Observations of Weekday-Weekend Activity Patterns for Area Sources in the Los Angeles Area

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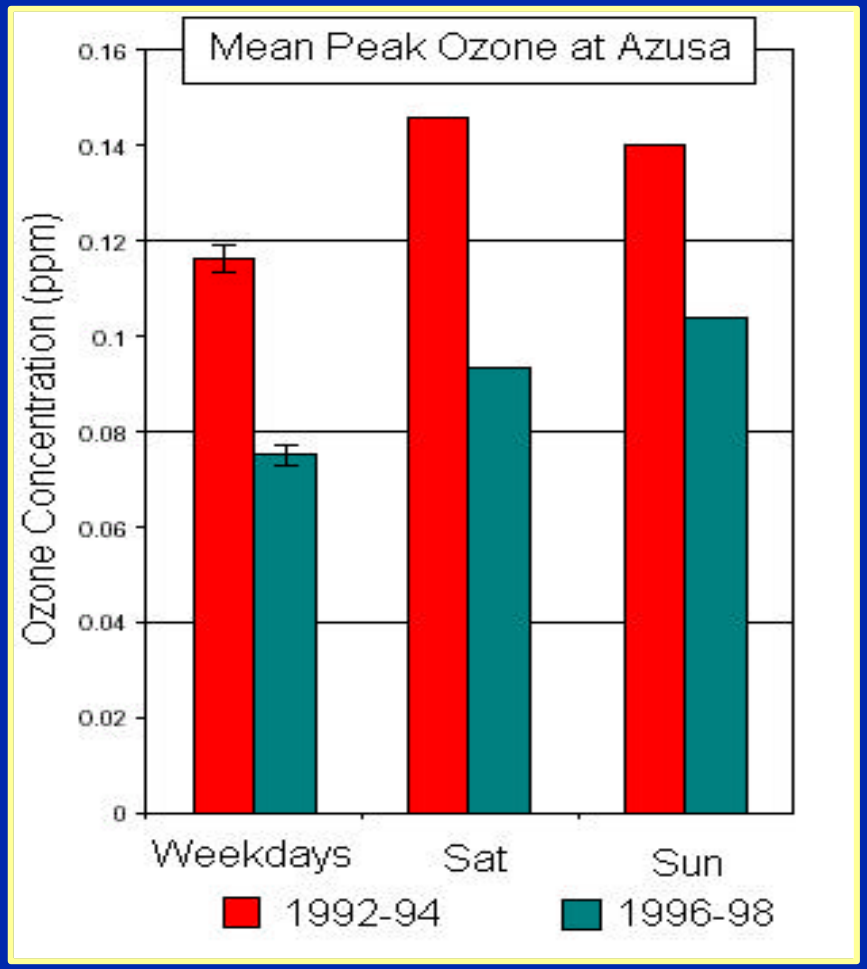
Weekend Effect in Los Angeles

Los Angeles ozone air quality improved from 1980 to 1999.

- No. of 1-hr exceedances decreased from about 150 to only 50 per yr.

Weekend (WE) peaks □ weekday (WD) peaks.

- From 1980-99, WD-WE difference became more pronounced.
- How can this be if WE precursor emissions are lower?



Source of figure: Austin, J.; Tran, H. "A Characterization of the Weekend-Weekday Behavior of Ambient Ozone Concentrations in California"; Draft staff report prepared by the Technical Support and Planning Division, California Air Resources Board, Sacramento, CA. 1999.

Purpose & Objectives

Purpose: Address a lack of WE-specific emissions data, which are needed to support air quality modeling exercises for WE conditions in Los Angeles.

Objectives:

Characterize WD-WE activity patterns for certain types of area sources in Los Angeles.

Coordinate with concurrent data collection efforts:

- In-vehicle travel activity measurements
- Monitoring of traffic volumes on surface streets
- Acquisition of freeway-based traffic volumes
- Acquisition of continuous emissions monitoring systems (CEMS) data for major stationary point sources

Summary of Findings

Some residential activities (RAs) in Los Angeles increase from WD to WE by 25% to 165% (e.g., BBQs, recreational boats, recreational RVs).

Other RAs vary little by day of week (DOW) (e.g., personal care products, water heating).

Diurnal distributions of some RAs vary by DOW.

