

# Ramifications of Charlotte Regional Growth and Weekday Activities on Primary and Secondary Emissions

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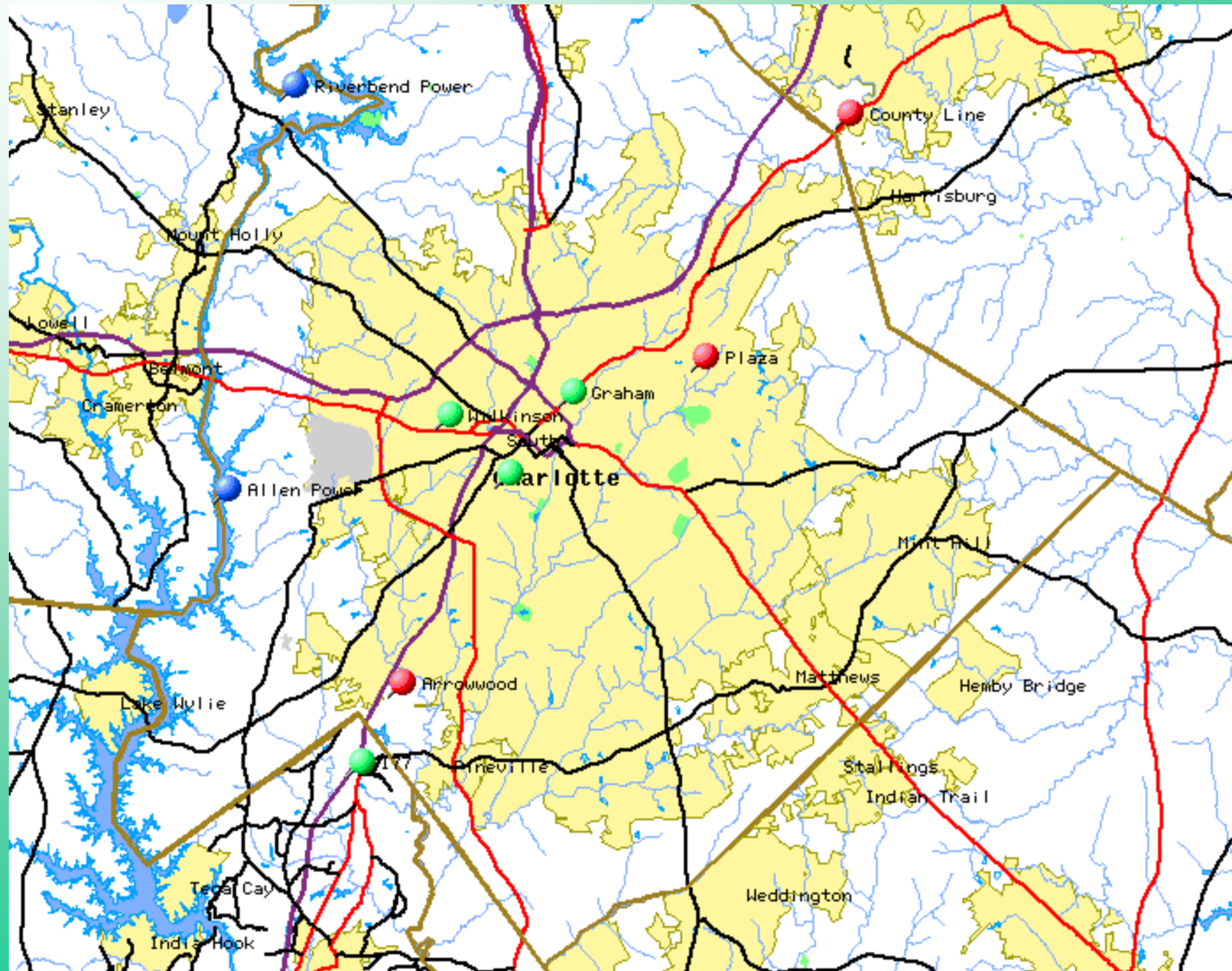
# Objectives

- Show Charlotte regional growth by traffic volumes
- Characterize trends in  $\text{NO}_y$ , CO, and Ozone monitoring data
- Understand how daily traffic fluctuations affect pollutant levels

# Approach Taken

- Characterize daily traffic patterns and growth using available traffic data
- Examine daily and long-term trends in primary pollutants  $\text{NO}_y$  and CO; relate traffic patterns to primary pollutants
- Assess emission patterns from power plants
- Evaluate changes in Ozone concentrations; compare the long-term ozone trend to traffic growth, precursor trends, & temperature

# Traffic, Monitor, and Power Plant Sites

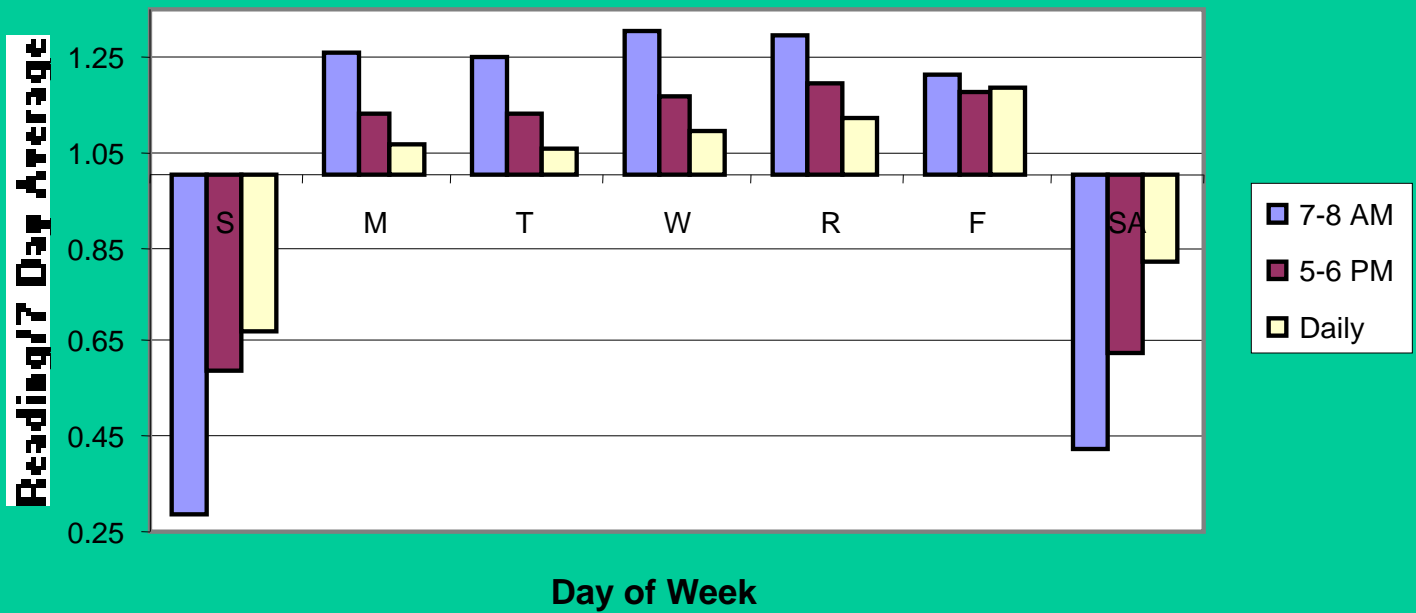


# Traffic Sites

<b>Roadway</b>	<b>Tachograph Loc.</b>	<b>Data Available</b>
Interstate 77	SC Welcome Center Between Exits 88 & 90	June-August 1990-1997 (Hourly data)
South Blvd (Hwy 521)	Between Poindexter & Marsh @ Pepsi Plant	May-Sept 1990-1998, (7-8AM, 5-6PM, Daily)
Wilkinson Blvd (Hwy 29&74)	Remount Rd Intersection	May-Sept 1990-1998, (7-8AM, 5-6PM, Daily)
Graham St.	Past Railroad Tracks @ 12th St.	May-Sept 1990-1998, (7-8AM, 5-6PM, Daily)

