A Resident's Observation of Visibility: Southwest La Plata County and the Greater Four Corners Region.

Fall and early winter, 2006.

Erich Fowler

10/14/2006—2:53pm. Image from near Kline, La Plata County, Colorado. Barker Dome is on the center horizon. Its summit lies 16 miles due southwest of Kline, and Farmington, NM is left of center, 30 miles due south. The two power plants lie approximately fifteen miles behind the left (east) flank of Barker Dome. The foreground of this photo is in Colorado, and the CO/NM state line traverses from left to right, just below the ridgeline. This is a moderately good visibility day for our area, indicating some haze from atmospheric moisture, but revealing no brownish hues.

10/21/2006—3:48pm. (Kline.) Excellent visibility. This is a good photograph to use as a control against which other photographs may be compared. Note especially that this photograph was taken in the late afternoon, and reveals excellent visibility despite the setting sun. The level of visibility in this photograph, while exceptional for Kline's southern view, is quite common when one looks to the north from the same location. Visibility in southwestern La Plata County is reliably worse when one looks south. Zoom in to view the details and color gradients on Barker Dome, which are better than the previous photo.

10/23/2006—3:55pm. (Kline.) High clouds are forming over the lower atmosphere. Visibility is diminished, revealing a pinkish/gray hue that is not present in the 10/14/2006 photograph. Looking at detail on Barker Dome, note how ground visibility is diminished as well. Lower level air quality seems to be associated with this type of cloud and haze formation. This type of haze occurs regularly over the San Juan Basin, throughout the entire year. It *rarely*, *if never*, occurs north or west of Kline. Note also the effect of contrails on visibility, the formation of which may be related to lower level conditions.

11/15/2006—11:53am. (Kline.) The atmosphere becomes more stable in colder months, and winter haze begins to set in. The horizon is turning pink. Contrails form and last more easily, as does the brown cloud over San Juan County, NM, to the south.

11/16/2006 (A)—4:32pm. (Kline.) It is especially revealing to zoom in on this photo. You will see a clearly defined cloud hovering over San Juan County, although it is slightly obscured by poor air quality in the foreground. The quality of light in the foreground is pink and dull, although today there are no clouds; it is likely that there is haze directly overhead as well. Brown clouds like this one have become almost a daily occurrence from November through February, and have been noticeably worsening each year since 2001. Be sure to compare the details on the far ridge to the "clear visibility" photo earlier in this section (10/21/2006.) Visibility in southwest La Plata County is deteriorating.

11/16/2006 (B)—6:26pm. (Kline.) Later that evening. This photograph is important. Zoom in on the "fluffy cloud" down on the horizon. This cloud is rising from the two power plants, and then gathers itself and moves east. I can affirm this. I took this photo just as I was leaving to go to Farmington. The whole way down CO hwy 140 (NM hwy 170 a.k.a. the La Plata Hwy,) I kept my eye on this "cloud." A few miles south of La Plata, NM, at a point 10 miles north of Farmington, I observed that these clouds were still rising from precisely the same location as the power plants.

11/17/2006 (A)—6:02pm. (Kline.) Since 2001, winter evenings in southwestern La Plata County look like this almost every day, and it seems that each year gets worse. This haze is predictably worse to the south, although often it stretches east and northeast into central La Plata County. The air in the north and west is always better, although I have observed the "brown cloud" drift northwest, and in front (east of) the Sleeping Ute Mountains, and then over to Cortez. Zoom into this photograph, and you will see the same cloud originating from a point on the horizon that corresponds to the location of the two power plants. This is a common winter occurrence.

11/17/2006 (B)—6:03pm. Extending our view to the left (southeast) just after the previous shot. On evenings like this, you can smell, and often taste, the air. While sometimes you get a whiff of ozone, most often it smells like an auto garage. Imagine chewing on an oiled rag. It is a greasy smell that hits you way back in the nose and throat. I first noticed this smell in December of 2003, and I have noticed it every winter ever since. It is very comparable to the smell you find in Denver on an early winter morning during an inversion.

11/19/2006 (Following photographs.) On my way to go camping and hiking in Utah, I took the opportunity to do some photo journalism. My route on the first day was: 1.) CO hwy 140 / NM hwy 170 south to Farmington; 2.) US 64 through Shiprock, Beclabito, and Teec Nos Pos; 3.) US 160 through Kayenta; 4.) The side highway up to Page, AZ. I have cropped sections of the panoramic photos I took that day, so that they can be displayed in Word format. Again, be sure to zoom in on these to see detail.

(A)

This photo was taken about 10 miles west of Shiprock, NM, at approximately 2:30 pm. Be sure to zoom in on this so that you can see the visibility "details." Almost completely obscured on the left side are the Blue Mountains (Abajos) in San Juan County, Utah. On the right are the Sleeping Ute Mountains in Montezuma County, Colorado. Visibility, while not horrendous, is clearly impaired.

Zooming in and panning right (now looking northeast) are the La Plata Mountains in Colorado. On top of, and behind, the middle plateau is Mesa Verde. Be sure to compare this photograph to that of excellent visibility on 10/21/2006. Here, visibility is clearly impaired by haze.

