



Exceptional Event Demonstration for PM10 Exceedances in Brookings and Watertown on October 6, 2011



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This document was prepared
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Chapter 1 Introduction

1.1 Overestimation of the Number of Expected Exceedances

Appendix K to 40 CFR Part 50 interprets the National Ambient Air Quality Standard for particulate matter 10 microns in diameter or less (PM₁₀) and explains how to calculate an expected exceedance number to compare and determine if there is a violation of the standard. This section will discuss the options in Appendix K for determining the expected exceedance number. This exceptional event demonstration is being put together because the U. S. Environmental Protection Agency's (EPA's) Air Quality System database overestimated the expected exceedance number in 2011 resulting in a violation of the 24-hour PM₁₀ National Ambient Air Quality Standard at the City Hall Site in Brookings, South Dakota.

The sampling frequency has a great impact on the expected exceedance number. For example, one sampling day over the standard in three years at an every sixth day sampling schedule will violate the expected exceedance number of no more than 1.0 expected exceedances per year. However, if the site is operating on an every third day, every other day or every day schedule and records one day over the standard in three years the expected exceedance rate is less than 1.0 expected exceedances per year and is not a violation of the standard.

1.1.1 History of PM₁₀ Data Collection

The City Hall Site has been operating for 24 years starting in 1990 and continues today. The site has exceeded the 24-hour PM₁₀ standard only three times in 24 years of testing. All three days were affected by high winds causing fugitive dust levels to exceed the 24-hour standard for PM₁₀. The first exceedance was in 1990, the first full year of testing at this site, and the sampling schedule was every sixth day. The sampling day was affected by high winds and the concentration was flagged in the Air Quality System (AQS) database as (RJ) which represents a High Winds exceptional event. Because of the sampling schedule of every sixth day, the expected exceedance number for the three year average would have been greater than 1.0 expected exceedance per year if the data had not been flagged as an exceptional event. The next three years showed no additional days over the 24-hour standard.

Eighteen years after the first exceedance day a second exceedance was recorded at the site in 2008, with a sampling schedule of every third day. The sampling day was flagged in the AQS database as (IJ) which represents an Informational High Wind exceptional event. In accordance with Appendix K, the exceedance did not calculate an expected exceedance number that caused a violation because the two years before and two years after had no exceedance days testing with a sampling schedule of every third day.

Three years later, on October 6, 2011, the site exceeded the standard a third time. The sampling schedule was every sixth day. The sampling day was again affected by high winds and the concentration was flagged in the AQS database as (RJ) which means High Winds exceptional event.

1.1.2 Calculation of Expected Exceedance Number

In accordance with Appendix K, section 3.0, if the sampling frequency for PM10 sampling occurs at a less frequent schedule than every day or a sample is missed, an expected exceedance value is calculated (see Equation 1). The estimated number of exceedances for a calendar quarter must be rounded to the nearest hundredth. The estimated number of exceedances for a single year is rounded to one decimal place. The expected number of exceedances for a 3 year period is rounded to one decimal point which if over 1.0, indicated the site in not attaining the PM10 24-hour National Ambient Air Quality Standard.

Equation 1 – Calculating the Expected Exceedance Number

$$e_q = v_q \times (N_q \div n_q)$$

Where:

- e_q = the estimated number of exceedances for calendar quarter q;
- v_q = the observed number of exceedances for calendar quarter q;
- N_q = the number of days in calendar quarter q;
- n_q = the number of days in calendar quarter q with PM10 data; and
- q = the index for calendar quarter, q = 1, 2, 3, or 4.

The Department of Environment and Natural Resources (DENR) pulled the Preliminary Design Value report from AQS for the City Hall Site for calendar year 2011. According to the report, the estimated number of exceedances for calendar year 2011 was 8.4 and the three year average for calendar year 2009, 2010, and 2011 was 2.8. The report based the estimated number of exceedances on there being one observed number of exceedances for the quarter (v_q), 92 days in the calendar quarter (N_q), and 11 days with PM10 data (n_q). Using these values in Equation 1, the estimated number of exceedances does represent 8.4 and the three year average would be 2.8. This represents a violation of the PM10 24-hour National Ambient Air Quality Standard. DENR disagrees with this report and believes the report overestimated the number of expected exceedances.

DENR disagrees with the AQS which shows only 11 valid samples were collected in the fourth quarter of 2011. In actuality, DENR collected valid sample concentrations for 42 of the 92 days in the fourth quarter of 2011. Of those, 23 samples were collected on the manual EPA reference method monitor and 24 were collected on the continuous EPA equivalent method monitor. Of the total sample number, five of the sampling days are duplicated with the manual and continuous monitors running at the same time for a total of 42 sampling days in the quarter with valid PM10 concentrations. Therefore, DENR believes it collected sufficient data for the quarter to consider it a valid sampling quarter and the calculation of expected exceedance number using the 42 valid PM10 sampling days provides a better estimate of the potential to exceed the standard from the October 6, 2011, exceedance.

In accordance with Appendix K, section 3.1(f), to reduce the potential for overestimating the number of expected exceedances, the correction for missing data is not required for a calendar quarter in which the first observed exceedance has occurred if:

1. There was only one exceedance in the calendar quarter;
2. Everyday sampling is subsequently initiated and maintained for 4 calendar quarters in accordance with 40 CFR § 58.12; and
3. Data capture of 75 percent is achieved during the required period of everyday sampling.

October 6, 2011 was the only exceedance recorded at the City Hall Site in the calendar quarter. Everyday sampling was initiated on December 8, 2011 and the data capture goal of 75 percent was achieved for the 4 calendar quarters following the fourth quarter in 2011 (see Table 1.1). Since the City Hall Site met this criterion, the first observed exceedance is not adjusted for incomplete sampling. There were no other exceedances in that quarter; therefore, the estimated exceedances number for the fourth quarter in 2011 is 1.0. The expected number of exceedances for a 3 year period is determined by dividing 1.0 by 3 because there were no other recorded exceedances. The expected number of exceedances for the 3 year period before and after 2011 is 0.3. Therefore, the October 6, 2011 exceedance did not cause a violation of the PM₁₀ 24-hour National Ambient Air Quality Standard.

1.1.3 Using All Years of Testing in the Calculation

Another option to ensure the number of expected exceedances is not overestimated is to use all of the years of testing to determine the estimated number of exceedances for the site. In accordance with Appendix K, section 2.3(b), “...*More than 3 years may be considered, if all additional representative years of data meeting the 75 percent criterion are utilized.*” Table 1.1 shows the calculated number of expected exceedances for each year. As can be seen the only year that does not have four quarters of representative data is 1992. All the other 23 years meet the 75% completeness requirement.

If the data from Table 1.1 is used to calculate the number of expected exceedances from the years after 1992 (1993 through 2013), 21 years of data are represented from the site. In those 21 years the total expected exceedances during that time period derived from the AQS database is 11.4. The average expected exceedance number for the 21 years is 0.5 per year.

If all years except 1992 are used there would be 23 year of data from the site. In those 23 years the total expected exceedances during that time period derived from the AQS database is 17.4. The average expected exceedance number for the 23 years is 0.8 per year.

Therefore, it is demonstrated in both cases which are allowed by Appendix K that the exceedance on October 6, 2011 is not considered a violation of the PM₁₀ 24-hour National Ambient Air Quality Standard.

Table 1.1 - Expected Exceedance Numbers for City Hall Site

Year	Sampling Schedule	Number of Exceedances	Valid Sampling Quarters	Number Valid Samples	Estimated Exceedance Number	Air Quality System Flags
1990	6th	1	4	58	6.0	RJ
1991	6th	0	4	58	0	
1992	6th	0	3	53	0	
1993	6th	0	4	58	0	
1994	6th	0	4	60	0	
1995	6th	0	4	61	0	
1996	6th	0	4	61	0	
1997	6th	0	4	58	0	
1998	3rd	0	4	116	0	
1999	3rd	0	4	115	0	
2000	3rd	0	4	120	0	
2001	3rd	0	4	116	0	
2002	3rd	0	4	117	0	
2003	3rd	0	4	118	0	
2004	3rd	0	4	119	0	
2005	3rd	0	4	119	0	
2006	3rd	0	4	113	0	
2007	3rd	0	4	107	0	
2008	3rd	1	4	119	3.0	IJ
2009	6th	0	4	60	0	
2010	6th	0	4	60	0	
2011	6th	1	4 ¹	69 ²	8.4 ³	RJ
2012	Every Day	0	4	365	0	
2013	Every Day	0	4	363	0	

¹ – The Air Quality System database indicates that during the 4th quarter of 2011, only 11 scheduled sampling days were collected out of 15 (73.3 percent) which represents less than 75 percent of the data being collected. This will be discussed further in this section; and

² – Number of samples collected using the manual method monitors at this site.

³ – Calculated number using only the scheduled sampling days.

1.2 Exceptional Events Rule

On March 22, 2007, the EPA adopted its final rule for state and local air quality management agencies regarding the review and handling of certain air quality monitoring data (72 FR 13560). The rule, “Treatment of Data Influenced by Exceptional Events” or Exceptional Events Rule became effective on May 22, 2007 (40 CFR §50.14). The Exceptional Events Rule allows the EPA to exclude data showing exceedances of a National Ambient Air Quality Standard when determining an area's ability to meet the standard for a given criteria air pollutant. DENR considers the October 6, 2011, exceedance of the PM₁₀ 24-hour National Ambient Air Quality

Standard not a violation of the standard. However, if EPA disagrees with DENR's interpretation of 40 CFR Part 50, Appendix K, then DENR submits this document to demonstrate the exceedance is an exceptional event and should not be used in determining if the area is attaining or not attaining the standard.

The administrative and procedural requirements of the Exceptional Events Rule must be met by DENR in order for EPA to consider excluding air quality monitoring data due to an exceptional event. DENR must notify EPA of its intent to exclude data by placing an initial flag and event description next to the data in EPA's AQS database. The initial flags must be submitted to EPA by July 1st following the end of the year in which an exceptional event takes place. The demonstration to support the initial flag and provide the EPA evidence of an exceptional event must be submitted by DENR within the lesser of three years from the calendar quarter of the event or 12 months prior to an EPA regulatory decision. Also, DENR must provide notice and opportunity for public comment and submit any public comments received along with the demonstration.

Prior to excluding data for South Dakota, DENR must demonstrate that an "exceptional event" occurred and the event affected measured criteria air pollutant concentrations at any site or group of sites in the monitoring network. An exceptional event is defined by Section 319 of the Clean Air Act as an event that:

1. Affects air quality;
2. Is not reasonably controllable or preventable;
3. Is caused by human activity that is unlikely to recur at a particular location or is a natural event; and
4. The EPA determines the event is exceptional.

The rule does not include specific requirements concerning the type or level of evidence an agency must provide due to the wide range of events and circumstances that are covered under the rule. Hence, EPA determines data exclusion on a case-by-case basis after considering the weight of evidence provided in the demonstrations.

In order for EPA to concur with an exceptional event flag, the State's demonstration must provide accurate and reliable evidence that shows:

1. The event was exceptional as defined in the Clean Air Act;
2. There is a clear causal relationship between the exceedance and the event that is claimed to have affected air quality;
3. The event is associated with measured concentrations in excess of background levels and normal historical fluctuations; and
4. There would not have been an exceedance but for the event.

Demonstrations that meet these criteria are eligible for concurrence flags in the AQS database and data exclusion for determinations of attaining a National Ambient Air Quality Standard if EPA agrees with the State's findings. The purpose of this report is to demonstrate that high PM10 concentrations exceeding the 24-hour standard were recorded at the City Hall Site (AQS

identification number 46-011-0002) in Brookings and Utility Site (AQS identification number 46-029-0002) in Watertown on October 6, 2011 were due to exceptional events, particularly natural events caused by high winds.

1.3 PM10 Standards

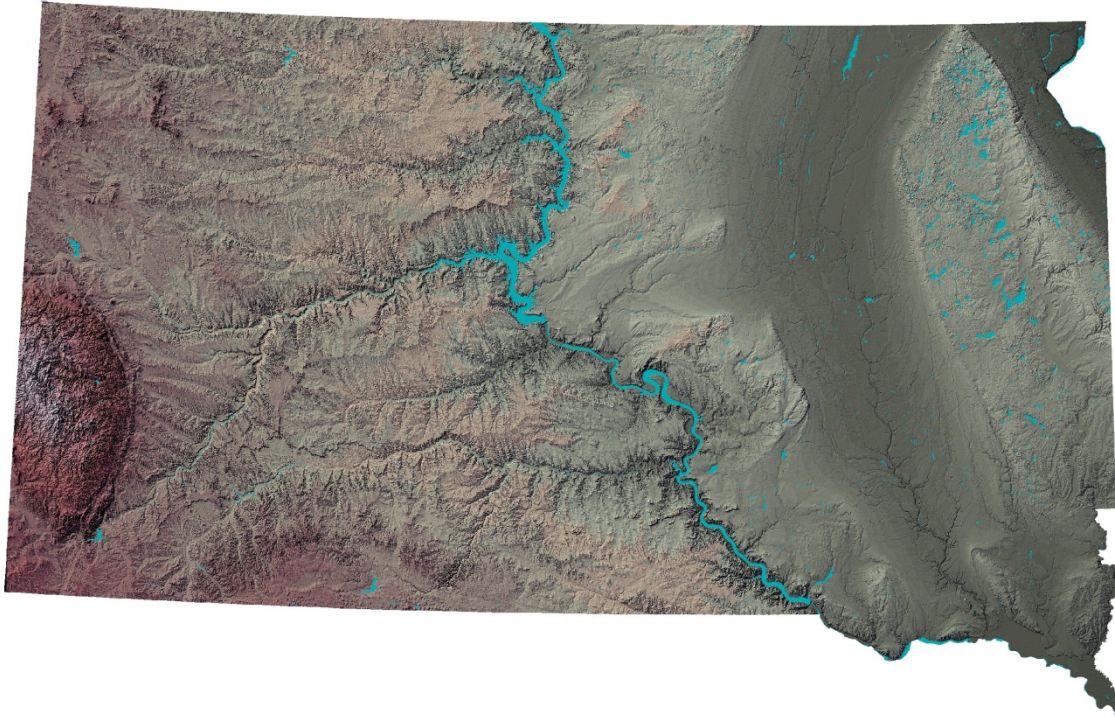
In July 1987, the EPA promulgated National Ambient Air Quality Standards. This is a size range that can affect the upper airways and can be inhaled into the alveolar regions of the lungs. The annual arithmetic mean standard of 50 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) was revoked on October 17, 2006. The standard currently has one form, a 24-hour standard of 150 $\mu\text{g}/\text{m}^3$. The 24-hour standard is attained when the expected number of exceedances for each calendar year, averaged over three years, is less than or equal to one. The estimated number of exceedances is computed quarterly using available data for each monitor type and adjusting for missing sample days. A data recovery of 75 percent is needed for each calendar quarter to be considered a valid quarter of data.

1.4 Topography

The state of South Dakota is a large geographic area with a low population density. Most of the South Dakota terrain is flat to rolling hills. The exception is the Black Hills Region which is a mountainous area ranging from 3,000 to 7,242 feet of elevation on Harney Peak the highest point in the state. Figure 1.1 shows the topography of South Dakota.

The flat to rolling terrain allows good dispersion of air pollutants over a large part of the state. In these areas there are few problems with inversions and stagnation of air pollution. The mountainous Black Hills region has some potential for stagnation of air pollution in the valleys, but this is usually short term. Low population and minimal air pollution from the industrial sources keeps most of the area free of air pollution problems. One of the main concerns for air pollution in this region is smoke from large local prescribed and wild land fires. During the evening and night time hours smoke from local burning of wood, prescribed fires and wild land fires can cause areas of high levels of fine particulate matter in the mountain valleys.

Figure 1.1 - Topographic Map of South Dakota



The topography is very flat surrounding Brookings. The area changes to slightly rolling hills to the east and west of Brookings. The topography is also flat in Watertown with some low rolling hills. There are no indications that topography is causing air pollutants to accumulate in either of these areas.

1.5 Climate

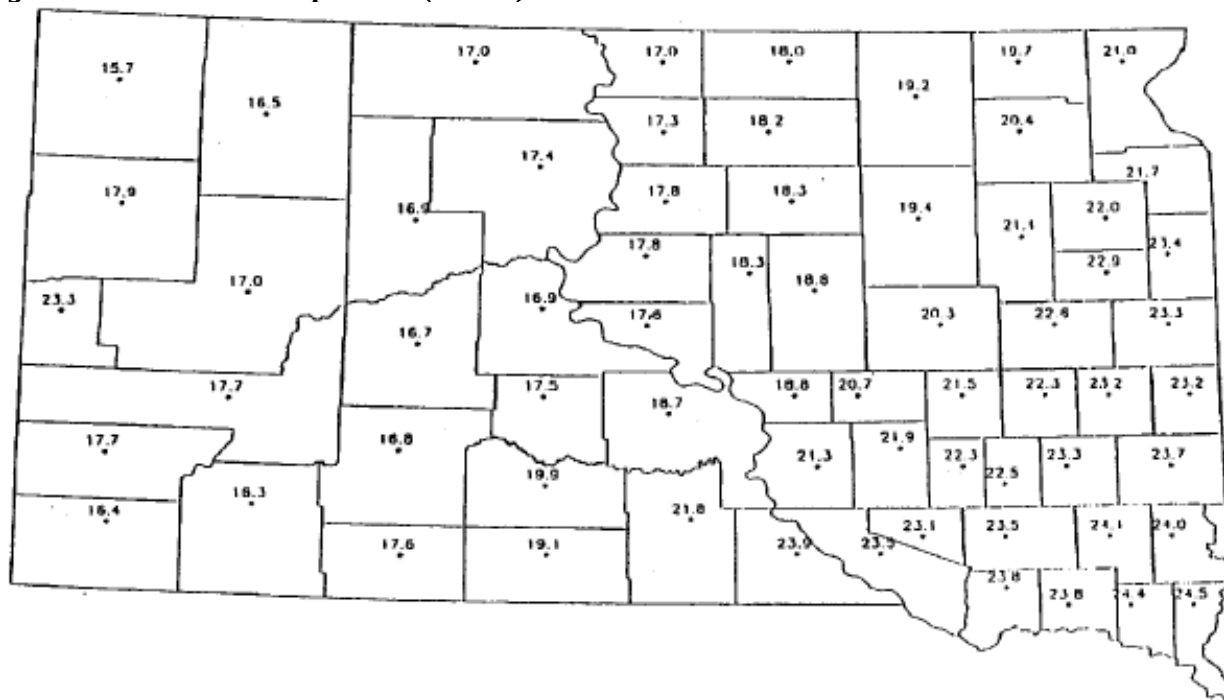
The region has a diverse climate with changing conditions. Winters can be cold reaching temperatures as low as a -40 degrees Fahrenheit (F). Summers are warm with some days hot and can have temperatures reaching 113 degrees F.

Annual precipitation varies from between 24 and 25 inches in the southeast to less than 14 inches in the northwest. See Figure 1.2 for a map of annual precipitation. Most of the precipitation occurs during the growing season in spring and early summer. Much of the summer precipitation comes from thunderstorms which can be very intense, delivering large amounts of precipitation in a short time. Snowfall averages vary from 30-50 inches in the lower elevation to over 100 inches in the northern Black Hills.

High winds can occur at any time of the year and can be a source of localized high PM10 concentrations. Usually the levels are the highest when high winds are associated with extended drought. Rapid City historically is one area of the state that has problems with PM10 levels over the National Ambient Air Quality Standard during high wind events. South Dakota has a Natural Events action plan for Rapid City. The plan includes a high wind dust alert and fugitive dust action plans for the facilities in the Rapid City Air Quality Control Zone. Under the plan the

National Weather Service provides a public service alert when forecast wind speeds will exceed 20 miles per hour, wind gusts 40 mile per hour and 0.02 inches or less of daily precipitation accumulation during the last 5 or more days. Several high wind dust alerts are called each year in Rapid City. During the last five years none of the high wind dust alert days have had concentrations greater than the 24-hour PM10 standard. With the coordinated efforts of the City of Rapid City, Pennington County, state agencies, and Rapid City regulated facilities have reduced PM10 concentrations in this area and the area was re-designated from unclassifiable to attainment in April 2006.