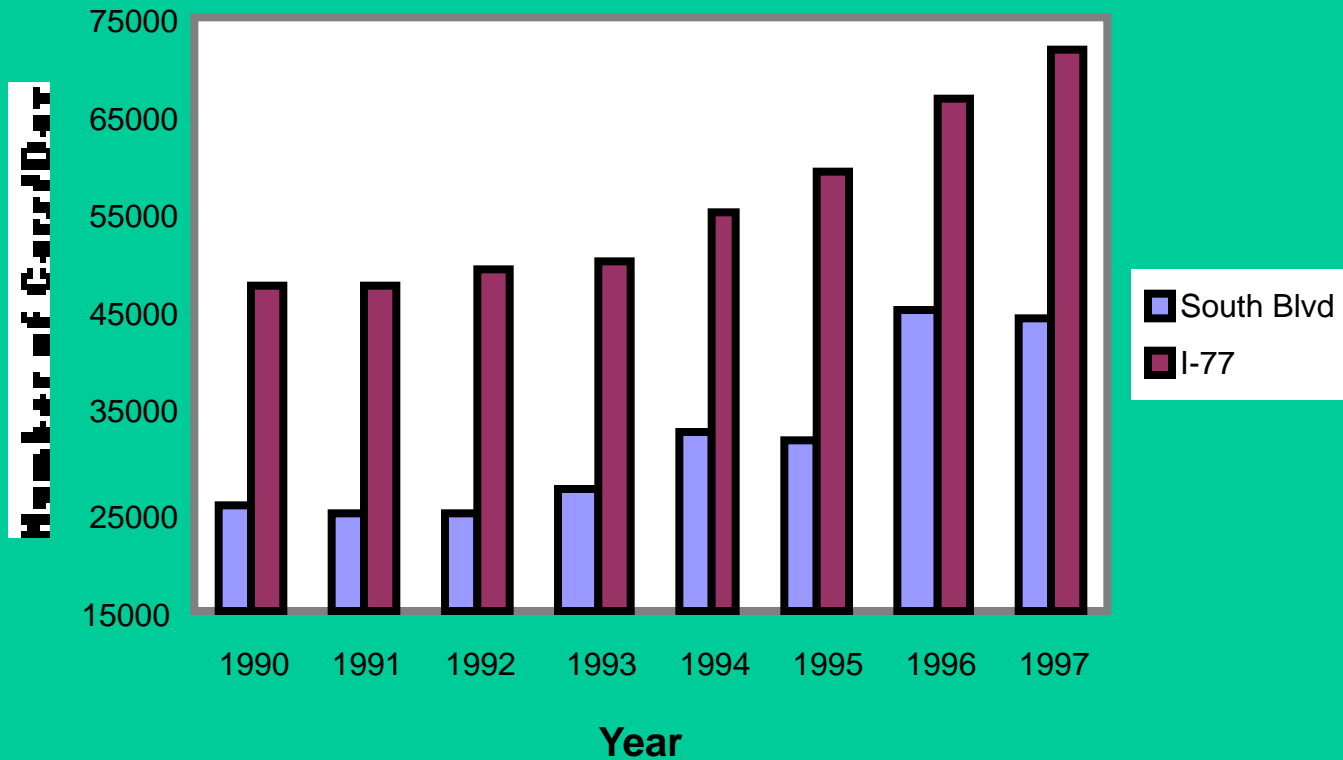


# Fluctuations of Average Traffic Volume (All Sites)



# Average Daily Traffic Volume vs Year

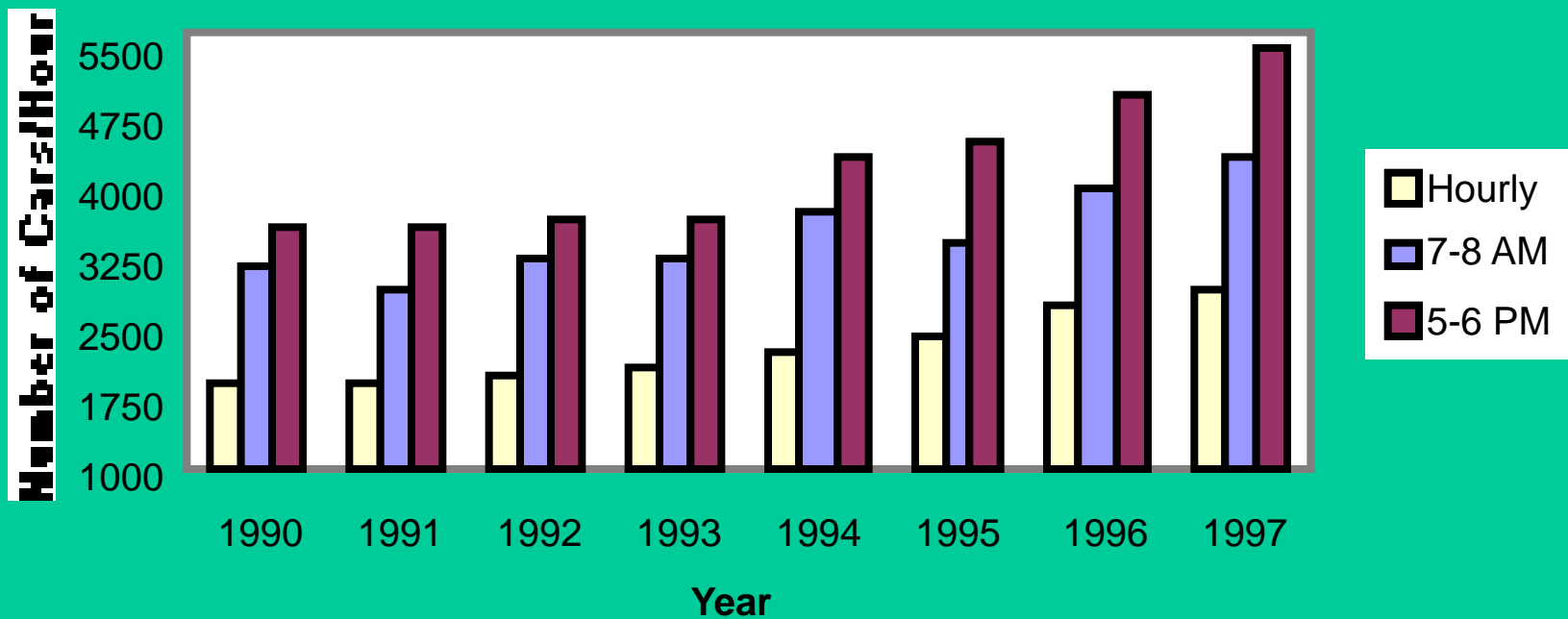
(South Blvd: May-Sept., I-77: June-August)





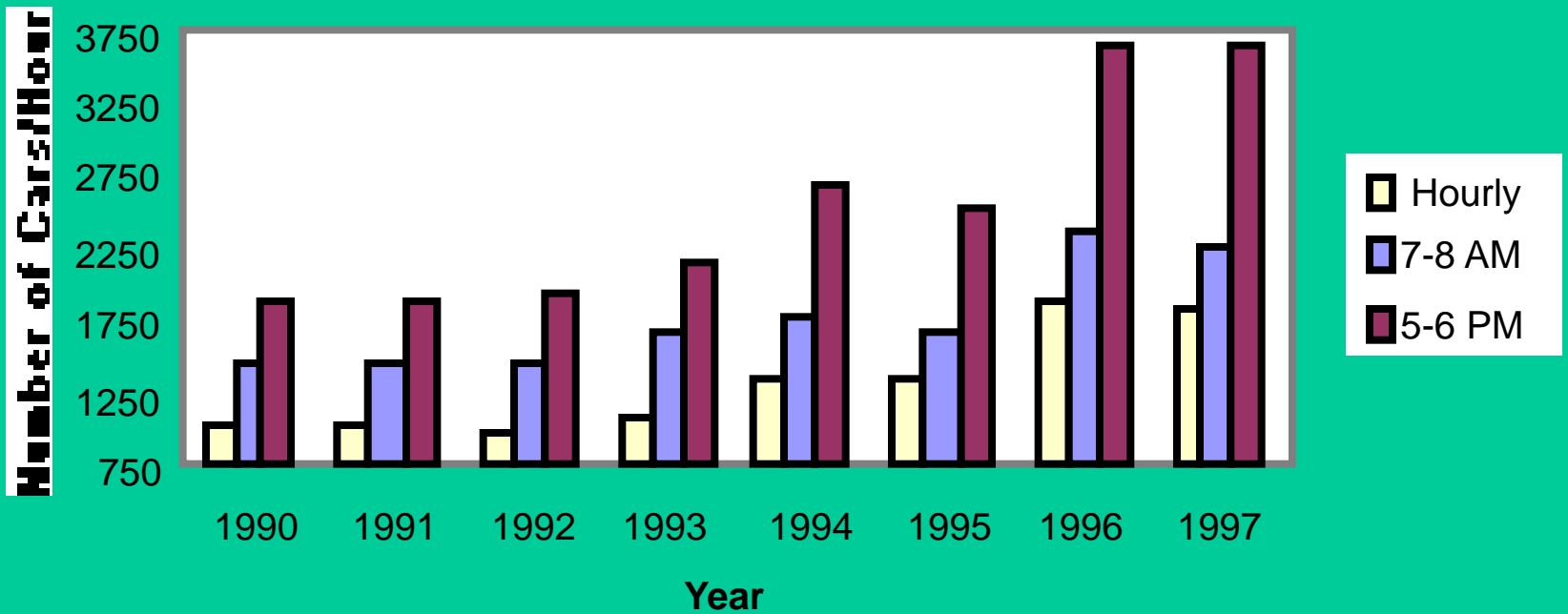
# I-77 Average Traffic Volume vs Year

(June-August)



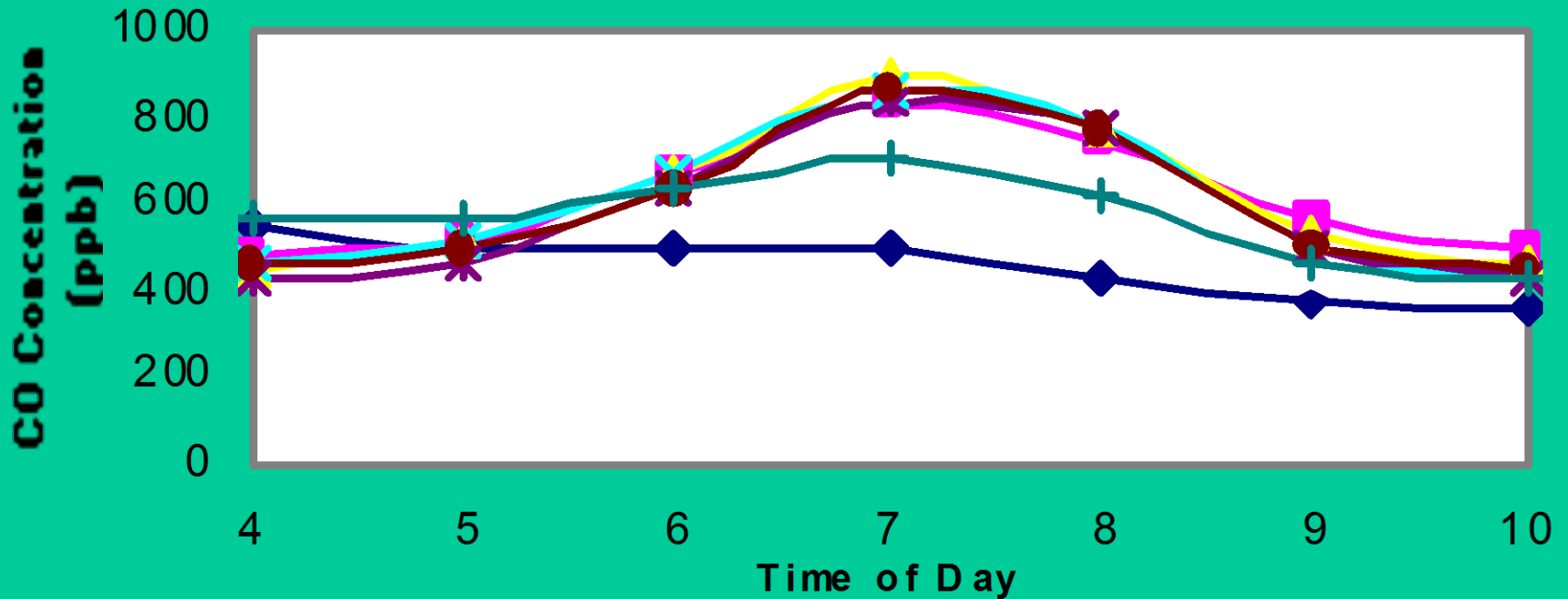
# South Blvd Average Traffic Volume vs Year

(May-September)

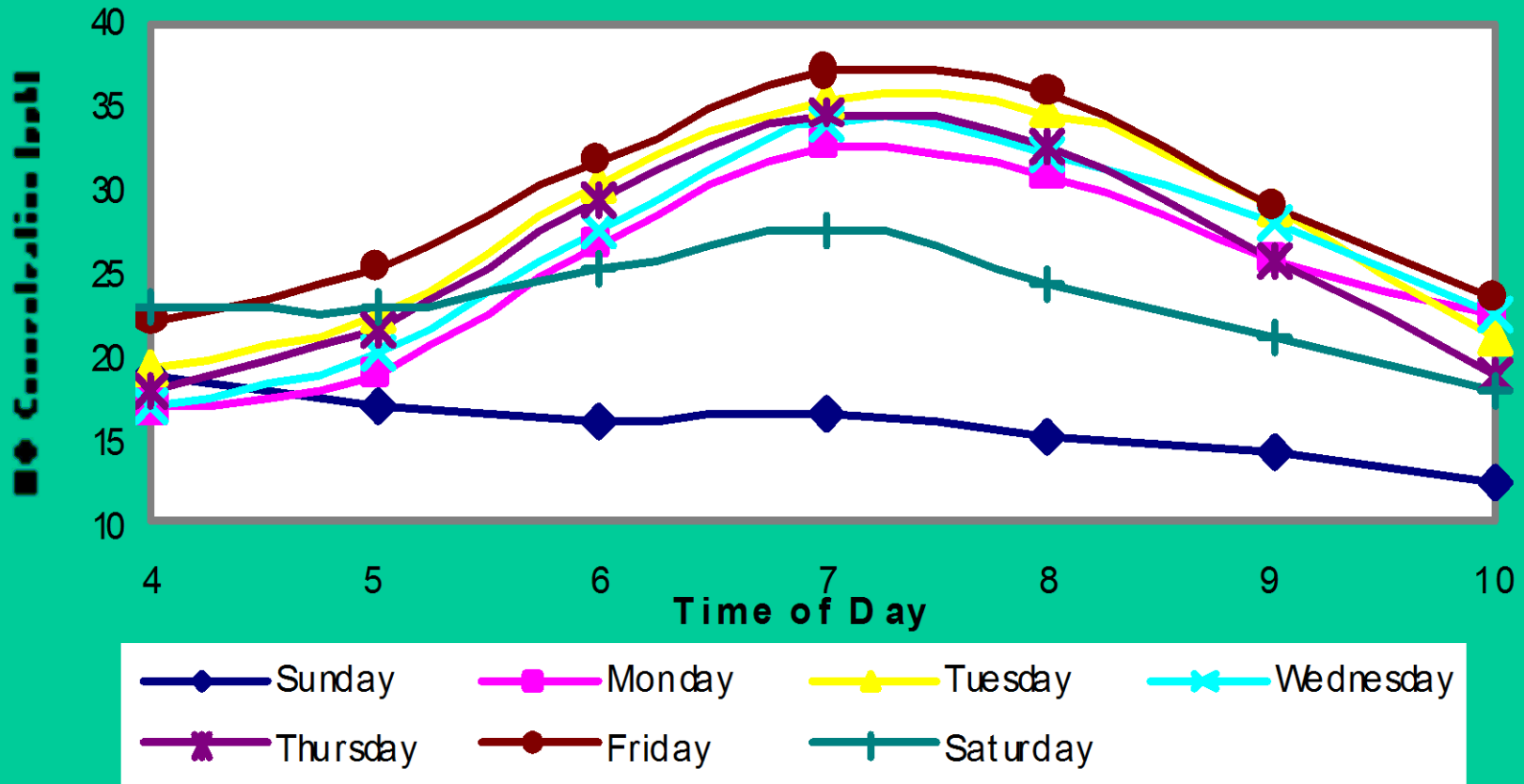


# Plaza Average Hourly CO Concentrations

( May - September 1993 - 1998 )

