Flood of the Century
Remembering the Great Midwest Flood of 1993

By Gloria Bucco

The Mighty Mississippi

It is the sixth largest river in the world and millions live along its banks. From its headwaters in the north woods of Minnesota to the Gulf of Mexico, the waters of the Mississippi touch 10 states. The Missouri River, which some believe to be a tributary of the Mississippi, winds more than 2,315 miles from its source in western Montana to its junction with the Mississippi in St. Louis.

Both of these powerful waterways are used for agriculture, commerce and recreation. The corn, soybeans and wheat grown in the Mississippi/Missouri basin feed not only the United States but also much of the world, and weather can mean the difference between a bumper crop and a ruined one. The Mississippi/Missouri system is also a major route for the transport of coal, grain and other bulk cargoes -- and flood, drought or freeze can cripple shipping for months at a time.

These rivers are most often our friends but when their waters rise, the Mighty Mississippi and the “Big Muddy” can become formidable enemies.

That is what happened during the spring and summer of 1993. Sometimes described as a “leisurely” disaster because it resulted not from one single storm but from a weather pattern that remained stationary for months, the Great Midwest Flood of 1993 covered 400,000 square miles in the upper Mississippi and lower Missouri river basins, took the lives of 50 people, destroyed or damaged 50,000 homes, inundated 75 cities and towns, and cost close to $20 billion.

No other natural disaster in American history touched so many lives for so long a time. The Flood of 1993 was distinctive because of its magnitude, severity, damage and timeframe. Typically, floods occur in the spring. This flood began in the summer along the Mississippi and the Missouri, continued into the fall and did not finally subside until October. In Hannibal, Mo., for example, the Mississippi remained above flood stage for more than six months.

How did this happen? Why was this flood so different? What have we learned? Let’s take a look.

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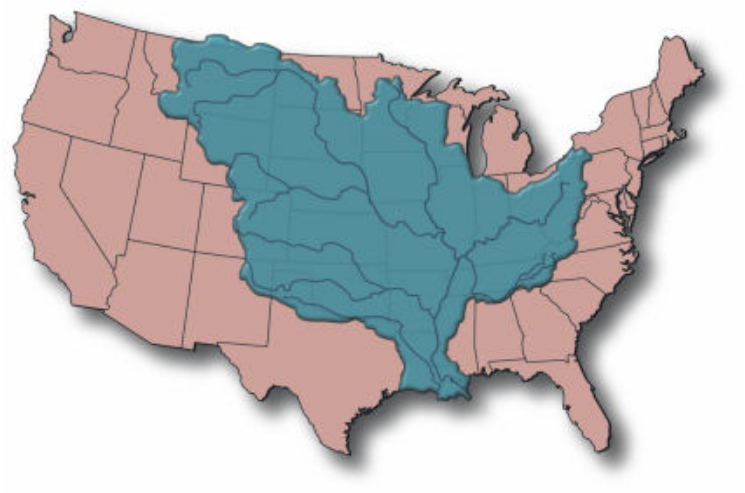
The Mississippi/Missouri Basin



Source: U.S. Geological Survey

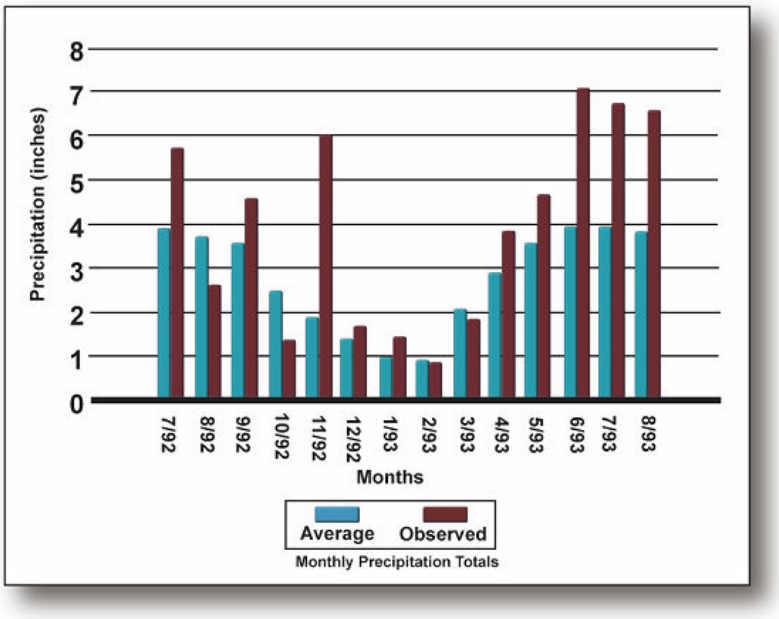
Beginnings

The Mississippi/Missouri basin is especially vulnerable to flood and drought, and an El Nino cycle can exacerbate these weather extremes. El Nino is a warming of the surface of the tropical Pacific that disrupts atmospheric circulation causing weather changes around the globe. An El Nino cycle was already a year old when the Flood of 1993 hit. Many climate scientists blamed El Nino for the flooding, however, every El Nino will not cause the extensive flooding of 1993, and flooding can occur without El Nino.

