YUKON SNOW SURVEY BULLETIN & WATER SUPPLY FORECAST

April 1, 2019

Prepared and issued by:
Water Resources Branch
Department of Environment

Yukon

DEDICATION

The 2019 Yukon Snow Survey Bulletin and Water Supply Forecasts are dedicated to the memory of Ric Janowicz (1952 – 2018). As Senior Hydrologist for Environment Yukon for more than 35 years, Ric was keenly interested in expanding the knowledge of northern hydrology. Ric promoted and contributed to the development of hydrologic models tailored to northern climates in an ongoing effort to better understand river ice break-up processes and risks to flood-prone communities.

Specific to the study of snow, Ric oversaw the significant expansion of the Yukon Snow Survey Network, establishing more than 20 new long-term monitoring sites throughout the territory. Additionally, Ric rallied for the construction of several remote meteorological stations equipped with snow pillows allowing for real-time monitoring of snowpack accumulation and degradation across the season. These advancements allowed Ric to increase the effectiveness of the flood forecasts that he produced through his work with Water Resources Branch.

Ric will be remembered for his unwavering devotion to his work; he will also be fondly remembered for his unique personality, humour, stories, and above all from his colleagues, as a world-renowned hydrologist.

YG Photo credit

PREFACE

The Yukon Snow Survey Bulletin and Water Supply Forecast is prepared and issued three times annually – early March, April and May – by the Department of Environment's Water Resources Branch. The bulletin provides a summary of winter meteorological and streamflow conditions for Yukon, as well as current snow depth and snow water equivalent observations for 57 locations. This information is used to evaluate the potential for spring flooding caused by both breakup ice jams and large spring snowmelt (freshet) flows. It is important to note that other processes such as summer rain and glacier melt can significantly influence maximum annual water levels in specific Yukon basins.

The Snow Bulletin is presented in a new format and will continue to improve using new technologies and comments provided by users and partners. The fall and winter average weather conditions (temperatures and precipitation) are spatially presented for the entire territory in two figures. The spatial distribution of Snow Water Content (or Snow Water Equivalent, SWE) is presented for 11 watersheds (or river basins) in a separate figure. Complementary meteorological and hydrological data are presented for each basin through a maximum of five graphs, depending on data availability:

- Figure A: Daily Snow Water Equivalent (SWE) data starting in September at one specific location in the watershed, showing an overview of winter snowpack evolution.
- Figure B: Current, basin averaged, estimated Snow Water Equivalent (SWE), from snow survey data, compared with historical data, which represents an indicator of potential runoff volumes in the spring (considering that snow sublimation, air temperatures, and rain also significantly affect runoff).
- Figure C: Monthly-averaged precipitation (rain and/or snow), from meteorological stations, since October compared with historical data (30-year climate normal), which complements the information presented in Figure B.
- Figure D: Cumulated degree-days of freezing (CDDF, sum of negative daily temperatures) since October, compared with historical data, that represents an indicator of winter coldness and overall river ice thickness which affects river ice breakup scenarios in the spring.
- Figure E: Current, estimated daily discharge or measured water level, compared with historical data, which presents an overview of the watershed hydrological condition.

Information about the bulletin, snowpack conditions, or streamflow projections can be obtained by contacting:

Jonathan Kolot	Anthony Bier	Benoit Turcotte
Hydrology Technologist	Hydrology Technologist	Senior Scientist, Hydrology
(867) 667-3234	(867) 667-3144	(867) 667-3223
jonathan.kolot@gov.yk.ca	anthony.bier@gov.yk.ca	benoit.turcotte@gov.yk.ca

Water Resources Branch, Department of Environment
(867) 667-3171, toll free (in Yukon, NWT, Nunavut): 1-800-661-0408, ext. 3171
Fax: 867-667-3195 | Email: water.resources@gov.yk.ca

There were no changes to the network for 2019. This bulletin, as well as earlier editions, are available online at: www.env.gov.yk.ca/snowbulletin

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- *Data Collection Officer, Natural Resources Conservation Service, United States Department of Agriculture*
- *Meteorologist, Wildland Fire Management, Yukon Department of Community Services, Whitehorse*
- *Officer in Charge, Water Survey of Canada, Whitehorse*
- *Water Management Engineer, Yukon Energy Corporation*
- *Vuntut Gwitchin First Nation*
- *McMaster University*

Agencies cooperating with Environment Yukon in the Snow Survey Program are:

- *B.C. Ministry of Environment, Water Stewardship Division*
- *Parks Canada, Kluane National Park and Reserve*
- *Yukon Department of Highways and Public Works*
- *Yukon Department of Energy Mines and Resources, Compliance Monitoring and Inspections Branch*
- *Yukon Department of Environment, Information Management and Technology Branch*
- *Government of the Vuntut Gwitchin First Nation*

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YUKON TERRITORY WEATHER AND SNOWPACK CONDITIONS

Fall and winter 2018-19 was largely warmer than the historical average[1] across the territory, with the exception being a colder than average February in most of Yukon. Precipitation has been below to well below historical average thanks to a combination of persistent blocking ridges and cold, dry arctic air.

December

Once again, temperatures fluctuated significantly as alternating warm ridges and cool artic air affected Yukon. A warm spell early in the second week brought temperatures to above freezing as far north as Dawson City, while an Arctic air mass brought cold temperatures to all areas just before Christmas. The month ended with another bump to above freezing in southwest Yukon. Precipitation varied significantly, with the far north and parts of southwest Yukon seeing above average amounts while the remainder of the territory was well below average.

January

Early January brought extreme cold to central and northern Yukon with temperatures dropping to the mid-minus-40s. Southern Yukon was variable, with another period of above freezing temperature to end the month. Temperatures were once again above average across most of the territory, with only Mayo reporting near historical average conditions. Precipitation was variable, with Old Crow at 150% of average, Whitehorse at 120% and most remaining stations recording well below average, with a minimum of 8%.

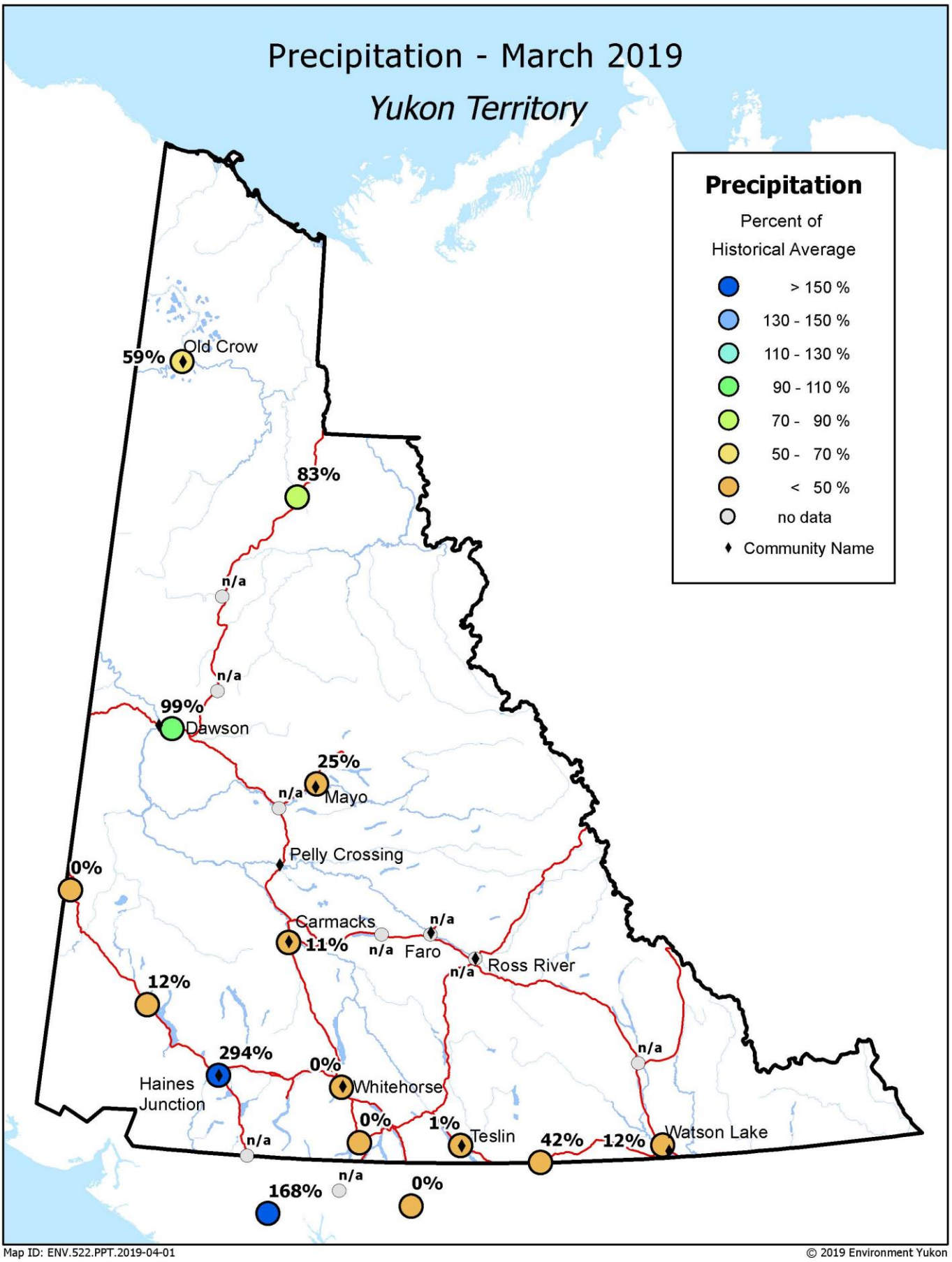
February

February was characterized by cold, clear weather from both upper ridges and arctic outbreaks. Although daytime highs often reached seasonal average, overnight lows ranged from mid-minus-20s to minus 40s. With the exception of Old Crow and parts of the Dempster highway, February was 2-5 degrees cooler than average. The mostly cool and clear conditions kept precipitation amounts low as well, with Whitehorse and Teslin reaching close to historical average amounts thanks to a storm late in the month.

