Detailed explanation about the COFFEE Model forecast chart

BC River Forecast Centre

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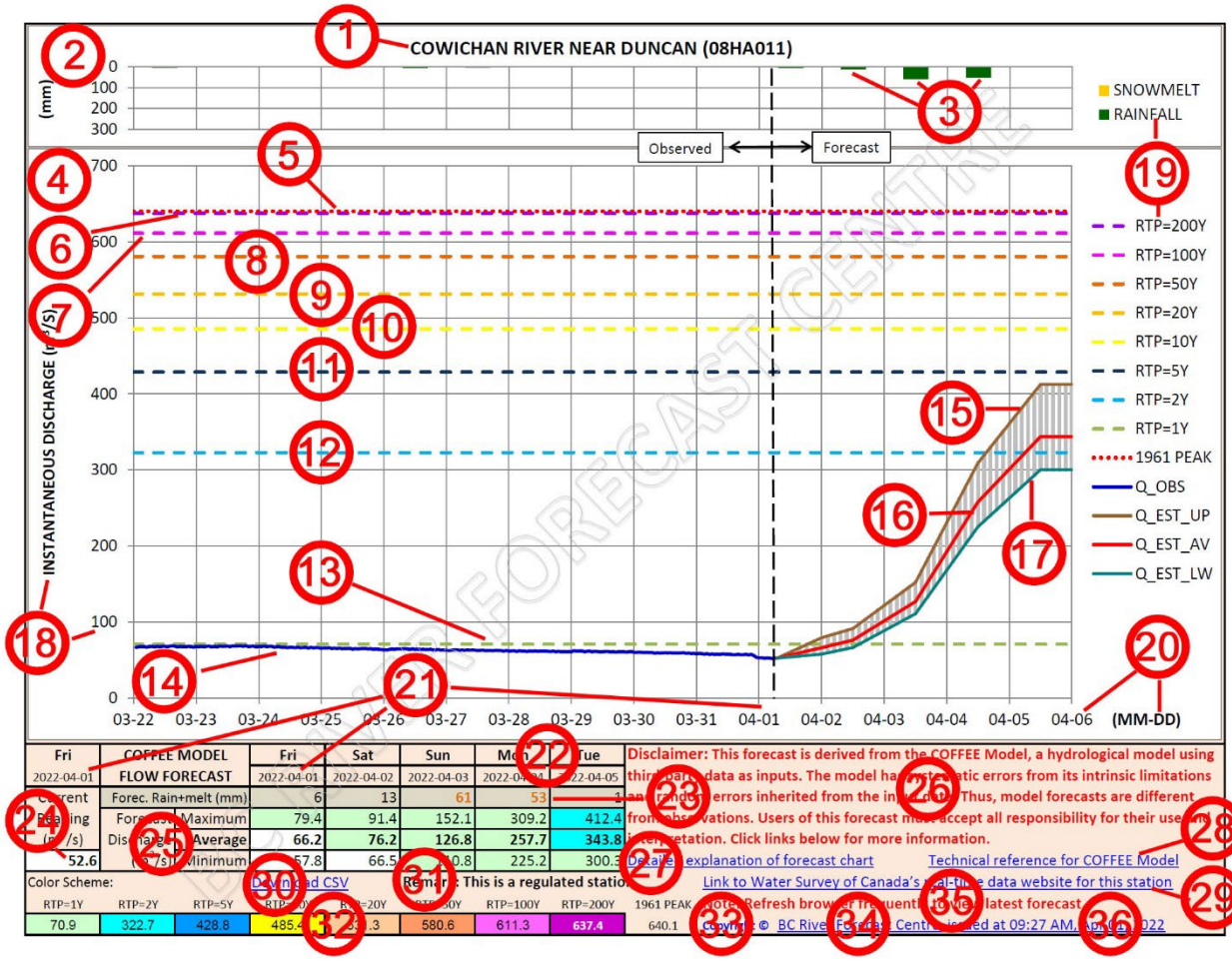

(Clicking on a circle will direct you to the explanation.)

(1) Hydrometric/Flow station name (station ID).

The Station ID is the WSC hydrometric ID if it is a WSC station. Otherwise, it is an ID which is used in the COFFEE Model.

(2) Snowmelt/rainfall bar chart.

(3) Snowmelt and rainfall in millimeter (mm) – vertical axis of the snowmelt/rainfall bar chart.

(4) Observed and forecast hydrograph chart.

(5) Historical record line.

