HAILFALL AND CROP DAMAGE IN CENTRAL ALBERTA

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Hail occurs within a 90-mile radius of Red Deer on an average of 61 days between 15 May and 15 September. Figure 1 shows a summary by months of various hail parameters. The season reaches its peak in July when the probability of a hailday is at a maximum of 66%. The probability gradually falls off in August and by September the season effectively is over. On the average very few haildays occur in May or in September, with most of the hail activity concentrated between June and August.

A major hailday is defined as a day on which at least one major hailswath occurred. A hailswath is defined as a precipitation pattern observed on the surface, as a result of convective activity, and from which at least 6 hail reports were obtained. A major hailswath is defined as a hailswath from which at least 10 hail reports were obtained (with walnut size or larger hail reported at some point).

The average number of major haildays is 16 with 7 of these occurring in July. The probability of a major hailday in either May or September is low, with only 12 days recording a major hailswath in the 17-year period. Shown in this table is also the monthly distribution of the mean number of reports obtained. In the 17-year period (1957-1973) 455 major hailswaths occurred in central Alberta, with about half of these in the month of July. Of these hailswaths 66% had a swath length less than 50 mi while 8.6% persisted over 90 mi distances. On the average 26.8 major hailswaths can be expected in central Alberta per year with 2 of these being greater than 90 mi in length. Over 96% of the major hailswaths occurred between the beginning of June and the end of August with a peak of 48.9% reported in July. Very few major hailswaths occur in May or September, and the occurrence of such swaths is extremely rare in April or October. Average hailfall durations in Alberta storms is 10 min. while hailfalls over 30 min are infrequent. This figure also shows a monthly summary of the mean number of haildays with hail walnut size or larger. Here again large hail occurs on more days in July than in any other month, with June and August about equal. The average number of haildays with large hail per year is 23.3 with 10 of these occurring in July. The last row is the percentage of reports indicating soft hail for 10 year period (1964-1973) of data. There was a marked seasonal variation with a maximum frequency of occurrence in May (59%), June (58%) and September (56%) and a minimum in July (45%) and August (43%).

Singularities. Figure 2 shows a tendency for hail activity to peak on certain dates. Eight peaks predominate between 16 June and 27 July, with the largest occurring on 15 and 16 July. In the 17 years it has hailed 15 times on these two days. The month of June has three peaks; 16, 17 and 30 June, while the remaining five peaks show up in July; 4, 5, 15, 16 and 27 July. No singularities show in May, August or September.

MONTHLY SUMMARY OF VARIOUS HAIL PARAMETERS

HAIL PARAMETER	MONTH					AVERAGE
	MAY	JUNE	JULY	AUG	SEPT	
AVG NO OF HAILDAYS	4.5	18.8	20.5	14.5	3.1	61.3
PROB OF A HAILDAY (%)	28.1	62.7	66.1	46.8	20.7	49.8
AVG NO OF MAJOR HAILDAYS	.5	4.4	7.1	3.7	.2	15.9
TOTAL NO REPORTS	1015	13602	26410	12508	505	54040
AVG NO REPORTS	59.7	800.1	1553.5	735.8	29.7	3178.8
MEAN HAILFALL DURATION (MIN)	9.3	9.6	10.7	9.8	9.1	10.1
MAJOR HAILSWATH OCCURRENCE (% FREQ)	2.4	25.1	48.7	23.7	.7	
NO OF HAILDAYS WITH HAIL WALNUT OR LARGER	1.0	5.9	10.0	6.1	.4	23.3
% REPORTS WITH SOFT HAIL	58.8	57.9	44.6	43.0	55.5	46.9

Figure 1. Monthly Summaryof Various Hail Parameters.

