YUKON SNOW SURVEY BULLETIN & WATER SUPPLY FORECAST

March 1, 2021

Prepared and issued by:
Water Resources Branch
Department of Environment

PREFACE

The Department of Environment's Water Resources Branch issues the *Yukon Snow Survey Bulletin and Water Supply Forecast* three times annually – early March, April and May. 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 continuing 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 showing October 1 to February 28 anomalies. 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 series 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, serving as an indicator of potential runoff volumes in the spring (acknowledging that snow sublimation, evapotranspiration, rain and glacier melt also significantly affect runoff).
- **Figure C**: Monthly-averaged winter precipitation (rain and/or snow) compared with historical data (1980-2020 period of record), complementing the information presented in Figure B.
- **Figure D**: Cumulated degree-days of freezing (CDDF, sum of negative daily temperatures) compared with historical data, functioning as an indicator of winter coldness and overall river ice thickness; variables that influence river ice breakup scenarios in the spring.
- **Figure E**: Current, estimated daily discharge or measured water level, compared with historical data, representing an overview of the watershed hydrological conditions.

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

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This bulletin, as well as earlier editions, are available online at:
https://yukon.ca/snow-surveys-and-water-supply-forecasts#snow-and-water-supply-data

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- *Meteorologist, Wildland Fire Management, Yukon Department of Community Services, Whitehorse*
- *Officer in Charge, Water Survey of Canada, Whitehorse*
- *Water Management Engineer, Yukon Energy Corporation*
- *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*
- *Vuntut Gwitchin First Nation*

DISCLAIMER AND LIMITATION OF LIABILITY

YUKON TERRITORY WEATHER AND SNOWPACK CONDITIONS

Fall and winter 2020-21 temperatures varied greatly from month to month. Generally, the months of October, November and February were colder than the historical average[1] in most regions of the territory while December and January were warmer than the historical average. Precipitation anomalies were substantial in November, December and February, with some regional contrasts between the much wetter conditions in the south and a drier winter in the far north. Heavy snowfall in November set the stage for above normal snowpack conditions observed in the majority of the territory.

October

October was drier than normal in southeastern, southwestern and northern Yukon while the Carmacks region received more precipitation than normal. Temperatures were two to three degrees colder than normal for central and southern Yukon and slightly warmer than normal in Old Crow.

November

The beginning of the month saw significant precipitation in southern and central Yukon with likely record-breaking snowfall in Whitehorse on November 2 (also high snowfall in Carcross, Atlin, Teslin, Dawson, Mayo & Watson Lake). Monthly average temperatures were two to four degrees colder than normal for much of the territory. By contrast, there was lower than average precipitation and close to normal temperatures in the far north (Old Crow, Eagle Plains) and the northern Kluane region (Beaver Creek and Burwash Landing).

December

December began with the incursion of an atmospheric river in southwestern Yukon; following substantial snowfall on December 1, unseasonably warm weather and rain resulted in significant snowmelt. Whitehorse and Carcross reported more than twice the normal amount of precipitation for December and a winter storm on December 14 brought closures to both the Haines and White Passes. By contrast, northern regions were drier than normal in December. Temperatures were substantially warmer than normal across all of south and central Yukon from Watson Lake to Beaver Creek to Stewart Crossing. Northern regions experienced slightly above normal temperatures.

January

Most areas of Yukon received less precipitation than normal in January. Only Carcross and Haines Junction stations reported more precipitation than normal. A January 18 winter storm closed both the Haines and White Passes as well as the Alaska Highway on January 19. January saw a continuation of the much warmer than normal weather throughout Yukon, with temperatures ranging from four to seven degrees above normal.

February

Precipitation varied throughout Yukon in February, with some areas in south and central Yukon reporting between 130% and 290% of normal. February 21-22 brought an atmospheric river that resulted in a multi-day closure of the White and Haines Passes. Dawson was also much wetter with 278% of normal precipitation, whereas far north regions were drier than normal. February was, overall, colder than normal with stations reporting temperatures ranging from four to eight degrees below normal.

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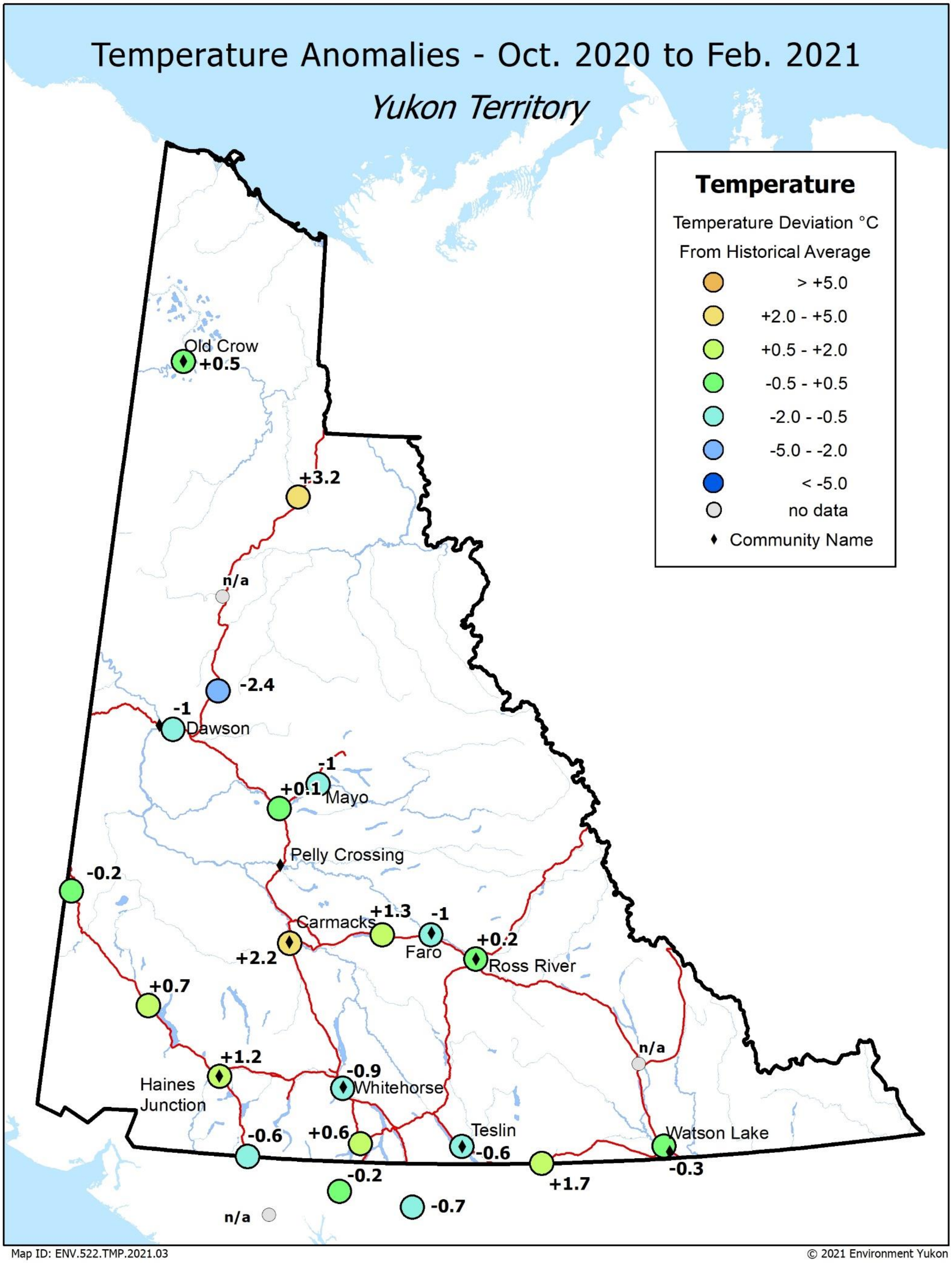
[1] Historical temperature, precipitation, snow water equivalent and discharge or water level records are not always long enough to establish a state-of-the-art “normal”, which implies 30 years of data. Therefore, this document refers to historical average, or more simply, average. Historical records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


