MACKENZIE DELTA AND BEAUFORT COAST SPRING BREAKUP NEWSLETTER

Report 2017-03
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Welcome to Breakup 2017

You may also want to check out the Mackenzie-Beaufort Breakup group on Facebook (https://www.facebook.com/groups/1745524288993851/).

This year, in addition to sharing the newsletter to our mailing list of >370 addresses, we are posting the newsletters on the CACCON (Circum-Arctic Coastal Communities Knowledge Network) website. You can find them at https://www.caccon.org/mackenzie-beaufort-break-up-newsletter/

Funding for our current breakup monitoring activity is from the Climate Change Geoscience Program of the Geological Survey of Canada, Natural Resources Canada.

Please let us know if you do not wish to receive these reports (contact info above) and we will take you off the list. For those of you living in the north, we welcome any observations of timing of events, extent of flooding, evidence of breakup, or anything out of the ordinary, and we thank you for all of the feedback received so far.

For those interested in conditions further south, we recommend that you contact Angus Pippy (Water Survey of Canada) in order to receive his very useful High Water Report: contact Angus at 867-669-4774 or angus.pippy@ec.gc.ca.

Water level data presented in our newsletters are courtesy of Environment Canada (Water Survey of Canada) and are derived from their real-time hydrometric data website at http://www.wateroffice.ec.gc.ca/index_e.html, which we acknowledge with thanks. Particular thanks to colleagues in Inuvik for keeping so many of the delta gauges operating through the difficult breakup season. Weather reports and forecasts are also from Environment Canada (Meteorological Service of Canada) at http://weather.gc.ca. Ice road conditions are from the GNWT Department of Transportation road reports and travel alerts (@GNWT_DOT). Daily MODIS imagery is courtesy of NASA Worldview at https://earthdata.nasa.gov/labs/worldview/.
Current conditions

Breakup is proceeding upstream in the Mackenzie Valley, as evident in the image below (Figure 1) provided in the NWT High Water Report for May 10 showing the current earlier today at Wrigley NWT. This community is approximately 900 km upstream of Tsiigehtchic, where one year ago today the ice had started to move. Temperatures continue to rise in the central Mackenzie Valley, with Norman Wells expected to reach high teens today. Cooler weather is forecast for the delta today and temperatures are expected to fall below freezing overnight. So far in the delta there is ponding of snowmelt and only minor signs of rising water (Figure 2).

As of yesterday at noon the Dempster Highway ice crossing of the Peel River was closed for the season (information from @GNWT_DOT).

Figure 1. Open Mackenzie River at Wrigley earlier today (from NWT High Water Report for May 10, courtesy of Angus Pippy)

Figure 2. Conditions at Semmler’s Channel, north of Inuvik on May 8. Thank you to Gerry St. Amand for the photo.
**Water levels**

The water level at Norman Wells (10KA001) has continued rising at an accelerating pace, up 43 cm over 24 hours from 07:00 MDT May 9 to May 10 and the (secondary) level was above 6.64 m as of 12:30 MDT today (Figure 3). In both East Channel at Inuvik (10LC002), and Peel Channel above Aklavik (10MC003), the water continues to rise slowly with both gauges showing an increase of 1.7 cm in 24 hours (Figures 4 and 5). In the outer delta, Reindeer Channel at Ellice Island (10MC011) is rising more slowly still with a 24 hour increase less than 1 cm (Figure 6).

Plots of daily mean water level at Inuvik, Aklavik, and Reindeer Channel all show the same slow rise and remain below all previous years shown (2006 and 2008-2016) apart from 2011 (Figures 7-9).

![Figure 3. Water level (secondary) in Mackenzie River at Norman Wells (WSC 10KA001) since April 15, 2017. Median level is shown in blue.](image)

![Figure 4. Water level in East Channel at Inuvik (WSC 10LC002) since May 1, showing a continued slow rise (courtesy Water Survey of Canada).](image)
Figure 5. Water level in Peel Channel above Aklavik (WSC 10MC003) since May 1 (courtesy Water Survey of Canada).