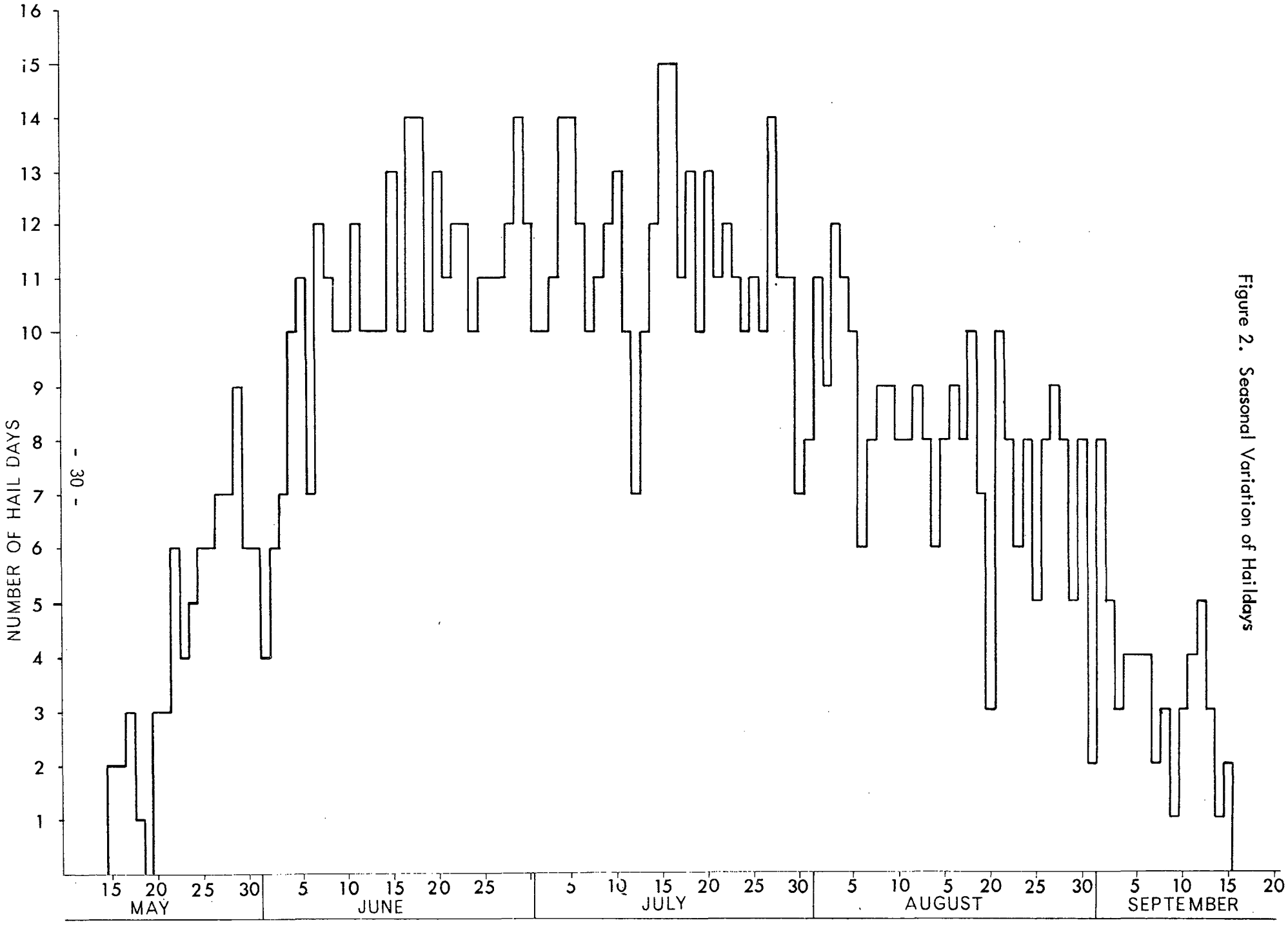


Figure 2. Seasonal Variation of Hail days

The comparison of frequency of occurrence of the number of major haildays with the total number of haildays for each year is shown in the bar graph of Figure 3. The shaded bars represent the total number of haildays while the solid bars the number of major haildays.

Figure 4 shows the occurrence of the number of haildays expected in a 10-year period when maximum size is larger than walnut. Contours in increments of 2 days are shown in this figure with corresponding shaded areas given in the key. Two main singularities are indicated (corresponding to the two main hail belts); one in the Rocky Mountain House area and a second in the Sundre area. In these areas on the average it can be expected to have 10 haildays with maximum size (walnut or larger) in 10 years or one per year. In areas not shaded, less than 2 days with large hail can be expected in a 10-year period. Large hail is not common in these areas.

Direct Losses to Crops. Figure 5 shows the estimated total damage to crops in Alberta. The average loss in the last 14 years is $28 million per year. Due to inflation (higher prices for crops) the losses in the last few years are over $40 million mark, even though the loss to risk ratio has decreased in these years.

In addition to these direct losses there are secondary losses in the areas affected, due to decrease in general business activity. Agricultural economists have estimated that these secondary losses could be accounted for by a multiplier factor of approximately 1.5. This then adds another $14 million to the direct crop losses, or about $20 million in the last few years.

The single worst day each year accounts for nearly 20 percent of the year's total damage. Half of the year's damage occurs on four days and 80 percent of the damage on the worst 12 days. Most of the hail damage occurs on those days with severe persistent travelling storms which produce hail walnut size or larger.

One such day this year was 6 July 1975 and Figure 6 shows the hail-swath produced by this storm as it tracked on west side of Edmonton, through Leduc, Millet, Wetaskiwin in a SE direction. The green and red area indicates the area where hail occurred while the red area indicates the area where stones walnut and larger were observed. Also shown in this figure is the radar echo plot with times and heights of the storm shown. At the peak of this storm over Wetaskiwin the cloud tops were observed to be 55,000 ft. high.

Figure 3. Frequency of the Number of Haildays (Shaded Bars - Total Number of Haildays; Solid Bars - Major Haildays).

