

Seasonal Summary

Great Lakes

Winter 2019-2020



By the North American Ice Service

Summary for the Great Lakes

The 2019-2020 Great Lakes ice season can be summarized by a well below normal ice cover and below normal ice thickness. The well below normal ice cover was driven by warmer than normal temperatures across the Great Lakes basin for the winter season. Although the year started similar to the previous season (2018/19) with ice formation in mid-November and early December, there was a significant divergence in the weather by the the end of December. Widespread across the Great Lakes basin, average daily temperatures were on the scale of 3-4 degrees Celsius above normal in January, usually the time of year when we see significant expansion of the ice cover.

The total accumulated ice coverage (TAC) for the past season (for the historical weeks of 4 December to 4 June) was 4.8%. This is the 5th lowest TAC on record since the 1972/73 season and the lowest since the 2015/16 season.

Peak ice coverage on the Great Lakes occurred in the week of February 19th 2020, 3 weeks before the climatological normal for peak ice. The ice coverage at the time was 18.6%, less than half the amount of the climate median peak of 39.8%. The peak of 18.6% is the 6th lowest maximum extent of ice since the 1972/73 season. The record low maximum ice extent continues to be 11.6% occurring in the 2011-2012 season.

Lake Erie specifically set a new record low TAC of 1% , the lowest on record since the 1972/73 season.

Below are subdivided temperature anomaly regimes for the winter of 2019-2020 (Figures 1-6).

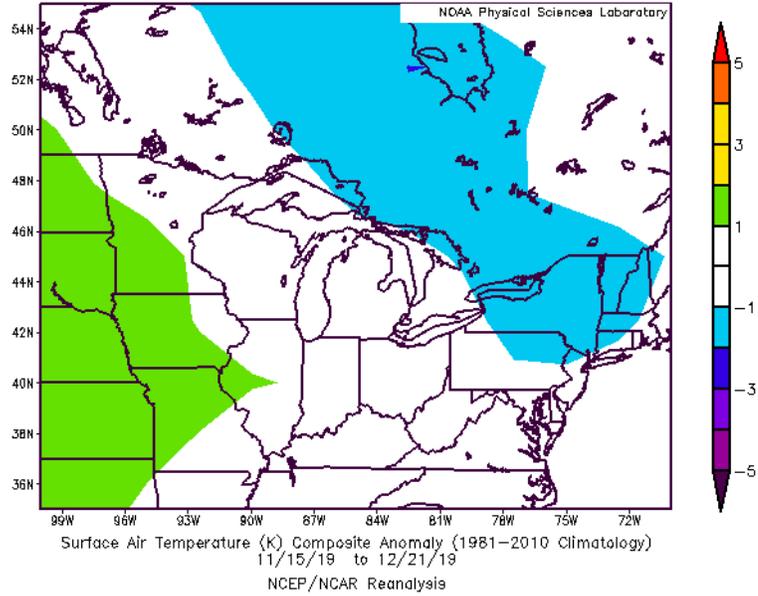


Figure 1: Surface Air Temperature Anomaly for the Great Lakes, 15 November 2019 to 12 December 2019

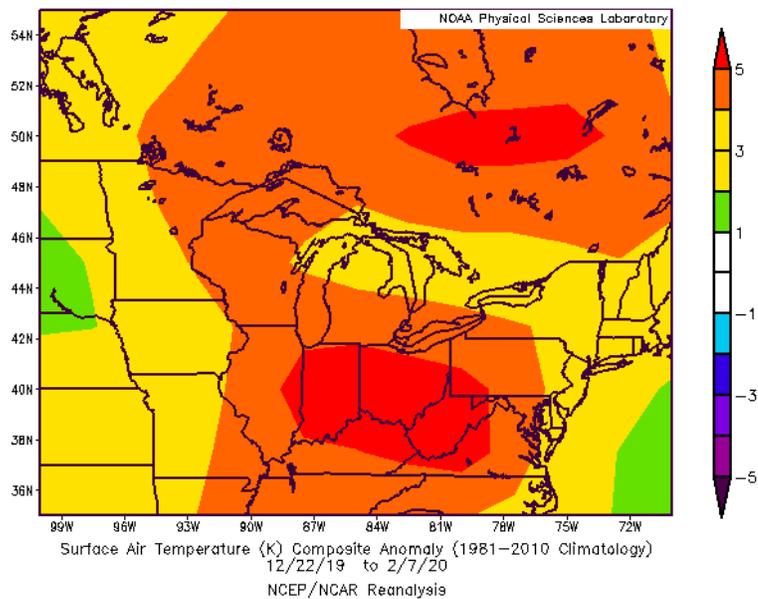


Figure 2: Surface Air Temperature Anomaly for the Great Lakes, 12 December 2019 to 7 February 2020

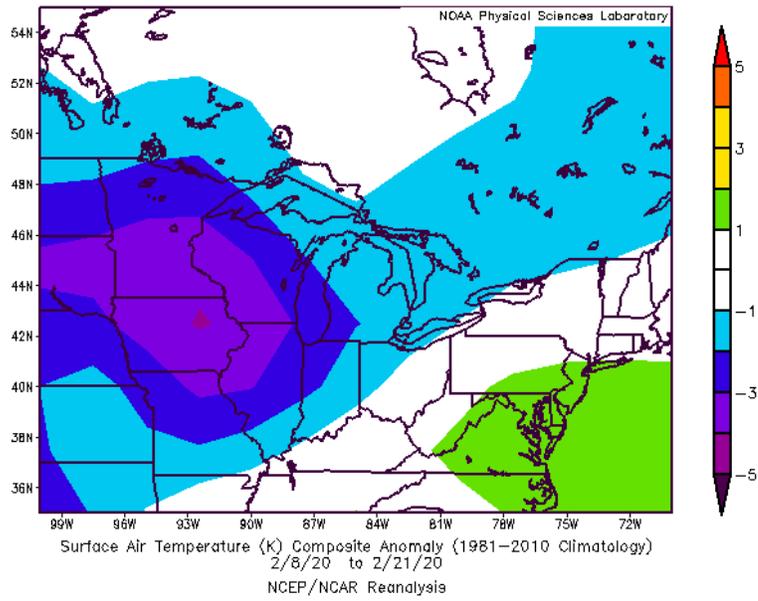


Figure 3: Surface Air Temperature Anomaly for the Great Lakes, 8 February 2020 to 21 February 2020

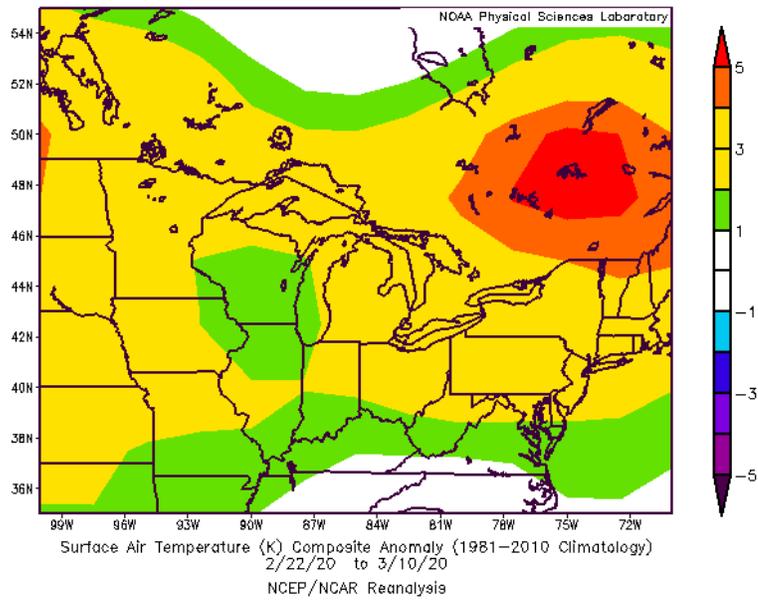


Figure 4: Surface Air Temperature Anomaly for the Great Lakes, 22 February 2020 to 10 March 2020

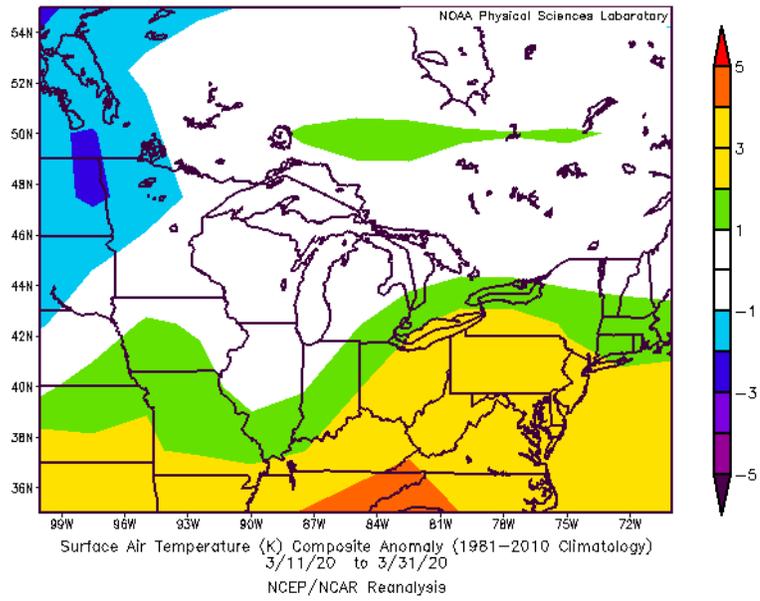


Figure 5: Surface Air Temperature Anomaly for the Great Lakes, 11 March 2020 to 31 March 2020

