Atmospheric Hazards:
Consecutive Wet and Dry Days in Atlantic Canada

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Abstract

An analysis of consecutive wet and dry days during the warm season was completed as part of the Atlantic Canada Atmospheric Hazards project. This portion of the project is intended to display a simple indicator of drought or wet weather in the region. Drought is a serious concern to agriculture and water resources industries in the region, the impact of which can be devastating. Consecutive dry days provide a count of the number of consecutive days where no measurable rainfall occurs. Conversely, consecutive wet days were assessed as the number of consecutive days where measurable precipitation did occur. 151 climate stations were used in the analysis. The per cent occurrences of consecutive three, five, seven, and ten wet and dry days were computed for the entire period of record at each climate station and for the most recent climate normal period of 1971 – 2000. Results are presented in maps included in this report and in graphs which can be viewed at the website (www.hazards.ca). The maps show areas where there is a higher potential for either dry or wet spells and can be used to plan for the hazard. Suggestions for future research include trend analysis, consideration of precipitation amounts, socio-economic impacts of drought, and application of alternate drought indices applicable to the unique climate of Atlantic Canada.

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Introduction

Periods of prolonged dry or wet weather can have significant impacts on various aspects of society. Prolonged dry spells, indicative of low precipitation, can cause dry soils, low fresh water levels and increased wild fire risk. Prolonged wet spells may lead to waterlogged soils, agricultural disease outbreaks or declines in summer tourism activity.

When people think about drought in Canada, they generally envision the Prairies, with failing crops and dust storms. While Atlantic Canada is not commonly associated with drought, it is a serious hazard. Take for example the 2001 drought in South-eastern New Brunswick, the Annapolis Valley in Nova Scotia, and Prince Edward Island (Wheaton *et al*., 2005). In PEI, crop yields dropped 50 per cent and potato crop yields were down 36 per cent at a value of $52.7 million. In New Brunswick, horticulture production was down between 30 and 60 per cent. Nova Scotia's wild blueberry crop yield was 50 to 75 per cent below normal and losses in spring wheat, hay, potatoes, beans, apples and blueberries cost $27.5 million. Newfoundland also saw a decrease in the production of cabbage, broccoli, cauliflower, and brussel sprouts crops. Drought related losses are not confined to agriculture sectors because as crop yields fail so to does the demand for related farming equipment, supplies and labour. In 2001, the Gross Domestic Product of the Maritimes was down $115,122,000 and the provinces lost 1,042 jobs due to the drought.

Future droughts do not just threaten agriculture, but also water supplies for industry, human consumption, and hydro electric generation facilities. Hydro electric power generation is gaining in popularity as the public strives to use more renewable energy and as electricity demands increase. A change in the precipitation regime of an area can threaten this generating potential. Similarly, a change in precipitation amounts may threaten fish habitat as water levels fall. A drop in water level could expose fish to higher temperatures and more sunlight than the species are able to survive in. Water demands continue to rise as cities grow, which, in periods of prolonged dry weather, will necessitate water conservation or rationing.

Areas are prone to flooding if there is a period of heavy rainfall and the land surface is unable to absorb the water before it runs off. Slope, elevation, the type of land surface, and soil conditions will strongly influence the location and severity of flooding. Long periods of wet weather may increase the flooding potential by reducing the amount of new rainfall that can be absorbed into the water table as the soil is near the saturation point. Too much rain may wash pollutants into rivers and streams resulting in fish mortality.

In order to develop an index or tool to estimate the potential risk from dry or wet spells a study of pronged wet and dry days was completed. This report is part of a larger project intended to assist provincial and municipal governments and other stakeholders in identifying risks that threaten their locations by providing information on high impact climate events. The Atmospheric Hazards website project is intended to provide information for all regions across Canada when completed. This report is a

background document in support of the Atlantic region node of the Atmospheric Hazards project. The website can be viewed at www.hazards.ca.

Drought Definition

Drought can be defined as a deficiency of precipitation from the expected value or "normal" such that it is insufficient to meet the demands of human activities and the environment. Drought is a normal part of climate variability and it affects all climates, whether tropical rain forest or mid-latitude desert. Drought should be distinguished from the term "aridity". It is a temporary condition while aridity describes the normal (Wilhite and Buchanan-Smith, 2005). Drought is a natural hazard which under certain circumstances can cause hardship or disaster. Whether a drought leads to disaster or not depends on the vulnerability of the human or natural environment. Just as drought has no unique definition there is no unique index to quantify it. They can be classified according to severity, area, duration and impact. Also important are onset and ending thresholds.

Consecutive Wet and Dry Days

There are many indices used to quantify droughts in Canada and around the world. However, because of the thin soil layer in Atlantic Canada and the varied climate regime, popular drought indices, such as the Palmer Drought Severity Index, do not translate well to Atlantic Canada. For this reason we used consecutive dry days as a drought index and consecutive wet days as a flood potential index.

Consecutive dry days are a count of the number of consecutive days in which no measurable precipitation (<0.2mm) occurs. Conversely, consecutive wet days are a count of the number of consecutive days in which measurable precipitation (≥0.2mm) does occur. For this analysis, the number of consecutive three, five, seven, and 10 day wet and dry periods were calculated annually during the warm season (May through September) over each selected station's period of record and for the years 1971-2000. It should be noted that because this analysis only covered the period extending from May to September, wet or dry days that began prior to May or ended after September 30 were truncated. This means a wet or dry period may have actually been longer than indicated in this study.

Data Source

A list of climate stations in Atlantic Canada was compiled from the National Climate Data and Information Archives (Environment Canada, 2006). Climate stations that did not have at least 20 years of data during the most recent climate normal period (1971-2000) were removed from the list. Exceptions were made for stations when their exclusion would produce a geographic gap in the data. These climate stations are noted on the maps with a “+”.

A total of 151 stations in Atlantic Canada were analysed (Appendix 1). Not all climate stations used in the analysis are still operating. In some cases, station precipitation records were extended by simply merging information from neighbouring stations. If data were not complete for the 153 day period and could not be approximated from neighbouring stations, that year was removed from the analysis.

Screening the Data

Precipitation data for places that met the selection criteria were downloaded into a text file. The number of years climate stations are in service varies, explaining differences in the length of analysis for locations in this study. Some stations were combined to make a longer, more complete, time series. For example, the Kouchibouguac climate stations were merged because they were located close together and with only a small altitude variation (see Table 1). The final period of record used in the analysis was 1974 to 2006 because the years 1972 and 1973 were missing data.

Name	Climate ID	Province	Latitude	Longitude	Elevation (m)	YR from	YR to
Kouchibouguac	8102325	NB	46.77	-65.00	35.1	1972	1995
Kouchibouguac CS	8102328	NB	46.77	-65.01	34	1995	2006

Table 1: Example of climate stations merged to produce a longer period of record

Raw precipitation data from the climate archives was run through a program titled “fixdataorder” obtained from and used by permission of Environment Canada Ontario region (Comer, 2006). The “fixdataorder” program removed precipitation data for the months October through April and ordered the data into a continuous climate record that could be analysed by the counting programs. Occasionally, values recorded in the archives were accompanied by “A”, “C”, “E”, “L”, and “M” flags.

Each file was manually scanned to locate flags in the climate record. An “M” flag refers to days where the precipitation tally is missing. If there were only a few missing days in any given month, neighbouring climate station data was used to estimate precipitation amounts for the days that data were missing. To make this substitution, precipitation values at neighbouring climate stations were queried from the archives and compared with the climate station under consideration. Several stations, within a 25 km radius, were used in the analysis to ensure accurate values were estimated. If neighbouring stations disagreed on whether there was precipitation on a particular day, then the value remained listed as missing and the year was removed. Similarly, if more than three days in any consecutive seven-day period during the summer period was absent and more than a week’s worth of data was missing during the month, then precipitation amounts were not estimated and the year was removed from the analysis. This screening process radically reduced the number of climate years that could be used in many of the climate station records and accounts for much of the missing data.

“L” flags reflected days where precipitation may or may not have occurred necessitating investigation in the same manner as was completed for “M” flags. If it was not possible to determine if precipitation had occurred from an analysis of neighbouring climate stations, it was inferred that precipitation did not occur. Conversely, “C” flags indicated that precipitation had occurred but the amount was uncertain. These days were normally followed with an “A” flag, which denoted an accumulated precipitation value. In these situations the accumulated value was divided among the preceding days

with “C” flags. More than three days of “C” flags were considered suspect and were investigated in the same manner as “L” and “M” flags. Estimated precipitation values were flagged with an “E” and were permitted to remain in the record unchanged.

On occasion an entire month of precipitation values was missing from the climate record for a particular location. When this occurred, the entire year was removed from the file prior to the execution of the counting program. It was necessary to manually scan the data and remove years with missing data because the counting programs used in the next step would combine counts from multiple years if a full 153 day record was not included for each year.

Analysis

Once the screening process was completed each modified climate station file was run through a series of programs to count the consecutive wet and dry days. The output was a summary of the counts of consecutive wet and dry days by year and a running count total for each climate station. Each climate station summary count file was downloaded into an excel spreadsheet where simple statistics were used to derive the per cent occurrence of consecutive wet and dry days. The per cent occurrence was calculated for each year in addition to a total per cent occurrence for the climate normal period of 1971 to 2000.