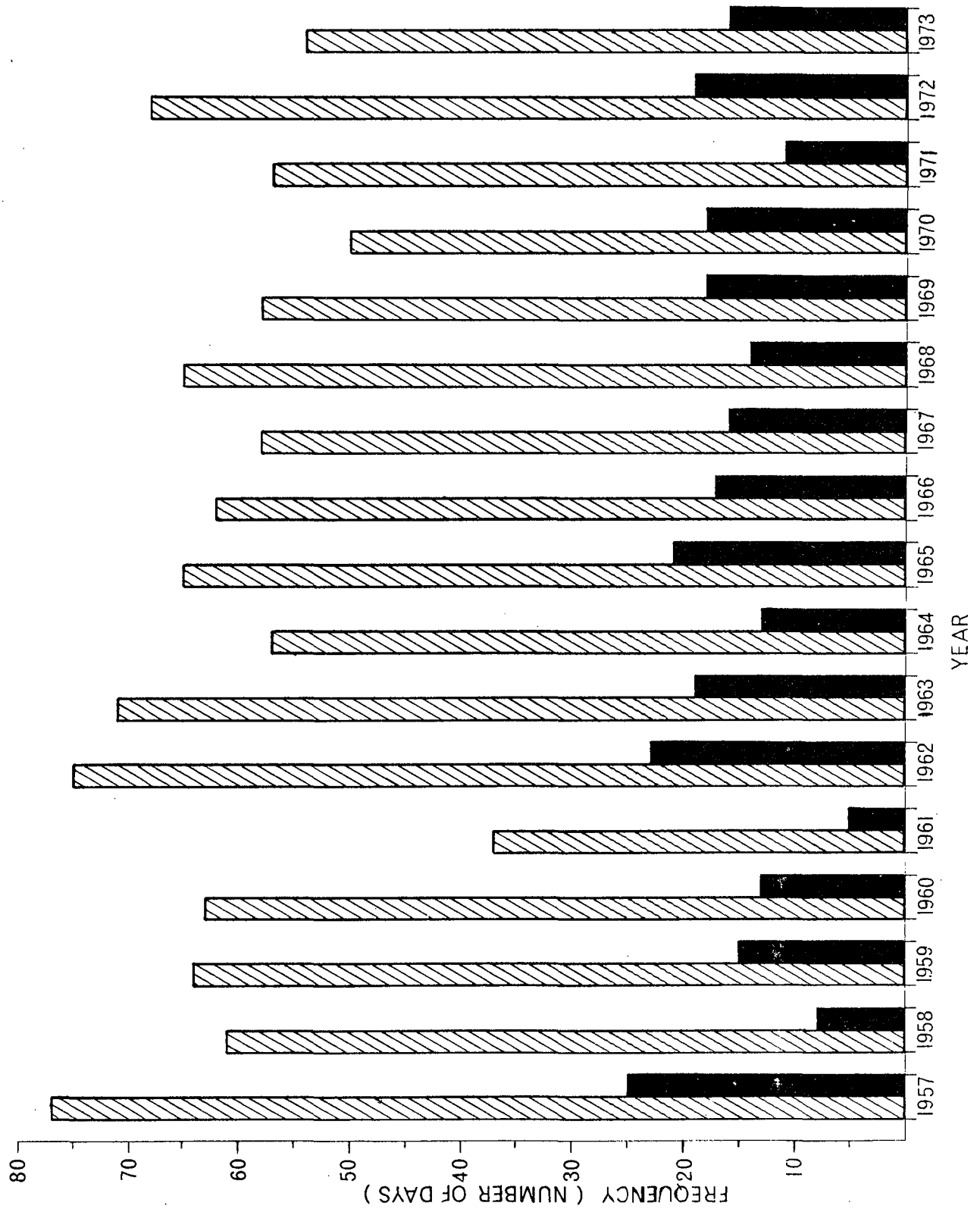
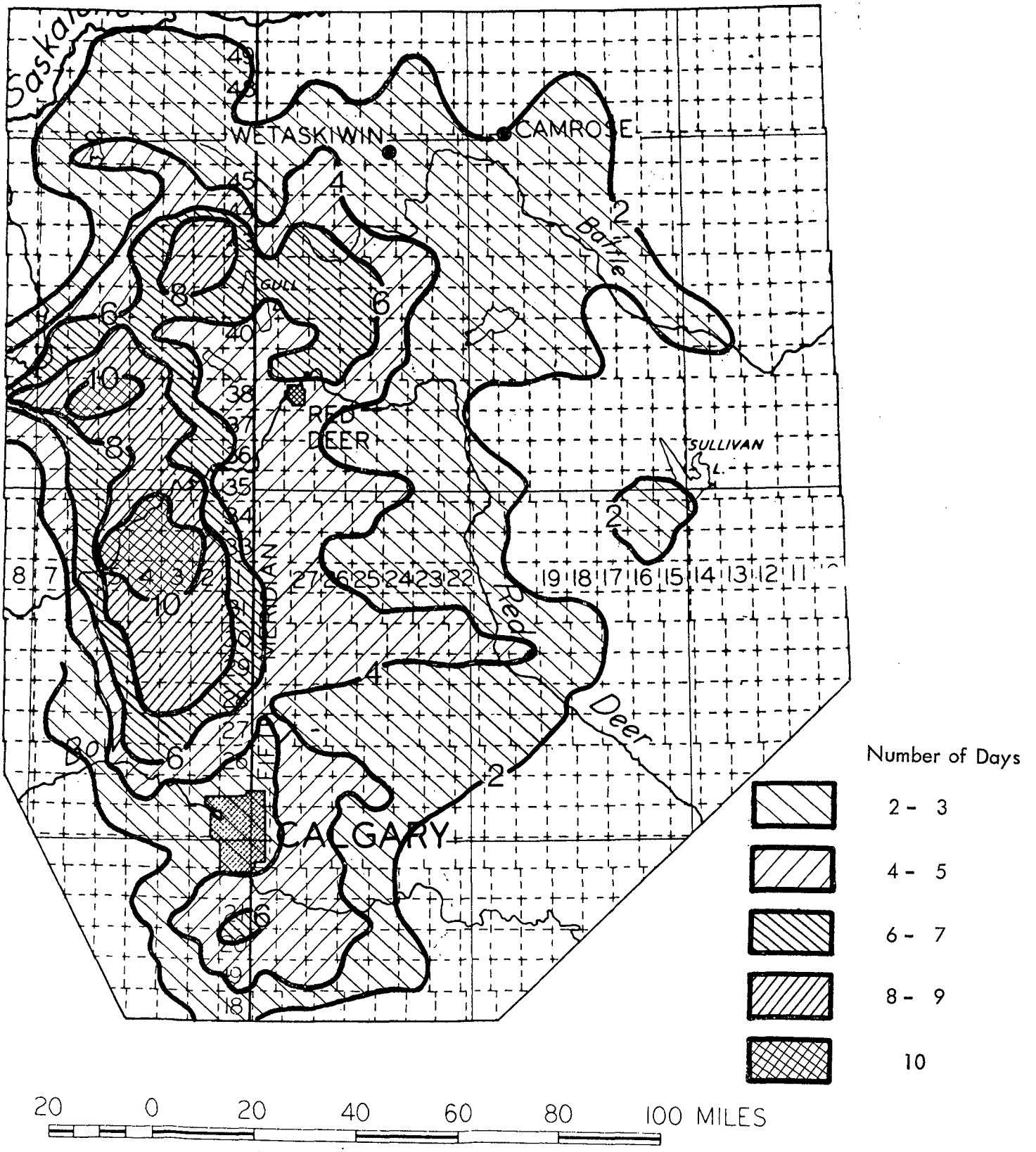


