

Basics of the ELF Model

MATHEMATICS,
DATA AND
FORECASTS

Mathematics of the ELF Model – Basic equations:

It was found that behaviour of the daily mean low flow during the recession period of dry weather conditions is characterized by the following exponential recession equation (Reed and Warne, 1985):

$$Q_t = Q_0 e^{-\alpha t}$$

Rearranging and conducting **logarithmic** calculation on both sides:

$$\ln(Q_t) = -\alpha t + \ln(Q_0)$$



$$y = ax + b$$



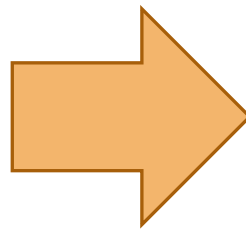
Extrapolating Logarithmic Flow (ELF) Model

A series of observations (e.g., 30 days) – overdetermined system

$$f = y = ax + b$$



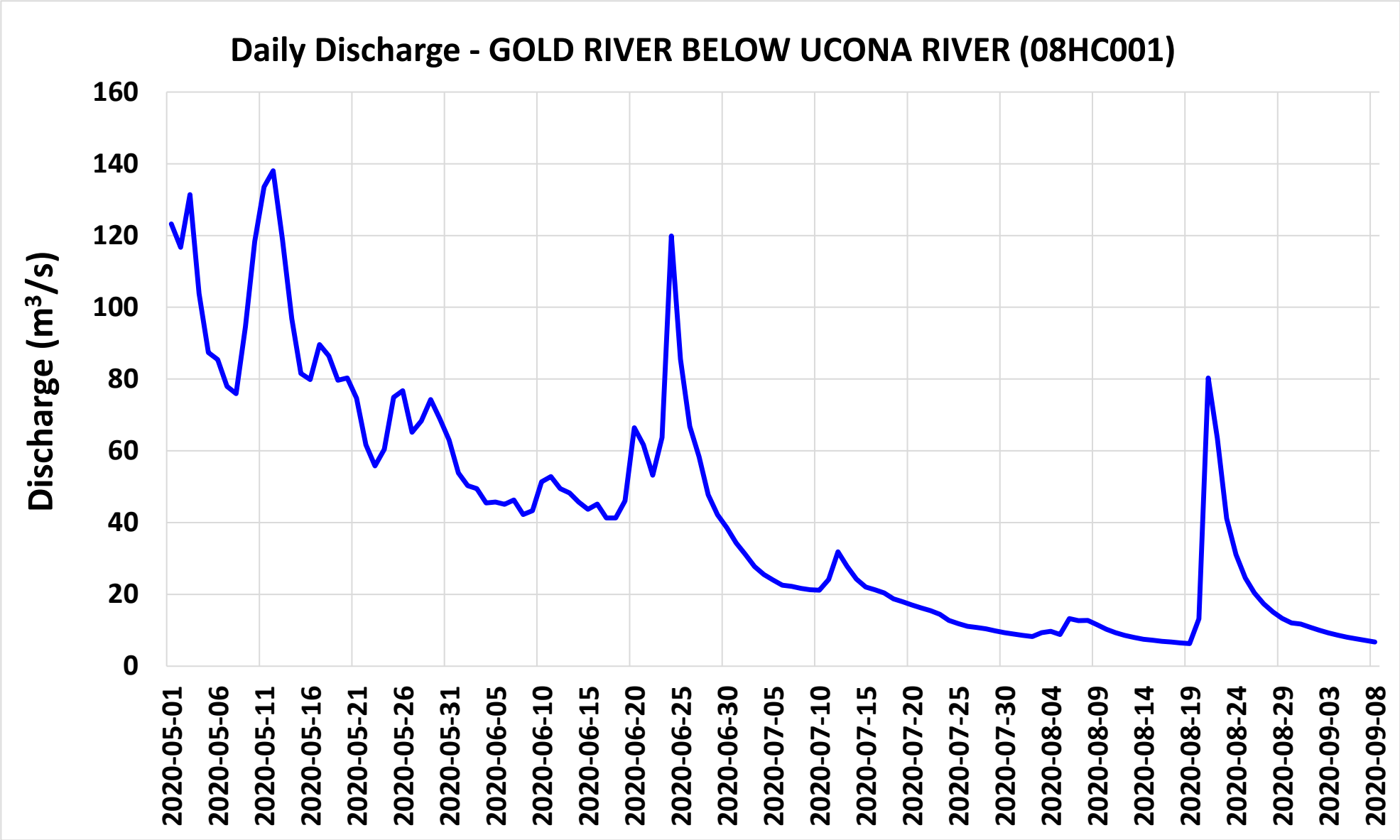
$$\begin{cases} R^2 = \sum_{i=1}^n [y_i - f(x_i, a_1, a_2, \dots, a_i, \dots, a_n)]^2 \\ \frac{\partial(R^2)}{\partial a_i} = 0 \end{cases}$$



