

Attachment C

**Trajectory Analysis for the Essex Ozone Monitoring Site in
Baltimore County, Maryland**

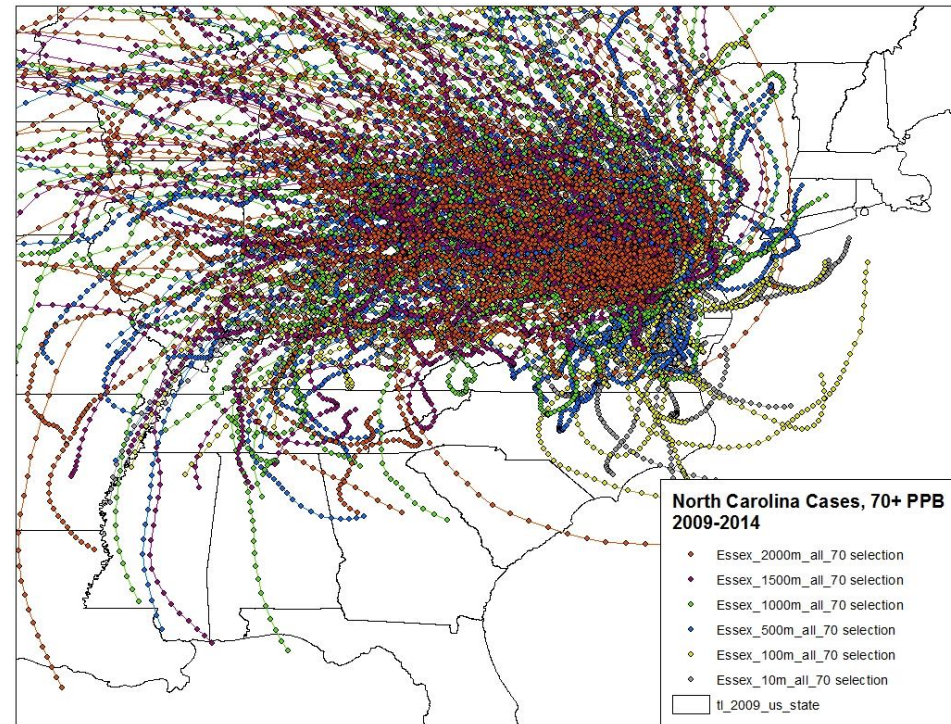
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Back Trajectory Exercise

- Back trajectories end at heights of 10m, 100m, 500m, 1000m, 1500m, and 2000m AGL at the lat/lon of the Essex MD ozone monitor site.
- Back trajectories end at 20Z (4PM EDT or 3PM EST) on the day the event occurred.
- Back trajectories were conducted for days where the daily 8-hour max. ozone value reached or exceeded 70 PPB at the Essex MD ozone monitor.
- Back trajectories go back in time 60 hours.
- Used NAM 12km data, running HYSPLIT trajectory model.
- Attempted to analyze daily ozone values at upwind sites in VA/NC on prior days where trajectories passes over or very near to a given site.
 - Utilized monitor sites in which a given trajectory passed near/over the monitor site between 17Z-23Z, in order to capture the period of highest diurnal ozone concentration.
- Used 2009-2014 data to produce list of event days.
 - No exceedances observed at Essex in 2013 or 2014.