Figure 4. Number of Days in a 10-Year Period with Large Hail as Maximum Size



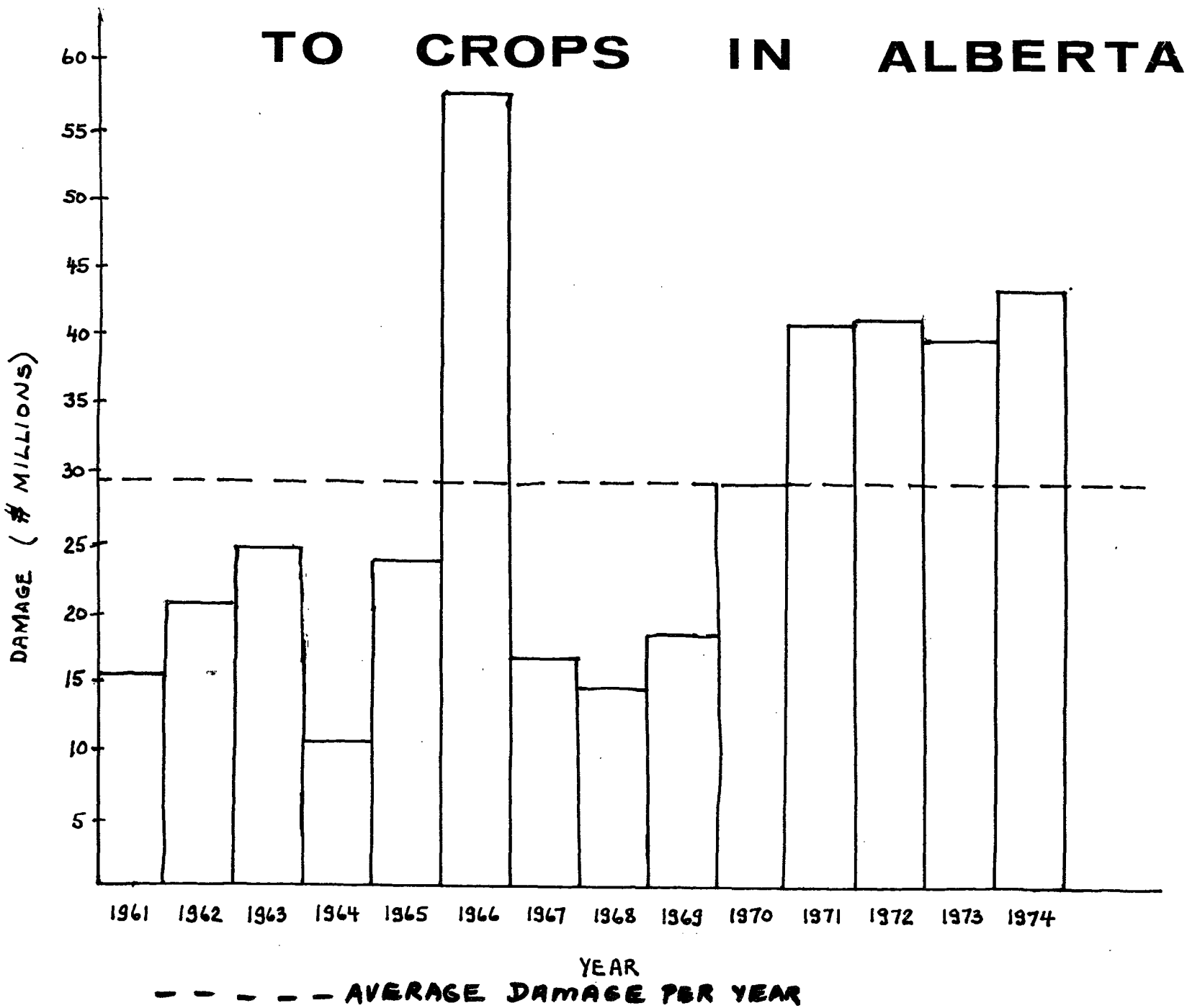


Figure 5. Estimated Total Damage to Crops in Alberta.

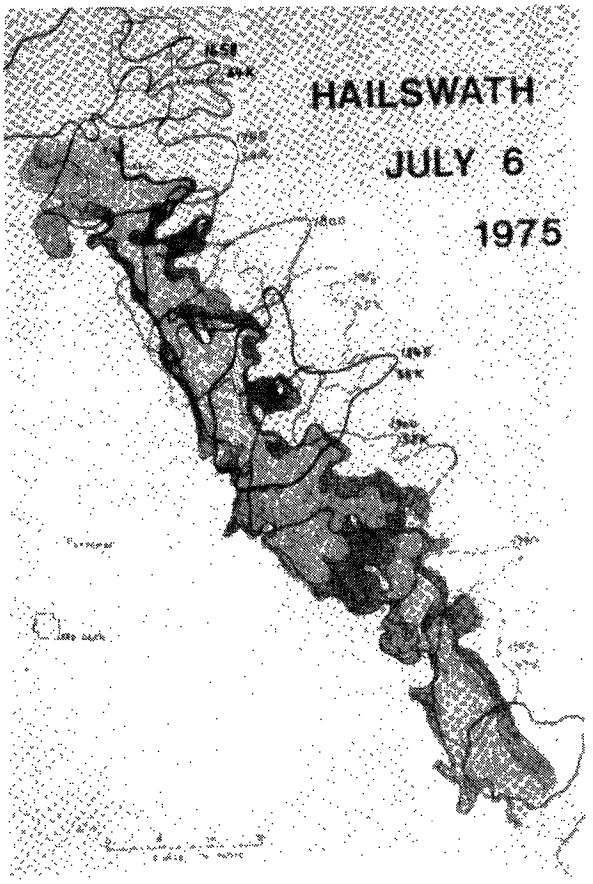


Figure 6. Hailswath of the 6 July, 1975 Storm.

