Water Year Data Summary

1993 and 1994

October 1, 1992 - September 30, 1994

by the Division of Waters Staff

St. Paul, MN
May 1995

Minnesota
Department of Natural Resources
Division of Waters

WATER YEAR 1993

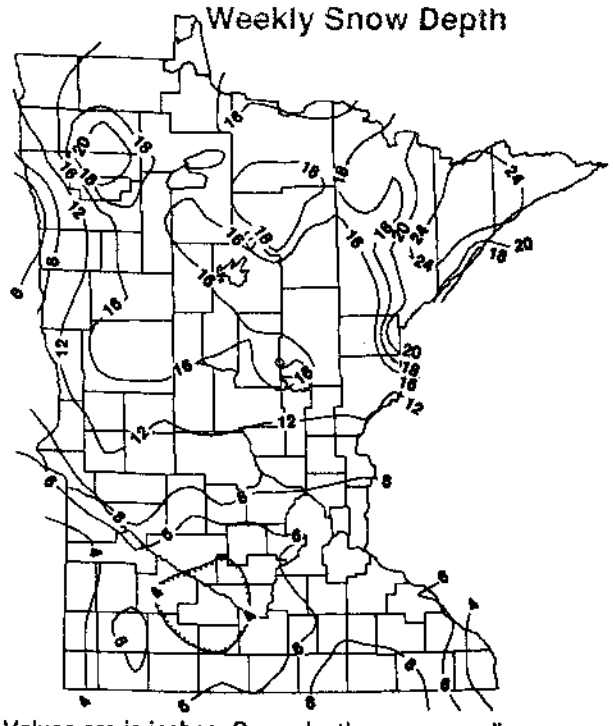
October 1, 1992 - September 30, 1993

Highlights

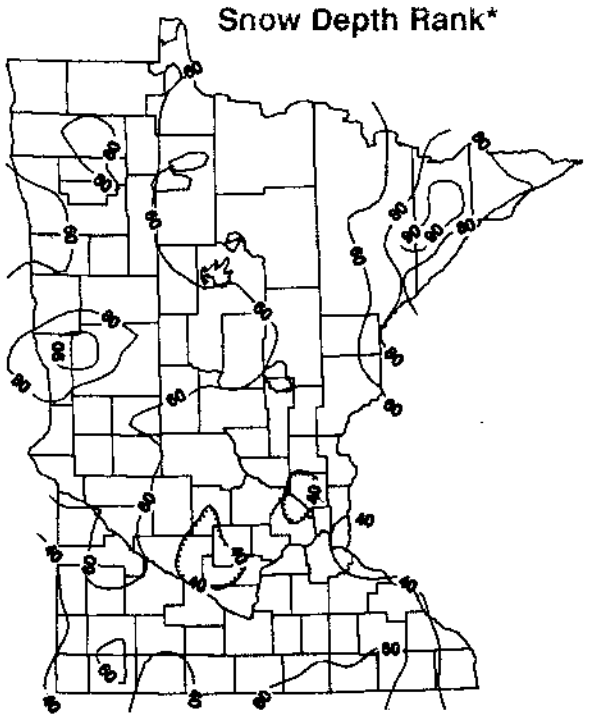
- Early snow, late spring ice-out
- Dry spring in northwest, wet elsewhere
- Very wet, cool summer; drier in autumn
- May-August among wettest periods on record

Like the winter of 1991-1992, the winter of 1992-1993 began with an unusually early November snow storm which blanketed many portions of the state. Some locations received more than six inches of snow. While this storm did not match the intensity of the Great Halloween Blizzard of 1991, it set the tone for a winter distinguished more for its longevity than its harshness. Relatively small but periodic snowfalls kept Minnesota's snow pack at or above the median throughout the winter (Figure 1). Notable events over the winter included a January ice storm in southern and eastern Minnesota, and a bitter cold spell in mid-March.

Figure 1. February 3, 1993



Values are in inches. Snow depths are generally measured on grassy, protected areas.

