

THE FIRST "SMUDGE POT" SUCCESS IN WESTERN COLORADO

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Abstract

The economic impact of late spring cold air outbreaks on the people of the Grand Valley of western Colorado can be catastrophic. One such event occurred in late April of 1904. Alerted by a frost warning received from the U.S. Weather Bureau forecast office in Denver, the business and political leaders of the area and the local Weather Bureau observer conceived and implemented a plan. This paper describes the first successful, albeit odorous, smudging operation in that area.

1. Introduction

Ever since its founding in 1870, the National Weather Service has been intimately involved in the life of those local communities in which its offices are located. An example of this involvement occurred in April 1904, in Grand Junction, Colorado. This episode, as recorded in the Daily Log (see Fig. 1) by Richard H. Sullivan, Observer in Charge of the Grand Junction Weather Bureau Office, is described in this historical review.

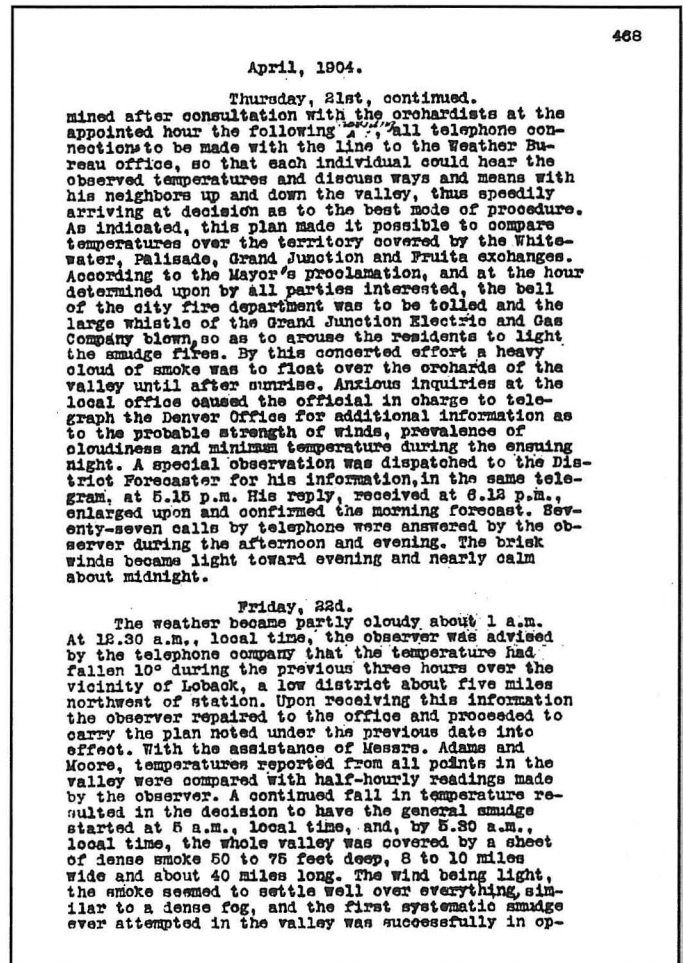
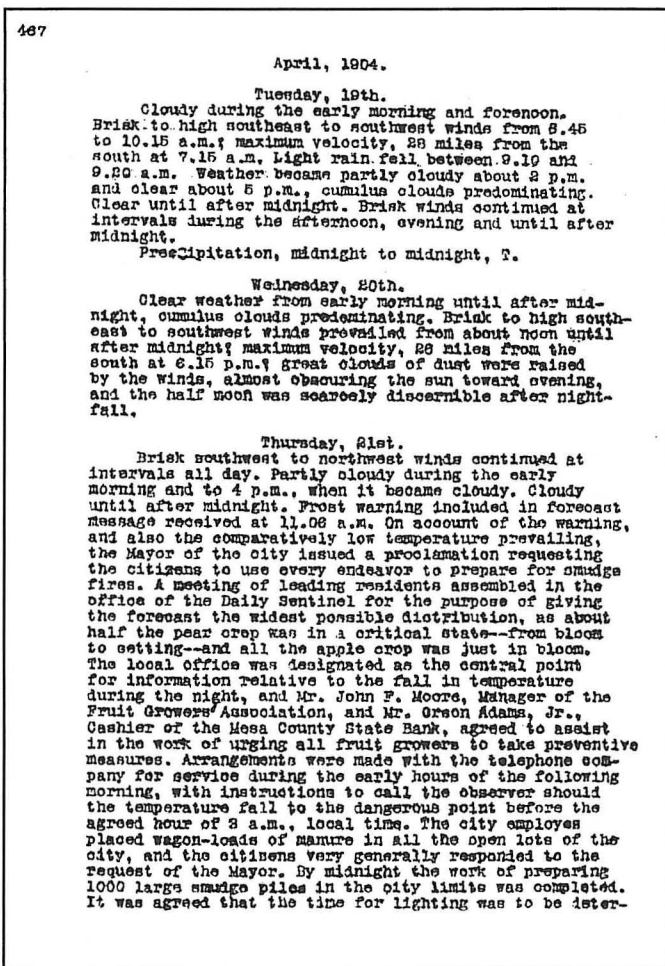


