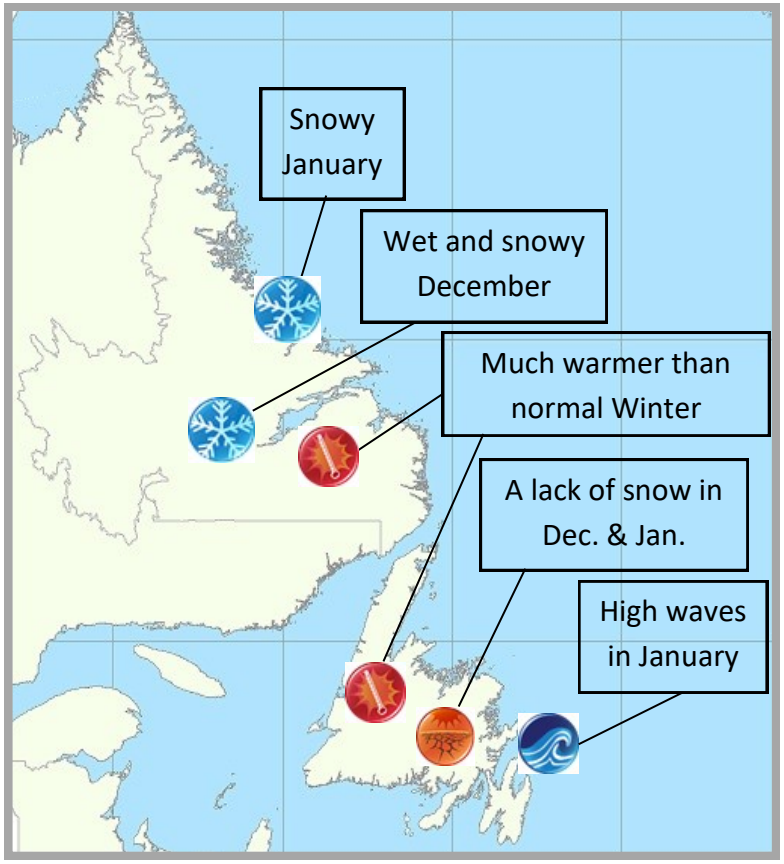

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Newfoundland and Labrador

Quarterly Climate Summary: Winter 2020/21

Summary & significant weather events (December—February)

Newfoundland and Labrador ended up with a balmy **winter** season. Labrador did pick up its share of snowfall over the course of the 3-month period, but extremely above normal temperatures stunted ice growth along the coast and over lakes. For Newfoundland, winter hit the snooze button through December and January before snow finally started to pile up through February.

December produced its share of storms for the province, but many of these gave a mix of precipitation across much of the island. The holiday season proved to be quite balmy across the entire province, and most of the island ended up with a green Christmas.

January started out much the same way, as a prolonged easterly flow brought days of spring-like RDF (Rain-Drizzle-Fog) to the island. Warm conditions were especially felt in Labrador, where 2021 had record-setting average temperatures for parts of the Big Land. The end of the month saw a pair of slow-moving deep storms well offshore churn up high waves towards Newfoundland's east and northeast coasts.

Winter finally arrived in February, though overall temperatures still ran above normal across the province. Several storms did bring snow to all parts of the province, leaving all areas with a good amount of snow on the ground by season's end.

Significant Weather Events:

December

December 1-3: A frontal wave resulted in a mix of wintry weather for Labrador, and heavy rain and mild temperatures for Newfoundland.

- **Snowfall:** 36 cm of fresh powder was observed at Wabush Lake. 17 cm fell in Goose Bay and 12 cm fell in Nain.
- **Rainfall & Freezing Rain:** 91 mm was observed at St. Lawrence, while two reports had 64-67 mm in Winterland. 30 -60 mm fell elsewhere in southern & eastern Newfoundland, along with 38 mm at Goose Bay.
- **Temperatures:** Ten stations in Newfoundland set or tied daytime high records on December 2. Eleven stations set daytime high records on December 3. Daytime highs reached the low to mid teens on these days.

December 8-9: A nor-easter passed near the Avalon Peninsula, with it coming a shot of heavy snowfall for central and northeastern Newfoundland. Heavy rainfall was in store for the Avalon and Burin Peninsulas, complete with thundershowers for the Avalon.

- **Snowfall:** Two reports had 22 cm in Gander, while Grand-Falls-Windsor picked up 11 cm.
- **Rainfall:** Generally 20-40 mm fell across the Avalon and Burin Peninsulas, with thundershowers reported at St. John's Airport.

December 15-17: A low pressure system passed across eastern Newfoundland, then rapidly intensified. Significant snowfall and strong winds resulted from this storm.

- **Snowfall:** Makkovik picked up 64 cm and Goose Bay received 47 cm. Corner Brook, Deer Lake, and Nain each got 25 cm, while amounts in northeastern Newfoundland ranged from 15 to 20 cm.
- **Wind:** Green Island (Fortune Bay) hit 145 km/h. Stations across the south, east & northeast coasts of Newfound-land, as well as the Labrador Strait, hit peak gusts of 95-120 km/h, with Port aux Basques at the high end of that range.

December 22: Another intensifying storm tracked through the Gulf of St. Lawrence. This was a very un-Christmas-like rain storm for Newfoundland, along with the Labrador Strait. Heavy snow was the story for central and northern Labrador though.

- **Rainfall:** 79 mm fell at the Wreckhouse station while 66 mm fell in Port aux Basques. Amounts of 20-55 mm were observed elsewhere across much of the island.
- **Snowfall:** Makkovik received 24 cm and Goose Bay got 20 cm.
- **Wind:** Peak gusts across the island and northern Labrador ranged from 90 to 121 km/h.

December 25-27: A deep low pressure system tracked west of Labrador. A period of unseasonable mild temperatures were in store for the Christmas holiday period across the province

- **Temperatures:** A selection of stations broke daily temperature records in both Newfoundland and Labrador on each of these three days. Daytime highs hit double digits over several areas during this period, with parts of the island reaching as high as 12-15 °C.

December 29: Unusually for mid-winter, a second bout of thundershowers occurred on the Avalon Peninsula during the night.

January

January 6-9: A slow moving low pressure system eventually crossed eastern Newfoundland. Most of the significant weather associated with this system occurred in Labrador, where heavy snowfall and a mix of freezing rain and rain fell.

- **Snowfall:** 53 cm was reported at Mud Lake, 50 cm at Goose Bay, and 45 cm at Makkovik.
- **Rainfall & Freezing Rain:** Generally 20-50 mm of rain fell across much of Newfoundland and southeastern Labrador. A lengthy period of freezing rain occurred in the Cartwright area and likely over some inland areas in southeastern Labrador.

January 15-16: A deep low pressure system passed southeast of the island. This gave a shot of heavy snowfall to the Avalon Peninsula.

- **Snowfall:** 10-23 cm was reported across much of the Avalon Peninsula.

January 20-21: A storm moving westward towards Labrador brought snow to parts of Labrador, blizzard conditions to the north.

- **Snowfall:** 30 cm was reported at Nain and 14 cm fell in Makkovik.
- **Wind:** Generally 80-90 km/h peak wind gusts in northern Labrador.

January 21-22: An intense storm tracked east of Newfoundland, bringing winter storm conditions for eastern areas.