Figure 1.2- Annual Precipitation (inches) 1961-1990 Normals



SOURCE: STATE CLIMATOLOGIST - SDSU.

Other areas of the state can have high PM10 concentrations during high wind events but the events occur infrequently and to date have not affected more than one day per year. The 2011 event occurred in the Brookings to Watertown area.

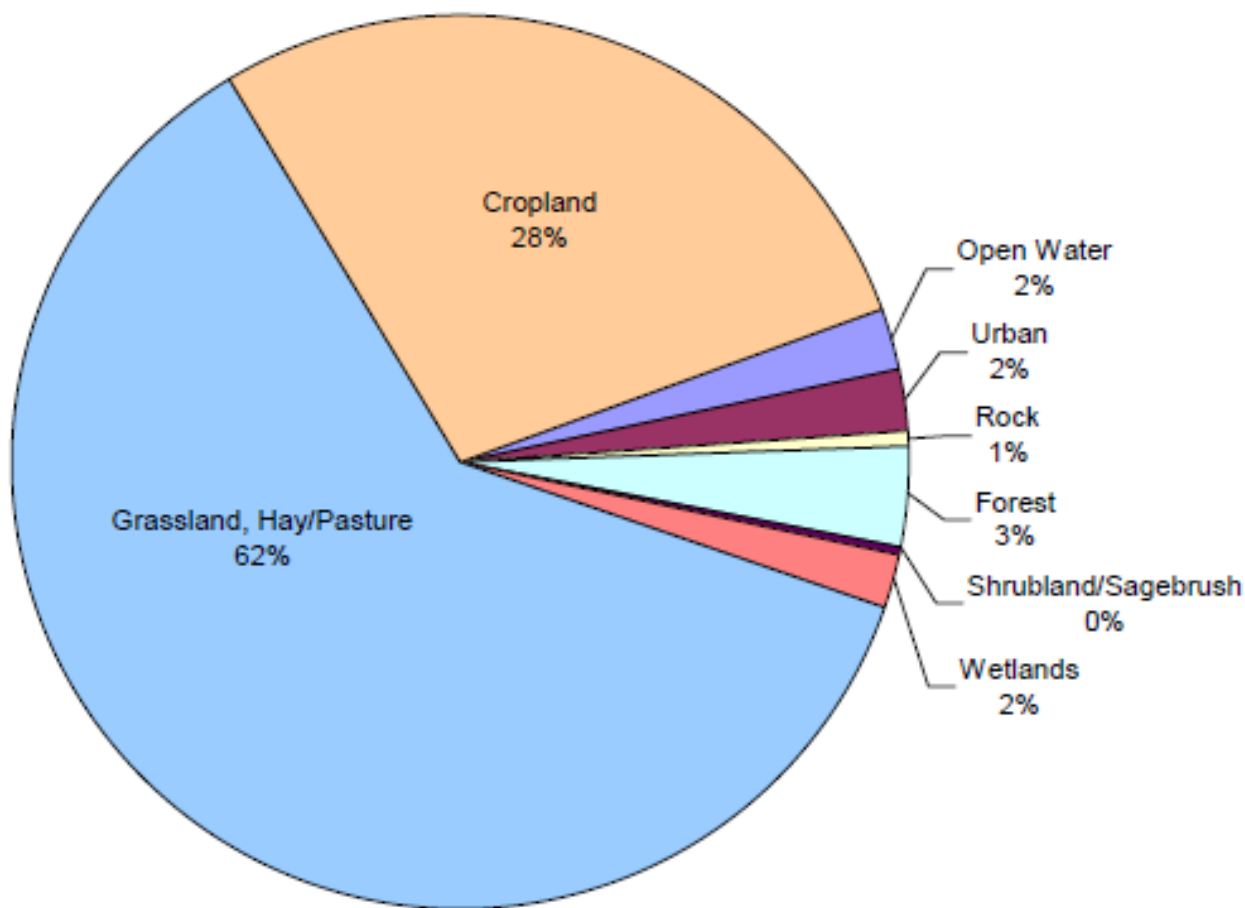
Unusual climate events can cause transport of air pollution into South Dakota but the events are not predictable and may occur once or not at all for many years. These events are becoming more important as EPA continues to lower air pollution standards close to concentrations recorded in South Dakota.

1.6 Land Use

Agriculture has historically been a key component of the South Dakota economy. Although other industries have expanded rapidly in recent decades, agricultural production is still very important to the state's economy as its largest industry, especially in rural areas. Figure 1.3 shows the

relative percentage of land uses and land covers in South Dakota, based on the National Land Cover Data Set. Over 60% of South Dakota's 77,047 square miles are grasslands, including pasture, hay, and range lands. The second most dominant land use is cropland, at 28%. All other land uses and land covers combined make up less than 11% of the state's area. Figure 1.4 shows land cover in South Dakota, from the forests of the Black Hills, to the grasslands of central and eastern South Dakota, and the wetlands of the northeastern prairie pothole region.

Figure 1.3 - South Dakota Land Cover (NRCS, 2000)

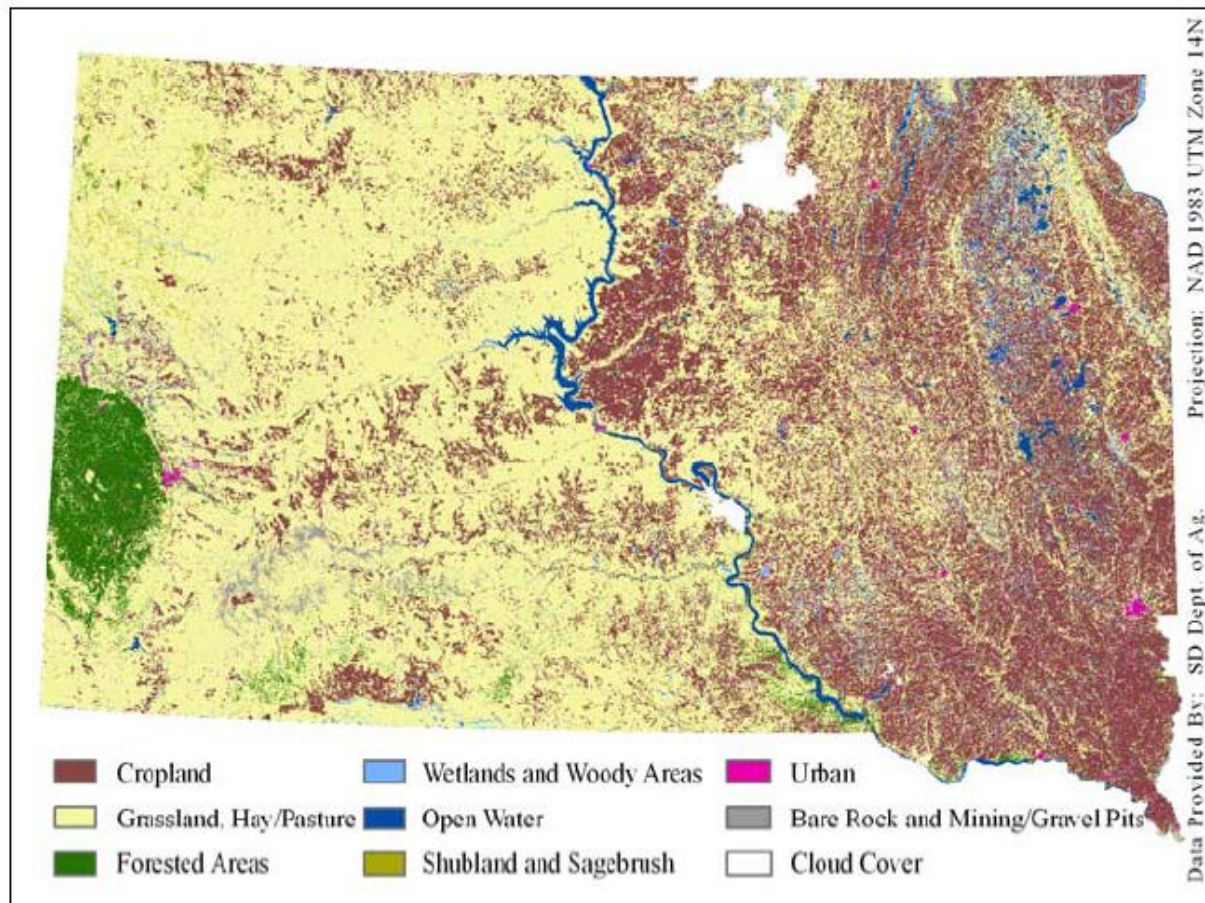


1.7 Not Reasonably Controllable or Preventable

Section 50.1(j) of Title 40 CFR Part 50 requires that an event must be “not reasonably controllable or preventable” in order to be defined as an exceptional event. This requirement is met by demonstrating that despite reasonable point source and agricultural control measures in place within Brookings, Codington and other counties in the northeastern part of the state, high wind conditions overwhelmed all reasonably available controls. The event occurring on October 6, 2011 was directly related to strong and gusty winds generated by an intense low pressure system and its accompanying cold front. The strong winds overwhelmed all reasonably available controls, and were also responsible for generation and transport of fugitive particulate matter to the sampling sites in the northeastern part of South Dakota. As explained in this document, an

intense low pressure system and its associated strong and gusty winds, in tandem with extremely dry conditions across the region lead to a region wide dust storm across several states.

Figure 1.4 - South Dakota Land Cover/Land Use Map



Controls on sources of dust were in place and implemented during the event of October 6, 2011, but were not capable of controlling dust (PM10) raised by the gusty and turbulent winds on this date. The following have been identified as potential sources of blowing dust during high wind events in South Dakota.

1. Tilled agricultural land;
2. Harvested agricultural land;
3. Unpaved roads and parking lots; and
4. Construction sites.

DENR staff located in the Watertown area noticed that any area not covered with vegetation had issues with blowing dust on the day of the high wind event. Some of the areas in Codington County with visible dust were the harvested soybean fields which have little or no vegetative cover after harvest. Due to very dry conditions farmers were unable to do the normal fall tillage because the subsoil was very hard to the point of making it almost impossible to run tillage equipment. The tillage equipment is normally used to break up the fine dust and organic matter

at the surface and incorporates into the soil lumps below that are more resistance to wind erosion. Indications are the area from Codington County to Brookings County experienced blowing dust from high winds. All of these conditions had a significant impact on PM10 concentrations during the high wind event. For more details on agricultural activities around the high wind event on October 6, 2011 see Figure 8.1, South Dakota Weekly Crop Report.

1.7.1 Regulated Facilities

The facilities in the City of Brookings regulated by the Air Quality Program include service oriented businesses and light industry. Major source facilities in the Brookings area include 3M, South Dakota Soybean Processors, South Dakota State University, Valero Renewable Fuels, and Brookings Municipal. The PM10 emissions from the permitted units at these facilities total 106.7 tons/year in the 2011 National Emissions Inventory. DENR did not have staff in the Brookings area on October 6, 2011 to verify if there were any issues from the regulated facilities but no complaints were received and records show no violations of permit conditions during the October 6, 2011, exceptional event.

The facilities regulated by the Air Quality Program in the City of Watertown also includes service oriented businesses and light industry. The major source facilities in the Watertown area include Glacial Lakes Energy, Benchmark Foam, and Watertown Municipal. The PM10 emissions from the permitted units at these facilities totaled 25.3 tons/year in the 2011 National Emissions Inventory. Watertown based DENR staff drove to each of the major emission source in Watertown and found no issues with compliance on October 6, 2011.

1.7.2 Construction Sites

A Google map dated from September 2011 shows a construction site in Brookings located to the east of the monitoring site at City Hall. An evaluation of the wind direction and wind speeds show this source should not have had an impact on the site because the wind was from the southeast during peak wind speeds. Therefore, DENR did no further evaluation of the possible fugitive emissions from this location for the exceptional event demonstration.

In Watertown there was a new construction site about a half mile south of the Utility Site. DENR staff stationed in Watertown drove to the construction site during the peak wind period and observed some fugitive dust but not anything significantly different than dust from unpaved roads and other bare areas in the Watertown area.

1.7.3 Agricultural Areas

Agriculture remains the largest industry in the Brookings and Watertown area. Land use around the cities is mainly mechanized agriculture with a small amount of grassland. Soil conservation measures include tillage methods which leave vegetative cover on the soil surface like no-tillage or minimum tillage. Low moisture amounts during late summer and into fall along with higher than normal temperatures allowed the crop maturity and fall harvest to be significantly ahead of normal. In particular the soybean harvest was 73% completed compared to a normal level of 46% by the day of the high wind event.

The following paragraphs describe the agriculture Best Available Control Measures in place during the event of October 6, 2011. The City Hall Site in Brookings and Utility Site in Watertown have not violated the PM10 standard so the areas are currently in attainment for the 24-hour PM10 National Ambient Air Quality Standard. Therefore, no stringent PM10 regulations are in place in Brookings and Codington counties or the region around the monitoring site.

The following have been identified as standard soil conservation measures which constitute agricultural Best Available Control Measures.

1. Reduced tillage farming practices;
 - a. No-till;
 - b. Strip till;
 - c. Ridge till;
 - d. Mulch tillage; and
 - e. Reduced tillage ;
2. Tree rows;
3. Other physical windbreaks;
 - a. Grass barriers; and
 - b. Grass buffer strips;
4. Cover crops;
5. Strip cropping; and
6. Emergency tillage.

Soil erosion specialists at the federal and state levels have been working for approximately seventy five years to develop and evaluate potential mitigating measures. These soil conservation experts continue to implement measures that prove effective for the reduction or prevention of blowing dust. Numerous measures have been applied and are currently in place across South Dakota in order to minimize the effects of wind erosion.

1.7.4 U.S. Natural Resources Conservation Service – Conservation Reserve Program

Most of Brookings and Codington counties cropland acreage is farmed using dry land practices with a small percentage of irrigated cropland. Recognizing the problems associated with erodible land and other environmental-sensitive cropland, the U.S. Department of Agriculture (USDA) included conservation provisions in the Farm Bill. This legislation created the Conservation Reserve Program to address these concerns through conservation practices aimed at reducing soil erosion and improving water quality and wildlife habitat.

The Conservation Reserve Program encourages farmers to enter into contracts with the U.S. Department of Agriculture to place erodible cropland and other environmentally-sensitive land into long-term conservation practices for 10-15 years. In exchange, landowners receive annual rental payments for the land and cost-share assistance for establishing those practices.

The Conservation Reserve Program was reasonably successful in both Brookings and Codington counties during the early years of the program. Most of this land has been planted with a perennial grass cover to protect the soil and retain its moisture. During the last 10 years a

significant amount of the Conservation Reserve Program acres in both counties have been converted back to tillable acres to raise row crops because of high commodity prices for corn, soybeans and wheat.

The Natural Resources Conservation Service has many efforts underway to educate farmers on the use of cover crops to improve soil health and to control erosion in South Dakota. While the use of cover crops are not new it is now recognized the use on summer tilled and some early fall tilled acres provide benefits for erosion control, soil compaction, moisture retention, maintenance of nutrients and general soil health. This leads to higher crop yields, reduced fertilizer use and less problems with pests. As this practice is included on more acres of tilled land, soil erosion from high winds will also be reduced. See Figure 8.2 for more information on the agricultural tilling practices in South Dakota.

While the initiatives implemented by the Natural Resources Conservation Service are not meant to be enforceable under South Dakota's state implementation plan, these measures help minimize windblown dust during high wind events as more and more farmers utilize these Best Available Control Measures.

1.7.5 South Dakota State University Extension Office

The U.S. Department of Agriculture has many efforts underway in South Dakota to reduce soil erosions. These include:

1. Crop residue efforts that encourage no- or low-till practices. These have been deemed appropriate and useful in reducing blowing dust;
2. Encourage soil health practices including crop rotation and cover crops on late summer and early fall tillage areas.
3. Ongoing outreach efforts to educate area agricultural producers on soil management programs. These include one-on-one visitations and annual meetings with various corn, soybeans and wheat programs to discuss crop management.

The Brookings and Codington counties area was influenced by high winds and blowing dust from the south and southeast on the day of the recorded PM10 exceedance. Considering the wind speeds and gusts noted during the day that the concentration above the PM10 24-hour National Ambient Air Quality Standard was recorded, it is apparent that these conditions were abnormal. The phenomena which gave rise to these blowing dust problems were, therefore, natural events which could not be prevented by application of Best Available Control Measures. With the top few inches of soil loose and the strength and short duration of this event, the farming community was unable to apply emergency tillage or other measures to aid in the reduction of blowing dust. In fact, these events occurred in spite of general area-wide application of accepted good agricultural soil conservation practices.

While the initiatives implemented by the U.S. Department of Agriculture are not meant to be enforceable under South Dakota's state implementation plan, these measures help minimize windblown dust during high wind events.

Chapter 2 Histories of Air Monitoring Sites

2.1 Brookings City Hall Site

Brookings is located on the eastern central edge of South Dakota in Brookings County. The population trends show a slightly increasing population in the 2000 census and projections indicate a continued slow growth rate. Both the city of Brookings and the county of Brookings are the fifth largest in the state. Table 2.1 contains general information about the site.

Table 2.1- City Hall Site

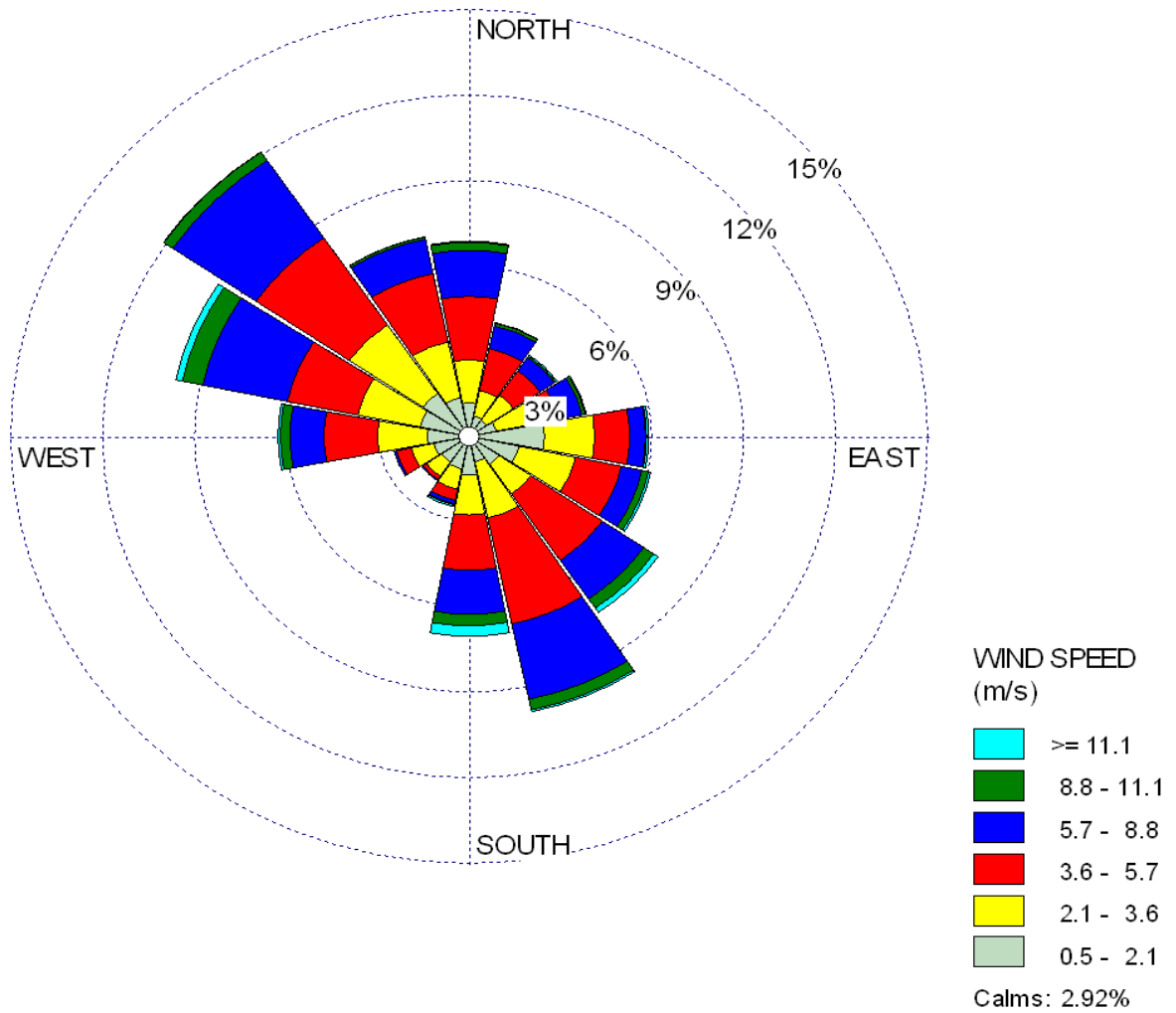
Location	City of Brookings
County	Brookings County
Air Quality System #	46-011-0002
Parameter	PM10
Goals	Population/High Concentration
Sampling Schedule	Every Sixth Day

Historically there have been two different air monitoring sites in the city. The first site located on the South Dakota State University campus tested for Total Suspended Particulate and was closed in 1987. The second site currently being operated is the City Hall Site. The City Hall Site is located in the center of the city close to the downtown business district. The City Hall Site was setup in 1989 testing for PM10 and was a cooperative agreement between the City of Brookings and DENR. Data concentrations for PM10 represent population and high concentration of air pollution levels in the east central part of the state associated with industry and an urban area.