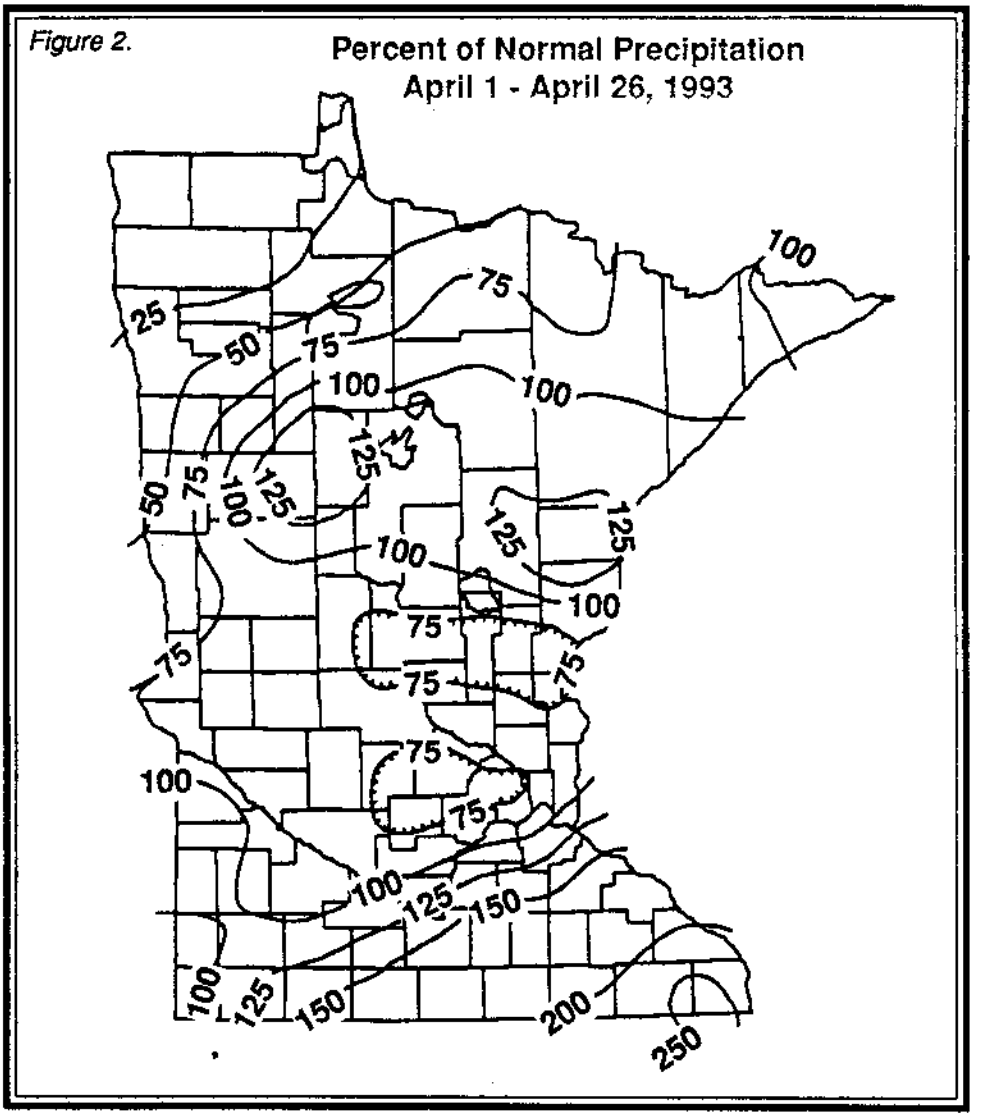


Values are a ranking relative to historical record for this date: 0 = lowest, 100 = highest

* Snow Depth Rank is a measure of the rarity of the absolute snow depth. The numbers represent an estimate of the number of years out of 100 in which the depth is less than the observed depth on the stated date. Thus a "95" would mean: "in 95 out of 100 years, the snow depth will be less" or "the snow depth is the 95th highest in a 100-year record" for the given day of the year. Actual long term snow depth records are generally less than 100 years in length.

Minnesota entered the spring of 1993 with most hydrologic systems at or above long-term average levels. The moist conditions resulted from extremely low evaporation rates during the summer of 1992, one of the coolest summers ever recorded.