Actually, many factors set the stage for the Flood of 1993; the flooding did not result from one huge storm. The fall of 1992 was a wet one saturating soils and raising stream levels. Winter rain and snow contributed to the nearly saturated soil conditions forcing spring precipitation and snowmelt, normally able to soak into the ground, to run off into streams and rivers. Heavy rainfall in late March fed directly into the headwaters of the Mississippi.

Then, an annual weather condition called a Bermuda High, which arrives in late spring, started acting out of character. A Bermuda High usually develops off the southeast coast of the U.S. and steers weather systems across the eastern part of the country. In 1993, however, the Bermuda High was much more powerful than usual and moved farther to the north and west. It basically formed an atmospheric dam over the Ohio River Valley and prevented storms from following their normal course to the eastern seaboard. Instead, storms kept regenerating over the central states, dropping record amounts of rain on an area already primed for flooding.

This unusual weather was held in place by an abnormally persistent atmospheric weather pattern consisting of an almost stationary jet stream positioned over the central part of the country. Moist, unstable air flowing north from the Gulf of Mexico converged with unseasonably cool, dry air moving south from Canada and simply sat there. In some areas, an endless march of thunderstorms dumped more than 3 feet of rain during the month of July alone. This continuous rainfall was a critical factor affecting the record flooding.

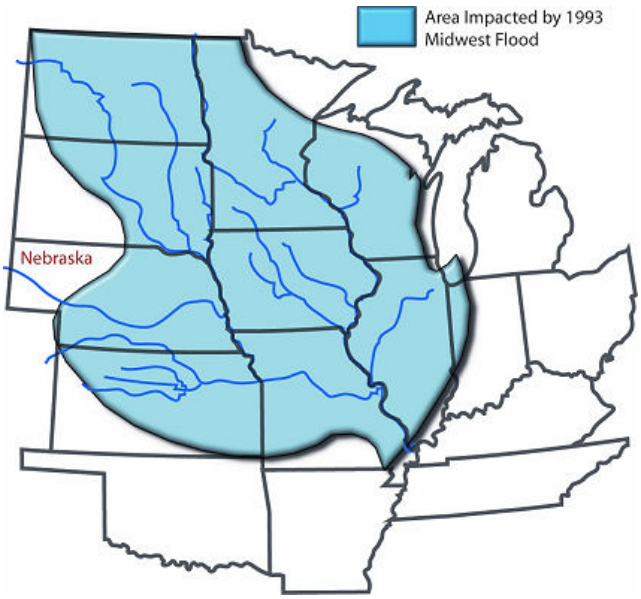


Comparison of Average and Observed Monthly Precipitation Totals for the Upper Mississippi River Basin

Summer did not provide a respite. From June to August 1993, rainfall totals surpassed 12 inches across eastern Nebraska, the eastern Dakotas, southern Minnesota, Wisconsin, Kansas, Iowa, Missouri, Illinois and Indiana. More than 24 inches of rain fell on southeastern Nebraska, central and northeastern Kansas, northern and central Missouri, most of Iowa and southern Minnesota with up to 38 inches in east-central Iowa. These amounts were 200 to 350 percent above normal.

The Flood

Flooding began slowly in early June when runoff from the spring's heavy rains filled stream and river channels causing rivers in Minnesota and Wisconsin to rise. Soon the excess flow reached the Mississippi. The Mississippi crested at St. Louis on July 12 at 43 feet, equaling a previous record, and then again on Aug. 1 at 49.6 feet (over 19 feet above flood stage and more than 6 feet above the old record set in 1973). The Mississippi remained over flood stage at St. Louis for more than two months. The Missouri River crested at Kansas City on July 27 at almost 49 feet. Flood stage is 32 feet. This crest traveled down the Missouri River setting new records.



Area Impacted by the 1993 Midwest Flood

The first levee breached on June 7, but levee failures soon became a common occurrence. Many locally constructed levees breached or overtopped. From May through September 1993, major and record flooding occurred across Nebraska, North Dakota, South Dakota, Kansas, Minnesota, Iowa, Missouri, Wisconsin and Illinois. The entire state of Iowa was declared a disaster area as were portions of eight other states including North Dakota, South Dakota, Minnesota, Wisconsin, Illinois, Missouri, Kansas and Nebraska. About 600 river forecast points in the Midwest were above flood stage at the same time.

Nebraska Sets a Record

The 1993 Flood was probably the most damaging in Nebraska history with 258 different entities filing for federal disaster assistance to the tune of $445 million. The state actually experienced two "seasons" of floods in 1993: spring ice-jam floods and summer riverine floods.