2.1.1 Meteorological Data

The meteorological data used for this site was collected from the Brookings Airport. Predominate wind directions and highest wind speeds are out of the northwest and the south southeast as indicated by the wind rose graph from the Research Farm Site located about 1 mile northwest of the city using 2009 data in Figure 2.1.

Figure 2.1- Wind Rose Brookings



2.1.2 History of PM10 Sampling at Brookings City Hall Site

PM10 testing at the City Hall Site started in 1989 using manual method sampling on an every 6th day schedule. In 1998, the sampling schedule was changed to the required minimum sampling frequency of every 3rd day. When allowed by EPA rule and after several years of testing showing low concentrations the sampling frequency was changed back to every 6th day in 2009 to reduce sampling costs.

After the high concentration day of October 6, 2011, the sampling day schedule went to every day with the addition of the continuous monitor. But because a high concentration day happened in 2008, the expected exceedance rate for 2011 is required to be adjusted for all missing days in the quarter. This means the everyday sampling that occurred after the high reading on October 6, 2011, that did not show any exceedances, cannot be used in calculating the expected exceedance rate in 2011. With a sample frequency of every 6th day and one exceedance, the calculated expected exceedance rate for the three year period shows a violation of the PM10 standard.

The previous high concentration day over the standard at the Brookings City Hall Site on July 2, 2008, was recorded on a day with a high wind event. It was flagged as an exceptional event. Concentrations at the Watertown Utility Site were elevated but still under the standard on that day.

2.2 Watertown Utility Site History

Watertown is located in northeastern corner of South Dakota and is the fourth largest city in the state. Population trends are slightly increasing and it is anticipated this trend for population will continue along with industrial growth. The topography is flat with some low rolling hills. There are no indications that topography is causing air pollutants to accumulate. Table 2.2 contains general information about the site.

Table 2.2 - Utility Site Watertown

Location	Watertown
County	Codington County
Air Quality System #	46-029-0002
Parameter	PM10
Goals	Population/High Concentration
Sampling Schedule	Every Day

Industrial development in the city and surrounding area includes service oriented businesses and light industry on the west and south sides of the city. New facilities in the area include an ethanol plant on the south edge of the city. Land use around the city is mainly agriculture with a small amount of grassland. Agriculture remains the largest industry in this area.

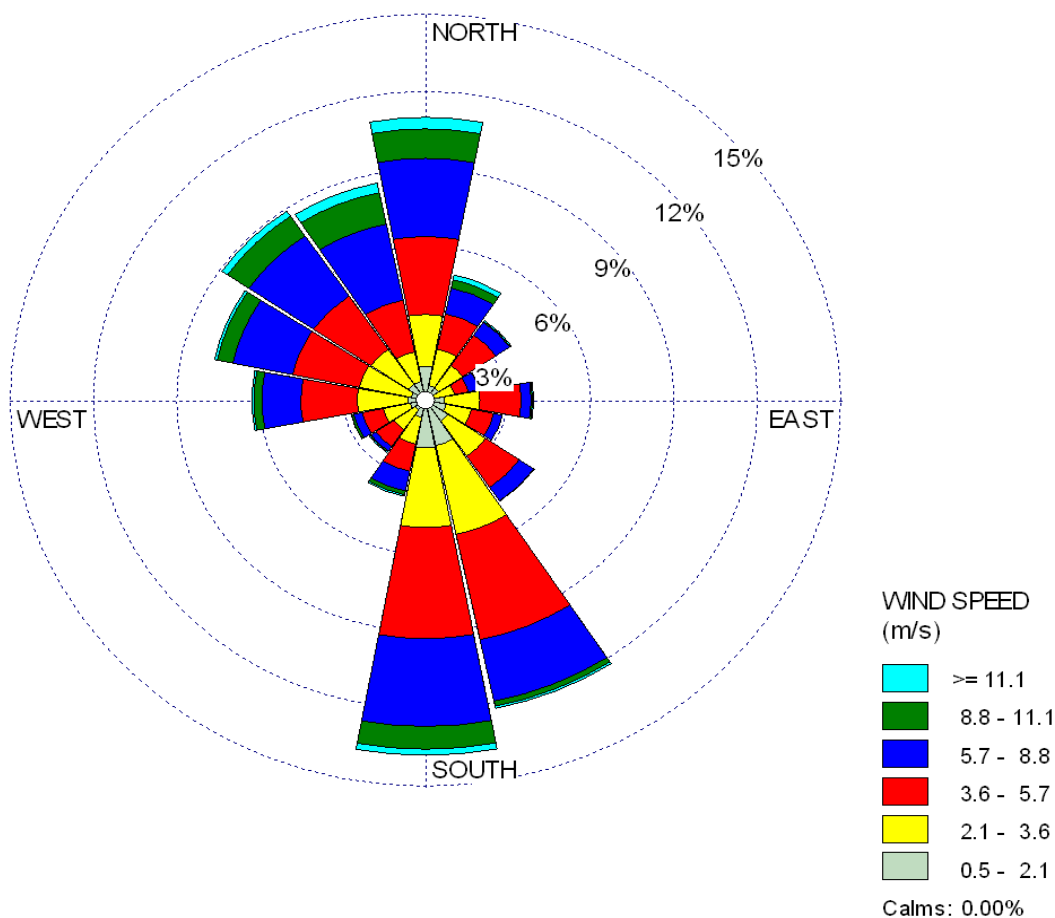
Historically there have been two different air monitoring sites in the city. The current site is the Utility Site set up in 2003 testing for PM10 and PM2.5. This is the only air monitoring site in Watertown, Codington County and in any of the surrounding counties. Concentrations for PM10

represent population and high concentration of air pollution levels in the northeast part of the state associated with industry and an urban area.

2.2.1 Meteorological Data Evaluation

Meteorological data used for this site was collected at the Watertown Airport located on the west edge of the city. The predominate wind directions and highest wind speeds are north to northwest and south to south southeast. The location of the monitoring site was selected to indicate if any air pollution levels from the industrial sources to the south, west and northwest of the site are causing health concerns. Figure 2.2 contains a wind rose graph of the meteorological data for Watertown collected in 2009.

Figure 2.2- Wind Rose Watertown Airport



2.2.2 History of PM10 Sampling at the Watertown Utility Site

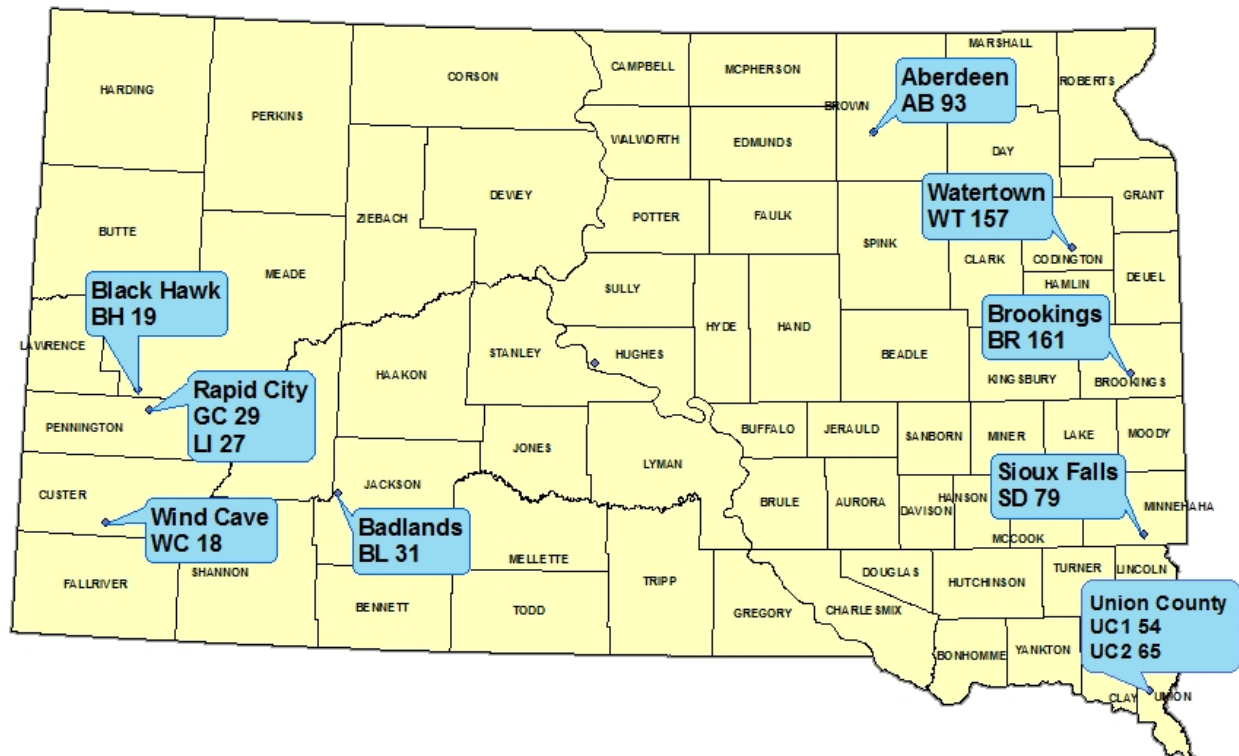
PM10 testing began with manual monitors sampling every 3rd day as required by EPA rule in 2003 and continued through 2005. In 2006, the manual monitor was replaced with a continuous monitor and is the current sampling method for PM10.

PM10 concentrations in general are steady to decreasing slightly over the life time of this site. Before the October 6, 2011, high concentration day, only one other day, December 14, 2008, recorded a concentration greater than the 24-hour standard. This day was also affected by high winds and occurred during a period of blowing snow so the concentration was suspect and could have been caused by moisture collecting on the filter media. The sampling day was flagged as high wind informational in the AQS database because the expected exceedance number showed attainment.

Chapter 3 Event Overview

On Thursday October 6, 2011, two monitoring sites in South Dakota recorded exceedances of the 24-hour PM10 standard. The Brookings City Hall site recorded a 24-hour concentration of 161 ug/m3 and the Watertown site recorded a 24-hour concentration of 157 ug/m3. Figure 3.1 shows the 24-hour PM10 readings across the state for October 6, 2011. DENR has prepared this report for EPA to demonstrate the exceedances of the National Ambient Air Quality Standard for PM10 in South Dakota were caused by a natural event, specifically high winds.

Figure 3.1 - 24-hour PM10 concentrations for October 6, 2011



Elevated 24-hour PM10 concentrations were recorded in Brookings and Watertown on October 6, 2011. Both of the 24-hour PM10 concentrations were above the 99th percentile concentrations for their locations. This is evidence that the sampling day event was not typical and associated with a measured concentration in excess of normal historical fluctuations including background. This historical fluctuation evaluation of PM10 monitoring data for sites affected by the October 6, 2011 event was made using valid samples from PM10 samplers in Brookings and Watertown from the last five years of data between 2007 through 2011.

The overall data summary is included in Tables 3.1 and 3.2. Time series plots showing each calendar quarter of data from 2007 to 2011 are presented here in Figures 3.2 and 3.3. The time series plot is used to determine if there is a trend to when higher concentrations are recorded and to show that high concentration days are infrequent.

Figure 3.2 - Brookings 24-hour average PM10 concentrations for 2007 – 2011

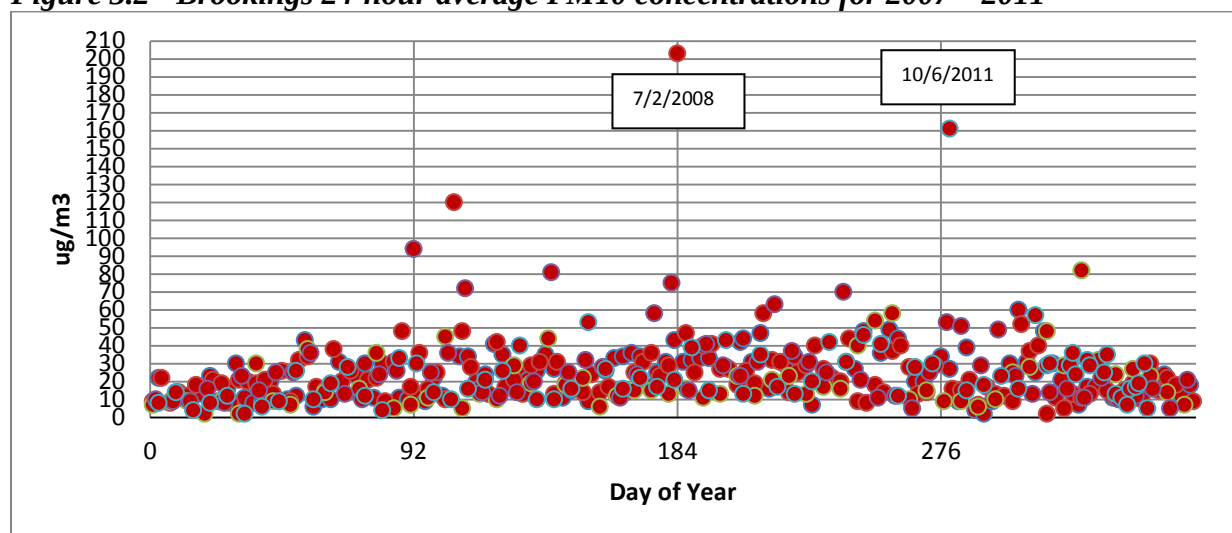


Table 3.1 - Brookings Daily Concentrations Statistics

Description		Frequency		
		# Readings	Ranges (µg/m3)	Percent of Total
Count	415 # Readings	72	0-10	17.3%
Minimum	2 µg/m3	193	11-25	46.5%
Maximum	203 µg/m3	130	26-50	31.3%
Average	23.9 µg/m3	14	51-75	3.4%
Median	20 µg/m3	3	76-100	0.7%
Mode	9 µg/m3	1	101-150	0.2%
Standard Deviation	18.4	0	151-160	0.0%
Variance	338.8	2	161+	0.5%

Table 3.3 shows the Exceedance Report from EPA's AQS database for Brookings and Codington Counties. The figures and tables show all the exceedances of the PM10 standard record in Air Quality System database for Brookings and Codington County. But for the high wind event described in detail in this report, there would have been no exceedances on this day in South Dakota. Therefore, the data for October 6, 2011 has been flagged and this document shows why it should be excluded.

Figure 3.3 - Watertown 24-hour average PM10 concentrations for 2007 – 2011

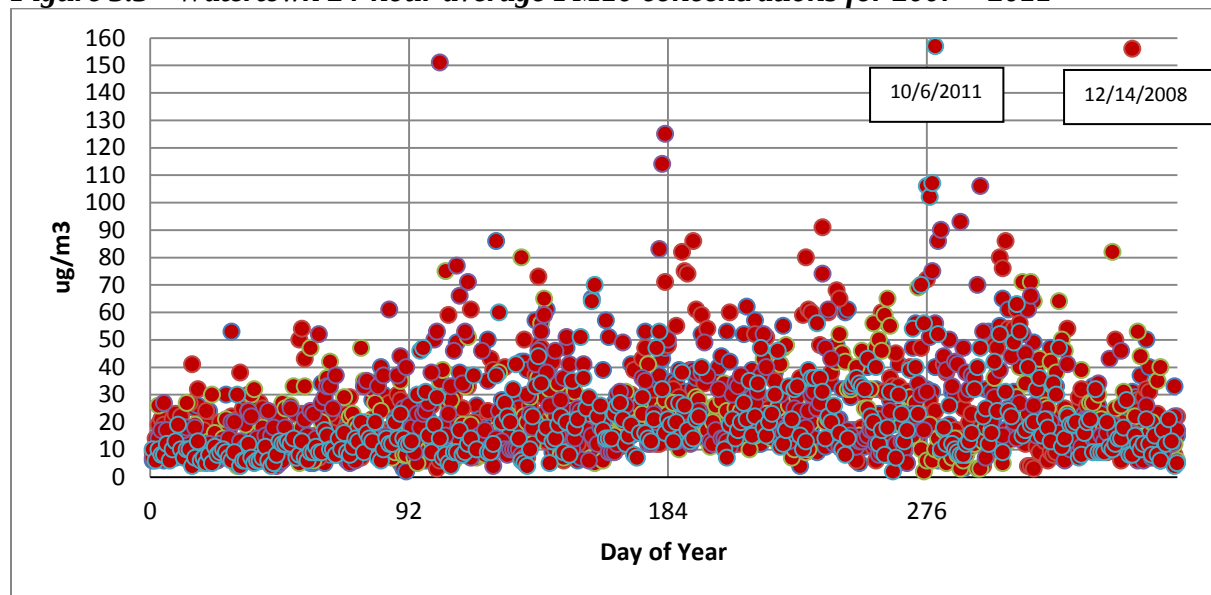


Table 3.2 - Watertown Daily Concentration 2007 – 2011 Statistics

Description		Frequency		
		# Readings	Ranges (µg/m3)	Percent of Total
Count	1797 # Readings	367	0-10	20.4%
Minimum	2 ug/m3	866	11-25	48.2%
Maximum	157 ug/m3	441	26-50	24.5%
Average	22.9 ug/m3	99	51-75	5.5%
Median	18 ug/m3	15	76-100	0.8%
Mode	10 ug/m3	6	101-150	0.3%
Standard Deviation	16.9	3	151-160	0.2%
Variance	280.6	0	161+	0.0%

The Brookings City Hall Site recorded two previous high concentration days one in 1990 and one in 2008. Both previously recorded days were during periods of high winds and were flagged as exceptional events. The Watertown Utility Site recorded only one previous reading over the 24-hour PM10 standard. Table 3.3 shows the list of 24-hour PM10 standard exceedances recorded at the Brookings City Hall and Watertown Utility sites.