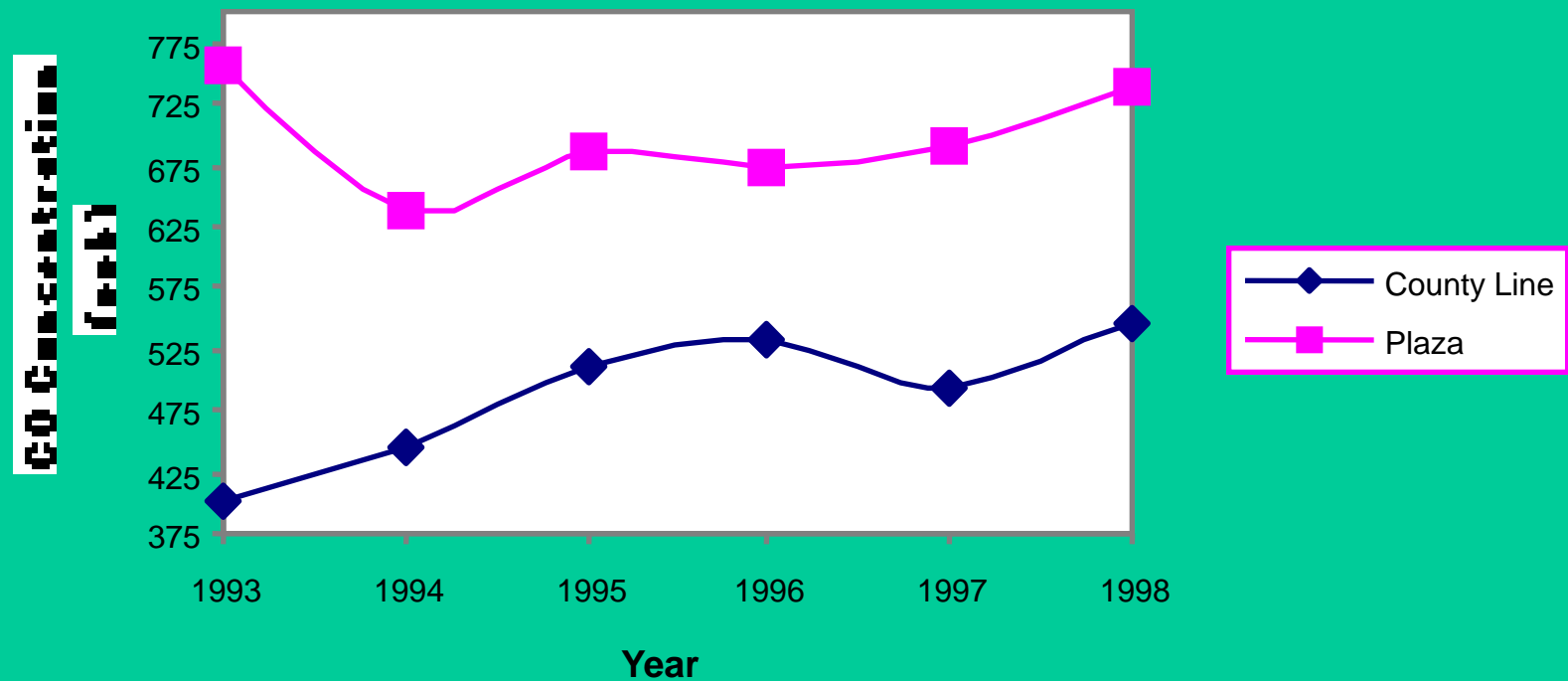


# Plaza Average Hourly NO<sub>y</sub> Concentrations ( May - September 1995 - 1998 )



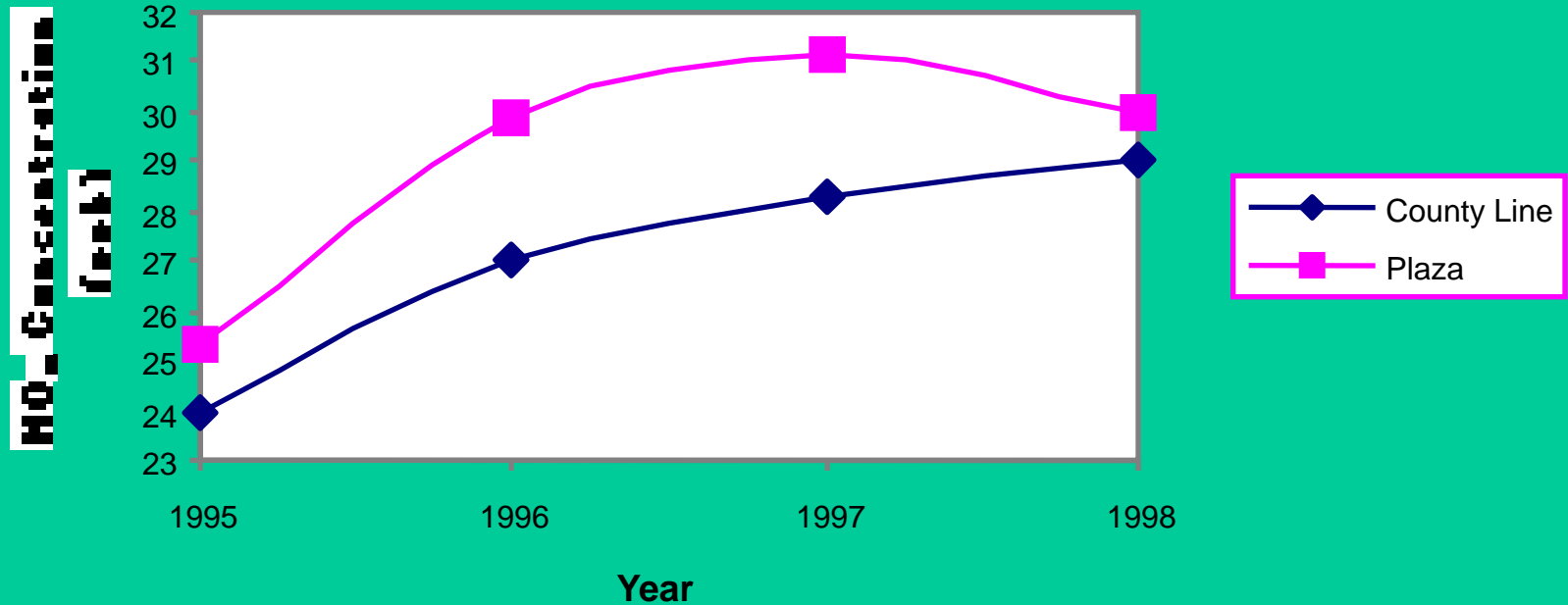
# Average 7-8 Am CO Concentrations vs Year

(May-September 1993-1998)



# Average 7-8 AM NO<sub>y</sub> Concentrations vs Year

(May-September 1995-1998)

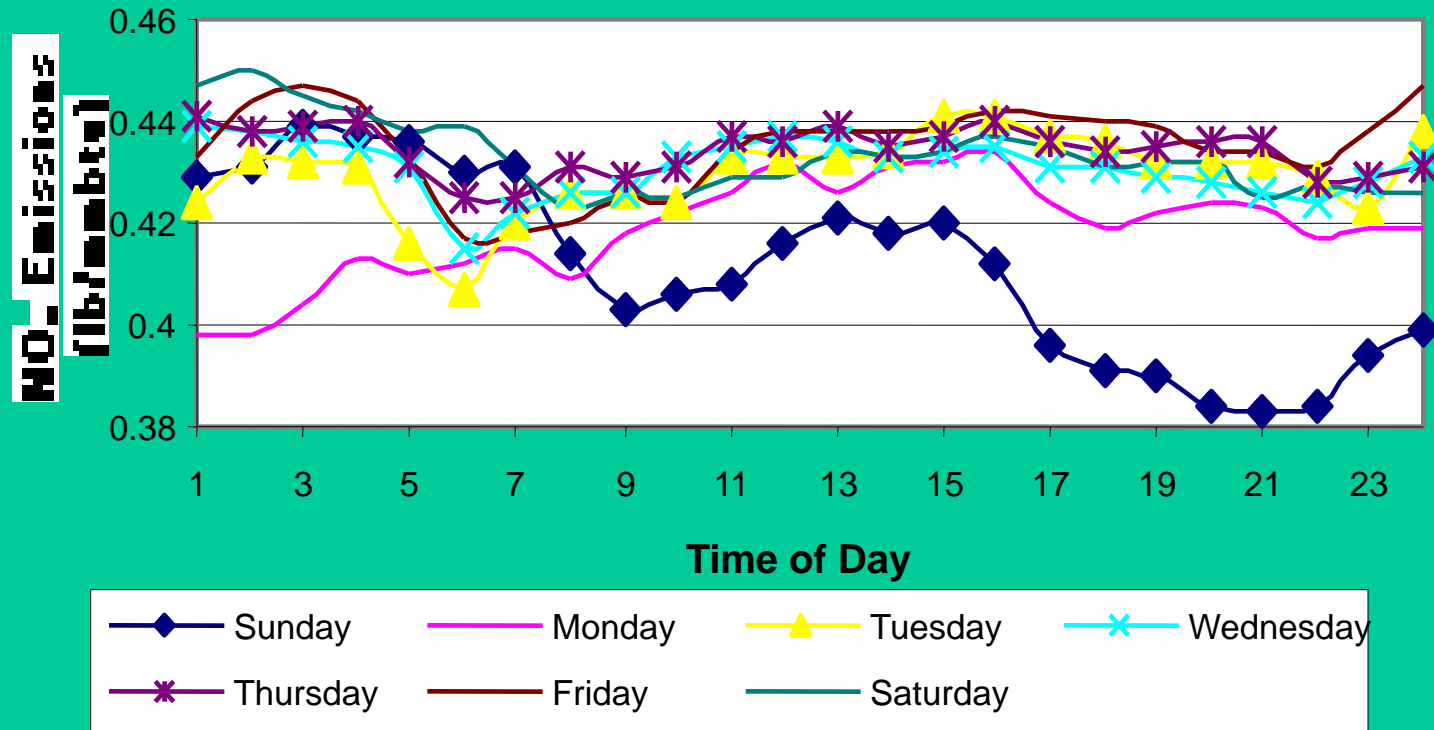


# Regional NO<sub>x</sub> Sources

- 1997 Gaston County Power Plant Emissions
  - 12,930 tons (Allen)
  - 3,780 tons (Riverbend)
- 1996 Mecklenburg County Emissions
  - 17,295 tons (mobile sources)
  - 687 tons (stationary sources)