Figure 6. Water level in Reindeer Channel at Ellice Island (10MC011) since May 1 showing a very slow rise (courtesy Water Survey of Canada).
Figure 7. Daily mean water levels in East Channel at Inuvik (10LC002) from May 1 this year (black) with equivalent data from the past 9 years and the record year of 2006 (derived from data courtesy of Water Survey of Canada).

Figure 8. Daily mean water levels in Peel Channel above Aklavik (10MC003) from May 1 this year (black) with equivalent data from the past 9 years and the record year of 2006 (derived from data courtesy of Water Survey of Canada).
Figure 9. Daily mean water levels in Reindeer Channel at Ellice Island (10MC011) from May 1 this year (black) with equivalent data from the past 9 years and the record year of 2006 (derived from data courtesy of Water Survey of Canada).

**Satellite imagery**

Using the Terra-MODIS satellite imagery we compare the river conditions today with the same day last year. On this date (May 10) in 2016, much of the river was clear of ice (Figure 10), while this year the ice is still present throughout the lower valley (Figure 11). This year, the breakup is lagging a bit behind previous years, but the breakup timing is expected to be average to slightly late. For more information on snowpack and projections for water levels and precipitation this year, please see the attached report developed by Shawne Kokelj at the GNWT.

The MODIS image from the Delta region (Figure 12) shows little change in the landfast ice extent, but there has obviously been lots of snowmelt in the mountains and south of the Delta. There may be some darkening related to snowmelt standing water in the delta, as reported by Gerry St. Amand yesterday.

Further east, landfast ice has pulled away from the coast west of Sachs Harbour at Cape Kellett and in a large section of Thesiger Bay to the southeast (Figure 13). There is open water at Nelson Head and mobile ice in Amundsen Gulf is more fractured, but there is little change since the last storm in the landfast ice off Ulukhaktok or from Pearce Pt west to Cape Bathurst.
Figure 10. MODIS corrected Land Surface Reflectance (true colour) from the Terra (MOD05) satellite acquired 10 May 2016, showing break-up conditions for the Mackenzie River between Great Slave Lake and the Mackenzie Delta (courtesy NASA Worldview).
Figure 11. MODIS corrected Land Surface Reflectance (true colour) from the Terra (MOD05) satellite acquired **10 May 2017**, showing break-up conditions for the Mackenzie River between Great Slave Lake and the Mackenzie Delta (courtesy NASA Worldview).
Figure 12. MODIS corrected Land Surface Reflectance (true colour) from the Terra (MOD05) satellite acquired 9 May 2017, showing ice conditions from the western Yukon coast to Cape Bathurst (courtesy NASA Worldview).
Figure 13. MODIS corrected Land Surface Reflectance (true colour) from the Terra (MOD05) satellite acquired 9 May 2017, showing the breakup of landfast ice in Amundsen Gulf (courtesy NASA Worldview).
This is an outlook for anticipated spring water levels in the NWT, with information compiled from several sources.

Through the winter of 2016-17, La Nina conditions dominated through the early portion of the winter (Nov-January), which generally brings colder than normal conditions which are associated with lower than usual snowfall (True North Weather Consulting for ENR). Atmospheric conditions have transitioned to a neutral state since February (True North). The North American Drought Monitor indicates the south-western portions of the NWT are part of the moderate drought conditions being experienced in northern British Columbia and the Yukon (https://www.ncdc.noaa.gov/temp-and-precip/drought/nadm/maps).

The potential occurrence and severity of freshet flooding depends in large part on the weather over the next few weeks and how this interacts with existing water levels and snow pack amounts. Extremely warm temperatures, extreme rain or rain on snow events greatly increase the likelihood of flooding.

Water level data are part of the NWT Hydrometric Monitoring Network, funded by Environment Canada and the GNWT, and operated by the Water Survey of Canada. Data can be seen and/or downloaded at https://wateroffice.ec.gc.ca/search/searchRealTime_e.html.

