

One for the History Books: The Winter of 2000–01 in St. John’s, Newfoundland

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ABSTRACT

The winter season of 2000–01 in St. John’s, Newfoundland and surrounding areas was one of the most significant all-time meteorological and climatological “events” on record for this area. Total snowfall shattered the previous record by 50 cm, or almost 2 feet while snow depth, rainfall and storm frequency also significantly deviated from normal values. This paper investigates the winter of 2000–01 and provides a glimpse into the impact on the communities, businesses, schools and municipal budgets.

INTRODUCTION

The winter of 2000–01 was perhaps the most memorable season on record for St. John’s, Newfoundland. Canada's most easterly city broke its all-time record for total snowfall, with 648.4cm (more than 21 feet), making it not only the highest total snowfall over 130 years of record but also the highest all-time snowfall among all major Canadian cities. In addition, an abnormally high frequency of winter storms and record high snowbanks had a significant impact on the city. Schools and businesses were frequently closed under blizzard conditions and municipal budgets ballooned as a consequence of snow clearing operations. Meanwhile, successive storms frequently provided front page or lead stories in the media and the march toward the all-time snowfall record captured provincial and national attention.

SNOWFALL RECORD

Two sources of record were used to determine heavy snowfall seasons. St. John’s ‘A’ provides extensive meteorological information from 1942 to present day collected from St. John’s International Airport. The Climate Station contains data collected from 1874 to 1956 at a sequence of locations in the downtown area of St. John’s and is not complete.

Although snowfall from May to October is minimal, snowfall totals for each “winter season” are based on monthly totals from July to June and therefore reflect a single, uninterrupted time period. The top snowfall seasons at St. John’s (those greater than 500 cm) are as follows:

2000–01	648.4	St. John’s A
1881–82	598.2	Climate Station
1893–94	576.6	Climate Station
1955–56	576.0	St. John’s A

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1977–78	570.9	St. John’s A
1954–55	567.9	St. John’s A
1896–97	523.5	Climate Station

Since the record snowfall of 2000–01 from St. John’s ‘A’ has “broken” a snowfall record at a different site (the Climate Station), we have taken a brief look at comparative snowfall and precipitation numbers.

Average Yearly Snowfall

The average yearly snowfall values from each site:

St. John’s A (Airport): 347 cm.

Climate Station (Downtown): 259 cm.

The ratio of Average Yearly Snowfall (St. John’s A / Climate Station) = $347/259 = 1.34$.

Total Snowfall in “Overlap” Years

There are three years for which both St. John’s A and the Climate Station contain a full data set: 1951–52 and 1954.

Year	Total Yearly Snowfall Ratio (St. John’s A / Climate Station)
1951	$379.7/306.2 = 1.24$
1952	$285.5/250.3 = 1.14$
1954	$421/297.7 = 1.41$

Average Ratio for those three years = 1.26.

Total Snowfall in “Overlap” Months

Table 1 contains a comparison of snowfall amounts in the overlap years for January and February. The average ratio, based on the 15 sets of data, is 1.28.

Table 1. A comparison of monthly snowfall amounts for St. John’s A and the Climate Station.

Year	January			February		
	Airport	Climate	Ratio	Airport	Climate	Ratio
1949	93.7	71.8	1.31	144.8	97.8	1.48
1950	40.9	40.0	1.02	109.7	110.3	0.99
1951	64.0	49.7	1.29	67.1	71.7	0.94
1952	82.0	85.5	0.96	79.0	49.7	1.59
1953				65.0	74.7	0.87
1954	90.9	69.6	1.31	40.6	42.0	0.97
1955	85.6	77.6	1.10	75.4	42.3	1.78
1956	33.5	13.0	2.58	130.1	134.4	1.03

On average, higher snowfall amounts are reported from the airport site (elevation 140 metres) than the climate station (elevations ranged between 15 and 70 metres). During many winter storms in the St. John’s area, temperatures hover near the freezing mark. It is likely that higher snowfall totals recorded at the airport are a consequence of colder temperatures at higher elevation.

Yearly averages of total precipitation reported at each site differ by less than 10%. Average total precipitation from St. John’s A (1512.1mm) is greater than the Climate Station average (1390.3) by 8.7%. A comparison of monthly data for January and February during the overlap period (1949 to 1956) is contained in Table 2. Average ratio of total precipitation (St. John’s A/Climate Station) during that time period is 0.93.

