

Trial Balloon – 85% Flow-by with 20th Percentile Baseflow

General Description

This method is that used by the Government of Alberta for planning and as a default desktop method for setting flow regimes without site-specific studies (Locke and Paul 2011). It is similar to the environmental flow policy of Canada's Department of Fisheries and Oceans (DFO 2013). Both are based on the presumptive standard approach (Richter et al. 2012) and the percentage of flow with sustainable boundary approach (Richter 2009). The Alberta and DFO methods are supported by field studies in Canada, the US and elsewhere.

This simplified approach requires only hydrologic data. The flow recommendation consists of two parts – a percentage of flow (POF) component and an ecosystem base flow (EBF) component. The POF component is set at 85% of the daily natural flow (i.e., a 15% reduction from natural flow). The EBF component is set as the 20th-percentile flow on a monthly time step. The attached graphs illustrate how the two components are combined to set an ecological flow.

How this trial balloon helps the EFSAB to advise DENR in characterizing the aquatic ecology of different river basins

This trial balloon does not address this aspect of the statutory charge, nor have any other trial balloons presented to the EFSAB to date. The direct connection between characterizing basin ecology and developing flow recommendations is not called for in the statute. Characterizing the aquatic ecology of different river basins can be done separately from determining the flow recommendation framework. See separate handout for more detail.

How this trial balloon helps the EFSAB to advise DENR in identifying the flows necessary to maintain ecological integrity

The POF component generally retains the natural shape of the hydrograph, including all five components of flow (magnitude, frequency, duration, timing and rate of change). The EBF component protects aquatic systems during periods of low flows by reducing the duration that low flows would exist just using the POB component.

The POF component is to be calculated on a cumulative basis at any point in a river basin. Due to the language of the NC statute, the baseline would be the current condition, not the natural (unaltered) flow. However, both baselines should be run to understand the degree to which the current condition is already changed from the natural condition.

Limitations of this trial balloon and options for how to address those limitations

In order for this flow approach to work in a planning context with the basin models, decision criteria must be developed to determine the timing (seasonality), frequency, and duration that water is inadequate to meet: 1) yield for all needs; 2) yield for essential uses; and 3) ecological flows. There are basically two ways to do this – develop timing, frequency and duration criteria for ecological flows, or develop such criteria for water needs/uses.

The first approach would be done in the model by giving water use priority over ecological flows and tabulating the timing, frequency and duration that the ecological flow standard is not met. While

appealing, this assumes that the EFSAB or DENR can determine the timing, frequency and duration criteria that are protective of ecological integrity. Due to the varying nature of ecological conditions throughout the state, this would be a difficult task. However, one could use statistical metrics from the natural hydrology to determine frequencies and durations of events (by season) that are outside of the norm.

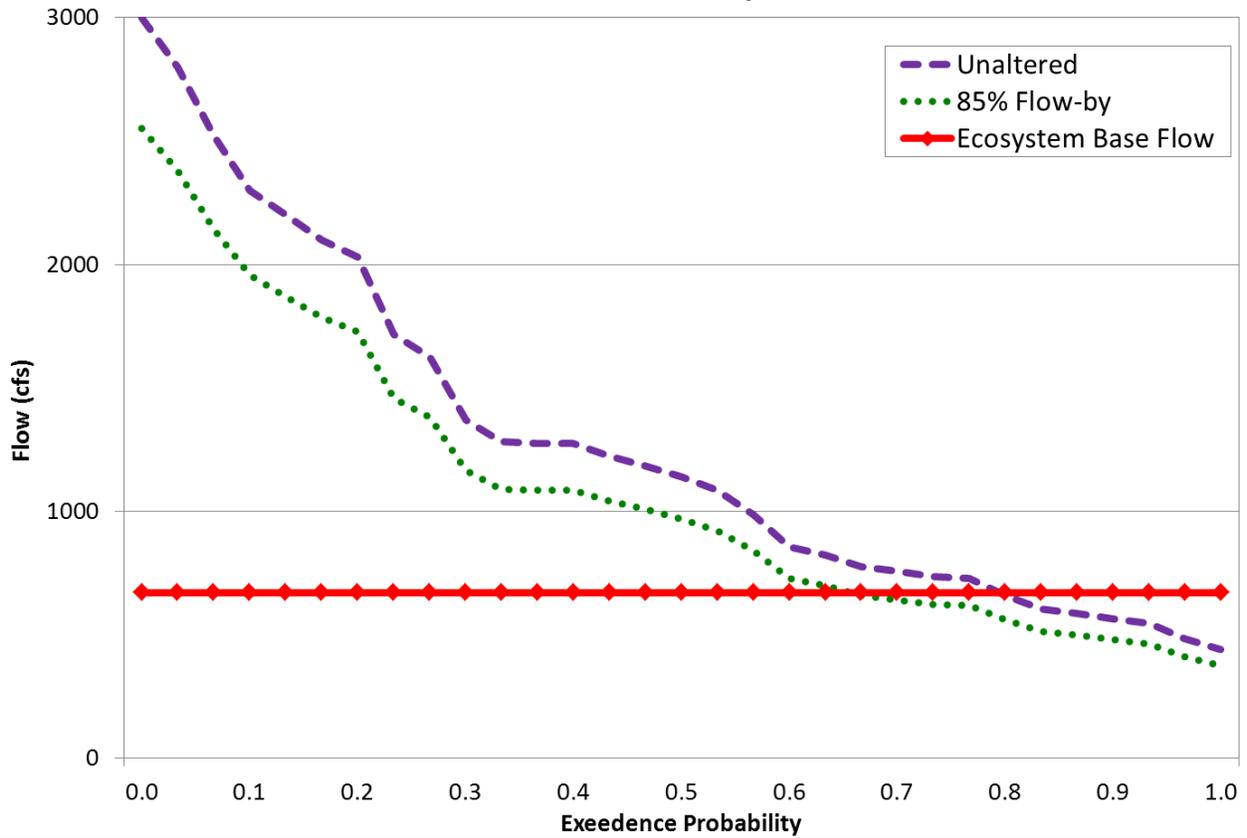
The second approach would be done by giving ecological flows priority over water use in the model, and tabulating the timing frequency and duration that water needs/uses are not met. It is understood that this is actually the approach that is used in OASIS. If so, it will be up to DENR to determine if those violations are unacceptable.