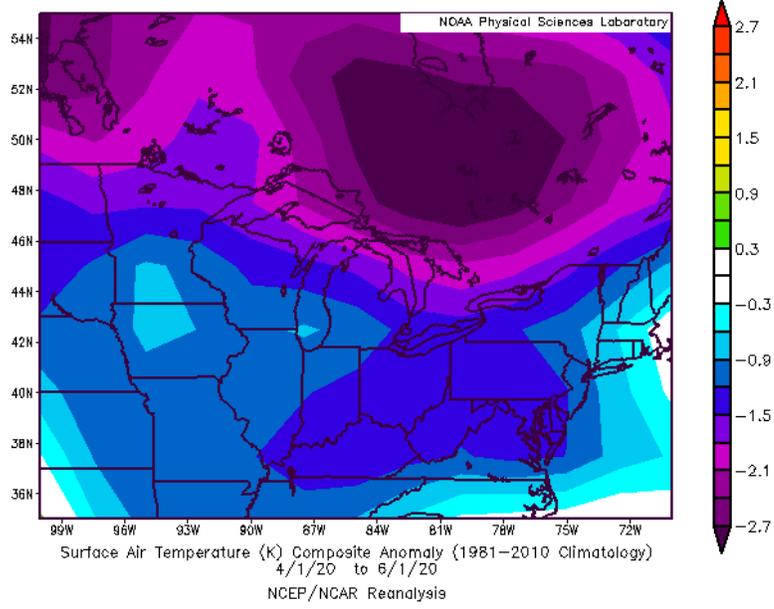


Figure 6: Surface Air Temperature Anomaly for the Great Lakes, 1 April 2020 to 1 June 2020

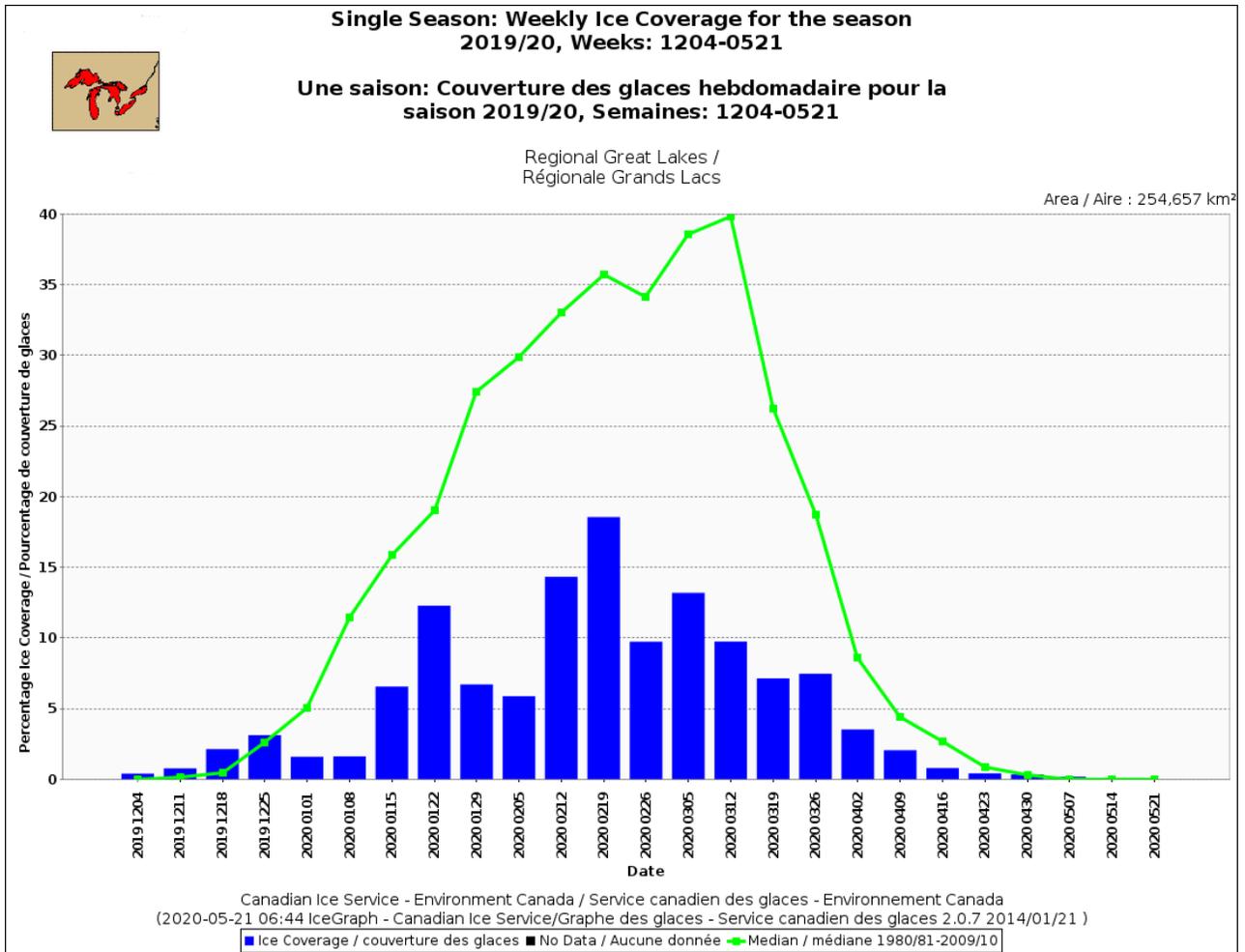


Figure 7: Weekly Ice Coverage for the Great Lakes, winter 2019-2020

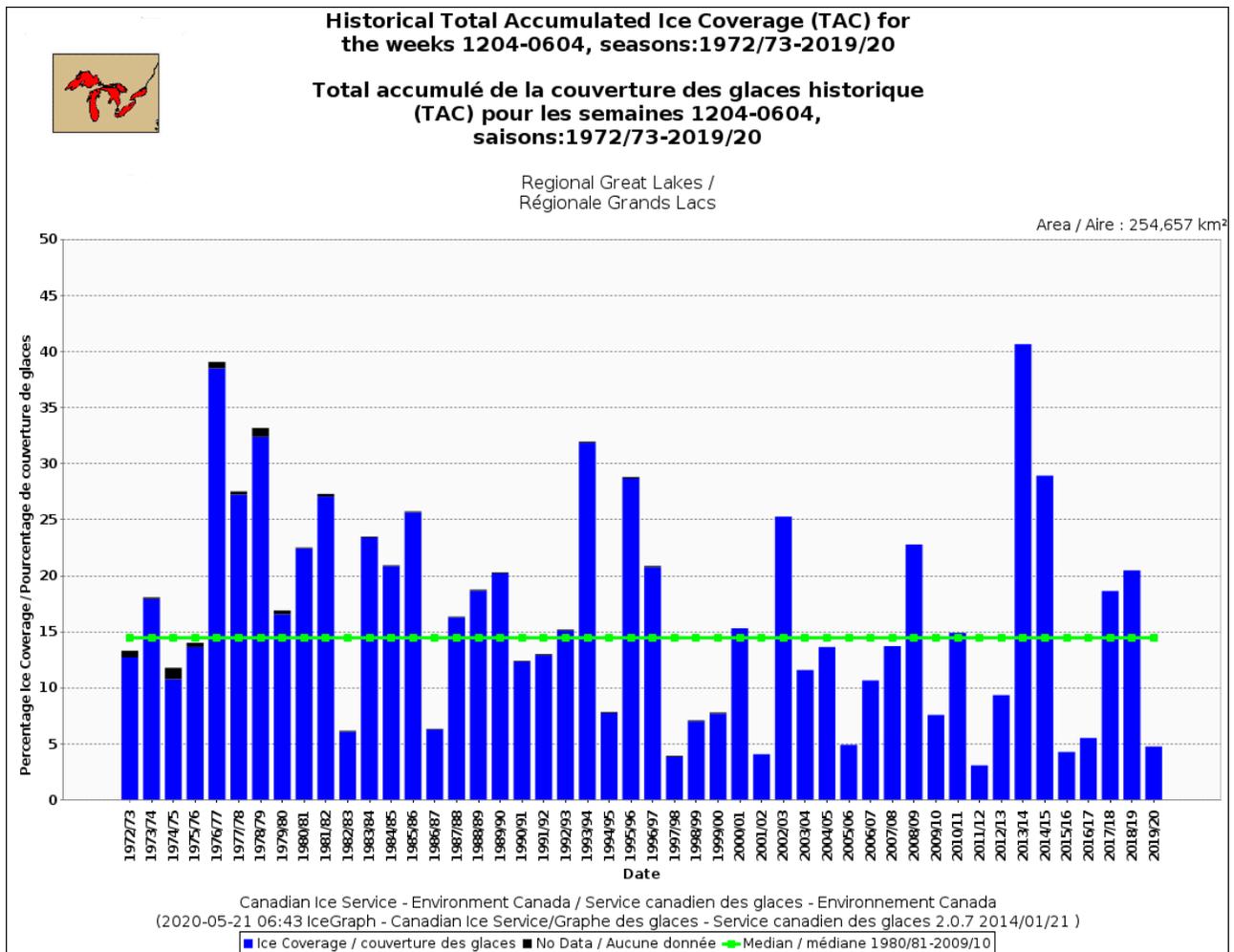


Figure 8: Historical Total Accumulated Ice Coverage on the Great Lakes, 1972-1973 to 2019-2020

Lake Superior

2019-2020 Season Temperatures:

The ice season started on the Great Lakes in mid-November with temperatures of 1-2 degrees Celsius below normal, with temperatures being the coolest on the eastern half of the lake.

After that initial cold temperature outbreak a long period of well above normal temperatures settled over Lake Superior. Average air temperatures from mid-December through the first week of February 2020 were on the order of 3-5 degrees Celsius above normal. The lake ice season was heavily influenced by this warmth as little significant ice growth occurred during this time, usually a time of substantial ice growth. Warmest average temperatures were in the western part of the lake, closer to 5 degrees Celsius above normal, with Whitefish Bay and the Sault Ste. Marie region seeing closer to 3 degrees above normal.

A 2-3 week window in the middle of February of slightly below normal average temperatures allowed ice to grow rapidly and caused the peak ice cover for the season.

From the third week of February to the second week of March temperatures were on average 2-3 degrees above normal across the entire lake allowing for the rapid decrease of the small amount of ice cover on the lake. The second half of March saw near normal temperatures, however by that time of year average daily temperatures are nearing zero.

April and May saw much colder temperatures than is normal for that time of year. Temperatures in the western portion of the lake were near 3 degrees Celsius colder than normal. Temperatures in the northeastern section were between 4-5 degrees Celsius colder than normal.