Fig. 1. Copies of pages 467 and 468 from the Daily Log of the Grand Junction, Colorado, Weather Bureau Office.

Grand Junction (Fig. 2) is located at the confluence of the Colorado and Gunnison Rivers in west central Colorado. In the late winter and early spring, this location is generally bathed by brisk drainage winds from the western slope of the Rocky Mountains. The mixing of the lower layers of the atmosphere caused by these winds usually keeps temperatures mild enough to allow extensive fruit orchards to thrive in this area. Peaches, pears, apricots, cherries, and apples are all grown there and have been a big part of the local economy since the town's founding in the early 1880s.

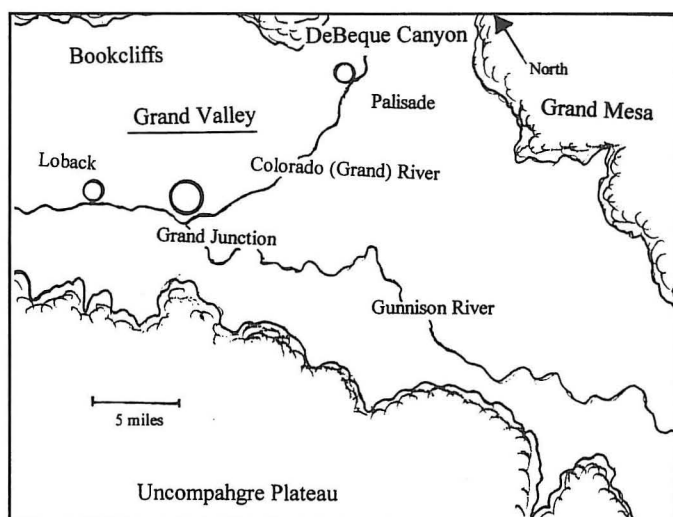


Fig. 2. Grand Valley - Western Colorado

However, weather conditions periodically develop that stop this wind. When this occurs, the resulting cold can kill just about all developing buds. One hundred years ago, the impact of such an event on the local populace would have been enormous. Thus, on the morning of Thursday, 21 April 1904, when the 'Weather Bureau' forecast included a frost warning for the upcoming night, there was a real cause for concern.

2. Morning of 21 April 1904

Each morning, Mr. Sullivan, like all weather observers around the country, would take and record an observation for his site. The official location for this was on the roof of the Mesa County State Bank building at 4 th and Main in which the weather office was located. He would encode this observation and have his messenger take it to the local telegraph station. Assuming that all telegraph lines were up and open, the observation would be wired to the Denver District Forecast Office and to the Central Weather Bureau office in Washington D.C. Meteorologists in Denver would receive Mr. Sullivan's report and, combining it with other observations and the most up-to-date forecast tools of the day, would write a forecast. This would be returned to the local offices via the same telegraphic method.

Mr. Sullivan would have received the forecast usually about 8 a.m. and, along with his messenger, would have spent much of the morning distributing it. This involved hand copying the forecast onto appropriate forms and

posting these on designated notice boards around the city, taking them to the local newspaper offices for publication, displaying an appropriate flag on the office roof, and running the forecasts to the departing railroad train so the conductor could hand these out at the various depots at which they stopped. He would also answer requests on the newest gadget available in the office, the telephone.

