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North Dakota State Water Commission

NATIONAL WEATHER SERVICE

10th Anniversary of the 1997 Red River Flood

Factors Contributing to 1997 Red River of the North (Red River) Flood

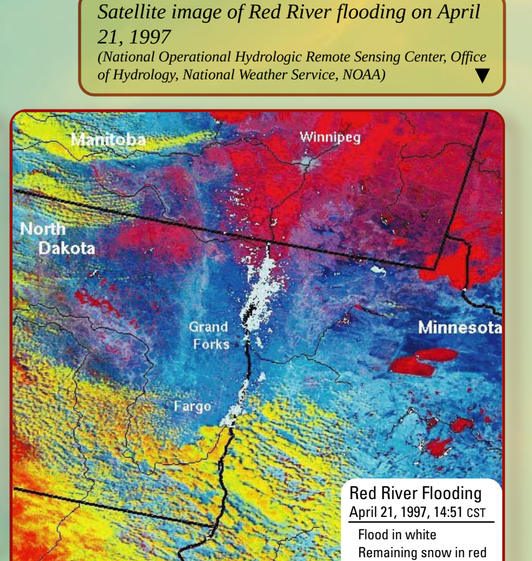
- Substantial precipitation in the fall of 1996 that produced high levels of soil moisture in the basin
- Early freezing of saturated ground in the fall of 1996 that prohibited infiltration of additional moisture throughout the winter
- Above-normal snowfall, from 70 to 120 inches, in the basin during the winter of 1996-97
- Above-normal precipitation during the spring of 1997 and a blizzard on April 5-6, 1997, during a late spring thaw
- A gentle slope (averaging 0.5 to 1.5 feet per mile) that slows channel flow and overland drainage in the basin
- A very shallow and meandering river channel
- The direction of flow combined with the timing of spring thaw throughout the basin
  - Flow is from the south (upstream) to the north (downstream) so snow and ice generally melt upstream while downstream (north) areas remain frozen. As water moves north toward a still frozen river channel, ice jams and substantial backward flow can occur.

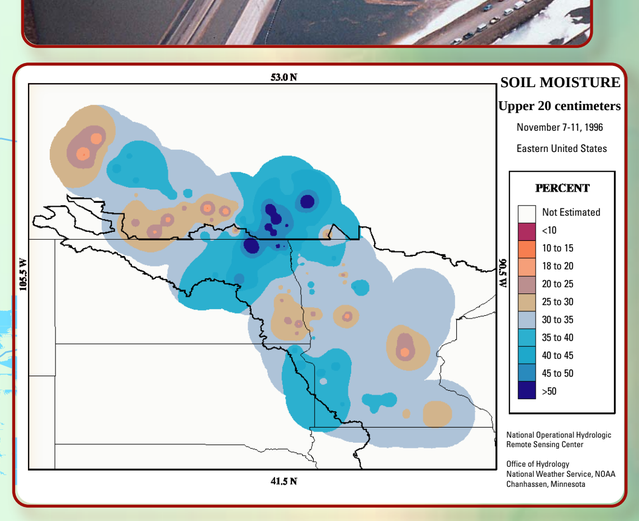
Pembina River
Tongue River
USGS gaging station at Pembina, North Dakota
North Branch
Two Rivers
South Branch
USGS gaging station at Drayton, North Dakota
Park River
Middle River
Forest River
Snake River
USGS gaging station at Oslo, Minnesota
Turtle River
USGS gaging station at Grand Forks, North Dakota/ East Grand Forks, Minnesota
Red Lake River
Goose River
USGS gaging station at Halstad, Minnesota
Wild Rice River
Buffalo River
Sheyenne River
USGS gaging station at Fargo, North Dakota/ Moorhead, Minnesota
Rice River
USGS gaging station at Hickson, North Dakota
Ashtabula Lake

Interchange of I-29, North Dakota, April 1997 ▼

▲ *Sorlie Bridge between Grand Forks, North Dakota, and East Grand Forks, Minnesota, during Red River flood, April 1997*