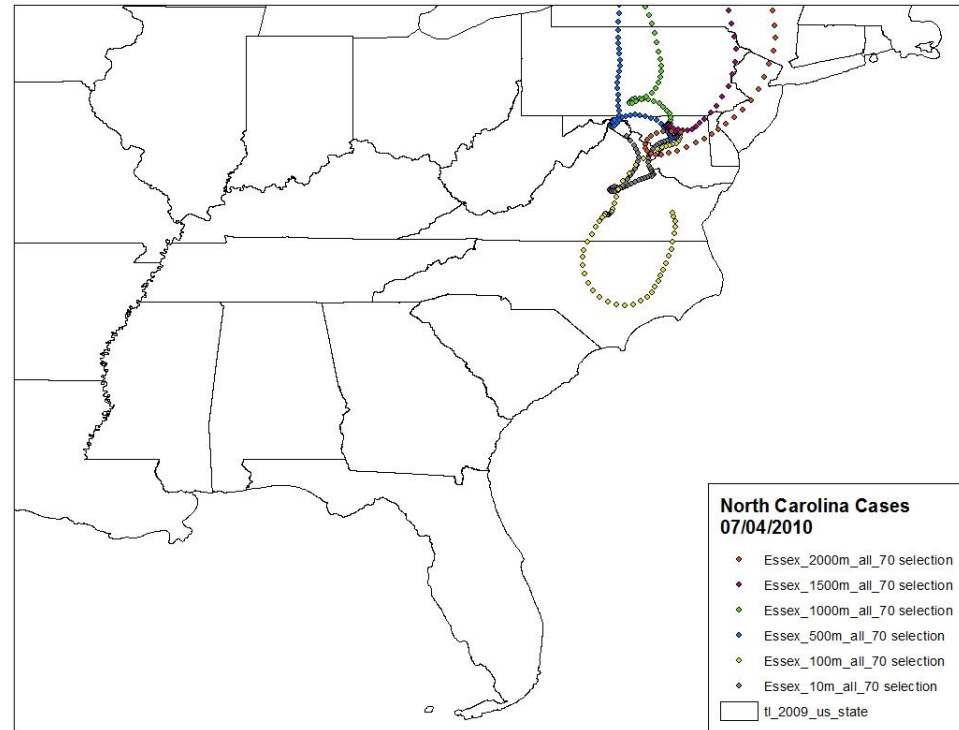
All back trajectories

- A total of 63 days were identified where the daily maximum 8-hour ozone average reached or exceeded 70 PPB at the Essex site in the state of Maryland between 2009-2014.
- Nine days were selected for additional analysis.