Temperature Anomalies - Oct. 2020 to Feb. 2021
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
+0.5
+3.2
n/a
-2.4
-1
Dawson
-1
+0.1
Mayo
Pelly Crossing
-0.2
Carmacks
+1.3
-1
Faro
+0.2
Ross River
+2.2
+0.7
+1.2
Haines Junction
-0.9
Whitehorse
n/a
-0.6
+0.6
Teslin
-0.6
Watson Lake
-0.3
+1.7
-0.2
-0.7
n/a
Map ID: ENV.522.TMP.2021.03
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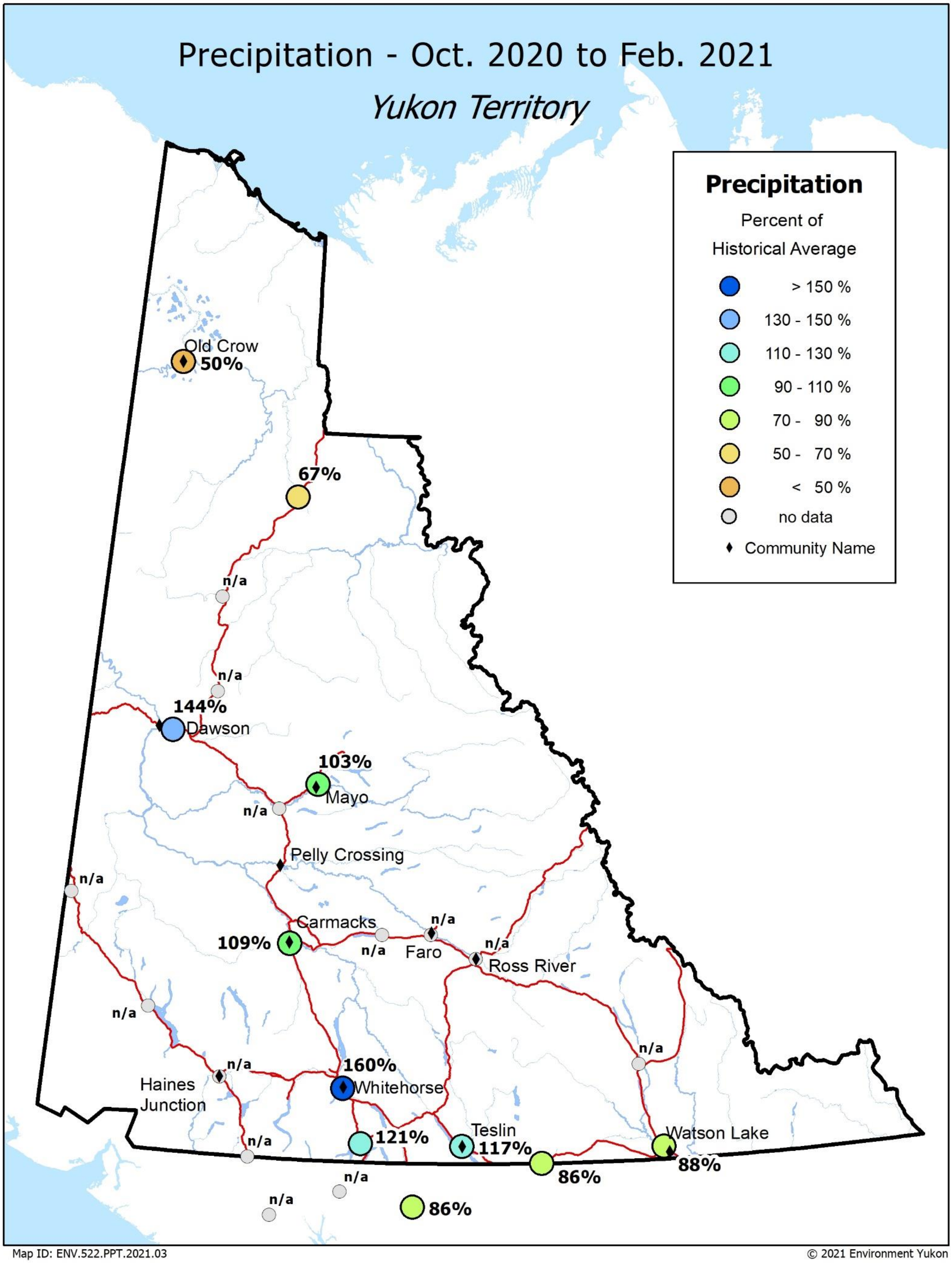
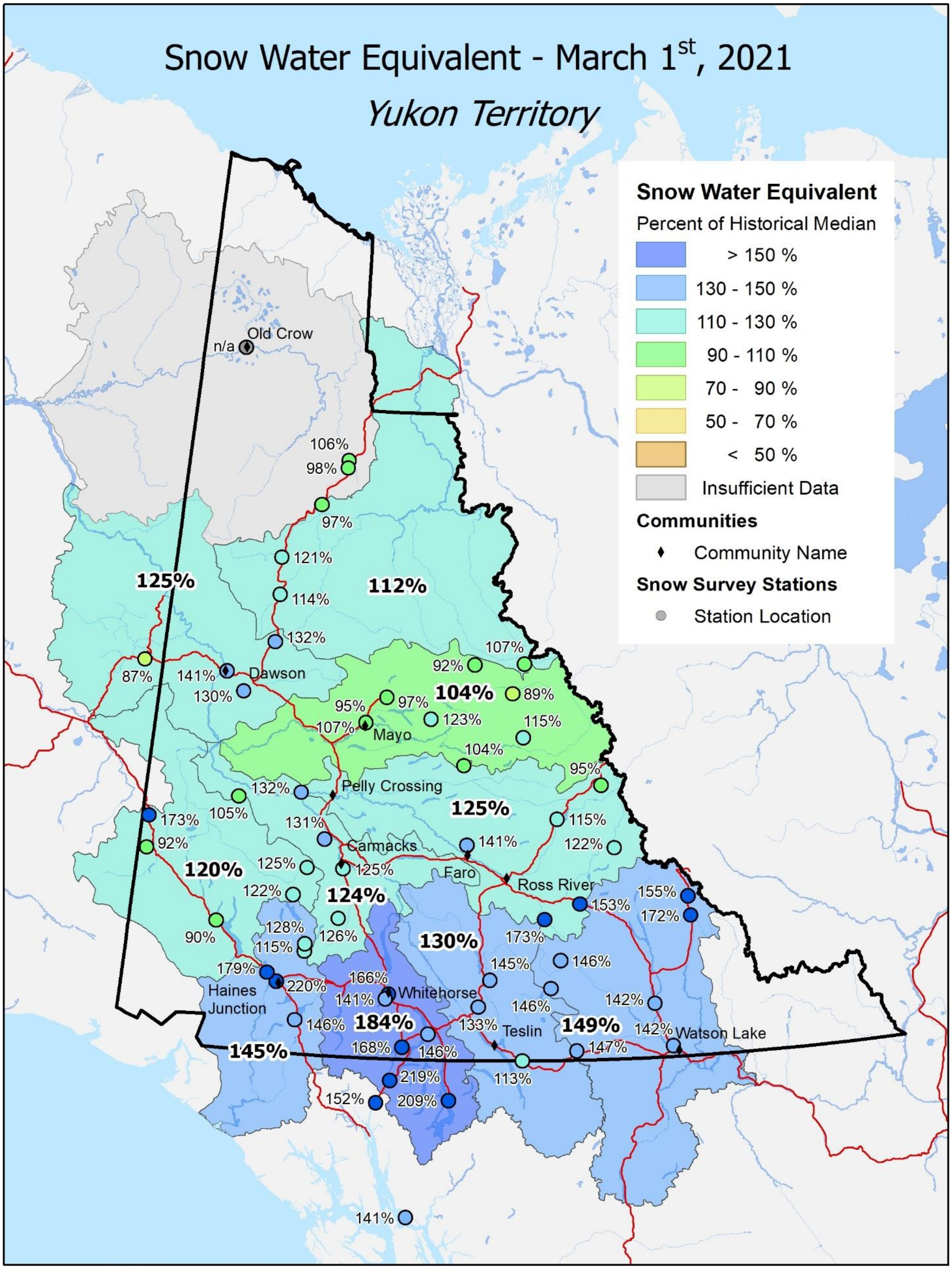
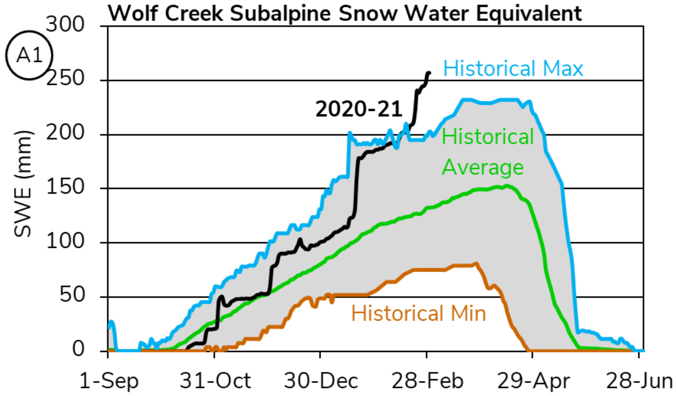

Precipitation - Oct. 2020 to Feb. 2021
Yukon Territory
Precipitation
Percent of
Historical Average
> 150 %
130 - 150 %
110 - 130 %
90 - 110 %
70 - 90 %
50 - 70 %
< 50 %
no data
Community Name
Old Crow
50%
67%
n/a
n/a
144%
Dawson
103%
Mayo
n/a
Pelly Crossing
n/a
Carmacks
109%
n/a
Faro
n/a
n/a
Ross River
n/a
n/a
n/a
Haines
Junction
160%
Whitehorse
n/a
121%
Teslin
117%
86%
Watson Lake
88%
n/a
n/a
86%
Map ID: ENV.522.PPT.2021.03
© 2021 Environment Yukon