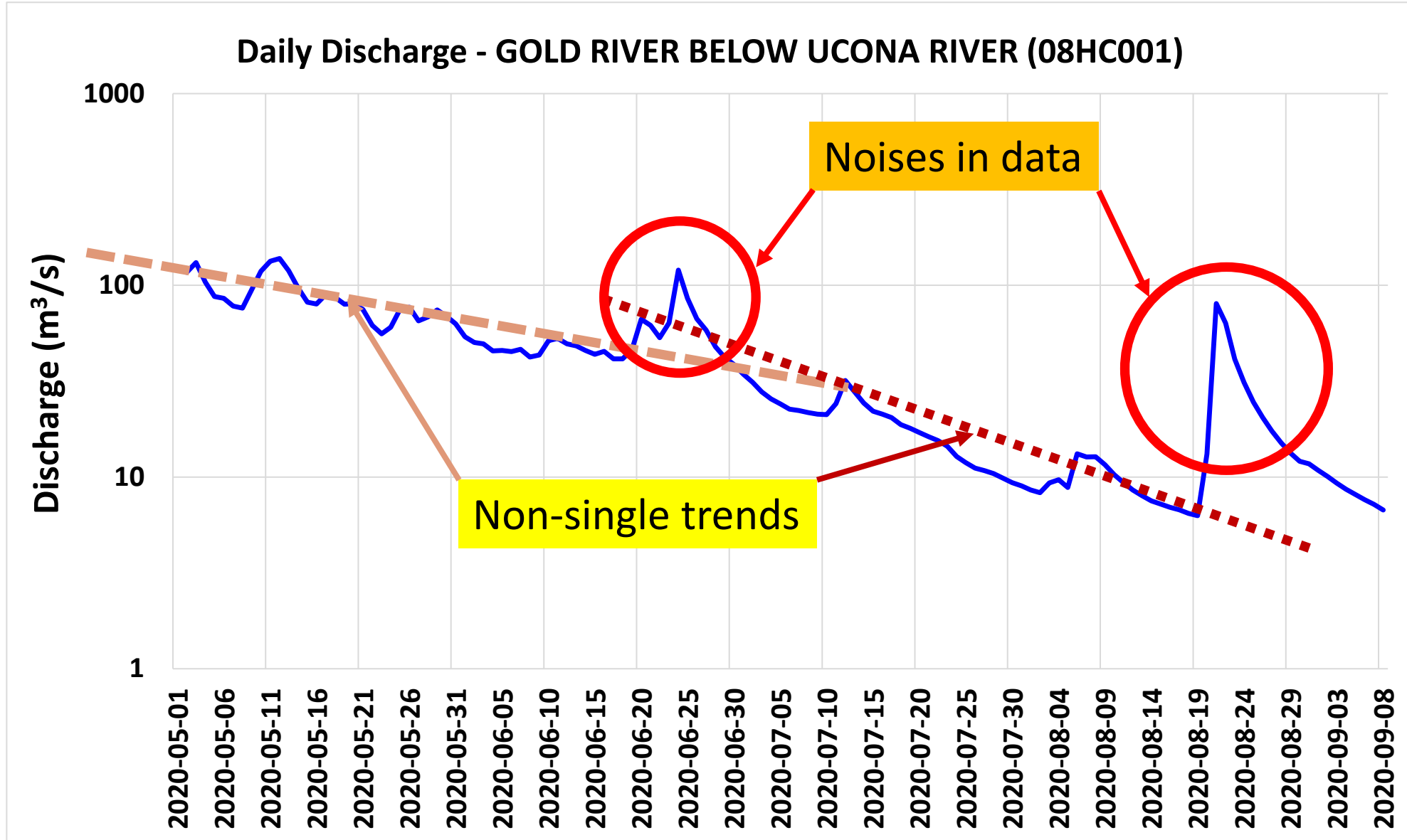
$$\begin{cases} a = \frac{\sum_i^n (x_i y_i) - n \bar{x} \bar{y}}{\sum_i^n x_i^2 - n \bar{x}^2} \\ b = \frac{\bar{y} \sum_i^n x_i^2 - \bar{x} \sum_i^n (x_i y_i)}{\sum_i^n x_i^2 - n \bar{x}^2} \end{cases}$$

Where $\bar{x} = \frac{1}{n} \sum_{n=1}^n x_i$
and $\bar{y} = \frac{1}{n} \sum_{n=1}^n y_i$

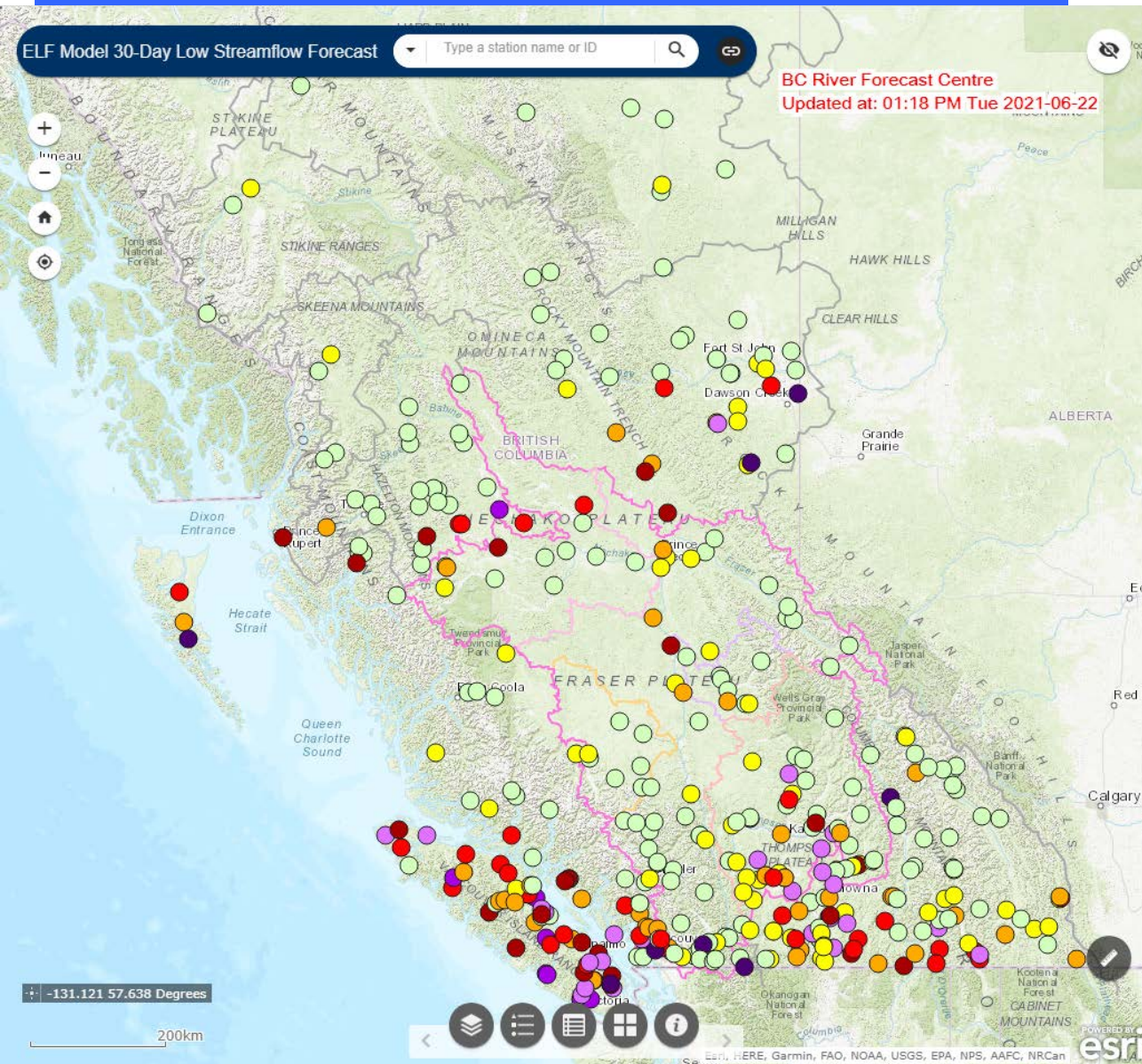
Data – Mean daily discharges/water levels :