2019-2020 Ice Conditions:

Below normal temperatures in mid-November brought the first ice formation to Lake Superior in the 3 northern bays of the lake. Continued cool temperatures in the following week saw Black and Nipigon bays fill with new lake ice. Some ice formed along the shore near the Apostle Islands, near the Keeweenaw peninsula, along the shore of Whitefish Bay, and along a few isolated sections of the southern shore of the lake. Although ice formed earlier in the season than normal for Lake Superior that ice did not grow in extent significantly in the second half of November. By December, ice growth was slightly ahead of normal however ice coverage remained below 2%. By the end of the first week of December, ice began to form in low

concentrations near Duluth with the rest of the ice on the lake located in the 3 northern Bays, mainly new and thin lake ice.

Mid-December ice began to become fast in Nipigon, Black, and Chequamegon Bays, with ice extent raising above 2% and remaininly slightly above the climate normal. A change occurred in the last part of December when well above normal temperatures set up over the lake. Instead of continuing to climb, as is expected at that time of year, ice cover remained between 1 and 2%. By the end of the month, much of the mobile ice had melted and most of the ice remaining was the more resilient fast ice. December ended the month at 1.6% ice covered, less than the 3.2% climatological median.

January is generally a month of gradual ice growth on Lake Superior. 2020 did not follow this path, ice did form, however, late in the month significant winds and warmer than normal temperatures associated with a low pressure system destroyed much of the mobile ice created along the shore. Ice coverage for the month started at 1.6%, rising to up to 7.1% covered in the third week before falling back to 4.3% ice covered by the end of the month. Climatologically at the end of January the ice cover median is 18.7%, over 4 times as much ice cover as 2020. Fast ice did thicken throughout the month with the first thick lake ice present in Black and Nipigon Bays by the third week of the month. The western portion of Thunder Bay became fast late in the month.

February started with warmer than normal temperatures and a decreasing ice cover, falling to 3.0% ice covered in the first week. A return to near normal temperatures in the second week saw the significant production of ice, mainly along the shore. The south shore of the lake completley filled with ice in concentrations of 7 to 9 tenths of new and thin lake ice. Whitefish Bay became fully ice covered in new lake ice. Some lower concentrations of ice formed along the north shore, mainly north of Isle Royale and near Black and Nipigon Bays. Ice coverage grew to 13.9% in the second week, below the climate normal for the week of 22.8%.

The maximum ice cover occurred during the 3rd week of February 2020, 3 weeks ahead of the climatological normal peak ice cover. The ice cover at maximum was 23.9%, less than half the normal maximum for the lake of 49.7%. That maximum puts the 2019/2020 ice season as the 11th lowest

maximum for the year since 1972/1973, in the bottom quarter of years. The main difference in ice extent this week was the expansion of new and thin ice along the southern shore of the lake.

The last half of February saw much of the newly created ice destroyed as a strong low pressure system moved across the eastern Great Lakes and brought strong northerly winds to lake Superior. Ice concentration fell to 8.0% in the last week of the month.

Climatologically, ice cover generally peaks in mid-March at 49.7% then goes through a rapid decline. This year during mid-March ice remained mainly along the southern and eastern shores, in Whitefish Bay, and in and near the 3 northern bays of the lake. Ice did thicken to very thick lake ice in eastern Thunder Bay, Black Bay, and Nipigon Bay. Ice concentration remained fairly steady through March, between 6.6% and 9.1%. Late in the month warmer than normal temperatures settled over the Lake, melting most of the mobile ice, except for the ice at the eastern extent of the lake. The ice cover fell to 3.7% at the end of the month, below the normal at that time of year of 10.4%.

The first two weeks of April saw all mobile ice in the lake melt out. By the second week the only ice remaining on the lake was in the 3 northern bays, Chequamegon Bay, in the St. Mary's river, and eastern extents of Whitefish Bay. Ice concentrations fell below 2% and more in line with the climatological extent in the third week of the month. Ice continued to melt with all ice melted out of the southern portion of the lake by the end of April. At the end of April, Black and Nipigon Bays remained fast with concentrations of near 1%.

Ice fractured from the bays in the first week of May and fully melted out before the end of the second week. The last ice was observed on the lake on May 11, 2020, near 2 weeks ahead of the normal full melt of ice.

The TAC for lake Superior for the 2019/20 season was 4.4%. This is well below the long term median of 15.0%, and well below the last 2 ice seasons of 25.0% and 24.2%. 4.4% puts the season as the 10th least severe ice season since the 1972/73 season.

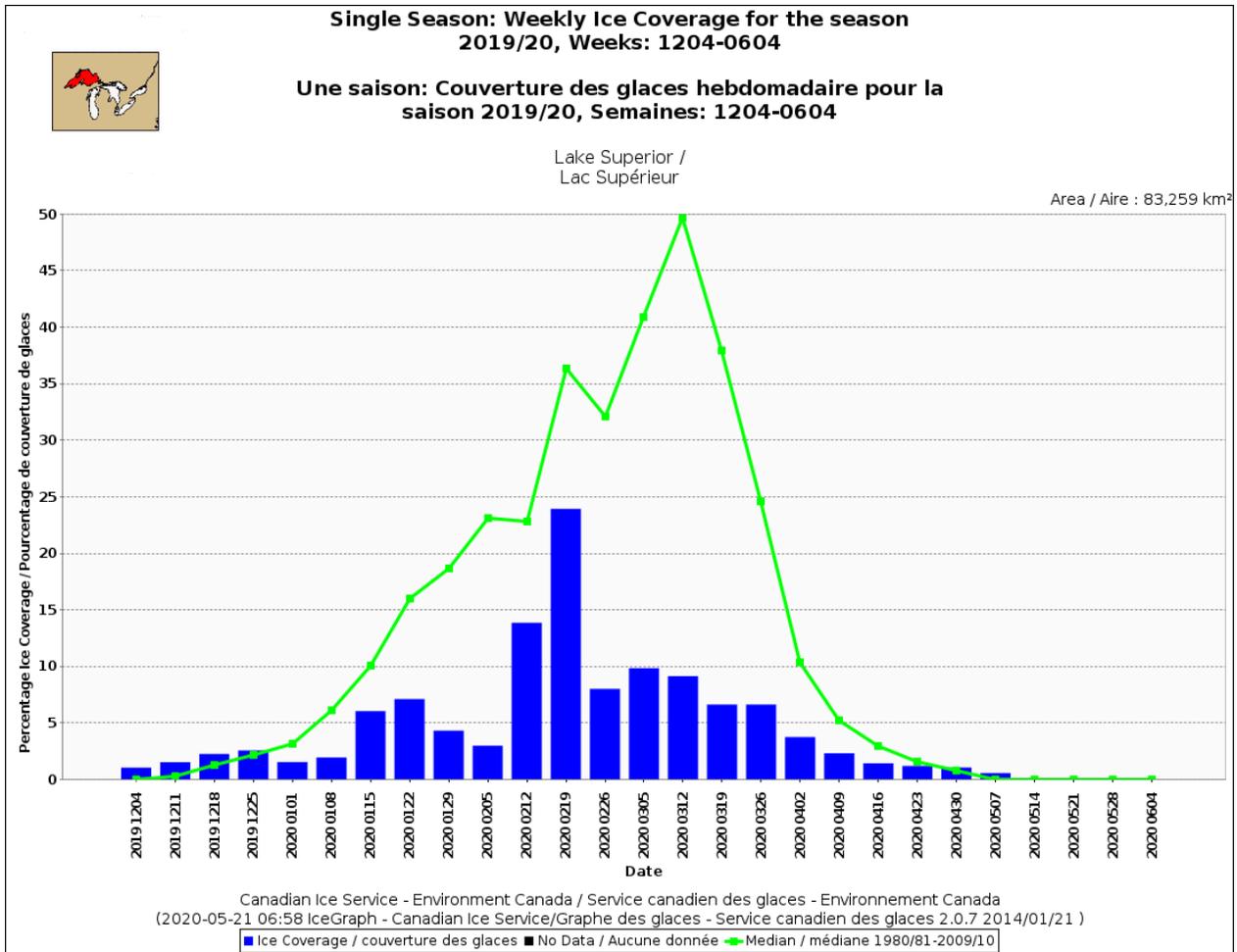


Figure 9: Weekly Ice Coverage in Lake Superior for winter 2019-20.