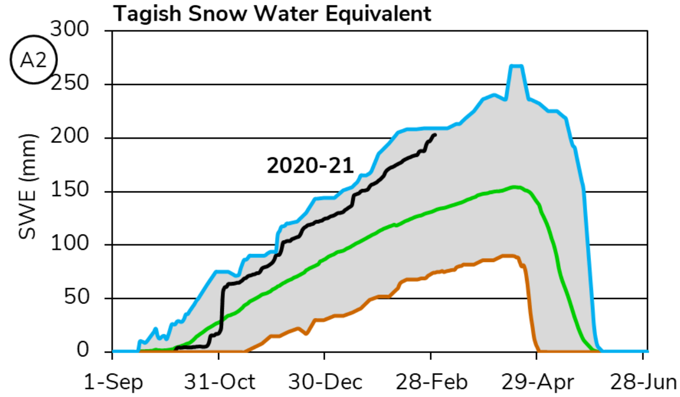


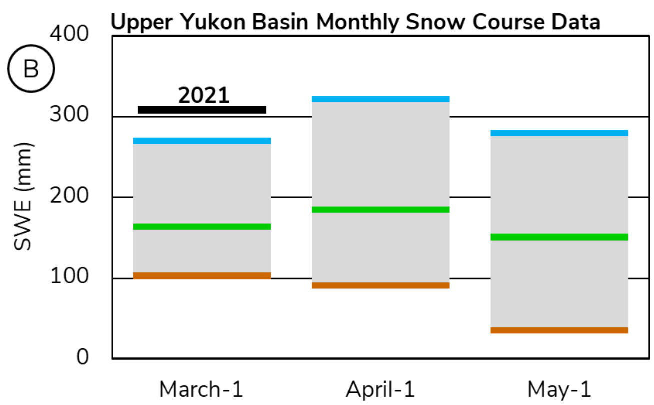
Map ID: ENV.522.2021.03

UPPER YUKON RIVER BASIN (SOUTHERN LAKES / WHITEHORSE)

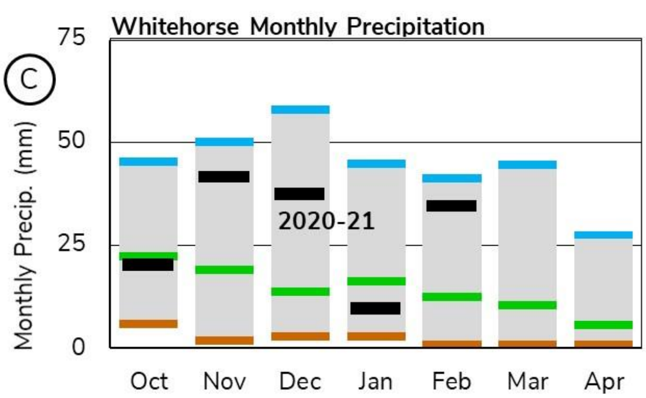
At Wolf Creek Subalpine Station, Snow Water Equivalent (SWE) is estimated to be **194%** of the **historical average** (Figure A1), while at Tagish Station, SWE is estimated to be **153%** of the **historical average** (Figure A2). The Upper Yukon basin-averaged SWE is estimated to be **184%** of the **historical median**, with **308 mm** on March 1 (Figure B). This is the **highest recorded snowpack on record** for this time of year.

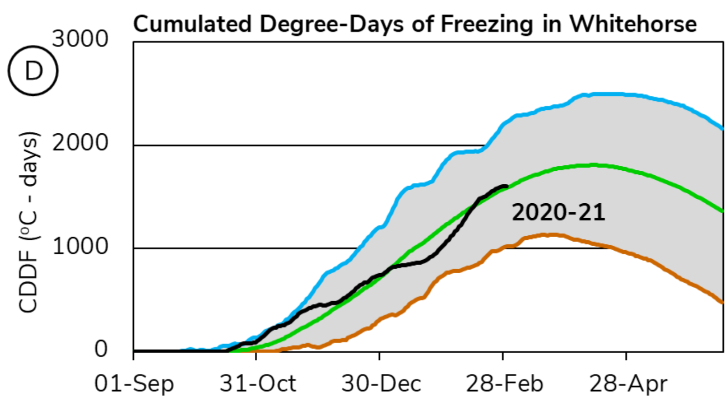




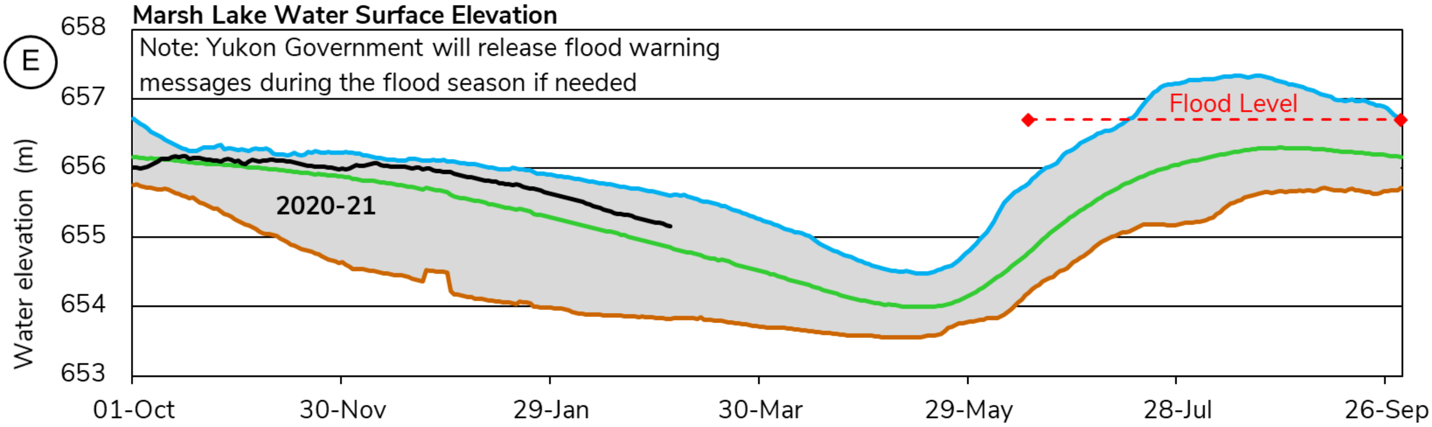


Monthly precipitation at Whitehorse Airport during fall and winter was, at times, well above average and at others, below average (Figure C) with the total precipitation being **well above average** on March 1. Cumulated degree-days of freezing (CDDF) are **close to average**, with 1600 °C-Days (Figure D), which suggests that the thickness of the ice cover on rivers and lakes of the region is likely **close to normal**.



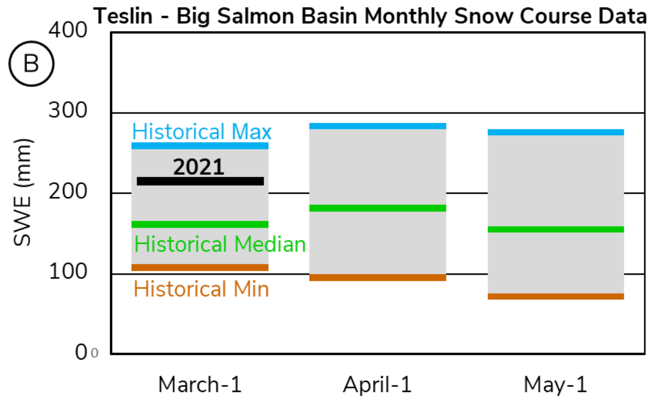


The measured water surface elevation (relative to sea level) in Marsh Lake is currently **above average** (Figure E). Water levels in the Southern Lakes are driven by a combination of snowmelt, summer precipitation and glacier melt. Current snow conditions suggest that water levels will be **higher** than **average** this summer. Weather conditions over the spring and summer will determine the peak water level in Marsh Lake.

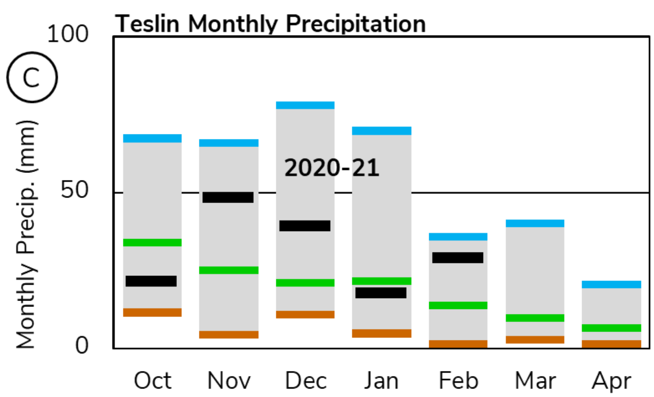


TESLIN RIVER BASIN

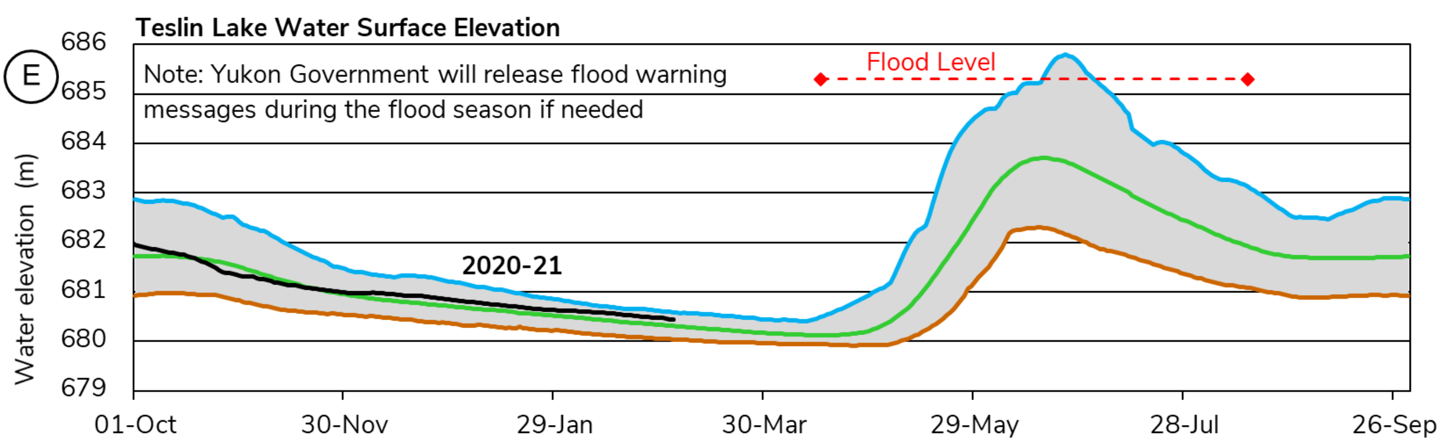
The Teslin River basin-averaged SWE is estimated at **130%** of the **historical median**, with **215 mm** on March 1 (Figure B).