Table 3.3 - PM10 Exceedance Day Report for Brookings and Codington Counties

Site ID	County	Date	Value ug/m3	EDT
46-011-0002	Brookings	01/11/1990	230	2
46-011-0002	Brookings	07/02/2008	203	0
46-011-0002	Brookings	10/06/2011	161	2
46-029-0002	Codington	12/14/2008	156	0
46-029-0002	Codington	10/06/2011	157	2
EDT Description: 0=No Events, 1=Events Excluded, 2=Events Included, 5=Events With Concurrence Excluded				

Chapter 4 Meteorological Conditions during the Event

These exceedances were the consequence of strong gusty winds, in combination with high temperatures, dry conditions and multiple wildfires. EPA's May 2, 2011 draft Guidance on the Preparation of Demonstrations in Support of Requests to Exclude Ambient Air Quality Data Affected by High Winds under the Exceptional Events Rule states — "Empirical evidence shows that a sustained wind speed of 25 mph is typically the minimum wind speed needed to entrain particles from many stable surfaces ...". Brookings had six consecutive hours with average hourly wind speeds above 25 mph and recorded gusts up to 46 mph. Watertown had nine consecutive hours with average hourly wind speeds above 25 mph and recorded gusts up to 49.5 mph. These speeds are above the thresholds for blowing dust identified in EPA draft guidance. The most compelling evidence the exceedances in Brookings and Watertown were caused by high wind is the co-occurrence in time of high winds and high PM10 concentrations as demonstrated by time series plots of PM10 concentrations and wind speed. These time series plots follow a common pattern, an abrupt rise in PM10 concentration when wind speeds rise and an equally abrupt fall in PM10 concentrations when wind speeds fall. Figure 4.1 shows this pattern in Watertown. Figure 4.2 shows a very similar pattern in the winds for Brookings. The Brookings site does not have a continuous monitor; therefore the hourly PM10 concentrations could not be plotted. However, based on DENR's experience we would expect to see the same pattern as was seen in Watertown. The Brookings and Watertown airport weather readings for October 6, 2011 are attached and shown in Tables 8.1 and 8.2.

Figure 4.1 - Watertown Wind Speeds and PM10 Concentrations on October 6, 2011

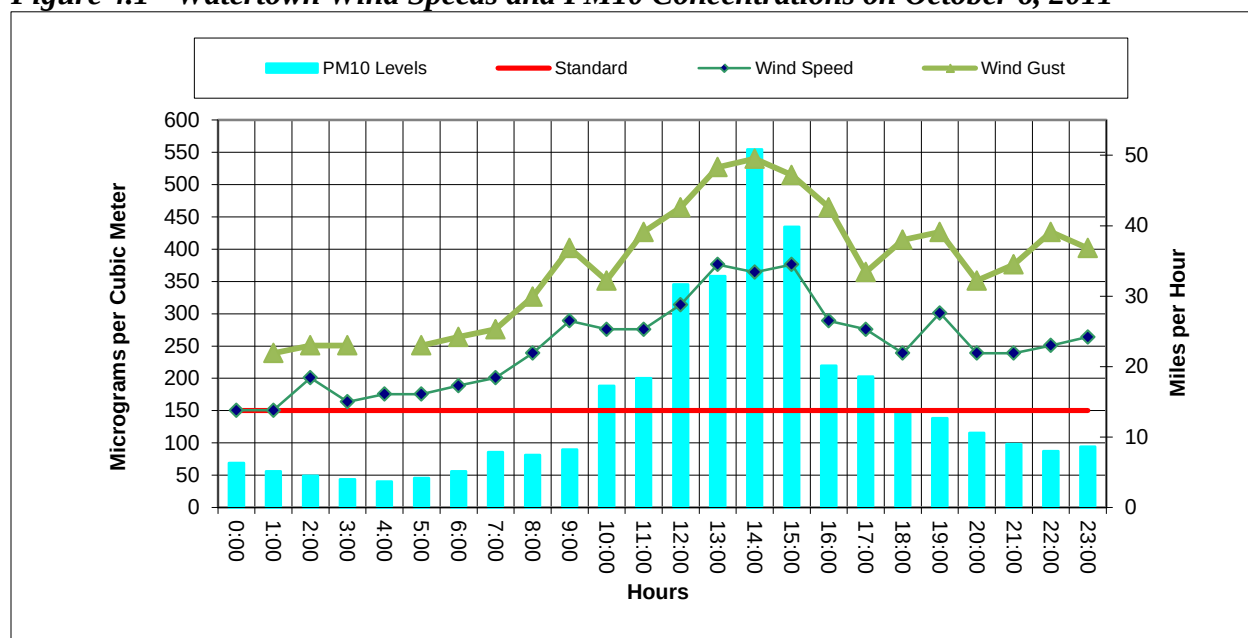
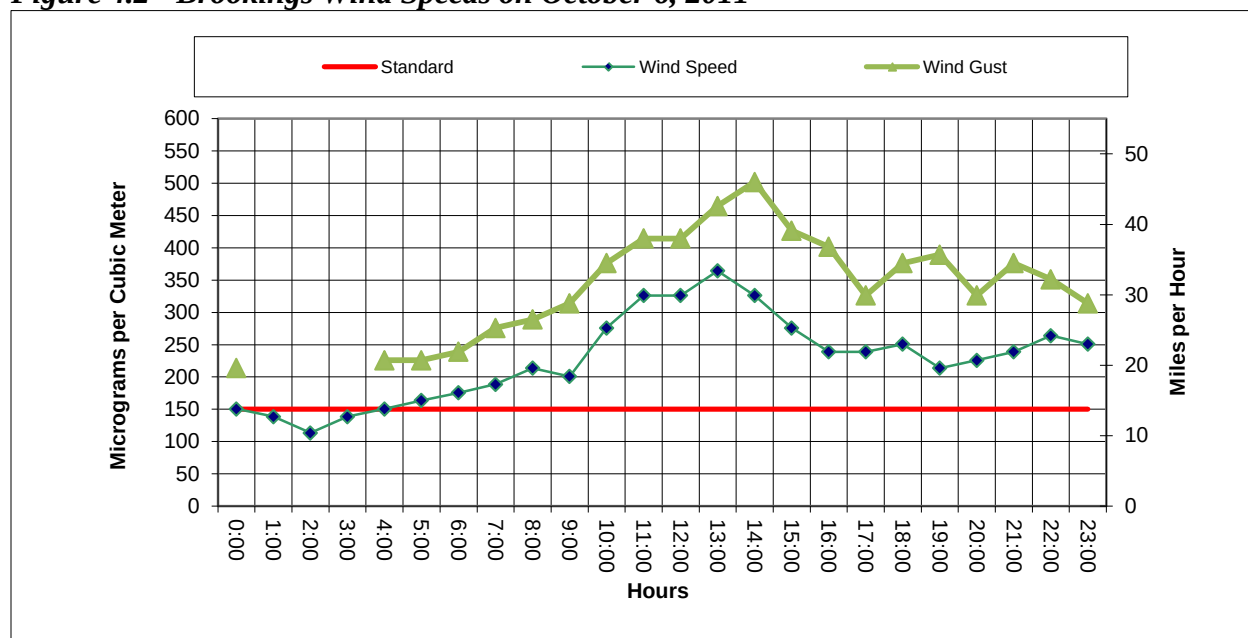


Figure 4.2 - Brookings Wind Speeds on October 6, 2011



Warm temperatures and strong southerly winds dominated weather for much of the week. The warm conditions were astounding for this time of year. Average temperatures in both Brookings and Watertown for the week ending October 9, 2011 were 67° F which was 16° F above normal. This information is available in Figure 8.1 – The South Dakota Weekly Crop Report (SD-CW6041 Volume 60 Issue 41). Surface wind speeds from October 6 at Noon, 2pm, and 4pm are shown in Figures 4.3 to 4.5. Notice that on October 6, 2011 surface winds were sustained out of the south/southeast with speeds over 25 mph and gusts nearing 50 mph. This would have advected any dust or smoke from the south. Wind Roses for the day are shown in Figures 4.6 and 4.7.