A three day consecutive dry period is defined as three straight days without a measurable amount of precipitation. Once a three day dry period was identified, the next potential three day dry period starts on the next dry day. The five, seven and 10 day consecutive dry periods are similarly defined. Hence, if there were 15 consecutive days without measurable precipitation, the counts would be as follows: 5 occurrences of three day dry periods, three five day dry periods, two seven day dry periods and lastly, one 10 day dry period. In contrast, a three day consecutive wet period was defined as three straight days with a measurable precipitation greater than or equal to 0.2 mm. The next three day wet period would begin on the next day with precipitation. The five, seven, and 10 day consecutive wet periods were defined in the same manner.

The consecutive wet and dry day counts were then converted to per cent occurrence over the period May 1 to September 30 of each year. Within the May-September period, there are:

- 51 possible occurrences of consecutive three day wet/dry periods
- 30 possible occurrences of consecutive five day wet/dry periods
- 21 possible occurrences of consecutive seven day wet/dry periods
- 15 possible occurrences of consecutive 10 day wet/dry periods

Therefore, for example, there is a 50 per cent occurrence of consecutive five day dry periods from May 1 - September 30 in a specific year if these periods occur 15 times during the 153 days from May 1 to September 30.

The per cent occurrence for the 1971-2000 climate normal period was calculated by averaging the yearly per cent occurrences of consecutive wet and dry days. The per cent occurrence of

consecutive three, five, seven, and 10 wet and dry days for the normal period was compiled in one excel spreadsheet for use in the mapping component of this project.

The per cent occurrence of consecutive three, five, seven, and 10 wet and dry days for each climate station over the period of record were graphed. Because the number of available years varies with each climate station, so too does the number of years graphed. Although all available years were plotted, only the per cent occurrence of consecutive three, five, seven, and 10 day wet and dry periods for the climate normal period were mapped. Mapping was completed in MapInfo Professional using thematic mapping.

Results and Discussion

Results of this analysis are displayed in eight maps that show the per cent occurrence of consecutive three, five, seven, and 10 day wet and dry periods recorded during the warm season (May through September), during the 30-year climate normal period (1971-2000) at climate stations in Atlantic Canada (Appendix 2). The maps can be used to show areas where there was a higher potential for dry or wet conditions in the climate normal period. Appendix 3 displays a table with the per cent occurrence of consecutive three, five, seven, and 10 wet and dry days for all 151 climate stations used to create the maps.

Most of the Maritime climate stations on the Percent Occurrence of 3-Day Dry Periods map are in the range of 30% to 60%. Locations with only 20-30% occurrence include Charlesville in Nova Scotia and Pennfield and Buctouche CDA in New Brunswick. In contrast, Newfoundland has more stations with the lower 20-30% occurrence ranking and one station with only 10-20% occurrence of consecutive dry days. In Labrador, the Nain station has the highest per cent occurrence of consecutive dry days.

Not surprisingly, areas that were highlighted as having the highest per cent occurrence of consecutive three day dry periods then appear to have the lowest per cent occurrence of consecutive wet periods. In most cases, the difference between the per cent occurrence of dry and wet periods is large; however there are some stations where the analysis shows that the values are much closer. For example in Nain, the per cent occurrence of consecutive three day dry periods is 34.8% and the per cent occurrence of consecutive three day wet periods is 23.6%. In comparison, at the Acadia Forest Exp St in New Brunswick the per cent occurrence of three day dry periods is 34.2 and there is a 17.0 per cent occurrence for three day wet periods, a ratio more common to this study. This shows that certain locations exhibit the potential both for drought and wet periods.

Stations with very high per cent occurrence of dry days and very low per cent occurrence of wet periods are more likely prone to drought. Avon in Nova Scotia has a 44.4% occurrence of consecutive dry days and an 11.7% occurrence of consecutive wet days. In comparison, Churchill Falls in Labrador has an 18.7% occurrence of consecutive dry days and a 37.3% occurrence of consecutive wet days.

Appendix 4 shows an example of the graphs that were created for this project. All the graphs are not included in this report because they were created for the website portion of this project where each

map is intended to be clickable. There are 151 climate stations included in this analysis and eight different variables; amounting to more than 1200 individual graphs. To see the climate station graph for each variable please visit either the drought or rainfall section of the Atlantic hazards website at www.hazards.ca. These graphs can be used to visually examine whether a given climate station is experiencing a trend towards a greater or lesser frequency of continuous dry or wet days over the period of record.

Suggestions for Future Research

Consider precipitation amounts

Future research could include an analysis of the amount of precipitation received during the consecutive wet and dry periods. This study only considered whether measurable precipitation did or did not occur, but did not evaluate what the impact of small amounts of precipitation might have on an area. For instance, if drought conditions are persisting in a region, a consecutive dry period would be broken by only 0.3 mm of rain. This would not be sufficient to break a drought. Nor would rainfall of this amount every day for a long period of time be enough to raise the flood potential.

Assess impacts

Areas identified in this study as being prone to drought or flood could be assessed further to determine how they were affected by consecutive wet and dry periods, how the population was impacted, and methods for mitigating the region's vulnerability to climate extremes. Flood and drought impacts could be modeled in order to assist planning for the climate extremes.

Trend Analysis

A trend analysis should be completed to help project future conditions in the region. Trends are shown somewhat in the climate station graphs so the reader can get a sense for whether the number of consecutive wet and dry periods is increasing or decreasing. However, no statistical tests have been completed to determine the magnitude or statistical significance of the trends.

Other drought indices

Other drought indicators could be used or a new drought indicator could be developed to consider the unique geography and climatology of Atlantic Canada. This new drought indicator should consider the wide range of climate regimes that exist in the area in addition to the soil conditions.

Conclusion

Consecutive wet and dry days analysis provides an index of drought or wet weather potential. Areas identified in this study as being more or less prone to dry and wet periods can be studied further to determine the true impact of precipitation regimes. It provides useful information for determining which

areas are prone to dry weather in support of studies of the impact of drought on the local population and environment. Furthermore, the time series graphs allows for a trend analysis to be conducted. This is very important for future planning and policy initiatives.

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Appendix 1: Climate Stations

Table 2: Climate stations used in the analysis of consecutive wet and dry days

Name	Climate ID	Province	Latitude	Longitude	Elevation (m)	YR from	YR to
Acadia Forest Exp St	8100100	NB	45.98	-66.37	61.0	1956	2005
Alberton	8300080	PE	46.85	-64.02	3.0	1970	2005
Alliston	8300100	PE	46.07	-62.60	61.0	1936	2005
Alma	8100200	NB	45.60	-64.95	42.7	1950	2005
Annapolis Royal	8200100	NS	44.75	-65.52	7.7	1916	2004
Arnolds Cove	8400135	NL	47.75	-54.00	15.2	1972	1993
Aroostook	8100300	NB	46.80	-67.72	91.4	1930	2004
Avon	8200200	NS	44.88	-64.22	23.7	1950	1998
Baddeck	8200300	NS	46.10	-60.75	7.6	1877	2004
Baie Verte	8400350	NL	49.98	-56.18	110.3	1959	1994
Bangor	8300128	PE	46.35	-62.68	36.6	1972	2003
Bathurst	8100502	NB	47.62	-65.65	4.6	1873	1991
Bay D'espoir Gen Stn	8400411	NL	47.88	-55.83	11.3	1966	2002
Bear River	8200500	NS	44.57	-65.63	7.6	1953	2004
Beechwood	8100512	NB	46.53	-67.67	91.4	1966	1996
Belledune	8100514	NB	47.90	-65.83	7.6	1971	2001
Bon Accord	8100566	NB	46.65	-67.58	450.3	1967	2004
Bonavista	8400600	NL	48.67	-53.11	25.6	1957	1996
Bridgewater	8200600	NS	44.40	-64.55	27.4	1962	2004
Buchans	8400698	NL	48.82	-56.87	269.7	1966	2004
Buctouche	8100590	NB	46.52	-64.72	10.7	1966	1998
Buctouche CDA	8100592	NB	46.43	-64.77	36.0	1983	2006
Burgeo	8400798	NL	47.62	-57.62	10.6	1939	2005
Burnt Pond	8400812	NL	48.17	-57.33	298.7	1973	1997
Canterbury	8100775	NB	45.88	-67.47	173.8	1971	1989
Cape Broyle	8400850	NL	47.10	-52.93	6.1	1956	1996
Cartwright	8501100	NL	53.71	-57.03	14.3	1935	2006
Centreville	8100850	NB	46.38	-67.70	143.0	1966	1993
Charlesville	8200810	NS	43.58	-65.78	2.7	1979	2004
Charlo A	8100880	NB	47.98	-66.33	40.2	1967	2006
Charlottetown CDA	8300400	PE	46.25	-63.13	22.6	1911	2000
Charlottetown A	8300300	PE	46.29	-63.13	48.8	1943	2006
Cheticamp	8200824	NS	46.63	-61.05	335.3	1956	2006
Churchill Falls	8501132	NL	53.55	-64.10	439.5	1969	1992
Clarence	8200860	NS	44.92	-65.17	51.5	1959	1992
Coleson Cove	8101151	NB	45.15	-66.20	30.5	1973	2000
Colinet	8401200	NL	47.22	-53.55	27.4	1939	1991
Collegeville	8201000	NS	45.48	-62.02	76.2	1917	2004
Come by Chance	8401257	NL	47.80	-54.00	34.0	1974	1994
Corner Brook	8401298	NL	48.93	-57.92	151.8	1933	2004
Daniels Harbour	8401400	NL	50.24	-57.58	19.0	1949	2006
Deer Lake	8401500	NL	49.17	-57.43	10.7	1933	2005
Deming	8201410	NS	45.22	-61.18	15.8	1957	2004
Doaktown	8101200	NB	46.55	-66.15	38.1	1941	2004