Table 2. Comparison of total precipitation between St. John’s ‘A’ and the climate station in overlap period.

Year	St. John’s A	January Climate Station	Ratio	St. John’s A	February Climate Station	Ratio
1949	135.1	129.4	1.04	173.7	143.4	1.21
1950	70.6	105.0	0.67	137.9	159.8	0.86
1951	167.1	162.8	1.03	136.9	170.0	0.81
1952	209.3	214.2	0.98	233.9	216.1	1.08
1953				122.7	173.5	0.71
1954	205.2	202.5	1.01	98.8	173.7	0.57
1955	264.7	309.2	0.86	152.1	134.8	1.13
1956	126.7	97.5	1.30	174.2	256.7	0.68

MONTHLY SUMMARIES

Table 3 contains a snapshot of meteorological conditions for the six-month period of interest (total snowfall covers a longer time period). With the exception of March, precipitation and snowfall amounts exceeded the normals for each month, usually by a wide margin. Rainfall amounts were high in November, dropped dramatically to 5.7 mm in January, and then approximated normal values for the remainder of the season. Temperatures were near, or slightly below normal.

Table 3. A comparison of temperature and precipitation normals and values from November 2000 to April 2001.

Month	Temperature	Rainfall	Snowfall	Total Pcpn
	Normal/Actual	Normal/Actual	Normal/Actual	Normal/Actual
Nov	3.1/3.5	121.6/188.1	21.5/32.8	144.7/218.9
Dec	-1.7/-2.3	91.0/50.2	54.7/173.4	144.2/231.6
Jan	-4.3/-5.3	69.3/5.7	83.0/151.4	147.8/156.5
Feb	-5.0/-5.5	69.2/66.6	68.8/122.6	133.6/188.6
Mar	-2.5/-2.4	73.6/80.9	54.0/45.8	126.7/125.4
Apr	1.3/0.2	79.6/56.4	26.8/104.0	110.4/160.4

The only monthly record set was total snowfall for December—173.4 cm—breaking the previous record of 151.6 cm, set in 1958. The January rainfall total of 5.7 mm is worthy of note in that although it was only 8% of normal, it did not break the record of 1.5 mm, set in 1970.

STORM FREQUENCY AND SIGNIFICANT EVENTS

For purposes of this paper, a “significant” event is defined as one with at least 10 mm of precipitation. Special attention is focussed on dates with at least 10 cm of snow.

Climatological days (2:30 AM NST to 2:30 AM NST) between November 1, 2000 to April 30, 2001 in which total precipitation exceeded 10 mm are listed in Appendix 1. Daily snowfall, rainfall, and total precipitation values accompany the list.

Within this six-month period, 37 days recorded at least 10 mm of precipitation. Of these, 25 had at least 10 cm of snow, including 5 days with 20 to 30 cm (three of these on April 1/2/3) and one event with more than 30 cm of snow (Dec. 1, 37.6 cm).

In particular, nineteen days during the Dec/Jan/Feb timeframe had at least 10 cm of snow—equating to one event every 4.8 days. In comparison, there have been 355 climatological days

since 1942 with at least 10 cm of snow in the same timeframe – equating to one 10cm+ event every 15 days.

For the Dec/Jan/Feb period of 2000/01, 6.3 events with 10+ cm of snow occurred per month, compared with 2.0 events per month in the previous sixty years of record. In other words, the frequency of a significant snowfall event was three times higher than normal during the Dec/Jan/Feb 2000/01 season.

For the six-month period of interest, there were seven events with more than 20mm of rain; two of these occurred in the Dec/Jan/Feb time period (Dec. 12 and Feb. 27). The highest daily rainfall was 38.8 mm on Mar 24.

Clearly, the record seasonal snowfall was a consequence of a high frequency of moderate storms (three times higher than average) and not a consequence of a few high volume snowfall events (only one date exceeded 30 cm). Although a couple of winter storms were newsworthy, the winter season can be characterized more accurately as a relentless series of relatively short-lived snowfall and/or blizzard events, rather than a few especially long-lived and intense ones.