March

The transition to spring weather came nearly a month early to much of the territory, with very warm and in many cases record-breaking daily high temperatures beginning early in the second week of March and continuing through the end of the month. Warm daytime highs were exacerbated by overnight lows that occasionally failed to drop below freezing, speeding the loss of the already thin snowpack in most of central and southern Yukon. Temperatures were 5.8°C above normal, on average, for the month of March. Precipitation was well below historical normal in central and south-central Yukon, near normal in Dawson and Old Crow areas, and well above the climactic mean in Haines Junction and down to the Alaskan border, due largely to a single large storm on March 18th.

[1] Historical temperature, precipitation, snow water equivalent and discharge or water level records are not always long enough to establish a state-of-the-art “normal”, which implies 30 years of data. Therefore this document refers to historical average, or more simply, average. Historical records considered in this bulletin are always long enough to be representative of recent hydro-meteorological conditions.


Precipitation - March 2019
Yukon Territory
Precipitation
Percent of
Historical Average
> 150 %
130 - 150 %
110 - 130 %
90 - 110 %
70 - 90 %
50 - 70 %
< 50 %
no data
Community Name
59%
Old Crow
83%
n/a
n/a
99%
Dawson
25%
n/a
Mayo
Pelly Crossing
0%
Carmacks
11%
n/a
n/a
Faro
n/a
Ross River
12%
294%
Haines
Junction
0%
Whitehorse
n/a
0%
1%
Teslin
42%
12%
Watson Lake
n/a
n/a
168%
0%
Map ID: ENV.522.PPT.2019-04-01
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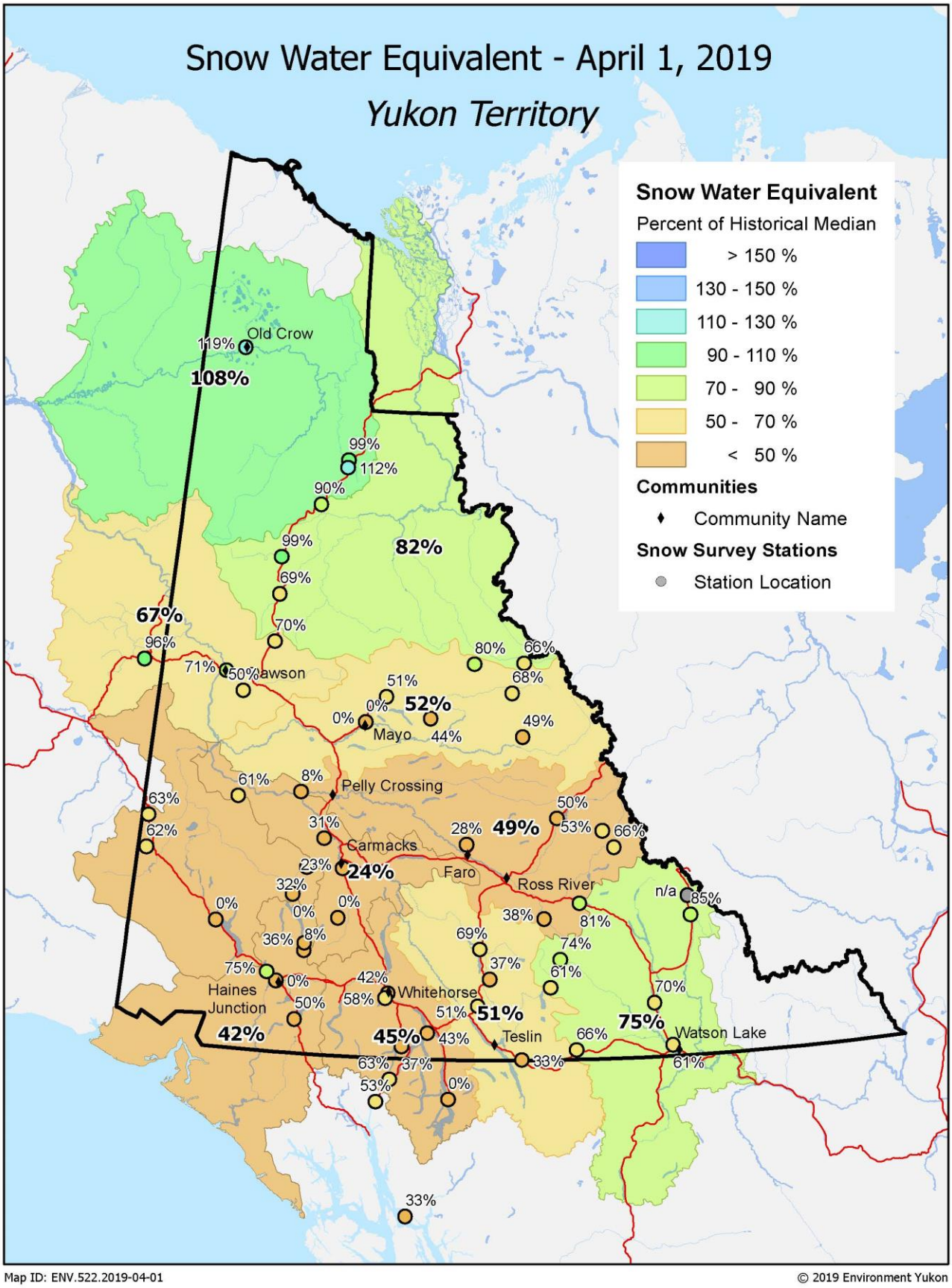
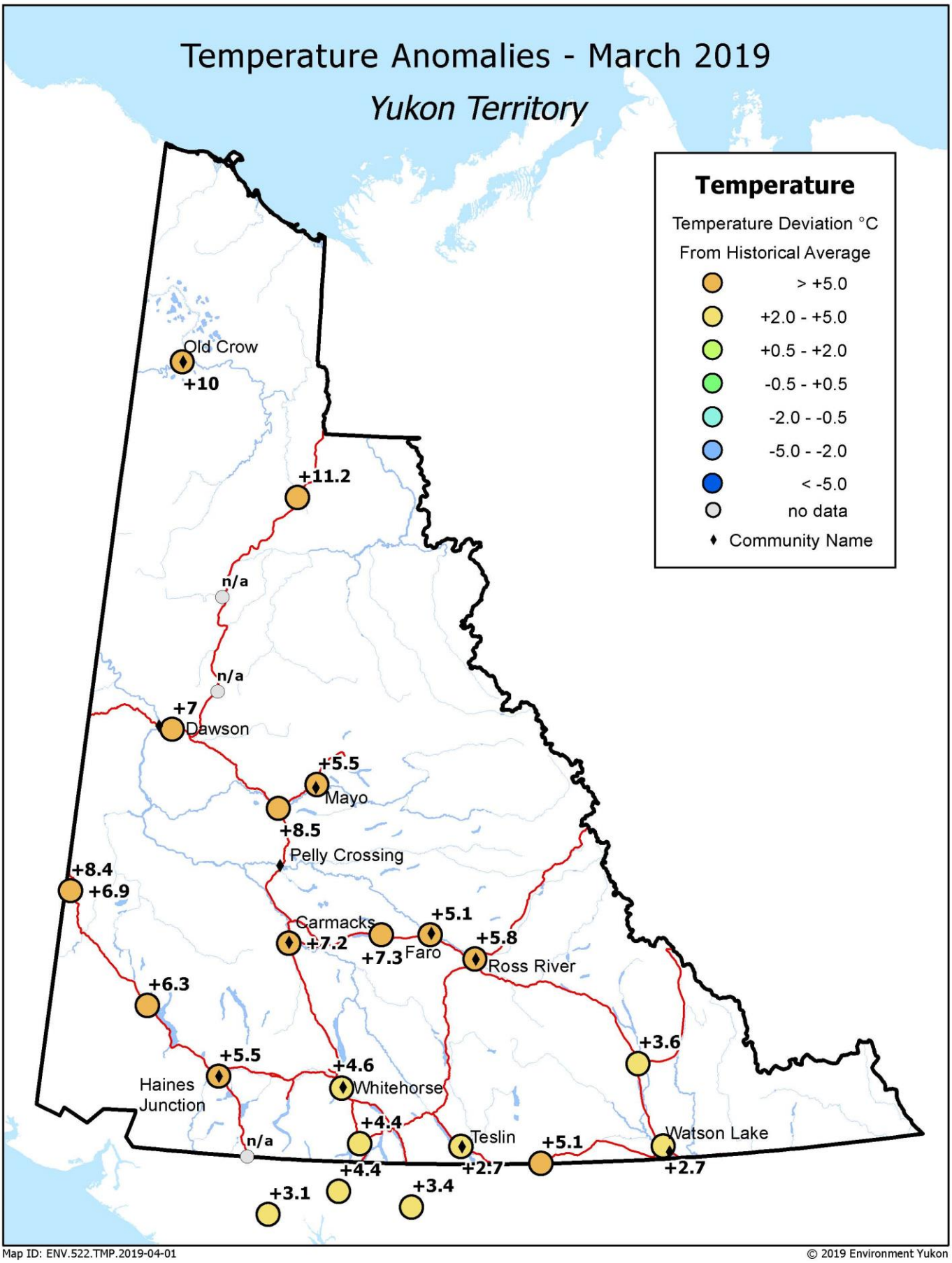