- **Snowfall:** One station in Mount Pearl reported 41 cm for the event. Accumulations elsewhere on the Avalon Peninsula ranged from 22 to 36 cm, while Gander and Terra Nova reported 18-24 cm.
- **Wind:** Peak gusts of 80-105 km/h were observed across much of the east coast of the island.

January 22-25: The previous storm merged with another low pressure system, leading to a multi-day heavy snowfall event for parts of coastal Labrador and the Northern Peninsula.

- **Snowfall:** Blanc Sablon picked up 40 cm while L'Anse au Loup received 36 cm. 17 cm was reported at Goose Bay Airport.
- **Winds:** Gusts reached 99 km/h at Hopedale. Stations across southeastern & central Labrador, along with St. Anthony, peaked at 70-90 km/h.

January 27-31: A nearly-stationary deep low pressure system well offshore, along with another system passing well south of the island, produced large swell waves across the east and northeast coasts of Newfoundland.

February

February 2-4: A deep low pressure system tracked to the west of Newfoundland, further delaying the true start of winter for much of the island but bringing more snow to Labrador.

- **Snowfall:** 36 cm was observed at Blanc Sablon, 18 cm at Goose Bay, and 17 cm at Makkovik.
- **Rainfall:** Port aux Basques received an estimated 44 mm and Ferryland picked up 31 mm. The Avalon Peninsula and parts of southern Newfoundland received rainfall of 10-20 mm.
- **Wind:** Gusts peaked at 76-124 km/h across the island and the Labrador Strait, except Wreckhouse peaked at 163 km/h and Green Island peaked at 142 km/h.

February 8-9: A very intense storm moved south of the Avalon Peninsula, resulting in winter storm conditions for much of the island. Simultaneously, a nearly stationary trough of low pressure gave more significant snowfall to northern Labrador.

- **Snowfall:** 37 cm was reported at a station in Mount Pearl, while amounts of 32-33 cm were recorded in Gander and Kippens. Stations scattered elsewhere across the island reported 18-28 cm, while Nain received 20 cm.
- **Wind:** A 132 km/h peak gust was noted at Green Island, while gusts elsewhere on the south, east & northeast coasts reached 70-116 km/h.

February 11-12: A warm front approaching Newfoundland from the north brought winter storm conditions to eastern & northeastern areas.

- **Snowfall:** Mount Pearl got another 35 cm, while a station in the north end of St. John's reported 31 cm. Amounts elsewhere on the Avalon, in northeastern Newfoundland, and parts of western Newfoundland picked up 15-25 cm. Blanc Sablon even received 28 cm with this storm.
- **Wind:** Green Island hit 121 km/h and Cape St. Mary's peaked at 116 km/h. Parts of the east & south coasts clocked gusts of 88-96 km/h.

February 16-17: A storm tracked across the island, giving a wintry mix of precipitation.

- **Snowfall:** Gander Airport reported 27 cm total while Gander West and Stephenville each received 20 cm. Observations of 10-17 cm were scattered elsewhere across the island and southeastern Labrador.
- **Wind:** Wreckhouse winds peaked at 129 km/h and Green Island hit 122 km/h. Elsewhere along the south, east and northeast coasts of the island, peak gusts ranged from 70-115 km/h.
- **Freezing Rain:** 4 consecutive hours of freezing rain or freezing drizzle was observed at St. John's Airport on the morning of the 17th.

February 28: An unsettled week of wintry weather was capped off by a weekend snowfall to end the winter season.

- **Snowfall:** St. John's received 21 cm, Deer Lake 18 cm, Gander 14-15 cm, and the Bay St. George area 11 cm.

Provincial Climate Overview (December—February):

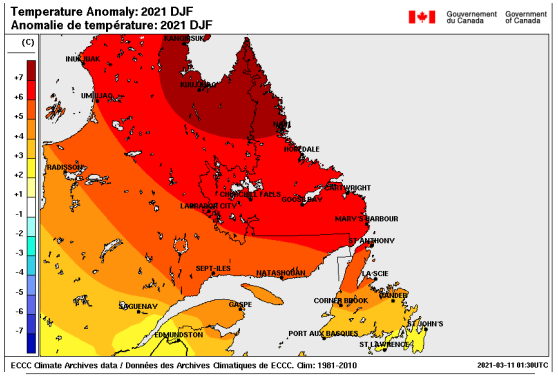
Temperature (Departure from Normal):

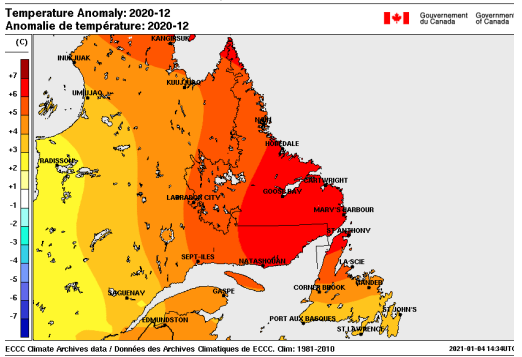
Winter average temperatures blew past the normal for Labrador and northwestern Newfoundland. Temperatures over these areas were 5 to 7 degrees above the norm for the season. For the remainder of Newfoundland, temperatures were 2 to 5 degrees above normal, making for a relatively balmy winter season across the province. For many areas of the province, this winter ranked among their 3 mildest winters on record. At several areas, this winter ranked as the mildest on record. This includes the Hopedale, Makkovik, and Mary's Harbour areas in Labrador; and the Bonavista, Clarenville, and Winterland areas in Newfoundland.

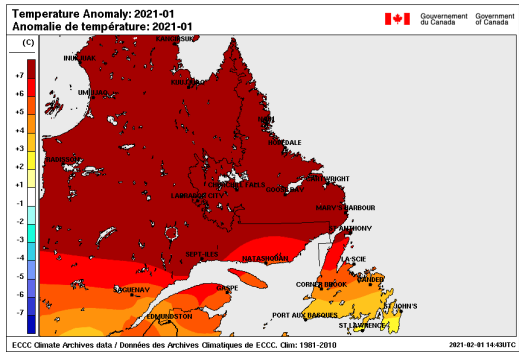
December average temperatures were 2 to 6 degrees above normal across Newfoundland, and 5 to 7 degrees above normal in Labrador. Several places scattered throughout the province had top-3 warmest Decembers on record, with the Buchans area experiencing its warmest December on record in 2020.

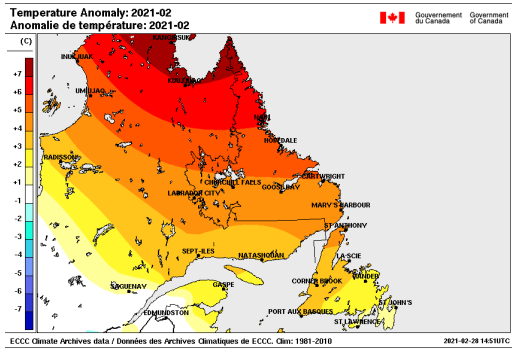
January temperature anomalies ranged from about 2 degrees above normal in parts of the south to near 7 degrees over northern sections of the Northern Peninsula. Deer Lake and Gander each had their 4th warmest January on record. Labrador's departure from normal was off the charts, ending up an astounding 7 to 10 degrees above normal for the month. Hopedale, L'Anse au Loup, Makkovik, Mary's Harbour and Wabush Lake each had their warmest January on record, while Goose Bay had its second warmest.