On April 21st, the following entry was included in the weather log:

"Brisk southwest to northwest winds continued at intervals all day. Partly cloudy during the early morning and to 4 p.m., when it became cloudy. Cloudy until midnight. Frost warning included in the forecast message received at 11:06 a.m."

As seen on the Weather Bureau surface analysis valid at 8 a.m. on 21 April 1904 (Fig. 3), a 29.45 inch low pressure center was sited over south-central Colorado. This low had tracked southeastward over the previous two days bringing colder, drier air over western Colorado. At 8 a.m. on 22 April (Fig. 4), the Weather Bureau analysis, which included the track of this storm over the past few days, showed the low had made a drastic turn to the northeast. With high pressure building in behind it over western Colorado, the skies were clearing and the pressure gradient across the area was greatly weakening. However, it was a pressure gradient that would have continued to support a southwest wind. Such winds would oppose the normal nighttime drainage. Usually, these drainage winds flow from the interior uplands of the state, along the Colorado River basin, arriving in the Grand Valley through the Debeque Canyon about 10 miles upstream from Grand Junction. As noted earlier, the resulting 15 to 20 mph easterly breeze inhibits most orchard killing temperatures. However, when an opposing synoptic scale gradient is in place, this breeze may be shut off. Light winds and, for fruit trees at a vulnerable stage of development, killing temperatures are the result. These conditions are what the Denver forecasters must have noticed early on the morning of 21 April. The 8 a.m. forecast for western Colorado was:

**"RAIN OR SNOW AND COLDER TONIGHT.
FROST. FRIDAY FAIR."**

Upon receipt of this forecast (and because the temperatures were already chilly), the elected officials and the city fathers of Grand Junction went into action.

"The Mayor of the city issued a proclamation requesting the citizens to use every endeavor to prepare for smudge fires. A meeting of leading residents assembled in the office of the DAILY SENTINEL, the local newspaper, for the purpose of giving the forecast the widest possible distribution, as about half the pear crop was in a critical state-from bloom to setting-and all the apple crop was just in bloom. The local (weather) office was designated as the control point for information relative to the fall in tem-