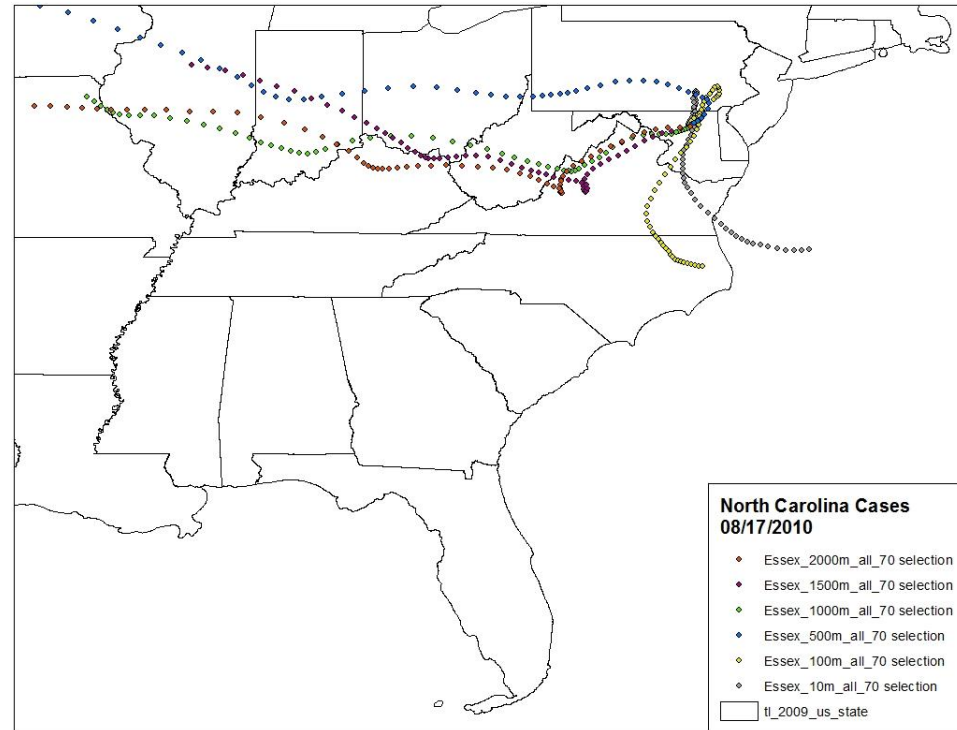
7/4/2010

- Essex: 80 PPB
- 100m trajectory
 - Across eastern NC 7/2/2010.
 - Lenoir Coll.: 55PPB
 - Castle Hayne: 52 PPB
 - Over southern VA, 7/3/2010.
 - Prince Edward VA: 52 PPB
- Re-circulating airmass over the greater DC area 7/4/2010, then moving NE over DC/95 corridor.
- No NC impact to this event.



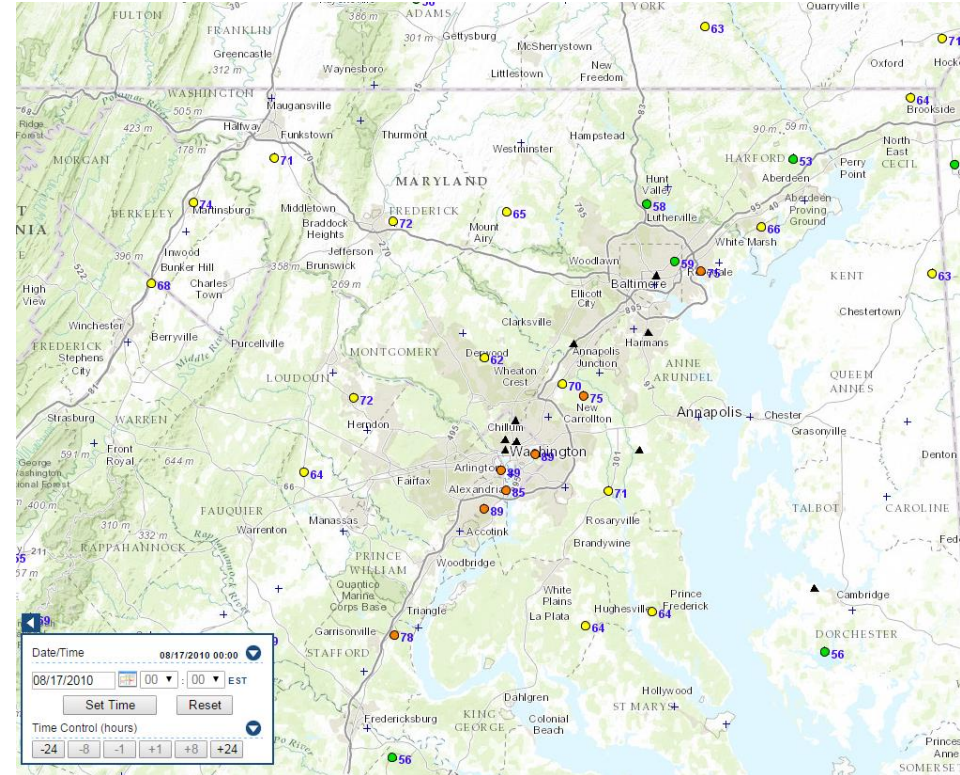
8/17/2010

- Essex: 75 PPB
- 100m trajectory
 - Across northeast NC, 8/15/2010.
 - Jamesville: 37 PPB
 - Across central/northern MD with 10m trajectory 8/16/2010.
 - Edgewood MD: 62 PPB
 - Aldino MD: 57 PPB
 - Re-circulated across southeastern PA then south across DC/MD area 8/17/2010.
 - Higher values downwind over DC Metro and NE VA.
 - Franconia VA: 89 PPB
- Little or no NC contribution likely.



