



# Modeling Area + Nonroad Inventories

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## **DFW Technical Committee Meeting**

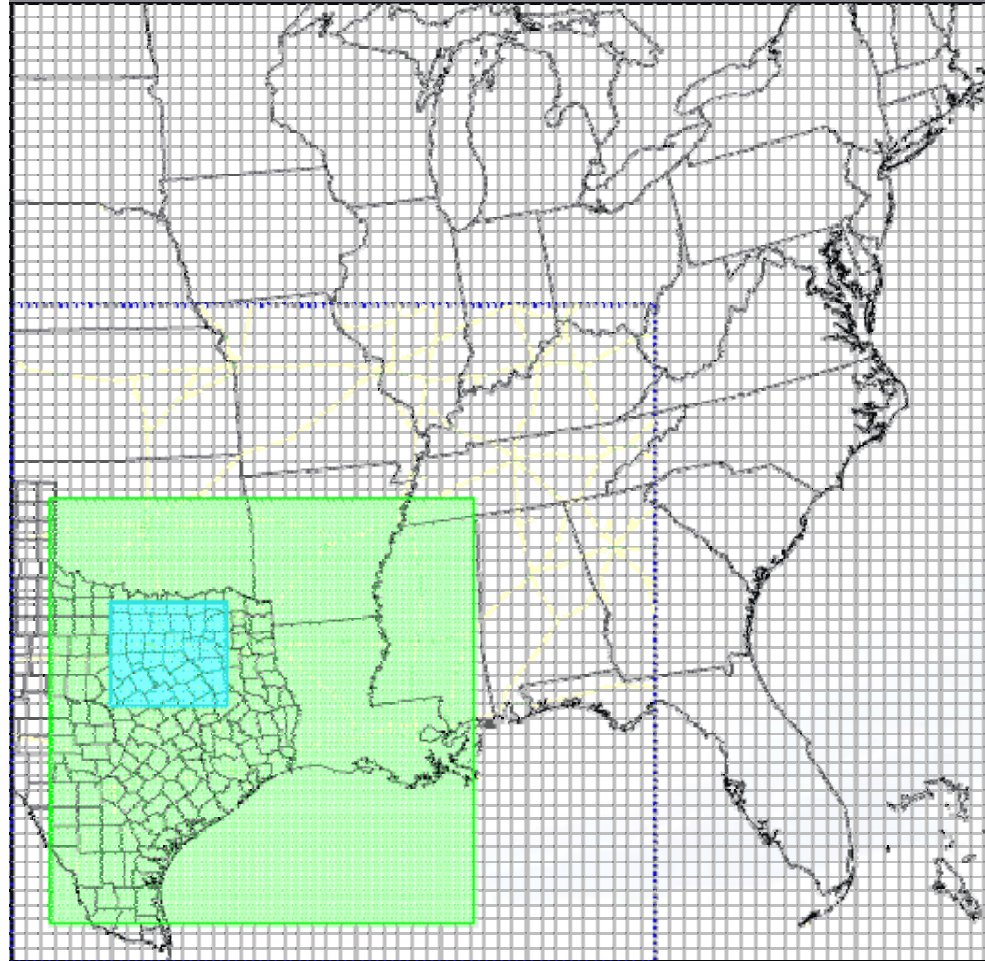
Jim MacKay

Air Quality Planning and Implementation Division

About 30 slides 05 May 2005



# Modeling Domain



Regional (Phase II)

Regional (Phase I)

East Texas

DFW



# EI Modeling Requirements

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- Hourly Emissions Data
- Spatially Allocated
- Temporally Allocated
- Chemically Allocated (Speciated)
  - CB-IV
  - SAPRC



# Sources of Modeling Data

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- Area Sources – TCEQ EI / NCTCOG
- NONROAD – TCEQ EI / NCTCOG
- NON-NONROAD Nonroad – TCEQ EI / NCTCOG / OTHER
- Offshore (MMS)
- Regional (NEI)
- Mexico (BRAVO)



# Sources of Modeling Data

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- 1999 PEI
  - Updated surveys
    - Shipping
    - Construction
    - Lawn & garden
    - Locomotives
    - Recreational boating
- NONROAD2002a model
- Ships as pseudo-points (HG)
- Wildfires as pseudo-points (HG)



# AMS Records

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- AMS (Area/Mobile Source) ASCII Records
- One record for each ASC/County/Pollutant
- Pollutants:
  - NO<sub>x</sub>
  - VOC
  - CO
- Emission Rate
  - Ozone-Season Daily (tons/day)
  - Ozone-Season Total (3 month tons)
- AFS - points (AIRS Facility Subsystem )



# AMS Records

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- Example Records (post SAS, Excel, Perl, etc.)