Teslin monthly precipitation was similar to that of other southern communities with some months being above average and other months below (Figure C), with total precipitation being **above average** on March 1.

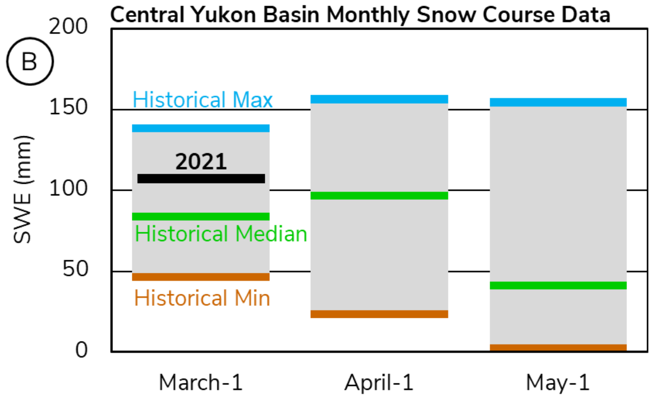


The measured water surface elevation (relative to sea level) in Teslin Lake is currently **close to average** (Figure E). The **higher** than **median** snowpack and the **close to average** water level suggest that summer water levels could be **higher** than **average**. Weather conditions in March and April will determine the most probable spring scenario.

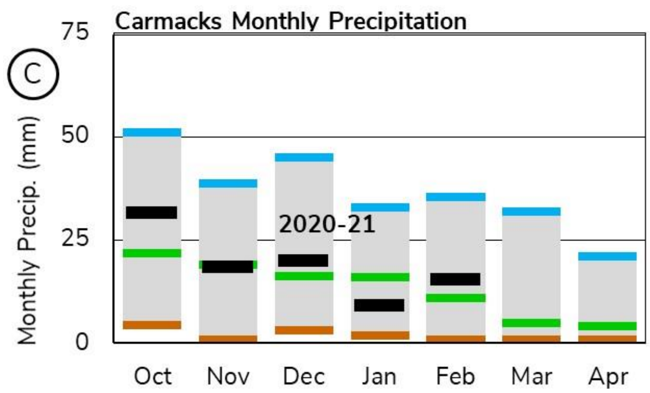


CENTRAL YUKON RIVER BASIN (CARMACKS AREA)

The Central Yukon basin-averaged SWE is estimated to be **124%** of the historical median, with **107 mm** on March 1 (Figure B).



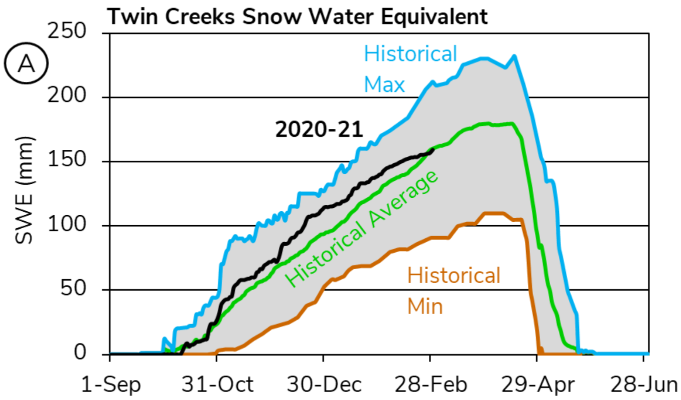
Carmacks monthly precipitation has varied; at times above average and at others, below average (Figure C), with total precipitation being just above average on March 1.

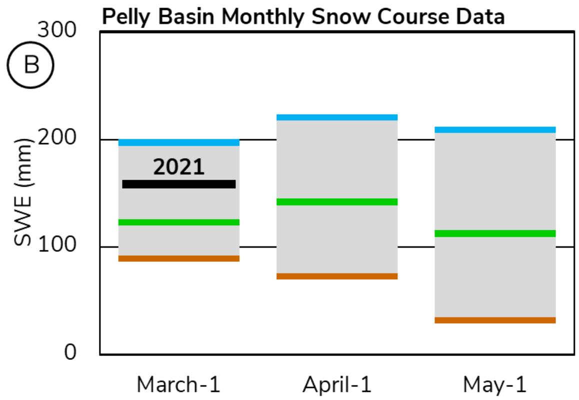


Water levels in Carmacks area rivers could be higher than average this spring and summer. Weather conditions in March and April will determine the most probable spring scenario.

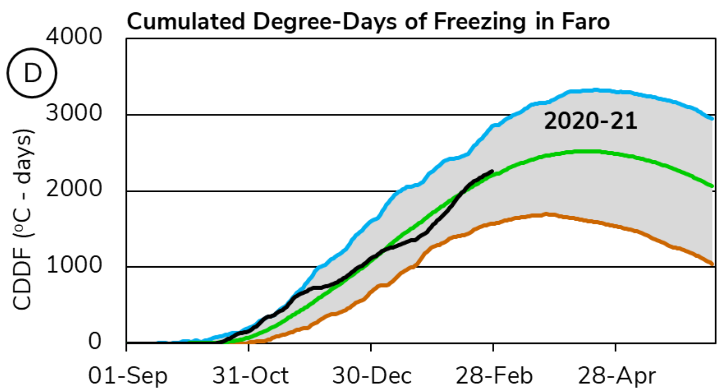
PELLY RIVER BASIN

At Twin Creeks weather station, Snow Water Equivalent (SWE) is estimated to be **99%** of the **historical average** (Figure A). The Pelly River basin-averaged SWE is estimated to be **125%** of the **historical median**, with **158 mm** as of March 1 (Figure B).

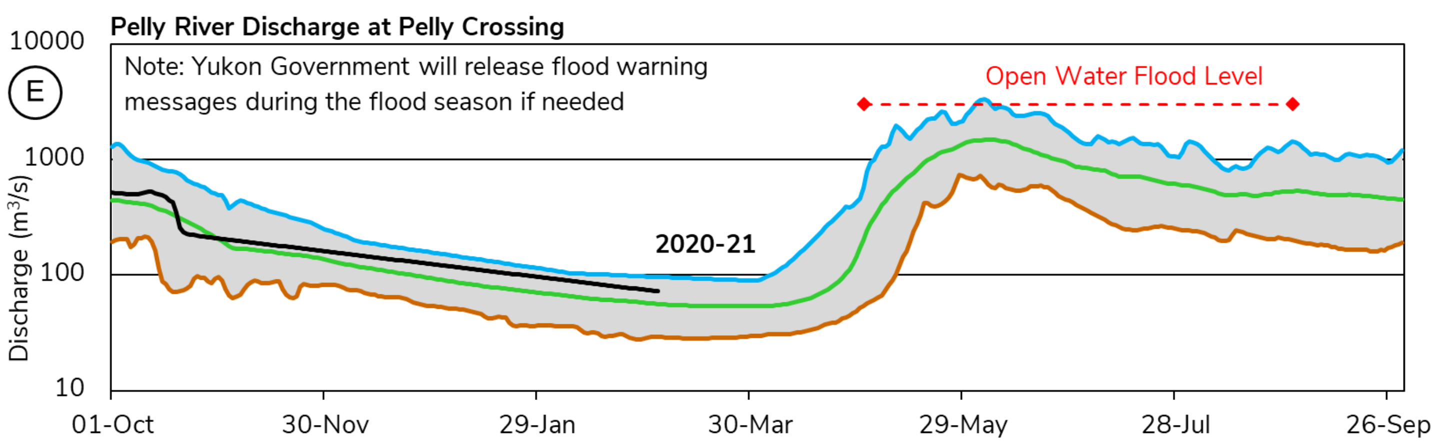




Precipitation at Faro has not been recorded, but snowpack observations indicate values are **above average**. Cumulated degree-days of freezing (CDDF) at Faro are **close to average** at 2270 °C-Days (Figure D), which suggests that the thickness of the ice cover on rivers and lakes of the region is likely **close to normal**.