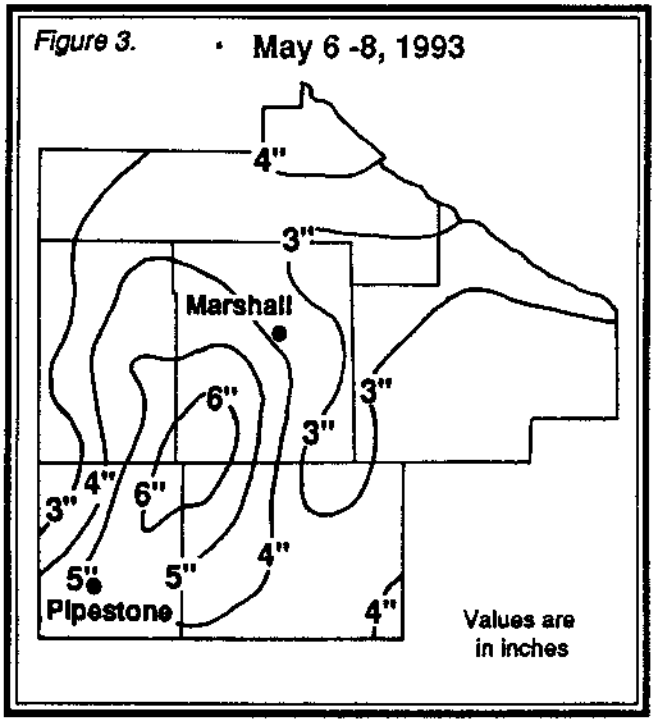
The spring of 1993 brought a disparate pattern of near to above normal temperatures and below normal precipitation in the northwest, with cold and wet conditions affecting the south. Figure 2 shows that April precipitation was sparse in the northwest, whereas portions of southeast Minnesota received more than 200 percent of normal precipitation (much of which came as snow). The heavy spring precipitation in the south, falling on already moist soil, led to some moderate flooding. Fortunately, the cool spring weather reduced the rate of snow melt, and somewhat diminished flooding potential. The unusually late snow in the south (plus very cool April temperatures) delayed lake ice-out by two weeks. Elsewhere around Minnesota, lake ice-out ranged from a few days behind to right on schedule.

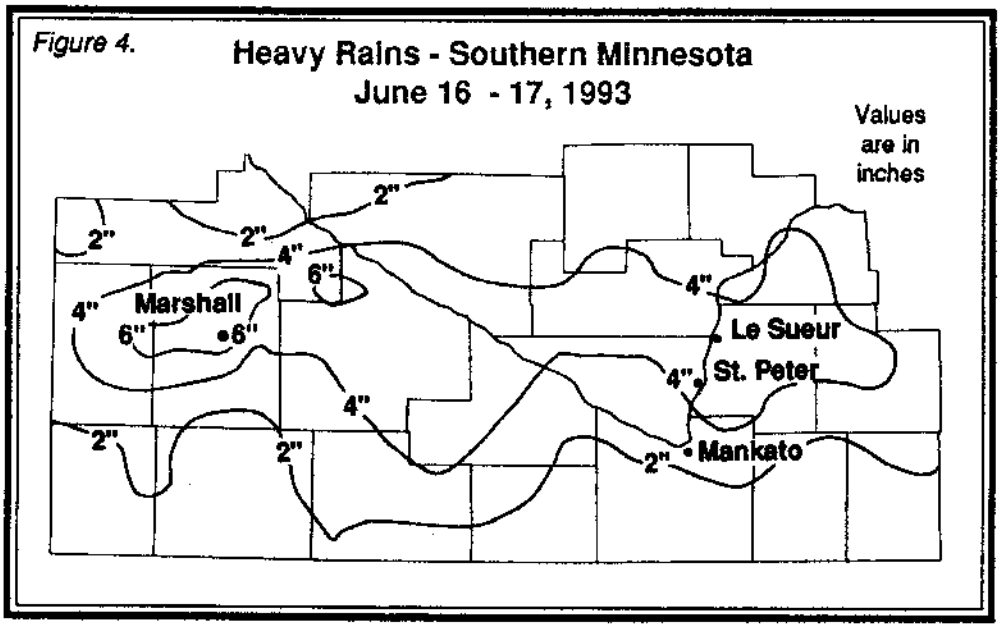


The spring and summer of 1993 combined to produce one of the wettest periods in Minnesota's recorded climate history. Rainfall was notable in both its volume and its persistence.

