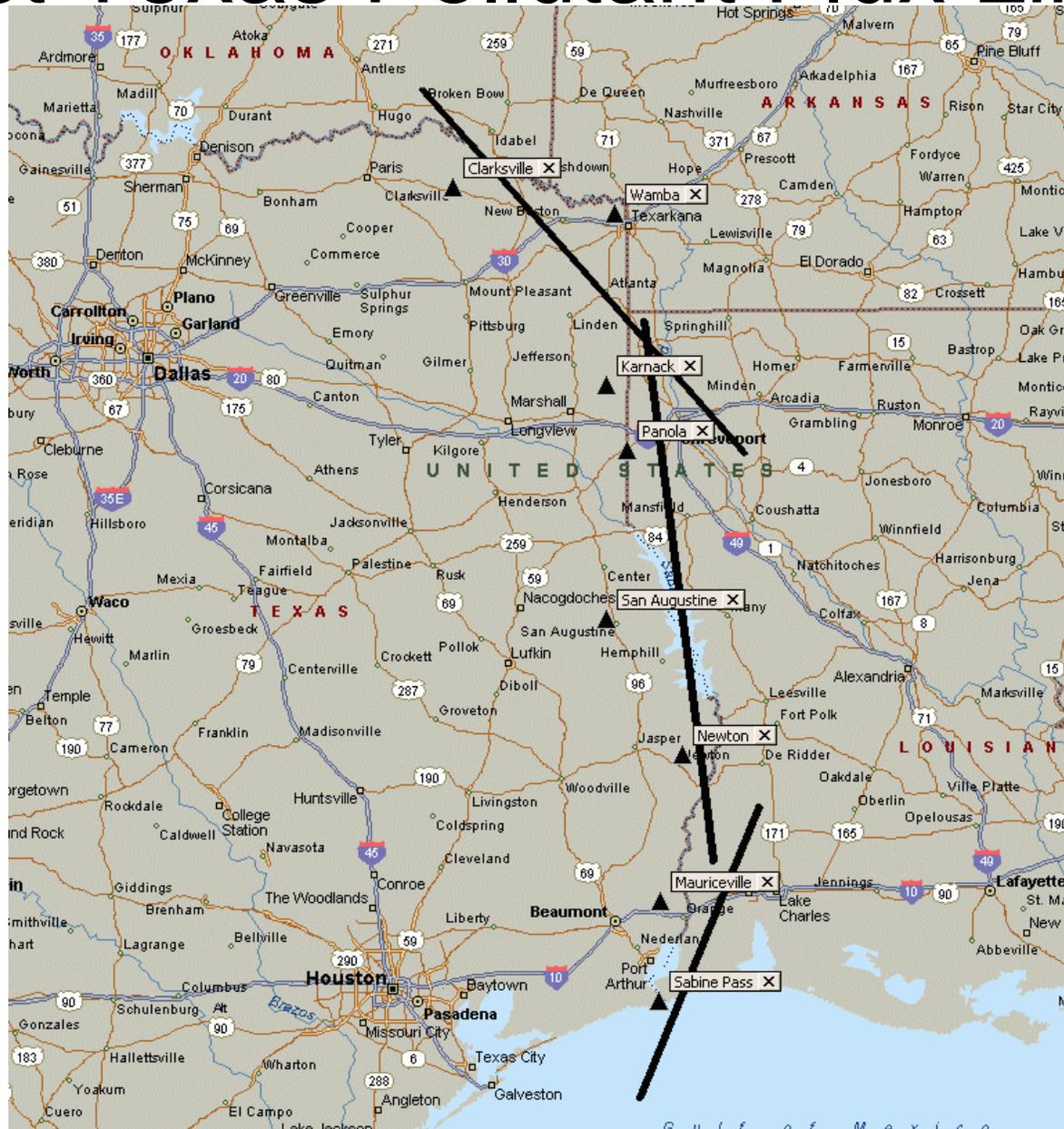
Distribution of O₃ along Flux Lines

- Along NE, high O₃ on 8/17
 - Clarksville 77 ppb, Wamba 86, Panola 81
- Along E, moderate O₃
 - San Augustine 60 ppb, Newton 61, Mauriceville 54
- Along SE Gulf Coast, high O₃
 - Sabine Pass 92 ppb
- IMAQS Forecast predicts high O₃ one day earlier.

UH IMAQS 1st Day Forecasts Aug. 15-18



East Texas Pollutant Flux Lines



Back-Trajectories

- Ran Hysplit with FNL data sets, as EDAS40 were unavailable on 8/23.
- Fetch from northeast on 8/17, east on 8/18
- Following maps show trajs color-coded by rounded 8hr O3 daily peak at flux sites
 - 48-hr back traj from 20 Z start time
 - using model vertical velocity,
 - 10, 500, & 1000 m AGL starting pts
 - Sites = Clarksville, Wamba, Panola, Karnack, San Augustine, Newton, Mauriceville.