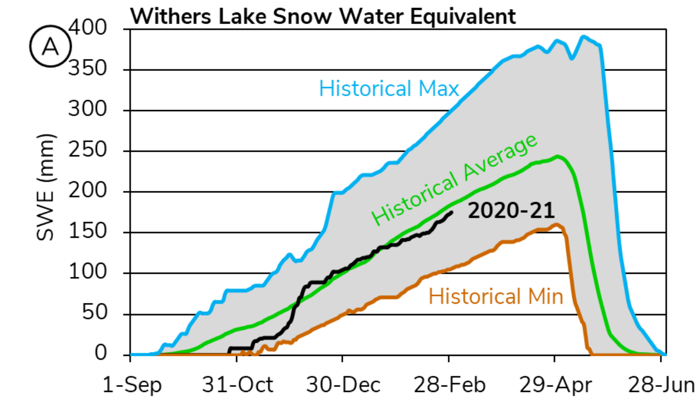


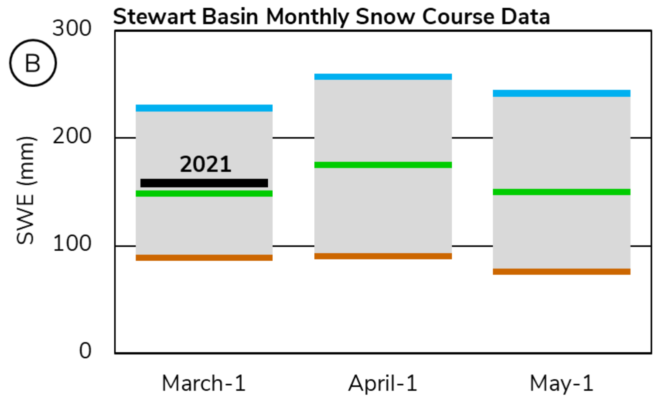
The estimated Pelly River discharge at Pelly Crossing is currently **above average** (Figure E). The **higher** than **normal** snowpack in the watershed increases the probability of **significant spring freshet flows.** Weather conditions in March and April will determine the most probable spring scenario.



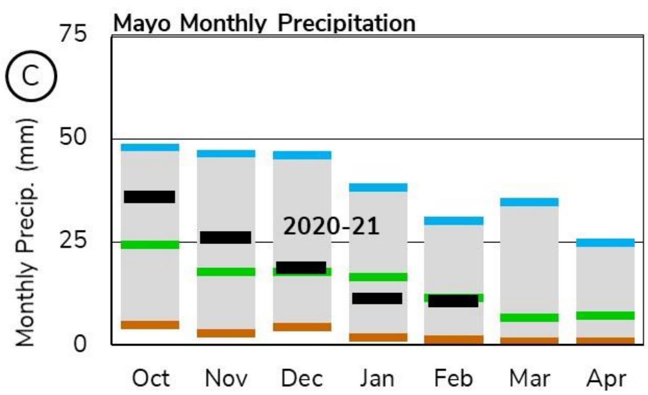
STEWART RIVER BASIN

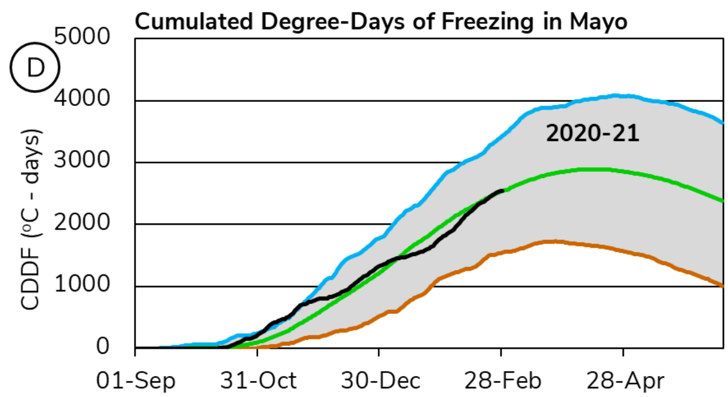
At Withers Lake Meteorological station, Snow Water Equivalent (SWE) is estimated to be **95%** of the **historical average** (Figure A). The Stewart River basin-averaged SWE is estimated to be **104%** of **historical median**, with **158 mm** as of March 1 (Figure B). This is considered a normal snowpack for the area.



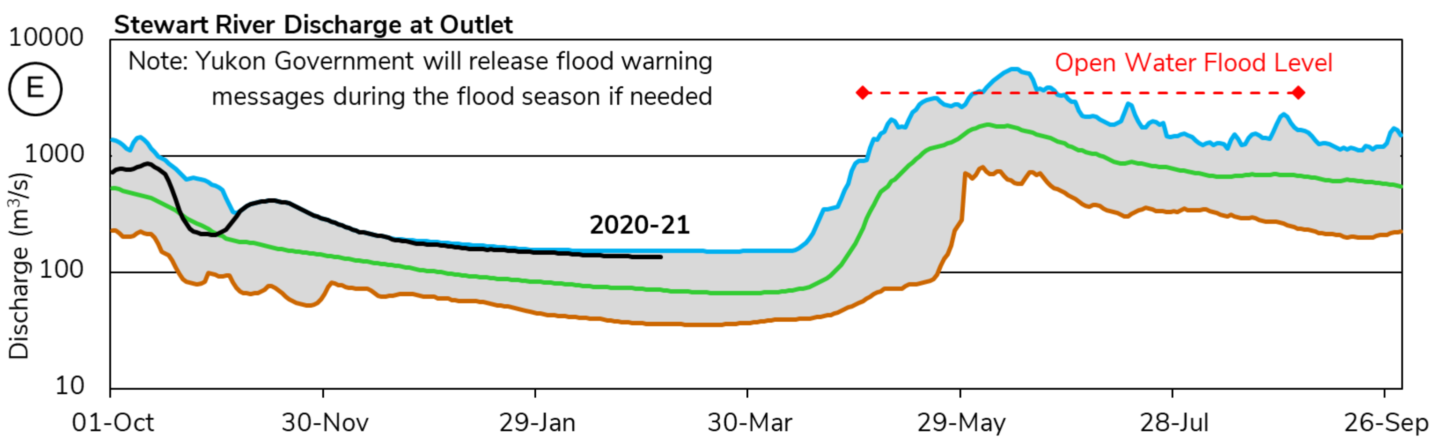


Precipitation at Mayo Airport has varied this winter, with the total amount being **average** on March 1 (Figure C). Cumulated degree-days of freezing (CDDF) are **close to average**, with 2550 °C-Days (Figure D), which suggests that the thickness of the ice cover on rivers and lakes of the region is likely **close to normal**.



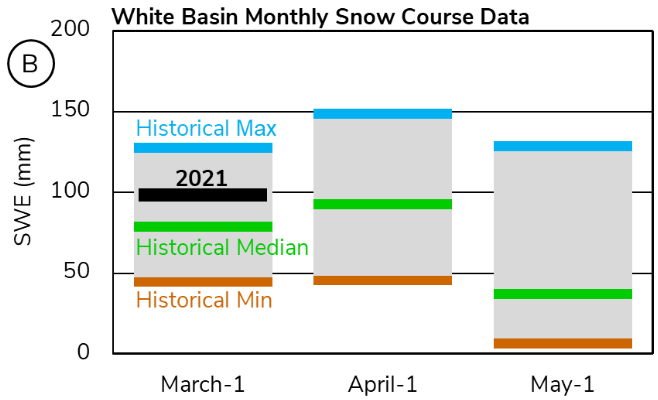


The estimated Stewart River discharge at the outlet is currently **near historically high winter flows** (Figure E). The **near median** snowpack suggests **close to average** peak flows. Weather conditions in March and April will determine the most probable spring scenario.

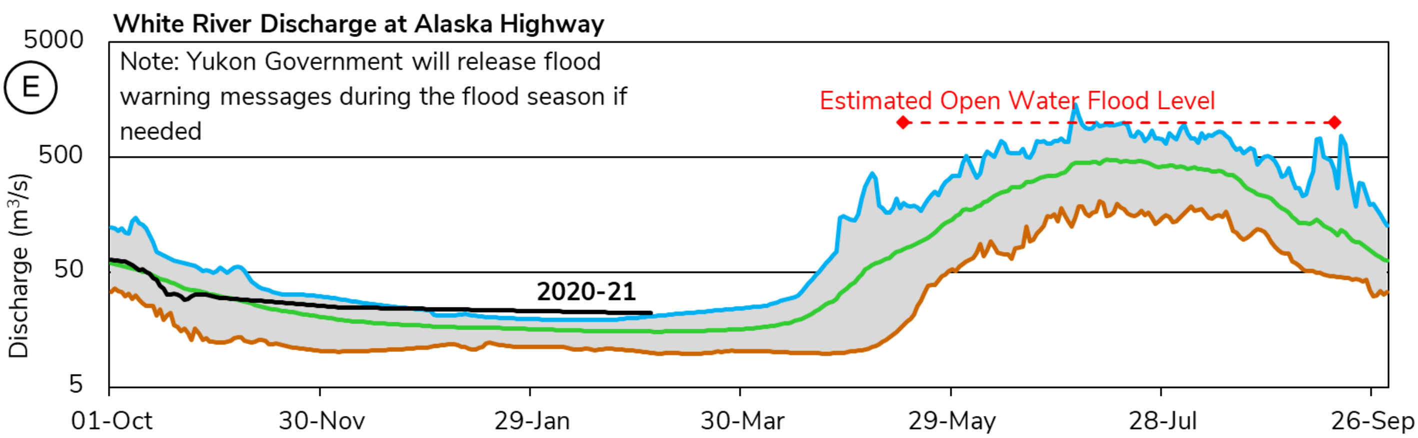


WHITE RIVER BASIN

The White River basin-averaged SWE is estimated to be **120%** of the **historical median,** with **98 mm** as of March 1 (Figure B). This, however, is probably more representative of the foothills of the St. Elias Range, while the relative SWE (%) in the range itself could be higher.