B09	AC48121	2270002021	PO	00082200	00083100	42101	0.003095
B09	AC48121	2270002021	PO	00082200	00083100	42603	0.005540
B09	AC48121	2270002021	PO	00082200	00083100	43104	0.000555
B09	AC48121	2270002024	PO	00082200	00083100	42101	0.117616
B09	AC48121	2270002024	PO	00082200	00083100	42603	0.241412
B09	AC48121	2270002024	PO	00082200	00083100	43104	0.017684

*...exciting isn't it ...*





# Modeling Inventory QA

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- Split AMS Records into Categories that make a little sense using PERL scripts
  - Area: a bunch of those
  - Nonroad: a bunch of those
- Process through EPS3 (big loop)
- Produce a mini-model-ready file for a bunch of categories





# EPS

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- Emissions Preprocessing System
- Allocates Emissions
  - Spatially
    - Assign low-level emissions to specific grid cells
    - Elevated emissions maintains geographic locale
  - Temporally
    - Convert daily emissions into hourly
  - Chemically
    - Break total VOC and NO<sub>x</sub> into species families using a chemical mechanism (CB-IV, SAPRC)
- Improved Periodically by Contractor (now EPS3)



# Temporal Allocation

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- Temporal Cross-Reference assigns a Monthly, Weekly, Daily to ASC County Combinations
- Each record assigned a temporal profile
  - Example: lots of Rec. Boating on Weekends less during the weekdays
- QA
  - Tileplots
  - Summaries



# Spatial Allocation

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- Surrogates – use best available
  - From GIS
  - 01\_km, 02\_km, 04\_km, 12\_km resolution
- Examples:
  - Residential (Residential Lawn + Garden)
  - Commercial /Residential (Lawn + Garden)
  - Oil and Gas well density (yep, Oil and Gas)
  - Rail Roads (Locomotives, RR Maintenance)
  - Water (Rec. Boating)



# DFW Draft Non-Road by2000 Summary

DFW00_b5 9 Co Total avg. osd	DFW 2000 Non-Road Mobile NOx (tons/day)	DFW 2000 Non-Road Mobile VOC (tons/day)
Agriculture	4.3	0.65
Aircraft	14.75	2.72
Commercial	7.39	9.99
Construction	49.86	9.4
GSE	2.13	0.69
Industrial	18.62	4.63
Commercial Lawn+Garden	1.69	12.87
Residential Lawn+Garden	1.5	13.32
RR Maintenance	0.14	0.04
Logging	0.09	0.05
Locomotives	22.57	0.91
Oil+Gas	5.68	1.47
Recreational Equipment	0.29	4.89
Recreational Boating	0.41	8.69
	129.42	70.32

Brand new \***DRAFT**\* data – 2nd people to see it (Jim MacKay was 1<sup>st</sup>)



# Future Case Modeling Data

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- NONROAD Model
- TCEQ Rules
  - Chs. 115, 117, 101 (Policy, Modelers)
- TERP (Policy, Modelers)
- EGAS (TCEQ EI)



# Area and Nonroad Growth

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- Area Sources
  - EGAS4 (Economic Growth Analysis System v4)
    - EPA default
    - 1996 base year
  - REMI-EGAS
    - Regional Economic Modeling, Inc.
    - Texas region-specific economic data
  - EGAS5
    - Coming soon
    - 2002 base year
    - To be updated with new REMI model for future
  - Construction of new LNG facilities
- NONROAD Sources
  - Rerun the NONROAD model for future year
  - EGAS built into NONROAD model