February temperatures moderated somewhat, but still ran above normal across the province. For the island, temperatures ranged from a degree above normal for parts of the Avalon and Burin Peninsulas up to about 5 degrees above for the Northern Peninsula. Labrador continued to blow past the winter normal, ranging 4 to 7 degrees above normal. The Makkovik area had its mildest February on record while the L'anse-au-Loup area had its second mildest February.









Right: Temperature anomalies based on observations for Newfoundland and Labrador for (from top) December-February combined, December, January, February

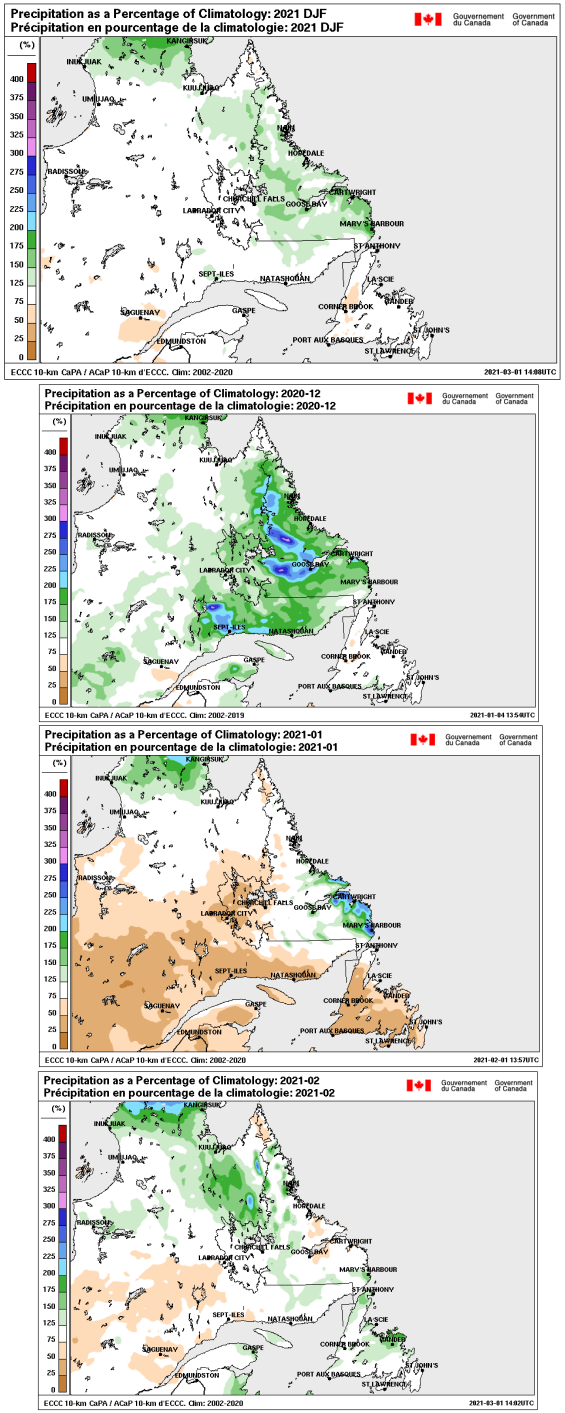
Precipitation (Departure from Normal/Percentage of Climatology):

Winter was generally near the average for Newfoundland in terms of precipitation, except a little drier than average in parts of the west. Higher than average precipitation was generally the story for Labrador. The Happy Valley-Goose Bay area had it 2nd wettest winter on record with 293 mm of total precipitation, with more than half of that falling in December. The main exceptions to these conditions in Labrador were noted in the west and along the Strait, where roughly average precipitation fell.

December precipitation was, for the most part, average across Newfoundland. The Connaigre Peninsula had slightly above average precipitation for the month, while the Humber Valley area ended the month slightly below average. Labrador though had one clear outcome: above average precipitation. Much of the region received anywhere from 25-80% more precipitation than the average, with central Labrador getting more than double its usual.

January precipitation trended drier for the island, with much of it receiving only 25-75% of average. These drier than average conditions extended to western Labrador, while much of central and northern Labrador ended up with near to slightly above average monthly totals. However, coastal Labrador from Postville to Lodge Bay ended up getting about 1.5-2.5 times their average precipitation for January.

Precipitation in **February** leveled out to an extent, with much of the province coming in with roughly average amounts. A few areas received about 25-80% higher than average precipitation. These areas include sections of northeastern and central Newfoundland, the Northern Peninsula, southeastern Labrador, and northern Labrador. Central Labrador ended up with a drier than average month to finish up the season.

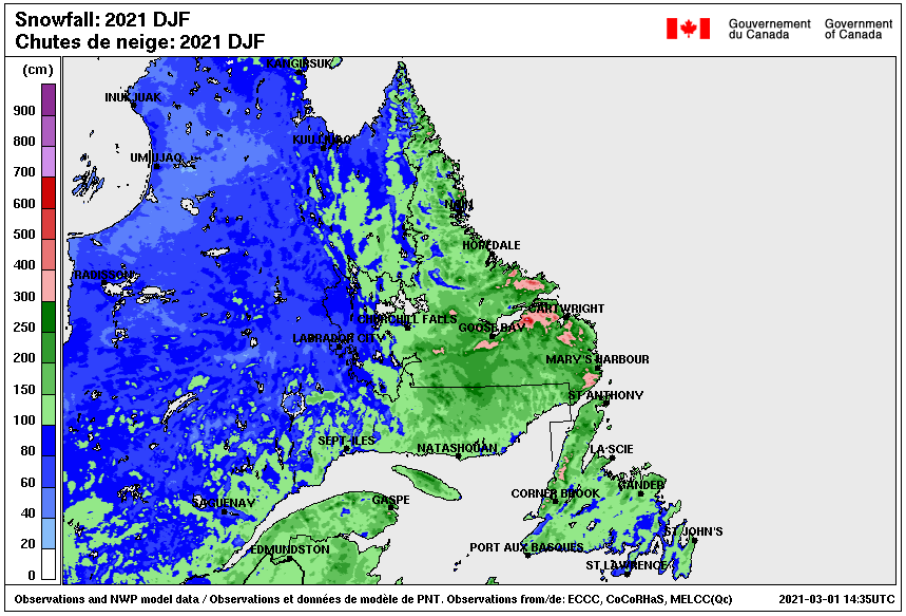


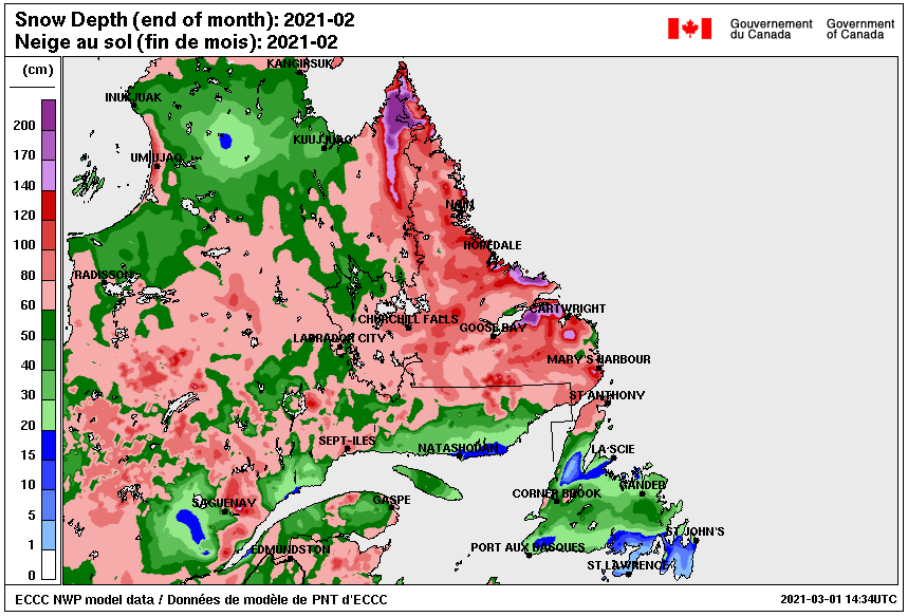
Right: Precipitation anomalies for Newfoundland and Labrador for (from top) December-February combined, December, January, February. Anomalies based on averages for the 2002-2020 period.