Figure 4.3 - Pressure and Surface Winds at Noon on October 6, 2011

NOAA/NWS/Storm Prediction Center

Mesoscale Analysis Data

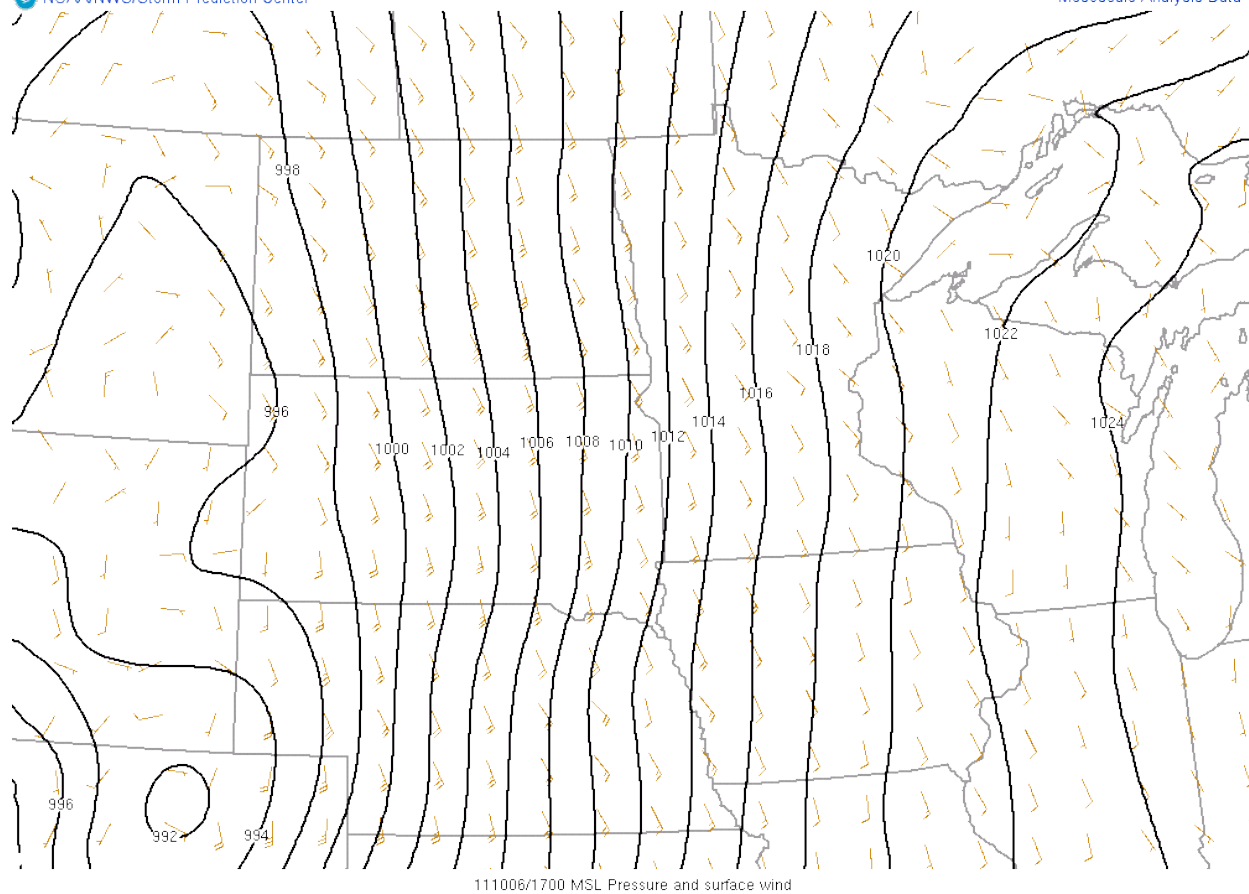


Figure 4.4 - Pressure and Surface Winds at 2:00 PM on October 6, 2011

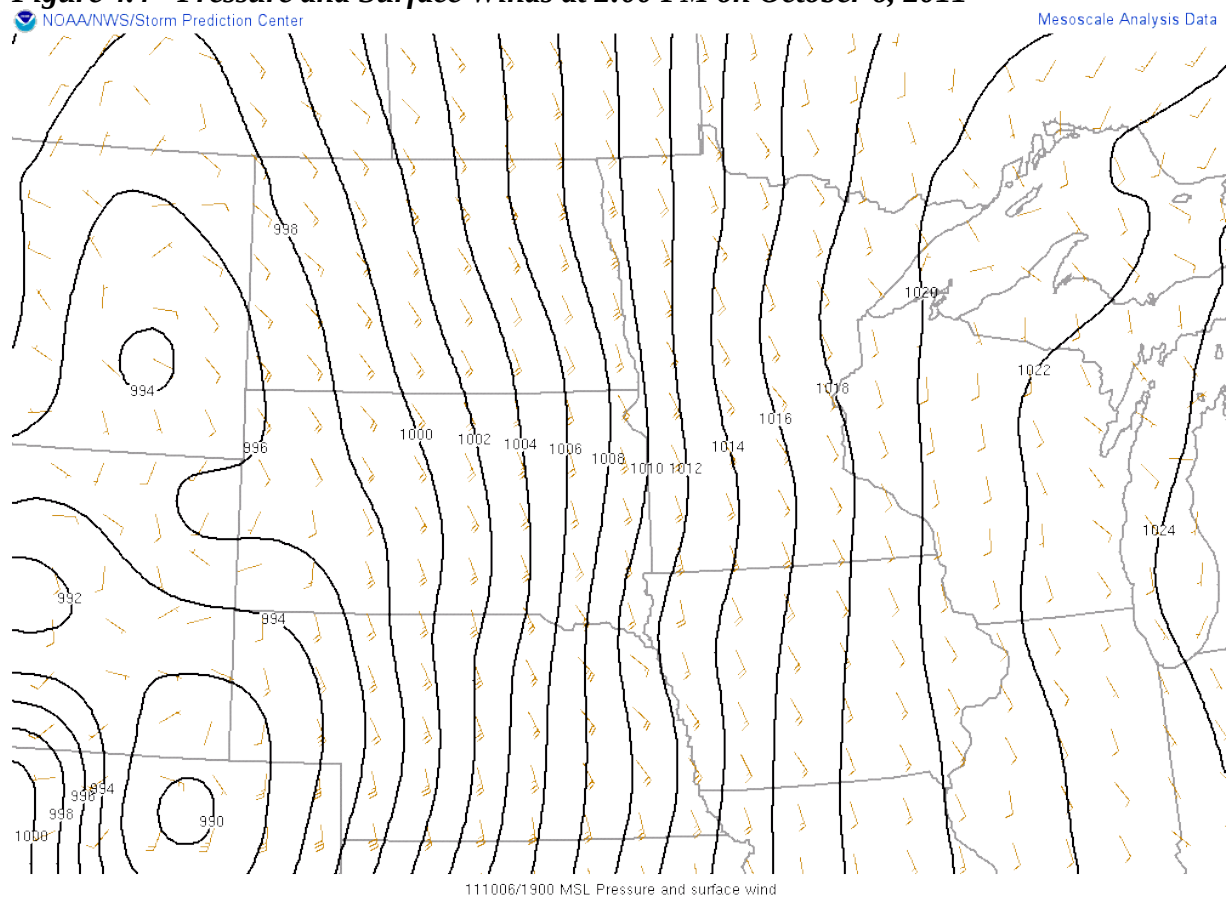


Figure 4.5 - Pressure and Surface Winds at 4:00 PM on October 6, 2011

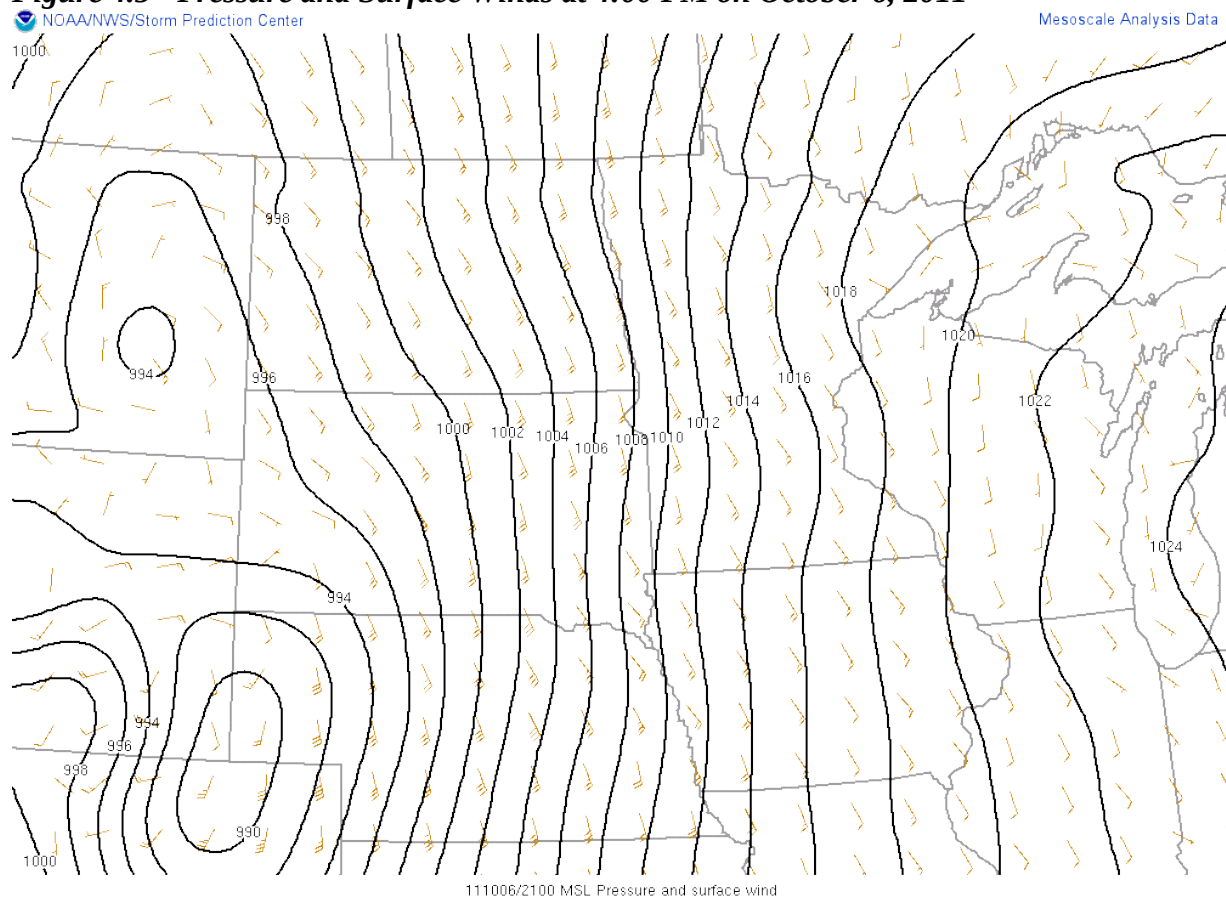


Figure 4.6 - Wind Rose from Brookings Airport on October 6, 2011

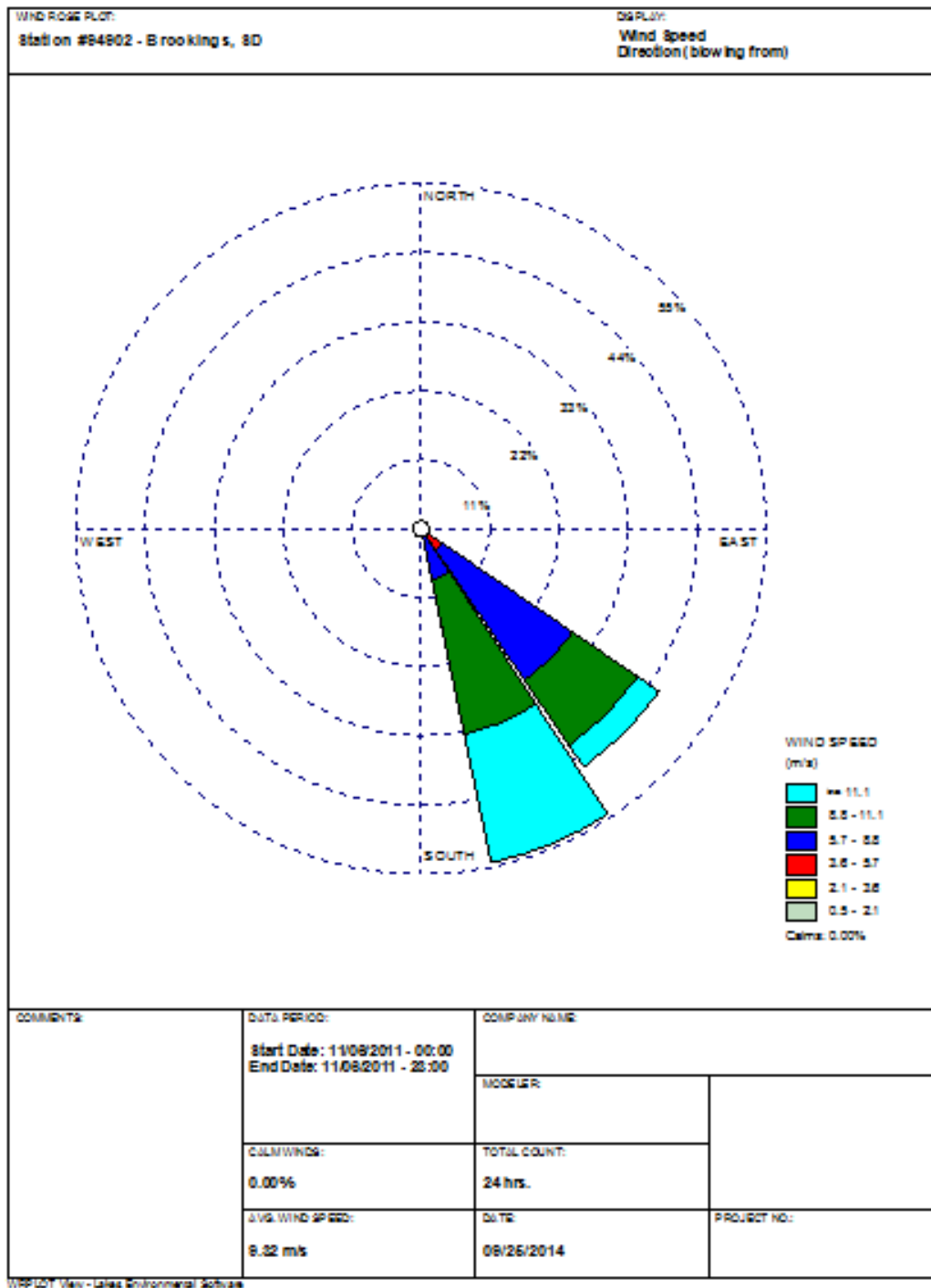
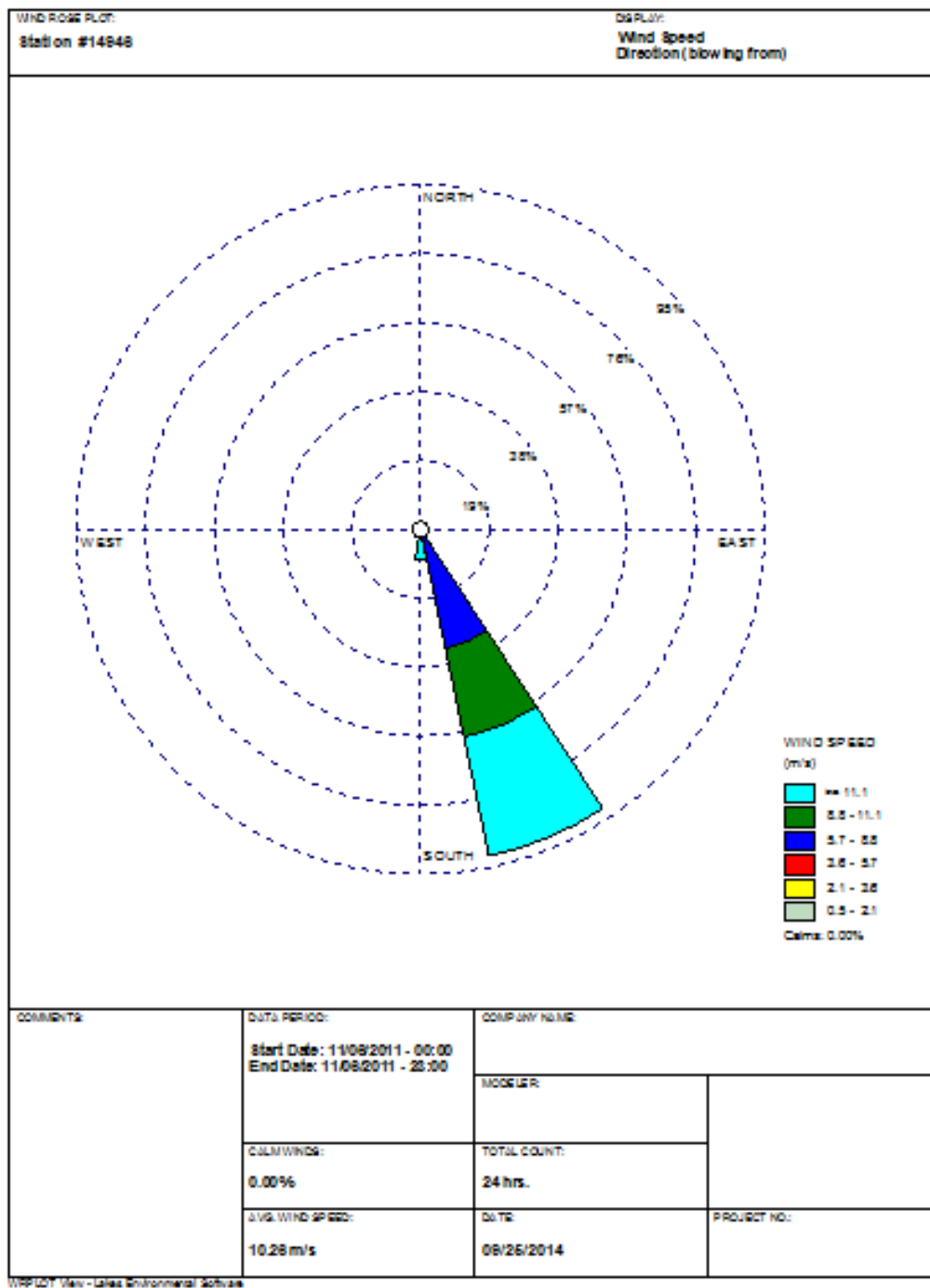


Figure 4.7 - Wind Rose from Watertown Airport on October 6, 2011



Climatological data shows that Brookings and Watertown received less than normal precipitation for the period of interest. Brookings received only 0.13 inches of precipitation and Watertown receive 0.22 inches of precipitation during the 30 days prior to October 6. High wind speeds, above normal temperatures and little precipitation were conducive to the generation of significant blowing dust.

Chapter 5 Related Fire Information

Dry conditions and wind gusts also created a high fire danger for much of the state causing the National Weather Service to issue a “red flag” fire warning for the area. The Watertown area had a burn ban in place for Codington County and the city. There were a number of large fires in the region at this time and satellite imagery shows that the strong southerly winds pushed the smoke plumes to the Brookings and Watertown areas. PM_{2.5} concentrations at Brookings 16.3 ug/m³ and at Watertown were 17.2 ug/m³ on October 6, 2011.

Aerosol optical depth is a measure of the scattering and absorption of visible light by particles in a vertical column of the atmosphere. Aerosol optical depth is useful for air quality analysis because it is proportional to the concentration of particulates in the atmosphere. There are two sources of aerosol optical depth satellite measurements: MODIS, the Moderate Resolution Imaging Spectroradiometer, which flies on the polar-orbiting NASA Terra and Aqua satellites, and GASP, the GOES Aerosol and Smoke Product, which is derived from GOES geostationary satellite measurements. Figures 5.1 to 5.2 show the descriptive text narrative for smoke/dust observed in satellite Imagery. Figure 5.3 is the MODIS satellite image for October 6, 2011. Figures 5.4 to 5.5 show the GASP Aerosol Optical Depth. Figure 5.6 was E-mailed to DENR from the NWS-Aberdeen and shows a graphical depiction of all fires large enough to be detected by satellite imagery over the upper Midwest - these would be the most significant smoke producers. Figure 5.7 was E-mailed to DENR from the NWS-Aberdeen and shows a graphical depiction of the "composite smoke plumes" from the larger fires. Notice that Watertown and Brookings do appear to be effected by several smoke plumes. Figure 5.8 is from AirNow-Tech Navigator showing PM₁₀ hourly concentration, wind barb, HMS fire, HMS smoke, and back trajectory layers at 2:00 pm central standard time on October 6, 2011, which represents the peak winds on that day in the Brookings and Watertown area.

The large number of fires is further evidence of how dry the area was and based on the satellite data, DENR concludes that smoke related particulate matter added to the PM₁₀ recorded concentrations in both Brookings and Codington Counties.

Figure 5.1 - October 5, 2011 Descriptive Text Narrative for Smoke/Dust Observed in Satellite Imagery

Wednesday, October 5, 2011

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 0430Z October 6, 2011

North Central US/South Central Canada:

Dozens of small agricultural burns mixed in with a few large wildfires are scattered throughout the Dakotas, Minnesota, southern Manitoba, and eastern Saskatchewan. Fires are most densely concentrated near the North Dakota-Manitoba border and in eastern Saskatchewan. Smoke mainly appears as elongated moderate density plumes that are moving due north. Thin density remnant smoke encompasses the eastern and central Dakotas and the southern half of Manitoba. A small contribution of remnant smoke in this area is also from fires in Nebraska and Kansas, whose smoke is swept north in the southerly flow.

Lower Mississippi Valley/Southeast US

Remnant thin density smoke covers parts of Florida, Georgia, Alabama, Mississippi, and much of eastern Arkansas and southeast Missouri. Plumes near the sources of the fires are moderate in density but disperse quickly with distance away from the source. Additionally, smoke continues to be produced from a wildfire near the Okefenokee Swamp in southeast Georgia.

Ramirez

THIS TEXT PRODUCT IS PRIMARILY INTENDED TO DESCRIBE SIGNIFICANT AREAS SMOKE ASSOCIATED WITH ACTIVE FIRES AND SMOKE WHICH HAS BECOME DETACHED FROM THE FIRES AND DRIFTED SOME DISTANCE AWAY FROM THE SOURCE FIRE..TYPICALLY OVER THE COURSE OF ONE OR MORE DAYS. AREAS OF BLOWING DUST ARE ALSO DESCRIBED. USERS ARE ENCOURAGED TO VIEW A GRAPHIC DEPICTION OF THESE AND OTHER PLUMES WHICH ARE LESS EXTENSIVE AND STILL ATTACHED TO THE SOURCE FIRE IN VARIOUS GRAPHIC FORMATS ON OUR WEB SITE:

JPEG: <http://www.osdpd.noaa.gov/ml/land/hms.html>

GIS: <http://www.firedetect.noaa.gov/viewer.htm>

KML: <http://www.ssd.noaa.gov/PS/FIRE/kml.html>

ANY QUESTIONS OR COMMENTS REGARDING THIS PRODUCT SHOULD BE SENT TO
SSDFireTeam@noaa.gov

Unless otherwise indicated:

- Areas of smoke are analyzed using GOES-EAST and GOES-WEST Visible satellite imagery.
- Only a general description of areas of smoke or significant smoke plumes will be analyzed.
- A quantitative assessment of the density/amount of particulate or the vertical distribution is not included.
- Widespread cloudiness may prevent the detection of smoke even from significant fires.

Figure 5.2 - October 6, 2011 Descriptive Text Narrative for Smoke/Dust Observed in Satellite Imagery

Thursday, October 6, 2011

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY THROUGH 1815Z October 6, 2011

North Central US/South Central Canada:

A large area of thin smoke covered most of Manitoba, Ontario, southwest Hudson Bay, and the Great Lakes region this morning. Thin remnant smoke was also present stretching southward through the north central US along the Minnesota/Dakota border to northwest Iowa with other small patches over Wisconsin, northwest Illinois, and northern Missouri. This smoke has originated from numerous fires in the north central US and south central Canada and was moving north and northeast across southern Canada. Additional smoke from a large amount of ag fires in the lower Mississippi River Valley has likely also contributed as it has moved northward.

British Columbia:

Thin remnant smoke could be seen over south and central British Columbia trapped between the Rockies and the Coastal Range. Numerous fires burning in the center of the province are responsible for this remnant smoke and some were producing new smoke this morning.

Northeast US:

An unknown aerosol could be seen streaming southeastward off the coast the Northeastern US today behind a frontal boundary now out over the Atlantic. The aerosol appeared to be moving southeastward from eastern Canada.

Sheffler

THIS TEXT PRODUCT IS PRIMARILY INTENDED TO DESCRIBE SIGNIFICANT AREAS SMOKE ASSOCIATED WITH ACTIVE FIRES AND SMOKE WHICH HAS BECOME DETACHED FROM THE FIRES AND DRIFTED SOME DISTANCE AWAY FROM THE SOURCE FIRE..TYPICALLY OVER THE COURSE OF ONE OR MORE DAYS. AREAS OF BLOWING DUST ARE ALSO DESCRIBED. USERS ARE ENCOURAGED TO VIEW A GRAPHIC DEPICTION OF THESE AND OTHER PLUMES WHICH ARE LESS EXTENSIVE AND STILL ATTACHED TO THE SOURCE FIRE IN VARIOUS GRAPHIC FORMATS ON OUR WEB SITE:

JPEG: <http://www.osdpd.noaa.gov/ml/land/hms.html>

GIS: <http://www.firedetect.noaa.gov/viewer.htm>

KML: <http://www.ssd.noaa.gov/PS/FIRE/kml.html>

ANY QUESTIONS OR COMMENTS REGARDING THIS PRODUCT SHOULD BE SENT TO
SSDFireTeam@noaa.gov

Figure 5.3 - October 6, 2011 MODIS Satellite Image



Figure 5.4 - GASP Aerosol Optical Depth Image

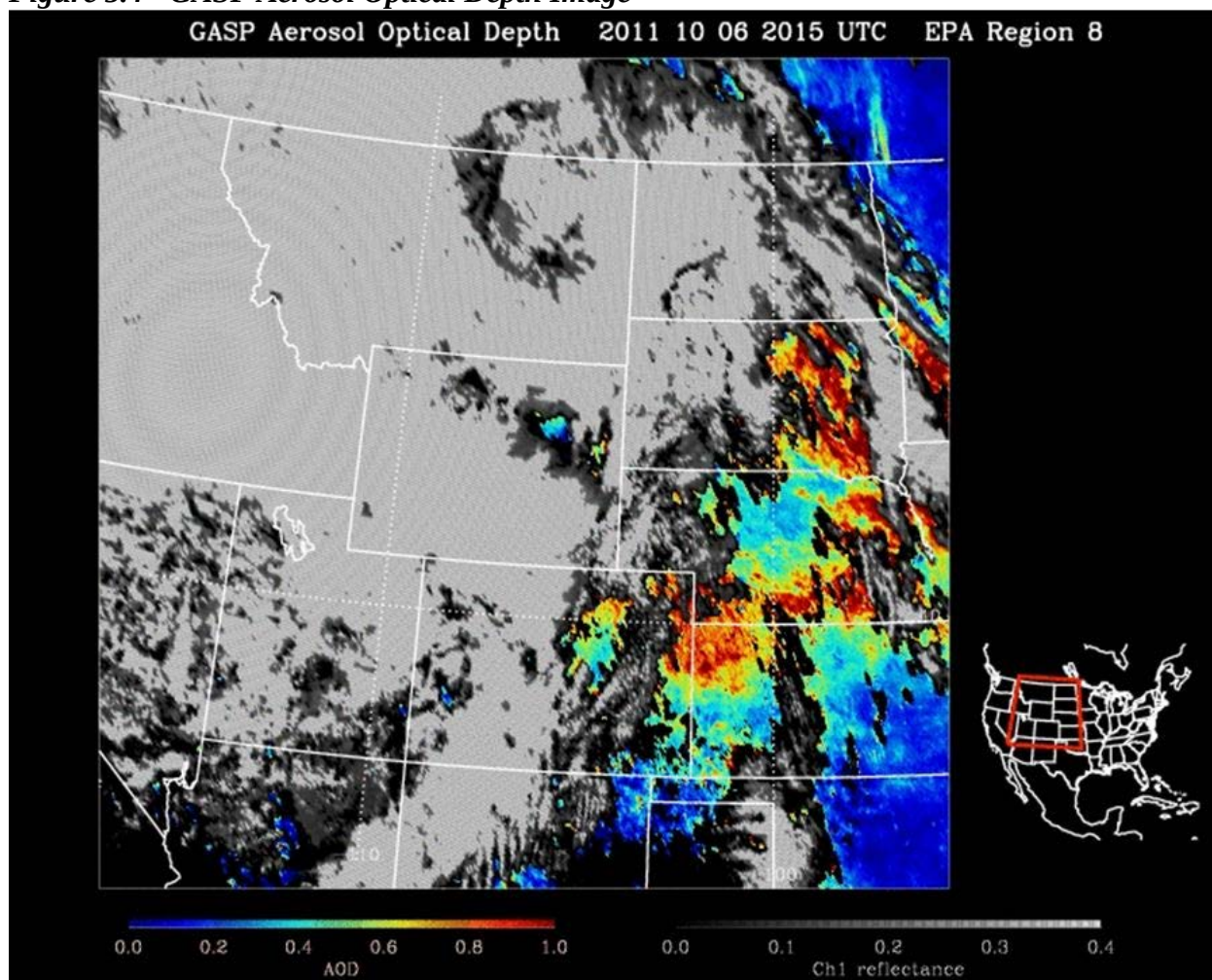


Figure 5.5 - GASP Aerosol Optical Depth Image Showing Fires and Winds

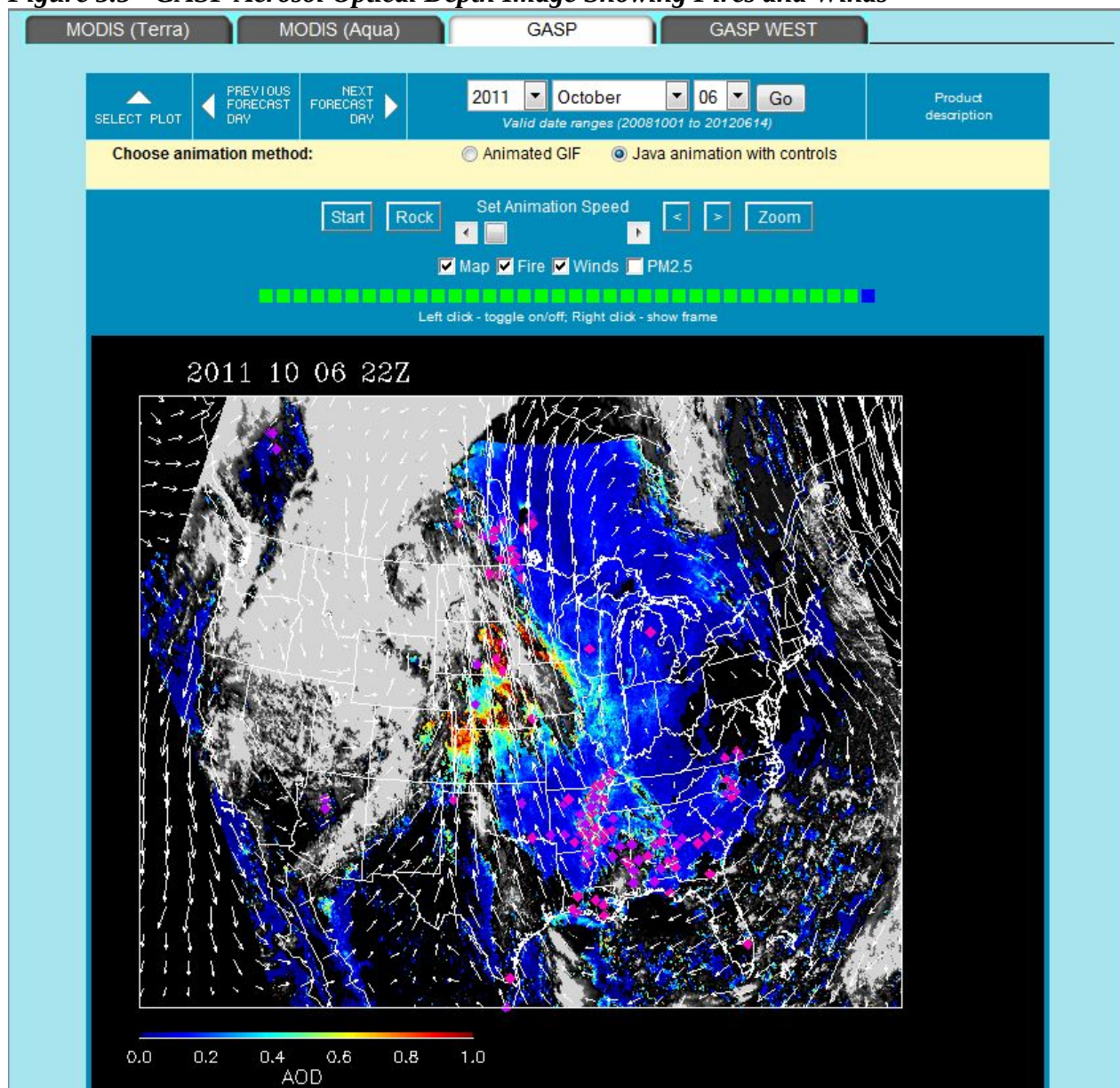


Figure 5.6 - Fires Large Enough to be Detected by Satellite Imagery on October 6, 2011