Snow Water Equivalent - April 1, 2019
Yukon Territory
Snow Water Equivalent
Percent of Historical Median
> 150 %
130 - 150 %
110 - 130 %
90 - 110 %
70 - 90 %
50 - 70 %
< 50 %
Communities
Community Name
Snow Survey Stations
Station Location
Old Crow
119%
108%
99%
112%
90%
99%
69%
82%
67%
96%
70%
71%
50%
Dawson
80%
66%
68%
51%
0%
52%
0%
Mayo
44%
49%
61%
8%
Pelly Crossing
63%
62%
31%
50%
53%
66%
28%
49%
Carmacks
23%
24%
Faro
Ross River
32%
0%
0%
0%
n/a
85%
38%
81%
36%
8%
69%
74%
37%
61%
75%
0%
42%
Haines
Junction
58%
Whitehorse
50%
51%
51%
70%
42%
45%
43%
Teslin
66%
75%
Watson Lake
63%
37%
33%
61%
53%
0%
33%
Map ID: ENV.522.2019-04-01
© 2019 Environment Yukon


Temperature Anomalies - March 2019
Yukon Territory
Temperature
Temperature Deviation °C
From Historical Average
> +5.0
+2.0 - +5.0
+0.5 - +2.0
-0.5 - +0.5
-2.0 - -0.5
-5.0 - -2.0
< -5.0
no data
Community Name
Old Crow
+10
+11.2
n/a
n/a
+7
Dawson
+5.5
Mayo
+8.5
Pelly Crossing
+8.4
+6.9
Carmacks
+7.2
+7.3
Faro
+5.1
+5.8
Ross River
+6.3
+5.5
Haines
Junction
+4.6
Whitehorse
+4.4
n/a
+4.4
Teslin
+2.7
+5.1
+3.6
Watson Lake
+2.7
+3.1
+3.4
Map ID: ENV.522.TMP.2019-04-01
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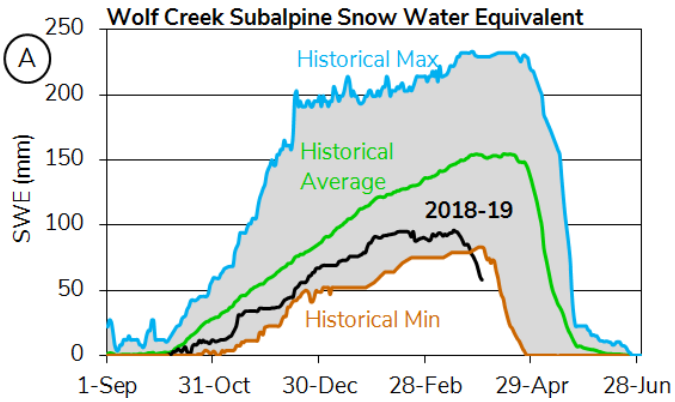
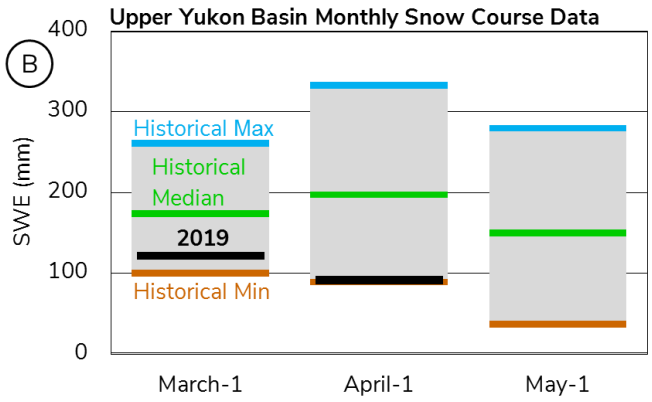
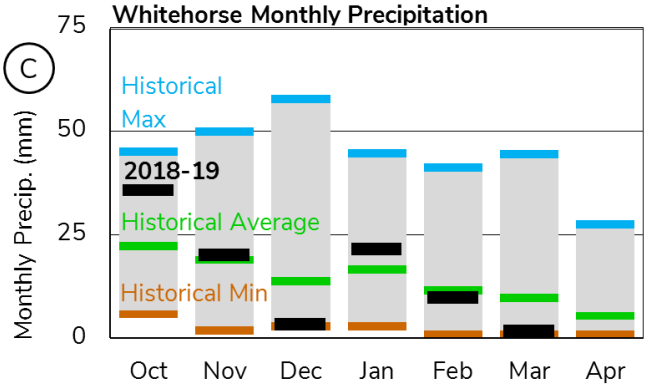
UPPER YUKON RIVER BASIN (SOUTHERN LAKES / WHITEHORSE)

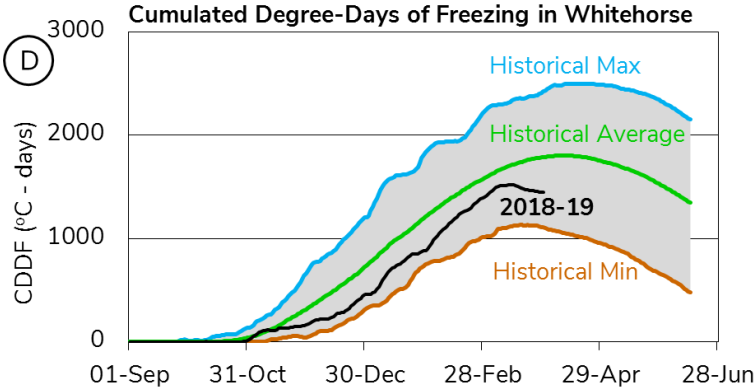
At Wolf Creek Subalpine Station, Snow Water Equivalent (SWE) is measured to be **39%** of the **historical average**, **well-below historical minimum** (Figure A). The Upper Yukon basin-averaged SWE is estimated to be **45%** of the **historical median**, with **91 mm** as of April 1 (Figure B).



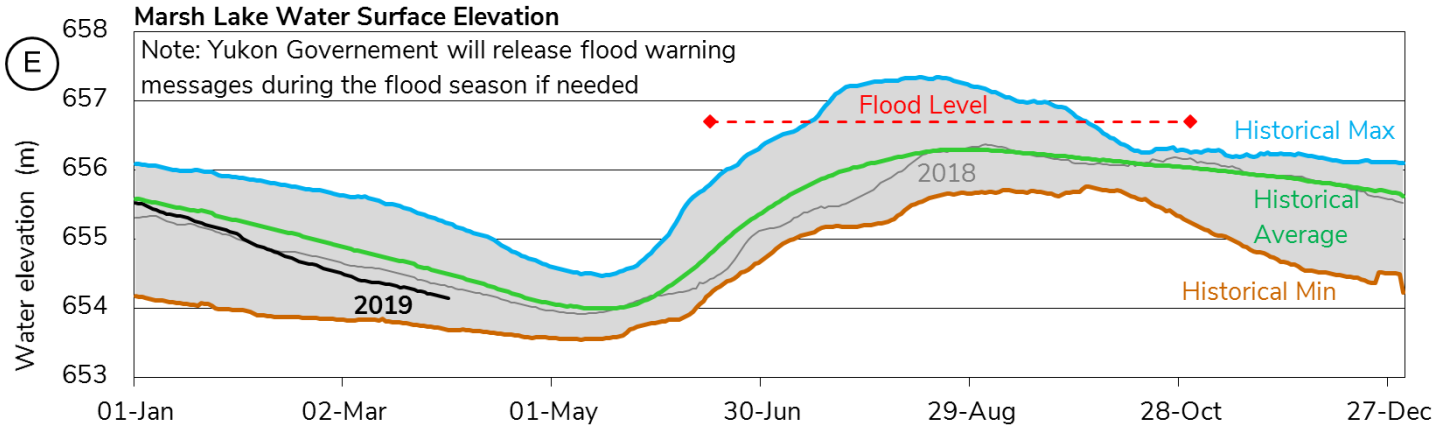


Whitehorse Airport weather data during fall and winter shows a cumulative precipitation total **near average** on March 1 whereas March precipitation was **below average** with 0 mm recorded (Figure C). Cumulative degree-days of freezing (CDDF) are **lower** than **average**, with 1450 °C-Days, which indicates a **mild** winter (Figure D). Warm weather in March has initiated an early CDDF decline and a thermal river ice breakup.



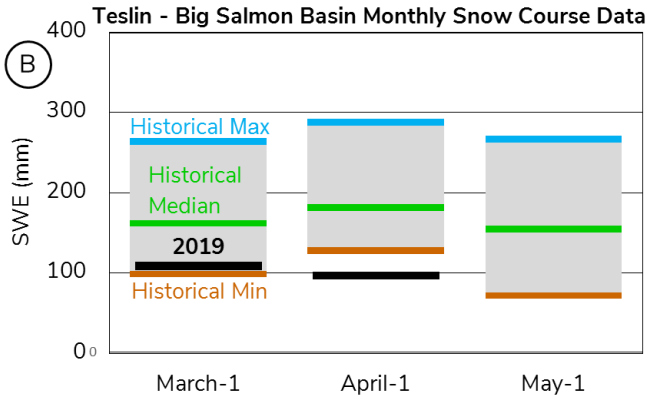


The measured water surface elevation (relative to sea level) in Marsh Lake is currently 0.3 m **lower** than the **historical average** (Figure E). It is too early in the season to determine if **2019** will be a high water level year, but the **well-below average** snowpack and **low** water levels suggest a **very low** **potential for summer floods**.

