FLASH FLOODS IN THE WELLS CREEK WATERSHED
1957, 1970, 1978

1957 Flash Flood - On the morning of June 22, 1957 heavy rains were reported in southeast Minnesota. No rainfall records are available from within the Wells Creek Watershed. Rainfall amounts for surrounding communities are plotted on figure 1. Reported rainfall amounts range from 1.7 inches in Wabasha to 3.6 in Fairbault. It is possible that the precipitation gaging network did not detect higher rainfall amounts because the higher rainfall occurred only in the Wells Creek Watershed where there were no gages. It is not uncommon for narrow bands of 4 to 6 inches of rain to occur within storms like the June 22 storm.

1970 Flash Flood - On May 27 - 28, 1970 a flash flood in Goodhue and Wabasha Counties caused creeks to jump their banks. However, the flash flood went undetected by the precipitation gaging network. After the storm, a "bucket" survey was completed by the National Weather Service to document rainfall amounts. A bucket survey is completed by talking directly with individuals, generally farmers, who have measured the rainfall amounts using a gage or can provide an estimate from pails or buckets left outdoors during the rainfall event. A map of the rainfall distribution is shown in Figure 2.

The flash flood began about 4:30 PM on May 27 and ended during the early morning hours on May 28. The greatest amount reported was 8.5 inches about 3 miles southeast of the small town of White Rock in Goodhue County. The area covered by 4 inches or more of rain covered 720 square miles in Minnesota and 280 square miles in Wisconsin. The flash flood caused 3 deaths, all from drowning.

1978 Flash Flood - East and southeast Minnesota experienced widespread flash flooding on June 30 thru July 1, 1978. These floods differed from the usual flash flood pattern. A typical pattern has only one localized area of high-intensity precipitation, generally from a single cell. Seven to nine separate areas in east and southeast Minnesota had over 6 inches of precipitation on June 30 to July 1 from several storm cells over a 14 hour period. Numerous heavy thunderstorms moved east to southeast from a 140-mile long line extending from western Ramsey County to western Houston County. Radar shows heavy showers occurred from about 6 PM on June 30 until 1 AM on July 1 with moderate showers continuing until 7 AM. A map of the rainfall distribution is shown in Figure 3.

Portions of Ramsey, Dakota, Goodhue, Wabasha, Olmstead, Winona, Filmore, and Houston Counties received over 6 inches of precipitation. A 6 or more inch rainfall is considered a 100 year or greater storm for this area. Greater than 8 inches of precipitation was reported in Mount Pleasant and Highland Townships in Wabasha County.

Flash Flood Facts

Flash Flood Definition - A flash flood is defined as a rainfall event with 6-inches or more of rainfall within a 24 hour period. This approximates a 100 year flood event (1% chance of occurrence in any given year) in Minnesota.

Flash Flood Size - measured in square miles it includes the area with 4-inches or more of rainfall reported. The areal extent of a 4-inch rainfall is included in the size of the flash flood because this best approximates the area which newspapers report increased erosion or other economic damages.

Precipitation Gaging Network - The SWCDs became involved with the precipitation network in 1977 marking the beginning of what has evolved into the present day gaging network. In Goodhue County 16 gages are in operation (Figure 4). However, none of the gages in Goodhue County are within the Wells Creek Watershed. As a rule of thumb, the smaller the watershed the greater the density of precipitation gage coverage needed to calibrate a hydrologic model. A precipitation gage in every section is an ideal goal for modeling hydrologic events in the watershed. At a minimum, a precipitation gage is needed in every township.

Weather Patterns Associated With Flash Floods - The basic pattern places a low pressure center or wave in the Dakotas with a cold front extending to the southwest of the low and a stationary front extending east or southeast across Minnesota where it separates into two high pressure systems as shown in Figure 5. The location of the southern high pressure system is such that very moist Gulf of Mexico air is drawn northward into the stationary front across Minnesota. The low pressure system will generally remain in the Dakotas or move slowly eastward.

Monthly Occurrences - Most flash floods occur in June and July.