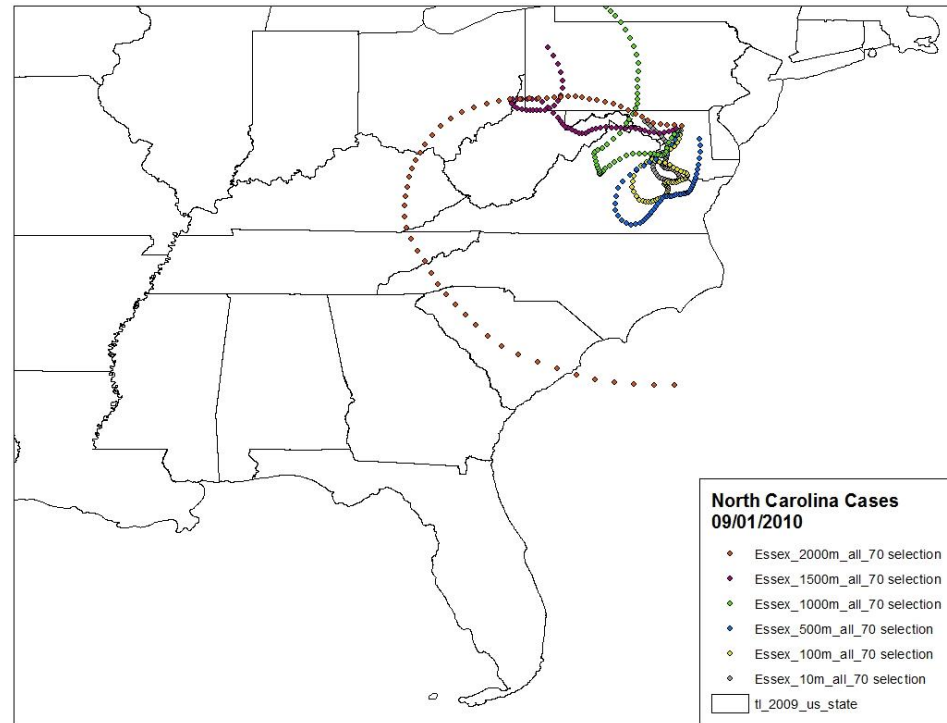
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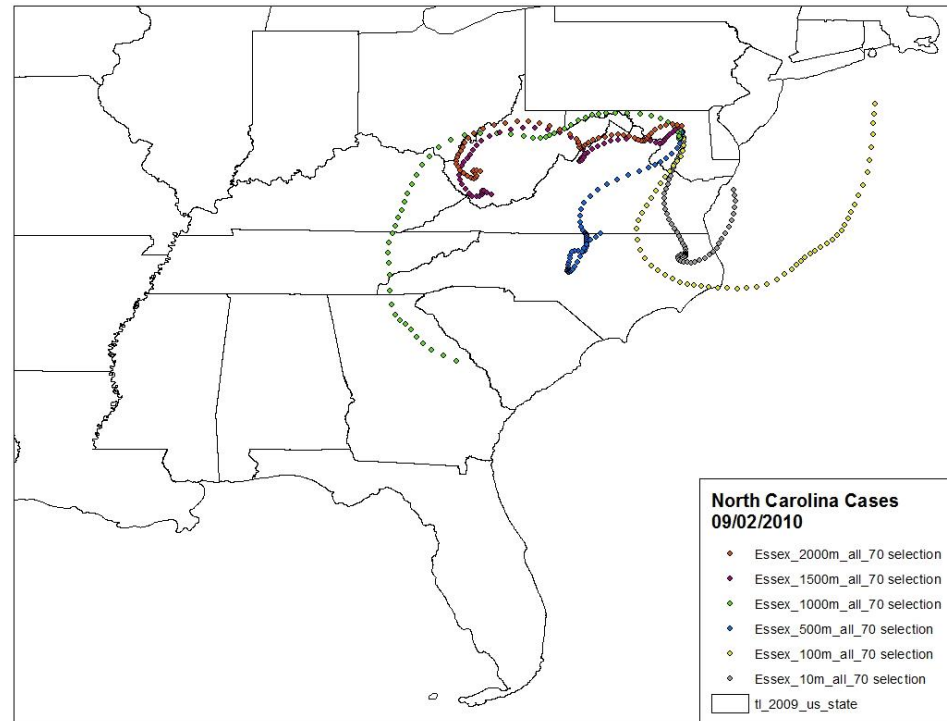
9/1/2010