One way to objectively measure the hailfall on the ground is to use a hailpad (1 ft. by 1 ft. styrofoam pad). Hailpad results are not yet available from the July 6, and not presented at this time. The following sequence of figures shows some of the returned hailpads from this storm, property and field damage caused by the storm and some of the large sizes of stones that fell.

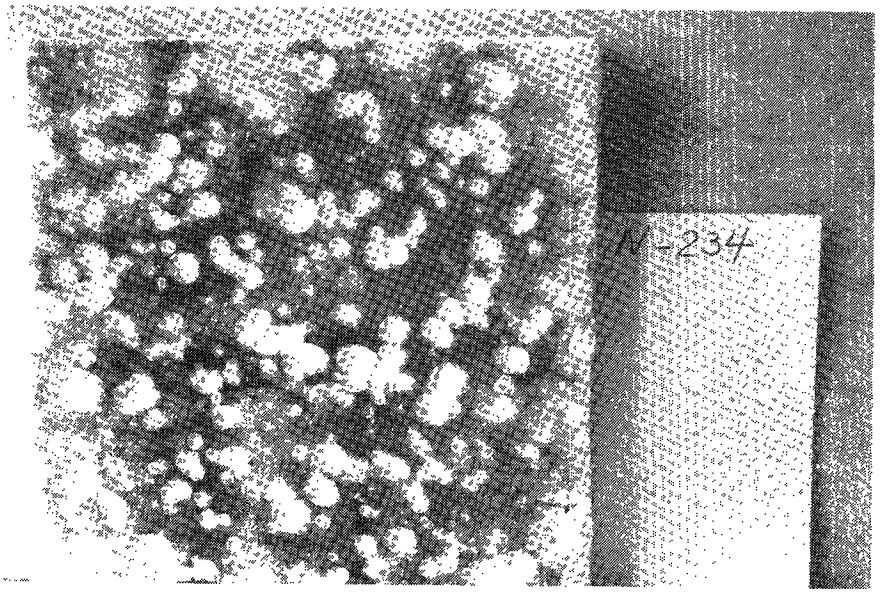


Figure 7. This hailpad shows dents caused by grape and pea size hail, accompanied by strong winds causing 100% damage to the field crop.

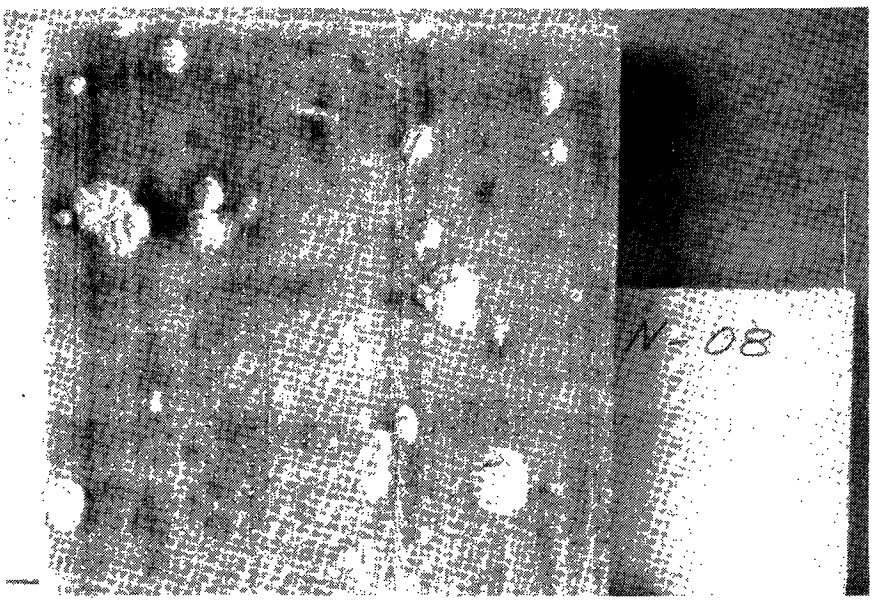


Figure 8. This hailpad shows dents caused by golfball stones, with some grape and pea size, accompanied by strong winds and causing little damage to the barley and ot crop.

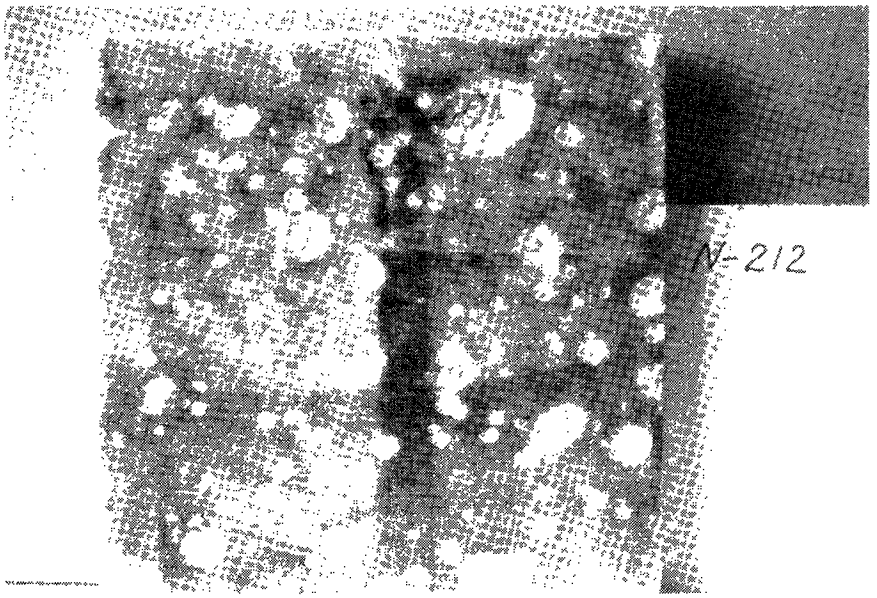


Figure 9. This hailpad had golfball stones hit the surface with the majority being grape in size. Light winds accompanied the hailfall causing 25% damage to all 625 acres of rape, barley and oats.