- On WDs, BBQ use occurs primarily in the evening, but on WEs the afternoon share of use increases significantly.

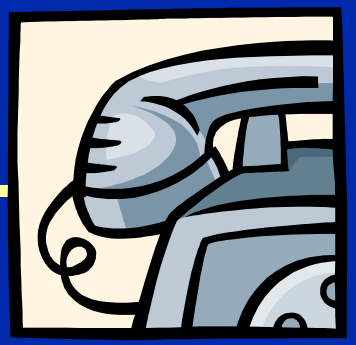
Summary of Findings

Business activities (BAs) in L.A. decline from WD to WE by 60% to 99% (e.g., construction).

Most BAs peak 8 a.m. to 4 p.m. on WDs and Sat, but are flat on Sun.

- Exceptions are construction, lawn/garden services, and use of gas ovens.

Approach



What? Telephone and mail surveys

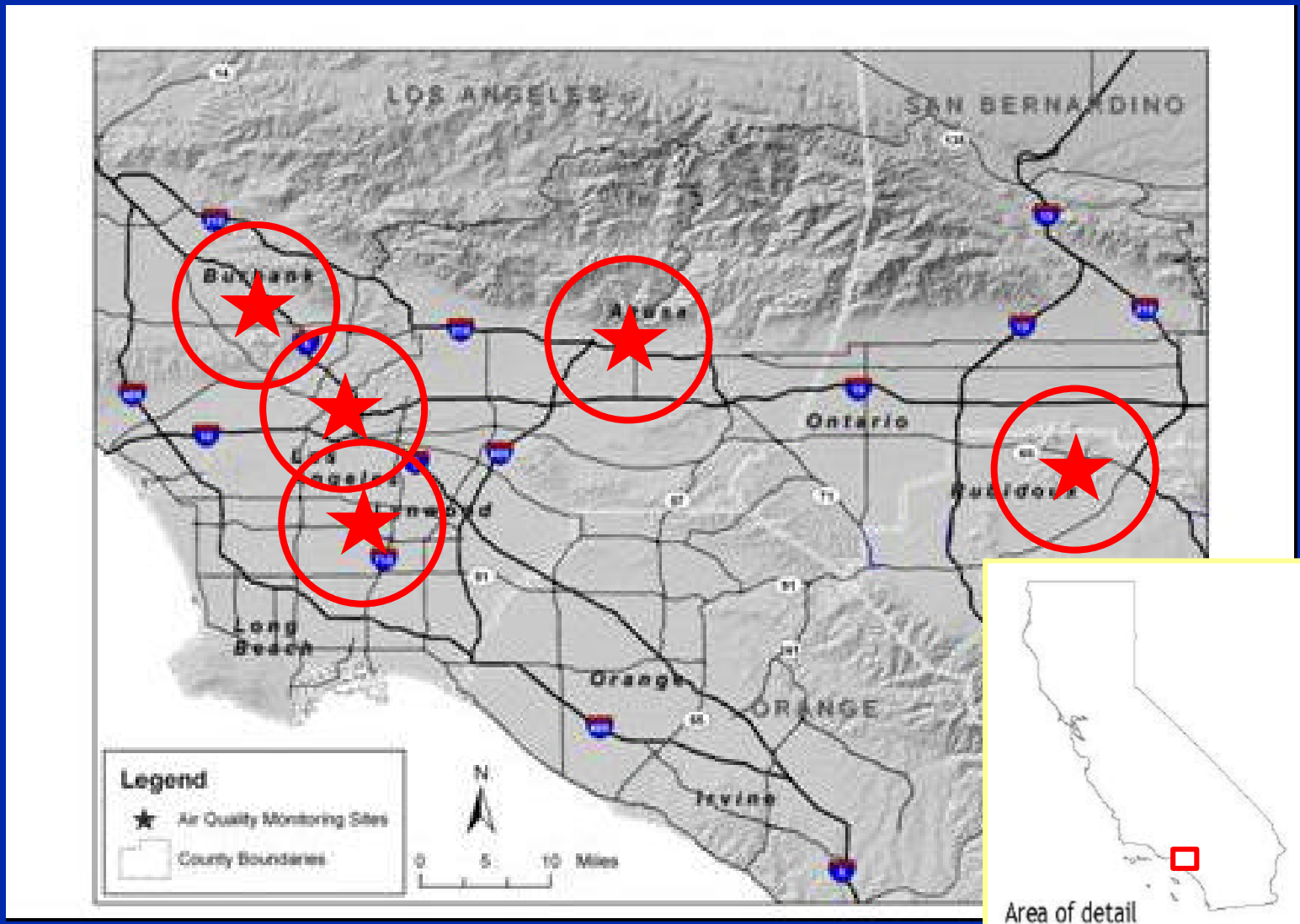
Who? Residences and small businesses

When? Summer of 2002, May 17-Sept 16.

