

Was the 2009 Ozone Design Value in the Dallas-Fort Worth Area Related to the Economic Downturn?

Dave Westenbarger

DFW Photochemical Modeling Technical Committee
August 31, 2010



The Assumed Link Between Ozone and the Economy



Reduced economic output, also known as recession,...

...leads to less emitting activity:

- less commuting and shopping
- fewer deliveries by trucks, ships, trains
- factories operating on reduced hours
- lower demand for electricity
- etc....

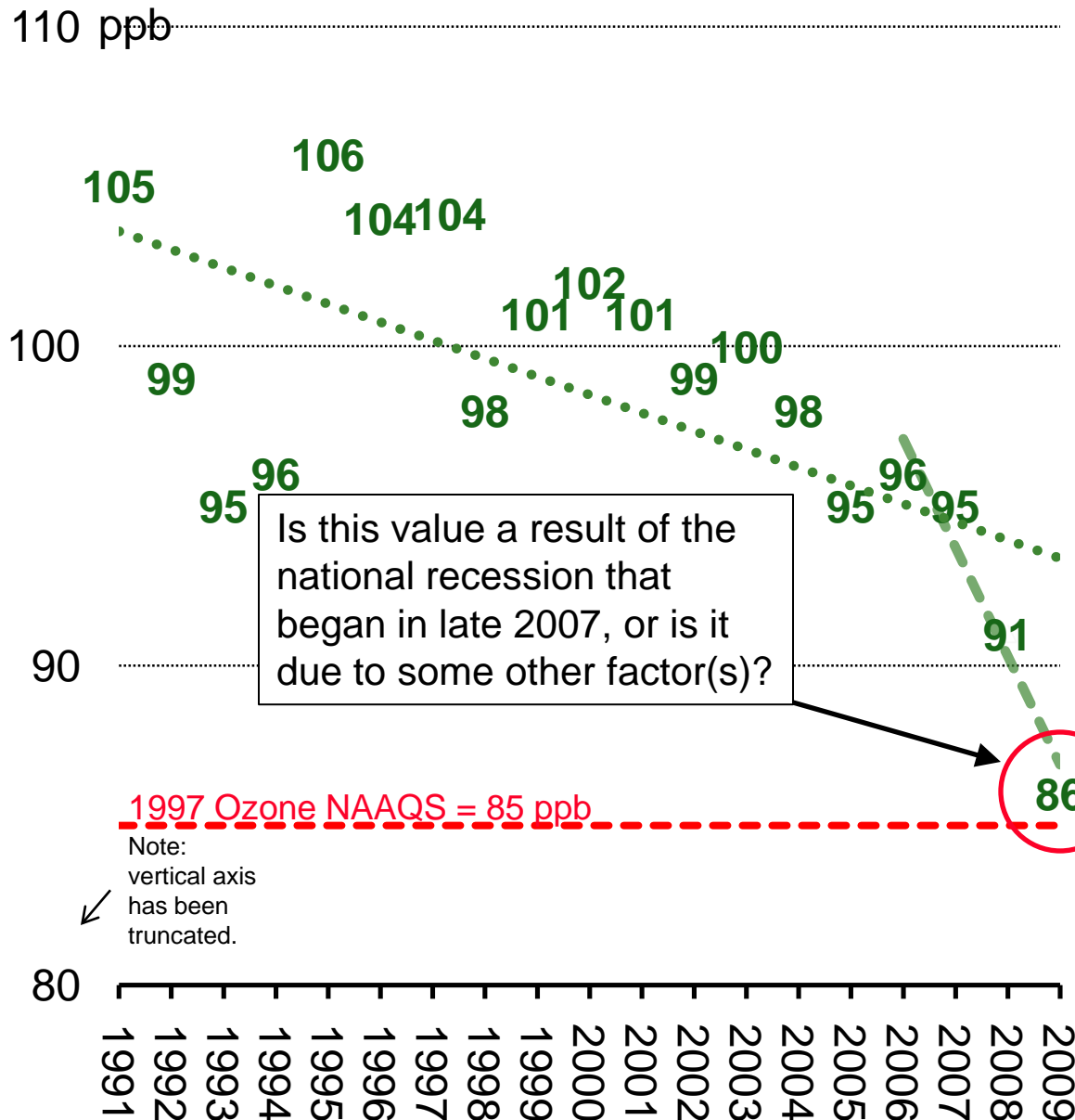
...which results in fewer precursor emissions and, therefore, less ozone.

Problem: evidence suggests it doesn't work this way in DFW.