# Proposed New REMI

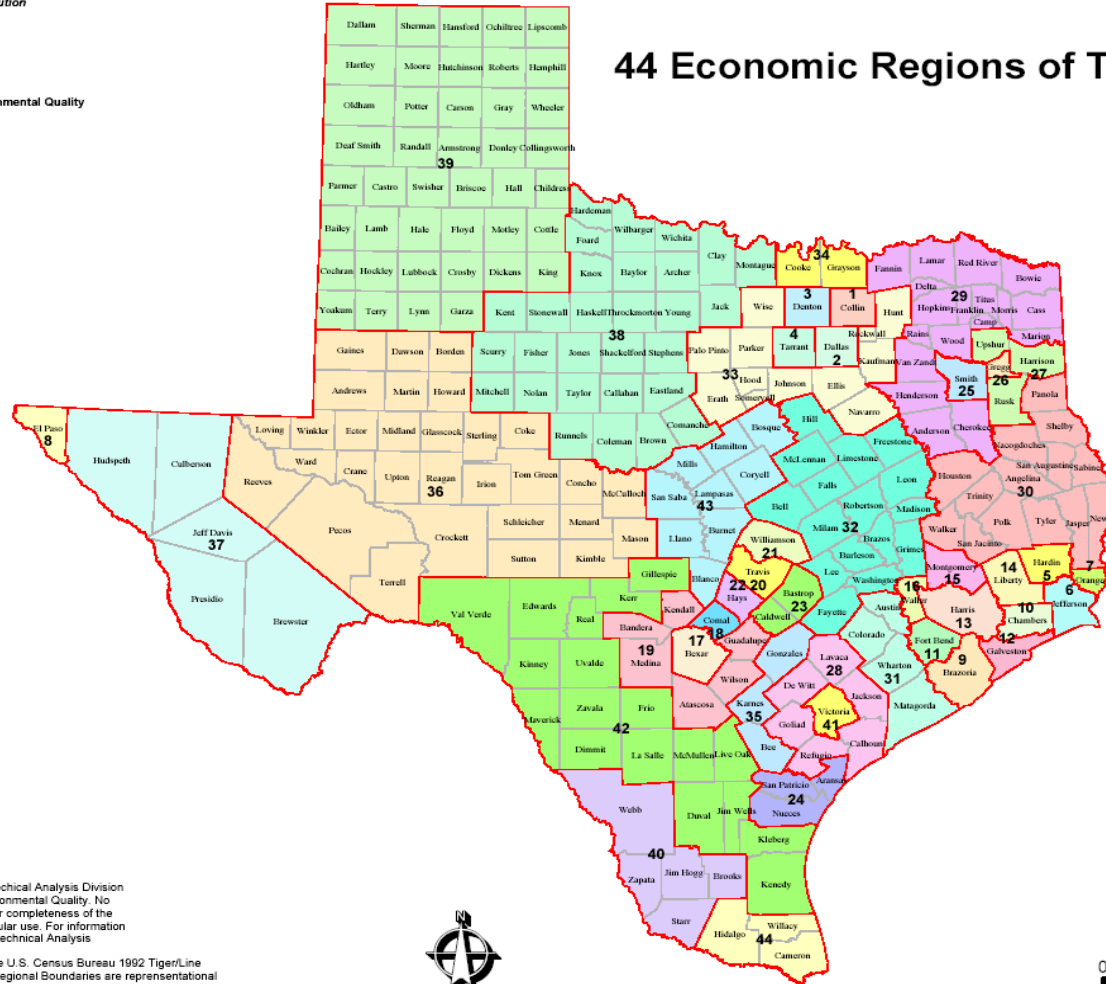


Protecting Texas by  
Reducing and  
Preventing Pollution

**TCEQ**

Texas Commission on Environmental Quality  
Technical Analysis Division  
PO Box 13087 (Mail Code 164)  
Austin, Texas 78711-3087

## 44 Economic Regions of Texas



This map was generated by the Technical Analysis Division of the Texas Commission on Environmental Quality. No claims are made to the accuracy or completeness of the data or to the suitability for a particular use. For information concerning this map, contact the Technical Analysis Division at (512) 239-1459.