Where? Half of respondents were drawn randomly from throughout the South Coast Air Basin.

Five neighborhoods of Los Angeles (L.A.) were selected to corroborate past results and to coordinate with concurrent WD-WE mobile source measurements.

Selected Neighborhoods



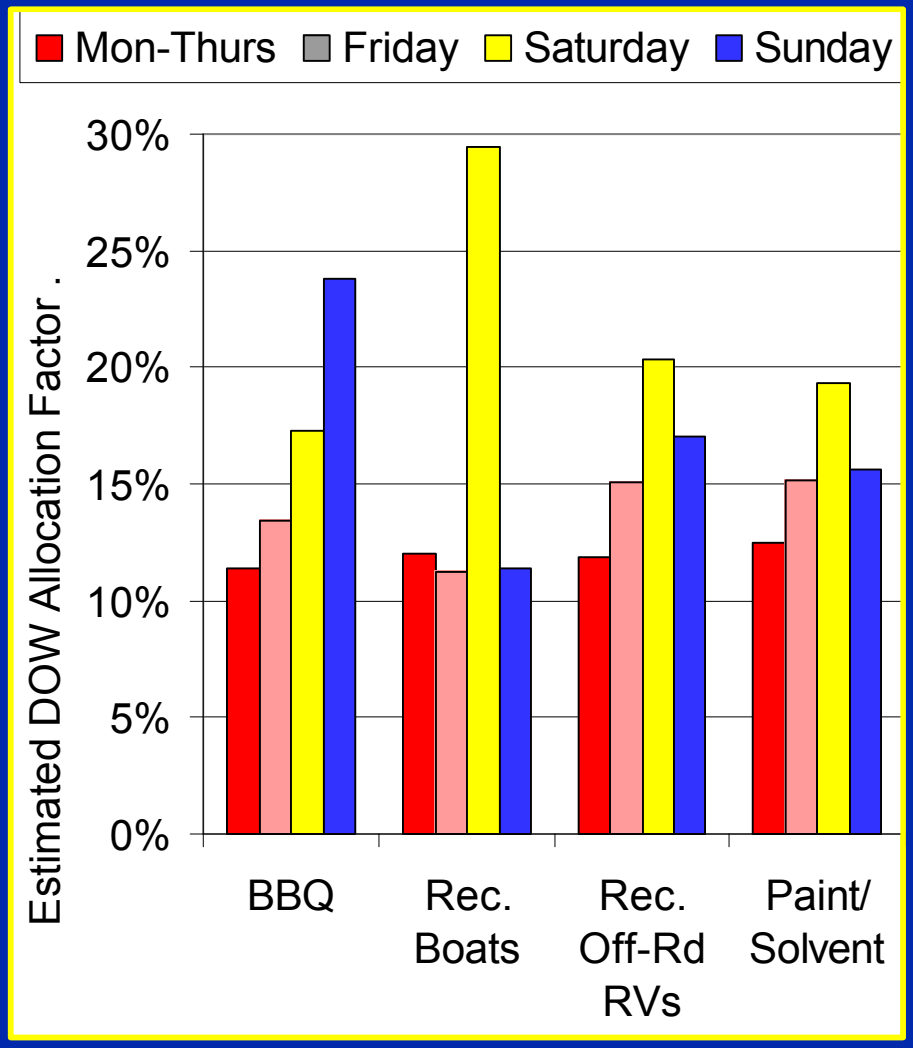
Results: Residential Activities

Some RAs increased from WDs to WEs by 25% to 165%, including uses of:

- barbecues*
- recreational boats*
- recreational off-road RVs*
- paints or solvents*

Some RAs varied <25% by DOW, including uses of:

- personal care products
- water heating



*see plot

Results: Residential Activities

Some RAs occurred at certain times of day:

- Evening: WD BBQ use*
- Afternoon: Recreational boats
- Morning: personal care products*

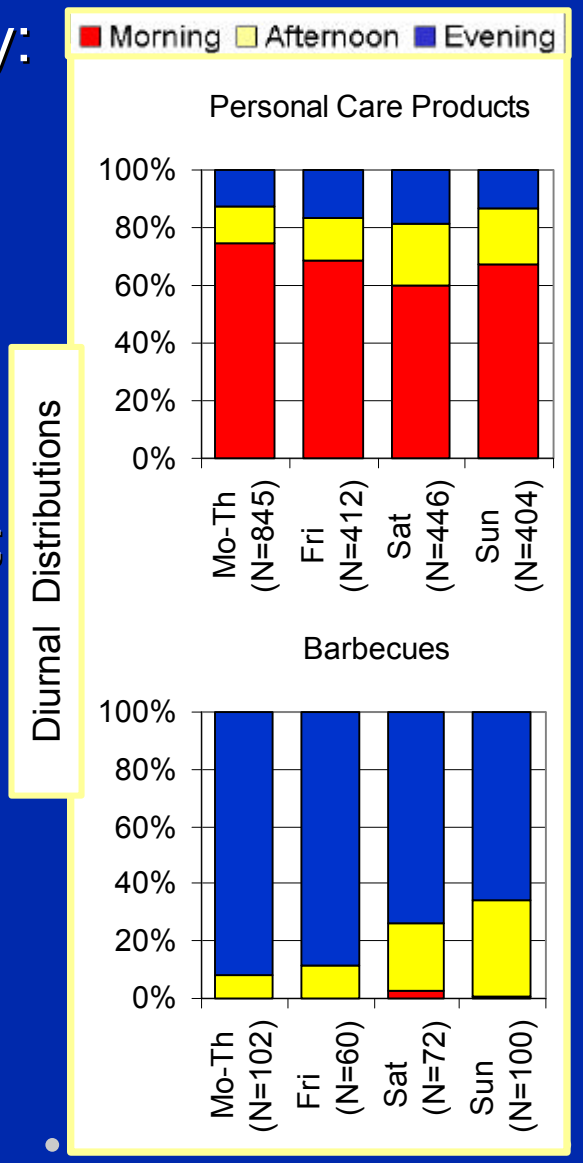
Some RAs had DOW-dependent patterns.

- WD BBQ use*: 8% to 12% of total in afternoon; 90% in evening
- WE BBQ use*: 24% to 33% of total in afternoon; 66% to 74% in evening

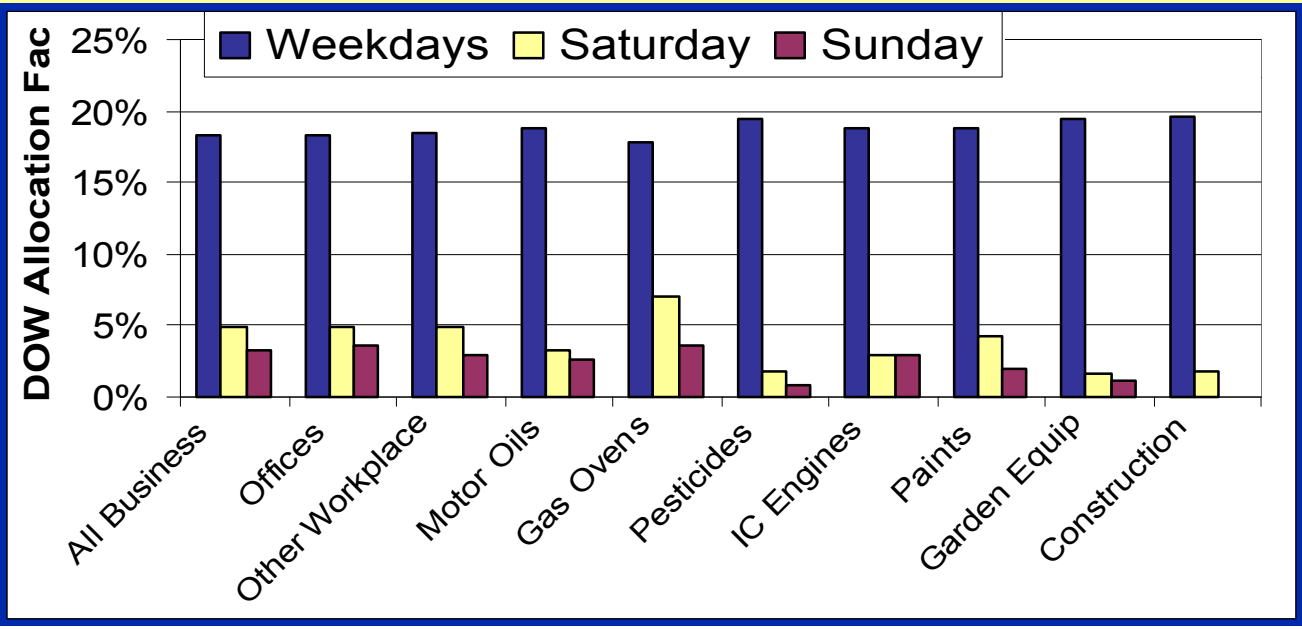
Some RAs had DOW-independent patterns.