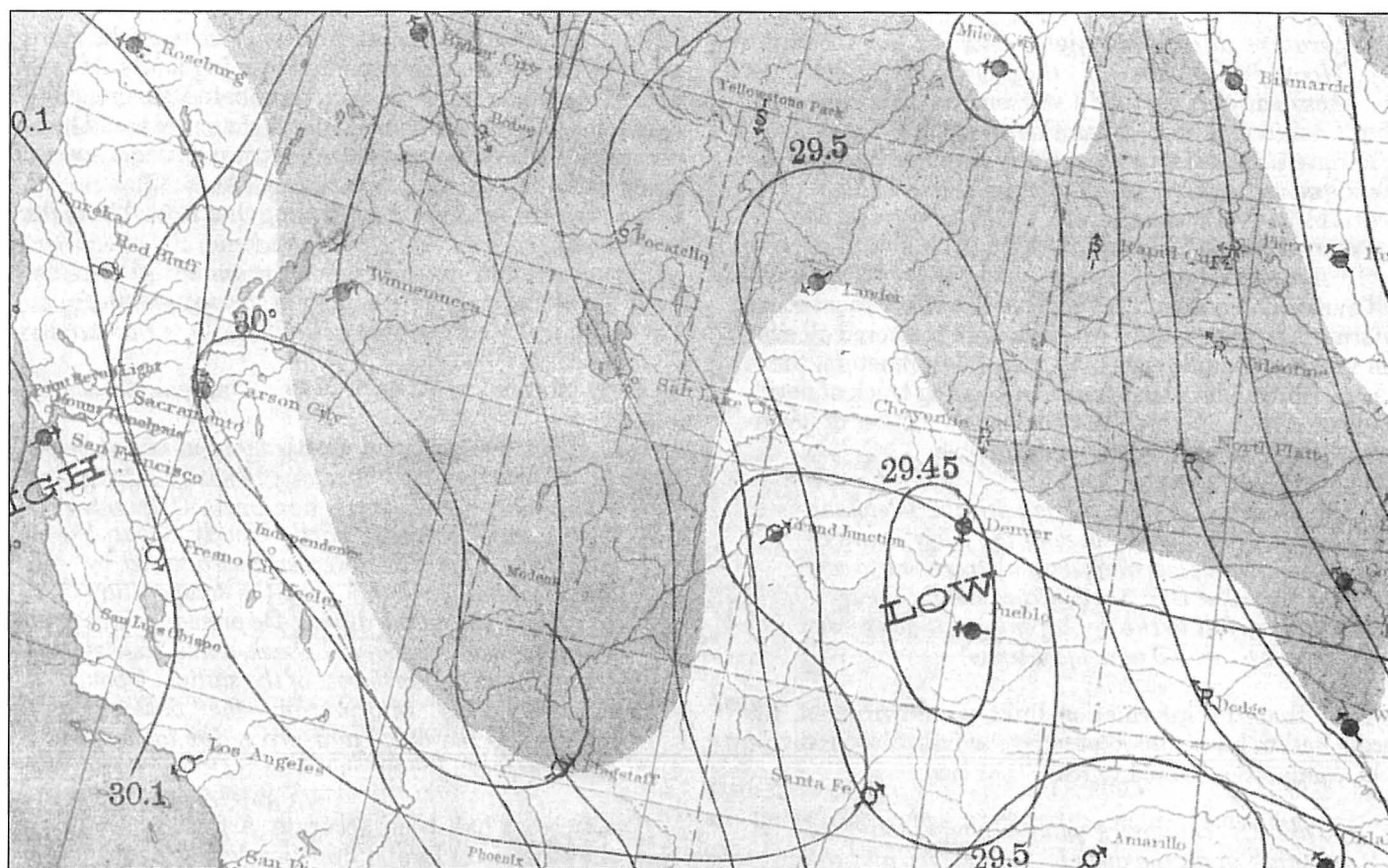


Fig. 3. Surface analysis at 8 a.m. of 21 April 1904.