Name	Climate ID	Province	Latitude	Longitude	Elevation (m)	YR from	YR to
East Baltic	8300416	PE	46.43	-62.17	61.0	1972	1999
Edmundston	8101300	NB	47.37	-68.33	173.7	1915	2004
Exploits Dam	8401550	NL	48.77	-56.60	153.6	1957	2004
Flowers Cove	8401582	NL	51.30	-56.73	9.1	1972	2004
Fogo	8401599	NL	49.72	-54.30	11.8	1974	2003
Fredericton A	8101500	NB	45.87	-66.53	20.7	1951	2006
Fredericton CDA	8101600	NB	45.92	-66.62	39.6	1914	2006
Gagetown 2	8101800	NB	45.78	-66.15	33.5	1897	2005
Gander Int'l A	8401700	NL	48.95	-54.58	151.2	1937	2006
Goose Bay	8501900	NL	53.32	-60.42	48.8	1942	2006
Grand Falls	8402050	NL	48.93	-55.67	60.0	1934	2000
Grand Falls Drummond	8101904	NB	47.03	-67.70	228.6	1966	1992
Greenwood A	8202000	NS	44.98	-64.92	28.0	1943	2006
Halifax Int'l A	8202250	NS	44.88	-63.52	145.4	1953	2006
Halifax Citadel	8202220	NS	44.65	-63.58	70.1	1934	2001
Harvey Station	8102200	NB	45.73	-67.00	152.4	1921	2003
Holyrood Gen Stn	8402309	NL	47.45	-53.10	6.0	1971	2004
Ingonish Beach	8202500	NS	46.65	-60.40	7.9	1951	2006
Juniper	8102275	NB	46.55	-67.17	259.1	1970	2003
Kejimkujik	8202590	NS	44.43	-65.20	126.8	1966	2006
Kemptville	8202700	NS	44.08	-65.77	76.2	1950	1991
Kentville CDA	8202800	NS	45.07	-64.48	48.8	1913	2006
Kouchibouguac	8102325	NB	46.77	-65.00	35.1	1974	2006
Liverpool Big Falls	8203100	NS	44.13	-64.93	49.6	1940	2003
Liverpool Milton	8203120	NS	44.08	-64.77	28.5	1967	2000
Lockston	8402565	NL	48.40	-53.38	18.0	1967	1998
Logy Bay	8402568	NL	47.62	-52.66	27.4	1970	2004
Long Harbour	8402569	NL	47.42	-53.82	8.4	1970	1999
Long River	8300500	PE	46.50	-63.55	18.0	1957	2003
Louisbourg	8203161	NS	45.90	-60.00	45.7	1973	2004
Lyons Brook	8203230	NS	45.65	-62.80	28.9	1969	2005
Mactaquac Prov Park	8102536	NB	45.95	-66.90	100.0	1976	2004
Mapleton	8102566	NB	46.18	-67.23	167.6	1973	2004
Margaree Forks	8203422	NS	46.37	-61.08	15.2	1961	2001
Mcgraw Brook	8102808	NB	46.82	-66.12	53.3	1970	1995
Middle Musquodoboit	8203535	NS	45.07	-63.10	47.8	1964	2004
Minto	8103000	NB	46.03	-66.03	22.9	1954	1992
Miramichi A	8100989	NB	47.01	-65.46	33.0	1944	2006
Moncton	8103100	NB	46.10	-64.79	12.2	1898	2006
Moncton A	8103200	NB	46.10	-64.69	70.7	1940	2006
Monticello	8300447	PE	46.47	-62.47	32.0	1961	2003
Mount Carleton	8103256	NB	47.42	-66.93	265.1	1973	2000
Mount Uniacke	8203600	NS	44.90	-63.83	158.5	1920	2000
Musgrave Harbour	8402770	NL	49.45	-53.98	3.0	1979	2004
Nain A	8502800	NL	56.55	-61.68	6.7	1930	2005
Nappan CDA	8203700	NS	45.77	-64.25	19.8	1913	2006

Name	Climate ID	Province	Latitude	Longitude	Elevation (m)	YR from	YR to
Nepisiguit Falls	8103500	NB	47.40	-65.78	106.1	1923	2004
New Chelsea	8402840	NL	48.03	-53.22	9.0	1962	1991
New Glasgow	8300497	PE	46.41	-63.35	6.1	1972	2003
O'Leary	8300525	PE	46.70	-64.26	38.1	1957	2003
Oromocto	8103800	NB	45.83	-66.47	45.7	1958	1994
Paradise	8204300	NS	44.83	-65.23	45.7	1952	1997
Parrsboro	8204400	NS	45.40	-64.33	24.3	1897	2006
Pennfield	8103845	NB	45.10	-66.73	22.9	1962	2002
Petty Harbour	8402925	NL	47.47	-52.72	6.1	1956	1998
Plum Point	8402958	NL	51.07	-56.88	6.1	1973	2004
Pockwock Lake	8204453	NS	44.77	-63.83	164.6	1979	2004
Pools Cove Fortune Bay	8402973	NL	47.70	-55.58	150.0	1980	1999
Port aux Basques	8402975	NL	47.57	-59.15	39.7	1909	1996
Port Hood	8204500	NS	45.98	-61.53	27.4	1951	1990
Pugwash	8204525	NS	45.84	-63.66	4.6	1965	2003
Rattling Brk Norris Arm	8403085	NL	49.07	-55.30	8.8	1959	2004
Rexton	8104400	NB	46.67	-64.87	4.6	1923	2004
Rocky Harbour	8403096	NL	49.57	-57.88	67.7	1973	2006
Roseway	8204600	NS	43.78	-65.35	15.2	1950	1995
Royal Road	8104480	NB	46.05	-66.72	115.8	1966	1992
Sable Island	8204700	NS	43.93	-60.01	5.0	1891	2006
Sackville	8104500	NB	45.90	-64.38	24.4	1878	2001
Saint John A	8104899	NB	45.30	-66.10	29.9	1947	2006
Salmon Hole	8205000	NS	44.93	-64.03	83.8	1939	2004
Salt Pond	8403623	NL	47.09	-55.20	30.3	1976	2004
Sandy Cove NRC	8205062	NS	44.47	-63.57	10.1	1976	2000
Shearwater A	8205090	NS	44.63	-63.50	50.9	1944	2006
Sops Arm White Bay	8403690	NL	49.77	-56.88	16.6	1980	2004
Springdale	8403700	NL	49.50	-56.08	23.0	1956	1992
Springfield	8205200	NS	44.67	-64.85	167.3	1920	2002
St Anthony	8403399	NL	51.38	-56.10	29.3	1947	1994
St John's A	8403506	NL	47.62	-52.74	140.5	1942	2006
St John's West CDA	8403600	NL	47.52	-52.78	114.3	1951	2006
St Lawrence	8403615	NL	46.92	-55.38	48.5	1966	1994
St Margaret's Bay	8204800	NS	44.70	-63.90	17.4	1922	2004
St Shotts	8403617	NL	46.63	-53.58	45.7	1974	1994
Stanhope	8300590	PE	46.42	-63.08	3.0	1967	2005
Stephenville A	8403800	NL	48.53	-58.55	25.6	1942	2006
Stillwater Sherbrooke	8205601	NS	45.14	-61.98	14.0	1968	2002
Summerside A	8300700	PE	46.44	-63.83	19.5	1942	2006
Summerville	8205650	NS	45.12	-64.18	38.1	1966	2003
Sussex	8105200	NB	45.72	-65.53	21.3	1898	2006
Sydney A	8205698	NS	46.15	-60.20	14.6	1941	2006
Terra Nova Nat Park HQ	8403852	NL	48.55	-53.98	83.8	1962	2006

Name	Climate ID	Province	Latitude	Longitude	Elevation (m)	YR from	YR to
Tignish	8300800	PE	46.95	-64.07	22.9	1972	1992
Truro	8205990	NS	45.37	-63.27	39.9	1961	2001
Turtle Creek	8105518	NB	45.92	-64.80	141.7	1965	2004
Tusket	8206100	NS	43.88	-65.98	9.1	1950	2004
Upper Stewiacke	8206200	NS	45.22	-63.00	22.9	1916	2004
Upsalquitch Lake	8105551	NB	47.45	-66.42	624.8	1968	2004
Wabush Lake A	8504175	NL	52.93	-66.87	550.5	1961	2006
Waterville Cambridge	8206222	NS	45.05	-64.65	30.6	1980	2004
Wellington	8300900	PE	46.47	-64.05	50.3	1957	1993
Westphal	8206250	NS	44.68	-63.52	67.7	1958	1997
Weymouth Falls	8206275	NS	44.40	-65.95	10.7	1966	2000
White Rock	8206316	NS	45.05	-64.38	38.1	1978	2004
Wiggins Point	8105568	NB	45.92	-66.00	15.2	1971	1995
Windsor Martock	8206415	NS	44.93	-64.17	38.1	1980	2004
Woodstock	8105600	NB	46.17	-67.55	153.0	1887	2004
Wreck Cove Brook	8206450	NS	46.53	-60.45	76.2	1976	2004
Yarmouth A	8206490	NS	43.83	-66.03	30.8	1880	2006