- personal care products*
- water heating

*see plot



Results: Business Activities



Business Type	WD-to-Sat % Reduced	WD-to-Sun % Reduced
All Businesses (Aggregate)	74%	82%
Gas Ovens	61%	80%
Construction	90%	99%

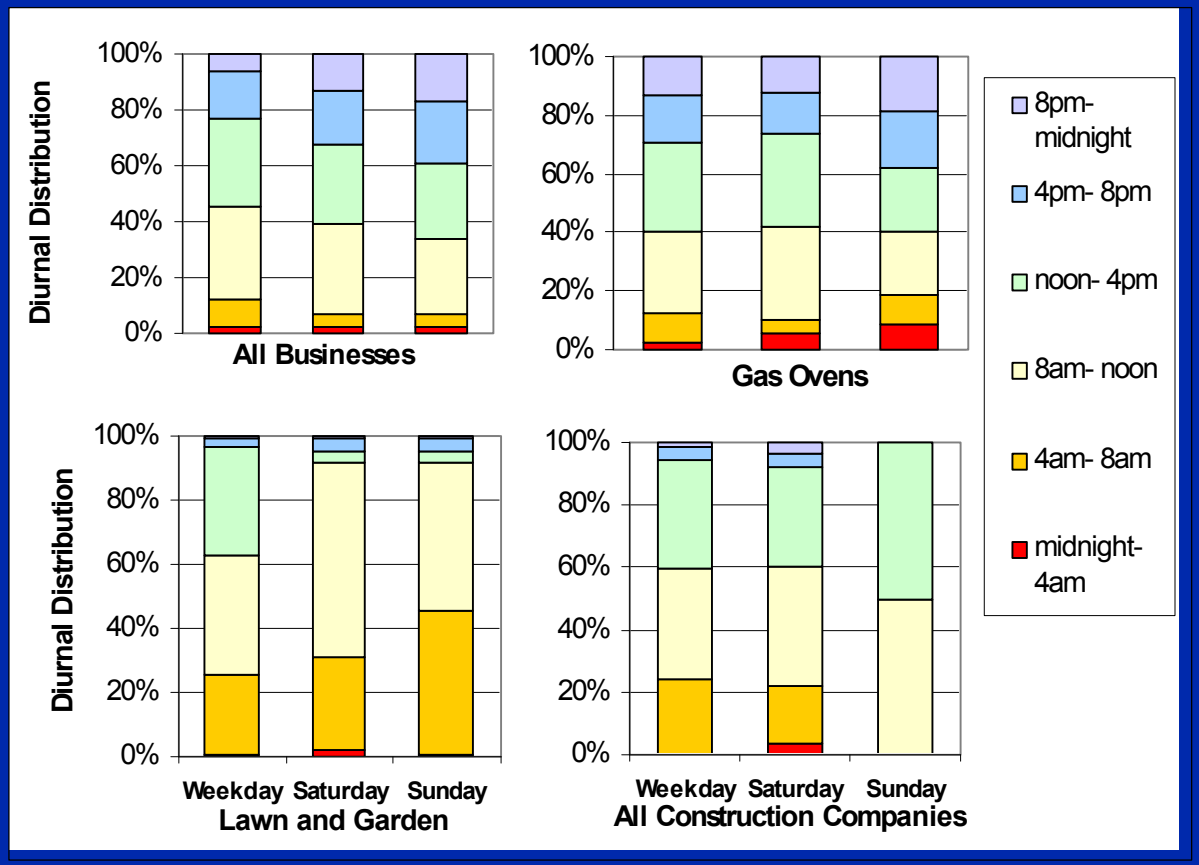
Results: Business Activities

Aggregate:

- On WD, BA peaks from 8 a.m.-4 p.m.
- On WE, BA evenly distributed 8 a.m.-12 a.m.