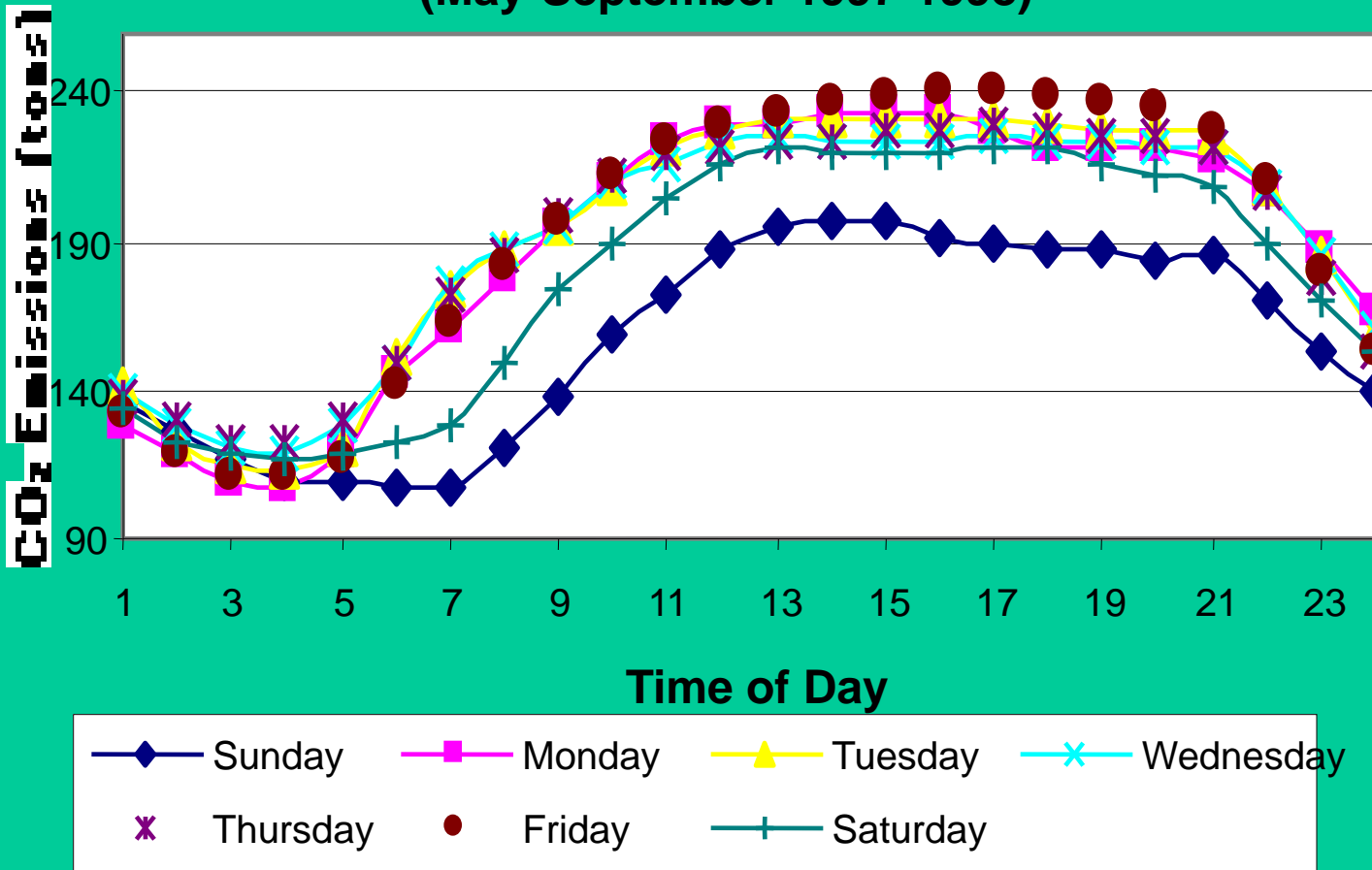
# Allen Average NO<sub>x</sub> Emissions vs Time of Day

(May-September 1997-1998)



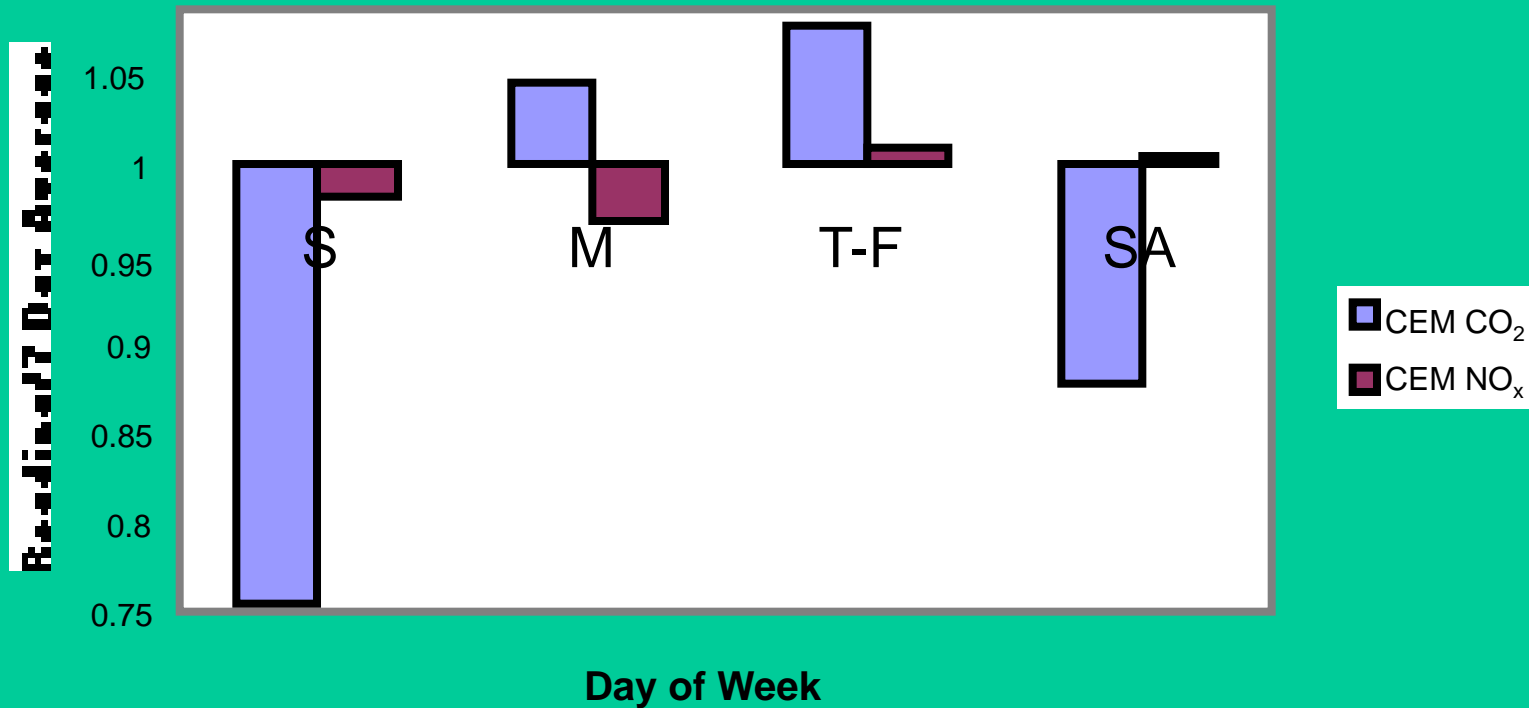


# Allen Plant CO<sub>2</sub> Emissions vs Time of Day (May-September 1997-1998)

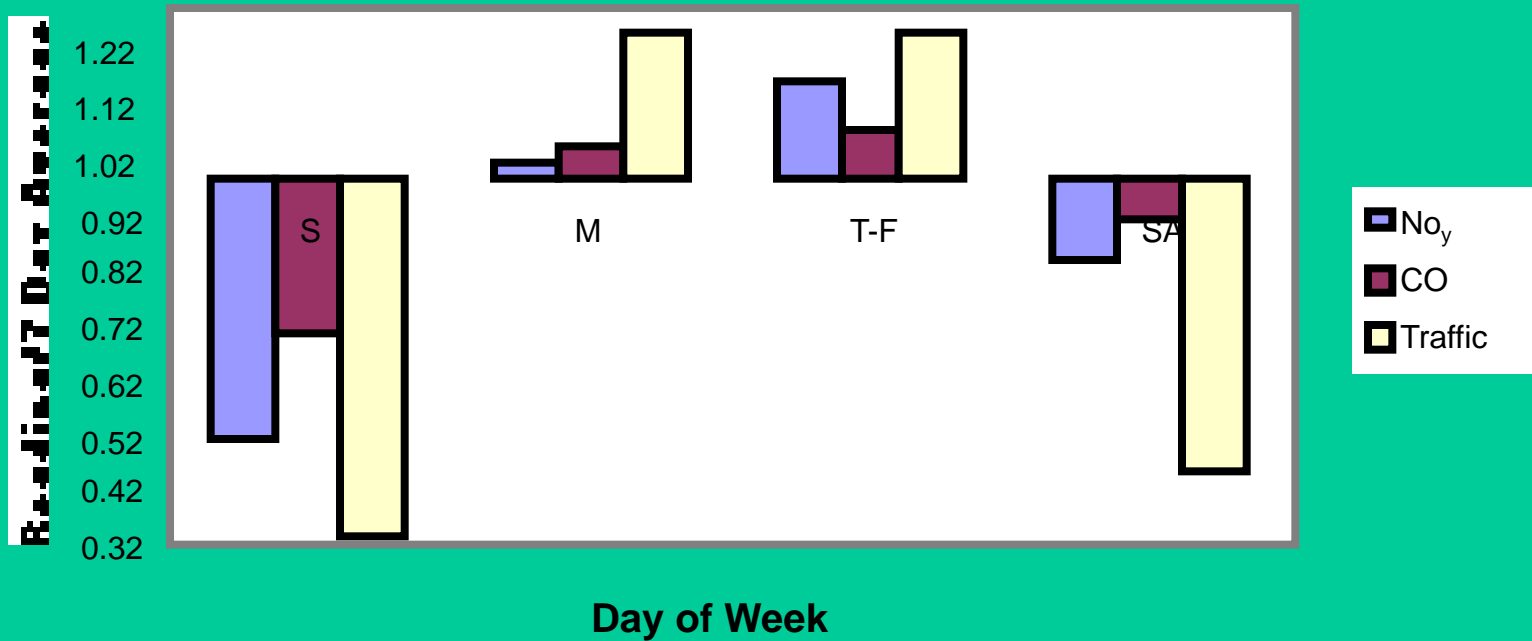


# Fluctuations in Average 7-8 AM CO<sub>2</sub> and NO<sub>x</sub>

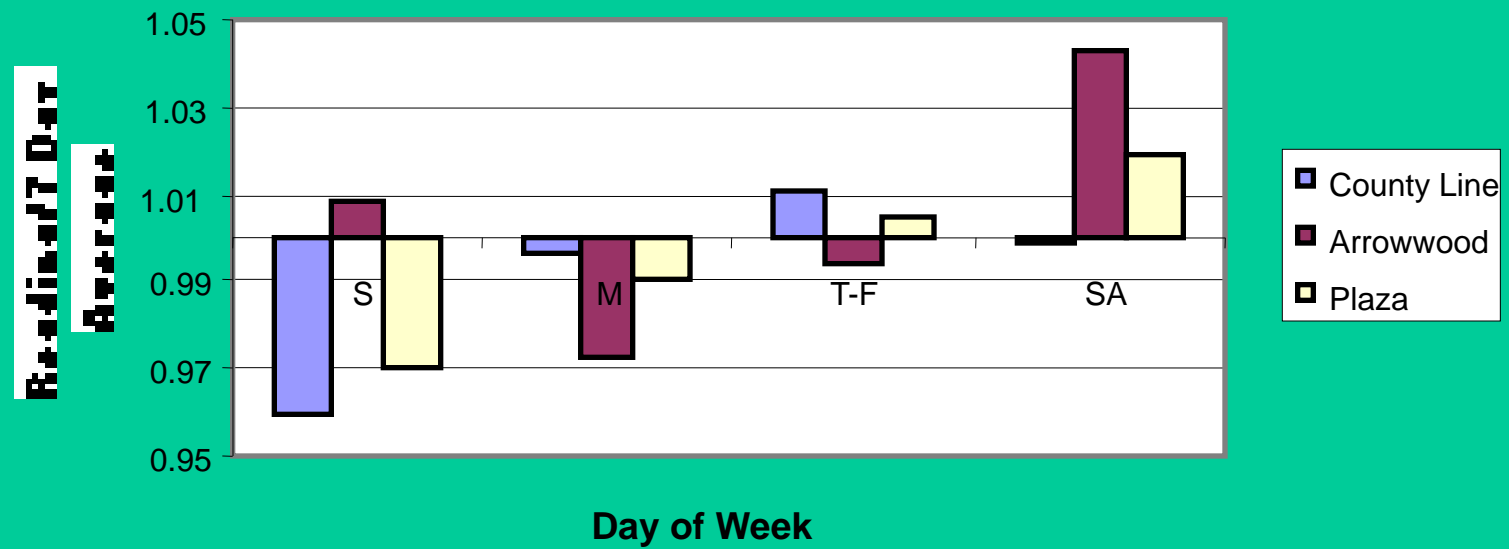
(Allen and Riverbend Plants, May-Sept. 1997-1998)



