Technical Support Document For the April 28 & 29, 2010, Alamosa, Pagosa Springs, and Durango Exceptional Event

Colorado Department
of Public Health
and Environment

Prepared by the Technical Services Program
Air Pollution Control Division
Colorado Department of Public Health and Environment

May 17, 2013

Executive Summary

In 2005, Congress identified a need to account for events that result in exceedances of the National Ambient Air Quality Standards (NAAQS) that are exceptional in nature[1] (e.g., not expected to reoccur or caused by acts of nature beyond man-made controls). In response, EPA promulgated the Exceptional Events Rule (EER) to address exceptional events in 40 CFR Parts 50 and 51 on March 22, 2007 (72 FR 13560). On May 2, 2011, in an attempt to clarify this rule, EPA released draft guidance documents on the implementation of the EER to State, tribal and local air agencies for review. The EER allows for states and tribes to "flag" air quality monitoring data as an exceptional event and exclude those data from use in determinations with respect to exceedances or violations of the NAAQS, if EPA concurs with the demonstration submitted by the flagging agency.

Due to the semi-arid nature of parts of the state, Colorado is highly susceptible to windblown dust events. These events are often captured by various air quality monitoring equipment throughout the state, sometimes resulting in exceedances or violations of the 24-hour PM_{10} NAAQS. This document contains detailed information about the large regional windblown dust event that occurred on April 28 and 29, 2010. The Colorado Department of Public Health and Environment (CDPHE) Air Pollution Control Division (APCD) has prepared this report for the U.S. Environmental Protection Agency (EPA) to demonstrate that the elevated PM_{10} concentrations were caused by a natural event.

On Wednesday April 28, 2010, PM_{10} exceedances greater than the 24-hour NAAQS of 150 $\mu g/m^3$ were recorded at the Adams State College (08-003-0001) monitor in Alamosa with a concentration of 285 $\mu g/m^3$, the Alamosa Municipal Building (08-003-0003) monitor with a concentration of 236 $\mu g/m^3$, and the Pagosa Springs School (08-007-0001) monitor with a concentration of 181 $\mu g/m^3$. Additionally on April 28, 2010, an exceptionally high sample (greater than the 99th percentile for the site) was recorded at the PM_{10} monitor in Mt. Crested Butte (08-051-0007) (123$\mu g/m^3$). On Thursday April 29, 2010, exceedances greater than 150 $\mu g/m^3$ were recorded at the Pagosa Springs School (08-007-0001) monitor with a concentration of 162 $\mu g/m^3$ and the Durango River City Hall (08-067-0004) monitor with a concentration of 226 $\mu g/m^3$. Additionally on April 29, 2010, high samples were taken at the Alamosa PM_{10} monitors at Adams State College (08-003-0001) (92 $\mu g/m^3$) and the Municipal Building (08-003-0003) (94 $\mu g/m^3$). These exceedances and other high concentrations across Colorado are plotted on the maps for April 28 and 29 in Figure 1 and Figure 2, respectively.

All of the noted April 28 and 29, 2010, twenty-four-hour PM_{10} concentrations were above the 90^{th} percentile concentrations for their locations (see Table 24 and Table 25). The statistical data and meteorological analysis clearly shows that but for this high wind blowing dust event, Alamosa, Pagosa Springs, and Durango would not have exceeded the 24-hour NAAQS on April 28 and 29, 2010. Since at least 2005, there has not been an exceedance that was not associated with high winds carrying PM_{10} dust from distant sources in these areas. This is evidence that the event was associated with a measured concentration in excess of normal historical fluctuations including background.

This large regional dust storm adversely affected the air quality exceeding the 24-hour PM_{10} NAAQS in Alamosa, Pagosa Springs, and Durango and impacted PM_{10} concentrations at several

[1] Section 319 of the Clear Air Act (CAA), as amended by section 6013 of the Safe Accountable Flexible Efficient-Transportation Equity Act: A Legacy for Users (SAFE-TEA-LU of 2005, required EPA to propose the Federal Exceptional Events Rule (EER) no later than March 1, 2006.

other monitoring stations in Colorado. Since at least 2005, there has not been an exceedance that was not associated with high winds carrying PM_{10} dust from distant sources in these areas. APCD is requesting exclusion for each of the samples taken at the Adams State College monitor in Alamosa, the Alamosa Municipal Building monitor, the Pagosa Springs School monitor and the Durango monitor.

Specifically, these high values taken on April 28 and 29, 2010, were the consequence of strong southwesterly prefrontal surface winds over dry soils which caused significant blowing dust across much of Arizona, northwest New Mexico, southeast Utah and southwest Colorado. These winds were the result of a significant surface low pressure and surface cold front associated with a major upper-level trough that was moving across the Western United States. This single storm system caused blowing dust during the afternoon and evening hours of April 28 that continued through the morning hours of April 29. It transported PM_{10} dust into the southwestern portion of Colorado.

Widespread restrictions to visibility occurred in northeastern Arizona, northwestern New Mexico, and southwestern Colorado. The weather system causing the winds affected southwestern Colorado during the afternoon and evening hours on April 28 and during the early morning hours of April 29 as the effects of the system shifted east and south. These observations contribute to the body of evidence that shows that a regional dust storm caused the PM_{10} exceedances at the monitoring sites in question.

EPA's June 2012 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 "the EPA will accept a threshold of a sustained wind of 25 mph for areas in the west provided the agencies support this as the level at which they expect stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed..." In addition, in both eastern and western Colorado it has been shown that wind speeds of 30 mph or greater and gusts of 40 mph or greater can cause blowing dust (see reference for the Technical Support Document for the January 19, 2009 Lamar Exceptional Event and Attachment A - Grand Junction, Colorado, Blowing Dust Climatology at the end of this document). For this blowing dust event, it has been assumed that sustained winds of 25 mph and higher or wind gusts of 40 mph and higher can cause blowing dust in Arizona, New Mexico, and Colorado. Observations for Cortez, Durango, Montrose, Alamosa, and Colorado Springs showed sustained wind speeds were as high as 47 mph and wind gusts were as high as 64 mph on April 28 and 29, 2010, and these are well above the identified blowing dust thresholds. Outside of Colorado, sustained wind speeds were as high as 53 mph and wind gusts were as high as 70 mph on April 28 and 29, 2010.

The Albuquerque, Flagstaff, and Grand Junction NWS Forecast Offices issue weather warnings and advisories for northeast Arizona, most of New Mexico, eastern Utah, and western and southwestern Colorado. The weather warnings and advisories issued by theses offices for April 28 and 29, 2010, are presented in Appendix B. These warnings and advisories show that strong winds and areas of blowing dust were expected and experienced across this region on these days.

The blowing dust climatology for the Four Corners area indicates that the area can be susceptible to blowing dust when winds are high. Landform imagery shows that northeastern Arizona and southeastern Utah in particular have experienced a long-term pattern of wind erosion and blowing dust when winds have been southwesterly and blowing into western and southern Colorado. Forecast products from the Navy Aerosol Analysis and Prediction System model provide evidence for a widespread blowing dust event in the Four Corners states, suggesting that significant source regions for dust transported into Colorado were located in arid regions of

Arizona, Utah, and New Mexico. NOAA HYSPLIT forward and backward trajectories provide clear supporting evidence that dust from desert regions of northwest New Mexico and Arizona caused the PM_{10} exceedances measured across portions of southwestern Colorado on April 28 and 29, 2010. Soils in the Four Corners area and in northeastern Arizona, southeastern Utah, and extreme northwestern New Mexico in particular were dry enough to produce blowing dust when winds were above the thresholds for blowing dust.

The Drought Monitor map of the western U.S. for April, 2010, shows that much of southeastern Utah, northeastern Arizona, and portions of extreme northwestern New Mexico had below normal soil moisture. Northeastern Arizona was classified as Abnormally Dry with an area of Moderate to Severe Drought in the Painted Desert region. Soils in southeastern Utah, northwestern New Mexico, and northeastern Arizona in particular were dry enough to produce blowing dust when winds were above the thresholds for blowing dust. At these locations of concern sustained wind speeds were as high as 53 mph and wind gusts were as high as 70 mph on April 28 and 29, 2010.

Surface weather maps for the Four Corner States show evidence of widespread blowing dust and winds above the threshold speeds for blowing dust on April 28 and 29, 2010. MODIS and GOES satellite imagery shows that the Painted Desert and Four Corners area in general were source regions for the blowing dust that spanned April 28 and 29, 2010.

MODIS and GOES satellite imagery shows that the Painted Desert and Four Corners area in general were source regions for the blowing dust that spanned April 28 and 29, 2010. This is consistent with the climatology for many dust storms in Colorado as described in the Grand Junction, Colorado, Blowing Dust Climatology report contained in Appendix A of this document. The observations of winds above blowing dust thresholds and restricted visibilities in the areas of concern demonstrate that this is a natural event that cannot be reasonably controlled or prevented.

The Center for Snow and Avalanche Studies has been studying the effects of wind-blown desert dust from Arizona, New Mexico, and Utah on snowpack albedo and snowmelt in the San Juan Mountains of Colorado. The Center for Snow and Avalanche Studies lists April 28, 2010, as one of nine Dust-on-Snow events for the 2009/2010 water year, and this provides clear supporting evidence that a regional blowing dust event with long-range transport caused the PM_{10} exceedances measured across portions of Colorado on April 28, 2010. Snow cover data provide strong evidence that a widespread, regional, blowing dust event caused exceedances at these locations. In addition, scientists at the NOAA Satellite Services Division reported significant dust transport from northeastern Arizona and northwestern New Mexico into Colorado during this event.

Friction velocities provide a measure of the near-surface meteorological conditions necessary to cause blowing dust. Friction velocities were high enough to sustain blowing dust over undisturbed soils in each of the Four Corners states during this event.

The PM_{10} exceedances in Alamosa, Pagosa Springs and Durango on April 28 and 29, 2010, would not have occurred if not for the following: (a) dry soil conditions over southeastern Utah, northeastern Arizona, portions of extreme northwestern New Mexico, and portions of southern Colorado with 30-day precipitation totals below the thresholds for blowing dust; (b) a strong surface and upper-level low pressure system that caused widespread strong gusty winds through a deep layer of the atmosphere over the area of concern; and (c) friction velocities over the desert regions of northwest New Mexico, Utah, Arizona and much of Colorado that were high enough to allow entrainment of dust from natural sources with subsequent transport of the dust into (or within) Colorado in strong, southwesterly winds. These PM_{10} exceedances were due to an

exceptional event associated with regional windstorm-caused emissions from erodible soil sources over a large area of Arizona, northwest New Mexico, southeast Utah and southwest Colorado. These sources are not reasonably controllable during a significant windstorm under abnormally dry or moderate drought conditions.

APCD is requesting concurrence on exclusion of the PM_{10} values from Alamosa-Adams State College (08-003-0001), Alamosa-Municipal Building (08-003-0003), and Pagosa Springs-Middle School (08-007-0001) on April 28, 2010.

APCD is requesting concurrence on exclusion of the PM_{10} values taken at Pagosa Springs-Middle School (08-007-0001) and Durango-River City Hall (08-067-0004) on April 29, 2010.

Table of Contents

Figures

Tables

List of Appendices

1.0 Exceptional Events Rule Requirements

In addition to the technical requirements that are contained within the EER, procedural requirements must also be met in order for EPA to concur with the flagged air quality monitoring data. This section of the report lays out the requirements of the EER and discusses how the APCD addressed those requirements.

1.1 Procedural Criteria

This section presents a review of the procedural requirements of the EER as required by 40 CFR 50.14 (Treatment of Air Quality Monitoring Data Influenced by Exceptional Events) and explains how APCD fulfills them.

The Federal EER requirements include public notification that an event was occurring, the placement of informational flags on data in EPA's Air Quality System (AQS), submission of initial event description, the documentation that the public comment process was followed, and the submittal of a demonstration supporting the exceptional events flag. ACPD has addressed all of these procedural and documentation requirements.

Public notification that event was occurring (40 CFR 50.14(c)(1)(i))
APCD issued Blowing Dust Advisories for western, central, and southern Colorado advising citizens of the potential for high wind/dust events on April 28 and 29, 2010. This area includes: Grand Junction, Rifle, Montrose, Aspen, Pagosa Springs, Delta, Cortez, Durango, Telluride, Alamosa, and nearby towns (i.e. Pagosa Springs and Crested Butte). The advisories that were issued on April 28 and 29, 2010, can be viewed at:
http://www.colorado.gov/airquality/forecast_archive.aspx?seeddate=04%2f28%2f2010 and
http://www.colorado.gov/airquality/forecast_archive.aspx?seeddate=04%2f29%2f2010 and are included in Appendix B.

Place informational flag on data in AQS (40 CFR 50.14(c)(2)(ii))
APCD and other applicable agencies in Colorado submit data into EPA's AQS. Data from both filter-based and continuous monitors operated in Colorado are submitted to AQS.

When APCD and/or another agency operating monitors in Colorado suspects that data may be influenced by an exceptional event, APCD and/or the other operating agency expedites analysis of the filters collected from the potentially-affected filter-based air monitoring instruments, quality assures the results and submits the data into AQS. APCD and/or other operating agencies also submit data from continuous monitors into AQS after quality assurance is complete.

If APCD and/or the applicable operating agency have determined a potential exists that the sample value has been influenced by an exceptional event, a preliminary flag is submitted for the measurement when the data is uploaded to AQS. The data are not official until they are certified by May 1st of the year following the calendar year in which the data were collected (40 CFR 58.15(a)(2)). The presence of the flag can be confirmed in AQS.

Notify EPA of intent to flag through submission of initial event description by July 1 of calendar year following event (40 CFR 50.14(c)(2)(iii))
In early 2011, APCD and EPA Region 8 staff agreed that the notification of the intent to flag data as an exceptional event would be done by submitting data to AQS with the proper flags and the initial event descriptions. This was deemed acceptable, since Region 8 staff routinely pull the data to review for completeness and other analyses.

On April 28, 2010, three PM_{10} sample values greater than 150 $\mu g/m^3$ were taken at multiple sites across southwestern Colorado during the high wind event that occurred that day. These were the monitors located in Alamosa at Adams State College (SLAMS), Alamosa Municipal Building (SLAMS), and Pagosa Springs (SLAMS). In addition, a high value greater than the 99^{th} percentile was recorded at the Mt. Crested Butte PM_{10} monitor. All of these monitors are operated by APCD in partnership with local operators.

On April 29, 2010, two PM_{10} sample values greater than 150 $\mu g/m^3$ were taken at multiple sites across southwestern Colorado during the high wind event that occurred that day. These were the monitors located in Pagosa Springs (SLAMS), and Durango (SLAMS). Both of these monitors are operated by APCD in partnership with local operators.

Document that the public comment process was followed for event documentation (40 CFR 50.14(c)(3)(iv))
APCD posted this report on the Air Pollution Control Division's webpage for public review. APCD opened a 30-day public comment period on May 28, 2013. A copy of the public notice certification, along with any comments received, will be submitted to EPA, consistent with the requirements of 40 CFR 50.14(c)(3)(iv). See Appendix D for a copy of the affidavit of public notice.

Submit demonstration supporting exceptional event flag (40 CFR 50.14(a)(1-2))
At the close of the comment period, and after APCD has had the opportunity to consider any comments submitted on this document, APCD will submit this document, along with any comments received (if applicable), and APCD's responses to those comments, to EPA Region VIII headquarters in Denver, Colorado. The deadline for the submittal of this demonstration package is June 30, 2013.

1.2 Documentation Requirements

Section 50.14(c)(3)(iv) of the EER states that in order to justify excluding air quality monitoring data, evidence must be provided for the following elements:

a. The event satisfies the criteria set forth in 40 CFR 501(j) that:
   (1) the event affected air quality,
   (2) the event was not reasonably controllable or preventable, and
   (3) the event was caused by human activity unlikely to recur in a particular location or was a natural event;

b. There is a clear causal relationship between the measurement under consideration and the event;

c. The event is associated with a measured concentration in excess of normal historical fluctuations; and

d. There would have been no exceedance or violation but for the event.

2.0 Meteorological analysis of the April 28/29, 2010, blowing dust event and PM_{10} exceedance – Conceptual Model and Wind Statistics

On April 28 and 29 of 2010, a strong spring storm system caused multiple exceedances of the twenty-four-hour PM_{10} standard in southwest Colorado. On Wednesday April 28, 2010, exceedances were recorded at the Adams State College monitor in Alamosa with a concentration of 285 ug/m3, the Alamosa Municipal Building monitor with a concentration of 236 ug/m3, and the Pagosa Springs School monitor with a concentration of 181 ug/m3. On Thursday April 29, 2010, exceedances were recorded at the Pagosa Springs School monitor with a concentration of 162 ug/m3 and the Durango monitor with a concentration of 226 ug/m3. These exceedances and other concentrations across Colorado are plotted on the maps for April 28 and 29 in Figure 1 and Figure 2, respectively. These exceedances were the consequence of strong southwesterly prefrontal surface winds over dry soils which caused significant blowing dust across much of Arizona, northwest New Mexico, southeast Utah and southwest Colorado. Strong winds were the result of a significant surface low pressure and surface cold front associated with a major upper-level trough that was moving across the Western United States. This single storm system caused blowing dust during the afternoon and evening hours of April 28 that continued through the morning hours of April 29.

EPA's June 2012 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 "the EPA will accept a threshold of a sustained wind of 25 mph for areas in the west provided the agencies support this as the level at which they expect stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed..." In addition, in both eastern and western Colorado it has been shown that wind speeds of 30 mph or greater and gusts of 40 mph or greater can cause blowing dust (see reference for the Technical Support Document for the January 19, 2009 Lamar Exceptional Event and Attachment A - Grand Junction, Colorado, Blowing Dust Climatology at the end of this document). For this blowing dust event, it has been assumed that sustained winds of 25 mph and higher or wind gusts of 40 mph and higher can cause blowing dust in Arizona, New Mexico, and Colorado.

Table 11 through Table 20 list wind observations for Cortez, Durango, Montrose, Alamosa, and Colorado Springs, respectively. It will be shown that this storm system caused winds that met these criteria at many of the weather stations in the affected region on April 28 and 29, 2010.

The surface weather associated with this storm on April 28, 2010, is presented in Figure 3 and Figure 4, the surface analyses for 5 AM MST and 5 PM MST April 28, respectively. Surface weather on April 29, 2010, is presented in Figure 5 and Figure 6, the surface analyses for 5 AM MST and 11 AM MST April 29, respectively. Significant surface features in Figure 3, Figure 4, Figure 5, and Figure 6 include the cold front moving across the Great Basin and Colorado, the surface low pressure complex with a center forming in Colorado, and a semi-stationary front moving slowly southward across Colorado.

The upper-level trough associated with this storm is shown in Figure 7, Figure 8 and Figure 9. Figure 7 and Figure 8 show the 500-mb height analysis maps for 5 AM and 11 AM MST, respectively on April 28. The 500 mb level is roughly 6 kilometers above mean sea level (MSL). These two maps show that a deep trough was located in the western United States. Figure 8 shows the jet stream maximum winds around the base of the trough from California through Wyoming. Figure 9 shows the trough at the 700 mb level which is approximately 3 kilometers MSL. Upper-level winds at the base of the trough ranged from 40 to 100 knots, with a wind speed maximum over northern Arizona at 700 mb (Figure 9).

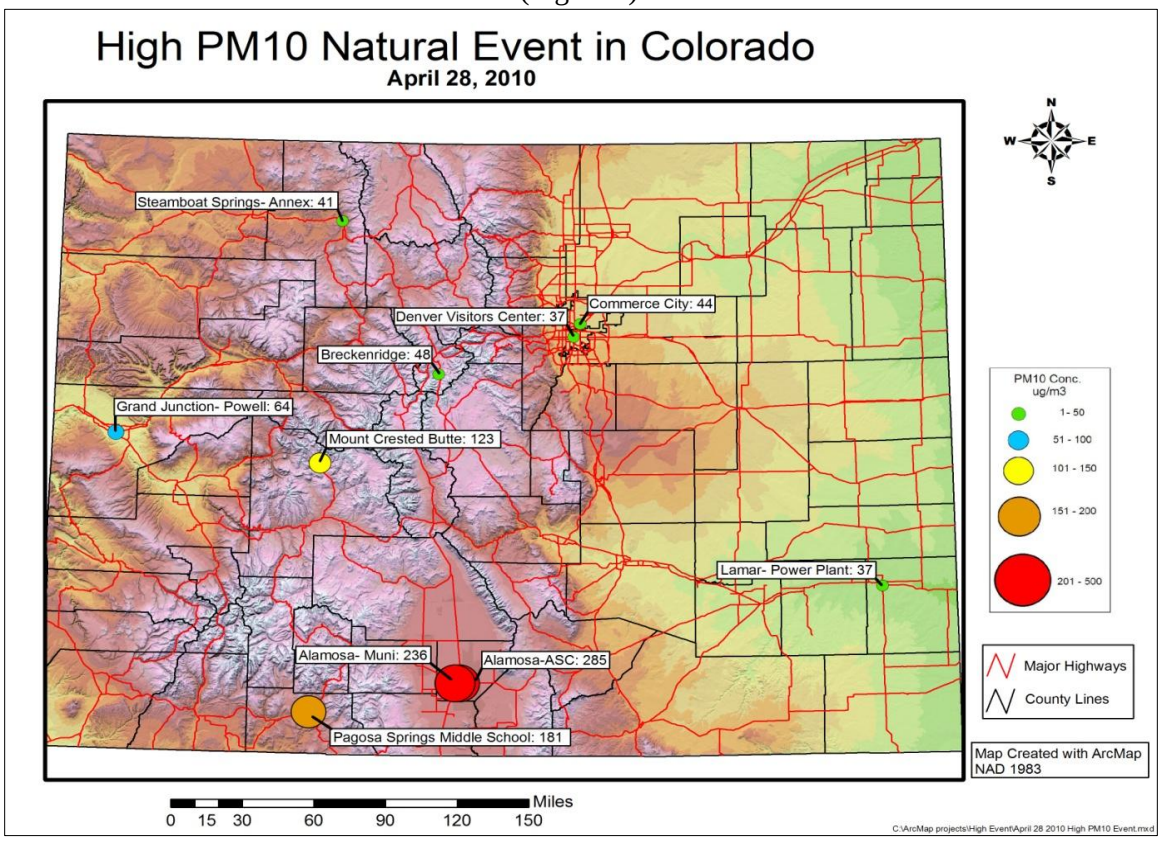


Figure 1: 24-hour PM_{10} concentrations for April 28, 2010.

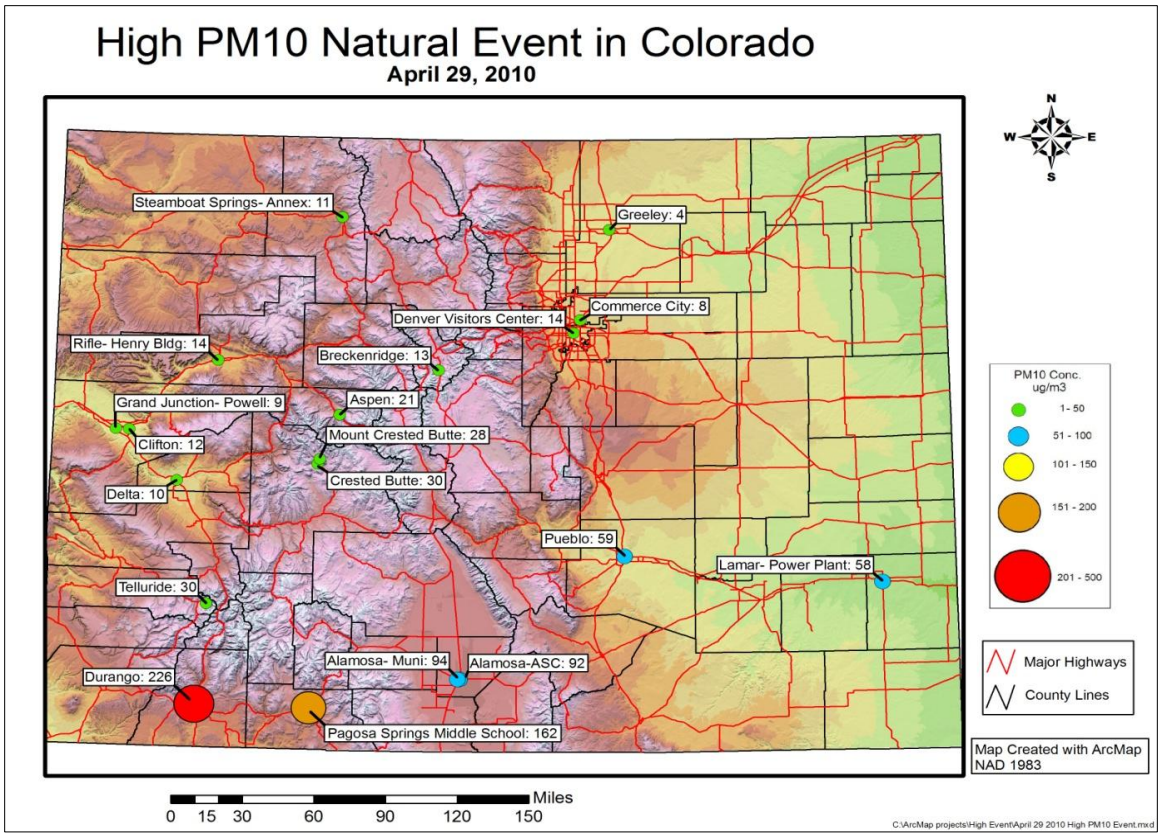


Figure 2: 24-hour PM_{10} concentrations for April 29, 2010.

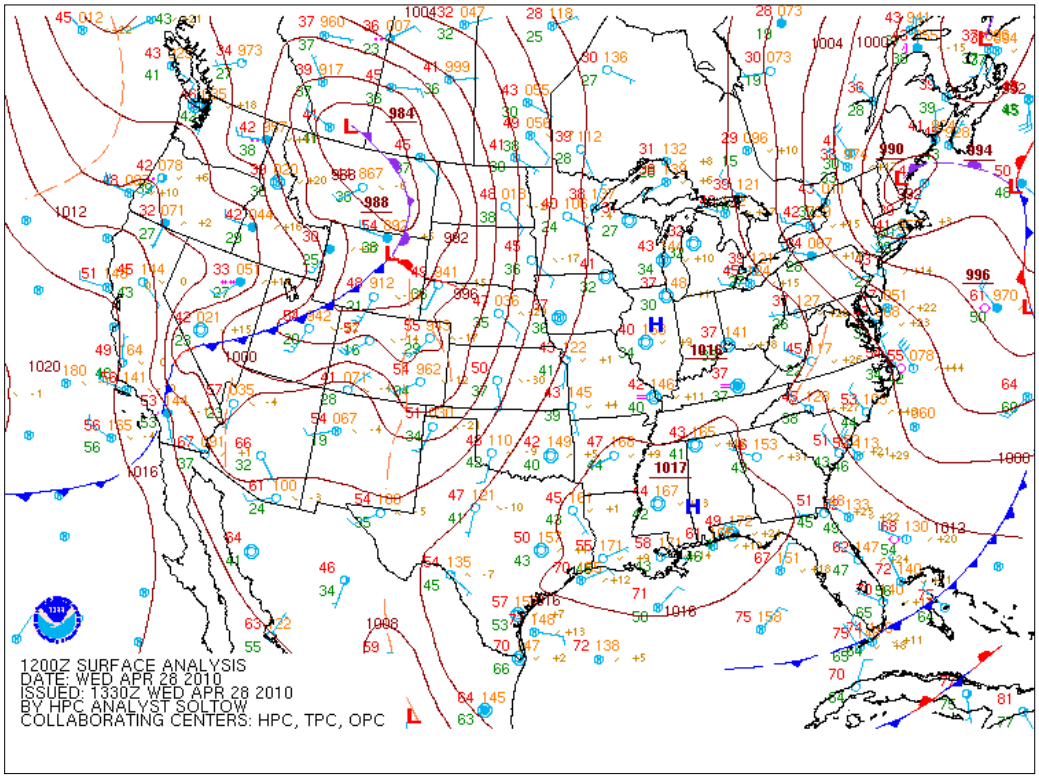


Figure 3: Surface analysis for 12Z April 28, 2010, or 5 AM MST April 28, 2010 (source: http://nomads.ncdc.noaa.gov/ncep/NCEP).

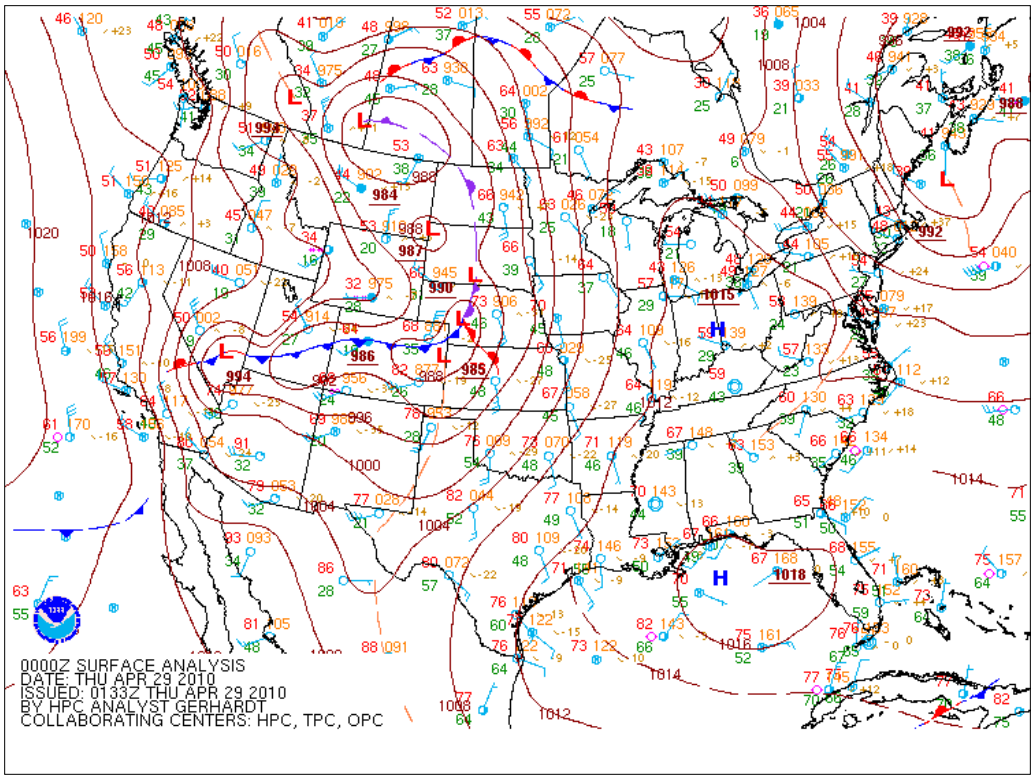


Figure 4: Surface analysis for 00Z April 29, 2010, or 5 PM MST April 28, 2010 (source: http://nomads.ncdc.noaa.gov/ncep/NCEP).

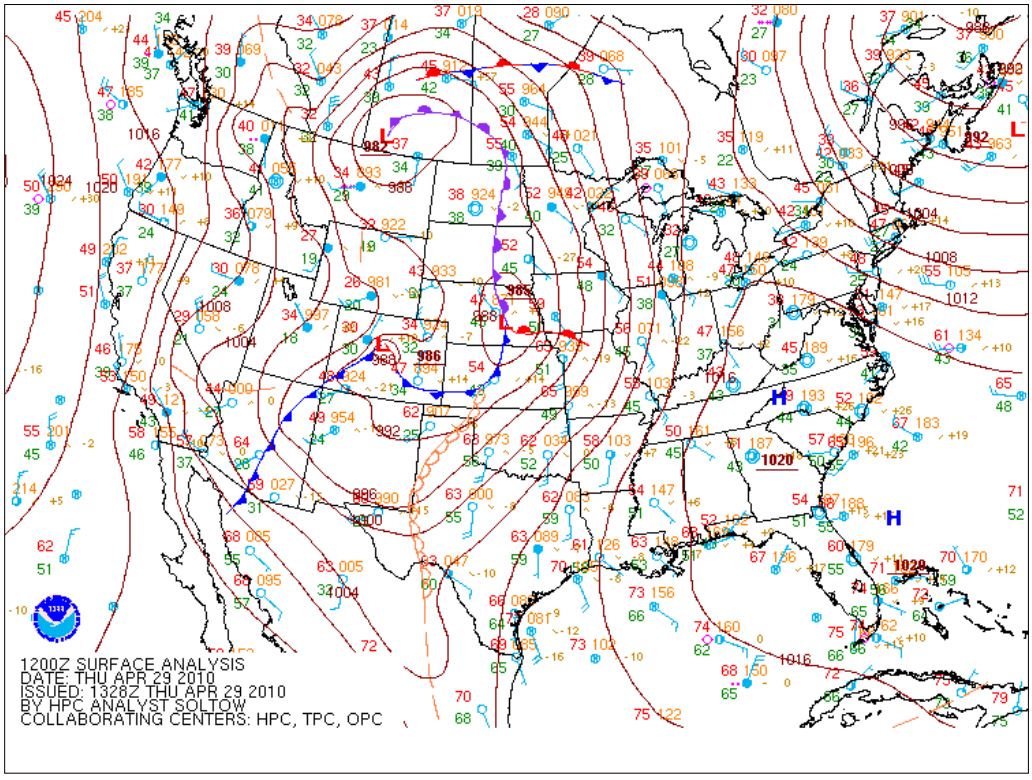


Figure 5: Surface analysis for 12Z April 29, 2010, or 5 AM MST April 29, 2010 (source: http://nomads.ncdc.noaa.gov/ncep/NCEP).

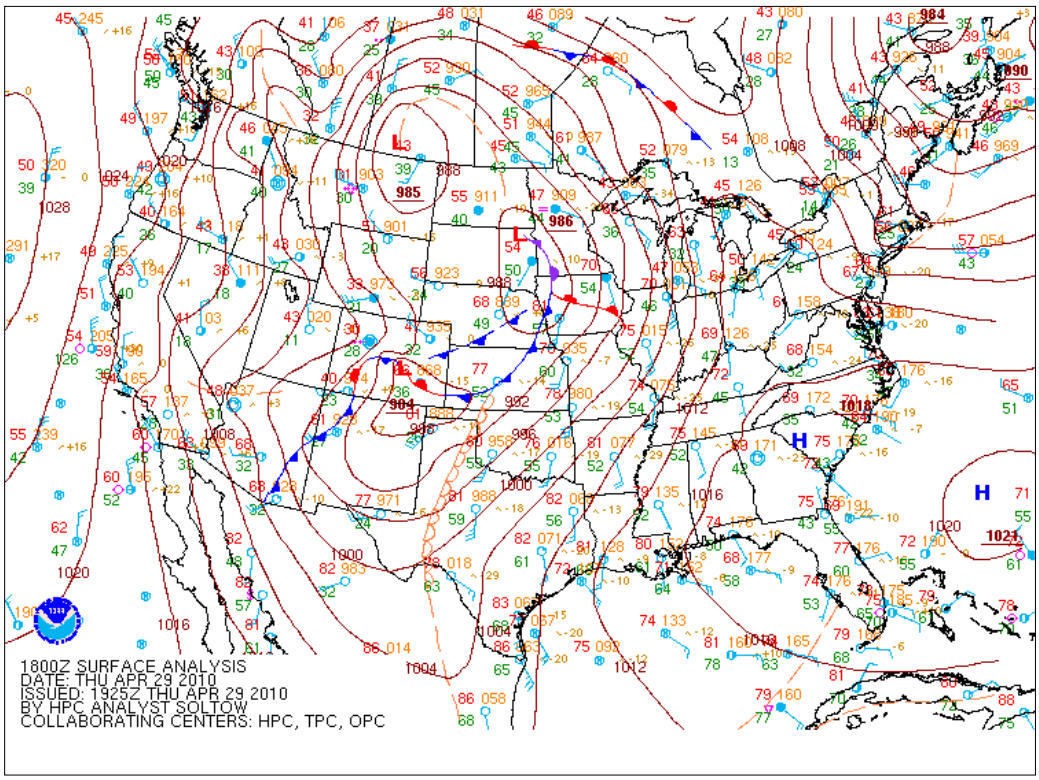


Figure 6: Surface analysis for 18Z April 29, 2010, or 11 AM MST April 29, 2010 (source: http://nomads.ncdc.noaa.gov/ncep/NCEP).

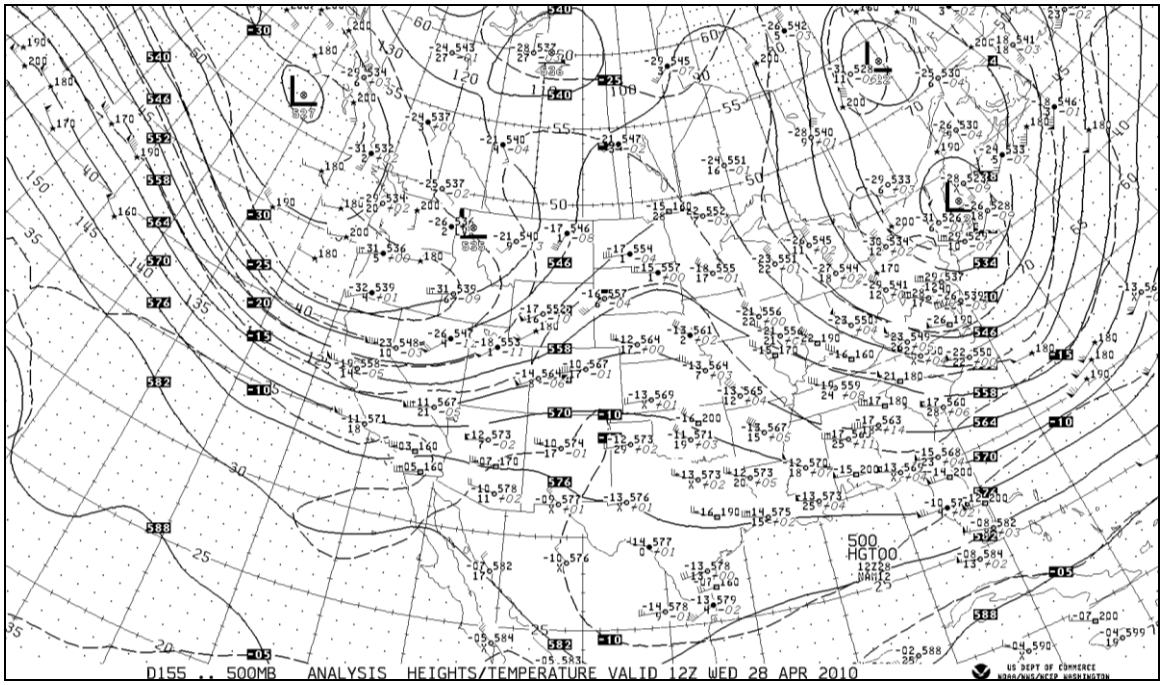


Figure 7: 500 mb (about 6 kilometers above sea level) analysis for 12Z April 28, 2010, or 5 AM MST April 28, 2010 (source: http://nomads.ncdc.noaa.gov/ncep/NCEP).

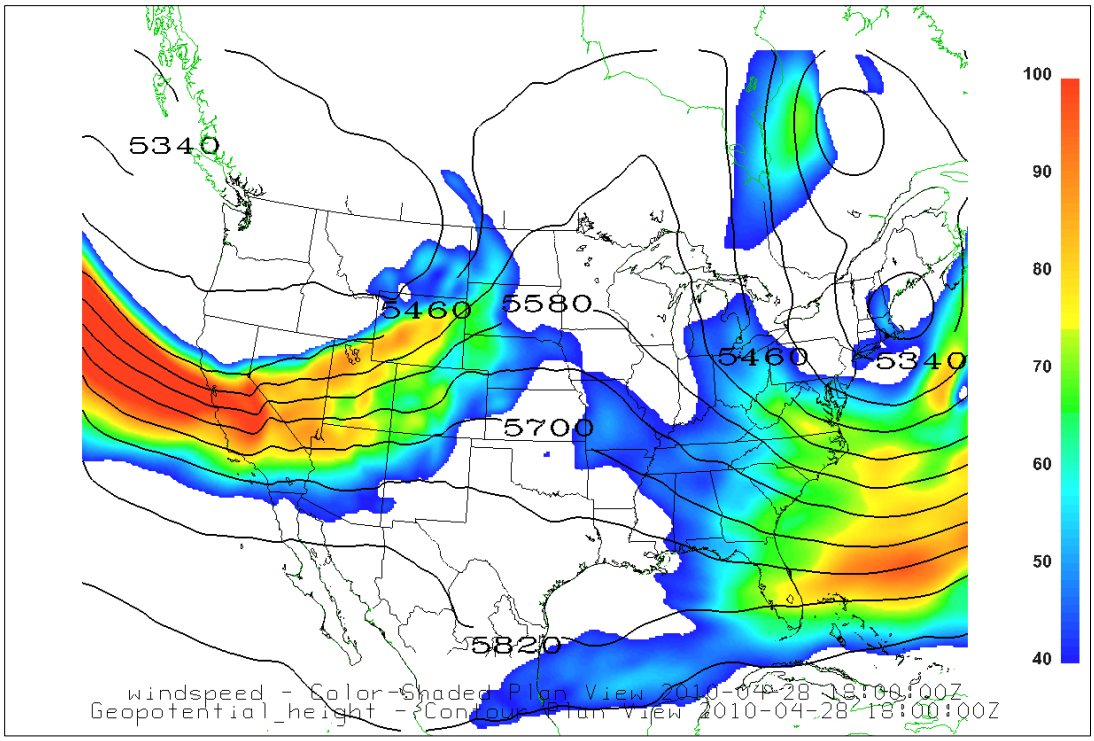


Figure 8: 500 mb (about 6 kilometers above sea level) analysis for 18Z April 28, 2010, or 11 AM MST April 28, 2010, showing wind speeds in knots. Only speeds greater than 40 knots are plotted. (source: RUC 13 km analysis http://nomads.ncdc.noaa.gov/data.php?name=access#hires_weather_datasets).

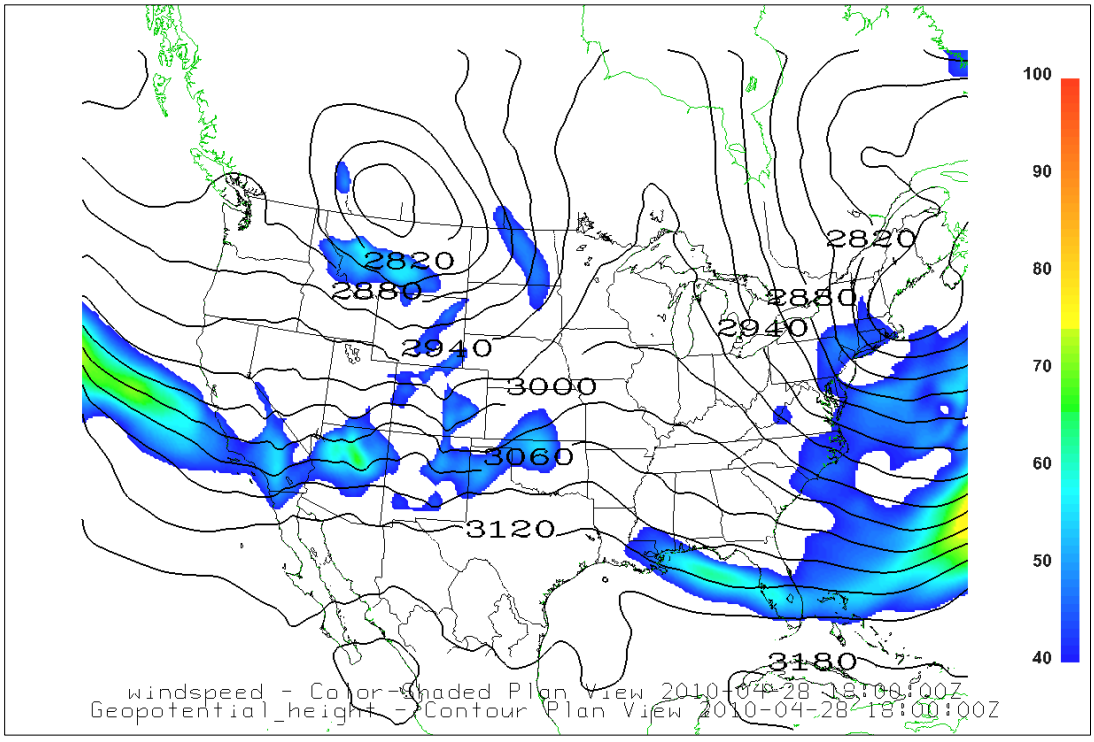


Figure 9: 700 mb (about 3 kilometers above sea level) analysis for 18Z April 28, 2010, or 11 AM MST April 28, 2010, showing wind speeds in knots. Only speeds greater than 40 knots are plotted. (source: RUC 13 km analysis http://nomads.ncdc.noaa.gov/data.php?name=access#hires_weather_datasets).

The upper level trough affected winds near the surface in two ways. First of all, the trough generated a surface low-pressure system with strong pressure gradients that caused strong winds at the surface. Secondly, momentum associated with the strong winds aloft at the base of the trough was mixed to the surface because of deep vertical mixing in the area of the strong winds aloft. Figure 10 shows the height of the top of the mixed layer in MSL at 11 AM on April 28, 2010. Mixing as deep as 3 to 6 kilometers MSL would have been sufficient to mix momentum to the surface from the zone of strong winds evident at 700 and 500 mb over the Four Corners area and southern Colorado. When blowing dust occurs with strong winds at the surface and aloft and deep mixing, dust can be suspended for many hours and transported long distances. These conditions are the hallmarks of a regional dust transport event.

Figure 11 and Figure 12 show the winds at 700 mb and the height of the mixed layer, respectively, at 5 PM MST on April 28, 2010. Both the extent of the wind speed maximum and the depth of the mixing had increased since 11 AM MST. Figure 12 shows that the mixing was as deep as 3 to 9 kilometers MSL in the Four Corners area and all of Colorado.

Figure 13 and Figure 14 show the 500-mb height analysis map and winds for 5 AM on April 29, 2010. By this time, the center of the trough had moved over Montana, and the jet stream maximum winds extended from California through Arizona and into New Mexico and the southern half of Colorado. Figure 15 shows the 700 mb analysis and winds at 5 AM on April 29, 2010. An area of strong winds was located over south-central Colorado. The mixing height analysis for 5 AM is presented in Figure 16. Mixing was as deep as 3 to 9 kilometers MSL in central and south-central Colorado and northern New Mexico. The coincidence of deep mixing and strong winds aloft would have enabled the transfer of momentum from the upper level winds to the surface in these areas.

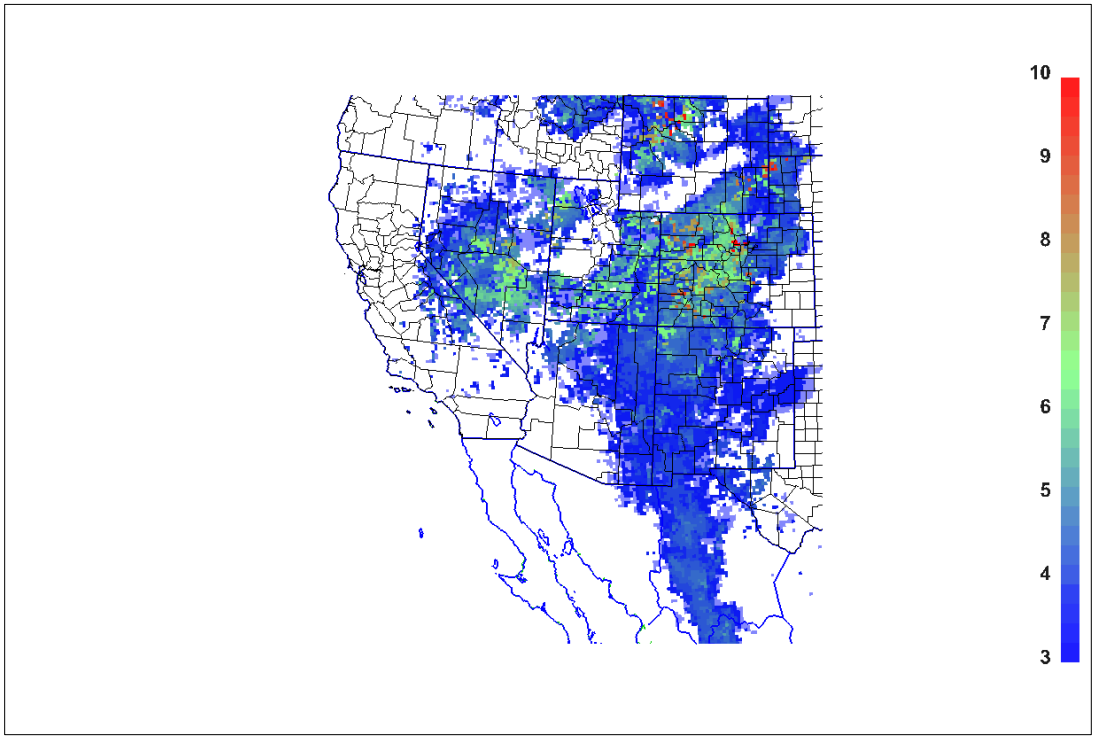


Figure 10: Height of the mixed layer in kilometers above sea level from the NAM12 analysis at 18Z April 28, 2010, or 11 AM MST April 28, 2010, showing mixing as deep as 3 to 6 kilometers MSL in the Four Corners area.

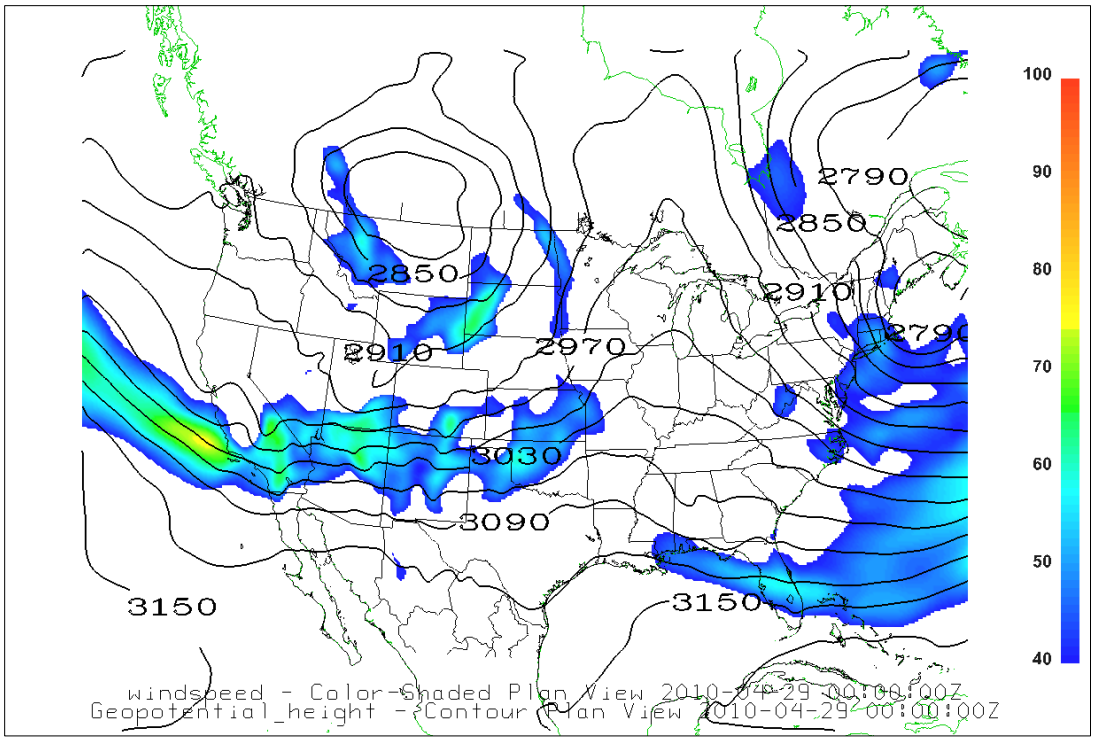


Figure 11: 700 mb (about 3 kilometers above sea level) analysis for 00Z April 29, 2010, or 5 PM MST April 28, 2010, showing wind speeds in knots. Only speeds greater than 40 knots are plotted. (source: RUC 13 km analysis http://nomads.ncdc.noaa.gov/data.php?name=access#hires_weather_datasets).

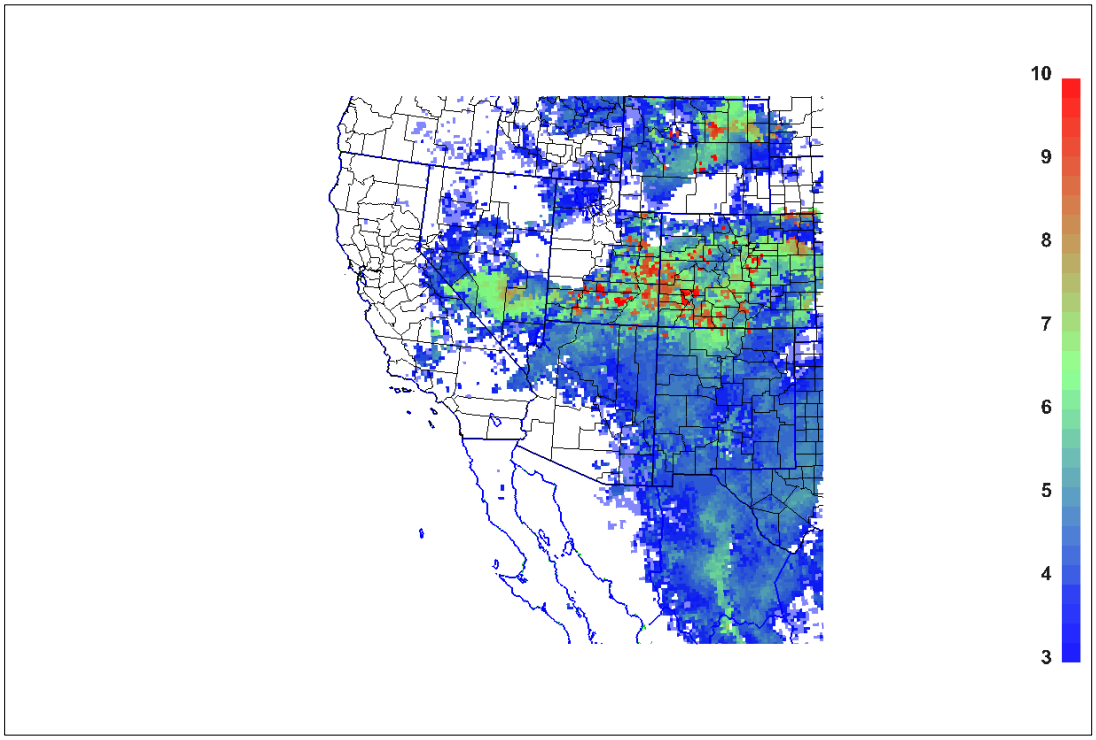


Figure 12: Height of the mixed layer in kilometers above sea level from the NAM12 analysis at 00Z April 29, 2010, or 5 PM MST April 28, 2010, showing mixing as deep as 3 to 9 kilometers MSL in the Four Corners area and all of Colorado.

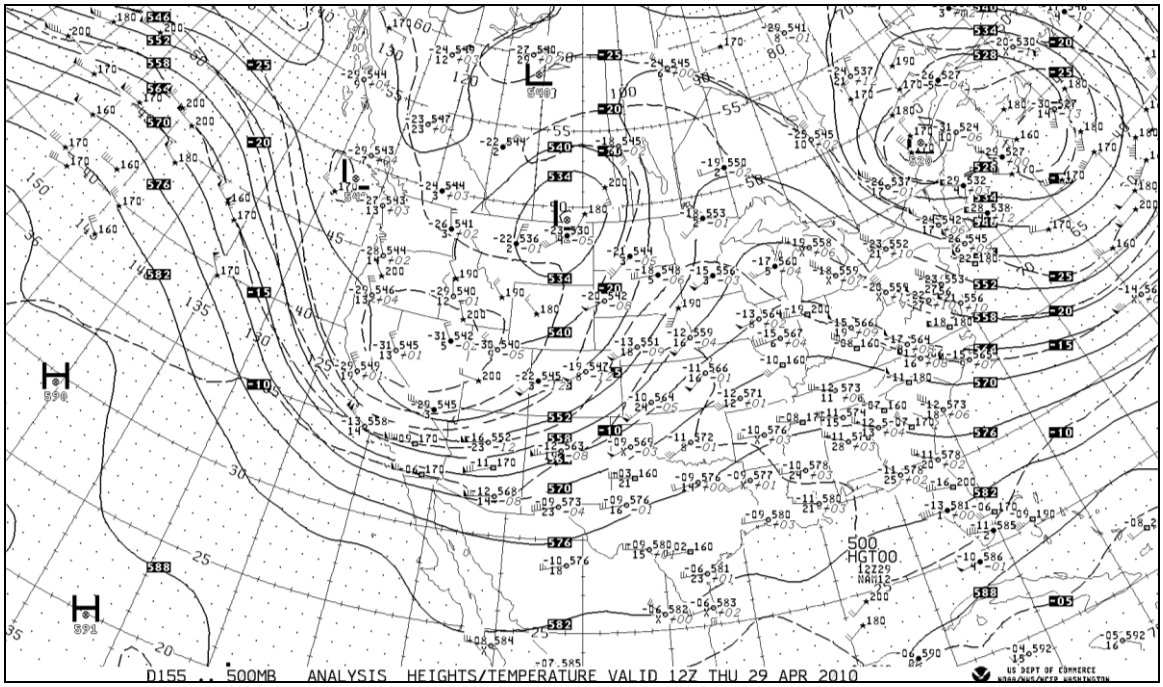


Figure 13: 500 mb (about 6 kilometers above sea level) analysis for 12Z April 29, 2010, or 5 AM MST April 29, 2010 (source: National Weather Service fax maps http://nomads.ncdc.noaa.gov/ncep/NCEP).

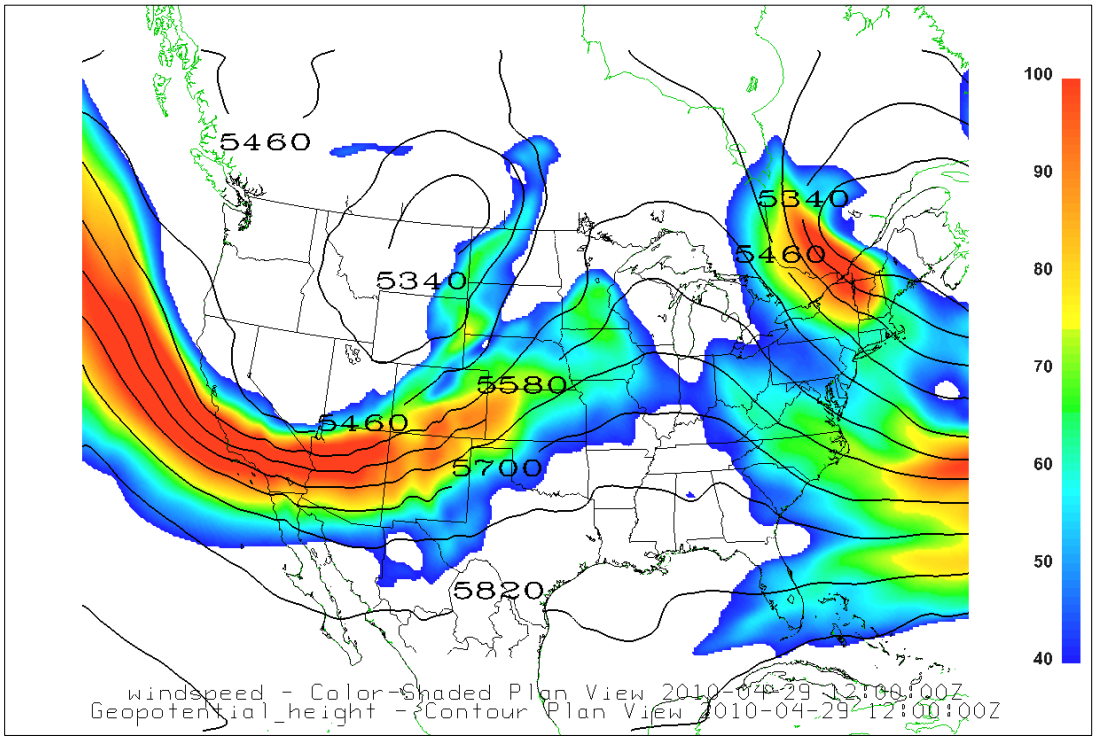


Figure 14: 500 mb (about 6 kilometers above sea level) analysis for 12Z April 29, 2010, or 5 AM MST April 29, 2010, showing wind speeds in knots. Only speeds greater than 40 knots are plotted. (source: RUC 13 km analysis http://nomads.ncdc.noaa.gov/data.php?name=access#hires_weather_datasets).

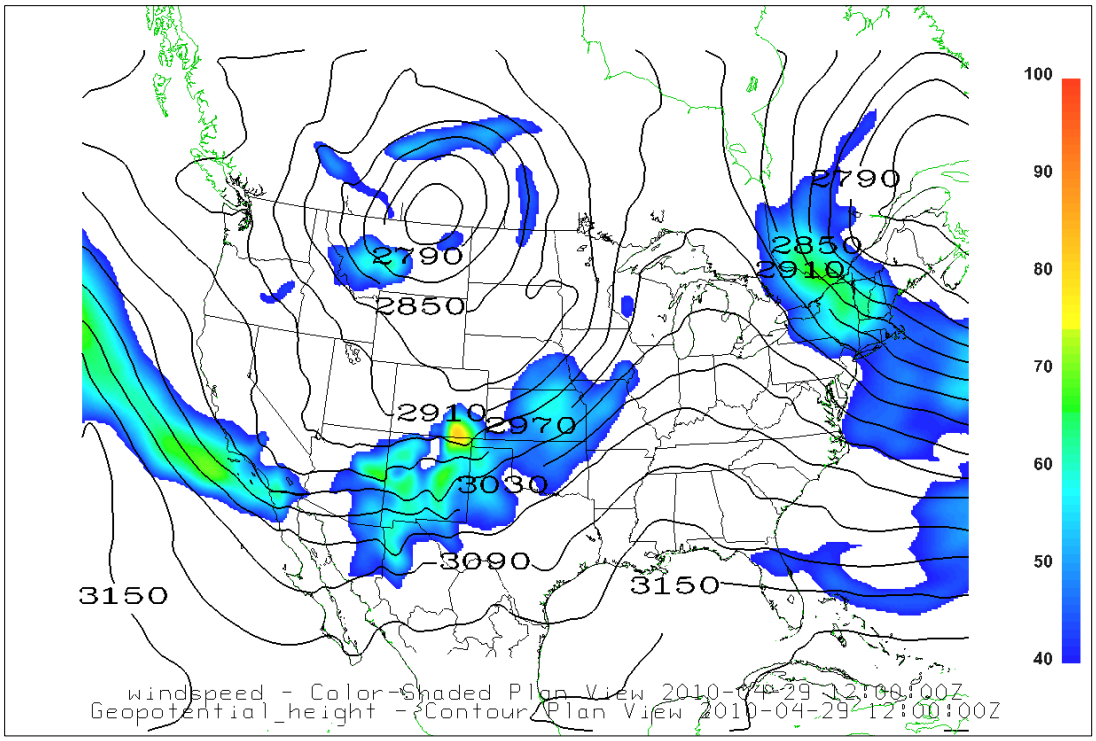


Figure 15: 700 mb (about 3 kilometers above sea level) analysis for 12Z April 29, 2010, or 5 AM MST April 29, 2010, showing wind speeds in knots. Only speeds greater than 40 knots are plotted. (source: RUC 13 km analysis http://nomads.ncdc.noaa.gov/data.php?name=access#hires_weather_datasets).

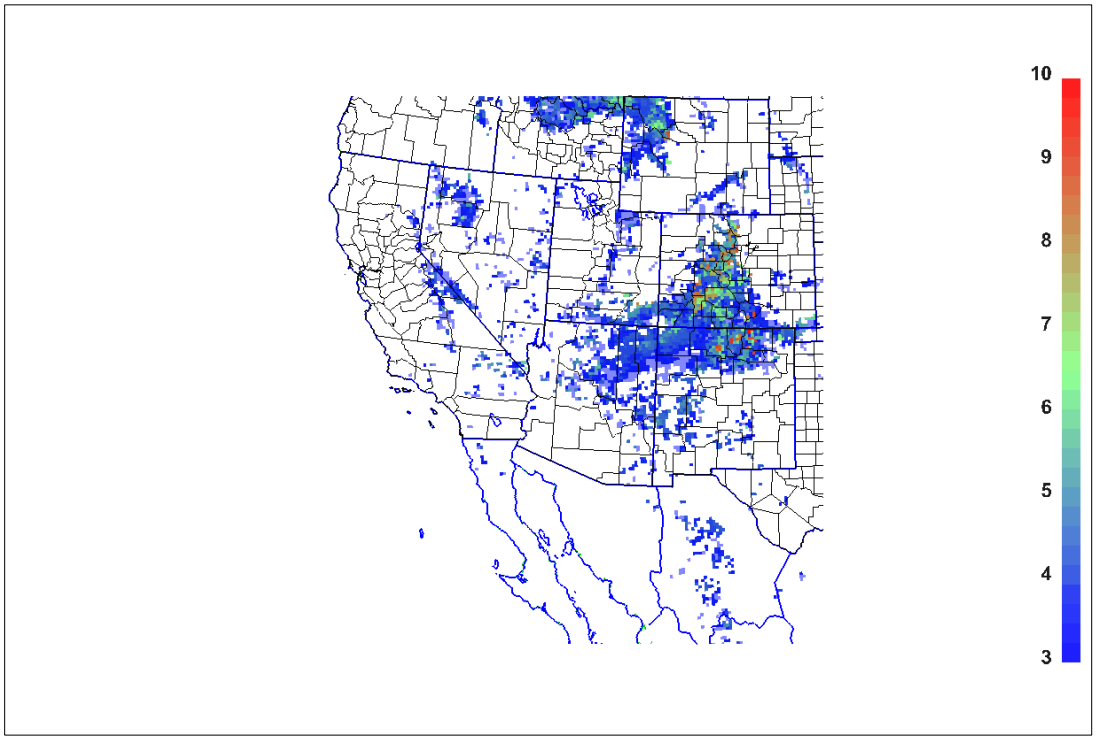


Figure 16: Height of the mixed layer in kilometers above sea level from the NAM12 analysis at 12Z April 29, 2010, or 5 AM MST April 29, 2010, showing mixing as deep as 3 to 9 kilometers MSL in central and south-central Colorado and northern New Mexico.