Legend and Overview

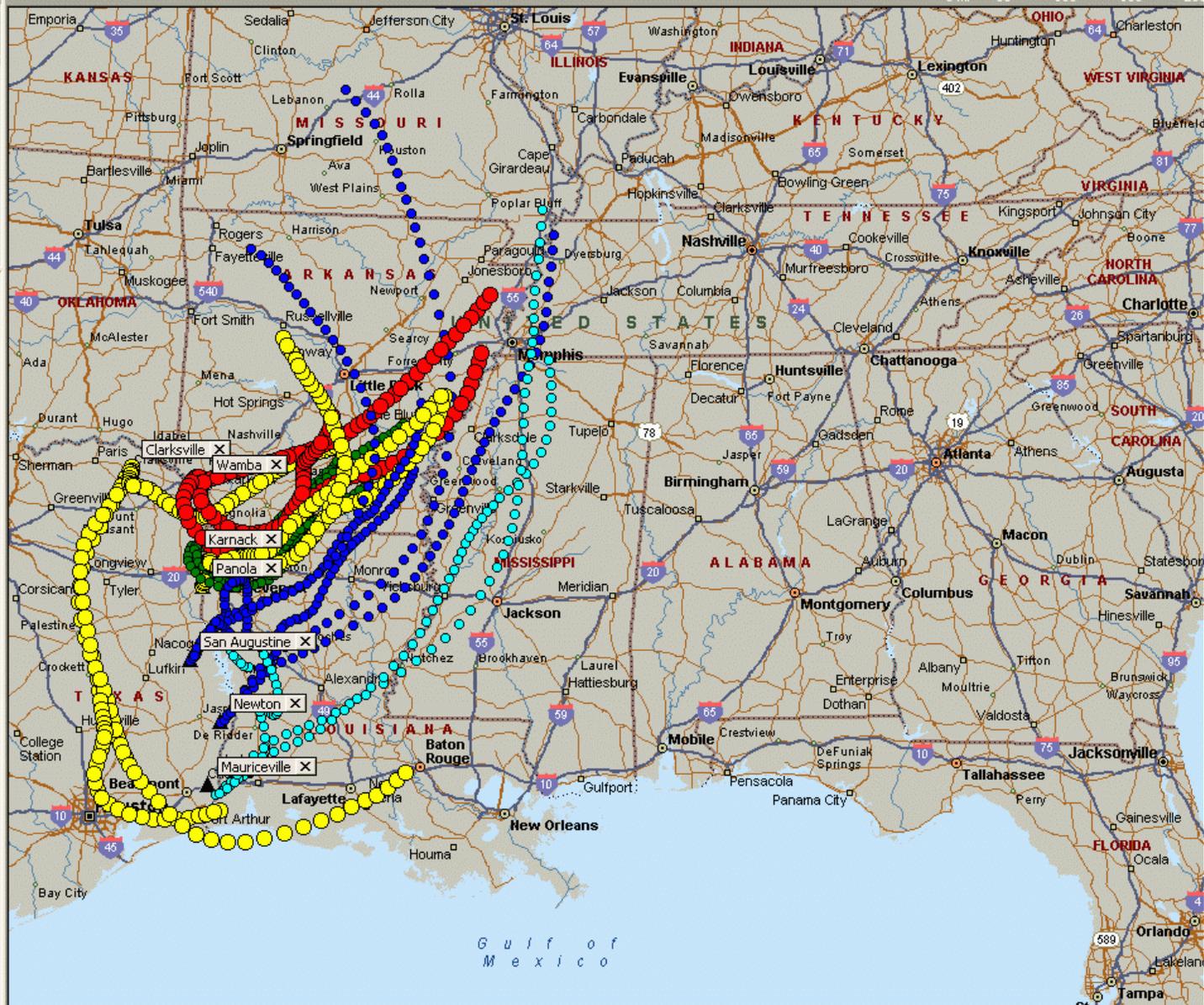


- Aug. 17
- 90
- 80
- 70
- 60
- 50

- Pushpins
- Sites

Aug. 17

North America United States States-



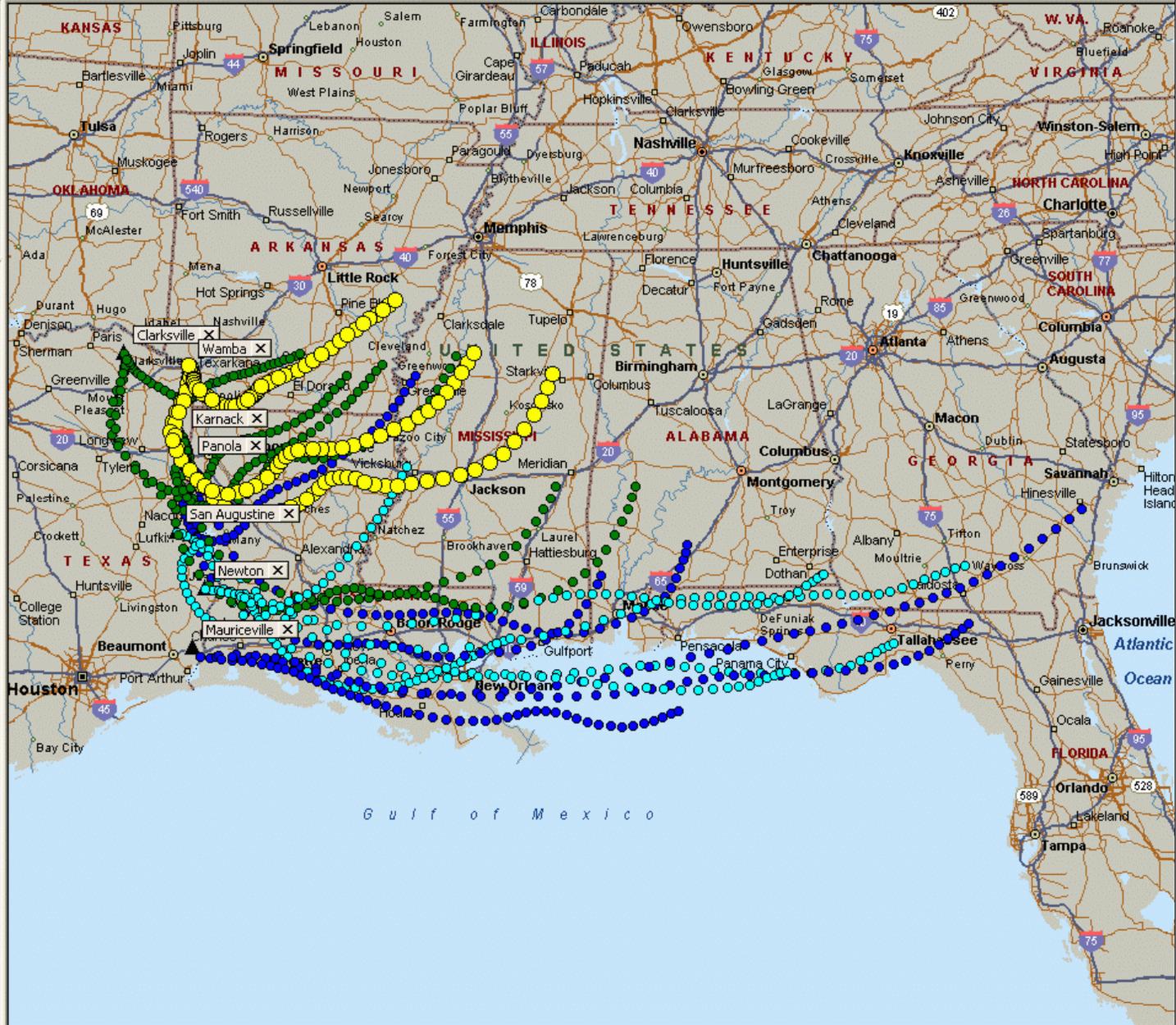
Legend and Overview



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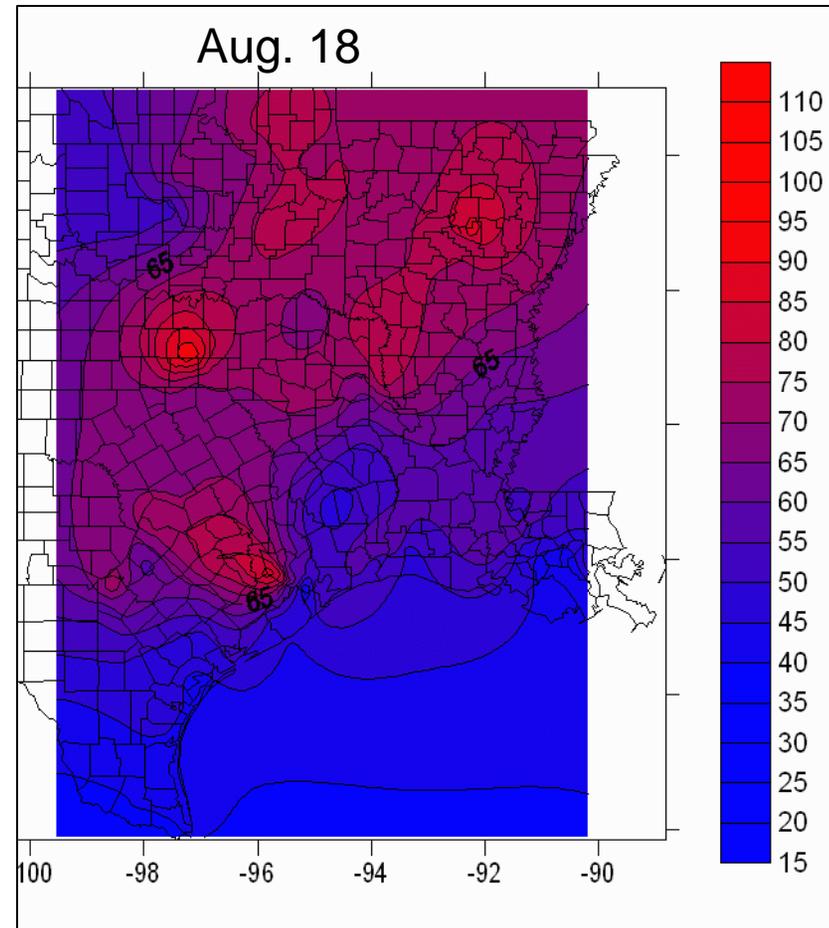
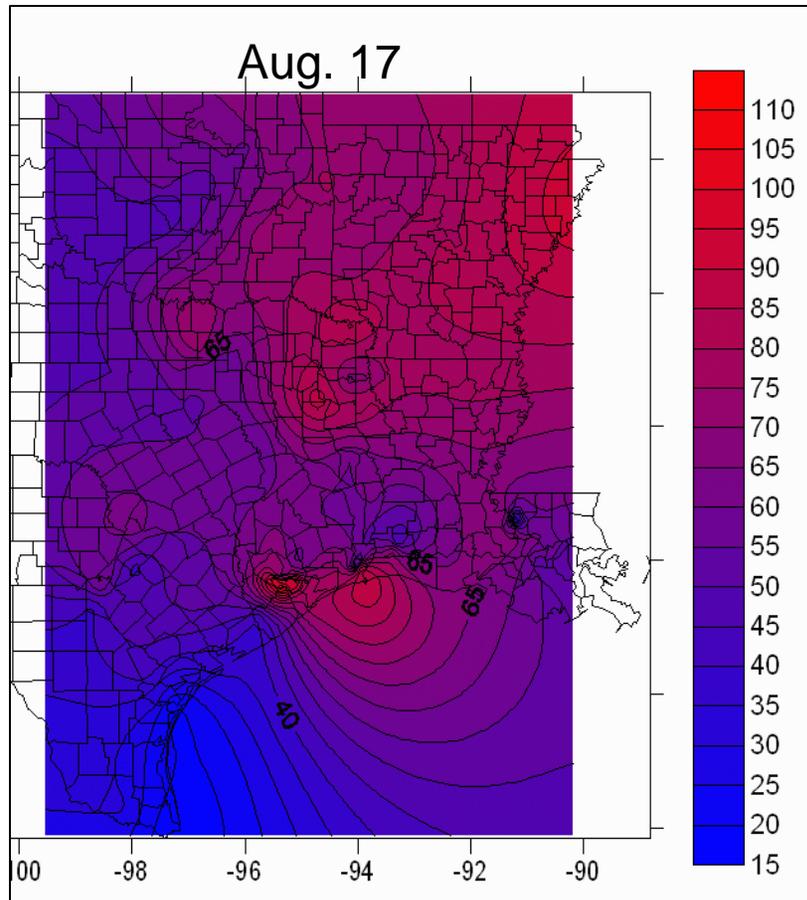


Aug. 18

AIRNOW Suggests Possible Advection from Memphis Area

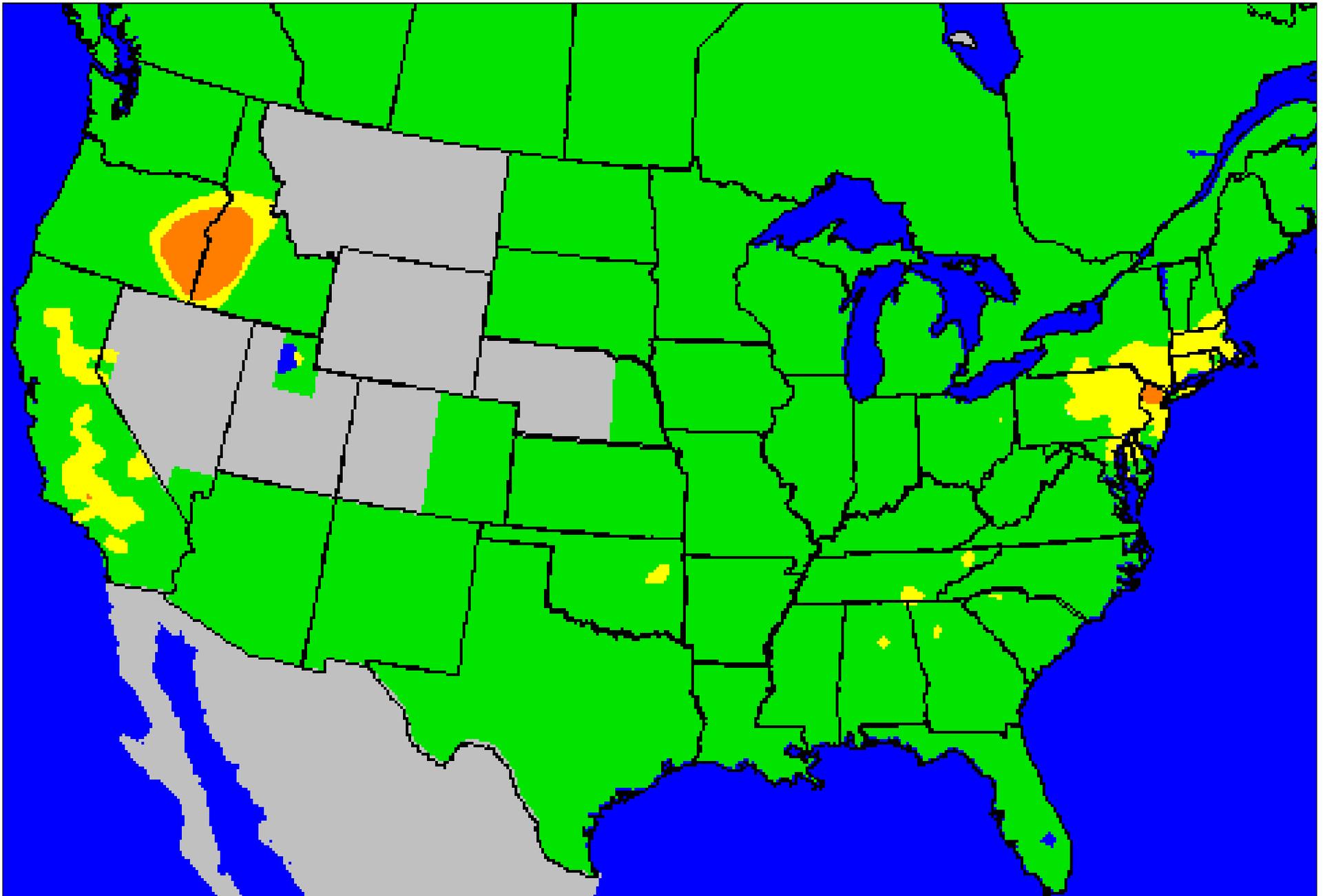
- 8 hr daily maxima across U.S. from Aug.
14 – 22

TX, LA, OK, AR O3 8hr Maxima Aug. 17, 18 from AIRNOW Data

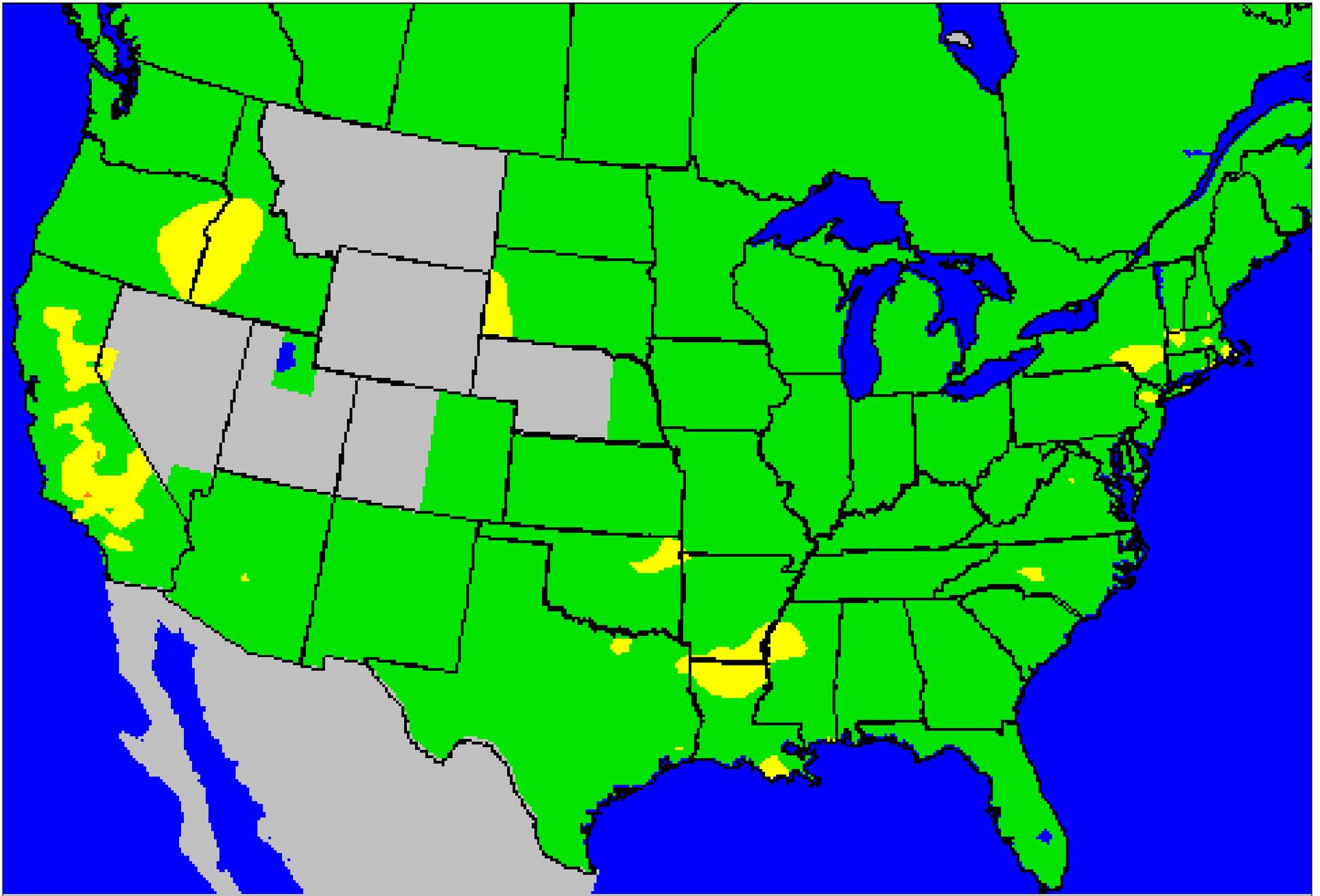


National AIRNOW Contours (Using TexAQS Rural Sites)