- Essex: 78 PPB
- Back trajectories traversed across mountainous and rural areas of NC, 8/30/2010.
 - Mt. Mitchell, NC: 50 PPB
 - Frying Pan, NC: 53 PPB
 - Purchase Knob, NC: 49 PPB
- As with 8/30/2010, very light 10m winds remained over or near Maryland throughout 60 hour back trajectory period.
- No NC contribution to this event.



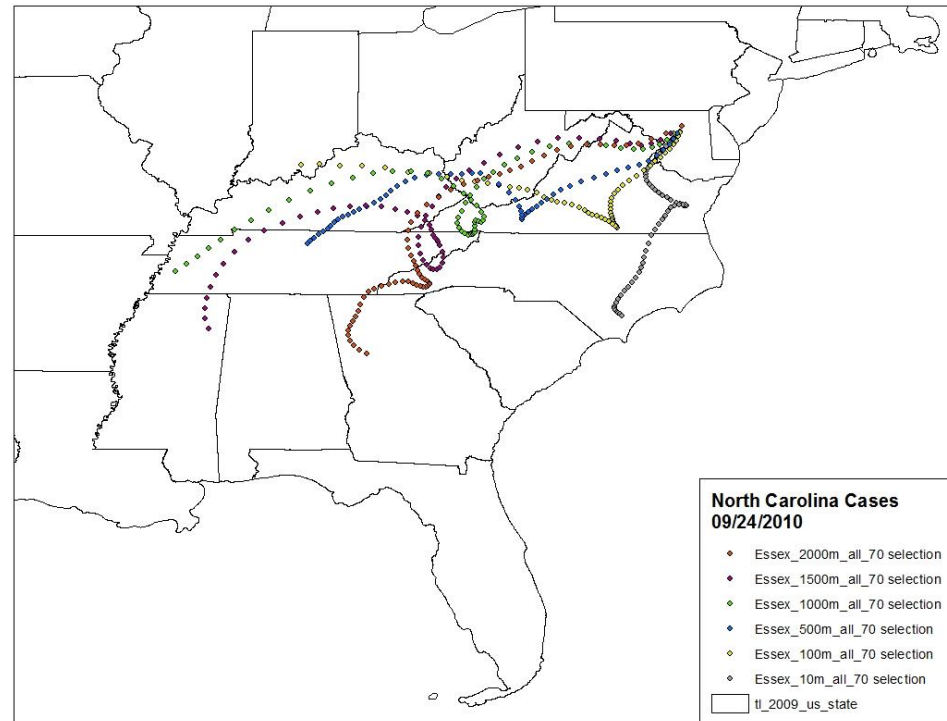
9/2/2010

- Essex: 71 PPB
- Regional high-ozone outbreak along East Coast, 8/29/2010-9/2/2010
- 10m trajectory
 - Across far-northeast NC 9/1/2010
 - Holland VA: 61 PPB
- 100m trajectory
 - Across northeastern NC 9/1/2010
 - Leggett NC: 61 PPB
 - Jamesville NC: 61 PPB
- 500m trajectory
 - Re-circulating over northern/central NC 8/31/2010-9/1/2010
 - Pittsboro NC, 8/31/2010: 73 PPB
 - Bushy Fort NC, 9/1/2010: 69 PPB
- 1000m trajectory
 - Over NC/TN Mountains, 8/31/2010
 - Look Rock GSM TN: 62 PPB
 - Over WV/W MD highlands 9/1/2010
 - Piney Run MD: 68 PPB
- Highest O3 values generally north/west of Baltimore/DC metros, 9/2/2010
 - Padonia MD: 92 PPB
 - Rockville MD: 81 PPB
- Some NC contribution possible, but high O3 values elsewhere indicate broader polluted airmass across Eastern U.S.