The combination of strong winds aloft, deep mixing, and the tight surface pressure gradient associated with the surface low pressure system caused surface winds of up to 53 mph with gusts to 70 mph. Winds of this strength will cause blowing dust if soils are dry. Recall that wind speeds of 30 mph or greater and/or gusts of 40 mph or higher have been shown to cause blowing dust in Colorado (see reference for the Natural Events Action Plan for High Wind Events - Lamar, Colorado and the Technical Support Document for the January 19, 2009, Lamar Exceptional Event and Attachment A - Grand Junction, Colorado, Blowing Dust Climatology at the end of this document). The synoptic weather conditions on April 28 and 29, 2010, (illustrated in Figure 3 through Figure 16) show that the conditions necessary for widespread strong gusty winds and transport of blowing dust were in place over the area of concern on April 28 and 29, 2010.

Figure 17, Figure 18, and Figure 19 show surface weather observations for 3:43 PM MST and 6:43 PM April 28, and12:43 AM April 29, respectively. These maps cover Colorado and the areas of Arizona, Utah, and New Mexico that were upwind of the portions of Colorado that experienced exceedances of the PM_{10} standard. These surface analyses shows that winds above 30 mph with gusts above 40 mph occurred in areas south of the stationary front and surface low pressure complex shown Figure 4, Figure 5, and Figure 6. On the map in Figure 17, the station plot for Chama, NM, (E33) is accompanied by a dollar sign which is the weather symbol for dust or sand raised by wind at the time of the observation. The infinity sign is the weather symbol for haze. This symbol is associated with stations across southwestern Colorado and central Colorado as far east as Colorado Springs (COS). Haze is often reported during dust storms, and in these dry windy events, haze typically refers to blowing dust. Note that haze was reported both in the valley locations like Cortez (CEZ), Farmington (FMN), Alamosa (ALS) and Durango (DRO) and in mountain valleys like Telluride (TEX). Additional surface weather maps not included here show that there was haze reported in portions of southwest Colorado and neighboring states from early afternoon on April 28 through early morning on April 29. Surface weather maps for the Four Corners states show evidence of widespread blowing dust and winds above the threshold speeds for blowing dust on April 28 and 29, 2010.

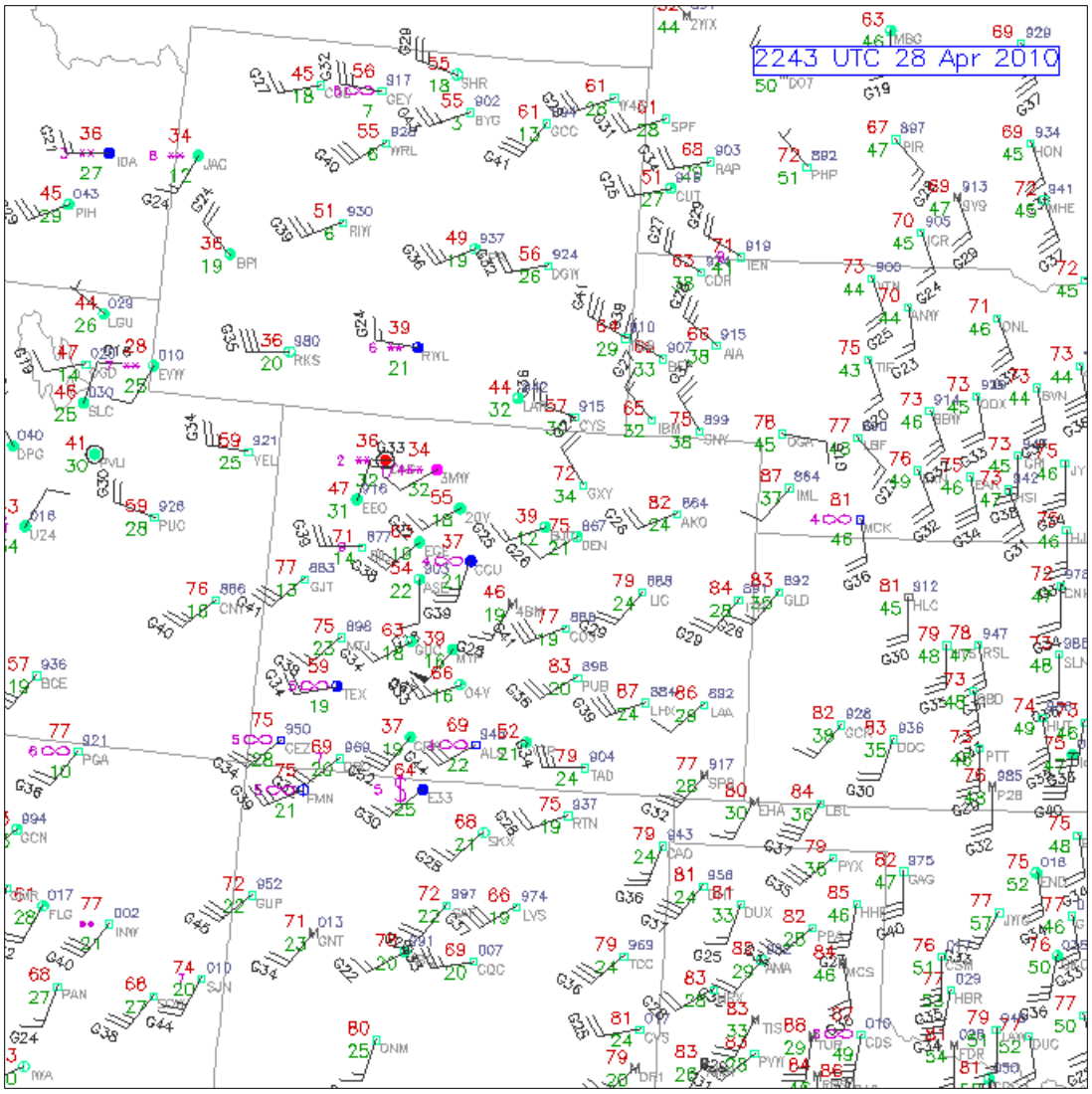


Figure 17: NCAR RAP Real-Time Weather Data website DEN sector surface analysis for 2243Z April 28, 2010, or 3:43 PM MST April 28, 2010 (source: http://www.rap.ucar.edu/weather/).

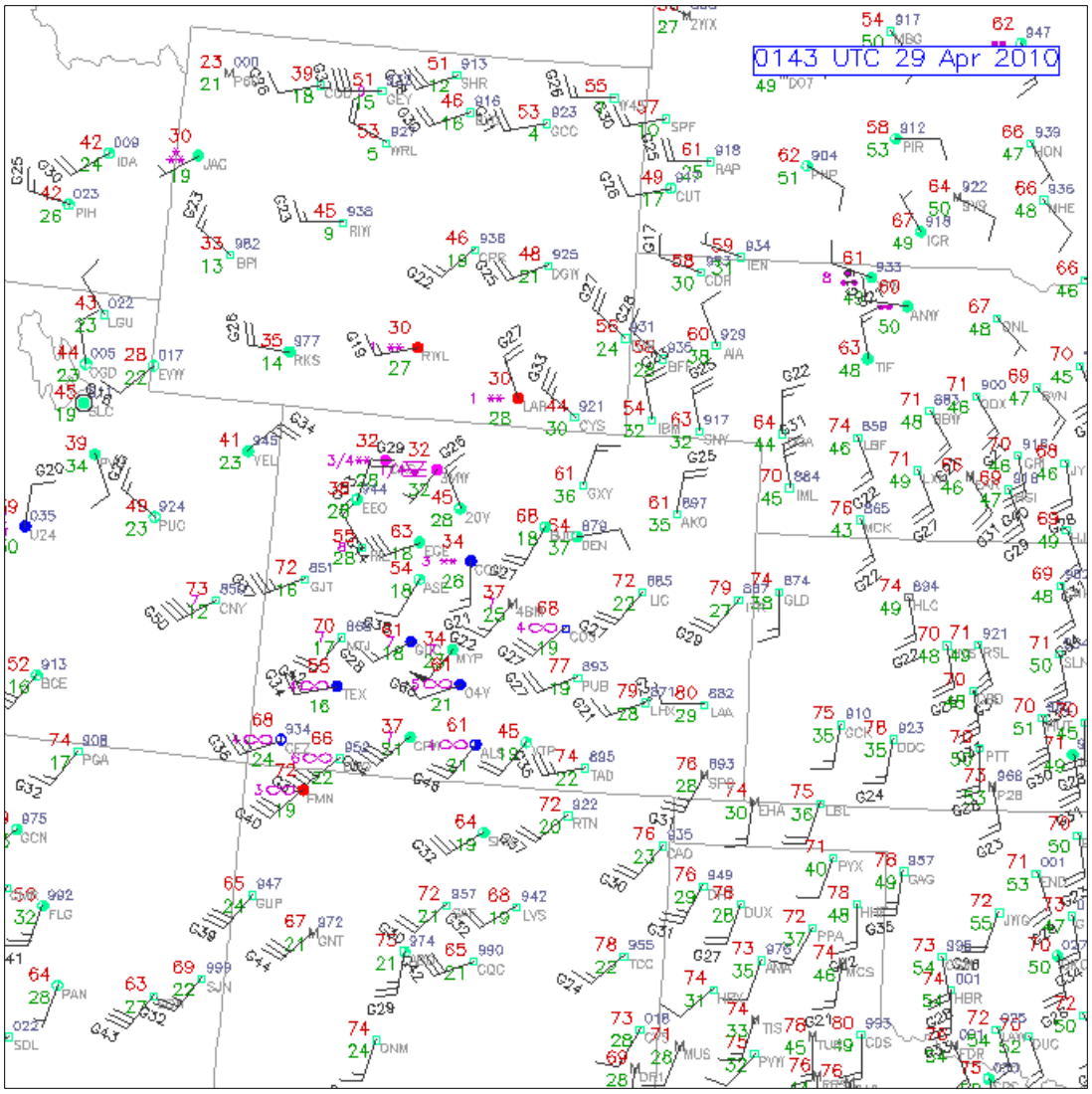


Figure 18: NCAR RAP Real-Time Weather Data website DEN sector surface analysis for 0143Z April 29, 2010, or 6:43 PM MST April 28, 2010 (source: http://www.rap.ucar.edu/weather/).

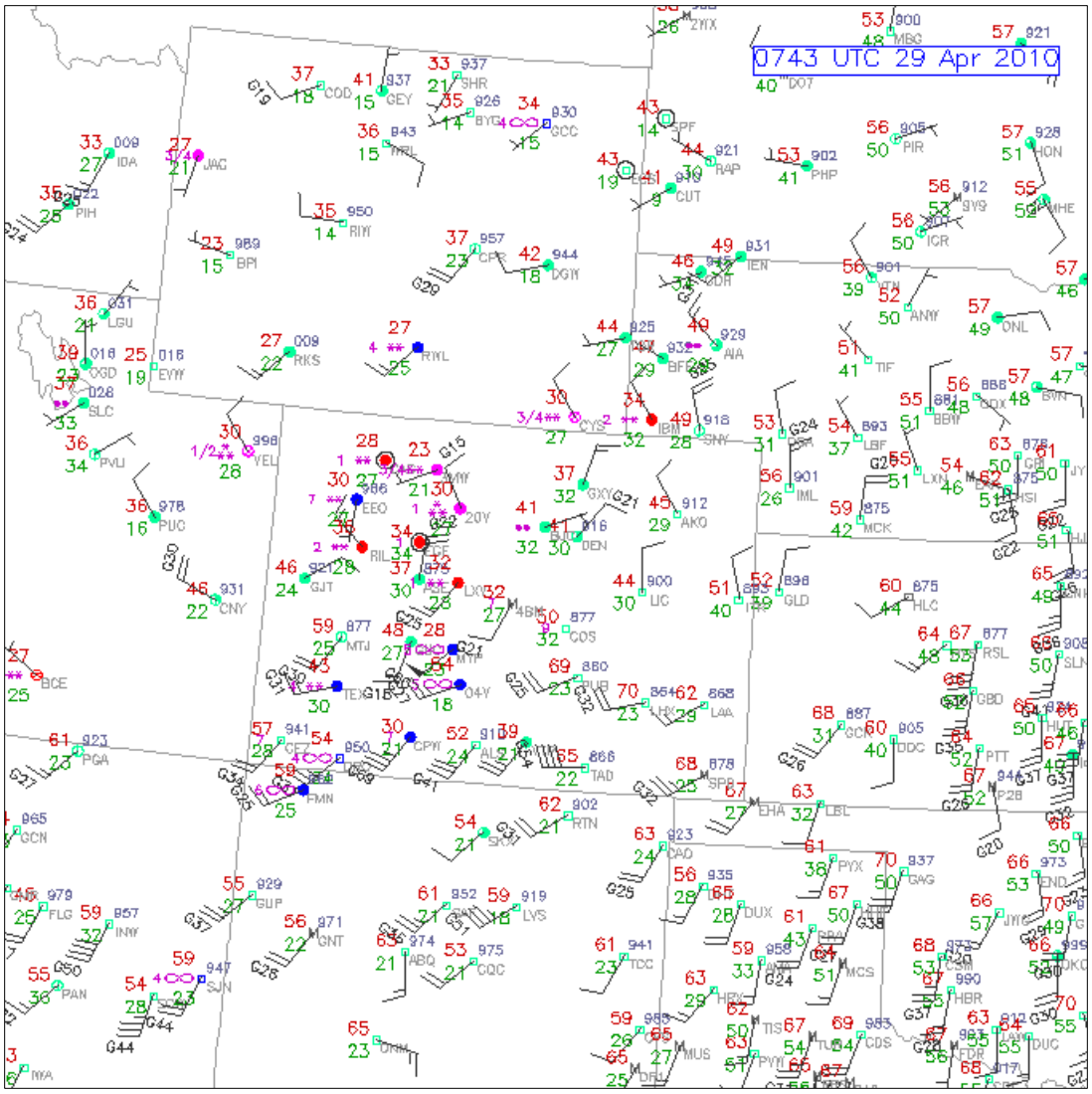


Figure 19: NCAR RAP Real-Time Weather Data website DEN sector surface analysis for 0743Z April 29, 2010, or 0:43 AM MST April 29, 2010 (source: http://www.rap.ucar.edu/weather/).

Table 1 through Table 10 contain the surface weather observations for Winslow, Hopi, and Window Rock, Arizona, and Gallup and Farmington, New Mexico for April 28 and 29. These locations are either in or near the areas in northeastern Arizona and northwestern New Mexico that are known sources for blowing dust as described in Attachment A (Grand Junction, Colorado, Blowing Dust Climatology - at the end of this document). At these locations wind speeds were as high as 53 mph and wind gusts were as high as 70 mph, and these are well above the blowing dust thresholds already identified.

Table 11 through Table 20 list observations for Cortez, Durango, Montrose, Alamosa, and Pagosa Springs, respectively. These are the National Weather Service sites in Colorado south of the stationary front in Figure 4, Figure 5, and Figure 6. These sites also experienced many hours of reduced visibility and wind speeds and gusts at or above the thresholds for blowing dust. Observations of wind speeds and gust speeds above the blowing dust thresholds and reduced visibilities on April 28 and 29 at weather stations in northeastern Arizona, northwestern New Mexico, and southwestern Colorado show that a regional dust storm event occurred under southwesterly flow. The weather system causing the winds affected southwestern Colorado during the afternoon and evening hours on April 28 and during the early morning hours of April 29 as the effects of the system shifted east and south. These observations contribute to the body of evidence that shows that a regional dust storm caused the PM_{10} exceedances at the monitoring sites in question.

Table 1: Wind and weather observations for Winslow, Arizona, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 28, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 28	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:56	58	23	6		170		10
1:56	60	22	7		180		10
2:56	61	21	9		210		10
3:56	61	21	14		200		10
4:56	60	23	8		180		10
5:56	59	21	10		160		10
6:56	60	17	10		160		10
7:56	65	14	27	32	210		10
8:56	67	15	21	28	220		10
9:56	71	12	31	39	210		10
10:56	74	17	25	41	210	lt rain	10
11:56	75	18	33	48	210	lt rain	10
12:56	77	16	28	41	220		10
13:56	79	11	33	45	220		10
14:56	77	12	37	46	220	lt rain	10
15:56	75	15	35	59	210		7
16:21	73	15	53	67	220	haze	1.75
16:41	73	16	50	62	220	lt rain	0.75
16:46	73	16	53	69	220	lt rain	0.5
16:56	72	17	51	69	220	lt rain	0.5
20:56	64	30	43	62	210		8
21:56	61	35	45	64	210	haze	4
22:18	61	36	46	70	220	haze	1.75
22:25	61	36	48	66	220	haze	2
22:47	61	34	51	60	220	haze	4
22:56	59	33	47	60	220	haze	4
23:08	59	31	47	61	220	haze	2.5
23:16	59	31	44	63	220	haze	4
23:56	59	36	46	58	210		10

Table 2: Wind and weather observations for Winslow, Arizona, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 29, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 29	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:56	58	44	46	61	210		9
1:56	57	44	45	58	210		10
2:56	54	43	41	58	210		10
3:56	53	35	40	54	220		10
4:56	52	32	33	47	210		10
5:56	51	29	28	39	220		10
6:56	52	29	25	42	220		10
7:56	53	28	32	44	230		10
8:47	66	30	7	18	240		30
8:56	56	28	28	41	230		10
9:56	54	30	23	39	240		10
10:56	54	24	36	50	240		8
11:56	53	28	18	33	220		10
12:56	54	23	26	37	240		10
13:56	55	21	26	39	210		10
14:56	51	33	35	47	270	haze	2.5
15:00	50	37	36	47	280	haze	1.5
15:08	48	40	34	46	280	haze	1.5
15:16	48	40	32	47	280	haze	3
15:56	48	39	26	38	270		9
16:56	46	43	10	23	250		10
17:10	45	45	17	22	240		10
17:26	43	49	21	33	290		10
17:53	43	52	19	36	260		9
17:56	42	53	16	31	320		9
18:56	41	52	17		250		10
19:56	41	56	5		30		10
20:56	38	70	7		310		10
21:56	37	67	5		260		10
22:56	38	62	7		230		10
23:56	39	55	8		210		10

Table 3: Wind and weather observations for Hopi, Arizona, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 28, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 28	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:13	53	27	6	10	207		
1:13	52	28	3	12	219		
2:13	48	32	2	8	271		
3:13	47	32	0	4	220		
4:13	49	30	6	9	248		
5:13	49	30	7	9	241		
6:13	52	28	11	16	208		
7:13	56	26	16	21	197		
8:13	63	18	19	29	188		
9:13	66	17	24	34	216		
10:13	69	18	28	37	222		
11:13	72	19	26	37	222		
12:13	73	18	28	40	222		
13:13	75	17	25	41	223		
14:13	74	18	29	43	216		
15:13	73	18	31	46	229		
16:13	71	19	34	48	218		
17:13	69	21	31	45	221		
18:13	65	25	34	46	230		
19:13	62	28	30	47	229		
20:13	60	32	31	45	237		
21:13	58	34	30	45	234		
22:13	57	37	29	39	232		
23:13	54	36	24	36	221		

Table 4: Wind and weather observations for Hopi, Arizona, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 29, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 29	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:13	53	32	29	42	223		
1:13	52	35	26	39	240		
2:13	51	42	23	34	240		
3:13	50	45	27	38	222		
4:13	48	37	21	35	246		
5:13	45	40	22	32	280		
6:13	42	41	18	34	284		
7:13	42	32	24	32	284		
8:13	43	32	24	36	277		
9:13	44	31	22	38	271		
10:13	45	30	20	32	280		
11:13	47	35	16	31	325		
12:13	48	31	17	29	283		
13:13	45	50	25	38	325		
14:13	47	34	19	29	314		
15:13	41	73	13	40	317		
16:13	43	52	14	21	311		
17:13	42	53	16	34	339		
18:13	40	46	10	15	292		
19:13	35	73	15	25	283		
20:13	35	75	5	21	262		
21:13	35	55	14	18	276		
22:13	34	74	5	16	224		
23:13	32	77	5	9	215		

Table 5: Wind and weather observations for Window Rock, Arizona, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 28, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 28	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	54	25	10		230		10
1:53	52	28	12		220		10
2:53	51	29	6		180		10
3:53	52	27	10		190		10
4:53	50	30	9		180		10
5:53	49	31	9		170		10
6:53	48	34	8		180		10
7:53	51	33	7		190		10
8:53	54	31	15	24	210		10
9:53	58	23	27	37	230		10
10:53	61	20	31	43	230		10
11:53	64	19	29	45	230		10
12:53	66	16	35	51	230		10
13:53	69	15	33	48	220		10
14:53	70	15	33	51	220		10
15:53	71	16	33	51	250		10
16:53	69	16	30	48	230		10
17:53	67	18	33	48	240		10
18:53	64	21	36	54	230		10
19:53	60	25	28	44	220		10
20:53	58	26	27	35	220		10
21:53	56	29	22	37	220		10
22:53	54	32	20	32	220		10
23:53	53	35	25	33	230		10

Table 6: Wind and weather observations for Window Rock, Arizona, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 29, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 29	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	52	44	25	41	240		10
1:53	51	48	25	43	230		10
2:53	50	50	24	37	230		10
3:53	49	48	25	41	230		10
4:53	49	48	23	40	220		10
5:53	46	51	29	40	230		10
6:53	45	53	32	40	230		10
7:53	46	51	29	45	220		10
8:53	48	37	32	48	240		10
9:53	49	25	37	47	240		10
10:53	46	34	20	30	260		10
11:53	47	35	21	37	270	lt rain	10
12:43	43	52	18	33	280	haze	4
12:53	41	55	18	31	270	haze	5
13:01	39	70	18	33	270	haze	1.75
13:19	37	75	14	24	280	lt snow	1.25
13:32	37	70	12	25	290	lt snow	2
13:40	39	65	15	24	300	lt snow	4
13:53	40	59	12	21	300		9
14:39	43	42	24	31	260		10
14:53	45	36	27	37	260		10
15:41	43	42	32	40	260	haze	4
15:49	39	60	14	40	280	haze	2.5
15:53	39	57	12	22	280	haze	5
16:53	41	41	16	31	240		10
17:03	37	65	18	31	280	haze	1.75
17:15	37	70	15	22	290	lt snow	3
17:25	37	65	13		280		10
17:48	36	69	10		280	lt snow	2.5
17:53	34	79	9		270	lt snow	1.5
18:01	34	80	8		230	lt snow	3
18:14	34	80	13	21	270	lt snow	1.75
18:20	34	80	9	21	270	lt snow	0.75
18:25	34	80	9		280	lt snow	1
18:31	34	80	6		260	lt snow	3
18:50	34	75	13	18	260		10
18:53	34	75	8	18	270	lt snow	9
19:17	34	80	13		280	lt snow	2
19:22	32	86	10		260	lt snow; fog	0.75
19:32	32	80	7		250	lt snow	2
19:34	32	80	6		250	lt snow	4

Table 7: Wind and weather observations for Gallup, New Mexico, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 28, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 28	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	55	24	15		220		10
1:53	54	26	13	20	220		10
2:53	52	28	13		210		10
3:53	50	30	10		180		10
4:53	48	32	6		170		10
5:53	50	30	13		210		10
6:53	50	33	16		210		10
7:53	52	33	21	27	220		10
8:53	56	31	20	27	230		10
9:53	59	27	30	38	230		10
10:53	63	22	31	43	220		10
11:53	63	20	31	56	230		10
12:53	67	19	32	45	230		10
13:53	69	15	38	47	240		10
14:53	71	14	37	56	240		10
15:53	72	15	36	52	230		10
16:53	70	17	39	54	230		10
17:53	68	18	33	51	220		10
18:53	65	21	33	45	220		10
19:53	61	24	30	43	210		10
20:53	59	26	32	43	220		10
21:53	58	28	28	36	220		10
22:53	57	29	23	35	220		10
23:53	56	31	27	37	220		10

Table 8: Wind and weather observations for Gallup, New Mexico, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 29, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 29	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	55	34	28	43	230		10
1:53	53	39	21	29	220		10
2:53	51	44	18	25	240		10
3:53	50	41	29	45	230		10
4:53	50	39	36	50	230		10
5:53	48	44	32	47	230		10
6:53	46	49	27	45	230		10
7:53	48	49	28	44	240		10
8:53	50	46	38	57	240		10
9:53	52	36	31	53	230		10
10:53	51	29	33	51	250		10
11:53	48	34	28	52	240		10
12:53	48	34	31	40	250		10
13:53	42	55	18	29	290		10
14:36	45	49	29	40	250		9
14:53	43	49	29	46	260		9
15:00	43	49	29	38	270		10
15:53	43	43	23	36	270		10
16:53	44	33	32	45	280		10
17:53	43	41	25	32	270		10
18:36	34	80	20	32	280	lt snow	0.75
18:46	34	86	17	25	270	lt snow; fog	2
18:53	35	78	21	28	260		9
19:53	34	79	12		250	lt snow	9
20:53	32	75	13		240		10
21:53	32	81	15		230	lt snow	8
22:53	31	89	7		220		10
23:53	31	82	8		210		10

Table 9: Wind and weather observations for Farmington, New Mexico, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 28, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 28	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	62	20	14		290		10
1:53	60	21	5		200		10
2:53	57	24	0				10
3:53	53	31	8		90		10
4:53	53	31	8		90		10
5:53	52	32	9		90		10
6:53	51	35	8		70		10
7:53	55	29	4		80		10
8:53	62	21	4		120		10
9:53	66	13	10		210		10
10:53	69	15	15	25	210		10
11:53	71	13	18	28	220		10
12:53	74	12	23	30	210	haze	6
13:53	76	11	23	37	250		10
14:53	78	10	30	39	260		9
15:09	79	9	35	43	240	haze	2
15:53	76	13	33	46	240	haze	2
16:00	75	13	31	45	250	haze	5
16:53	78	12	28	43	240	haze	5
17:53	74	14	35	44	240	haze	4
18:06	73	13	33	45	240	haze	4
18:23	73	13	25	40	240	haze	5
18:42	72	14	36	43	230	haze	3
18:53	72	13	29	50	230	haze	2.5
19:04	72	14	33	46	230	haze	3
19:53	68	15	29	46	240	haze	4
20:04	68	16	31	41	250	haze	4
20:53	66	17	24	40	250	haze	4
21:35	64	19	25	33	240		7
21:53	64	20	20	31	240		7
22:53	62	22	20	29	250		8
23:40	61	23	29	38	250	haze	6
23:53	61	23	24	36	240	haze	5

Table 10: Wind and weather observations for Farmington, New Mexico, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 29, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 29	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:19	61	25	20	31	250	haze	6
0:53	59	27	18	29	250	haze	6
1:45	59	27	22	33	250	haze	4
1:53	58	26	23	36	240	haze	3
2:05	57	26	22	41	250	haze	2.5
2:14	57	28	25	36	250	haze	2.5
2:21	57	26	22	37	250	haze	3
2:53	57	23	29	43	260	haze	4
3:02	55	24	23	38	260	haze	4
3:36	55	28	23	36	250		7
3:53	55	32	20	35	250		8
4:53	55	35	16	28	260		10
5:39	54	38	13	21	250	haze	6
5:53	54	40	14	23	240	haze	6
6:28	54	35	24	37	240	haze	4
6:53	53	33	23	40	240	haze	4
7:01	52	35	24	33	240	haze	6
7:53	51	35	20	38	270		9
8:53	50	34	20	30	280		10
9:53	46	49	20	34	300		10
10:53	48	42	25	32	290		10
11:53	48	35	22	27	250		10
12:53	51	29	24	30	270		10
13:53	51	26	21	32	270		10
14:53	47	37	18	30	300		10
15:53	47	31	21	31	280		10
16:53	48	27	16	29	290		10
17:53	40	57	17	29	330	lt rain	5
18:53	43	43	15	25	320		10
19:53	41	42	9		290		10
20:53	39	46	8		290		10
21:53	38	48	7		290		10
22:53	38	54	18		290		10
23:53	38	50	13		270		10

Table 11: Wind and weather observations for Cortez, Colorado, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 28, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 28	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	61	21	10		220		10
1:53	61	22	14	23	220		10
2:53	54	31	7		200		10
3:53	49	41	7		200		10
4:53	48	40	5		270		10
5:53	47	44	0				10
6:53	48	42	0				10
7:53	53	36	6		200		10
8:53	59	27	12	17	190		10
9:53	61	21	16	28	210		10
10:53	67	20	20	31	220		10
11:53	70	20	22	29	190		10
12:53	70	18	23	41	210		9
13:53	72	17	30	43	210		8
14:53	74	17	25	43	220		8
15:53	75	18	29	39	230	haze	5
16:53	72	17	24	43	240	haze	5
17:53	69	18	27	41	240	haze	4
18:53	68	19	29	41	250	haze	4
19:53	67	22	31	41	220	haze	3
20:53	64	24	33	44	220	haze	4
21:53	62	27	23	39	220	haze	4
22:53	60	30	29	41	220	haze	4
23:53	58	33	30	41	220	haze	5

Table 12: Wind and weather observations for Cortez, Colorado, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 29, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 29	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	57	33	25	39	220		7
1:53	56	34	29	41	220		7
2:53	54	34	27	40	220		10
3:53	51	35	27	38	220		9
4:53	51	35	16	30	230		10
5:53	49	36	16	30	240		10
6:53	48	39	23	32	240		10
7:27	43	56	15	21	320		10
7:53	41	62	10		320		10
8:53	40	70	13		280	lt rain	10
9:39	37	87	10		210	lt snow	7
9:53	37	89	10		170	lt snow	8
10:03	37	87	7		170	unknown prcp	9
10:53	43	49	23	35	210		10
11:53	46	49	21	32	320		10
11:59	41	61	18	25	320		10
12:22	37	75	10	21	320	lt snow	5
12:50	41	65	7		360		10
12:53	42	64	7		20		10
13:33	37	75	10	18	270	lt snow	7
13:39	36	75	10	22	270	lt snow	2
13:43	36	80	14	22	270	lt snow	1.5
13:48	34	86	13	23	280	lt snow; fog	0.75
13:53	33	88	5	23	240	lt snow; fog	0.75
13:58	34	80	5		140	lt snow; fog	1.25
14:00	34	86	7		150	lt snow; fog	2.5
14:07	37	81	10		170		9
14:15	37	87	9		150		10
14:53	42	57	14		200		10
15:48	36	75	21	33	340		10
15:53	36	73	20	30	340		10
16:13	36	75	13	27	330	lt snow	2
16:16	34	86	13	27	330	lt snow; fog	1.25

Table 13: Wind and weather observations for Durango, Colorado, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 28, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 28	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	50	33	0				10
1:53	50	32	5		140		10
2:53	49	34	0				10
3:53	48	39	4		30		10
4:53	45	47	5		20		10
5:53	41	60	5		40		10
6:53	43	53	8		90		10
7:53	47	48	7		60		10
8:53	50	42	6		120		10
9:53	54	35	7		100		10
10:53	59	26	0				10
11:53	64	18	12	23	230		10
12:53	66	18	17	29	210		10
13:53	69	15	25	40	220		10
14:53	68	15	22	37	240		10
15:53	69	15	24	37	230		7
16:53	69	17	32	54	240	haze	5
17:53	68	19	27	41	240	haze	6
18:53	66	18	28	43	230	haze	6
19:53	63	19	33	44	230	haze	4
20:53	61	21	25	40	230	haze	5
21:44	61	22	22	43	240	haze	3
21:53	59	23	24	36	240	haze	2.5
22:53	58	26	28	33	250	haze	2.5
23:05	57	26	24	38	240	haze	3
23:18	57	26	28	44	240	haze	2.5
23:36	55	28	31	40	250	haze	2.5
23:51	55	28	30	46	240	haze	2
23:53	56	28	29	44	250	haze	2

Table 14: Wind and weather observations for Durango, Colorado, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 29, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 29	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:39	54	32	20	29	230	haze	3
0:53	54	31	27	36	230	haze	4
1:53	52	35	21	36	230	haze	4
2:53	51	32	21	33	240	haze	6
3:53	49	29	23	35	240		8
4:53	48	32	16	25	240		9
5:53	48	44	28	40	240		10
6:53	48	40	27	39	250		9
7:53	43	53	18	28	280		10
8:53	44	47	23	30	280		10
9:53	44	45	31	38	250		10
10:53	44	49	23	36	250		10
11:53	40	50	15	27	250		9
12:06	39	52	22	25	270		9
12:19	41	45	20	28	220		10
12:53	44	38	14	29	250		10
13:53	46	30	24	33	270		10
14:53	43	41	21	31	270		10
15:53	43	36	17	27	280		10
16:53	44	29	24	37	240		10
17:53	42	37	17	29	280		10
18:53	39	39	15	21	350		10
19:53	37	38	10		320		10
20:53	35	36	9		330		10
21:53	32	47	7		230		10
22:53	31	61	4		250		10
23:53	30	63	6		230		10

Table 15: Wind and weather observations for Montrose, Colorado, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 28, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 28	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	63	18	10		140		10
1:53	64	15	29	46	220		8
2:53	63	16	9		150		10
3:53	61	16	9	21	140		10
4:53	60	19	16	23	130		10
5:53	58	22	4		130		10
6:53	60	20	10	23	110		10
7:53	60	21	21	31	210		10
8:53	64	18	30	41	210		10
9:53	66	16	35	46	210		10
10:53	68	15	32	44	230		10
11:53	70	15	32	45	220		10
12:53	72	15	28	41	210		10
13:53	70	16	30	40	210		10
14:53	74	13	29	45	220		10
15:53	75	14	16	44	230		10
16:53	73	12	32	45	220		10
17:53	72	11	29	43	230		10
18:53	70	13	25	48	220		7
19:53	67	16	33	50	220	haze	5
20:53	66	17	29	43	220	haze	6
21:21	64	19	28	39	220		7
21:53	65	18	32	48	220	haze	6
22:53	63	22	24	40	220		8
23:53	61	23	47	64	200		7

Table 16: Wind and weather observations for Montrose, Colorado, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 29, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 29	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	59	27	24	35	220		10
1:53	58	30	18	39	210		10
2:29	43	65	23	32	330	lt rain	10
2:53	37	82	16	25	340	lt rain	10
3:08	36	93	15		340	lt rain	10
3:34	36	93	12		330	lt rain	10
3:53	34	96	9		320	lt snow; fog	6
4:11	34	100	8		320	lt snow; fog	5
4:43	34	100	8		330	lt snow; fog	4
4:53	33	100	5		340	lt snow; fog	2
5:20	34	100	4		10	lt snow; fog	3
5:30	34	100	5		360	lt snow; fog	2.5
5:37	34	100	4			lt snow; fog	3
5:44	34	93	5		330	lt snow; fog	2
5:46	34	93	4		330	lt snow; fog	1.75
5:53	33	96	4		350	lt snow; fog	1.25
6:00	34	100	0			lt snow; fog	1.25
6:08	34	93	6		350	lt snow; fog	2
6:27	34	93	7		360	lt snow; fog	1.75
6:43	32	100	9		350	lt snow; fog	1
6:51	32	93	10		340	lt snow; fog	0.75
6:53	32	96	9		350	lt snow; fog	0.75
7:53	31	100	8		320	mod snow; ice fog	0.5
8:53	31	100	0			hvy snow; ice fog	0.25

Table 17: Wind and weather observations for Alamosa, Colorado, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 28, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 28	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:52	50	29	15		200		10
1:52	47	37	13		190		10
2:52	49	36	9		180		10
3:52	48	34	13		140		10
4:52	41	52	8		140		10
5:52	45	43	18		170		10
6:52	43	49	13		150		10
7:52	52	32	17	27	180		10
8:52	56	26	17		170		10
9:52	58	25	24	36	170		10
10:16	63	20	24	33	230		10
10:52	62	20	24	32	230		10
11:52	64	20	22	32	200		10
12:52	68	17	21	33	230		10
13:52	69	15	24	33	230		10
14:52	69	15	40	48	220	haze	5
15:35	70	15	41	55	240	haze	2.5
15:52	69	17	36	51	240	haze	4
16:52	68	16	36	48	240	haze	5
17:52	64	19	41	55	220	haze	3
17:55	64	19	37	56	230	haze	2.5
18:03	64	19	33	47	240	haze	3
18:52	61	21	32	50	230	haze	4
19:04	61	22	31	53	220	haze	4
19:52	60	24	30	39	220	haze	5
20:18	59	25	30	48	230	haze	5
20:52	60	23	36	52	220	haze	4
21:48	57	26	29	47	220		8
21:52	57	28	32	44	220		8
22:52	55	30	28	46	220		10
23:52	54	31	37	48	220		10

Table 18: Wind and weather observations for Alamosa, Colorado, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 29, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 29	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:52	52	33	35	47	220		10
1:52	51	35	35	54	220		8
2:52	50	37	37	46	230		10
3:52	48	39	36	51	220		9
4:52	45	47	25	32	240		10
5:52	43	60	23	32	240	lt rain	10
6:12	39	81	24	39	240	lt rain	9
6:52	40	83	30	41	220	lt rain	9
7:52	40	79	35	41	230	lt rain	10
8:47	36	93	38	50	250	lt snow; fog	1.5
8:52	34	92	32	50	230	lt snow; fog	1
8:59	37	87	35	47	230	lt snow; fog	2
9:07	39	81	33	43	240		9
9:16	43	70	35	43	240		10
9:52	44	67	31	37	230		10
10:52	49	46	27	40	240		10
11:52	50	37	29	38	260		10
12:52	50	37	25	41	240		10
13:52	49	36	27	37	220		10
14:52	49	31	24	36	270		10
15:52	45	40	22	28	250		10
16:52	46	34	28	35	280		10
17:52	45	32	31	43	270		10
18:52	38	48	20	28	280		10
19:52	34	59	8		210		10
20:36	34	47	15		340		10
20:52	34	45	20	23	330		10
21:52	32	58	9		290		10
22:52	29	66	4		360		10
23:52	30	58	8		320		10

Table 19: Wind and weather observations for Pagosa Springs, Colorado, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 28, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 28	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:15	43	45	0			thunder	10
2:15	45	39	0				10
3:15	46	34	7		140		10
4:15	39	60	0				10
5:15	41	56	0				10
6:15	39	65	0				10
7:15	43	56	0				10
8:15	46	39	0				10
9:15	50	32	6		160		10
10:15	52	30	7		160		10
11:15	54	28	4		250		10
12:15	57	21	8		220		10
13:15	61	18	10	32	210		10
14:15	61	18	25	33	220		10
15:15	63	17	25	36	230		10
16:15	61	17	23	38	220		10
16:55	63	16	31	41	210	haze	5
17:15	63	16	18	35	210	haze	5
17:35	63	19	25	40	210	haze	5
17:55	63	19	29	39	220	haze	5
18:15	63	20	27	36	220	haze	5
18:35	63	19	23	41	220	haze	5
18:55	61	20	25	37	220	haze	5
19:15	61	20	29	43	220	haze	5
19:35	61	20	28	44	220	haze	5
19:55	59	21	16	30	220	haze	5
20:15	59	20	23	41	220		7
20:55	59	18	29	40	220		7
21:35	55	22	24	40	220		7
21:55	55	24	25	41	230		7
22:15	55	24	30	39	230	haze	5
22:35	54	26	24	41	220	haze	5
22:55	54	28	28	37	220	haze	5
23:15	54	28	23	37	220		7
23:35	54	28	20	32	220		7
23:55	54	28	20	37	220		7

Table 20: Wind and weather observations for Pagosa Springs, Colorado, reported by the University of Utah MesoWest site (http://www.met.utah.edu/mesowest/) for April 29, 2010.

Speeds at or above the blowing dust thresholds, weather, and visibility (caused by or reduced by dust) have been highlighted in yellow.

Time MDT April 29	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:15	52	30	32	44	220		7
0:35	52	30	30	43	220		7
0:55	52	30	28	47	220		7
1:15	50	32	30	44	220		7
1:35	50	32	31	44	230		7
1:55	50	32	27	44	230		7
2:15	50	34	23	38	220	haze	5
2:35	50	34	22	32	210	haze	5
2:55	48	37	28	35	220		5
3:15	48	34	31	45	220	haze	4
3:35	46	34	22	43	220	haze	3
3:55	46	34	20	39	230	haze	4
4:15	46	31	24	39	220	haze	4
4:35	46	31	23	32	220	haze	5
4:55	45	33	22	38	230		7
5:15	45	39	22	32	250		10
5:35	45	45	24	40	250		10
5:55	43	56	20	31	250		10
6:15	43	56	16	27	250		10
6:35	43	56	9	18	220		10
6:55	43	61	20	25	200	mod drizzle	7
7:15	41	70	15	25	210	unknown prcp	5
7:35	39	75	25	38	250	unknown prcp	7
7:55	37	81	25	36	250	lt snow	4
8:15	36	87	18	41	240	lt snow	4
9:15	36	93	15	24	240	fog	5
10:15	36	87	12	24	240	lt snow	7
11:15	36	80	18	28	250	lt snow	4
13:15	37	65	21	43	270		10
13:35	37	56	16	23	270		10
13:55	37	52	15	27	230		10
14:15	37	52	8		220		10
14:35	39	41	21	30	230		10

The Albuquerque, Flagstaff, and Grand Junction NWS Forecast Offices issue weather warnings and advisories for northeast Arizona, most of New Mexico, eastern Utah, and western and southwestern Colorado. The weather warnings and advisories issued by theses offices for April 28 and 29, 2010, are presented in Attachment B. These warnings and advisories show that strong winds and areas of blowing dust were expected and experienced across this region on these days.

Figure 20 shows the NOAA HYSPLIT 18-hour forward matrix trajectories (Draxler and Rolph, 2012) for northeast Arizona and northwest New Mexico starting at 5 PM MST April 28, 2010 (see the following link for more information on HYSPLIT: http://ready.arl.noaa.gov/HYSPLIT.php). This analysis shows transport of air from this region into Colorado on April 28. HYSPLIT 12-hour back trajectories for 5 PM and 11 PM April 28, 2010, for Durango, Pagosa Springs, and Alamosa, respectively, are presented in Figure 21 through Figure 26. These also show that Arizona and northwest New Mexico were source regions for air transported into Colorado on April 28. NOAA HYSPLIT forward and backward trajectories provide clear supporting evidence that dust from desert regions of northwest New Mexico and Arizona caused the PM_{10} exceedances measured across portions of southwestern Colorado on April 28 and 29, 2010.

Figure 27 shows the output for blowing dust from the Navy Aerosol Analysis and Prediction System (NAAPS) Global Aerosol Model for 5 PM April 28 (00Z April 29), 2010 (source: http://www.nrlmry.navy.mil/aerosol-bin/aerosol/display_directory_all?DIR=/web/aerosol/public_html/globaer/ops_01/wus/). The NAAPS system models blowing dust emissions and transport based on soil moisture content, soil erodibility factors, and a variety of meteorological factors known to be conducive to blowing dust (for a description of NAAPS see: http://www.nrlmry.navy.mil/aerosol_web/Docs/globaer_model.html).

The forecast panel in the lower left of Figure 27 shows blowing dust generation over northeast Arizona, portions of southern Utah, and northwest New Mexico. The NAAPS model can overestimate dust emissions, and in this case it shows high concentrations of dust in southeast Colorado that were not actually observed. The model output, however, does suggest that Four Corners areas of Arizona, New Mexico, and Utah were major source regions for blowing dust on April 28, 2010. Forecast products from the Navy Aerosol Analysis and Prediction System model provide evidence for a widespread blowing dust event in the Four Corners states, suggesting that significant source regions for dust in Colorado were located in arid regions of Arizona, Utah, and New Mexico.

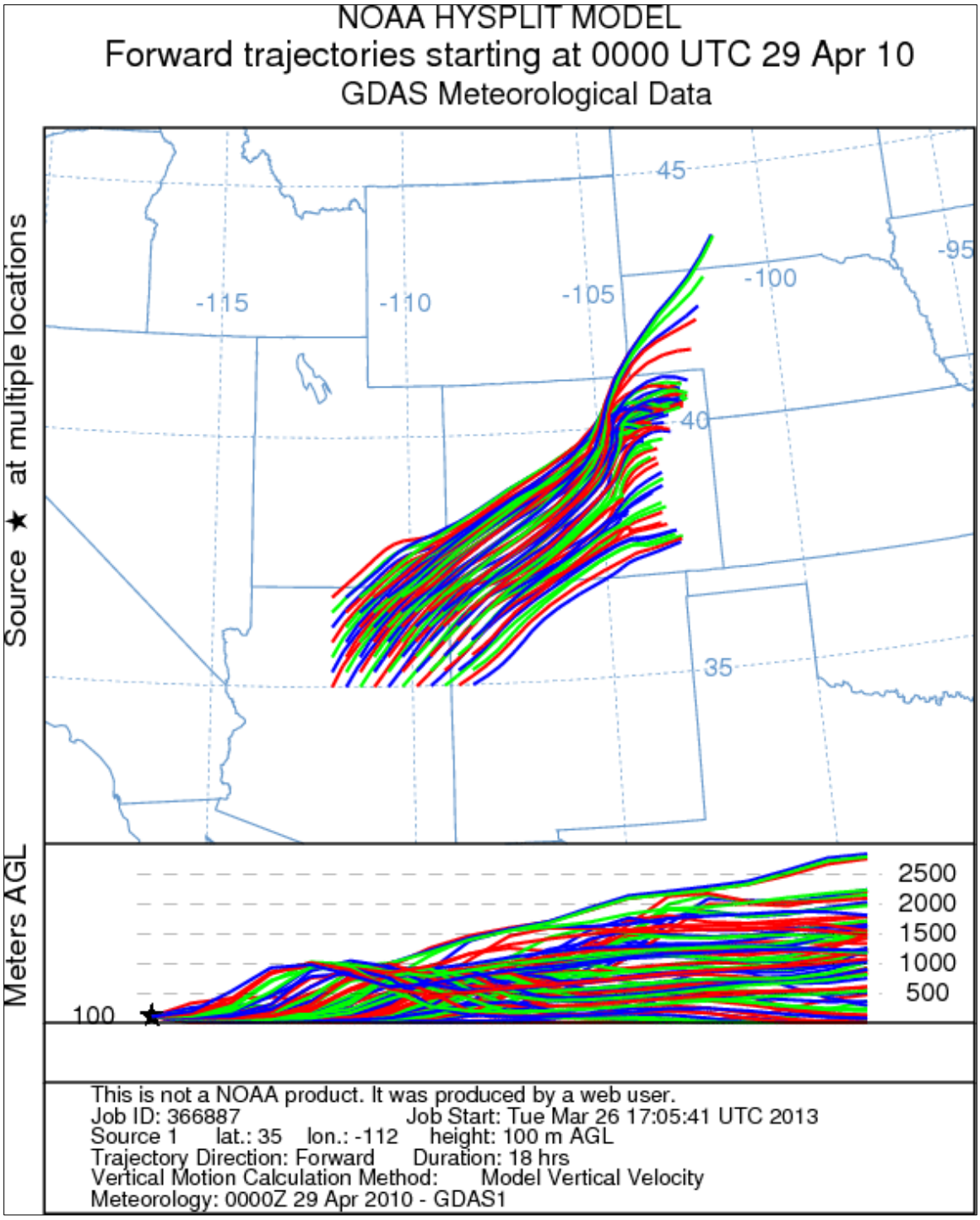


Figure 20: NOAA HYSPLIT 18-hour forward trajectories for northeast Arizona and northwest New Mexico for 5 PM MST April 28 (00Z April 29), 2010, (source: NOAA Air Resources Laboratory at: http://ready.arl.noaa.gov/HYSPLIT.php).

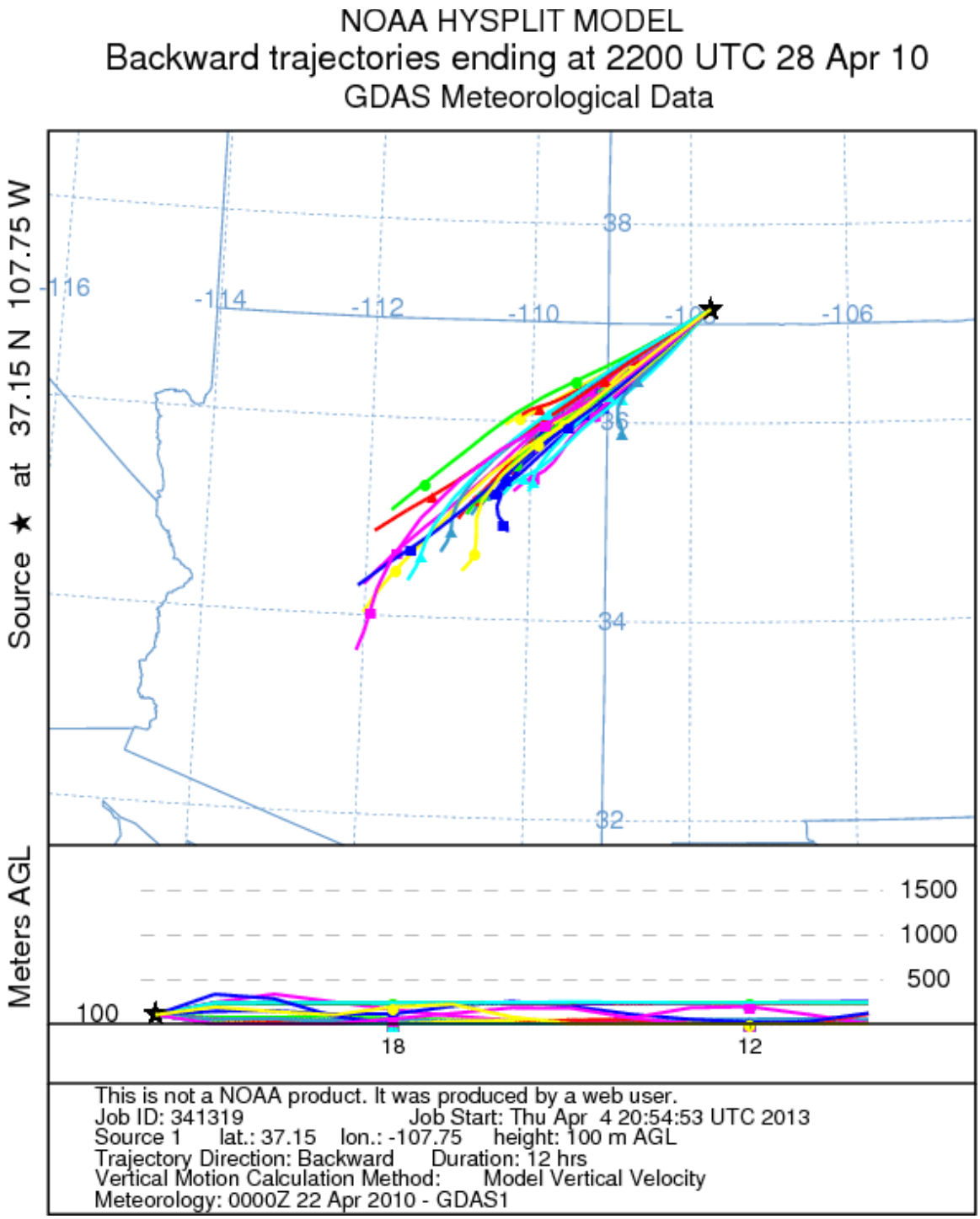


Figure 21: NOAA HYSPLIT 12-hour back trajectories for Durango, Colorado, for each hour from 3 AM MST April 28, 2010, to 3 PM MST April 28, 2010 (source: NOAA Air Resources Laboratory at: http://ready.arl.noaa.gov/HYSPLIT.php).

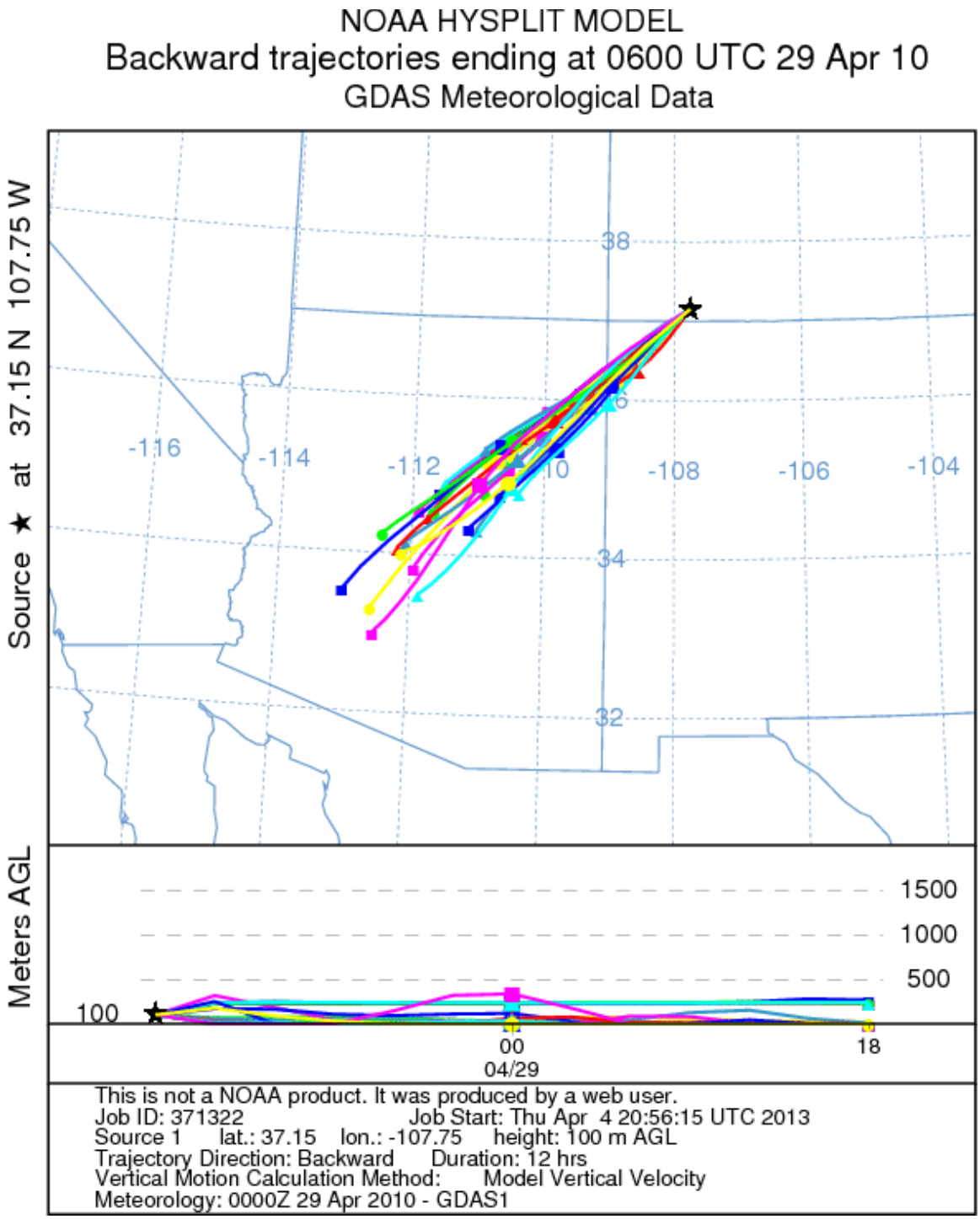


Figure 22: NOAA HYSPLIT 12-hour back trajectories for Durango, Colorado, for each hour from 11 AM MST April 28, 2010, to 11 PM MST April 28, 2010 (source: NOAA Air Resources Laboratory at: http://ready.arl.noaa.gov/HYSPLIT.php).

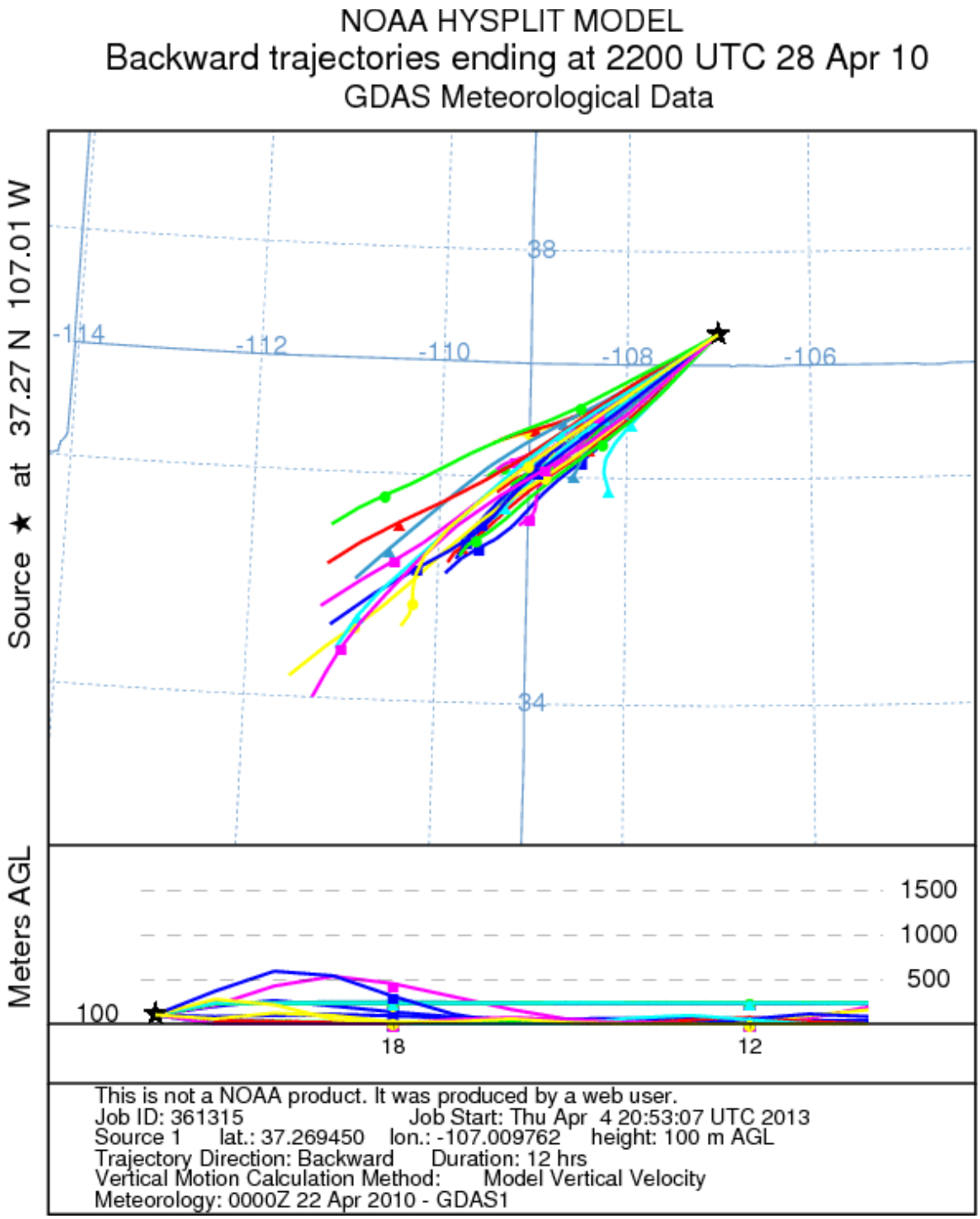


Figure 23: NOAA HYSPLIT 12-hour back trajectories for Pagosa Springs, Colorado, for each hour from 3 AM MST April 28, 2010, to 3 PM MST April 28, 2010 (source: NOAA Air Resources Laboratory at: http://ready.arl.noaa.gov/HYSPLIT.php).

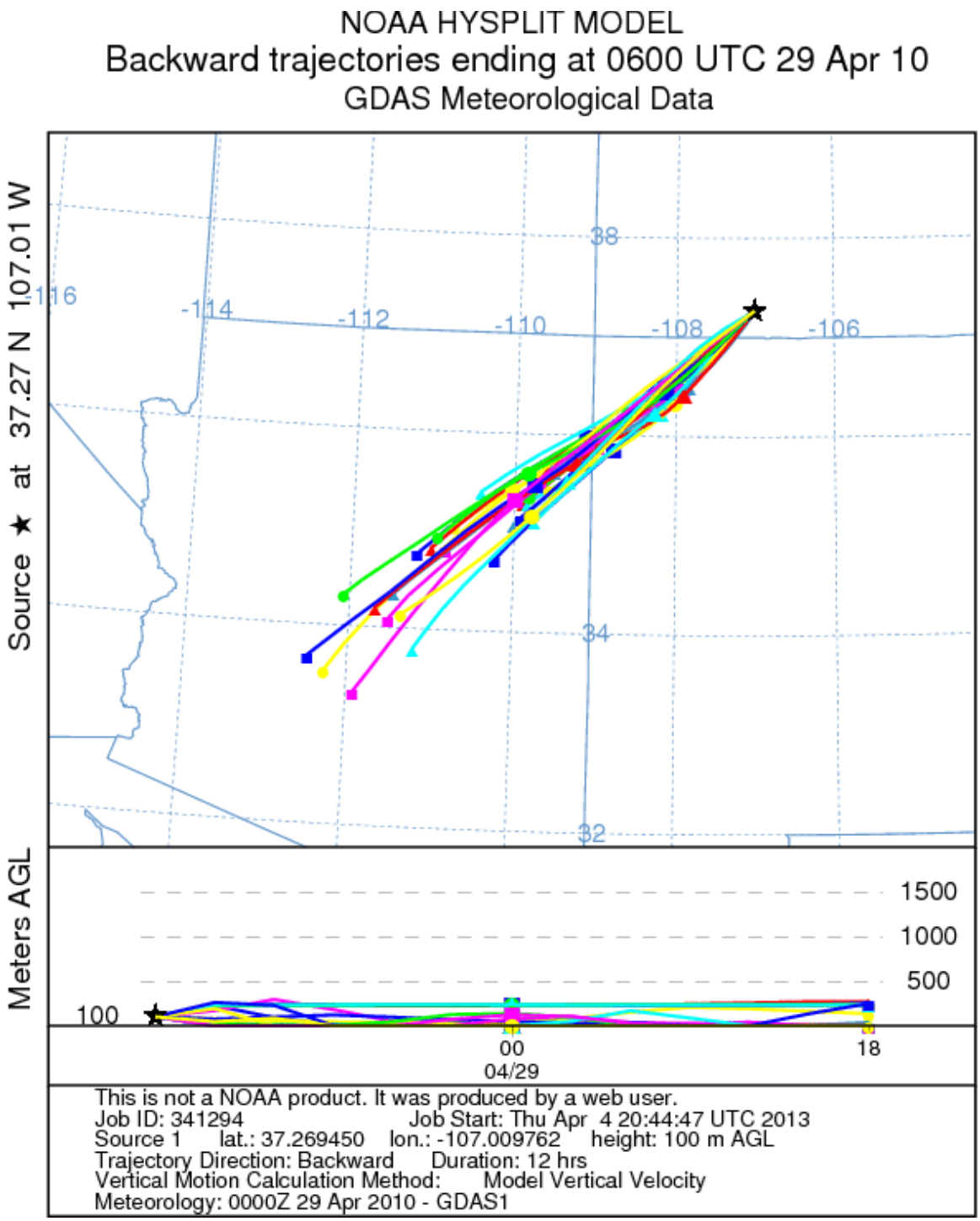


Figure 24: NOAA HYSPLIT 12-hour back trajectories for Pagosa Springs, Colorado, for each hour from 11 AM MST April 28, 2010, to 11 PM MST April 28, 2010 (source: NOAA Air Resources Laboratory at: http://ready.arl.noaa.gov/HYSPLIT.php).

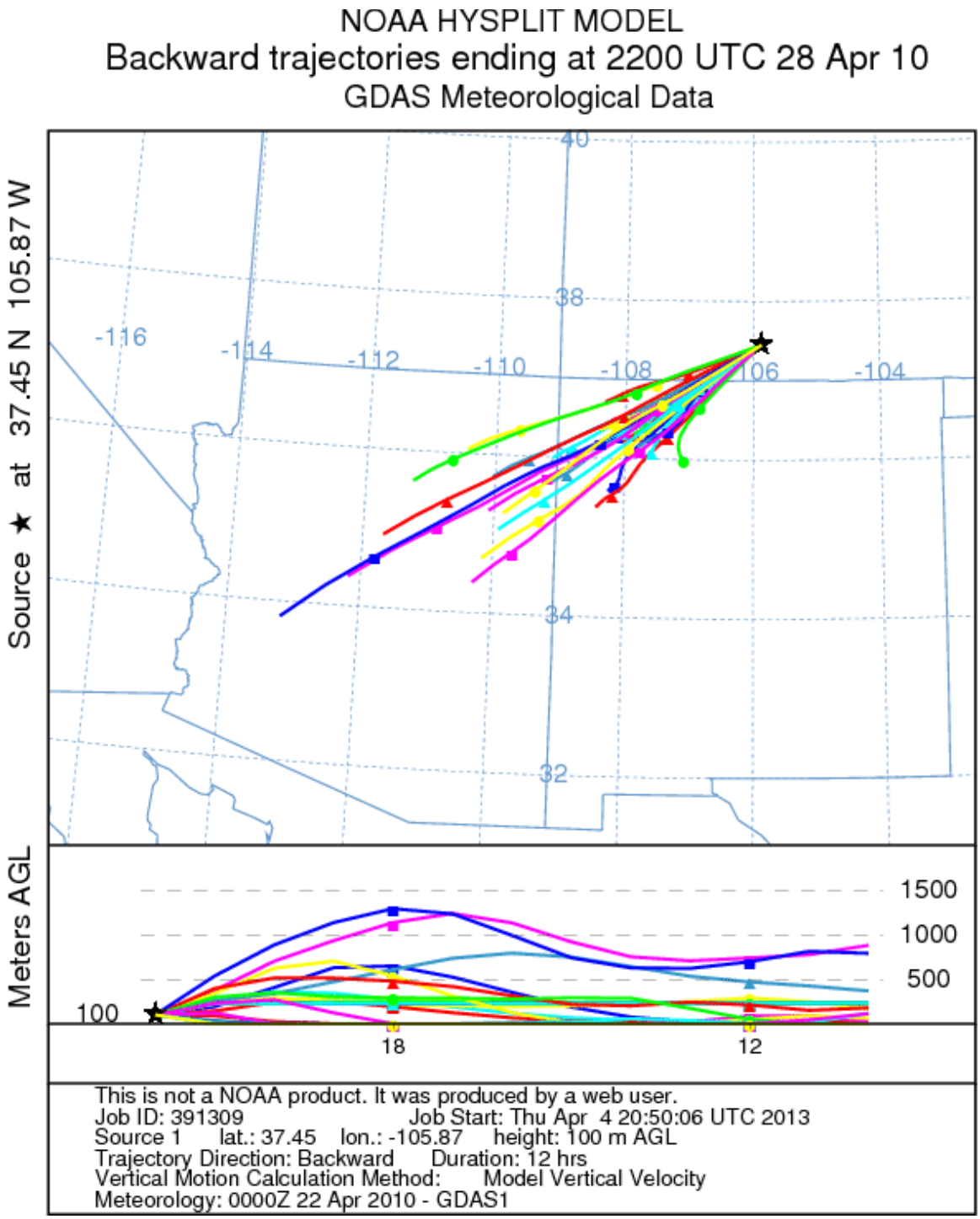


Figure 25: NOAA HYSPLIT 12-hour back trajectories for Alamosa, Colorado, for each hour from 3 AM MST April 28, 2010, to 3 PM MST April 28, 2010 (source: NOAA Air Resources Laboratory at: http://ready.arl.noaa.gov/HYSPLIT.php).