Reduced economic output, also known as recession, leads to less emitting activity:
less commuting and shopping
fewer deliveries by trucks, ships, trains
factories operating on reduced hours
lower demand for electricity



DFW 8-Hour Ozone Design Values



4th high
8-hour
ozone
concentration

Year	concentration ppb	Design Value ppb
------	----------------------	---------------------

Keller C17

2007	84	
2008	85	
2009	90	= 86

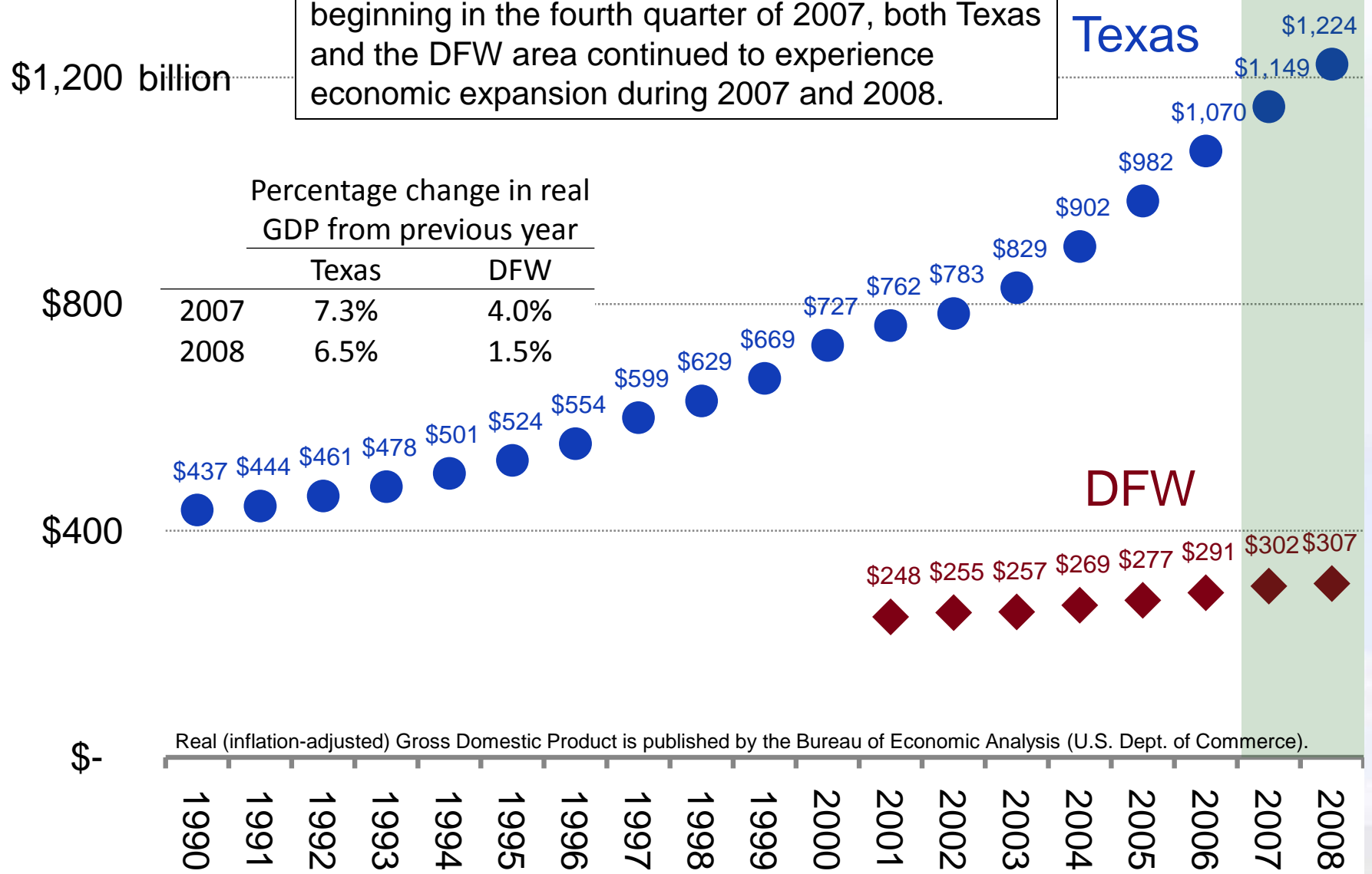
Eagle Mountain Lake C75

2007	84	
2008	85	
2009	91	= 86

Recall: the 2009 DV is composed of 4th highs from 2007, 2008 and 2009. Two DFW monitors recorded DVs of 86 for 2009.

Real Gross Domestic Product of Texas & DFW

Though the national economy entered a recession beginning in the fourth quarter of 2007, both Texas and the DFW area continued to experience economic expansion during 2007 and 2008.



Real (inflation-adjusted) Gross Domestic Product is published by the Bureau of Economic Analysis (U.S. Dept. of Commerce).

Source: Data courtesy the Bureau of Economic Analysis, U.S. Department of Commerce (www.bea.gov/regional/gsp). Chart created by Dwestenbarger, TCEQ Air Modeling and Data Analysis Section.