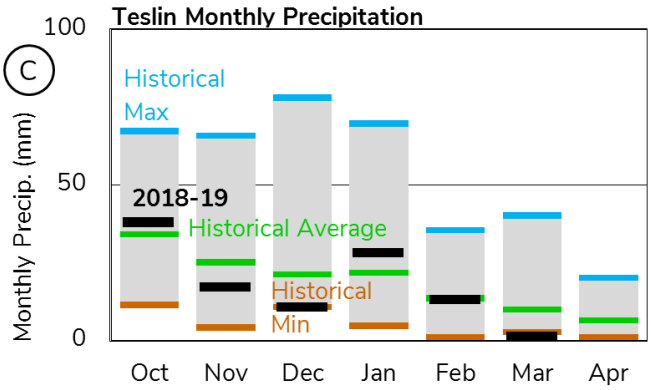


TESLIN RIVER BASIN

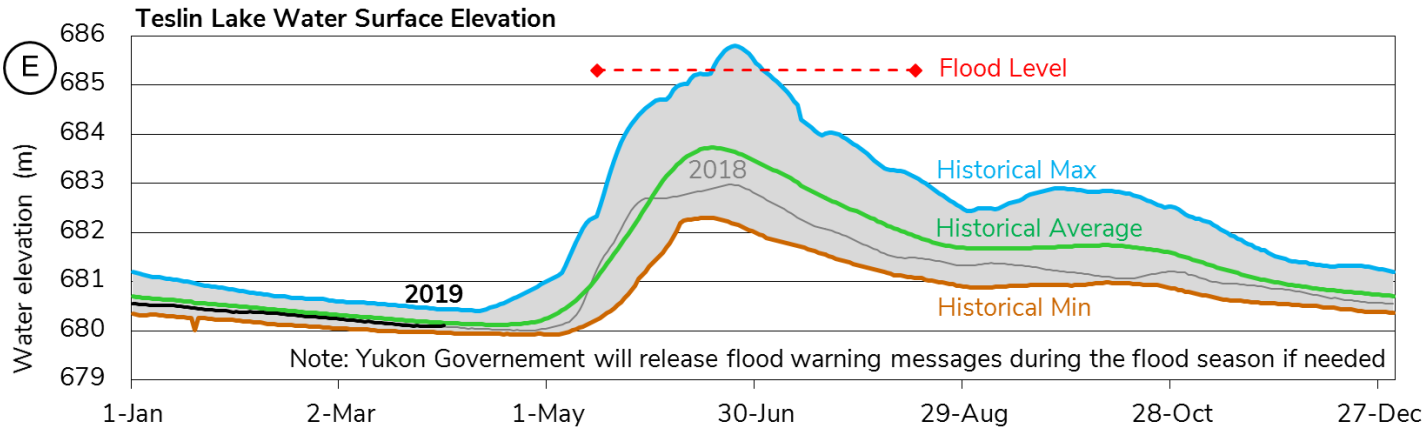
The Teslin River basin-averaged SWE is estimated to be **51%** of the **historical median**, with **96 mm** as of April 1, setting a new record minimum (Figure B).



Teslin precipitation during fall and winter shows **below average** cumulative precipitation and a new record low for the month of March with less than 1 mm (Figure C).

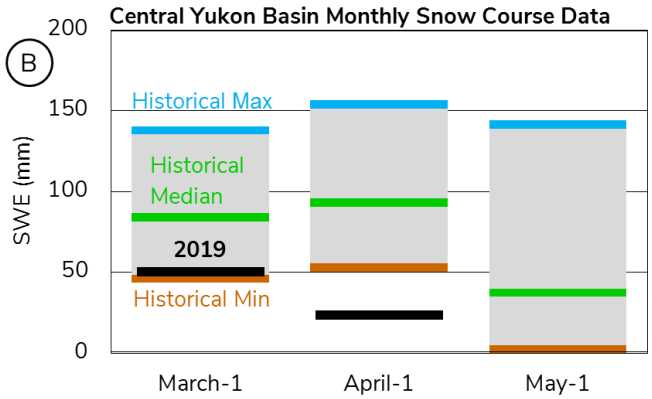


The measured water surface elevation (relative to sea level) in Teslin Lake is currently close to the **historical average** (Figure E). It is too early in the season to determine if **2019** will be a high water level year, but the **well-below average** snowpack and **close to average** water levels suggest a **low potential for summer floods**.

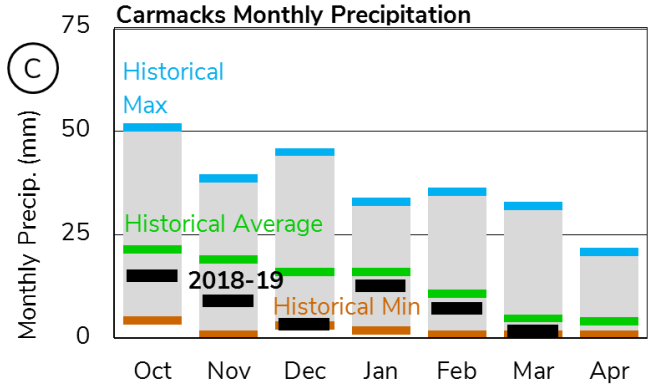


CENTRAL YUKON RIVER BASIN (CARMACKS AREA)

The Central Yukon basin-averaged SWE is estimated to be **24%** of the **historical median**, with **23 mm** as of April 1, setting a new record minimum (Figure B). Large portions of the Central Yukon Basin had no snow cover on April 1.

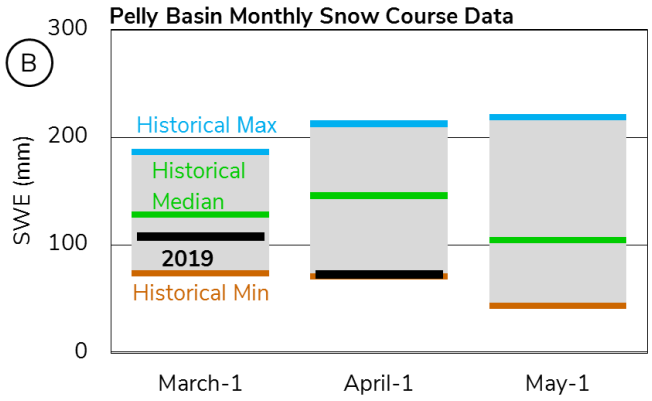


Precipitation at Carmacks shows consistently **lower** than **average** monthly values during fall and winter, including close to historical minimum in March (Figure C).

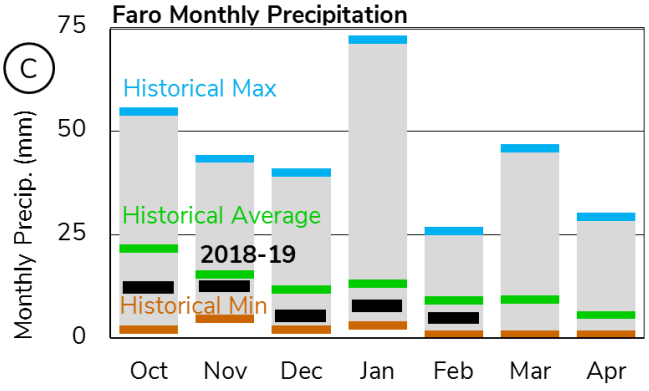


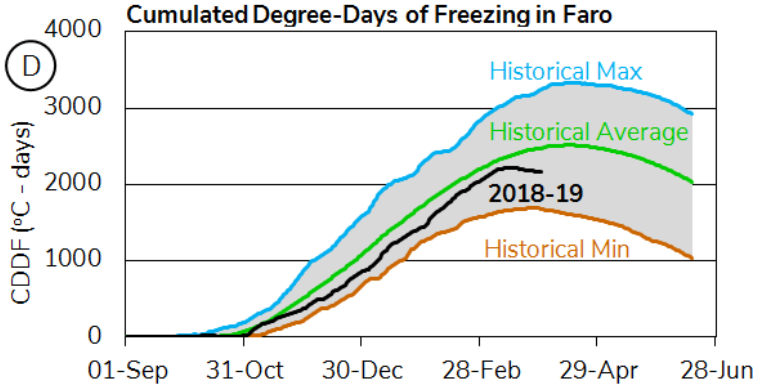
PELLY RIVER BASIN

The Pelly River basin-averaged SWE is estimated to be **49%** of the **historical median**, with **72 mm** as of April 1, (Figure B).

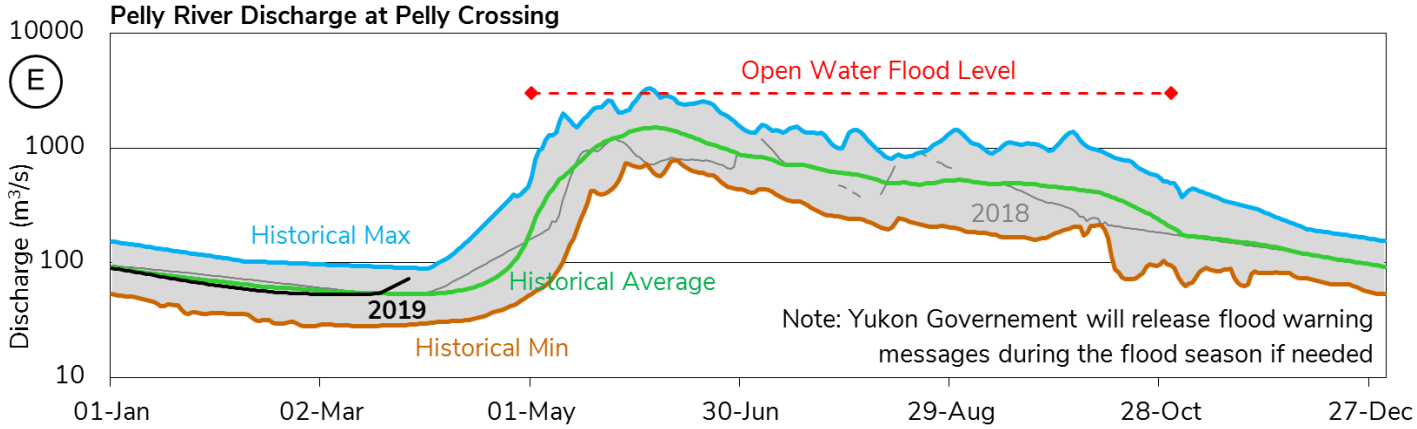


Precipitation at Faro shows consistently **lower** than **average** monthly values during fall and winter (Figure C). Precipitation values were not available for March in Faro, but Ross River registered 0 mm. Cumulated degree-days of freezing (CDDF) are **lower** than **average**, with 2160 °C-Days, which indicates a **mild** winter (Figure D). Warm weather in March has initiated an early CDDF decline and a thermal river ice breakup.