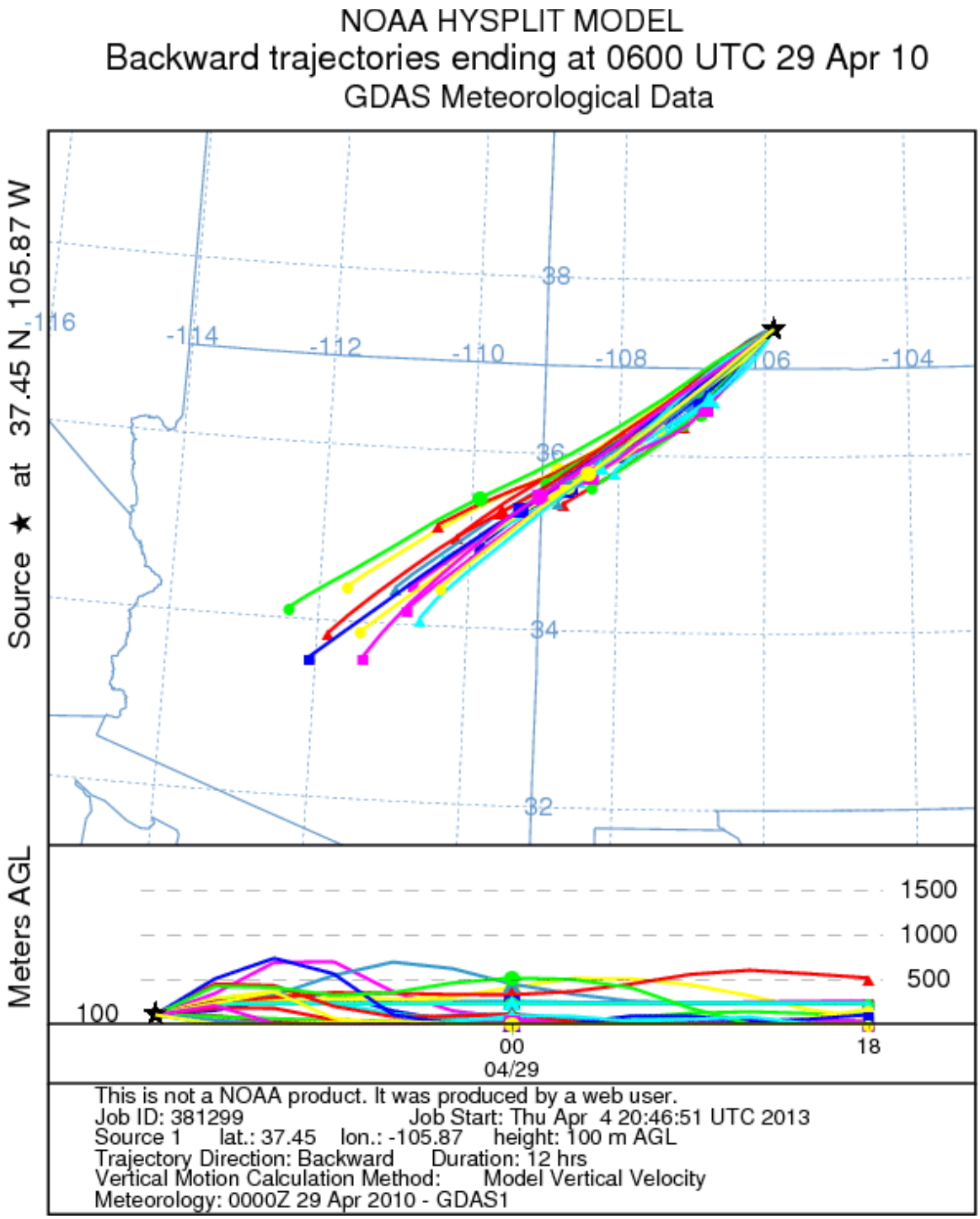


Figure 26: NOAA HYSPLIT 12-hour back trajectories for Alamosa, Colorado, for each hour from 11 AM MST April 28, 2010, to 11 PM MST April 28, 2010 (source: NOAA Air Resources Laboratory at: http://ready.arl.noaa.gov/HYSPLIT.php).

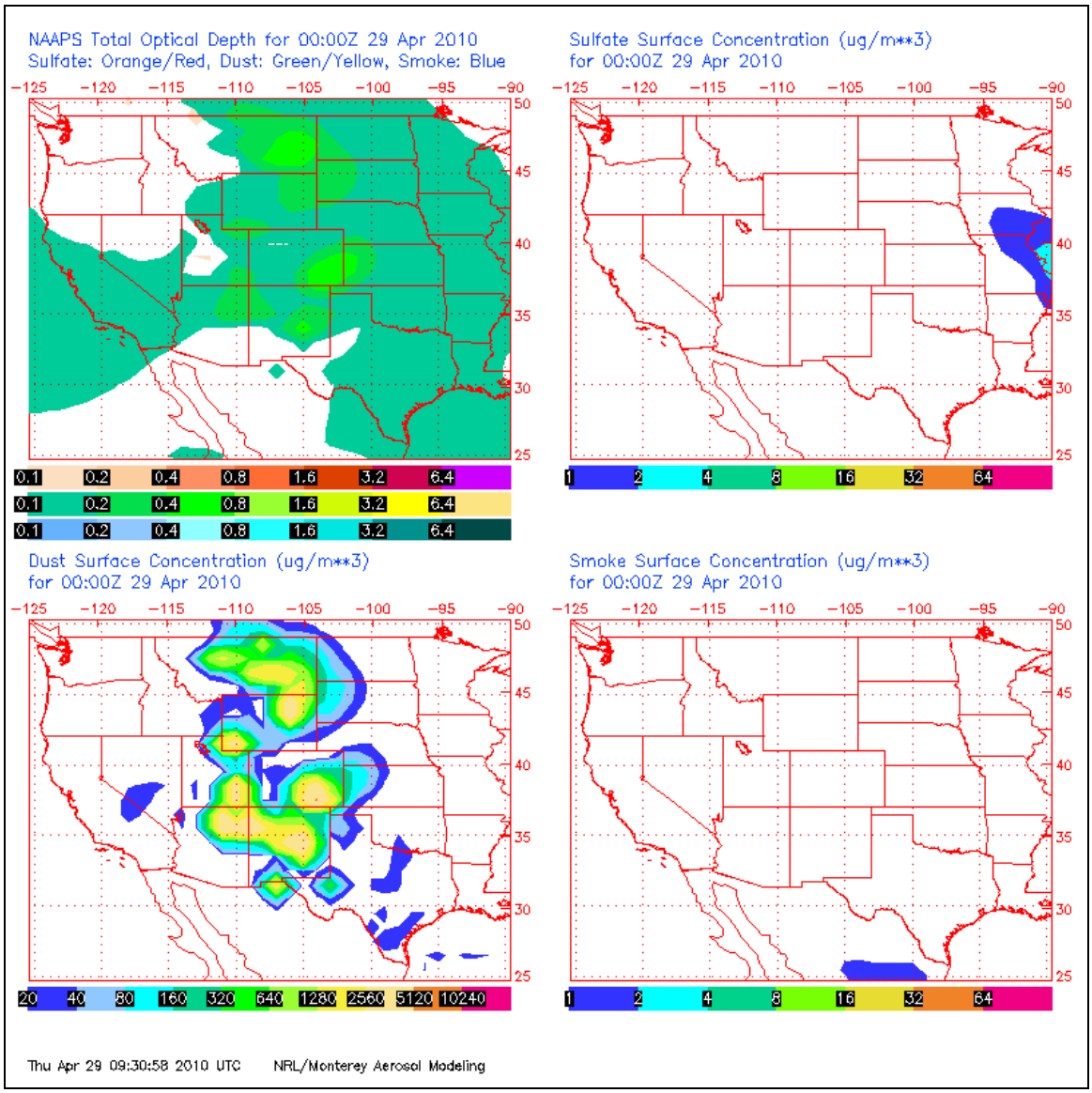


Figure 27: NAAPS forecasted dust concentrations for 5 PM April 28 (00Z April 29), 2010 (source: http://www.nrlmry.navy.mil/aerosol-bin/aerosol/display_directory_all?DIR=/web/aerosol/public_html/globaer/ops_01/wus/).

The Center for Snow and Avalanche Studies has been studying the effects of wind-blown desert dust from Arizona, New Mexico, and Utah on snowpack albedo and snowmelt in the San Juan Mountains of Colorado. Figure 28 is the Center's log of events that are associated with deposits or layers of wind-blown dust on or within the snowpack of the San Juan Mountains. The Center for Snow and Avalanche Studies lists April 28, 2010, as one of nine Dust-on-Snow events for the 2009/2010 water year, and this provides clear supporting evidence that a regional blowing dust event with long-range transport caused the PM_{10} exceedances measured across portions of Colorado on April 28, 2010.

Colorado Dust-on-Snow (CODOS)

Dust-on-Snow Deposition Events Log

Thanks to our original National Science Foundation research grants for collaborative research (grants ATM-0432327 to Painter at National Snow and Ice Data Center and ATM-0431955 to Landry at Center for Snow and Avalanche Studies), and to the subsequent support of the Colorado Dust-on-Snow program by Colorado water districts the State of Colorado, the U.S. Bureau of Reclamation, and others, this program has accumulated several seasons of dust-on-snow observations at our Senator Beck Basin Study Area (SBBSA) at Red Mountain Pass, summarized in the table below. It is reasonable to assume that our skill at detecting dust-on-snow events has improved and that we may have failed to observe very small events during the early years of this work. Therefore the table represents an absence of events in grey for the first two years of observation but thereafter indicates an absence of observed events as "0" (zero).

Dust-on-Snow Events Documented per Month, by Winter
Senator Beck Basin Study Area at Red Mountain Pass – San Juan Mountains

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	**Total**
2002/2003					2		1			**3**
2003/2004							2	1		**3**
2004/2005	0	0	0	0	0	1	2	1	0	**4**
2005/2006	0	0	1	0	1	1	3	2	0	**8**
2006/2007	0	0	1	0	1	1	3	1	1	**8**
2007/2008	0	0	0	0	0	3	3	1	0	**7**
2008/2009	1	0	1	0	1	4	5	0	0	**12**
2009/2010	1	0	0	0	0	1	4	3	0	**9**

Dates of the events, by winter/spring season, were as follows (WY = Water Year):

2002/2003 (WY2003): Feb 3, Feb 22, Apr 2-3

2003/2004 (WY 2004): Apr 17, Apr 28, May 11

2004/2005 (WY 2005): Mar 23, Apr 4, Apr 8, May 9

2005/2006 (WY 2006): Dec 23, Feb 15, Mar 26, Apr 5, Apr 15, Apr 17, May 22, May 27

2006/2007 (WY 2007): Dec 17, Feb 27, Mar 27, Apr 15, Apr 18, Apr 24, May 4, Jun 6

2007/2008 (WY 2008): Mar 16, Mar 26-27, Mar 30-31, Apr 15, Apr 21, Apr 30, May 12

2008/2009 (WY 2009): Oct 11, Dec 13, Feb 27, Mar 6, Mar 9, Mar 22, Mar 29, Apr 3, Apr 8, Apr 15, Apr 24, Apr 25

2009/2010 (WY 2010): Oct 27, March 30, April 3, April 5, April 12, April 28, May 9, May 11, May 22

Figure 28: Dust-on-Snow Deposition Events Log at the Senator Beck Basin Study Area on Red Mountain Pass, Colorado. (source: Chris Landry. 9/24/2010).

Figure 29 shows the MODIS Aqua satellite image for the Four Corners region, Utah, Arizona, New Mexico, and Colorado for April 28, 2010. Areas of blowing dust can be seen in Utah, Arizona, and New Mexico. Plumes of blowing dust originating in the Painted Desert region of northeastern Arizona and northwest New Mexico stretched across southwest Colorado and southeastern Utah. Figure 30 and Figure 31 show the GOES visible satellite imagery for the same region for 3:02 PM MST and 4:45 PM MST, respectively. These images show the increase in dust in the region as the afternoon progressed and the extension of the plume across Alamosa and the San Luis Valley area and onto the plains of southeastern Colorado. Satellite imagery that shows the plumes after sunset on April 28, 2010, and during the early morning hours of April 29, 2010, is not available because of nighttime darkness and cloud cover. MODIS and GOES satellite imagery shows that the Painted Desert and Four Corners area in general were source regions for the blowing dust that spanned April 28 and 29, 2010. This is consistent with the

climatology for many dust storms in Colorado as described in the Grand Junction, Colorado, Blowing Dust Climatology report contained in Attachment A of this document.

The Smoke Text Product from NOAA's Satellite Services Division - Descriptive Text Narrative for Smoke/Dust Observed in Satellite Imagery through 0115Z April 29, 2010, (6:15 PM MST April 28) (http://www.ssd.noaa.gov/PS/FIRE/DATA/SMOKE/2010/2010D290159.html) - describes dust from Arizona and New Mexico moving into Colorado:

> "A significant area of blowing dust is being picked up across parts of NE Arizona and NW New Mexico and moving ENE across a large section of Colorado and beginning to reach parts of W Nebraska and Kansas. There are very high winds across the region."

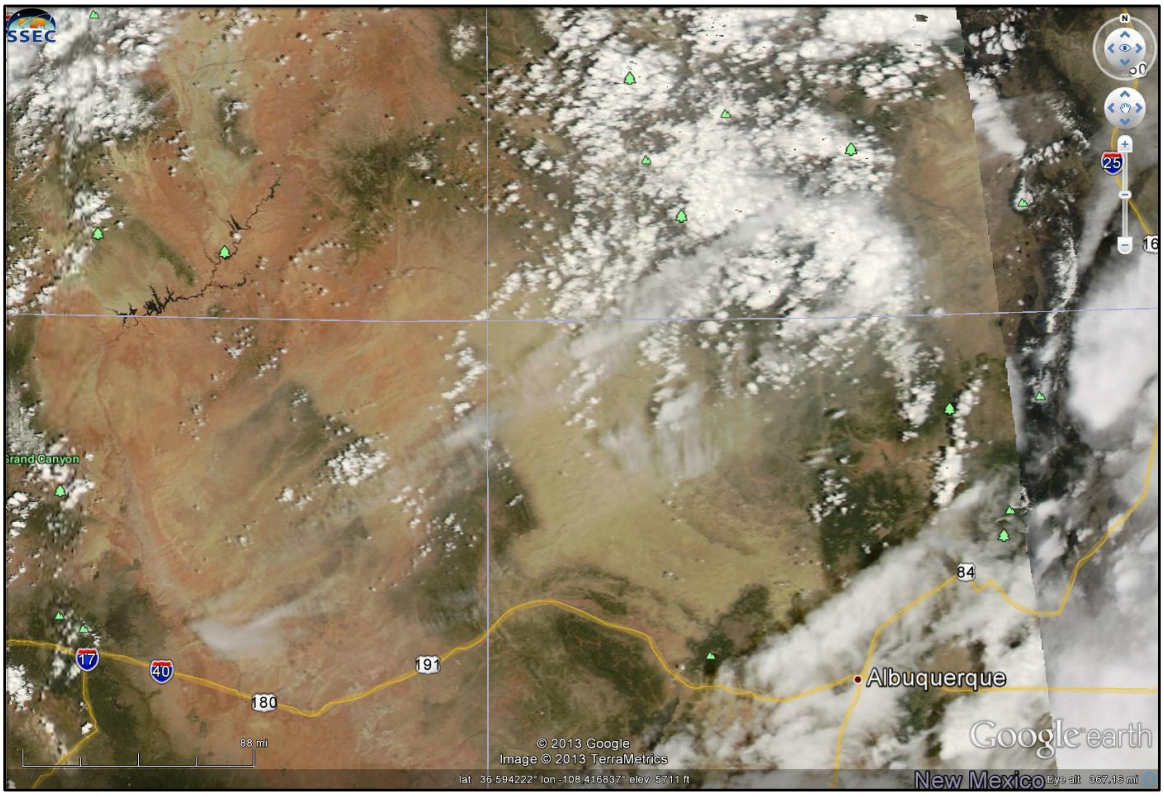


Figure 29: MODIS Aqua satellite afternoon image of Arizona on April 28, 2010, showing plumes of blowing dust in the Four Corners area, with the greatest plume densities in the Painted Desert and northwest New Mexico areas north of I-40 (source: http://ge.ssec.wisc.edu/modis-today/index.php).

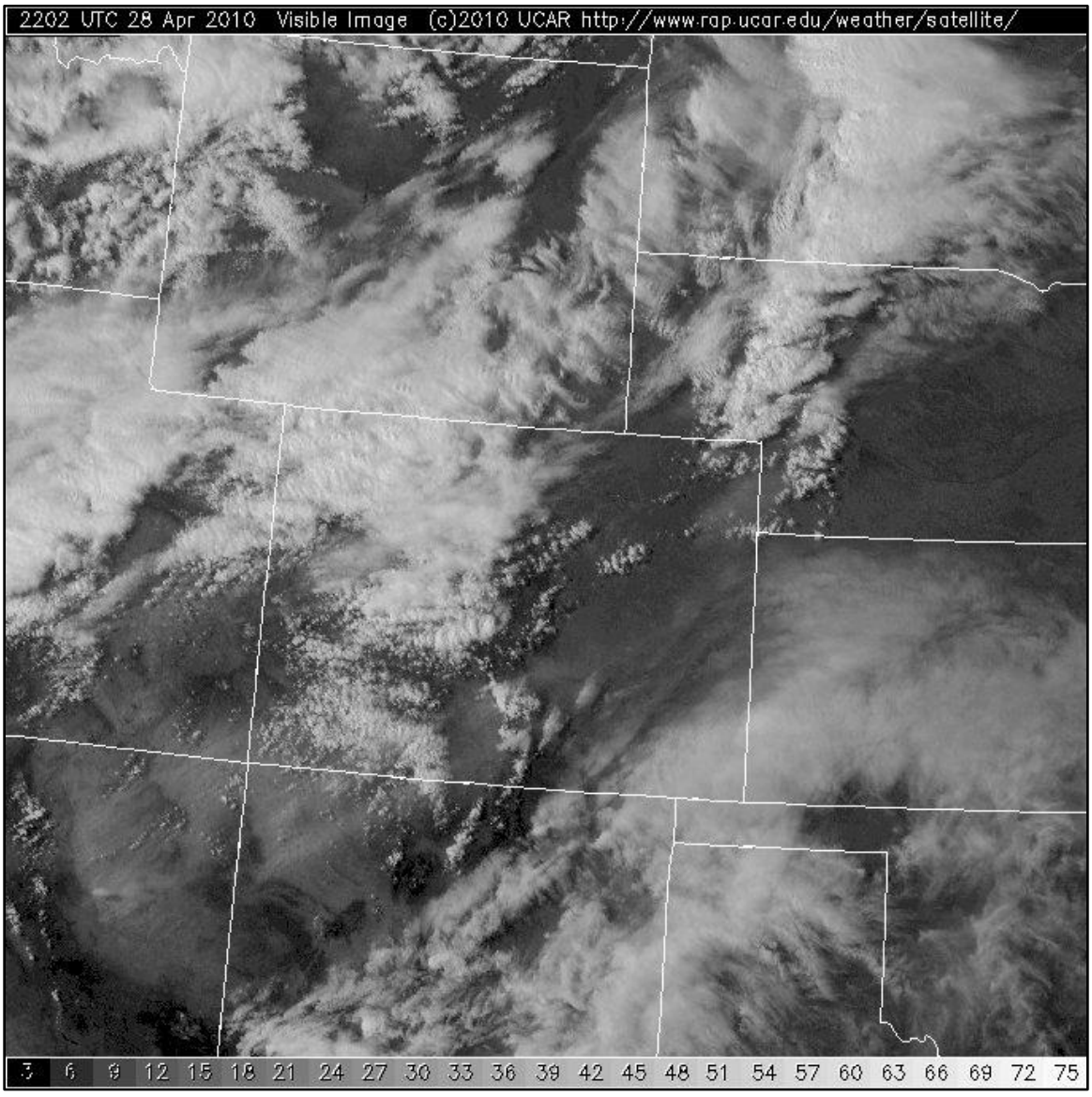


Figure 30: GOES visible satellite image for 3:02 PM MST April 28, 2010, showing plumes of blowing dust in the Four Corners area, with the greatest plume densities in the Painted Desert and northwest New Mexico areas north of I-40 and extending into southern Colorado and the cloud-free San Luis Valley just north of Colorado-New Mexico border in south-central Colorado (source: http://weather.rap.ucar.edu/satellite/).

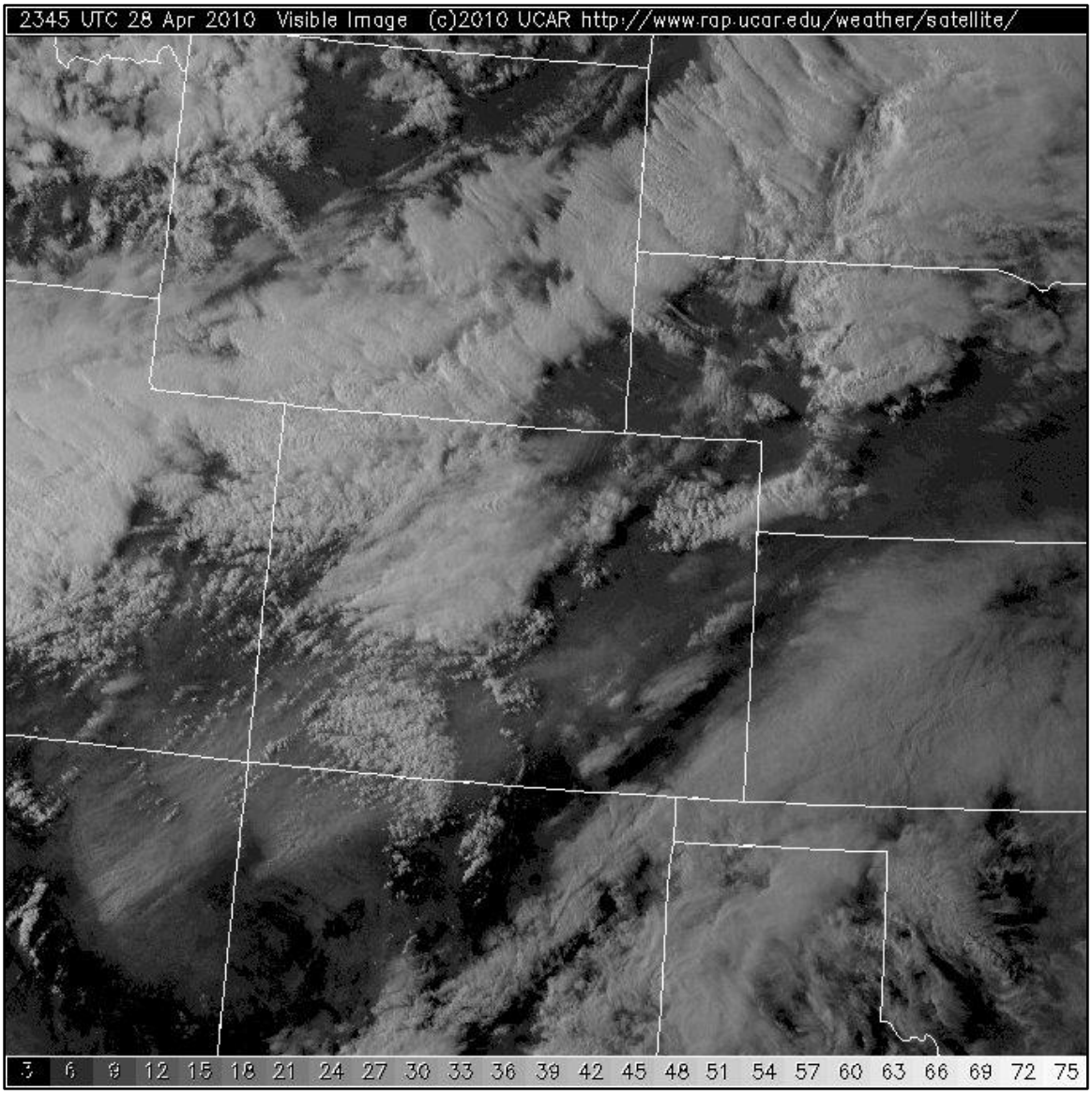


Figure 31: GOES visible satellite image for 4:45 PM MST April 28, 2010,showing plumes of blowing dust in the Four Corners area, with the greatest plume densities in the Painted Desert, extreme southeast Utah, and northwest New Mexico areas north of I-40 and extending into southern Colorado and the cloud-free San Luis Valley just north of Colorado-New Mexico border in south-central Colorado (source: http://weather.rap.ucar.edu/satellite/). Dust is also visible in southeast Colorado east of the Southern Front Range.

The U.S. Geological Survey (USGS) Southwest Geographic Science Team: Dust Monitoring web pages (http://sgst.wr.usgs.gov/dust_detection/dust-events/2010-2/april-28th-2010/ and http://sgst.wr.usgs.gov/dust_detection/dust-events/2010-2/april-29th-2010/) list April 28 and 29, 2010, as a dust event days. The web page for the April 28, 2010, event has various satellite pictures, videos, and time lapse imagery of the dust storm. This web page provides the following characterization for this event:

> "A strong pacific storm front moved through the southwest today, bringing very strong winds cold temperatures and snow in the higher elevations. The dominant wind direction was out of the south-west. Severe dust was viewable from satellite by both visible band

and thermal imaging in the Four Corners area. Activity was apparent from mid morning on to well after sunset. Interstate 40 in Arizona was closed from Belmont to Winslow for most of the day."

USGS Scientists with expertise in the analysis of dust storms have indicated that a regional dust storm occurred in the Four Corners area on April 28, 2010. They also provide evidence for the dust storm on April 29, when the daytime effects of the storm were most pronounced in New Mexico, Texas, and Mexico.

Figure 32 shows the total precipitation in inches for the western U.S. for the month of April 2010. It shows that much of southeastern Utah, northeastern Arizona, and portions of extreme northwestern New Mexico had less than 0.5 inches of precipitation in April. This is an approximate threshold below which blowing dust can occur in the Painted Desert area when winds are above the blowing dust thresholds. The precipitation hreshold is reported in Attachment A that shows that blowing dust occurs in northeastern Arizona source regions when soils are dry (typically less than 0.5 inches in a 30-day period at Hopi, Arizona) and winds are strong. Figure 33 is the Drought Monitor report for the western U.S. It shows that northeastern Arizona was classified as Abnormally Dry with an area of Moderate to Severe Drought in the Painted Desert region. Soils in the Four Corners area and in northeastern Arizona, southeastern Utah, and extreme northwestern New Mexico in particular were dry enough to produce blowing dust when winds were above the thresholds for blowing dust.

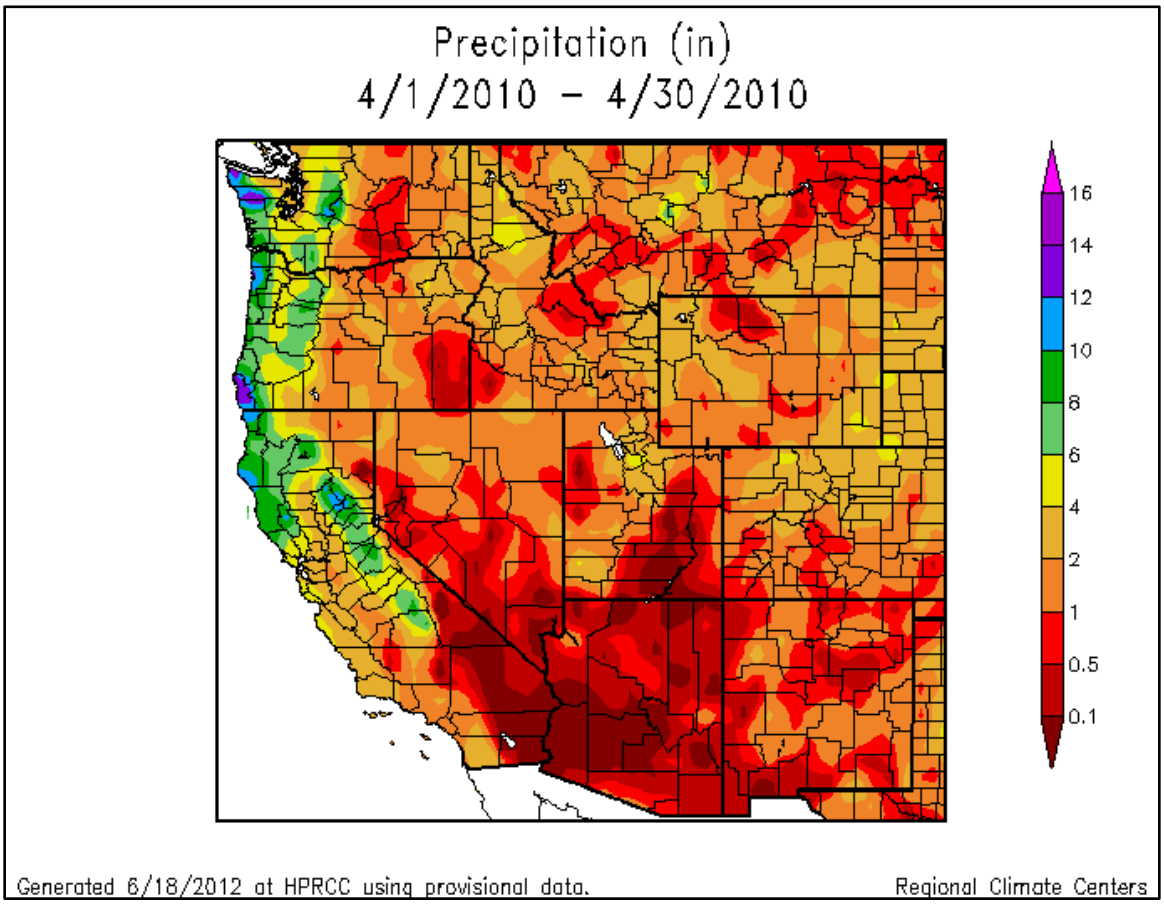


Figure 32: Total precipitation in inches for April 2010 (source: http://www.hprcc.unl.edu/maps/current/index.php?action=update_region&region=WRCC).

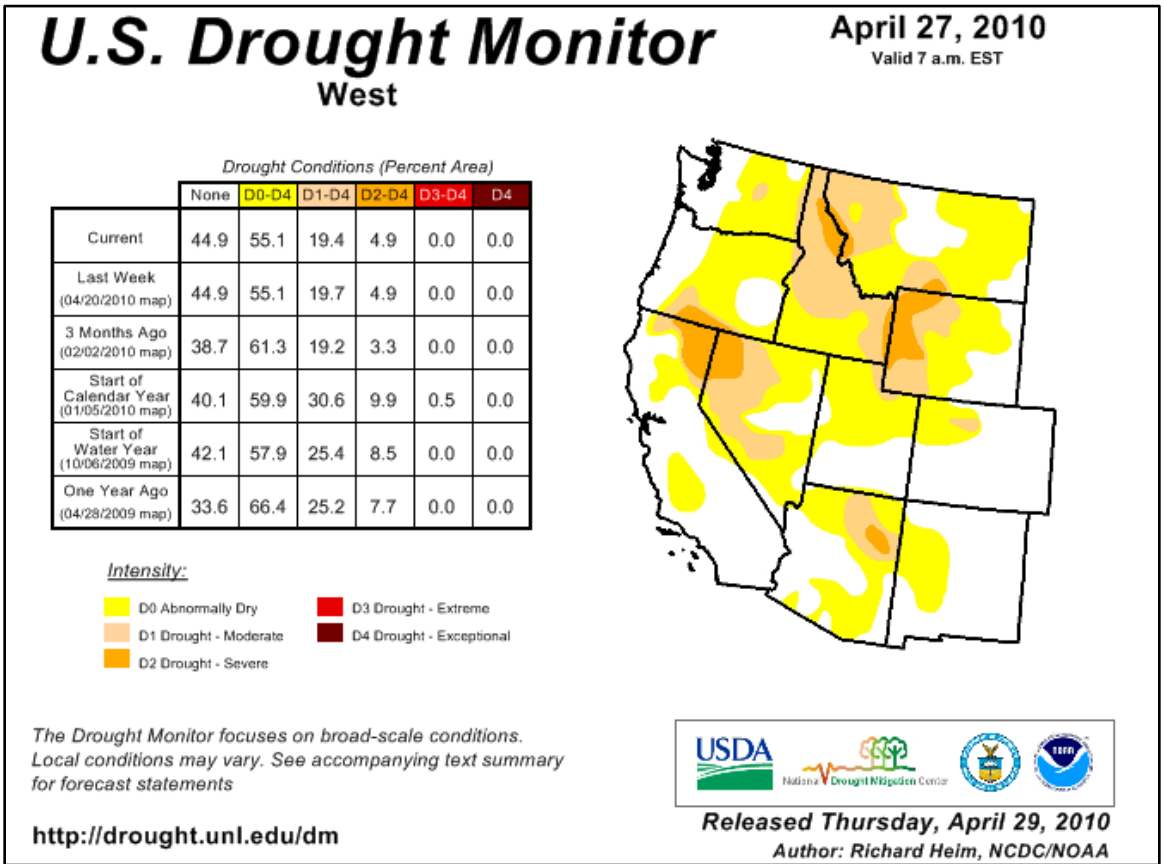


Figure 33: Drought status for the Colorado on April 27, 2010 (source: the USDA, NOAA, and the National Drought Mitigation Center at: http://drought.unl.edu/dm/archive.html).

In a 1997 paper "Factors controlling threshold friction velocity in semiarid and arid areas of the United States" (Marticorena et al., 1997), the authors characterized the erodibility of both disturbed and undisturbed desert soil types. The threshold friction velocity, which is described in detail in this paper, is a measure for conditions necessary for blowing dust and is higher for undisturbed soils and lower for disturbed soils.

Friction velocities have been calculated for 5 PM MST and 11 PM MST April 28 using the NAM12 model (data source: http://nomads.ncdc.noaa.gov/data.php?name=access#hires_weather_datasets). These friction velocities are shown in Figure 34 and Figure 35, respectively. According to Marticorena and coauthors (1997), even undisturbed desert soils normally resistant to wind erosion will be susceptible to emission of blowing dust when threshold friction velocities are greater than about 1.0 to 2.0 meters per second. These figures show that a wide area of northern Arizona, northwestern New Mexico, southeastern Utah, and southwestern Colorado had friction velocities above 1.0 meters per second during the second half of the day on April 28. High values were present within the Little Colorado River Valley and Painted Desert region of northeastern Arizona where satellite imagery shows the eruption of large plumes of blowing dust and where 30-day precipitation totals were below 0.5 inches. Note that blowing dust will typically only occur where friction velocities are high and the soils are dry and not protected by vegetation,

forest cover, boulders, rocks, etc. This is why blowing dust occurred in the desert and more arid areas of northeastern Arizona, and northwestern New Mexico on April 28 and 29, 2010.

The elevated friction velocities shown in Figure 34 and Figure 35, the data on soil moisture conditions presented elsewhere in this report, and the prevalence of winds above blowing dust thresholds (all occurring in traditional source regions in northeastern Arizona and northwestern New Mexico) prove that this dust storm was a natural event that was not reasonably controllable or preventable.

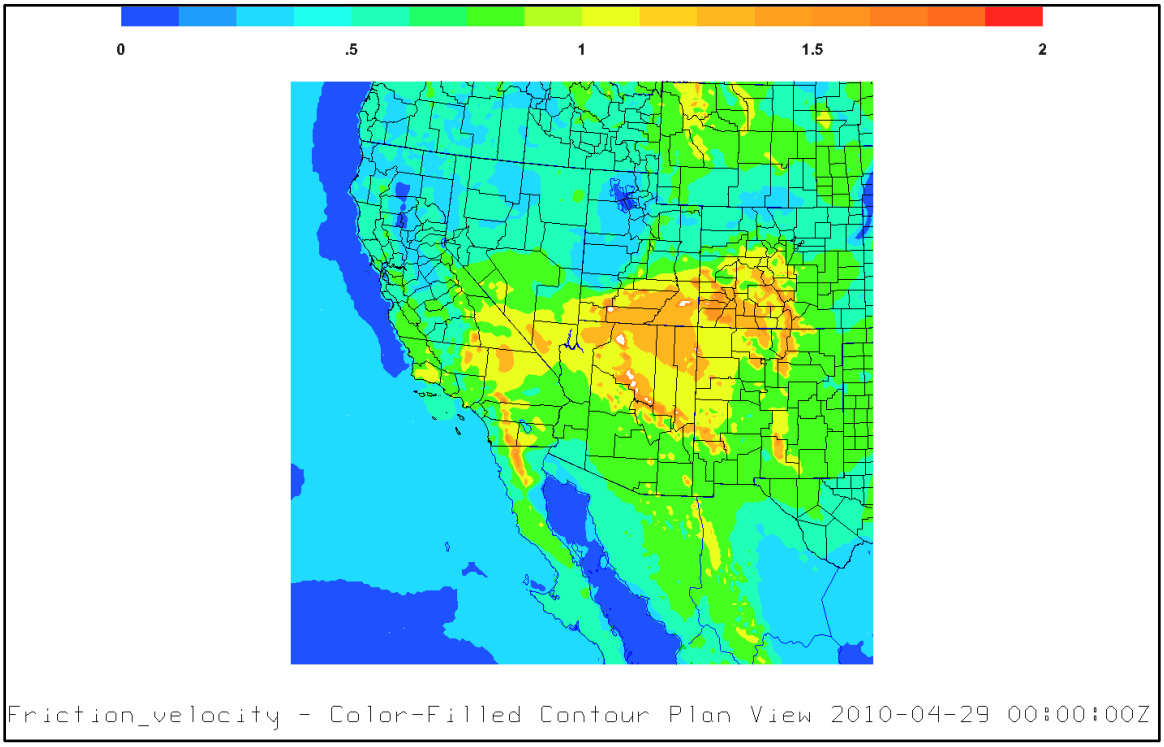


Figure 34: Friction velocities in meters/second from the NOAA NCEP North American Model with 12 kilometer grid spacing at 00Z April 29, 2010 (5 PM MST April 28).

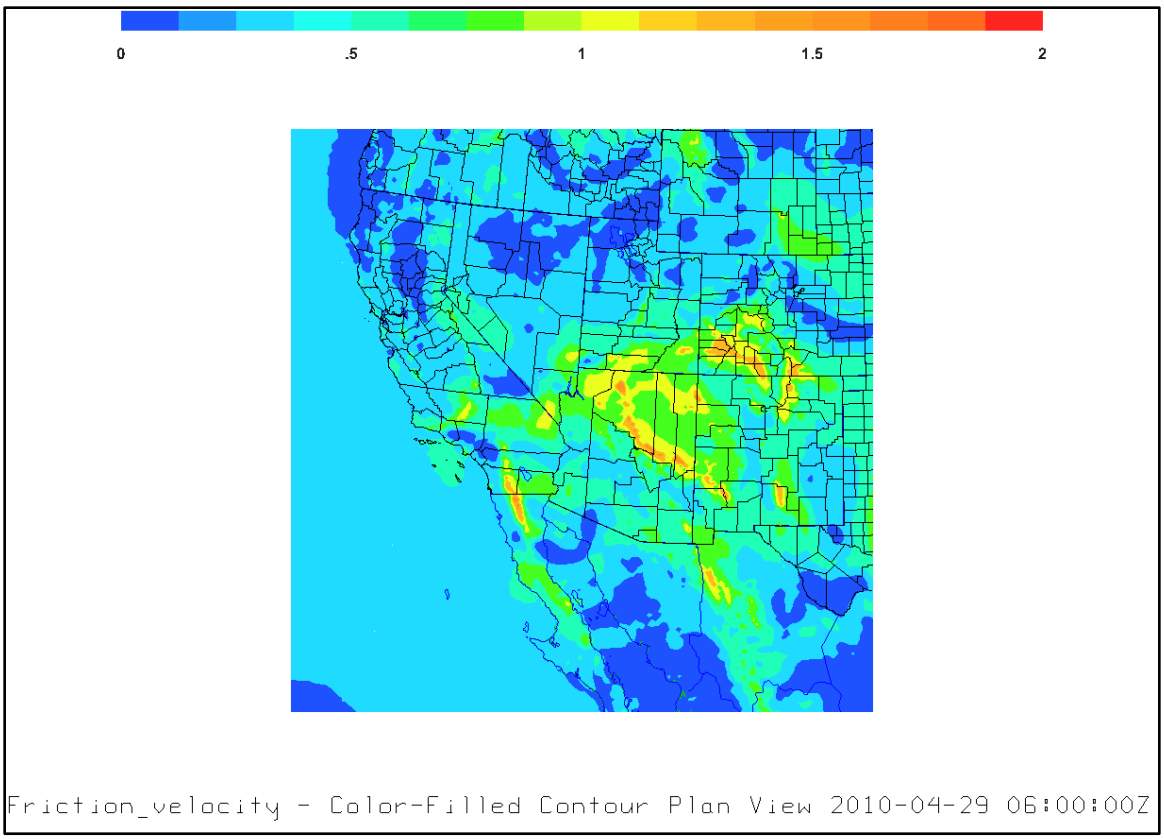


Figure 35: Friction velocities in meters/second from the NOAA NCEP North American Model with 12 kilometer grid spacing at 06Z April 29, 2010 (11 PM MST April 28).

3.0 Evidence-Ambient Air Monitoring Data and Statistics

PM_{10} concentrations that exceeded the level of the twenty-four-hour PM_{10} NAAQS were monitored across a broad geographical area of Colorado on April 28 and 29, 2010. On Wednesday April 28, 2010, exceedances greater than 150 $\mu g/m^3$ were recorded at the Adams State College ("ASC") monitor in Alamosa with a concentration of 285 $\mu g/m^3$, the Alamosa Municipal Building ("Muni") monitor with a concentration of 236 $\mu g/m^3$, and the Pagosa Springs School monitor with a concentration of 181 $\mu g/m^3$. Additionally on April 28, 2010, an exceptionally high sample (greater than the 99th percentile for the site) was recorded at the PM_{10} monitor in Mt. Crested Butte (123$\mu g/m^3$). On Thursday April 29, 2010, exceedances greater than 150 $\mu g/m^3$ were recorded at the Pagosa Springs School monitor with a concentration of 162 $\mu g/m^3$ and the Durango monitor with a concentration of 226 $\mu g/m^3$. Additionally on April 29, 2010, high samples were taken at the Alamosa PM_{10} monitors at Adams State College (92$\mu g/m^3$) and the Municipal Building (94$\mu g/m^3$). These high values would not have occurred if not for the following: (a) dry soil conditions over southeastern Utah, northeastern Arizona, portions of extreme northwestern New Mexico, and portions of southern Colorado with 30-day precipitation totals below the thresholds for blowing dust; (b) a strong surface and upper-level low pressure system that caused widespread strong gusty winds through a deep layer of the atmosphere over the area of concern; and (c) friction velocities over the desert regions of northwest New Mexico, Utah, Arizona and much of Colorado that were high enough to allow entrainment of dust from natural sources with subsequent transport of the dust into (or within) Colorado in strong, southwesterly winds. These exceedances and other high concentrations across Colorado are plotted on the maps for April 28 and 29, 2010, in Figure 1 and Figure 2, respectively. The high values on both days were the consequence of strong southwesterly prefrontal surface winds over dry soils which caused significant blowing dust across much of Arizona, northwest New Mexico, southeast Utah and southwest Colorado. These winds were the result of a significant surface low pressure and surface cold front associated with a major upper-level trough that was moving across the Western United States.

Section 2 provides the meteorological evidence for the spatial extent of this regional blowing dust event including the dust on snow data from the Colorado Dust-on-Snow (CODOS) network. The CODOS network clearly shows that the spatial extent of this dust storm was quite large, covering thousands of square miles.

The APCD reviewed PM_{10} monitoring data in Western Colorado in the path of the dust storm (see Section 3.1). The PM_{10} concentrations at affected sites were compared using time series plots for a number of days pre and post event (see Figure 52). The PM_{10} time series graphs clearly show that the regional blowing dust storm adversely affected the air quality in Alamosa, Pagosa Springs and Durango on April 28 and 29, 2010. PM_{10} samples the day before and the day two days after the event were typical of samples at each affected site.

3.1 Historical Fluctuations of PM_{10} Concentrations in Alamosa, Pagosa Springs, and Durango

This evaluation of PM_{10} monitoring data for sites affected by the April 28-29, 2010, event was made using valid samples from hi-vol PM_{10} samplers in Alamosa, Pagosa Springs, and Durango from 2005 through 2011. APCD has been monitoring PM_{10} concentrations in these areas since

1985. On-going data collection at all the sites affected by the event began in 2005; therefore, the data in this analysis is from January 2005 through the end of 2011. The overall data summary for the affected sites is presented in Table 21 with all data values in $\mu g/m^3$:

Table 21: PM_{10} Monitoring Data Summary (Affected Sites)

	Alamosa ASC	*Alamosa Muni*	*Pagosa Springs*	*Mt. Crested Butte*	*Durango*
04/28/10	**285**	**236**	**181**	**123**	**n/a**
04/29/10	**92**	**94**	**162**	**28**	**226**
Mean	22.1	27.9	22.7	20.8	20.7
Median	18	23	20	17	18
Mode	16	20	16	11	16
SD	24.0	26.8	17.0	14.6	18.8
Variance	578.3	716.4	290.6	213.5	355.3
Minimum	1	1	2	1	3
Maximum	473	635	349	168	320
Count	2214	2168	2287	2262	811

Table 21 demonstrates the spatial scope of this event, addressed elsewhere in this document, was broad and had an impact on PM_{10} concentrations at multiple sites covering an extensive geographical area. Since the event will affect attainment status of only Alamosa, Pagosa Springs, and Durango only these data sets will be discussed in detail. The attainment status of the other site (Mt. Crested Butte) will not be affected by this event. It is a certainty that the sampler in Mt. Crested Butte was affected by the event to the same extent as Alamosa, Pagosa, and Durango and so it is included here to help define the geographical extent of the affected area. A snapshot summary of data from all those sites affected by the event is presented in Table 22, along with the approximate percentile value that data point represents for each site for their unique historical data sets, for the month of the event (every sample in any April), and for the year of the event. All percentile calculations presented anywhere in this section were made using the entire dataset, including known high wind events. There is no difference between the two datasets (with and without high wind events) in regards to percentile calculations. All data sets were restricted to valid samples from the interval 2005 – 2011.

Table 22: Data Summary between 2005 and 2011

Evaluation	**Alamosa ASC**	**Alamosa Muni**	**Pagosa Springs**	**Mt. Crested Butte**	**Durango**
4/28/2010	285 $\mu g/m^3$	236 $\mu g/m^3$	181 $\mu g/m^3$	123 $\mu g/m^3$	n/a
4/29/2010	92 $\mu g/m^3$	94 $\mu g/m^3$	162 $\mu g/m^3$	28 $\mu g/m^3$	226 $\mu g/m^3$
Overall	99.68%	Max Value	Max Value*	99.87%	99.98%
All April	98.95%	Max Value	Max Value*	99.37%	99.96%
2010	#N/A	Max Value	Max Value*	99.72%	#N/A

*The 'Max Value' notation refers to the 28 April sample value

This event produced the maximum value in three of the five datasets and exceeded the 98th% value of any evaluation criteria for the other two sites. The overall magnitude and broad

geographical extent of affected sites suggests that there was a common contribution to each sample from other than local sources.

Those data sets for sites with samples for which exclusion is being requested are further summarized by month. As with previous submittals these summaries (see charts, below) present no obvious 'season'; PM_{10} levels at any particular site in Colorado do not necessarily fluctuate by season. Of greater importance affecting day-to-day, typical PM_{10} concentrations are local sources, e.g. road sanding and sweeping, local burning from agriculture and residential heating, vehicle contributions via road dust, unpaved lots or roads, etc. While the historic monthly mean values for the affected sites can be higher during the winter and spring months there is little month-to-month variation. Additionally, some of the sites exhibit monthly medians over this period (winter/spring) that are generally lower than other months of the year. This time frame (winter and early spring) is that which is most likely to experience the regional meteorological and dry soil conditions exhibited during this event and discussed elsewhere in this document. Although the maximum values for these months (winter/spring) are the highest in the data set the 'typical' data (i.e. day-to-day, reflective of local conditions) are similar or lower than the same 'typical' data for the rest of the year. The summary data for the month of April (all samples in any April) and for 2010 for Alamosa ASC, Alamosa Muni, Pagosa Springs, and Durango are presented in Table 23:

Table 23: Month and Year PM_{10} Monitoring Data Summary

Site:	Alamosa ASC		Pagosa Springs		Durango	
	April	2010	April	2010	April	2010
Mean	27.9	23.5	31.2	24.3	34.4	25.3
S.E.	2.7	1.5	2.6	1.6	6.2	3.6
Median	18	19	24	18	19.5	18
Mode	11	20	23	18	13	18
SD	38.0	26.5	36.9	28.7	51.4	37.7
Minimum	1	2	2	4	6	3
Maximum	295	285	349	349	320	320
Count	192	314	195	310	68	111

Alamosa Adams State College – 080030001

The PM_{10} sample on April 28, 2010, at Alamosa ASC of 285 $\mu g/m^3$ exceeds the 99th percentile value for all April data, exceeds the 99th percentile value for all 2010 data, and is greater than the 99th percentile value (97 $\mu g/m^3$) for the entire dataset. Overall, this sample is the fifth highest sample in the entire data set and the largest sample in 2010. The four samples greater than the event sample are all associated with high wind events. There are 2214 samples in this dataset. The sample of April 28, 2010, clearly exceeds the typical samples for this site.

Figure 36 through Figure 39 graphically characterize the Alamosa ASC PM_{10} data. The first is a simple time series; every sample in this dataset (2005 – 2011) greater than 150 $\mu g/m^3$ is identified. Note the overwhelming number of samples occupying the lower end of the graph; an interested reader can count the number of samples greater than 100 $\mu g/m^3$. Of the 2214 samples in this data set less than 1% are greater than 100 $\mu g/m^3$.

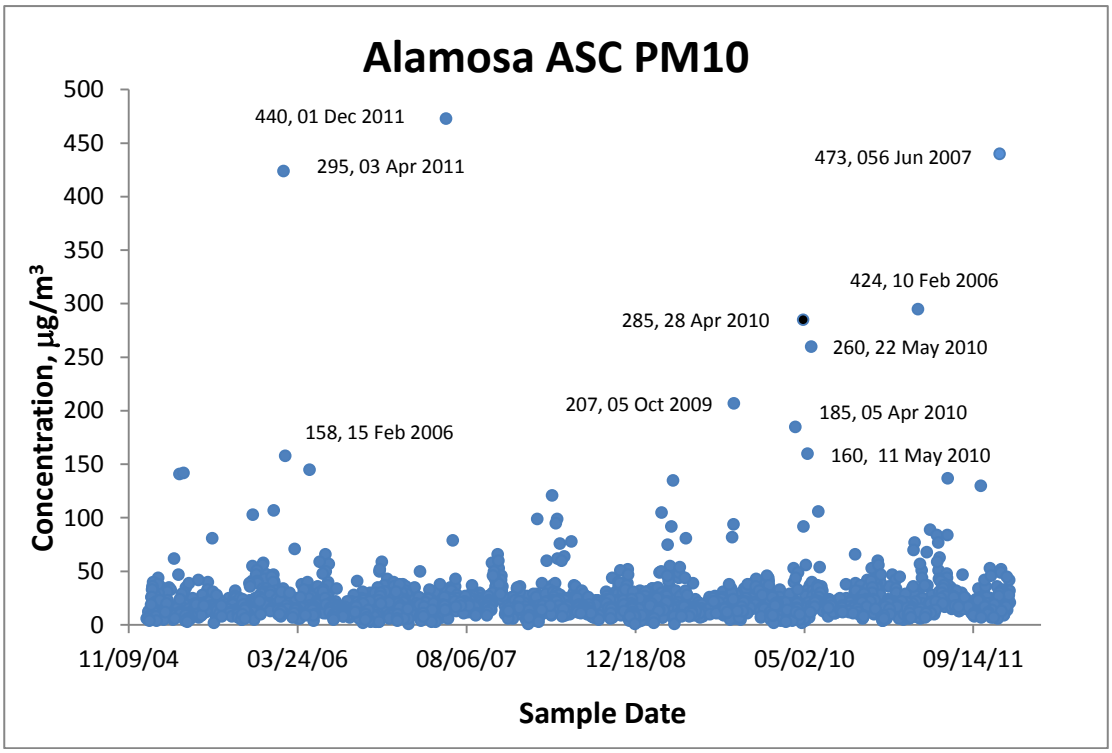


Figure 36: Alamosa ASC PM_{10} Time Series

Figure 37 is a simple histogram, demonstrating the overwhelming weight of samples on the low end of the curve. Over 60% of the samples in this data set are less than 20 µg/m^3. Even in the highly variable month of April, the month with the largest sample standard deviation, 90% of the samples are less than 50 µg/m^3. Clearly the sample on April 28, 2010, exceeds what is typical for this site.

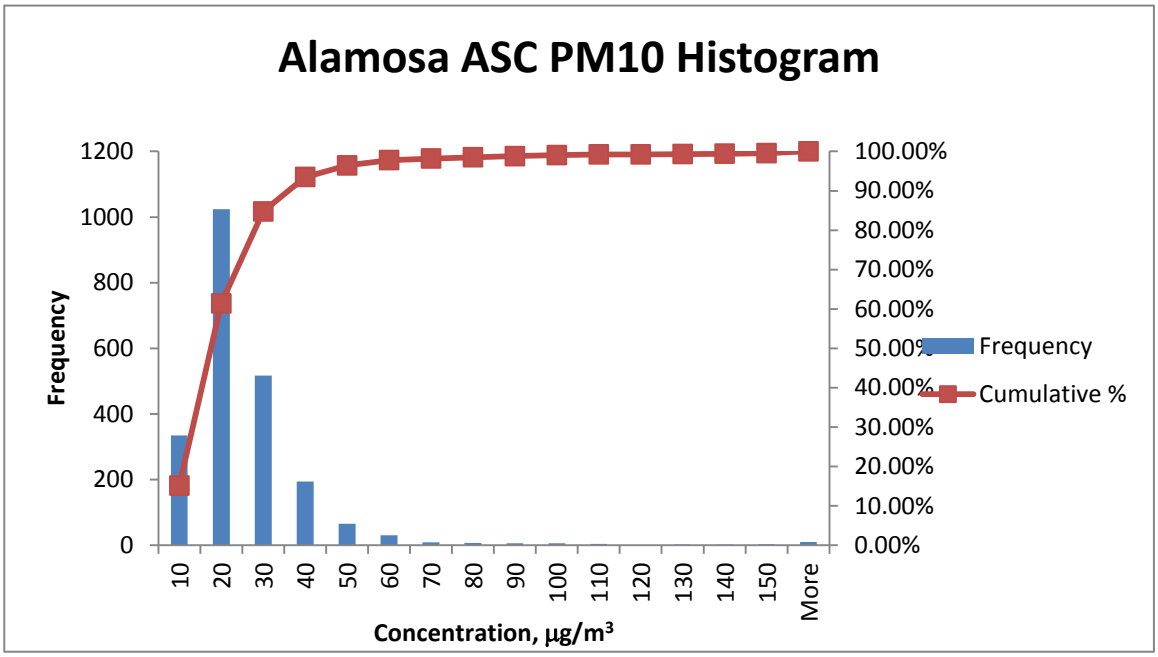


Figure 37: Alamosa ASC PM_{10} Histogram

The monthly box-whisker plot in Figure 38 highlights the consistency of the majority of data from month to month. Note the greater variability (wider inner-quartile range) and greater range of the data through the winter and early spring months that's accompanied by typically greater monthly maxima. Recall, this time period experiences a greater number of days with meteorological conditions similar to those experienced on April 28, 2010. Although these high values affect the variability and central tendency (average) of the dataset they aren't representative of what is typical at the site.

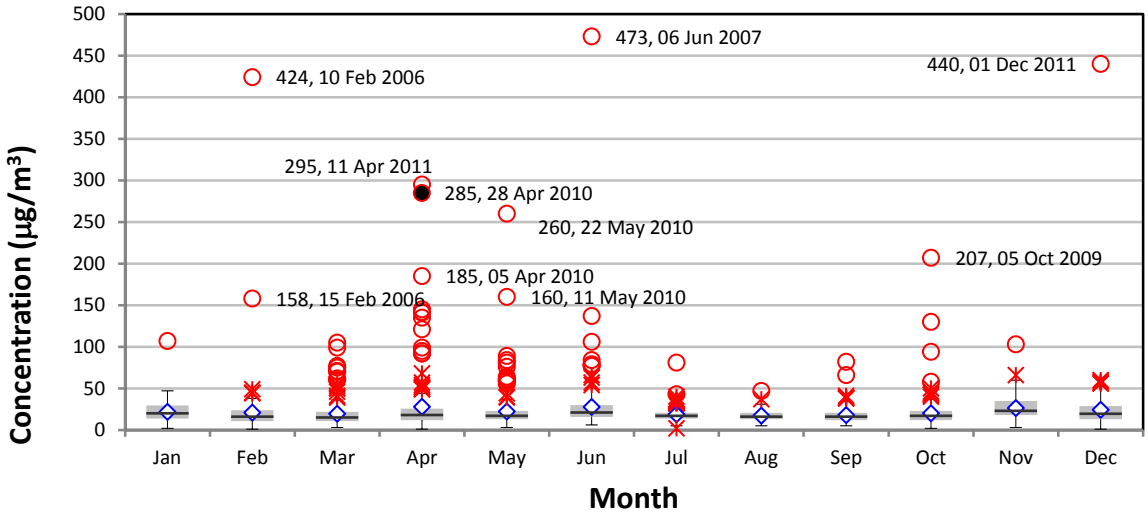


Figure 38: Monthly Alamosa ASC PM_{10} Box and Whisker Plot

The box and whisker plots graphically represent the overall distribution of each data set including the mean (◇), the inner quartile range (IQR, defined to be the distance between the 75th% and 25th%), the median (represented by the horizontal black line) and two types of outliers identifed in these plots: outliers greater than 75th% +1.5*IQR (✳)and outliers greater than 75th% + 3*IQR (○). The outliers that satisfy the last criteria and are greater than 150 µg/m^3 are labeled with sample value and sample date. Each of these outliers is associated with a known high-wind event similar to that of 05 April.

The presence of the extreme values distorts the graph, losing definition and distorting information presented across the range where the majority of data resides. The same plot graphed to 100 µg/m^3, which includes almost 99% of all the data, is presented in Figure 39.

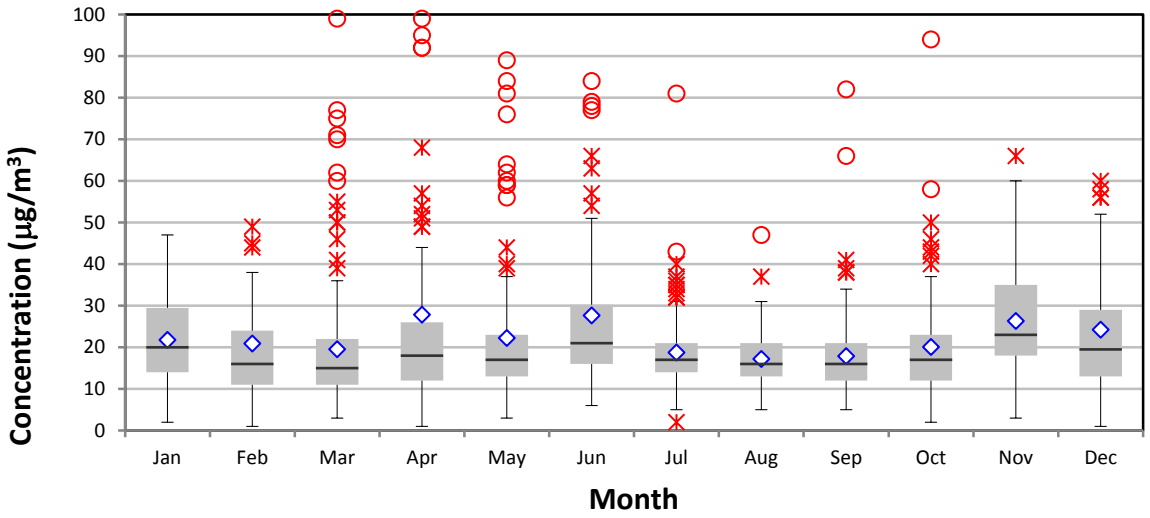


Figure 39: Monthly Alamosa ASC PM_{10} Box and Whisker Plot (expanded view)

Note the degree to which the April (among other months) data is skewed. The mean (27.8 µg/m^3) is greater than the 75th percentile value (26 µg/m^3). This is due to the presence of a handful of extreme values and can create the perception that those months experiencing these high wind events are somehow 'dirtier' than other months of the year. This data exposes that perception as flawed as the typical data is similar to every other month of the year. The sample of April 28, 2010, clearly exceeds the typical data at this site.

Alamosa Municipal – 080030003

The PM_{10} sample on April 28, 2010, at Alamosa Muni of 236 µg/m^3 exceeds the 99th percentile value for all April data, is the maximum value for all 2010 data, and is greater than the 99th percentile value (110 µg/m^3) for the entire dataset. Overall, this sample is the fifth highest sample in the entire data set and the largest sample in 2010. The four samples greater than the event sample are all associated with high wind events. There are 2168 samples in this dataset. The sample of April 28, 2010, clearly exceeds the typical samples for this site.

Figure 40 through Figure 43 graphically characterize the Alamosa Muni PM_{10} data. The first is a simple time series, the sample of April 28, 2010, is identified. Note the overwhelming number of samples occupying the lower end of the graph; an interested reader can count the number of samples greater than 100 µg/m^3. Of the 2214 samples in this data set less than 1% are greater than 110 µg/m^3.

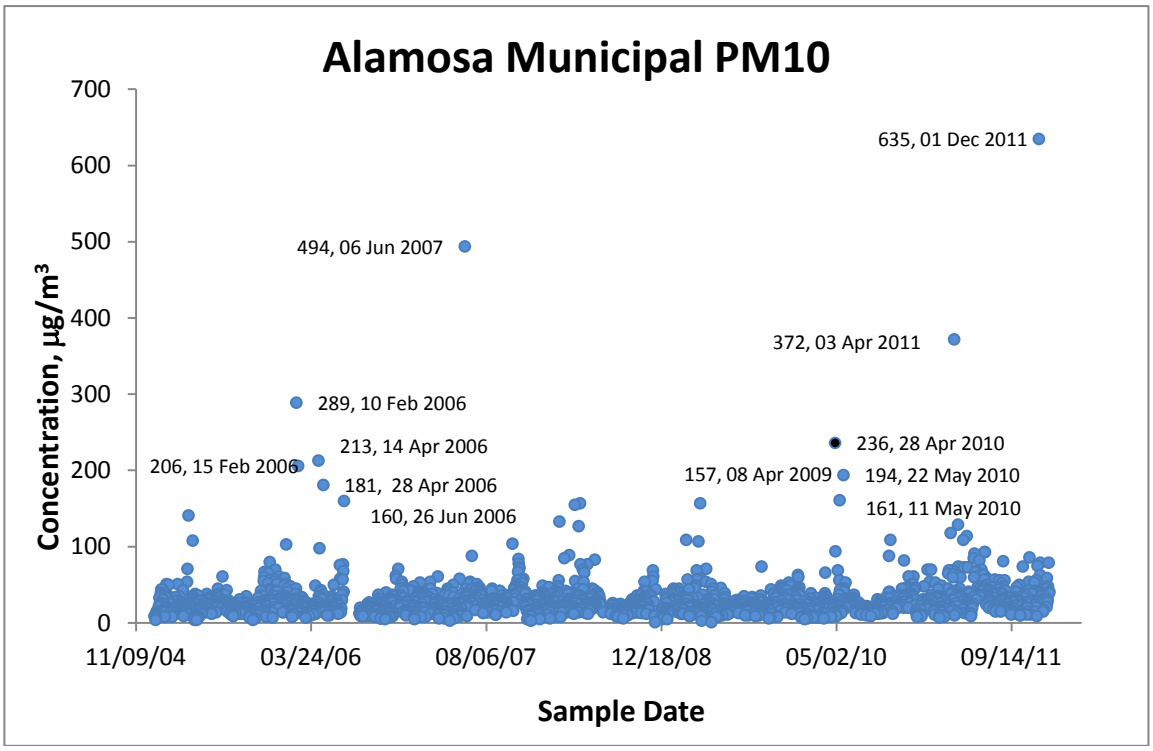


Figure 40: Alamosa Municipal PM_{10} Time Series

Figure 41 is a simple histogram, demonstrating the overwhelming weight of samples on the low end of the curve. Over 60% of the samples in this data set are less than 20 µg/m^3. Even in the highly variable month of April, the month with the largest sample standard deviation, 90% of the samples are less than 50 µg/m^3. Clearly the sample on April 28, 2010, exceeds what is typical for this site.