Real GDP of DFW -- Selected Sectors

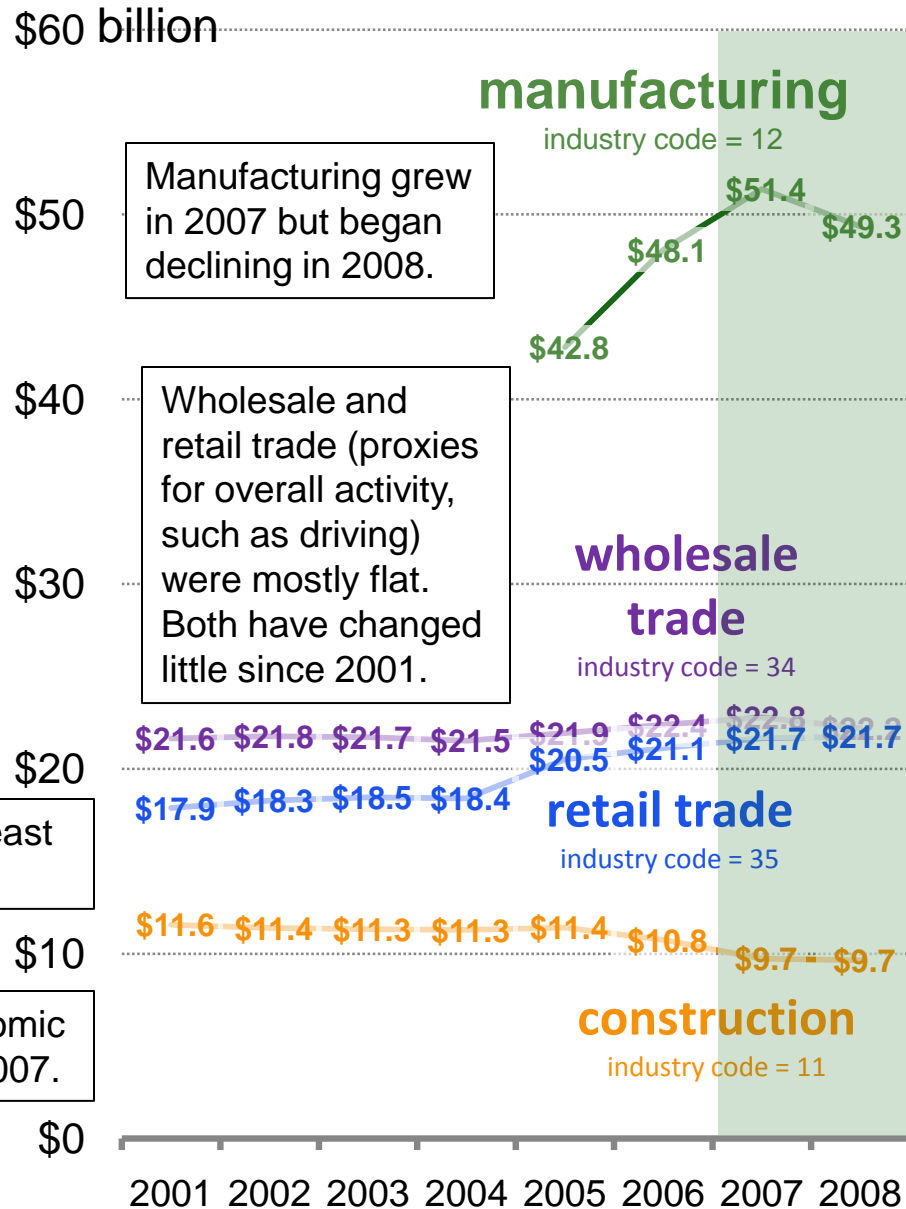
Looking at individual sectors associated with emitting activities reveals patterns that might be due to the recession.

Percentage change in real GDP from previous year

DFW area	industry code				
	cons truc tion 11	manu factur ing 12	whole sale trade 34	retail trade 35	
2002	3.0%	na	0.6%	2.2%	
2003	0.5%	na	-0.2%	1.0%	
2004	4.6%	na	-0.9%	-0.3%	
2005	3.2%	na	1.9%	11.5%	
2006	4.8%	-5.8%	12.3%	2.0%	2.9%
2007	4.0%	-9.5%	6.9%	1.8%	2.6%
2008	1.5%	-0.8%	-4.0%	-2.5%	0.3%

Construction has been slowly falling since at least 2001, and was steady in 2008.

These trends suggest a slight slowing of economic activity in 2008, but probably not as early as 2007.



2001 2002 2003 2004 2005 2006 2007 2008

Source: Data courtesy the Bureau of Economic Analysis, U.S. Department of Commerce (www.bea.gov/regional/gsp). Chart created by Dwestenbarger, TCEQ Air Modeling and Data Analysis Section.