Appendix 2: Maps

Figure 1: Percent occurrence of consecutive 3-day dry periods

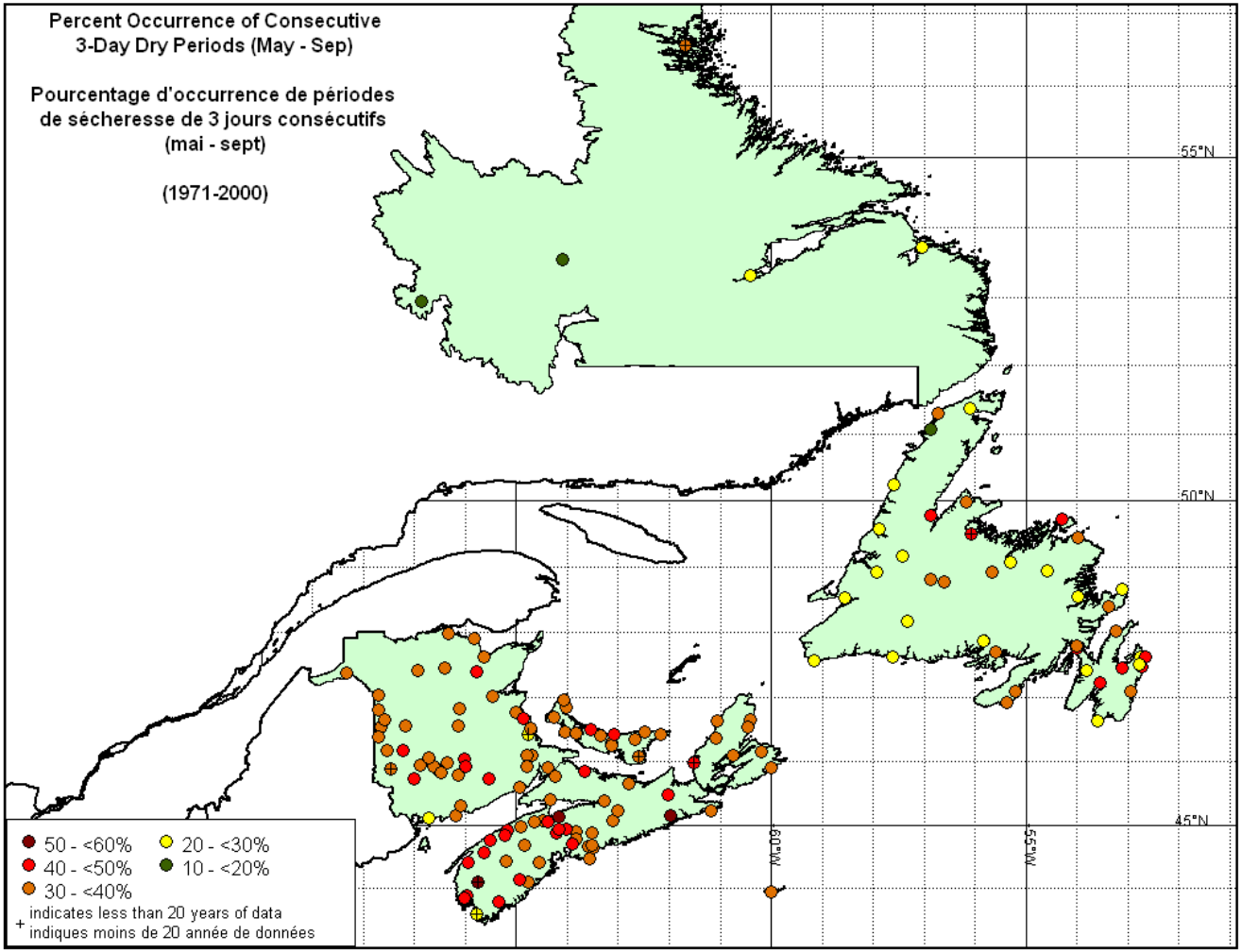


Figure 2: Percent occurrence of consecutive 3-day wet periods

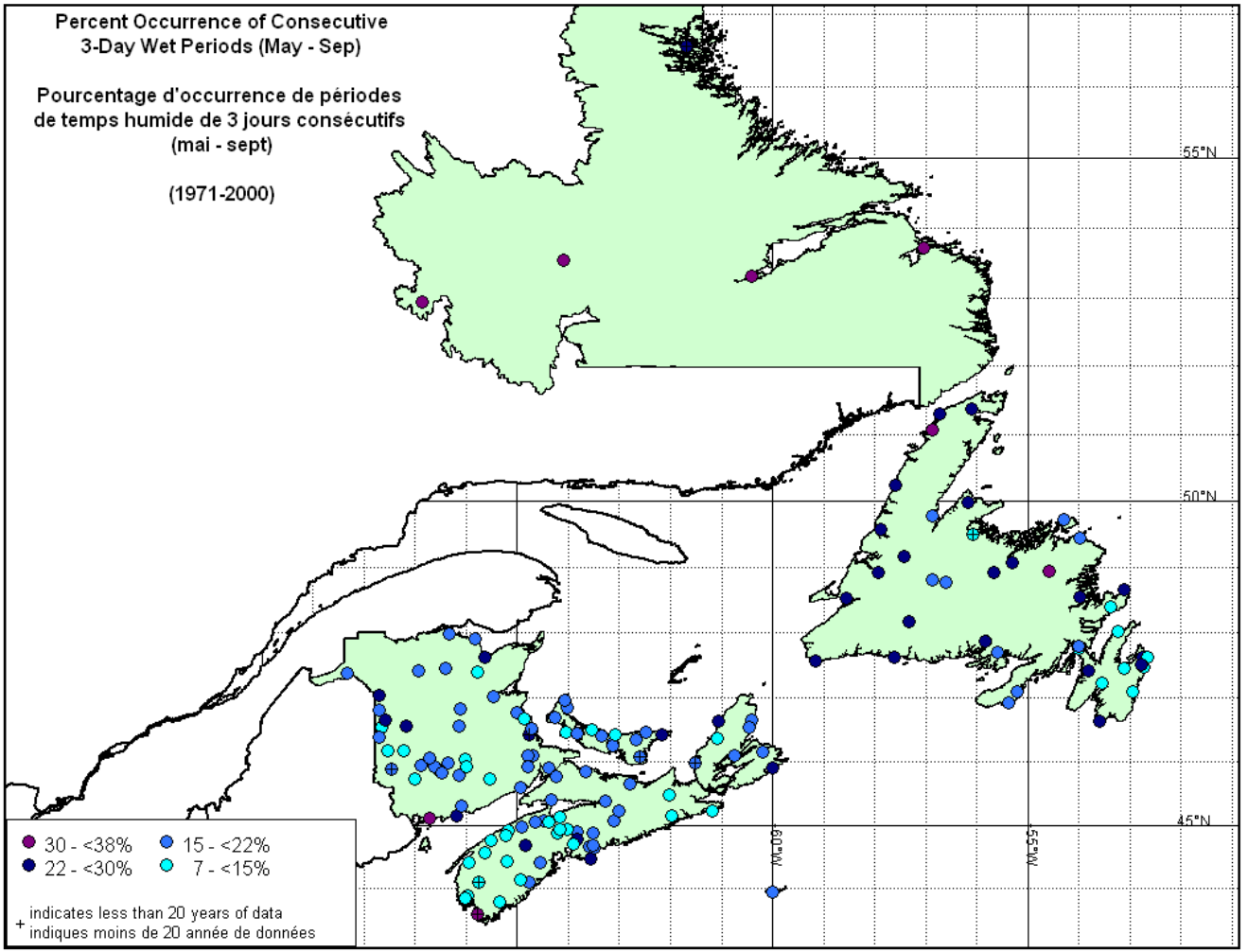


Figure 3: Percent occurrence of consecutive 5-day dry periods