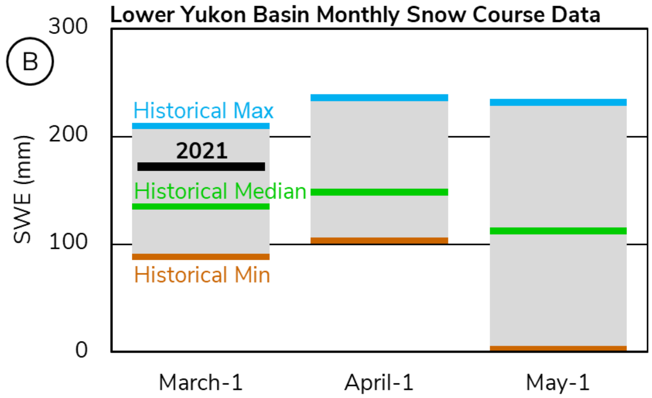


The estimated White River discharge at the Alaska Highway is currently **well above average** at historically high winter levels (Figure E). In this watershed, high flows are dominated by mountain snowmelt and glacial melt that are largely influenced by summer temperatures and precipitation. The current **above median** snowpack suggests **higher than average freshet volumes are possible.** Weather conditions over the spring and summer will determine peak flows.

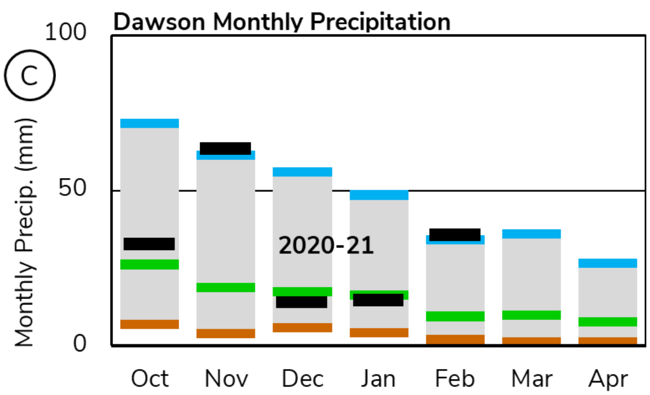


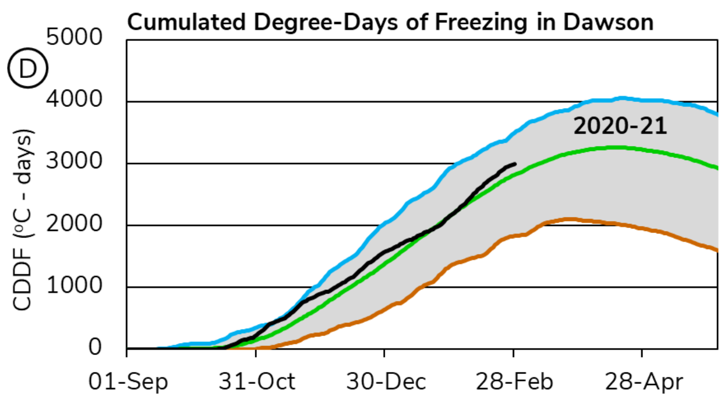
LOWER YUKON RIVER BASIN (DAWSON AREA)

The Lower Yukon basin-averaged SWE is estimated to be **125%** of the historical median, with **172 mm** as of March 1 (Figure B).

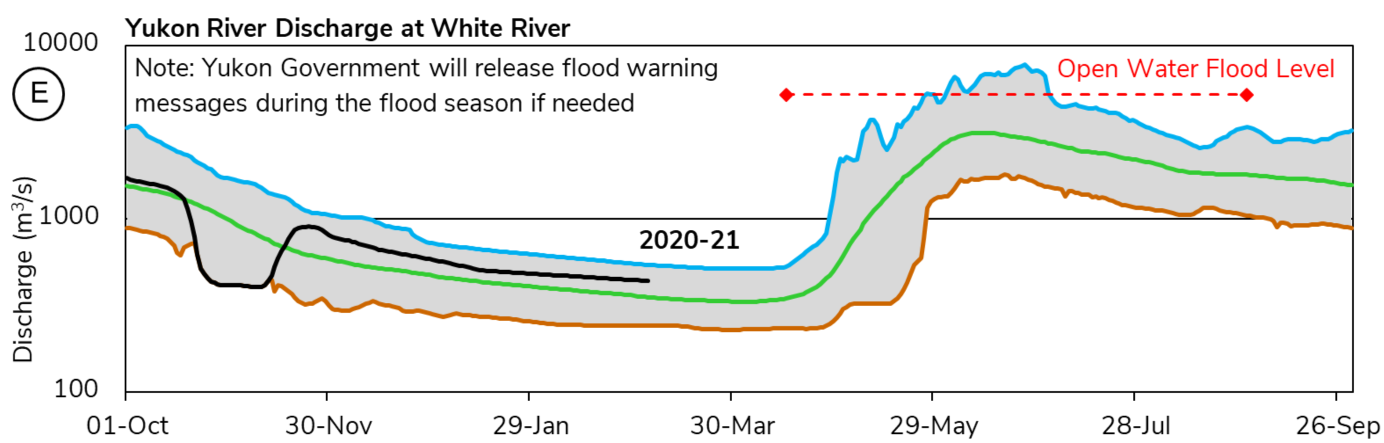


Monthly precipitation at Dawson Airport (Figure C) alternated between close to normal values and record high precipitation in November 2020 and February 2021. Cumulated degree-days of freezing (CDDF) are **slightly above average**, with 2990 °C-Days (Figure D), which suggests that the thickness of the ice cover on rivers and lakes of the region is likely **close to normal**.



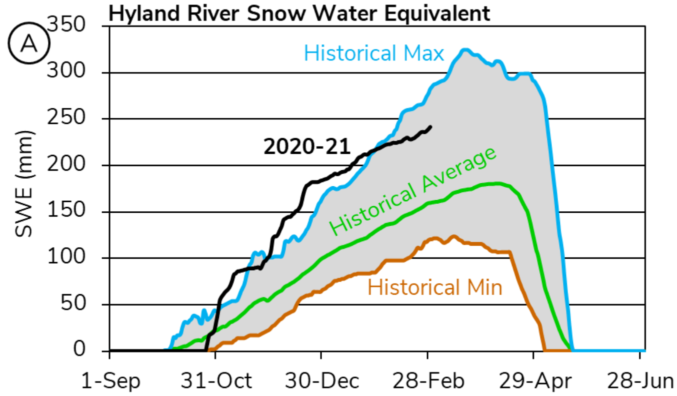


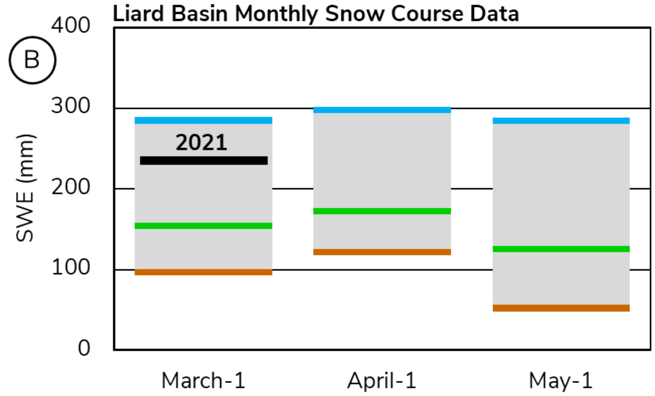
The estimated Yukon River discharge at the White River is **well above average** (Figure E). The **above median** snowpack in all upstream basins suggests a **high potential for significant spring freshet flows.** These statements also apply to the Klondike River. Weather conditions in March and April will determine the most probable spring scenario.



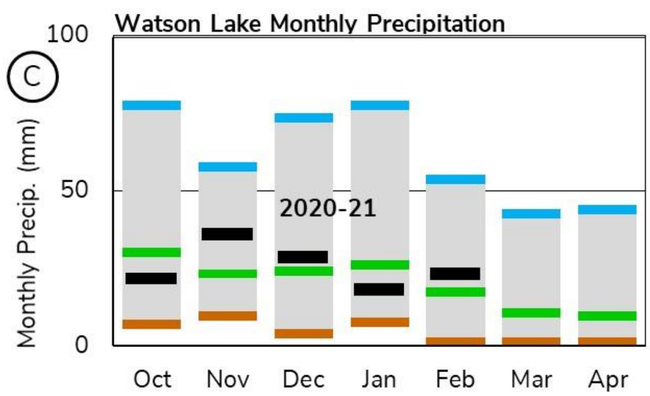
LIARD RIVER BASIN

At Hyland meteorological station, Snow Water Equivalent (SWE) is estimated to be **151%** of the **historical average** (Figure A). The Liard River basin-averaged SWE is estimated to be **149%** of the **historical median**, with **235 mm** as of March 1 (Figure B). This is considered a significant snowpack for the area.