The unceasing thunderstorms began in early May in southwestern Minnesota which led to significant urban and rural flooding in the Marshall and Pipestone areas (Figure 3). Throughout southern Minnesota in May, extremely wet soils delayed or eliminated prospects for agricultural field work.

Heavy rains continued during June, drenching many areas of the southern third of Minnesota. Some locations reported June totals exceeding 15 inches. The pivotal rainfall event of the period was a large storm system that struck southern Minnesota on June 16 and 17 when four or more inches of rain fell across much of the Minnesota River basin (Figure 4). This rain fell on already saturated ground and swollen water bodies and led to large scale flooding. Flooding in southern Minnesota marked the beginning of a natural disaster that plagued the Midwest for many months (see side bar, page 5).





the GREAT FLOOD of 1993

The Great Flood of 1993 had its origins in an extended wet period starting 9-10 months prior to the onset of major flooding. This wet period moistened soils to near saturation and raised many stream levels to bank full or flood levels. This set the stage for rapid runoff and record flooding that followed excessive June and July 1993 rainfall.

The event was exceptional in many ways:

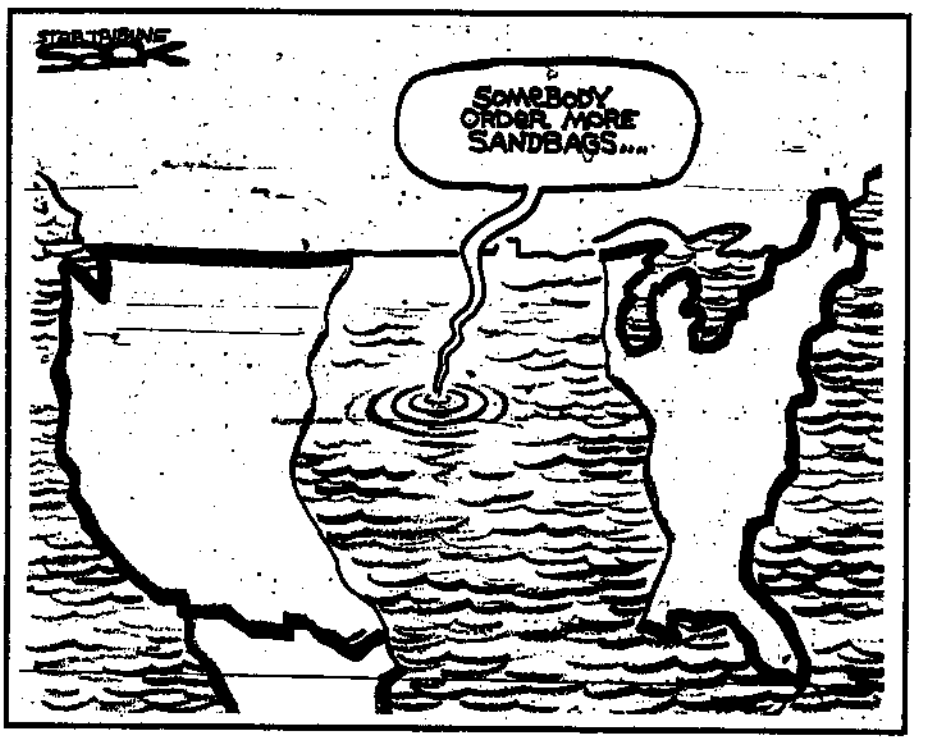
- the weather pattern which caused the excessive rainfall from mid-June to August was uncommonly persistent
- the flooding occurred during the summer months as opposed to the more typical spring snow-melt season.
- major flooding and record flooding occurred along portions of dozens of rivers, including portions of the main stems of the Mississippi and Missouri
- while most significant floods last days to weeks, this flood lasted weeks to months.

Over 15 million acres across 9 states were inundated by the flood of 1993. The entire state of Iowa was designated as a federal disaster area. Large sections of 8 other states (North Dakota, South Dakota, Minnesota, Wisconsin, Illinois, Missouri, Nebraska and Kansas) were also declared federal disaster areas. The toll was heavy all across the region, with 48 deaths and some 70,000 people left homeless in the 421 counties declared federal disaster areas. Farmers suffered greatly with $8 billion in damage to crops. Although the exact amount may never be known, the total damage from the Great Flood of 1993 could rival the $21 billion of Hurricane Andrew, the nation's costliest disaster.