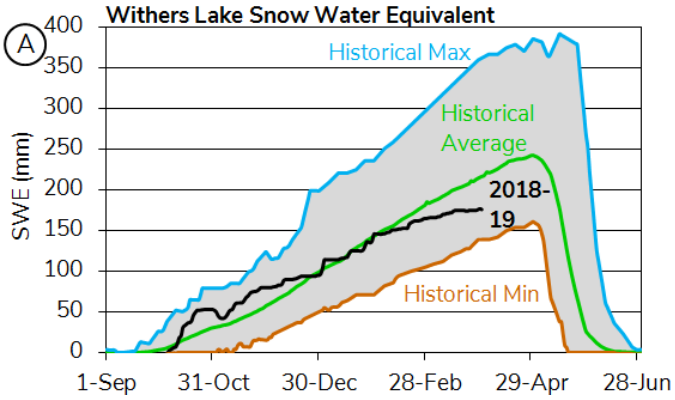


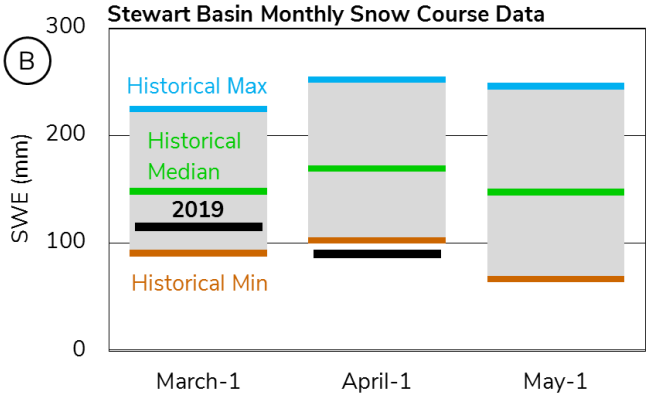
The estimated Pelly River discharge at Pelly Crossing is currently rising **above** the **historical average** as a consequence of early snowmelt (Figure E). The **well-below average** snowpack suggests a **lower than average spring freshet volume**. Spring peak flows will depend on residual snowmelt rates and rainfalls, but there is currently a **low potential for spring floods**.



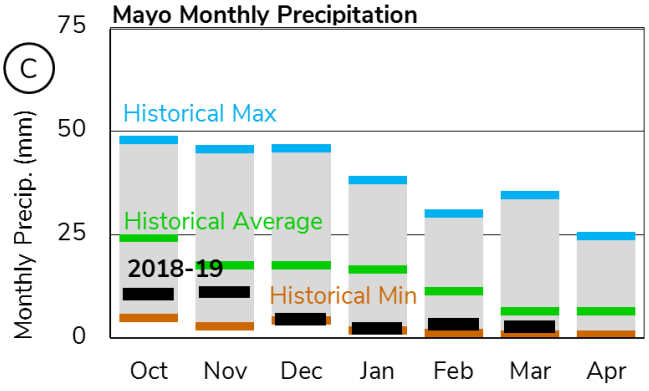
STEWART RIVER BASIN

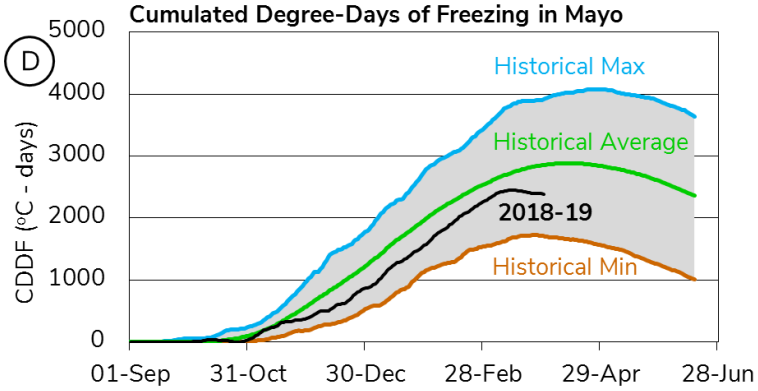
At Withers Lake Meteorological station, Snow Water Equivalent (SWE) is measured to be **81%** of the **historical average** (Figure A). The Stewart River basin-averaged SWE is estimated to be **52%** of **historical median**, with **90 mm** as of April 1, setting a new record minimum (Figure B).



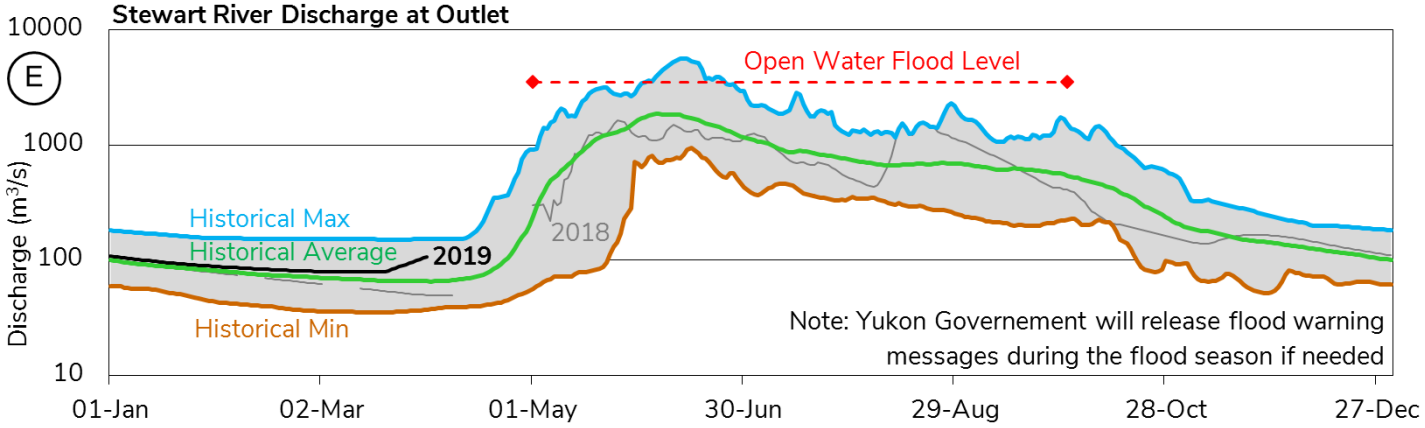


Precipitation at Mayo Airport has been consistently **lower** than **average** for the fall and winter, including in the month of March (Figure C). Cumulated degree-days of freezing (CDDF) are **lower** than **average**, with 2390 °C-Days, which indicates a **mild** winter (Figure D). Warm weather in March has initiated an early CDDF decline and a thermal river ice breakup.



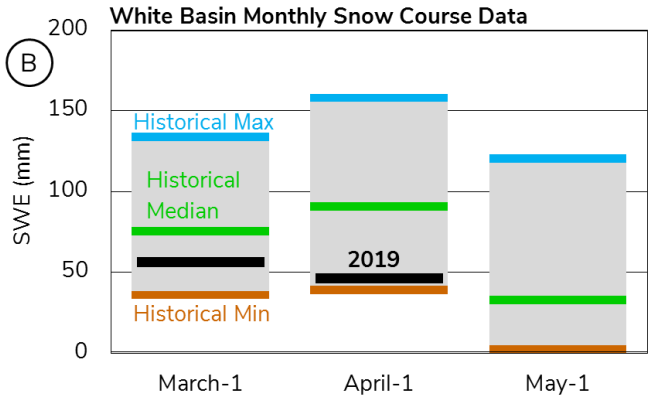


The estimated Stewart River discharge at the outlet has been rising **well-above** the **historical average** (Figure E). The **well-below average** snowpack suggests a **lower than average spring freshet volume**. Spring peak flows will depend on residual snowmelt rates and rainfalls, but there is currently a **low potential for spring floods**.

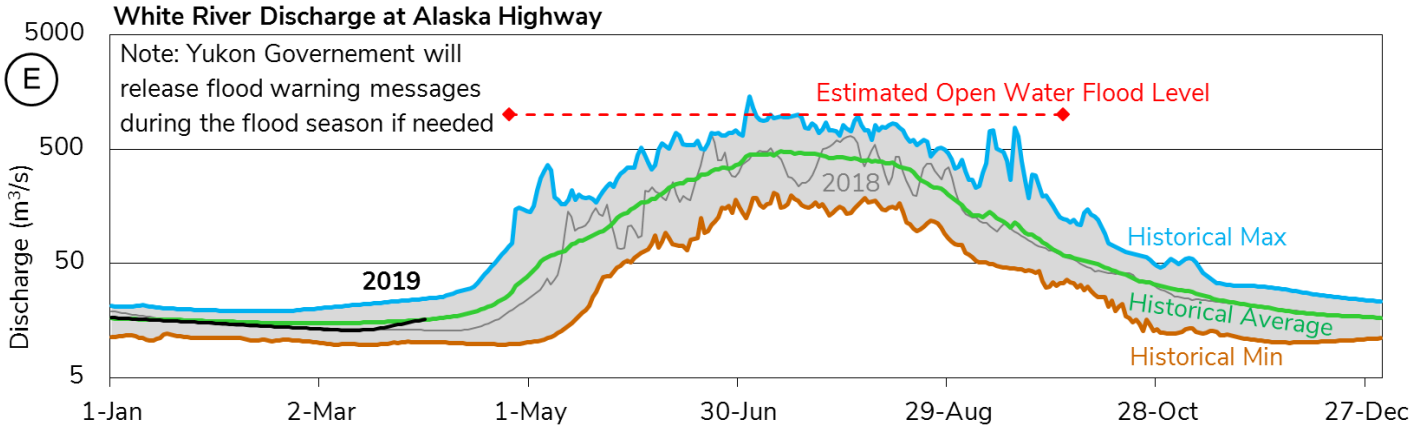


WHITE RIVER BASIN

The White River basin-averaged SWE is estimated to be **71%** of the **historical median**, with **56 mm** as of April 1 (Figure B).