Time of Occurrence - 50 % of flash floods occur between 6 and 11 PM.

Orientation - Flash floods heaviest band of precipitation generally run west-southwest to east-northeast or west to east.

Shape - Flash floods heaviest band of precipitation can be grouped into two general shapes; "cigar" or "oblong". Most flash floods are cigar shaped which means the length to width ratio is more than 4 to 1.

References

Kuehnast, E.L., D.G. Baker and J.A. Zandlo, 1988, Sixteen Year Study of Minnesota Flash Floods, Minnesota DNR and U of M.

Spoden, G., 1995, personal comm.

Figure 1. June 22, 1957 flash flood precipitation amounts.

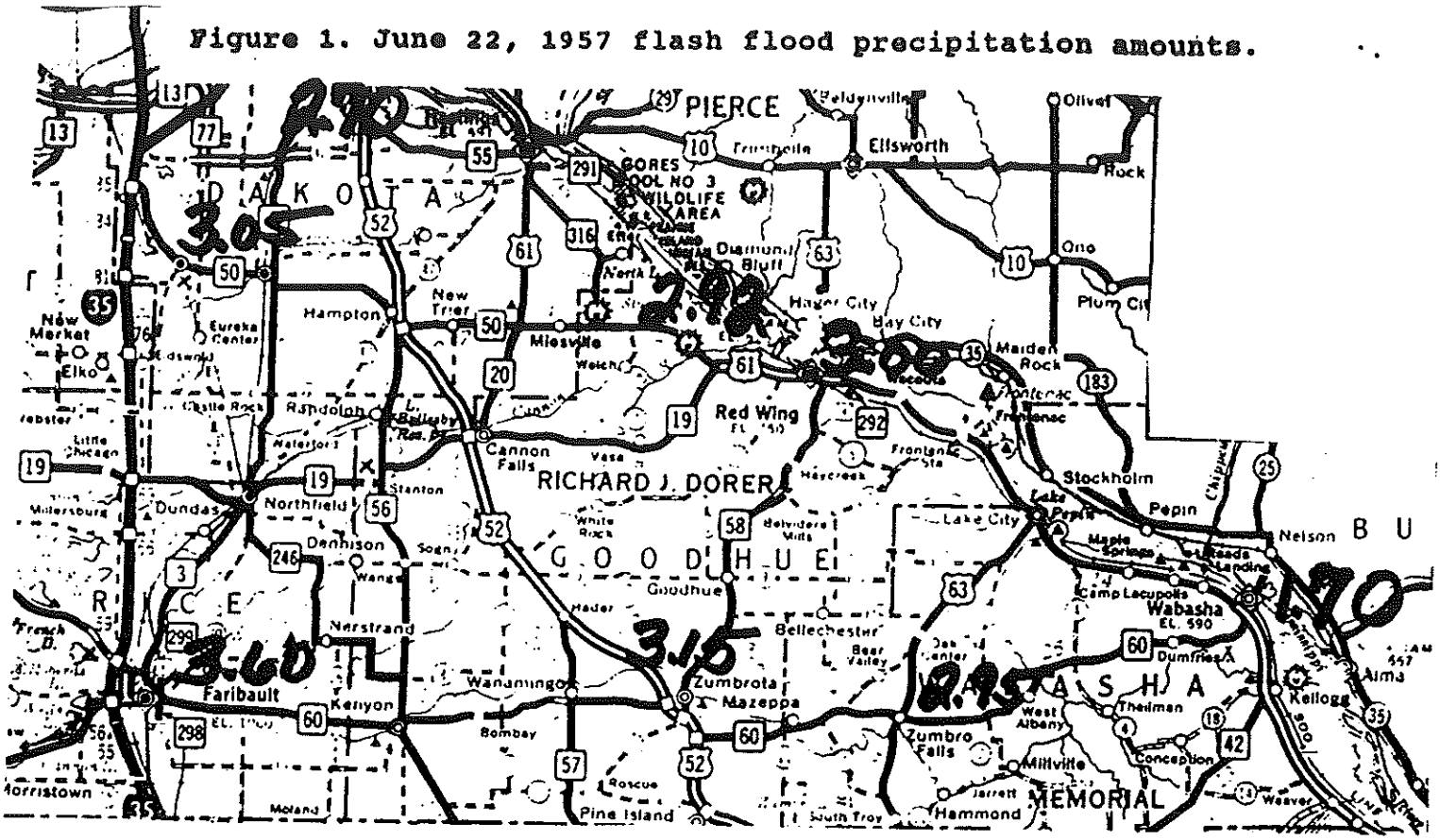

Figure 2.