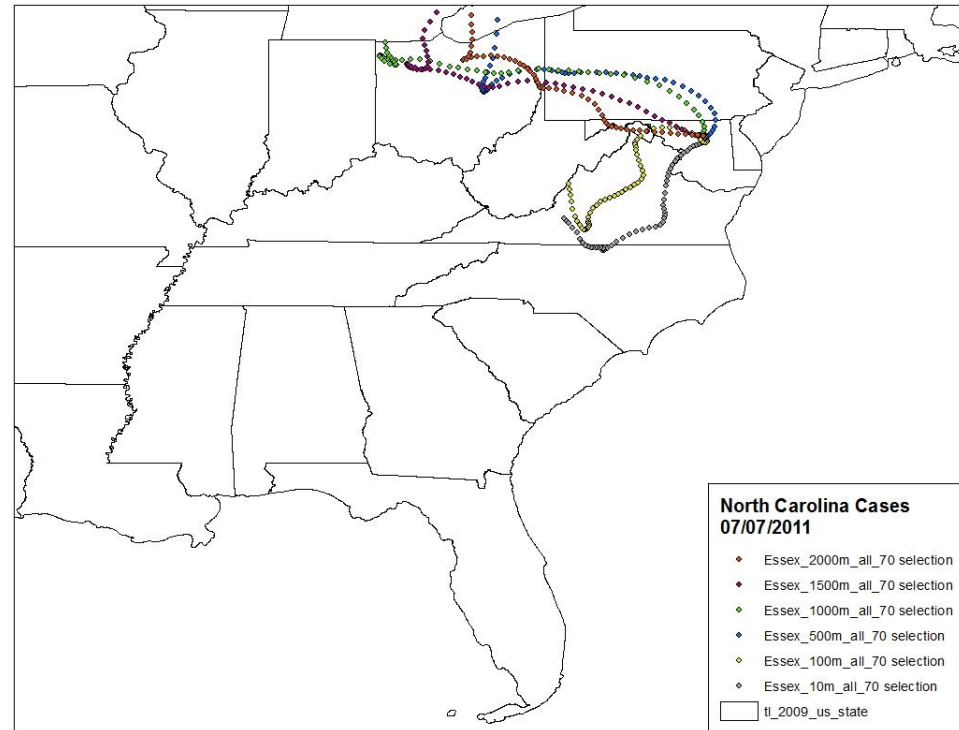
9/24/2010

- Essex: 75 PPB
- 10m trajectory
 - Across eastern NC, 9/22/2010
 - Farmville NC: 54 PPB
 - Recirculating over VA Tidewater, 9/23/2010
 - Hampton VA: 72 PPB
- 1500m trajectory
 - Over NC Mountains, 9/23/2010
 - Purchase Knob NC: 50 PPB
- 2000m trajectory
 - Over southern NC Mountains, 9/22/2010
 - Afternoon/evening values in the mid-50s PPB
 - Over TN/KY/VA border, 9/23/2010
 - Cumberland Gap, KY: 62 PPB
 - HAZ2 site, KY: 51 PPB