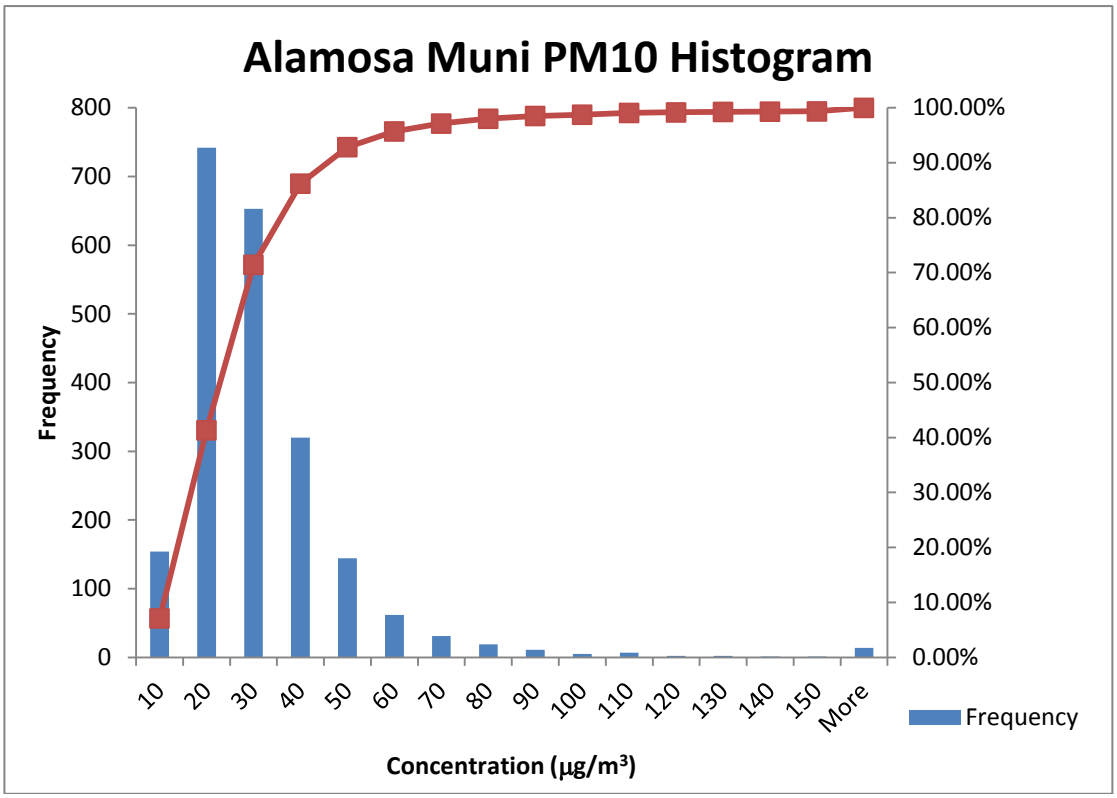


Figure 41: Alamosa Municipal PM_{10} Histogram

The monthly box-whisker plot in Figure 42 highlights the consistency of the majority of data from month to month. Note the greater variability (wider inner-quartile range) and greater range of the data through the winter and early spring months that's accompanied by typically greater monthly maxima. Recall, this time period experiences a greater number of days with meteorological conditions similar to those experienced on April 28, 2010. Although these high values affect the variability and central tendency (average) of the dataset they aren't representative of what is typical at the site.

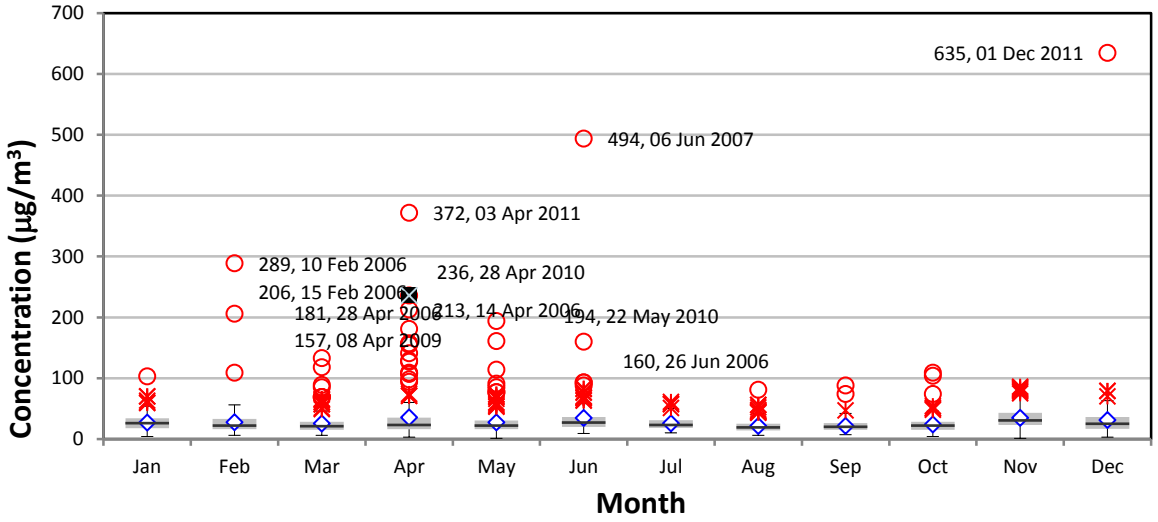


Figure 42: Monthly Alamosa Muni PM_{10} Box and Whisker Plot

The presence of the extreme values distorts the graph, losing definition and distorting information presented across the range where the majority of data resides. The same plot graphed to 100 µg/m^3, which includes almost 99% of all the data, is presented in Figure 43.

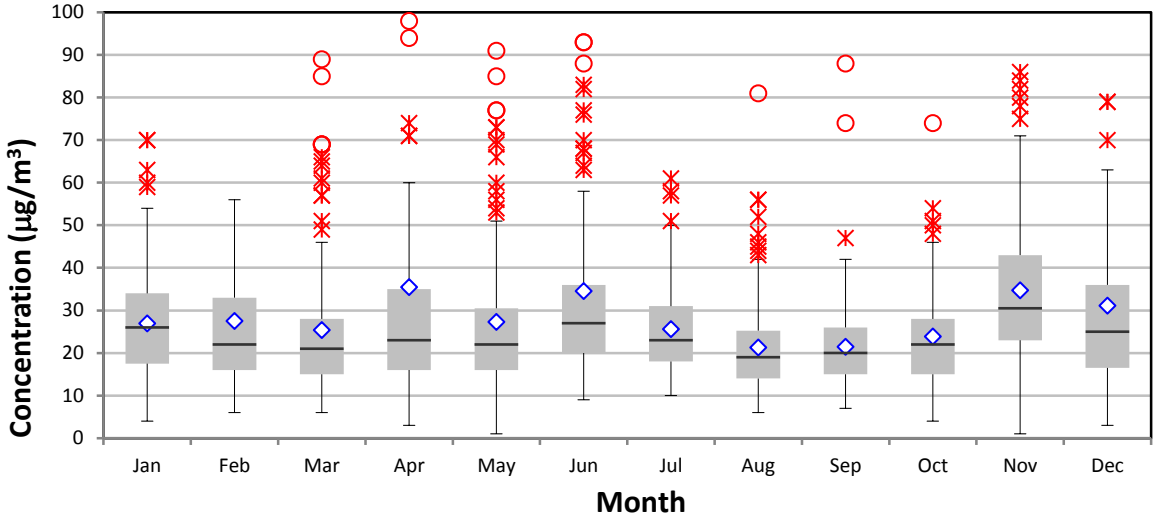


Figure 43: Monthly Alamosa Muni PM_{10} Box and Whisker Plot (expanded view)

Note the degree to which the April (among other months) data is skewed. The mean (35.4 µg/m^3) is greater than the 75th percentile value (35 µg/m^3). This is due to the presence of a handful of extreme values and can create the perception that those months experiencing these high wind events are somehow 'dirtier' than other months of the year. This data exposes that perception as flawed as the typical data is similar to every other month of the year. The sample of April 28, 2010, clearly exceeds the typical data at this site.

Pagosa Springs Middle School - 080070001

The PM_{10} samples on April 28 and 29, 2010, at Pagosa Springs of 181 µg/m^3 and 162 µg/m^3, respectively, both exceed the 97th percentile value for any April, exceed the 99th percentile value for any data in 2010, and exceed the 99th percentile value for all data in this data set. There are 2287 samples in this dataset. The samples of April 28 and 29, 2010, clearly exceed the typical samples for this site.

Figure 44 through Figure 47 graphically characterize the Pagosa Springs PM_{10} data. The first is a simple time series, the samples of April 28 and 29, 2010, have been identified. Note the overwhelming number of samples occupying the lower end of the graph; an interested reader can count the number of samples greater than 100 µg/m^3. Of the 2287 samples in this data set less than 1% are greater than 110 µg/m^3.

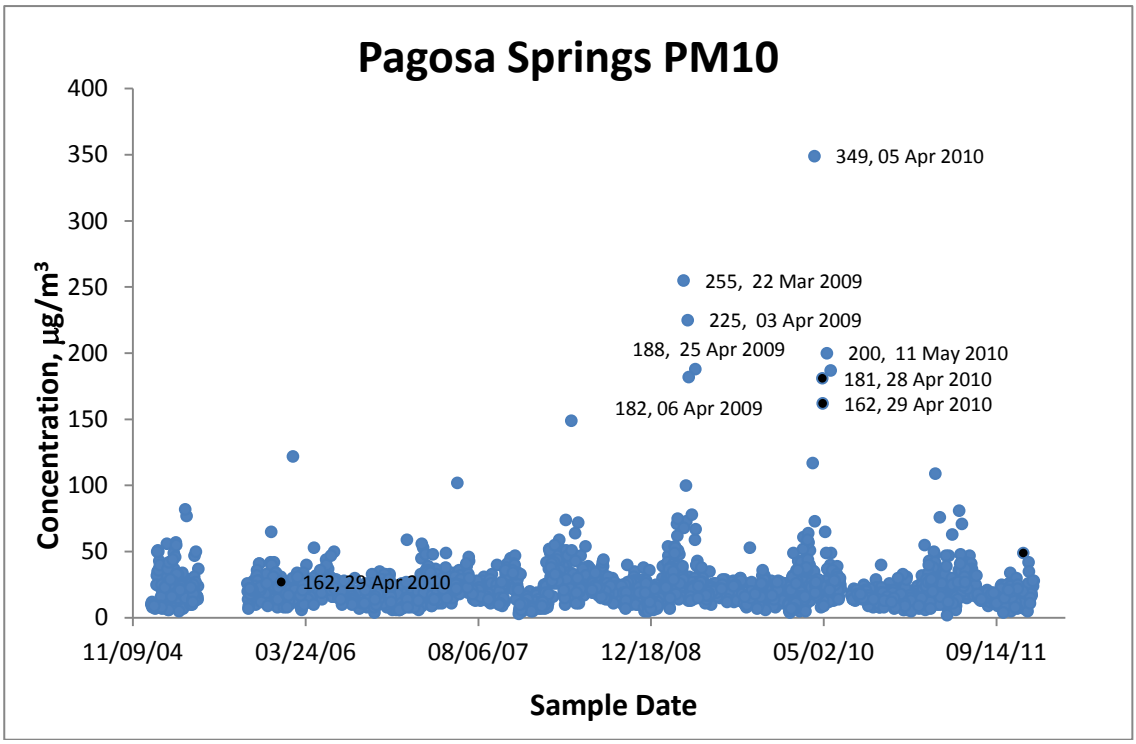


Figure 44: Pagosa Springs ASC PM_{10} Time Series

Figure 45 is a simple histogram, demonstrating the overwhelming weight of samples on the low end of the curve. Over 50% of the samples in this data set are less than 20 µg/m^3. Even in the highly volatile month of April the month with the largest sample standard deviation, 95% of the samples are less than 50 µg/m^3. Clearly the samples on April 28 and 29, 2010, exceed what is typical for this site.

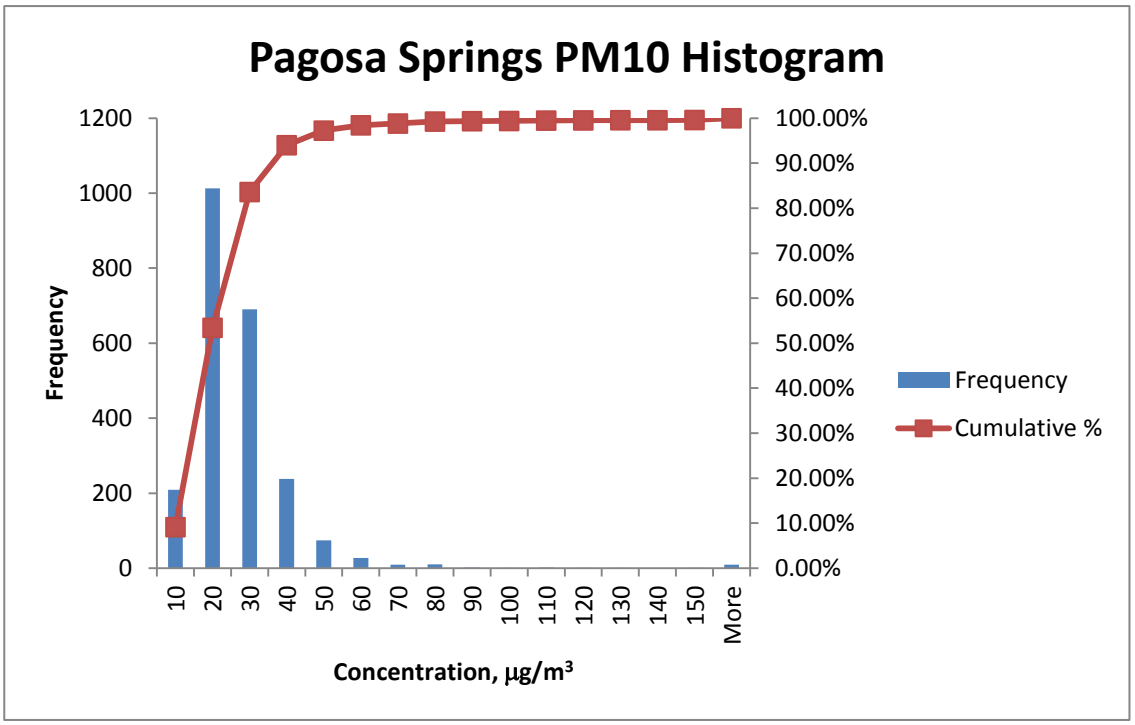


Figure 45: Pagosa Springs ASC PM10 Histogram

The monthly box-whisker plot in Figure 46 highlights the consistency of the majority of data from month to month. Note the greater variability (wider inner-quartile range) and greater range of the data through the winter and early spring months that's accompanied by typically greater monthly maxima. Recall, this time period experiences a greater number of days with meteorological conditions similar to those experienced on April 28 and 29, 2010. Although these high values affect the variability and central tendency of the dataset they aren't representative of what is typical at the site.

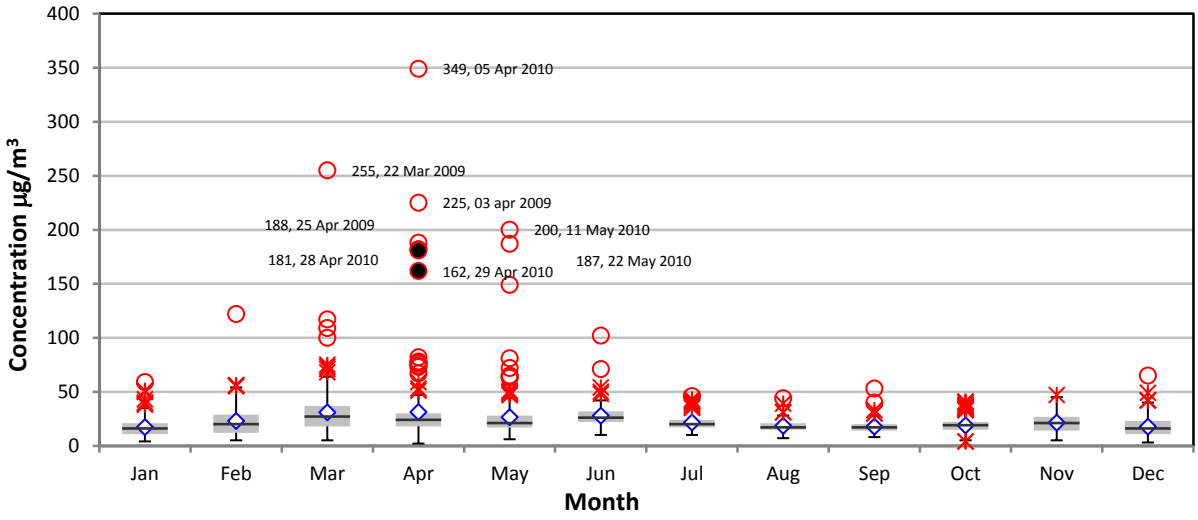


Figure 46: Monthly Pagosa Springs PM_{10} Box and Whisker Plot

As with the previous box and whisker plots outliers greater than 150 µg/m^3 are identified by concentration and date. Each of these outliers is associated with a known high-wind event similar to that of April 28 and 29, 2010. The presence of the extreme values distorts the graph, losing definition and distorting information presented across the range where the majority of data resides. The same plot graphed to 100 µg/m^3, which includes almost 99% of all the data, is presented in Figure 47.

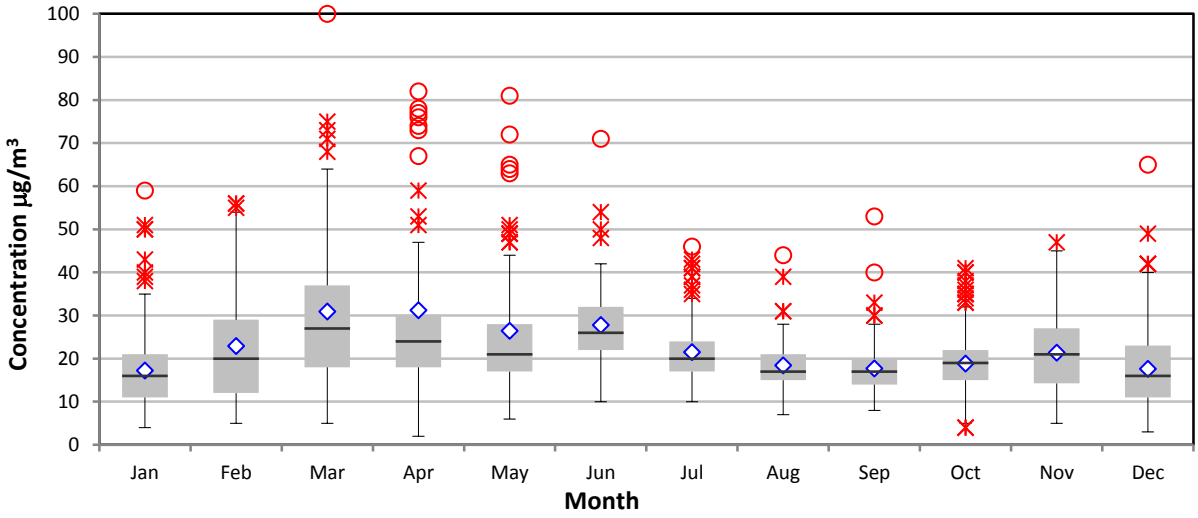


Figure 47: Monthly Pagosa Springs PM_{10} Box and Whisker Plot (expanded view)

Durango River City Hall - 080670004

The PM_{10} sample on April 29, 2010, at Durango of 262 µg/m^3 is the 2nd largest sample in the data set, is the 2nd largest in any April and is the 2nd largest sample in all of 2010. There are 811 samples in this dataset. The sample of 29 April clearly exceeds the typical samples for this site.

Figure 48 through Figure 51 graphically characterize the Durango PM_{10} data. The first is a simple time series graph, every sample in this dataset (2005 – 2011) greater than 150 µg/m^3 is identified. As with the previous time series an overwhelming number of samples occupy the lower end of the graph, over 99% of all the samples in this dataset are less than 75 µg/m^3. Of the 811 samples in this data set exactly four are greater than 150 µg/m^3; all four of these samples are related to high wind events similar to this event. Clearly the April 29, 2010, sample is not typical of samples at this site.

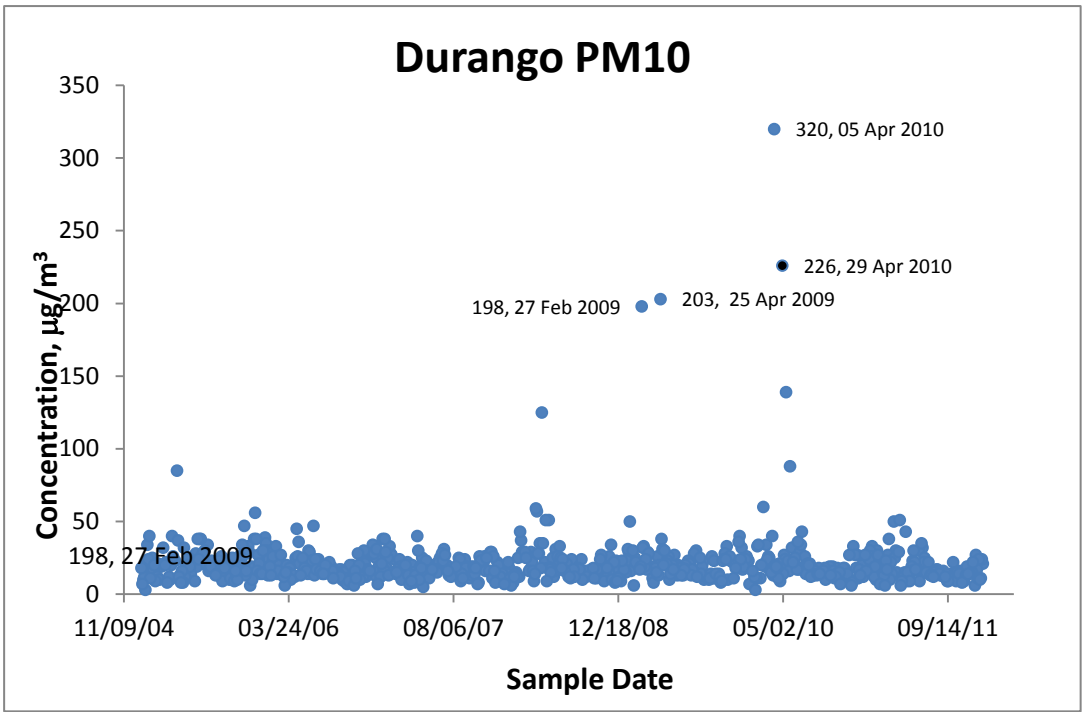


Figure 48: Durango PM_{10} Time Series

Figure 49 is a simple histogram, demonstrating the overwhelming weight of samples on the low end of the curve. Almost 50% of the samples in this data set are less than 20 µg/m^3. Even in the highly volatile month of April, the month with the largest sample standard deviation, 90% of the samples are less than 50 µg/m^3. Clearly, the sample on April 29, 2010, exceeds what is typical for this site.

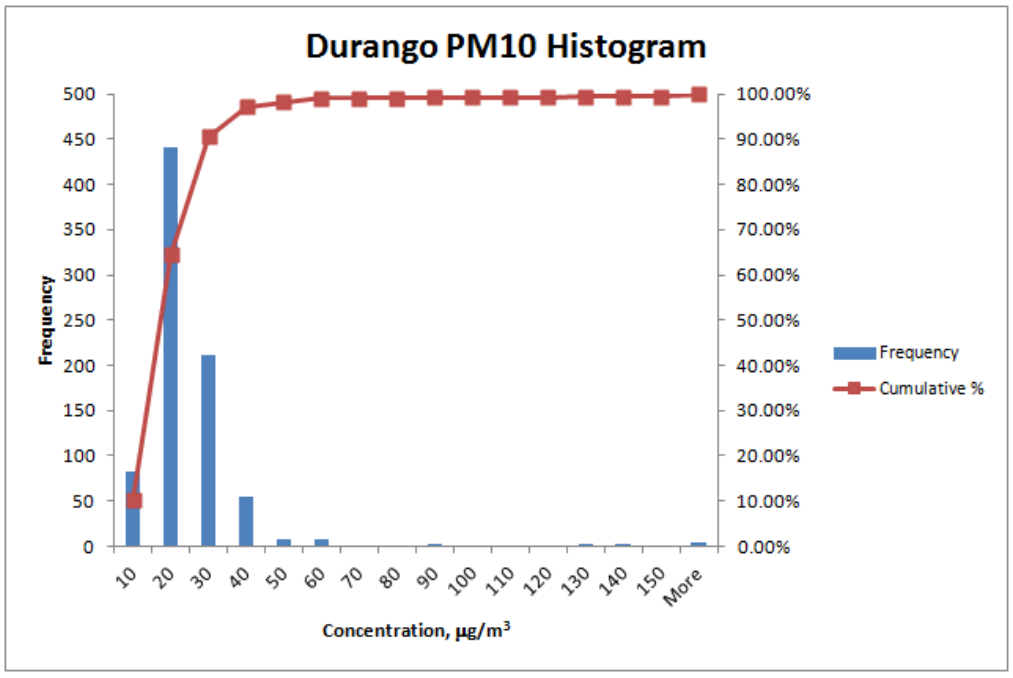


Figure 49: Durango PM_{10} Histogram

The monthly box-whisker plot, below, highlights the consistency of the majority of data from month to month. Note the greater variability (wider inner-quartile range) and greater range of the data through the winter and early spring months that's accompanied by typically greater monthly maxima. Recall, this time period experiences a greater number of days with meteorological conditions similar to those experienced onApril 29, 2010. Although these high values affect the variability and central tendency of the dataset they aren't representative of what is typical at the site.

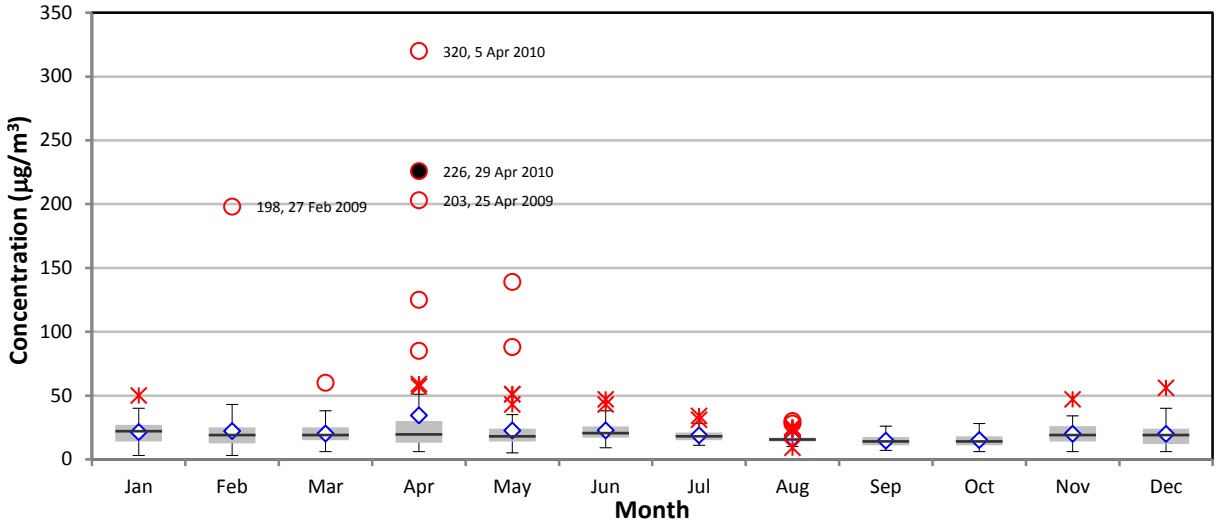


Figure 50: Monthly Durango PM_{10} Box and Whisker Plot

As with the previous box and whisker plots outliers greater than 150 µg/m^3 are identified by concentration and date. Each of these outliers is associated with a known high-wind event similar to that of April 29, 2010. The presence of the extreme values distorts the graph, losing definition and distorting information presented across the range where the majority of data resides. The same plot graphed to 100 µg/m^3, which includes almost 99% of all the data, is presented in Figure 51.

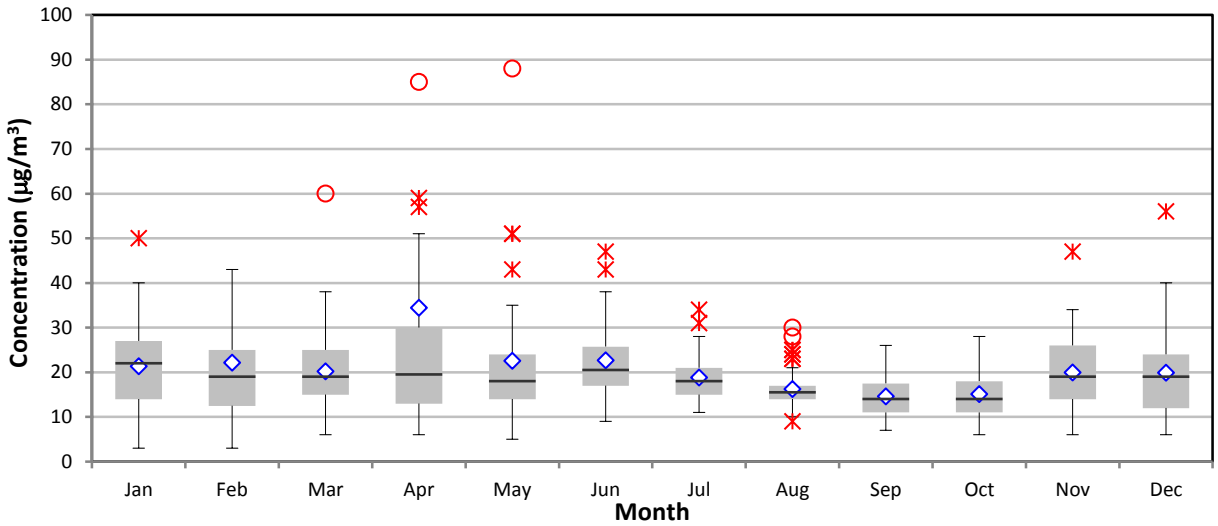
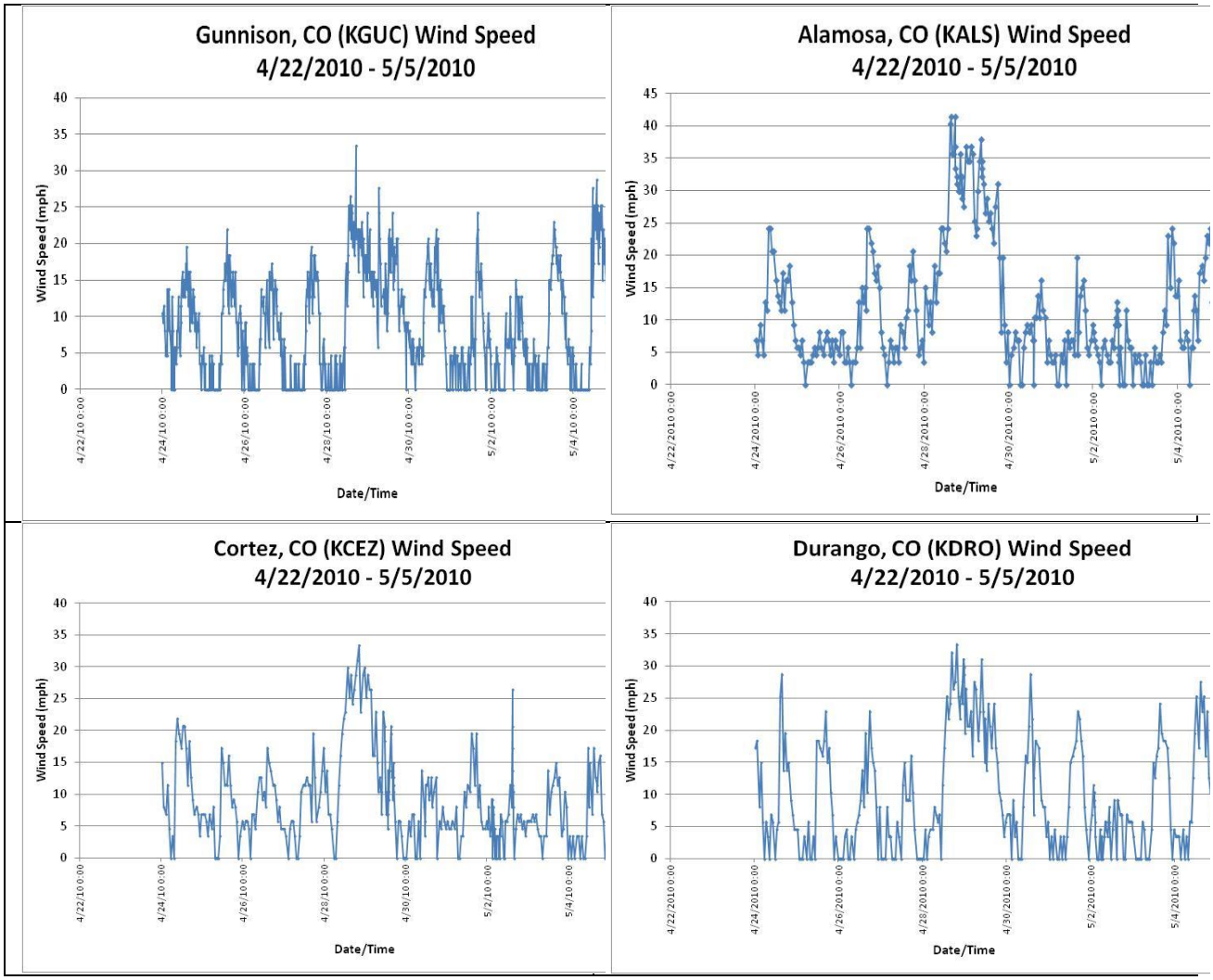


Figure 51: Monthly Durango PM_{10} Box and Whisker Plot (expanded view)

3.2 Wind Speed Correlations

Wind speeds around the region (Southwest Colorado, Northeast Arizona, Northwest New Mexico) increased early in the morning April 28, 2010, and stayed high through late afternoon of April 29, 2010, gusting to speeds in excess of 60 mph. The charts in Figure 52 display wind speed (mph) as a function of date from six widely dispersed stations across the region. Every one of these stations, despite being in completely disparate locations, exhibits nearly the same behavior in regards to the sustained high winds from April 28 and 29, 2010.



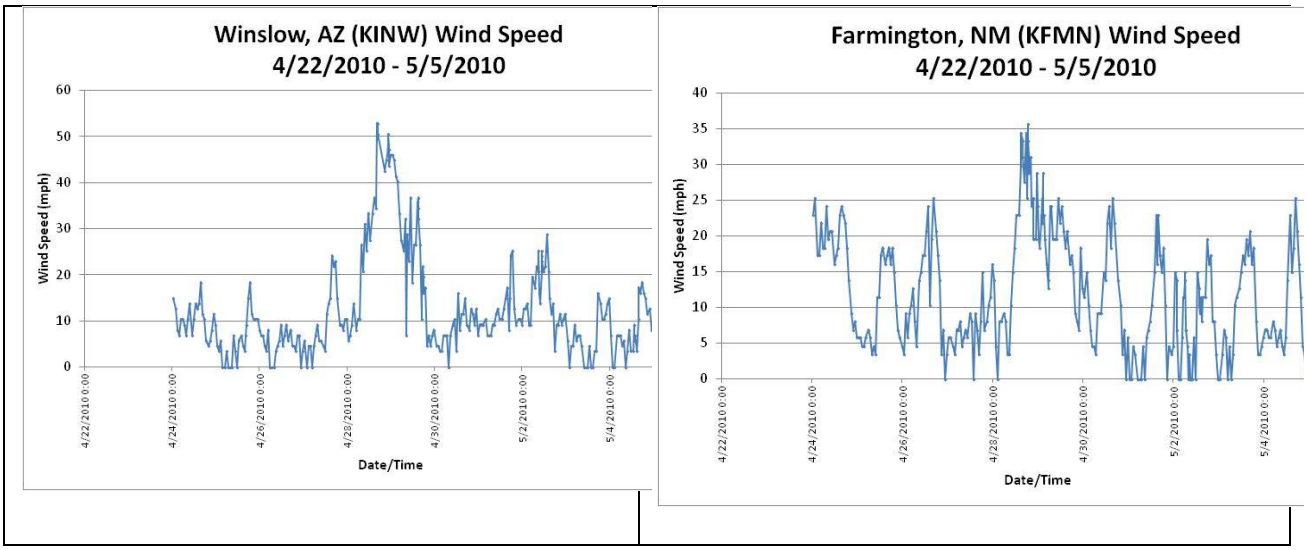


Figure 52: Wind Speed Graphs for Select Areas in Southwest Colorado, Northeast Arizona, and Northwest New Mexico (Wind Speed data courtesy of University of Utah, Mesowest)

Figure 53 plots PM_{10} concentrations from the affected sites for a small number of days prior to and following the sample(s) of April 28 and 29, 2010.

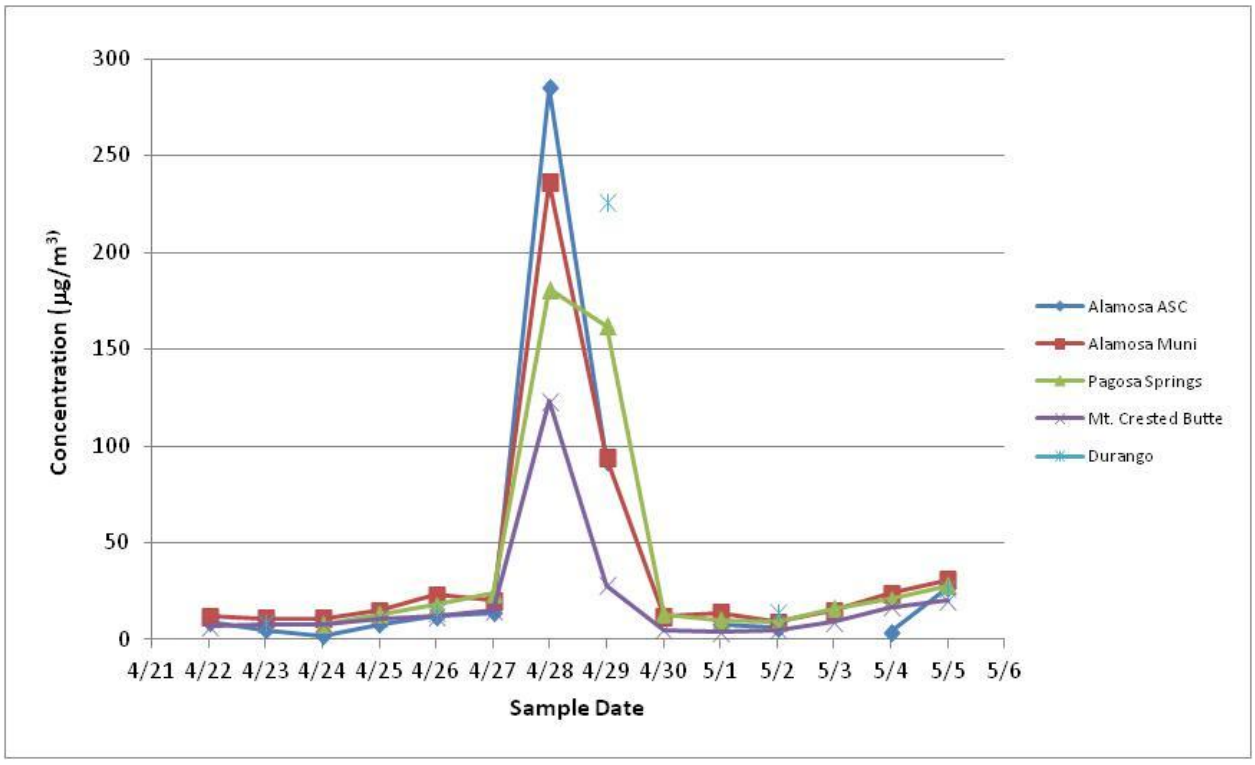


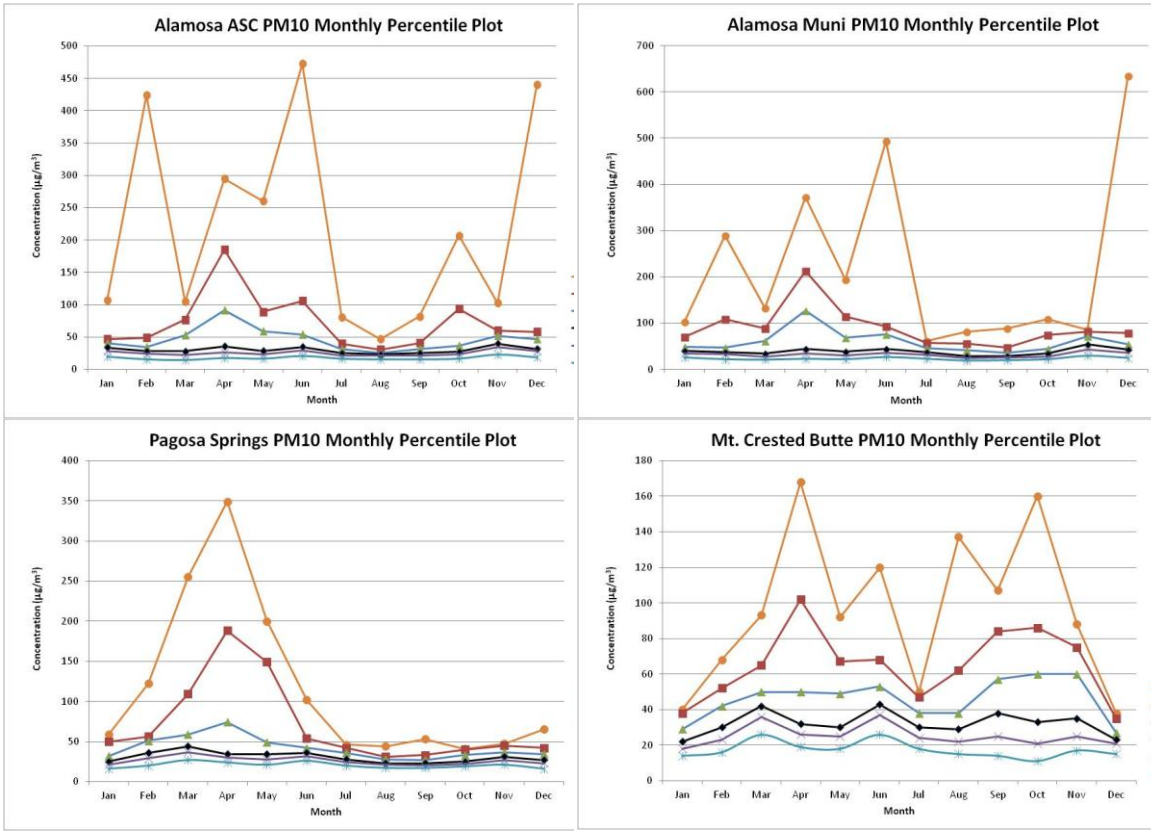
Figure 53: PM_{10} Concentrations, Select Affected Sites (04/22/2010 – 05/05/2010)

Figure 53 precisely mimics the plots for wind speed in Figure 52. Although not every sample from April 28 and 29, 2010, is in excess of 150 µg/m^3 the elevated concentrations are clearly associated with the elevated wind speeds. Given the spatial dislocation of the sites (meteorological and PM_{10}) the relationship between the two data sets would suggest that the

regional high winds had a similar effect on PM_{10} samples in across a broad spatial region in Colorado from April 28 and 29, 2010.

3.3 Percentiles

Monthly percentile plots for each site demonstrate a high degree of association between monthly median values and relatively high monthly percentile values, e.g. the r^2 value between the Alamosa ASC monthly 90th percentile and the Alamosa ASC monthly median is 0.699. The same value(s) for Pagosa Springs and Durango are 0.827 and 0.613, respectively. As the percentile value decreases (i.e. 85%, 75%, etc) the correlation between those values and the median increases sharply. The monthly percentile plots for each site are presented in Figure 54 (the black line is the 85th percentile):



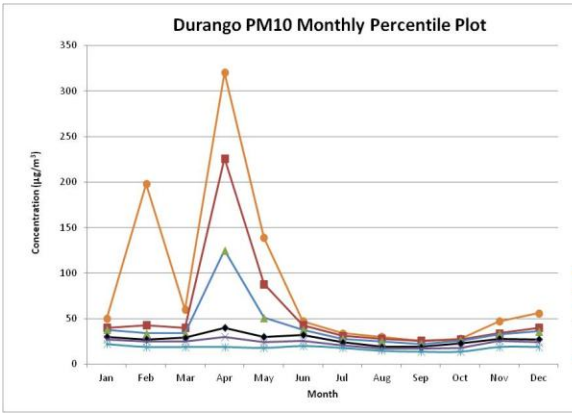


Figure 54: Monthly Percentile Plots for Alamosa ASC, Alamosa Muni, Durango, Mt Crested Butte, and Pagosa Springs

It is certainly the case that monthly median values are indicative of typical, day to day concentrations. Additionally, there is a range of samples that are a product of normal variation subject to typical, day to day local effects. This range may be restricted to percentile values that are well correlated with the median. For these data sets a conservative estimate of the percentile value that is reflective of typical, day to day variation is the 90th percentile value. A different way to phrase this may be that most of the variability in the monthly 90th percentile values can be explained by the variation in monthly medians. If we take the 90th percentile as an estimate of the maximum contribution that could have come from local sources then the portion of the sample concentration remaining would be due to the event. Nearly all of the variation in the monthly 84th percentile values can be explained by the variation in monthly medians; for these five sites the correlation between the median and 84th percentile values vary from an $r^2 = 0.69$ (Mt. Crested Butte) to an $r^2 = 0.93$ (Alamosa Muni). Table 24 and Table 25 identify various percentile values for each site from all April data for both sample dates. The range estimate in the 'Est. Conc. Above Typical' column is derived using the difference between the actual sample value and the 90th percentile as the minimum event contribution estimate and the difference between the actual sample value and the 84th percentile as the maximum event contribution estimate.

Table 24: Various Percentile Values for Each Site from all April Data compared to April 28, 2010

Site	Event Day Concentration (April 28th) (µg/m^3)	April Median (µg/m^3)	April Average (µg/m^3)	April 75th % (µg/m^3)	April 84th % (µg/m^3)	April 90th % (µg/m^3)	Est. Conc. Above Typical (µg/m^3)
Alamosa ASC	**285**	18	27.8	26	**33**	**47**	**238 - 252**
Alamosa Muni	**236**	23	35.5	35	**42**	**60**	**176 - 194**
Pagosa Springs	**181**	24	34.0	30	**34**	**41**	**140 - 147**
Mt. Crested Butte	123	19	31.2	26	31	39	84 - 92
Durango	n/a	19	34.4	30	40	51	n/a

Table 25: Various Percentile Values for Each Site from all April Data compared to April 29, 2010

Site	Event Day Concentration (April 29th) (μg/m3)	April Median (μg/m3)	April Average (μg/m3)	April 75th % (μg/m3)	April 84th % (μg/m3)	April 90th % (μg/m3)	Est. Conc. Above Typical (μg/m3)
Alamosa ASC	92	18	27.8	26	33	47	45 - 59
Alamosa Muni	94	23	35.5	35	42	60	34 - 52
Pagosa Springs	**162**	24	34.0	30	**34**	**41**	**121 - 128**
Mt. Crested Butte	28	19	31.2	26	31	39	n/a
Durango	**226**	19	34.4	30	**40**	**51**	**175 - 186**

Clearly, there would have been no exceedance but for the additional contribution provided by the event.

Since the local anthropogenic sources are well controlled in Alamosa, Pagosa Springs, and Durango and the sustained surface wind speeds were well above 25 mph in the region of the dust storm, it follows that the dust was transported into the region on April 28 and 29, 2010. The size, extent, and origination of the blowing dust storm made the event not preventable and it could not be reasonably controlled. Statistical data clearly shows that but for this high wind blowing dust event Alamosa, Pagosa Springs, and Durango would not have exceeded the 24-hour NAAQS on April 28 and 29, 2010.

4.0 News and Credible Evidence

NEWS: Wed. April 28, 2010

Apr 28th @ 4:30 pm *in* *News* *by* *Scott Staley*

High winds have hit just about all of the Western Slope this afternoon. And in some cases the winds have become quite inconvenient. The **Daily Sentinel** reports that some Grand Junction residential and commercial trash customers won't have their trash picked up until Thursday, as high winds forced the closure of the Mesa County Landfill this morning. The city's recycling service was also forced to close because of the wind but should reopen tomorrow. Much of the western slope has been under a High wind warning which remains in effect until 9pm tonight. Then look for a drastic drop in temperatures tomorrow and Friday….
Source: **Daily Sentinel** (Posted 5:05p by Jim Kapp)

The Colorado Senate has endorsed adding a "zipper" lane on Interstate 70 to ease weekend traffic. The **Daily Sentinel** reports Senators unanimously passed a bill today that's aimed at prodding the Colorado Department of Transportation to move ahead with the idea. CDOT is already studying whether it's feasible to use moveable concrete barriers to temporarily add an extra eastbound lane, known as the "zipper lane"….
Source: **Daily Sentinel** (Posted 4:25p by Jim Kapp)

Dozens of people gathered in Clifton last night for a candlelight vigil to honor Buddy the dog, who was dragged to death on the Colorado National Monument this winter. According to **KJCT**the Lebers, who owned Buddy, hope that last night's vigil will help people remember not just Buddy, but other animals who are victims of neglect and cruelty….
Source: **KJCT** (Posted 4:26p by Jim Kapp)

http://coloradoradio.com/2010/04/28/news-wed-april-28-2010-2/

NEWS: Friday April 30, 2010

Apr 30th @ 6:41 am *in* *News* *by* *Scott Staley*

A Freeze Watch remains in effect from late tonight through Saturday morning. Freezing temperatures are expected. If plants and trees are left unprotected they risk freeze damage. The National Weather Service says sub-freezing temperatures could kill crops and other sensitive vegetation.
Source: **National Weather Service** (Posted 6:41a)

This freeze is the last thing Mattics Orchards needs right now as late night winds Wednesday and snow early yesterday have caused serious damage to some of their property, leaving crops exposed to the cold air. Orchard owner Pete Mattics estimates the damage between $6,000-$10,000. A greenhouse was destroyed, a chunk of roof from a packing shed knocked down power lines, disabling a transformer and scattered pieces of roof throughout the crop fields. Winds were recorded as high as 66mph in the area Wednesday night. Mattics Orchards is headquartered in Olathe. The damaged greenhouse is where crops were growing for kids in the Montrose County School District. Its unknown how much the storm and freeze will affect their business.
Source: **Daily Press** (Posetd 6:41a)

The supply of cinders used to treat Ouray County's paved roads in the winter is running low, and might be depleted within 7-10 years. The County is looking at options on what to do when that happens. According to **The Watch**, Ouray County spends about $30,550 a year to have the cinders hauled in from Nucla. Future options include hauling a salt/sand mixture from Montrose for an estimated cost of $83,000 a year or go with magnesium chloride which would initially cost about $125,000. The topic is up for discussion next month.
Source: **The Watch** (Posted 6:39a)

Governor Ritter signed a 20 billion dollar state budget bill on Thursday, calling it a tough but balanced budget that reflects tough times. But fiscal policy analyst Terry Scanlon with the Colorado Fiscal Policy Institute says cuts in state spending could wind up being too tough on Coloradans that need the most help. He says that funding goes towards programs dealing with children in foster care or that were in abusive homes among other situations. Scanlon says it's possible the budget situation could be even worse next year if ballot initiatives to further limit government pass in the fall. The new budget goes into effect July 1st.
Source: Colorado News Connection (Posted 6:39a)

http://coloradoradio.com/2010/04/30/news-friday-april-30-2010-2/

High winds expected through evening

Posted: Apr 28, 2010 4:55 PM by **Greg Boyce**

Updated: Apr 28, 2010 4:55 PM

SHARE

Rating:

0.0 (0 votes)

Wind is the word in Southern Colorado. A High Wind Warning is in effect until midnight along the southern I-25 corridor and the Wet Mountains.

The strongest winds are expected late Wednesday afternoon and evening. Winds of 35 to 45 miles an hour will be common south of Pueblo, from Westcliffe to Trinidad, with gusts of 75 miles an hour possible.

This will make travel difficult along I-25.

Topics: wind, warning, pueblo, westcliffe, trinidad, walsenburg, I-25

Weatherblog: Incoming storm could bring more desert dust

Posted on April 27, 2010 by Bob Berwyn

Evening casts a blue light over Dillon Reservoir.

Strong cold front will bring high winds, cold temperatures and snow at the end of the week

By Bob Berwyn

SUMMIT COUNTY — Enjoy Tuesday and Wednesday, because a cold and windy storm is set to roll out of the Great Basin and into the Colorado Plateau and the Rockies Thursday. Winds in advance of the system could bring another layer of desert dust to parts of the Rockies Wednesday night.

Snow banners streaming off the Gore and Tenmile Ranges Tuesday morning indicated the approach of strong high-level winds. Wind speeds could approach 60 MPH over the higher elevations Wednesday.

The Pacific weather system will initially bring high winds and unseasonably cold temperatures, along with chance of snow on and off through early next week, according to the Grand Junction National Weather Service office, where forecasters said they're leaning toward issuing winter storm watches or advisories in the coming days.

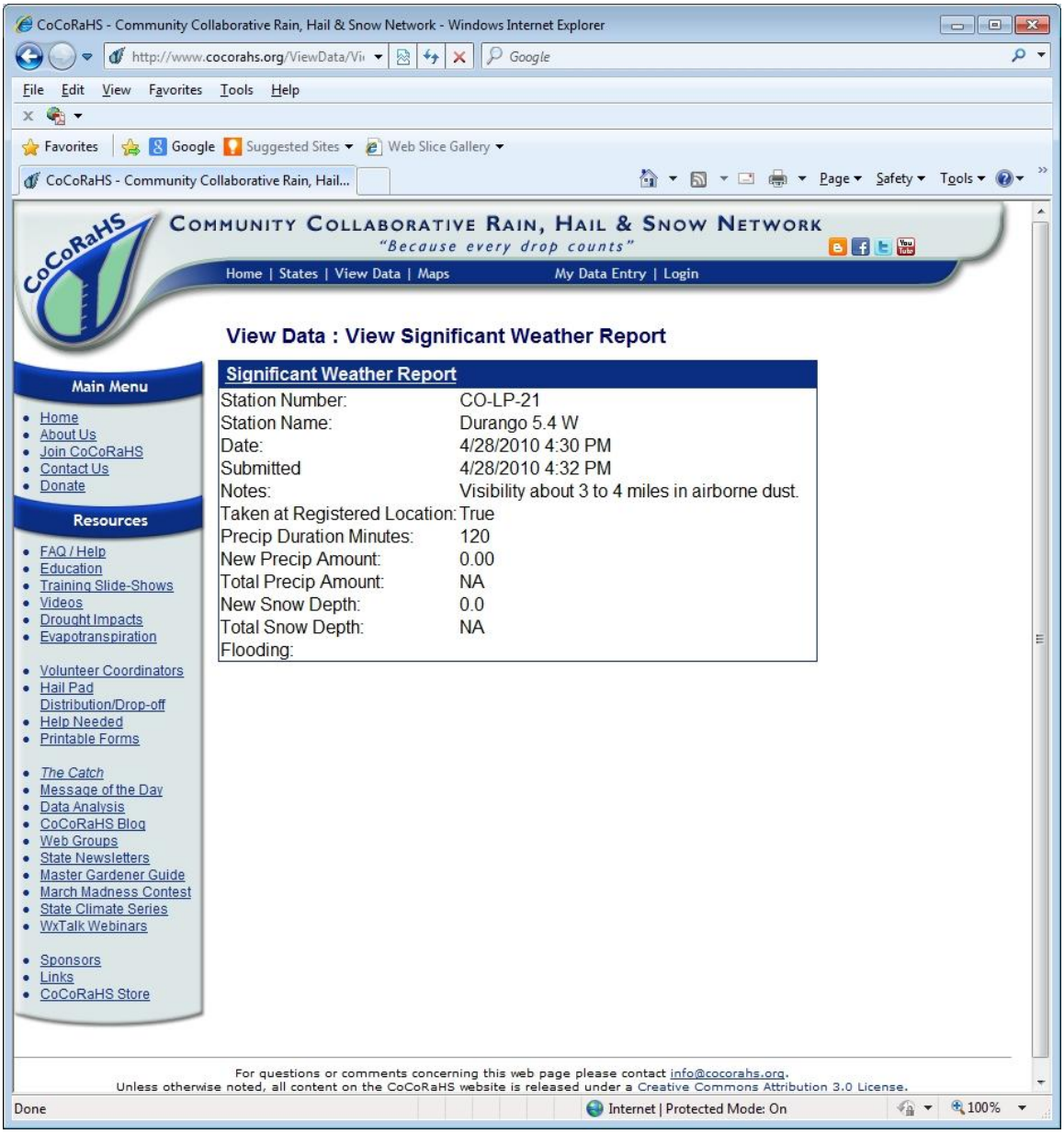
In their forecast discussion, the Grand Junction-based forecasters wrote that they're having a hard time remembering a system with these types of wind speeds. A wind advisory with a red flag fire warning is in effect for parts of the West Slope.

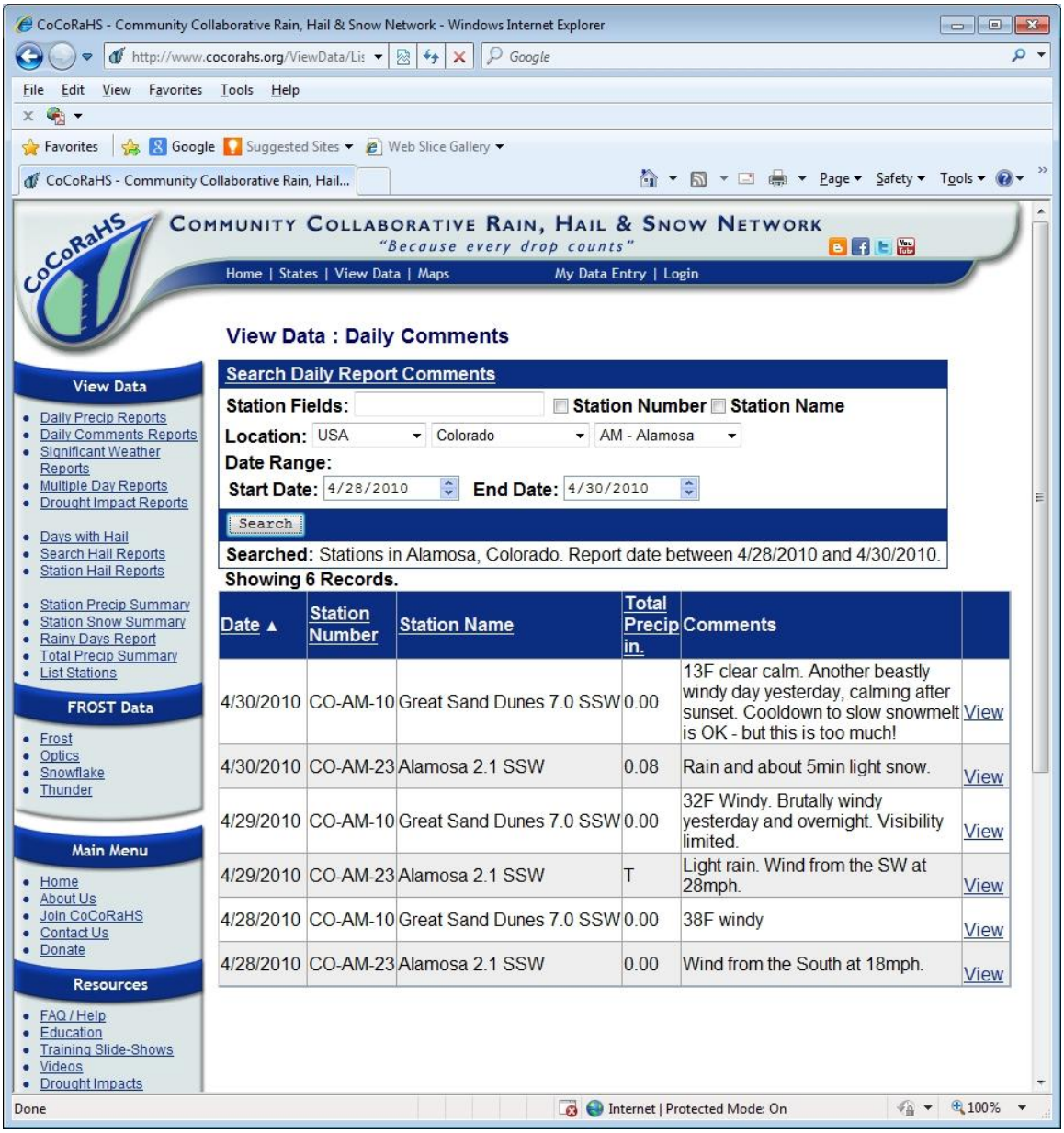
Temperatures will drop sharply with arrival of a strong cold front.

But until the front arrives late Wednesday, look for temperatures to climb into the 40s and 50s across the Summit-Vail forecast area. The warm weather is expected to trigger wet and loose snow avalanches in the backcountry from the recent storm that brought significant accumulations to the higher mountain areas.