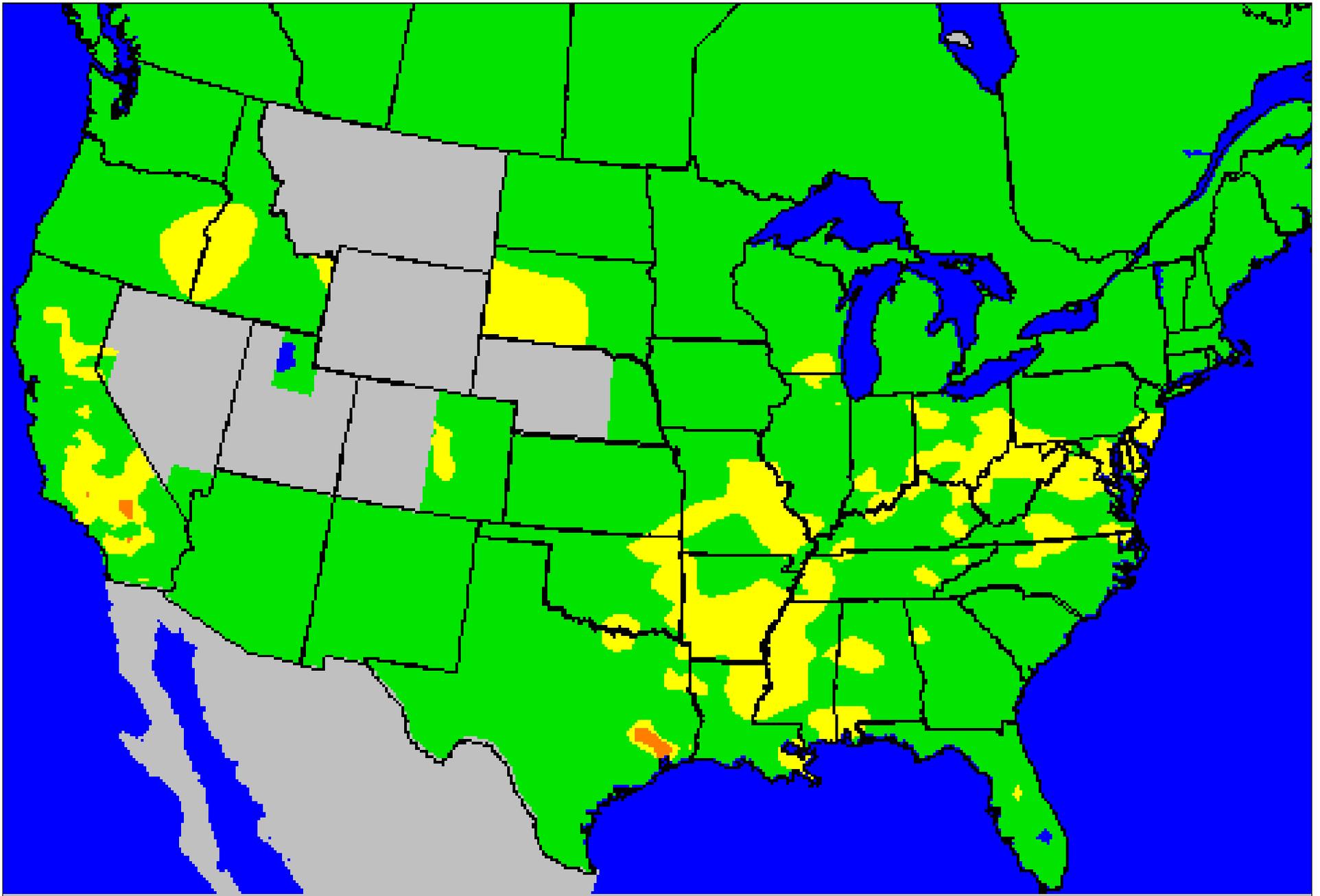
Aug. 14 - 22



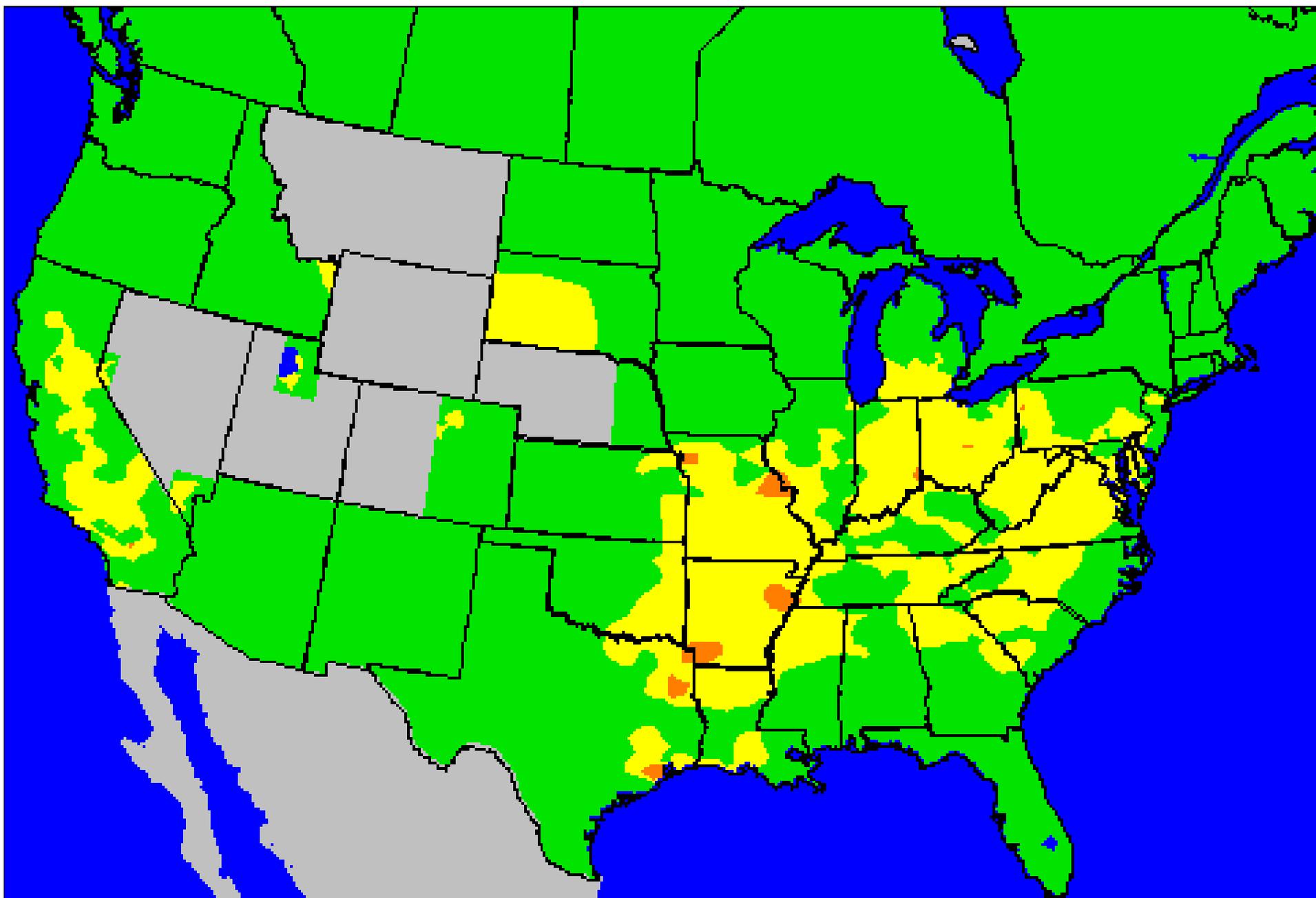
August 14, 2006



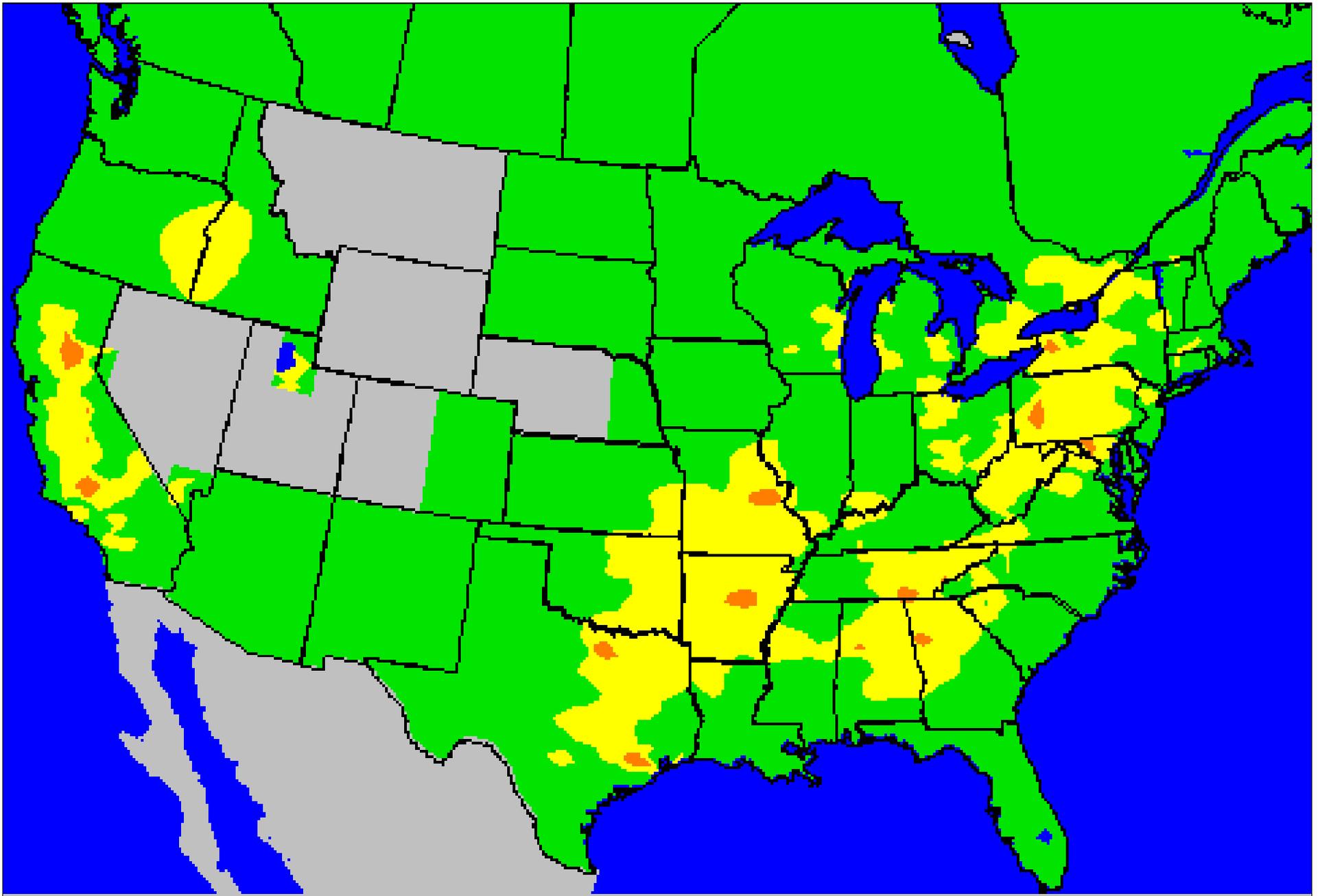
August 15, 2006



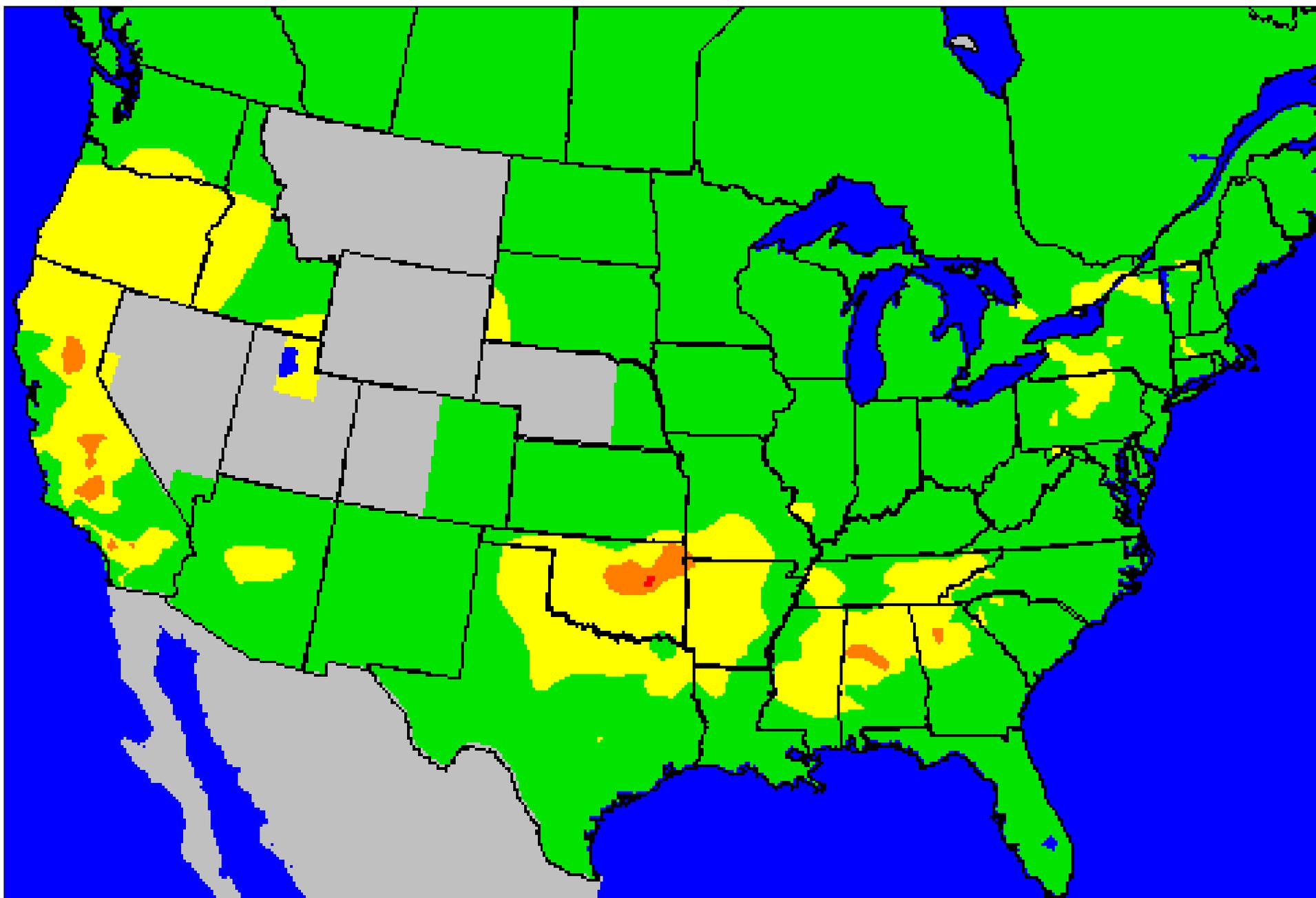
August 16, 2006



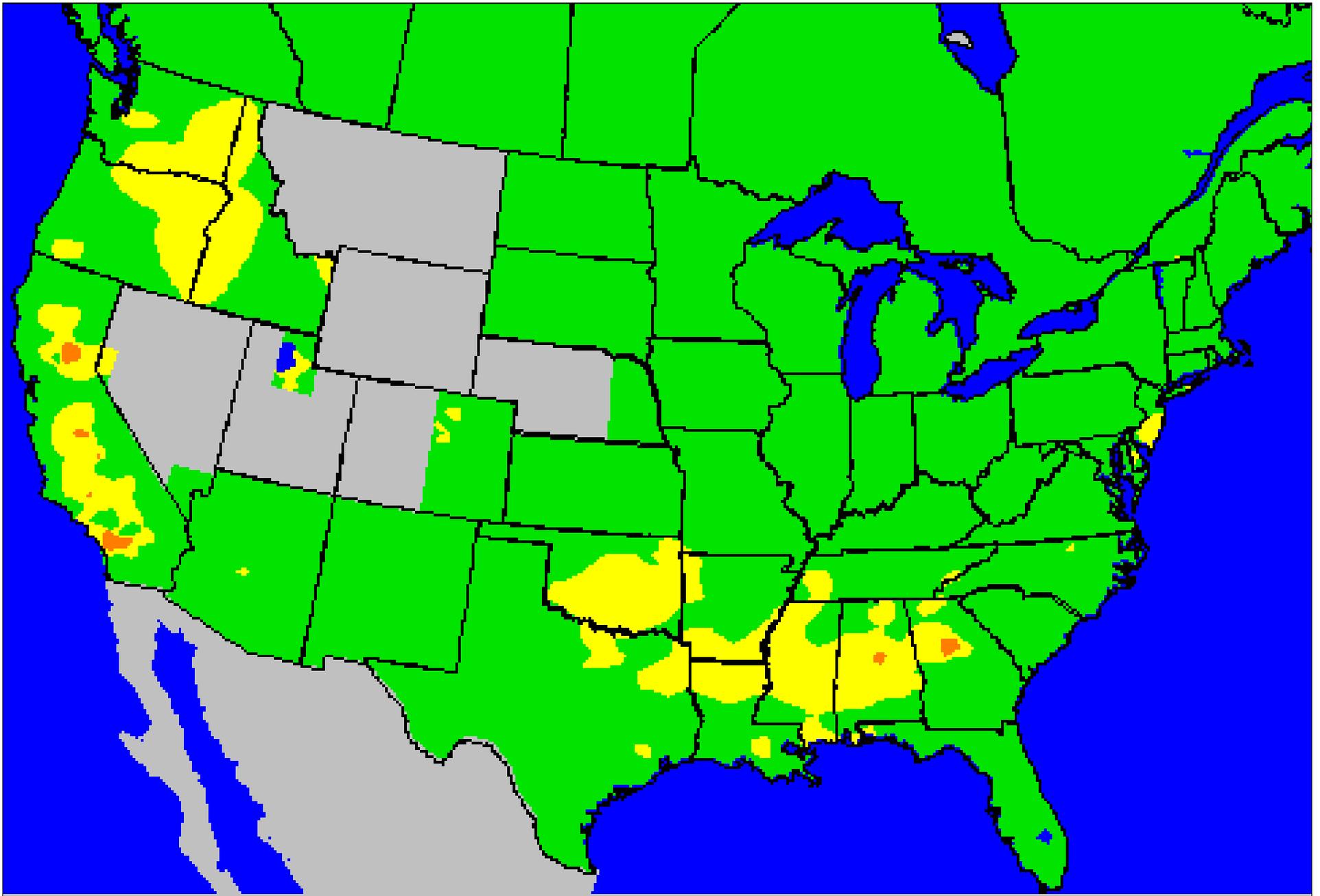
August 17, 2006



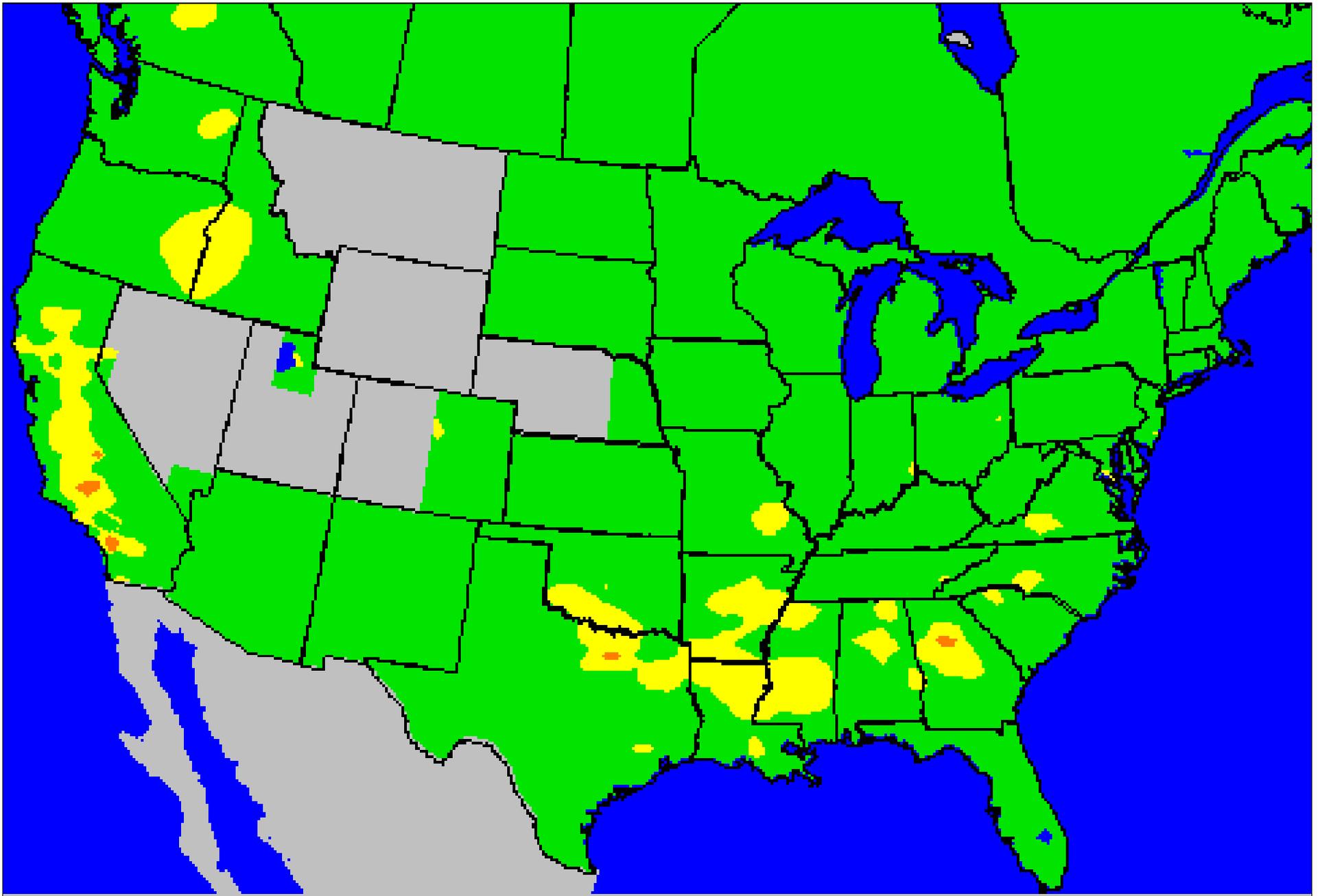
August 18, 2006



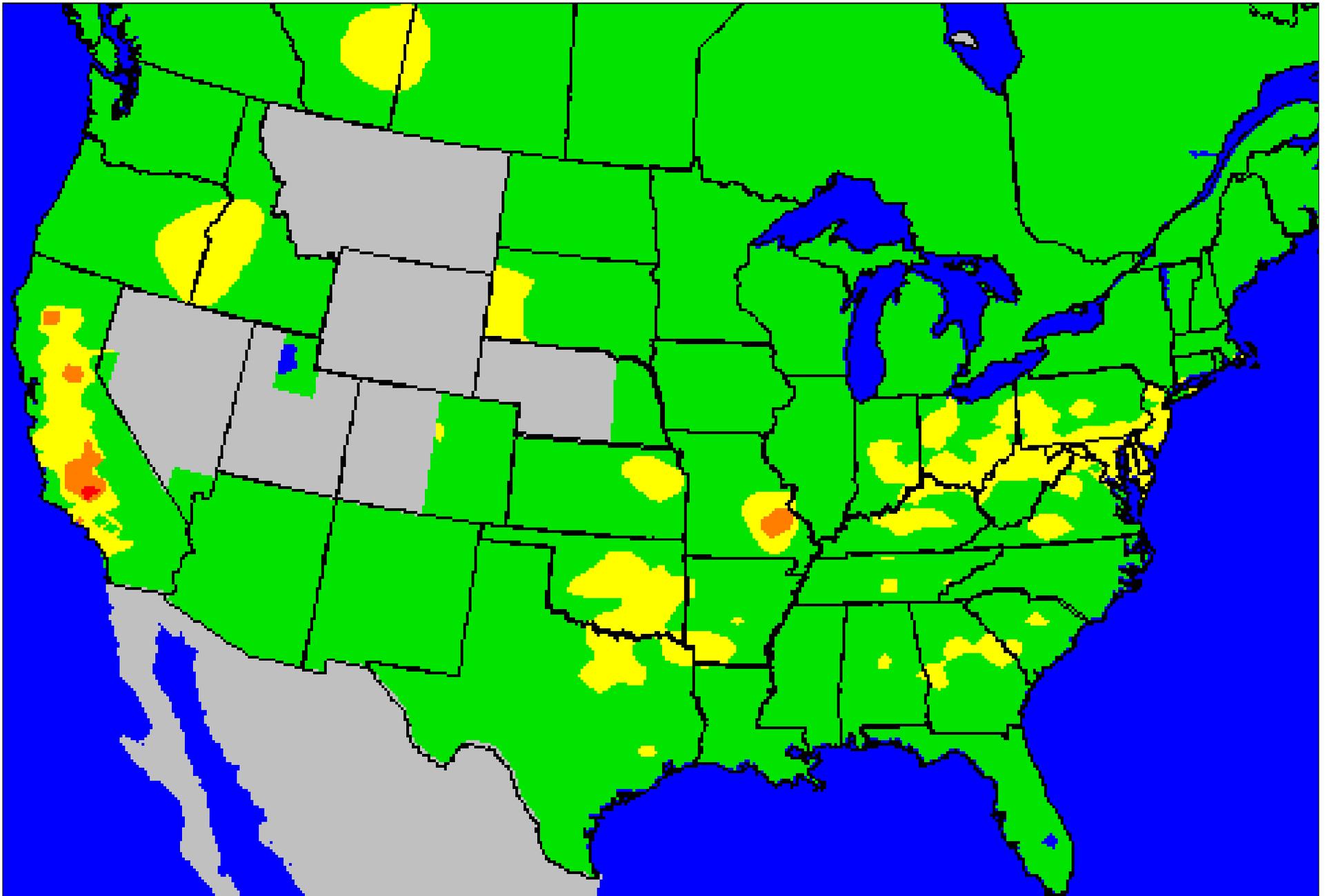
August 19, 2006