FLASH FLOOD
(Goodhue & Wabasha Counties & Wisconsin)
May 27-28, 1970

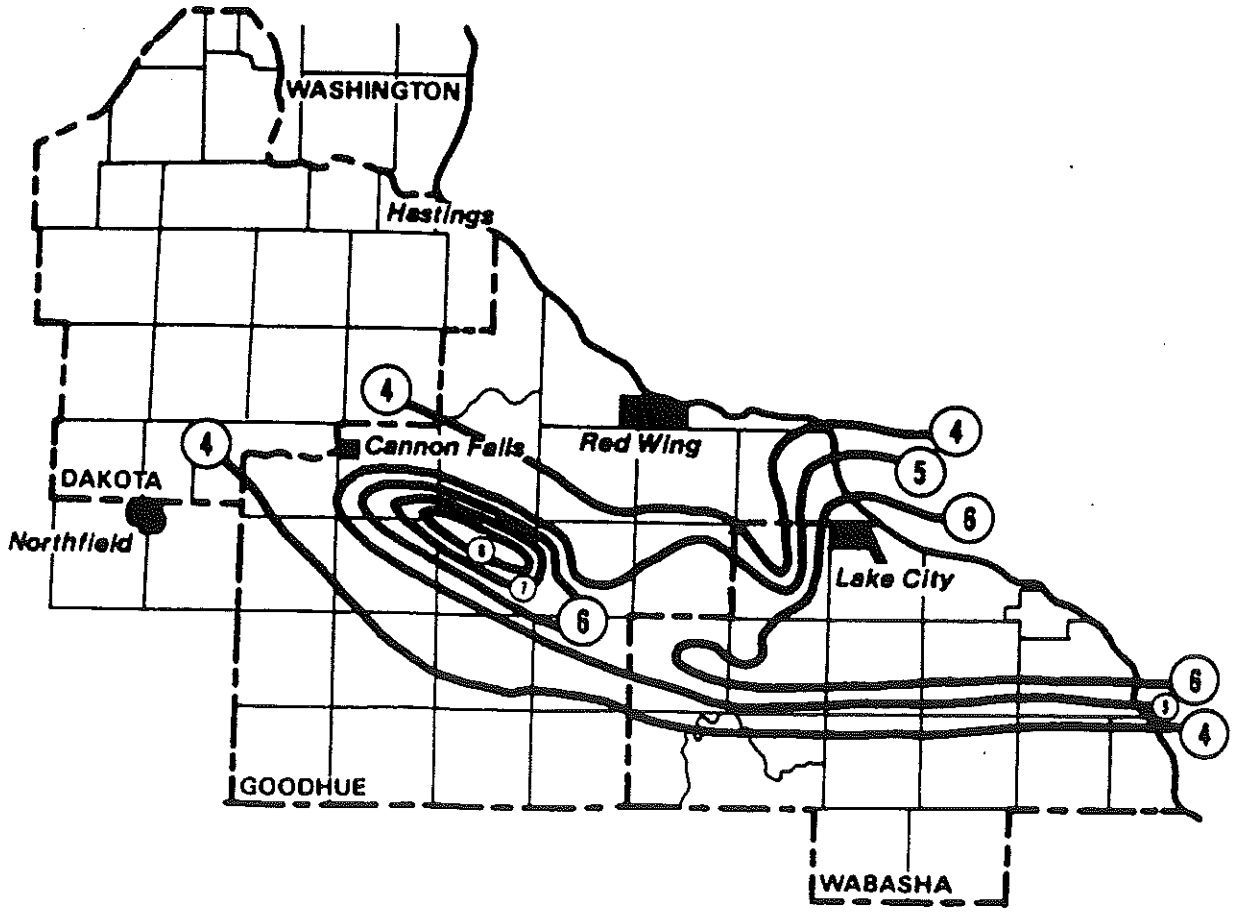

Figure 3. SOUTHEAST FLASH FLOOD
June 30 — July 1, 1978

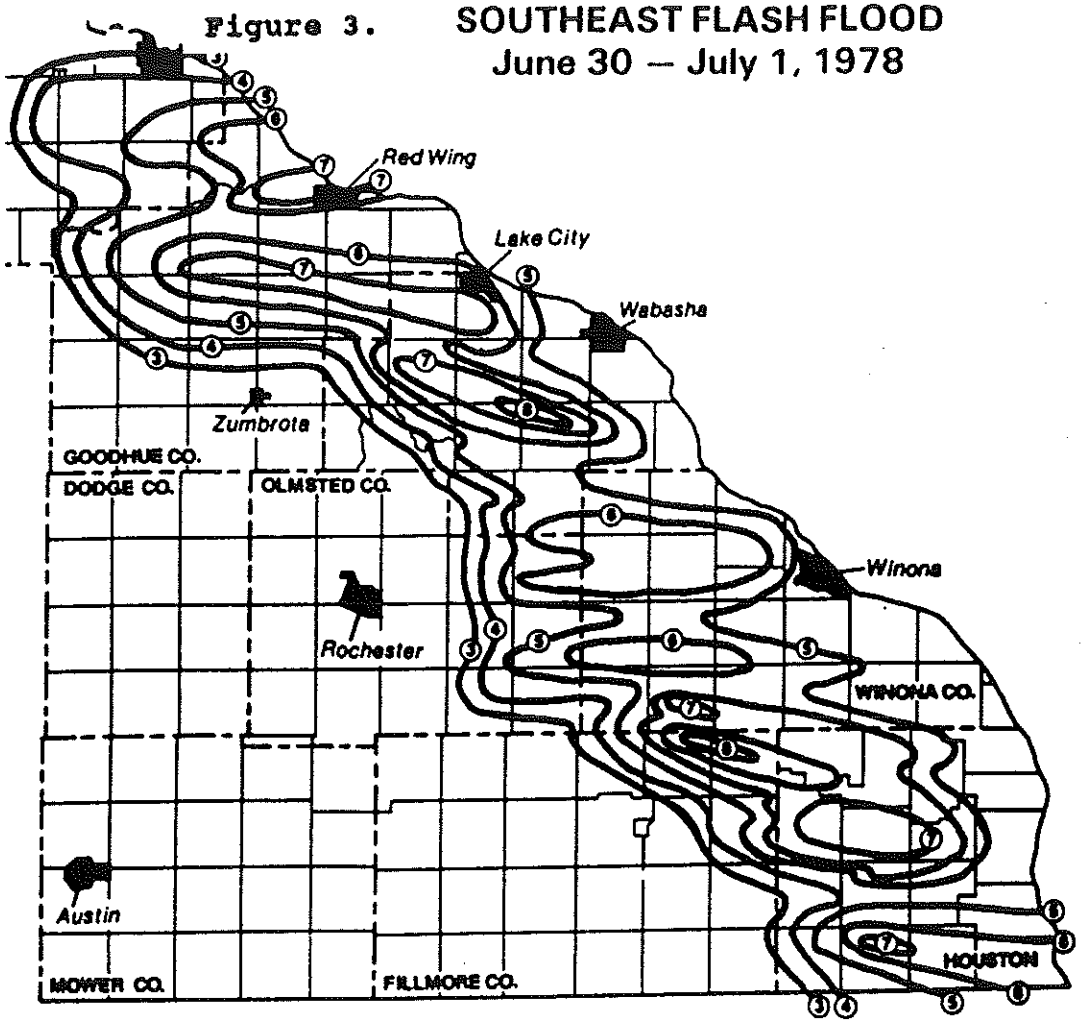

Figure 4. Precipitation Gaging Network

1994 GOODHUE Monthly Precipitation, Totals

TTTRRSSN OOOOOOOO	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AGR	HYD	ANN	GRO
10916197 BORAAS R	1.29	0.96	0.57	4.14	1.77	4.49	2.67	6.53	4.75	2.75	1.25	1.06	28.84	30.18	32.23	20.21
10917237 BANG GEN			0.10	3.98	1.44	4.07	1.82	6.84	5.61	2.70						19.78
10918 67 FINNESGA	1.37	0.70	0.37	3.97	2.03	6.47	3.31	7.15	5.32	2.80	1.41	0.36	31.42	33.86	35.26	24.28
11015302 ZUMBROTA	1.18	e0.60	0.39	4.81	2.01	3.24	3.25	8.23	4.53	2.67	1.48	0.53	29.40	31.49	32.92	21.26
11015324 LOHMANN				4.90	2.09	3.55	2.60	8.35	4.75	3.01						21.34
