

SHJH Report on 2010 Ozone Monitoring in Teton County, Wyoming

26 Aug 2011

Summary

Save Historic Jackson Hole (SHJH), working with a number of volunteers, monitored ozone levels at various locations in Teton County Wyoming during 2010. Higher ozone levels were observed in locations close to major roads. The highest level of ozone recorded was 50 ppb. This is below the current Federal limit of 75 ppb. There is still reason to be concerned, as increasing vehicle traffic could cause levels to exceed the current limit. The Data from one year is not enough to say that ozone levels are below Federal limits. For this reason work continues in 2011.

Objective

Because of high ozone readings in Pinedale which is approximately 65 air miles SE of Jackson, SHJH began ozone measurements in Jackson Hole in January of 2010. In March of 2011 ozone levels in the Pinedale area were almost double the allowable levels.

The objectives of our Teton county project were:

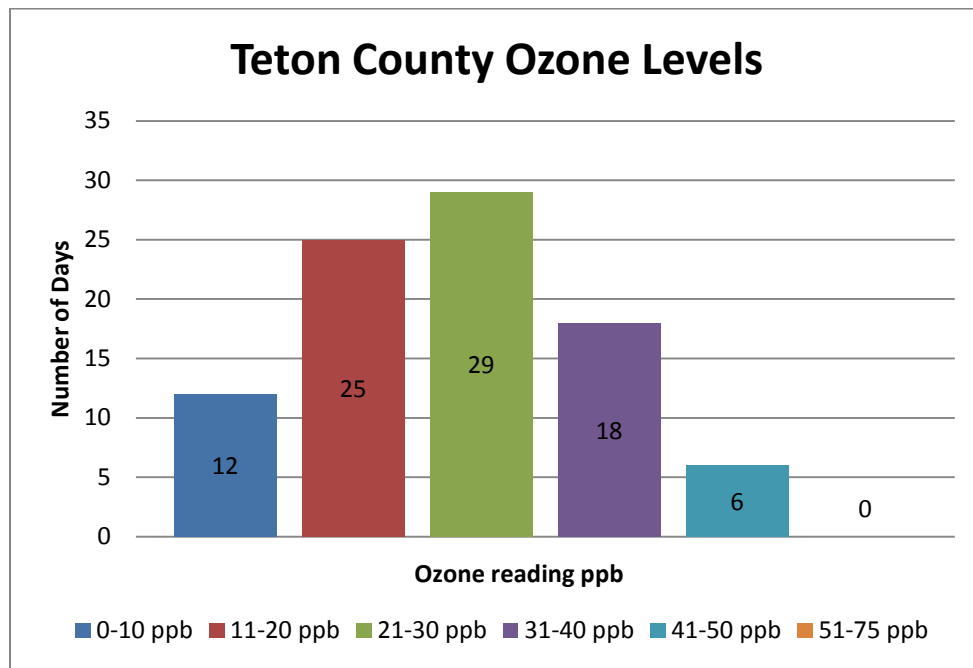
- 1) Determine if ozone levels in Jackson exceed current Federal Limits
- 2) Determine what areas in Jackson have the highest ozone levels even if they do not exceed Federal limits
- 3) If ozone levels in Teton County do not exceed current Federal limits, determine base line levels for future reference. This will be very important if levels exceed the limits in the future or if it appears ozone levels are increasing with time.

Method

One hour Eco Badge test cards were exposed by volunteers at various locations in Teton County. After one hour the badges were read in a Zikua optical reader after following the factory calibration procedure. The ozone reading in parts per billion (ppb), time of exposure, temperature, wind direction, wind speed and cloud cover were all recorded. Wind direction and wind speed were taken from the National Weather Service website for Jackson at the time of the reading. The goal was to expose the badges sometime after true noon. It was not possible to take readings at exactly the same time so the time period was recorded. The manufacturer recommends that readings be taken as close to noon as possible because some studies have shown that generally ozone levels peak around mid day because the ozone is generated by reactions that depend on sunlight. Primary locations monitored were Cottonwood Park (Armond Acri), Wilson (Jeff Springett), and Jackson Hole Community School Campus (students of Stacey Grohne). In addition, various locations around Teton County were monitored when time permitted. Because we had three observers, it was possible to monitor multiple locations on the same day at close to the same time.

Data Summary

	Date	Location	1 hr Ozone ppb
Maximum reading	3 February 2010	JH Community School	50
Minimum reading	12 January 2010	Fish Creek Road	1
Winter average reading	n/a	n/ a	22
Summer average reading	n/a	n/a	28



Note: Current Federal limit for ozone is 75 ppb.