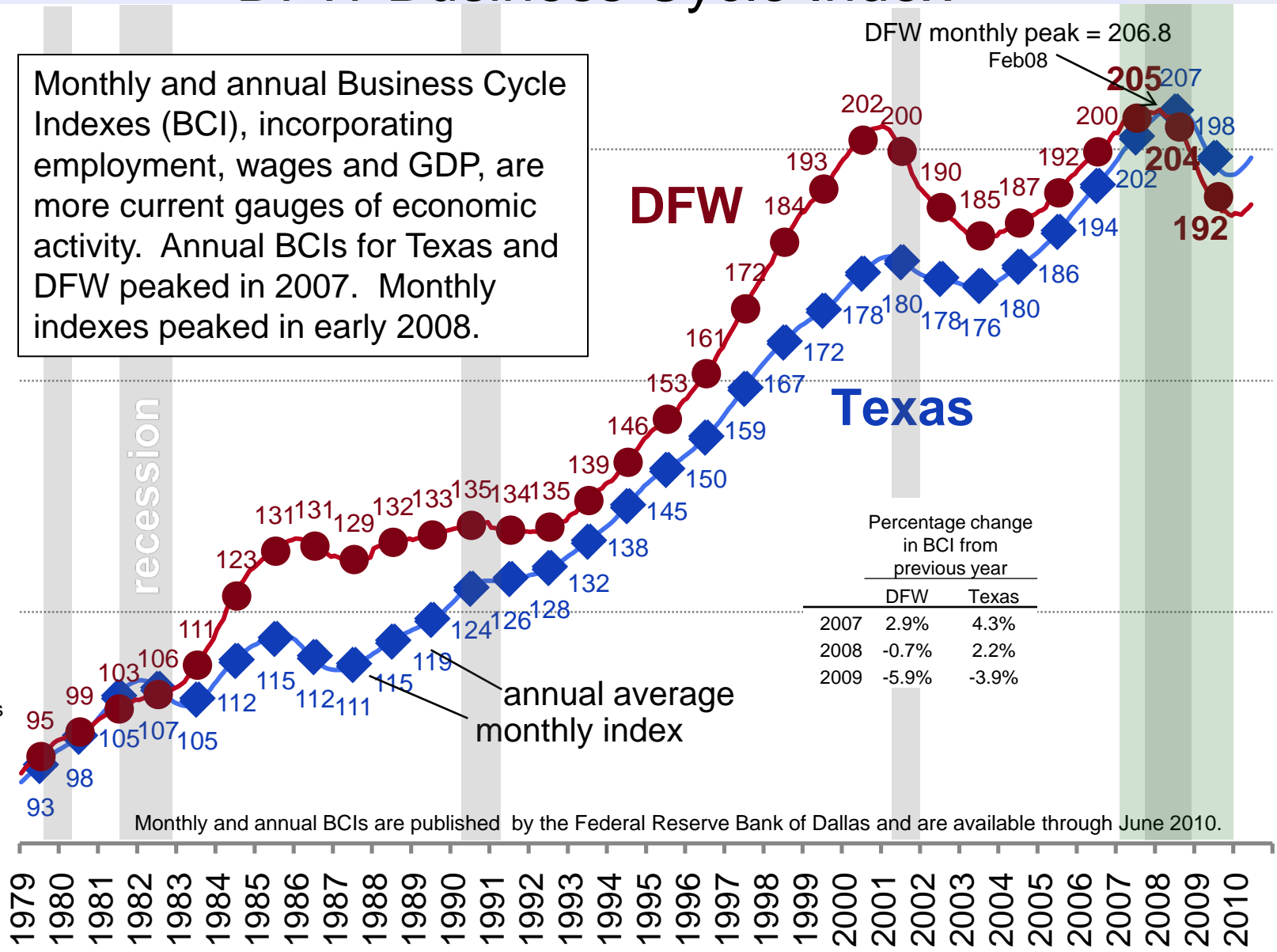


DFW Business Cycle Index

BCI Index
Oct1980=100

Monthly and annual Business Cycle Indexes (BCI), incorporating employment, wages and GDP, are more current gauges of economic activity. Annual BCIs for Texas and DFW peaked in 2007. Monthly indexes peaked in early 2008.