Total Snowfall and Snow Depth

For the winter season, total estimated snowfall ranged from 100 to 250 cm across Newfoundland and Labrador for the most part. Snowfall totals as low as 80 cm were estimated across portions of the island and in western Labrador. Conversely, snowfall totals near 300 cm likely fell over parts of coastal and central Labrador, as well as over the Long Range Mountains. Winter snowfall was mostly below normal across Newfoundland. Corner Brook ended up with its lowest January snowfall total on record in 2021, though that was followed up by 108 cm snow in February, more than double what fell in the previous 2 months combined. Meanwhile, central Labrador ended up receiving above normal snowfall for the season. The Happy Valley-Goose Bay area had its 8th snowiest winter on record with 272 cm of snowfall, with the bulk of that falling in December and January.

At the end of February, estimated snow on ground was in the 60-120 cm range across Labrador, with potentially 150 cm or more along a stretch of the mid coast. Similar estimated snow depths were noted across much of the Northern Peninsula as there were across most of Labrador. Elsewhere across the island, in general, snow depths were in the 20-60 cm range. Much of southeastern Newfoundland had lesser snow on ground estimates at the end of February, while some pockets of the island had snow depths of 60-80 cm or more. (Note: snow depths displayed in the image below are estimates only, and may under-represent the amount of snow on ground for some areas, especially in Newfoundland).





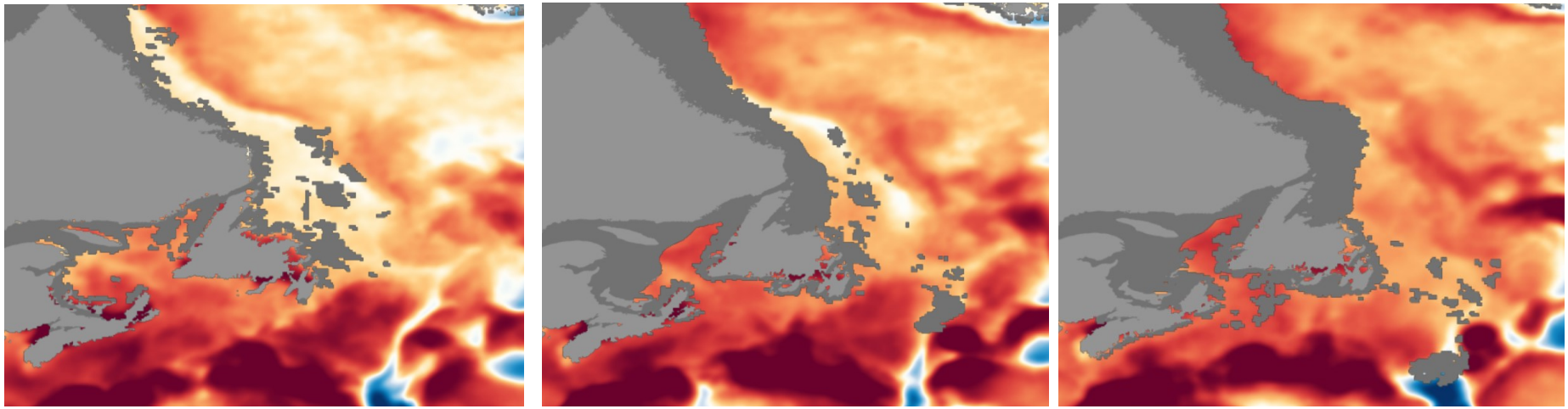
Left: Total snowfall (estimated) for December, January, February combined.

Right: Snow depth for Newfoundland and Labrador at the end of February 2021 (estimated using a blend of observations and model data).

Sea Surface Temperature (Departure from Normal)**:**

Note: We are excluding the area over the southern Grand Banks where the Labrador Current and the Gulf Stream meet. This area is extremely variable even in normal conditions. Grey areas may represent gaps in data or presence of sea ice.

Warmer than normal conditions weren't just confined to land areas. For each of **December, January** and **February**, sea surface temperatures were generally about 1 to 3 ºC warmer than average over most Labrador and northeastern Newfoundland waters. Sea surface temperature anomalies were even higher across southern Newfoundland waters and the Gulf of St. Lawrence, where temperatures were 3 to 5 ºC above the normal. These higher than normal sea surface temperatures contributed to a below normal season for sea ice extent and concentration (more on that on the next page).

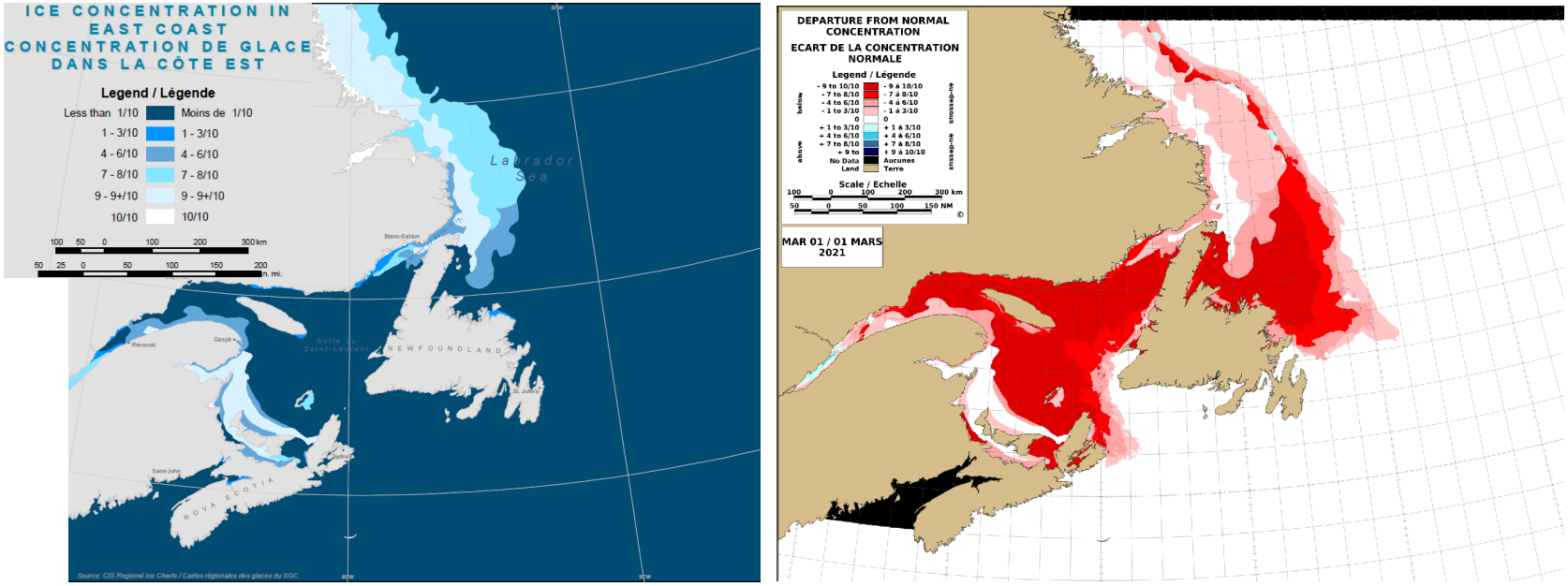


NOAA monthly mean SST anomaly map (based on 1981-2010 Normals) for Dec 2020 (left), Jan 2021 (middle), and Feb 2021 (right) - https://www.nnvl.noaa.gov/view/globaldata.html#SSTA