August 20, 2006

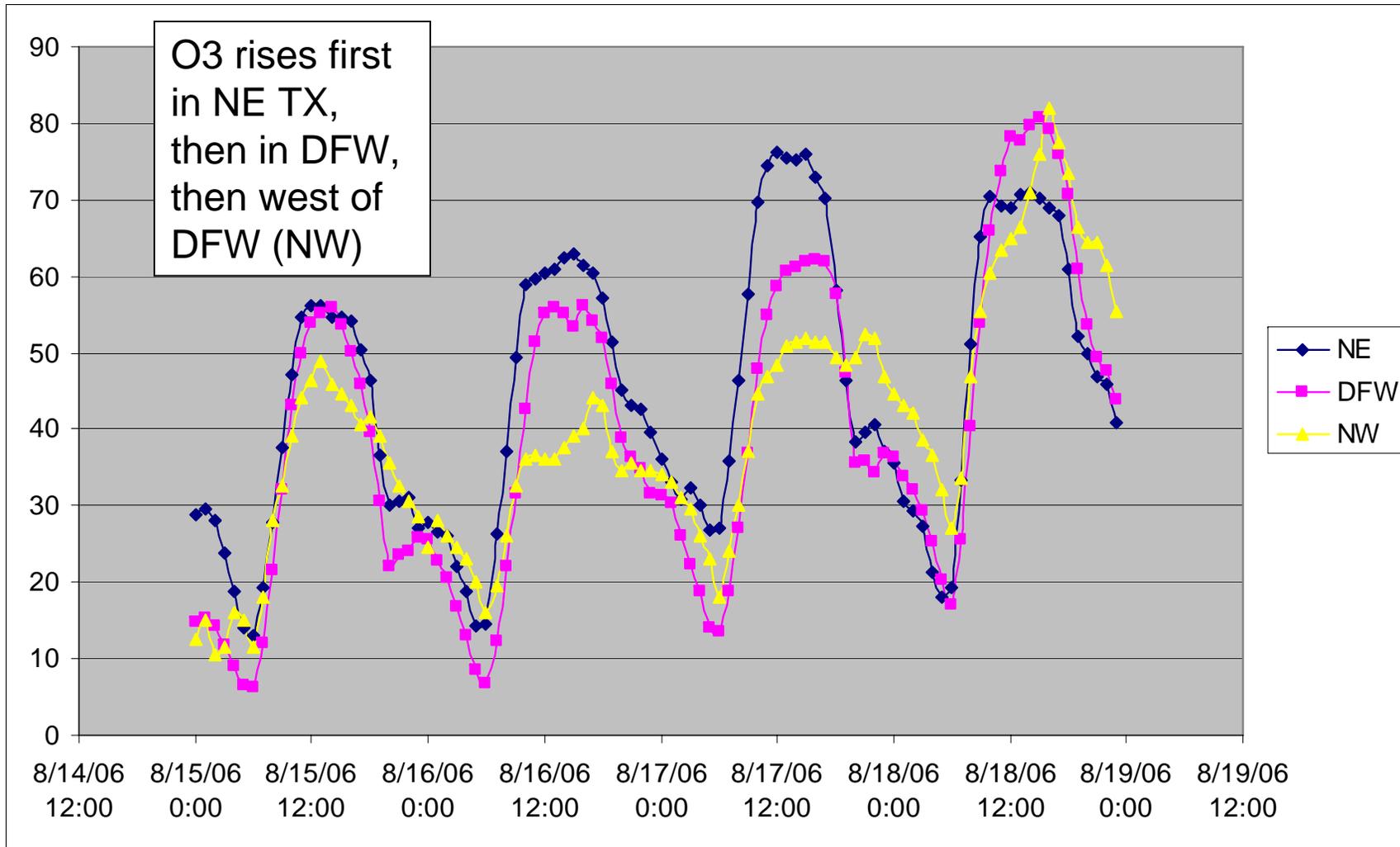


August 21, 2006



August 22, 2006

Perceived O3 movement from Ambient Monitors



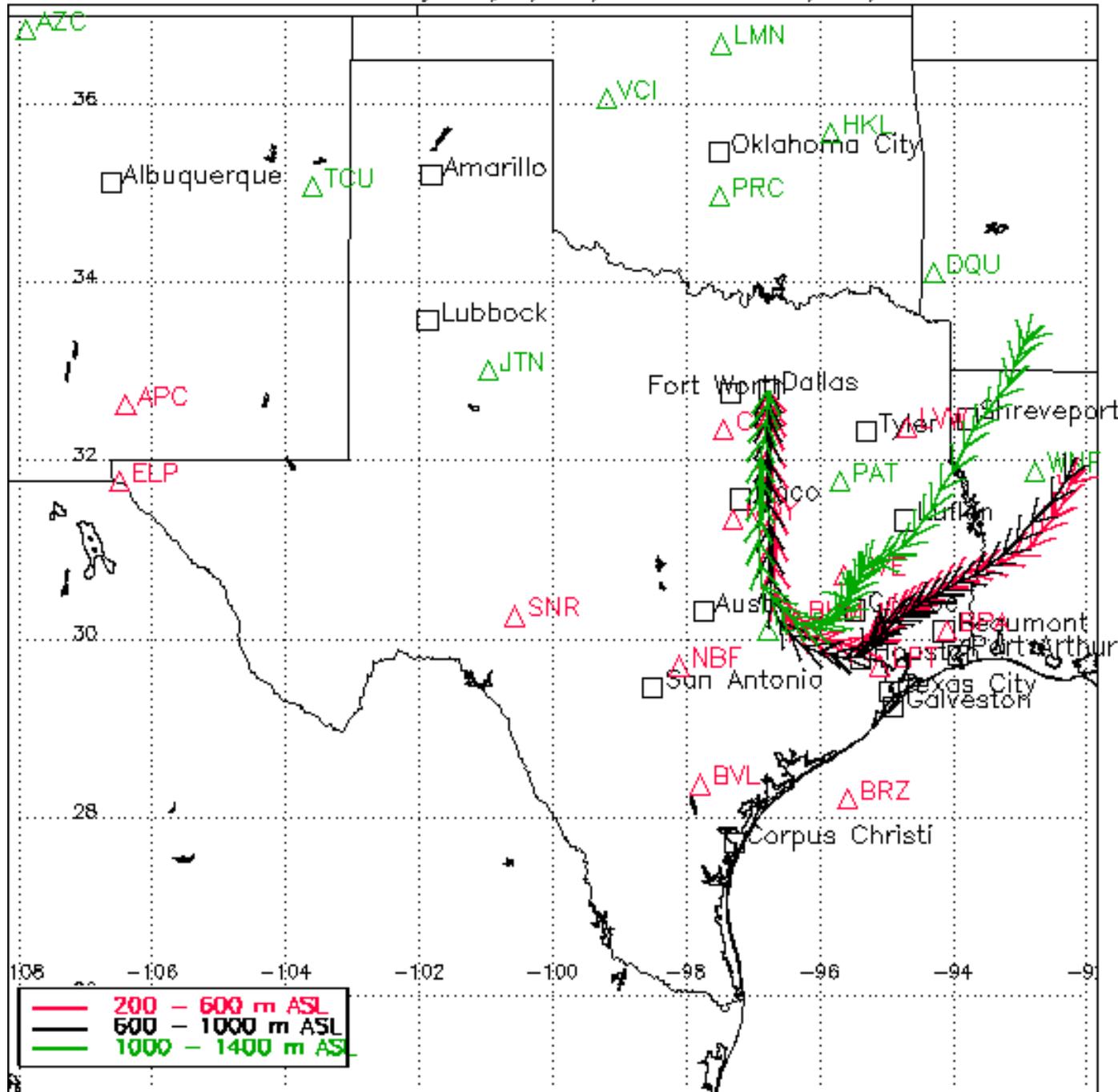
Conclusion

- Preliminary conclusion - air moved into NE TX on 8/17 and contributed to DFW exceedances on 8/18.

Second Case in Mid-Sept.

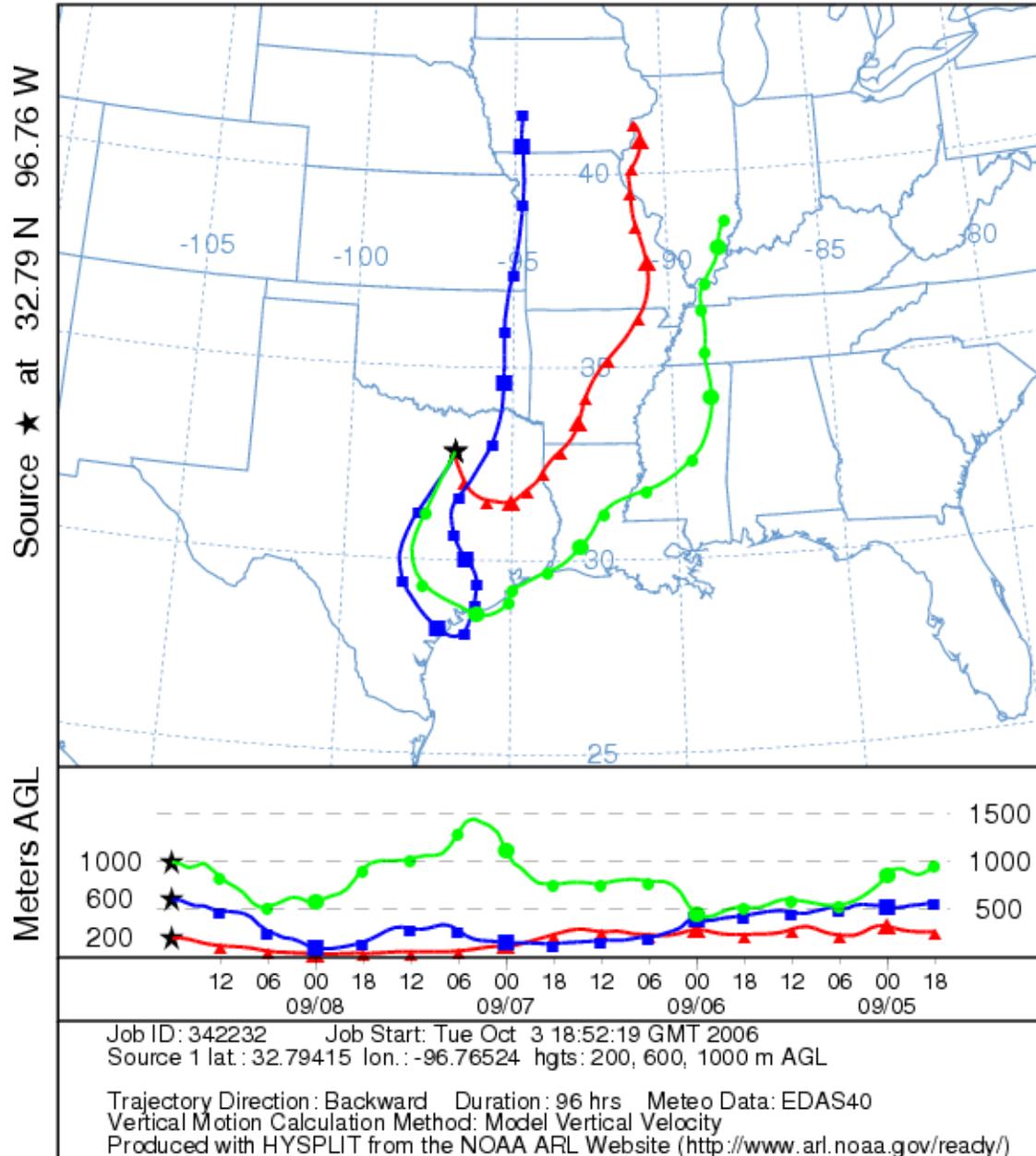
- Houston has exceedances on Sept 7, DFW on Sept. 8.