Discussion

Ozone can exist at ground level or in the upper atmosphere. In the upper atmosphere it is considered “good” because it reduces UV radiation at ground level. When ozone exists at ground level it is considered “bad.”¹ Ground Level Ozone is formed when oxides of nitrogen (NO_x) and Volatile Organic Compounds (VOC) react with sunlight. Sources of NO_x and VOC are internal combustion engines, industrial operations and power plants. Most likely sources in Teton County are emissions from automobiles and airplanes. Ground level ozone is a concern because it irritates the respiratory tract. Prolonged exposure may result in permanent damage to lung tissue.² High ozone levels may also damage some plants which could impact wildlife.³

Current Federal limits for ozone are 75 ppb for an 8 hour reading. In 2010 the EPA proposed reducing the limit for an 8 hour average to 60 to 70 ppb. A decision is expected this year on the proposed reduction. The Zikua optical reader was used because it eliminates operator error when reading the color change that indicates ozone level. The optical reader can only read one hour exposure so all data

is for one hour. Although the Federal limits are based on 8 hour average exposure, one hour readings taken by citizen scientists are still useful until a government agency begins monitoring ozone with equipment that measures an 8 hour average. Based on a review of data collected in Yellowstone National Park, we believe the 1 hour average is very close to the 8 hour average.

Yellowstone National Park has monitored ozone since 1988. The location was changed in 1996 so it is difficult to compare data taken before 1996.⁴ The current location is approximately 70 air miles from the Town of Jackson. Ozone levels in the Park appear to peak in the spring. Observations show variation on a daily basis, but there is very little variation throughout the day. The 1 hour average reading is very close to the 8 hour average.⁵ On April 12, 1999 the highest ozone reading in Yellowstone National Park was over 70 ppb. From 1999-2004 the highest ozone readings were generally around 60 ppb.⁶ This illustrates the importance of having data from more than one year.

Conclusions

No measured ozone readings in Teton County in 2010 exceeded the current Federal limits. The highest reading in the winter was 50 ppb. The average reading in the winter was 22 ppb. The highest reading in the summer was 50 ppb. The average reading was 28 ppb. Because the average readings in the summer were higher than in the winter, we plan to increase monitoring in the summer. Since ozone levels can vary from year to year we will continue to monitor ozone levels in Teton County. It is important to determine what the long term trend is for ozone levels in Teton County.

Although 2010 readings of ozone did not exceed Federal limits there is concern that future readings could exceed the limits. Based on 2010 data, it appears ozone levels in Teton County can vary greatly depending on location. Readings on the same day could vary by as much as a factor of six depending on the location. Cottonwood Park, a location with little vehicle traffic had the lowest readings. The highest readings were close to roads with heavy automobile traffic. This would indicate that vehicle emissions have a large effect on ozone levels in Teton County. This is important because traffic has been increasing in Teton County at a rate that is much higher than the national average. The Comprehensive Plan has an objective to reduce traffic while our population grows. If that objective is not met, it is likely that at some point in the future, ozone levels in Teton County may exceed Federal limits.

Another reason for concern is that current Federal limits on ozone may be too high. If the EPA renews efforts to lower Federal limits on Ozone, it is possible that levels in Teton County could exceed the new limits, especially if increased traffic causes the levels to increase. Continued monitoring will provide a warning to citizens and elected officials of the need to take action if ozone levels rise over a several year period. It would be preferable to take action before Federal limits are reached as that would trigger restrictions by the Federal Government.

Future Work

In 2011 we will continue to monitor ozone at various locations in Teton County. We will also increase monitoring in the summer and will examine locations that may have high vehicle emissions such as

major arterial roads in Teton County and the Jackson Hole Airport. The goal will be to develop several years of data so we can examine long term trends.

This study was funded by Save Historic Jackson Hole, a non-profit dedicated to preserving our rural way of life in Teton County. Permission is granted to reproduce all or portions of this report as long as credit is given to Save Historic Jackson Hole.

¹(EPA website on common pollutants)

² (EPA website on common pollutants)

³ (NPS report “Reassessment of the Risk of Foliar Injury from Ozone on Vegetation in Parks Experiencing Increases in Levels of Exposure”)

⁴ (ASL Associates “Ozone Trends in Yellowstone National Park”)

⁵ (Data sheet for Yellowstone National Park, example included in Data)

⁶ (ASL Associates “Ozone Trends in Yellowstone National Park”)

References

National Park Service Current Ozone Measurements in Yellowstone National Park:

http://www.nature.nps.gov/air/data/current/Data_YELL.cfm

National Park Service Annual Performance Reports on Air Quality:

<http://www.nature.nps.gov/air/who/npsPerfMeasures.cfm>

US EPA website on Ozone:

<http://www.epa.gov/ozone/>

Vistanomics Zikua Optical Reader:

<http://www.ecobadge.com/ozone/zikuainfo.html>

Globe protocol for monitoring Ozone:

http://www.ecobadge.com/articles/GLOBE_PROTOCOL.pdf

NPS report “Reassessment of the Risk of Foliar Injury from Ozone on Vegetation in Parks Experiencing Increases in Levels of Exposure”:

<http://www.nature.nps.gov/air/Pubs/pdf/O3Risk/ReassessmentYELL2006.pdf>

ASL Associates “Ozone Trends in Yellowstone National Park.”

http://www.asl-associates.com/yellowstone_glacier_trends.htm

Appendix

Data

Note: In a few cases the time of exposure was greater than one hour. When that occurred, the reading was adjusted by multiplying the reading by a ratio (60 minutes/ actual exposure time in minutes).

Date	Location	1 hr Ozone ppb
10 December 2009	Cottonwood Park	8
7 January 2010	Cottonwood Park	5
7 January 2010	Town Square	12
7 January 2010	"Y" Intersection	34
7 January 2010	Hungry Jacks	26
8 January 2010	Cottonwood Park	21
8 January 2010	Fish Creek Road	34
8 January 2010	Old Wilson School	16
8 January 2010	Town Square	26
8 January 2010	Hungry Jacks	22
8 January 2010	Teton Science School	31
9 January 2010	Cottonwood Park	17
10 January 2010	Cottonwood Park	13
11 January 2010	Cottonwood Park	12
12 January 2010	Cottonwood Park	9
12 January 2010	Fish Creek Road	1
13 January 2010	Cottonwood Park	12
15 January 2010	Cottonwood Park	8
18 January 2010	Cottonwood Park	8
19 January 2010	Cottonwood Park	8

20 January 2010	Cottonwood Park	17
21 January 2010	Cottonwood Park	9
22 January 2010	Cottonwood Park	9
25 January 2010	Cottonwood Park	21
26 January 2010	Cottonwood Park	11
27 January 2010	Cottonwood Park	14
28 January 2010	Cottonwood Park	18
28 January 2010	Cottonwood Park	10
29 January 2010	Cottonwood Park	13
29 January 2010	S. Side Brew Pub	23
29 January 2010	Wilson School	23
29 January 2010	Hungry Jacks	16
29 January 2010	Fish Creek Road	17
30 January 2010	Cottonwood Park	15
1 February 2010	Cottonwood Park	16
3 February 2010	Cottonwood Park	31
3 February 2010	JH Community School	50
4 February 2010	Cottonwood Park	17
8 February 2010	Cottonwood Park	18
8 February 2010	JH Community School	28
9 February 2010	JH Community School	21
9 February 2010	Wilson School	36
9 February 2010	Hungry Jacks	26
9 February 2010	Fish Creek Road	31

9 February 2010	JH Community School	21
10 February 2010	JH Community School	27
12 February 2010	JH Community School	38
12 February 2010	Cottonwood Park	29
15 February 2010	JH Community School	32
17 February 2010	JH Community School	21
18 February 2010	JH Community School	34
18 February 2010	JH Community School	38
19 February 2010	JH Community School	34
22 February 2010	JH Community School	49
23 February 2010	JH Community School	30
24 February 2010	JH Community School	21
5 March 2010	JH Community School	37
8 March 2010	JH Community School	15
9 March 2010	JH Community School	20
10 March 2010	JH Community School	16
15 March 2010	Fish Creek Road	43
17 March 2010	JH Community School	24
23 March 2010	JH Community School	20
24 March 2010	JH Community School	12
27 April 2010	Cottonwood Park	38
24 June 2010	Cottonwood Park	19
25 June 2010	Cottonwood Park	25
7 July 2010	Cottonwood Park	23

8 July 2010	Cottonwood Park	38
8 July 2010	Cottonwood Park	30
9 July 2010	Cottonwood Park	9
14 July 2010	Cottonwood Park	21
19 July 2010	Cottonwood Park	34
20 July 2010	JH Conservation Alliance	34
20 July 2010	Parking Garage	43
21 July 2010	JH Conservation Alliance	10
28 July 2010	Cottonwood Park	21
3 August 2010	Cottonwood Park	27
4 August 2010	Cottonwood Park	22
6 August 2010	Cottonwood Park	19
10 August 2010	Cottonwood Park	50
13 August 2010	Cottonwood Park	27
17 August 2010	Cottonwood Park	42
18 August 2010	Cottonwood Park	22
19 August 2010	Cottonwood Park	24
20 August 2010	Cottonwood Park	38
23 August 2010	Cottonwood Park	25
3 September 2010	Cottonwood Park	28
7 September 2010	Cottonwood Park	18
28 September 2010	Cottonwood Park	11