-From the executive summaries of the following reports:

The Great Flood of 1993, the Minnesota Experience, March, 1994, MN Department of Public Safety

Coastal Oceanographic Effects of 1993 Mississippi River Flooding, 1994, NOAA/National Weather Service



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July brought a continuation of the extremely wet weather. Heavy rains persisted in southern Minnesota, but also influenced the west and north. West central, northwestern and northeastern Minnesota experienced downpours, raining many inches in just a few hours. One such event in mid-July led to significant urban and rural flooding in Clay and Becker Counties (Figure 5).

Figure 5. **Flash Flood - Northwestern Minnesota July 15-16, 1993**

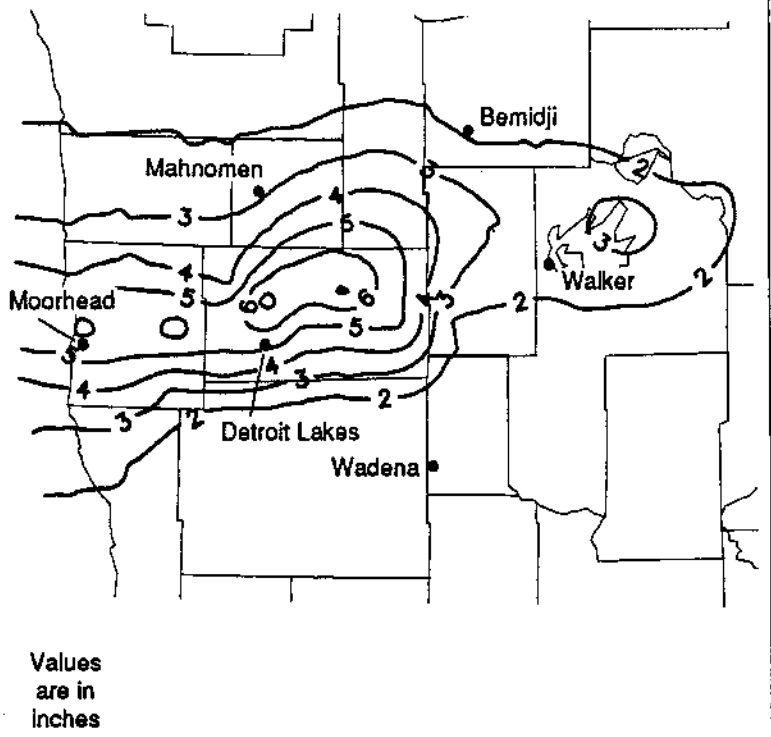
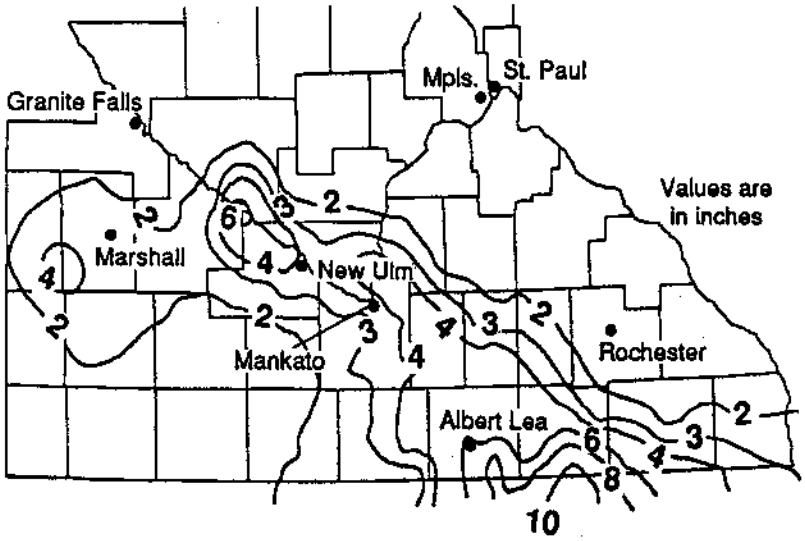
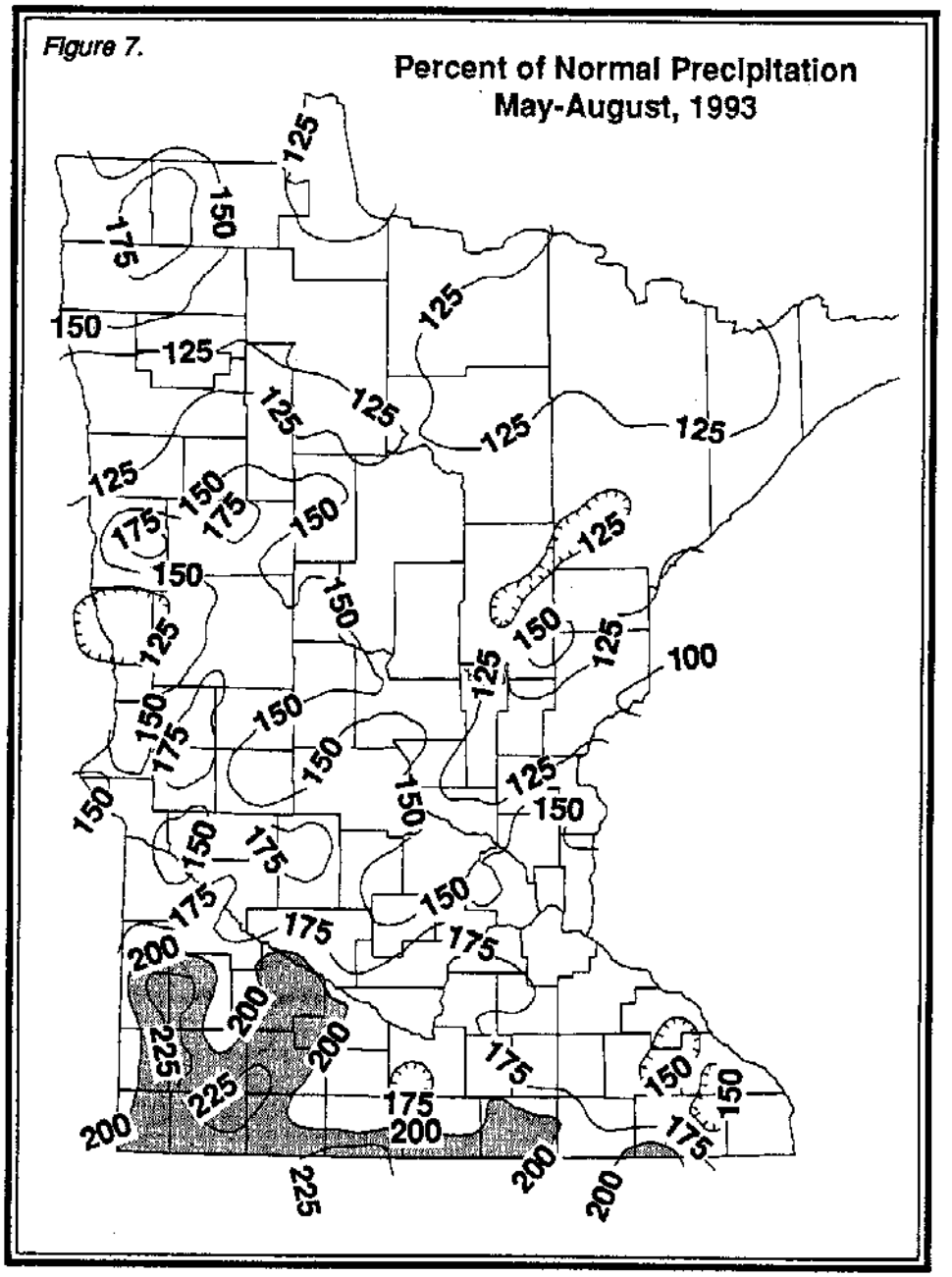


Figure 6. **Heavy Rains in Southern Minnesota August 15-16, 1993**



The most significant rainfall event of late summer occurred on August 15 and 16 along a line that stretched from near New Ulm to south of Austin (Figure 6). A multi-county area received more than four inches of precipitation from this storm. Eight or more inches fell in some areas leading to widespread soil erosion and flooding in and around Austin.