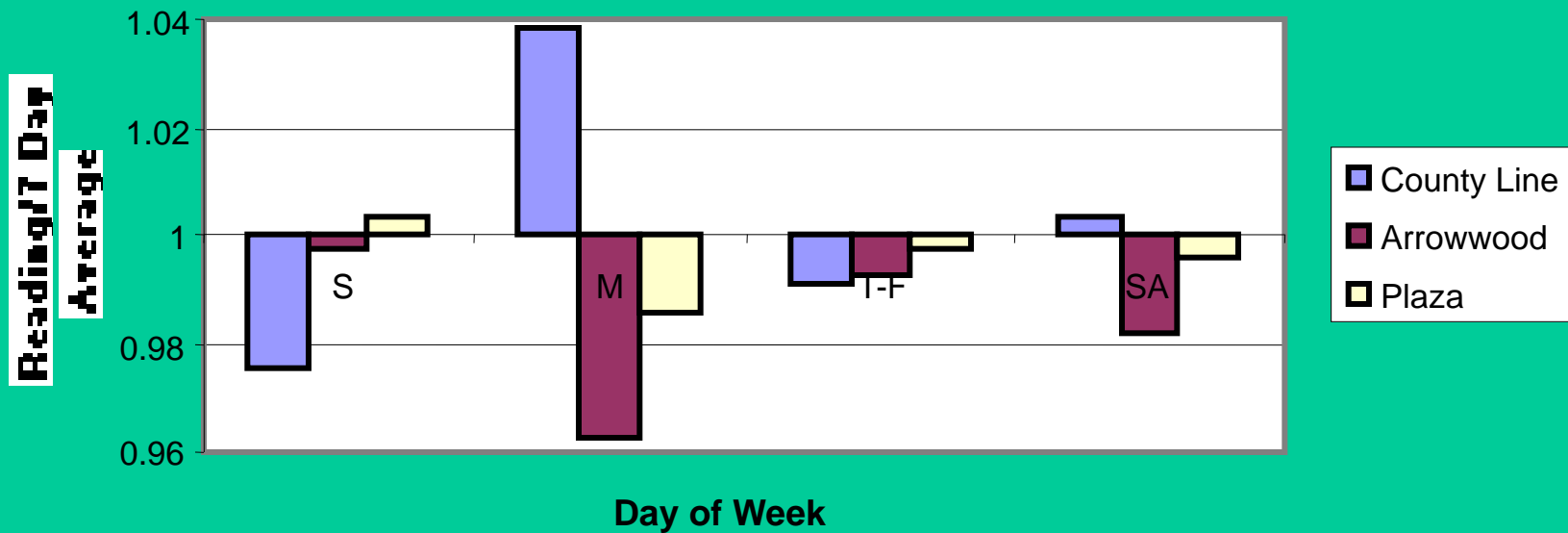
# Daily Fluctuations of 7-8 AM CO, NO<sub>y</sub> and Traffic (All Monitors)