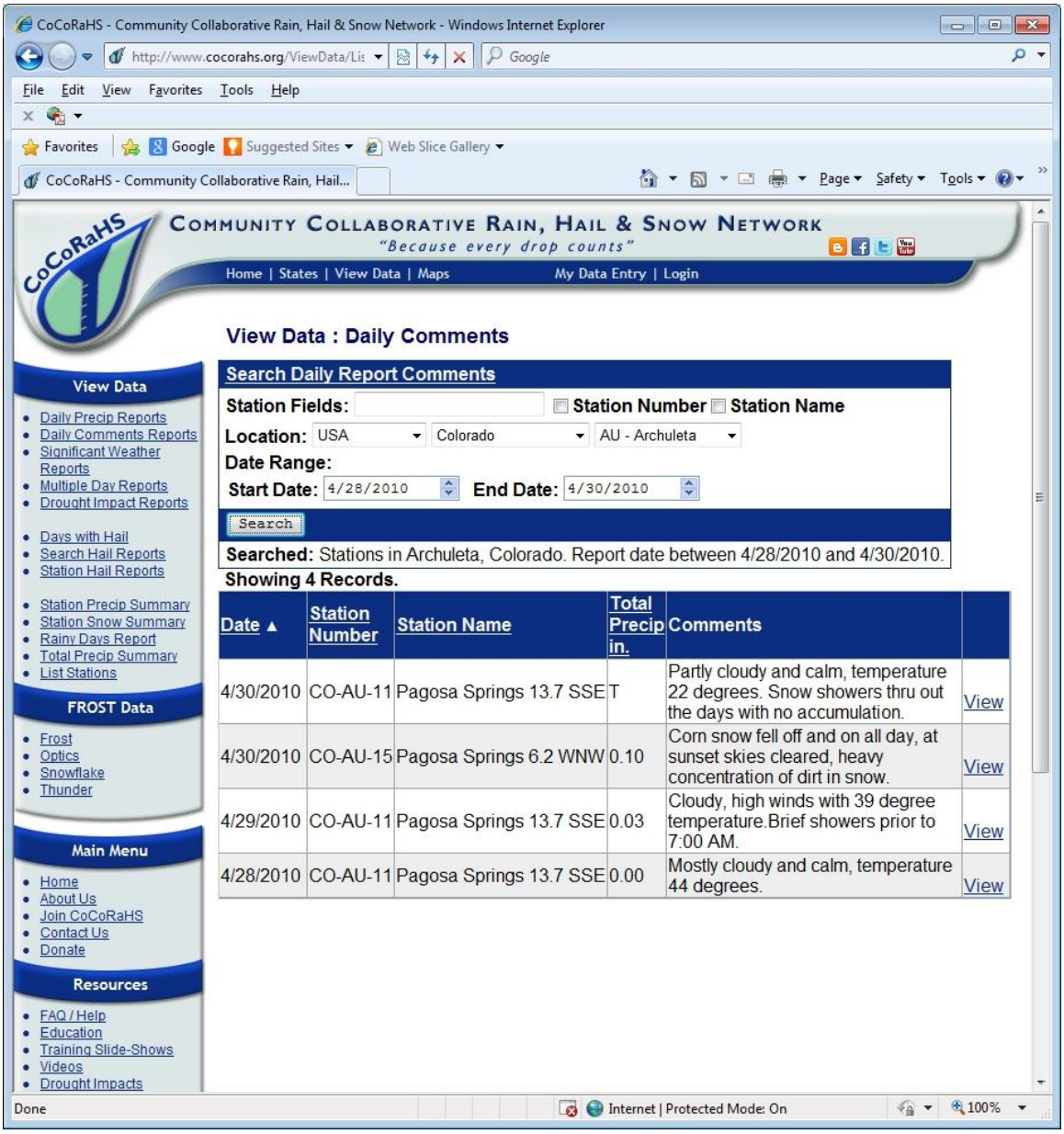
Backcountry observers reported drifts and slabs as deep as four to five feet, setting the stage for potentially large snow slides. Suspect areas include cornices and slopes below rocky areas that can quickly heat and weaken the surrounding snowpack. Check in with the Colorado Avalanche Information Center for general backcountry avalanche information and updates Wednesday, Friday and Sunday through the end of May.

http://summitcountyvoice.com/2010/04/27/weatherblog-incoming-storm-could-bring-more-desert-dust/

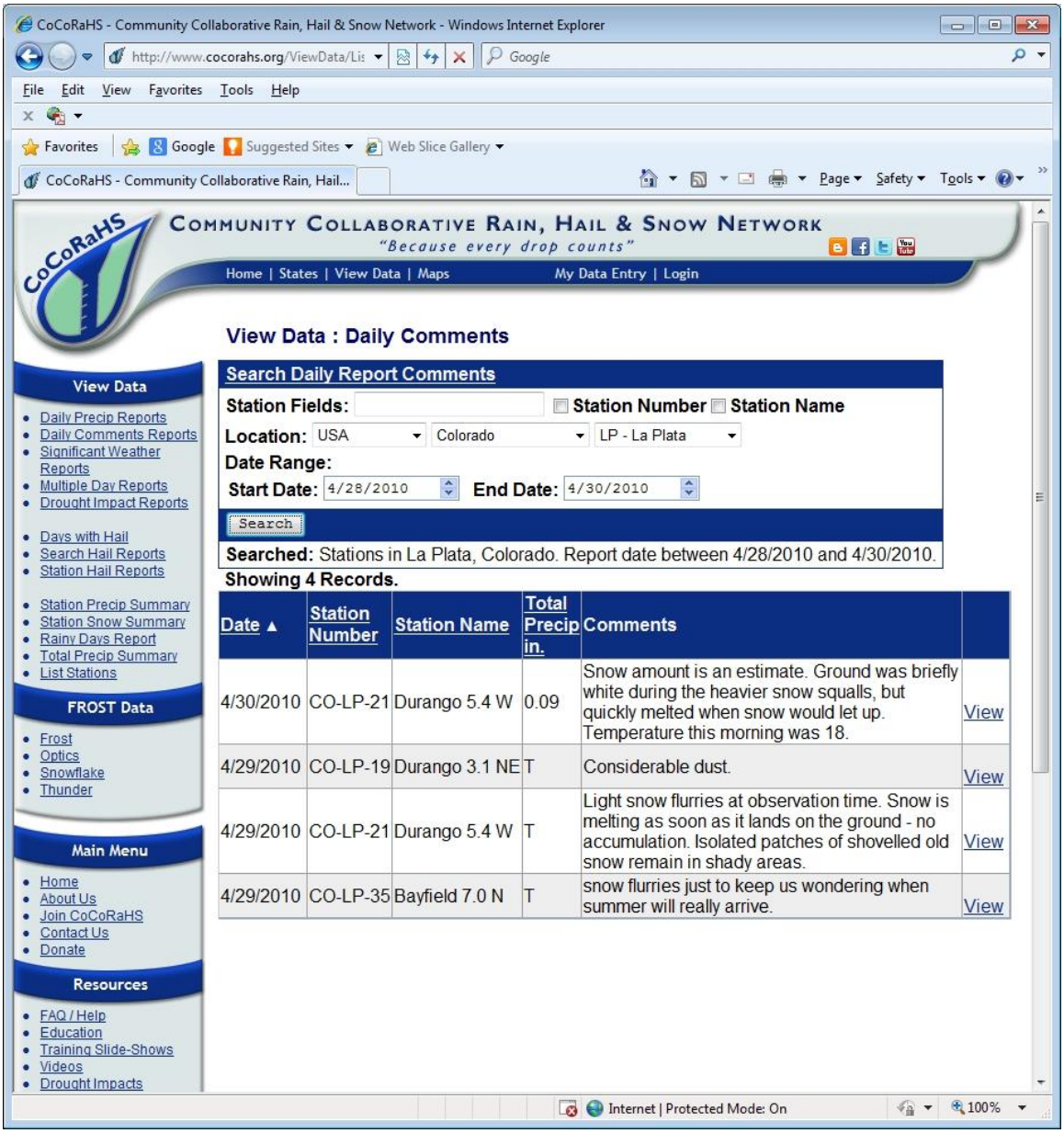

CoCoRaHS - Community Collaborative Rain, Hail & Snow Network - Windows Internet Explorer
http://www.cocorahs.org/ViewData/Vi
Google
File Edit View Favorites Tools Help
Favorites Google Suggested Sites Web Slice Gallery
CoCoRaHS - Community Collaborative Rain, Hail...
Page Safety Tools
COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK
"Because every drop counts"
Home | States | View Data | Maps
My Data Entry | Login
View Data : View Significant Weather Report
Main Menu
Home
About Us
Join CoCoRaHS
Contact Us
Donate
Resources
FAQ / Help
Education
Training Slide-Shows
Videos
Drought Impacts
Evapotranspiration
Volunteer Coordinators
Hail Pad Distribution/Drop-off
Help Needed
Printable Forms
The Catch
Message of the Day
Data Analysis
CoCoRaHS Blog
Web Groups
State Newsletters
Master Gardener Guide
March Madness Contest
State Climate Series
WxTalk Webinars
Sponsors
Links
CoCoRaHS Store
Significant Weather Report
Station Number: CO-LP-21
Station Name: Durango 5.4 W
Date: 4/28/2010 4:30 PM
Submitted 4/28/2010 4:32 PM
Notes: Visibility about 3 to 4 miles in airborne dust.
Taken at Registered Location: True
Precip Duration Minutes: 120
New Precip Amount: 0.00
Total Precip Amount: NA
New Snow Depth: 0.0
Total Snow Depth: NA
Flooding:
For questions or comments concerning this web page please contact info@cocorahs.org.
Unless otherwise noted, all content on the CoCoRaHS website is released under a Creative Commons Attribution 3.0 License.
Done
Internet | Protected Mode: On
100%



(NOTE: CoCoRaHS "Daily Comments" reports are submitted at approx. 7:00 a.m.)



(NOTE: CoCoRaHS "Daily Comments" reports are submitted at approx. 7:00 a.m.)



(NOTE: CoCoRaHS "Daily Comments" reports are submitted at approx. 7:00 a.m.)

Wednesday, April 28, 2010

Way Too Windy

We spent a very windy night at Great Sand Dunes, and even though we planned on staying a second night, we decided to break camp and look elsewhere to camp for our second night. We read the weather forecast at the Visitor's Center and there were to be wind gusts of up to 60 mph this evening. Even though our tent did well last night, we didn't have that great of a time because we couldn't sit outside and enjoy our campsite. We decided to head west in hopes that the weather would be better. Along they way, we saw a large elk herd that reminded us of when we lived in Estes Park upwards of 200 elk would gather in our yard at the same time.

This part of Colorado has quite a few farms where bison are raised. It was interesting watching them and it's quite relieving to know that they aren't as endangered as they were even a generation ago.

As we drove west, through southern Colorado, we traveled a few roads through country we hadn't visited before. We went through Pagosa Springs and when we got to Durango, we stopped at the Public Lands Office to check the weather. We had thought about stopping for the night near Dolores and Canyons of the Ancients National Monument, but found that it was going to be even windier there than at Great Sand Dunes. We even thought about staying at Hovenweep National Monument, which is even farther west. It was very windy there as well. It seemed at times that the whole state of Utah was blowing east into Colorado. The skies had such a hazy, dusty look. We decided to cut our losses and head home for the night. We headed north and visited the small resort/ski town of Telluride. We decided we would visit later in the summer since it looked like a pretty neat place. Later, we drove the the small town of Ridgway where we saw this old firehouse and fire truck. They also have an interesting railroad museum there that we might check out at a later date. Overall, we spent a long day in the car, but it was fun to see so many places we hadn't seen before.

Posted by Tom at 10:24 PM 1 comments

http://bigblueglobe.blogspot.com/2010_04_01_bigblueglobe_archive.html

04-28-2010, 09:28 PM

jim9251 Original Poster

Status: "Living in paradise" (set 5 days ago)

Location: Western Colorado
3,833 posts, read 2,073,549 times
Reputation: 4880

The dust storm is kinda sucking the oxygen out of the air and it's a bit difficult to breathe without getting a mouthful of dirt, but I haven't had allergy problems since I moved here. I expected wind since this is the windy season, but wasn't told about the dust storms. Utah can have their dirt back. But I know it will be back to fresh, crisp mountain air in a day or two.

Rate this post positively

04-29-2010, 07:52 AM

CosmicWizard

Location: Wherabouts Unknown!
6,825 posts, read 8,322,753 times
Reputation: 7113

Get used to it Jim...it happens from time to time. Last summer, when it rained, the rain was full of dust, and it did a real number on the windows and cars. Before I lived in the desert, I experienced rain as something that cleaned my car, not something that splatterd it with mud drops. I'm sure you'll soon have a chance to experience first hand what I'm talking about.

This morning in Grand Junction reminds me of the good ole days in southeatern PA when I was growing up. Yesterday the temp was almost 80, and this morning it's snowing hard enough to coat the grass and rooftops with a nice white dusting.

Rate this post positively

04-29-2010, 08:04 AM

jim9251 Original Poster

Status: "Living in paradise" (set 5 days ago)

Location: Western Colorado
3,833 posts, read 2,073,549 times
Reputation: 4880

Already did that, rained mud here last week. That was different.

And now it's snowing.

Rate this post positively

04-29-2010, 09:17 AM

80skeys

Location: Sunnyvale, CA
3,314 posts, read 3,274,810 times
Reputation: 1090

Quote:

> Originally Posted by **jim9251**
> *I discovered something I do not like about living here. The dust storms. Everything is brown, the sky, the air, and there's this dirt taste in my mouth. Yecch.*

Unfortunately we live on the Western slope. To the west of us is nothing but hundreds of miles of open, unprotected deserts of Utah. Nothing to hold down the sand.

Rate this post positively

04-29-2010, 09:49 AM

CosmicWizard

Location: Wherabouts Unknown!
6,825 posts, read 8,322,753 times
Reputation: 7113

80skeys wrote:
Unfortunately we live on the Western slope
Just curious, what do you find unfortuante about living on the western slope? I've always considered it my **good fortune** to be living on the western slope!

Rate this post positively

04-29-2010, 11:15 AM

80skeys

Location: Sunnyvale, CA
3,314 posts, read 3,274,810 times
Reputation: 1090

Quote:

> Originally Posted by **CosmicWizard**
> *80skeys wrote:*
> *Unfortunately we live on the Western slope*
> *Just curious, what do you find unfortuante about living on the western slope? I've always considered it my **good fortune** to be living on the western slope!*

I meant in the context of the dust storms and wind.

Rate this post positively

04-30-2010, 12:47 PM

mrgoodwx

Location: Albuquerque
669 posts, read 821,352 times
Reputation: 587

Yep...it does.

Quote:

> Originally Posted by **80skeys**
> *Not just a Colorado phenomenon. That type of thing happens in AZ and NM too.*

It's the last day of April. We had several snow showers this morning on the eastern edge of Albuquerque, where I live up against the Sandia Mountains. This is much better than watching pieces of western New Mexico and Arizona fly by overhead...driven by wind gusts to 70 mph.

Rate this post positively

04-30-2010, 03:09 PM

jim9251 Original Poster

Status: "Living in paradise" (set 5 days ago)

Location: Western Colorado
3,833 posts, read 2,073,549 times
Reputation: 4880

It has snowed, heavy here the past two days. No more dust or winds. Just snow. I'm a Ham Radio operator and when I tell guys in Cuba, or South America it's snowing here I always get a "IT'S WHAT?" Hopefully it's nice for the big hot air balloon festival and car show next weekend here!

Rate this post positively

05-04-2010, 09:40 AM

jim9251 Original Poster

Status: "Living in paradise" (set 5 days ago)

Location: Western Colorado
3,833 posts, read 2,073,549 times
Reputation: 4880

Well after a dust storm, winds clocked at 100mph, snow, snow and a blizzard Sunday evening, MOnday May 3rd was clear, crisp, bright sunshine and deep blue sky.

Here is a photo of Mt Lamborn over Paonia Monday and again today. How fast the snow melts in the sunshine. The San Juans by my town are still snowpacked.

Rate this post positively

05-04-2010, 12:47 PM

CALIFRE

Location: Way Out West...
82 posts, read 64,829 times
Reputation: 107

Beautiful Jim, Always enjoy your pics. I have a similar view of Mt. Lamborn from property in the area, I'm planning to build and settle in a few years.

Maybe spring has finally sprung on the Western slope??

Read more: http://www.city-data.com/forum/colorado/693202-retiring-colorado-western-slope-grand-junction-18.html#ixzz2SiG8Tivj

http://www.city-data.com/forum/colorado/693202-retiring-colorado-western-slope-18.html

5.0 Not Reasonably Controllable or Preventable: Local Particulate Matter Control Measures

While it is likely that some dust was generated within the local communities as gusts from the regional dust storm passed through the area, the amount of dust generated locally was easily overwhelmed by, and largely unnoticeable as compared to the dust transported in from the source regions of the dust storm. The following sections will describe in detail the regulations and programs in place designed to control PM_{10} in each affected community. These sections will demonstrate that the event was not reasonably controllable, as laid out in Section 50.1(j) of Title 40 CFR 50, within the context of reasonable local particulate matter control measures. As shown from the meteorological and monitoring analyses (Sections 2 and 3), the source region for the associated dust that occurred during the April 28 and 29, 2010, event originated outside of the monitored areas, primarily from the desert regions of Arizona, northwest New Mexico, and southeast Utah.

The Colorado Air Pollution Control Division (Division) conducted thorough analyses and outreach with local governments to confirm that no unusual anthropogenic PM10-producing activities occurred in these towns and that despite reasonable control measures in place, high wind conditions overwhelmed all reasonably available controls. The following subsections describe in detail Best Available Control Measures (BACM), other reasonable control measures, applicable federal, state, and local regulations, appropriate land use management, and an in-depth analysis of potential areas of local soil disturbance for each affected community during the April 28 and 29, 2010 event, as well as subsequent outreach designed to administer these activities. This information shall confirm that no unusual anthropogenic actions occurred in the local areas of Alamosa, Pagosa Springs, or Durango during this time.

Regulatory Measures- State
The Division's regulations on PM_{10} emissions are summarized in Table 26.

Table 26: State Regulations Regulating Particulate Matter Emissions

Rule/Ordinance	Description
Colorado Department of Public Health and Environment Regulation 1- Emission Control For Particulate Matter, Smoke, Carbon Monoxide, And Sulfur Oxides	Applicable sections include but are not limited to: Everyone who manages a source or activity that is subject to controlling fugitive particulate emissions must employ such control measures and operating procedures through the use of all available practical methods which are technologically feasible and economically reasonable and which reduce, prevent and control emissions so as to facilitate the achievement of the maximum practical degree of air purity in every portion of the State. Section III.D.1.a) Anyone clearing or leveling of land greater than five acres in attainment areas or one acre in non-attainment areas from which fugitive

	particulate emissions will be emitted are required to use all available and practical methods which are technologically feasible and economically reasonable in order to minimize fugitive particulate emissions.(Section III.D.2.b) Control measures or operational procedures for fugitive particulate emissions to be employed may include planting vegetation cover, providing synthetic cover, watering, chemical stabilization, furrows, compacting, minimizing disturbed area in the winter, wind breaks and other methods or techniques approved by the Division. (Section III.D.2.b) Any owner or operator responsible for the construction or maintenance of any existing or new unpaved roadway which has vehicle traffic exceeding 200 vehicles per day in the attainment/maintenance area and surrounding areas must stabilize the roadway in order to minimize fugitive dust emissions (Section III.D.2.a.(i))
Colorado Department of Public Health and Environment Regulation 3- Stationary Source Permitting and Air Pollutant Emission Notice Requirements	Construction Permit required if a land development project exceeds 25 acres and spans longer than 6 months in duration (Section II.D.1.j)
Colorado Department of Public Health and Environment Regulation 6- Standards of Performance for New Stationary Sources	Implements federal standards of performance for new stationary sources including ones that have particulate matter emissions. (Section I)
Colorado Department of Public Health and Environment Regulation 9- Open Burning, Prescribed Fire, and Permitting	Prohibits open burning throughout the state unless a permit has been obtained from the appropriate air pollution control authority. In granting or denying any such permit, the authority will base its action on the potential contribution to air pollution in the area, climatic conditions on the day or days of such burning, and the authority's satisfaction that there is no practical alternate method for the disposal of the material to be burned. Among other permit conditions, the authority granting the permit may impose conditions on wind speed at the time of the burn to minimize smoke impacts on smoke-sensitive areas. (Section III)
Federal Motor Vehicle Emission Control Program	The federal motor vehicle emission control program has reduced PM_{10} emissions through a

	continuing process of requiring diesel engine manufacturers to produce new vehicles that meet tighter and tighter emission standards. As older, higher emitting diesel vehicles are replaced with newer vehicles; the PM_{10} emissions in areas will be reduced.

5.1 Alamosa

Natural Events Action Plan (NEAP)

The Final NEAP for High Wind Events in Alamosa, Colorado was completed in May 2003. The NEAP addresses public education programs, public notification and health advisory programs, and determines and implements Best Available Control Measures (BACM) for anthropogenic sources in the Alamosa area. The Division followed up with the City and County of Alamosa in January 2007 and in the spring of 2013 on whether the NEAP mitigation measures and commitments were satisfied, the results of which are detailed below. The City of Alamosa, Alamosa County, the Division, and participating federal agencies worked diligently to identify contributing sources and to develop appropriate BACM as required by the Natural Events Policy.

Regulatory Measures- City
The Division and the City of Alamosa are responsible for implementing regulatory measures to control emissions from agricultural sources, stationary sources, fugitive dust sources, and open burning within Alamosa. Alamosa's ordinances of PM_{10} emissions are summarized in Table 27.

Table 27: Rules and Ordinances Regulating Particulate Matter Emissions in Alamosa

Rule/Ordinance	Description
City of Alamosa Code of Ordinances Article VII of Section 21-140 (5)	Addresses dust control for home occupations
City of Alamosa Code of Ordinances Article V Sec. 17-87(3))	Requires all new roads and alleys to be paved
City of Alamosa Code of Ordinances (Article VI Sec. 21-119(g)(3)).	New large commercial/retail establishments must install underground automatic irrigation systems for all landscaped areas

City of Alamosa
The City of Alamosa has been active in addressing potential PM_{10} sources within the Alamosa area through various efforts. Some of these efforts, plus other potential future measures, include the adoption of local ordinances to reduce PM_{10}. Copies of current ordinances and any related commitments are included in the NEAP in Appendix C. According to the City's Public Works Director, as of 2013, the City is planning on adding additional dust control best management practices to the International Building Codes that are adopted by the city in the next update. The best management practices will include requiring a Dust Control Plan for any site that is issued a clearing permit for any site over 2 acres. The City is also currently (as of 2013) working on revising part of their landscaping ordinances to require mulch in areas that are not vegetated or covered by rock to help mitigate fugitive particulate emissions. These efforts have been stalled in the past due to employee turnover at City Manager's Office.

Street Sweeping
The City of Alamosa sweeps on an every 4-week schedule or as needed, as determined by local officials on a case by case situation (e.g., following each snowstorm and/or where sand was applied). Sweeping occurs on every single City street with an emphasis on the downtown corridor where public exposure is expected to be greatest. In fact as of Spring 2013, street sweeping in the downtown corridor currently takes place twice per week according to the City's Public Works Director.

According to the City's Public Works Director, the city currently (as of 2013) owns an Elgin Pelican (mobile mechanical sweeper) and a Tymko 600 (brush-assisted head) street sweeper. As of June 2013, the City will also own a new Elgin Broom Badger street sweeper at which time the Tymko 600 will be sent in for a re-build. The new Elgin Broom Badger street sweeper can be used in the winter months when the Tymko cannot due to freezing of the water delivery system.

Unpaved Roads within the City
The City of Alamosa (as of 2008) requires all new roads and alleys to be paved according to the Municipal Code (Article V Sec. 17-87(3)) and some existing unpaved roads are being treated with dust suppressants until all underground utilities are installed. No new development is allowed until paving is complete unless a performance bond is in place.

According to the City's Public Works Director, as of 2013, less than 3% of City roads are unpaved; most of these unpaved roads are legacy annexations. One of these unpaved roads is scheduled for paving this year (2013). The remaining unpaved roads are all low traffic (less than 100 ADT) and the City continues to seek funding sources for paving these streets.

Sod/Vegetative Cover Projects in the City of Alamosa
As of 2008, the City of Alamosa placed vegetative cover in all city parks and has installed irrigation systems to maintain the cover. As of 2013, the City has been emphasizing more low-water use landscaping with shrubs, mulch, etc. including both organic and rock. All turf areas do have irrigation systems which utilize drip systems for specimen plantings.

<u>Alamosa County</u>
Alamosa County has also been active in addressing blowing dust and is preparing a county ordinance as such.

Unpaved Roads
Alamosa County is presently addressing unpaved roads and lanes that are anticipated to contribute to PM_{10} emissions in the community. As of 2002, Alamosa County was nearing the end of its five-year road paving plan and was developing their next plan with the intention of paving on a yearly basis, based on traffic, community needs/priorities, and funding availability.

In 2002, Alamosa County addressed approximately ten (10) miles of unpaved roads. This includes the stabilization of approximately five section roads, the seal coating of two roads, and the overlay (repaving) of four (4) additional roads.

In 2003, approximately 14 miles of roads were paved. This includes the Seven Mile Road (three miles long), Road 109 (one mile long), and 10^{th} Street (also one mile long). These roads are in close proximity to the City of Alamosa, are upwind (prevailing) from the city, and have heavy traffic. Paving is anticipated to greatly reduce blowing dust and impacts in the vicinity.

No paving projects took place between 2004 and 2010 due to lack of funding. Between 2010 and 2013 the County was able to get funding but only for maintenance paving on previously paved roads that needed repair. Now that the county is caught up on maintenance paving, it is focusing on paving the remaining unpaved roads. The County's goal is to pave about 2.5 miles of unpaved road per year depending on funding availability.

As of 2013, Alamosa County has funding to pave approximately 2.5 miles of the 106 North which is currently unpaved. After this paving project the County will only have 2.5 miles of unpaved road remaining on the 106 North which is anticipated to be paved in the summer of 2014.

In the summer time the County regularly hauls water and wets down the unpaved roads (mostly gravel, clay and sand) to reduce the fugitive particulate emissions. The County wets the unpaved roads on an as needed basis based on weather conditions and traffic volume. In addition, when it gets cold enough in the area, the County wets down some of the more sandy roads. Once the water soaks in and freezes, good dust suppression is seen. Road construction areas are being dampened with water for dust control. These practices reduce PM_{10} emissions in and near Alamosa. This control measure is balanced with the availability of water in the area.

Alamosa County used to assess the need to use $MgC1_2$ treatment on roads in front of residences that request such service. This practice stopped in 2004 when funding was lost. Assessments included the sensitivity to dust of residents, the materials of the road base for safety reasons, and possible environmental concerns of the neighborhood. Most requests for treatment are were granted. Other areas for treatment, such as commercial construction zones or gravel pits, are investigated on a case by case basis. The County hopes to be able to start offering this service again when funding is restored.

Dust Control Plans

Alamosa County may consider changes in local ordinances governing dust control plans at construction sites. This would be addressed through the revision of Alamosa County's Comprehensive Plan and supporting zoning codes. Alamosa County is reviewing language from other successful dust control programs for inclusion in their local ordinances.

The County may update the Comprehensive Plan to include a dust control plan. The Land Use Administrator is researching the potential for a dust control ordinance. This effort is anticipated to reduce PM_{10} emissions in Alamosa, especially as it relates to impacts on the community and high recorded PM_{10} values. At the time of this submittal (June 2013), this effort is still underway.

Wind Erosion of Open Areas

To reduce PM_{10} emissions from open areas outside of the City limits, low tilling and other soil conservation practices continue to be utilized in the community. In addition, the community is using in strategic areas the State of Colorado Agricultural Office's program to purchase and plant shelter trees to reduce wind erosion in open areas. These trees have a demonstrated advantage for the community and for air quality. Once the trees reach maturity, it is anticipated that the equivalent of 112 miles of double-rowed trees will be in place. The survival rate of the tree seedlings varies but according to the District Coordinator for the Seedling Tree Program, potted seedlings have about a 60% to 80% survival rate and the bare root seedlings have about a 40 to 60% survival rate. The Seedling Program recommends Siberian elm and Rocky Mountain juniper trees for low maintenance, drought resistance windbreaks in the valley. In addition, there is ongoing planting of trees (approximately 50) on newly developed Alamosa County property

south/southwest of Alamosa (prevailing winds from southwest) and the Airport south of Alamosa for added air quality improvement.

Windblown Dust from Disturbed Soils

Alamosa has a semi-arid climate with approximately 7.25 inches of precipitation annually. The San Luis Valley, as noted within 25 miles of the San Luis Valley Regional Airport in Alamosa, is primarily comprised of forests (43%) and shrublands (42%). Consequently, soils in all areas are typically a mixture of silt and sand with limited vegetation due to low precipitation. In winter and spring, windstorms are common, especially in drier years. It is due to these high velocity windstorms that Alamosa experiences most of the PM_{10} problems for the area.

Figure 1 illustrates potential areas of local soil disturbance that have been evaluated by the Division for the Alamosa Adams State PM_{10} monitor.

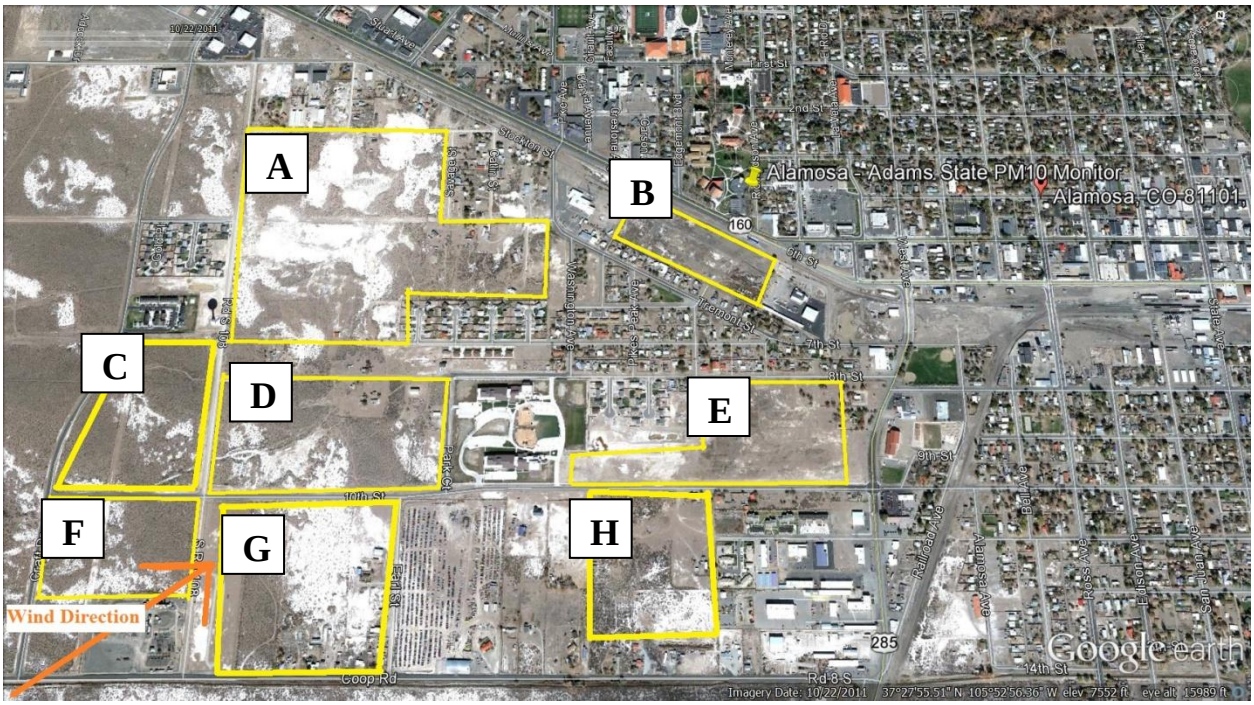


Figure 55: Relative positions of Adam's State College PM_{10} Monitor and potential disturbed soil. (Image from Google Earth 2007)

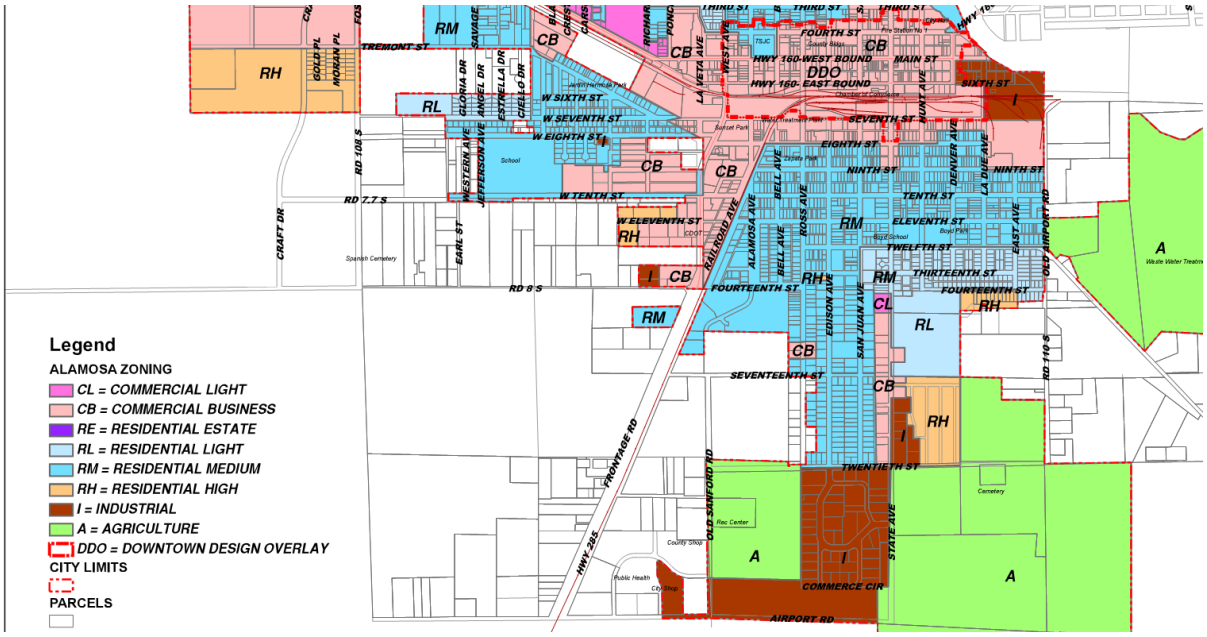


Figure 56: 2011 City of Alamosa Zoning Map (Provided by the Public Works Department)

Site A in Figure 55 (approximately 85 acres) is East of Rd S 108 and South of Chico St. It is zoned outside of the city's limits by the city as a "Parcel" as shown in Figure 56. The eastern portion of Area A is being considered for annexation into the City.

Site C in Figure 55 (approximately 25 acres) is north of 10th St, West of Road 108, and east of Craft St. It is zoned outside of the city's limits by the city as a "Parcel" as shown in Figure 56.

Site D in Figure 55 (approximately 34 acres)is north of 10th street, east of Rd S 108, west of Park Ct, and south of 8th St. It is zoned outside of the city's limits by the city as a "Parcel" as shown in Figure 56.

Site F in Figure 55 (approximately 31 acres)is south of 10th St, east of Craft Dr, west of S Rd 108, and North of Coop Rd. It is zoned outside of the city's limits by the city as a "Parcel" as shown in Figure 56.

Site G in Figure 55 (approximately 41 acres) is east of S Rd 108, north of Coop Rd, west of Earl St, and South of 10th St. It is zoned outside of the city's limits by the city as a "Parcel" as shown in Figure 56.

Sites A, C, D, F, and G are noted by the City of Alamosa's Public Works Director to be vacant land with natural vegetation (i.e. shrubland) with no artificial irrigation and no access restriction. The City emphasizes that the areas are not suited for motorized travel. These lots are not considered to be anthropogenically disturbed soils and should be considered to be natural sources at this time. If future high wind or other exceptional events occur, the Division will re-assess these lots to determine if they are still natural sources.

Site B in Figure 55 (approximately 22 acres) is south of Highway 160 and north east of Tremont St. It is zoned outside of the city's limits by the city as a "Parcel" as shown in Figure 56. Site E in Figure 55 (approximately 30 acres) is north of 10th St, south of 8th St, east of Park Ct, and west of West Ave. It is zoned mostly as a "Commercial Business" as shown in Figure 56. There is a small portion in the top right corner that is zoned outside of the city's limits by the city as a

"Parcel". Site H (approximately 23 acres) in Figure 55 is east of Earl St, south of 10th St, and north of Rd 8 S. It is zoned as "Commercial business", "Residential High" and a little "Industrial" as shown in Figure 56. Sites B, E, and H are naturally vegetated and potentially irrigated as shown in Figure 57. Figure 57 demonstrates that these sites are minimally (if at all) disturbed soil areas.

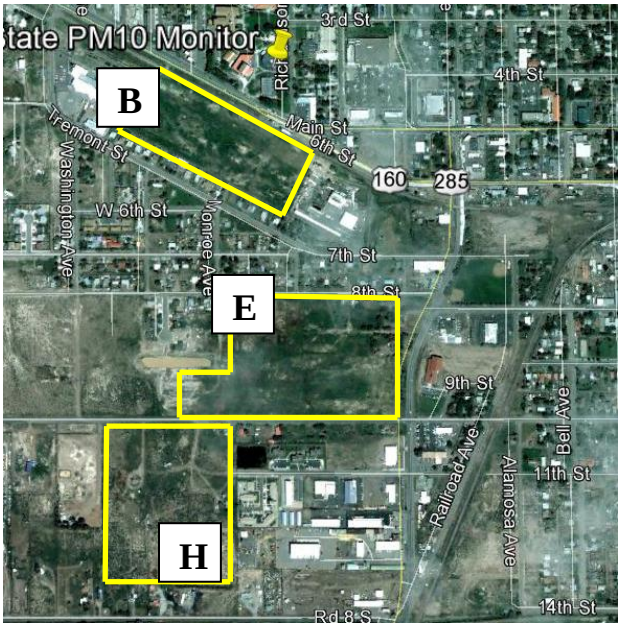


Figure 57: Sites B, E, and H with natural vegetation (Google Earth 2007)

The Division conducted thorough assessments to determine if the potential soil disturbances shown in Figure 55 were present during the 2010 exceedances. During the course of these assessments, the Division discovered that these sites were either reasonably controlled or considered to be natural sources during the April 28 and 29, 2010 high wind event. Therefore, these sites were not significant contributors to fugitive dust in the Alamosa area during the April 28 and 29, 2010 high wind event.

The Division is currently investigating the applicable area around the Alamosa Municipal Building (08-003-0003) PM_{10} monitor in coordination with the County and City of Alamosa, shown in Figure 1. The Division plans to submit an in-depth analysis similar to the analysis for the Alamosa Adams State PM_{10} monitor.Figure 58 illustrates potential areas of local soil disturbance that have been evaluated by the Division for the Alamosa Municipal Building (08-003-0003) PM_{10} monitor.

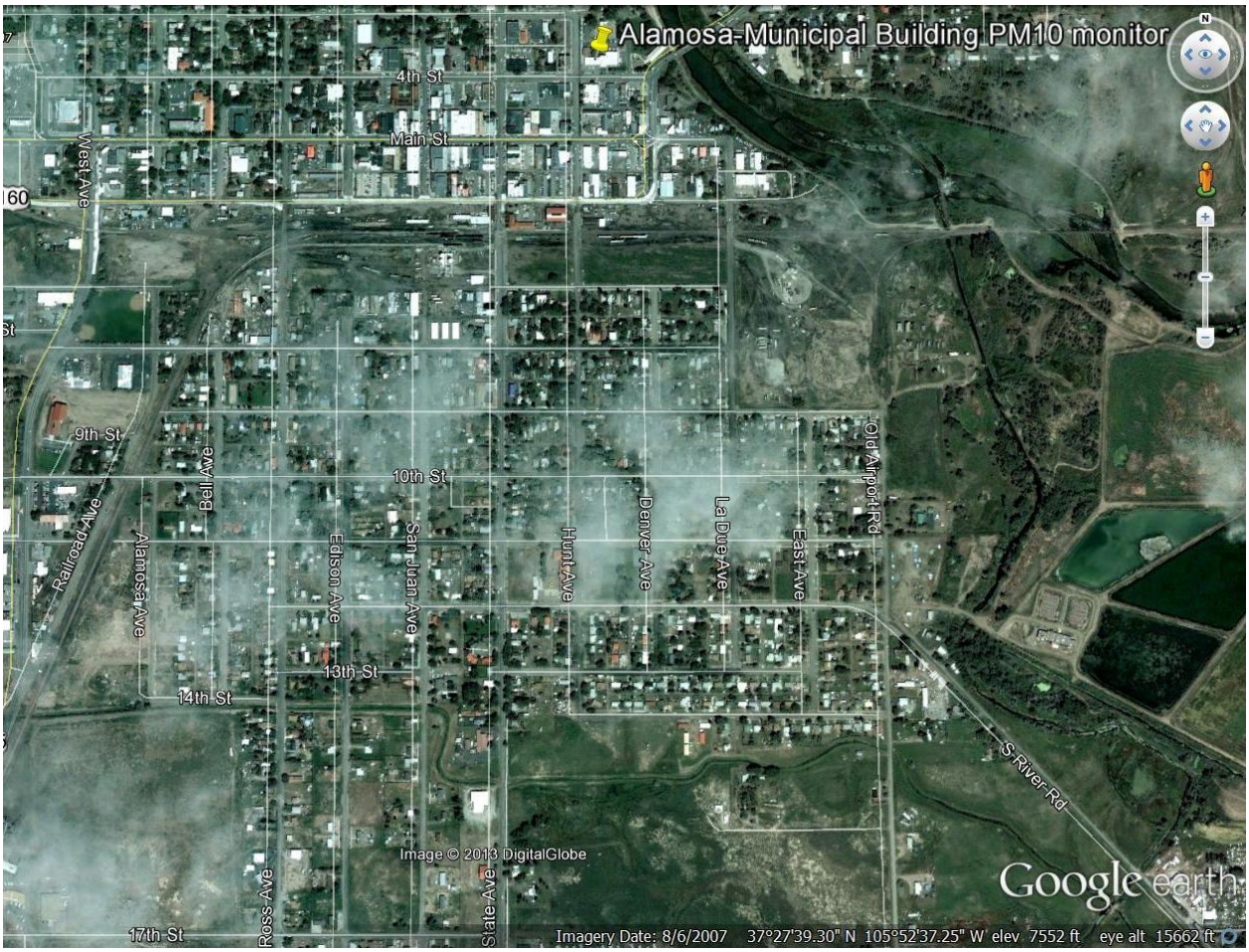


Figure 58: Relative positions of Municipal Building PM10 Monitor and potential disturbed soil. (Image from Google Earth 2007)

Sod and Vegetative Projects in the County

The development and construction of a local park, Eastside Park, is complete in Alamosa County. It has been completed with turf grass, shrubs, and landscape rock. No exposed soil remains. This park has reduced blowing dust from this previously undeveloped site.

Numerous other projects to reduce blowing dust and its impacts have happened or are happening at the County Airport. For example:

- Through additional grounds maintenance of the 40-acre Alamosa County airport south of the city, grass is being grown for aesthetics and dust control.

- Sodding and the placement of decorative rock and ground cover have been implemented in the landscaping of the Alamosa County property (2007-2012). These measures have directly abated blowing dust at the Airport.

- Also, the widening of the airport's safety areas (250 feet on either side of the runway) is now complete and seeding of natural grasses was incorporated in the project. Trees and grass were incorporated in the approaches to the airport and have provided additional wind-break advantages to South Alamosa.

In other areas where watering is a problem, xeriscape (the use of native drought resistant vegetation and/or rock cover) is being encouraged for County owned property and for all other property owners.

Colorado State University Co-Op Extension Office
In response to extremely dry conditions, the need to maintain area topsoil, and reduce impacts, the Colorado State University Co-Op Extension Office of Alamosa County provides the following outreach efforts and recommendations:

- Modification of grazing practices to improve protective crop cover
- Increasing crop residues left in the fields to reduce blowing dust
- Planting of Fall crops to maintain fields
- Application of manure to protect top soils from blowing away
- Staggering of the harvest to minimize blowing dust
- Outreach programs on soil conservation efforts
- Development of outreach/education materials (e.g., news articles, newsletters, fact sheets, etc.), and
- Attendance at Statewide workshop to educate other Co-Op offices to various practices to reduce blowing top soil and minimize impacts.

These control strategies are not meant to be enforceable. They are meant only to demonstrate the regional nature of cooperation in addressing blowing dust and its impacts on the community.

Natural Resources Conservation Service (NRCS)
Alamosa County is a predominately agricultural area where limited water, coupled with the frequent high winds experienced during late fall and early spring, can destroy crops, encourage pests, and damage soil surfaces lending them susceptible to wind erosion. Thus, activities that improve the topsoil and prevent its lifting during high wind events are encouraged. Some notable NRCS and agricultural examples include:

- Cover crops and perennial crops (e.g., alfalfa) are recommended to protect soils;
- NRCS works with area farmers in the development of conservation compliance plans to also protect topsoil;
- NRCS encourages the use of perennial crops or the leaving in place of weeds on the corners of area acreage (instead of tilling that might lead to open, barren lands) to reduce the lifting of topsoil;
- NRCS "cost shares" on conservation practices with local farmers to prevent soil erosion, and;
- The NRCS works with Colorado State University to identify other strategies that minimize blowing dust.

Other successful agricultural practices encouraged in the area include: timing of tillage, crop rotation, amount of crop residue left on the land, and proper water usage. These control strategies are not meant to be enforceable. They are meant only to demonstrate the regional nature of cooperation in addressing blowing dust and its impacts on the community.

Please refer to the Final NEAP in Appendix C for more detail if needed.

5.2 Pagosa Springs

Regulatory Measures- City and County
The Division and the Archuleta County Air Quality Department are responsible for implementing regulatory measures to control emissions from agricultural sources, stationary sources, fugitive dust sources, and open burning within Pagosa Springs. Archuleta County regulations of PM_{10} emissions are summarized in Table 28.

Table 28: Rules and Ordinances Regulating Particulate Matter Emissions in Archuleta County

Rule/Ordinance	Description
Pagosa Springs Land Use and Development Code 6.6.3(h)	Requires that all new developments have paved streets.
Pagosa Springs Land Use and Development Code 6.6.3(m)(i)	All new roads having a projected trip generation of 200 or greater ADT (average daily traffic) shall be paved.

The following control measures resulted in the area‘s attainment of the PM_{10} NAAQS, and these measures should ensure continued maintenance of the PM_{10} NAAQS through the year 2021, which is the duration of the maintenance period.

Control of Emissions through Road Paving
The Town of Pagosa Springs paved 6.5 miles of unpaved roads during 1992, 1993, and 1994 in order to reduce PM_{10} emissions. This strategy was adopted locally in 1991 and included in State regulation in 1992 (Section I.B. of the State Implementation Plan-Specific Regulations for Nonattainment - Attainment/Maintenance Areas (Local Elements)). The rule was approved by EPA in 1994 and was removed from the Colorado regulation in 2000 as the paving requirements had been completed.

Street Sanding Controls
There is a requirement that any user that applies street sanding material on Highway 160 and Highway 84 in the Pagosa Springs attainment/maintenance area must use materials containing less than one percent fines. Users of street sand on these highways must also use 15 percent less sand than an established base sanding amount. These strategies were adopted in 1992 and approved by EPA in 1994, and they are defined in detail in Sections I.B. and C., respectively, of the ―State Implementation Plan-Specific Regulations for Nonattainment - Attainment/Maintenance Areas (Local Elements) Regulations (5 CCR 1001-20).

Control of Emissions from Stationary Sources
Although there are no stationary sources located in the Pagosa Springs attainment/maintenance area, the State‘s comprehensive permit rules will limit emissions from any new source that may, in the future, locate in the area. These rules are outlined in Table 26.

As indicated above, emissions from new or modified major stationary sources emissions of PM10 are controlled under AQCC Regulation No. 3's nonattainment-area (NAA) new source review (NSR) permitting requirements. The NSR provisions require all new and modified major stationary sources to apply emission control equipment that achieves the "lowest achievable emission rate" (LAER) and to obtain emission offsets from other stationary sources of PM_{10}.

The EPA approval of the original PM_{10} Maintenance Plan, effective on 08/14/01, reinstates the prevention of significant deterioration (PSD) permitting requirements in the Pagosa Springs Attainment/Maintenance area. The federal PSD requirements are considered a relaxation from the

NAA NSR requirements, as LAER is no longer required and is replaced by the less stringent "best available control technology" (BACT), along with the removal of the requirement to offset PM_{10} emissions. The future reapplication of NAA NSR provisions appears unlikely in the Pagosa Springs Attainment/Maintenance area based on current PM_{10} monitoring trends.

Voluntary and State-Only Measures

In addition to the mandatory control measures discussed above, there are other activities that result in the reduction of PM_{10} emissions that are not classified as "federally enforceable control measures." Some notable examples include:

The Town of Pagosa Springs has historically cleaned Highway 160 in town throughout the winter and spring using regenerative air vacuum sweepers. The frequency of this voluntary sweeping/cleaning has been about once after each street sanding deployment. The Town of Pagosa Springs is committed to regularly vacuum sweep/clean Highway 160 within four days of the roadway becoming free and clear of snow and ice following each street sanding deployment, as weather, temperature, and street conditions permit, between the intersections of Highway 84 to the east and 14th street to the west. The town also street sweeps regularly on the side streets.

The Town of Pagosa Springs encourages private businesses to properly clean/sweep private parking lots on a regular basis. These strategies are considered to be voluntary local initiatives intended to reduce PM10 emissions. These strategies are not intended to be federally enforceable.

The city of Pagosa Springs has completed the road paving (100% of total segment) of Hot Springs
Boulevard.

The city of Pagosa Springs is gradually paving Majestic Road (see Figure 59) depending on funding sources.

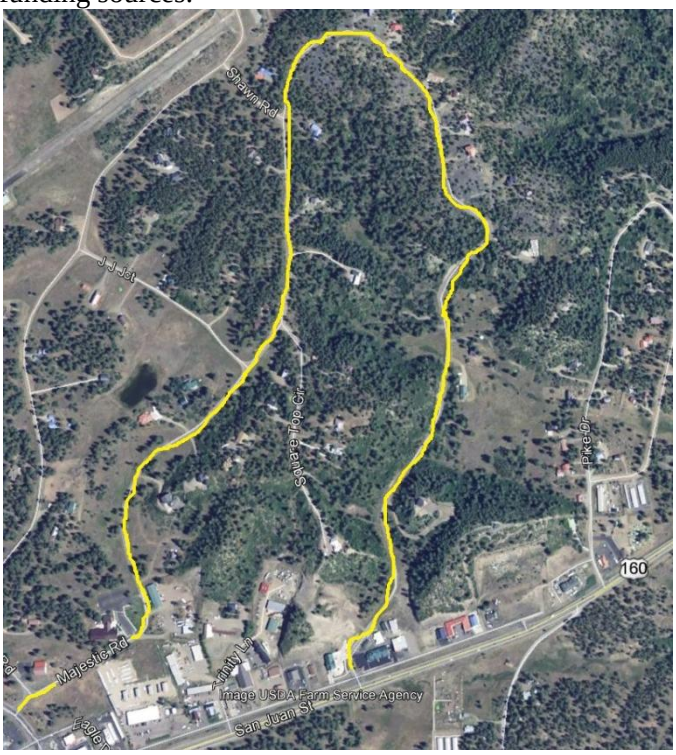


Figure 59: Majestic Road Highlighted in Yellow (Google Earth 2011)

Windblown Dust from Disturbed Soils

Pagosa Springs has a semi-arid climate with approximately 17 inches of precipitation annually. The town is located about 35 miles north of the New Mexico border at 7,000 feet. This area is considered a high desert plateau, creating an unusually mild climate. In winter and spring, regional windstorms are common, especially in drier years. It is during these high velocity windstorms that Pagosa Springs experiences PM_{10} issues. Figure 60 illustrates potential areas of local soil disturbance that have been evaluated by the Division.

Figure 60: Relative positions of Pagosa Springs PM_{10} monitor and known or potential disturbed soil. (Image from EPA)

Site A in Figure 60 shows a 1 acre vacant lot that previously contained a small convenience store which was torn down by the new owner between March and April of 2006. Division conversations with neighboring local business owners indicate the owner seeded the vacant lot (site A) with grass soon after demolishing the building. According to several nearby businesses and a court house clerk, the lot has been under continuous vegetative cover since the seeding in 2006. The grass is well maintained and is enclosed by a small fence (shown in Figure 61) to deter people from walking on the grass. Moreover, the lot is not used for parking or storage.

Figure 61: View of the fence surrounding the vacant lot (Site A)- Google Image 12-2007

Site B in Figure 60 (approximately 2 acres) shows The Springs Resort and Spa. The resort underwent an expansion; construction began in June 2008 and was completed in May 2009. By April 2009, the entire construction site was paved and the building was constructed; the interior was just being finished. Therefore, this project was completed and did not contribute to the April 28 and 29, 2010 exceptional event.

Site C in Figure 60 is a 35-acre area of vacant land. According to the Pagosa Springs Parks Department, the area is private property and is entirely naturally vegetated because of a continuous supply of ground water from the nearby stream. The Parks Department also indicates that off-road recreational vehicles are prohibited on the property. The Parks Department is very aware of dust prevention practices and does not believe that the area is a significant source of dust during high winds. With regard to AQCC Regulation 1 requirements (Section III.D.2.b), the Division considers the natural vegetation with regular ground water availability due to the low-lying terrain to be the appropriate available and practical method that is technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this lot at this time. Local sources, including the Pagosa Daily Post, cite the proposed future 35-acre hotel expansion (Site C) to be projected to occur in several phases over a 10-15 year time period.

The Division will conduct appropriate outreach and compliance assistance so the hotel is aware of potentially applicable AQCC Regulation 1 (Section III.D.2.b) and Regulation 3 (Construction Permit required if the project exceeds 25 acres and spans longer than 6 months in duration) requirements for future construction projects. The Division has specific Air Pollutant Emissions Notices (APENs) for land development and associated guidance documents posted on its website for these type of sources. Additionally, the Division has staff that conduct Small Business Assistance outreach as warranted. Compliance and enforcement inspectors from the Division are assigned regions throughout the state. As part of their workplans, they are required to be reasonably (within 1-2 business days) responsive to community and local government concerns and complaints regarding air quality issues, including fugitive dust.

Site D in Figure 60 is Yamaguchi Park, a 16-acre park consisting mostly of well-maintained turf and some stabilized clay associated with a baseball field. The entire park is irrigated on a regular basis to both maintain the vegetation and to mitigate dust. In the fall of 2008, Pagosa Springs

hydro-seeded the park and vegetation emerged around April 2009 which was watered on a regular basis to help the vegetation grow. In Figure 62 below, it is apparent that the park has well maintained vegetation and a small amount of stabilized clay. With regard to AQCC Regulation 1 requirements (Section III.D.2.b), the Division considers hydro-seeding to be the appropriate available and practical method that is technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this magnitude of construction project.

Figure 62: Yamaguchi Park- Google Image from 10-2011

The Division conducted thorough assessments to determine if the potential soil disturbances shown in Figure 5 were present during the 2010 exceedances. During the course of these assessments, the Division discovered that these sites were reasonably controlled during the April 28 and 29, 2010 high wind event. Therefore, these sites were not significant contributors to fugitive dust in the Pagosa Springs area during the April 28 and 29, 2010 high wind event.

5.3 Durango

Regulatory Measures- City and County
The Division, the La Plata County Air Quality Department, and the Southern Ute Indian Tribe are responsible for implementing regulatory measures to control emissions from agricultural sources, stationary sources, fugitive dust sources, and open burning within Durango. A summary of regulations regarding PM_{10} emissions is in Table 29.

Table 29: Rules and Ordinances Regulating Particulate Matter Emissions in Durango

Rule/Ordinance	Description
City of Durango's Municipal Code No. 10-1-22 (b)(6 &8)	Requires that all temporary (not to exceed eighteen months) office structures parking areas must have all weather surface gravel to eliminate exposed dirt. Also, the landscaping must have vegetative ground cover in all areas not covered by the building, pavement, or gravel.
City of Durango's Municipal Code Ord. No. 10-1-6 (a) "Vehicular Circulation Areas" Ord. No. 10-1-28 (a) "Driveways" Ord. No. 10-2-1 (m)(6) "On-site Parking" Ord. No. 4-3-12 (d)(1)	All developed vehicular traffic areas, driveways, on-site parking areas, and off-site parking districts are required to be properly graded for drainage and surfaced with concrete, asphaltic concrete, or any other dust-free surface materials, and maintained in good condition, free of weeds, dust, trash, and debris
City of Durango's Municipal Code Ord. No. 10-1-8 "Pollution"	Dust from developments is required to be effectively minimized to not be injurious to the neighborhood or detrimental to the general public
City of Durango's Municipal Code Ord. No. 10-1-17 (f)(14)"Recycling Facilities"	Recycling facilities are permitted and encouraged for redemption and recycling of reusable materials in order to reduce litter. These facilities are not allowed to produce dust that is detectable on neighboring properties.
City of Durango's Municipal Code Ord. No. 10-1-31 (l) (6) "Self-storage Facilities"	Self-storage facilities are prohibited for any use that produces dust or fumes
City of Durango's Municipal Code Ord. No. 10-2-4 "Bicycle Parking Spaces"	The surfaces of all bicycle parking spaces do not have to be paved, but shall be finished to reduce mud and dust
City of Durango's Municipal Code Ord. No. 10-5-14 (a)(6) "Campgrounds"	All recreational campgrounds that have parking spaces and interior roads are required to be paved or treated to reduce dust
City of Durango's Municipal Code Ord. No. 10-10-16 (c)(11) (e)	Construction sites are required to evaluate and control dust pollutants for runoff potential
City of Durango's Municipal Code Ord. No. 10-10-16 (y)(1)(d)	Construction sites are required to have an erosion control plan for gravel, sand, dirt, or topsoil removal
City of Durango's Municipal Code Ord. No. 2000-10, § 1, 5-2-00	All work in the public right-of-way shall control dust and debris and promptly remove

	dirt and material deposited on roadways
City of Durango's Municipal Code Ord. No. 6-2-1 (a)(4))	All planned residential districts must comply with dust ordinances and not be objectionable due to dust emissions
La Plata County Land Use Code (LPLUC)[2] Sec. 82-191-193	Proposed developments must conduct a compatibility assessment, including a neighborhood meeting, if there is a potential to produce dust or significant dust influence. Possible solution for dust may include changing emitter specifications to mitigate problem. Dust emissions cannot have significant adverse impacts on neighbors.
La Plata County Land Use Code (LPLUC)[1] Sec. 82-167 (b)(3)	Proposed multiple unit developments are required to contain and/or mitigate dust among other external nuisances.
La Plata County Land Use Code (LPLUC)[1] Sec. 90-124 (c)(8)	Roads and access driveways for all new facilities shall be constructed in a manner that suppresses dust through construction, drilling, and operational activities. Facilities that reduce or destroys existing vegetation may consult with the Soil Conservation Service (renamed the Natural Resources Conservation Service in 1994) and develop a re-vegetation plan, specifying particular species as well as appropriate planting schedules and methods
La Plata County Land Use Code (LPLUC)[1] Sec. 74-174 (a)	Cattle guards are required to be kept clean of all sand, silt, dirt, and other solid debris.

The City of Durango, La Plata County, and the Southern Ute Indian Tribe have implemented dust control regulatory measures for numerous sources. Both the City and the County have a number of proactive programs that reduce dust from significant PM_{10} source categories in La Plata County. The following detail local dust control ordinances as of March 2012 for the Durango area:

Street Sweeping and Sanding Controls

The City of Durango performs street sweeping five days per week in the downtown area on a rotating basis and once every two months in residential areas. The City is responsible for street sweeping State Highways 550 and 160 that run through the City. In 2012, the City estimates sweeping an average of
11,873 miles per year, running sweeper operations 2,130 hours, and removing 4,195 cubic yards of debris. The town of Bayfield in La Plata County performs street sweeping on town streets periodically.

The City of Durango employs a Snow and Ice Division that uses street maintenance crews to remove snow and ice for 30% of their time. This Division de-ices major streets prior to snow with magnesium chloride ($MgCl_2$). Streets are plowed and sanded according to priority (i.e. hazardous intersections, snow routes, downtown, and bus routes) after snowstorms. The City spends on

[2] The LPLUC applies to all county lands, which includes the exterior boundaries of the Southern Ute Indian Reservation, except trust lands, in order to decrease nuisances from approved land uses.

average 2,968 hours per year plowing streets (as of 2012). The City estimates that it spends on average 979 hours sanding/salting streets (as of 2012).

Dust Suppressant Program
La Plata County currently employs a dust suppressant program. The major focus of the program is to reduce dust from gravel roads. La Plata County has approximately 196 miles of paved roads and about 490 miles of gravel roads. Approximately 220 centerline miles of gravel road are treated with about 950,000 million gallons of $MgCl_2$ annually. The County typically begins application of $MgCl_2$ in late April or early May, and continues as needed through September. In May and June (annually), roads not slated to receive new gravel are the first to be treated with $MgCl_2$. During July through September (annually), other roads are treated, including roads being resurfaced, and those roads needing a second application.

Landfills
La Plata County closed the Durango Landfill in 1990, and has been working with the Colorado Department of Public Health and Environment to ensure post-closure care and maintenance standards are met. These include, but are not limited to, minor grading to correct any erosion, maintenance of the surface drainage, and ground cover enhancement.

The remaining landfill in La Plata County, Bondad Landfill, is located approximately 15 miles south of Durango within the exterior boundaries of the Southern Ute Indian Reservation, and has been in operation since 1997. The landfill is privately owned and operated by WCA Waste Corporation.
The landfill has a fugitive dust emission control plan in its Part 71 permit currently enforced by the Environmental Protection Agency (EPA) (Region 8).

On March 2, 2012, the Southern Ute Indian Tribe received full approval from EPA to administer its
Part 70 Operating Permit Program within the exterior boundaries of the Reservation. The Tribe is currently conducting the process of its Transition Plan to inform the Landfill (and other Title V sources) about the jurisdictional change. The Southern Ute Indian Tribe will transition Part 71 permits to the Tribe-issued Part 70 permits for all Reservation Title V sources. This transition process will take place over a three-year period in accordance with the Tribe's Transition Plan (found at: *http://www.southernute-nsn.gov/air-quality/part-70*). The transition process is planned to be completed by March 2, 2015 (three years (36 months) after the program was approved by EPA).

Durango Train Smoke Mitigation Task Force
The Durango and Silverton Narrow Gauge Railroad operates historic coal-fired steam locomotives from its yard located on the south-side of Durango. Because of the potential for thermal stress damage (cracking) to the antique boilers (greater than 100 years in age) from repeated cycling between cold and hot, they must idle throughout the night in order to be ready for use the next day, creating emissions from various pollutants. In 2001, the train operator installed scrubbers at the train yard roundhouse to control emissions from some of the locomotives while idling overnight. However, space limitations at the roundhouse prevented the operator from controlling all of the locomotives.

In 2007, the train operator pledged to spend $1 million over 5 years to reduce emissions by 10% each year. The railroad employs several emission-reducing alternatives, including burning wood pellets instead of coal at night to keep engines warm, building a new ash pit in Silverton to reduce idle time in Durango in 2005, using diesel for all switching and track maintenance, and

specialized training for engine firemen on how to place coal and wood pellets. Durango Service Clubs collaborated to completely offset the carbon footprint of the D&SNGRR through the purchase of Green Power through La Plata Electric Association. IN 2009, the Urban Reforestation Project to offset Greenhouse gas emissions associated with Railroad vehicle fleet planted 2,587 trees in Durango and Silverton. The planted trees also reduce wind erosion and blowing dust.

There is a Train Smoke Mitigation Task Force that was created to proactively implement a responsible smoke mitigation program that maintains the railroad's historic steam engine operations while reducing smoke and pollution. The Task Force began meeting in late 2005 to address public and neighborhood concerns. Currently as of 2013, the Train Smoke Mitigation Task Force is seeking funding to construct an expanded scrubber system, estimated at $1.2 million dollars.

Vegetative Cover/Parks

The Durango Parks and Recreation Department removes sand, dirt, and organic debris from park roads, City parking lots, and hard surfaces twice a year and sweeps the hard surface trails monthly. There are 14.49 miles of hard surface trails in Durango. The multi-use trails systems are either in completion or construction phases, which have multiple benefits, including reducing motor vehicle use and reducing fugitive dust from lengthy unpaved trails. The largest of these projects are the Animas River Trail (ART) and the Safe, Multi-Modal, Aesthetic, Regional Transportation trail aligning along Highway 160 (SMART 160). The ART is an ongoing project to provide a 10 foot wide cement trail along the river corridor. Each year the City completes a new stage of the project as it is all cash funded. The SMART 160 project is also ongoing. There is a large section of the walking trails that will be finished in the summer of 2014. There are approximately 93.2 of natural surface unpaved trails in the open space surrounding Durango that are primarily dirt and native rock.

The City of Durango built a new 15 acre soccer complex at 700 Talon Lane on the Fort Lewis College campus. It is called Smith Sports Complex and it is anticipated to open in the fall of 2013. The 15 acre site was previously open dirt (as shown in Figure 63) and now it is full covered with turf grass, parking, restroom facility and playground area. The complex including the 8-acre turf grass playing fields is irrigated.

Figure 63: Site of the new Smith Sports Complex. (Google Earth 2011)

From 2010-2013, the Three Springs subdivision developer planted and irrigated the vegetation in the 34.78 acre Three Springs Southern Open Space located at 700 Wilson Gulch Drive (shown in

Figure 64). Additionally, the 15.28 acre Three Springs Confluence Park has been constructed in phases within the development at 100 Confluence Avenue (also shown in Figure 64).

Figure 64: Three Springs Southern Open Space and the Three Springs Confluence Park before Completion (Google Earth 2011)

Oil and Gas Exploration and Development Standards for Federal Lands

- La Plata County and the Southern Ute Indian Reservation contain oil and gas exploration and development sites. The Bureau of Land Management (BLM) and the Forest Service (FS) have surface operating standards and guidelines for oil and gas exploration and development (see: (http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy/oil_and_gas.Par.18714.File.dat/OILgas.pdf). These standards control dust from a number of contributing sources, including:
- Road maintenance is required for all roads that will be constructed or used in conjunction with drilling. These maintenance plan activities include blading, surface replacement, dust abatement, spot repairs, slide removal, ditch cleaning, culvert cleaning, litter cleanup, noxious weed control, and snow removal. Key maintenance considerations include regular inspections; reduction of ruts and holes; maintenance of crowns and outslope to keep water off the road; replacement of surfacing materials; clearing of sediment blocking ditches and culverts; maintenance of interim reclamation; and noxious weed control (page 30).
- Regarding BLM resource and FS local roads (page 25):
    - The design speed limit on roads, specific to oil and gas roads, is 10 to 30 miles per hour. For the FS, this should generally be less than 15 miles per hour.
    - The road gradient should not exceed 8 percent except for pitch grades (300 feet or less in length) in order to minimize environmental effects.

- Drainage control must be ensured over the entire road through the use of drainage dips, insloping, natural rolling topography, ditch turnouts, ditches, or culverts.

- Regarding BLM local and FS collector roads (page 26):
  - The design speed limit is generally 15 to 50 miles per hour. For the FS, it is 15 to 25 miles per hour.
  - Maximum grades should not exceed 8 percent. Pitch grades for lengths not to exceed 300 feet may be allowed to exceed 8 percent in some cases.
- Regarding BLM collector and FS arterial roads:
  - Design speed is 30 miles per hour or greater unless otherwise directed.
  - Maximum grades should not exceed 8 percent. Pitch grades for lengths not to exceed 300 feet may be allowed to exceed 8 percent in some cases.

Windblown Dust from Disturbed Soils

Durango has a semi-arid climate with approximately 19 inches of precipitation annually. The town is located in southwest Colorado near the Four Corners area where New Mexico, Colorado, Utah, and Arizona connect at about 6,500 feet. In winter and spring, regional windstorms are common, especially in drier years. It is during these high velocity windstorms that Durango may experience PM_{10} issues. Figure 3 illustrates potential areas of local soil disturbance that have been evaluated by the Division.

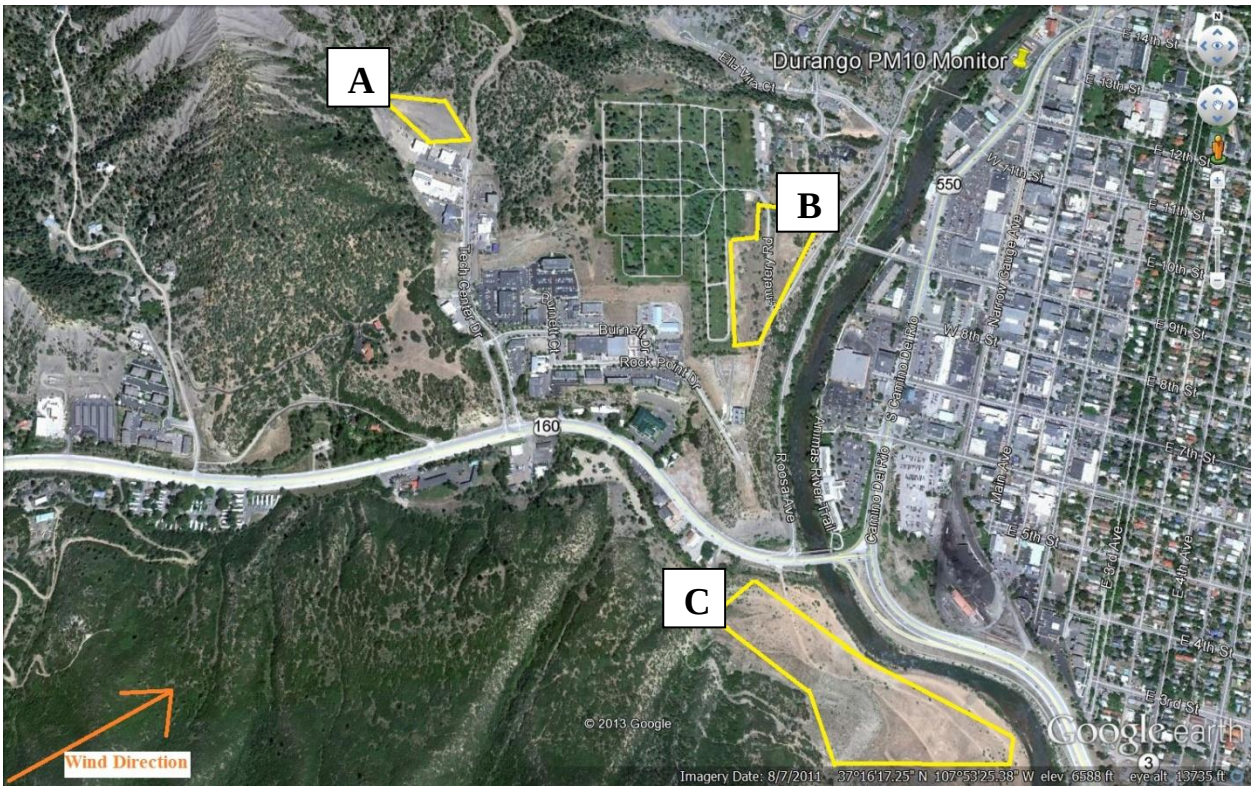


Figure 65: Relative positions of Durango PM_{10} Monitor and potential disturbed soil. (Image from Google Earth 2011)

Site A (approximately 2.5 acres) in Figure 65 is west of town at the north end of Tech Center Dr. This land is zoned by the City of Durango as "Public". This site is a privately owned vacant lot.