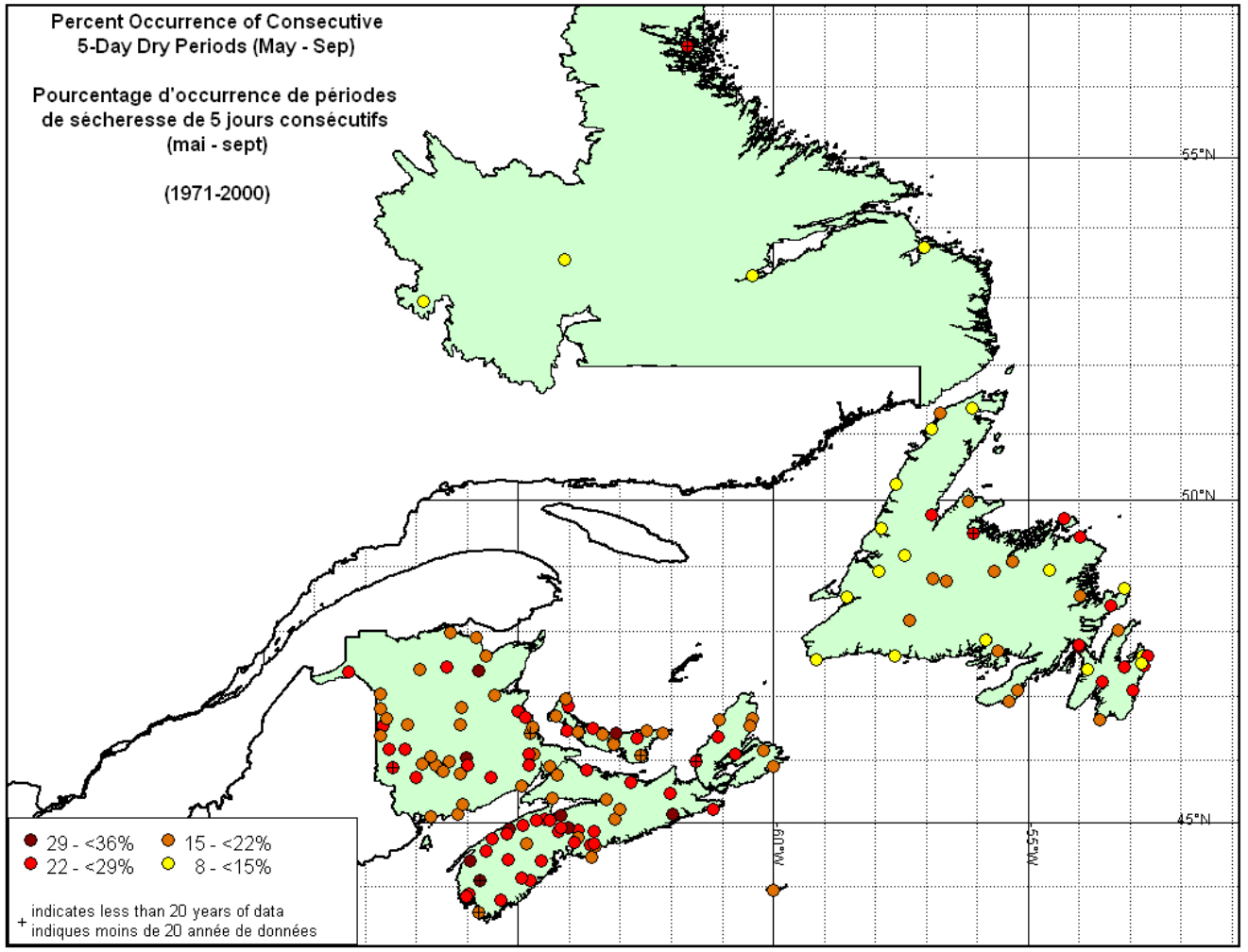


Figure 4: Percent occurrence of consecutive 5-day wet periods

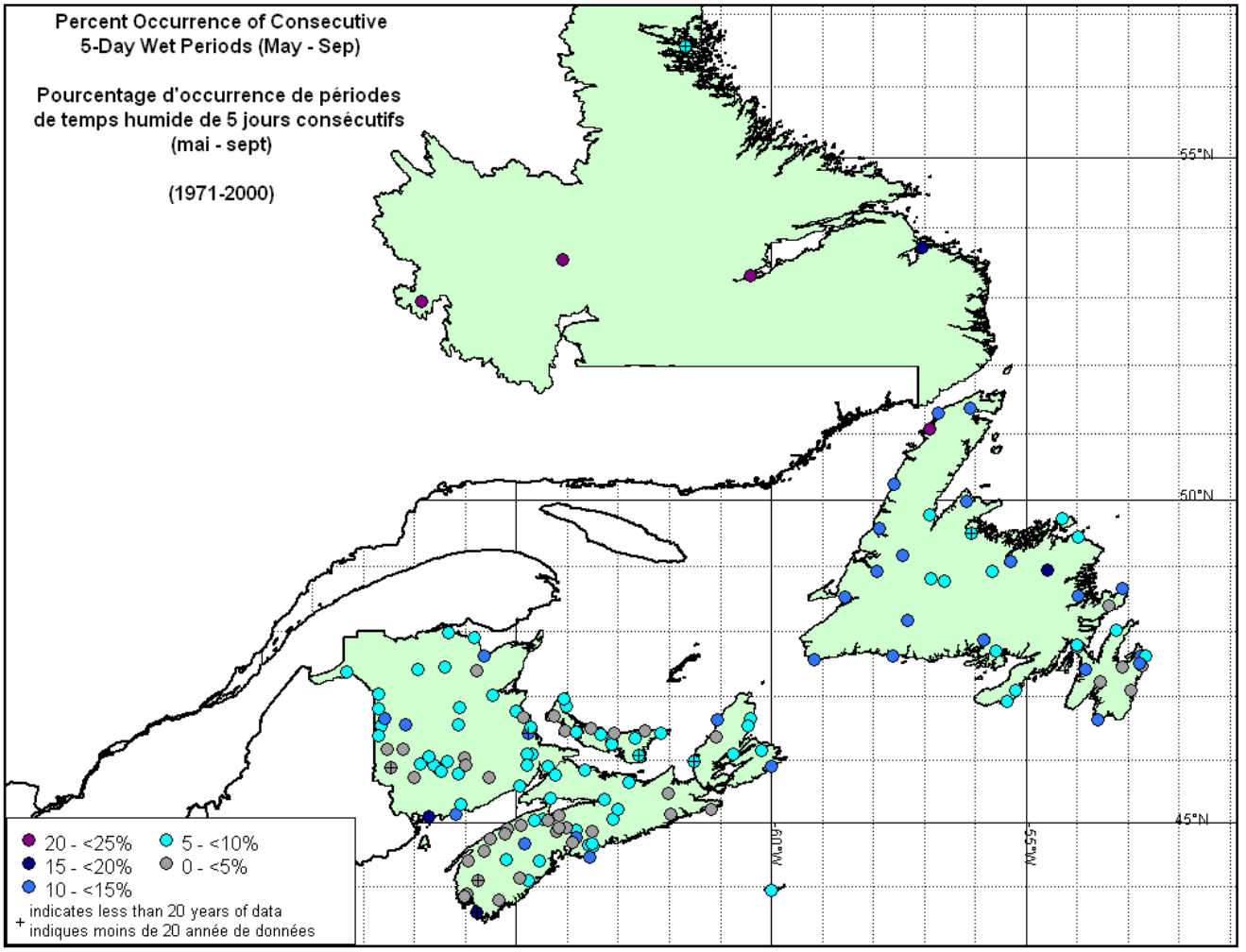


Figure 5: Percent occurrence of consecutive 7-day dry periods

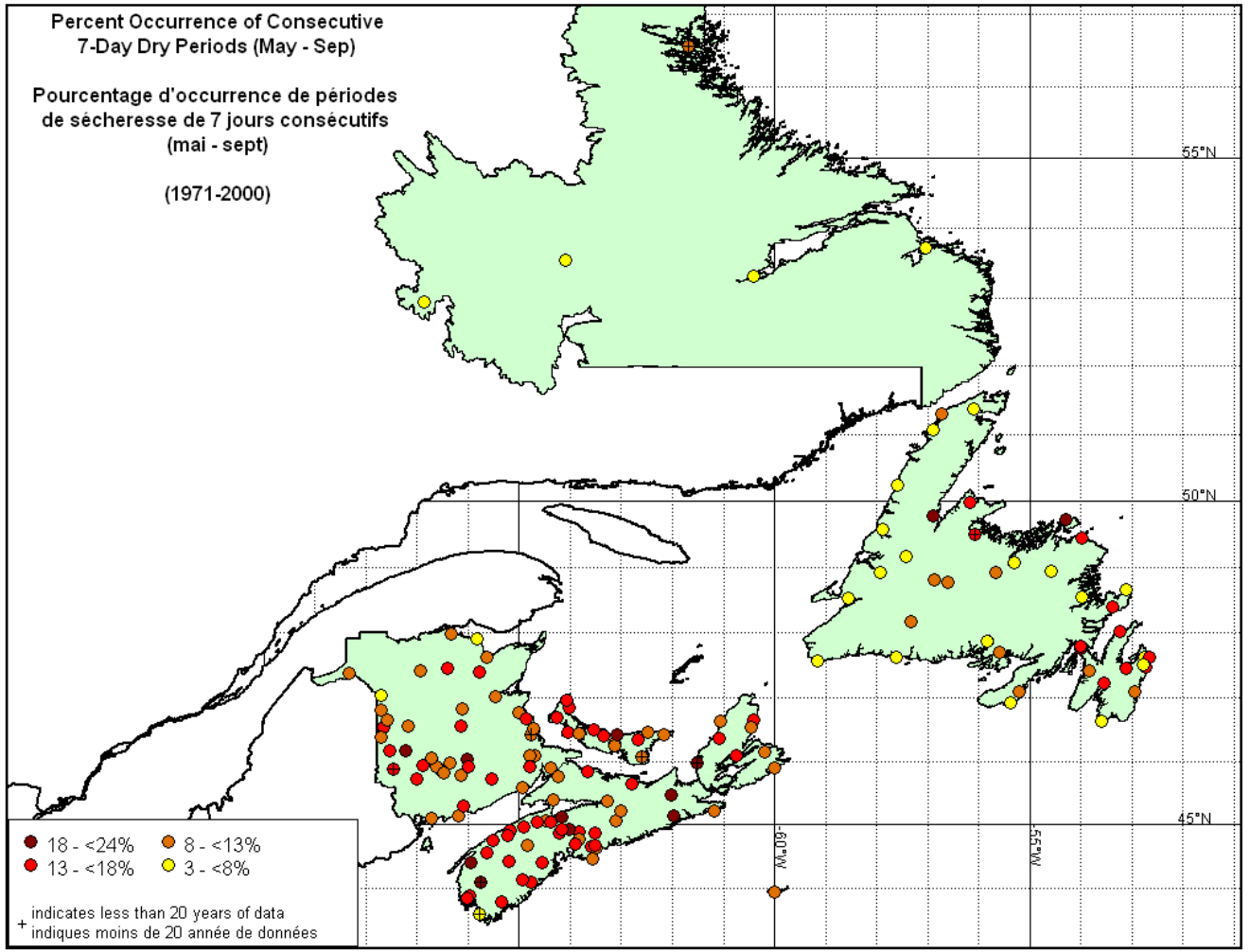