# Daily Fluctuations in Average 1-hr Max O3 (May-Sept. 1990-1998)

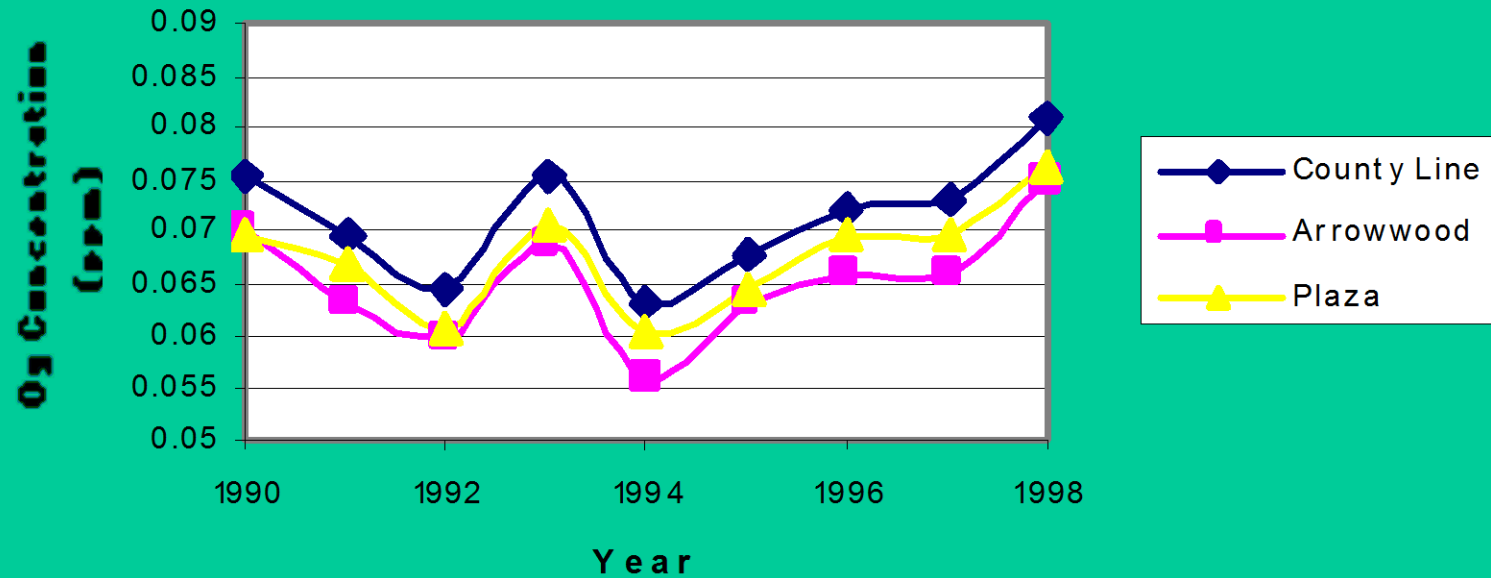


# Daily Fluctuations in O<sub>3</sub> by Average Max 8hr (May-September 1990-1998)

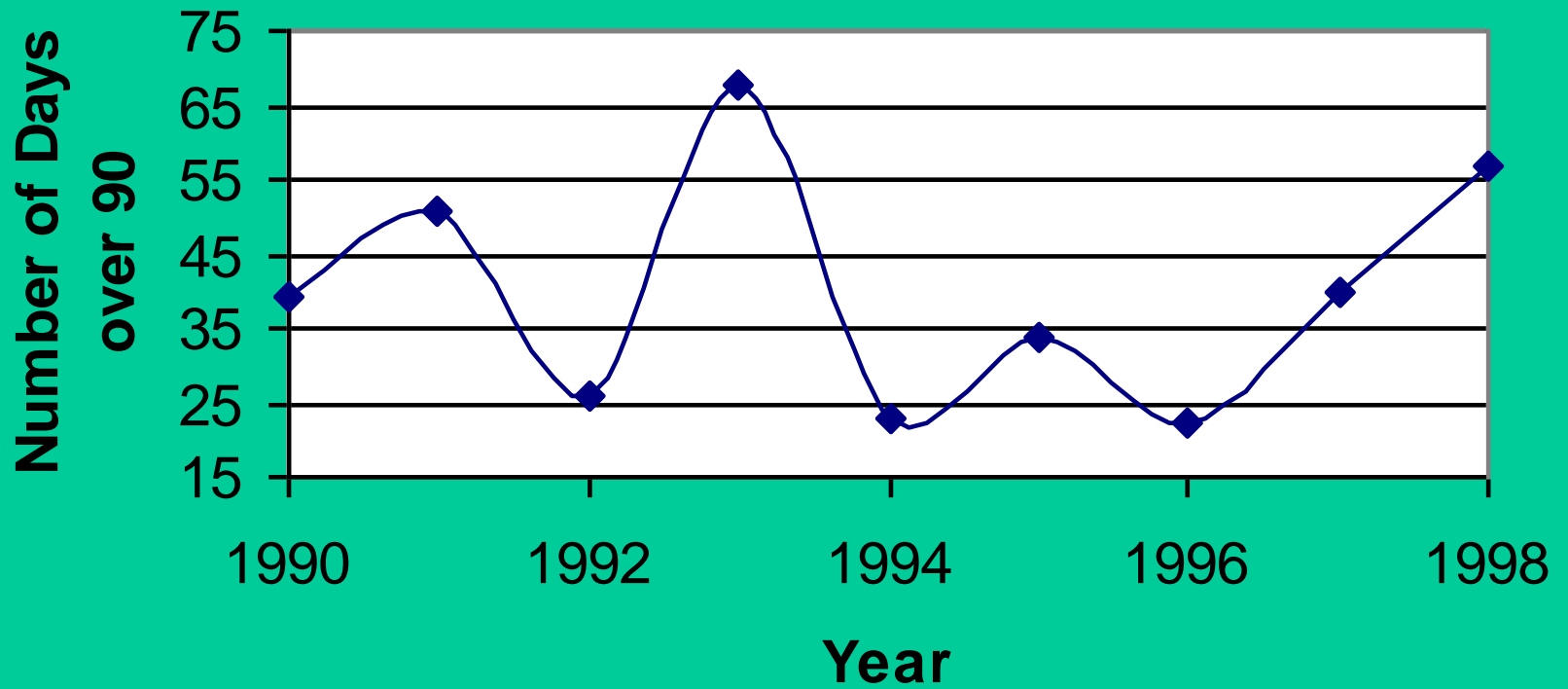


# Average Daily 1-Hour Max O<sub>3</sub> Concentration

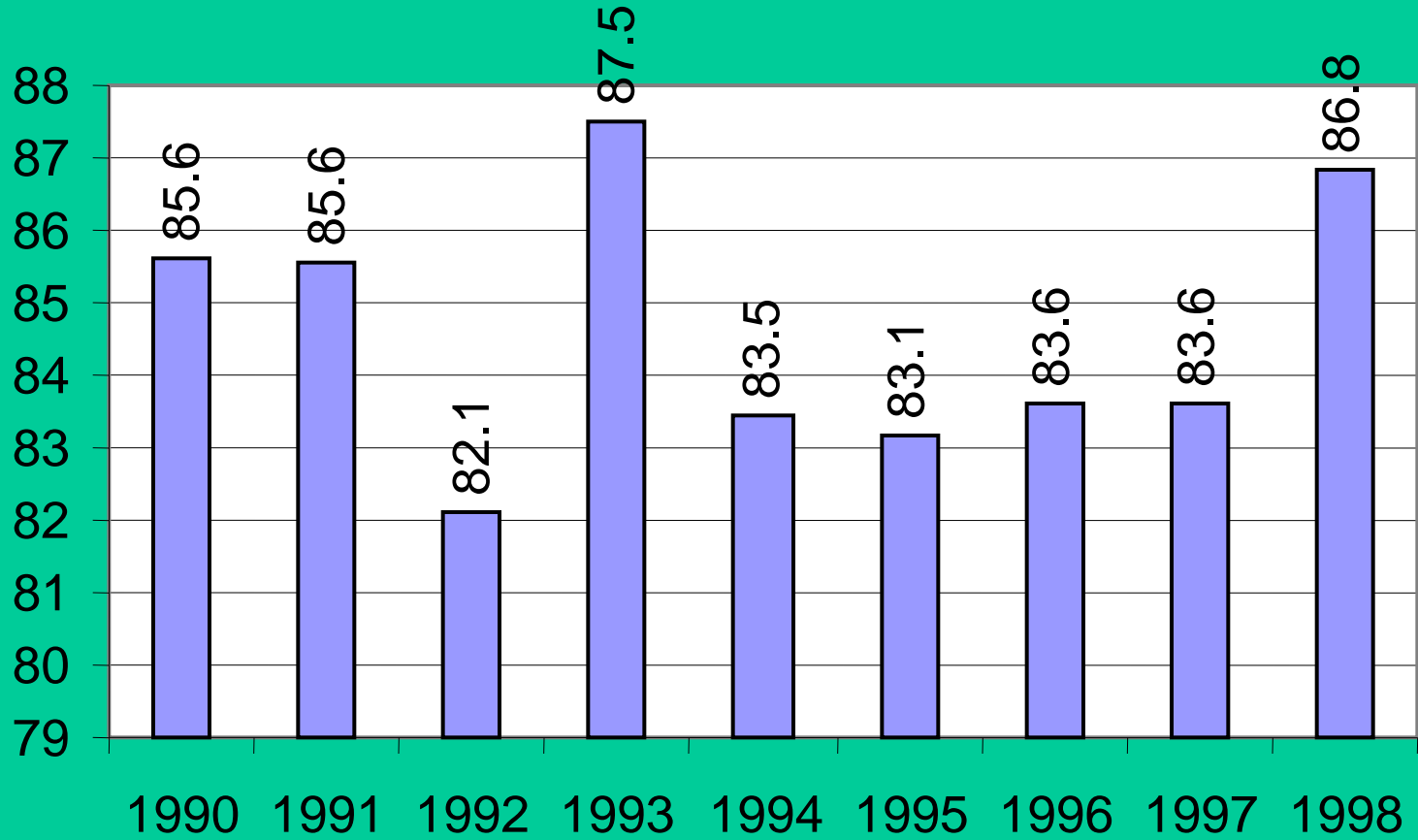
( M ay - S e p t e m b e r 1 9 9 0 - 1 9 9 8 )