Site B (approximately 11 acres) in Figure 65 is west of Roosa Ave, south of Ella Vita Court and east of the Greenmount Cemetery. This land is zoned by the City of Durango as "Planned Development". The cemetery informs us that this land is open space that is naturally vegetated.

Site C (approximately 35 acres) in Figure 65 is along the river to the south west of town. This land is zoned by the City of Durango as "Public". Further investigation revealed that this site is the Durango Dog Park Off-Leash area. The park is comprised of scrublands with a natural surface trail and was converted from a city park into an off-leash area in 2003. A sign at the park's entrance and three signs around the park mark the border of the property. The park has no fencing but the Durango Director of Parks and Recreation notes the city has not experienced issues within the park's natural boundaries of Smelter Mountain and the Animas River.

The Division conducted thorough assessments to determine if the potential soil disturbances shown in Figure 65 were present during the 2010 exceedances. During the course of these assessments, the Division discovered that these sites were either reasonably controlled or considered to be natural sources during the April 28 and 29, 2010 high wind event. Therefore, these sites were not significant contributors to fugitive dust in the Durango area during the April 28 and 29, 2010 high wind event.

6.0 Summary and Conclusions

APCD is requesting concurrence on exclusion of the PM_{10} values from Alamosa-Adams State College (08-003-0001), Alamosa-Municipal Building (08-003-0003), and Pagosa Springs-Middle School (08-007-0001) on April 28, 2010.

APCD is requesting concurrence on exclusion of the PM_{10} values taken at Pagosa Springs-Middle School (08-007-0001) and Durango-River City Hall (08-067-0004) on April 29, 2010.

Elevated 24-hour PM_{10} concentrations were recorded across Colorado on April 28 and 29, 2010. All of the noted April 28 and 29, 2010, twenty-four-hour PM_{10} concentrations were above the 90^{th} percentile concentrations for their locations (see Table 24 and Table 25). The statistical data and meteorological analysis clearly shows that but for this high wind blowing dust event, Alamosa, Pagosa Springs, and Durango would not have exceeded the 24-hour NAAQS on April 28 and 29, 2010. Since at least 2005, there has not been an exceedance that was not associated with high winds carrying PM_{10} dust from distant sources in these areas. This is evidence that the event was associated with a measured concentration in excess of normal historical fluctuations including background.

The PM_{10} exceedances in Alamosa, Pagosa Springs and Durango on April 28 and 29, 2010, would not have occurred if not for the following: (a) dry soil conditions over southeastern Utah, northeastern Arizona, portions of extreme northwestern New Mexico, and portions of southern Colorado with 30-day precipitation totals below the thresholds for blowing dust; (b) a strong surface and upper-level low pressure system that caused widespread strong gusty winds through a deep layer of the atmosphere over the area of concern; and (c) friction velocities over the desert regions of northwest New Mexico, Utah, Arizona and much of Colorado that were high enough to allow entrainment of dust from natural sources with subsequent transport of the dust into (or within) Colorado in strong, southwesterly winds.

Surface weather maps for the Four Corner States show evidence of widespread blowing dust and winds above the threshold speeds for blowing dust on April 28 and 29, 2010. These surface analyses show that wind speeds were as high as 53 mph and wind gusts were as high as 70 mph on April 28 and 29, 2010, occurred. These speeds are above the thresholds for blowing dust identified in EPA draft guidance and in detailed analyses completed by the State of Colorado. These PM_{10} exceedances were due to an exceptional event associated with regional windstorm-caused emissions from erodible soil sources over a large area of Arizona, northwest New Mexico, southeast Utah and southwest Colorado. These sources are not reasonably controllable during a significant windstorm under abnormally dry or moderate drought conditions.

The blowing dust climatology for the Four Corners area indicates that the area can be susceptible to blowing dust when winds are high. Landform imagery shows that northeastern Arizona and southeastern Utah in particular have experienced a long-term pattern of wind erosion and blowing dust when winds have been southwesterly and blowing into western and southern Colorado. Forecast products from the Navy Aerosol Analysis and Prediction System model provide evidence for a widespread blowing dust event in the Four Corners states, suggesting that significant source regions for dust transported into Colorado were located in arid regions of Arizona, Utah, and New Mexico. NOAA HYSPLIT forward and backward trajectories provide clear supporting evidence that dust from desert regions of northwest New Mexico and Arizona caused the PM_{10} exceedances measured across portions of southwestern Colorado on April 28 and 29, 2010. Soils in the Four Corners area and in northeastern Arizona, southeastern Utah, and

extreme northwestern New Mexico in particular were dry enough to produce blowing dust when winds were above the thresholds for blowing dust.

Both wind speeds and soil moisture in the Four Corners area and northeastern Arizona were conducive to the generation of significant blowing dust. Soils in southeastern Utah, northwestern New Mexico, and northeastern Arizona in particular were dry enough to produce blowing dust when winds were above the thresholds for blowing dust. At these locations of concern wind speeds were as high as 53 mph and wind gusts were as high as 70 mph on April 28 and 29, 2010. But for the dust storm on April 28 and 29, 2010, this exceedance would not have occurred.

Friction velocities in wide area of northern Arizona, northwestern New Mexico, southeastern Utah, and southwestern Colorado had friction velocities above 1.0 meters per second during the second half of the day on April 28, 2010. Even undisturbed desert soils normally resistant to wind erosion will be susceptible to blowing dust when friction velocities are greater than about 1.0 to 2.0 meters per second. Note that blowing dust will typically only occur where these values are high and the soils are dry and not protected by vegetation, forest cover, boulders, rocks, etc. This is why blowing dust occurred in the desert and more arid areas of Arizona, northwestern New Mexico, southeastern Utah, and southwestern Colorado on April 28 and 29, 2010. These elevated friction velocities (shown in Figure 34 and Figure 35) and the data on soil moisture conditions presented elsewhere in this report, and the prevalence of winds above blowing dust thresholds prove that this dust storm was a natural event that was not reasonably controllable or preventable.

MODIS and GOES satellite imagery shows that the Painted Desert and Four Corners area in general were source regions for the blowing dust that spanned April 28 and 29, 2010, This is consistent with the climatology for many dust storms in Colorado as described in the Grand Junction, Colorado, Blowing Dust Climatology report contained in Appendix A of this document. The observations of winds above blowing dust thresholds and restricted visibilities in the areas of concern demonstrate that this is a natural event that cannot be reasonably controlled or prevented.

The Center for Snow and Avalanche Studies has been studying the effects of wind-blown desert dust from Arizona, New Mexico, and Utah on snowpack albedo and snowmelt in the San Juan Mountains of Colorado. The Center for Snow and Avalanche Studies lists April 28, 2010, as one of nine Dust-on-Snow events for the 2009/2010 water year, and this provides clear supporting evidence that a regional blowing dust event with long-range transport caused the PM_{10} exceedances measured across portions of Colorado on April 28, 2010. Snow cover data provide strong evidence that a widespread, regional, blowing dust event caused exceedances at these locations. In addition, scientists at the NOAA Satellite Services Division reported significant dust transport from northeastern Arizona and northwestern New Mexico into Colorado during this event. Friction velocities provide a measure of the near-surface meteorological conditions necessary to cause blowing dust. Friction velocities were high enough to sustain blowing dust over undisturbed soils in each of the Four Corners states during this event. But for the dust storm on April 28 and 29, 2010, this exceedance would not have occurred.

7.0 References

Colorado Department of Public Health and Environment, City of Lamar, Prowers County Commissioners, *Natural Events Action Plan for High Wind Events – Lamar, Colorado*, April 1998.

Draxler, R.R. and Rolph, G.D., 2012. *HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) Model access via NOAA ARL READY Website (http://ready.arl.noaa.gov/HYSPLIT.php). NOAA Air Resources Laboratory, Silver Spring, MD.*

Marticorena, B., G. Bergametti, D. Gillette, and J. Belnap, 1997, Factors controlling threshold friction velocity in semiarid and arid areas of the United States, *Journal of Geophysical Research 102 D19*, 23,277-23, 287.

Technical Services Program, Air Pollution Control Division, Colorado Department of Public Health and Environment, November 22, 2011,*Technical Support Document for the January 19, 2009 Lamar Exceptional Event.*

United States Environmental Protection Agency, June 2012, 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.

Appendix A- Grand Junction, Colorado, Blowing Dust Climatology January 24, 2012

There can be significant transport of regional blowing dust into Grand Junction from source regions in Utah and Arizona. While there are sources for wind-blown dust within the Grand Valley and Grand Junction itself, there is evidence from the analysis of soil features, wind and precipitation climatology, and statistical analyses of Grand Junction exceedances of the PM10 standard that regional sources often play a significant role during these blowing dust events. This document provides a weight of evidence analysis for dust transport into Colorado.

Grand Junction, Colorado, is located in a part of the country that is largely arid to semi-arid. Figure A-1 through A-3 show the annual average precipitation for Colorado, Arizona, and Utah, respectively. Grand Junction is in the Grand Valley of Western Colorado where the annual precipitation is typically less than 10 inches. Northeastern Arizona, which is frequently upwind of Grand Junction during blowing dust events, receives between 5 and 15 inches of precipitation each year. The Colorado River Basin in eastern and southeastern Utah, which is also frequently upwind of Grand Junction during blowing dust events, also receives 5 to 10 inches per year.

Figure A-4 shows the 1971-2000 monthly normal precipitation amounts for Grand Junction, Colorado. The annual average for this time period is 8.99 inches. The wettest months are March through May and August through October. The driest months are January, February, June, July, November, and December. These months receive an average of 0.57 inches per month. The annual monthly average precipitation is 0.75 inches.

Arid to semi-arid soils make much of the region susceptible to blowing dust. The map in Figure A-5 shows that portion of the Colorado Plateau (circled in red) where modern wind erosion features are common and clearly visible in Google Earth images. These features include longitudinal dunes and other sand or soil erosion structures with a predominant southwest to northeast orientation. This orientation is the result of the predominant southwesterly flow that occurs during high wind and blowing dust events in the region. Figures A-6 through A-12 present aerial views of ubiquitous erosion features in northeastern Arizona and southeastern Utah. The Painted Desert of northeastern Arizona is frequently the source for much of the blowing dust in the Four Corners region. Figure A-13 provides a particularly good satellite image of a blowing dust event originating in the Painted Desert and extending northeastward across the junction of the Four Corners (source: NASA Tera satellite, http://earthobservatory.nasa.gov/IOTD/view.php?id=37791). Strong southwesterly winds caused this blowing dust event.

The text that accompanies this image on NASA's Earth Observatory 10th Anniversary page follows below:

> "A dust storm struck northeastern Arizona on April 3, 2009. With winds over 145 kilometers (90 miles) per hour reported near Meteor Crater, east of Flagstaff, the storm reduced visibility and forced the temporary closure of part of Interstate 40, according to *The Arizona Republic.*
>
> The Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite captured this image on April 3, 2009. Clear skies allow a view of multiple source points of this dust storm. The source points occur along an arc that runs from northwest to southeast.
>
> This dust storm occurred in the area known as Arizona's Painted Desert, and the dust plumes show why. Whereas many dust plumes are uniform in color, these plumes resemble a band of

multicolored ribbons, ranging from pale beige to red-brown, reflecting the varied soils from which the plumes arise. The landscapes of the Painted Desert are comprised mostly of Chinle Formation rocks—remains of sediments laid down during the time of the first dinosaurs, over 200 million years ago."

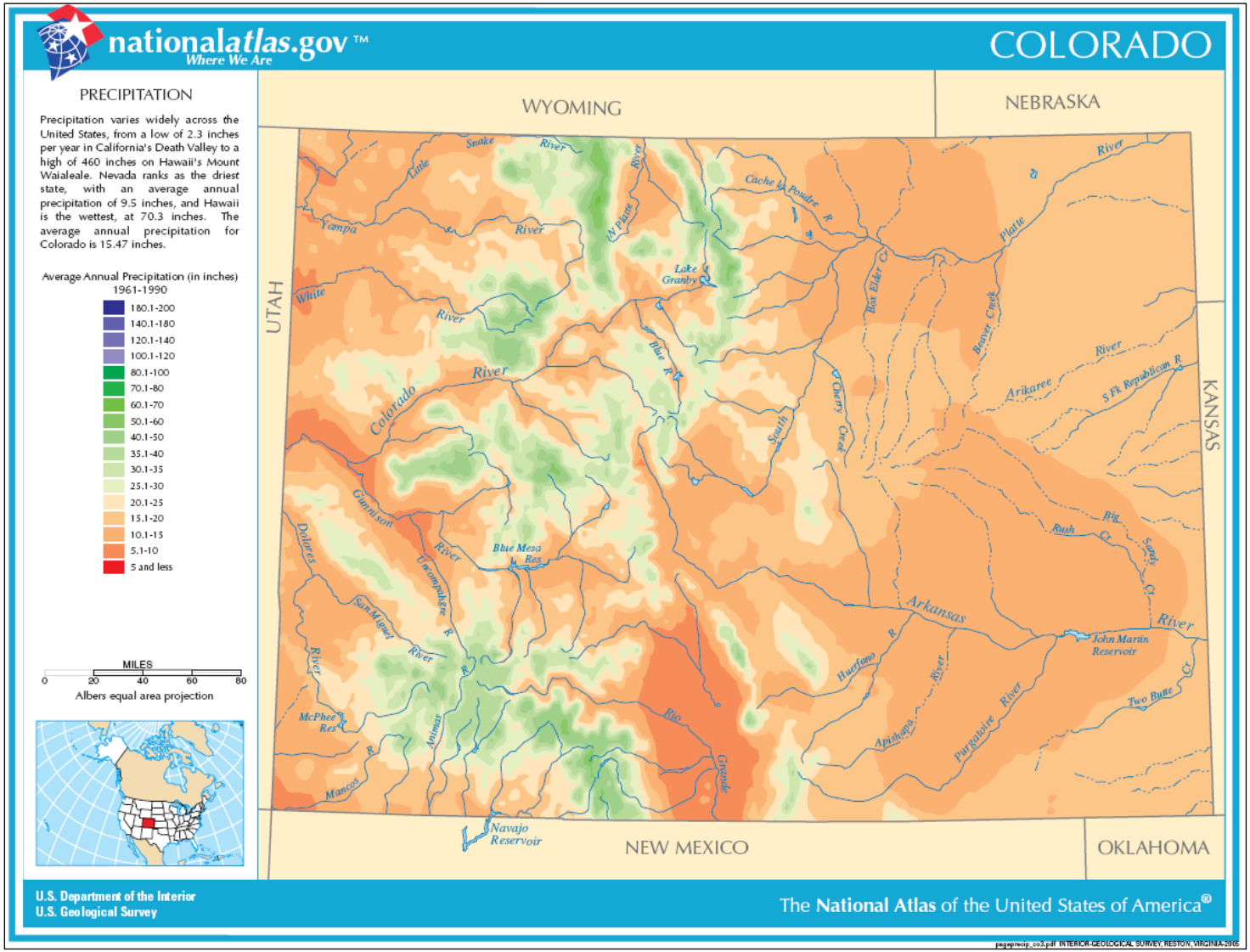


Figure A-1. Average annual precipitation in Colorado based on 1961-1990 normals.

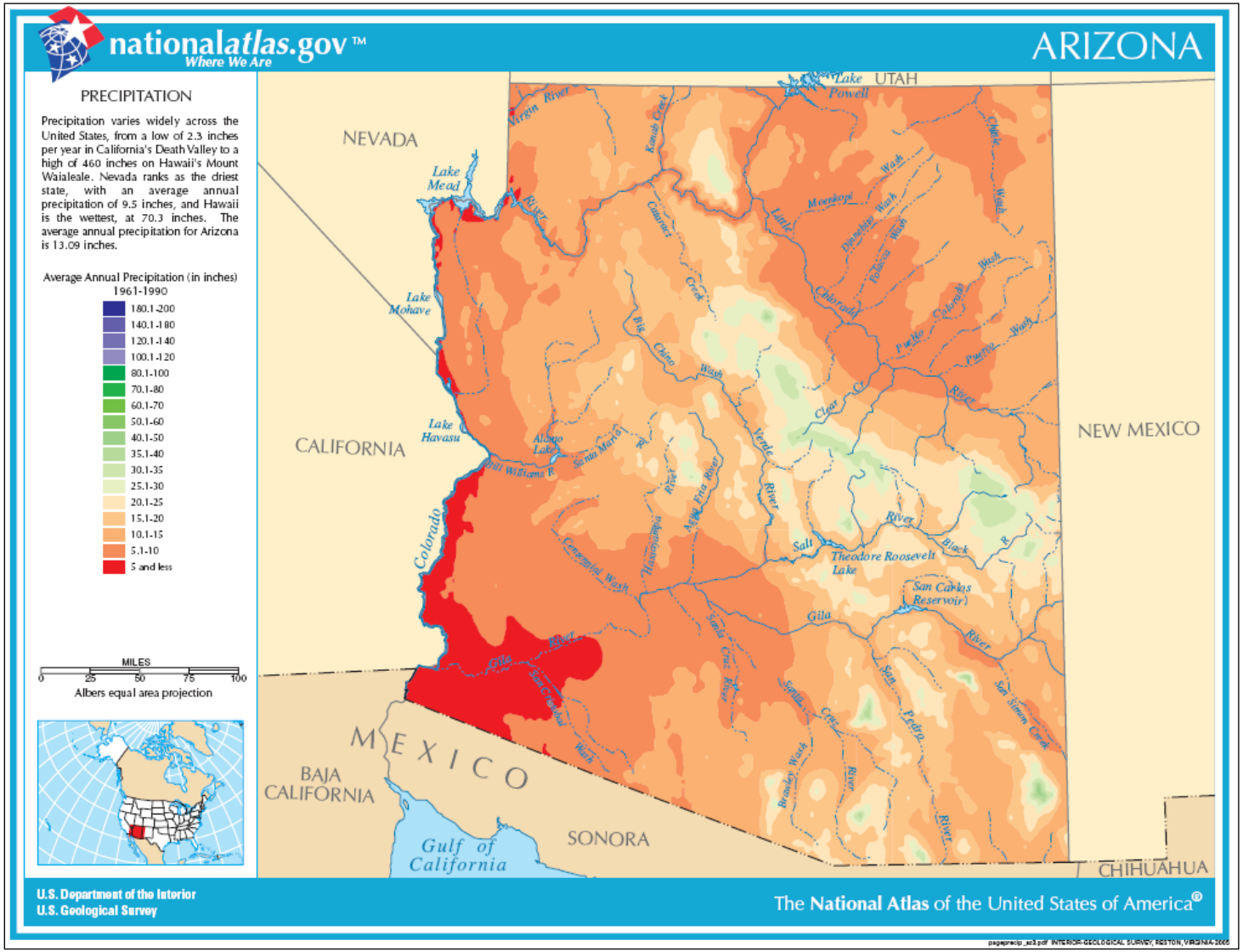


Figure A-2. Average annual precipitation in Arizona based on 1961-1990 normals.

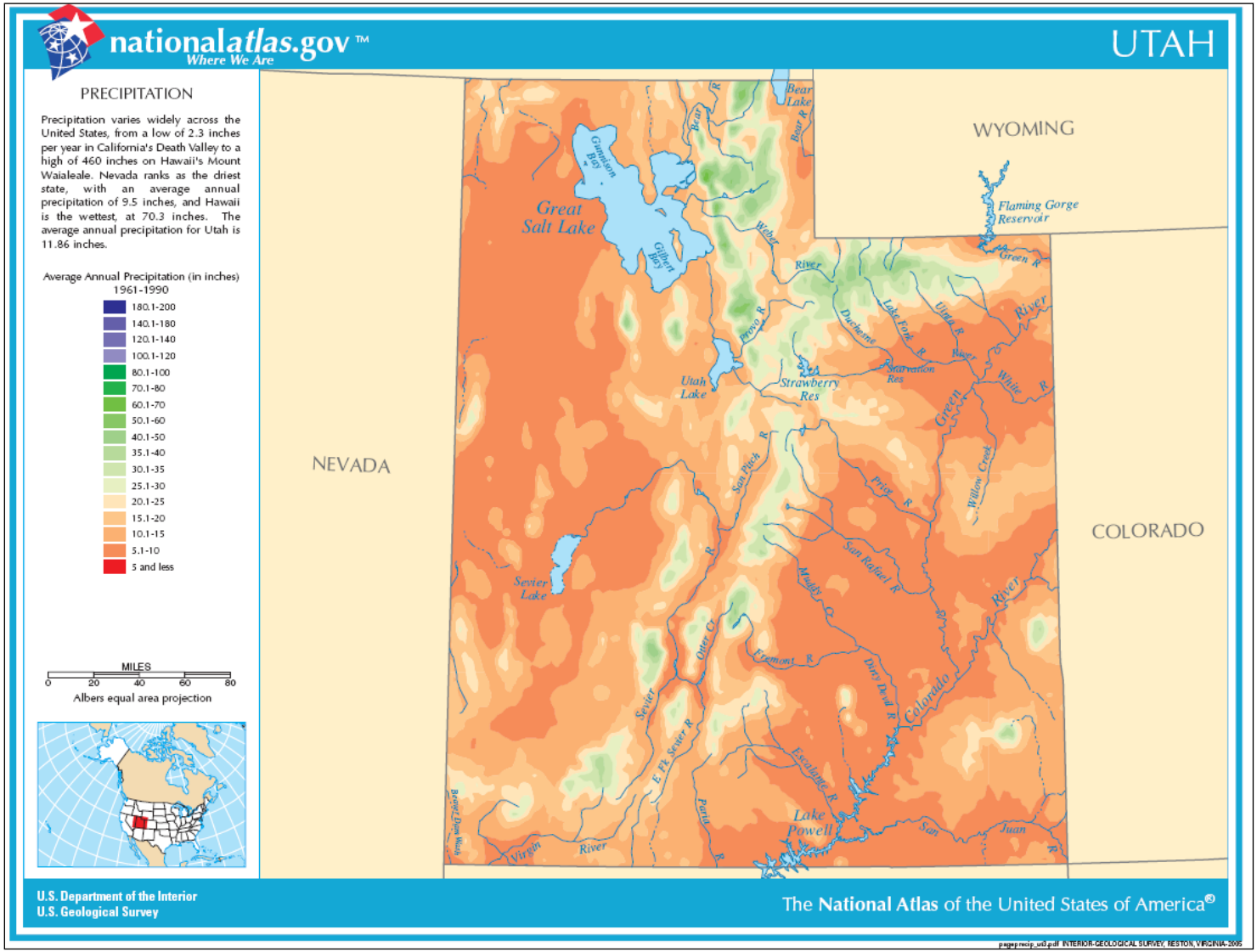


Figure A-3. Average annual precipitation in Utah based on 1961-1990 normals.

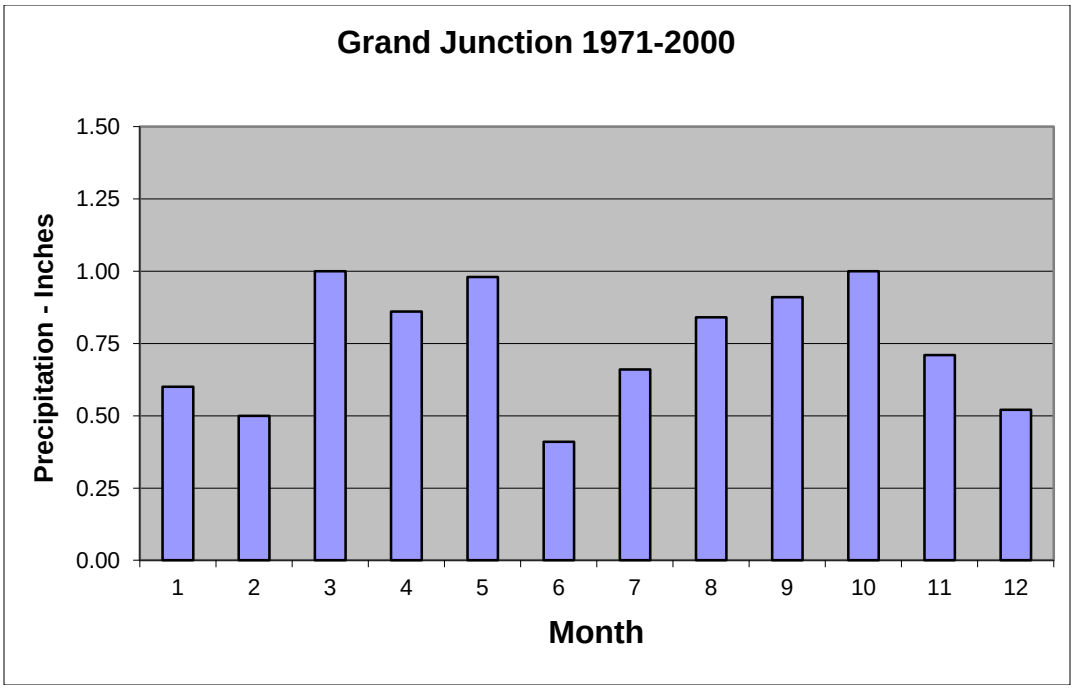


Figure A-4. 1971-2000 monthly normal precipitation in Grand Junction Colorado.

Figure A-5. The portion of the Colorado Plateau in Utah, Arizona, and New Mexico that exhibits widespread surface soil and sand erosion features in Google Earth imagery. Much of the highlighted area within Arizona is within the Painted Desert.

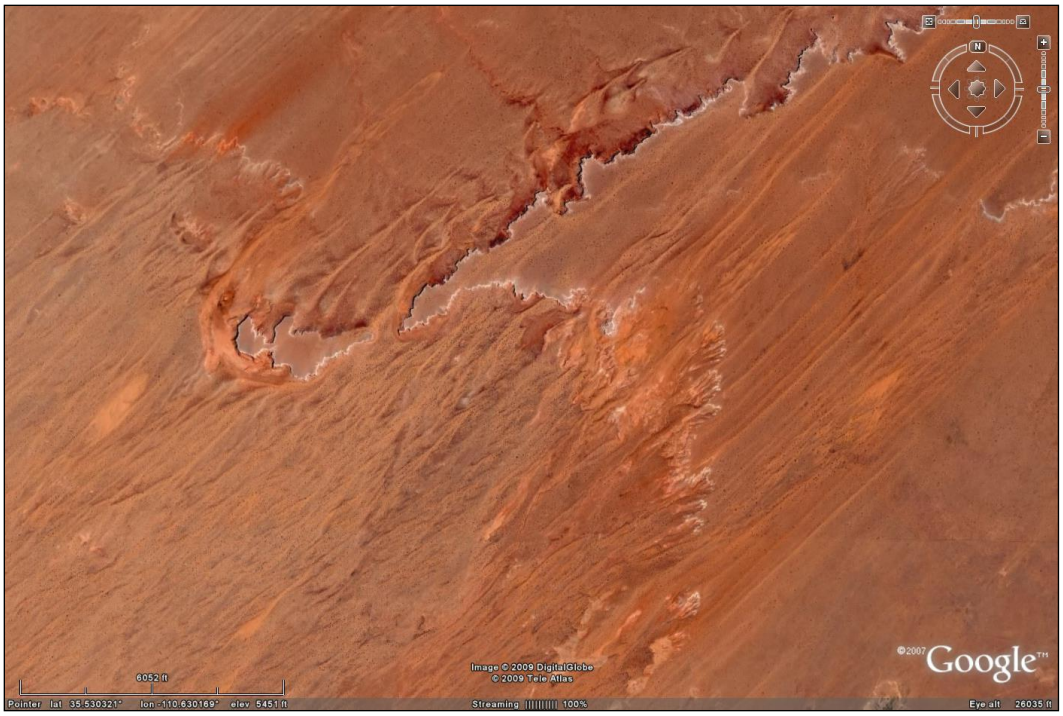


Figure A-6. Southwest to northeast soil and sand erosion structures in southeastern Utah.

Figure A-7. Southwest to northeast soil and sand erosion structures in northeastern Arizona (Painted Desert).

Figure A-8. Southwest to northeast soil and sand erosion structures in southeastern Utah.

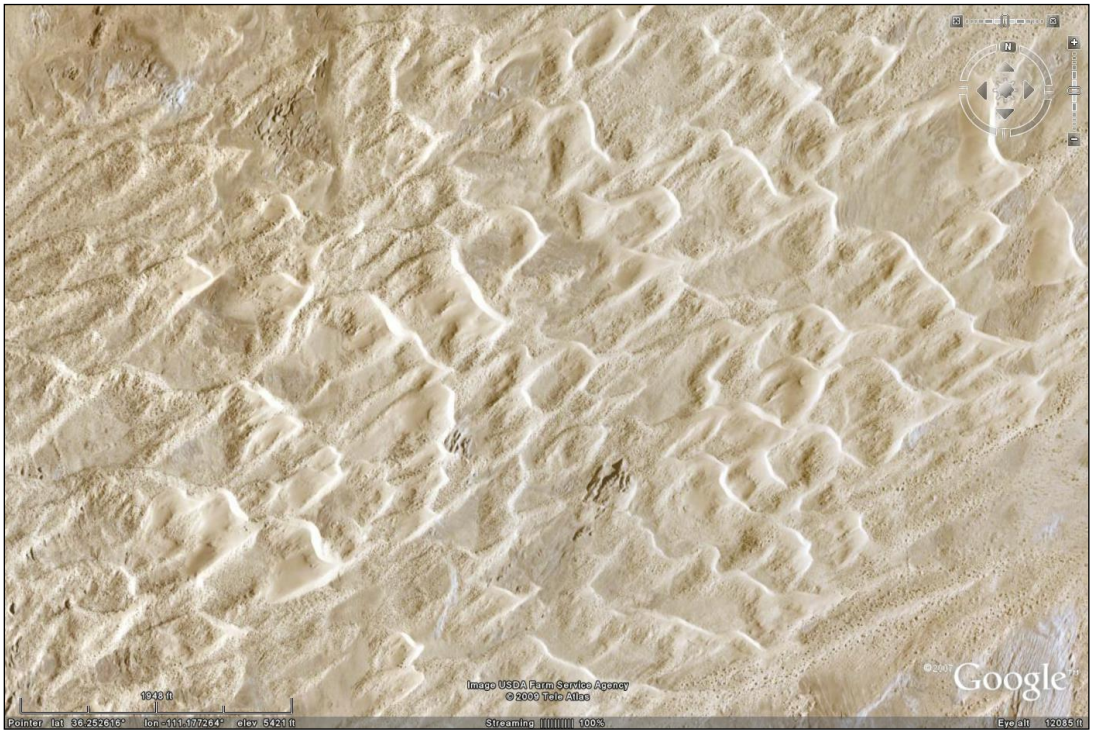


Figure A-9. Southwest to northeast soil and sand erosion structures in northeastern Arizona (Painted Desert). The slip faces of dunes (lighter bands) face in the direction of wind flow – toward the northeast.

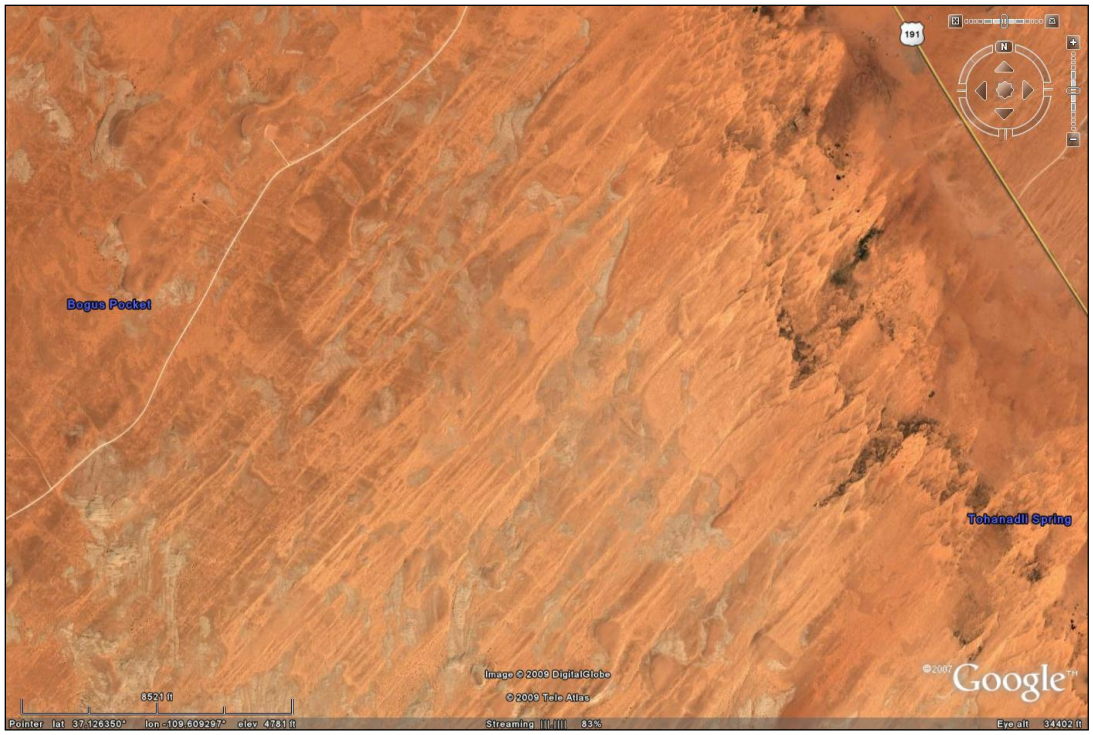


Figure A-10. Southwest to northeast soil and sand erosion structures in southeastern Utah.

Figure A-11. Southwest to northeast soil and sand erosion structures in northeastern Arizona (Painted Desert).

Figure A-12. Southwest to northeast soil and sand erosion structures in northeastern Arizona (Painted Desert).

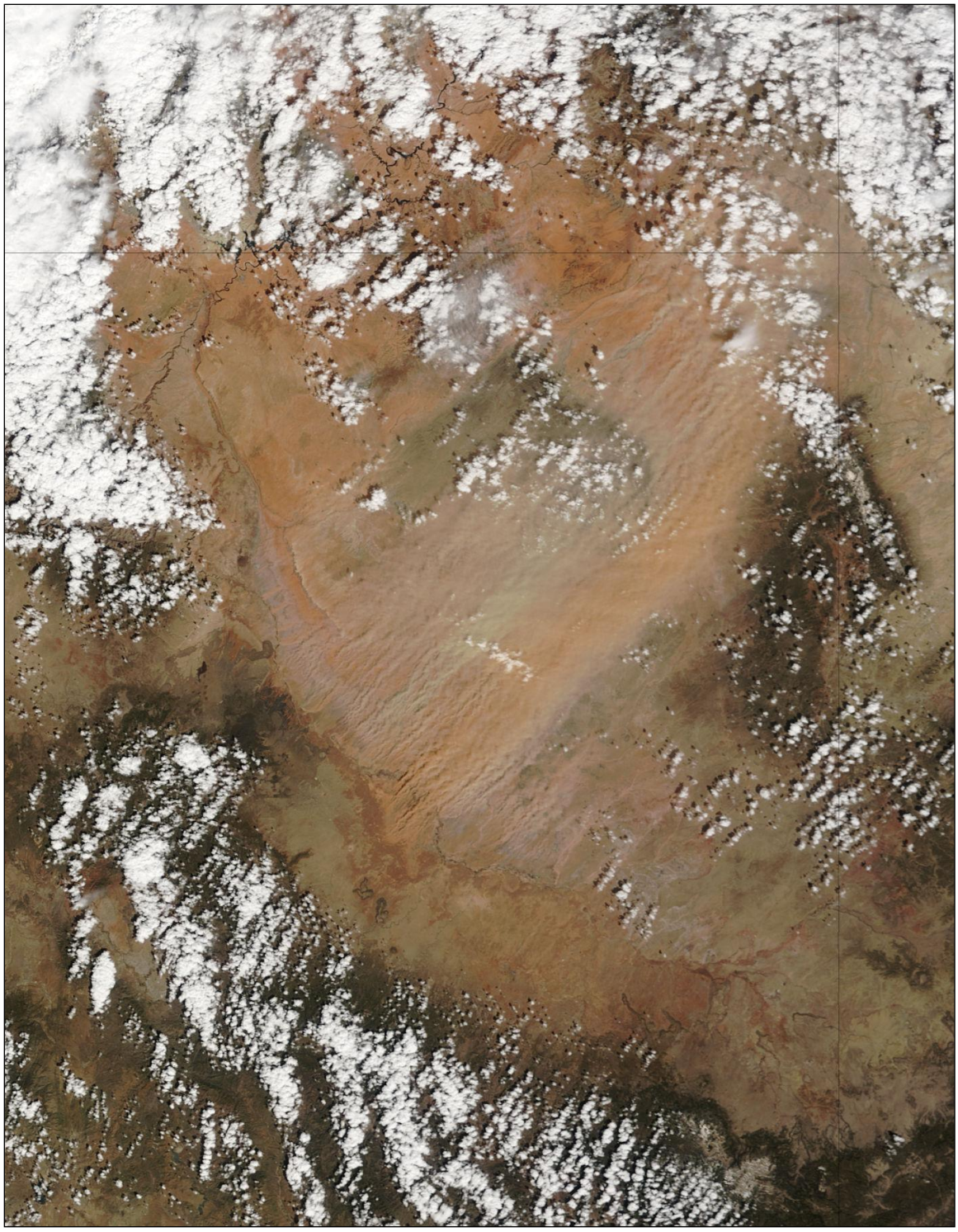


Figure A-13. NASA Tera satellite image of a dust storm on April 3, 2009, in southwesterly flow over the Painted Desert of northeastern Arizona (http://earthobservatory.nasa.gov/IOTD/view.php?id=37791).

Figure A-14 displays the surface weather map for this event (00Z April 4, 2009, or 5 PM MST April 3, 2009). A strong low pressure system in southern Colorado, strong southwesterly winds in the Four Corners area, and the blowing dust symbol (infinity sign) at Farmington (New Mexico) and Cortez (Colorado) are evident in this map. Blowing dust in this region is frequently associated with southwesterly flow.

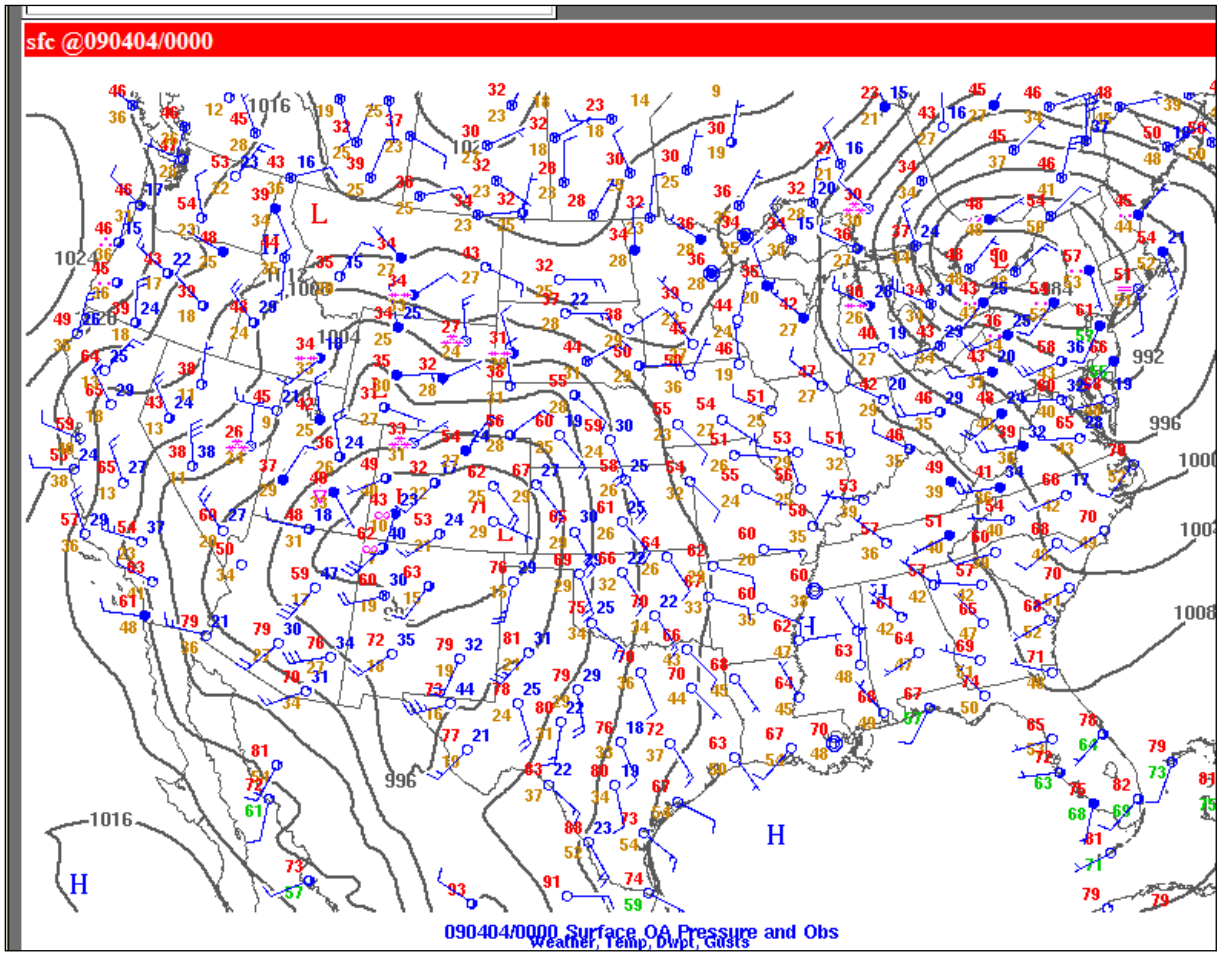


Figure A-14. Surface weather map for 00Z April 4, 2009, (5 PM MST April 3, 2009), showing a strong low pressure system in southern Colorado, strong southwesterly winds in the Four Corners area and the blowing dust symbol (infinity sign) at Farmington (New Mexico) and Cortez (Colorado).

A USGS map of the Colorado Plateau in Figure A-15 shows the prevalence of eolian or wind-blown sand deposits in southeastern Utah and northeastern Arizona. An analysis of the annual frequency of dust storms (Orgill and Sehmel, 1976) in the western half of the U.S. suggests that portions of eastern and western Utah and northeastern Arizona are source regions for blowing dust (see Figure A-16). Soil and sand structures point to the prevalence of southwesterly flow during blowing dust events, and precipitation climatology highlights the potential for blowing dust across much of the region. In addition, an analysis of back trajectories associated with high PM10 concentration events in Grand Junction discussed in the next section of this document supports the conclusion that soils in Arizona and Utah are likely significant contributors to PM10 measured during many dust storms affecting Grand Junction.

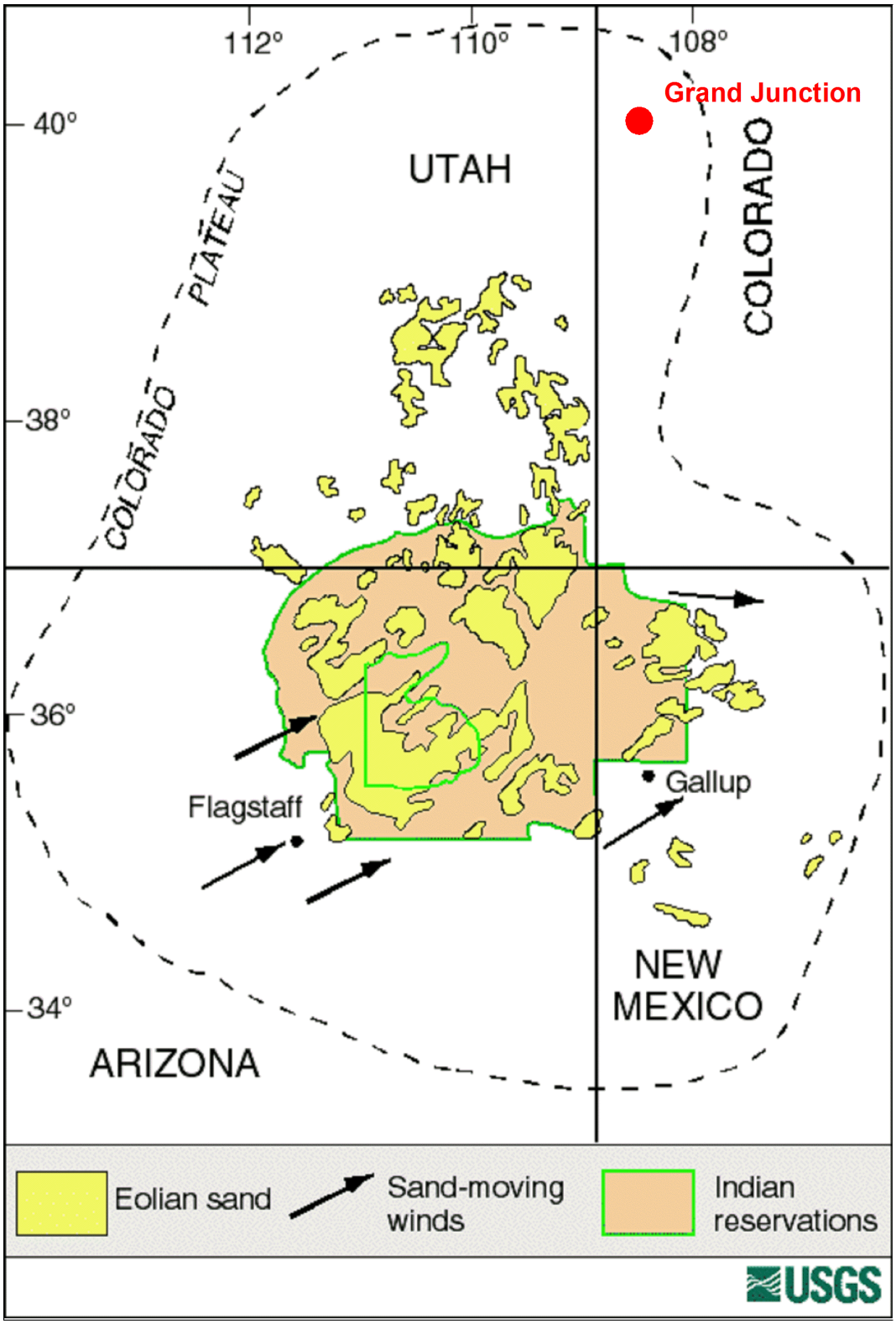


Figure A-15. USGS map of eolian sand features on the Colorado Plateau (http://geochange.er.usgs.gov/sw/impacts/geology/sand/).

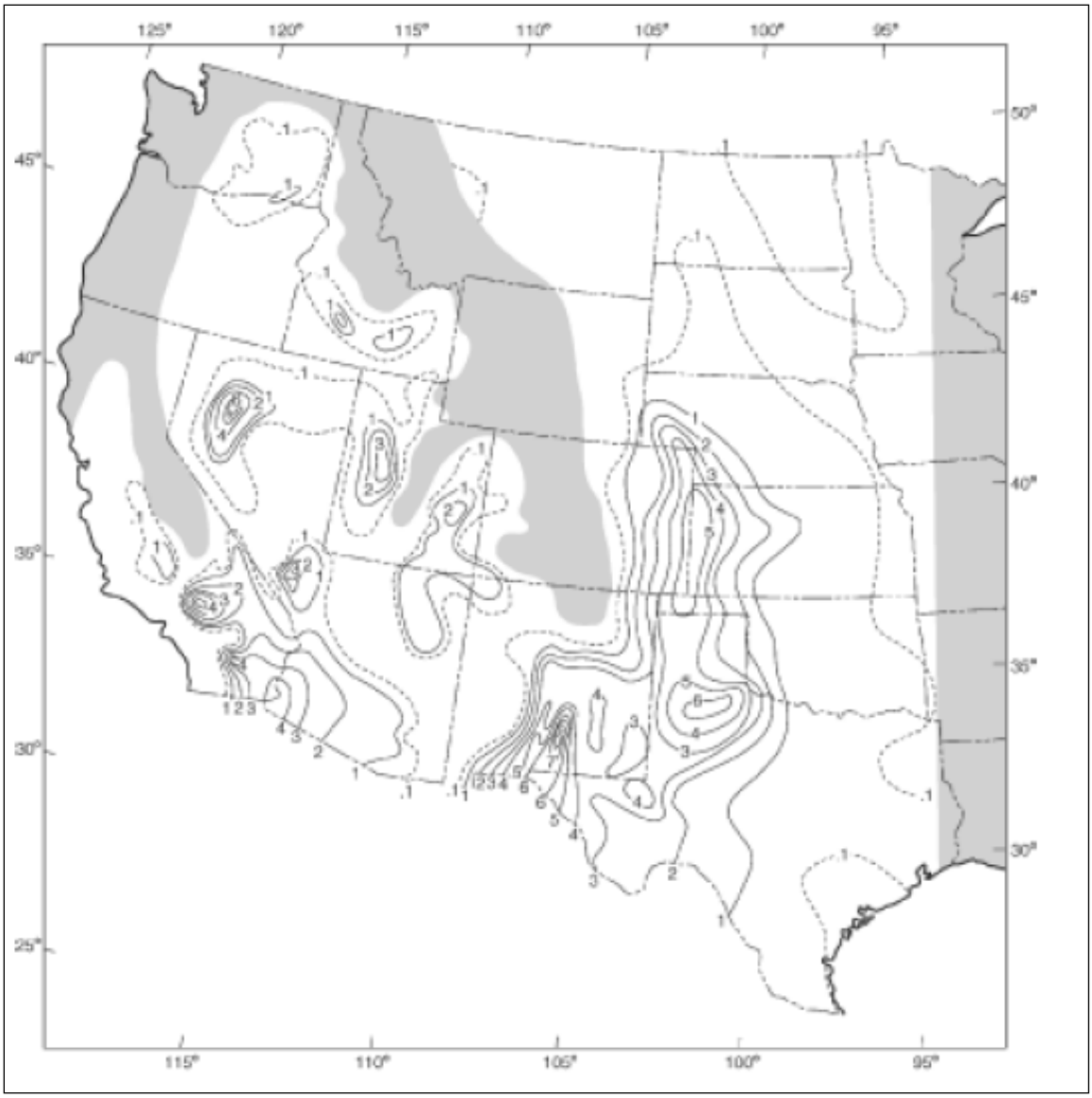


Figure A-16. Number of dust storms per year from: Orgill, M.M., Sehmel, G.A., 1976. Frequency and diurnal variation of dust storms in the contiguous USA. **Atmospheric Environment 10**, 813-825.

NOAA HYSPLIT 36-hour back trajectories were calculated for Grand Junction for the eight 24-hour periods from 2004 through early 2009 with the Powell monitor PM10 concentrations in excess of 75 ug/m3, strong regional winds, and dry soils. Trajectories were modeled every 4 hours for each day. Data presented later in this document provides evidence that the moderate to high PM10 levels on these days were from blowing dust. The 6 back trajectories for each day were calculated for an arrival height of 500 meters using EDAS40 data and model vertical velocities (see: http://www.arl.noaa.gov/HYSPLIT.php). The eight days used in the analysis and the Powell monitor concentrations measured on these days are presented in Table A-1.

The back trajectories for these high-concentration days are shown in Figure A-17. Transport was generally from the west through southwest. A high density of trajectory points is found in northeast

Arizona and southeast Utah. Most of these trajectories in Figure A-17 are also consistent with transport from or across suspected or known blowing dust source regions highlighted in Figures A-5, A-13, A-15, and A-16.

Table A-1. Grand Junction Powell monitor days with concentrations in excess of 75 ug/m3 and blowing dust conditions (from 2004 through early 2009).

Year	Month	Day	Powell 24-hour PM10 concentration in ug/m3
2005	4	19	197.8
2008	4	15	116.1
2008	4	21	103.6
2004	9	3	102
2006	3	3	98.3
2008	5	21	86.7
2008	4	30	83.5
2006	6	7	77.9

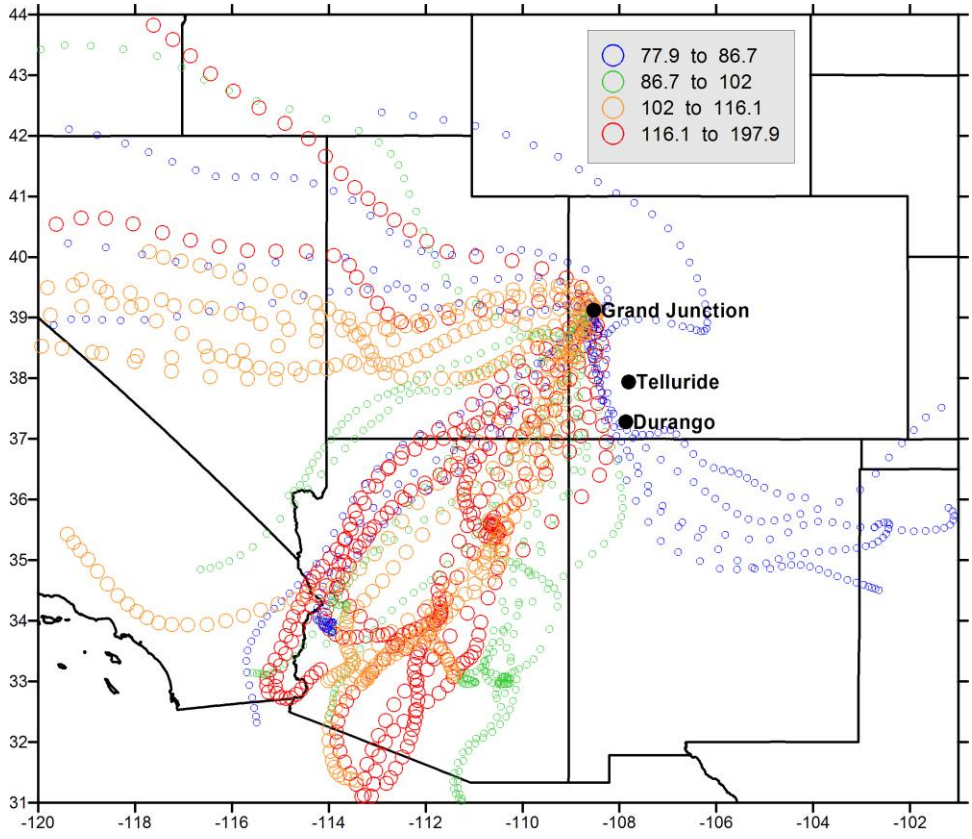


Figure A-17. NOAA HYSPLIT 36-hour back trajectories for Grand Junction for those eight 24-hour periods from 2004 through early 2009 with the Powell monitor PM10 concentrations in excess of 75 ug/m3, strong regional winds, and dry soils. Trajectory points are sized and color-coded to reflect 24-hour PM10 concentrations in ug/m3. Trajectories were calculated every 4 hours for each day.

The trajectories in Figure A-17 point to the possibility that, at times, dust from Utah and Arizona can have a major impact on Grand Junction and less of an impact elsewhere in western Colorado. This non-homogeneity is possible given the fact that dust storms are frequently organized into discreet plumes from discreet areas that maintain their integrity for long distances. An example of this can be seen in Figure A-18 that shows plumes of dust in New Mexico during a windstorm on May 20, 2008.

Figure A-19 shows the NOAA HYSPLIT back trajectories for the highest concentration day during the 2004 through early 2009 period: April 19, 2005. Twenty-four hour back trajectories for each hour during the period with high winds (using EDAS40 data and 500-meter arrival heights) show that the back trajectories for Grand Junction were more likely to have crossed the Painted Desert and southeastern Utah than those for Telluride and Durango, which measured lower PM10 concentrations on this day.

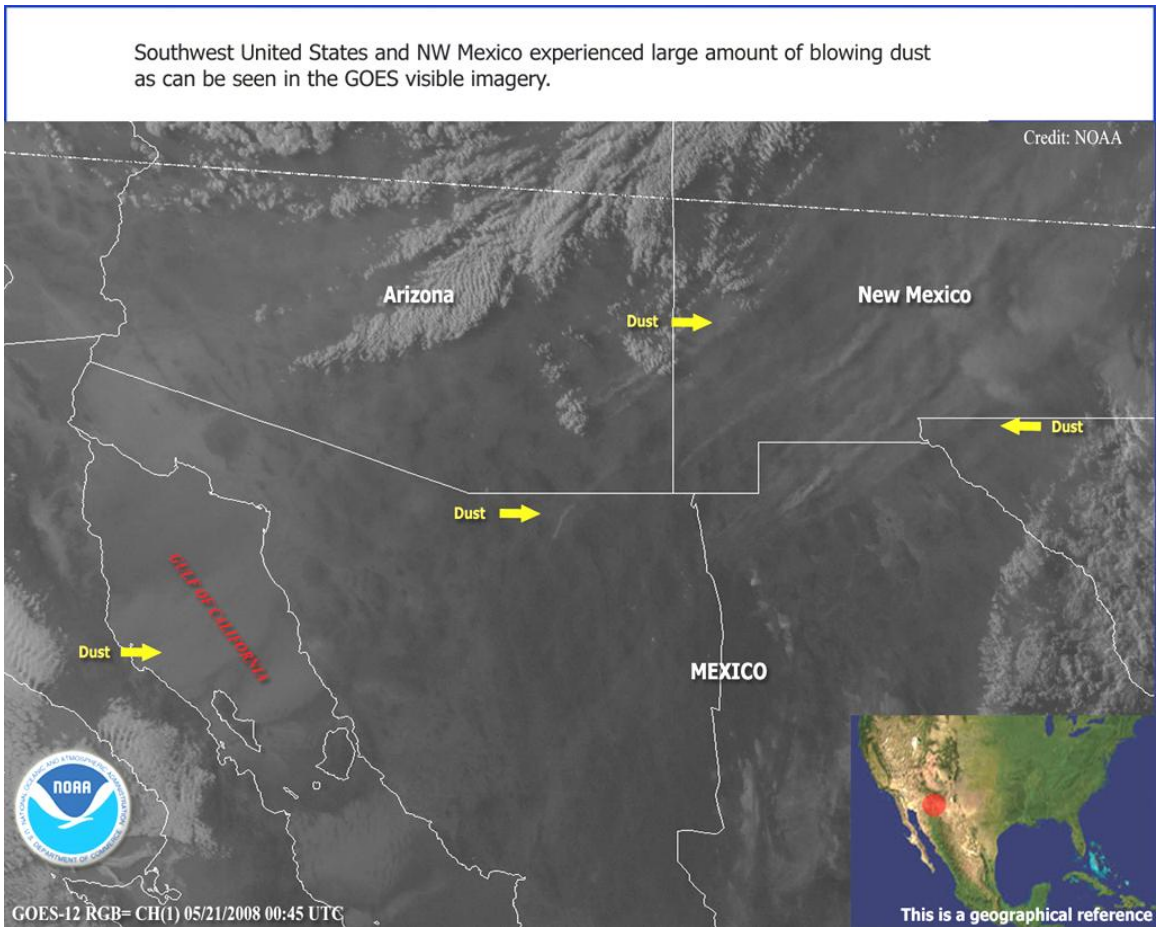


Figure A-18. Discreet plumes of blowing dust in New Mexico, Mexico, and Arizona visible in GOES satellite imagery for May 20, 2008 (http://www.osei.noaa.gov/Events/Dust/US_Southwest/2008/DSTusmx142_G12.jpg).

K-means cluster analysis has been applied to Grand Junction Powell PM10 concentrations, Grand Junction and Painted Desert 30-day total precipitation for each PM10 monitoring day, and Grand Junction and Painted Desert daily maximum wind gust speeds for each monitoring day. K-means cluster analysis is a statistical method for identifying clusters or groupings of values for many variables. For environmental variables, these clusters often represent distinct processes, conditions, or events. In this case, cluster analysis differentiates PM10

concentrations associated with strong winds, low soil moistures, and blowing dust by providing mean values for these 5 variables for 5 distinct categories of PM10 events. The period of record considered was from January 2004 through March 2009. The Hopi weather station located in the central portion of the Painted Desert was used to represent Painted Desert conditions in northeastern Arizona, and the Grand Junction National Weather Service station was used to represent Grand Junction conditions. The 30-day total precipitation values appear to be a better metric for blowing dust conditions than shorter-term totals.

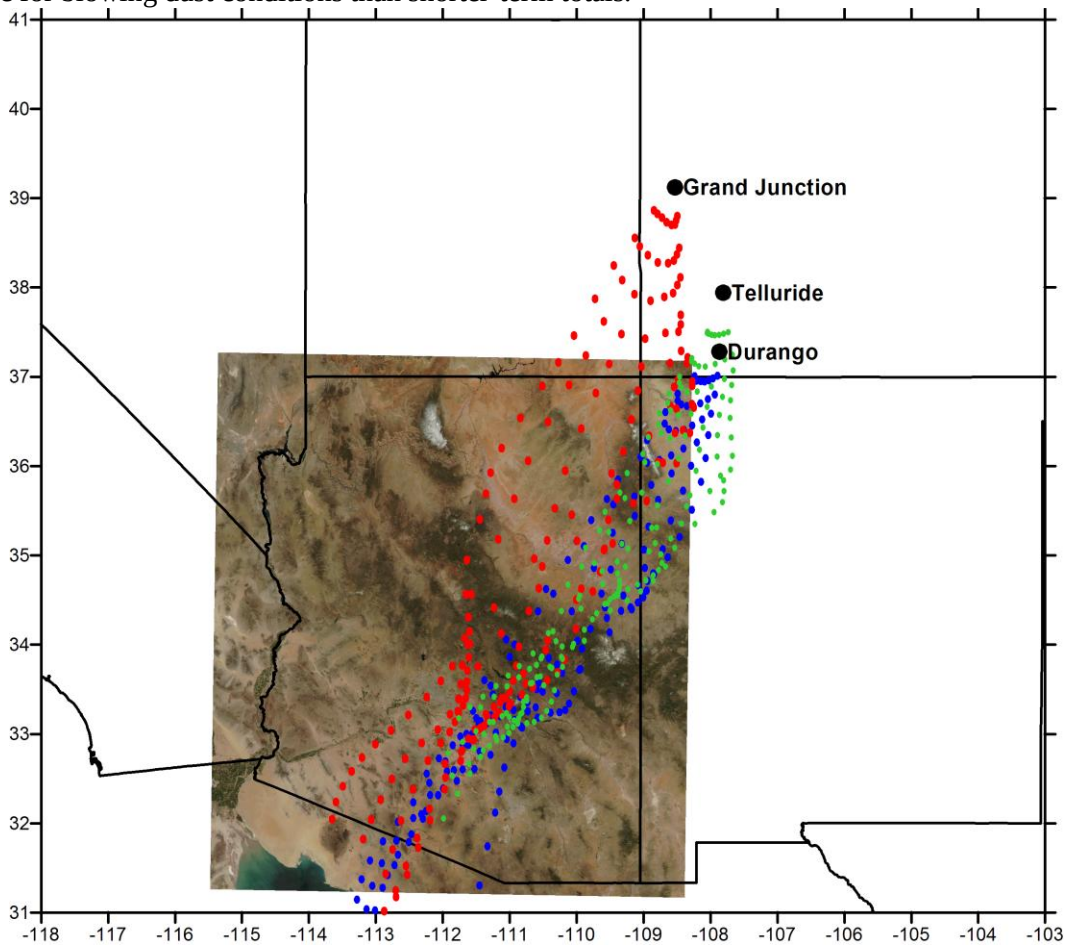


Figure A-19. 24-hour NOAA HYSPLIT back trajectories for every hour from 1500 MST to 2200 MST for Grand Junction (red), Telluride (green), and Durango (blue) for the dust storm of April 19, 2005.

The results of the cluster analysis are presented in Table A-2 below. Cluster 1 represents high soil moisture conditions, moderate gust speeds, and low PM10 concentrations. Cluster 2 represents very low soil moisture, moderate PM10, and low gust speeds. Cluster 3 represents low soil moisture, moderate gusts, and low PM10. Cluster 4 represents moderate soil moisture, low gusts, and low PM10. Finally, Cluster 5 represents high PM10, high gusts, and low soil moisture. Cluster numbers, Grand Junction Powell PM10 concentrations, and Grand Junction daily maximum gust speeds are plotted in Figure A-20.

The data in Figure A-20 clearly show that the highest PM10 concentrations tend to occur in Cluster 5 with gusts above 40 mph. The only exceedance in this period occurred on a day with a peak gust of 43 mph. Cluster 2 is likely to be indicative of wintertime inversion conditions with lighter winds and moderately elevated PM10. Figure A-21 shows the concentrations and cluster values associated with Hopi station daily maximum gust

speeds. The overall pattern is similar. The highest concentration day is associated with a peak gust of 47 mph at Hopi. All of the days/events presented in Figure A-17, A-19, and Table A-1 were classified as Cluster 5.

Table A-2. K-means cluster analysis means for Grand Junction PM10 and meteorological variables.