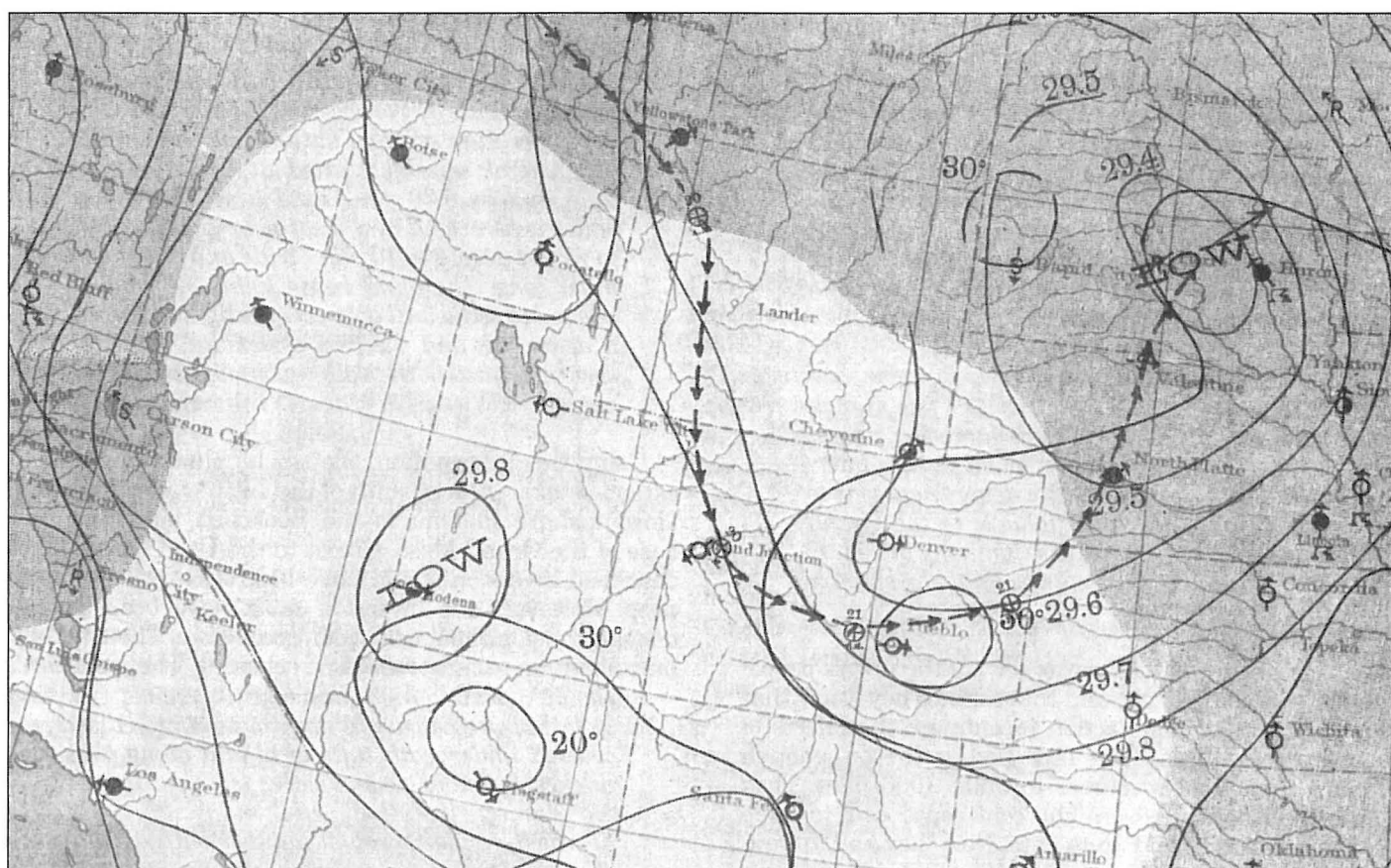


Fig. 4. As in Fig. 3, except for 8 a.m. 22 April 1904.

perature during the night, and Mr John F. Moore, Manager of the Fruit Growers Association, and Mr. Orson Adams, Jr., Cashier of the Mesa County State Bank, agreed to assist in the work of urging all fruit growers to take preventative measures."

3. Afternoon and Evening of 21 April 1904

On the afternoon of 21 April 1904, up-to-date weather information was critical. Orchards were scattered all over the valley and, although most had thermometers, there was no central data base to use in keeping track of developing conditions. So, necessity being the mother of invention, the people used what was available.

"Arrangements were made with the telephone company for service during the early hours of the following morning, with instructions to call the (Weather Bureau) observer should the temperature fall to the dangerous point before the agreed hour of 3 a.m. local time."

Now that the information links were arranged, the locals had to have a plan of action to fight the predicted cold. Again, they looked to what they had.

"The city employees placed wagon-loads of manure in all the open lots of the city, and the citizens very generally responded to the request of the Mayor. By midnight the work of preparing 1000 large smudge piles in the city limits was completed. It was agreed that the time for lighting was to be determined after consulting with the orchardists at the appointed hour the following morning, all telephone connections to be made with the line to the Weather Bureau office, so that each individual could hear the observed temperatures and discuss ways and means with his neighbors up and down the valley, thus speedily arriving at decision as to the best mode of procedure."

And to implement the plan:

"According to the Mayor's proclamation, and at the hour determined upon by all parties interested, the bell of the city fire department was to be tolled and the large whistle of the Grand Junction Electric and Gas Company blown, so as to arouse the residents to light the smudge fires."

At this point everything was set. All the town's people knew it was going to get cold that night. They knew that they had to take some action to mitigate the effects of these temperatures. The city had gathered enough manure from local resources to build 1000 piles. They also established an overnight conference call to keep everyone informed and up-to-date. Now they had to wait.

By late afternoon on the 21st, the local citizens were very concerned about upcoming conditions and began

calling the office for updates. Seventy seven calls were received during the afternoon and evening hours. At 5:15 p.m. Mr. Sullivan sent another telegram to Denver asking for additional information on winds, cloudiness, and temperatures. In the same message, he transmitted a special observation of existing conditions. At 6:12 p.m. the Denver forecaster replied confirming that frost that night was still likely.