Sea Ice Coverage (Analysis / Concentration departure from normal):

Sea ice charts for the East Coast at the end of the winter season show ice cover along the Labrador Coast and through the Strait of Belle Isle, just extending into the northeast coast of Newfoundland and the Gulf of St. Lawrence. However, most areas had below normal ice concentration for this time of year, especially across the northeast coast and the Gulf of St. Lawrence. Persistent onshore winds prevented the usual migration of ice from along the Labrador coast down to the waters of the northeast coast and above normal temperatures prevented ice from growing in place. This trend continued through the first half of February before closer to normal temperatures returned allowing ice coverage to increase towards the end of the month.

Labrador started out February at just 5% ice covered compared to the median of 23% ice covered. Ice cover steadily grew through the month, approaching the climatological median by the end of the month. Normally ice coverage would remain steady near 24% for the month, with all of the growth usually occurring in January. Persistent onshore winds and well above normal temperatures dominated the first half of February, preventing any substantial ice growth. As temperatures cooled slightly towards the end of February and offshore winds returned, ice coverage was allowed to grow, though remaining below the climatological median. The iceberg limit at the end of February extended across Belle Isle Bank and off the northeast coast of Newfoundland.



Left: Sea ice analysis chart for March 1, 2021. Right: Sea ice concentration departure from normal: March 1, 2021

Provincial Impacts (December—February):

Winter was late arriving to the party:

A typical winter season chock full of snowmobiling and skiing was very much abbreviated to the later stages of the season. While the province saw its share of storms, many of them through the early stages of the winter gave mostly rain and mild conditions to the island. A lack of snow and unseasonable mild caused several delays to opening of the island's ski hills, and to the snowmobiling season in Gros Morne National Park. The mild winter spared no area during the Christmas Holiday period, as daily high temperature records were set across a wide swath of both Newfoundland and Labrador during this time. A prolonged mild and wet spell across most of the island to open January brought more visions of spring than winter-time ski-doo trips and boil-ups. It was an especially stark contrast for the east coast of the island considering the one-year anniversary of "Snowmageddon." Winter did finally arrive across the entire province by late January, but the extreme milder-than-normal conditions didn't do any favours for sea ice cover along the Labrador coast, nor for skating or snowmobiling enthusiasts. All in all, the season still managed to produce its share of ferry delays and cancellations, despite the mild start.

High swell waves along the east & northeast coasts of Newfoundland:

A few of winter's storms ended up well offshore, and generally out of harm's way...or so one would think. A very deep system off of Greenland ended up providing very high swell waves across much of Newfoundland's east and northeast coast in the later part of January. These waves caused some damage along the breakwater near Long Pond. Very high waves were observed near Little Harbour and Bonavista as well. Another storm in February created more high waves, with both of these events resulting in cancellations for the Bell Island ferry, and required the use of a helicopter to get people to and from the island.

An untypical winter ends with a typical run of storms:

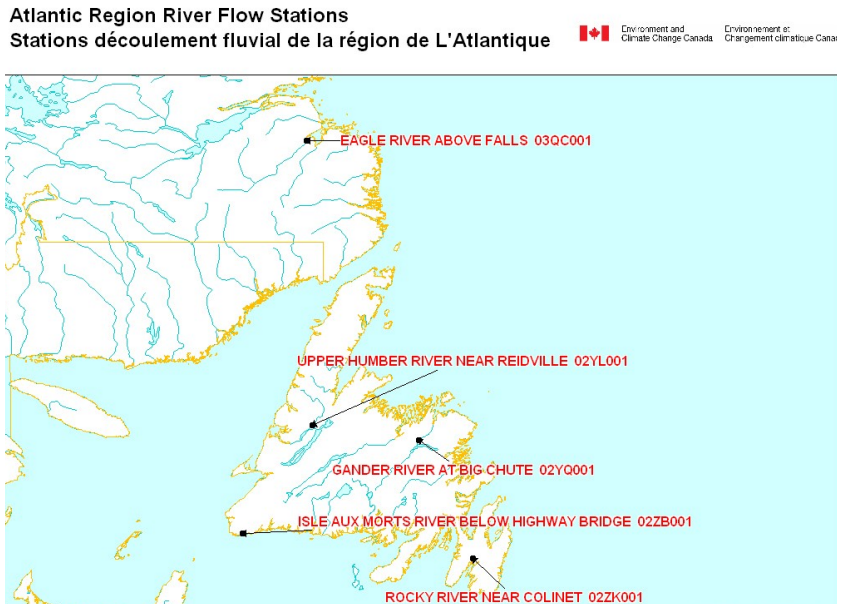
While snow cover across most of the island struggled to grow through the winter's first couple of months, February gave us a more typical period of stormy and snowy conditions. Even though temperatures continued to run above normal across the province, several storms brought significant snowfall to all areas of the province. This allowed for snow depths to grow, especially across Newfoundland, and winter finally did arrive. The month (and season) ended off with a string of several low pressure systems tracking across the island during the last week, allowing for folks to dig out their toboggans and skis, and enjoy some classic winter outdoor time.

River Flows / Drought Conditions:

River flow rates in Newfoundland and Labrador were above normal for **December**, with Eagle River and the Upper Humber River reporting excessive flow.

January flows continued to be above normal across rivers in Labrador and much of the island. Eagle River continued to exhibit excessive flow rate. Scattered rivers in western, southern, and eastern Newfoundland bucked this trend though, and had flows which were near to below normal for January.

Flow rates for **February** ran above normal in Labrador, with Eagle River reporting excessive flow for the third consecutive month. Flows in Newfoundland were generally near to below normal, with the Rocky and Upper Humber Rivers exhibiting deficient monthly flow rates.