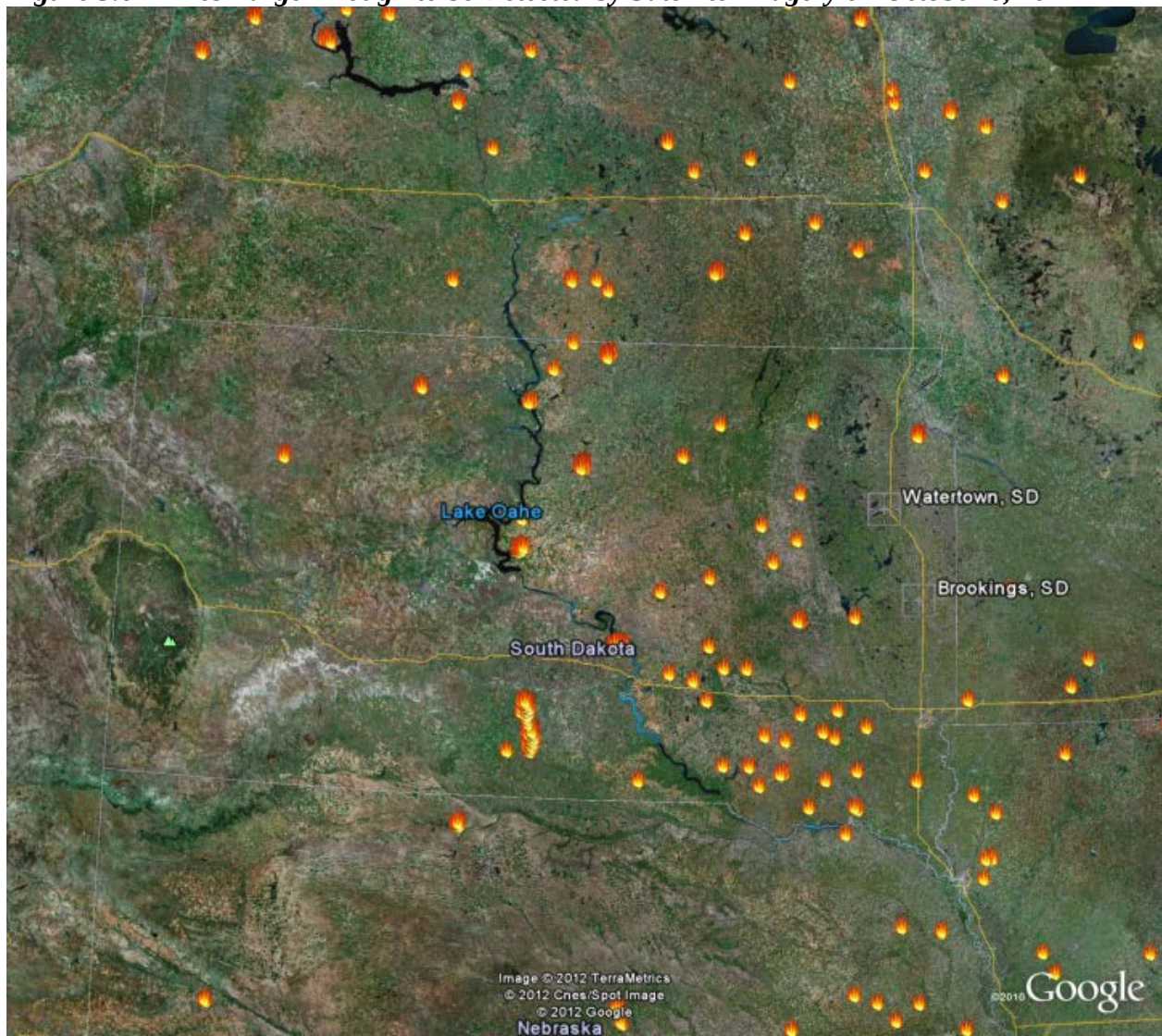


Figure 5.7 - Composite Smoke Plumes for 10/6/11

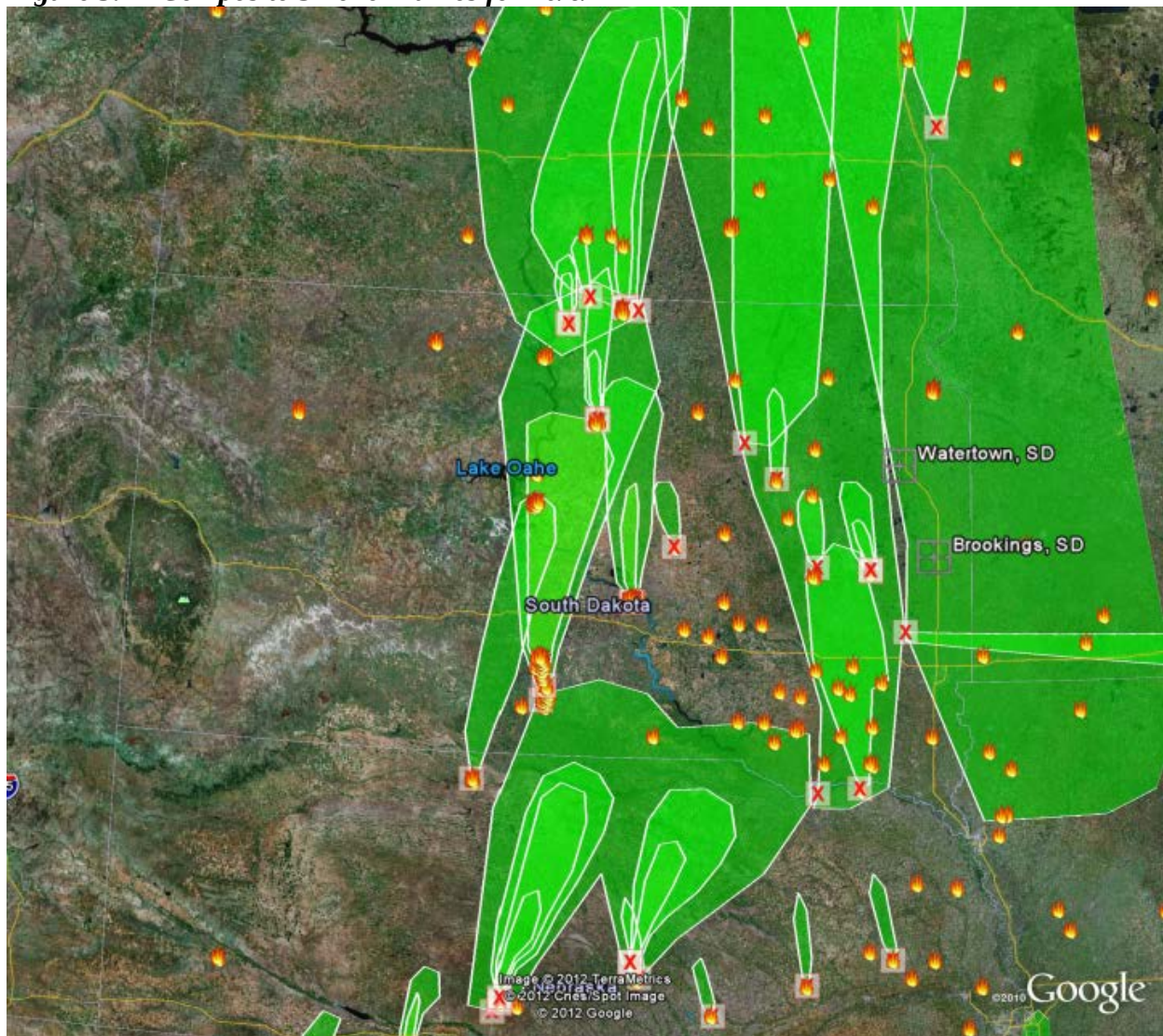
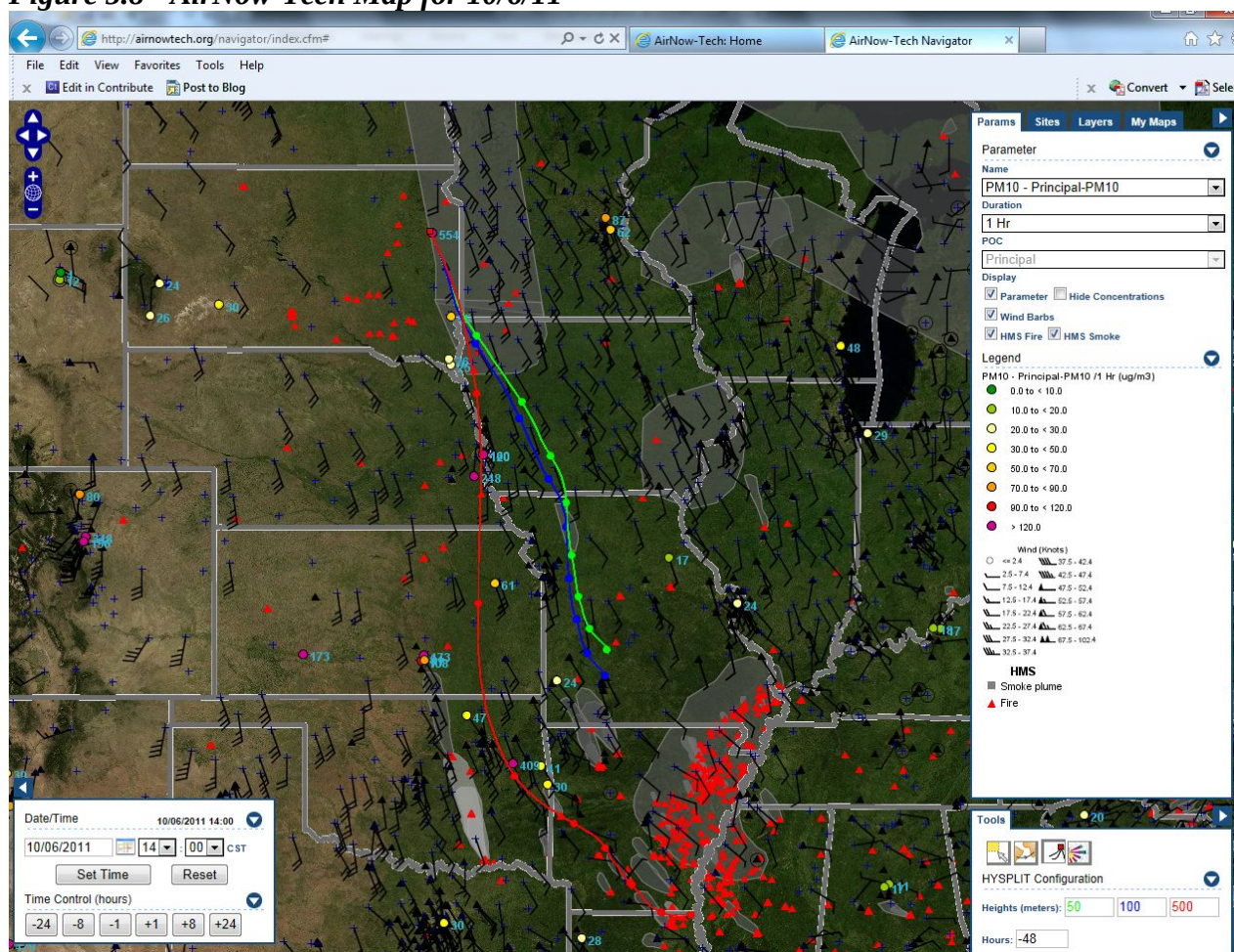


Figure 5.8 - AirNow-Tech Map for 10/6/11



Chapter 6 Related News Articles

Figures 6.1 to 6.4 - show articles related to the exceptional events.

Figure 6.1 - October 6, 2011 ARGUSLEADER.COM Article

LOCAL NEWS

Thursday, Oct. 6, 2011 ARGUSLEADER.COM 3A

Wayland Avenue standoff ends peacefully in arrest

Ex-wife tips off police to wanted man's location

By John Hult
jhult@argusleader.com

The unarmed man who held police at bay in a 12.5-hour standoff Tuesday made a mess of the rental home he'd been hiding in before emerging to surrender with a cardboard Burger King crown on his head and a stuffed parrot on his shoulder.

Michelle Azure, who rents the home at 313 S. Wayland Avenue, came home after 3 p.m. Tuesday to see the house surrounded by police cars and SWAT officers.

Charles Ohman, a 35-year-old wanted for kidnapping and failure to pay fines on drug-dealing offenses, was inside and refusing to come out.

Officers later would tell Azure the man who had identified himself as "David" to her nephew Tuesday had been awake for several days and probably was under the influence of methamphetamine. Officers thought Ohman had a rifle.

"We didn't even know



inside.

"They said he was inside," Clemens said.

That's when Azure's 15-year-old son walked out the door and saw the deputies with their guns drawn, she said.

"They said, 'Is he in there?' and he was like, 'Is who in there?'" Azure said.

That's when Ohman told the 15-year-old and his 18-year-old brother to leave with their two younger siblings because "some bad stuff's about to go down."

Autumn Knight, Azure's adult daughter, said her mother is gone for school and work and often returns to find "random people" in the garage.

Knight lives in Hartford. She was in Sioux Falls helping her mother clean up Wednesday afternoon, but she was there Tuesday, as well. Azure gradually had been moving into a new apartment and had planned to move more of her things that night.

"There weren't even any steak knives in there," Knight said. "I took them out last week."

Officers think they had good reason to consider Ohman dangerous, however.

In addition to the kidnap-

Fires springing up in Sioux Falls area

Dry conditions, wind also help scorch state

From staff and wire reports

A number of fires broke out in the Sioux Falls area Wednesday.

Monte Albertson, chief of the Split Rock Volunteer Fire Department, said about six acres of grass and a few trees burned along the river near the Perry Nature Area around 3 p.m.

Albertson said that fire was started by a monitored burn conducted by a nearby resident that spread too quickly.

John Jarding with the Humboldt Volunteer Fire Department said crews battled two combine fires. One fire started by a combine five miles south of Humboldt burned about two acres of unharvested corn and heavily damaged the combine.

The other, six miles north of Humboldt, was put out by the farmer driving the combine and didn't cause extensive damage, Jarding said.

Fires were more serious elsewhere across the state.

The *Aberdeen American News* reported that at least one house was evacuated afternoon in Potter County because of a grass fire. Another fire near Mound City in Campbell County has traveled seven miles.

The *Aberdeen American News* said grass fires in Spink County and Walworth County were under control. Information on damage or acres burned has not been released.

KCCR radio reported that at least two fires, one from the north and one from the south, have been pushing smoke into the Pierre-Fort Pierre area.

KELO-TV reported a 20-mile-long fire between Ocreek and Carter in the south-central part of the state is quickly moving north.

Dry conditions and wind gusts continue to create a high fire danger in much of South Dakota and southwestern North Dakota, putting them in a "red flag" warning throughout today.

A wind advisory is in effect from 10 a.m. today to 8 p.m. Friday, according to the National Weather Service. Friday night could bring gusts of up to 40 mph. Today and Friday will bring chances of thunderstorms, with a better chance Friday night.

Charles Ohman holds up his hands Wednesday while he is led through the Minnehaha County Jail for a hearing. Ohman was in a standoff with police until about 3:30 a.m. Wednesday. He appeared in court on kidnapping and drug charges. DEVIN WAGNER / ARGUS LEADER

ARGUS 911 Get the latest on crime and other emergencies in the Sioux Falls area by logging on **ARGUSLEADER.COM**.

FRIDAY - SATURDAY - SUNDAY

Figure 6.2 - October 6, 2011 KELOLAND.COM Article

Hot, Dry Conditions Lead To Dakotas Wildfires

Published: October 6, 2011, 6:21 AM

SIOUX FALLS, SD - Crews in the Dakotas continue to battle wildfires as hot, dry and windy conditions persist this week.

A fire burned about 650 acres of cropland in South Dakota's Sully County on Wednesday. Onida Fire Chief Alan Birney estimates damage to a sunflower field and two corn fields in the hundreds of thousands of dollars.

Two Yankton firefighters were injured fighting a field fire in Nebraska's Cedar County. They were reported in good condition after receiving medical attention.

In North Dakota, Emmons County has declared a burn ban through Saturday after numerous wildfires.

The National Weather Service says a "red flag" fire danger warning remains in effect for much of the Dakotas.

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Figure 6.3 - October 7, 2011 KELOLAND.COM Article

Watertown Area Under Burn Ban

By Hailey Higgins

Published: October 7, 2011, 6:10 PM

WATERTOWN, SD - Fire danger continues to be high across KELOLAND.

Unusually hot weather, high winds and critically low rainfall amounts in the Watertown area are forcing a burn ban in Codington County and the city.

Along with his uncle and cousin, Laramie Zimprich are busy harvesting 60 acres of corn in Codington County.

"Right now it would be nice to get it out before it starts raining, if it does start raining. It would be nice to see some moisture," Zimprich said.

Those who live in this area say they haven't seen a soaking rain in months, which is contributing to an extremely high fire danger.

"I've never seen it this dry, especially in the fall," Zimprich said. "This is the first year we've been combining corn this early. It is really nice it is this dry for getting the crops out, but as far as fire danger and everything like that, it could be bad if a fire did break out."

And that is what Watertown Fire Battalion Chief Tyler McElhany is hoping doesn't happen. A burn ban is enacted in Codington County to keep the fire potential as low as possible, but the threat is high.

"The conditions are just as bad as ever," McElhany said.

Watertown Fire Department says they are two to three times busier than they are on a normal day and they expect that to continue as long as the dry conditions exist.

"A burn ban is just that, no burning what so ever, especially with the winds like they have been," McElhany said. "It can blow something out of a controlled area and carry it quite a long distance into an uncontrolled area and away it goes."

And that is what is in the back of Zamprich's mind as several unharvested acres still sit on extremely dry soil.

"It could be thousands and thousands of dollars gone in a matter of minutes before a fire department ever got here," Zamprich said.

The ban includes bonfires, recreational, rubbish or any other outdoor fire. The burn ban is in effect until further notice by the county and city.