Source: The county boundaries are U.S. Census Bureau 1992 Tiger/Line data (1:100,000). The Economic Regional Boundaries are representational and any and all questions on these should be directed to Stephen P. Anderson P.E. at the TCEQ - TAD 512-239-1246

June 23, 2004 Raj Nadkarni



1:6,229,052





# DFW DRAFT fy2009 Non-Road Summary

<b>DFW09_b5 9 Co Total</b>	<b>DFW 2009 Non-Road Mobile</b>	<b>DFW 2009 Non-Road Mobile</b>
avg. osd	<b>NOx (tons/day)</b>	<b>VOC (tons/day)</b>
Agriculture	3.72	0.42
Aircraft	21.01	3.87
Commercial	7.19	6.43
Construction	40.17	5.68
GSE	3.04	0.98
Industrial	10.95	2.19
Commercial Lawn+Garden	1.86	5.76
Residential Lawn+Garden	1.36	7.91
RR Maintenance	0.14	0.03
Logging	0.05	0.03
Locomotives	26.81	1.08
Oil+Gas	2.96	0.77
Recreational Equipment	0.33	8.75
Recreational Boating	0.63	4.92
	<b>120.22</b>	<b>48.82</b>

Brand new \***DRAFT**\* data – 2nd people to see it (Jim MacKay was 1<sup>st</sup>)



## DFW DRAFT 2009 Area Source Summary

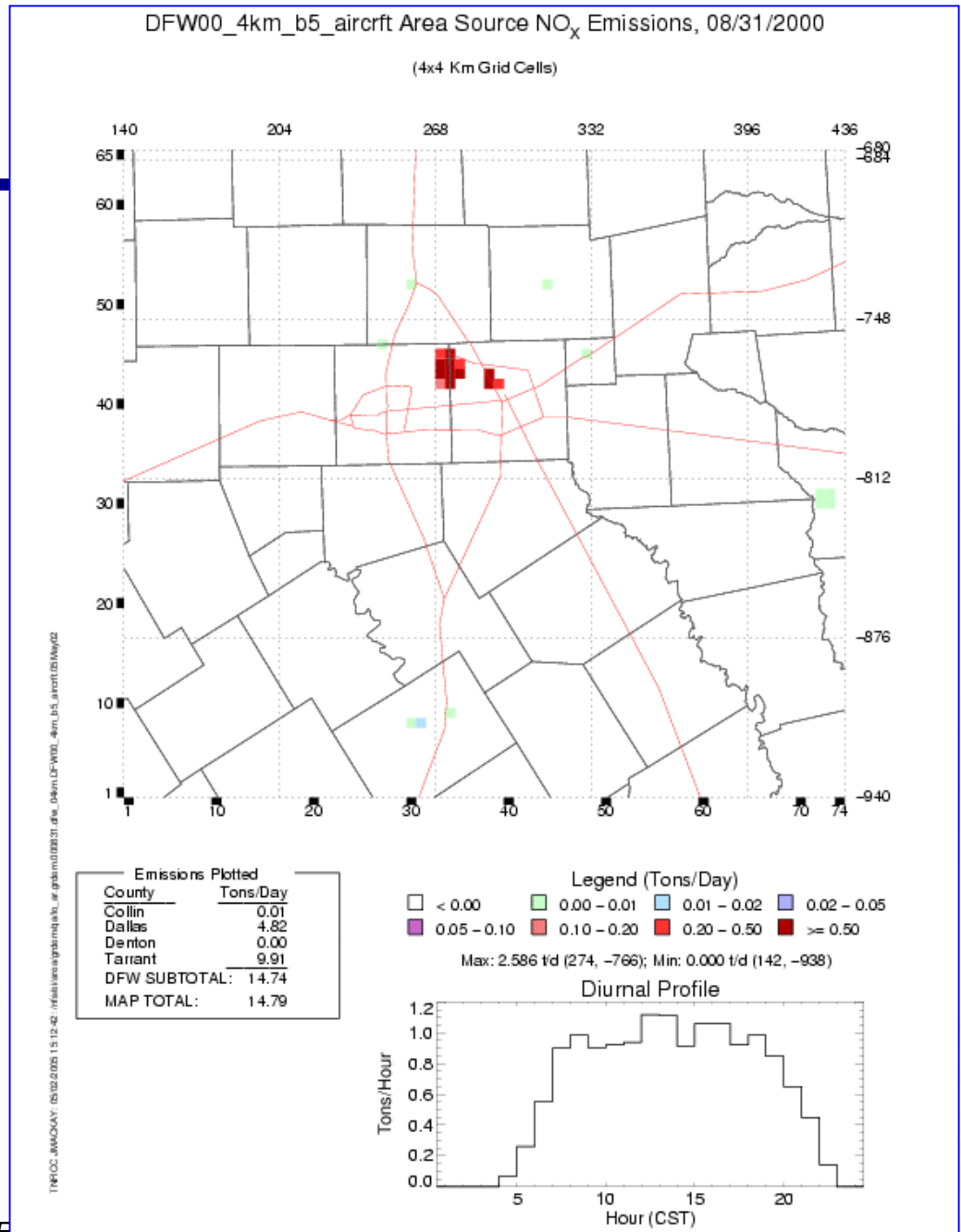
DFW09_4km_b5a 9 Co. avg. osd	2009 Area Source NOx (tons/day)	2009 Area Source VOC (tons/day)
Architectural Coating	0	31.79
Asphalt Paving	0	5.72
Auto Refinishing	0	2.79
Bakeries+Breweries	0	1
Drycleaning	0	4.59
Graphic Arts	0	1.58
Industrial Fuel Use	24.08	0.64
Leaking Underground ST	0	3.56
Oil+Gas Production	14.27	8.36
Open Burning	0.45	2.78
Pesticide Use	0	0.01
Petro Transport+Refueling	0	30.47
Residential Fuel Use	3.41	0.2
Solvent Use	0	58.15
Surface Cleaning	0	1.88
Surface Coating	0	65.37
Traffic Marking	0	0.5
Waste Treatment	0	11.14
<b>Total</b>	<b>42.21</b>	<b>230.53</b>