Right: Monthly runoff summary for select river sites in Newfoundland and Labrador (map above) for Dec 2020 (top), Jan 2021 (middle), and Feb 2021 (bottom) - tables courtesy of ECCC Water Survey of Canada

STATION NUMBER	DRAINAGE AREA	MEAN FLO (M3/S)	% OF MEDIAN
EAGLE		183	198
03QC001	10900 KM2	E	
GANDER		170	147
02YQ001	4400 KM2		
ISLE AUX MORTS		16.5	150
02ZB001	205 KM2		
ROCKY		17.5	120
02ZK001	301 KM2		
UPPER HUMBER		89.8	217
02YL001	2110 KM2	E	

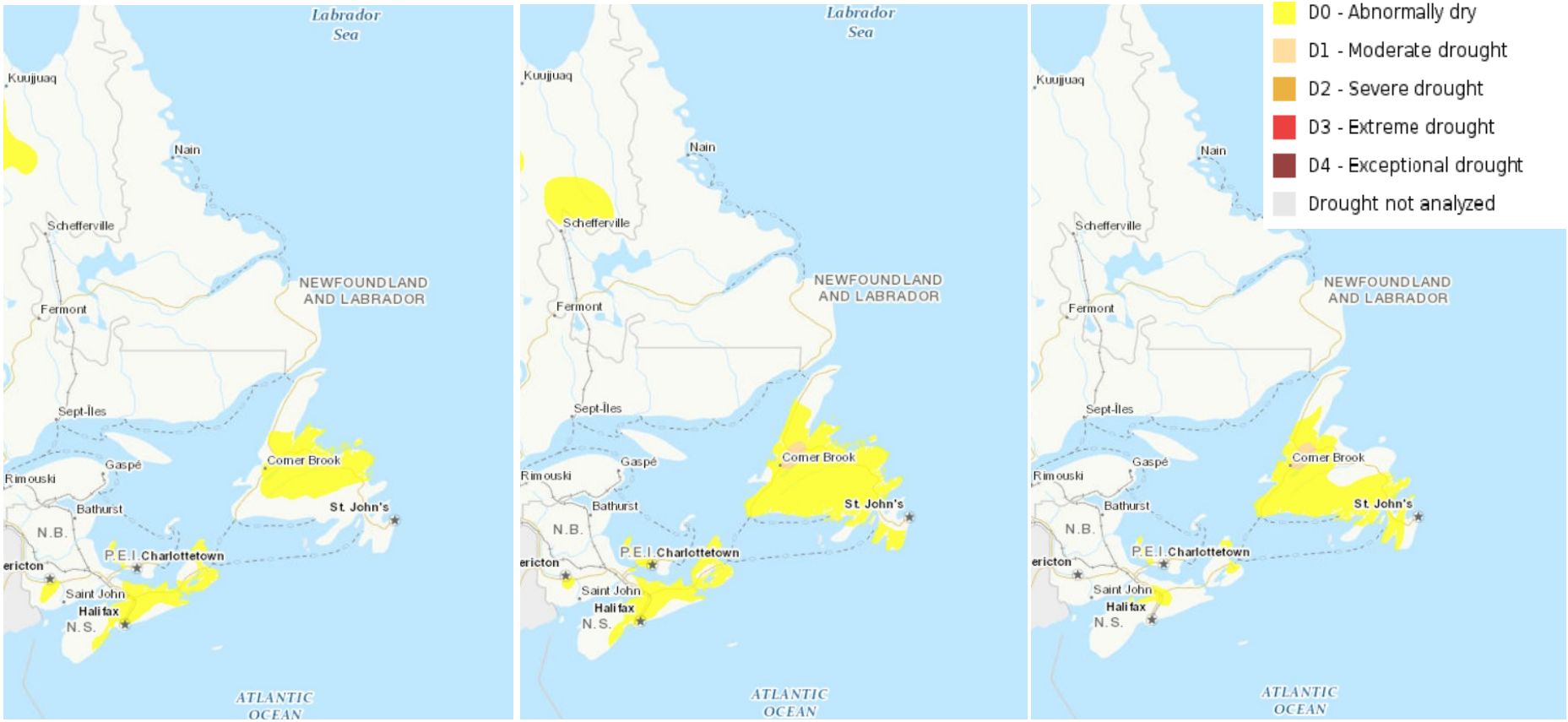
STATION NUMBER	DRAINAGE AREA	MEAN FLO (M3/S)	% OF MEDIAN
EAGLE		84	150
03QC001	10900 KM2	E	
GANDER		112	125
02YQ001	4400 KM2		
ISLE AUX MORTS		4.64	97
02ZB001	205 KM2		
ROCKY		8.35	61
02ZK001	301 KM2		
UPPER HUMBER		37.1	143
02YL001	2110 KM2		

STATION NUMBER	DRAINAGE AREA	MEAN FLO (M3/S)	% OF MEDIAN
EAGLE		67.1	171
03QC001	10900 KM2	E	
GANDER		69.4	101
02YQ001	4400 KM2		
ISLE AUX MORTS		5.78	161
02ZB001	205 KM2		
ROCKY		6.06	52
02ZK001	301 KM2	D	
UPPER HUMBER		7.11	45
02YL001	2110 KM2	D	

E - Excessive
D - Deficient
R - Record

Drought Conditions:

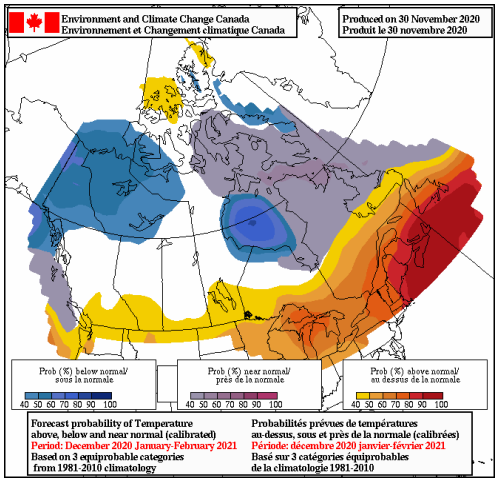
Drier than normal conditions were noted in **December** across central Newfoundland. This area of dry conditions expanded in **January** to most of the remainder of the island (except for parts of the Avalon, Burin, Port au Port, and Northern Peninsulas). These dry conditions were thanks in part to January having lower than normal precipitation for most of the island. Moderate drought conditions were noted across the Humber Valley area. These drought conditions continued through **February**, as did abnormally dry conditions for much of the island, though this area did contract somewhat. In Labrador, abnormally dry conditions were not observed through the winter season.

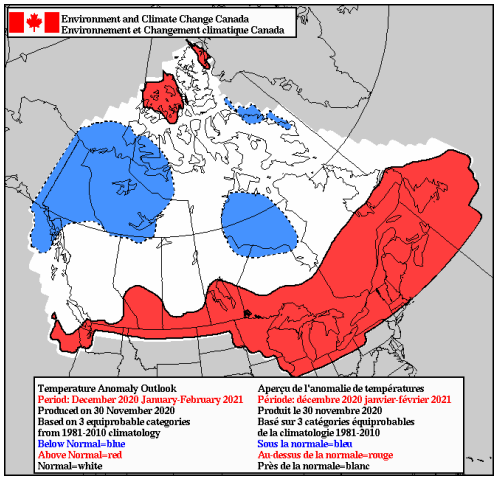


Canadian Drought Monitor Map for December 31, 2020 (left), January 31, 2021 (middle), and February 28, 2021 (right) . Drought maps courtesy of Agriculture and Agri-Food Canada- http://www.agr.gc.ca/eng/programs-and-services/list-of-programs-and-services/drought-watchcanadian-drought-monitor/?id=1463575104513

Winter Season (Period: December-January-February) Temperature Outlook Performance

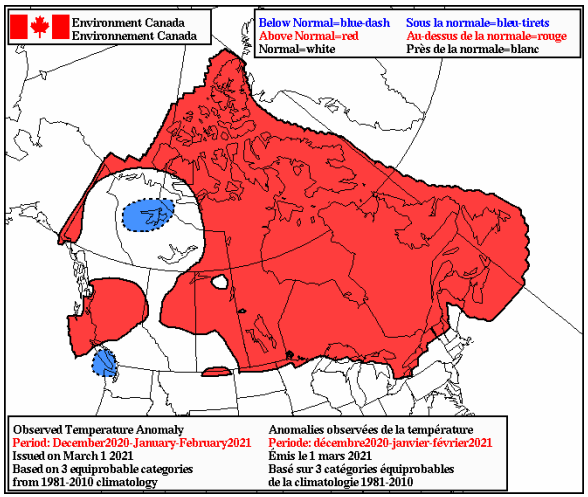
The temperature outlook for the winter predicted a warmer than normal season for Newfoundland, and a near to warmer than normal season for Labrador.