The historical line shows the historical maximum discharge or water level (instantaneous peak) recorded in the year shown in the legend. This line may be at any height on the vertical axis (discharge or water level). Historical maximum values are based on available annual maximum data available from the WSC. In some cases, historic data may be incomplete, and flows larger than this number may have occurred.

(6) The 200-year return period flood line.

This line shows the 200-year return period discharge or water level. Return period, or recurrence interval or repeat interval, is an average time between two floods/flows. “200-year return period flood” is only a probability term about the flood level, which means that a flood of this magnitude might occur once in a two-hundred-year period based on the historical statistics. However, a “200-year return period flood” could occur in any year in reality, even if a “200-year return period flood” had just occurred a year ago.

All return periods and their theoretical floods are estimated by a flood frequency analysis (FFA) using available WSC annual instantaneous peaks of discharge/water level as the input, which may be treated when insufficient data is available and/or inconsistent data are present for a station. In the FFA, the observed data were fitted in eight probability distributions and the best fitted distribution was selected based on certain criteria to determine the theoretical floods for the return periods for a station. The return periods and their theoretical floods are meant to assist with interpreting the relative magnitudes of the forecast streamflows. The values of return periods and their theoretical floods may be different from published values in other studies or assessments and should not be used as official values. These theoretical floods and return periods must NOT be used for design purposes.

(7) The 100-year return period flow line.

This line shows the 100-year return period discharge or water level. About “return period”, please refer to (6).

(8) The 50-year return period flow line.

This line shows the 50-year return period discharge or water level. About “return period”, please refer to (6).

(9) The 20-year return period flow line.

This line shows the 20-year return period discharge or water level. About “return period”, please refer to (6).

(10) The 10-year return period flow line.

This line shows the 10-year return period discharge or water level. About “return period”, please refer to (6).

(11) The 5-year return period flow line.

This line shows the 5-year return period discharge or water level. About “return period”, please refer to (6).

(12) The 2-year return period flow line.

This line shows the 2-year return period discharge or water level. About “return period”, please refer to (6).

(13) The 1-year return period flow line.

This line shows the 1.01-year return period discharge or water level. About “return period”, please refer to (6).

(14) Observed instantaneous flow.

The observed instantaneous discharge/ water level data (discharge in m^3/s and water level in m) on the chart are not raw data but treated data from the Water Survey of Canada (WSC) real-time hydrometric data or BC real-time data, which pick up the maximum discharge/ water level in an hour in order to reduce the file size of the model’s input data. This treatment should be safe because the observed hydrograph always shows the highest level of the hour so that the modelers and the public are cautious with the streamflow conditions.

The WSC real-time hydrometric data are provisional and subject to changes. Please refer to WSC’s Hydrometric data and information service standards and Disclaimer for Hydrometric Information for these data. When missing data are present in the observed flow data series (discharges and/or water levels), the observed hydrograph becomes discontinuous with blanks in between or at either of the ends or no-show at all, and there is no estimation provided for the missing data in the COFFEE Model.

(15) Forecast upper bound.

The forecast upper bound (discharge in m^3/s or water level in m) is estimated from the historical statistics only. Because of this and the model uncertainty, it is possible that the actual flow is higher than the forecast

upper bound. The color scheme of the station marker on the map is determined by the maximum forecast upper bound in the next five days. For the model uncertainty, please refer to 26. Please click the Technical Reference for the COFFEE Model for more information.

(16) Forecast daily average instantaneous peak.

The unit is m^3/s for the forecast discharge and m for the forecast water level. This is the forecast average peak rather than forecast daily average flow (discharge or water level). Please refer to the Technical Reference for the COFFEE Model for more information.

(17) Lower bound of the forecast flow.

The forecast lower bound (discharge in m^3/s or water level in m) is estimated from the historical statistics only. Because of this reason and the model uncertainty, it is possible that the actual flow is lower than the forecast lower bound. For the model uncertainty, please refer to 26. Please click the Technical Reference for the COFFEE Model for more information.

(18) Vertical axis for discharge (m^3/s) or water level (m) of the hydrograph chart.

(19) Legends for the snowmelt/ rainfall bar chart and hydrograph chart.

(20) Horizontal axis for date in MM-DD for both the snowmelt/ rainfall and hydrograph charts.

(21) Date of the forecasting day.

This date is in YYYY-MM-DD or MM-DD, on which the model was run, and the forecast was issued/ updated.

(22) Date (in YYYY-MM-DD) and day of week for table output below the hydrograph chart.

(23) Forecast rainfall plus snowmelt.