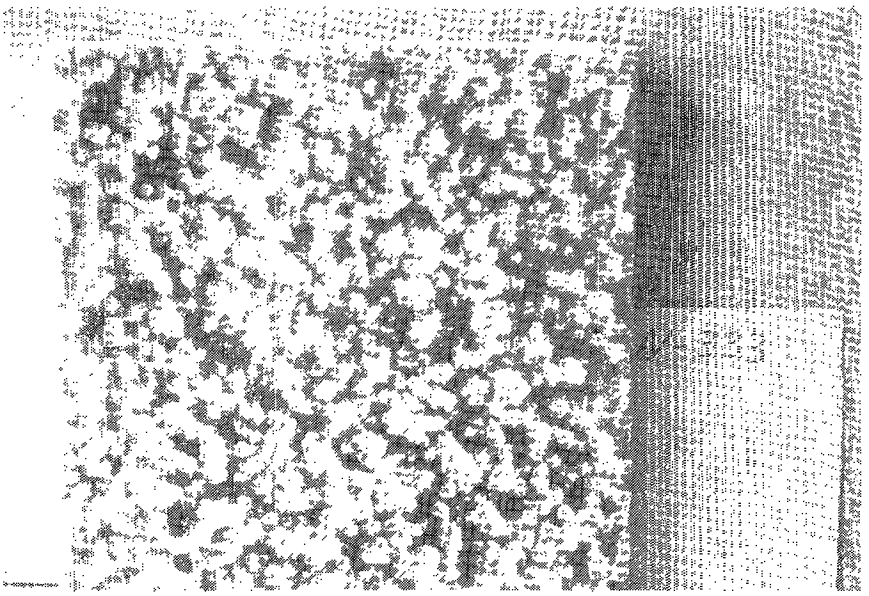


Figure 10. This hailpad had mostly grape and pea size stones strike the surface, accompanied by moderate winds, causing 100% damage to all 130 acres of barley. The hailfall lasted for 5 min.

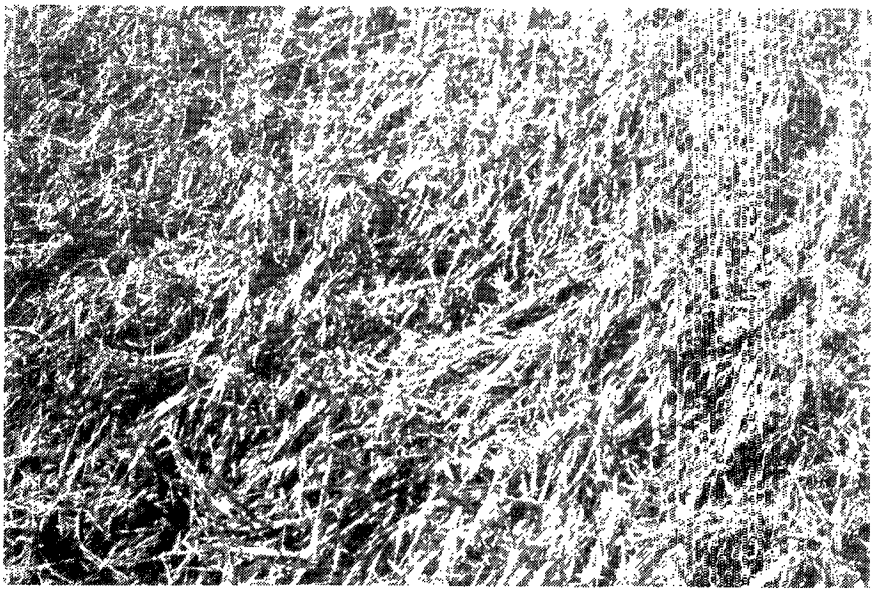


Figure 11. This is a picture of a field near Leduc as a result of the storm of July 6, 1975.

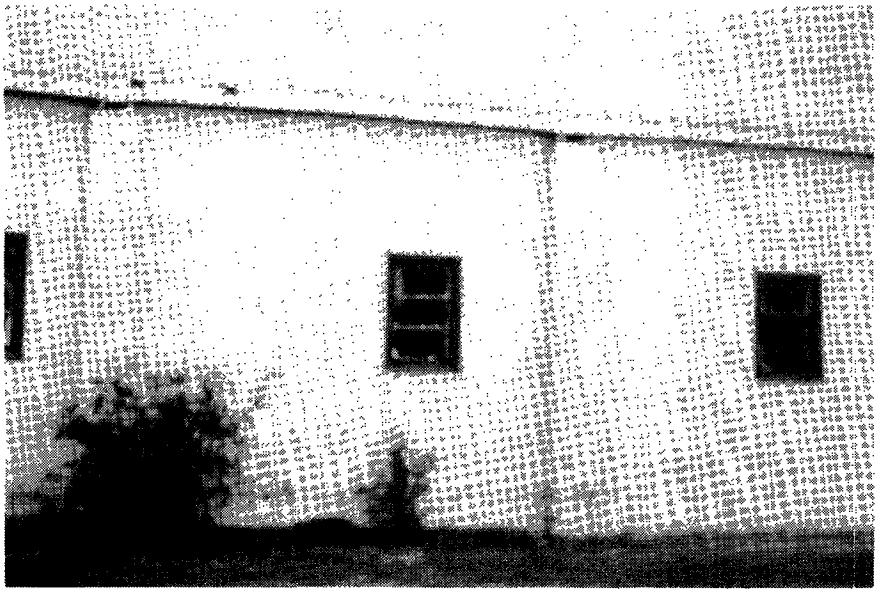


Figure 12. Hotel in Millet, Alberta with all the windows on the north side smashed. This picture was taken 3 hr. after the storm of July 6, 1975.