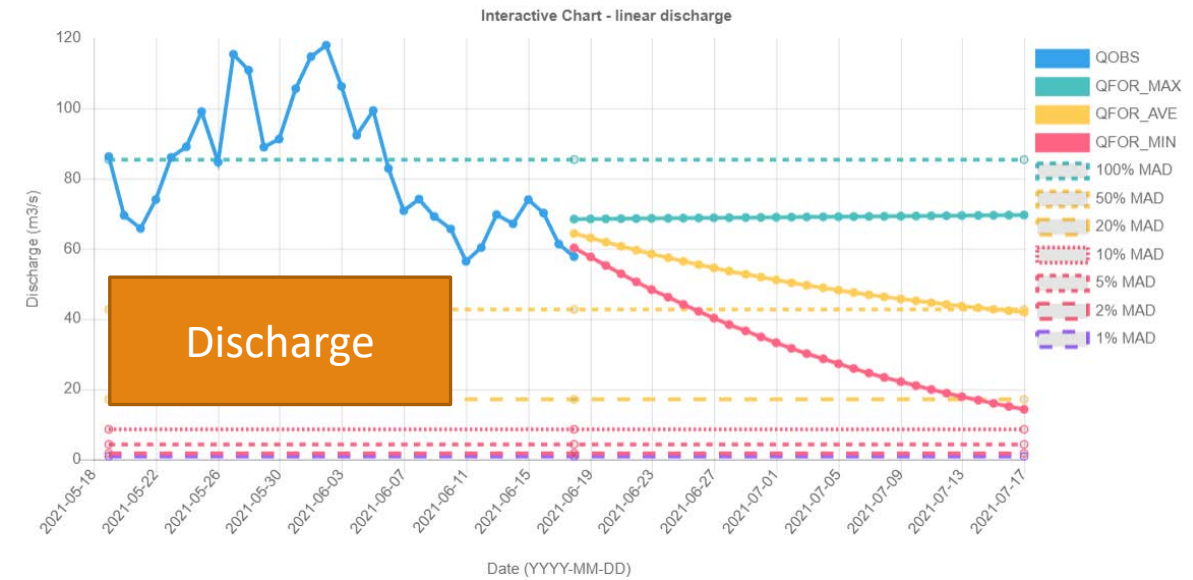
Data – Mean daily discharges/water levels :



30-day observation data, 30-day forecast :



ELF Model 30-Day Low Streamflow Forecast for GOLD RIVER BELOW UCONA RIVER (08HC001) - Issued at: 12:31 PM Fri Jun 18, 2021



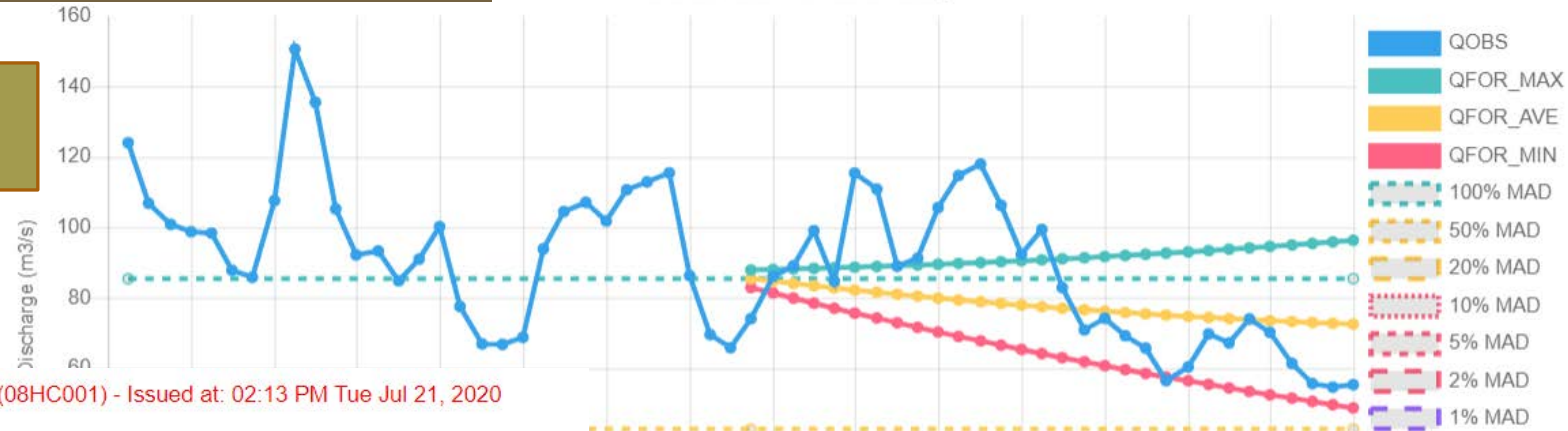
ELF Model 30-Day Low Streamflow Forecast for GOLD RIVER BELOW UCONA RIVER (08HC001) - Issued at: 12:31 PM Fri Jun 18, 2021