"The brisk winds became light toward evening and nearly calm about midnight."

4. Early Morning of 22 April 1904

On Friday, 22 April, the weather observer made the following entry:

"The weather became partly cloudy about 1 a.m., local time. The observer was advised by the telephone company that the temperature had fallen 10 degrees during the previous three hours over the vicinity of Loback, a low district about five miles northwest of the station. Upon receiving this information the observer repaired to the office and proceeded to carry (out) the plan..."

The forecast had been accurate. A frost was coming. Now the citizens of Grand Junction would determine if their plan would work.

"With the assistance of Messrs. Adams and Moore, temperatures reported from all points in the Valley were compared with half hourly readings made by the observer. A continued fall in temperature resulted in the decision to have the general smudge started at 5 a.m., local time, and by 5.30 a.m., local time, the whole valley was covered by a sheet of dense smoke 50 to 75 feet deep, 8 to 10 miles wide and about 40 miles long. The wind being light, the smoke seemed to settle well over everything, similar to a dense fog, and the first systematic smudge ever attempted in the Valley was successfully in operation."

Using this information, the smoke plume must have extended across the breadth of the entire valley from the Uncompahgre Plateau to the Bookcliffs and from the base of the Grand Mesa almost to the Utah border. The described inversion would have been less than 100 feet deep. However, this inversion must have been strong enough to keep the smoke plume cohesive. The smell of burning manure must have been choking. The result?

"A light frost, by careful examination, was discovered underneath tufts of alfalfa along the ditches, but none on the walks or in the open. No damage resulted, due, many growers affirmed, to the thorough manner with which the smudging was pursued. The smoke had almost entirely disappeared by 10 a.m."

5. Conclusion

Several other references were made by the Grand Junction weather observer to the use of this smoking process over the next couple of years. Whether they were as successful was not clearly recorded. However, as described in this paper, the first attempt worked. It may have smelled. It may have been a bit of a hassle to get up that early in the morning. But, smoke from the burning manure piles, at least for one night, protected the orchards in the Grand Valley.

Acknowledgments

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Author

Robert Jacobson was the Meteorologist in Charge of the National Weather Service Forecast Office in Grand Junction, Colorado, from November 1993 to May 2000. He then moved to the Headquarters of the National Weather Service in Silver Spring, Maryland as Marine Program Manager. He retired from the National Weather Service in May 2002 after 31 years of Federal Service. He now resides in Bellingham, Washington. Bob was the chairman of the NWA Marine Committee from 1990-1992.

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For more information, contact John Crosby, Vice President at EnviroTech Sensors, Inc., P.O. Box 794, Clarksville, MD 21029; Tel: 410-531-8596; Fax: 410-531-7010 or e-mail: jcrosby@envirotechsensors.com. Or visit our Web site at www.envirotechsensors.com.

AccuWeather, Inc.

Acquires Media Business of WeatherData, Inc.

State College, PA, (November 19, 2002) — AccuWeather, Inc. announces that it has acquired the entire media division of competitor WeatherData, Inc. The sale expands the AccuWeather customer base in both the newspaper and radio markets.

Already the largest supplier of electronic, pagination-ready weather presentations for U.S. newspapers, the acquisition brings the total AccuWeather client base to 851 newspapers. Among the former WeatherData clients that have begun receiving AccuWeather weather presentations are major urban papers such as *The Dallas Morning News*. AccuWeather has also already commenced service to the radio stations formerly served by WeatherData.

"AccuWeather has recently made a million-dollar investment in system development and the automation of internal processes," said Dr. Joel N. Myers, president and founder of AccuWeather. "This gives us ample capacity to assure the very highest level of quality, accuracy and consistency in serving the weather needs of the customers who are joining us, as well as our continuing customers."

"Given our new strategic markets focus, which prompted our decision to sell our media business unit, we are pleased to introduce AccuWeather as the new weather provider for our media clients," said Mike Smith, WeatherData's founder and Chief Executive Officer. "AccuWeather has quality products and is easy to work with. We know their innovative Web products – Alert, Desktop and iSight – will be of interest to many of our former clients."

For more information about AccuWeather, contact them at:
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