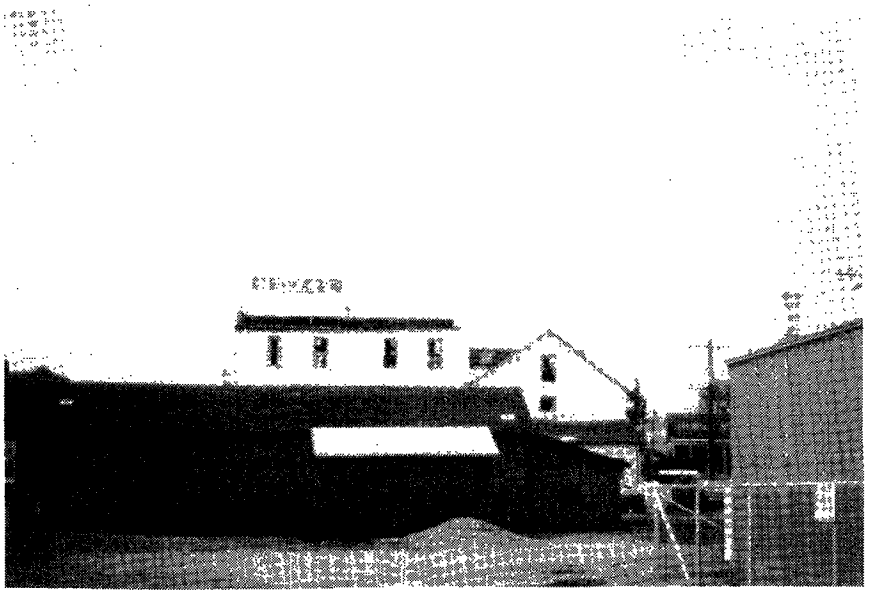


Figure 13. Townhall in Millet with all the windows broken.

Figure 14. "Ford" sign in Wetaskiwin broken by the hail from the July 6, 1975 storm. Also in the background is the "Action Muffer" sign broken.

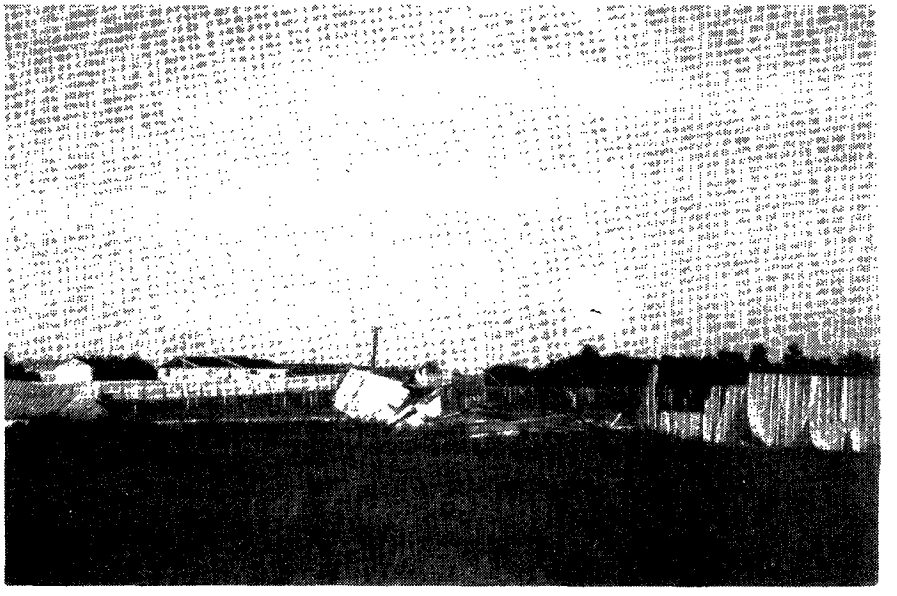


Figure 15. All that remains of a drive-in screen in Wetaskiwin, which was ripped by hail and torn and twisted by the strong winds accompanying the storm.

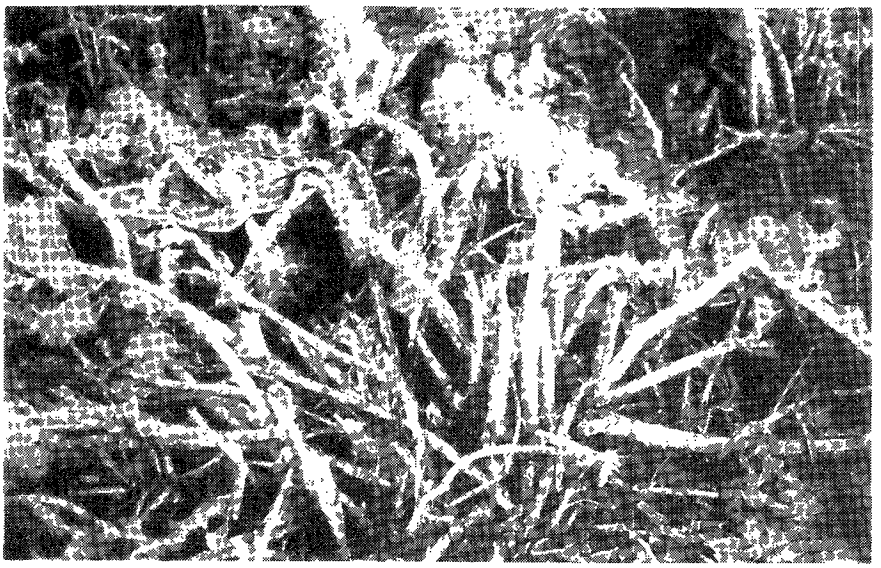


Figure 16. Rhubarb hit by walnut and golfball hailstones.