Figure 6: Percent occurrence of consecutive 7-day wet periods

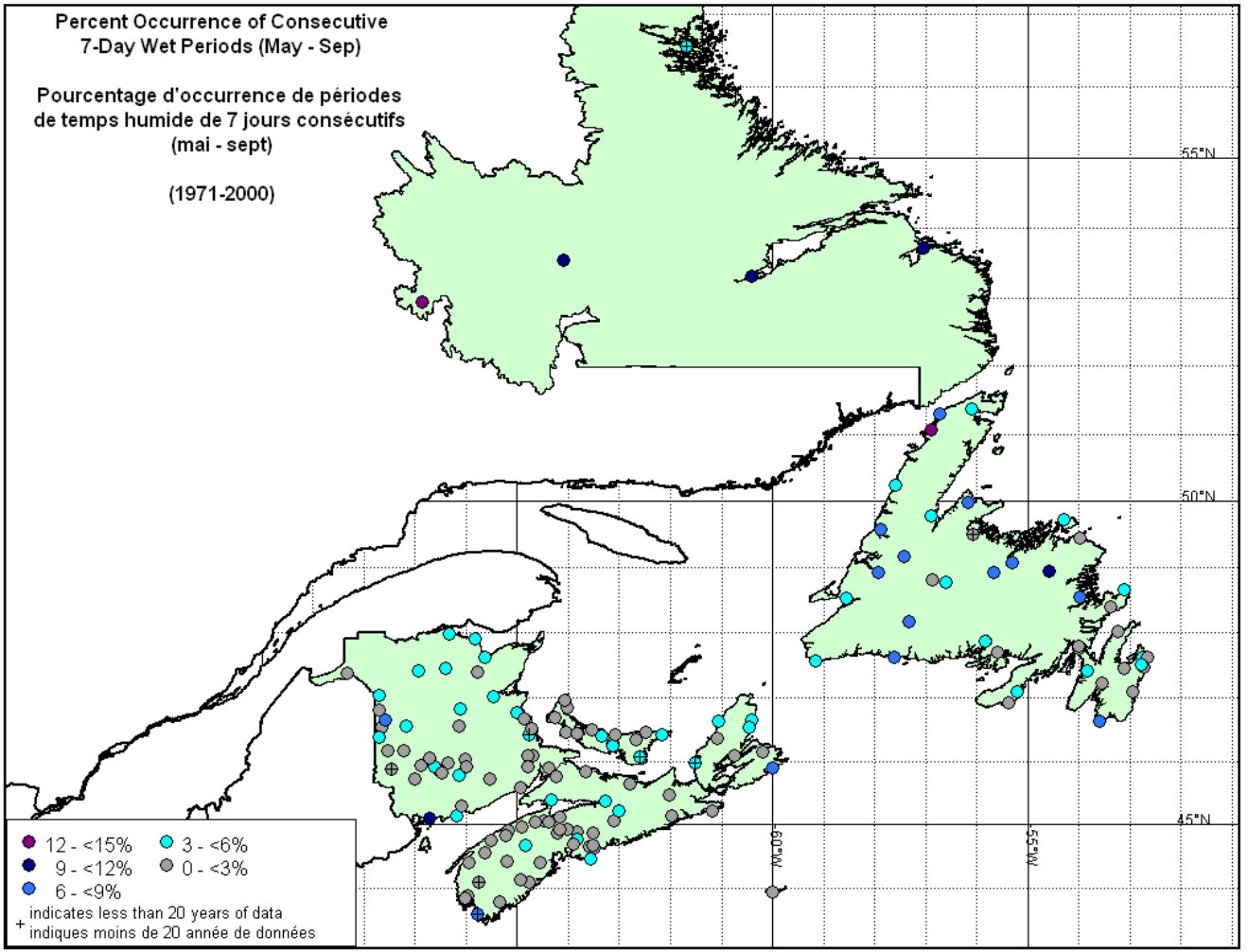


Figure 7: Percent occurrence of consecutive 10-day dry periods

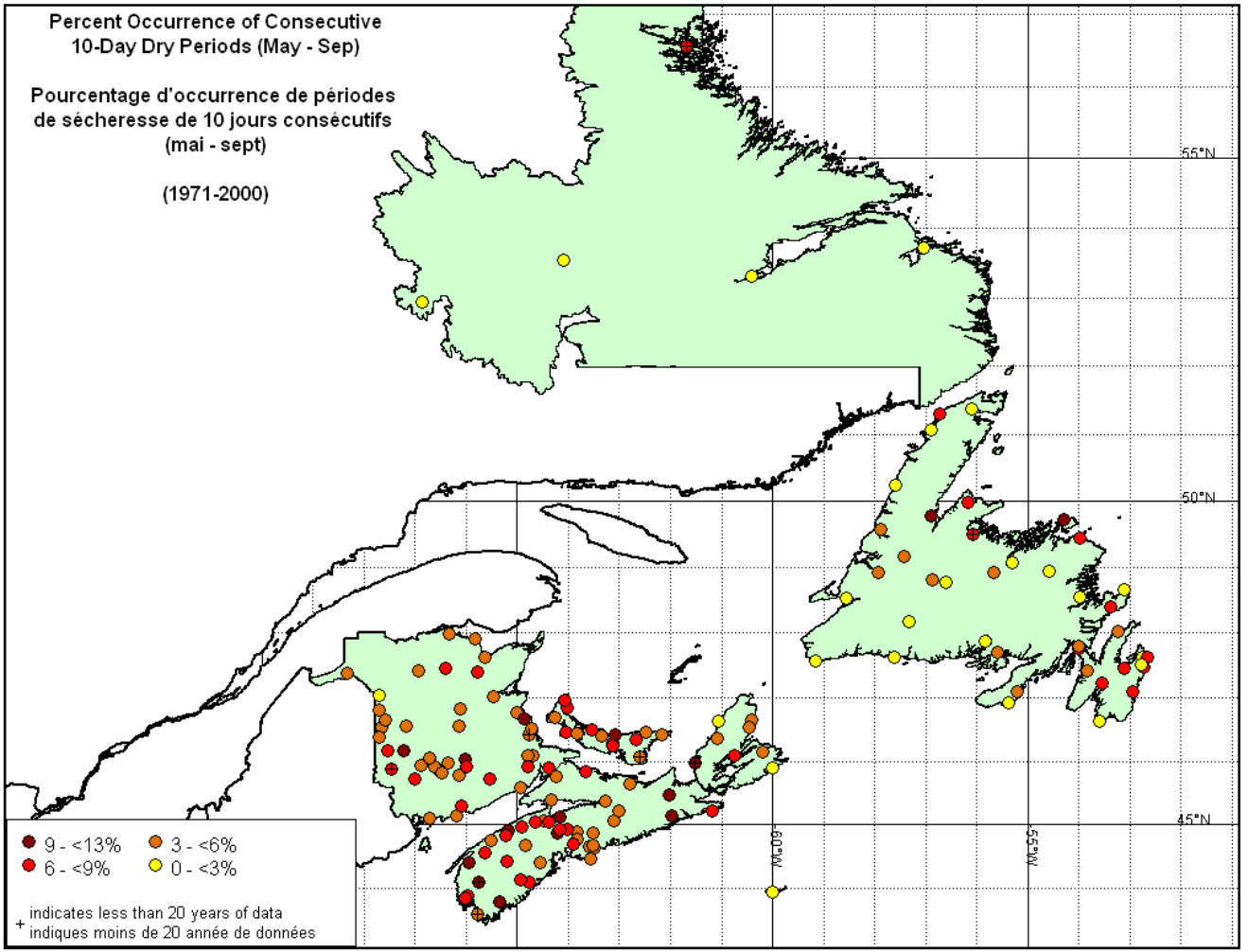
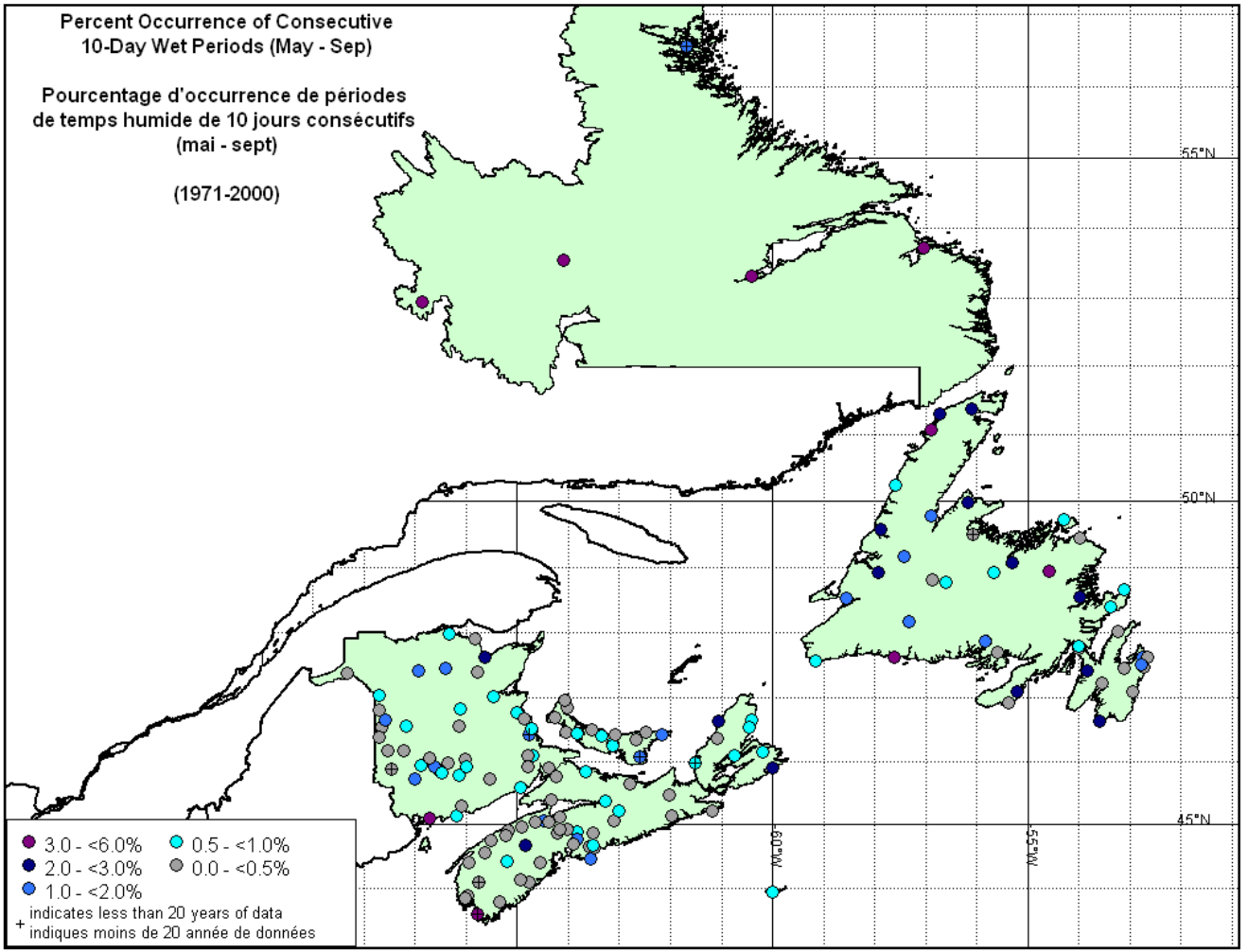