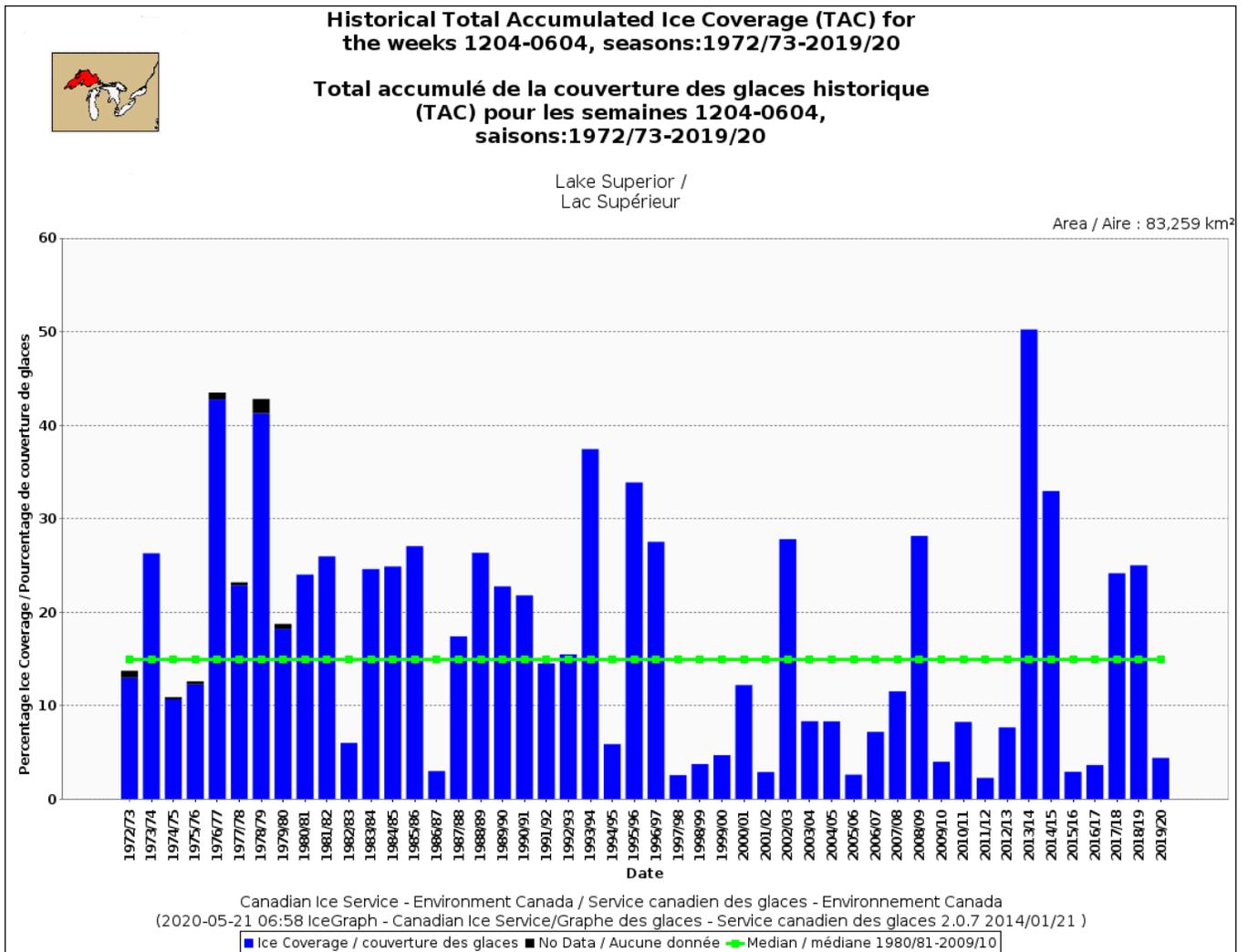


Figure 10: Historical Total Accumulated Ice Coverage in Lake Superior by season, 1972-2020.

Lake Michigan

2019-2020 Season Temperatures:

A cooler than normal period in mid-November allowed early formation of small areas of ice across northern Lake Michigan.

The ice season was then heavily influenced by a well above normal temperature regime that settled over the lake from mid-December to the first week of February. Average temperatures in the southern portion of the lake were 4-5 degrees Celsius above normal while temperatures in the northern section of the lake were on the order of 3 degrees Celsius above normal. During this time little new ice formed.

Temperatures shifted for the middle half of February with average temperatures below to well below normal. Average temperatures in the southwestern portion of the lake were 2-3 degrees Celsius below normal and in the northeastern portion of the lake were 1-2 degrees Celsius below normal. This cold spell coincided with the peak ice cover conditions on the lake for the ice season.

Following this 2 week window of below normal temperatures more moderate, slightly above normal temperatures settled over the lake. Average temperatures for the end of February and the first 2 weeks of March were near 3 degrees Celsius above normal in much of the lake except closer to 1-2 degrees Celsius in the southwestern portion of the lake.

Normal temperatures finished out the last 3 weeks of the month, allowing for the slow melt out of ice.

April did see temperatures of near 1 degree Celsius below normal, however, on average daily temperatures are well above freezing in April and there was little ice left to melt by this time of year.

2019-2020 Ice Conditions:

Lake Michigan saw its first ice formation in mid-November, over a month ahead of the climatological normal, when a well below normal air mass moved across the lake. Ice formed in extreme southern Green Bay and in

the northern portions of the Bays de Noc. Although ice formed, it was in small concentrations and had a very small extent. The cold temperatures did not last long and the ice situation in lake Michigan remained nearly unchanged until mid-December.

Mid-December ice began to form in the southern and northern extents of Green Bay, roughly 1 week ahead of the climatological start date. 9 tenths of new lake ice formed near Green Bay while a small amount of thin lake ice became fast in the northern stretches of the Bays de Noc. Ice coverage jumped to over 2%, well above the near 0% coverage in the climatological median coverage. Over the next week ice remained in similar locations and with below freezing temperatures, thickened to predominantly thin lake ice in the northern and southern sections of Green Bay. By the 23rd of December the first new lake ice outside of Green Bay formed, along the northernmost shore of the lake north and east of Beaver Island. Ice coverage remained near 2%, very close the climatological ice amount. Warmer than normal temperatures set up over the lake in late December and early January with little change in ice cover when usually, by the end of the first week of January, ice cover should be up above 10%.

The second week of January saw near normal temperatures and ice growth through Green Bay and in the northeastern section of Lake Michigan. Ice was mainly new and thin lake ice in concentrations from 5 to 9 tenths. The northern extents of the Bays de Noc contained some fast medium lake ice. Ice coverage increased to 7.3%, less than half of the climatological value of 19.6%. Cold temperatures in the 3rd week of the month continued the gradual increase in ice amount on the lake. Some new lake ice formed along the southwestern and western shores. Ice in Green Bay thickened to a combination of medium and thin lake ice. Warmer temperatures in the final week saw all the new ice along the shore melt with ice coverage returning to 7.3%.

The first week of February saw little change in ice cover however, ice thickness increased, with the ice in Green Bay becoming predominantly medium lake ice. Cooler temperatures in the second week saw new and thin lake ice redeveloping along much of the shore and saw the southern half of Green Bay become consolidated and fast.

The maximum ice coverage extent occurred around the 17th of February 2020 at 15.0% ice covered, below the 23.0% climatological normal. The peak did occur during the same week as is usual. Following the peak ice cover, the new and thin ice that had formed along the shore melted. During the third week the ice in the Straits of Mackinac fasted and ice coverage dropped below 10%.

From the third week of February until the 3rd week of March, ice extent decreased by 1% a week, from 9% to 6% as ice gradually melted out of the pack that was present. The first significant change was in the second week of March when the Green Bay and Straits of Mackinac fast ice fractured. Ice coverage actually rose by 1% in the third week of March as the fractured ice became mobile. Warmer than normal temperatures in the final week of March rapidly melted much of the remaining ice with ice cover falling to 1.5%. The remaining ice was mainly in the Straits of Mackinac with some mobile ice in southern Green Bay and fast ice still remaining in the Bays de Noc.

April continued the rapid ice melt with all ice melting from the Straits of Mackinac in the first week and all mobile ice in Green Bay melting. A sliver of ice remained in northern Little Bay de Noc through the second week of the month, melting completely by the 19th of April 2020.

The TAC for the 2019/2020 season was 4.6%. This value is less than half of the historical median of 9.6% and well below the last two ice seasons. This TAC puts the ice season as the 6th least severe ice season since the 1972/73 season.