SNOW DEPTH

Although snowfall totals for the winter season average around 300 cm for the St. John’s area, the average snow depth, as shown in the “Normal” column of Table 4 is much less. Rain, fog, and periodic mild conditions contribute significantly to snowmelt.

The low rainfall totals and colder temperatures evidenced in Table 1 suggests an environment with lower than average snowmelt. As indicated in Table 4, actual snow depth on January 31 (144 cm) was 7 times the average for that date, while the maximum snow depth of 180 cm (February 9th and 10th) was the highest on record.

Table 4. Comparison of snow depth on the last day of the month (normal vs. actual).

Month	Normal (cm)	Actual (cm)	Maximum (cm) and corresponding date
Nov	1	7	12 (28 th)
Dec	10	36	54 (4 th)
Jan	21	144	144 (31 st)
Feb	24	76	180 (9 th and 10 th)
Mar	11	53	72 (1 st and 2 nd)
Apr	0	16	105 (13 th and 14 th)

IMPACTS

The cost of snow-clearing operations for the City of St. John’s for 2000–01 was \$12.4 million. This compares with average costs of \$6.6 million and minimum expenses (during a relatively quiet winter) of \$4.5 million. Snow clearing costs also ballooned in the neighbouring city of Mount Pearl, as well as local municipalities.

The frequent and intense blizzards throughout the St. John’s area resulted in numerous school closures. The Avalon East School Board, which covers a large area in and around St. John’s, reported almost a threefold increase in days lost due to weather conditions while a particular school a few miles from St. John’s was closed for a total of three weeks. Official figures were not available on business and government closures but school and business closures were frequently coincident.

The heavy snowbanks and consequent burden on fuel lines resulted in 600 residential oil spills from home heating oil tanks. Three hundred and forty claims were filed totaling over \$9 million. As a consequence, a Domestic Fuel Oil Spill Prevention Committee representing a cross-section of the community (vendors, government, environment, insurance, consumers) was struck. On

April 1, 2002, the provincial government enacted most of the recommendations from this committee.

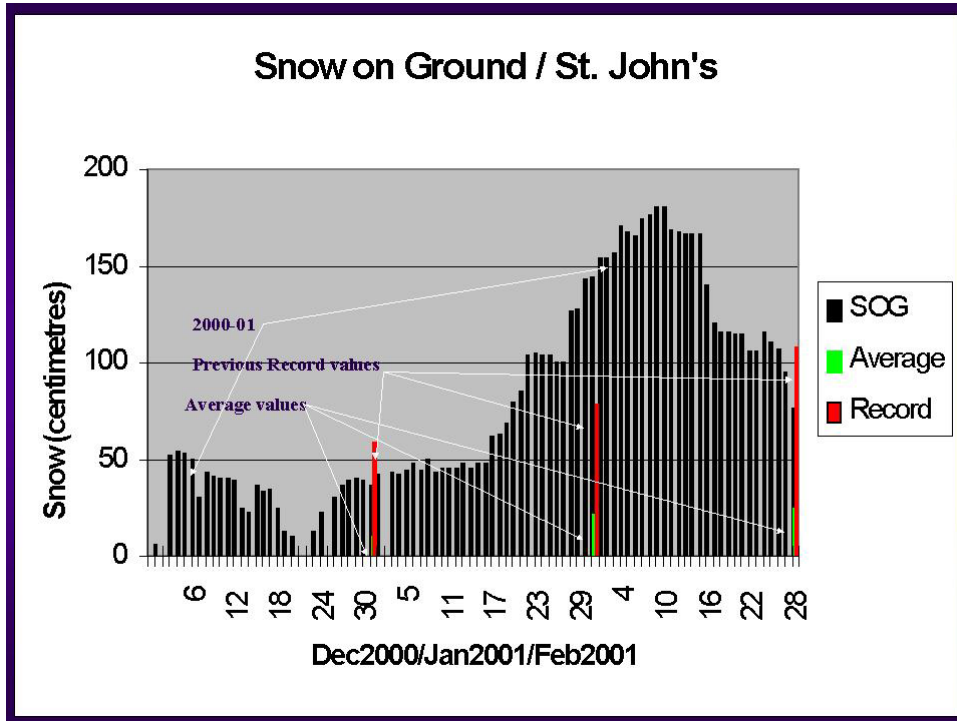


Figure 1. A comparison of snow depth during the winter of 2000–01 with normal and previous records.