Type-specific:

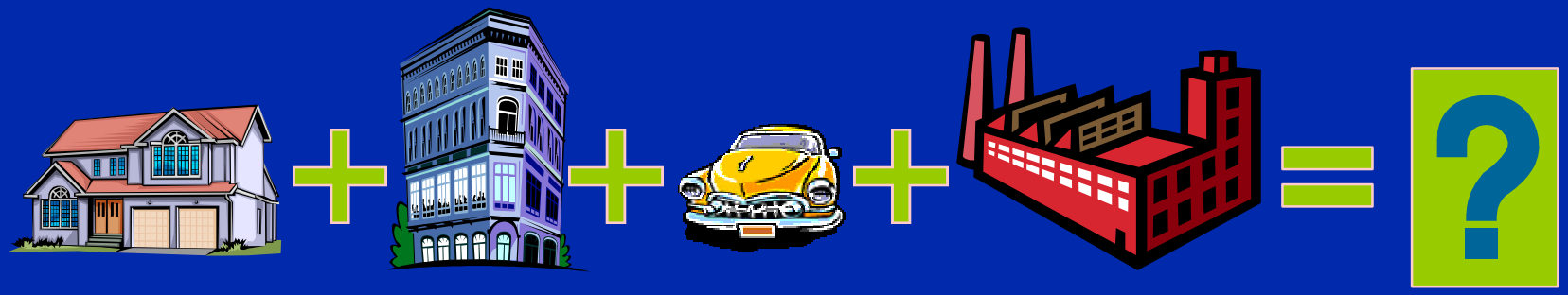
- BA with gas ovens is sustained late into the evening and late-night hours
- BAs of lawn/garden and construction businesses peak early, then drop off fast after 4 p.m.



Integration & Implications

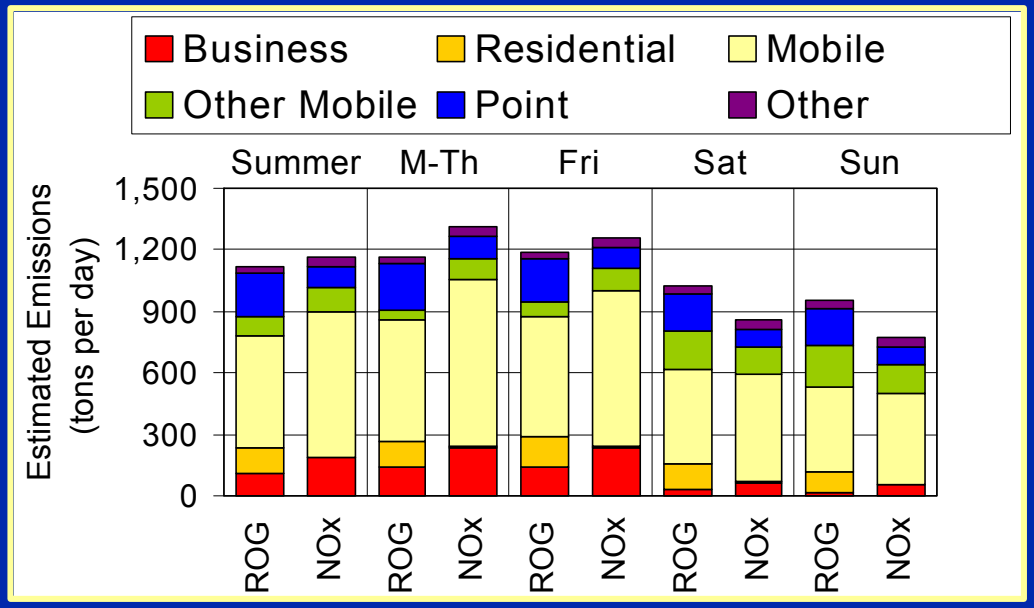
Previously, we combined our RA and BA survey results with our findings from concurrent studies of on-road mobile and point sources.