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VIDEOPLAYER

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Figure 6.4 - October 7, 2011 *BROOKINGSREGISTER.COM* Article Grass fire burns 13.6 acres

Posted: Friday, Oct 7th, 2011

BY: Staff reports

- Farm buildings threatened; BFD also at combine fire

Brookings firefighters were called on to douse two rural fires Wednesday, the volunteers responding to back-to-back calls from distant parts of the county.

The first call actually took the fire department into Moody County, just south of 221st Street. The crew was dispatched at 3:02 p.m. to a combine fire in that area.

There was very little damage to the combine, according to Pete Bolzer, deputy fire chief. There was a fire in the surrounding bean stubble, "but basically we just cooled everything down."

While the firefighters were still south of town on that call, they got a 3:23 p.m. report of a grass fire at 46733 209th St., about 2 miles north and 2 1/2 miles west of Voss' Corner.

Because the Brookings team was south of town when the call came in, they asked that Volga and Bruce firefighters be dispatched as well. The Aurora Fire Department also joined the effort.

Bolzer said the fire burned 13.6 acres of grass before firefighters were able to control and extinguish it. The fire threatened several farm buildings, but they survived without damage. One structure that had collapsed under heavy snows last winter was consumed by the blaze.

Bolzer said that because of winds and extremely dry conditions, the fire burned rapidly through a nearby shelterbelt and into a field of CRP grass. Firefighters were able to stop the fire at the road before it entered a cornfield.

The cause of that fire remains under investigation. Bolzer was unable to pinpoint where the fire started, and property owners said there had been no open burning in the area for some time.

Bolzer offered some advice for other farmers and fieldworkers:

"Be extremely careful out there," he said. "This afternoon we'll have even worse conditions than yesterday. It's fire weather when we're expecting extremely high winds at a time when the humidity is at its lowest - below 30 percent."

Bolzer said that with soil and grass conditions as they are now, "within an hour after a rain, we could have a grass fire."



Area firefighters battle a Wednesday afternoon grass fire northwest of Brookings. The flames originated at a rural Brookings property and spread north to 209th Street.

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Chapter 7 Conclusions

The exceedances that occurred on October 6, 2011, in the Brookings and Watertown area satisfy the criteria of 40 CFR 50.1(j) and meet the definition of an exceptional event. DENR believes the EPA should determine the events are exceptional. These criteria are:

1. Affects air quality;
2. Is not reasonably controllable or preventable; and
3. Is caused by human activity that is unlikely to recur at a particular location or is a natural event.

7.1 Affects Air Quality

As stated in the preamble to the Exceptional Events Rule, the event in question is considered to have affected air quality if it can be shown there is a clear causal relationship between the monitored exceedances and the event and the event is associated with a measured concentration in excess of normal historical fluctuations. The hourly meteorological data (i.e., wind speed, wind gusts) on October 6, 2011 comparison with the PM10 hourly concentrations demonstrate the PM10 concentrations were affected by the high winds. The time series plots for each monitoring station demonstrates the measured concentrations were in excess of the normal historical fluctuations. Given the information presented in this report, DENR and EPA can reasonably conclude the event in question affected air quality.

7.2 Not Reasonably Controllable or Preventable

Section 50.1(j) of Title 40 CFR Part 50 requires that an event must be “not reasonably controllable or preventable” in order to be defined as an exceptional event. This requirement is met by demonstrating that despite compliance by major emissions sources within Brookings and Codington Counties, high wind conditions overwhelmed all reasonably available controls. Despite Best Available Control Measures, strong gusty winds, in combination with high temperatures, dry conditions and multiple wildfires, brought or caused high concentrations of PM10 in the Brookings and Codington County area. The events discussed in this document that caused the exceedances in this request were caused by very high winds that caused or transported dust and other emissions into the area. The fact that this was a natural event involving strong winds that caused or transported PM10 emissions into the area, with a majority of the PM10 emissions recorded by the monitors coming from natural sources, not permitted sources, provides strong evidence that the event and exceedances of October 6, 2011 were not reasonably controllable or preventable.

7.3 Natural Event

As discussed above, the events shown to cause these exceedances were emissions of PM10 driven by high winds moving through the area on October 6, 2011. This event therefore qualifies as a predominantly natural event.

In summary, the exceedances of the federal 24-hour PM10 standard on October 6, 2011, would not have occurred but for the extreme high winds and windblown dust in the Brookings and Codington County area, based on the following weight of evidence:

1. Historical fluctuation analyses and graphs showing five years of 24-hour average data for the Brookings and Watertown monitors depict the atypically high PM10 concentrations during the October 6, 2011 event. The elevated PM10 concentrations during this day were exceptional from a historical perspective.
2. The exceedances of the PM10 standard recorded on October 6, 2011 were tied to very strong winds, as can be seen National Weather Service meteorological summaries of wind speeds in the areas. Figures show that the timing of the increases in wind speeds at monitoring locations and National Weather Service stations during the event is consistent with the timing of elevated PM10 concentrations recorded at the monitoring locations in the area.
3. Wind directions, satellite imagery, and back trajectories, help show that a major portion of the dust that impacted the Brookings and Watertown monitors originated from local fugitive sources or from areas located generally south and southeast.
4. Additionally, the newspaper accounts and crop report of dry conditions and fires also help illustrate the magnitude and scale of this event which supports the claim that the exceedances recorded during this day were not reasonably controllable or preventable.

Chapter 8 Supporting Documents

Figure 8.1 - South Dakota Weekly Crop Weather Report

South Dakota Weekly Crop Weather Report

Released: October 11, 2011 - 3:00 p.m. CST
For Week Ending October 9, 2011
SD-CW6041 Volume 60 Issue 41



National Agricultural Statistics Service
South Dakota Field Office
P.O. Box 5068
Sioux Falls, SD 57117-5068
Cooperating with:
SOUTH DAKOTA STATE UNIVERSITY
AGRICULTURAL EXTENSION SERVICE and
U.S. DEPARTMENT OF AGRICULTURE
FARM SERVICE AGENCY

AGRICULTURAL SUMMARY

With 5.8 days suitable for field work last week, harvest of soybeans is near complete; while corn harvest is starting to intensify in many areas. Around the state, areas are dealing with field and grass fires, in which some crops have been destroyed. Major activities this week included: row crop harvest, winter wheat seeding, harvesting of silage, moving hay and controlling fires.

This report was based on information from county extension educators, Farm Service Agency county directors, and other reporters across the state.

WEATHER INFORMATION

Early week winds and warm temperatures, while providing excellent drying conditions for crops, also produced very serious fire conditions across the state, according to the State Climate Office of South Dakota. Warm temperatures, low relative humidities and strong southerly winds dominated weather for much of the week. Numerous fires burned in grass and crop areas and several combines were lost due to fires from the excessively dry conditions.

The warm conditions were astounding for this time of year. Average temperatures were in the 60's to low 70's F in the southeast. Except for a few western stations these values were 11-17° F above average. For many stations this was record warmth for that seven day period. Many locations reached daily highs in the 90's F. Picketown had the high temperature at 97° F; Custer had the low at 33° F.

A late week storm system helped to bring some precipitation across the state. Rainfalls were widespread, but not always heavy. Thirteen stations received less than a quarter of an inch of precipitation. Britton had the low at 0.02 of an inch. Onida had the high at 3.43 inches.

SOIL CONDITION

Soil temperatures responded to the warm temperatures and dry conditions by actually warming several degrees at some locations. Most stations were around 60° F except for stations in the south central, which were in the mid - upper 60's F.

Topsoil moisture is rated at just 45 percent adequate to surplus, up 8 percentage points from last week, and 36 percentage points below last year. Subsoil moisture was rated at 51 percent adequate to surplus, 6 percentage points below last week, and 30 percentage points below the previous year.

FIELD CROPS REPORT

Harvest of corn and soybeans was a common sight in many areas this last week, with soybeans nearing completion. Soybeans harvested at 73 percent, compared to 60 percent last year and 47 percent on average. Ninety-six percent of the corn is now rated mature, with 18 percent harvested, ahead of the 5-year average of 14 percent harvested. Sunflower in the mature stage is estimated at 86 percent, ahead of the 5-year average of 66 percent. Sorghum is 40 percent harvested, behind last year at 47 percent harvested. Seeding of winter wheat needs some moisture with 80 percent complete, making seeding 5 percentage points behind last year. Only 46 percent of winter wheat has emerged, 13 percentage points behind last year and 11 percentage points behind the 5-year average.

Average Soil Temperatures: Week Ending October 9, 2011 (4-inch Depth)

Location	Temp	Location	Temp
Aberdeen	61	Nielsen	59
Beresford	60	Oacoma	67
Bowdle	57	Pickston	66
Brookings	62	Pierre	68
Capota	57	Redfield	59
Cottonwood	62	South Shore	58

LIVESTOCK, PASTURE, AND RANGE REPORT

Cattle in some areas are still showing signs of respiratory problems due to dry, dusty conditions, but overall cattle are still rated mostly in the good to excellent range. Cattle are rated 88 percent in good to excellent condition. Sheep are rated 88 percent in good to excellent condition. Range and pasture is reported at 62 percent in good to excellent condition, 4 percentage points up from last week. Stock water supplies are 92 percent adequate to surplus and feed supplies are 95 percent adequate to surplus, both ahead of the 5-year averages of 77 and 88 percent, respectively.

Feed and Water Supplies Comparison as of October 9, 2011

Rating	Feed Supplies			Stock Water Supplies		
	This Week	Last Year	5 Yr. Avg.	This Week	Last Year	5 Yr. Avg.
Very Short	0	0	3	0	0	8
Short	5	3	9	8	5	15
Adequate	82	82	78	81	78	69
Surplus	13	15	10	11	17	8

Soil Moisture Condition Comparison as of October 9, 2011

Rating	Topsoil			Subsoil		
	This Week	Last Week	Last Year	This Week	Last Week	Last Year
Very Short	14	12	4	11	6	6
Short	41	51	15	38	37	13
Adequate	44	36	69	46	52	64
Surplus	1	1	12	5	5	17

Crop and Livestock Conditions as of October 9, 2011

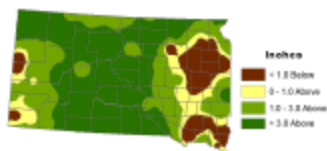
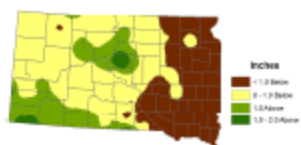
Item	V Poor	Poor	Fair	Good	Excel
	Percent	Percent	Percent	Percent	Percent
Corn	2	4	25	52	17
Soybeans	2	6	28	50	14
Sorghum	0	9	26	55	10
Sunflower	0	2	32	55	11
Alfalfa	3	4	19	64	10
Cattle	0	1	11	75	13
Sheep	0	1	11	69	19
Range & Pasture	1	8	29	50	12

Crop Progress as of October 9, 2011¹

Item	This Week	Last Week	Last Year	5-Yr Avg.
	Percent	Percent	Percent	Percent
Winter Wheat				
Seeded	80	72	85	87
Emerging	46	26	59	57
Corn				
Mature	96	79	93	88
Grain Harvested	18	8	16	14
Soybeans				
Mature	99	78	95	91
Harvested	73	30	60	47
Sorghum				
Mature	85	56	95	87
Grain Harvested	40	9	47	31
Silage Harvested	98	90	99	94
Sunflower				
Mature	86	48	78	66
Harvested	6	3	12	8
Alfalfa				
3rd Cutting	96	93	94	92

¹ Percentages represent all acreage in or beyond each stage.

To access this and other South Dakota Internet reports, go to www.nass.usda.gov/sd



Week Ending Sunday, October 9, 2011									
District and Station	Temperatures Past Week				Precipitation				
	Average	Departure from Normal	High	Low	Total			Departure from Normal	
					Current Week	Since Oct. 1	Since Apr. 1	Since Oct. 1	Since Apr. 1
	Degrees	Degrees	Degrees	Degrees	Inches	Inches	Inches	Inches	Inches
Northwest									
Ilwaco	61	8	89	42	0.24	0.24	14.58	-0.21	1.46
Buffalo	63	12	94	43	0.40	0.40	16.15	0.03	3.81
Dupree	66	13	89	45	1.15	1.15	19.30	0.70	5.34
Melrostok	63	11	90	45	0.35	0.35	12.04	-0.10	-1.15
Neswell	63	10	92	42	0.35	0.35	14.48	-0.17	1.10
Timber Lake	62	10	90	44	0.71	0.71	18.28	0.24	4.27
North Central									
Aberdeen	68	16	86	48	0.04	0.04	18.82	-0.50	3.13
Faultless	65	11	87	41	0.12	0.12	17.41	-0.39	2.03
Morbridge	68	14	91	50	1.00	1.00	14.56	0.55	2.17
Roscoe	64	13	84	45	0.10	0.10	18.32	-0.35	3.01
Northeast									
Drifton	70	17	87	52	0.02	0.02	22.27	-0.52	6.02
Clear Lake	67	11	94	43	0.77	0.77	18.07	0.14	0.11
Sloaton	66	13	87	47	0.19	0.19	22.19	-0.35	5.96
Waterdown	67	16	83	46	0.05	0.05	14.36	-0.55	-2.54
Webster	67	16	83	51	0.08	0.08	14.82	-0.46	-2.59
West Central									
Fairb	65	13	92	47	0.42	0.42	15.23	0.01	2.19
Millerville	66	14	94	43	0.31	0.31	16.76	-0.21	1.73
Philby	66	12	96	42	0.14	0.14	14.20	-0.23	0.99
Rapid City	63	10	96	40	1.20	1.20	15.62	0.82	2.90
Spearfish	68	16	90	46	0.35	0.35	14.92	-0.26	0.18
Central									
Chamberlain	69	14	95	48	0.65	0.65	17.35	0.10	1.47
Hightower	66	12	88	48	0.12	0.12	13.44	-0.42	-1.82
Ukiah	67	14	87	49	0.12	0.12	16.29	-0.42	0.51
Orinda	64	11	92	48	3.43	3.43	19.62	2.95	4.86
Pierre	68	13	93	47	0.22	0.22	20.42	-0.31	5.14
East Central									
Brookings	67	16	84	46	0.30	0.30	18.24	-0.30	-0.10
Madison	67	15	85	47	0.49	0.49	20.37	-0.14	0.98
Mitchell	69	15	90	52	1.13	1.13	17.40	0.61	0.93
Sioux Falls	69	16	86	50	0.48	0.48	20.61	-0.15	2.03
Southwest									
Custer	54	5	82	33	0.14	0.14	17.68	-0.31	1.85
Hot Springs	60	7	90	41	0.98	0.98	15.03	0.55	1.04
Oelrichs	62	8	92	40	0.90	0.90	13.73	0.48	0.32
Porcupine	63	11	94	35	1.17	1.17	16.94	0.73	3.87
South Central									
Kenneth	68	12	94	44	1				

Figure 8.2 - USDA Report



United States Department of Agriculture

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(605) 352-1200
www.sd.nrcs.usda.gov

South Dakota
April 2014



Cropping Systems in South Dakota A 2013 Inventory and Review



In 2013, the U. S. Department of Agriculture's Natural Resources Conservation Service (NRCS) and partners in South Dakota conducted a county-level inventory of the types of cropland management systems being used by agricultural producers across the state.

The purpose was to capture a "snapshot in time" of the types of cropping systems being used across South Dakota and to be able to apply current knowledge of how various cropping systems relate to soil health, productivity and sustainability.

Information was collected for the cropping management systems used. It was completed in June, after crop emergence but before the crop canopies closed, and while it was still evident what type of cropping system had been employed to plant it.

The field observations by trained technical personnel show that South Dakota farmers have continued to be leaders in the use of conservation technology and advanced cropping systems. The new 2013 data shows a 29 percent expansion in acres farmed under a no-till system since 2004 (*the last time this type of data was collected*), however, the location of those acres has shifted.

The 2013 Cropping Systems Inventory will be used to:

1. provide information that can be used by individual conservation districts and others in establishing priorities for educational or other programs,
2. evaluate progress achieved in reaching county or statewide goals, and
3. provide data on the adoption of conservation cropping systems across the state of South Dakota by crop.

Cropping Systems in South Dakota - A 2013 Inventory and Review

Results of the South Dakota Cropping Systems 2013 Inventory

The inventory recorded a statistical "snapshot" of the types of cropping systems being used on cropland in each county. Use of a no-till cropping system was found to be the predominant cropping system with 45 percent of South Dakota cropland (6.2 million acres). A cropping system that leaves more than 30 percent residue cover on the soil surface after planting (including no-till) was used on more than 60 percent of the state's cropland. The percentage of acres under a conventional tillage system was unchanged, however, the location of the acres shifted.

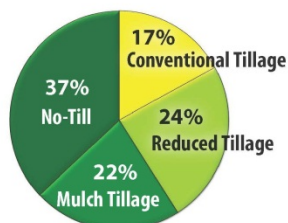
No Tillage (no-till): the soil is left undisturbed from harvest to planting with greater than 30 percent residue remaining after planting.

Mulch Till: disturbs the entire soil surface and is done prior to and/or during planting with greater than 30 percent residue left after planting. Usually, 1 to 3 tillage trips. Chisel plow, disk, field cultivator and combination tools are used.

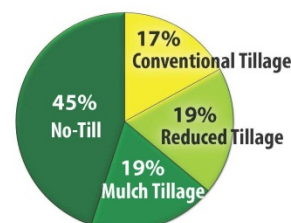
Reduced Tillage: disturbs the entire soil surface and is performed prior to and/or during planting with 15-30 percent residue cover remains planting.

Conventional Tillage: soil in the entire field is tilled with one or more tillage trips that disturb the entire soil surface and is performed prior to and/or during planting with less than 15 percent residue cover remaining after planting. Generally involves plowing or intensive (numerous) tillage trips.

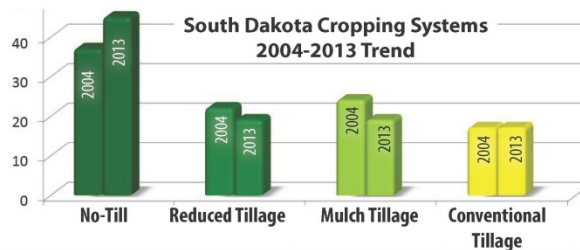
South Dakota Planted Cropland 2004
(13,068,600 Acres)



South Dakota Planted Cropland 2013
(13,926,037 Acres)



	2004	2013
No-Till	4,873,352 acres (37%)	6,229,856 acres (45%)
Mulch Tillage	2,851,399 acres (22%)	2,603,467 acres (19%)
Reduced Tillage	3,165,728 acres (24%)	2,665,327 acres (19%)
Conventional Tillage	2,178,121 acres (17%)	2,357,387 acres (17%)



Cropping Systems Matter...

Cropping systems impact the health and productivity of soil. Reducing or eliminating tillage not only improves soil health, but can increase fertility, lower long-term fertilizer inputs and save fuel costs. A 50-percent reduction in fuel costs at \$4/gallon would come to a \$10,000 annual savings on the average 1,200-acre farm.

Advanced soil health management systems include conservation practices such as no-till, diversified cropping rotations and cover crops.

Healthy soils are high-performing, productive soils with increased levels of organic matter. Research shows that organic matter builds when tillage declines and plants and residues cover the soil. Organic matter plays a big role in soil/water interaction. One percent of organic matter in the top six inches

of soil holds approximately 16,500 gallons of water per acre. The rate water infiltrates a soil and the amount of water that a soil can hold is higher with increased organic matter. Higher organic matter means less run-off and erosion. It means more plant available water held in the root-zone, and it means more of the crop inputs (fertilizer, etc.) remain with the soil and plants.

The adoption of increased residue management practices or no-till systems on additional acres could make a substantial increase in organic matter and the soil's ability to infiltrate and retain precipitation.