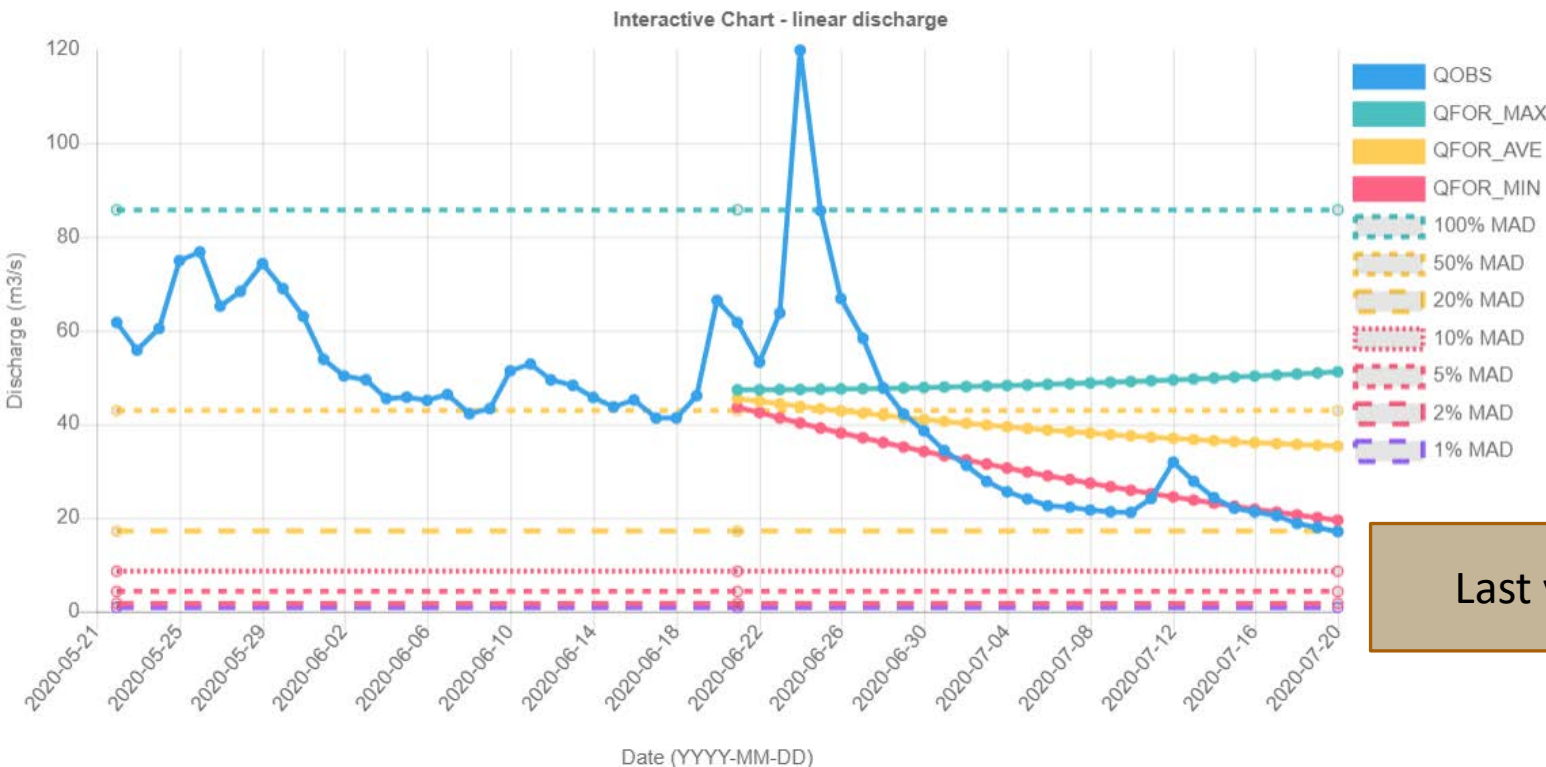
Verification: Forecasts for last month and last year :

Forecast for GOLD RIVER BELOW UCONA RIVER (08HC001) - Issued at: 01:27 PM Tue Jun 22, 2021