Left: Probability of above, below and near normal: Produced November 30, 2020 – Right: Forecast Temperature Anomaly: Produced November 30, 2020

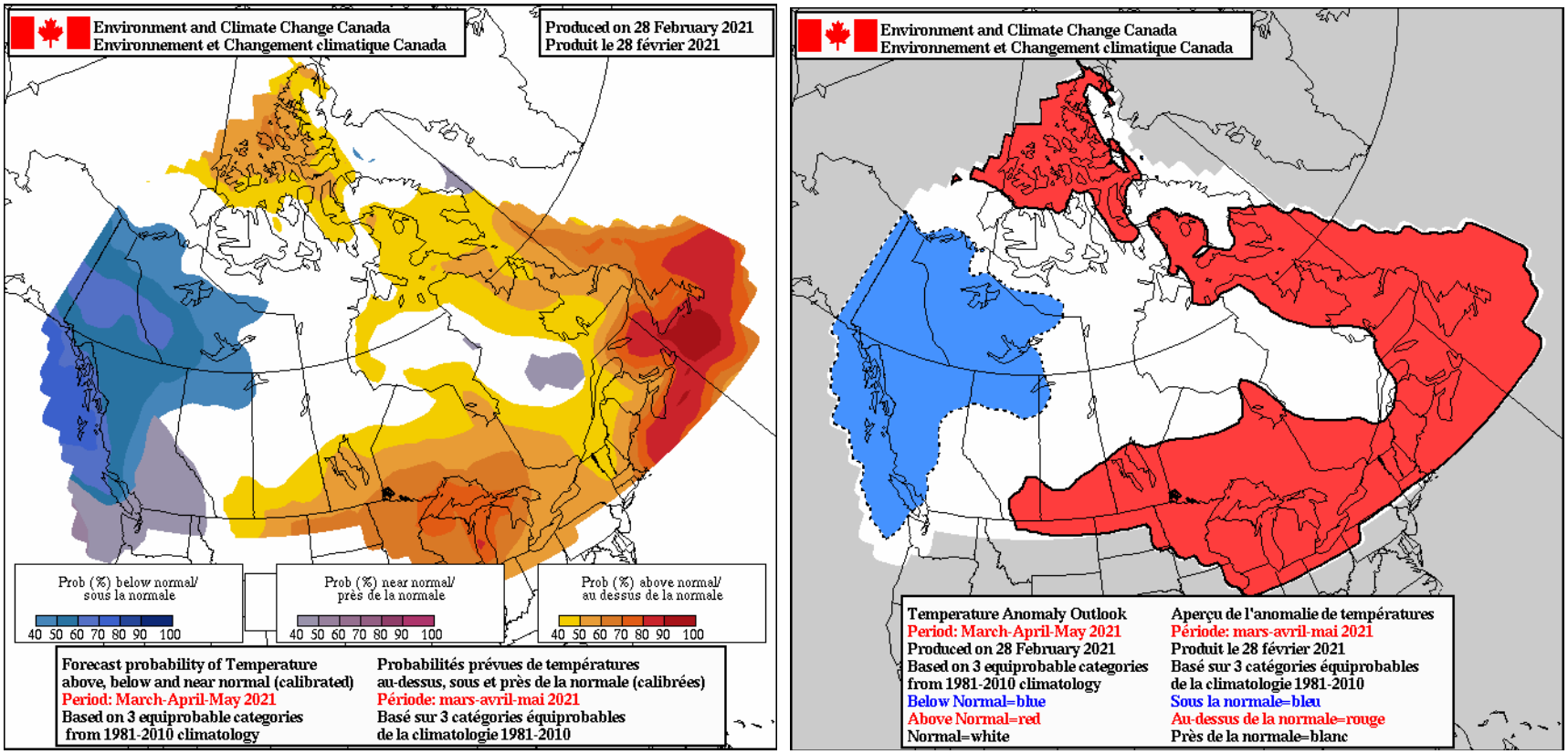
The temperature outlook was a slam dunk for most of the province. Warmer than normal conditions also managed to extend to northern Labrador this past winter.



Spring Season (Period: March-April-May) Temperature / Precipitation Outlook

For Newfoundland, there is a moderate to high probability for warmer than normal conditions to continue into the spring. In Labrador, a warmer than normal season is also predicted, but with a low to moderate probability.

The precipitation forecast (not shown) anticipates higher than normal precipitation in extreme western Labrador, but with a low to moderate probability. Elsewhere in the province, there are equal probabilities for above, near, and below normal precipitation for the spring. The seasonal precipitation forecast typically does not perform as well as the seasonal temperature forecast, so the graphics are not included.



Left: Probability of above, below and near normal temperature: Produced February 28, 2021 – Right: Temperature Anomaly Outlook: Produced February 28, 2021