200
160
120
80

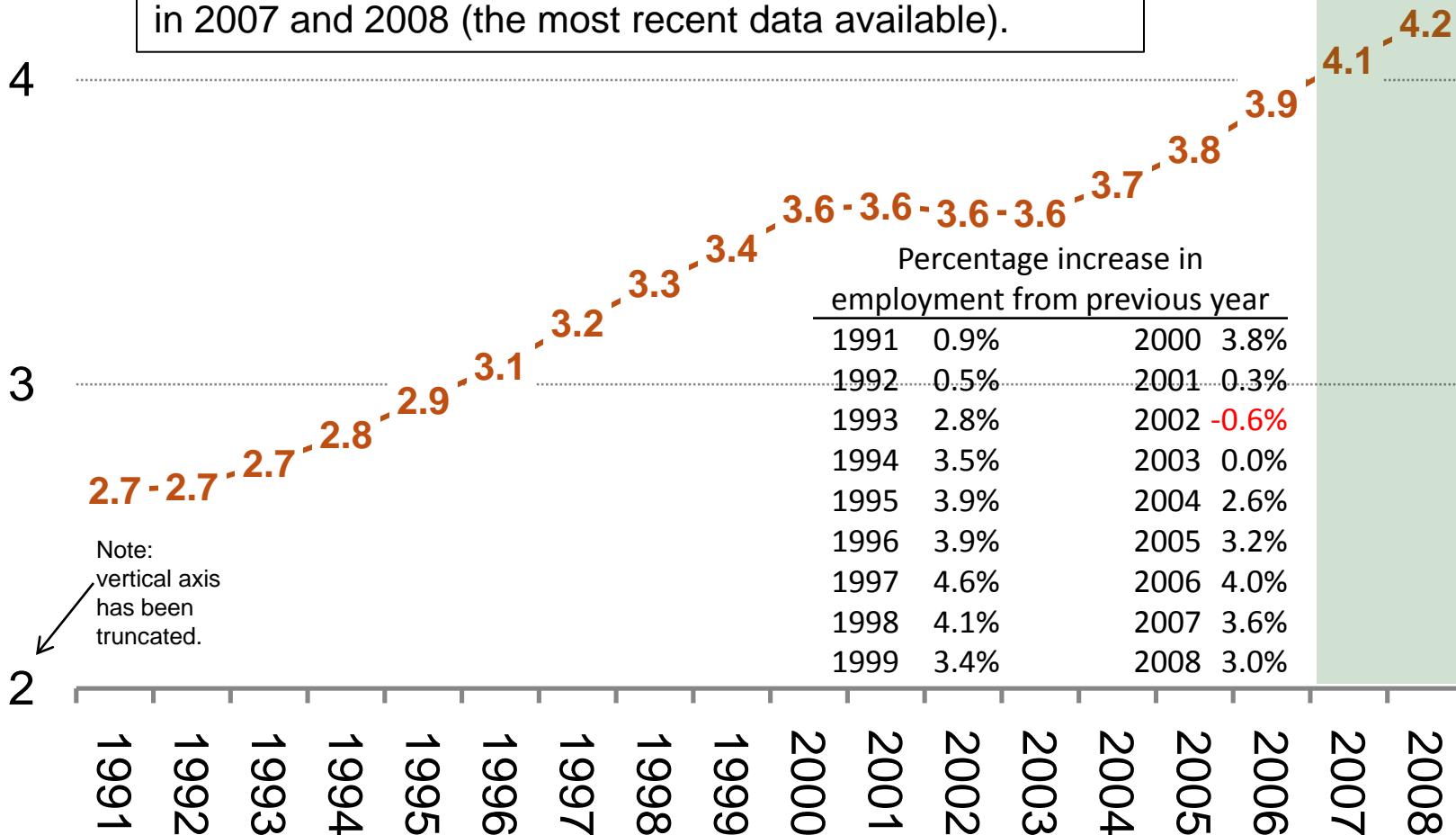


Note: vertical axis has been truncated.

DFW Employment

5 millions

Employment is a strong indicator of economic activity. While some sectors of the DFW economy were starting to slow by 2008, total employment continued to increase in 2007 and 2008 (the most recent data available).



Note:
vertical axis
has been
truncated.

• Employment is a strong indicator of economic activity.

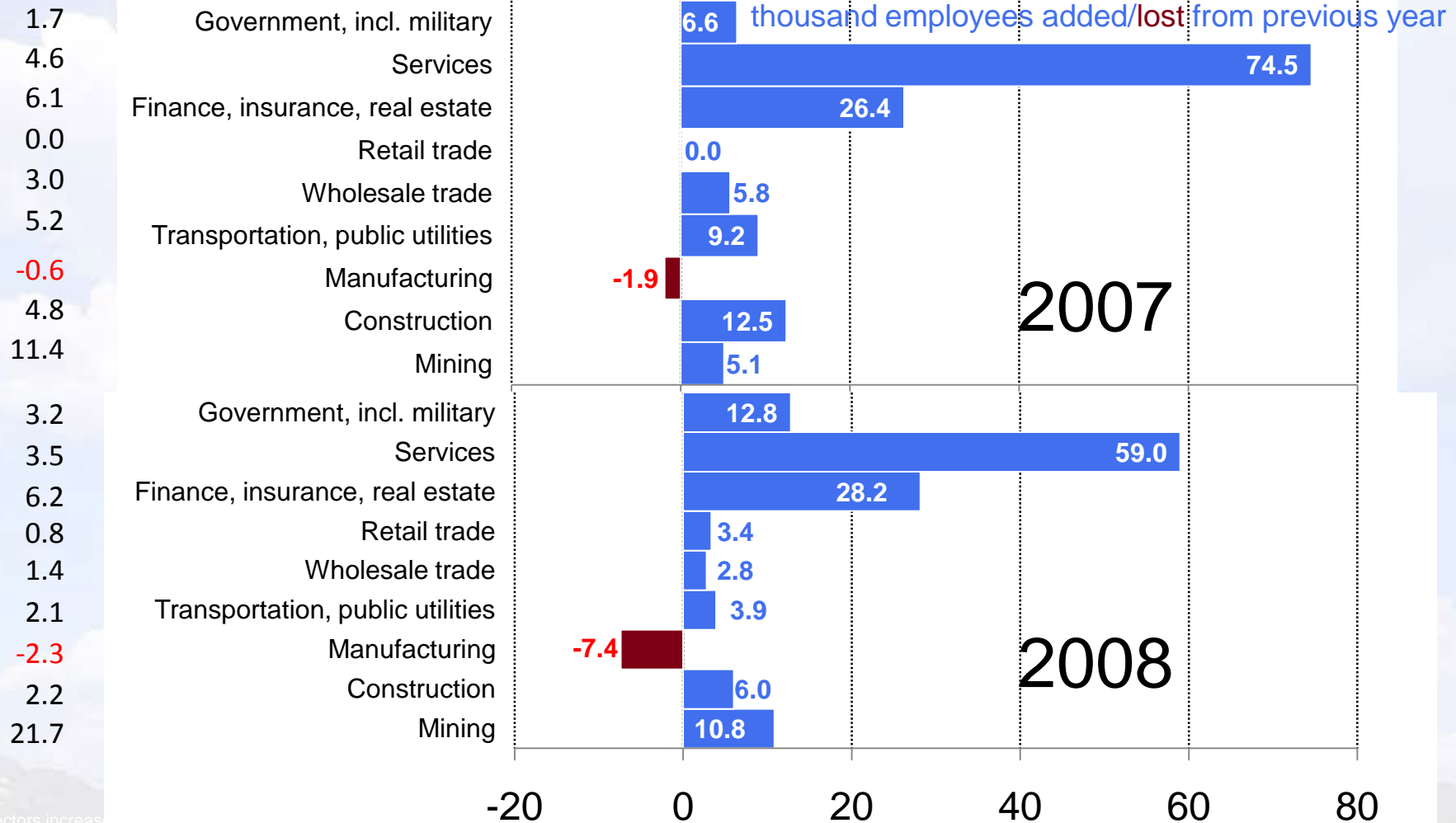
• While some sectors of the DFW economy were starting to slow by 2008, total employment continued to increase in 2007 and 2008 (the most recent data available). Source: Data courtesy the Bureau of Economic Analysis, U.S. Department of Commerce (www.bea.gov/regional/gsp). Chart created by Dwistenbarger, TCEQ Air Modeling and Data Analysis Section.