Last month

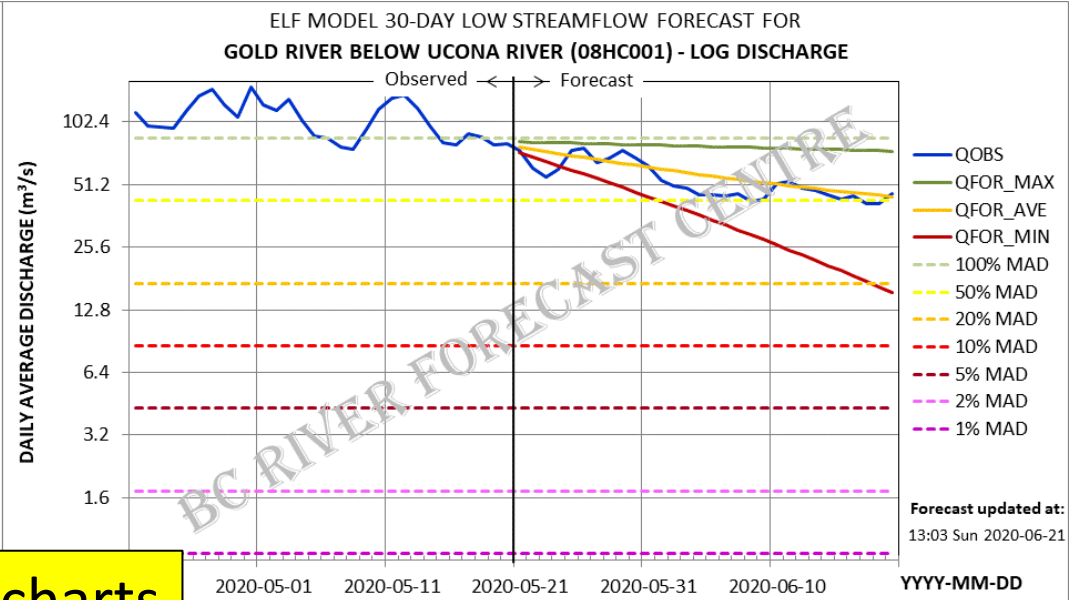
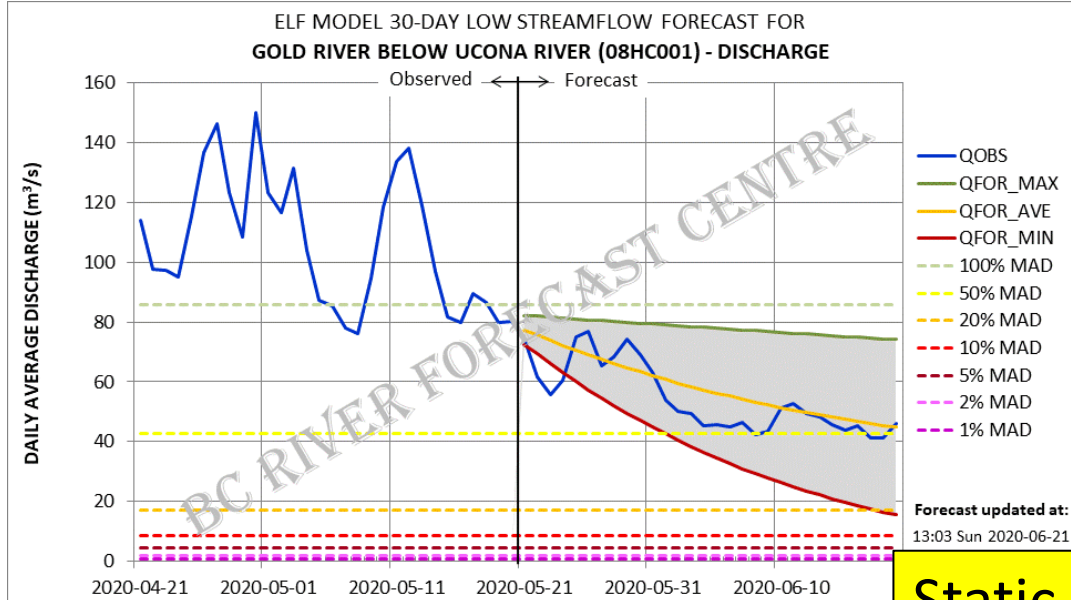


ELF Model 30-Day Low Streamflow Forecast for GOLD RIVER BELOW UCONA RIVER (08HC001) - Issued at: 02:13 PM Tue Jul 21, 2020

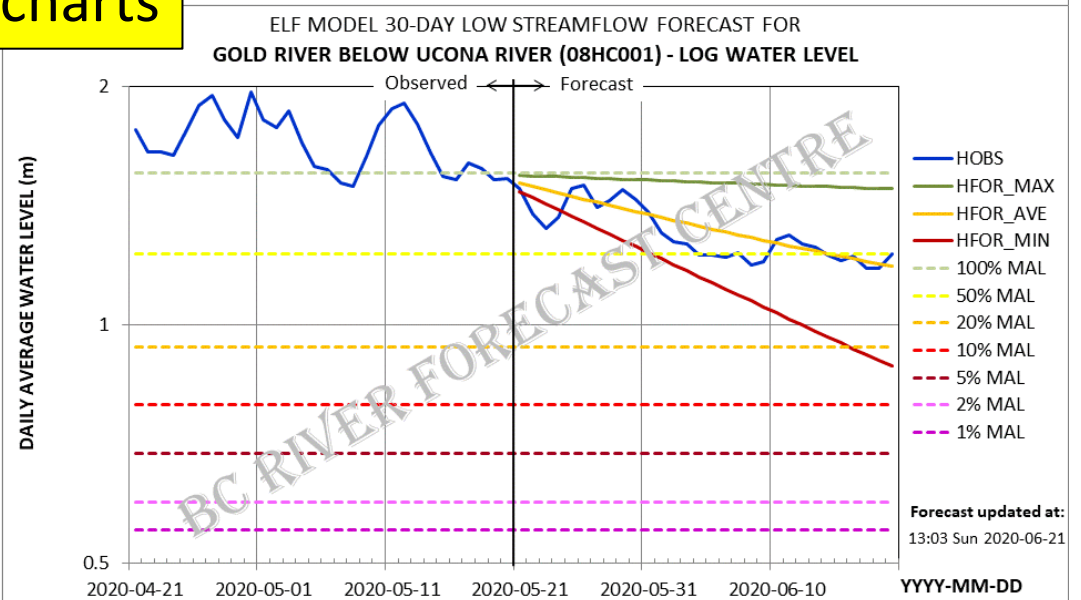
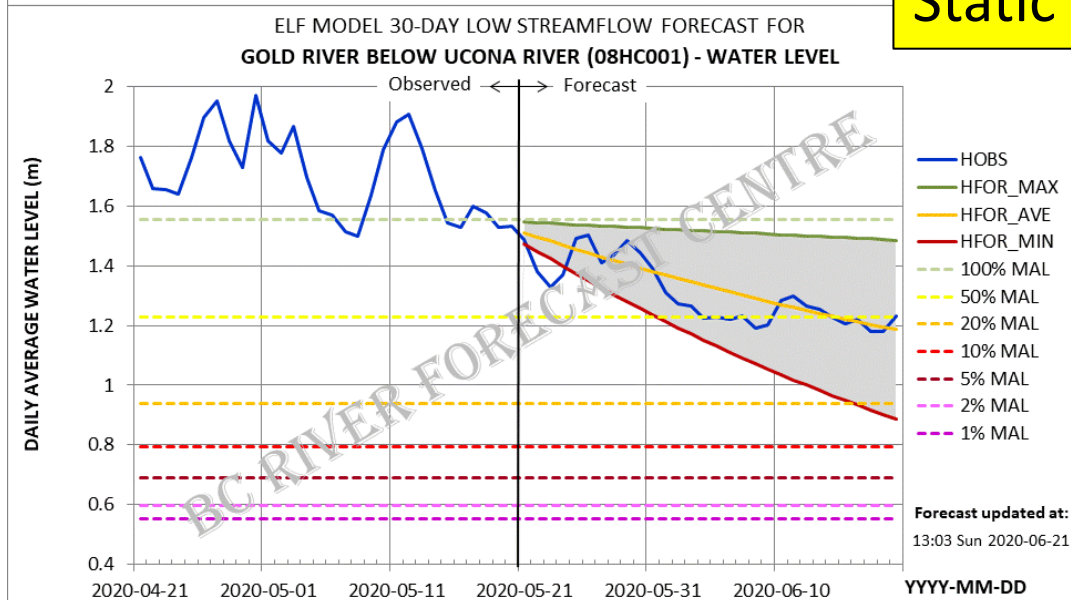