Brand new \***DRAFT**\* data – 2nd people to see it (Jim MacKay was 1<sup>st</sup>)



# El Tileplot

- DFW 4km Aircraft NO<sub>x</sub>



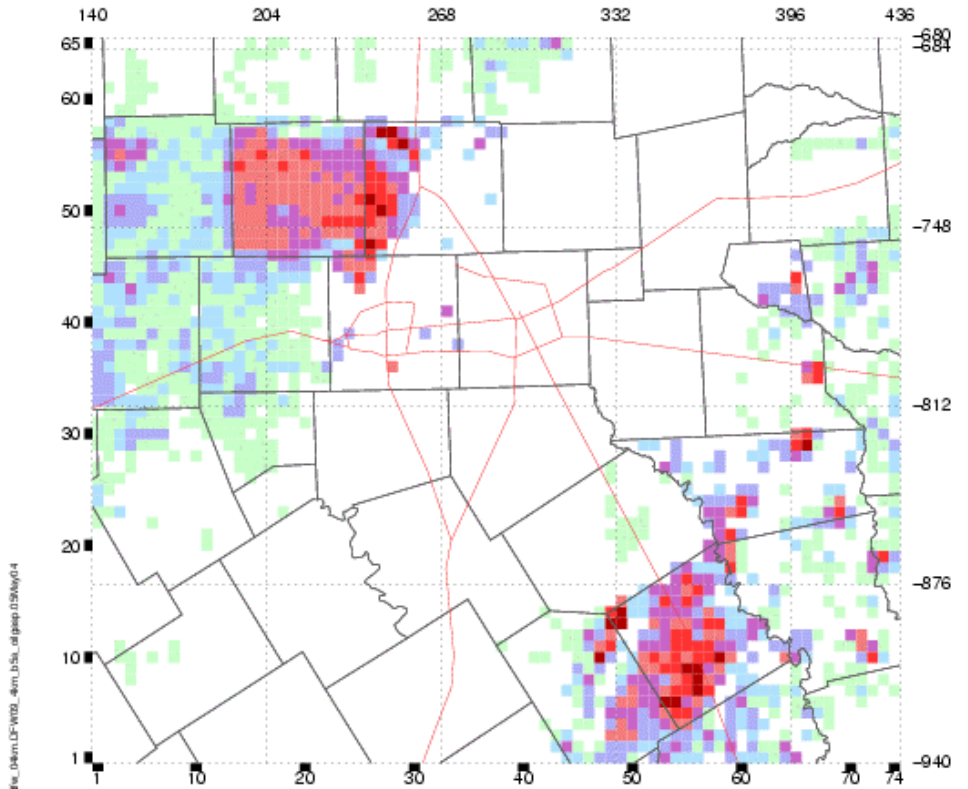


# El Tileplot

DFW 2009  
Oil and Gas Production  
NO<sub>x</sub>

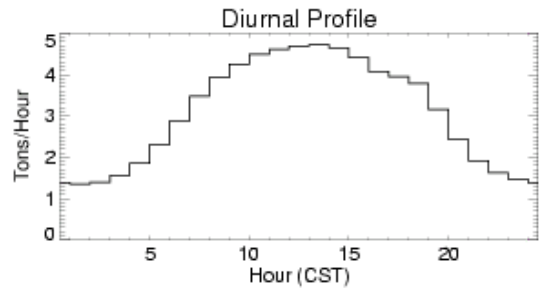
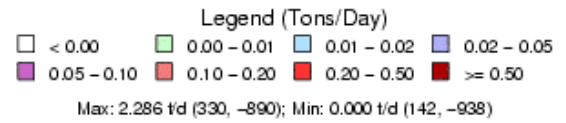
DFW09\_4km\_b5a\_oilgasp Area Source NO<sub>x</sub> Emissions, 08/31/2000