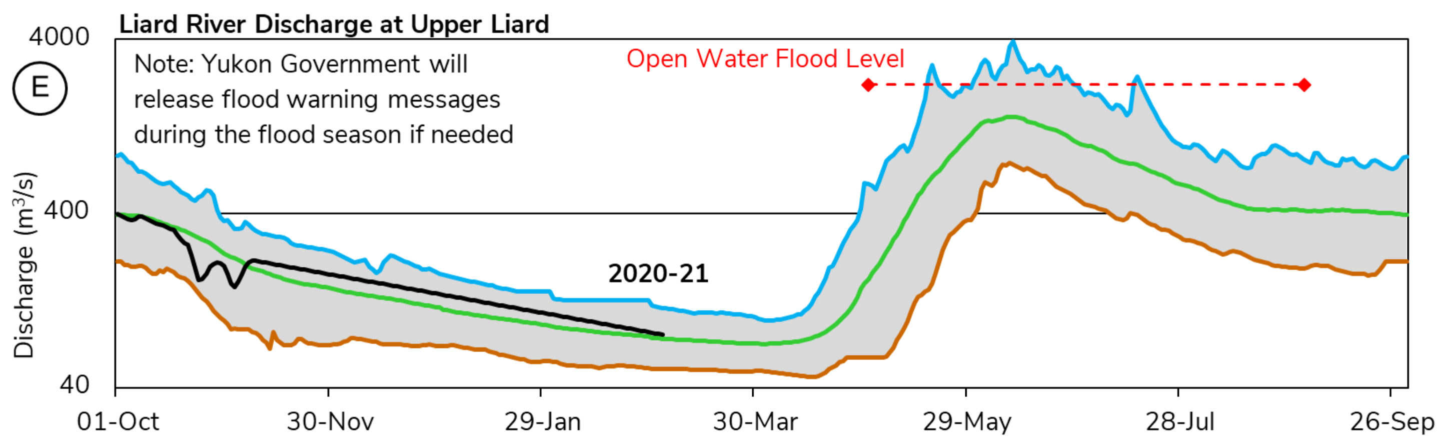




Precipitation at Watson Lake Airport has been variable in the last six months (Figure C). The cumulative result is **below average**, but this only applies to the southern portion of the Liard watershed.

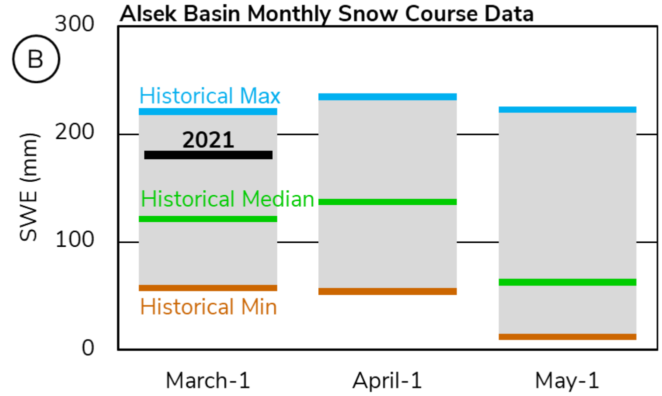


The estimated Liard River discharge at Upper Liard is currently **slightly above average** (Figure E). The **well above median** snowpack in the watershed suggests a **high potential for significant spring freshet flows**. Weather conditions in March and April will determine the most probable spring scenario.

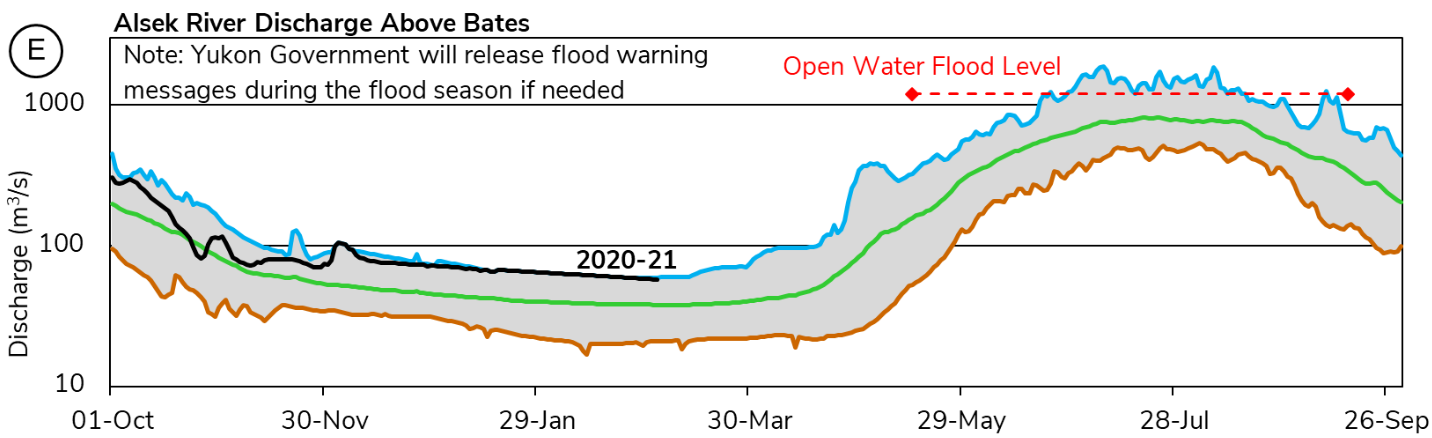


ALSEK RIVER BASIN

The Alsek River basin-averaged SWE is estimated to be **145%** of the **historical median**, with **181 mm** as of March 1 (Figure B). This, however, may only be representative of the Kluane and Aishihik Lake areas while the snowpack in the St. Elias Range may be higher. This is considered a significant snowpack for the area.

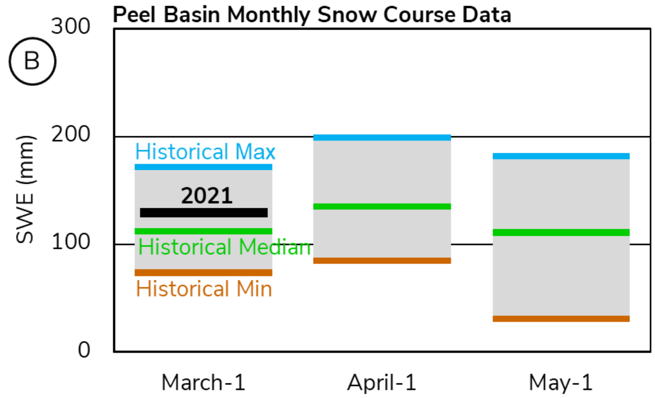


The estimated Alsek River discharge is currently near **historically high** levels (Figure E). High flows in this watershed are dominated by mountain snowmelt and glacial melt that are largely influenced by summer temperatures and precipitation. The snowpack in the St. Elias Range is likely to generate **significantly higher than average freshet volumes**. Weather conditions over the spring and summer will determine peak flows.

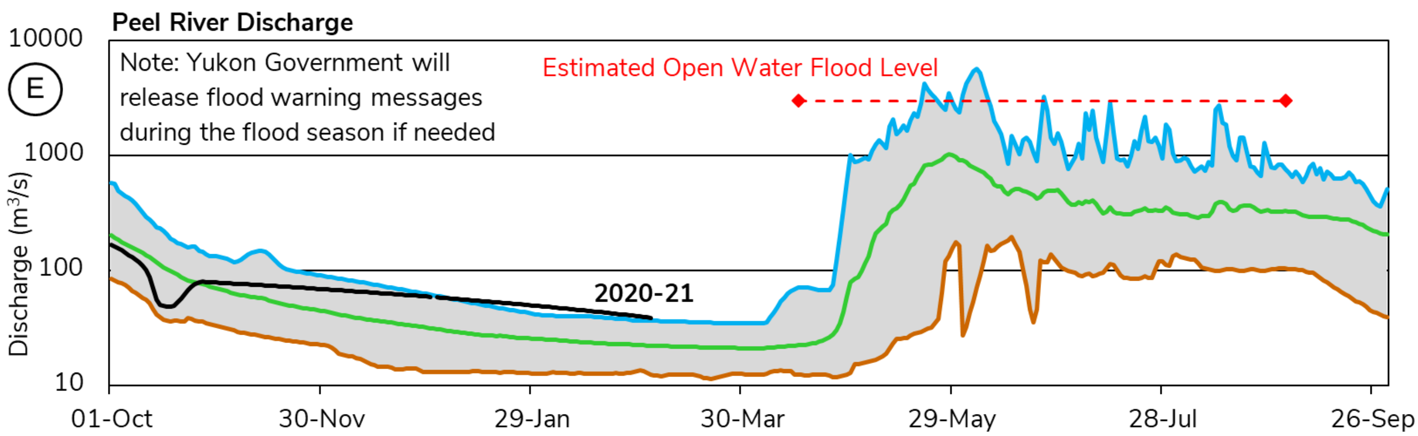


PEEL RIVER BASIN

The Peel River basin-averaged SWE is estimated to be **112%** of the **historical median,** with **129 mm** on March 1 (Figure B). This is considered a normal snowpack for this time of year.

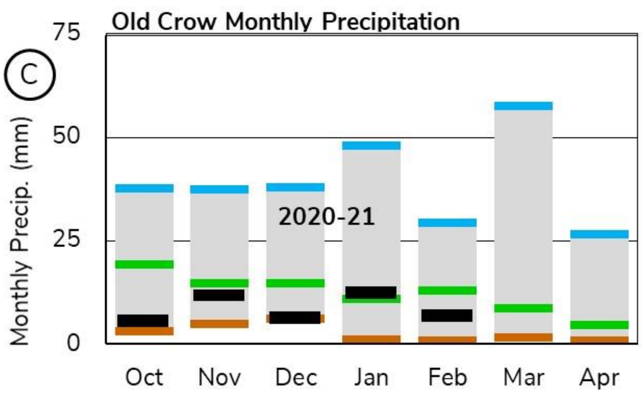


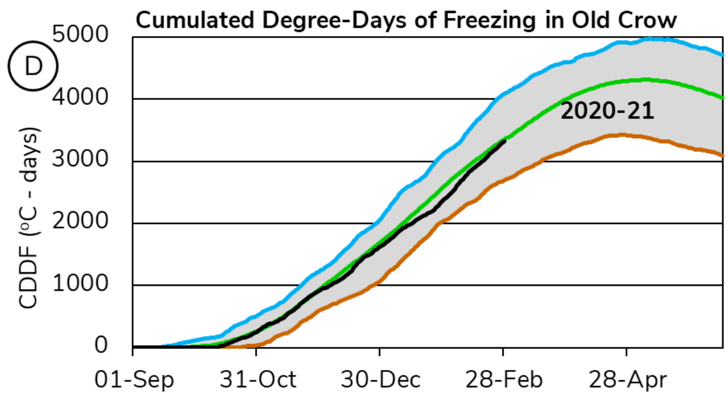
The estimated Peel River discharge is historically **high** (Figure E). The **near median** snowpack suggests **close to average** peak flows. Weather conditions in March and April will determine the most probable spring scenario.