Figure 8: Percent occurrence of consecutive 10-day wet periods



Appendix 3: Table of Results

Table 3: Per cent occurrence of consecutive wet and dry days (1971-2000)

Name	Prov	Years	3 day dry	3 day wet	5 day dry	5 day wet	7 day dry	7 day wet	10 day dry	10 day wet
Acadia Forest Exp St	NB	30	34.2	17.0	18.9	6.1	9.8	1.6	3.8	0.0
Alberton	PE	30	36.7	16.3	22.3	5.0	13.7	1.4	6.2	0.0
Alliston	PE	17	35.4	18.5	20.8	6.3	12.0	3.1	4.3	1.2
Alma	NB	29	33.3	20.8	19.8	8.4	11.7	2.7	5.3	0.9
Annapolis Royal	NS	21	42.6	13.9	26.5	4.1	15.0	0.9	5.7	0.3
Arnolds Cove	NL	21	45.0	12.6	30.6	3.5	19.0	1.8	8.6	0.0
Aroostook	NB	29	35.8	17.6	21.6	6.0	12.0	1.8	4.6	0.2
Avon	NS	26	44.4	11.7	28.5	2.3	15.8	0.5	9.2	0.0
Baddeck	NS	29	37.3	17.8	23.6	6.8	14.0	2.8	6.2	0.5
Baie Verte	NL	21	32.3	24.7	19.5	13.3	13.4	6.6	6.3	2.9
Bangor	PE	29	36.8	17.7	23.2	6.7	13.0	2.5	6.4	0.0
Bathurst	NB	30	33.5	22.9	20.8	11.1	11.1	5.4	3.8	2.0
Bay D'espoir Gen Stn	NL	29	28.9	24.7	13.8	12.3	6.7	5.9	2.1	1.4
Bear River	NS	29	43.5	12.7	27.1	3.0	16.1	1.0	6.9	0.2
Beechwood	NB	27	39.4	13.7	22.8	5.3	13.1	2.5	4.9	0.0
Belledune	NB	22	32.4	20.3	18.9	8.2	7.8	3.0	4.2	0.3
Bon Accord	NB	29	31.8	24.5	19.9	11.8	11.8	7.1	5.3	1.8
Bonavista	NL	26	26.5	25.4	12.2	12.3	5.7	5.5	1.0	0.5
Bridgewater	NS	30	38.8	16.5	23.0	5.3	13.2	2.1	5.8	0.4
Buchans	NL	29	34.0	18.3	20.3	6.9	11.2	2.3	3.7	0.2
Buctouche	NB	28	32.5	20.7	16.8	8.7	8.2	2.6	4.0	0.7
Buctouche CDA	NB	18	29.3	24.9	17.2	11.5	10.1	5.8	5.6	1.5
Burgeo	NL	24	23.6	26.4	11.0	13.9	4.4	6.0	1.4	3.1
Burnt Pond	NL	23	28.6	26.1	15.1	12.9	9.3	7.5	2.6	1.7
Canterbury	NB	19	36.2	16.0	22.6	4.9	14.8	1.0	6.7	0.0
Cape Broyle	NL	25	39.2	12.1	22.4	3.1	11.8	0.8	6.4	0.0
Cartwright	NL	28	21.0	33.3	10.5	19.5	3.6	10.2	1.2	3.8
Centreville	NB	22	35.7	19.3	21.4	6.8	11.7	3.0	4.5	0.0
Charlesville	NS	18	26.8	30.0	15.2	15.7	7.7	7.7	3.3	4.1
Charlo A	NB	29	32.0	19.7	18.2	9.5	9.2	3.8	3.0	0.9

Name	Prov	Years	3 day dry	3 day wet	5 day dry	5 day wet	7 day dry	7 day wet	10 day dry	10 day wet
Charlottetown CDA	PE	29	33.5	21.3	20.6	8.5	11.7	3.4	6.9	0.5
Charlottetown A	PE	29	35.1	18.5	20.3	6.7	11.0	2.3	6.0	0.5
Cheticamp	NS	29	31.0	23.3	16.6	11.8	8.7	5.7	2.3	2.3
Churchill Falls	NL	22	18.7	37.3	8.8	23.3	4.8	11.5	2.4	4.8
Clarence	NS	22	45.7	10.6	29.8	2.3	17.3	0.6	10.3	0.0
Coleson Cove	NB	27	32.6	24.2	17.8	11.2	10.9	4.9	4.0	0.7
Colinet	NL	21	43.3	9.0	25.6	1.3	17.2	0.5	7.6	0.0
Collegeville	NS	29	45.1	10.3	27.5	2.1	19.2	0.3	9.9	0.0
Come by Chance	NL	21	38.0	15.8	22.1	6.5	13.6	1.6	4.4	0.6
Corner Brook	NL	30	29.1	23.7	14.8	11.8	6.5	6.3	3.1	2.2
Daniels Harbour	NL	24	26.3	25.0	12.4	12.6	6.7	4.6	0.8	0.8
Deer Lake	NL	28	27.5	25.9	13.9	12.9	7.5	7.5	3.1	1.7
Deming	NS	30	39.0	13.6	22.0	4.4	12.5	1.4	6.9	0.0
Doaktown	NB	30	37.7	16.3	21.3	6.4	13.3	2.4	4.4	0.2
East Baltic	PE	28	32.5	22.7	18.2	9.8	10.0	4.8	4.5	1.0
Edmundston	NB	27	36.1	17.6	22.3	7.4	12.5	1.9	4.4	0.2
Exploits Dam	NL	30	32.6	20.1	17.7	7.8	10.0	3.8	2.4	0.9
Flowers Cove	NL	24	35.0	24.3	21.4	12.1	12.7	6.3	6.1	2.2
Fogo	NL	23	41.7	15.6	28.8	7.4	20.1	3.5	11.0	0.6
Fredericton A	NB	30	35.2	16.3	19.6	4.8	10.8	1.3	3.8	0.0
Fredericton CDA	NB	29	33.3	21.2	20.5	9.8	12.2	3.6	3.7	1.6
Gagetown 2	NB	29	32.9	20.4	18.7	8.5	10.5	3.9	4.6	0.7
Gander Int'l A	NL	30	24.1	32.6	10.7	18.3	4.3	10.3	1.6	3.3
Goose Bay	NL	30	20.8	32.2	10.2	20.0	4.4	9.4	1.1	3.6
Grand Falls Drummond	NB	22	30.2	22.1	17.4	7.9	7.6	4.1	2.7	0.6
Grand Falls	NL	28	30.9	23.0	18.5	9.8	10.0	6.0	3.3	0.5
Greenwood A	NS	30	39.3	15.4	23.4	4.6	13.2	2.2	6.0	0.4
Halifax Int'l A	NS	30	38.2	15.5	22.9	4.4	14.1	1.6	5.6	0.0
Halifax Citadel	NS	30	39.2	16.3	23.4	5.7	13.8	1.6	5.6	0.0
Harvey Station	NB	27	42.1	14.5	26.2	4.3	15.9	1.4	8.1	0.2
Holyrood Gen Stn	NL	28	40.2	12.7	23.6	4.4	13.9	1.4	7.6	0.2
Ingonish Beach	NS	28	35.2	21.1	21.4	9.3	14.3	4.6	5.5	0.7
Juniper	NB	28	31.4	23.9	16.7	10.2	8.2	4.8	3.3	0.7