Satellite image of Red River flooding on April 21, 1997
(National Operational Hydrologic Remote Sensing Center, Office of Hydrology, National Weather Service, NOAA) ▼



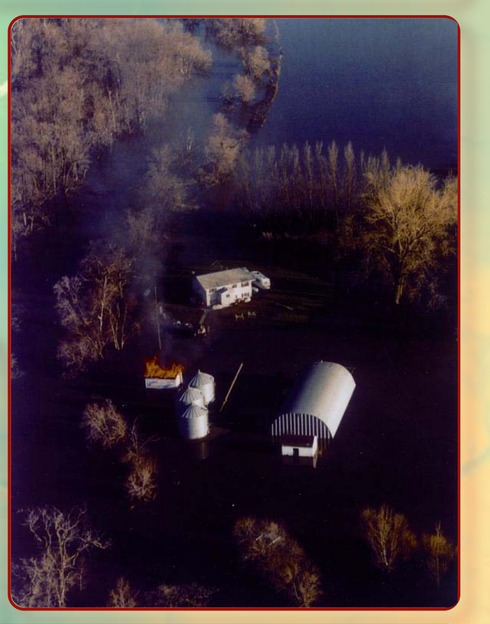


Soil moisture during November 7-11, 1996 ▲

Obelisk at Grand Forks, North Dakota, showing peak water-surface elevation of five major Red River floods ▶

Cottonwood Community Church in Grand Forks, North Dakota, April 1997
(Photo from North Dakota Water Education Foundation and North Dakota National Guard) ▶

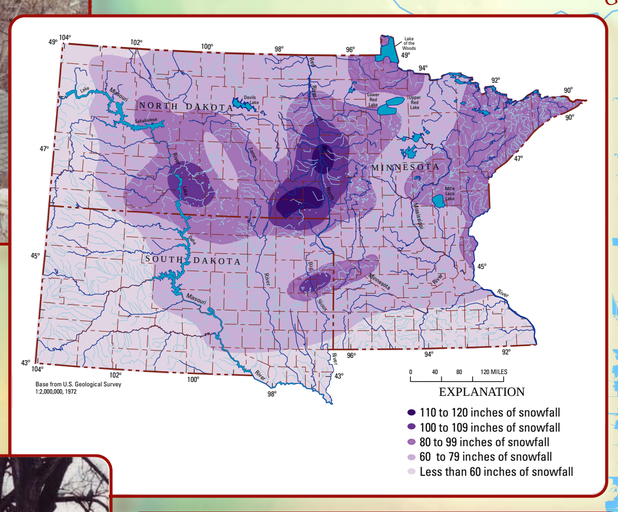
Farmstead near Red River, North Dakota, April 1997
(Photo from North Dakota Water Education Foundation and North Dakota National Guard) ▶



The flag of the United States of America and floodwaters in Grand Forks, North Dakota, April 1997
(Photo from North Dakota Water Education Foundation and North Dakota National Guard) ▼

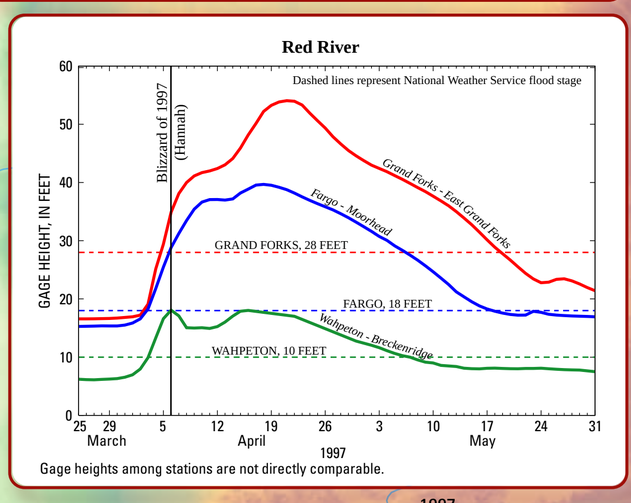
▼ *Welcome sign in East Grand Forks, Minnesota*