- High O₃ across East Texas Sept 8.
- Back-trajectory suggests Houston affected Dallas.
- O₃ persists in DFW, moves into Oklahoma.

TEXAQS 2006 Backwards Trajectory 9/008/2006 18:00 - 9/006/2006 18:00



NOAA PSD Back-traj

NOAA HYSPLIT MODEL
Backward trajectories ending at 18 UTC 08 Sep 06
EDAS Meteorological Data

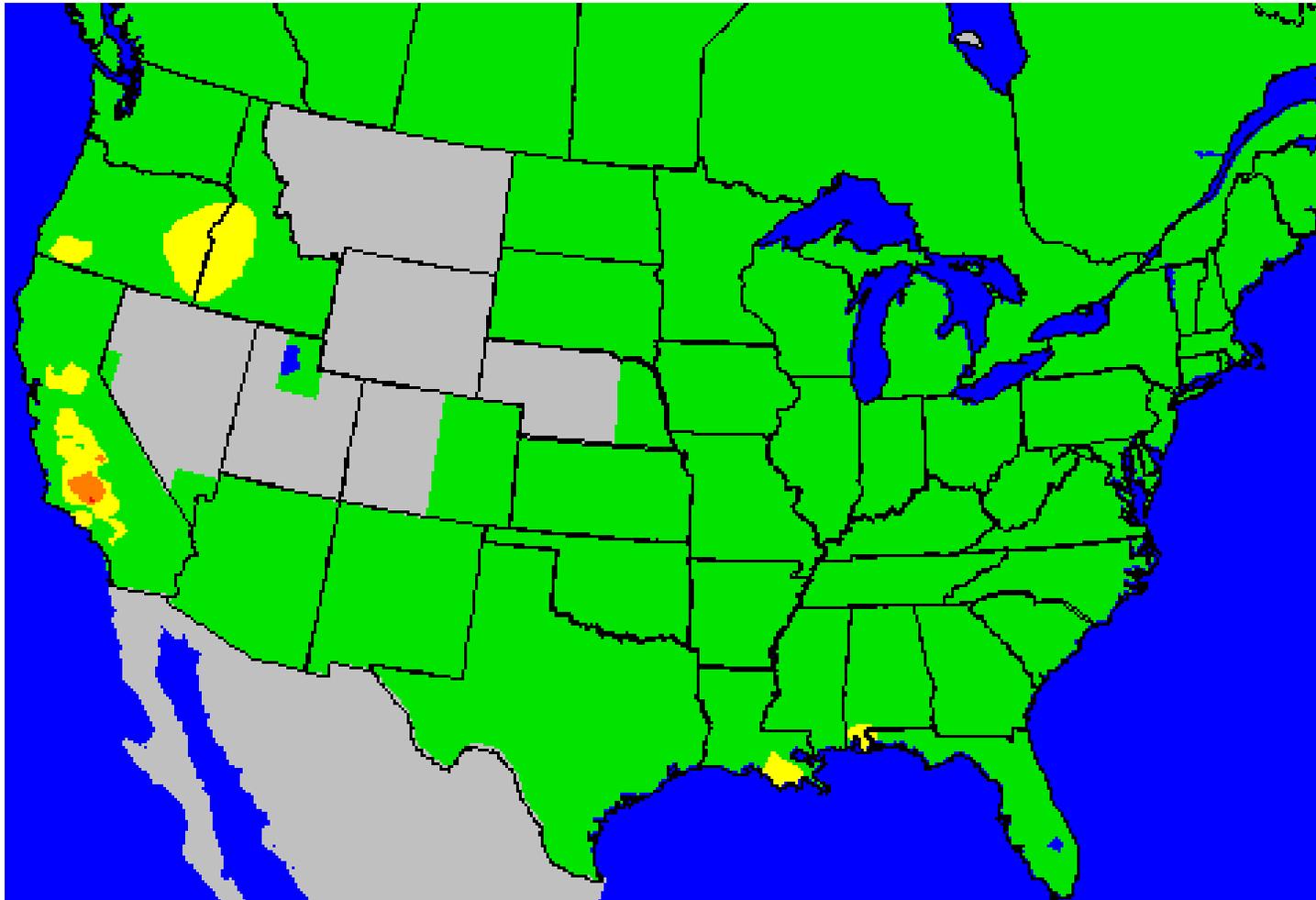


NOAA
Hysplit
Back-traj

National AIRNOW Contours (Using TexAQS Rural Sites)