Cluster Variables	Cluster 1 Means	Cluster 2 Means	Cluster 3 Means	Cluster 4 Means	Cluster 5 Means
Powell 24-hour PM10 in ug/m3	24.5	37.3	24.3	21.8	74.9
Hopi Wind Gust in mph	20.8	18.0	32.5	20.7	40.5
Grand Junction Wind Gust in mph	20.4	16.5	31.8	19.6	43.1
Grand Junction 30-day Precipitation	1.7	0.4	0.5	0.8	0.6
Hopi 30-day Precipitation	1.8	0.2	0.5	0.7	0.3
Count	85	120	170	147	24

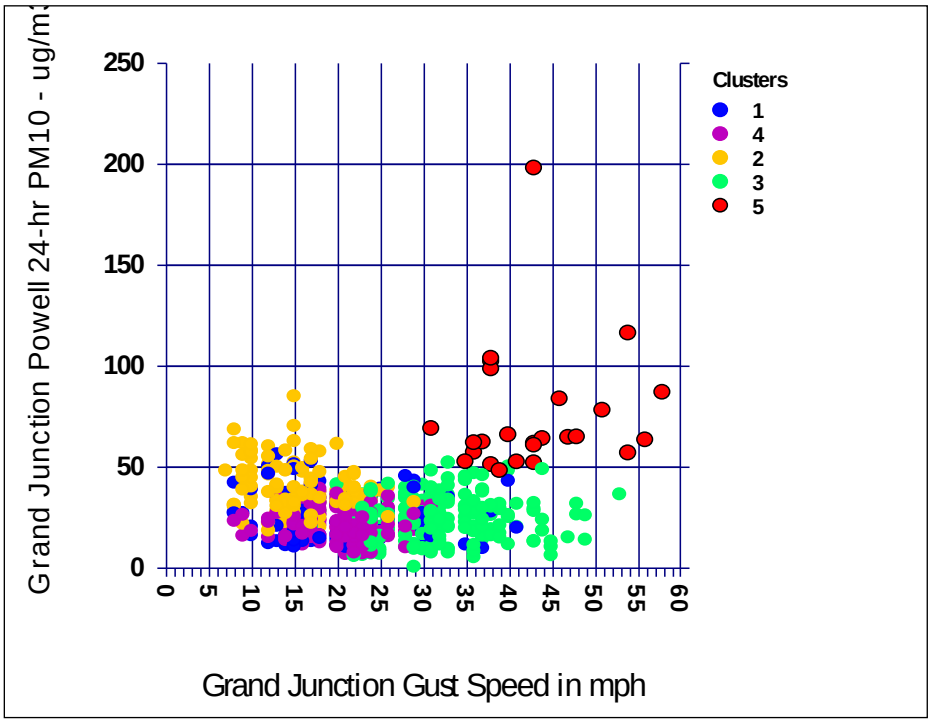


Figure A-20. Grand Junction Powell 24-hour PM10 concentrations versus Grand Junction gust speed by cluster.

Figures A-22 and A-23 show Powell PM10 concentrations versus Grand Junction and Hopi 30-day precipitation totals, respectively, by cluster. The blowing dust group, Cluster 5, is generally associated with 30-day precipitation totals of less than 1.00 inches at Grand Junction and less than 0.50 inches at Hopi. While this is not proof that the measured dust in Grand Junction is from Arizona, it adds to the weight of evidence that the Painted Desert makes a significant contribution to PM10 concentrations in Grand Junction during many blowing dust events. Of interest in this regard are the two high concentrations (greater than 100 ug/m3) that occurred when Grand Junction 30-day precipitation totals

were greater than an inch (see Figure A-22). One of these occurred when transport was from the southwest. On this day (April 21, 2008) the NOAA Satellite Smoke Text Archive reported the following (see http://www.ssd.noaa.gov/PS/FIRE/smoke.html):

"Blowing dust is seen over most of Utah (and part of western Nevada) and the dust is moving toward the northeast, reaching into northwestern Colorado and southern Wyoming."

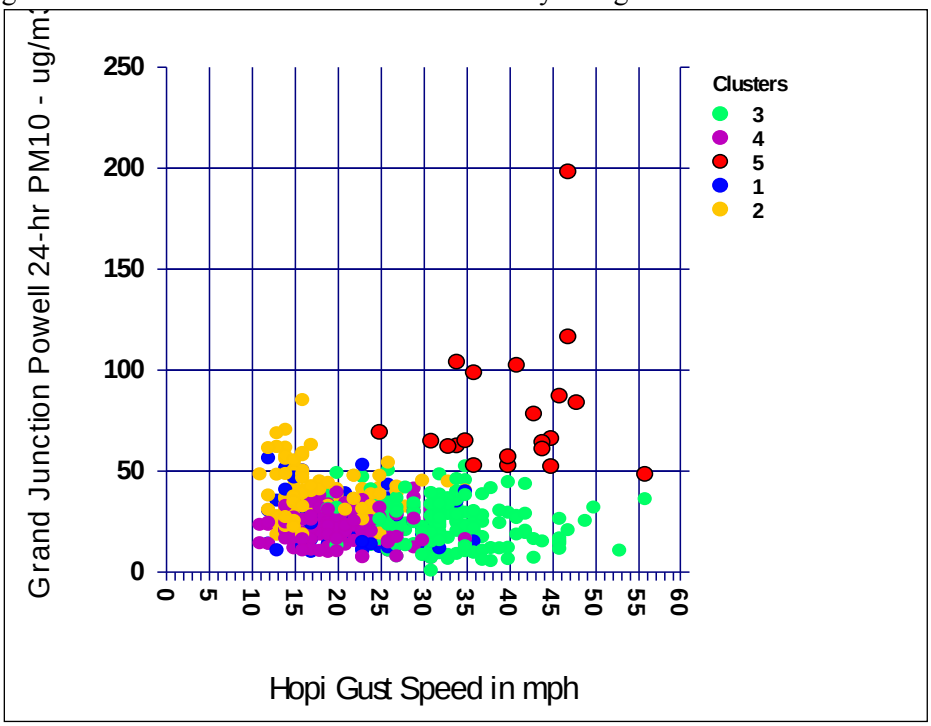


Figure A-21. Grand Junction Powell 24-hour PM10 concentrations versus Hopi gust speed by cluster.

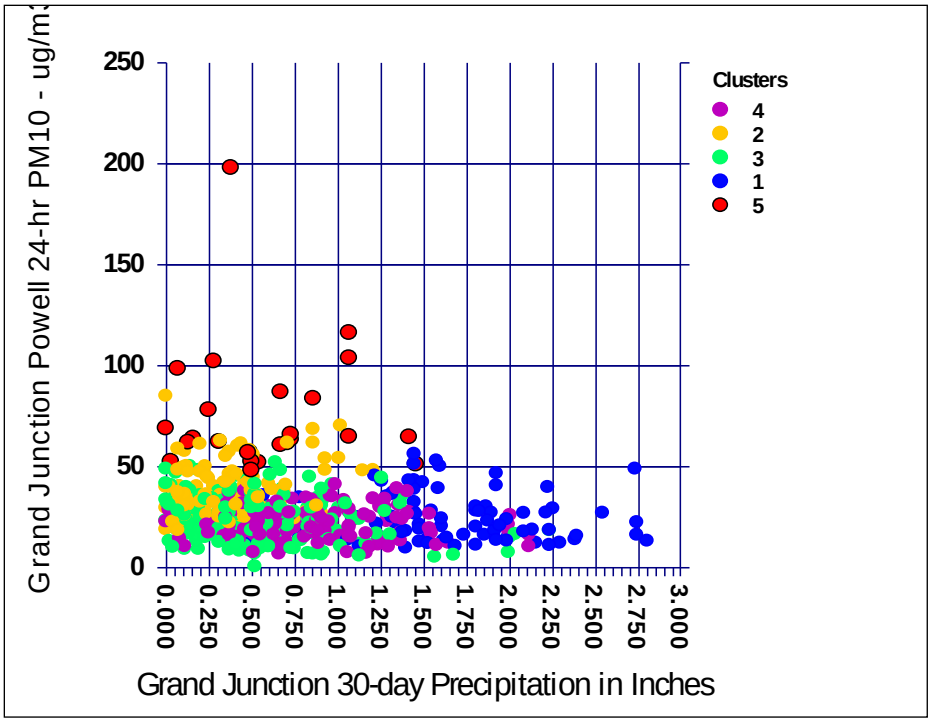


Figure A-22. Grand Junction Powell 24-hour PM10 concentrations versus Grand Junction 30-day total precipitation by cluster.

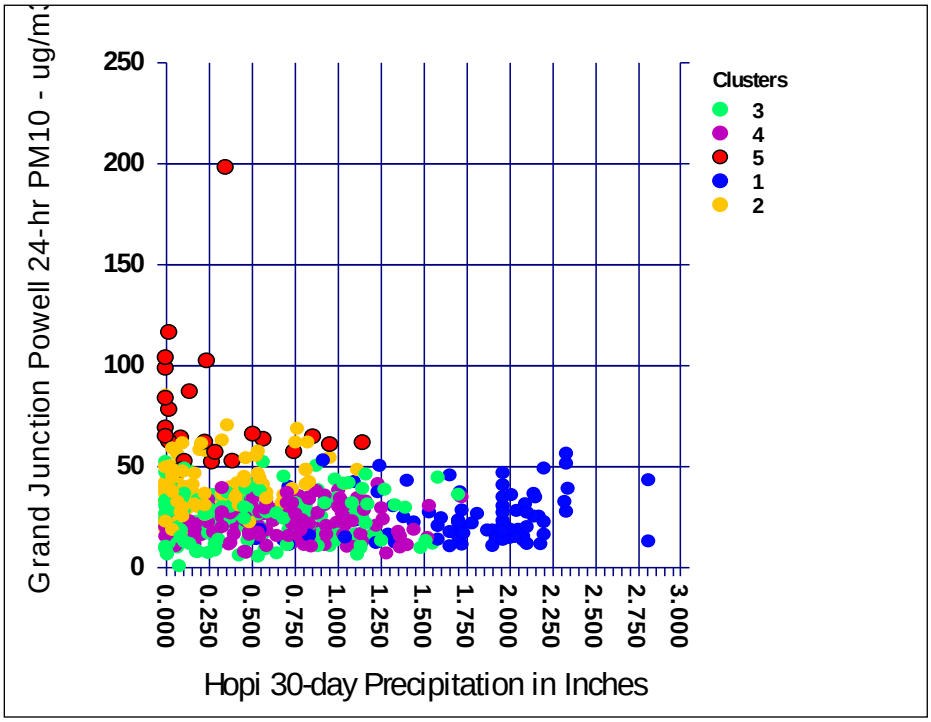


Figure A-23. Grand Junction Powell 24-hour PM10 concentrations versus Hopi 30-day total precipitation by cluster.

The other occurred on April 15, 2008, when the flow was from Arizona and southeast Utah. The transport conditions, the discrepancy between high recent precipitation in Grand Junction and low recent precipitation at Hopi for these two days, and, in one case, analyst discussion of what was visible in satellite images suggest that much of the dust might have originated from outside of the Grand Junction environment.

Figure A-24 shows Grand Junction Powell 24-hour PM10 concentrations versus peak gust wind directions at the Little Delores RAWS weather station about 25 miles west-southwest of Grand Junction. Grand Junction is situated on the floor of the Grand Valley, a major northwest to southeast trending basin than can force or channel synoptic scale flows. As a result, surface wind directions in Grand Junction may not be useful indicators of the direction of longer-range transport. Little Delores is on the Umcompahgre Plateau, and winds here are more likely to reflect the larger-scale transport directions for the region. This graph indicates that high PM10 at Grand Junction (Cluster 5) is associated with winds from the south-southeast to west-southwest at Little Delores. These directions point to dust sources in southeast Utah and northeastern Arizona. This is further evidence that dust from these areas may make a significant contribution to PM10 measured in Grand Junction during blowing dust events.

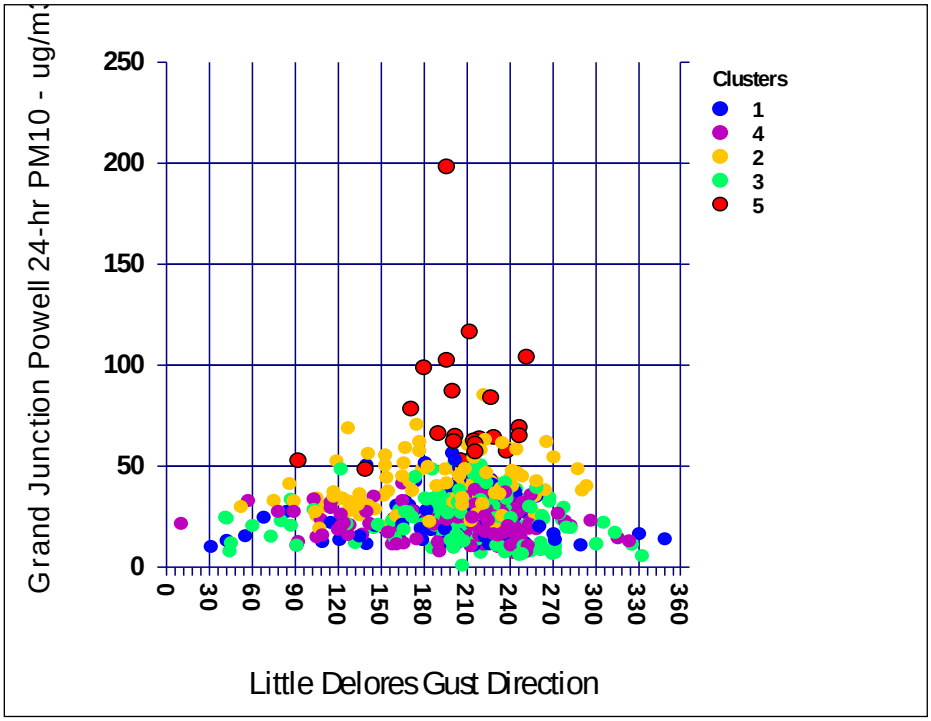


Figure A-24. Grand Junction Powell 24-hour PM10 concentrations versus peak gust wind directions at the Little Delores RAWS weather station, by cluster.

Figure A-25 presents monthly percentiles for Grand Junction gust speeds. Wind gusts generally considered to be high enough for significant blowing dusts (40 mph or higher) are within the upper 5 to 15 percent during each month of the year. Consequently, these events can be viewed as exceptional rather than normal. Gusts in this category can occur any month of the year, but are most likely in March, April, May and October. Figure A-4 shows that in Grand Junction these are typically among the wettest months of the year. It is in drier years, therefore, that blowing dust may be most prevalent during the spring and fall months. January, February, and June are typically very dry, and might be expected to have a significant proportion of blowing dust events.

Figures A-26 and A-27 show histograms for Grand Junction and Hopi wind gusts, respectively. The 95th percentile gust speed for Grand Junction is 43 mph. For Hopi it is 41 mph. For both sites, it is clear that gusts in the range that is associated with blowing dust are the exception rather than the rule. Cluster analysis also shows that the blowing dust events represent only 4% of the PM10 sample days (from Table A-2, Cluster 5 had 24 cases out of a total of 546). The weight of evidence presented in this document clearly suggests that source regions in Arizona and Utah can have a significant impact on PM10 concentrations in Grand Junction during blowing dust events and that these events occur when dry soils are affected by winds of exceptional strength. Control of these sources, which are outside of Colorado, may not be reasonably achievable or possible.

The precipitation climatology for the Four Corners area indicates that the area can be susceptible to blowing dust when winds are high. Landform imagery shows that northeastern Arizona and southeastern Utah in particular have experienced a long-term pattern of wind erosion and blowing dust when winds have been southwesterly and blowing into western and southern Colorado. Back trajectories, case studies, satellite imagery, and statistical analyses have also shown that northeastern Arizona and southeastern Utah are a significant source for blowing dust transported into Colorado. Elevated PM10 in Grand Junction during windstorms is generally associated with wind gusts of 40 mph or higher at Grand Junction and Hopi in northeastern Arizona and southwesterly flow in Grand Junction. Elevated PM10 in Grand Junction is generally associated with 30-day precipitation totals of less than 1.00 inches at Grand Junction and less than 0.50 inches at Hopi.

Reference:

Orgill, M.M., Sehmel, G.A., 1976. Frequency and diurnal variation of dust storms in the contiguous USA. **Atmospheric Environment 10**, 813-825

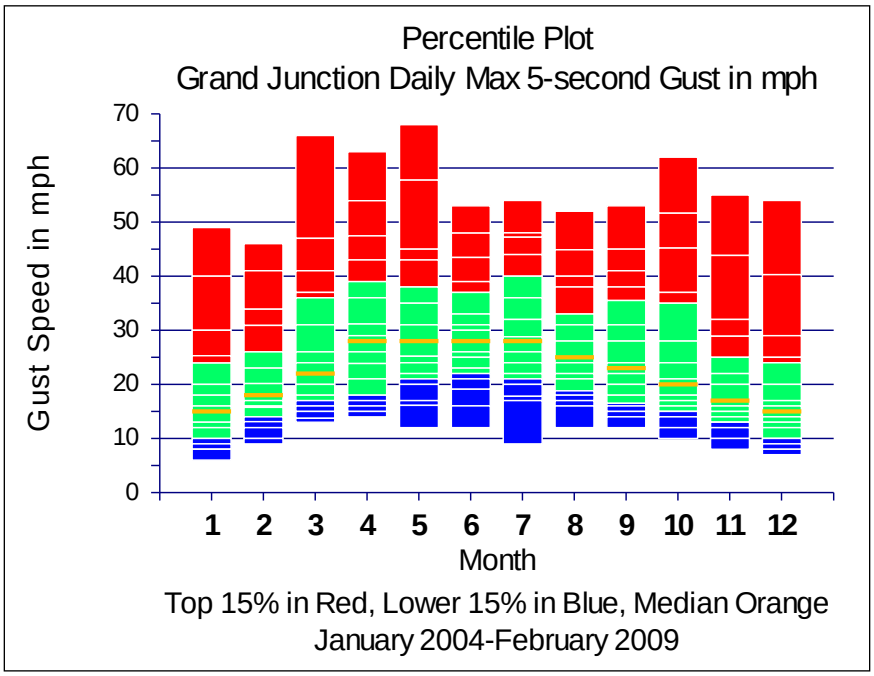


Figure A-25. Percentile plot of Grand Junction daily maximum 5-second gust speed in miles per hour showing that gusts of 40 mph or greater always occur within the top 15 percentile speeds for each month of the year.

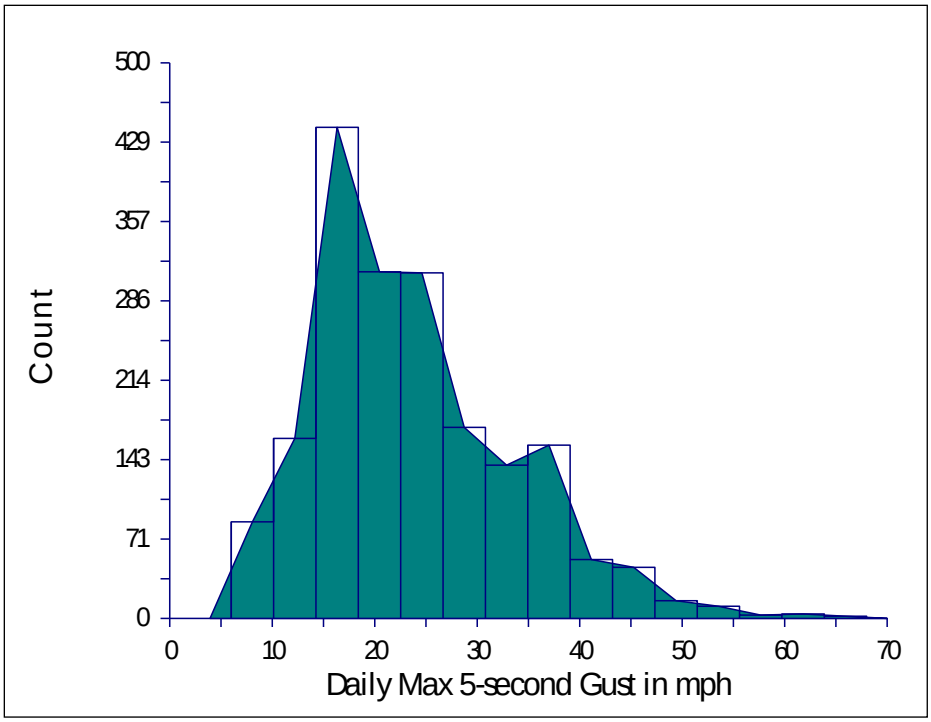


Figure A-26. Histogram of daily maximum 5-second wind gusts at Grand Junction based on January 2004 – February 2009.

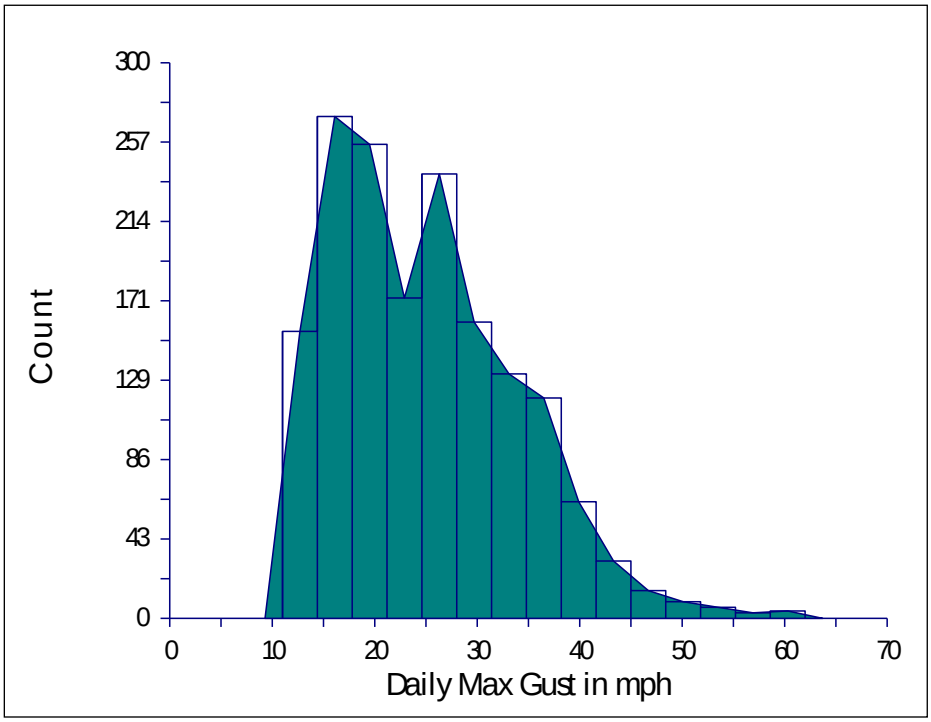


Figure A-27. Histogram of daily maximum 5-second wind gusts at Hopi based on January 2004 – February 2009.

Appendix B- Weather Warnings and Blowing Dust Advisories for April 28 and 29, 2010

WWUS75 KABQ 281034
NPWABQ

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE ALBUQUERQUE NM
434 AM MDT WED APR 28 2010

...DANGEROUSLY WINDY CONDITIONS DEVELOPING ACROSS NEW MEXICO WEDNESDAY AND THURSDAY...

.A VIGOROUS PACIFIC STORM SYSTEM MOVING OVER CENTRAL CALIFORNIA WEDNESDAY MORNING WILL DIVE RAPIDLY TO CENTRAL ARIZONA BY THURSDAY...AS SURFACE LOW PRESSURE DEEPENS STEADILY OVER EASTERN COLORADO. STRONG SOUTHWEST WINDS WILL DEVELOP BY LATE WEDNESDAY ACROSS NEW MEXICO...WITH DANGEROUS GUSTS DEVELOPING BY WEDNESDAY AFTERNOON. WIND SPEEDS WILL DECREASE ONLY GRADUALLY OVERNIGHT BEFORE REDEVELOPING ONCE AGAIN ON THURSDAY OVER MUCH OF THE STATE. WIND SPEEDS WILL DECREASE THURSDAY EVENING TO EASE THESE DANGEROUS WIND CONDITIONS.

NMZ532-533-281800-
/O.UPG.KABQ.WI.Y.0022.100428T1800Z-100429T0200Z/
/O.EXA.KABQ.HW.W.0006.100428T1800Z-100429T0200Z/
/O.CON.KABQ.HW.A.0007.100429T1500Z-100430T0300Z/
EASTERN SAN MIGUEL COUNTY-GUADALUPE COUNTY-
434 AM MDT WED APR 28 2010

...HIGH WIND WARNING IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING...
...HIGH WIND WATCH REMAINS IN EFFECT FROM THURSDAY MORNING THROUGH THURSDAY EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A HIGH WIND WARNING...WHICH IS IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING. THE WIND ADVISORY IS NO LONGER IN EFFECT. A HIGH WIND WATCH REMAINS IN EFFECT FROM THURSDAY MORNING THROUGH THURSDAY EVENING.

* LOCATION...EXPECT STRONG WINDS ACROSS INTERSTATE 40 FROM MILAGRO TO MONTOYA...OR FROM MILE POST 24O TO MILE POST 310...AND ACROSS STATE ROAD 104 NEAR CONCHAS LAKE STATE PARK. EXPECT STRONGEST WINDS ACROSS HILLTOPS AND THROUGH GAPS.

* WINDS...SOUTHWEST WIND SPEEDS WILL INCREASE TO 40 MPH...WITH GUSTS TO 60 MPH. SPEEDS WILL DECREASE TO 35 MPH WITH GUSTS TO 50 MPH OVERNIGHT. ON THURSDAY...WIND SPEEDS WILL REDEVELOP TO 45 MPH...WITH GUSTS TO 65 MPH.

* TIMING...WIND SPEEDS WILL INCREASE STEADILY THIS MORNING TO REACH HAZARDOUS SPEEDS BY EARLY AFTERNOON. WIND SPEEDS WILL

DECREASE OVERNIGHT...WITH HAZARDOUS WIND SPEEDS REDEVELOPING THURSDAY MORNING. WIND SPEEDS WILL DECREASE THURSDAY EVENING TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE REDUCED LOCALLY TO A MILE OR LESS IN BLOWING DUST.

* LOCAL IMPACTS...GUSTY SOUTHWEST WINDS WILL IMPACT LARGE OR TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN STRONG AND GUSTY WINDS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

REMEMBER...A HIGH WIND WATCH MEANS CONDITIONS ARE FAVORABLE FOR A POTENTIALLY DAMAGING HIGH WIND EVENT IN AND CLOSE TO THE WATCH AREA. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE. MONITOR THE LATEST FORECASTS AT WEATHER.GOV/ABQ...LISTEN TO NOAA WEATHER RADIO OR YOUR FAVORITE MEDIA OUTLET.

&&

$$

NMZ510-516-281800-
/O.UPG.KABQ.WI.Y.0022.100428T1800Z-100429T0200Z/
/O.EXA.KABQ.HW.W.0006.100428T1800Z-100429T0200Z/
/O.EXA.KABQ.HW.A.0007.100429T1200Z-100430T0300Z/
SAN JUAN MOUNTAINS-UPPER RIO GRANDE VALLEY-
434 AM MDT WED APR 28 2010

...HIGH WIND WARNING IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING...
...HIGH WIND WATCH IN EFFECT FROM THURSDAY MORNING THROUGH THURSDAY EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A HIGH WIND WARNING...WHICH IS IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING. A HIGH WIND WATCH HAS ALSO BEEN ISSUED. THIS HIGH WIND WATCH IS IN EFFECT FROM THURSDAY MORNING THROUGH THURSDAY EVENING. THE WIND ADVISORY IS NO LONGER IN EFFECT.

* LOCATION...EXPECT STRONG WINDS ACROSS RIO ARRIBA AND TAOS COUNTIES...ESPECIALLY ALONG HIGHWAYS 64 AND 84...AND HIGHWAY 285. EXPECT STRONGEST WINDS OVER SUMMITS AND THROUGH GAPS.

* WINDS...SOUTHWEST WIND SPEEDS WILL INCREASE TO 40 TO 45 MPH WITH DANGEROUS GUSTS TO 65 MPH ON WEDNESDAY. WIND SPEEDS WILL DECREASE TO 35 MPH OVERNIGHT BEFORE REDEVELOPING TO 40 MPH WITH GUSTS TO 60 MPH ON THURSDAY.

* TIMING...WIND SPEEDS WILL INCREASE STEADILY THIS MORNING TO
  REACH HAZARDOUS SPEEDS BY EARLY AFTERNOON. WIND SPEEDS WILL
  DECREASE OVERNIGHT...WITH HAZARDOUS WIND SPEEDS REDEVELOPING
  THURSDAY MORNING. WIND SPEEDS WILL DECREASE THURSDAY
  EVENING TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE REDUCED LOCALLY TO A MILE
  OR LESS IN BLOWING DUST.

* LOCAL IMPACTS...GUSTY SOUTHWEST WINDS WILL IMPACT LARGE OR
  TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN STRONG AND
  GUSTY WINDS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT
OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR
GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

REMEMBER...A HIGH WIND WATCH MEANS CONDITIONS ARE FAVORABLE FOR
A POTENTIALLY DAMAGING HIGH WIND EVENT IN AND CLOSE TO THE WATCH
AREA. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH
OR MORE CAN LEAD TO PROPERTY DAMAGE. MONITOR THE LATEST FORECASTS
AT WEATHER.GOV/ABQ...LISTEN TO NOAA WEATHER RADIO OR YOUR
FAVORITE MEDIA OUTLET.

&&

$$

NMZ523-524-526-281800-
/O.UPG.KABQ.WI.Y.0022.100428T1800Z-100429T0200Z/
/O.EXA.KABQ.HW.W.0006.100428T1800Z-100429T0200Z/
/O.CON.KABQ.HW.A.0007.100429T1200Z-100430T0300Z/
CENTRAL HIGHLANDS-SOUTH CENTRAL HIGHLANDS-SOUTH CENTRAL MOUNTAINS-
434 AM MDT WED APR 28 2010

...HIGH WIND WARNING IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS
EVENING...
...HIGH WIND WATCH REMAINS IN EFFECT FROM THURSDAY MORNING
THROUGH THURSDAY EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A HIGH
WIND WARNING...WHICH IS IN EFFECT FROM NOON TODAY TO 8 PM MDT
THIS EVENING. THE WIND ADVISORY IS NO LONGER IN EFFECT. A HIGH
WIND WATCH REMAINS IN EFFECT FROM THURSDAY MORNING THROUGH
THURSDAY EVENING.

* LOCATION...EXPECT HAZARDOUS WINDS ACROSS INTERSTATE 40 FROM NEAR
  MORIARTY TO MILAGRO...OR FROM MILE POST 200 TO MILE POST
  240...ACROSS HIGHWAY 60 NEAR ENCINO AND DURAN...HIGHWAY 54 NEAR
  CORONA AND ANCHO...AND HIGHWAYS 70 AND 380 ACROSS SOUTHERN
  LINCOLN COUNTY. EXPECT STRONGEST WINDS ACROSS SUMMITS AND

HILLTOPS...AND THROUGH GAPS.

* WINDS...SOUTHWEST WIND SPEEDS WILL INCREASE TO 40 TO 45 MPH...WITH GUSTS TO 60 TO 65 MPH DEVELOPING ON WEDNESDAY. WIND SPEEDS WILL DECREASE TO 35 MPH WITH GUSTS TO 50 MPH OVERNIGHT BEFORE REDEVELOPING THURSDAY TO 45 MPH WITH GUSTS TO 65 TO 70 MPH.

* TIMING...WIND SPEEDS WILL INCREASE STEADILY THIS MORNING TO REACH HAZARDOUS SPEEDS BY EARLY AFTERNOON. WIND SPEEDS WILL DECREASE OVERNIGHT...WITH HAZARDOUS WIND SPEEDS REDEVELOPING THURSDAY MORNING. WIND SPEEDS WILL DECREASE THURSDAY EVENING TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE REDUCED LOCALLY TO A MILE OR LESS IN BLOWING DUST.

* LOCAL IMPACTS...GUSTY SOUTHWEST WINDS WILL IMPACT LARGE OR TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN STRONG AND GUSTY WINDS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

REMEMBER...A HIGH WIND WATCH MEANS CONDITIONS ARE FAVORABLE FOR A POTENTIALLY DAMAGING HIGH WIND EVENT IN AND CLOSE TO THE WATCH AREA. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE. MONITOR THE LATEST FORECASTS AT WEATHER.GOV/ABQ...LISTEN TO NOAA WEATHER RADIO OR YOUR FAVORITE MEDIA OUTLET.

&&

$$

NMZ501-281800-
/O.UPG.KABQ.WI.Y.0022.100428T1800Z-100429T0200Z/
/O.EXA.KABQ.HW.W.0006.100428T1800Z-100429T0200Z/
NORTHWEST PLATEAU-
434 AM MDT WED APR 28 2010

...HIGH WIND WARNING IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A HIGH WIND WARNING...WHICH IS IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING. THE WIND ADVISORY IS NO LONGER IN EFFECT.

* LOCATION...EXPECT HAZARDOUS WINDS ACROSS MUCH OF SAN JUAN COUNTY...INCLUDING HIGHWAY 64 NEAR SHIPROCK...FARMINGTON...AND BLOOMFIELD...AND HIGHWAYS 491 AND 550...AND STATE ROAD 371.

EXPECT STRONGEST WINDS OVER HILLTOPS AND THROUGH GAPS.

* WINDS...SOUTHWEST WIND SPEEDS WILL INCREASE STEADILY TO 40 MPH WITH FREQUENT GUSTS TO 60 MPH.

* TIMING...WIND SPEEDS WILL INCREASE STEADILY THIS MORNING TO REACH HAZARDOUS SPEEDS BY EARLY AFTERNOON. WIND SPEEDS WILL DECREASE OVERNIGHT TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE REDUCED LOCALLY TO TWO MILES OR LESS IN BLOWING DUST.

* LOCAL IMPACTS...GUSTY SOUTHWEST WINDS WILL IMPACT LARGE OR TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN STRONG AND GUSTY WINDS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

&&

$$

NMZ506-281800-
/O.EXA.KABQ.HW.A.0007.100429T1200Z-100430T0300Z/
/O.CON.KABQ.HW.W.0006.100428T1800Z-100429T0200Z/
WEST CENTRAL MOUNTAINS-
434 AM MDT WED APR 28 2010

...HIGH WIND WARNING REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING...
...HIGH WIND WATCH IN EFFECT FROM THURSDAY MORNING THROUGH THURSDAY EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A HIGH WIND WATCH...WHICH IS IN EFFECT FROM THURSDAY MORNING THROUGH THURSDAY EVENING. A HIGH WIND WARNING REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING.

* LOCATION...EXPECT DANGEROUSLY GUSTY WINDS ACROSS INTERSTATE 40 FROM CHURCH ROCK TO BLUEWATER...OR FROM MILE POST 30 TO MILE POST 70...AND ACROSS STATE ROAD 53 NEAR EL MORRO...AND STATE ROAD 117 NEAR ACOMA PUEBLO AND EL MALPAIS NATIONAL MONUMENT. EXPECT STRONGEST WINDS ACROSS SUMMITS AND HILLTOPS...AND THROUGH GAPS.

* WINDS...EXPECT SOUTHWEST WINDS INCREASING TO 45 MPH...WITH GUSTS TO 65 MPH TODAY. WIND SPEEDS WILL DECREASE TO 35 MPH OVERNIGHT. ON THURSDAY...WIND SPEEDS WILL INCREASE TO 45 MPH WITH GUSTS TO 65 MPH.

* TIMING...WIND SPEEDS WILL INCREASE STEADILY THIS MORNING TO
  REACH HAZARDOUS SPEEDS BY EARLY AFTERNOON. WIND SPEEDS WILL
  DECREASE OVERNIGHT...WITH HAZARDOUS WIND SPEEDS REDEVELOPING
  THURSDAY MORNING. WIND SPEEDS WILL DECREASE THURSDAY
  EVENING TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE REDUCED LOCALLY TO TWO MILES
  OR LESS IN BLOWING DUST.

* LOCAL IMPACTS...GUSTY SOUTHWEST WINDS WILL IMPACT LARGE OR
  TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN STRONG AND
  GUSTY WINDS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT
OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR
GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

REMEMBER...THE HIGH WIND WATCH THURSDAY MEANS CONDITIONS ARE
FAVORABLE FOR A POTENTIALLY DAMAGING HIGH WIND EVENT IN AND CLOSE
TO THE WATCH AREA. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR
GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE. MONITOR THE
LATEST FORECASTS AT WEATHER.GOV/ABQ...LISTEN TO NOAA WEATHER
RADIO OR YOUR FAVORITE MEDIA OUTLET.

&&

$$

NMZ527-528-530-531-281800-
/O.EXA.KABQ.HW.A.0007.100429T1500Z-100430T0300Z/
/O.CON.KABQ.HW.W.0006.100428T1800Z-100429T0200Z/
RATON RIDGE/JOHNSON MESA-FAR NORTHEAST HIGHLANDS-UNION COUNTY-
HARDING COUNTY-
434 AM MDT WED APR 28 2010

...HIGH WIND WARNING REMAINS IN EFFECT FROM NOON TODAY TO 8 PM
MDT THIS EVENING...
...HIGH WIND WATCH IN EFFECT FROM THURSDAY MORNING THROUGH
THURSDAY EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A HIGH
WIND WATCH...WHICH IS IN EFFECT FROM THURSDAY MORNING THROUGH
THURSDAY EVENING. A HIGH WIND WARNING REMAINS IN EFFECT FROM NOON
TODAY TO 8 PM MDT THIS EVENING.

* LOCATION...EXPECT DANGEROUS WINDS TODAY AND THURSDAY ACROSS
  INTERSTATE 25 FROM VALMORA AND WATROUS TO THE COLORADO LINE AT
  RATON PASS...OR FROM MILE POST 360 TO MILE POST 470...AND ACROSS
  HIGHWAYS 64 AND 87...HIGHWAYS 56 AND 412...AND STATE ROAD 39.

* WINDS...SOUTHWEST WINDS WILL INCREASE TO 45 MPH BOTH WEDNESDAY
  AND THURSDAY...WITH GUSTS REACHING 60 TO 65 MPH EACH AFTERNOON.

* TIMING...WIND SPEEDS WILL INCREASE STEADILY THIS MORNING TO
  REACH HAZARDOUS SPEEDS BY EARLY AFTERNOON. WIND SPEEDS WILL
  DECREASE OVERNIGHT...WITH HAZARDOUS WIND SPEEDS REDEVELOPING
  THURSDAY MORNING. WIND SPEEDS WILL DECREASE THURSDAY
  EVENING TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE REDUCED LOCALLY TO TWO MILES
  OR LESS IN BLOWING DUST.

* LOCAL IMPACTS...GUSTY SOUTHWEST WINDS WILL IMPACT LARGE OR
  TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN STRONG AND
  GUSTY WINDS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT
OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR
GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

REMEMBER...THE HIGH WIND WATCH THURSDAY MEANS CONDITIONS ARE
FAVORABLE FOR A POTENTIALLY DAMAGING HIGH WIND EVENT IN AND CLOSE
TO THE WATCH AREA. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR
GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE. MONITOR THE
LATEST FORECASTS AT WEATHER.GOV/ABQ...LISTEN TO NOAA WEATHER
RADIO OR YOUR FAVORITE MEDIA OUTLET.

&&

$$

NMZ512>515-281800-
/O.EXA.KABQ.HW.A.0007.100429T1200Z-100430T0300Z/
/O.CON.KABQ.HW.W.0006.100428T1800Z-100429T0200Z/
WEST SLOPES SANGRE DE CRISTO MOUNTAINS-
NORTHERN SANGRE DE CRISTO MOUNTAINS ABOVE 9500 FEET/RED RIVER-
SOUTHERN SANGRE DE CRISTO MOUNTAINS ABOVE 9500 FEET-
EAST SLOPES SANGRE DE CRISTO MOUNTAINS-
434 AM MDT WED APR 28 2010

...HIGH WIND WARNING REMAINS IN EFFECT FROM NOON TODAY TO 8 PM
MDT THIS EVENING...
...HIGH WIND WATCH IN EFFECT FROM THURSDAY MORNING THROUGH
THURSDAY EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A HIGH
WIND WATCH...WHICH IS IN EFFECT FROM THURSDAY MORNING THROUGH
THURSDAY EVENING. A HIGH WIND WARNING REMAINS IN EFFECT FROM NOON
TODAY TO 8 PM MDT THIS EVENING.

* LOCATION...EXPECT DANGEROUS WINDS ACROSS THE SANGRE DE CRISTO
  MOUNTAINS...WITH STRONGEST WINDS OVER SUMMITS AND THROUGH GAPS
  AND PASSES. EXPECT DANGEROUS WINDS ACROSS HIGHWAY 64 NEAR ANGEL
  FIRE AND EAGLE NEST...STATE ROAD 38...AND STATE ROAD 434.

* WINDS...SOUTHWEST WINDS WILL INCREASE TO 40 TO 45 MPH...WITH GUSTS TO 60 TO 65 MPH DEVELOPING TODAY. WIND SPEEDS WILL DECREASE TO 35 MPH OVERNIGHT BEFORE WIND SPEEDS RETURN TO 40 TO 45 MPH WITH GUSTS TO 60 TO 65 MPH ON THURSDAY.

* TIMING...WIND SPEEDS WILL INCREASE STEADILY THIS MORNING TO REACH HAZARDOUS SPEEDS BY EARLY AFTERNOON. WIND SPEEDS WILL DECREASE OVERNIGHT...WITH HAZARDOUS WIND SPEEDS REDEVELOPING THURSDAY MORNING. WIND SPEEDS WILL DECREASE THURSDAY EVENING TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE REDUCED LOCALLY TO TWO MILES OR LESS IN BLOWING DUST.

* LOCAL IMPACTS...GUSTY SOUTHWEST WINDS WILL IMPACT LARGE OR TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN STRONG AND GUSTY WINDS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

REMEMBER...THE HIGH WIND WATCH THURSDAY MEANS CONDITIONS ARE FAVORABLE FOR A POTENTIALLY DAMAGING HIGH WIND EVENT IN AND CLOSE TO THE WATCH AREA. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE. MONITOR THE LATEST FORECASTS AT WEATHER.GOV/ABQ...LISTEN TO NOAA WEATHER RADIO OR YOUR FAVORITE MEDIA OUTLET.

&&

$$

NMZ529-281800-
/O.CON.KABQ.HW.W.0006.100428T1800Z-100429T0200Z/
/O.CON.KABQ.HW.A.0007.100429T1200Z-100430T0300Z/
NORTHEAST HIGHLANDS-
434 AM MDT WED APR 28 2010

...HIGH WIND WARNING REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING...
...HIGH WIND WATCH REMAINS IN EFFECT FROM THURSDAY MORNING THROUGH THURSDAY EVENING...

A HIGH WIND WARNING REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING. A HIGH WIND WATCH REMAINS IN EFFECT FROM THURSDAY MORNING THROUGH THURSDAY EVENING.

* LOCATION...EXPECT DANGEROUS WINDS ACROSS INTERSTATE 40 FROM RIBERA TO WATROUS...OR FROM MILE POST 320 TO MILE POST 365...AND ACROSS STATE ROAD 104. EXPECT STRONGEST WINDS OVER HILLTOPS AND

THROUGH GAPS.

* WINDS...SOUTHWEST WINDS WILL INCREASE TO 45 MPH WITH GUSTS TO 65 MPH BOTH TODAY AND THURSDAY.

* TIMING...WIND SPEEDS WILL INCREASE STEADILY THIS MORNING TO REACH HAZARDOUS SPEEDS BY EARLY AFTERNOON. WIND SPEEDS WILL DECREASE OVERNIGHT...WITH HAZARDOUS WIND SPEEDS REDEVELOPING THURSDAY MORNING. WIND SPEEDS WILL DECREASE THURSDAY EVENING TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE REDUCED LOCALLY TO A MILE OR LESS IN BLOWING DUST.

* LOCAL IMPACTS...GUSTY SOUTHWEST WINDS WILL IMPACT LARGE OR TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN STRONG AND GUSTY WINDS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

REMEMBER...A HIGH WIND WATCH MEANS CONDITIONS ARE FAVORABLE FOR A POTENTIALLY DAMAGING HIGH WIND EVENT IN AND CLOSE TO THE WATCH AREA. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE. MONITOR THE LATEST FORECASTS AT WEATHER.GOV/ABQ...LISTEN TO NOAA WEATHER RADIO OR YOUR FAVORITE MEDIA OUTLET.

&&

$$

NMZ502-505-281800-
/O.CON.KABQ.HW.W.0006.100428T1800Z-100429T0200Z/
CHUSKA MOUNTAINS-WEST CENTRAL PLATEAU-
434 AM MDT WED APR 28 2010

...HIGH WIND WARNING REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING...

A HIGH WIND WARNING REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING.

* LOCATION...EXPECT DANGEROUS WINDS TODAY ACROSS THE CHUSKA MOUNTAINS AND NEAR THE ARIZONA BORDER. THIS INCLUDES INTERSTATE 40 FROM THE ARIZONA LINE TO GALLUP...OR FROM MILE POST ZERO TO MILE POST 30...AND ACROSS STATE ROAD 134...STATE ROAD 264...STATE ROAD 53...AND STATE ROADS 32 AND 604. EXPECT STRONGEST WINDS ACROSS SUMMITS AND THROUGH GAPS AND PASSES.

* WINDS...SOUTHWEST WINDS WILL INCREASE TO 45 MPH...WITH FREQUENT

GUSTS TO 65 MPH.

* TIMING...WIND SPEEDS WILL INCREASE STEADILY THIS MORNING TO REACH HAZARDOUS SPEEDS BY EARLY AFTERNOON. WIND SPEEDS WILL DECREASE OVERNIGHT TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE REDUCED LOCALLY TO A MILE OR LESS IN BLOWING DUST.

* LOCAL IMPACTS...GUSTY SOUTHWEST WINDS WILL IMPACT LARGE OR TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN STRONG AND GUSTY WINDS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

&&

$$

NMZ507-511-517>519-281800-
/O.EXA.KABQ.HW.A.0007.100429T1200Z-100430T0300Z/
/O.CON.KABQ.WI.Y.0022.100428T1800Z-100429T0200Z/
WEST CENTRAL HIGHLANDS-JEMEZ MOUNTAINS-LOWER CHAMA RIVER VALLEY-
SANTA FE METRO AREA-ALBUQUERQUE METRO AREA-
434 AM MDT WED APR 28 2010

...WIND ADVISORY REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING...
...HIGH WIND WATCH IN EFFECT FROM THURSDAY MORNING THROUGH THURSDAY EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A HIGH WIND WATCH...WHICH IS IN EFFECT FROM THURSDAY MORNING THROUGH THURSDAY EVENING. A WIND ADVISORY REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING.

* LOCATION...EXPECT HAZARDOUS WINDS ACROSS INTERSTATE 40 FROM GRANTS TO TIJERAS...OR FROM MILE POST 80 TO MILE POST 175...AND ACROSS INTERSTATE 25 FROM BELEN TO GLORIETA PASS...OR FROM MILE POST 190 TO MILE POST 300..AND ACROSS HIGHWAY 550...STATE ROAD 4...AND HIGHWAYS 84 AND 285. EXPECT STRONGEST WINDS ACROSS SUMMITS AND HILLTOPS AND THROUGH GAPS.

* WINDS...SOUTHWEST WIND SPEEDS WILL INCREASE TO 35 MPH...WITH GUSTS TO 55 MPH. DAMAGING WIND GUSTS OF 65 TO 70 MPH MAY BE POSSIBLE THURSDAY.

* TIMING...WIND SPEEDS WILL INCREASE STEADILY THIS MORNING TO REACH HAZARDOUS SPEEDS BY EARLY AFTERNOON. WIND SPEEDS WILL DECREASE OVERNIGHT...WITH HAZARDOUS WIND SPEEDS REDEVELOPING

THURSDAY MORNING. WIND SPEEDS WILL DECREASE THURSDAY
EVENING TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE REDUCED LOCALLY TO TWO MILES
OR LESS IN BLOWING DUST.

* LOCAL IMPACTS...GUSTY SOUTHWEST WINDS WILL IMPACT LARGE OR
TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN STRONG AND
GUSTY WINDS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

MOTORISTS SHOULD EXERCISE CAUTION WHILE TRAVELING. SUDDEN GUSTS
OF WIND MAY CAUSE YOU TO LOSE CONTROL OF YOUR VEHICLE. EXTRA
ATTENTION SHOULD BE GIVEN TO CROSS WINDS.

REMEMBER...THE HIGH WIND WATCH THURSDAY MEANS CONDITIONS ARE
FAVORABLE FOR A POTENTIALLY DAMAGING HIGH WIND EVENT IN AND CLOSE
TO THE WATCH AREA. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR
GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE. MONITOR THE
LATEST FORECASTS AT WEATHER.GOV/ABQ...LISTEN TO NOAA WEATHER
RADIO OR YOUR FAVORITE MEDIA OUTLET.

&&

$$

NMZ534>538-281800-
/O.CON.KABQ.WI.Y.0022.100428T1800Z-100429T0200Z/
/O.CON.KABQ.HW.A.0007.100429T1500Z-100430T0300Z/
QUAY COUNTY-CURRY COUNTY-ROOSEVELT COUNTY-DE BACA COUNTY-
CHAVES COUNTY PLAINS-
434 AM MDT WED APR 28 2010

...WIND ADVISORY REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT
THIS EVENING...
...HIGH WIND WATCH REMAINS IN EFFECT FROM THURSDAY MORNING
THROUGH THURSDAY EVENING...

A WIND ADVISORY REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT
THIS EVENING. A HIGH WIND WATCH REMAINS IN EFFECT FROM THURSDAY
MORNING THROUGH THURSDAY EVENING.

* LOCATION...EXPECT HAZARDOUS WINDS ACROSS HIGHWAYS 60 AND
84...HIGHWAYS 70 AND 380...AND HIGHWAY 285. EXPECT STRONGEST
WINDS OVER HILLTOPS AND THROUGH GAPS.

* WINDS...SOUTHWEST WIND SPEEDS WILL INCREASE TO 35 MPH...WITH
GUSTS TO 55 MPH. ON THURSDAY...WIND SPEEDS WILL INCREASE TO 45
MPH WITH GUSTS TO 60 TO 65 MPH.

* TIMING...WIND SPEEDS WILL INCREASE STEADILY THIS MORNING TO
REACH HAZARDOUS SPEEDS BY EARLY AFTERNOON. WIND SPEEDS WILL
DECREASE OVERNIGHT...WITH HAZARDOUS WIND SPEEDS REDEVELOPING

THURSDAY MORNING. WIND SPEEDS WILL DECREASE THURSDAY
EVENING TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE REDUCED LOCALLY TO TWO MILES
OR LESS IN BLOWING DUST.

* LOCAL IMPACTS...GUSTY SOUTHWEST WINDS WILL IMPACT LARGE OR
TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN STRONG AND
GUSTY WINDS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

MOTORISTS SHOULD EXERCISE CAUTION WHILE TRAVELING. SUDDEN GUSTS
OF WIND MAY CAUSE YOU TO LOSE CONTROL OF YOUR VEHICLE. EXTRA
ATTENTION SHOULD BE GIVEN TO CROSS WINDS.

REMEMBER...THE HIGH WIND WATCH THURSDAY MEANS CONDITIONS ARE
FAVORABLE FOR A POTENTIALLY DAMAGING HIGH WIND EVENT IN AND CLOSE
TO THE WATCH AREA. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR
GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE. MONITOR THE
LATEST FORECASTS AT WEATHER.GOV/ABQ...LISTEN TO NOAA WEATHER
RADIO OR YOUR FAVORITE MEDIA OUTLET.

&&

$$

NMZ508-509-520>522-525-539-540-281800-
/O.CON.KABQ.WI.Y.0022.100428T1800Z-100429T0200Z/
/O.CON.KABQ.HW.A.0007.100429T1200Z-100430T0300Z/
SOUTHWEST MOUNTAINS-SAN FRANCISCO RIVER VALLEY-
LOWER RIO GRANDE VALLEY-SANDIA/MANZANO MOUNTAINS-ESTANCIA VALLEY-
UPPER TULAROSA VALLEY-EASTERN LINCOLN COUNTY-
SOUTHWEST CHAVES COUNTY-
434 AM MDT WED APR 28 2010

...WIND ADVISORY REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT
THIS EVENING...
...HIGH WIND WATCH REMAINS IN EFFECT FROM THURSDAY MORNING
THROUGH THURSDAY EVENING...

A WIND ADVISORY REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT
THIS EVENING. A HIGH WIND WATCH REMAINS IN EFFECT FROM THURSDAY
MORNING THROUGH THURSDAY EVENING.

* LOCATION...EXPECT HAZARDOUS WINDS ACROSS INTERSTATE 40 FROM
TIJERAS TO MORIARTY...OR FROM MILE POST 170 TO MILE POST
210...AND ACROSS INTERSTATE 25 FROM ELEPHANT BUTTE LAKE STATE
PARK TO BELEN...OR FROM MILE POST 100 TO MILE POST 190...AND
ACROSS HIGHWAYS 60 AND 180...STATE ROAD 12...STATE ROADS 14 AND
337...HIGHWAYS 70 AND 380...AND HIGHWAY 285. EXPECT STRONGEST
WINDS OVER SUMMITS AND HILLTOPS AND THROUGH GAPS.

* WINDS...SOUTHWEST WIND SPEEDS WILL INCREASE TO 35 MPH...WITH

GUSTS TO 55 MPH. DAMAGING WIND GUSTS OF 65 TO 70 MPH MAY BE POSSIBLE THURSDAY.

* TIMING...WIND SPEEDS WILL INCREASE STEADILY THIS MORNING TO REACH HAZARDOUS SPEEDS BY EARLY AFTERNOON. WIND SPEEDS WILL DECREASE OVERNIGHT...WITH HAZARDOUS WIND SPEEDS REDEVELOPING THURSDAY MORNING. WIND SPEEDS WILL DECREASE THURSDAY EVENING TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE REDUCED LOCALLY TO TWO MILES OR LESS IN BLOWING DUST.

* LOCAL IMPACTS...GUSTY SOUTHWEST WINDS WILL IMPACT LARGE OR TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN STRONG AND GUSTY WINDS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

MOTORISTS SHOULD EXERCISE CAUTION WHILE TRAVELING. SUDDEN GUSTS OF WIND MAY CAUSE YOU TO LOSE CONTROL OF YOUR VEHICLE. EXTRA ATTENTION SHOULD BE GIVEN TO CROSS WINDS.

REMEMBER...THE HIGH WIND WATCH THURSDAY MEANS CONDITIONS ARE FAVORABLE FOR A POTENTIALLY DAMAGING HIGH WIND EVENT IN AND CLOSE TO THE WATCH AREA. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE. MONITOR THE LATEST FORECASTS AT WEATHER.GOV/ABQ...LISTEN TO NOAA WEATHER RADIO OR YOUR FAVORITE MEDIA OUTLET.

&&

$$

NMZ503-504-281800-
/O.CON.KABQ.WI.Y.0022.100428T1800Z-100429T0200Z/
FAR NORTHWEST HIGHLANDS-NORTHWEST HIGHLANDS-
434 AM MDT WED APR 28 2010

...WIND ADVISORY REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING...

A WIND ADVISORY REMAINS IN EFFECT FROM NOON TODAY TO 8 PM MDT THIS EVENING.

* LOCATION...EXPECT HAZARDOUS WINDS ACROSS HIGHWAYS 64 AND 84 IN EASTERN SAN JUAN AND WESTERN RIO ARRIBA COUNTIES INCLUDING NAVAJO STATE PARK AND DULCE...HIGHWAY 550 NEAR CUBA...JEMEZ PUEBLO...AND ZIA PUEBLO...AND STATE ROAD 197 NEAR TORREON.

* WINDS...SOUTHWEST WIND SPEEDS WILL INCREASE TO 35 MPH...WITH GUSTS TO 55 MPH.

* TIMING...WIND SPEEDS WILL INCREASE STEADILY THIS MORNING TO REACH HAZARDOUS SPEEDS BY EARLY AFTERNOON. WIND SPEEDS WILL

DECREASE OVERNIGHT TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE REDUCED LOCALLY TO TWO MILES OR LESS IN BLOWING DUST.

* LOCAL IMPACTS...GUSTY SOUTHWEST WINDS WILL IMPACT LARGE OR TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN STRONG AND GUSTY WINDS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

MOTORISTS SHOULD EXERCISE CAUTION WHILE TRAVELING. SUDDEN GUSTS OF WIND MAY CAUSE YOU TO LOSE CONTROL OF YOUR VEHICLE. EXTRA ATTENTION SHOULD BE GIVEN TO CROSS WINDS.

&&

$$

WWUS75 KFGZ 281107
NPWFGZ

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE FLAGSTAFF AZ
407 AM MST WED APR 28 2010

AZZ011>014-017-040-282100-
/O.EXB.KFGZ.WI.Y.0008.100429T0500Z-100430T0200Z/
/O.CON.KFGZ.HW.W.0004.100428T1600Z-100429T0500Z/
CHUSKA MOUNTAINS AND DEFIANCE PLATEAU-
LITTLE COLORADO RIVER VALLEY IN COCONINO COUNTY-
LITTLE COLORADO RIVER VALLEY IN NAVAJO COUNTY-
LITTLE COLORADO RIVER VALLEY IN APACHE COUNTY-WHITE MOUNTAINS-
NORTHEAST PLATEAUS AND MESAS SOUTH OF HWY 264-
INCLUDING THE CITIES OF...WINDOW ROCK...GANADO...WINSLOW...
HOLBROOK...SNOWFLAKE...ST. JOHNS...SPRINGERVILLE...SHOW LOW...
DILKON
407 AM MST WED APR 28 2010

...HIGH WIND WARNING REMAINS IN EFFECT FROM 9 AM THIS MORNING TO 10 PM MST THIS EVENING...
...WIND ADVISORY IN EFFECT FROM 10 PM THIS EVENING TO 7 PM MST THURSDAY...

THE NATIONAL WEATHER SERVICE IN FLAGSTAFF HAS ISSUED A WIND ADVISORY...WHICH IS IN EFFECT FROM 10 PM THIS EVENING TO 7 PM MST THURSDAY. A HIGH WIND WARNING REMAINS IN EFFECT FROM 9 AM THIS MORNING TO 10 PM MST THIS EVENING.

* TIMING: STRONG SOUTHWEST WINDS WILL DEVELOP THIS MORNING AND CONTINUE THROUGH LATE EVENING AS A STORM SYSTEM APPROACHES THE REGION. GUSTY WINDS WILL PERSIST THURSDAY...THOUGH NOT AS STRONG AS TODAY.

* WINDS: SUSTAINED SOUTHWEST WINDS OF 35 TO 45 MPH WITH GUSTS OF 55 TO 70 MPH ARE LIKELY.

* IMPACTS: FOR HIGH PROFILE VEHICLES...TRAVEL WILL BE DIFFICULT ACROSS NORTHERN ARIZONA. IN ADDITION TO THE STRONG WINDS... EXPECT AREAS OF BLOWING DUST WHICH COULD REDUCE THE VISIBILITY TO 1/4 MILE OR LESS AT TIMES. SPECIFICALLY...AN AREA THAT MAY EXPERIENCE NEAR-ZERO VISIBILITIES IN BLOWING DUST WILL BE INTERSTATE 40 FROM TWIN ARROWS TO WINSLOW. MOTORISTS ARE URGED TO USE CAUTION IN THESE AREAS. MINOR PROPERTY OR TREE DAMAGE IS ALSO POSSIBLE.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A HIGH WIND WARNING MEANS A HAZARDOUS HIGH WIND EVENT IS EXPECTED OR OCCURRING...WITH SUSTAINED WIND SPEEDS GREATER THAN 40 MPH OR GUSTS GREATER THAN 58 MPH. WINDS THIS STRONG CAN CAUSE PROPERTY DAMAGE. CONTINUE TO MONITOR THE LATEST FORECASTS. ADDITIONAL WEATHER INFORMATION IS ON THE WEB AT WWW.WEATHER.GOV/FLAGSTAFF.

&&

PUBLIC INFORMATION STATEMENT
NATIONAL WEATHER SERVICE FLAGSTAFF AZ
930 PM MST WED APR 28 2010

...STRONG WINDS ACROSS NORTHERN ARIZONA ON WEDNESDAY...

A LOW PRESSURE SYSTEM MOVING INTO THE WESTERN U.S. PRODUCED STRONG AND GUSTY SOUTHWEST WINDS TO MUCH OF NORTHERN ARIZONA TODAY. THESE STRONG WINDS PRODUCED SIGNIFICANT BLOWING DUST ACROSS AREA ROADWAYS FROM THE LITTLE COLORADO RIVER VALLEY TO THE FOUR CORNER REGION WITH VISIBILITIES BELOW 10 FEET REPORTED IN SOME LOCATIONS. INTERSTATE 40 WAS CLOSED NEAR WINSLOW DUE TO THE STRONG WINDS AND BLOWING DUST IN THE AREA. POWER OUTAGES WERE ALSO REPORTED NEAR WINSLOW DUE TO THE STRONG WINDS BLOWING DOWN POWER LINES.

SOME PEAK WIND GUSTS REPORTED AS OF 8 PM MST TODAY INCLUDE:

TWO GUNS ..... 73 MPH.
WINSLOW ..... 69 MPH.
HOUSE ROCK ..... 64 MPH.
LIMESTONE CANYON ..... 63 MPH.
DONEY PARK ..... 61 MPH.
TUBA CITY ..... 60 MPH.
LUPTON ..... 60 MPH.
WUPATKI ..... 59 MPH.
MOGOLLON AIR PARK ..... 57 MPH.
FOUR SPRINGS ..... 55 MPH.
FLAGSTAFF AIRPORT ..... 55 MPH.
GRAND CANYON ..... 55 MPH.
SHOW LOW AIRPORT ..... 53 MPH.
FRAZIER WELLS ..... 51 MPH.

SAINT JOHNS ..... 51 MPH.
SEDONA AIRPORT ..... 49 MPH.
HOPI RAWS ..... 48 MPH.
SUNSET POINT ..... 45 MPH.
PRESCOTT ..... 43 MPH.
PLEASANT VALLEY ..... 40 MPH.

COLDER AND UNSETTLED AIR WILL MOVE INTO THE REGION ON THURSDAY WITH DAYTIME TEMPERATURES CLOSE TO 20 DEGREES BELOW NORMAL...ALONG WITH SNOW AND RAIN SHOWERS. WINDS WILL REMAIN STRONG IN THE LITTLE COLORADO RIVER VALLEY ON THURSDAY...HOWEVER THE WIND SPEEDS WILL BE MUCH LIGHTER THAN TODAY.

$$

WWUS75 KGJT 280842
NPWGJT

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE GRAND JUNCTION CO
242 AM MDT WED APR 28 2010

...VERY STRONG WINDS WILL BLOW ACROSS EASTERN UTAH AND WESTERN COLORADO TODAY...

.WINDS WILL CONTINUE TO STRENGTHEN TODAY WITH HIGH WIND GUSTS TO OVER 60 MPH EXPECTED BY THIS AFTERNOON AND EVENING. THESE HIGH WINDS WILL DEVELOP IN ADVANCE OF A VIGOROUS COLD FRONT MOVING ACROSS UTAH. THE STRONGEST WINDS WILL OCCUR LATE IN THE AFTERNOON AS THE FRONT MOVES INTO SOUTHEAST UTAH AND APPROACHES WESTERN COLORADO. FOR THE LATEST UPDATES...VISIT THE NATIONAL WEATHER SERVICE GRAND JUNCTION WEB PAGE AT WEATHER.GOV/GJT.

COZ002-003-006-007-009-011-017>021-UTZ022-025-027>029-282130-
/O.EXT.KGJT.HW.W.0001.100428T0842Z-100429T0300Z/
CENTRAL YAMPA RIVER BASIN-ROAN AND TAVAPUTS PLATEAUS-GRAND VALLEY-
DEBEQUE TO SILT CORRIDOR-GRAND AND BATTLEMENT MESAS-
CENTRAL GUNNISON AND UNCOMPAHGRE RIVER BASIN-
UNCOMPAHGRE PLATEAU AND DALLAS DIVIDE-
NORTHWEST SAN JUAN MOUNTAINS-SOUTHWEST SAN JUAN MOUNTAINS-
PARADOX VALLEY/LOWER DOLORES RIVER-
FOUR CORNERS/UPPER DOLORES RIVER-SOUTHEAST UTAH-TAVAPUTS PLATEAU-
ARCHES/GRAND FLAT-LA SAL AND ABAJO MOUNTAINS-
CANYONLANDS/NATURAL BRIDGES-
INCLUDING THE CITIES OF...CRAIG...HAYDEN...MEEKER...RIO BLANCO...
GRAND JUNCTION...FRUITA...PALISADE...RIFLE...SILT...PARACHUTE...
MESA...SKYWAY...CEDAREDGE...DELTA...HOTCHKISS...MONTROSE...
RIDGWAY...GLADE PARK...OURAY...TELLURIDE...LAKE CITY...
SILVERTON...RICO...HESPERUS...GATEWAY...NUCLA...CORTEZ...
DOVE CREEK...MANCOS...BLANDING...BLUFF...MEXICAN HAT...MOAB...
CASTLE VALLEY...THOMPSON SPRINGS...MONTICELLO AND VICINITY
242 AM MDT WED APR 28 2010

...HIGH WIND WARNING NOW IN EFFECT UNTIL 9 PM MDT THIS EVENING...

THE HIGH WIND WARNING IS NOW IN EFFECT UNTIL 9 PM MDT THIS EVENING.

* TIMING...HIGH WINDS EXPECTED THROUGH 9 PM MDT THIS EVENING.

* WINDS...SUSTAINED STRONG WINDS FROM THE SOUTHWEST OF 20 TO 40 MPH WILL BE COMMON. HIGH WIND GUSTS TO 60 MPH FOR THE VALLEYS AND 75 MPH IN THE MOUNTAINS WILL BE POSSIBLE.

* VISIBILITY...VISIBILITY WILL BE SIGNIFICANTLY REDUCED FROM BLOWING DUST...ESPECIALLY ALONG INTERSTATE 70 FROM GREEN RIVER TO FRUITA.

* IMPACTS...BUFFETING WINDS WILL CREATE HAZARDOUS DRIVING CONDITIONS FOR HIGH PROFILE VEHICLES.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A HIGH WIND WARNING MEANS A HAZARDOUS HIGH WIND EVENT IS EXPECTED OR OCCURRING. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

PEOPLE...ESPECIALLY THOSE WITH RESPIRATORY ILLNESSES...HEART DISEASE...THE ELDERLY...AND CHILDREN ARE RECOMMENDED TO STAY INDOORS AND AVOID PROLONGED OUTDOOR EXERCISE OR HEAVY EXERTION DUE TO WIND-BLOWN DUST.

&&

WWUS75 KABQ 291040
NPWABQ

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE ALBUQUERQUE NM
440 AM MDT THU APR 29 2010

...VERY WINDY CONDITIONS CONTINUING ACROSS NORTH AND CENTRAL NEW MEXICO TODAY...