Last year

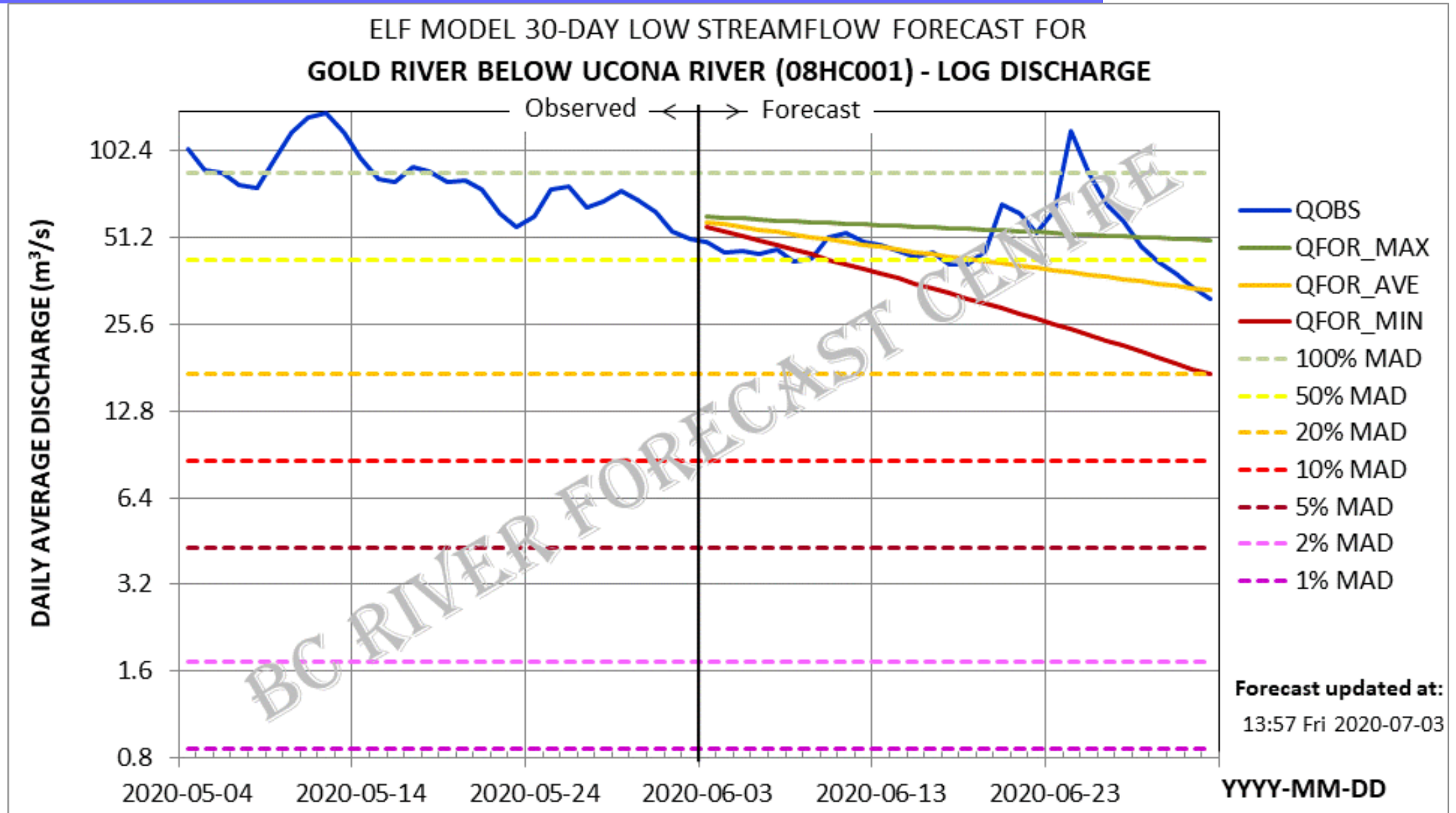
Forecast example – GOLD RIVER BELOW UCONA RIVER (08HC001):