DFW Employment by Sector

Most sectors increased employment in 2007 and 2008. Only Manufacturing shed employees in either 2007 or 2008. Services was the big gainer in both years. Though a smaller sector, Mining (oil&gas) grew 11.4% in 2007 and 21.7% in 2008.

% change from
previous year



Most sectors increased employment in 2007 and 2008. Only Manufacturing shed employees in either 2007 or 2008. Services was the big gainer in both years. However, Mining (oil&gas) grew 11.4% in 2007 and 21.7% in 2008.

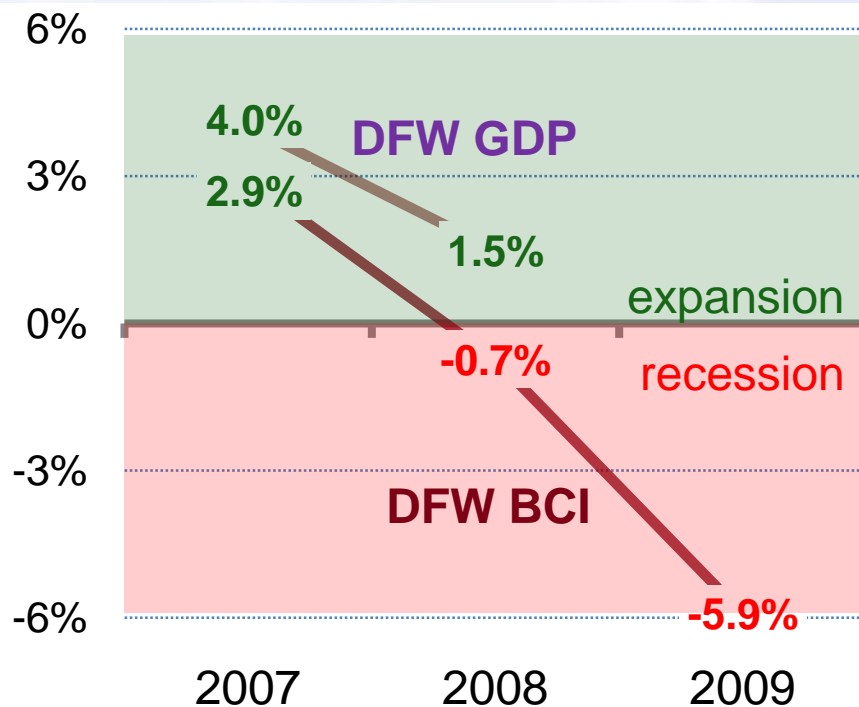
Source: Data courtesy the Texas Commission on Environmental Quality (www.tceq.state.tx.us). Chart created by Dwistenbarger, TCEQ Air Modeling and Data Analysis Section.

Ozone and the Economy in DFW

By the earlier assumption, we expect reduced economic activity to reduce ozone. However, in DFW, as economic growth in 2007 slowed mid-way into 2008, then turned to recession in 2009, 4th high ozone concentrations (the ones that determine the design value) increased in 2008 and 2009.