This is important; for example in South Dakota's Lower James River watershed about 52 percent of the land is cultivated cropland with about

30 percent under a no-till cropping system. If no-till was applied to one fourth of the acres currently not in a no-till system, infiltration of an additional two-tenths of an inch of rainfall could occur over those acres from just one 2.5-inch rainfall.

That small increase in infiltration is nearly 1.1 billion gallons! That amount of water would potentially flood over 3,300 acres downstream (one foot deep) if it ran off instead of infiltrating.

Most farmers can increase their soil's organic matter and infiltration by keeping the soil covered as much as possible, minimizing soil disturbance, and using diverse crop rotations and cover crops to maximize the time growing plants can feed the soil.

Cropping Systems in South Dakota - A 2013 Inventory and Review

Cropping Systems: Use of No-Till is on the Rise, but Acres Have Shifted

Since 2004, large areas of South Dakota have been, and are being, managed with a minimum level of soil disturbance, primarily the no-till cropping system.

In South Dakota, the overall acres of planted cropland in 2013 increased by 857,437 acres since 2004 to 13,926,037. The inventory showed the acres of cropland under a no-till system increased since 2004 by 29 percent, or an increase of 1,426,504 acres.

The number of counties with less than 25 percent of their cropland acres under no-till systems decreased from 32 counties in 2004 to 22 counties in 2013.

The number of counties with more than 75 percent of the acres under a no-till system increased from 4 counties in 2004 to 14 counties in 2013.

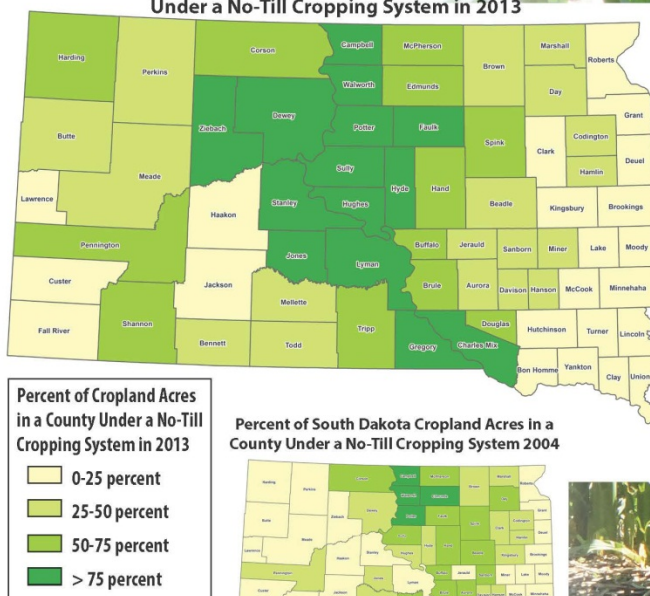
While the overall number of counties with acres under no-till systems increased between 2004 and 2013, in eastern South Dakota 16 counties decreased their acres of cropland under a no-till system. The counties listed below moved cropland acres out of a no-till farming system:

County and Percent Decrease in Acres under No-till	
Kingsbury (64.9)	Lake (61.6)
Grant (60.4)	Clark (56.6)
Moody (44.3)	Day County (44)
Brookings (42.8)	Codington (33.9)
Yankton (32.2)	Beadle (29.4)
Marshall (25.4)	Sanborn (23.7)
Aurora (18.9)	Union (15.5)
Spink (13.1)	Brown (2.2)

The distribution of cropping systems across South Dakota, in part, reflects the variation in soils and climate and the crops that are well-adapted to those conditions. It may be notable that most of the counties that reduced acres of no-till systems also greatly reduced small grain production. Row crop production (corn, soybeans) saw a corresponding increase in the same counties.

The greatest density in increased use of no-till systems occurred in central South Dakota's transition zone between the drier western and the more moist eastern areas. This area's cropping systems are built around a diverse crop rotation of row crops and small grains.

Percent of South Dakota Cropland Acres in a County Under a No-Till Cropping System in 2013



Percent of South Dakota Cropland Acres in a County Under a No-Till Cropping System 2004



Soil samples in Bill Nelson's fields in Lake County, SD, show a rich, dark soil with high organic matter (averaging 5- to 6.1 percent). For more than 30 years, the fields have been under no-till with a diversified crop rotation including corn, soybeans, alfalfa, oats, spring wheat, winter wheat, rye, and cover crops. Nelson adjusts the rotation based on what he feels the soil needs based on visual and soil test results. He believes that the use of a cover crops mixture and small grains has been the key factor why he has fewer weed, disease and insect problems because they build the soil.

For example, 2009-2011 were above average precipitation years in eastern South Dakota. "Like everyone, I was worried about getting in to plant. By waiting, I allowed the soil to function (let the macro pores move the extra precipitation into the soil profile) rather than using tillage to dry the surface. I was surprised when my soil performed well under the planting equipment." Nelson says, "That's a good cropping system!"

"We had that big rain on May 5 and I had no erosion and no run-off. Not one field had a problem because the organic matter and good soil structure put that water into the profile." That sub soil moisture was useful in August.

"The no-till cropping system works and I'm happy with the yield results," he says. "For me, it is my choice and a personal challenge to continue to decrease chemical inputs while getting respectable return. I am seeing better soil structure, better infiltration, an increase in the biological activity in the soil, and more beneficial insects around my fields."



Cropping Systems in South Dakota - A 2013 Inventory and Review

Diversified Crop Rotations and Cropping Systems

No-till cropping systems appear to go hand-in-hand with diverse crop rotations. The 2013 Inventory showed cropping systems with the lowest soil disturbance were also the systems with the greatest diversity in crop rotations.

Areas with less diversity in their crop rotation were also the areas with the greatest soil disturbance, i.e., conventional tillage. Areas with the greatest amount of acres under a no-till cropping system also had the greatest diversity in crops grown.

At the time of this inventory, the 14 counties with greater than 75 percent of their cropland acres under a no-till system typically had a more diversified crop rotation (*a ratio of 1 acre small grain to 2.5 acres row crops*) than the 22 counties with the least amount of acres under no-till systems.

In those 14 counties, small grains were spring or fall planted and also included a sizable acreage of millet seeded during the summer. Row crops used in the rotation included a diverse mix of corn, soybeans, sunflowers, sorghum, sudangrass and field peas.

The 2013 data showed systems in the 22 counties with the least diversity in crop rotations also had the least percentage of no-till acres and were relying heavily on tillage for seedbed preparation.

At the time of the inventory, the 22 counties in eastern South Dakota with less than 25 percent no-till acres averaged a ratio of 1 acre small grain to 28 acres row crop. The row crops were almost exclusively corn and soybeans. The inventoried acres of small grain in this area was negligible.

Research shows that soil managed with the highest diversity of crops in the rotation is also healthier soil.

Prior to advancements in conservation farming technology, many producers



had used tillage to prepare seed beds and for weed control. In wetter areas, tillage caused soil compaction. Now, no-till systems that use diverse crop rotations have become critical for drier areas of South Dakota because of the moisture savings that allows introduction of alternative crops types in the rotation.

With the proper crop diversity and crop intensity over the long-term, producers in both wet and dry areas are seeing improved yields and less weed, disease and insect problems.

A well-designed no-till cropping system with a diversified crop rotation, including cover crops or perennial crops to use the extra water in the soil profile, will also reduce compaction and address salinity issues.

The bigger benefit is that using a diversified crop rotation with cover crops equates to more diversity below the soil's surface also promoting better soil biological health and productivity.

Contact your local NRCS for help in "Unlocking the Secrets" in your soil.



Jorgensen Farms manage 16,500 acres in south central South Dakota near Ideal. Their no-till farming system has a diversified cropping rotation with cover crops and livestock. Their crop rotation includes: corn, cane, milo, oats, soybeans, winter wheat and alfalfa with use of cover crops.

In the 1990s, Bryan Jorgensen channeled his energy and interest in healthier soil toward a complete overhaul of their operation. "Frankly, our soils are now much more robust and healthy for the direction we've taken. Our fields have about 4 percent organic matter and the microbial growth in the soil has increased significantly over the past three decades."

Jorgensen's nutrient management plan approach has shifted from relying solely on soil test chemical results to now evaluating a combination of soil chemical and biological processes to achieve his yield goals with less inputs. Yield is the proof, but the success of his decisions, he says, lies in the soil.



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Table 8.1 - Brookings Airport Weather Readings on October 6, 2011

Time (CDT)	Temp.	Humidity	Visibility	Wind Direction	Wind Speed	Gust Speed	Precip	Conditions
0:55	64.4 °F	37%	10.0 mi	SE	15.0 mph	20.7 mph	N/A	Clear
1:55	62.6 °F	39%	10.0 mi	SE	13.8 mph	19.6 mph	N/A	Clear
2:55	60.8 °F	42%	10.0 mi	SSE	12.7 mph	-	N/A	Clear
3:55	60.8 °F	42%	10.0 mi	SE	10.4 mph	-	N/A	Clear
4:55	59.0 °F	45%	10.0 mi	SE	12.7 mph	-	N/A	Clear
5:55	57.2 °F	51%	10.0 mi	SE	13.8 mph	20.7 mph	N/A	Clear
6:55	57.2 °F	51%	10.0 mi	SE	15.0 mph	20.7 mph	N/A	Clear
7:55	57.2 °F	51%	10.0 mi	SE	16.1 mph	21.9 mph	N/A	Clear
8:55	60.8 °F	48%	10.0 mi	SE	17.3 mph	25.3 mph	N/A	Clear
9:55	64.4 °F	45%	10.0 mi	SSE	19.6 mph	26.5 mph	N/A	Clear
10:55	69.8 °F	38%	10.0 mi	SSE	18.4 mph	28.8 mph	N/A	Clear
11:55	73.4 °F	31%	10.0 mi	SSE	25.3 mph	34.5 mph	N/A	Clear
12:55	77.0 °F	26%	10.0 mi	SSE	29.9 mph	38.0 mph	N/A	Clear
13:55	75.2 °F	34%	10.0 mi	SSE	29.9 mph	38.0 mph	N/A	Partly Cloudy
14:55	73.4 °F	33%	10.0 mi	SSE	33.4 mph	42.6 mph	N/A	Mostly Cloudy
15:55	73.4 °F	36%	10.0 mi	SSE	29.9 mph	46.0 mph	N/A	Scattered Clouds
16:55	75.2 °F	31%	10.0 mi	SE	25.3 mph	39.1 mph	N/A	Mostly Cloudy
17:55	75.2 °F	31%	10.0 mi	SE	21.9 mph	36.8 mph	N/A	Clear
18:55	73.4 °F	33%	10.0 mi	SSE	21.9 mph	29.9 mph	N/A	Clear
19:55	73.4 °F	33%	10.0 mi	SE	23.0 mph	34.5 mph	N/A	Clear
20:55	71.6 °F	35%	10.0 mi	SE	19.6 mph	35.7 mph	N/A	Clear
21:55	71.6 °F	35%	10.0 mi	SSE	20.7 mph	29.9 mph	N/A	Clear
22:55	71.6 °F	35%	10.0 mi	SSE	21.9 mph	34.5 mph	N/A	Clear
23:55	69.8 °F	38%	10.0 mi	SSE	24.2 mph	32.2 mph	N/A	Clear
0:55	69.8 °F	38%	10.0 mi	SSE	23.0 mph	28.8 mph	N/A	Clear

Table 8.2 - Watertown Airport Weather Readings for October 6, 2011

Time (CDT)	Temp.	Humidity	Visibility	Wind Direction	Wind Speed	Gust Speed	Precip	Conditions
0:53	63.0 °F	40%	10.0 mi	SSE	13.8 mph	23.0 mph	N/A	Clear
1:53	62.1 °F	41%	10.0 mi	SSE	13.8 mph	-	N/A	Clear
2:53	62.1 °F	43%	10.0 mi	SSE	13.8 mph	21.9 mph	N/A	Clear
3:53	62.1 °F	43%	10.0 mi	SSE	18.4 mph	23.0 mph	N/A	Clear
4:53	60.1 °F	46%	10.0 mi	SSE	15.0 mph	23.0 mph	N/A	Clear
5:53	59.0 °F	48%	10.0 mi	SSE	16.1 mph	-	N/A	Clear
6:53	59.0 °F	49%	10.0 mi	SSE	16.1 mph	23.0 mph	N/A	Clear
7:53	59.0 °F	49%	10.0 mi	SSE	17.3 mph	24.2 mph	N/A	Clear
8:53	61.0 °F	48%	10.0 mi	SSE	18.4 mph	25.3 mph	N/A	Clear
9:53	66.0 °F	42%	10.0 mi	SSE	21.9 mph	29.9 mph	N/A	Clear
10:53	70.0 °F	36%	10.0 mi	South	26.5 mph	36.8 mph	N/A	Clear
11:53	73.0 °F	31%	10.0 mi	SSE	25.3 mph	32.2 mph	N/A	Clear
12:53	77.0 °F	29%	10.0 mi	SSE	25.3 mph	39.1 mph	N/A	Clear
13:53	77.0 °F	26%	10.0 mi	SSE	28.8 mph	42.6 mph	N/A	Clear
14:53	75.9 °F	37%	7.0 mi	SSE	34.5 mph	48.3 mph	N/A	Partly Cloudy
15:53	75.0 °F	40%	8.0 mi	South	33.4 mph	49.5 mph	N/A	Clear
16:53	75.0 °F	36%	10.0 mi	SSE	34.5 mph	47.2 mph	N/A	Scattered Clouds
17:53	73.9 °F	33%	10.0 mi	SSE	26.5 mph	42.6 mph	N/A	Clear
18:53	73.0 °F	33%	10.0 mi	SSE	25.3 mph	33.4 mph	N/A	Clear
19:53	72.0 °F	34%	10.0 mi	SSE	21.9 mph	38.0 mph	N/A	Clear
20:53	72.0 °F	34%	10.0 mi	SSE	27.6 mph	39.1 mph	N/A	Clear
21:53	71.1 °F	35%	10.0 mi	SSE	21.9 mph	32.2 mph	N/A	Clear
22:53	69.1 °F	38%	10.0 mi	SSE	21.9 mph	34.5 mph	N/A	Clear
23:53	69.1 °F	38%	10.0 mi	SSE	23.0 mph	39.1 mph	N/A	Clear

Chapter 9 Public Comments

DENR, in following the requirements listed in 40 CFR 50.14 (c)(3)(i) **Submission of demonstrations**, posted this Exceptional Events Demonstration Package on the “DENR One-Stop List of Current Public Notices” webpage (<http://denr.sd.gov/public/default.aspx>) for a 30-day public comment from October 24, 2014 through November 24, 2014. In accordance with 40 CFR 50.14 (c)(3)(v), DENR has documented the public comments received in this section.

9.1 Information Shown on Webpages

The exceptional events demonstration was placed on DENR’s website on October 24, 2014 and was open for public comment through November 24, 2014. Figure 9.1 shows a screen shot of the “Air Quality Program” webpage with a link to the department’s public notices webpage. Figure 9.2 shows a screen shot of the “DENR One-Stop List of Current Public Notices” webpage with the bottom entry showing the exceptional events section. Figure 9.3 shows a screen shot of the “DENR Public Notice Comment Form” where comments can be submitted online.

Figure 9.1 - "Air Quality Program" webpage on 10/24/14



Figure 9.2 - "DENR One-Stop List of Current Public Notices" webpage on 10/24/2014

South Dakota Department of Environment & Natural Resources
Protecting South Dakota's tomorrow...today!

125th Anniversary

1 Stop Permitting Air Land Water Permits/Forms Funding About us Press

Upcoming...
One-Stop Public Notice
Scheduled events
Board meetings
Jobs
Info about DENR
Organization
Staff directory
Who to call
Email us
DENR offices
Documents & Data
Documents
Databases/Lists
Mapping
Miscellaneous
FAQ
Laws and rules
3rd party services

DENR One-Stop List of Current Public Notices

All public notices generated by DENR are available below with links provided to each public notice and supporting information. If you would like more information than what is provided, please email us at DENRINTERNET@state.sd.us or call (605) 773-3151 for further assistance.

Subscribe To Email Updates: You can be notified weekly by email when public notices are added to this page. Subscribe to the service by providing your email address to DENRINTERNET@state.sd.us. Your email address will not be used for any other purposes.

NOTE! An online comment form is accessible via the "Comment Deadline" links provided below.

Proposed Rules (One-stop website for all state agency rule proceedings)
Notice of public hearing for adoption of rules.

Rule	Description	Comment Deadline	Link	Link	Link
Water Management Board	Notice of Public Hearing to Amend Rules: Surface Water Quality Standards: ARSD 74.81-01, Uses Assigned to Lakes: ARSD 74.81-02, Uses Assigned to Streams: ARSD 74.81-03	12/2/2014	Public Notice	Draft Rules	More...

Air Quality Permit
A permit is needed for businesses that emit air pollution. [For more information...](#)

Source	Description	Location	Comment Deadline	Link	Link	Link
Lake View Municipal	Lake View Municipal	Lake View	10/24/2014	Public Notice	Draft Permit	Application Review
Stout Falls Regional Sanitary Landfill	The Stout Falls Regional Sanitary Landfill operates a municipal Subtitle D solid waste landfill. The air quality operating permit for the landfill is being renewed.	Stout Falls	11/7/2014	Public Notice	Draft Permit	Application Review
NUGEN	NUGEN Energy, LLC is an ethanol production plant that is proposing to construct and operate an above ground storage tank with an internal floating roof.	Marion	11/5/2014	Public Notice	Draft Permit	Application Review
Kingbrook Rural Water	Kingbrook Rural Water is a water treatment facility that operates a non-emergency generator. The department recommended a minor operating permit.	DeSmet	11/14/2014	Public Notice	Draft Permit	Application Review
Southeastern Electric Cooperative Inc	Southeastern Electric Cooperative Inc. operates a non-emergency generator to provide electricity for off peak load control. The department recommended a minor operating permit.	Lemmon	11/19/2014	Public Notice	Draft Permit	Application Review
Deer Creek	Deer Creek generating station consists of a natural gas-fired combustion turbine and a heat recovery steam generator capable of providing approximately 200 megawatts of electricity.	White	11/21/2014	Public Notice	Draft Permit	Application Review

Air Quality (Exceptional Event)
An exceptional event is one that affects air quality, is not reasonably controllable or preventable, and is caused either by human activity that is unlikely to recur at a particular location, or a natural event.

Description	Location	Comment Deadline	Link
DENR is accepting public comments on the Exceptional Event Demonstration for PM10 Exceedances in Brookings and Watertown on October 6, 2011.	Brookings and Watertown	11/24/2014	Public Notice

Figure 9.3 - "DENR Public Notice Comment Form" webpage on 10/24/14

South Dakota Department of Environment & Natural Resources
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125th ANNIVERSARY

1 Stop Permitting Air Land Water Permits/Forms Funding About us Press Facebook

Upcoming...
One-Stop Public Notice
Scheduled events
Board meetings
Jobs

Info about DENR
Organization
Staff directory
Who to call
Email us
DENR offices

Documents & Data
Documents
Databases/Lists
Mapping
Miscellaneous

FAQ
Laws and rules
3rd party services

Google Custom Search
Search

DENR Public Notice Comment Form
* required fields

Public notice for: Brookings and Watertown Exceptional Event 10/06/2011
Comment deadline: 11/24/2014

Commenting on:
DENR is accepting public comments on the Exceptional Event Demonstration for PM10 Exceedances in Brookings and Watertown on October 6, 2011.

Commenter's Name: * **Address:** *

City: * **State:** * **Zip:** *

Email: **Phone:**

Comments: *

10000

Attachment: (size limit 15 MB)

Consideration of a comment is not guaranteed if submitted after the comment deadline. Please be timely!

[SD Home](#) | [DENR Home](#) | [Employee Intranet](#) | [Feedback](#) | [Disclaimer](#) | [Privacy](#) | [Accessibility](#)

9.2 Public Comments Received

No comments were received during the public comment period from October 24, 2014 through November 24, 2014.