.A POWERFUL WEATHER SYSTEM OVER NORTHERN ARIZONA WILL MOVE TO WESTERN NEW MEXICO BY LATE THIS AFTERNOON. A COLD FRONT APPROACHING THE FOUR CORNERS THIS MORNING WILL SWEEP SOUTH AND EAST ACROSS THE STATE BY THIS EVENING TO PRODUCE DANGEROUSLY GUSTY WINDS STATEWIDE AS THE FRONT MOVES THROUGH. AS THE WEATHER SYSTEM MOVES OVER NEW MEXICO THIS EVENING...WIND SPEEDS WILL DECREASE AFTER SUNSET TO EASE THESE DANGEROUSLY WINDY CONDITIONS.

NMZ502-291800-
/O.CAN.KABQ.HW.W.0006.000000T0000Z-100429T1200Z/
/O.EXB.KABQ.WI.Y.0022.000000T0000Z-100430T0300Z/
CHUSKA MOUNTAINS-
440 AM MDT THU APR 29 2010

...HIGH WIND WARNING REPLACED BY WIND ADVISORY...IN EFFECT UNTIL 9 PM MDT THIS EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A WIND ADVISORY...WHICH IS IN EFFECT UNTIL 9 PM MDT THIS EVENING. THE HIGH WIND WARNING HAS BEEN CANCELLED.

* LOCATION...EXPECT HAZARDOUS WINDS ACROSS THE CHUSKA MOUNTAINS...WITH STRONGEST WINDS ACROSS SUMMITS AND THROUGH GAPS. EXPECT HAZARDOUS WINDS ACROSS STATE ROAD 134.

* WINDS...SOUTHWEST WINDS TO 40 MPH WITH GUSTS UP TO 55 MPH.

* TIMING...HAZARDOUS SOUTHWEST WIND SPEEDS WILL REDEVELOP THIS MORNING AND CONTINUE THROUGH THE AFTERNOON. WIND SPEEDS WILL DECREASE AFTER SUNSET TO EASE THESE HAZARDOUS WIND CONDITIONS.

* VISIBILITY...VISIBILITIES WILL BE LOCALLY REDUCED IN BLOWING DUST.

* LOCAL IMPACTS...HAZARDOUS CROSS WINDS WILL IMPACT LARGE OR TALL VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE IN GUSTS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

MOTORISTS SHOULD EXERCISE CAUTION WHILE TRAVELLING. SUDDEN GUSTS OF WIND MAY CAUSE YOU TO LOSE CONTROL OF YOUR VEHICLE. EXTRA ATTENTION SHOULD BE GIVEN TO CROSS WINDS.

&&

$$

NMZ506-512>515-523-526-529-539-540-291800-
/O.CAN.KABQ.HW.A.0007.100429T1200Z-100430T0300Z/
/O.EXT.KABQ.HW.W.0006.000000T0000Z-100430T0300Z/
WEST CENTRAL MOUNTAINS-WEST SLOPES SANGRE DE CRISTO MOUNTAINS-
NORTHERN SANGRE DE CRISTO MOUNTAINS ABOVE 9500 FEET/RED RIVER-
SOUTHERN SANGRE DE CRISTO MOUNTAINS ABOVE 9500 FEET-
EAST SLOPES SANGRE DE CRISTO MOUNTAINS-CENTRAL HIGHLANDS-
SOUTH CENTRAL MOUNTAINS-NORTHEAST HIGHLANDS-
EASTERN LINCOLN COUNTY-SOUTHWEST CHAVES COUNTY-
440 AM MDT THU APR 29 2010

...HIGH WIND WATCH UPGRADED TO HIGH WIND WARNING...IN EFFECT
UNTIL 9 PM MDT THIS EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS CANCELLED THE
HIGH WIND WATCH. THE HIGH WIND WARNING IS NOW IN EFFECT UNTIL
9 PM MDT THIS EVENING.

* LOCATION...EXPECT DANGEROUS WIND SPEEDS ACROSS INTERSTATE 40
  FROM THE ARIZONA LINE TO MILAGRO...OR FROM MILE POST ZERO TO
  MILE POST 240...AND ACROSS INTERSTATE 25 FROM ELEPHANT BUTTE
  LAKE STATE PARK TO WATROUS AND VALMORA...OR FROM MILE POST 100
  TO MILE POST 365. EXPECT STRONGEST WINDS ACROSS SUMMITS AND
  THROUGH GAPS.

* WINDS...SOUTHWEST WINDS 45 TO 50 MPH WITH GUSTS OF 65 TO 75 MPH.

* TIMING...STRONG WINDS WILL CONTINUE THROUGH THIS EVENING BEFORE
  DECREASING SPEED AFTER SUNSET.

* VISIBILITY...EXPECT LOCALLY POOR VISIBILITIES IN BLOWING DUST.

* LOCAL IMPACTS...DANGEROUS CROSS WINDS WILL IMPACT LARGE OR TALL
  VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE. TREE LIMBS MAY
  BREAK OFF WITH DAMAGE POSSIBLE TO BUILDINGS...POWER LINES...AND
  LARGE SIGNS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT
OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR
GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

&&

$$

NMZ527-528-291800-
/O.CAN.KABQ.HW.A.0007.100429T1200Z-100430T0300Z/
/O.EXT.KABQ.HW.W.0006.000000T0000Z-100430T0300Z/
RATON RIDGE/JOHNSON MESA-FAR NORTHEAST HIGHLANDS-
440 AM MDT THU APR 29 2010

...HIGH WIND WATCH UPGRADED TO HIGH WIND WARNING...IN EFFECT
UNTIL 9 PM MDT THIS EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS CANCELLED THE
HIGH WIND WATCH. THE HIGH WIND WARNING IS NOW IN EFFECT UNTIL
9 PM MDT THIS EVENING.

* LOCATION...THIS INCLUDES INTERSTATE 25 FROM WATROUS AND VALMORA
  TO THE COLORADO LINE AT RATON PASS...OR FROM MILE POST 365 TO
  MILE POST 460.

* WINDS...EXPECT SOUTHWEST WINDS TO 45 MPH WITH GUSTS TO 65 MPH.

* TIMING...HAZARDOUS WIND SPEEDS EARLY THIS MORNING WILL INCREASE
  TO DANGEROUS SPEEDS BY LATE MORNING. WIND SPEEDS WILL DECREASE
  AFTER SUNSET TO EASE THESE DANGEROUS WIND CONDITIONS.

* VISIBILITY...EXPECT LOCALLY POOR VISIBILITIES IN BLOWING DUST.

* LOCAL IMPACTS...DANGEROUS CROSS WINDS WILL IMPACT LARGE OR TALL
  VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE. TREE LIMBS MAY
  BREAK OFF WITH DAMAGE POSSIBLE TO BUILDINGS...POWER LINES...AND
  LARGE SIGNS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT
OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR
GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

&&

$$

NMZ507>511-521-522-524-291800-
/O.UPG.KABQ.WI.Y.0022.000000T0000Z-100429T1200Z/
/O.UPG.KABQ.HW.A.0007.100429T1200Z-100430T0300Z/
/O.EXB.KABQ.HW.W.0006.000000T0000Z-100430T0300Z/
WEST CENTRAL HIGHLANDS-SOUTHWEST MOUNTAINS-
SAN FRANCISCO RIVER VALLEY-SAN JUAN MOUNTAINS-JEMEZ MOUNTAINS-
SANDIA/MANZANO MOUNTAINS-ESTANCIA VALLEY-SOUTH CENTRAL HIGHLANDS-
440 AM MDT THU APR 29 2010

...HIGH WIND WARNING IN EFFECT UNTIL 9 PM MDT THIS EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A HIGH
WIND WARNING...WHICH IS IN EFFECT UNTIL 9 PM MDT THIS EVENING.
THE WIND ADVISORY IS NO LONGER IN EFFECT. THE HIGH WIND WATCH IS
NO LONGER IN EFFECT.

* LOCATION...THIS INCLUDES INTERSTATE 40 FROM MILAN TO ACOMA
  PUEBLO...OR FROM MILE POST 80 TO MILE POST 130...AND FROM
  TIJERAS TO MORIARTY...OR FROM MILE POST 170 TO MILE POST

200...AND HIGHWAY 60 NEAR QUEMADO AND MAGDALENA...SOCORRO...
MOUNTAINAIR...AND WILLARD...AND HIGHWAY 180 NEAR LUNA AND
GLENWOOD.

* WINDS...EXPECT SOUTHWEST WINDS INCREASING TO 40 TO 50 MPH...WITH
GUSTS OF 60 TO 75 MPH.

* TIMING...STRONG WINDS EARLY THIS MORNING WILL CONTINUE THROUGH
EARLY EVENING. WIND SPEEDS WILL DECREASE AFTER SUNSET TO EASE
THESE DANGEROUS WIND CONDITIONS.

* VISIBILITY...EXPECT LOCALLY POOR VISIBILITIES IN BLOWING DUST.

* LOCAL IMPACTS...DANGEROUS CROSS WINDS WILL IMPACT LARGE OR TALL
VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE. TREE LIMBS MAY
BREAK OFF WITH DAMAGE POSSIBLE TO BUILDINGS...POWER LINES...AND
LARGE SIGNS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT
OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR
GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

&&

$$

NMZ516>520-525-291800-
/O.UPG.KABQ.HW.A.0007.100429T1200Z-100430T0300Z/
/O.EXB.KABQ.HW.W.0006.000000T0000Z-100430T0300Z/
UPPER RIO GRANDE VALLEY-LOWER CHAMA RIVER VALLEY-
SANTA FE METRO AREA-ALBUQUERQUE METRO AREA-
LOWER RIO GRANDE VALLEY-UPPER TULAROSA VALLEY-
440 AM MDT THU APR 29 2010

...HIGH WIND WARNING IN EFFECT UNTIL 9 PM MDT THIS EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A HIGH
WIND WARNING...WHICH IS IN EFFECT UNTIL 9 PM MDT THIS EVENING.
THE HIGH WIND WATCH IS NO LONGER IN EFFECT.

* LOCATION...EXPECT DANGEROUS WINDS ACROSS INTERSTATE 40 IN THE
ALBUQUERQUE METRO AREA...AND ACROSS INTERSTATE 25 FROM ELEPHANT
BUTTE LAKE STATE PARK TO GLORIETA PASS...OR FROM MILE POST 100
TO MILE POST 300...AND ACROSS HIGHWAY 60...HIGHWAY 550...AND
HIGHWAYS 84 AND 285.

* WINDS...SOUTHWEST WINDS WILL INCREASE SPEED TO 40 TO 45
MPH...WITH GUSTS OF 60 TO 65 MPH.

* TIMING...DANGEROUS WINDS REDEVELOPING EARLY THIS MORNING WILL
CONTINUE THROUGH THIS EVENING. WIND SPEEDS WILL DECREASE AFTER
SUNSET TO EASE THESE DANGEROUS WIND CONDITIONS.

* VISIBILITY...EXPECT LOCALLY POOR VISIBILITIES IN BLOWING DUST.

* LOCAL IMPACTS...DANGEROUS CROSS WINDS WILL IMPACT LARGE OR TALL
  VEHICLES. LOOSE OBJECTS MAY BECOME AIRBORNE. TREE LIMBS MAY
  BREAK OFF WITH DAMAGE POSSIBLE TO BUILDINGS...POWER LINES...AND
  LARGE SIGNS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT
OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR
GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

&&

$$

NMZ530>538-291800-
/O.UPG.KABQ.HW.A.0007.100429T1200Z-100430T0300Z/
/O.EXB.KABQ.HW.W.0006.000000T0000Z-100430T0300Z/
UNION COUNTY-HARDING COUNTY-EASTERN SAN MIGUEL COUNTY-
GUADALUPE COUNTY-QUAY COUNTY-CURRY COUNTY-ROOSEVELT COUNTY-
DE BACA COUNTY-CHAVES COUNTY PLAINS-
440 AM MDT THU APR 29 2010

...HIGH WIND WARNING IN EFFECT UNTIL 9 PM MDT THIS EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A HIGH
WIND WARNING...WHICH IS IN EFFECT UNTIL 9 PM MDT THIS EVENING.
THE HIGH WIND WATCH IS NO LONGER IN EFFECT.

* LOCATION...EXPECT DANGEROUS WINDS ACROSS HIGHWAYS 64 AND
  87...HIGHWAYS 56 AND 412...STATE ROADS 120...104...AND
  39...HIGHWAY 60...HIGHWAYS 70 AND 380...AND HIGHWAY 285. THIS
  INCLUDES INTERSTATE 40 FROM MILAGRO TO THE TEXAS LINE...OR FROM
  MILE POST 240 TO MILE POST 370.

WWUS75 KFGZ 291659
NPWFGZ

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE FLAGSTAFF AZ
959 AM MST THU APR 29 2010

AZZ014-017-300100-
/O.UPG.KFGZ.WI.Y.0008.000000T0000Z-100430T0200Z/
/O.NEW.KFGZ.HW.W.0006.100429T1659Z-100430T0200Z/
LITTLE COLORADO RIVER VALLEY IN APACHE COUNTY-WHITE MOUNTAINS-
INCLUDING THE CITIES OF...ST. JOHNS...SPRINGERVILLE...SHOW LOW
959 AM MST THU APR 29 2010

...HIGH WIND WARNING IN EFFECT UNTIL 7 PM MST THIS EVENING...

THE NATIONAL WEATHER SERVICE IN FLAGSTAFF HAS ISSUED A HIGH WIND WARNING...WHICH IS IN EFFECT UNTIL 7 PM MST THIS EVENING. THE WIND ADVISORY IS NO LONGER IN EFFECT.

* TIMING: STRONG SOUTHWEST WINDS WILL CONTINUE TODAY BEFORE DECREASING THIS EVENING.

* WINDS: SUSTAINED SOUTHWEST WINDS OF 35 TO 45 MPH WITH GUSTS UP TO 65 MPH WILL CONTINUE.

* IMPACTS: FOR HIGH PROFILE VEHICLES...TRAVEL WILL BE DIFFICULT ACROSS NORTHERN ARIZONA. IN ADDITION TO THE STRONG WINDS...AREAS OF BLOWING DUST WILL CONTINUE.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A HIGH WIND WARNING MEANS A HAZARDOUS HIGH WIND EVENT IS EXPECTED OR OCCURRING...WITH SUSTAINED WIND SPEEDS GREATER THAN 40 MPH OR GUSTS GREATER THAN 58 MPH. WINDS THIS STRONG CAN CAUSE PROPERTY DAMAGE. CONTINUE TO MONITOR THE LATEST FORECASTS. ADDITIONAL WEATHER INFORMATION IS ON THE WEB AT WWW.WEATHER.GOV/FLAGSTAFF.

&&

$$

AZZ016-300100-
/O.EXA.KFGZ.WI.Y.0008.000000T0000Z-100430T0200Z/
EASTERN MOGOLLON RIM-
959 AM MST THU APR 29 2010

...WIND ADVISORY IN EFFECT UNTIL 7 PM MST THIS EVENING...

THE NATIONAL WEATHER SERVICE IN FLAGSTAFF HAS ISSUED A WIND ADVISORY...WHICH IS IN EFFECT UNTIL 7 PM MST THIS EVENING.

* TIMING: STRONG SOUTHWEST WINDS WILL CONTINUE TODAY BEFORE DECREASING THIS EVENING.

* WINDS: SUSTAINED SOUTHWEST WINDS OF 30 TO 40 MPH WITH GUSTS UP TO 55 MPH WILL CONTINUE.

* IMPACTS: FOR HIGH PROFILE VEHICLES...TRAVEL WILL BE DIFFICULT ACROSS NORTHERN ARIZONA.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A WIND ADVISORY MEANS THAT SUSTAINED WINDS OF 30 TO 39 MPH...OR GUSTS FROM 40 TO 57 MPH...ARE EXPECTED. WINDS THIS STRONG CAN MAKE DRIVING DIFFICULT...ESPECIALLY FOR HIGH PROFILE VEHICLES. CONSIDER SECURING LOOSE BELONGINGS ON YOUR PROPERTY. ADDITIONAL WEATHER INFORMATION IS ON THE WEB AT WWW.WEATHER.GOV/FLAGSTAFF.

&&

$$

AZZ011>013-040-300100-
/O.CON.KFGZ.WI.Y.0008.000000T0000Z-100430T0200Z/
CHUSKA MOUNTAINS AND DEFIANCE PLATEAU-
LITTLE COLORADO RIVER VALLEY IN COCONINO COUNTY-
LITTLE COLORADO RIVER VALLEY IN NAVAJO COUNTY-
NORTHEAST PLATEAUS AND MESAS SOUTH OF HWY 264-
INCLUDING THE CITIES OF...WINDOW ROCK...GANADO...WINSLOW...
HOLBROOK...SNOWFLAKE...DILKON
959 AM MST THU APR 29 2010

...WIND ADVISORY REMAINS IN EFFECT UNTIL 7 PM MST THIS EVENING...

A WIND ADVISORY REMAINS IN EFFECT UNTIL 7 PM MST THIS EVENING.

* TIMING: STRONG SOUTHWEST WINDS WILL CONTINUE TODAY BEFORE
  DECREASING THIS EVENING.

* WINDS: SUSTAINED SOUTHWEST WINDS OF 30 TO 40 MPH WITH GUSTS UP
  TO 55 MPH WILL CONTINUE.

* IMPACTS: FOR HIGH PROFILE VEHICLES...TRAVEL WILL BE DIFFICULT
  ACROSS NORTHERN ARIZONA. IN ADDITION TO THE STRONG WINDS...AREAS
  OF BLOWING DUST WILL CONTINUE.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A WIND ADVISORY MEANS THAT SUSTAINED WINDS OF 30 TO 39 MPH...OR
GUSTS FROM 40 TO 57 MPH...ARE EXPECTED. WINDS THIS STRONG CAN
MAKE DRIVING DIFFICULT...ESPECIALLY FOR HIGH PROFILE VEHICLES.
CONSIDER SECURING LOOSE BELONGINGS ON YOUR PROPERTY. ADDITIONAL
WEATHER INFORMATION IS ON THE WEB AT WWW.WEATHER.GOV/FLAGSTAFF.

&&

WWUS75 KGJT 291038
NPWGJT

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE GRAND JUNCTION CO
438 AM MDT THU APR 29 2010

...STRONG SOUTHWEST WINDS WILL CONTINUE OVER THE FOUR CORNERS AND
SAN JUAN MOUNTAINS THROUGH MIDDAY...
...UNSEASONABLY COLD TEMPERATURES EXPECTED TONIGHT...

.STRONG SOUTHWEST WINDS AHEAD OF AN APPROACHING COLD FRONT WILL
CONTINUE TO BUFFET THE FOUR CORNERS REGION THROUGH NOON TODAY.
ONCE THE FRONT PASSES THROUGH LATER THIS MORNING WINDS WILL
DECREASE IN INTENSITY.

UNSEASONABLY COLD TEMPERATURES ARE BEHIND THE FRONT AND WILL

SPREAD ACROSS THE AREA TODAY. AS A RSULT...WIDESPREAD FREEZING
TEMPERATURES ARE EXPECTED TONIGHT.

FOR THE LATEST WEATHER UPDATES...VISIT THE NATIONAL WEATHER
SERVICE GRAND JUNCTION WEB PAGE AT WEATHER.GOV/GJT.

COZ021>023-291800-
/O.CON.KGJT.WI.Y.0007.000000T0000Z-100429T1800Z/
FOUR CORNERS/UPPER DOLORES RIVER-ANIMAS RIVER BASIN-
SAN JUAN RIVER BASIN-
INCLUDING THE CITIES OF...CORTEZ...DOVE CREEK...MANCOS...
DURANGO...BAYFIELD...IGNACIO...PAGOSA SPRINGS AND VICINITY
438 AM MDT THU APR 29 2010

...WIND ADVISORY REMAINS IN EFFECT UNTIL NOON MDT TODAY...

A WIND ADVISORY REMAINS IN EFFECT UNTIL NOON MDT TODAY.

* TIMING...STRONG WINDS WILL CONTINUE ACROSS THE REGION THROUGH
  MIDDAY.

* WINDS...SOUTHWEST 20 TO 30 MPH WITH GUSTS TO 50 MPH.

* VISIBILITY...BLOWING DUST MAY SIGNIFICANTLY REDUCE VISIBILITY.

* IMPACTS...STRONG CROSS WINDS WILL CREATE HAZARDOUS DRIVING
  CONDITIONS FOR HIGH PROFILE VEHICLES.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A WIND ADVISORY MEANS THAT A SIGNIFICANT WIND EVENT IS EXPECTED
OR OCCURRING. WINDS THIS STRONG CAN MAKE DRIVING DIFFICULT. USE
EXTRA CAUTION.

PEOPLE...ESPECIALLY THOSE WITH RESPIRATORY ILLNESSES... HEART
DISEASE...THE ELDERLY...AND CHILDREN ARE RECOMMENDED TO STAY
INDOORS AND AVOID PROLONGED OUTDOOR EXERCISE OR HEAVY EXERTION
DUE TO WIND-BLOWN DUST.

&&

$$

COZ018-019-291800-
/O.CON.KGJT.WI.Y.0007.000000T0000Z-100429T1800Z/
NORTHWEST SAN JUAN MOUNTAINS-SOUTHWEST SAN JUAN MOUNTAINS-
INCLUDING THE CITIES OF...OURAY...TELLURIDE...LAKE CITY...
SILVERTON...RICO...HESPERUS
438 AM MDT THU APR 29 2010

...WIND ADVISORY REMAINS IN EFFECT UNTIL NOON MDT TODAY...

A WIND ADVISORY REMAINS IN EFFECT UNTIL NOON MDT TODAY.

* TIMING...STRONG WINDS WILL CONTINUE ACROSS THE REGION THROUGH MIDDAY.

* WINDS...SOUTHWEST 30 TO 40 MPH WITH GUSTS TO 60 MPH OR MORE.

* VISIBILITY...VISIBILITY WILL BE SIGNIFICANTLY REDUCED FROM BLOWING DUST.

* IMPACTS...STRONG CROSS WINDS WILL CREATE HAZARDOUS DRIVING CONDITIONS FOR HIGH PROFILE VEHICLES.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A WIND ADVISORY MEANS THAT A SIGNIFICANT WIND EVENT IS EXPECTED OR OCCURRING. WINDS THIS STRONG CAN MAKE DRIVING DIFFICULT. USE EXTRA CAUTION.

PEOPLE...ESPECIALLY THOSE WITH RESPIRATORY ILLNESSES... HEART DISEASE...THE ELDERLY...AND CHILDREN ARE RECOMMENDED TO STAY INDOORS AND AVOID PROLONGED OUTDOOR EXERCISE OR HEAVY EXERTION DUE TO WIND-BLOWN DUST.

Appendix C- Final Natural Events Action Plan For High Wind Events, Alamosa, Colorado

FINAL NATURAL EVENTS ACTION PLAN

FOR

HIGH WIND EVENTS

ALAMOSA, COLORADO

Colorado Department
of Public Health
and Environment

CITY OF ALAMOSA,
ALAMOSA COUNTY,
and
COLORADO AIR POLLUTION CONTROL DIVISION
4300 Cherry Creek Drive South
Denver, Colorado 80222-1530
(303) 692-3100

May 2003

I. EXECUTIVE SUMMARY

On March 31 and April 9, 1999 and again on April 18 and December 17, 2000, the monitor located in Alamosa, Colorado recorded exceedances of the 24-hour National Ambient Air Quality Standard (NAAQS) for PM10 (particulate matter having a nominal aerodynamic diameter equal to or less than 10 microns). Each of these exceedances was associated with high winds and blowing dust in the Alamosa area.

Recognizing that certain uncontrollable natural events, such as high winds, wildfires, and volcanic/seismic activity can have on the NAAQS, the Environmental Protection Agency (EPA) issued a Natural Events Policy (NEP) on May 30, 1996. The NEP sets forth procedures through the development of a Natural Events Action Plan (NEAP) for protecting public health in areas where the PM10 standard may be violated due to these uncontrollable natural events. The guiding principles of the policy are:

1. Federal, State, and local air quality agencies must protect public health;

2. The public must be informed whenever air quality is unhealthy;

3. All valid ambient air quality data should be submitted to the EPA Aerometric Information Retrieval System (AIRS) and made available for public access;

4. Reasonable measures safeguarding public health must be taken regardless of the source of PM10 emissions; and,

5. Emission controls should be applied to sources that contribute to exceedances of the PM10 NAAQS when those controls will result in fewer violations of the standards.

In response to Alamosa's four exceedances of the PM10 NAAQS in 1999 and 2000, the Colorado Department of Public Health and Environment's Air Pollution Control Division (Division), in conjunction with the City of Alamosa, Alamosa County, and other agencies developed a NEAP for the Alamosa area. The referenced NEAP was developed based on Natural Events Policy that calls for states to "develop a NEAP for any area where natural events cause or have caused a PM10 NAAQS to be violated within eighteen (18) months of the date of the violation." April 18, 2000 was the triggering event for the development of the NEAP. The referenced NEAP was developed and submitted to EPA in October 2001. A revised version of the NEAP (including U.S. EPA recommendations) was submitted February 2002. A copy of the letter of concurrence for these submittals is available in the Appendix.

The Natural Events Policy also indicates that in attainment areas (such as Alamosa), best available control measures (BACM) must be implemented within three (3) years after the triggering event. With that, this *Final Natural Events Action Plan for Alamosa, Colorado*

includes BACM not identified in the February 2002 submittal and includes additional efforts in the community to limit blowing dust and its impacts on public health.

The *Final Natural Events Action Plan* also addresses PM10 exceedances experienced in the area that have occurred since the December 17, 2000 event.

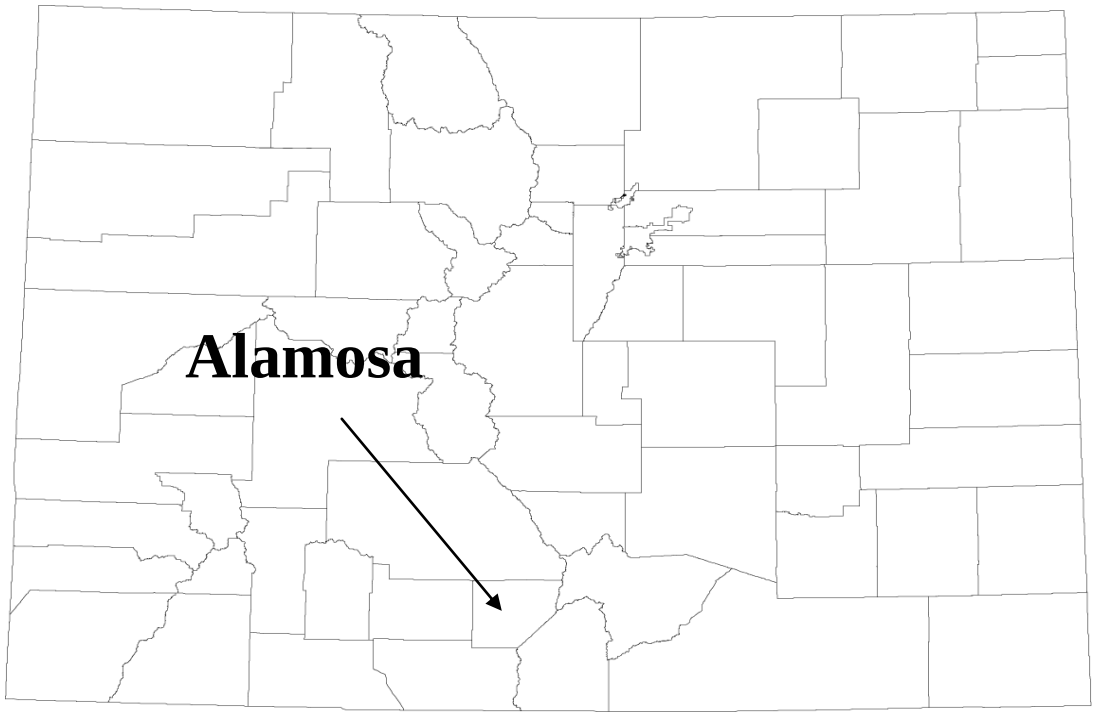
The plan provides analysis and documentation of the exceedances as attributable to uncontrollable natural events due to unusually high winds. In addition, the NEAP is designed to protect public health, educate the public about high wind events; mitigate health impacts on the community during future events; and, identify and implement Best Available Control Measures (BACM) for anthropogenic sources of windblown dust.

TABLE OF CONTENTS

II. INTRODUCTION

The City of Alamosa is located in Alamosa County in south central Colorado. Situated in the San Luis Valley, Alamosa serves as one of the largest cities and the agricultural center for south central Colorado. The area surrounding Alamosa consists of gently rolling to nearly level uplands where the dominant slopes are less than 3 percent. The climate is generally mild and semiarid. Annual precipitation is about 7.5 inches. Summers are considered short and cool, with winters long and cold. In winter and spring, windstorms are common, especially in drier years. It is due to these high velocity windstorms that Alamosa experiences most of the PM10 problems for the area.

Area Map



On March 31 and April 9, 1999 and again on April 18 and December 17, 2000 the PM10 monitor located on the roof of Alamosa's Adams State College recorded exceedances of the primary 24-hour NAAQS for PM10. The PM10 concentrations of 263 $\mu g/m^3$, 190 $\mu g/m^3$, 238 $\mu g/m^3$, and 217 $\mu g/m^3$ respectively, were recorded on these days - as were unusually high wind speeds and little or no precipitation. The circumstances surrounding the Alamosa exceedances has provided

adequate reason for the Division to believe the high wind events and blowing dust have caused exceedances of the NAAQS that otherwise would not have occurred.

As required by the NEP, each of the exceedances was flagged by the Division's Technical Services Program in the AIRS system. The flags appear after the recorded values in AIRS with the descriptor code "A" for high winds. According to EPA guidance the type and amount of documentation provided for each event should be sufficient to demonstrate that the natural event occurred, and that it impacted a particular monitoring site in such a way as to cause the PM10 concentrations measured. This documentation has been previously submitted to EPA.

Recognizing the need to protect public health in areas where PM10 exceeds the NAAQS due to natural events such as the unusually high winds, a Natural Events Action Plan has been developed for the Alamosa area based on the NEP guidance. This plan outlines specific procedures to be taken in response to future high wind events. In short, the purpose of the plan is to:

1. Educate the public about the problem;
2. Mitigate health impacts on exposed populations during future events; and
3. Identify and implement Best Available Control Measures (BACM) for anthropogenic sources of windblown dust.

A. Background

High winds are common to the southern region of Colorado. Under some conditions, these winds are strong enough to lift particulate matter into the air and cause elevated levels of PM10 above the Federal and State standards. Due to observed problems in Alamosa, particulate monitoring of total suspended particulate pollution was instituted at the Adams State College monitoring site in 1970. In 1989, monitoring for PM10 began.

More recently, an additional monitoring site has been established in the Alamosa area. Specifically, a second PM10 monitor was established at the Alamosa Municipal Building to ensure adequate coverage of local air quality monitoring and to ensure protection of public health. This monitor, like the first PM10 monitor at Adams State College, operates on an everyday sampling protocol.

Alamosa's monitoring history shows that the annual PM10 standard of 50 $\mu g/m^3$ (averaged over an annual period) has never been exceeded. The 24-hour PM10 standard of 150 $\mu g/m^3$ has been exceeded on a number of occasions. However, all exceedances have been due to natural events. The associated weather conditions on each of the exceedance days conform to a repeated pattern of regional high winds and blowing dust. In each case an intense, fast-moving, surface low-pressure system tracked through Colorado. Typically these systems had surface lows that were

not collocated with a closed upper low or nearly-closed upper level trough. This distinction is important because the collocated or vertically "coupled" systems usually bring significant up slope snow or rain to the region. The intensity of the lows associated with the PM10 exceedances is evident in the average central pressure of 990 mb (corrected to sea level). This value is typical of a deep, well-organized system. Such well-organized systems usually generate high winds in the vicinity of the low center.

The NEP applies only to emissions caused by natural events that have occurred since January 1, 1994. Only those high wind events experienced since that time are addressed by this NEAP. This submittal includes those exceedances occurring since the previous NEAP submittal as well. See table on page 6 for more details of all area exceedances.

B. The Natural Events Policy

1. Background

On May 30, 1996, EPA issued the Natural Events Policy in a memorandum from Mary D. Nichols, Assistant Administrator for Air and Radiation. In this memorandum EPA announced its new policy for protecting public health when the PM10 NAAQS are violated due to natural events. Under this policy three categories of natural events are identified as affecting the PM10 NAAQS: (1) volcanic and seismic activity; (2) wildland fires; and, (3) high wind events. Only high wind events will be addressed in this NEAP.

Based on EPA's natural events policy high winds are defined as uncontrollable natural events under the following conditions: (1) the dust originated from non-anthropogenic sources; or, (2) the dust originated from anthropogenic sources controlled with best available control measures (BACM). Furthermore, the conditions that create high wind events vary from area to area with soil type, precipitation, and the speed of wind gusts.

2. Content

In order for exceedances of the NAAQS to be considered as due to a natural event, a Natural Events Action Plan must be developed to address future events. The following is a summary of the specific EPA guidance regarding development of a NEAP.

1. Analysis and documentation of the event should show a clear causal relationship between the measured exceedance and the natural event. The type and amount of documentation provided should be sufficient to demonstrate that the natural event occurred, and that it

impacted a particular monitoring site in such a way as to cause the PM10 concentrations measured.

2. Establish education programs. Such programs may be designed to educate the public about the short-term and long-term harmful effects that high concentrations of PM10 could have on their health and inform them that: (a) certain types of natural events affect the air quality of the area periodically, (b) a natural event is imminent, and (c) specific actions are being taken to minimize the health impacts of events.

3. Minimize public exposure to high concentrations of PM10 through a public notification and health advisory program. Programs to minimize public exposure should (a) identify the people most at risk, (b) notify the at-risk population that a natural event is imminent or currently taking place, (c) suggest actions to be taken by the public to minimize their exposure to high concentrations of PM10, and (d) suggest precautions to take if exposure cannot be avoided.

4. Abate or minimize appropriate contributing controllable sources of PM10. Programs to minimize PM10 emissions for high winds may include: the application of BACM to any sources of soil that have been disturbed by anthropogenic activities. The BACM application criteria require analysis of the technological and economic feasibility of individual control measures on a case-by-case basis. The NEAP should include analyses of BACM for contributing sources. If BACM are not defined for the anthropogenic sources in question, step 5 listed below is required.

5. Identify, study, and implement practical mitigating measures as necessary. The NEAP may include commitments to conduct pilot tests of new emission reduction techniques. For example, it may be desirable to test the feasibility and effectiveness of new strategies for minimizing sources of windblown dust through pilot programs. The plan must include a timely schedule for conducting such studies and implementing measures that are technologically and economically feasible.

6. Periodically reevaluate: (a) the conditions causing violations of a PM10 NAAQS in the area, (b) the status of implementation of the NEAP, and (c) the adequacy of the actions being implemented. The State should reevaluate the NEAP for an area every 5 years at a minimum and make appropriate changes to the plan.

7. The NEAP should be developed by the State in conjunction with the stakeholders affected by the plan.

8. The NEAP should be made available for public review and comment and may, but is not required, to be adopted as a revision to the State Implementation Plan (SIP) if current SIP

rules are not revised.

9. The NEAP should be submitted to the EPA for review and comment.

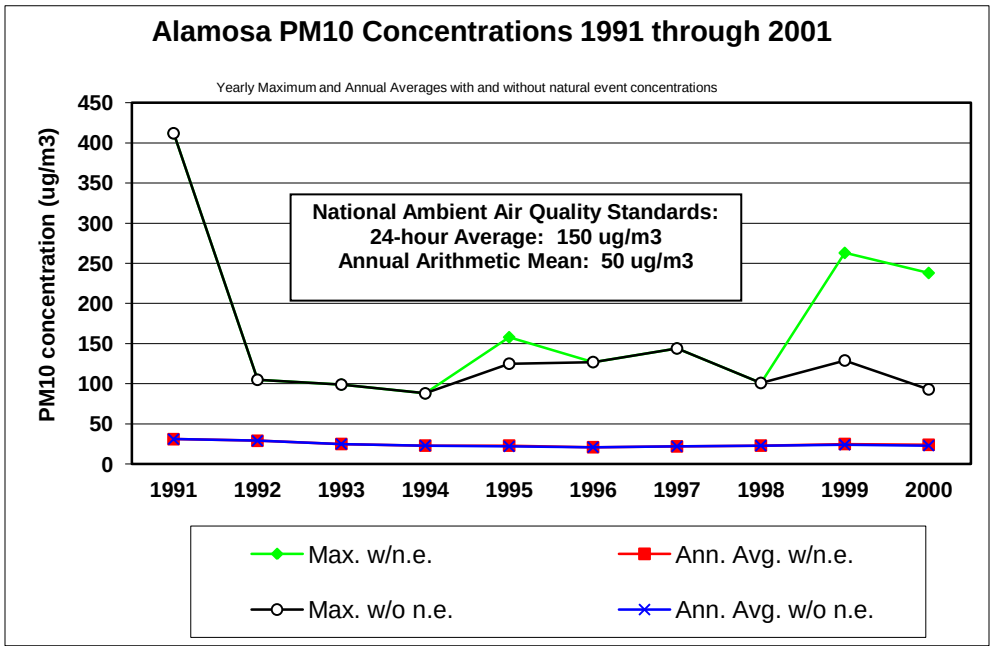
The following text describes the Alamosa NEAP and its conformance with the above-described EPA guidance on natural events.

III. NATURAL EVENTS ACTION PLAN

A. Element 1: Documentation & Analysis

On March 31 and April 9, 1999 and again on April 18 and December 17, 2000, the air quality monitor located in Alamosa, Colorado recorded exceedances of the 24-hour National Ambient Air Quality Standard (NAAQS) for PM10 (Figure 1). Each of these exceedances was associated with unusually high winds in the Alamosa area (Table 1).

Figure 1. Recent Alamosa PM10 Concentrations



n.e.- Natural Event

On October 29, 1999 and again on March 30, 2000 the Division submitted documentation to EPA Region VIII in support of Alamosa's most recent exceedances of the PM10 NAAQS due to

natural events. The documentation contained monitoring data, meteorological data, PM10 filter analysis and receptor model results, maps of the area, news accounts of the events and other miscellaneous supporting material. On July 3, 2001, EPA concurred that the aforementioned natural events were, in fact, high wind events (Table 1). The EPA letter of concurrence can be found in the Appendix of this NEAP.

More recently (since the February 2002 submittal), several additional exceedances of the PM10 NAAQS have been experienced in the community. These exceedances were recorded at the Adams State site only; none have been seen at the recently sited PM10 monitor at the Municipal Complex. Details are included in the table below and documentation for these events is on file with EPA.

Table 1. Recent 24 Hour PM-10 Values in Alamosa Colorado

EVENT Date	**PM-10 Concentration**	***Details***
3/31/99	263 ug/m^3	Natural Event- EPA concurrence on July 3, 2001
4/9/99	190 ug/m^3	Natural Event- EPA concurrence on July 3, 2001
4/18/00	238 ug/m^3	Natural Event- EPA concurrence on July 3, 2001
12/17/00	217 ug/m^3	Natural Event- EPA concurrence on July 3, 2001
2/8/02	215 ug/m^3	Natural Event Under EPA consideration
2/25/02	182 ug/m^3	Natural Event Under EPA consideration
3/23/02	164 ug/m^3	Natural Event Under EPA consideration
5/21/02	160 ug/m^3	*Natural Event Under EPA consideration*

Taken together, the supporting documentation establishes a clear, casual relationship between the measured exceedances and the natural events as required by the NEP. On the days of Alamosa's PM10 exceedances, unusually high winds and/or wind gusts were experienced over a prolonged period of time. For example, meteorological data in and around the area (Trinidad, Colorado) demonstrate that on April 18, 2000, maximum wind speeds were over 41 miles per hour and gust speeds were as high as nearly 59 miles per hour. Meterological data for the December 18, 2000 event indicate that gusts were as high as 49 miles per hour in the Alamosa area. Both events were coupled with dry periods of weather.

According to the Natural Events Policy, "the conditions that create high wind events vary from area to area with soil type, precipitation and the speed of wind gusts." Thus, states are to determine the conditions that define high winds in an area. Making a precise determination, however, is a complex task that requires detailed information on soil moisture, daily wind speeds, temperature, and a number of other variables that are not readily available at this time.

Until such research and/or guidance is available, the Division will use the definition of high winds included in the *Guideline on the Identification and Use of Air Quality Data Affected by Exceptional Events* for the Alamosa area. According to this guidance, high winds are defined as: "An hourly wind speed of greater than or equal to 30 mph or gusts equal to or greater than 40 mph, with no precipitation or only a trace of precipitation." In all these high wind events, hourly wind speeds and/or wind gust data coupled with low precipitation levels meet this high wind definition.

The analysis and documentation of the natural high wind events fulfill Element 1 as described on page 3 of this NEAP.

B. Element 2: Public Education Programs

The purpose of this program is to inform and educate the public about the problem. The Division has worked with the City of Alamosa, Alamosa County Commissioners, and interested stakeholders to educate the public about the problems associated with elevated levels of PM10 in the Alamosa area. Several meetings have taken place with the City and County governments to discuss these issues and to develop a plan to address future high wind events in Alamosa. Elements of the public education program include: informing the public when air quality in the area is unhealthy; explaining what the public can expect when high wind events occur; what steps will be taken to control dust emissions during future high wind events; and, how to minimize the public's exposure to high concentrations of PM10 during high wind conditions. The public notification and education programs will include but are not limited to:

- An informational and health-related brochure has been and will continue to be distributed by the local governments, the Alamosa County Health Nurses, and Alamosa County conservation and agricultural extension agencies to sensitive populations (elderly and local school districts) as well as the general public. Distribution of the *Blowing Dust Health Advisory Brochure* began in March 2000. A copy of this brochure is available in the Appendix. More recent (since the February 2002 submittal of the NEAP) activities include: 1) the revision of the area brochure to highlight additional activities in the community and make the document more reader friendly; 2) a review of the effectiveness of the brochure distribution in the community. The brochure is now available at additional sites in the community (e.g., County Land Use office), and; 3) the development of a Spanish version of the brochure.

- Beginning in February 2002, blowing dust watches and health advisories are being issued by the Alamosa County Public Health Nursing office during the high wind season (see Appendix for details). More recent (since the February 2002 submittal of the NEAP) activities include: 1) expanding the public education effort to include staff from the

County Land Use office; 2) meetings with city, county, and local public health nurse to devise improved ways to educate/reach the community regarding blowing dust and its impacts.

- Media press releases for both the print and local radio will be issued in the community as needed. More recent (since the February 2002 submittal of the NEAP) activities include: 1) newspaper articles highlighting the significant impacts of the drought on blowing dust in the Alamosa area (e.g., "Biblical Level Help Needed for Drought," *The Denver Post*, April 22, 2002. This referenced article also highlighted some of the mitigation strategies underway to limit impacts), and; 2) identifying possible Public Service Announcement outlets for additional outreach into the community and the ongoing development of an area press release on the NEAP development and control strategies.

- Meetings have been held to review the requirements of and local involvement in the NEAP. Other meetings will be convened as deemed necessary by State and/or local agencies.

- Advertising at local meetings (e.g. Sunshine Festival - Summer 2003) of ongoing efforts to reduce blowing dust and its impacts. This is new effort not part of the February 2002 submittal.

- Development of a logo/brand to better familiarize area residents to the NEAP and components of that plan including the blowing dust advisory. An example of that logo can be found on the revised *Blowing Dust Health Advisory Brochure,* located in the Appendix. This is new effort not part of the February 2002 submittal.

- Ongoing development of educational materials to be made available through the County's tax announcement (2004). These educational materials will be distributed in the mail alongside tax announcements and are expected to go to all area residents (approximately 13,000 notices). Materials are likely to be in both English and Spanish. This is new effort not part of the February 2002 submittal.

- The Division in conjunction with the area County Public Health Nurse is revising the blowing dust education/notification procedure to highlight public health issues associated with blowing dust.

- Finally, County building inspectors will also educate citizens (home owners and contractors) about blowing dust issues and strategies to minimize such. This will be done in all construction zones in the county and documented as an item on the inspector's checklist of building issues covered during the permitting process. This is new effort not part of the February 2002 submittal.

This section fulfills the requirement of Element 2 as described on page 4.

C. Element 3: Public Notification Program and Health Advisory Program

The Blowing Dust Health Advisory program will notify the public that a high wind/blowing dust event is imminent or currently taking place, and will include an advisory suggesting what actions can be taken to minimize PM10 emissions and exposure to high concentrations of particulate matter.

Advisories are issued by the Alamosa area Public Health Nursing office, with forecasting assistance provided by the National Weather Service (Pueblo) and the Colorado Air Pollution Control Division. Since 2002, five (5) advisories have been issued locally. The forecasting methodology, the public education brochure, and a copy of the text of blowing dust forecasts and health advisories are provided in the Appendix.

Alamosa County will be investigating, during 2003, the possibility of modifying the 911 data base for reverse notification of sensitive populations during high wind events. This is new activity not included in the February 2002 submittal.

Finally, high winds are currently being documented to determine if the Division and the local agencies can better address these issues. For example, the Alamosa County Public Health Nursing office maintains records of all blowing wind events and the associated notifications. Included in this analysis is a rudimentary review of the high wind data to identify patterns of events and possible solutions to minimize public exposure. Given the drought conditions affecting the Alamosa area over the past several years, no consistent pattern (outside of extremely dry conditions and lack of rainfall) has been noted. Nonetheless, the Division is committed to continually investigating this issue and improving the advisory as possible. Ongoing review of those records will continue to investigate patterns of the exceedances and the notifications. This is a new activity that was not part of the February 2002 submittal and demonstrates additional efforts by the Division and the local agencies to minimize blowing dust and protect public health.

This section fulfills the requirement of Element 3 as described on page 4.

D. Element 4: Determination and Implementation of BACM

1. BACM Determination

According to the NEP, Best Available Control Measures (BACM) must be implemented for anthropogenic sources contributing to NAAQS exceedances in attainment and unclassifiable areas, like Alamosa. BACM must be in place for those contributing sources within *three years* after the first NAAQS violation attributed to high wind event(s) for sources in the Alamosa area. BACM must be in place no later than April 18, 2003. BACM for PM10 are defined (in 59 F.R. 42010, August 16, 1994) as techniques that achieve the maximum degree of emissions reduction from a source as determined on a case-by-case basis considering technological and economic feasibility.

On September 2, 1999 the Division attended several meetings in Alamosa with officials representing the City of Alamosa and Alamosa County Commissioners. Discussed were the monitoring data, meteorological data, potential contributing sources to the high wind events, the development of a NEAP, and possible control measures. In addition, meetings in December 2001 and February 2002 and numerous correspondences at other times have covered the same. The meetings, coupled with the analyses of the supporting documentation, identified two distinct sets of circumstances that lead to Alamosa's high wind/blowing dust exceedances of the PM10 NAAQS:

10. High concentrations of PM10 caused by a mixture of anthropogenic and non-anthropogenic sources coming largely from outside the area under high wind conditions; and,

2. Prolonged climatic conditions of low precipitation over an extended period of time that act to dry area soils, making them more susceptible to airborne activity under high wind conditions.

Discussions with the community stakeholders also covered local agricultural practices. Alamosa County is a predominately agricultural area where a lack of water, coupled with the frequent high winds experienced during late fall and early spring, can destroy crops, encourage pests, and damage soil surfaces lending them susceptible to wind erosion.

Other potential contributing sources may include construction sites, wind erosion of open areas, paved and unpaved roads, residential wood burning, and/or open burning. See below for more details on each of these potentially contributing sources and their consideration for BACM.

2. BACM Options Considered

Based on the contributing source analysis and/or in review with community stakeholders, the following BACM options were considered as possible PM10 control measures for the community:

a) Street Sweeping Activities- community street sweeping programs have demonstrated effectiveness in other communities. Such activities were considered as a local control measure. Expanding the current street sweeping program was also reviewed.

b) Construction/Demolition Activity – local ordinances to control emissions from construction and demolition sites have been implemented in other parts of the state with good success.

c) Wind Erosion of Open Areas – several practices were reviewed regarding the wind erosion of open areas, including both local and regional efforts.

d) Control of Stationary Source Emissions- as identified elsewhere in this NEAP, a review of stationary sources and their relative contribution to overall PM concentrations was completed. It was determined that six PM-10 sources exist in the area, appearing to contribute a small amount of particulate matter to the overall inventory.

e) Road Stabilization- In a effort to better understand the effects of road stabilization, several options were reviewed including the use of chemical stabilizers and water as a stabilizing measure.

Also, periodic assessments to determine if traffic levels on unpaved roads surpass Colorado Regulation No. 1 limits were considered. If daily traffic counts exceed 200 trips per day on unpaved roads, state regulations apply that reduce PM-10 emissions from those roads. Specifically, periodic assessments of traffic levels on unpaved roads within the city limits and within one mile of the city limits were considered. State regulation calls for a road traffic count and dust control plan for roads that exceed the 200 trips threshold.

In addition, Alamosa currently suggests that drivers maintain their vehicles at a slow speed on unpaved roads and other dirt surfaces to reduce dust emissions.

f) Woodburning Curtailment Programs- the possibility of instituting a citywide curtailment program was reviewed and considered. This consideration includes discouraging wood burning on high wind days.

g) Open Burning- The usefulness of imposing and maintaining an open burning curtailment program during high wind events was reviewed. Current state air pollution control laws and regulations provide some guidance on the effort.

h) Avoidance of Dust Producing Equipment- The effectiveness of avoiding the use of dust producing equipment has also been considered. Currently Alamosa discourages the use of dust-producing equipment (e.g., leaf blowers) in an effort to reduce PM10 emissions and does so through public education and outreach efforts.

(i) Reducing or Postponing Tilling and Plowing or Other Agricultural Practices that Contribute to PM10 Emissions- It is well recognized that dust-producing activities such as tilling, plowing, and other agricultural practices increase the amount of PM10 released. As such, these control measures were discussed as part of the effort to reduce PM10 impacts on Alamosa. Review of existing and potentially future control practices were considered at the local, regional, state, and federal (e.g., Natural Resources Conservation Service) level.

j) Wind Break- Various trees are found throughout Alamosa. However, the placement of one row of barrier trees (e.g., Russian Olives) would block potential contributing sources. The Russian Olive is a quick growing large shrub/small tree will do well given the windy climate of Alamosa. According to section 3.5.2.1 of EPA guidance entitled Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, dated September 1992, one-row of trees is considered an effective windbreak.

k) Vegetative Cover/Sod- Efforts elsewhere in the State have demonstrated the usefulness of using a vegetative cover at sites where dust is known to blow. Efforts to use this control measure were reviewed for applicability and effectiveness.

Alamosa PM10 Stationary Source Emissions

To ensure that PM10 emissions from local stationary sources are not a significant contributing factor to area exceedances, an emission inventory was prepared and reviewed. Identified stationary sources are as follows: Public Service Company (natural gas/fuel oil plant), Rakhra Mushroom Farm Corporation (coal-fired boilers and one natural gas fired boiler), Rocky Mountain Soils (fugitive dust emissions), Rogers Family Mortuary (crematorium), San Luis Valley Regional Medical Center (biomedical waste incinerator), and Southwest Ready Mix (concrete batch plant). While no emission inventory of natural sources was prepared as part of this NEAP, appreciation for the significant sand dunes at Great Sand Dunes National Monument highlights that these few and limited stationary sources have very little effect on the total PM10 emission inventory for the Alamosa area. The following table demonstrates their limited impacts on the total emission estimation.

Alamosa PM10 Emission Inventory (circa 2003)

Source	Emissions in lbs/day
Public Service Company of Colorado	44.4
Southwest Ready Mix	4.4
San Luis Valley Regional Medical Center	0.1
Rakhra Mushroom Farm Corp.	11.1
Rocky Mountain Soils, Inc.	11.5
Rogers Family Mortuary	0.5
TOTAL EMISSIONS	***72.1***

Limited Stationary Source Impacts

The largest of these stationary sources, Public Service Company of Alamosa (PSC), is 44.4 pounds per day of particulate matter (as reported to the Colorado APCD). At PSC, the site consists of two turbines that can run on natural gas, #1 fuel oil, #2 fuel oil, or a combination thereof. PSC must stay in compliance with Colorado Air Quality Regulation No. 1 particulate standard. PSC must also meet the state 20% opacity standard.

Other Alamosa area stationary sources have considerably smaller particulate matter emissions than PSC and their own existing control measures in place. For example:

Southwest Ready-Mix has a concrete batch plant in the City of Alamosa. Southwest Ready-Mix has several outside storage piles for their raw materials (sand & aggregate). There exists a sprinkler system at the facility to keep these piles watered. Cement and fly ash are stored in silos, each controlled with a baghouse to capture particulate when the silos are being loaded. When all of the raw materials are loaded into the concrete trucks, 25% of the total water is loaded first, followed by rock, sand, cement, and then the remaining water. This helps to minimize the particulate emissions from the truck during loading. The baghouses are part of the Southwest Ready-Mix permit, and as such are required. This source is also subject to the 20% opacity standard. Finally, Southwest Ready-Mix may be upgrading their baghouses.

San Luis Valley Regional Medical Center has a permit for a biomedical waste incinerator, which is natural gas fired. The incinerator is subject to New Source Performance Standards which limit opacity to 10% and also has a particulate standard. Ash removal from the incinerator must be done in an enclosed area to limit particulate emissions. Ash must be completely enclosed during transport as well.

3. BACM Options Discounted

Several BACM options were discounted from further consideration based on meteorological analysis, on-site inspections, and discussions with local government officials and sources.

Woodburning curtailment was discounted because high wind events are actually beneficial to good atmospheric clearing of particulate matter. In addition, woodburning curtailment was not recognized as an effective control measure on high wind days. Lastly, many of the community citizens rely on woodburning as their sole source of home heating- reducing or eliminating wood burning is thus not an option.

BACM of stationary sources at great distances from the City were discounted as their impacts would be negligible, if seen at all.

Finally, for this revised NEAP (since the February 2002 submittal), the community remains committed to meet BACM in all instances, as feasible. For example, meetings with local officials indicate that the ongoing regional drought may significantly impact the amount of water available as a control measure (e.g., watering of roads to reduce PM10). With that, water restrictions (and related economic impacts of the drought) will likely dictate the utility of this control measure.

4. BACM Implemented

Refer to the stakeholder agreements for details of selected BACM.

IV. STAKEHOLDER AGREEMENTS

The City of Alamosa, Alamosa County, the Division, and participating federal agencies have been working diligently to identify contributing sources and to develop appropriate BACM as required by the Natural Events Policy. A copy of relevant agreements and supplemental information are included in the Appendix**.** This section fulfills the requirements of Element 4 as described on page 4.

City of Alamosa
The City of Alamosa has been active in addressing potential PM10 sources within the Alamosa area through various efforts. Some of these efforts, plus other potential future measures, include the adoption of local ordinances to reduce PM10. Copies of current ordinances and any related commitments are included in the Appendix.

Street Sweeping
Currently, the City of Alamosa sweeps on an every 6-week schedule or as needed, as determined by local officials on a case by case situation (e.g., following each snowstorm and/or where sand was applied). Sweeping occurs on every single City street with an emphasis on the downtown corridor where public exposure is expected to be greatest. In fact, street sweeping in the downtown corridor currently takes place three times per week.

In addition, the City recently agreed to lease/own a new TYMCO 600 (brush-assisted head) sweeper. Efforts are underway to get this effective piece of equipment into place immediately. This new sweeper will complement a mobile mechanical sweeper already in use.

Unpaved Roads within the City
While very few unpaved roads exist in the City of Alamosa, the city did recently annex new land. This annexation includes roadways not currently paved. The City of Alamosa is discussing the paving of these annexed roads. At a minimum, the City of Alamosa commits to continually provide in-kind engineering services for the development of the annexed lands.

Sod/Vegetative Cover Projects in the City of Alamosa
The development and construction of a local park, Eastside Park, is underway in Alamosa. It is anticipated that sodding at the park will take place this year. This commitment is anticipated to reduce blowing dust from this previously undeveloped site.

Alamosa County

Alamosa County has also been active in addressing blowing dust and is preparing county ordinance as such. Examples can be found below and available supporting documents in the Appendix.

Unpaved Roads
Alamosa County is presently addressing unpaved roads and lanes that are anticipated to contribute to PM10 emissions in the community. As of 2002, Alamosa County was nearing the end of its five-year road paving plan and was developing their next plan with the intention of paving on a yearly basis, based on traffic and community needs/priorities.

In 2002, Alamosa County addressed approximately ten (10) miles of unpaved roads. This includes the stabilization of approximately five section roads, the seal coating of two roads, and the overlay (repaving) of four (4) additional roads.

For 2003, approximately 14 miles of roads are scheduled for paving. This includes the Seven Mile Road (three miles long), Road 109 (one mile long), and 10th Street (also one mile long). These roads are in close proximity to the City of Alamosa, are upwind (prevailing) from the city,

and have heavy traffic. Paving is anticipated to greatly reduce blowing dust and impacts in the vicinity.

In addition, once it gets cold enough in the area, the County will wet down some of the more sandy roads. Once the water soaks in and freezes, it is anticipated that good dust suppression will be seen. These commitments are anticipated to reduce PM10 emissions in and near Alamosa. This control measure will be balanced with the availability of water in the area.

Finally, Alamosa County assesses the need to use $MgC1_2$ treatment on roads in front of residences that request such service. Assessments include the sensitivity to dust of residents, the materials of the road base for safety reasons, and possible environmental concerns of the neighborhood. Most requests for treatment are granted. Road construction areas are being dampened with water for dust control. Other areas for treatment, such as commercial construction zones or gravel pits, are investigated on a case by case basis.

Dust Control Plans

Alamosa County is considering changes in local ordinances governing dust control plans at construction sites. This will be addressed through the revision of Alamosa County's Comprehensive Plan and supporting zoning codes. Alamosa County is currently reviewing language from other successful dust control programs for inclusion in their local ordinances. The process is due for completion in December 2003 or early 2004 and will specifically include dust control language. This effort is anticipated to reduce PM10 emissions in Alamosa, especially as it relates to impacts on the community and high recorded PM10 values. The Division commits to providing copies of this language to EPA upon finalization and availability.

Wind Erosion of Open Areas

To reduce PM10 emissions from open areas outside of the City limits, low tilling and other soil conservation practices will continue to be utilized in the community. In addition, the community is using in strategic areas the State of Colorado Agricultural Office's program to purchase and plant shelter trees to reduce wind erosion in open areas. These trees have a demonstrated advantage for the community and for air quality. Once the trees reach maturity, it is anticipated that the equivalent of 112 miles of double-rowed trees will be in place.

In addition, there is ongoing planting of trees (approximately 50) on newly developed Alamosa County property south/southwest of Alamosa (prevailing winds from southwest) and the Airport south of Alamosa for added air quality improvement.

These commitments are anticipated to further reduce the PM-10 emissions in Alamosa.

Sod and Vegetative Projects in the County
Numerous projects to reduce blowing dust and its impacts have happened or are happening at the County Airport. For example:

- Through additional grounds maintenance of the 40-acre Alamosa County airport south of the city, grass is being grown for aesthetics and dust control.

- Sodding and the placement of decorative rock and ground cover will be implemented in the landscaping of the Alamosa County property, as well. These measures will directly abate blowing dust at the Airport.

- Also, the widening of the airport's safety areas (250 feet on either side of the runway) is now complete and seeding of natural grasses was incorporated in the project. Trees and grass were incorporated in the approaches to the airport and have provided additional wind-break advantages to South Alamosa.

In other areas where watering is a problem, xeriscape (the use of native drought resistant vegetation and/or rock cover) is being encouraged for County owned property and for all other property owners.

These efforts are anticipated to further reduce PM10 emissions in Alamosa.

Open Burning Issues at the County
The Colorado air pollution control laws and regulations prohibit open burning throughout the state unless a permit has been obtained from the appropriate air pollution control authority. In granting or denying any such permit, the authority will base its action on the potential contribution to air pollution in the area, climatic conditions on the day or days of such burning, and the authority's satisfaction that there is no practical alternate method for the disposal of the material to be burned. No open burning is allowed when local wind speeds exceed 5 miles per hour.

Colorado State University Co-Op Extension Office
In response to extremely dry conditions, the need to maintain area topsoil, and reduce impacts, the Colorado State University Co-Op Extension Office of Alamosa County provides the following outreach efforts and recommendations:

- Modification of grazing practices to improve protective crop cover
- Increasing crop residues left in the fields to reduce blowing dust
- Planting of Fall crops to maintain fields
- Application of manure to protect top soils from blowing away
- Staggering of the harvest to minimize blowing dust

- Outreach programs on soil conservation efforts
- Development of outreach/education materials (e.g., news articles, newsletters, fact sheets, etc.), and
- Attendance at Statewide workshop to educate other Co-Op offices to various practices to reduce blowing top soil and minimize impacts

These control strategies are not meant to be enforceable. They are meant only to demonstrate the regional nature of cooperation in addressing blowing dust and its impacts on the community.

Natural Resources Conservation Service
As stated elsewhere in this NEAP, Alamosa County is a predominately agricultural area where limited water, coupled with the frequent high winds experienced during late fall and early spring, can destroy crops, encourage pests, and damage soil surfaces lending them susceptible to wind erosion. Thus, activities that improve the topsoil and prevent its lifting during high wind events are encouraged. Some notable NRCS and agricultural examples include:

- Cover crops and perennial crops (e.g., alfalfa) are recommended to protect soils;
- NRCS works with area farmers in the development of conservation compliance plans to also protect topsoil;
- NRCS encourages the use of perennial crops or the leaving in place of weeds on the corners of area acreage (instead of tilling that might lead to open, barren lands) to reduce the lifting of topsoil;
- NRCS "cost shares" on conservation practices with local farmers to prevent soil erosion, and;
- The NRCS works with Colorado State University to identify other strategies that minimize blowing dust.

Other successful agricultural practices encouraged in the area include: timing of tillage, crop rotation, amount of crop residue left on the land, and proper water usage.

These control strategies are not meant to be enforceable. They are meant only to demonstrate the regional nature of cooperation in addressing blowing dust and its impacts on the community.

Natural Events Policy guidance indicates that control options must be implemented within three years of the exceedance in question. For Alamosa, BACM must be in place no later than April 18, 2003. This submittal is meant to meet that three year commitment.

This section fulfills the requirement of Element 4.

V. PUBLIC REVIEW AND PERIODIC EVALUATION

This section describes the public process used to develop this NEAP and the commitment made to periodically evaluate the plan.

Stakeholder Involvement
The EPA's NEAP development guidance states that the NEAP should be developed by the State in conjunction with the stakeholders affected by the Plan. The Colorado APCD worked with stakeholders mentioned throughout this document. Numerous meetings and telephone conversations occurred with stakeholders, and the final agreement here reflects control measures offered as part of the NEAP.

Public Review
The Division made this documentation available for and presented the NEAP and its strategies to the public to ensure public review and comment. Examples of these efforts in Alamosa, beginning with the earliest community involvement, include:

- Briefing of the San Luis Valley County Commissioners, "Air Quality Briefing," San Luis Valley County Commissioners' Association Meeting, September 1999.
- "Control Alamosa's Dust? Lots of Luck." Newspaper article appearing in *Pueblo Chieftan* indicating the area is developing a plan (NEAP) to address blowing dust – November 1, 2001.
- Briefing of the Alamosa City Council, "Alamosa Air Quality and the Development of a Local Natural Events Action Plan," a meeting to reintroduce the NEAP to City Council staff, February 6, 2002.
- Placement of *Natural Events Action Plan for Alamosa, Colorado* at the area library (Southern Peaks Public Library) for public review, February 2002.
- "Odd Issues Keep Alamosa Busy." Newspaper article appearing in *Valley Courier* indicating NEAP being developed and available for public review at the Southern Peaks Public Library, February 2002.
- Briefing of the Alamosa City Council, "Alamosa Natural Events Action Plan," a meeting to incorporate comments from the City Council, local stakeholders, and the public, February 20, 2002.
- Briefing of the Colorado Air Quality Control Commission, "Natural Events Action Plan for Alamosa, Colorado," May 2002.
- Briefing of the Colorado Air Quality Control Commission, "Alamosa Natural Events Action Plan – Final Activities," January 2003.
- Public Notice, "Natural Events Action Plan for Alamosa, Colorado" Available for Public Review and Comment at the Public Library, April 2003.
- "Media Advisory" notifying public of upcoming Alamosa City Council meeting to

discuss the NEAP, monthly city council meeting agenda published in the area newspaper, May 2003.

- "Media Advisory" notifying public of City Council meeting to discuss the NEAP, Channel Ten Cable Access Channel Public Service Announcement, May 2003.
- Briefing of the Alamosa City Council, "Final Alamosa Natural Events Action Plan," May 2003.

Periodic Evaluation

EPA's Natural Events Policy guidance requires the state to periodically reevaluate: 1) the conditions causing violations of the PM10 NAAQS in the area, 2) the status of implementation of the NEAP, and 3) the adequacy of the actions being implemented. The State will reevaluate the NEAP for Alamosa at a minimum of every 5 years and make appropriate changes to the plan accordingly.

Evaluation of the effectiveness of the NEAP included several key strategies to ensure protection of public health and a robust plan. Strategies included: review of Natural Events Policy in specific relation to the Alamosa community, review of the effectiveness/appropriateness of ongoing control strategies, consideration of new/additional control options, review of meteorological and climatological conditions leading to blowing dust, review of local and regional PM10 monitoring data, discussions with other States (e.g., South Dakota, Washington) and Federal (US EPA) personnel regarding NEAP updates and protocols, review of the established emission inventory and identification of any new emission sources, review of the blowing dust advisory protocol and notification records, public/stakeholder meetings and community outreach/education efforts, etc.

The Division commits to continually review the effectiveness of the Alamosa Natural Events Action Plan and improve the effort, where feasible.

The Division commits to evaluate the NEAP at a minimum of every five years.

Submittal to EPA

The NEAP was submitted in its initial form to EPA in October 2001. Following EPA comment and input from stakeholders, appropriate changes were made to the NEAP. The Alamosa City Council heard and approved the NEAP in February 2002. Since that period, meetings with local agencies and stakeholders have led to finalization of stakeholder agreements (found elsewhere in the NEAP). The *Final Natural Events Action Plan for Alamosa, Colorado* and its Best Available Control Measures, where feasible, are presented here as required under the Natural Events Policy.

This section fulfills the requirements of Elements 6, 7, 8, and 9 as described on page 4 and 5.

Appendix D – Copy of Affidavit of Public Notice