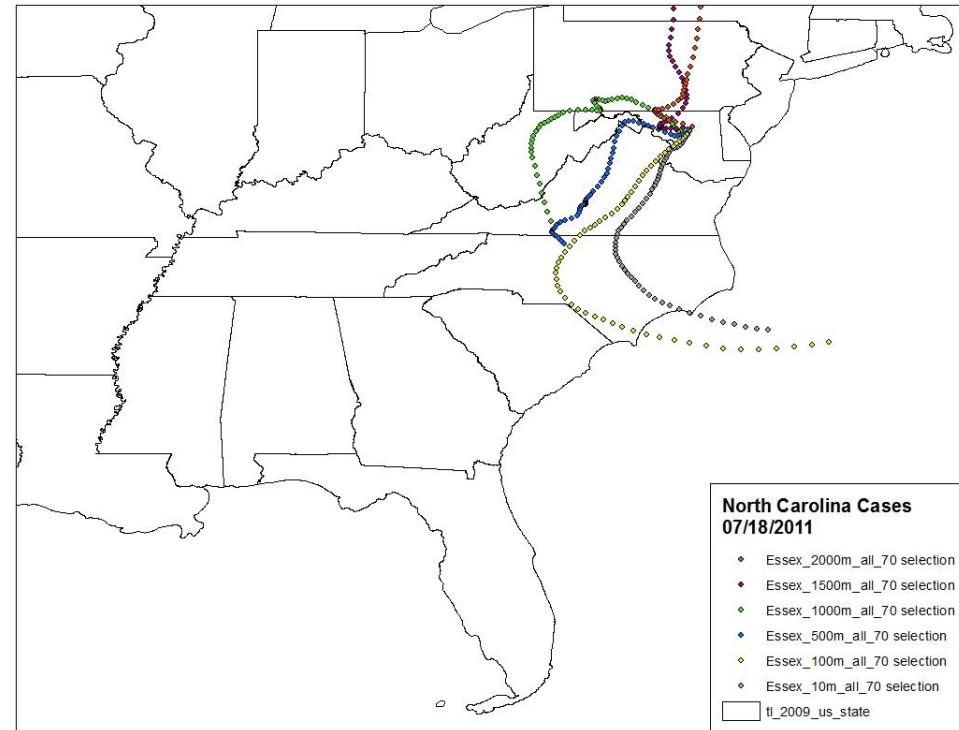
7/7/2011

- Essex: 85 PPB
- 10m back trajectory start in northern NC.
- Upwind sites:
 - Richmond VA area, 7/6/2011:
 - Math & Sci. Ctr.: 32 PPB
 - Beach Rd.: 42 PPB
 - KRIC:
Rain/Thunderstorms 16-21Z
 - [Satellite Imagery](#)
 - Triangle Region NC 7/5/2011:
 - Millbrook: 64 PPB
 - Franklinton: 55 PPB



7/18/2011

- Essex: 71 PPB
- 10m trajectory
 - Across eastern/northeastern NC, 7/16/11.
 - Lenoir Coll.: 37 PPB
 - Across Richmond VA area, 7/17/11
 - Beach Rd: 33 PPB
 - Math & Sci. Cntr: 37 PPB
- 100m trajectory
 - Across southeastern NC, 7/16/11.
 - Castle Hayne: 38 PPB
 - Across south-central VA, 7/17/11
 - Prince Edward VA: 38 PPB
- 500m trajectory
 - Starts over north-central NC, over southern VA 7/16/11, then over northern VA 7/17/11.
 - Shenandoah NP, 7/17/11: 45 PPB
- Code Orange readings upwind of DC and Baltimore, 7/18/11.
- No NC impact to this event.



8/20/2011

- Essex: 71 PPB
- 10m & 100m trajectories
 - Across eastern NC, 8/18/11.
 - Beaufort NC: 63 PPB
 - Across central/eastern MD, 8/19/11
 - Blackwater NWR MD: 51 PPB
 - Davidsonville MD: 53 PPB
 - Beltsville MD: 73 PPB
 - Re-circulated over central MD, 8/19/11-8/20/11.
 - Code Yellow ozone across all of MD.
- No NC impact to this event.