However, as a planning tool it really isn't necessary to develop "acceptable violation" criteria for either approach. If the model is run as understood in the second approach, DENR just needs to know that there isn't adequate water at a particular node, at a certain time, with a certain frequency and duration. It will be up to DENR to work with appropriate parties to determine possible planning-level solutions to situations where there is inadequate water to meet all needs.

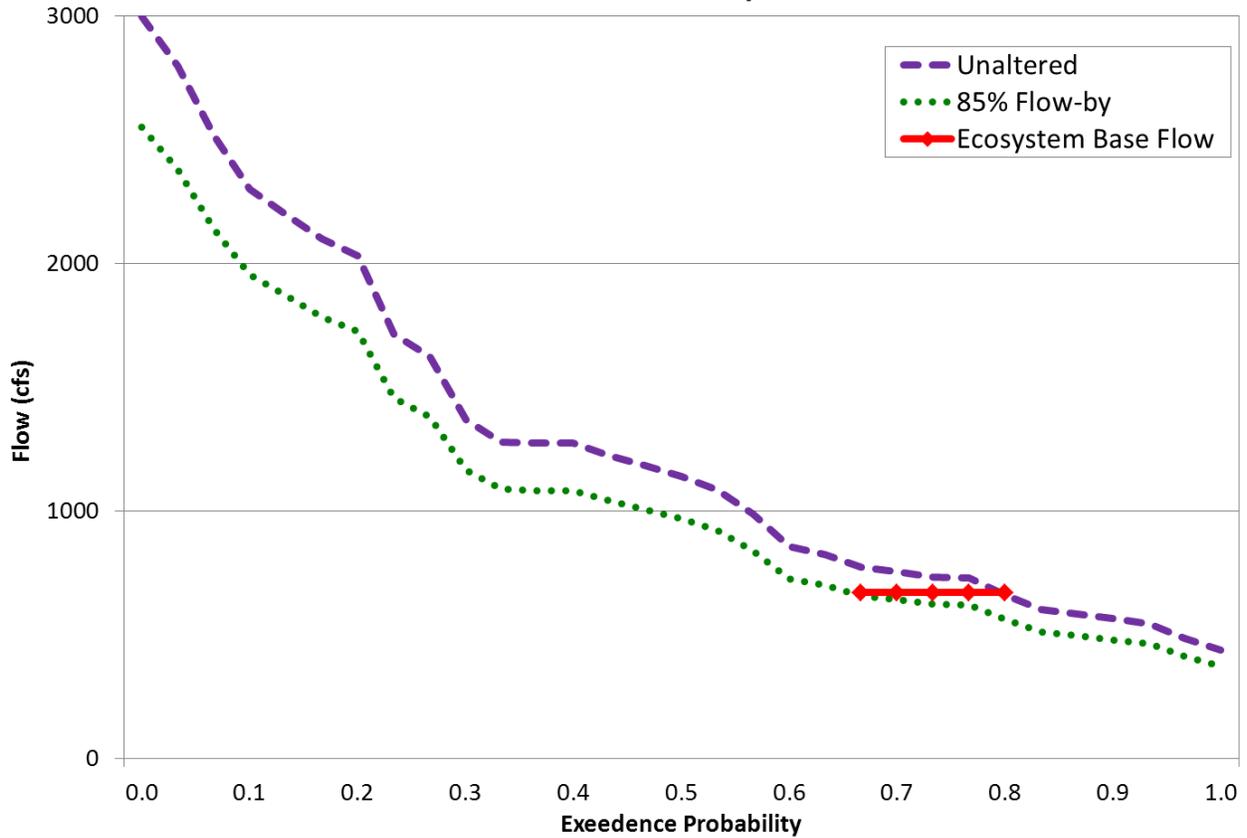
References

- DFO. 2013. [Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada](#). DFO Canada Science Advisory Section, Science Advisory Report 2013/017.
- Locke, A., and A. Paul. 2011. [A Desk-top Method for Establishing Environmental Flows in Alberta Rivers and Streams](#). Alberta Environment and Alberta Sustainable Resource Development, Edmonton.
- Richter, B.D. 2009. Re-thinking environmental flows: from allocations and reserves to sustainability boundaries. *Rivers Research and Applications* 25: 1–12.
- Richter, B.D., M.M. Davis, C. Apse, and C. Konrad. 2012. A Presumptive Standard for Environmental Flow Protection. *River Research and Applications* 28: 1312–1321.

Example of Alberta Desktop Method
SAB River - January



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