https://weather.gc.ca/saisons/index_e.html

Temperature Outlook: Next 4 Weeks

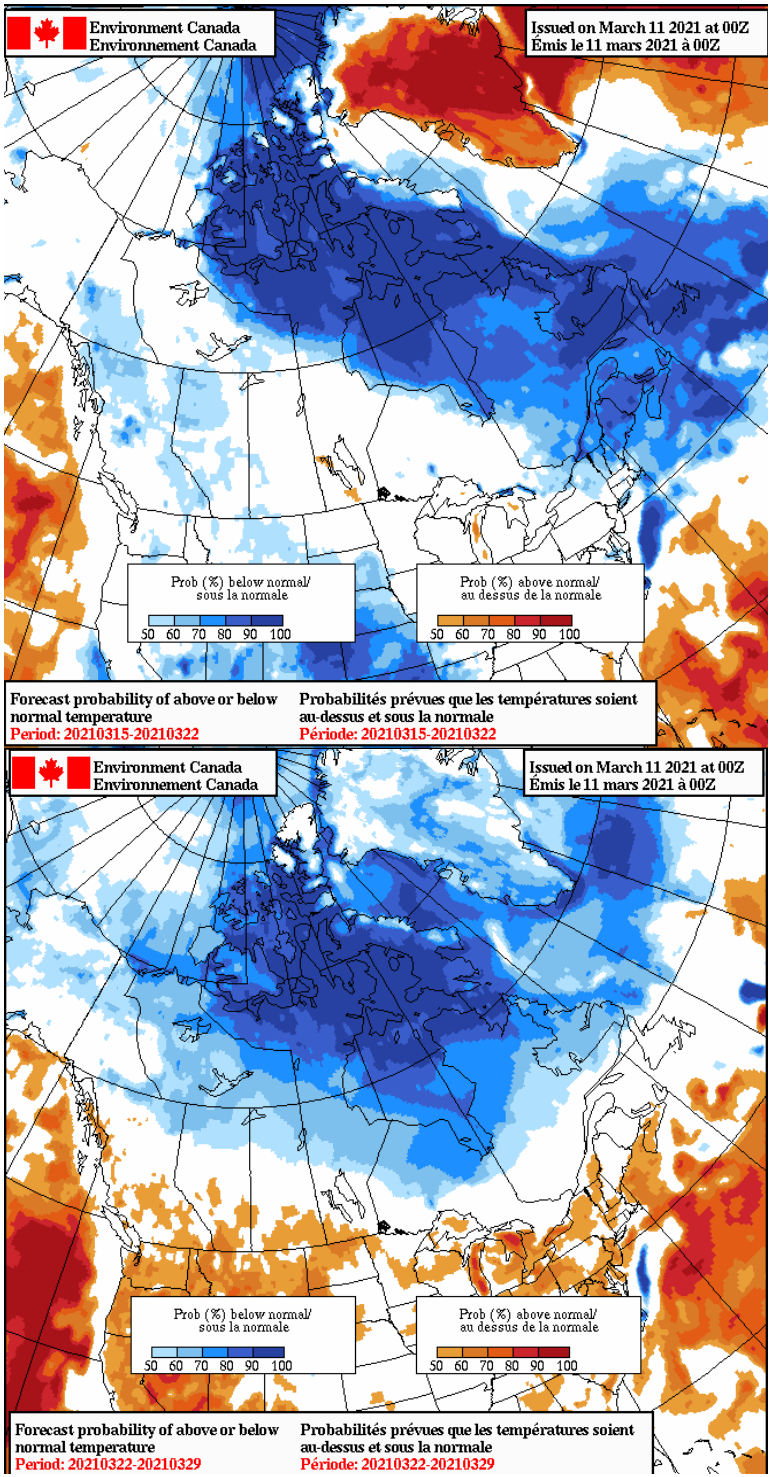
Newfoundland and Labrador had temperatures which were near to above normal for the first week of March. A mix of below, near, and above normal temperatures occurred in the second week. This result was decently predicted by the Global Ensemble Prediction System, though a few areas of western Newfoundland had below-normal temperatures in week one. Earlier runs of the model showed an outlook for above normal temperatures for Newfoundland for week two, but the most recent run corrected itself somewhat, predicting near to slightly below normal temperatures for the province.

Week 1 (March 15 to 22):

Moving into the official start of spring, both Newfoundland and Labrador are predicted to have below normal temperatures, with a moderate to high probability.

Week 2 (March 22 to 29):

A roughly similar forecast is shown for Labrador as we move later into March, though the probability of below-normal temperatures is more in the moderate range. Near normal temperatures are forecast for the island portion of the province.



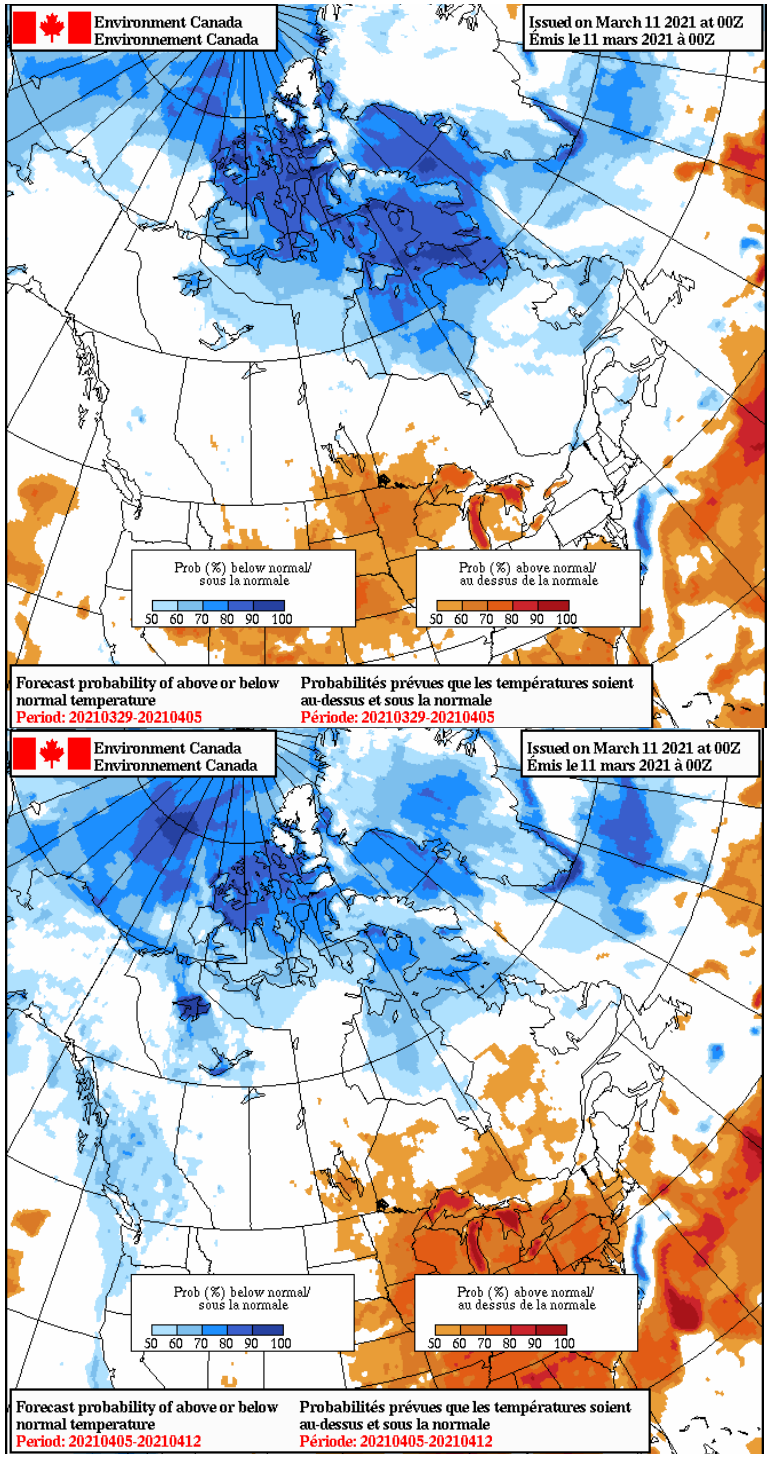
Right: Forecast probability of above or below normal temperature from the Canadian Global Ensemble Prediction System for week 1 (top) & week 2 (bottom): Produced March 11, 2021

Week 3 (March 29 to April 5):

Into the first few days of April and Easter weekend, a similar outlook to the previous week is shown. Labrador temperatures continue to be forecast to be below normal, with a low to moderate probability. Meanwhile, near normal temperatures are predicted for Newfoundland.

Week 4 (April 5 to 12):

Generally near normal temperatures are predicted across the entire province for the week after Easter. A low probability of below normal temperatures is forecast for parts of central, southeastern, and extreme northern Labrador. Conversely, a low probability of above normal temperatures is predicted in the Placentia Bay area of Newfoundland.



Right: Forecast probability of above or below normal temperature from the Canadian Global Ensemble Prediction System for week 3 (top) & week 4 (bottom): Produced March 11, 2021

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