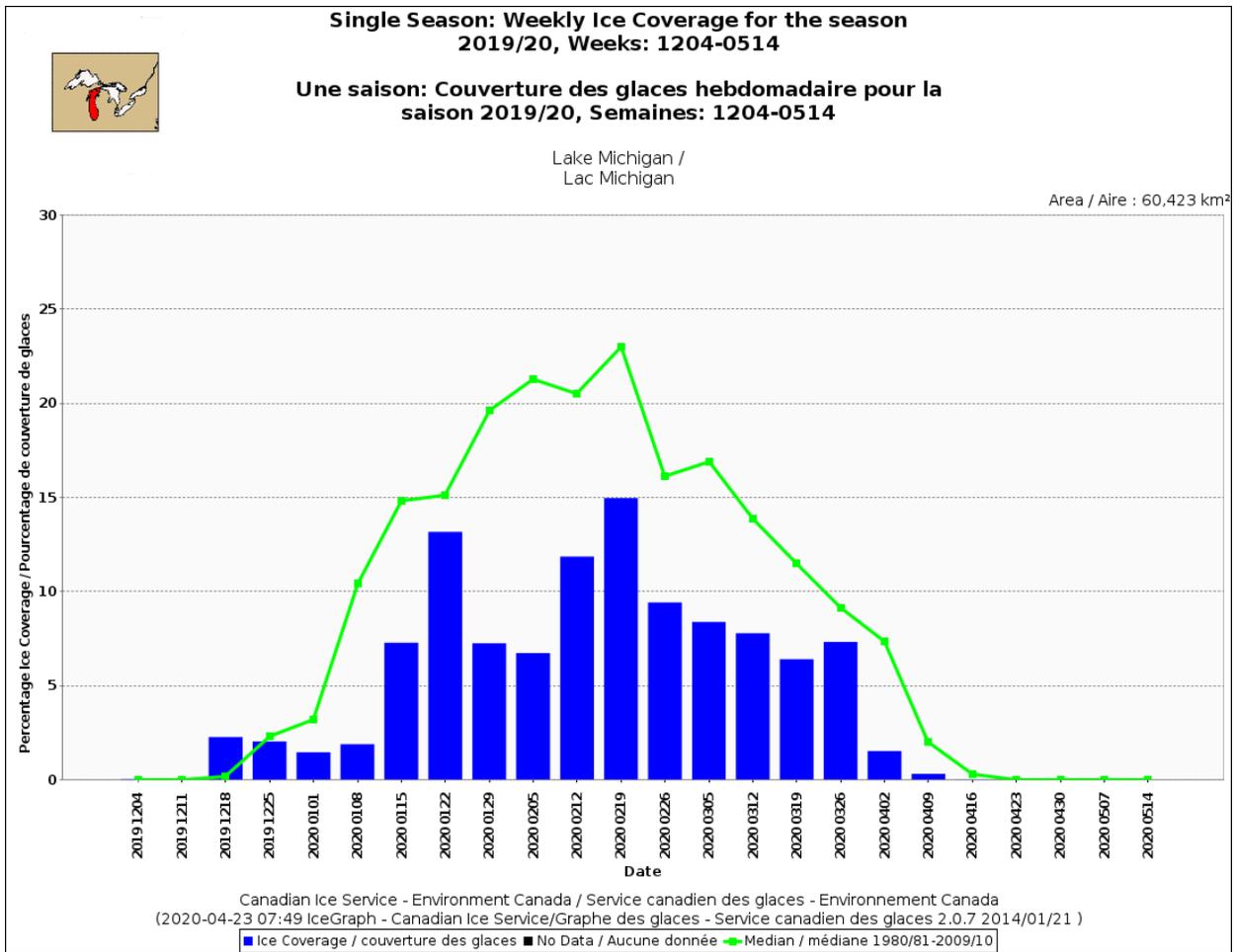


Figure 11: Weekly Ice Coverage in Lake Michigan for winter 2019-20

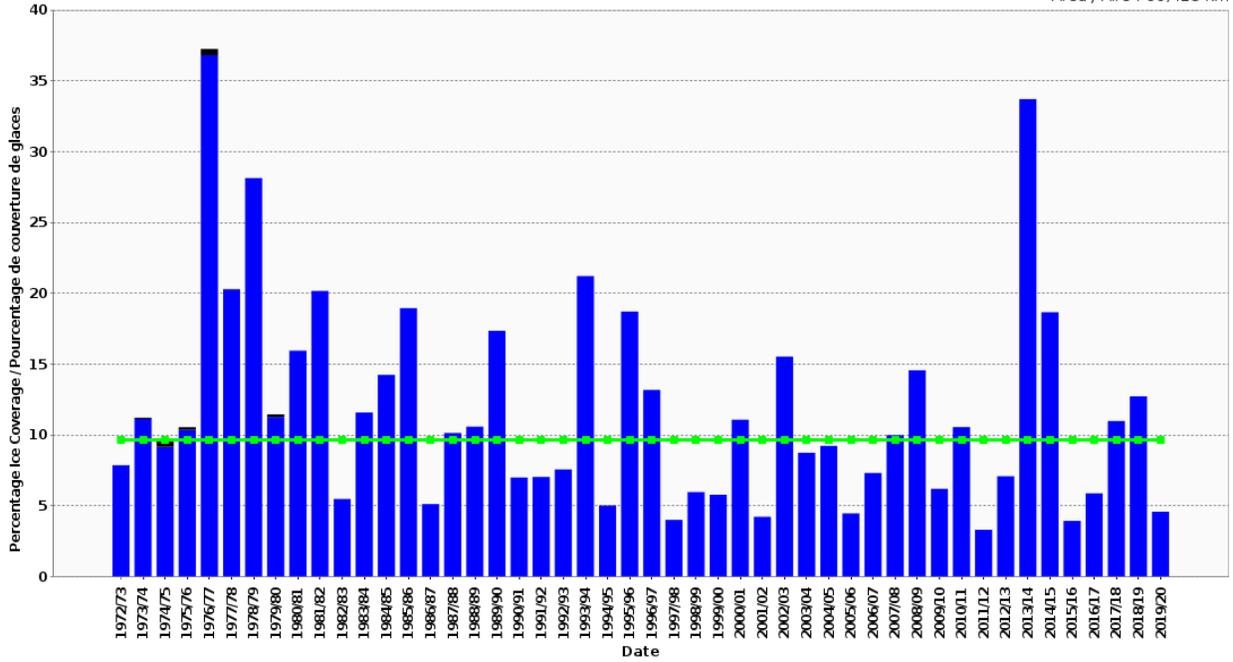


**Historical Total Accumulated Ice Coverage (TAC) for
the weeks 1204-0514, seasons:1972/73-2019/20**

**Total accumulé de la couverture des glaces historique
(TAC) pour les semaines 1204-0514,
saisons:1972/73-2019/20**

Lake Michigan /
Lac Michigan

Area / Aire : 60,423 km²



Canadian Ice Service - Environment Canada / Service canadien des glaces - Environnement Canada
(2020-04-23 07:49 IceGraph - Canadian Ice Service/Graphe des glaces - Service canadien des glaces 2.0.7 2014/01/21)

■ Ice Coverage / couverture des glaces ■ No Data / Aucune donnée — Median / médiane 1980/81-2009/10

Figure 12: Historical Accumulated Ice Coverage in Lake Michigan by season, 1972-2020

Lake Huron

2019-2020 Season Temperatures:

Near to slightly below normal temperatures started out the ice season in mid-November, allowing the early formation of ice. These below normal temperatures continued through the first 2 weeks of December. A drastic switch in temperatures occurred in mid-December.

Temperatures from mid-December to the first week of February were well above normal. Average temperatures near Sarnia were 4-5 degrees Celsius above normal while the rest of the lake was closer to 3-4 degrees Celsius above normal. There was a few short stretches during this time of below normal temperatures, one of which in mid-January allowed some ice to briefly form.

The middle part of February had average temperatures across the lake of 1-2 degrees below normal.

Following that brief period of below normal temperatures another 3 week period, from the third week of February to the second week of March, of above average temperatures moved across the lake. Average temperatures were in the 2-4 degrees Celsius above normal range.

During the rest of March temperatures were near normal except near Sarnia, where temperatures were on average 1-2 degrees above normal. These temperatures slightly slowed the melt of ice during the remainder of March.

April had average temperatures of 1-2 degrees Celsius below zero on Lake Huron, however normal temperatures at that time of year are generally above freezing, so ice continued to melt during this time. These slightly warmer temperatures allowed ice to remain slightly longer than if warm conditions had occurred in April over the lake.

2019-2020 Ice Conditions:

The Lake Huron Ice season started early in early November with an unusually cold outbreak of weather. 2 tenths of new lake ice formed in the

St. Mary's River in the second week of the month, roughly 1 month ahead of the climatological normal, similar to last ice season. Through the end of the month little new ice formed with the exception of a few small bays along the northern edge of the North Channel.

The first ice of the season in Georgian Bay formed late in the first week of December along the northern and eastern shores. Ice coverage remained below 1% until mid-month.

Ice cover increased gradually through the second and third week of the month with new and thin ice forming in Saginaw Bay and through the eastern portion of the North Channel. Much of the St. Mary's river fasted during this time, mainly as thin lake ice. A warm air outbreak halted all ice production in the last week of the month and the first part of January. Ice cover in mid-December of 6.2% fell to 1.9% covered by January 10th, 2020, well below the median at that time of year of 16.9%.

The return of cold air in mid-January restarted ice formation. By the 20th of January ice concentration jumped to 25.3%, only 3% below the median climate value of ice cover for that week. The ice formed rapidly along the entire shore of the lake. Northeastern Georgian Bay became mainly ice covered in new and thin lake ice. The North Channel filled in fully with ice while the eastern and the western sections fasted with medium lake ice. A slow moving low crossed the eastern Great Lakes in late January. The strong winds and warmer than normal temperatures associated with this low quickly melted and destroyed the majority of the new ice created over the previous weeks. At the end of the month ice conditions returned to a similar extent and location as was there at the middle of January, close to 13% ice covered.

Ice cover remained near steady in the first week of February behind the low pressure system, with no ice growth and ice cover ending the week near 12.7%. Cooler temperatures allowed ice to grow in the second week of the month. Ice growth was mainly along the shores with extent growing to 24.4% by the 10th of February 2020. Ice conditions were unchanged through the next week. Usually the week of February 19th is the peak of ice cover on Lake Huron at 46.8%. This year, on the same week, coverage was 24.3%. Retraction occurred in the third week of the month as above

normal temperatures and a strong low crossed the eastern lakes. Ice cover remained along most of the shores but decreased in extent to 17.7%.

The first few days of March saw the peak ice conditions of the year on Lake Huron at 26.5% ice cover. Generally cooler temperatures occurred at the end of February and early March behind the low that crossed, allowing ice to form. Ice was mainly along the shore, however the increased coverage was mainly due to the increase in ice in the extreme southern extent of the lake near Sarnia.

The lake ice maximum coverage peak occurred two weeks after the historical peak. A peak of 26.5% puts the 2019/20 season as the 3rd lowest maximum ice extent since the 1972/73 season. The only 2 seasons with a lower peak in the past were 2011/2012 (24.3%) and 2001/2002 (25.9%).

The second week of March saw the melt and destruction of ice, dropping the coverage to 19.1%. The ice lost was mainly along the western shore of the lake and in Saginaw Bay. Mid-March is usually where the lake starts to see a significant loss of lake ice. This year was not different. By the 16th of March all the ice melted from Saginaw Bay and along the shore south of Alpena. Ice in the straits of Mackinac fractured. All ice in the southern half of the lake melted by the 23rd of March with ice cover dropping to 14.7%. Ice cover still remained along the shore north of Alpena, in the North Channel, and in northeastern Georgian Bay. Ice thicknesses were generally medium and thin lake ice. Some thick lake ice was present in the North Channel fast ice. By the end of the month all ice along the shore of Lake Huron, except near the Straits of Mackinac, had melted. The mobile lake ice in Georgian Bay decreased significantly, while the fast ice along the shore fractured and thinned. The North Channel remained ice covered. Total ice coverage fell to 8.0%, slightly less than half of the climate median ice cover of 16.3%.

The melt and destruction of ice continued through the first few weeks of April, remaining 1 to 2 weeks behind the climate normal for melt. In the first week of April all mobile ice melted out of Georgian Bay and half of the mobile ice in the North Channel melted. The straits of Mackinac lost all ice cover during the same time. By the end of the second week of April Georgian Bay fast ice melted, the remaining fast ice in the North Channel fractured, and the only remaining ice was the rotten, previously fast, ice in

the eastern and western sections of the North Channel. Ice cover dropped to 1.3%. The next week saw the melt of all ice except for 2 tenths of rotten thick lake ice in the St. Mary's river. The final ice of the season melted out of the St. Mary's river on the 22nd of April, 1 week ahead of the climatological full melt of ice, bringing an end to the ice season on Lake Huron.

The TAC for the 2019/20 season for Lake Huron was 9.7%. This is well below the long term median TAC of 22.2%. A TAC of 9.7% puts the season as the 5th lowest TAC since the 1972/73 season and is less than half of the TAC of the two previous seasons.