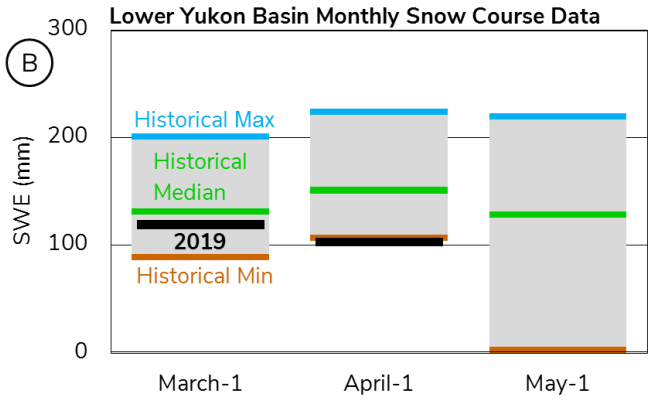


The estimated White River discharge at the Alaska Highway is currently **close to the historical average** (Figure E). High flows in this watershed are dominated by mountain snowmelt and glacial melt that are largely influenced by summer temperatures and precipitations. The **well-below average** snowpack currently suggests a **lower than average spring and summer freshet volume**.

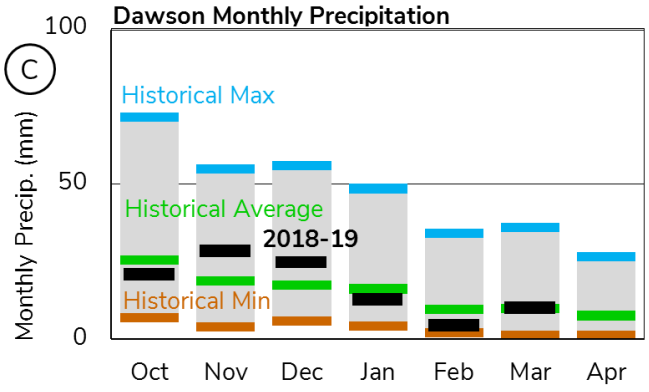


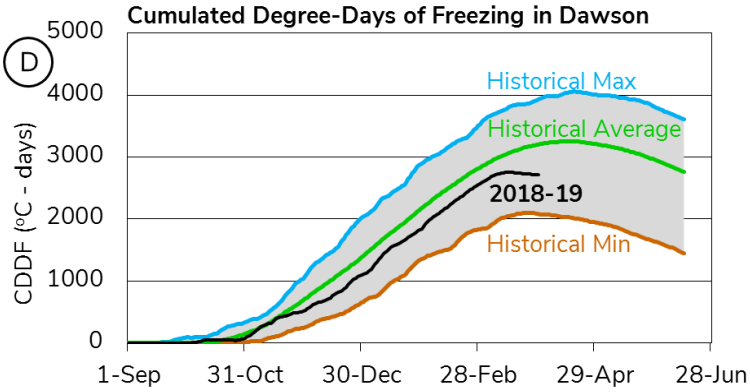
LOWER YUKON RIVER BASIN (DAWSON AREA)

The Lower Yukon basin-averaged SWE is estimated to be **67%** of the **historical median**, with **103 mm** as of April 1, setting a new historical minimum (Figure B).

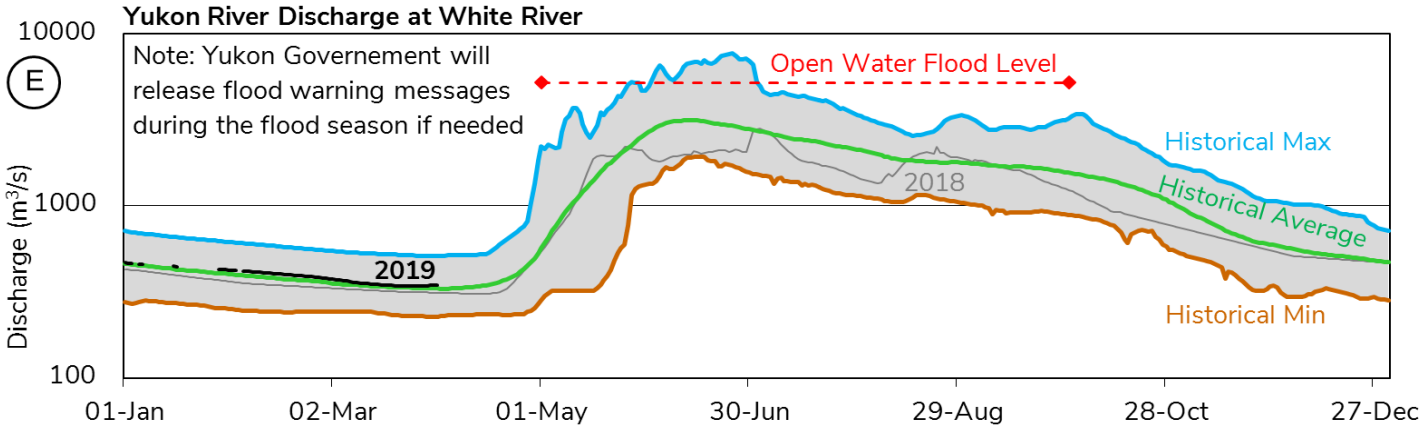


Precipitation at Dawson Airport generally shows **close to average** monthly values during fall and winter, including the month of March (Figure C). Cumulated degree-days of freezing (CDDF) are **lower** than **average**, with 2710 °C-Days, which indicates a **milder-than average winter** (Figure D). Warm weather in March has initiated a historically early CDDF decline and ice cover degradation in the Yukon and Klondike rivers.



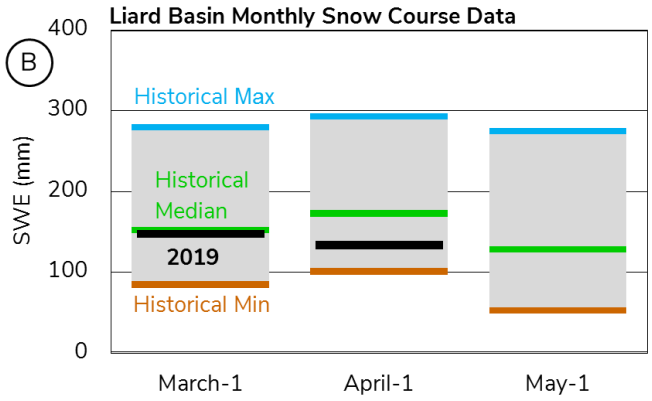


The estimated Yukon River discharge is currently **close to the historical average** (Figure E). The **well-below average** snowpack in all upstream basins suggests a **low spring freshet volume**. Spring peak flows will depend on residual snowmelt rates and rainfalls, but there is currently a **low potential for spring floods**. **Spring breakup intensity** in the Yukon River is currently forecasted to be **low** (to be updated regularly).

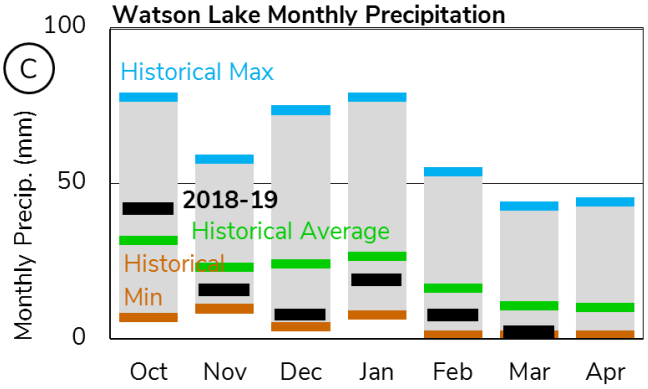


LIARD RIVER BASIN

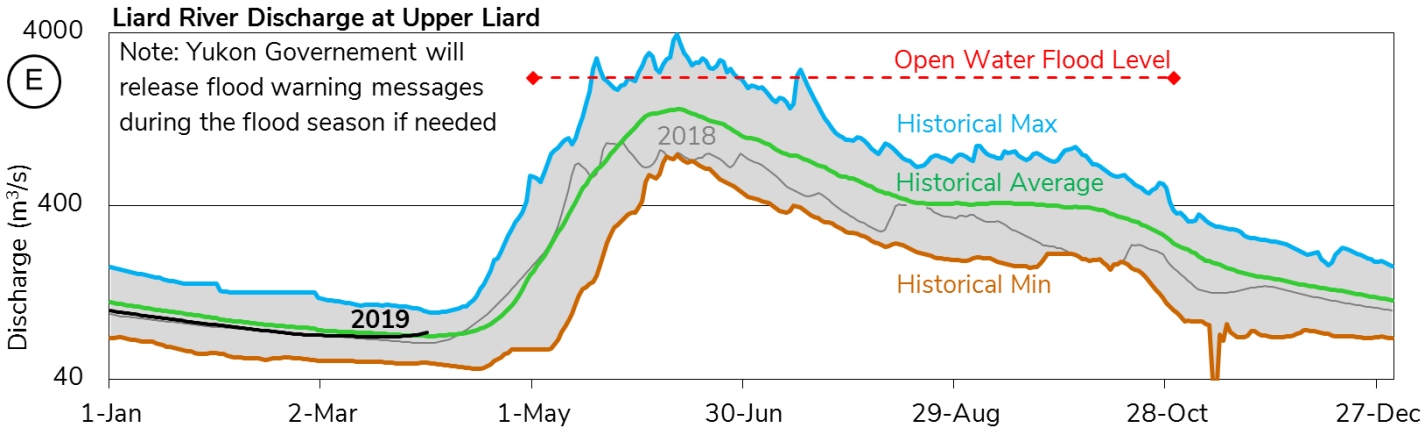
The Liard River basin-averaged SWE is estimated to be **75%** of the **historical median**, with **133 mm** as of April 1 (Figure B).