A cold winter had left rivers in the western part of the state under thick ice. Then warmer spring weather and rain caused this ice to melt and break apart into huge chunks. The current soon moved these chunks downstream in the Lower Platte and the Lower Elkhorn rivers.

In the meantime, eastern Nebraska was experiencing a massive early March thaw with snow up to 18 inches deep starting to melt.

When the ice chunks from the western part of the state reached narrow sections of the rivers, they piled together and began to act like a dam with water building up behind them. With near-record inflows blocked by ice jams, the Platte and Elkhorn rivers along with area streams jumped their banks and destroyed levees. In fact, during 11 days beginning March 6, 1993, the National Weather Service issued 187 flood notices for Nebraska.

Most of the damage along the Platte-Elkhorn came from this phenomenon.

Ice “dams” can be a danger in another context. When ice dams eventually break apart, water that was trapped comes rushing downstream, and has the potential to cause flash floods. The scary thing about ice-jam floods is they can develop very quickly – often in hours instead of days like normal river floods. As a result, if conditions are favorable for ice formation, as they were in 1993, rivers need to be watched very closely.

In response to the 1993 spring ice-jam floods in Nebraska, the state in concert with the U.S. Army Corps of Engineers created the Nebraska Ice Jam Reporting System (available through the DNR website). A network of site observers was formed to make river observations during peak ice forming and breakup periods. These observations are compiled in a database and are available over the Internet.

The data serve two purposes: It provides up-to-date information on the status of rivers which decision makers and people living along the river can use to assess risk; and it will provide a long-term data repository that can be used in the future to develop models to predict where ice jams and associated flooding are most likely to occur based on weather conditions.

Eventually, 52 Nebraska counties containing 1.3 million people were declared federal disaster areas due to flooding and tornadoes from the severe storms. The month of June 1993 was the sixth wettest on record since 1931, with an average of 5.3 inches of precipitation (normal is 3.7 inches). In July, statewide precipitation set an all-time record with 8.5 inches of rainfall. Twenty to 26 inches of rain fell in the southeastern counties of Pawnee, Nemaha, Otoe and Richardson. Ten to 20 inches fell in a band from Harlan County Dam to Omaha.

The Missouri set record crests in Plattsmouth and Brownville, and river levels from Omaha to Rulo were the highest since 1952. Lowlands from the mouth of the Platte to below Rulo flooded, and 15 riverfront cabins were damaged by water near the U.S. 159 bridge.

The stretch from Brownville to Rulo was above flood stage for the entire month of July. Rulo crested at 23.8 feet (flood stage is 17 feet); Brownville crested at 34.5 feet (flood stage is 32 feet); and Nebraska City crested at 19.4 feet (flood stage is 18 feet.) A breach in an Army Corps of Engineers' levee near Brownville threatened the Cooper Nuclear Power Plant. In addition, the Big Nemaha River at Falls City crested at 29.8 feet (flood stage is 20 feet.

The American Red Cross reported that 42 single-family residences, 90 mobile homes and three multifamily dwellings were destroyed in Nebraska. In addition, 1,457 additional residential structures were damaged. The Red Cross also served 12,850 meals in 10 shelters housing 247 people.

Additional statistics show just how extensive this flood was in Nebraska:

* Two Nebraska residents were killed.
* Public infrastructure damage totaled $44 million.
* 5.8 million acres of cropland were flooded resulting in $317 million in damage.
* More than 100,000 trees were damaged or destroyed.

Impacts

When the flood waters finally receded, 50 people were dead, economic damages approached $20 billion, 150 major rivers and tributaries had flooded, at least 15 million acres of farmland had been inundated, 50,000 homes had been destroyed or damaged, 75 towns had been underwater and some would never be rebuilt, levees were broken, and the banks and channels of many rivers were severely eroded.

The flood carried away more than 600 billion tons of top soil and deposited great amounts of sand and silt on valuable farm land. In large areas inundated by the flood, the harvest of 1993 was a total loss, and some farmers lost any chance for a 1994 harvest as well.

Transportation was severely impacted. Barge traffic on the Missouri and Mississippi rivers was stopped for nearly two months. Bridges were out or inaccessible on the Mississippi River from Davenport, Iowa, downstream to St. Louis, Mo. On the Missouri River, bridges were out from Kansas City downstream to St. Charles, Mo. Numerous interstate highways and other roads were closed. Ten commercial airports were flooded. All railroad traffic in the Midwest was halted. Numerous sewage treatment and water treatment plants were destroyed.

Affected locks, dams and levees had to be inspected and repaired after the flood. The U.S. Army Corps of Engineers reported that 40 of 229 federal levees and 1,043 of 1,347 non-federal levees were overtopped or damaged during the flood.