(4x4 Km Grid Cells)



TRFCC\_#MOCAY: 05/04/2005 15:50:04: \\fs1\iss\sig\m\p\ab\_s\gr\m\020031\file\_04em\_DF\09\_4km\_b5a\_oilgasp.05040504

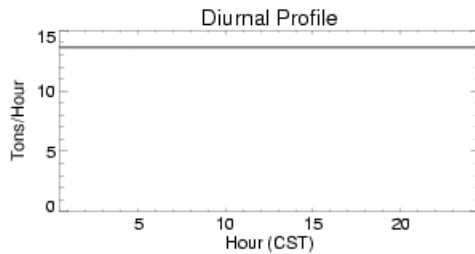
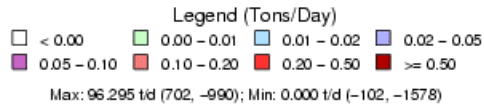
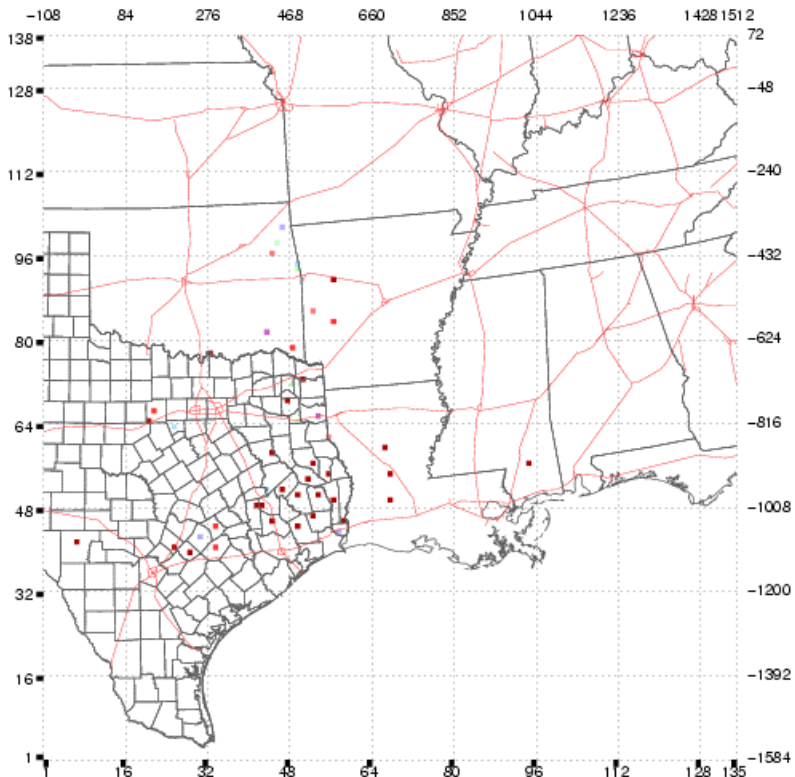
Emissions Plotted	
County	Tons/Day
Collin	0.00
Dallas	0.00
Denton	9.30
Tarrant	2.01
<b>DFW SUBTOTAL:</b>	<b>11.31</b>
<b>MAP TOTAL:</b>	<b>74.42</b>