11016367 STEGER T	0.84	0.45	0.34	4.11	2.05	2.96	3.12	7.73	3.72	2.87	1.27	0.41	27.91	29.21	29.87	19.58
11018157 SCHMIDT	0.56	1.35	0.24	3.79	2.59	5.11	3.21	7.02	4.22	2.57	1.49	0.44	29.88	31.03	32.59	22.15
11018287 SHELSTAD	0.93			4.06	2.44	5.12	2.43	7.66	4.28	2.75	1.06	0.40				21.93
11216317 ANDERSON	2.15	1.30	0.65	3.64	1.86	3.75	3.45	6.93	6.63	3.30	1.57	0.71	28.99	32.83	35.94	22.62
11217184 SPRINGER				4.77	1.69	3.97	5.43	5.22	8.48	3.33						24.79
11218307 NORTHRUP				3.23	1.65	4.14	3.46	5.99	5.46	3.02	1.01					20.70
11314292 RED WING	1.26	0.66	e0.48	4.15	2.17	3.64	5.18	6.73	10.85	2.40	1.18	0.28	29.67	38.43	38.98	28.57
11314314 LARSON L	3.23	1.75		6.68	2.87			7.29	12.28	2.11	1.55	1.00				
11315 47 KCUE/KWN	2.55	1.54	0.72	3.91	1.73	4.63	5.88	6.84	11.29	2.33	1.76	0.75	33.66	42.44	43.93	30.37
11315 52 RED WNG	0.95	0.31	0.23	3.19	2.26	4.79	4.05	6.72	8.74	3.02	1.23	0.47	27.40	33.97	35.96	26.56
11316 87 EISERT G				4.63	1.89	5.41	3.10	5.78	8.98	4.30						25.16
county averages	1.48	0.96	0.41	4.25	2.03	4.36	3.53	6.94	6.87	2.87	1.36	0.58	29.69	33.72	35.30	23.29
# of obs	11	10	10	16	16	15	15	16	16	16	12	11	9	9	9	15

Abbreviations denote the following: CC = county #; TTT = township #; RR = range #; SS = section #; N = network #
(networks: 1 = Minn DNR Forestry; 2 = National Weather Service; 3 = Metro Mosquito Control; 4 = Back Yard Rain Gauge; 5 = Future Farmers of America; 6 = KSTP - TV; 7 = Soil & Water Conservation Districts; 8 = Deep Portage Conservation Reserve, Minnesota Association of Watersheds, Minnesota Power & Light)
JAN-DEC = monthly total precipitation; AGR = agricultural year (Sep 93 thru Aug 94) precip; HYD = hydrologic year (Oct 93 thru Sep 94) precip;
ANN = annual (Jan 94 thru Dec 94) precip; GRO = growing season (May 94 thru Sep 94) precip;