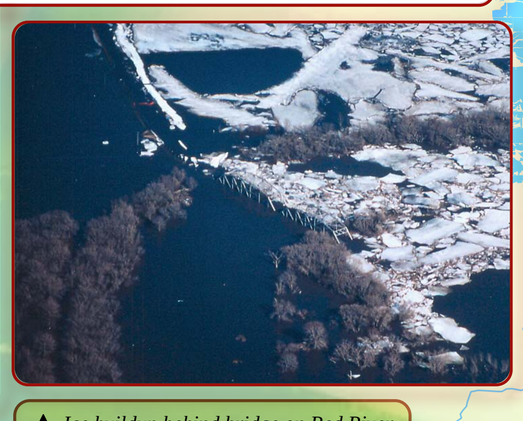
Flooded commercial buildings on Demers Avenue in East Grand Forks, Minnesota, April 1997 ▶



Area distribution of snowfall, in inches, for the northern plains, November 1996 through April 1997 ▶
(Modified from Macek-Rowland, K.M., Burr, M.J., and Mitton, G.B., 2001, Peak discharges and flow volumes for streams in the northern plains, September 1996 through April 1997: U.S. Geological Survey Circular 1185-A, 19 p.)

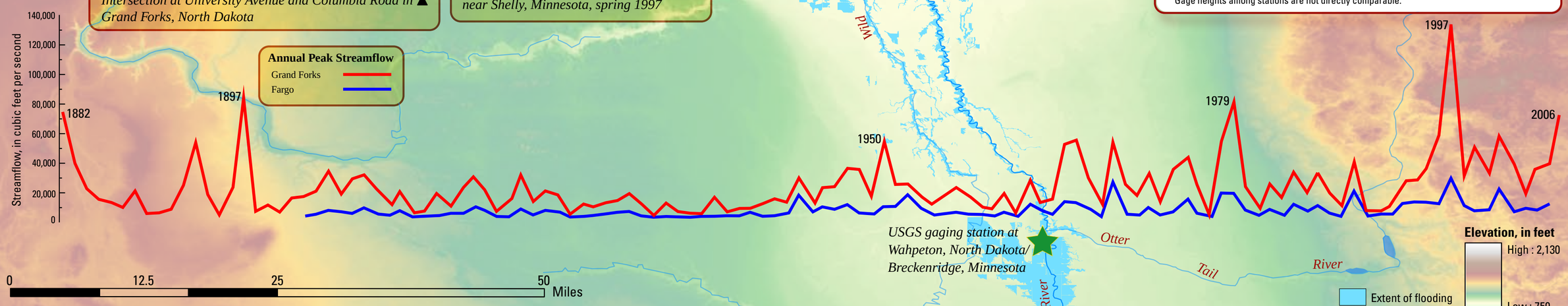
Selected gage heights for Red River, 1997 ▶





Intersection at University Avenue and Columbia Road in Grand Forks, North Dakota ▲

▲ *Ice buildup behind bridge on Red River near Shelly, Minnesota, spring 1997*



USGS gaging station at Wahpeton, North Dakota/ Breckenridge, Minnesota

Otter Tail River
Bois de Sioux River

Elevation, in feet
High : 2,130
Low : 750
Extent of flooding

Sources of Information:
North Dakota State Water Commission -- http://www.swc.state.nd.us/
U.S. Geological Survey -- http://nd.water.usgs.gov

The 1997 flood on the Red River was one of the worst natural disasters in recent history for many people and communities in the Red River of the North Basin. The U.S. Geological Survey (USGS), one of the principal Federal agencies responsible for the collection and interpretation of water-resources data, works with other Federal, State, local, tribal, and academic entities to ensure that accurate and timely data are available for making decisions regarding public welfare and property during natural disasters and to increase public awareness of the hazards that occur with such disasters.

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Base map, including a two-dimensional perspective of elevation data from USGS EROS Data Center National Elevation Dataset (1999), created by *Chris D. Laveau*
Digital outline of 1997 (Red River) flood event created by U.S. Army Corps of Engineers (2003)

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