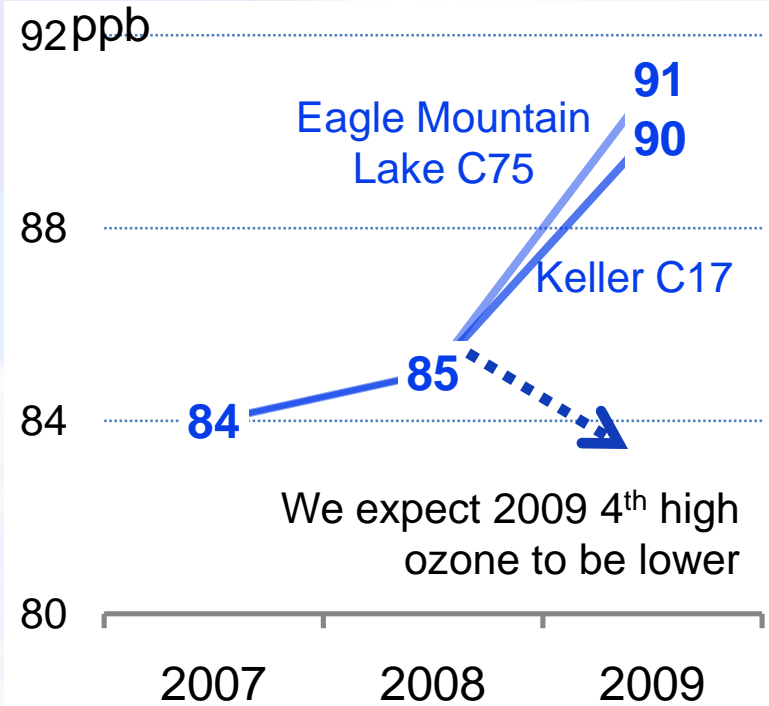
ECONOMY

Percentage change from previous year



OZONE

4th high daily peak 8-hour average



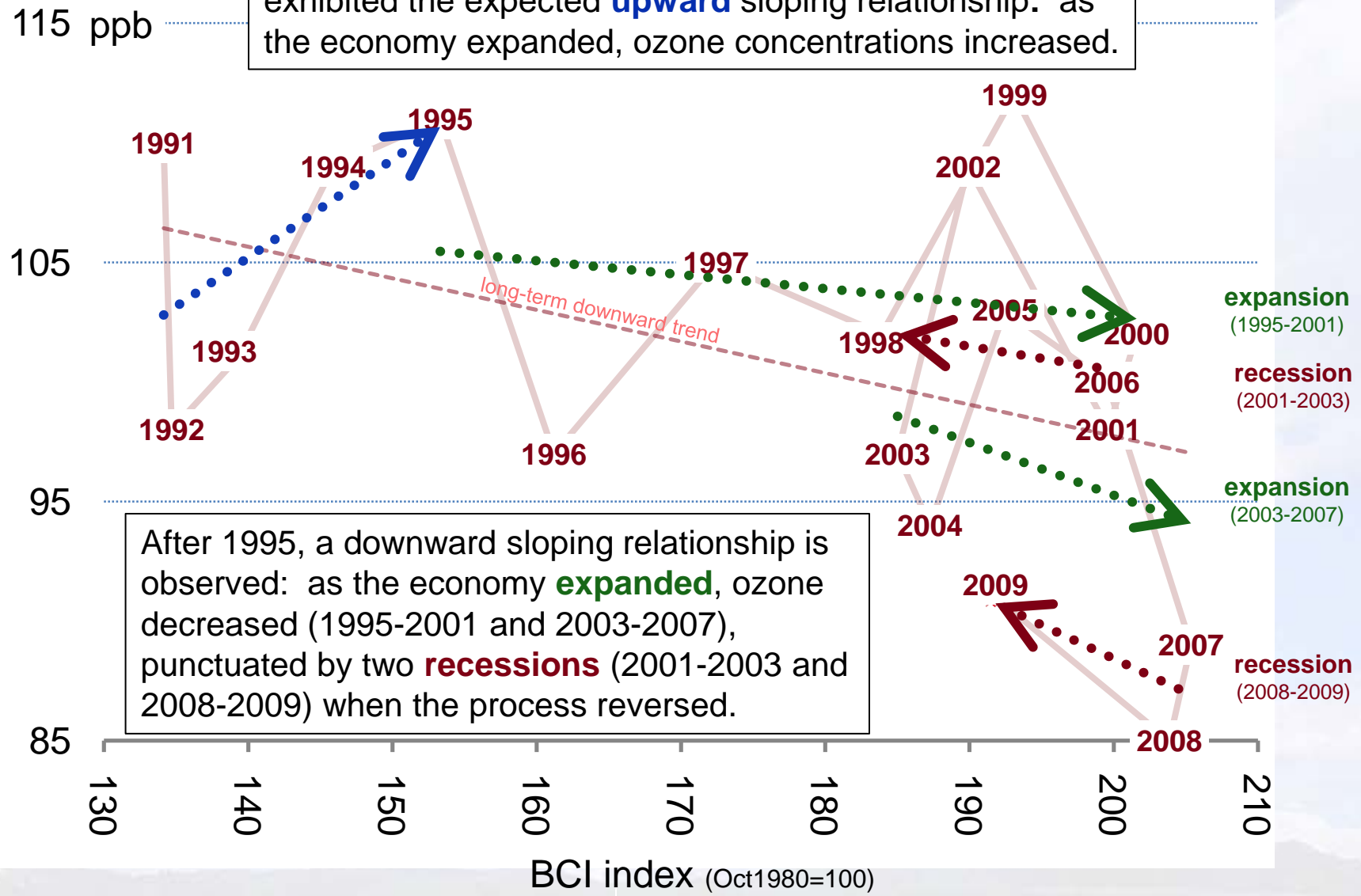
By the earlier assumption, we expect reduced economic activity to reduce ozone. However, in DFW, as economic growth in 2007 slowed mid-way into 2008, then turned to recession in 2009, 4th high ozone concentrations (the ones that determine the design value) increased in 2008 and 2009. Source: Data courtesy Bureau of Economic Analysis, U.S. Dept. of Commerce (www.bea.gov/regional/gsp), Federal Reserve Bank of Dallas, (dallasfed.org/data/data/metro9.tab.htm). BCI is defined at Dallasfed.org/data/basics/definitions.html#coincident. Chart created by DWestenbarger, TCEQ Air Modeling and Data Analysis Section.



Ozone and the Economy in DFW

Until about 1995, ozone & the DFW area economy exhibited the expected **upward** sloping relationship: as the economy expanded, ozone concentrations increased.