Zooming back out and panning further to the right, the haze becomes a readily identifiable brown smear. The power plant in Fruitland, NM, is visible on the right.

(B)

This photo was taken about 10 miles west of Teec Nos Pos, AZ, at approximately 3:30pm. In the center right are the Sleeping Ute Mountains, and to the left (west of those mountains) a brown cloud extends into southeast Utah.

(C)

This photo was taken west of Red Mesa, AZ, at approximately 4:00pm. The perspective is looking northeast back to Shiprock and Farmington, with the Carrizo Mountains (sometimes called the Chuska Mountains) on the right. A brown haze to the east is discernable.

The same view, zooming out and adjusting for contrast and light, better defines the scope and definition of the Four Corners' brown cloud.

This image was taken at the same time and location as the previous two photos, but our perspective is now looking southwest into central Arizona. This photo reveals a rather nice evening to the southwest, despite the effect of light scattering, which is enhanced by the setting sun. This photograph serves as a control against which the previous photos may be compared.

Recall that the previous photo from November 17th documented our perspective from the northeastern area of the Four Corners Region in La Plata County, and which revealed obvious visibility impairment to the south and southwest. Now our view, two days later, is from the southwestern side of the cloud, documenting good visibility to the southwest, and obvious impairment to the northeast. It is therefore reasonable to infer that visibility impairment shares a causal relationship with activities in the Four Corners Region.

(D)

11/20/2006—10:00am. US 89 from the Public Lands Center, Page, AZ. This photo documents a cloud from the Navajo Generating Station, as it drifts along a *northwesterly air flow*, and into southwestern Utah. Glen Canyon Dam is on the left of the photo. This photograph is useful because it documents the existence of northwesterly air flows in the Four Corners, and reinforces the observation that emissions can also be transported from the San Juan Basin into southeastern Utah, where there is currently little monitoring.

12/01/2006—5:59pm. (Kline.) A random photograph of a Four Corners wintertime sunset, with that persistent smudge on the southern horizon.

Same photograph as above, zooming in. That cloud is very persistent during the winter months.

12/05/2006—4:54pm. In early December of 2006, the air was getting progressively worse and worse each day. As described above, you could smell and sometimes even taste it. December 5th was a particularly bad day. I drove one mile east up to the mesa to get a better view. On this day, the Defiance Plateau is almost completely obscured. (Barker Dome is on the right.) Let's compare it to a good day:

Description of 12/05/2006 photograph: From the far right side, follow the ridgeline of Barker dome to the left (east.) The point at which it meets the next "middle mesa," which appears to be behind the ridge, marks the precise location of the two power plants. (They are only a few miles apart from each other, thirty-some miles due southwest of this photo.) Looking above this "middle mesa" from where these two ridgelines meet, you can see the top of the Defiance Plateau, just barely poking above the haze. It is very important to note that, even on the *bad* days from the top of our mesa, you can see the Defiance Plateau. This evening it is almost completely obscured. This was the first time in my life I have ever seen it so bad. From the location of the power plants, follow the ridgeline of this second mesa to the left (east.) The point where it terminates below the third and final horizon (now looking in the center left of the photograph) marks the exact location of Farmington, NM.

The air was still and cold, so I knew that we were in for a great inversion. I set my alarm, and at dawn the next morning, I drove up to Hesperus to get the view.

12/06/2006 (A)—9:03am. This is a crop of a panoramic photo, taken from U.S. hwy 160 on the western flank of Hesperus Hill. (Adjacent to the town of Hesperus, Colorado.) The air has so neatly stratified that you can clearly see the entire ridgeline of the Defiance Plateau, while locations below it are obscured. Barker Dome lies in the center of the photo, with plumes from the two power plants coming up behind and to the right of it.

This photo is a continuation of the previous photo, panning to the east, and now looking due south. Farmington, NM lies underneath the cloud, dead-center. On a clear day, from Hesperus Hill you can see the details in the cliffs that rise from the San Juan River in Farmington. Today they are completely obscured. From this photograph, it is reasonable to conclude that this inversion has reduced visibility to *less than fifty miles*.

Next, I drove one mile east, to the eastern flank of Hesperus Hill.

12/06/2006 (B)—9:15am. This morning's inversion clearly extends north and east from the San Juan Basin, and into the basins of central and eastern La Plata County. In the center right is Ridges Basin, home to the Animas-La Plata Project. Center is Carbon Junction. On the left horizon is the beginning of the HD mountains.

Zooming in slightly, this photo is a continuation of the previous photo, now looking due east. Center and right, the HD mountains poke above the inversion. Below this ridgeline, the radio towers of Smelter Mountain are visible, and at its base lies Durango. On the far left horizon is the Continental Divide, and the South San Juan Mountains.

Visibility in the Four Corners region is often quite poor, and it is deteriorating. There have always been wintertime impairment episodes, as well as summertime haze, but in the past, they were limited to a few days of each month. Currently, visibility impairment episodes during the winter can last for weeks at a time, or until a cold front pushes it all out. I am an avid mountain climber, as well as a photographer, and I have been watching the skies over the Four Corners for over seventeen years. As a resident of southwestern La Plata County, I attest that a worsening trend began in approximately 2001, and continues to this day.