Precipitation at Watson Lake Airport shows overall **lower** than **average** monthly values during fall and winter, including a **well-below average** month of March (Figure C).

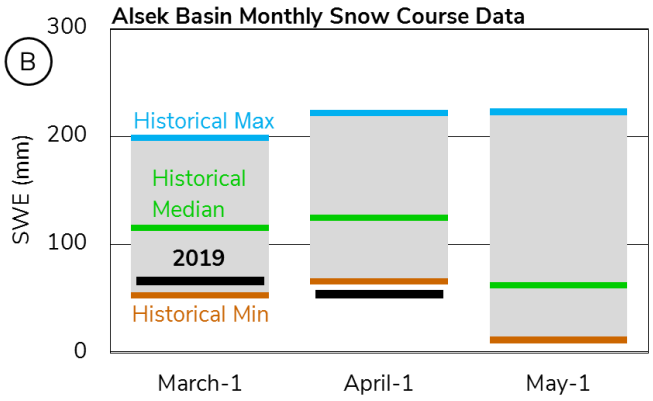


The estimated Liard River discharge at Upper Liard is currently **close to historical average** (Figure E). The **below average** snowpack and **close to average** discharge suggests a **slightly lower than average spring freshet volume**. Spring peak flows will depend on residual snowmelt rates and rainfall, but there is currently **an average potential for spring floods**.

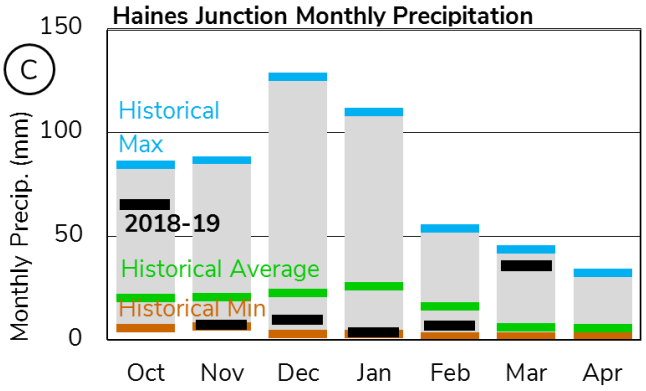


ALSEK RIVER BASIN

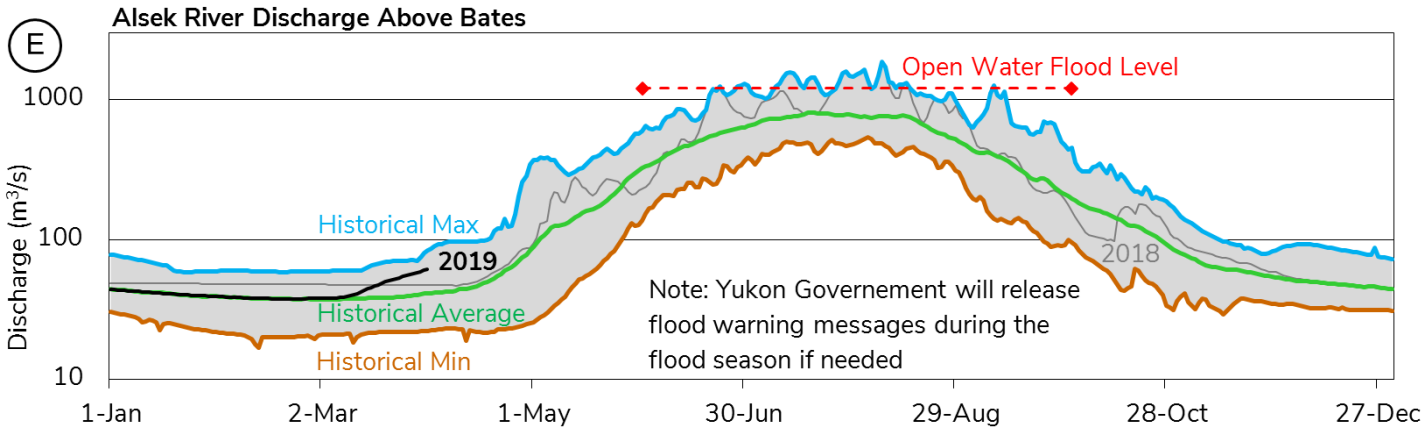
The Alsek River basin-averaged SWE is estimated to be **42%** of the **historical median**, with **54 mm** as of April 1, setting a new record minimum (Figure B).



Precipitation at Haines Junction showed consistently **lower** than **average** monthly winter values until March when precipitation was well **above average** (Figure C). Most of this precipitation fell in the form of rain in low elevation areas.

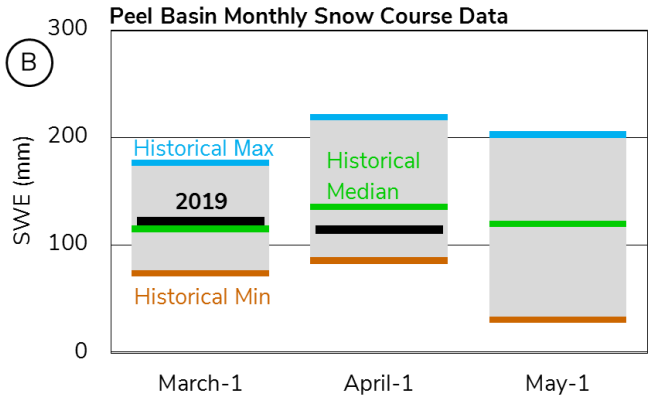


The estimated Alsek River discharge is currently well **above the historical average** (Figure E). High flows in this watershed are dominated by mountain snowmelt and glacial melt that are largely influenced by summer temperatures and precipitations. Therefore, the snow data presented above only provides a partial indicator of potential summer flows.

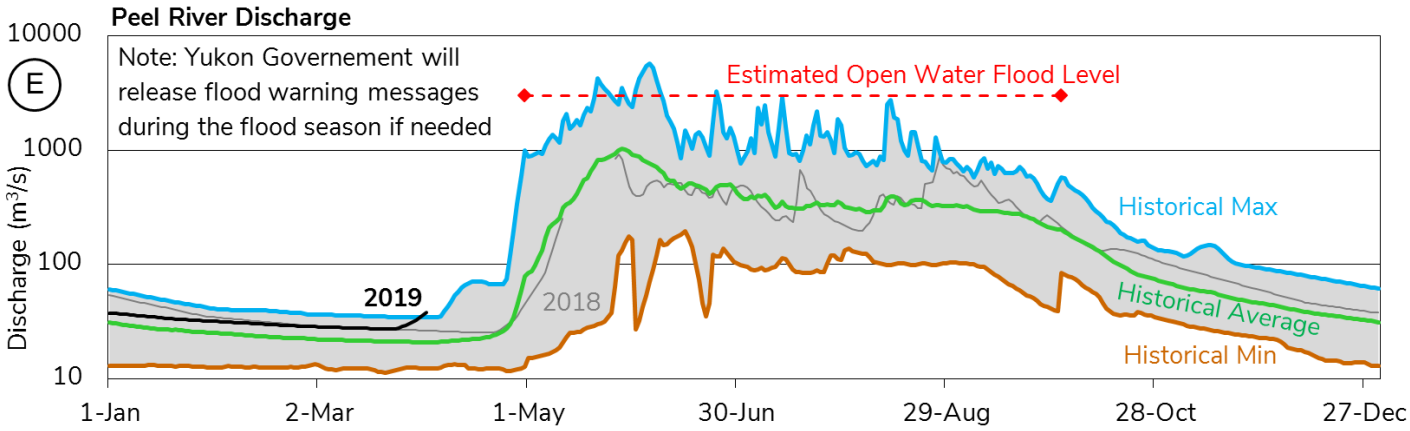


PEEL RIVER BASIN

The Peel River basin-averaged SWE is estimated to be **82%** of the **historical median**, with **114 mm** as of April 1 (Figure B).

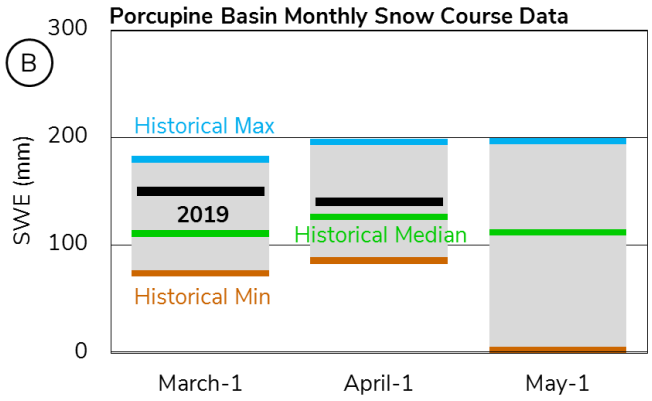


The estimated Peel River discharge as of April 1st was **above the historical maximum** (Figure E). It is too early in the season to determine if **2019** will be a high water level year, but the near **average** snowpack and current hydrological conditions suggest a **potentially average spring freshet volume**. Spring peak flows will largely depend on snowmelt rates and rainfall intensity, but there is currently an **average potential for spring floods**.