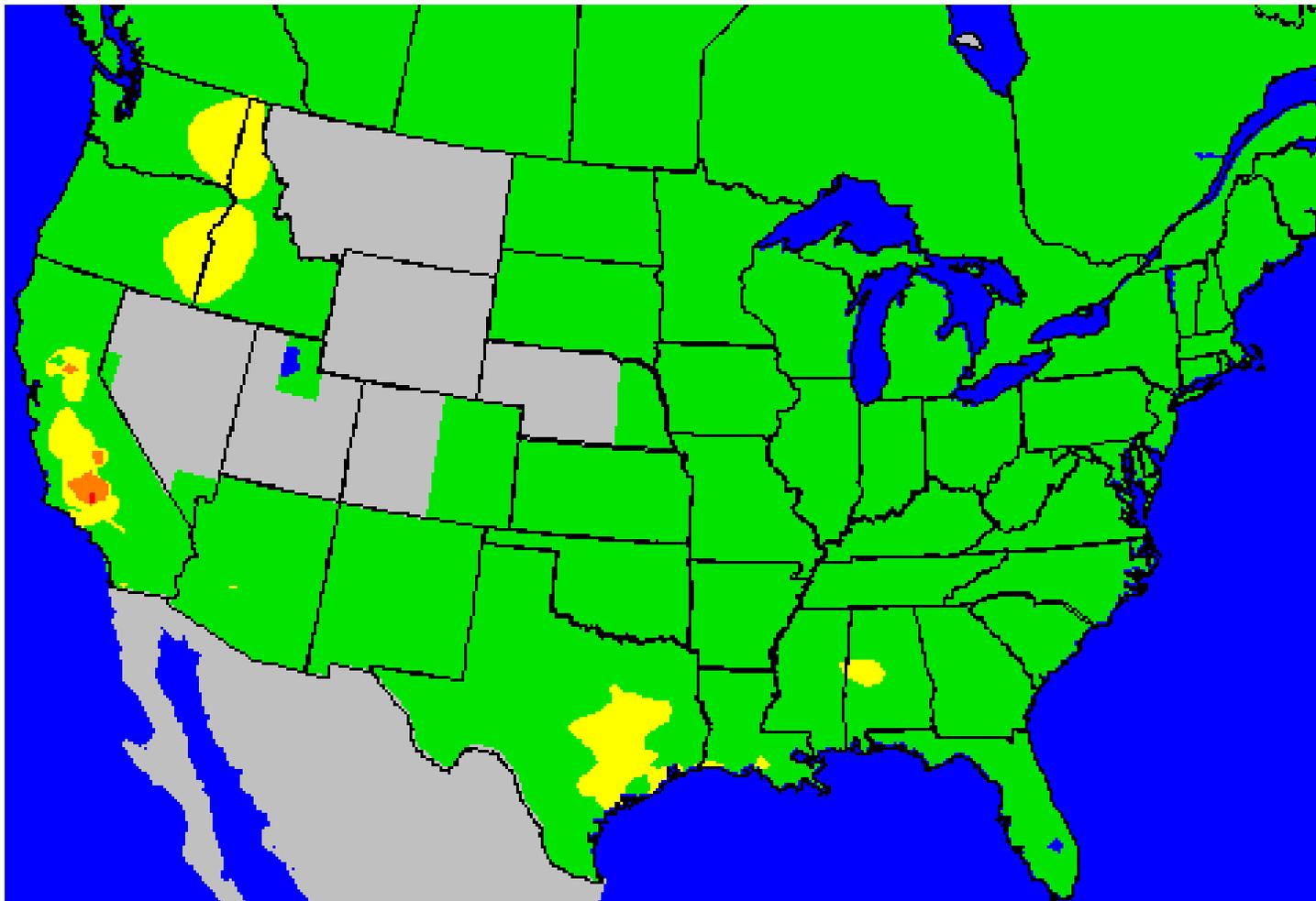
Sept. 5 - 10

Ozone: 8-Hour Peak AQI



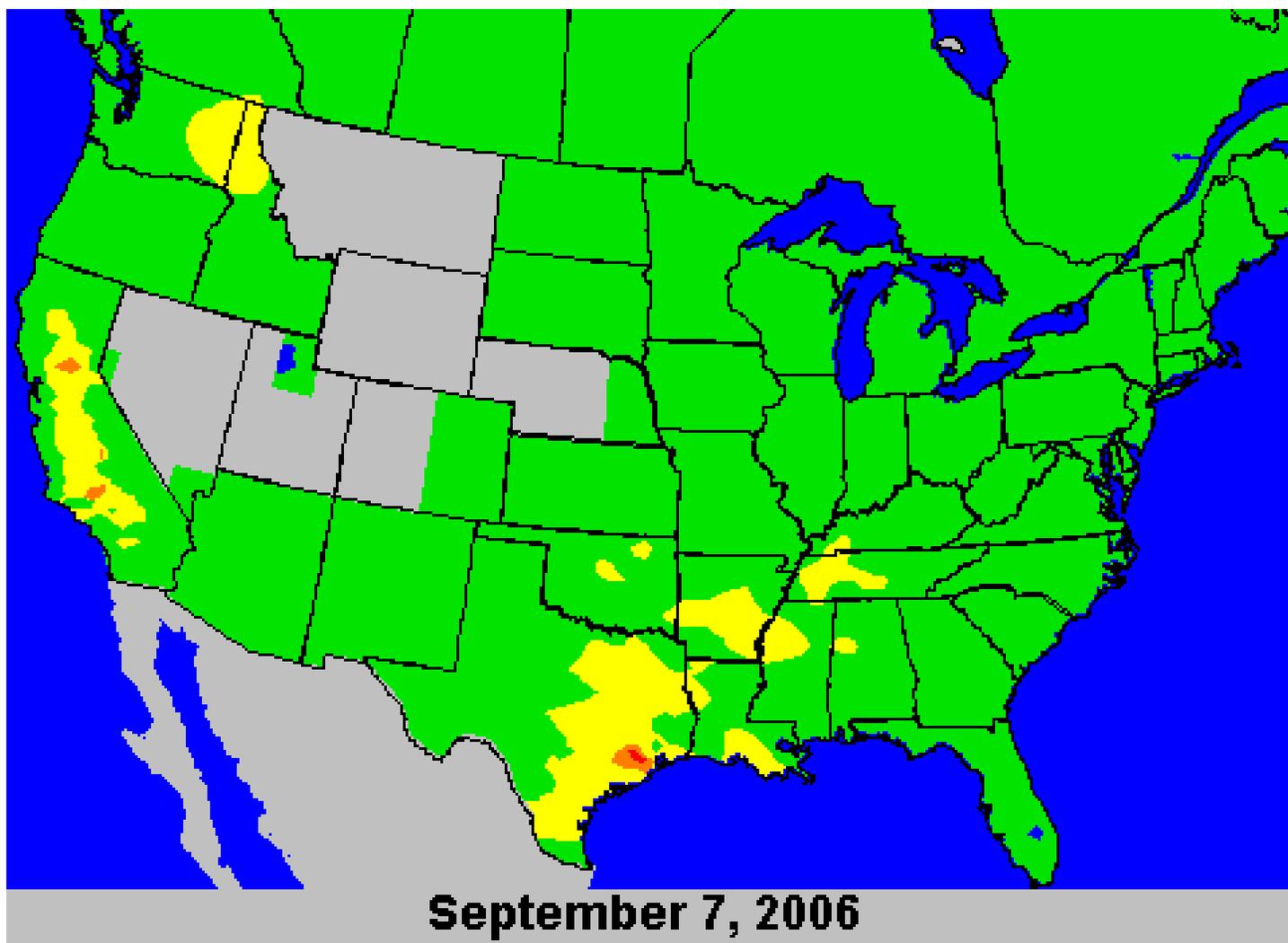
September 5, 2006

Ozone: 8-Hour Peak AQI

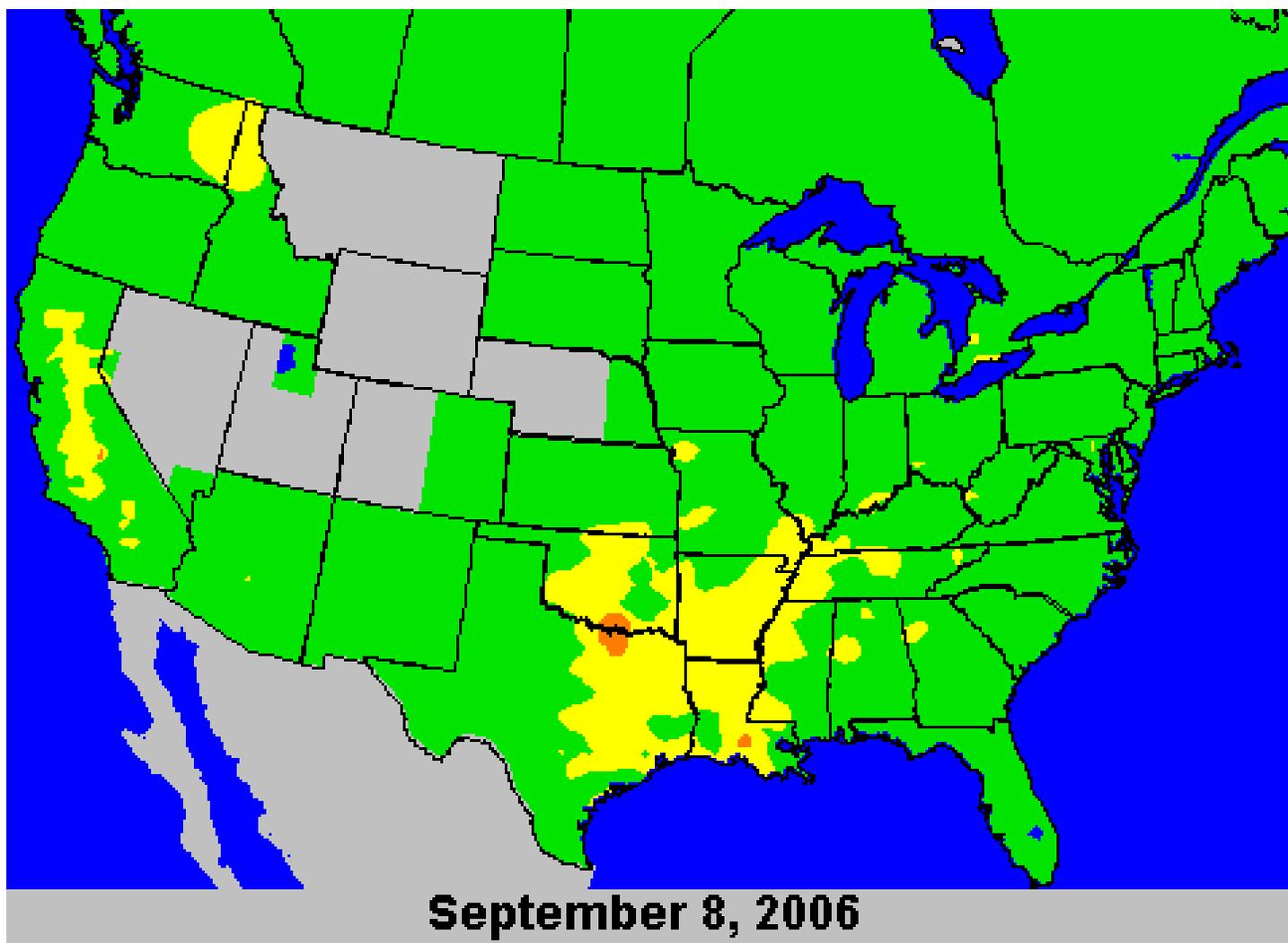


September 6, 2006

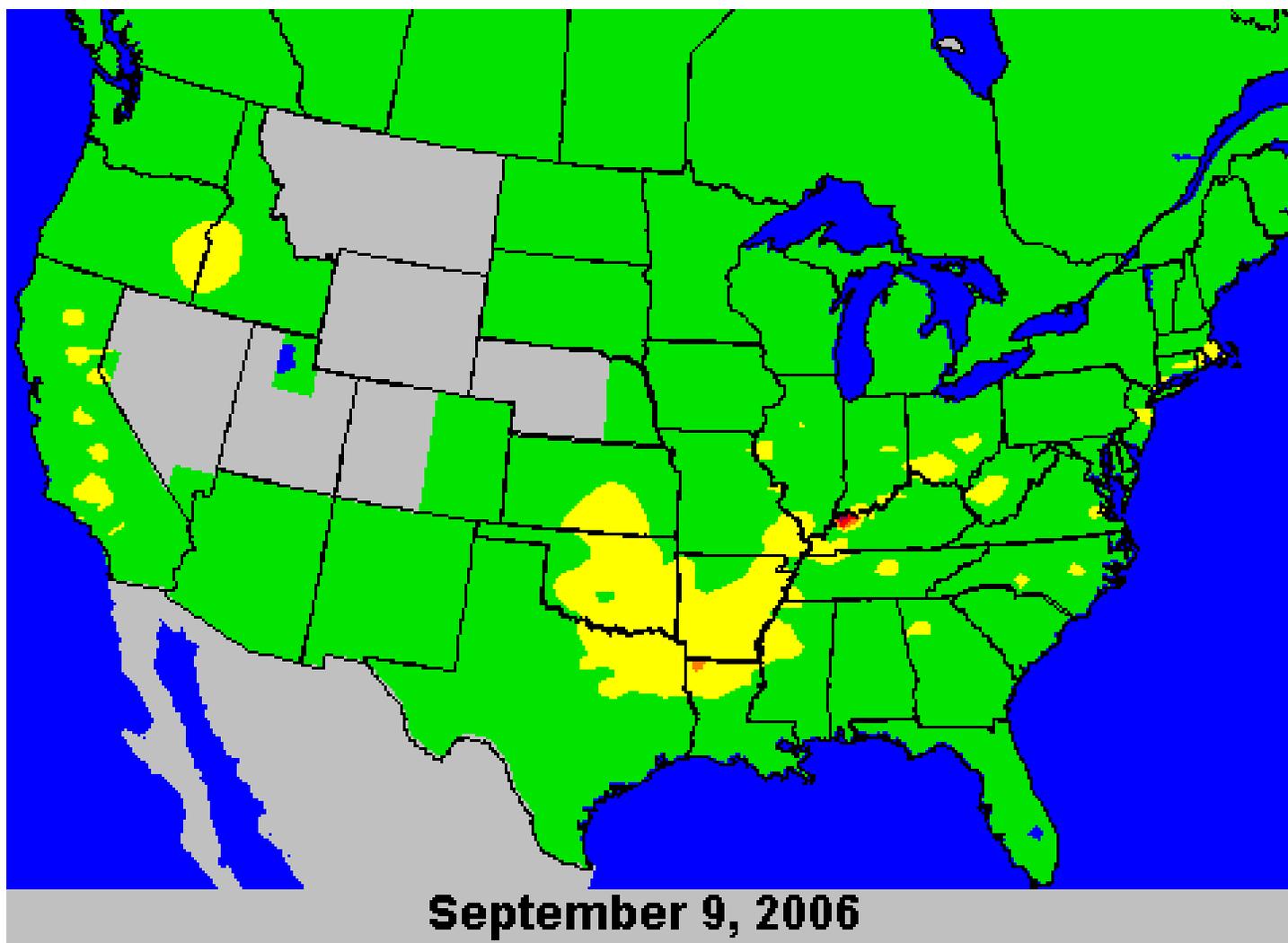
Ozone: 8-Hour Peak AQI



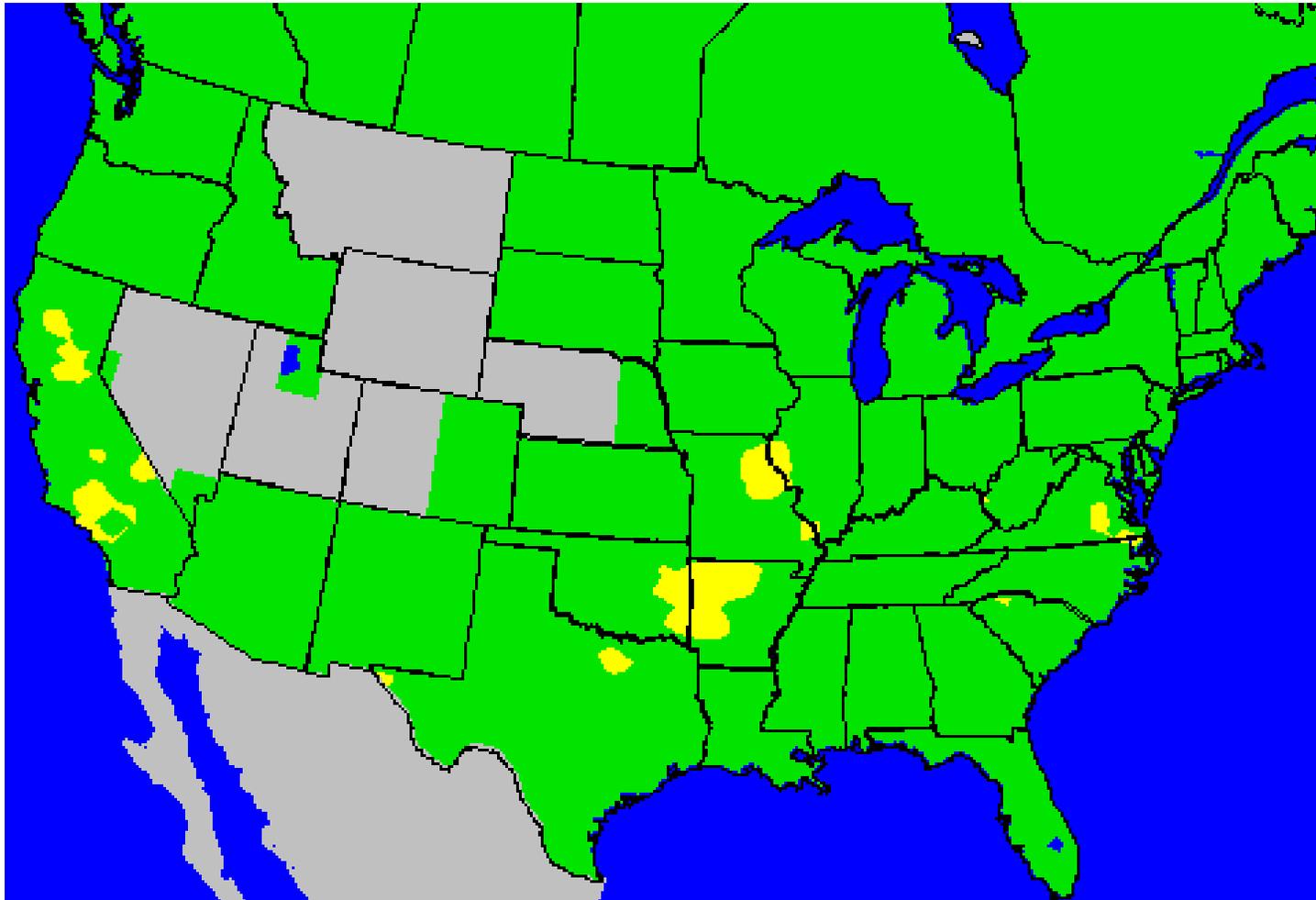
Ozone: 8-Hour Peak AQI



Ozone: 8-Hour Peak AQI

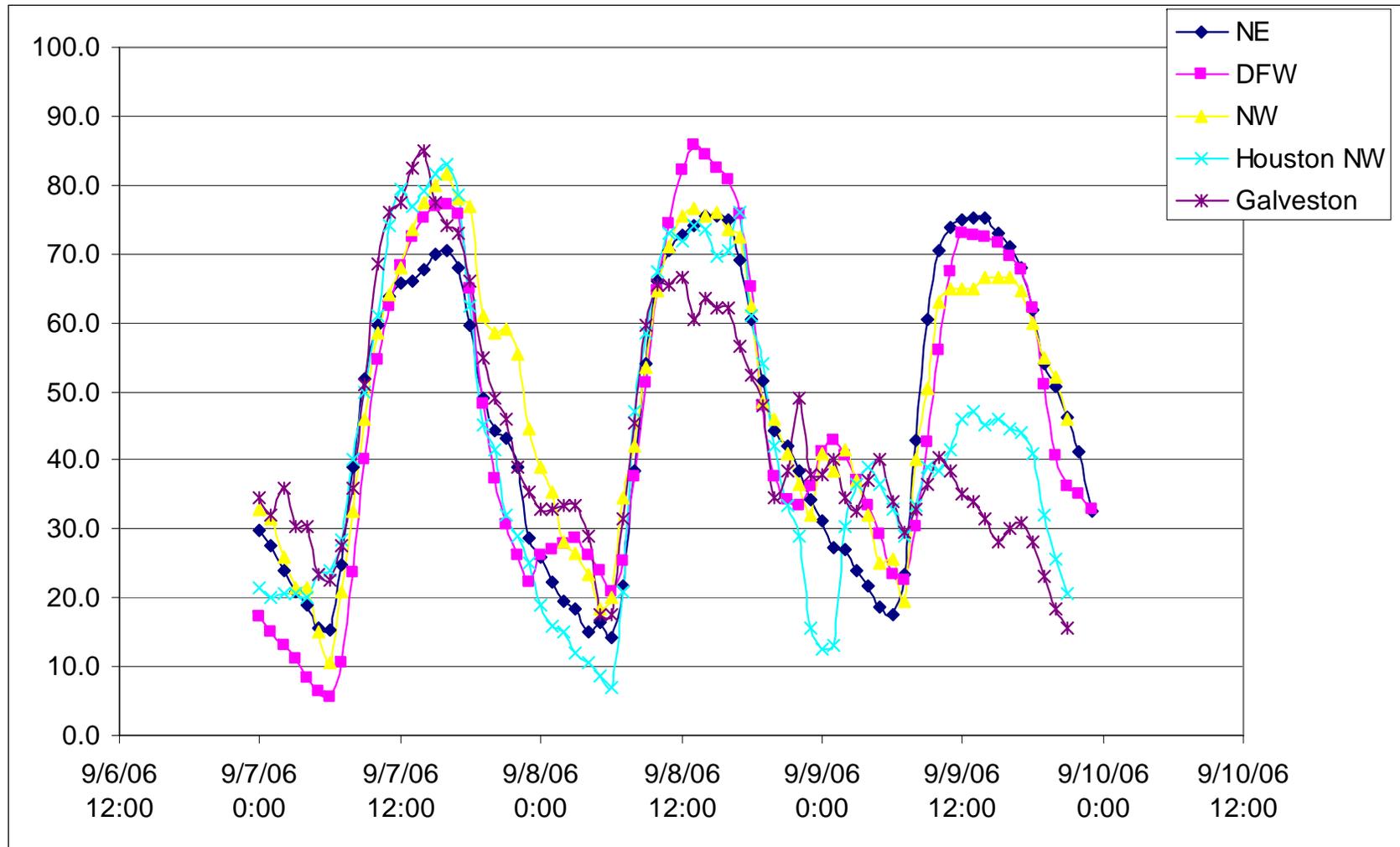


Ozone: 8-Hour Peak AQI



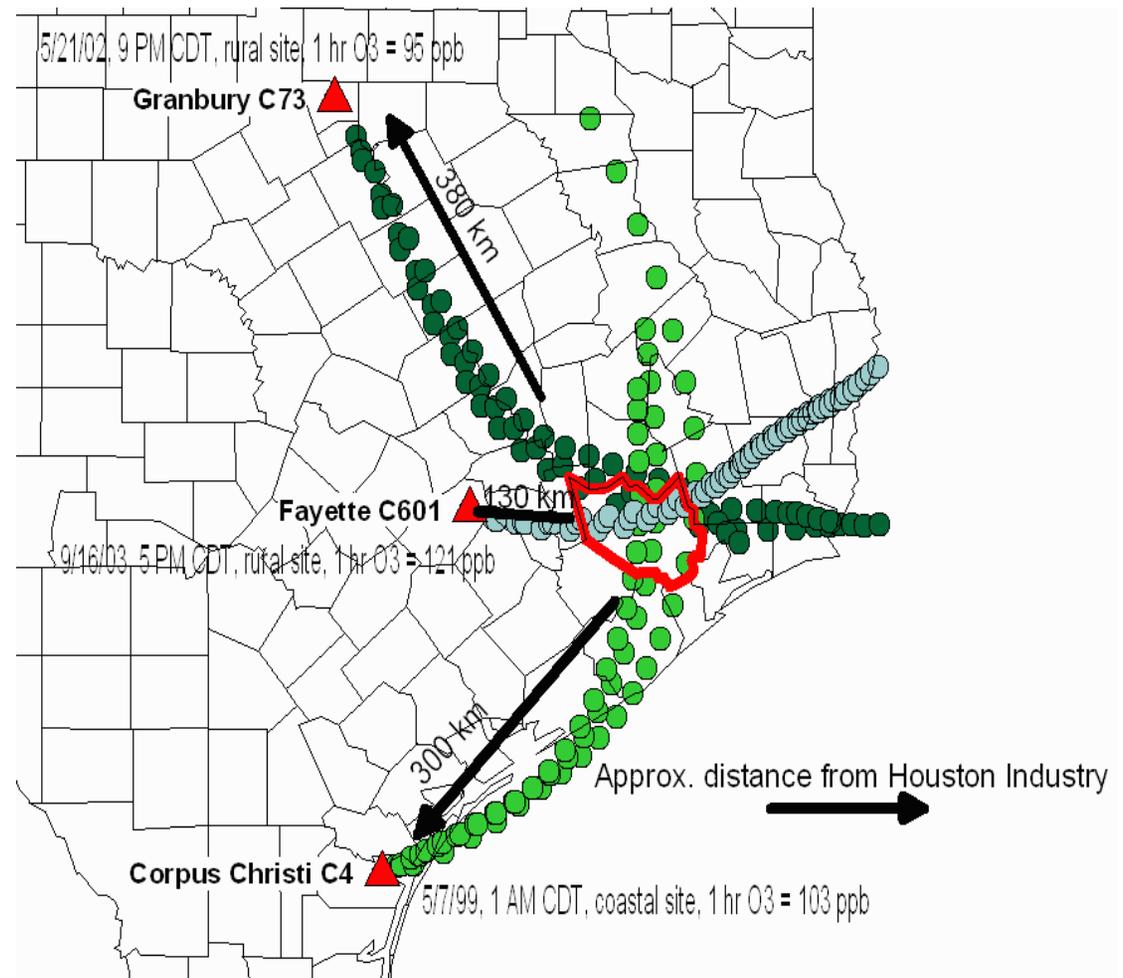
September 10, 2006

Perceived O3 movement from Ambient Monitors



Other Example of Air Pollution Transport within Texas: 3 examples