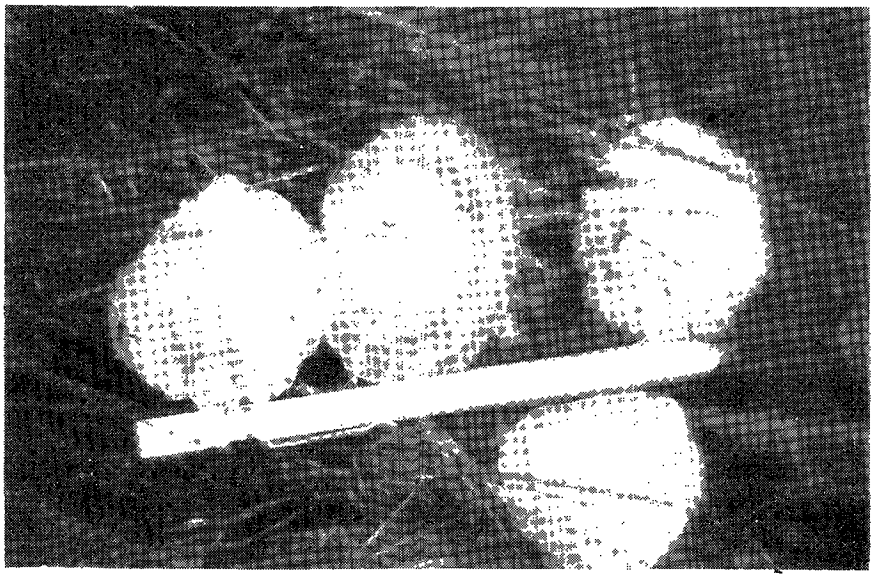


Figure 17. Some of the stones that fell in Millet lying on the ground three hours after the storm. Note the flat stone in center of the picture with its visible ring structure.

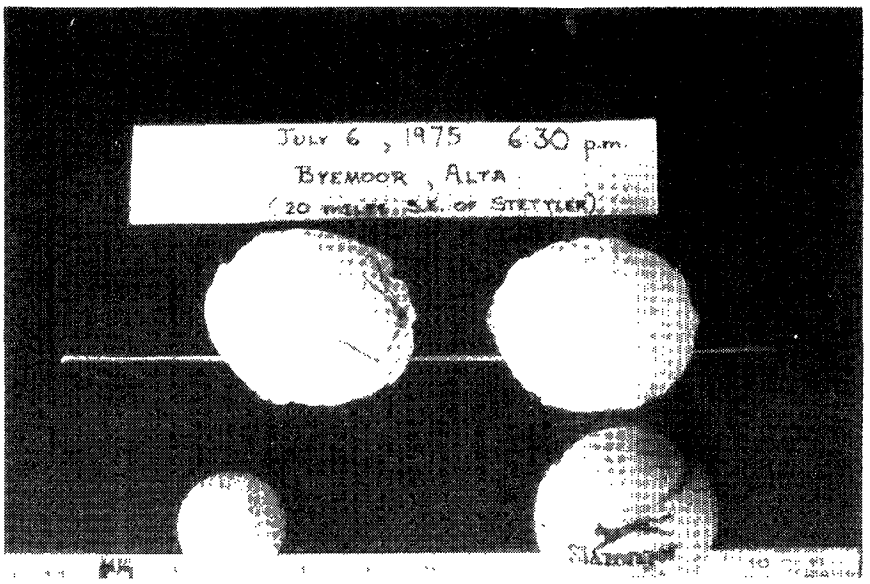


Figure 18. Size of some of the large hailstones that fell from the July 6, 1975 storm. These were picked up near Byemoor, Alta. at 6:30 pm. (photo courtesy of T. Krauss).

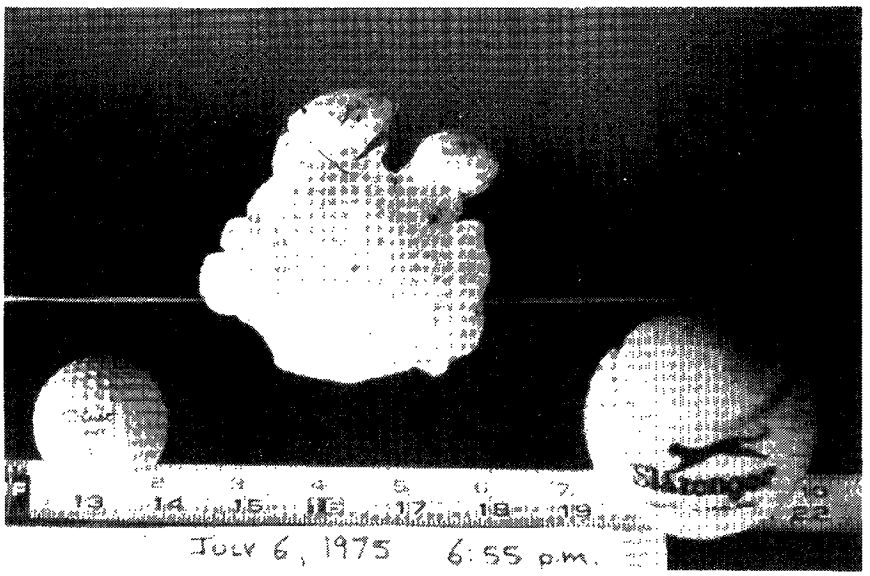


Figure 19. Note the odd shape of the stone in this picture. This stone weighs 149 gm. (photo courtesy of T. Krauss).