Yellowknife and Snare River basins
ENR snow surveys show that the snowpack in the Yellowknife and Snare River basins are at about average amounts, at 95% and 96% respectively. While there are a few exceptions, the water levels on most of the lakes and rivers in the North Slave region with monitoring gauges remain below average. Evidence of spring freshet has not hit these North Slave streams due to the enduring cold temperatures. Based on the values seen in North Slave region snow surveys and the existing moisture deficit, there is likely not enough moisture to replenish most river systems in the region back to average levels. Much will now depend on rain through late spring and summer.

Hay River Watershed
For the Hay River watershed, the spring runoff outlook of Alberta Environment is anticipating much below average runoff, with the end of season snow ranked as much below average. The snow survey site at Assumption (AB) was at 58% of normal as of April 1st, while snow surveys in
the area near Swede Creek indicated snow pack was just under 90% of normal (GNWT ENR). Hay River break-up is ongoing, and the Hay River Director of Protective Services, Ross Potter, reported that while they are keeping a close watch on conditions, at this point, there is little threat of flooding in Town. This is due to low over-winter snow in the basin headwaters, as well as relatively average to just below average water levels in the river.

**Peace and Athabasca River Basins**
Alberta Environment spring runoff outlook as of April 1st for the Peace and Athabasca river basins ranged from average in the upper (more southerly) portions of the basins, to much-below-average in the lower reaches (more northerly) within Alberta. The % of precipitation between Nov 1 2016 and April 1 2017 was much-below-average in the northern third of the province, including the Peace and Athabasca river basins, with a small region of above average precipitation in the upper basin of both the Peace and Athabasca rivers. The BC River Forecast Centre indicates that as of April 1, 2017, there was 76% of normal basin snow water index in the BC portion of the Peace River basin. South Slave region snow surveys completed by ENR indicated a snow pack that was just slightly above average values.

**Slave River and Great Slave Lake**
While the water level on the Slave River is currently above average, levels are extremely variable over freshet. Similarly, Great Slave Lake water level is above average at this time, but has remained relatively stable over the past couple of weeks.

**Liard River Basin**
For the Liard River Basin, snow pack in the Yukon is well below average as of April 1st, according to Environment Yukon, with values ranging from 36% of normal at Pine Lake Airstrip to 89% at Hyland River. A basin-wide value of 67% of normal (Yukon Snow Survey April 2017) has been estimated. The average flow volume for the Liard River upstream of Upper Liard was 75% of normal for March and given normal summer meteorological conditions, flow volumes are expected to range between 70-75% of normal (Yukon Snow Survey). Accumulation in the British Columbia portion of the Liard basin is also below average (overall, 62% of normal) with values ranging from 61% of normal at Sikanni Lake to 102% measured at Fort Nelson airport, indicating a potential for increased risk of summer low flows (BC River Forecast Centre).

**Dehcho Region**
ENR snow surveys in the Dehcho Region indicate that snow pack is average (97%). The water level on the Liard River at Fort Liard has been well below average over most of the winter, and remains there currently, although levels have just started to climb this week with freshet, as is usual for this time of year. Water levels on the Mackenzie River were generally well below average at Fort Simpson since December but just above average at Norman Wells. Both sides currently reflect seasonally normal upward trends.

**Inuvik Region**
ENR snow surveys in Inuvik region indicate snow pack is a bit below average (91%).
Seasonal precipitation forecast

Below is an indication of what various seasonal weather forecasting models show as likely to occur (True North Weather Consulting for ENR):

May
• Northern BC – areas of ongoing drought forecast;
• Dehcho, Sahtu, Inuvik regions – potential for below seasonal precipitation;
• Great Bear Lake region, portions of North and South Slave regions - majority of models
  indicate above normal precipitation.

June
• Dehcho – most models suggest below average precipitation
• All other regions - models have variable results with little consensus

July
• Dehcho, North Slave and Sahtu – above normal precipitation
• South Slave – below normal precipitation
• Inuvik region – no significant trends
• Northern NWT – little trend

August
• Northern NWT – below normal precipitation
• Southern NWT – above normal precipitation