The forecast rainfall is the model calibrated/ treated rainfall, and the snowmelt is the model estimated snowmelt with the temperature-index method. Please refer to the Technical Reference for the COFFEE Model for more information.

(24) Latest reading of the observed instantaneous flow on the forecasting day.

The unit is m^3/s for the forecast discharge and m for the forecast water level. When the reading is missing, the box shows “NO DATA.”

(25) Table of forecast upper bound (maximum), daily average peak, and lower bound (minimum).

(26) Modeling Uncertainty and Disclaimer:

This forecast is derived from the COFFEE Model, which is driven by the observed and forecast climate data and calibrated with the observed (provisional) flow data. These data are referred to as "input data." The input data are from the third parties and may include errors. The observed climate data are from Environment and Climate Change Canada (ECCC) and Province of British Columbia. The forecast climate data are the Numerical Weather Prediction (NWP) GRIB2 data (terms and conditions) from the Canadian Meteorological Centre (CMC), ECCC. For ECCC's observed and forecast climate data, please check the Licence Agreement for Use of Environment and Climate Change Canada Data. The COFFEE Model uses daily climate data. Daily maximum and minimum temperatures and daily precipitation are calculated with the data from the above sources. When observed temperatures and/or precipitation are missing for a station, the data are estimated with the data from the adjacent stations. The forecast temperature data may be subject to bias corrections. But no bias correction is done to the precipitation data.

The COFFEE Model is a simplified hydrological model. The core of the model is an integration of computer codes (about four thousand lines) which solves hydrological equations numerically. Please refer to the Technical Reference for the COFFEE Model for details about the methodology of the COFFEE Model.

Because of the intrinsic limitations of the model's methodology and the errors inherited from the input data, the COFFEE Model's forecasts may include forecast errors, which is the so-called "modeling uncertainty." There are two categories of modeling uncertainty. The first category of modeling uncertainty is the COFFEE Model's forecast errors stemmed from the model's intrinsic limitations, which are referred to as "systematic errors," and which are recurring and relatively constant. The second category of modeling uncertainty is the COFFEE Model's forecast errors inherited from the input data, which are referred to as "random errors," and which are dependent on case-specific conditions. It is acknowledged that meteorological modeling, which provides input forecast climate data for hydrological modeling, is super complicated and that forecasting of extreme weather events such as atmospheric rivers (ARs), which have been becoming more frequent, intensified, and widespread across BC under climate change impacts, is extremely difficult and challenging. Sometimes the errors in the forecast climate data could be significant with respect to the forecast rainfall intensities and forecast storm centre locations, which in turn could incur significant errors to the hydrological forecasts. Meanwhile, large errors could also be present in the observed (provisional) flow data, which could negatively impact the model calibration significantly, and the model calibration errors would also transfer into the model forecast errors.

As the result of modeling uncertainty, the forecast included in this chart, the CSV file for users to download, and the map may also include errors. It can be expected that the actual observed discharges and water levels will be different from the model forecasts. Moreover, it is also possible that the actual flow is higher than the forecast upper bound (maximum) or lower than the forecast lower bound (minimum). **Users of this forecast and data must accept all responsibility for their use and interpretation.**

(27) Detailed explanation of forecast chart.

A link to this document.

(28) Technical reference for COFFEE Model.

A link to the Technical Reference for the COFFEE Model.

(29) Link to the WSC real-time hydrometric data website/ BC real-time water data site for this station.

Only an active WSC real-time hydrometric station or BC real-time water data station has such a link.

(30) Download CSV.

Users may click the link to download the COFFEE Model five-day forecast data in an Excel CSV file.

(31) Remark for special stations

Such stations include regulated stations and others.

(32) Color scheme:

Color scheme and return periods, discharges (or water levels) for different return periods, and the historical maximum discharge (or water level). For return periods, please refer to 6.

(33) Link to Copyright statement of Province of British Columbia.

(34) Link to the homepage of BC River Forecast Centre.

(35) Note for web browser settings to view the latest forecast:

a. For Internet Explorer, set “Tools/Internet Options/Settings/Temporary Internet Files/Check for newer versions of stored pages” to “to “Every time I visit the webpage.”
b. For Microsoft Edge, set “Settings/Privacy, search, and services/Clear browsing data/Choose what to clear every time you close the browser/Cached images and files” to “On.”
c. For Google Chrome, refresh the browser manually or set “Settings/Privacy and security/Cookies and other site data/General settings/Clear cookies and site data when you quit Chrome” to “On.”

(36) Time and date when the forecast was issued/updated.