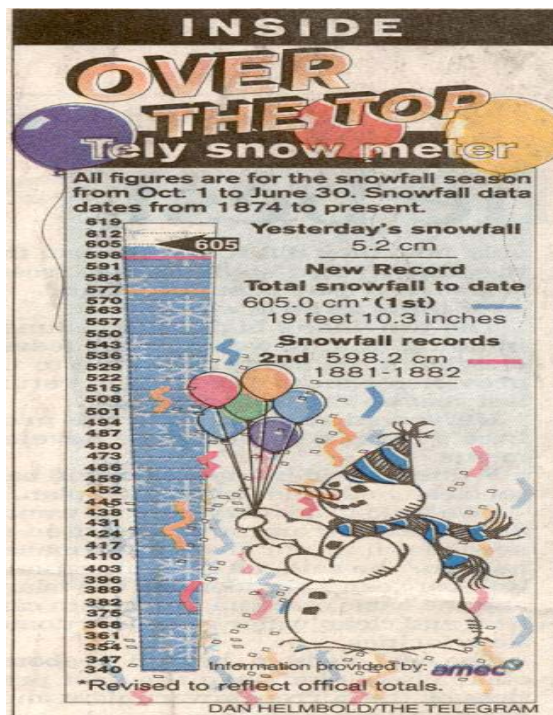


Figure 2. The daily newspaper headline the day following the record-breaking event.

CONCLUSIONS

The record snowfall of 2000–01 resulted from an abnormally high frequency of winter storms of moderate intensity extended throughout much of the winter season. Low rainfall and colder temperatures contributed to a reduced snowmelt, and consequent record snow depth.

The impact on the region was significant. School and business closures were frequent and the cost of snow clearing ballooned beyond budgetary limits. Even legislative measures were introduced as a consequence of the financial and environmental impacts of oil spills from heavy snowbanks. The impact on business downtime, lost revenue, reduced air and road traffic, and highway accidents has not been thoroughly investigated. Meanwhile, the seemingly endless series of winter storms eventually became a primary focus of the local and even national news media.

The winter of 2000–01 was clearly one of the most significant climatological events of record for eastern Newfoundland in general, and especially, for the City of St. John's.

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Appendix 1. Significant precipitation events (≥ 10 mm total precipitation).

Date	Month	Year	Rain (mm)	Snow (cm)	Total (mm)
05	Nov	2000	37.8	0	37.8
06	Nov	2000	11.7	0	11.7
08	Nov	2000	25.1	0	25.1
11	Nov	2000	18.2	0	18.2
18	Nov	2000	28.2	0	28.2
23	Nov	2000	0	11.0	11.0
27	Nov	2000	11.6	10.0	19.6
01	Dec	2000	Trace	37.6	37.6
02	Dec	2000	0	10.6	10.6
07	Dec	2000	1.2	11.0	22.2
08	Dec	2000	5.2	13.4	16.6
12	Dec	2000	24.1	Trace	24.1
15	Dec	2000	1.4	17.0	18.4
23	Dec	2000	2.4	18.8	21.2
24	Dec	2000	0	12.0	12.0
31	Dec	2000	0.2	12.8	13.0
07	Jan	2001	0.8	9.4	10.2
16	Jan	2001	Trace	14.8	14.4
20	Jan	2001	0	16.6	16.6
21	Jan	2001	0	13.6	13.6
27	Jan	2001	0.8	28.2	29.0
29	Jan	2001	Trace	16.4	16.4
31	Jan	2001	0	10.8	10.8
03	Feb	2001	Trace	21.4	21.4
06	Feb	2001	Trace	17.0	17.0
15	Feb	2001	14.8	14.4	28.8
17	Feb	2001	2.0	16.6	18.6
23	Feb	2001	0	19.6	19.6
27	Feb	2001	21.9	0	21.9
28	Feb	2001	15.7	6.0	21.7
10	Mar	2001	19.5	0.6	20.1
14	Mar	2001	38.8	0	38.8
24	Mar	2001	15.5	0	15.5
01	Apr	2001	8.1	20.8	28.9
02	Apr	2001	0.6	23.8	24.4
03	Apr	2001	25.6	23.2	48.8
30	Apr	2001	0	11.6	11.6