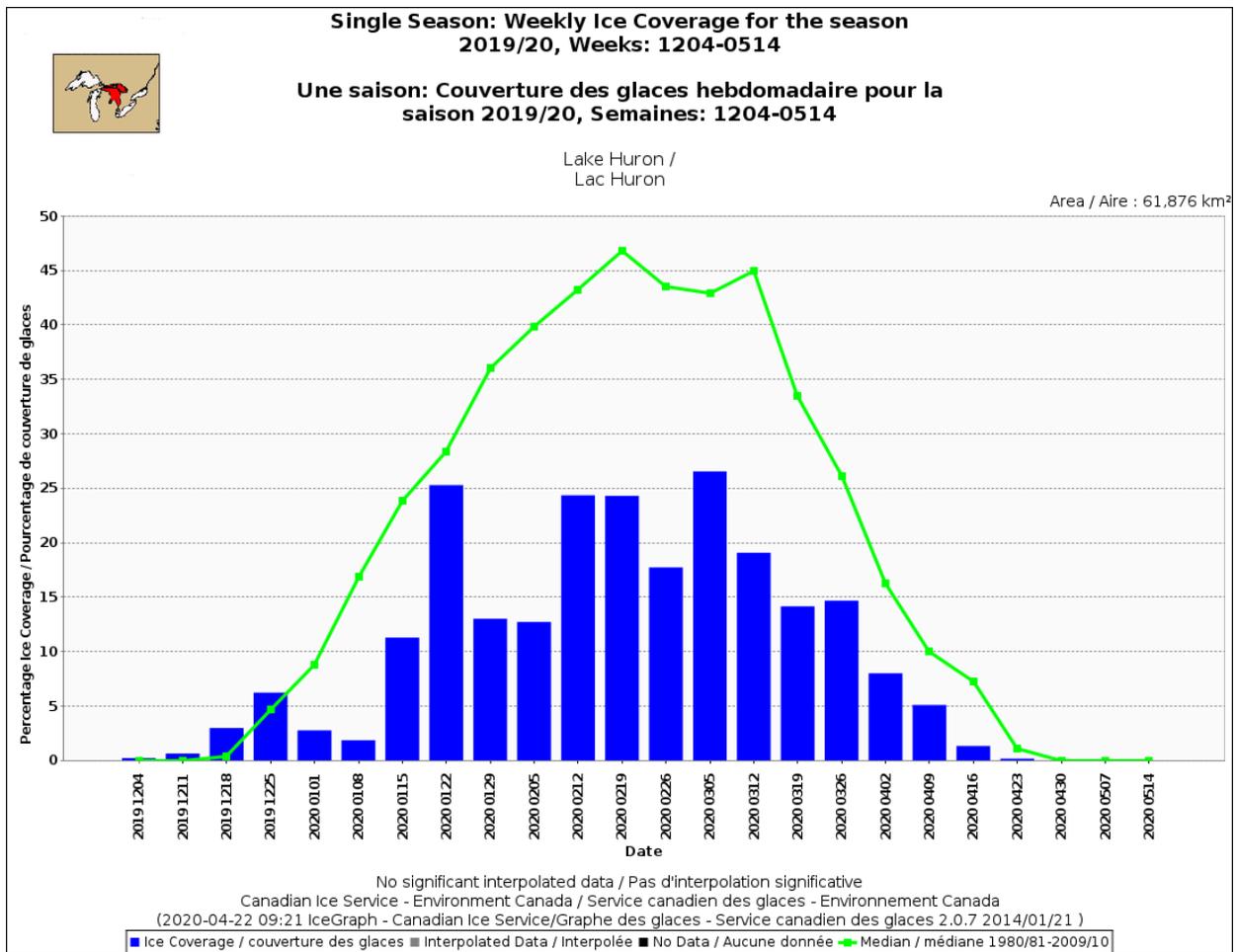


Figure 13: Weekly Ice Coverage in Lake Huron for winter 2019-20

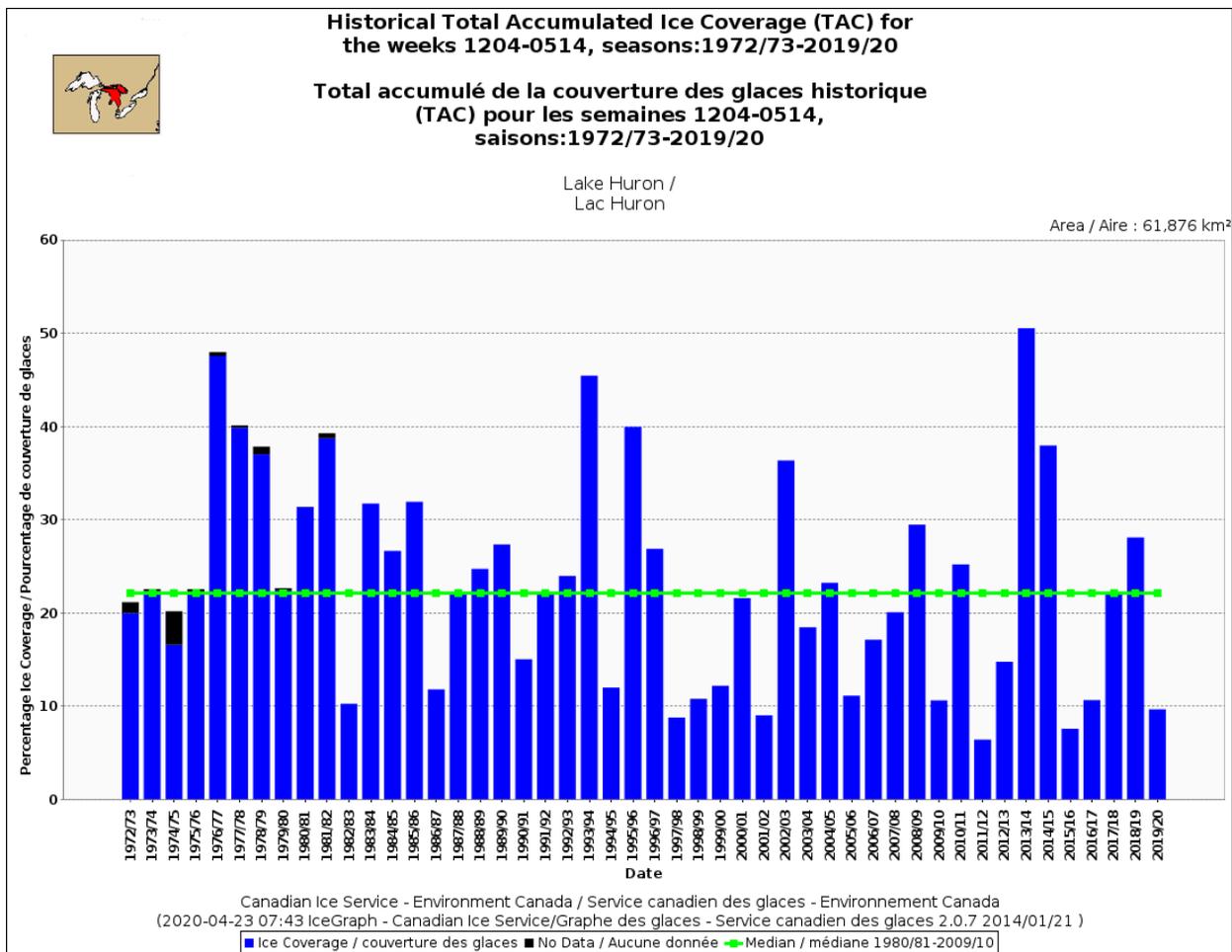


Figure 14: Historical Accumulated Ice Coverage in Lake Huron by season, 1972-2020

Lake Erie

2019-2020 Season Temperatures:

Winter time temperatures on Lake Erie can partially explain the severe lack of ice on the lake this year. Unlike many of the other Great Lakes, Lake Erie did not see a significant below normal period of temperatures early in the season to form early ice. Although some slightly cooler than normal temperatures did occur in November and through mid-December, average daytime temperatures remained above freezing for much of the period.

A big shift occurred in mid-December and lasted through until the first week of February. Average temperatures during that time were near 5 degrees

Celsius above normal in the extreme southwestern portion of the lake, and between 4-5 degrees above normal in the rest of the lake. This led to average daily temperatures generally at or above freezing during this time frame.

The middle weeks of February saw temperatures generally near 1 degree Celsius below normal, with normal temperatures being minus 2 to minus 3 Celcius. This 2 week window did allow some of the only ice to form on Lake Erie for the season.

Temperatures shifted back to above normal after the third week of February with temperatures across the lake of near 3 degrees Celsius above normal from the end of February through until the end of March. Normal temperatures generally push above zero in early March for Lake Erie so the above normal average temperatures ensured that no significant new ice formed on the lake during this time and all the ice present on the lake melted out.

2019-2020 Ice Conditions:

Lake Erie saw the highest ice year in our records in 2019/20.

The first ice of the season was observed in the third week of December on schedule with the usual development of ice on the lake. Low concentrations of new ice formed along the shore of Lake St.Clair, in the western basin, and a few small bays along the north shore of the lake. As with much of the year, well above normal temperatures melted this ice away in the last week of the month, dropping the concentration of ice back to zero by the end of 2019.

The first half of January saw continuing above normal temperatures and no ice formation. The second half of the month did see the return of small patches of new lake ice in similar locations and extents as was seen in mid-December as temperutures averaged just below freezing. Ice cover grew to 1% of the lake, well below the median of 58.8%. The return of warmer tempertures at the end of the month melted most of the ice, dropping the concentration back under 1% until mid-February. The usual peak of lake ice on Lake Erie occurs during this week, with the median climatological ice cover in the second week of February near 87.3%.

The coldest consistent temperatures of the year occurred from mid-February until early March. During the second week of February ice formed across much of lake St.Clair and the western basin in concentrations from 5 to 9 tenths of new and thin lake ice. As well, the north shore of the lake saw 1-3 tenths of new lake ice form. Ice concentration by mid-February jumped to 7.3%, well below the climatological median of 81.7%. The ice levels diminished in late February as a vigorous low crossed the eastern Great Lakes with strong winds moving across Lake Erie.

Peak ice cover occurred in the first week of March behind the late February low pressure system. Ice was mainly new and thin lake ice in Lake St.Clair and the western basin. Peak ice concentration was 9.2%, well below the normal peak of 87.3%, and 3 weeks later than normal. The maximum ice coverage of 9.2% puts the 2019/20 lake Erie ice season as the second lowest maximum ice cover since the 1972/73 season, only behind the strong El Nino year in 1997/1998 which had a maximum of 8.4%.

After the peak in early March warm air returned to the region. Ice rapidly melted in the second week, with all ice melting out of the lake by March 13th, 2020. The median week of full ice melt is April 23rd, 6 weeks later than what occurred in the 2019/2020 season.

The TAC for the 2019/2020 season was 1.0%, the lowest on record since the 1972/73 season. This correlates to 2019/2020 being the highest ice season on record for the lake. The only other seasons below 2% TAC in the records are 1997/98 (1.2%) and 2011/12 (1.7%). By comparison, the median TAC is 27.1%.

