

How's the Weather? A Report from Our State Climatologist

Formal observations of Minnesota's weather date back to temperature measurements taken at Fort Snelling in 1819. Drawing on weather data recorded to the present, the state climatologist evaluates the impact of Minnesota's weather on people, wildlife, and natural environments

MINNESOTA is a state full of weather watchers, among them the state climatologist. From his office in the Soil Sciences Building on the University of Minnesota's St. Paul Campus, Jim Zandlo monitors the state's climate.

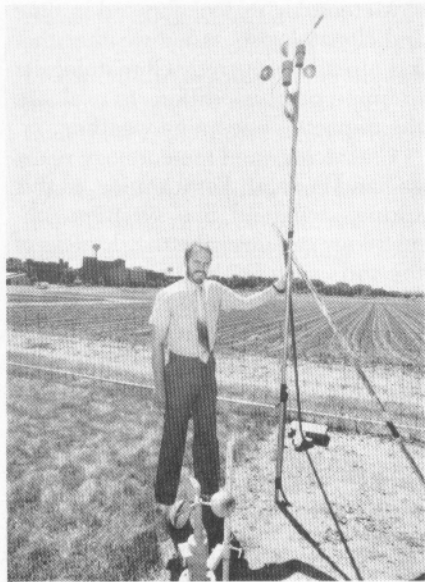
For Zandlo, who works for the Department of Natural Resources Division of Waters, weather watching means much more than observing temperature, rainfall, wind speed and direction, humidity, and other weather indicators. He relies on computer techniques to help him

gather and analyze multitudes of weather statistics that go into creating a picture of Minnesota's climate. Individuals, businesses, and government agencies may study that picture when planning their activities.

On a rare rainy morning in an otherwise dry, warm spring, the *Volunteer* visited Zandlo to find out more about Minnesota's climate and its office of climatology.

What does Minnesota's state climatologist do?

I spend a lot of time each day re-



At University of Minnesota, St. Paul, State Climatologist Jim Zandlo checks anemometers which measure wind speed. Small one measures speed at ground level.

sponding to needs of people who call for weather-related information. Calls come from state and federal agencies, the news media, and private citizens. Typically, people call and say they need such-and-such kind of data.

Give me an example of someone who might ask for data.

A homeowner might call to find out why his basement is leaking. He might ask if rainfall has been extremely frequent or unusually heavy in the recent past.

An engineer from NSP [Northern States Power] might call for information to correlate heating costs with degree days.

I also have broader responsibilities, such as assessing the effects of this spring's dry spell. I look at how much precipitation was lacking and compare that to the precipitation excess we had just before this period. I try to come up with a net result in terms of soil-moisture conditions.

That result can help farmers determine how crop germination might proceed if dry conditions persist. Foresters might use the information to determine how planting young trees would be affected by the dry spell.

What is the difference between your work and what a meteorologist does?

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Meteorologists look forward in time and climatologists assess weather that has already occurred. Climatologists examine prior conditions to evaluate the impact of upcoming weather.

Climatology and meteorology really go hand in hand. For instance, in this spring's wildland fire situation, climatology can describe the dryness of the soil's surface. However, the day-to-day fire danger needs to be watched with techniques of meteorology — immediate forecasts for wind, heat, moisture. Climatology is not a good predictive tool.

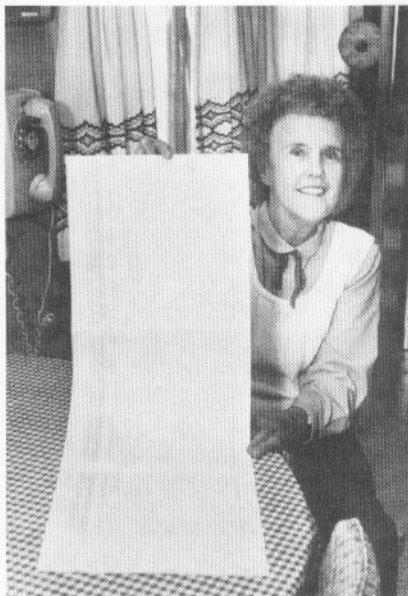
How do you determine climate? What atmospheric elements do you measure?

Climate is the inclination of the weather. To describe it, we use statistics and categories reflecting such things as prevalent air masses affected by how far we are from the poles or the oceans.

In Minnesota, the most widely recorded data are precipitation observations. Precipitation — rain, snow, sleet — is ultimately the only source for water.

The other most common measurement is temperature. The National Weather Service observes precipitation and temperatures at about 150 locations in the state. With the Backyard Rain Gauge Network, individual

Backyard Rain Gauge Network volunteer Lorraine Hammerstrom, Minneapolis, holds computer print-out of her data collections since 1971. Without fail, she checks her rain gauge daily.



volunteers enlisted through Soil and Water Conservation Districts and other agencies, and from DNR Division of Forestry observations, we bump up precipitation measurements to about 800 to 1,000 during the summer.

Fully equipped weather stations of the National Weather Service and the UM Extension Service also measure wind speed and direction, solar radiation, evaporation, atmospheric humidity, and so on.

When did people begin collecting and recording weather data?

Basic techniques of observing weather events have been practiced for thousands of years. Some formal records of precipitation extend back to the 18th century in the U.S. and further in Europe. Most early records in Minnesota are associated with forts established in the state — Fort Snelling on the southern border of the Twin Cities, for instance.