Figure 7.

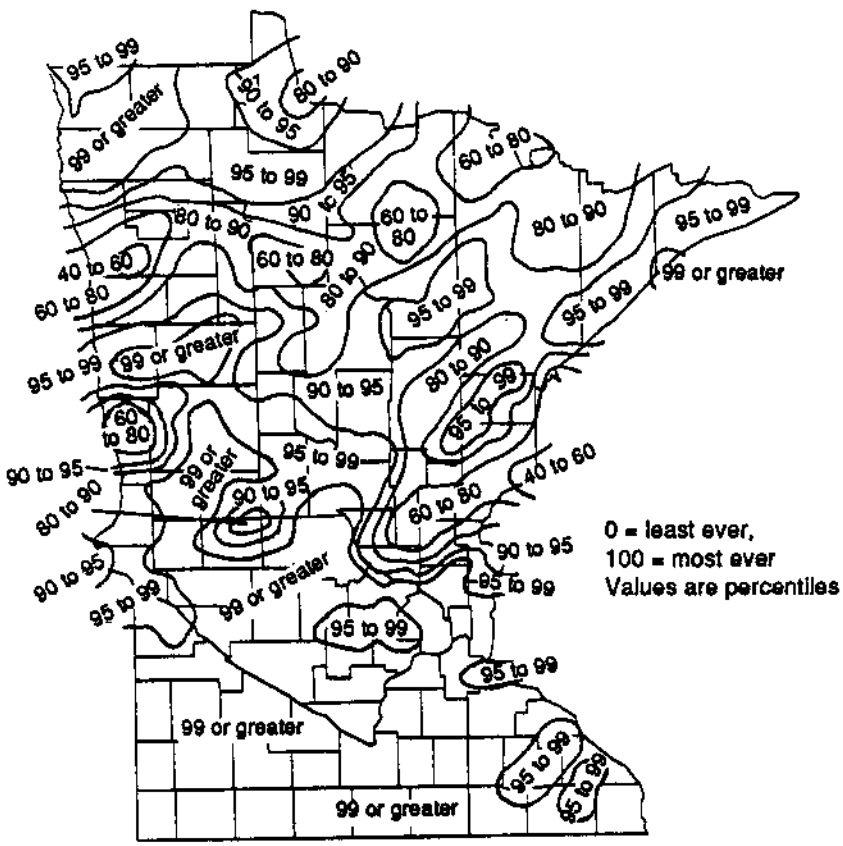


The months of May through August of 1993 constituted one of the wettest multi-month periods in Minnesota's recorded climate history. The torrential rains that impacted nearly all of the Midwest left many locations in Minnesota with precipitation totals exceeding 200 percent of the mean, the equivalent of two summers worth of rain (Figure 7).

Figure 8 shows that roughly one half of Minnesota ranked at, or above, the 99th percentile for May through August rainfall. A value above the 99th percentile means that those locations broke, or nearly broke, all-time May through August rainfall records. Four-month totals exceeded 28 inches over much of southern Minnesota, the normal *annual* rainfall for many of those areas. Record breaking rainfall over such a broad area, for such an extended period of time, is nearly unprecedented in Minnesota's 100-year climate history.

The same atmospheric conditions that caused the heavy rains also led to very low evaporation rates. Cloudy and cool weather, in tandem with persistently high relative humidity, combined to reduce the atmosphere's ability to evaporate water from the surface. For the first time since such records have been kept, precipitation totals exceeded pan evaporation values for the May through August period. The lack of evaporation exacerbated the existing hydrologic imbalance.

Figure 8. May-August, 1993 Precipitation Historical Ranking



This map depicts where the May to August, 1993 precipitation totals fall in the context of history (100 years of climate data). A value of 99 or greater means the May to August all-time rainfall record was nearly matched or broken. A value of 90 means that greater amounts would only be expected one out of ten years.

The deluge led to numerous problems for nearly all elements of society. Rising rivers and streams damaged private property and endangered lives. Damage to and closure of roads and bridges hindered transportation. Heavy rains flooded croplands, eroded soils, hampered or eliminated agricultural field work and decreased production. The wetness also impacted other weather sensitive industries such as construction and outdoor recreation.