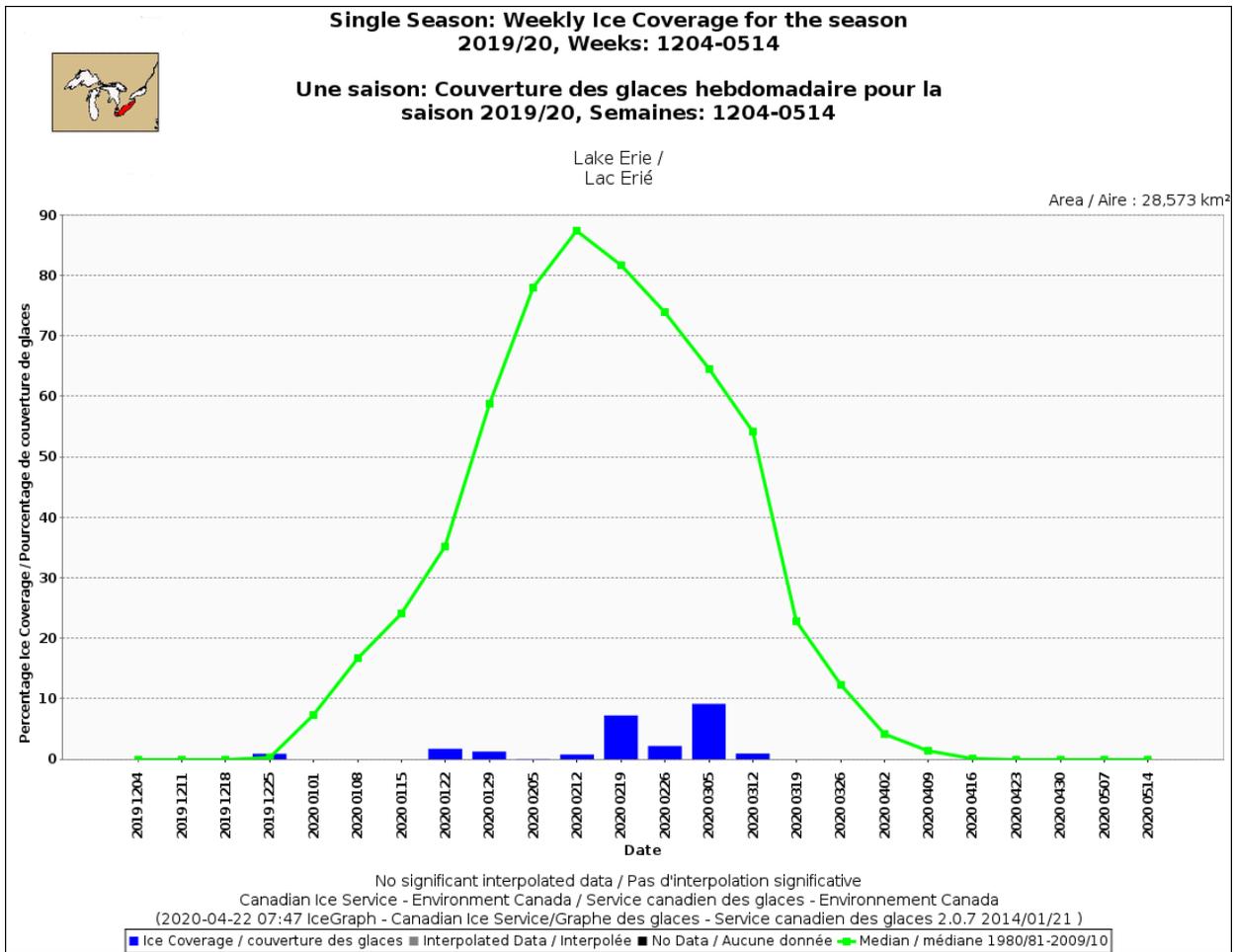


Figure 15: Weekly Ice Coverage in Lake Erie for winter 2019-20

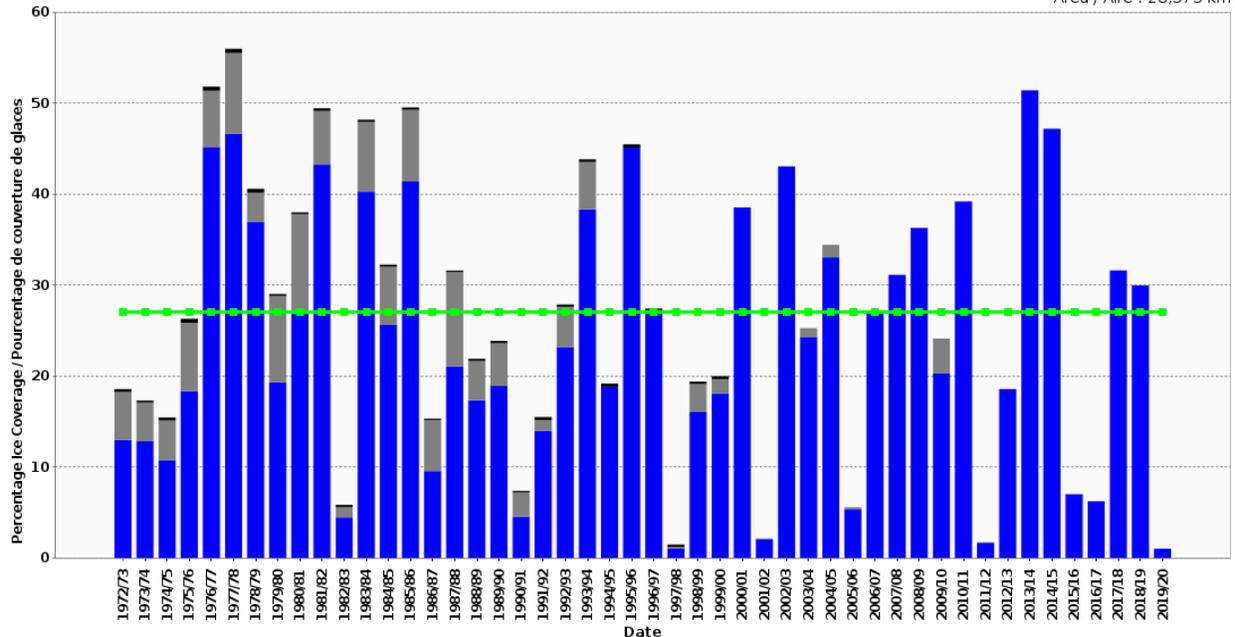


Historical Total Accumulated Ice Coverage (TAC) for the weeks 1204-0514, seasons:1972/73-2019/20

Total accumulé de la couverture des glaces historique (TAC) pour les semaines 1204-0514, saisons:1972/73-2019/20

Lake Erie /
Lac Érié

Area / Aire : 28,573 km²



11.63 % of data is interpolated / 11.63 % des données sont interpolées

Canadian Ice Service - Environment Canada / Service canadien des glaces - Environnement Canada
(2020-04-22 07:47 IceGraph - Canadian Ice Service/Grappe des glaces - Service canadien des glaces 2.0.7 2014/01/21)

■ Ice Coverage / couverture des glaces ■ Interpolated Data / Interpolée ■ No Data / Aucune donnée - Median / médiane 1980/81-2009/10

Figure 16: Historical Accumulated Ice Coverage in Lake Erie by season, 1972-2020

Lake Ontario

2019-2020 Season Temperatures:

Average temperatures of 1-2 degrees Celsius below normal started out the ice season from mid-November until mid-December. These early season cool temperatures allowed early ice to form.

Following these early season cool temperatures a long stretch of generally above normal temperatures occurred from mid-December until the first week of February. Average temperatures were near 3 degrees above normal.

A slightly colder than normal period in the middle of February allowed the lake ice peak to occur on Lake Ontario. Temperatures were generally 1-2 degrees Celsius below normal, with areas in the southeastern portion of the lake being closer to 1 degree Celsius below normal and areas in the northwestern portion of the lake being closer to 2 degrees below normal.

After the brief cold spell a period of above normal temperatures moved across the basin. Temperatures near 3-4 degrees Celsius above normal were seen across the lake from the third week of February until the second week of March. Average temperatures, still above normal, continued for the remainder of March, however were closer to 1-2 degrees Celsius above normal. These above normal temperatures brought about the early end to a below normal ice season on Lake Ontario.

2019-2020 Ice Conditions:

Cold temperatures in November and early December caused the early bloom of ice in the first week of December. Ice formed in the Bay of Quinte with 9 tenths of new lake ice forming by the 9th of December. The entrance to the St. Lawrence River saw, during the same week, concentrations of 1 to 3 tenths of new lake ice. The total cover of ice on the lake was 1%.

Between the 9th and 16th of the month the first thin lake ice of the season was observed on Lake Ontario in the Bay of Quinte. The week saw little change to the ice cover, remaining near 1%. Ice in the St. Lawrence seaway saw an increase in concentration from the 1-3 tenths coverage the previous week to areas of 7 tenths, all new lake ice. The small bays surrounding Prince Edward County filled in with new lake ice.

The third week of December saw continued cold temperatures, below normal for the time of year. These cold temperatures saw the ice cover increase to 2% on Lake Ontario. The climatological median of ice cover for the week is less than 0.5% ice cover. The main increase in ice during the week leading up to December 23rd was in the small bays in eastern Lake Ontario. By December 23rd the Bay of Quinte was observing the first medium lake ice of the season on the Lake, in amounts of 2 tenths. The bay itself was fully ice covered. The bays surrounding Prince Edward County increased in cover to 9 tenths of new and thin lake ice, while the St. Lawrence seaway saw increased coverage to 9 tenths, but the ice remained as new lake ice.

After above normal ice conditions for the first 3 weeks of December on Lake Ontario, well above normal temperatures (weekly mean temperature over 6 degrees Celsius warmer than normal) in the final week saw a rapid melt of the young ice that had formed on the lake. By December 30th, ice coverage fell below 1%, and below the climatological median. The new ice that had formed in the St. Lawrence seaway melted, the ice in the Bay of Quinte dropped from 9 to 10 tenths of ice to 7 tenths, and much of the ice in the smaller bays thinned and decreased in concentration significantly.

The month of January saw little change in the ice extent in the first 2 weeks of the month. Ice conditions remained near 1% ice coverage with the slow filling in of ice in areas which had seen them in mid-December. Temperatures in the first week were 8 degrees Celsius above normal, and were on average above zero. The second week saw temperatures falling below zero on average, but still much warmer than climatology. During the second week the ice in the Bay of Quinte became fast.