Name	Prov	Years	3 day dry	3 day wet	5 day dry	5 day wet	7 day dry	7 day wet	10 day dry	10 day wet
Kejimkujik	NS	30	39.2	14.8	23.8	5.4	14.1	2.4	7.3	0.7
Kemptville	NS	19	51.4	7.5	34.6	1.2	20.1	0.8	11.9	0.0
Kentville CDA	NS	30	37.8	17.5	22.2	6.2	12.4	2.7	5.8	1.8
Kouchibouguac	NB	23	37.4	17.8	22.5	7.4	11.6	3.3	5.5	0.6
Liverpool Big Falls	NS	26	40.4	14.7	25.0	4.2	14.5	2.0	7.9	0.3
Liverpool Milton	NS	29	39.7	17.0	24.6	5.3	14.6	2.6	7.8	0.2
Lockston	NL	27	38.3	13.4	23.3	4.9	13.8	1.6	6.2	0.5
Logy Bay	NL	25	40.1	14.7	24.5	6.4	13.5	1.9	7.5	0.0
Long Harbour	NL	27	27.0	26.4	14.6	13.7	8.8	5.5	3.5	2.2
Long River	PE	30	40.5	14.1	25.4	4.4	16.3	1.6	7.6	0.4
Louisbourg	NS	28	30.2	26.1	15.2	11.1	8.0	6.3	2.4	2.4
Lyons Brook	NS	21	37.8	15.5	22.9	5.4	13.4	1.1	5.4	0.0
Mactaquac Prov Park	NB	25	37.0	19.8	21.6	8.7	13.7	2.9	5.1	0.5
Mapleton	NB	28	42.5	12.2	28.7	3.2	18.9	0.9	9.3	0.0
Margaree Forks	NS	30	38.4	14.2	24.3	3.7	13.2	1.6	5.8	0.2
Mcgraw Brook	NB	25	34.7	19.9	19.6	9.2	10.5	4.6	4.0	0.5
Middle Musquodoboit	NS	30	35.2	18.6	18.1	6.8	11.6	2.2	4.2	0.0
Minto	NB	22	46.2	10.2	30.6	3.8	22.7	1.7	9.1	0.3
Miramichi A	NB	29	31.7	20.3	16.1	9.5	8.5	4.1	3.0	0.5
Moncton	NB	30	35.6	18.2	22.1	6.3	12.7	2.1	5.6	0.2
Moncton A	NB	30	33.0	20.3	19.6	8.4	10.3	2.7	5.1	0.9
Monticello	PE	29	37.1	17.2	21.1	4.0	12.0	1.3	5.1	0.0
Mount Carleton	NB	27	34.6	21.3	20.9	9.0	12.9	4.9	5.4	1.0
Mount Uniacke	NS	29	37.4	17.8	22.6	7.2	13.3	2.6	4.6	0.5
Musgrave Harbour	NL	22	39.6	16.8	25.3	6.5	15.2	2.8	7.0	0.3
Nain A	NL	19	34.8	23.6	22.5	9.8	12.8	3.5	6.0	1.4
Nappan CDA	NS	30	35.2	19.2	19.7	7.4	11.4	2.1	4.2	0.2
Nepisiguit Falls	NB	30	44.2	13.7	29.1	4.9	16.7	1.4	8.0	0.4
New Chelsea	NL	21	37.8	13.7	20.5	5.2	14.5	2.0	5.7	0.3
New Glasgow	PE	27	36.5	18.6	21.1	8.0	14.1	3.0	5.4	0.7
O'Leary	PE	30	36.6	15.2	21.1	4.4	13.0	1.1	5.8	0.0
Oromocto	NB	23	34.9	17.4	20.0	6.1	9.9	2.3	4.3	0.9
Paradise	NS	26	40.1	14.5	23.7	3.8	13.2	0.5	6.9	0.0

Name	Prov	Years	3 day dry	3 day wet	5 day dry	5 day wet	7 day dry	7 day wet	10 day dry	10 day wet
Parrsboro	NS	30	33.0	21.0	18.8	8.9	11.1	3.2	5.1	0.4
Pennfield	NB	30	26.7	30.5	15.8	17.7	8.4	10.2	4.0	4.4
Petty Harbour	NL	28	41.8	12.9	25.7	3.1	16.2	1.2	7.4	0.0
Plum Point	NL	28	19.6	36.4	9.0	22.4	4.8	12.1	1.7	4.8
Pockwock Lake	NS	21	30.2	24.0	15.9	10.3	8.6	3.6	3.2	1.3
Pools Cove Fortune Bay	NL	20	36.9	16.3	20.2	5.7	11.9	2.9	5.7	0.3
Port aux Basques	NL	25	26.0	26.5	13.3	11.7	5.5	5.0	1.6	0.5
Port Hood	NS	16	42.3	17.4	28.8	8.8	18.2	5.1	9.2	0.8
Pugwash	NS	26	38.2	17.5	24.5	6.3	15.6	2.6	8.2	0.5
Rattling Brk Norris Arm	NL	30	29.2	24.9	15.1	12.6	7.1	6.7	2.0	2.7
Rexton	NB	30	41.6	11.6	26.3	3.9	17.0	0.8	9.1	0.2
Rocky Harbour	NL	25	26.9	28.1	14.5	14.8	5.9	7.8	3.5	2.9
Roseway	NS	24	44.0	11.8	28.1	3.2	16.5	1.0	10.0	0.0
Royal Road	NB	22	36.2	15.7	19.8	5.3	12.6	0.6	4.8	0.0
Sable Island	NS	22	34.1	17.8	18.2	6.5	9.1	2.6	2.7	0.6
Sackville	NB	28	34.4	17.8	20.6	7.4	10.9	2.4	6.0	0.2
Saint John A	NB	30	36.6	15.4	21.2	5.2	13.2	0.8	7.3	0.2
Salmon Hole	NS	29	45.7	11.4	30.3	2.6	19.5	0.7	8.5	0.2
Salt Pond	NL	21	34.3	20.4	20.2	9.0	11.8	4.5	5.7	2.2
Sandy Cove NRC	NS	25	31.7	24.2	17.1	10.5	8.6	4.2	3.7	1.6
Shearwater A	NS	30	35.9	16.1	20.9	5.7	11.9	1.7	4.9	0.0
Sops Arm White Bay	NL	21	40.9	17.7	27.6	7.9	20.0	4.5	10.8	1.0
Springdale	NL	16	44.2	14.6	26.0	5.0	17.9	2.1	7.9	0.0
Springfield	NS	30	31.0	24.6	17.1	11.3	10.0	5.7	4.2	2.2
St Anthony	NL	23	23.7	28.6	11.4	13.3	5.0	5.8	1.4	2.0
St John's A	NL	30	27.1	23.8	13.0	11.4	6.5	4.9	2.4	1.1
St John's West CDA	NL	30	28.0	23.9	13.6	12.0	7.1	5.1	2.7	1.6
St Lawrence	NL	24	30.3	18.5	16.1	5.6	7.3	1.4	1.7	0.3
St Margaret's Bay	NS	30	41.0	14.8	27.0	4.4	14.3	1.7	7.3	0.2
St Shotts	NL	21	28.0	25.1	15.1	11.9	6.8	6.1	2.5	2.9
Stanhope	PE	29	44.4	13.5	30.5	4.7	20.0	2.3	11.7	0.0
Stephenville A	NL	30	27.5	24.7	13.3	11.6	6.5	4.8	1.8	1.6
Stillwater Sherbrooke	NS	23	50.3	8.8	33.9	3.0	23.6	1.4	13.0	0.0

Name	Prov	Years	3 day dry	3 day wet	5 day dry	5 day wet	7 day dry	7 day wet	10 day dry	10 day wet
Summerside A	PE	24	31.9	19.8	16.4	7.4	9.3	2.4	4.4	0.6
Summerville	NS	29	50.5	8.2	35.3	1.8	23.2	0.5	12.6	0.2
Sussex	NB	30	42.7	12.9	28.1	3.9	17.5	0.8	8.9	0.0
Sydney A	NS	30	33.5	18.3	18.8	6.0	9.5	1.7	3.1	0.7
Terra Nova Nat Park HQ	NL	26	28.6	25.4	15.6	14.4	7.3	7.3	2.3	2.1
Tignish	PE	21	37.6	16.8	21.3	6.7	14.3	1.6	6.7	0.0
Truro	NS	28	33.3	21.1	18.1	9.4	11.7	3.1	3.8	0.5
Turtle Creek	NB	24	37.3	16.2	23.2	5.8	14.5	1.4	6.7	0.3
Tusket	NS	27	42.9	12.6	26.8	3.3	16.8	1.1	7.7	0.0
Upper Stewiacke	NS	29	34.3	20.7	19.0	7.9	10.7	3.6	4.8	0.5
Upsalquitch Lake	NB	28	36.9	19.7	24.5	8.5	14.8	4.8	8.1	1.2
Wabush Lake A	NL	30	19.7	36.7	8.6	22.4	5.9	13.3	1.8	5.3
Waterville Cambridge	NS	21	37.5	17.6	23.5	5.9	13.8	1.8	6.3	0.3
Wellington	PE	22	38.5	12.8	23.3	4.1	13.4	1.3	6.7	0.0
Westphal	NS	25	38.7	18.3	23.3	6.9	13.9	2.1	5.6	0.5
Weymouth Falls	NS	27	46.6	11.2	30.6	2.1	19.4	0.5	10.4	0.2
White Rock	NS	23	43.5	12.8	27.8	3.2	16.6	0.4	7.5	0.0
Wiggins Point	NB	24	40.6	13.1	24.6	4.2	15.9	1.6	8.9	0.6
Windsor Martock	NS	21	41.1	14.9	25.1	4.1	14.5	0.9	6.0	0.0
Woodstock	NB	25	39.0	13.0	23.2	4.0	16.2	1.5	6.7	0.0
Wreck Cove Brook	NS	22	32.8	21.6	16.5	9.8	10.8	3.9	3.3	0.6
Yarmouth A	NS	30	42.7	12.1	27.2	3.1	15.7	1.1	7.6	0.0

Appendix 4: Sample of Graphs