The good news, however, according to former Brig. Gen. Gerald E. Galloway, chairman of the Federal Interagency Floodplain Management Review Committee, was that flood damage reduction projects and floodplain management programs, where implemented, worked as designed and significantly reduced damages to population centers, agriculture and industry. It was estimated that:

* Reservoirs and levees built by the Corps prevented more than $19 billion in potential damages.

* Watershed projects built by the Soil Conservation Service saved an estimated additional $400 million.

* Land-use controls required by the National Flood Insurance Program and state floodplain management programs reduced the number of structures at risk throughout the Mississippi basin.

Weather cooperated with a freeze late in the year, and spring 1994 saw only a few minor floods. This allowed many repairs to be made.

Lessons Learned

The National Oceanic and Atmospheric Administration said at the time, “Although the Great Flood of 1993 has caused devastating human, environmental and economic impacts, the lessons learned will guide us in providing improved services and benefits to the nation in the future.”

But did they? Some changes have been made since 1993, according to Galloway, but they have been “more evolutionary than revolutionary.”

In 1966, President Johnson’s Task Force on Federal Flood Control Policy issued its report, “A Unified National Program for Managing Flood Losses.” While that report captured the nation’s attention and lead to creation of the National Flood Insurance Program, there is still no unified effort to address the nation’s flood problems. Galloway noted that broad national legislation for a national floodplain management policy still has not come about. However, agencies that have the responsibility for flood damage reduction planning and mitigation have modified their programs in the direction of a more balanced approach.

Galloway also observed that education is improving, and there is a greater national awareness of flood hazards. For example, the Federal Emergency Management Agency (FEMA) has sponsored television commercials reminding people of flood risk and encouraging them to buy insurance.

FEMA has also launched new programs and initiatives to reduce flood impacts through prevention, pre-and post-disaster planning and mitigation, and improvements in floodplain mapping.

One of the most important consequences of the 1993 flooding was passage of the National Flood Insurance Reform Act of 1994. Once the flood water had receded, it became apparent that most homeowners in the flooded areas did not have flood insurance. In addition, lenders had been lax in checking to determine if federally backed mortgages were being granted in flood-prone areas.

The Reform Act's intent, therefore, was to improve compliance with the National Flood Insurance Program's (NFIP) mandatory flood insurance requirement, and put pressure on lenders to ensure that at-risk home buyers and owners in a flood zone purchase flood insurance before receiving a federally backed mortgage.

The 1994 legislation also:

* Created the Increased Cost of Compliance program within the NFIP for all people who have a flood insurance policy. This program gives money to owners of substantially damaged properties to meet the more expensive costs of rebuilding according to a local floodplain management ordinance. Program rules were published in 1997.

* Created the Flood Mitigation Assistance program, which went into effect in 1997-98. This program is funded from a surcharge added to all flood insurance policies nationwide. The money is then redistributed to states in the form of grants to be used to mitigate future flood losses.

* Increased emphasis on floodplain mapping.

* Codified the Community Rating System (CRS) into the NFIP. The CRS is an incentive program which allows communities to reduce their costs for all flood insurance policies in exchange for going above and beyond minimum NFIP requirements.

Under the Clinton Administration, FEMA targeted buyouts of flood-damaged properties as the first priority for Midwest flood mitigation funds. This initiative represented a turning point in flood recovery policy: it was the first time buyouts had been attempted on such a large scale.

In the nine states that flooded, FEMA ultimately moved more than 300 homes, and bought and demolished nearly 12,000 at a cost of over $150 million. The lands were turned to flood-friendlier uses such as parks and wildlife habitat. State and federal agencies have also acquired interest in over 250,000 acres of flood-prone land.

According to FEMA data, another 9,140 properties in 140 communities were elevated, acquired or relocated under hazard mitigation grants. Projects ranged in size from elevations of one or two homes in a neighborhood to entire communities moving to new locations.

One example was the town of Valmeyer, Ill., which was completely destroyed when floodwater overtopped its levee. Valmeyer was never rebuilt. Its citizens sold their land, and moved to a new site two miles away and 400 feet above the Mississippi floodplain.

Nebraska eventually received more than $10 million in federal mitigation assistance funds from FEMA. The state bought and demolished 101 houses and one restaurant on the Missouri River floodplain south of Bellevue. Another buyout project took place along the Big Blue River floodplain in Beatrice.

Meanwhile, since 1993, there have been increasing challenges from decaying locally and privately maintained flood protection infrastructure, according to an article in the Journal of Contemporary Water Research & Education. The level of coastal storm damage and flooding is increasing and development continues in the floodplain just outside the 1 percent flood risk zone.

Galloway adds: “While the cause and effect relationship among floodplain activities is difficult to define, it is clear that any human use of the floodplain carries with it some vulnerability to damage and has some impact on natural functions of the floodplain.”

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