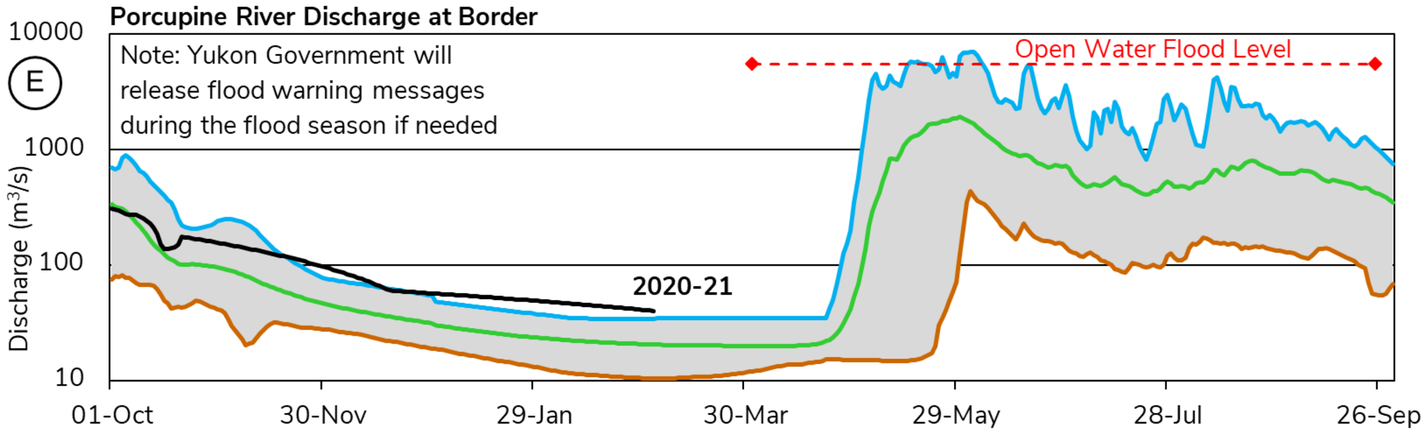
PORCUPINE RIVER BASIN

The Old Crow snow course was not sampled for March 1, 2021. Snow courses on the eastern edge of the Porcupine basin were near normal; however, precipitation at Old Crow shows overall **below average** monthly values during fall and winter (Figure C). Cumulated degree-days of freezing (CDDF) are **close to average**, with 3315 °C-Days as of March 1 (Figure D), which suggests a **normal** ice cover thickness on lakes and rivers in the region.





The estimated Porcupine River discharge is historically **high** (Figure E). With limited snowpack data it is difficult to predict potential spring flow volumes. However, given the available data, peak flows are likely to be **close to average**. Weather conditions in March and April will determine the most probable spring scenario.



DRAINAGE BASIN AND SNOW COURSE

For Sample Date: 2021-03-01

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	2021-02-24	53	92	70	80	43
Alder Creek	08AA-SC02	768	2021-02-24	92	194	131	144	40
Aishihik Lake	08AA-SC03	945	2021-02-24	50	88	69	72	27
Haines Junction Farm	08AA-SC04	610	2021-03-01	79	174	78	85	21
Summit	08AB-SC03	1000	2021-03-01	139	411	203	233	41
Yukon River Basin								
Tagish	09AA-SC01	1080	2021-02-25	85	184	143	127	45
Montana Mountain	09AA-SC02	1020	2021-02-24	92	220	140	130	45
Log Cabin (B.C.)	09AA-SC03	884	2021-02-23	216	700	405	329	59
Atlin (B.C)	09AA-SC04	730	2021-03-01	90	207	54	107	55
Mt McIntyre B	09AB-SC01B	1097	2021-02-25	88	189	157	135	45
Whitehorse Airport	09AB-SC02	700	2021-02-25	74	151	105	91	56
Meadow Creek	09AD-SC01	1235	2021-03-01	139	322	277	244	44
Jordan Lake	09AD-SC02	930	2021-02-24	85	172	N.S.	125	30
Morley Lake	09AE-SC01	824	2021-03-01	77	141	123	138	32
Mount Berdoe	09AH-SC01	1035	2021-02-26	70	119	124	97	45
Satasha Lake	09AH-SC03	1106	2021-02-26	60	101	89	83	33
Williams Creek	09AH-SC04	914	2021-02-26	63	104	110	87	24
Twin Creeks B	09BA-SC02B	900	2021-02-24	74	146	181	132	4
Hoole River	09BA-SC03	1036	2021-02-24	95	201	203	122	42
Burns Lake	09BA-SC04	1112	2021-02-24	106	236	248	198	32
Finlayson Airstrip	09BA-SC05	988	2021-02-24	68	136	146	94	34
Fuller Lake	09BB-SC03	1126	2021-02-23	88	162	171	169	31
Russell Lake	09BB-SC04	1060	2021-02-23	97	201	196	200	33
Rose Creek	09BC-SC01	1080	2021-02-25	66	134	121	98	26
Mount Nansen	09CA-SC01	1021	2021-02-26	53	84	79	68	44
MacIntosh	09CA-SC02	1160	2021-02-26	61	94	94	81	44
Burwash Airstrip	09CA-SC03	810	2021-02-24	26	36	49	40	44
Beaver Creek	09CB-SC01	655	2021-02-24	55	109	70	73	45
Chair Mountain	09CB-SC02	1067	2021-02-24	50	71	99	85	27
Casino Creek	09CD-SC01	1065	2021-02-26	73	112	128	108	42
Pelly Farm	09CD-SC03	472	2021-03-01	61	100	127	76	34
Plata Airstrip	09DA-SC01	830	2021-02-23	93	185	191	168	39
Withers Lake	09DB-SC01	975	2021-02-23	91	167	253	198	33
Rackla Lake	09DB-SC02	1040	2021-02-23	79	147	218	164	30

Code "E" - Estimate, Code "B" - Survey date is outside of valid sampling range, "N.S." – No survey.

DRAINAGE BASIN AND SNOW COURSE

For Sample Date: 2021-03-01

Name	Number	Eleva-tion (m)	Date of survey	This year snow depth (cm)	Water content (SWE) (mm)	Last year (mm)	Median Historical SWE (mm)	Years of record
Yukon River Basin								
Mayo Airport A	09DC-SC01A	540	2021-02-25	58	98	154	91	50
Mayo Airport B	09DC-SC01B	540	2021-02-25	59	90	150	94	31
Edwards Lake	09DC-SC02	830	2021-02-23	89	167	N.S.	142	31
Calumet	09DD-SC01	1310	2021-02-24	84	167	277	174	43
King Solomon Dome	09EA-SC01	1070	2021-02-25	85	190	189	148	46
Grizzly Creek	09EA-SC02	975	2021-02-23	84	193	263	155	45
Midnight Dome	09EB-SC01	855	2021-02-25	86	190	218	135	45
Boundary (Alaska)	09EC-SC02	1005	2021-02-28	64	99	198	117	42
Porcupine River Basin								
Riff's Ridge	09FA-SC01	650	2021-02-23	69	128	155	130	34
Eagle Plains	09FB-SC01	710	2021-02-23	70	141	115	150	38
Eagle River	09FB-SC02	340	2021-02-23	66	113 E	97	114	37
Old Crow	09FD-SC01	299	N.S.			N.S.	106	27
Liard River Basin								
Watson Lake Airport	10AA-SC01	685	2021-02-24	75	168	135	131	56
Tintina Airstrip	10AA-SC02	1067	2021-02-24	116	265	274	188	40
Pine Lake Airstrip	10AA-SC03	995	2021-03-01	131	275	229	199	44
Ford Lake	10AA-SC04	1110	2021-02-24	108	236	279	173	31
Frances River	10AB-SC01	730	2021-02-24	88	192	206	142	45
Hyland River	10AD-SC01	855	2021-02-23	106	265	263	156	45
Hyland River B	10AD-SC01B	880	2021-02-23	112	276	275	197	3
Peel River Basin								
Blackstone River	10MA-SC01	920	2021-02-23	57	96	111	87	45
Ogilvie River	10MA-SC02	595	2021-02-23	63	108	144	93	45
Bonnet Plume Lake	10MB-SC01	1120	2021-02-23	72	153	203	150	30
Alaska Snow Courses								
Eaglecrest	08AK-SC01	305	2021-03-04	198	551	643	419	38
Moore Creek Bridge	08AK-SC02	700	2021-02-26	216	691	518	454	28

Code "E" - Estimate, Code "B" - Survey date is outside of valid sampling range, "N.S." – No survey.

Location of Water Resources Snow Courses