How have methods of measuring atmospheric elements changed? Were early weather records less accurate?

Some measurement techniques have changed. A new type of thermometer measuring minimum and maximum temperatures was introduced during the latter half of the 19th century. Rain gauges have changed mainly in auxiliary devices, such as a built-in scale to weigh the rain. The hot-wire anemometer, which measures wind speed by measuring heat removed from a heated wire, de-

pends on electronics.

Although technological advances provide more devices, some modern instruments are actually less accurate than their traditional counterparts.

You said that farmers and foresters use climate reports. Tell me more about how climatology helps them plan their work.

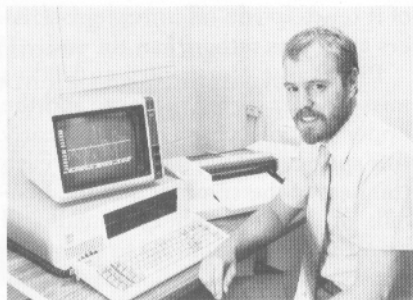
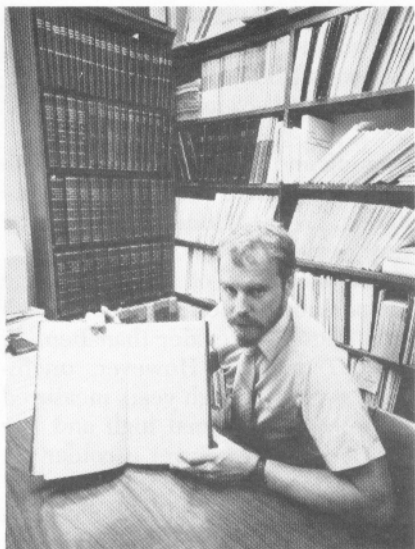
First and last frost dates bracket a growing season. Farmers work with the average and the range of these dates to assess risks in planting too early or waiting too long to harvest. They need to know temperature levels and moisture received during past growing seasons to decide types of crops and dates to plant.

Foresters can use this same information to set tree-planting dates. People planting gardens or trees in their own yards can use it, too. Agricultural specialists and other researchers use this data for field experiments on new species of horticultural plants.

Who else benefits from climate reports?

Climatology benefits almost everyone who must adjust his or her activities to the weather. Factors such as frequency of rain or snow are important to resort operators, builders, and outdoor maintenance workers.

Similarly, knowing *likely* conditions of the atmosphere guides wildlife managers and other natural resource planners. For example, we used precipitation data for a peat har-



Far left and left: Zandlo in University of Minnesota archives where original records of weather data, collected by U.S. Army in 1877 at Breckenridge, Minn., are stored. Page for week ending June 5, 1878, shows "clear, fair weather." **Above:** Zandlo examines screen displaying portion of long-term precipitation record for Minneapolis-St. Paul. Data base contains weather records for 50 years.

Other local features — whether the land is hilly or flat, whether it is open cropland or covered with trees — also influence the weather.

How about city and rural climates? Are they different?

Cities don't let the heat out. This results in average temperatures a few degrees higher than in rural areas. Buildings, factories, and cars release heat into the city's atmosphere. Spaces between buildings and asphalt surfaces absorb radiation better than many natural environments.

What amazes you most about Minnesota's climate?

I am amazed by its ability to change quickly from one extreme to another — day to day or year to year. For in-

stance, the minimum and maximum precipitation year records occurred back to back: 1910 had only 10.2 inches while 1911 had 40.4 inches. Last year, we went from a fairly wet summer to a very wet September, then into one of the driest springs we've ever seen in the state.

We had very little snow last winter and little rain this spring. Are we entering a drought period?

There's been a lot of talk about the drought this spring, but we should remember that our winters normally are dry. By the end of winter, you might expect a half-foot of water in the form of snow to have accumulated on the surface. When spring comes the snow melts quite rapidly. Because it melts on frozen ground, much

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of it tends to run off to replenish rivers and lakes rather than the soil.

Primarily, the rivers and lakes missed their spring recharge and the upper portions of soil dried out early this spring. But we have yet to reach the heat of the summer and the benefits of last September's rainfall still linger in deeper soil. So to say we're entering a drought period is probably premature.

So far this spring, the greatest impact of dryness has been an increase in wildland fires and lack of spring runoff. If dryness continues, more sectors of the economy will gradually be affected.

The 1986–87 winter was the warmest one I remember in Minnesota. Was it the warmest on record?

The winter was indeed very warm. January, February, March, and April were each about 10 degrees above the 1951–80 normal values. If we look at different groupings of cold weather months from November through

April, we see that 1877–78 remains the warmest winter on record. The winters of 1986–87, 1982–83, 1930–31, and 1881–82 follow close behind.

Bemidji and International Falls both have been called the “ice box of the nation.” What Minnesota town is the state's coldest?

On the basis of annual average temperatures, International Falls with 36.4 degrees is colder than Bemidji at 37.7 degrees. However, unofficially — not enough years measured to determine normal high and low temperatures — Tower is colder yet at 35.9 degrees.

January is generally the coldest month; July the warmest. Hallock has the coldest Januarys, averaging minus 0.6 degrees. Grand Marais, air-conditioned by Lake Superior, has the coolest Julys at 61.3 degrees. But from December through February it has essentially the same average temperature, 15.3 degrees, as Minneapolis/St. Paul. □