## Days over 90 vs Year

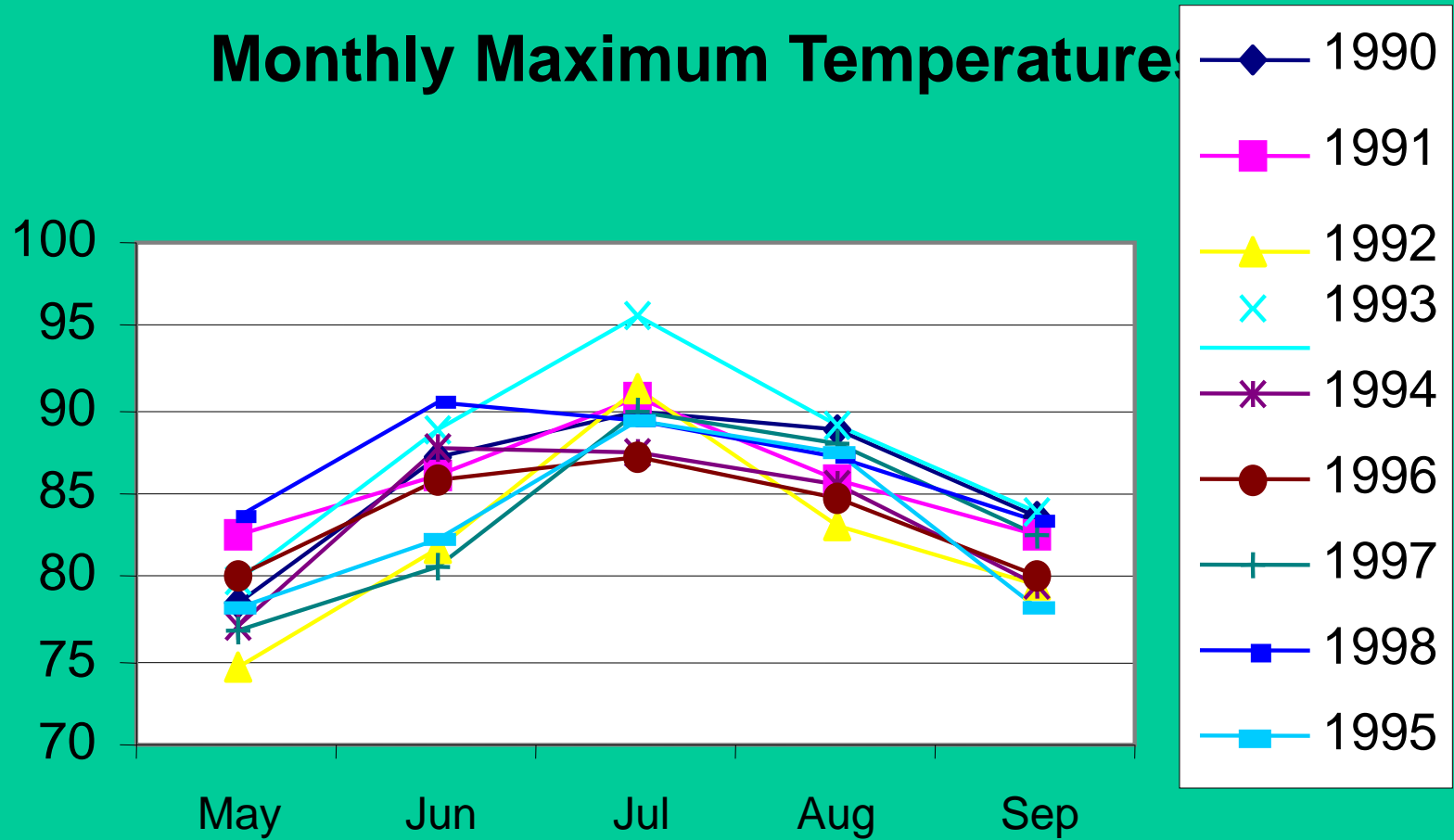


## Average May-Sept. High Daily Temperatures

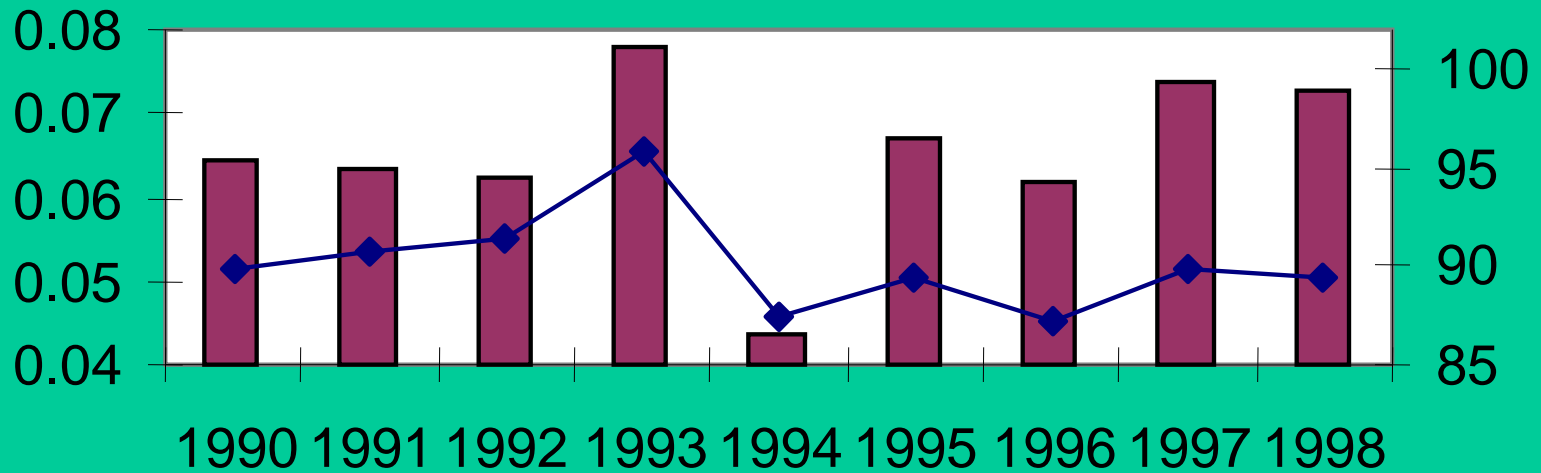




# Monthly Maximum Temperatures

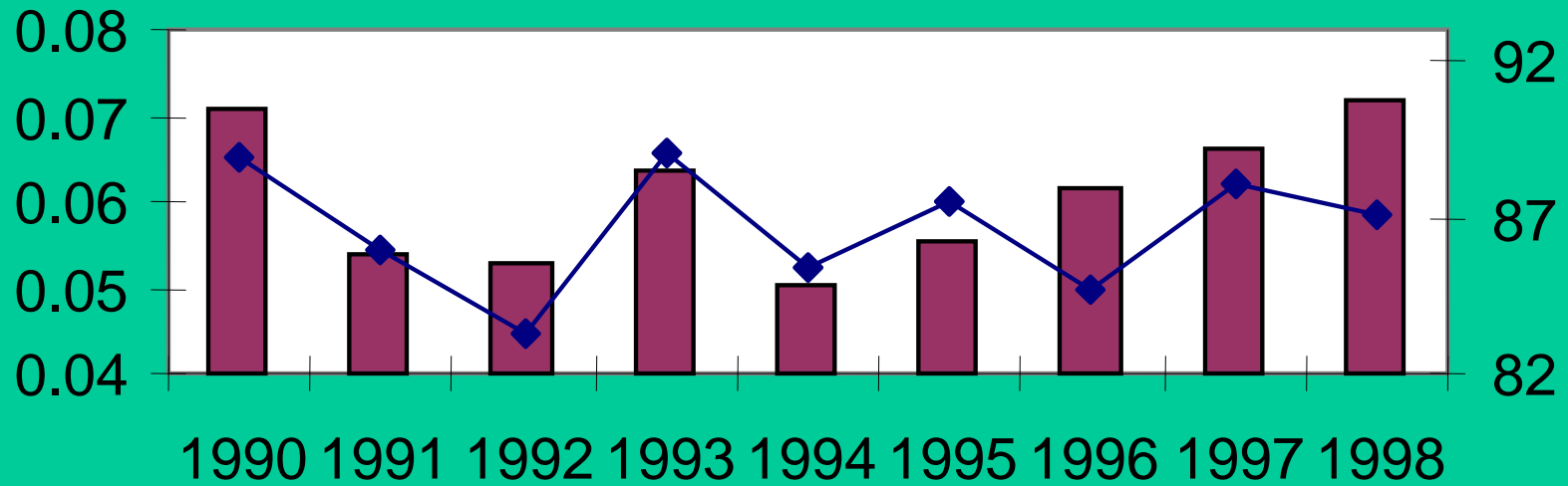


## July Max Avg Temp and 8 hr O<sub>3</sub> Levels



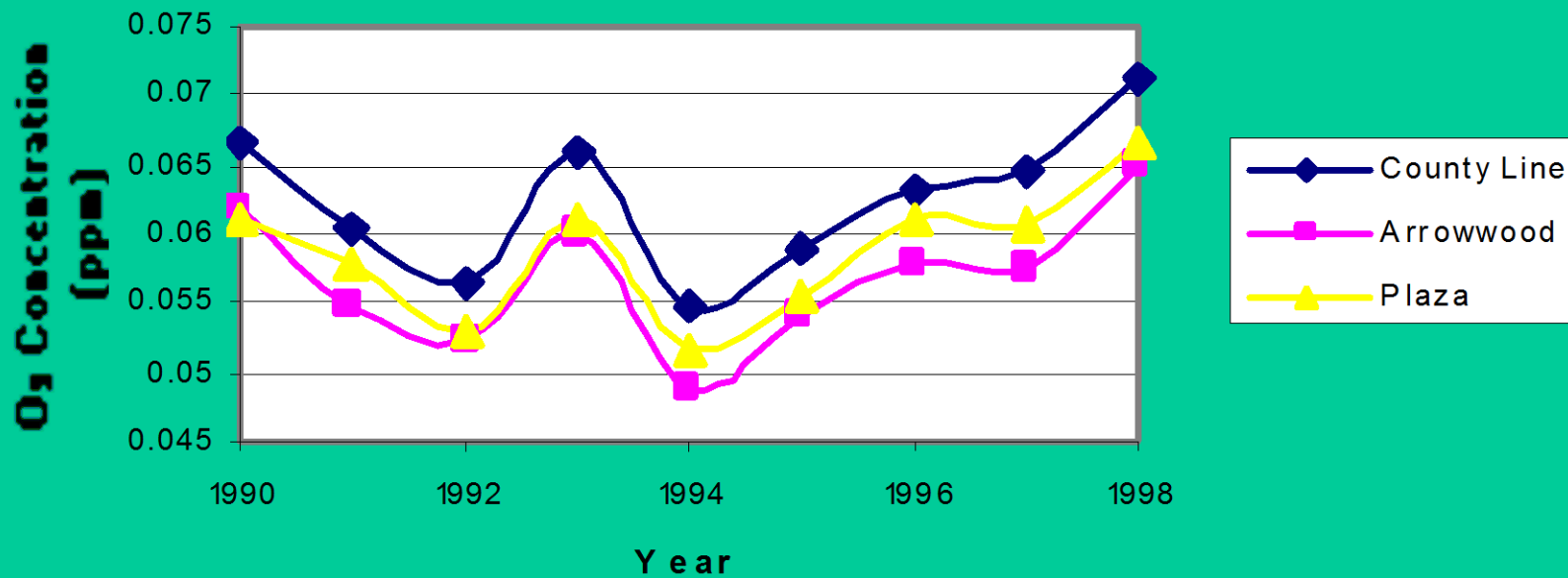
Max 8Hr Ozone —◆— Max Daily Temp

## August Max Avg Temp and 8 hr O<sub>3</sub> Levels

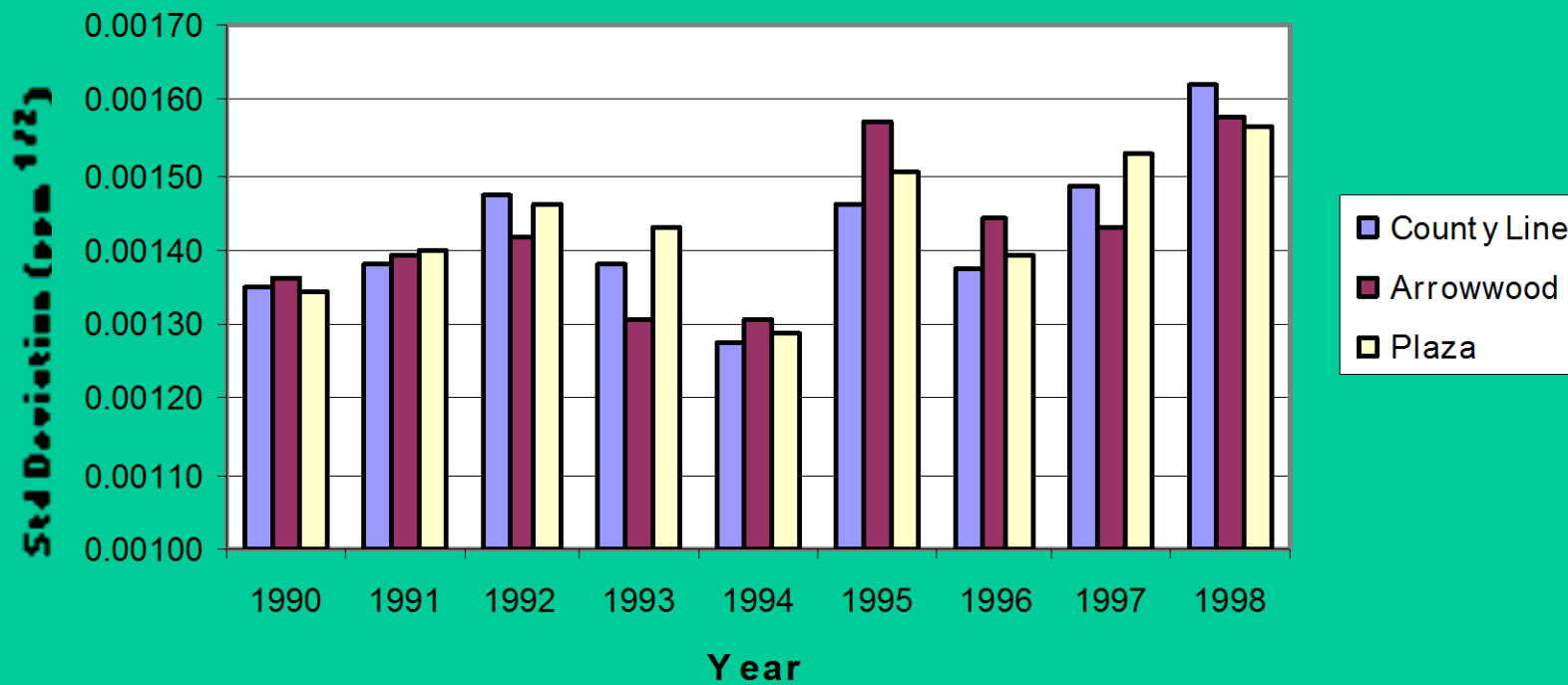


Max 8Hr Ozone —◆— Max Daily Temp

## Average Daily 8-hr Max O<sub>3</sub> vs Year (M ay - S e p t e m b e r 1990 - 1998)



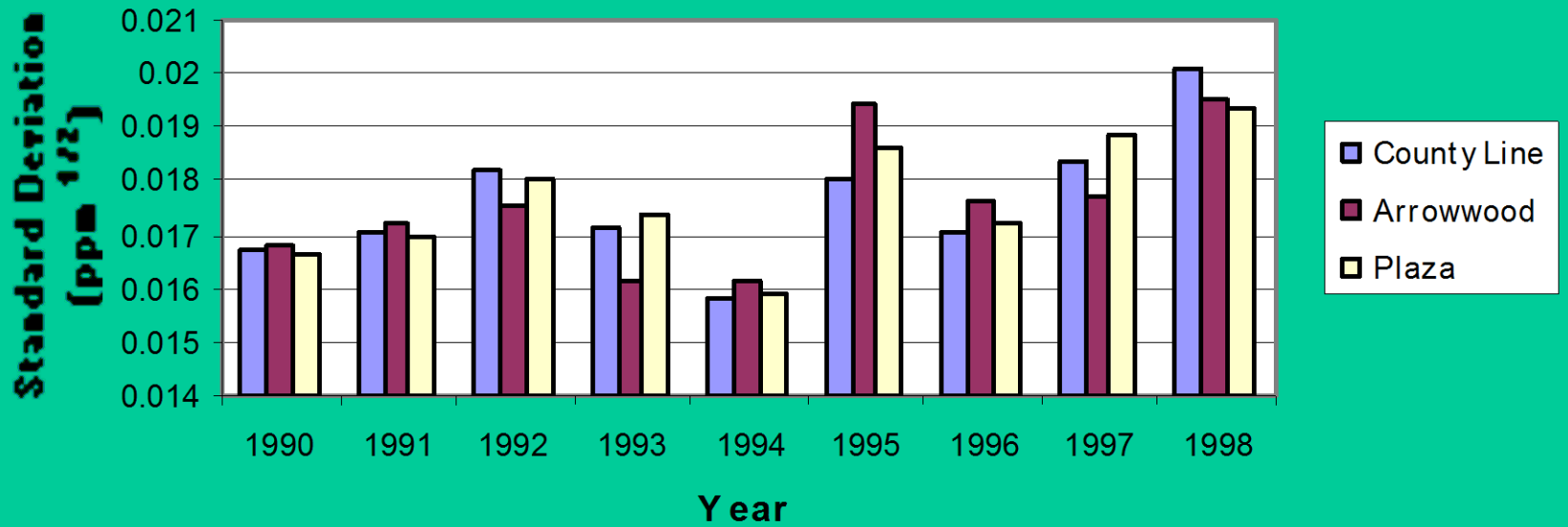
## O<sub>3</sub> Standard Deviation of the Mean (8-hr Average)



# Changes in May-Sept Average Daily Maximum 8 Hr Ozone Level

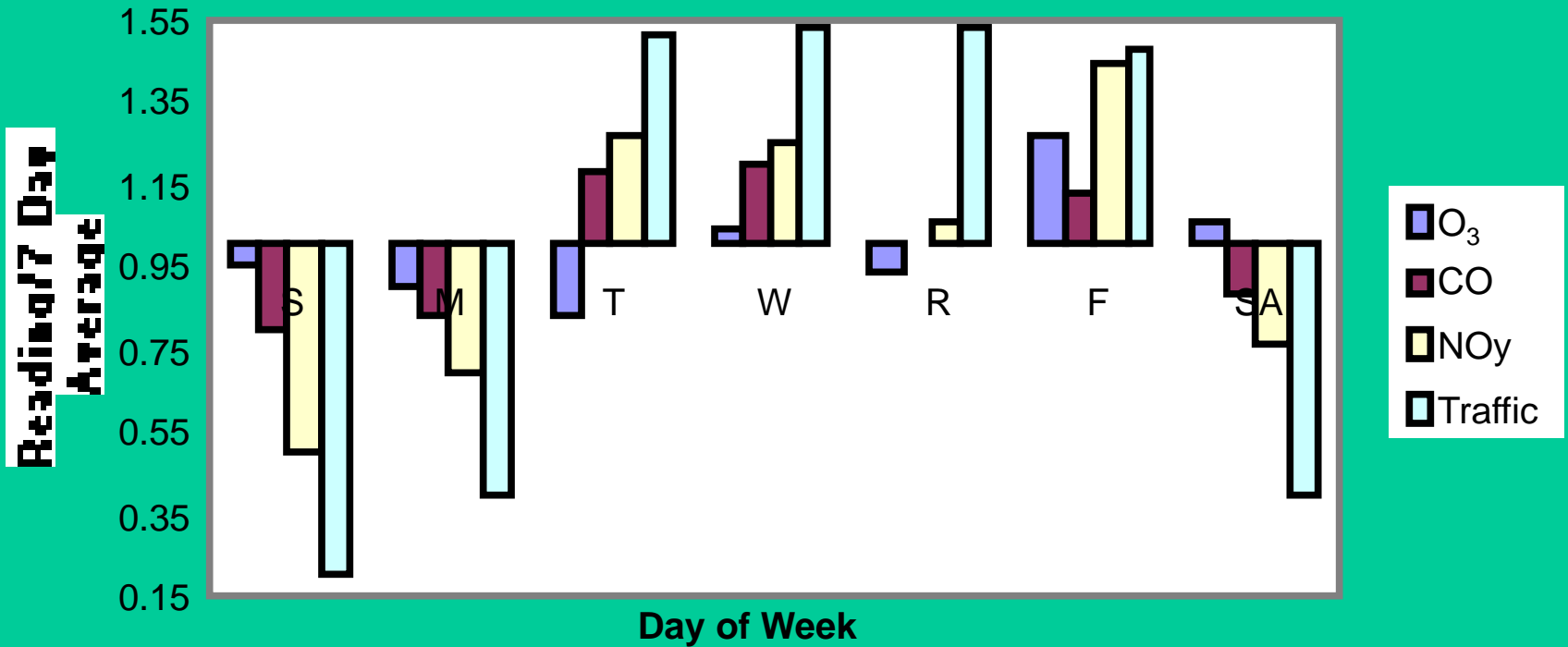
<b>Monitoring Site</b>	<b>1994 Average</b>	<b>1998 Average</b>	<b>% Increase</b>
County	0.055	0.071	29
Arrowwood	0.048	0.065	35
Plaza	0.052	0.067	29