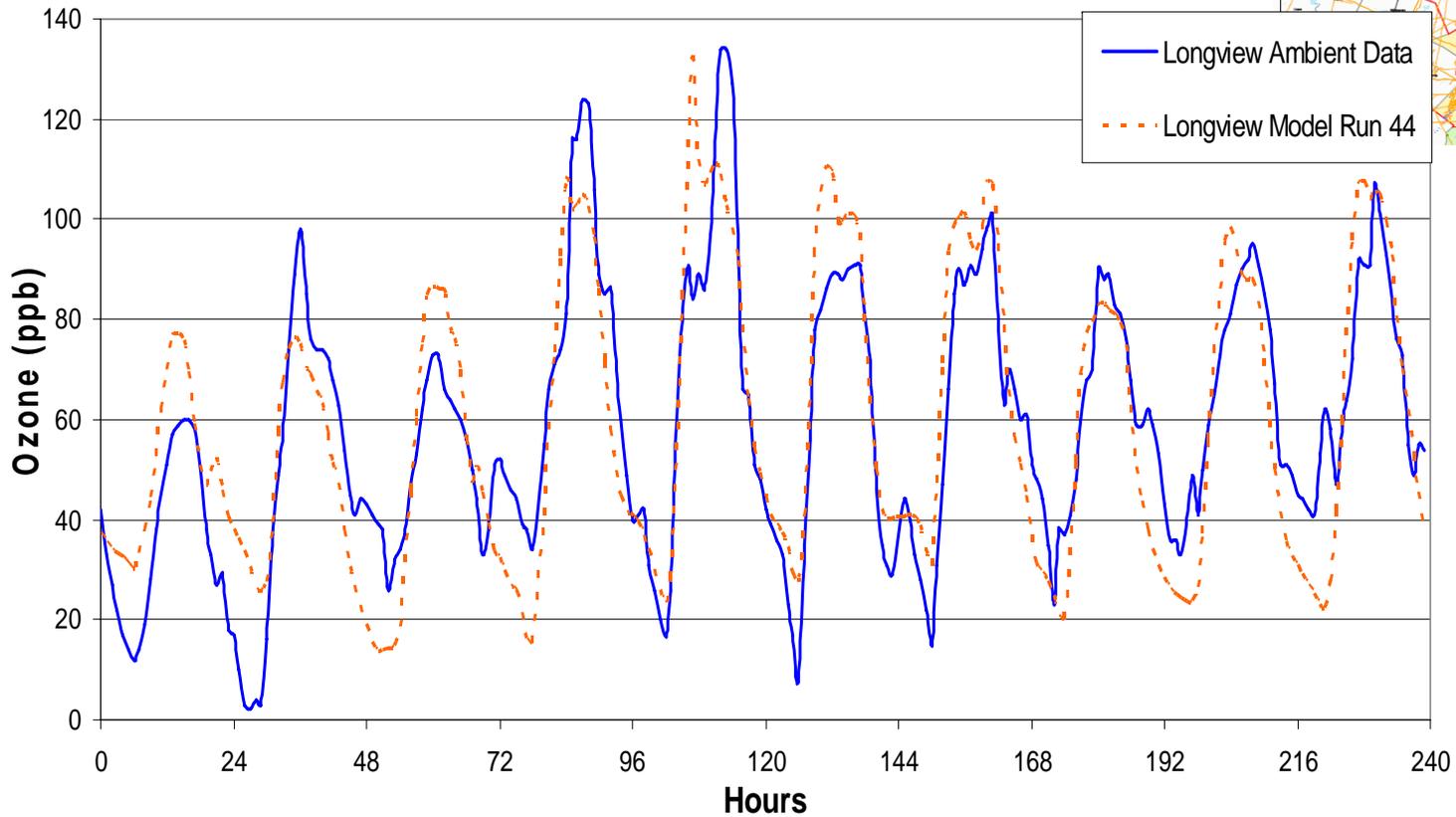
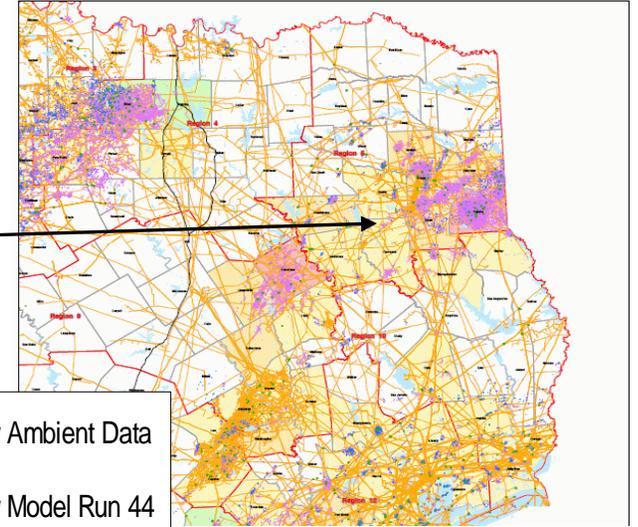
- High O₃ values at unusual times and locations – back trajectories show origin at Harris Co.
- A similar recent event occurred on May 1, 2006 - 95 ppb reading in Palestine – back trajectories also originate from Harris Co.



CAMx Results vs. Ambient Data – Longview Site

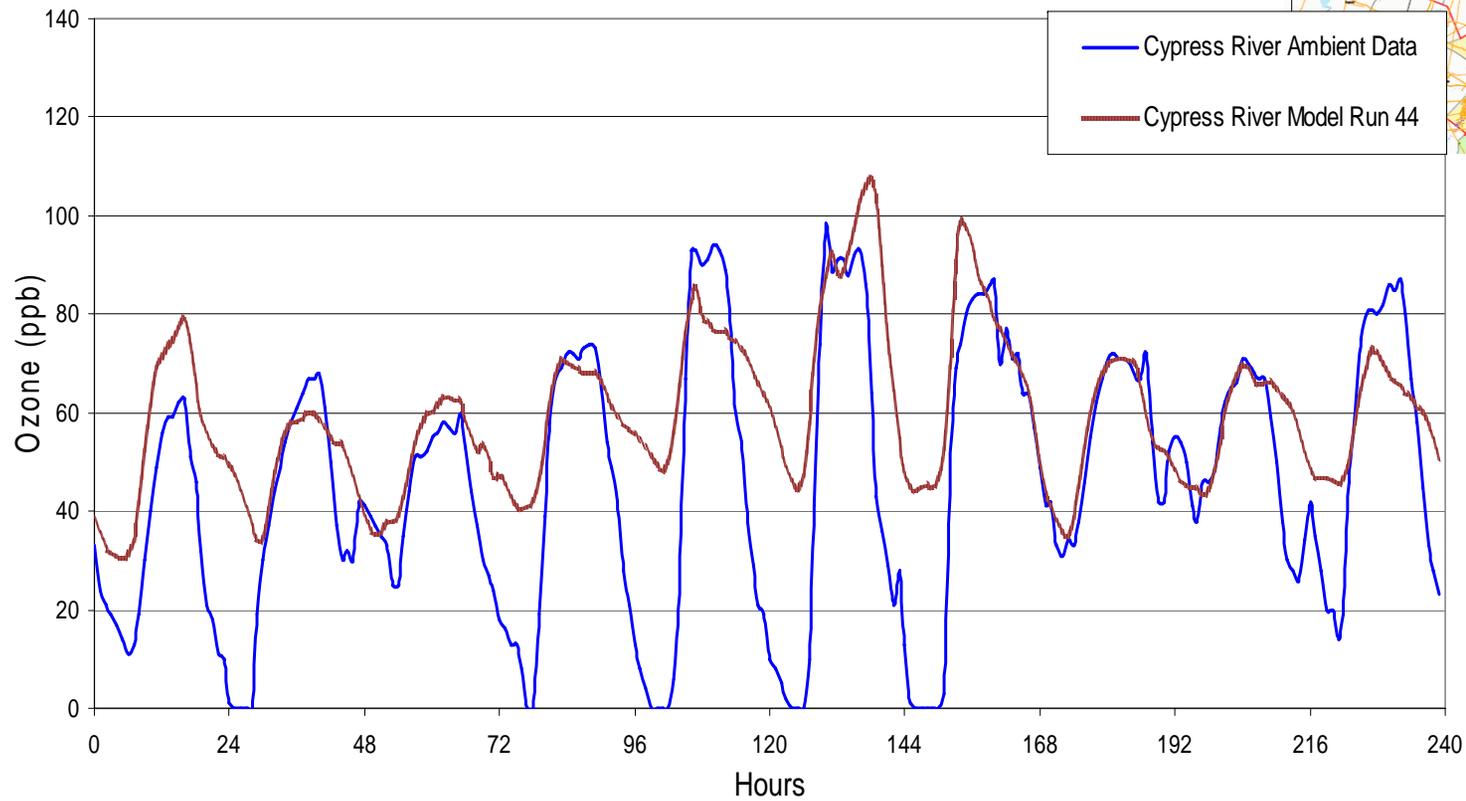
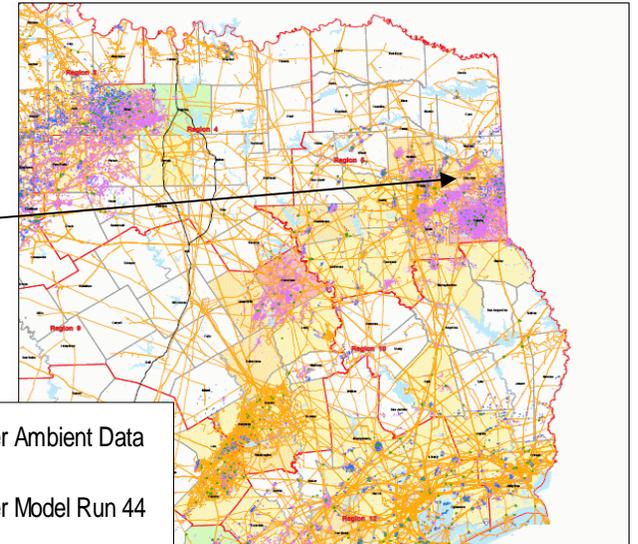
Aug. 13-22 1999

Note: Longview is not immediately in the gas production region

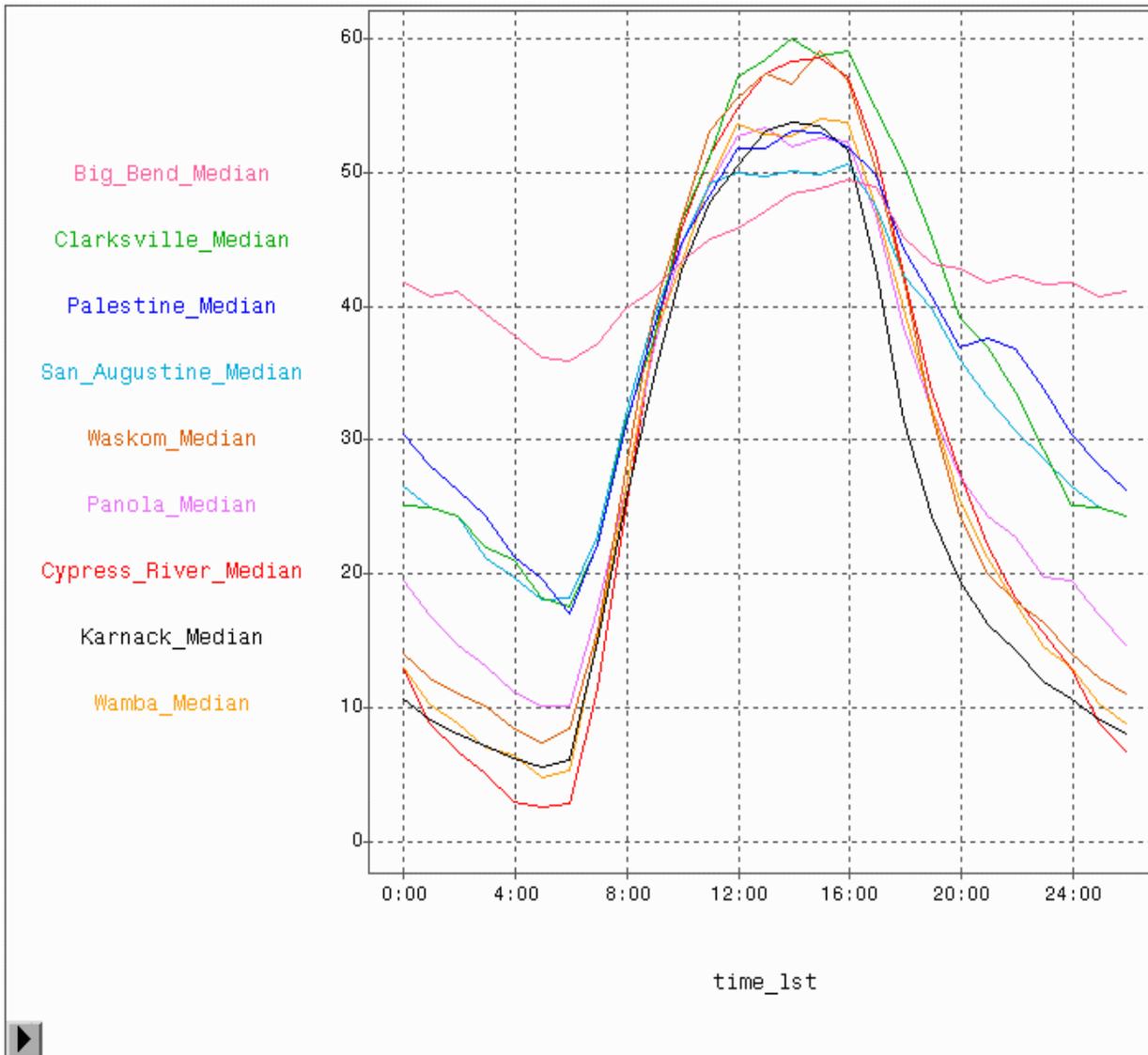


CAMx Results vs. Ambient Data – Cypress River Site Aug. 13-22 1999

Note: Cypress River is located near the gas production region



Ozone Concentration Diurnal Patterns for Rural Northeast Texas Sites and Big Bend



- Averaged over ?? recent summers

- Low nighttime ozone values with a minimum around 5 am are suspicious – too low to reflect true rural patterns

- Big Bend site represents a prototypical rural site with higher nighttime ozone values due to less NO_x titration

Conclusion

- Added rural surface sites and upper air network help show advection between cities.
- Rural sites may help uncover unknown sources.