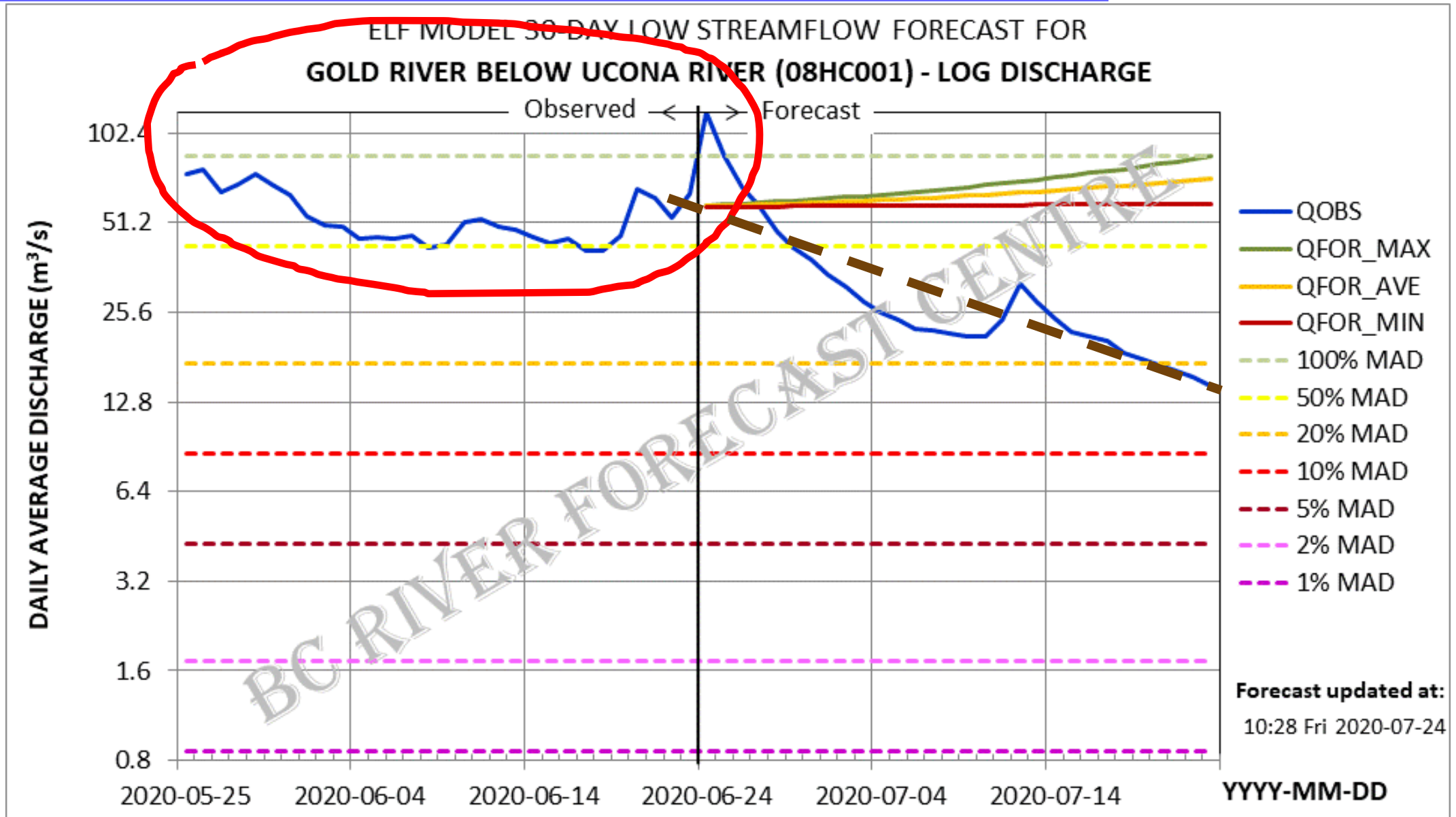
Static charts



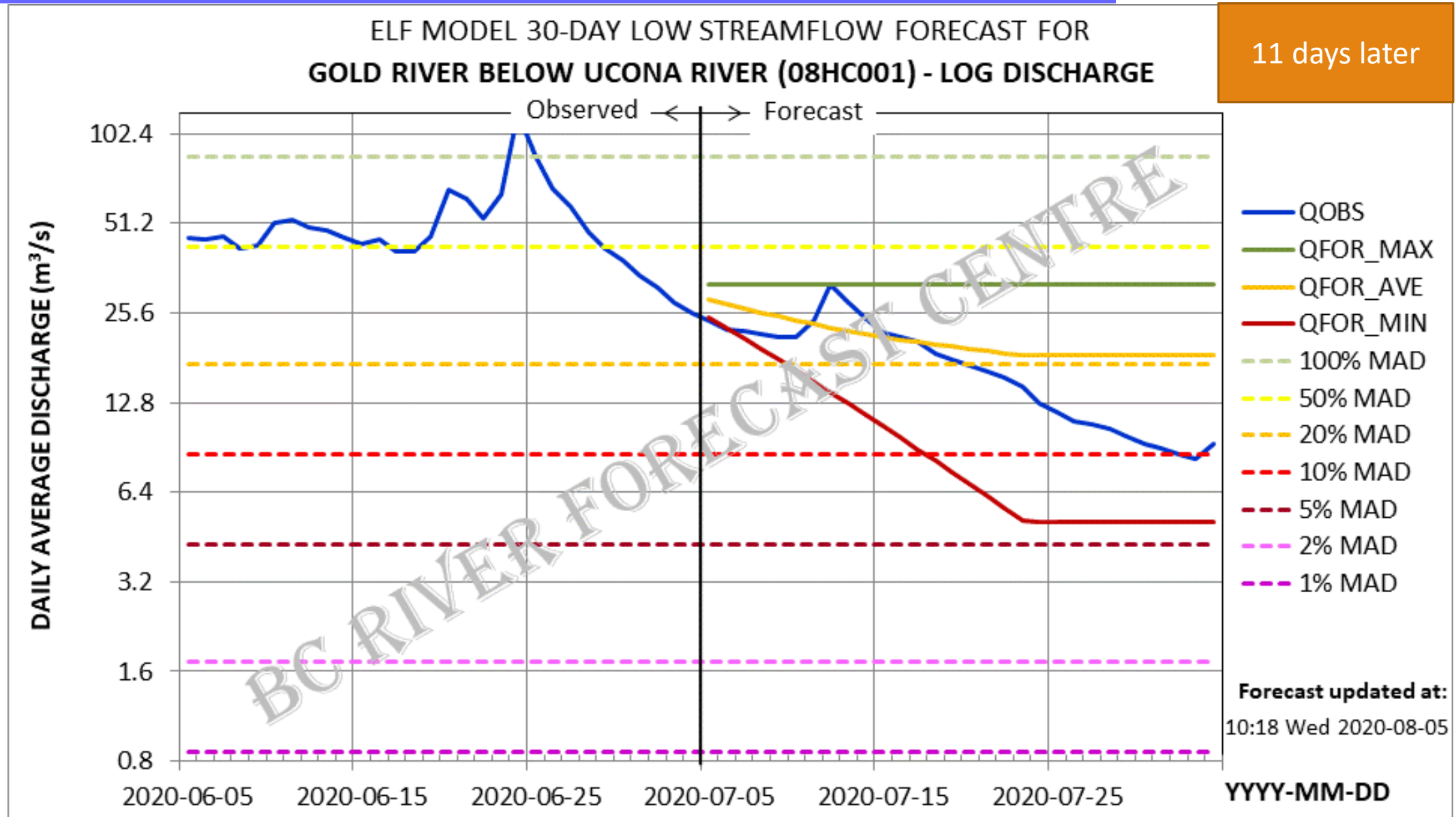
Forecast example – GOLD RIVER BELOW UCONA RIVER (08HC001):