## O<sub>3</sub> Standard Deviation of the Population (8-hr Average)



# Holiday Fluctuations in 1hr Max O<sub>3</sub>, & 7-8 AM CO, NO<sub>y</sub> & Traffic

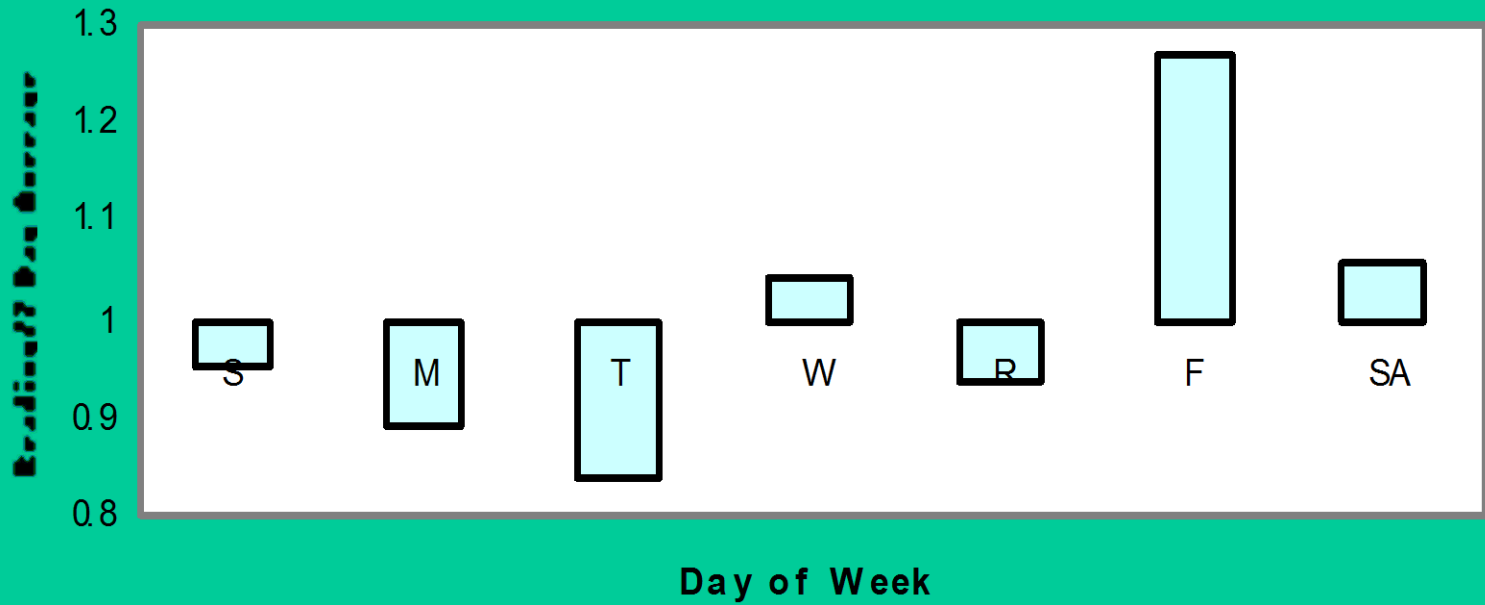
(Labor and Memorial Day, F-R Week, All Monitors, 17 Weeks of O<sub>3</sub> Data)





## Daily Fluctuations in 1-Hr Max O<sub>3</sub>

(All Monitors, 17 Weeks of Memorial & Labor Day F-R)



# Conclusions

- Weekend traffic reductions correlate with  $\text{NO}_y$  and to a lesser extent with CO
- Weekend traffic reduction appears to have little immediate effect on Ozone levels; there seems to be a small cumulative effect from current and previous days' activities
- Power production emulates traffic pattern;  $\text{NO}_x$  power plant emissions vary little within each week

# Conclusions

- Average May-Sept daily 7-8 AM  $\text{NO}_y$  and 7-8 AM CO levels in the region appear to be on the rise
- Average daily maximum Ozone readings at all three monitoring sites in Mecklenburg County have been rising since 1994
- Long-term trends in ozone are influenced by temperature

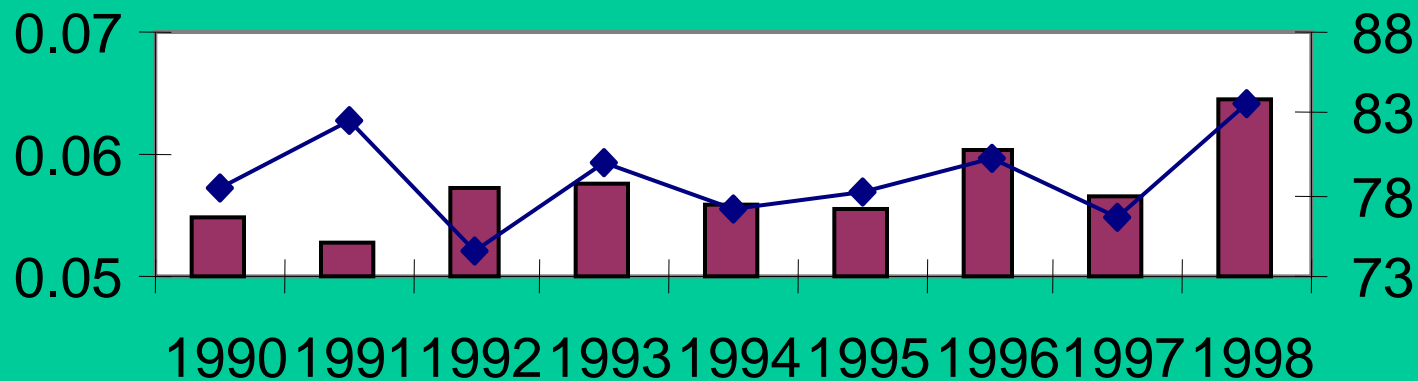
# Acknowledgements

- North Carolina Division of Air Quality  
(Steve Few, Brian Timin)
- City of Charlotte Department of  
Transportation (Charles Able)
- South Carolina Department of  
Transportation (Joe Boozer)

# Additional Supporting O<sub>3</sub> and Temperature Graphs

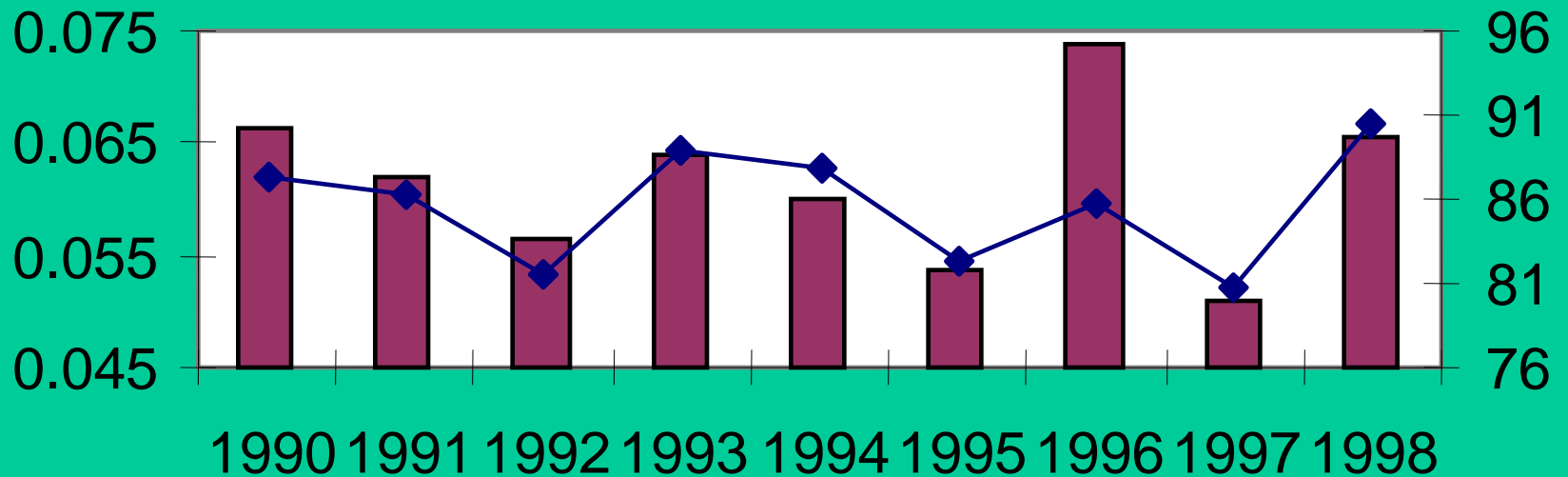
- O<sub>3</sub> and temperature graphs for the months of May, June and September follow. The months of July and August are depicted in the presentation.

## May Max Avg Temp and 8 hr O<sub>3</sub> Levels



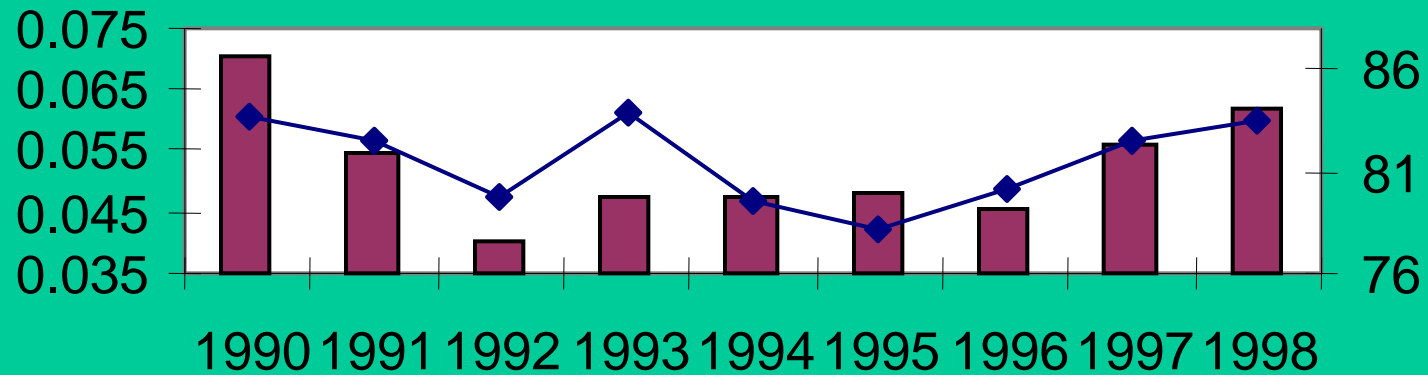
Max 8Hr Ozone — Max Daily Temp

## June Max Avg Temp and 8 hr O<sub>3</sub> Levels



Max 8Hr Ozone —◆— Max Daily Temp

## September Max Avg Temp and 8 hr O<sub>3</sub> Levels



Max 8Hr Ozone —◆— Max Daily Temp