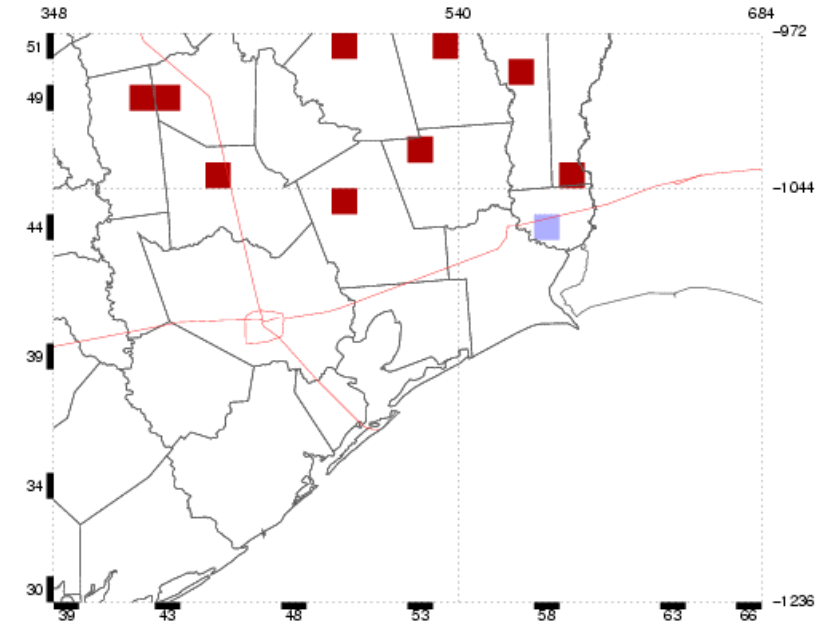
# VOC emissions from wildfires, Sept 4, 2000

fires Area Source CB-IV HC Emissions, 09/04/2000

fires\_zoom Area Source CB-IV HC Emissions, 09/04/2000

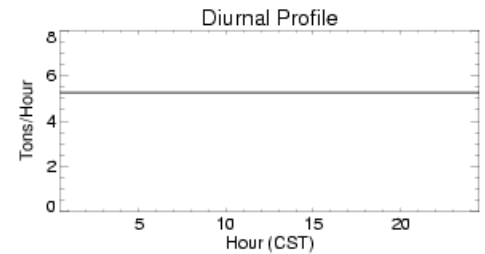
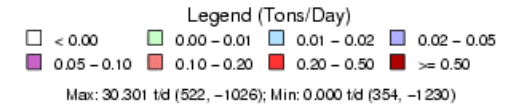


Total Emissions:  
326.891 T/D



Emissions Plotted

County	Tons/Day
Brazoria	0.00
Chambers	0.00
Fort Bend	0.00
Galveston	0.00
Harris	0.00
Liberty	10.70
Montgomery	16.53
Waller	0.00
HG SUBTOTAL:	27.23
Hardin	29.37
Jefferson	0.00
Orange	2.75
BPA SUBTOTAL:	32.11
MAP TOTAL:	126.56





# 2007 Area and Nonroad Controls

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- Applied to ASC codes and counties
  - Low-Emissions Diesel (LED) fuel
  - Clean gas
  - California Large Spark Ignition rules
- Applied statewide
  - Gas Can rule
    - VOC factor applied to gasoline-powered equipment in the Lawn & Garden category



# 2007 Area and Nonroad Controls

**Table 3.5-28: 2007 HGB 8-County Area/Nonroad Control Measures Applied**

Control Measure ¶	NO <sub>x</sub> Emissions Reductions ¶ (tpd)	VOC Emissions Reductions ¶ (tpd)
TERP	35.9	1.86
Clean Diesel	2.6	0.5
VMEP	3.4	0.2
Small gas-fired boiler, water heater reductions	0.5	0
California Spark-ignition rules	0.4	3.9
Clean portable fuel containers	0.0	2.9
Airport ground support equipment*	see footnote	see footnote
Stationary engines	1.0	0
Total	43.8	9.36

\*: Since the 2007 future base case already reflects GSE reductions, no additional reductions are required in the control case. ¶



A background image of a bright blue sky filled with soft, white, fluffy clouds. The clouds are scattered across the frame, creating a serene and open atmosphere.

Questions?