Cooler temperatures in the third week of the month allowed new ice to form across the shore of eastern Lake Ontario. In the third week, by January 20th, ice cover increased to 5.7% ice covered, less than the climatological

ice coverage of 9.6%. Much of the new ice cover was present along the shore from Cobourg eastwards to eastern Lake Ontario in amounts of up to 3 tenths. This week ended the year as the second highest ice cover on Lake Ontario for the season.

The last week of January had a slow moving low pressure system cross Lake Ontario. The winds associated with this low destroyed much of the ice in Lake Ontario with ice cover falling to 2.9% at the end of the month, and further falling to 2.5 % by the end of the first week of February.

The peak of ice cover on Lake Ontario occurred in the second week of February, around the 10th of February 2020. Ice cover attained 11.6%, lower than the median climatological maximum of 15.0%, and 1 week earlier than normal. Different this year is that the majority of the ice at the maximum was new lake ice with only just over 2% of ice cover present as thin or medium lake ice. The maximum of 11.6% puts the 2019/20 season as the 8th lowest maximum ice cover for the season since 1972/73. The ice present was in the northeastern section in a wide area of 5 tenths of new lake ice. Along the north shore ice was present from Cobourg and eastwards. On the south shore, from Rochester and eastwards, a thin band of new lake ice was present.

The second half of February saw the destruction of much of the new lake ice that formed in the second week and the thickening of the rest. By the end of the month ice concentration was hovering between 3.5% and 5.5% with all ice remaining in the northeastern section, close to the shore. The St. Lawrence River filled in with 7 to 8 tenths of ice, thickening to thin lake ice. Climatologically, after mid-month, there is a general reduction in lake ice on Lake Ontario. This occurred again this year.

The first week of March did see the growth of a small amount of new ice, destroyed and melted quickly in the second week of the month as the average weekly temperature stayed above zero. The fast ice in the Bay of Quinte became rotten in the second week of the month while ice concentration fell to 2% with the melt of much of the non-fast ice. Above normal temperatures continued in the third week of the month, melting all ice by March 20th. The ice season on Lake Ontario came to an end on that date as the last rotten ice melted out of the Bay of Quinte.

TAC for the 2019-2020 season was 2.0%, well below the long term median TAC of 5.9%, and less than 1/3 of the value from the previous season of 7.1%. The TAC of 2.0% puts the season as the 8th lowest year since the 1972/73 season, similar to the 2015/16 and 2016/17 years.

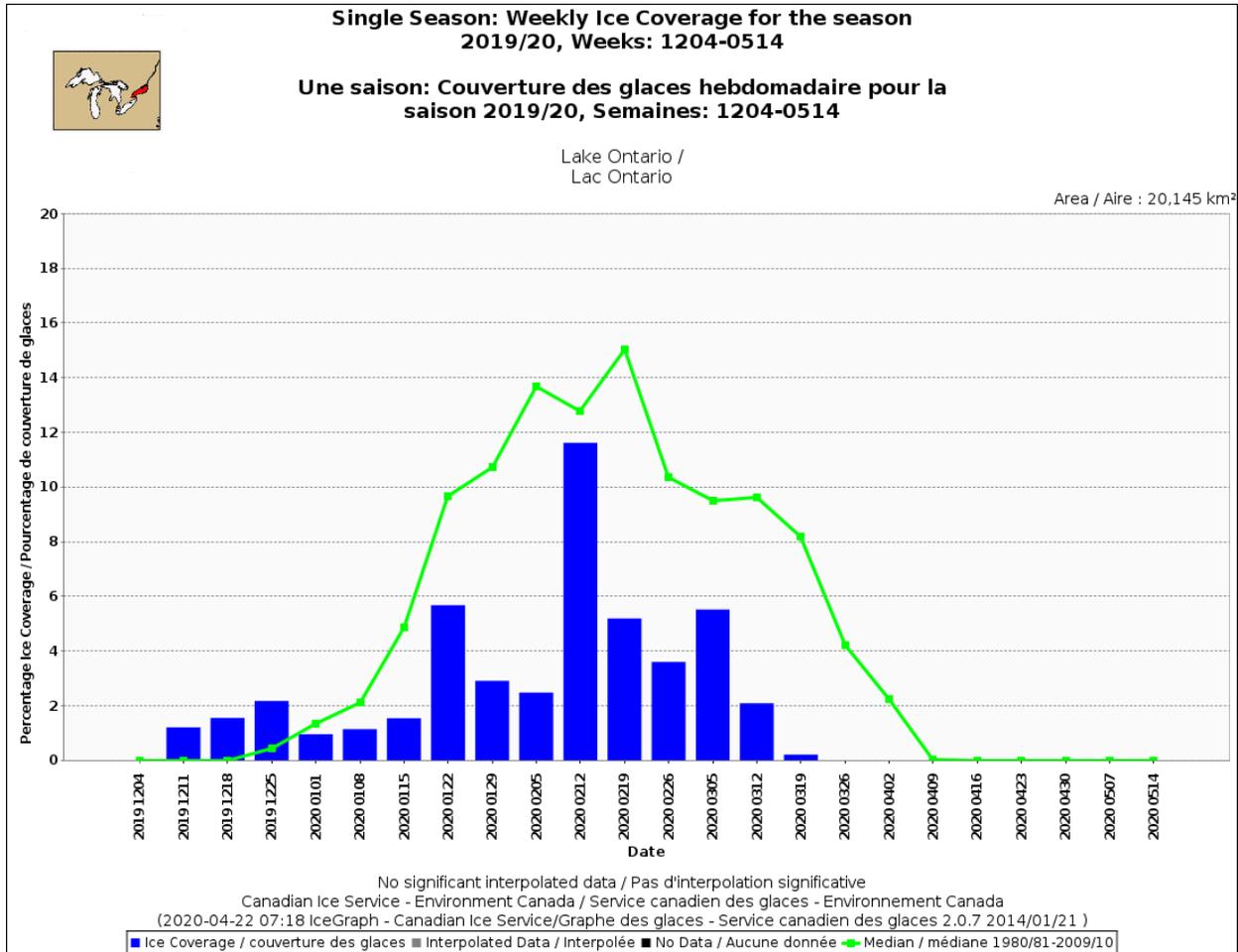


Figure 17: Weekly Ice Coverage in Lake Ontario for winter 2019-2020

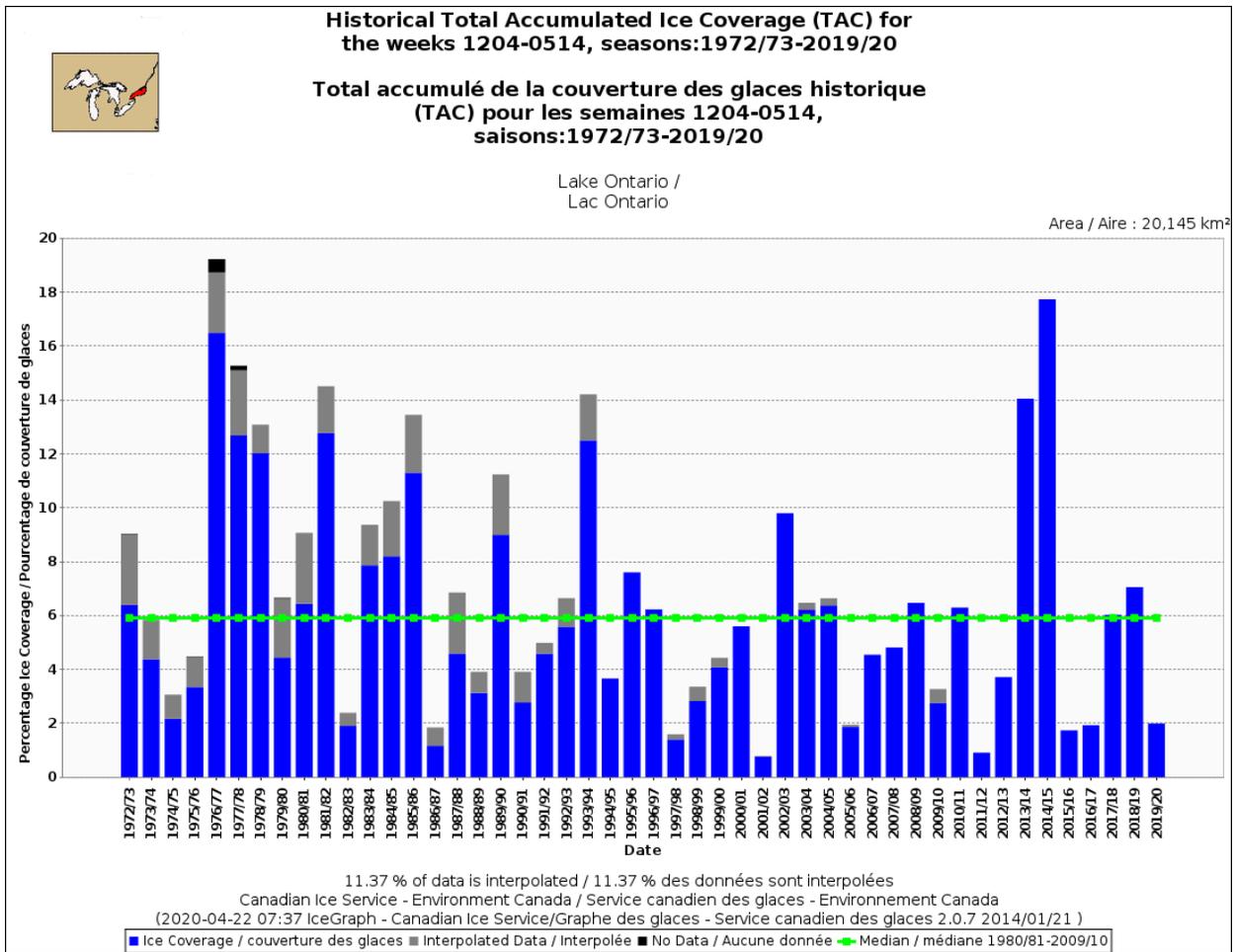


Figure 18: Historical Total Accumulate Ice Coverage in Lake Ontario by season, 1972-2020.