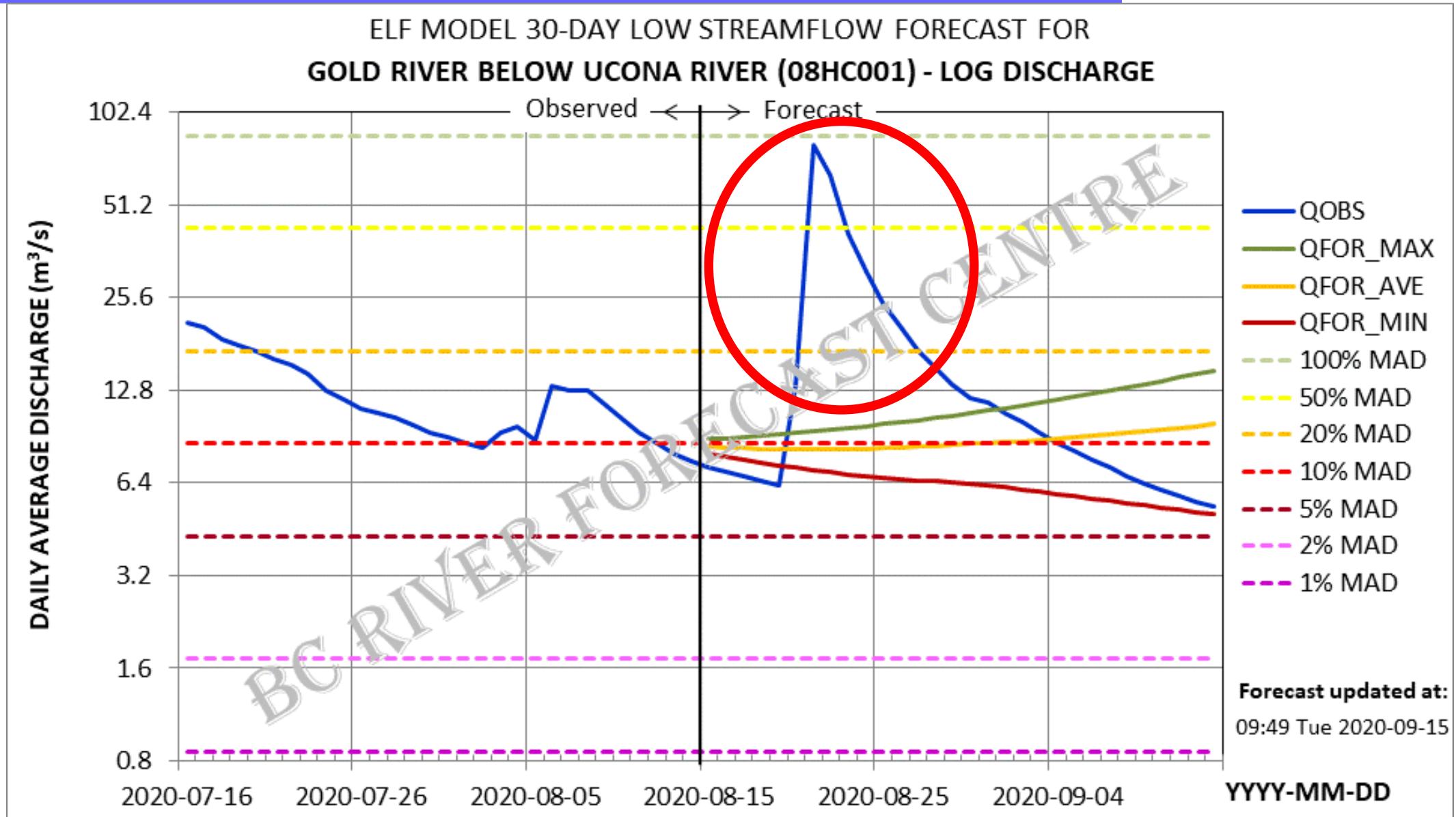
Forecast example – GOLD RIVER BELOW UCONA RIVER (08HC001):



Forecast example – GOLD RIVER BELOW UCONA RIVER (08HC001):



Forecast example – GOLD RIVER BELOW UCONA RIVER (08HC001):



Download a static version of this chart: [Linear Y axis for water level](#); [Logarithmic Y axis for water level](#).

Links:

1. [Download ELF MODEL 30-DAY LOW STREAMFLOW FORECAST \(csv file\) for this station \(08HC001\)](#)
2. [Water Survey of Canada's real-time hydrometric data site for this station \(08HC001\)](#)
3. [Technical Reference for the ELF Model \(PDF\)](#)
4. [Go back to Map of ELF Model 30-Day Low Streamflow Forecast](#)

Map of Extrapolating Logarithmic Flow (ELF) Model 30-Day Low Streamflow Forecast:

http://bcrfc.env.gov.bc.ca/lowflow/map_elf.html

Thank you!

Questions:

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