Maximum 4th high ozone concentration

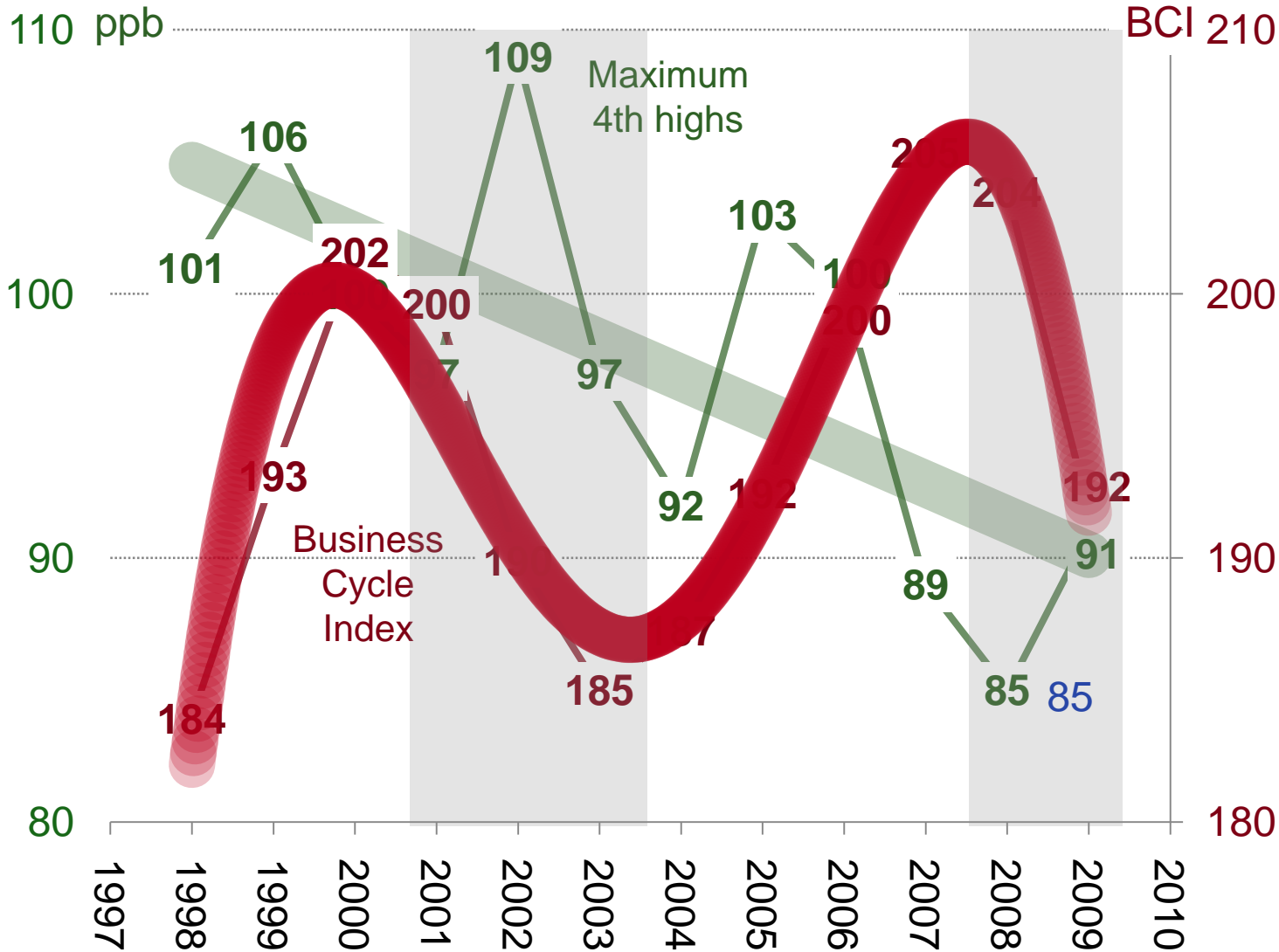


After 1995, a downward sloping relationship is observed: as the economy **expanded**, ozone decreased (1995-2001 and 2003-2007), punctuated by two **recessions** (2001-2003 and 2008-2009) when the process reversed.

Source: Data courtesy Bureau of Economic Analysis, U.S. Dept. of Commerce (www.bea.gov/regional/gsp), Federal Reserve Bank of Dallas, (dallasfed.org/data/data/metro9.tab.htm). BCI is defined at dallasfed.org/data/basics/definitions.html#coincident. Chart created by DWestenbarger, TCEQ Air Modeling and Data Analysis Section.

Ozone 4th Highs and the Business Cycle Index

DFW ozone is highly variable year-to-year, though long-term it's declining.



Since 1997, the DFW economy has seen two recessions: 2001-2003 and 2008-2009.

Ozone does not appear to rise and fall with the economy, suggesting its pattern is determined by other factors.



Conclusions

- The DFW economy overall was expanding in 2007 and 2008, though some sectors were slowing during 2008.
- The recession became evident in DFW only by mid-2008 and 2009.
- Evidence suggests that ozone concentrations in the DFW area are not determined by the level of economic activity.
- In the past two decades, as the local economy has expanded, ozone design values and 4th highest concentrations have declined.