We applied our integrated findings to the California Air Resources Board's emission inventories of NO_x and ROG for the South Coast Air Basin.



Integration & Implications

WD-WE Emissions: Year 2000



Our corroborating and new results suggest that WE emission reductions for several source categories will be even greater than the previous estimates shown above.

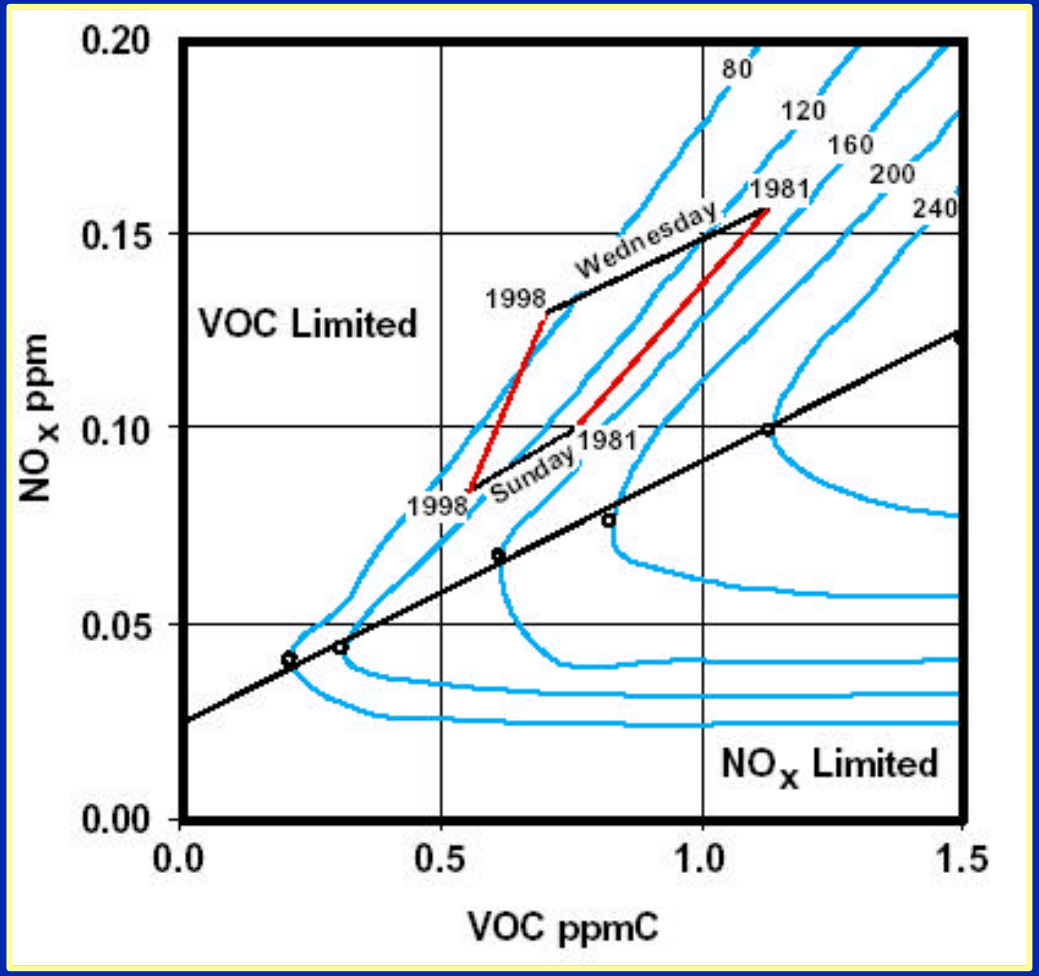
Integration & Implications

What effects would be expected?

- Increased ROG:NO_x ratio
- Decreased morning O_3 titration capacity by NO_x

WE conditions are more favorable for

O_3 formation than WD conditions.



Source of figure: Fujita, E.M., et al. "Weekend/Weekday Ozone Observations in the South Coast Air Basin: Retrospective Analysis of Ambient and Emissions Data And Refinement of Hypotheses, Volume I – Executive Summary"; Final report prepared for the National Renewable Energy Laboratory, December 2000.

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