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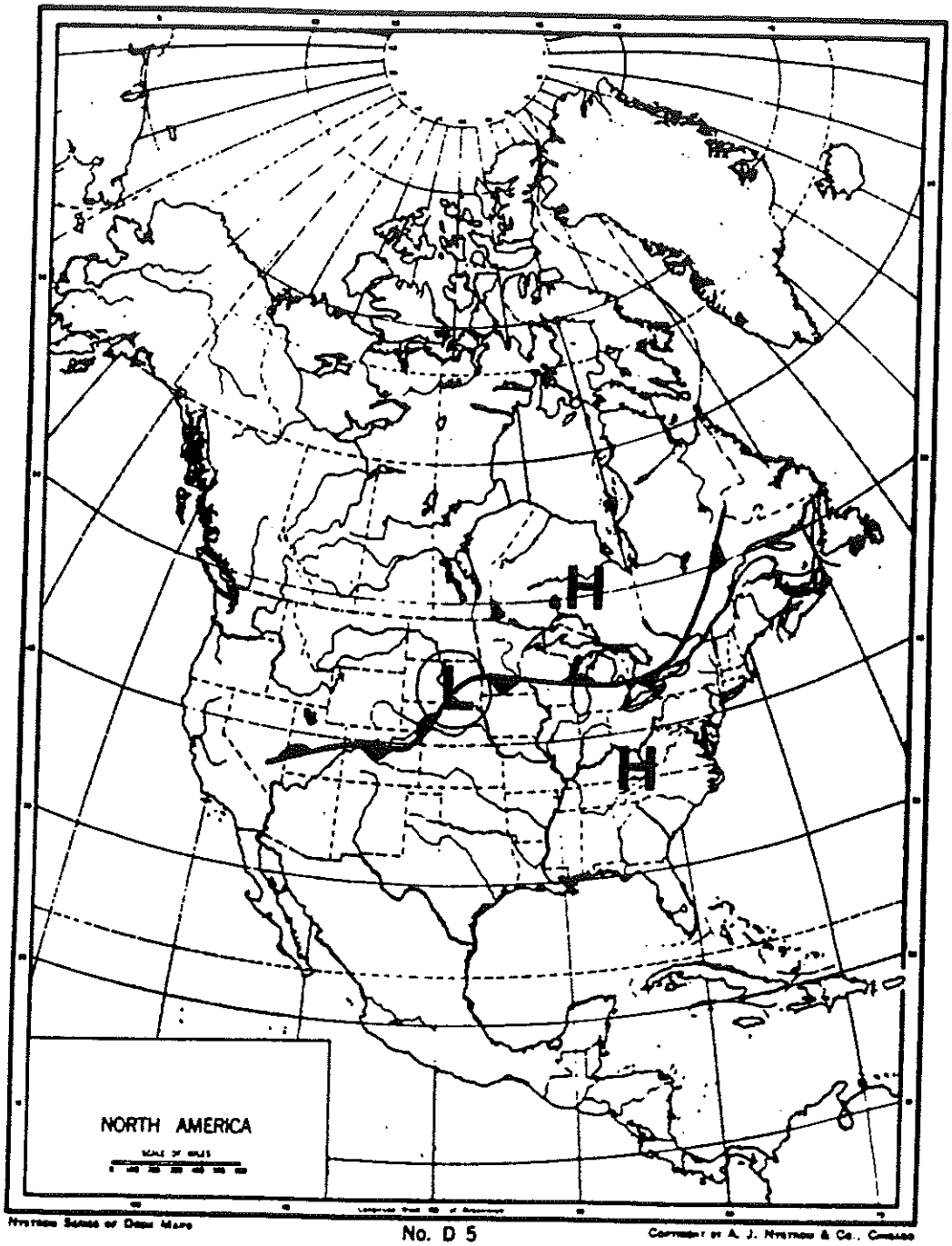

Figure 5. Basic surface synoptic weather pattern associated with Minnesota flash floods.