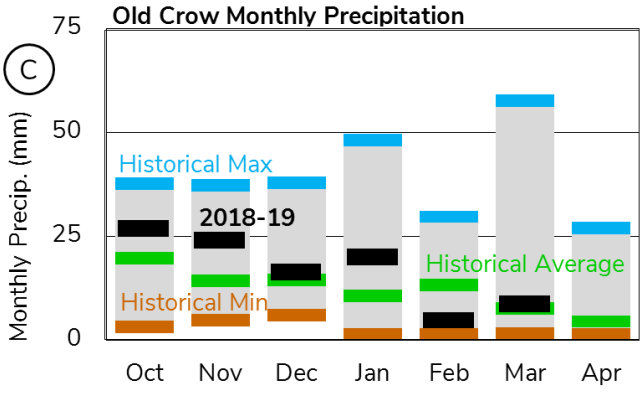


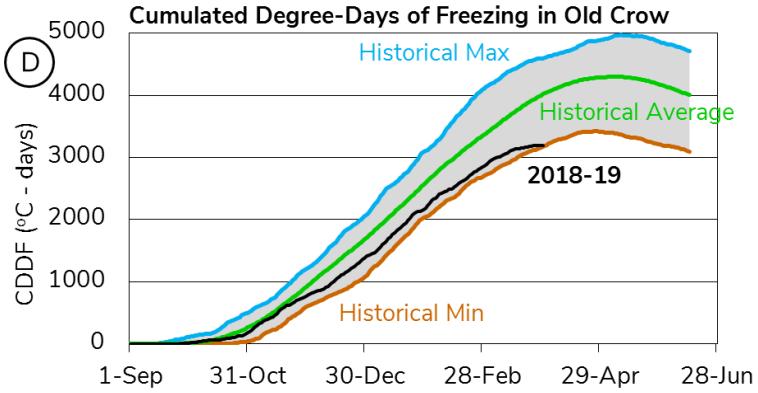
PORCUPINE RIVER BASIN

The Porcupine River basin-averaged SWE is estimated to be **108%** of the **historical median**, with **140 mm** as of April 1 (Figure B).

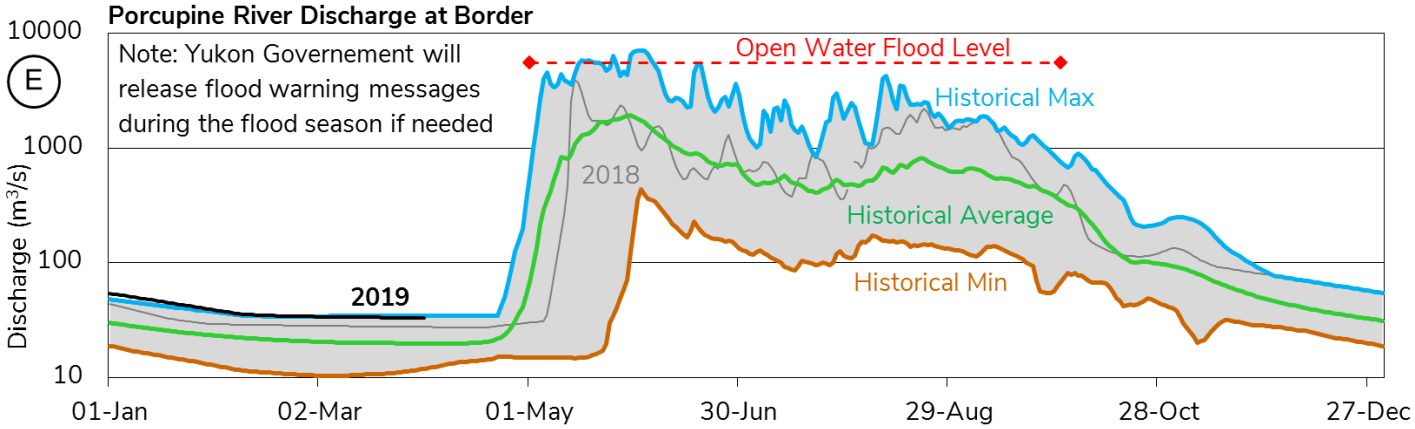


Precipitation at Old Crow shows overall **higher** than **average** monthly values during fall and winter, but slightly **below average** in the month of March (Figure C). Cumulated degree-days of freezing (CDDF) are well **below average**, with 3190 °C-Days, which indicates a **mild** winter (Figure D). The river ice cover is probably thinner than average and it has not started to degrade.





The estimated Porcupine River discharge is currently well **above the historical average** (Figure E). It is too early in the season to determine if **2019** will be a high water level year, but the **higher** than **average** snowpack and estimated discharge suggest a **potentially above average** **spring freshet volume and peak flows**. It is too early to forecast spring breakup timing and intensity (updates will follow).



Drainage Basin and Snow Course

For Sample Date: 2019-03-01

Name	Number	Elevation (m)	Date of survey	This year snow depth (cm)	Water content (SWE) (mm)	Last year (mm)	Median Historical SWE (mm)	Years of record
Alsek River Basin								
Canyon Lake	08AA-SC01	1160	3/26/2019	1.8	7	96	93	40
Alder Creek	08AA-SC02	768	3/27/2019	28	72	146	157	39
Aishihik Lake	08AA-SC03	945	3/26/2019	14	26	75	79	25
Haines Junction Farm	08AA-SC04	610	3/29/2019	0	0	76	96	19
Summit	08AB-SC03	1000	3/29/2019	70	194	180	256	39
Yukon River Basin								
Tagish	09AA-SC01	1080	3/29/2019	26	64	160	147	43
Montana Mountain	09AA-SC02	1020	3/28/2019	20	53	144	142	42
Log Cabin (B.C.)	09AA-SC03	884	3/26/2019	65	228	285	376	59
Atlin (B.C)	09AA-SC04	730	3/27/2019	0	0	75	118	54
Mt McIntyre B	09AB-SC01B	1097	3/28/2019	36	91	182	157	43
Whitehorse Airport	09AB-SC02	700	3/26/2019	15	42	124	102	52
Meadow Creek	09AD-SC01	1235	3/27/2019	62	140	228	280	42
Jordan Lake	09AD-SC02	930	3/27/2019	24	49	121	137	32
Morley Lake	09AE-SC01	824	3/27/2019	22	46	126	149	31
Mount Berdoe	09AH-SC01	1035	3/28/2019	12	23	135	110	43
Satasha Lake	09AH-SC03	1106	3/28/2019	0	0	91	100	32
Williams Creek	09AH-SC04	914	3/28/2019	17	29	96	101	24
Twin Creeks B	09BA-SC02B	900	3/26/2019	39	92	123	121	3
Hoole River	09BA-SC03	1036	3/27/2019	25	50	133	139	42
Burns Lake	09BA-SC04	1112	3/27/2019	64	152	158	222	33
Finlayson Airstrip	09BA-SC05	988	3/27/2019	33	79	118	106	32
Fuller Lake	09BB-SC03	1126	3/26/2019	57	103	124	195	32
Russell Lake	09BB-SC04	1060	3/26/2019	63	150	193	228	32
Rose Creek	09BC-SC01	1080	3/28/2019	15	30	113	111	25
Mount Nansen	09CA-SC01	1021	3/28/2019	14	25	77	80	43
MacIntosh	09CA-SC02	1160	3/28/2019	0	0	105	99	43
Burwash Airstrip	09CA-SC03	810	3/27/2019	0	0	54	42	42
Beaver Creek	09CB-SC01	655	3/27/2019	24	51	113	86	44
Chair Mountain	09CB-SC02	1067	3/27/2019	31	61	153	100	29
Casino Creek	09CD-SC01	1065	3/28/2019	47	73	202	129	41
Pelly Farm	09CD-SC03	472	3/30/2019	1.4	6	106	79	33
Plata Airstrip	09DA-SC01	830	3/26/2019	34	92	139	188	41
Withers Lake	09DB-SC01	975	3/26/2019	55	152	170	229	33
Rackla Lake	09DB-SC02	1040	3/26/2019	61	153	124	189	32

Code "E" - Estimate, Code "B" - Survey date is outside of valid sampling range

Drainage Basin and Snow Course

For Sample Date: 2019-03-01

Name	Number	Elevation (m)	Date of survey	This year snow depth (cm)	Water content (mm)	Last year (mm)	Water content average	Years of record
Yukon River Basin								
Mayo Airport A	09DC-SC01A	540	3/28/2019	0	0	56	96	49
Mayo Airport B	09DC-SC01B	540	3/28/2019	0	0	64	103	31
Edwards Lake	09DC-SC02	830	3/26/2019	37	68	109	160	32
Calumet	09DD-SC01	1310	3/29/2019	44	95 E	172	195	40
King Solomon Dome	09EA-SC01	1080	3/29/2019	39	83	172	163	43
Grizzly Creek	09EA-SC02	975	4/1/2019	57	119	161	178	43
Midnight Dome	09EB-SC01	855	3/28/2019	49	109	161	154	44
Boundary (Alaska)	09EC-SC02	1005	3/28/2019	48	122	137	136	48
Porcupine River Basin								
Riff's Ridge	09FA-SC01	650	4/1/2019	59	132	165	148	31
Eagle Plains	09FB-SC01	710	4/1/2019	77	185	178	166	35
Eagle River	09FB-SC02	340	4/1/2019	70	132	172	138	34
Old Crow	09FD-SC01	299	3/27/2019	71	140	130 E	120	37
Liard River Basin								
Watson Lake Airport	10AA-SC01	685	3/28/2019	30	77	120	139	54
Tintina Airstrip	10AA-SC02	1067	3/27/2019	62	139	183	206	41
Pine Lake Airstrip	10AA-SC03	995	3/27/2019	54	144	172	223	43
Ford Lake	10AA-SC04	1110	3/27/2019	61	113	191	192	32
Frances River	10AB-SC01	730	3/27/2019	42	105	88	159	44
Hyland River	10AD-SC01	855	3/29/2019	56	148	121	177	42
Hyland River B	10AD-SC01B	880	3/29/2019	60	165	131	131	1
Peel River Basin								
Blackstone River	10MA-SC01	920	4/1/2019	35	72	123	106	43
Ogilvie River	10MA-SC02	595	4/1/2019	51	102 E	102	107	41
Bonnet Plume Lake	10MB-SC01	1120	3/26/2019	54	109	125	178	32
Alaska Snow Courses								
Eaglecrest	08AK-SC01	305	4/2/2019	51	163	203	495	37
Moore Creek Bridge	08AK-SC02	700	1/4/2019	76	269	191	517	26

Code "E" - Estimate, Code "B" - Survey date is outside of valid sampling range

Location of water resource snow courses