

Duncan: Lower Duncan River Mosquito Performance Measure (PM) – Research Status Summary

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The research team has thoroughly considered this performance measure (PM) after consulting all available information sources, including interviews with the Regional District of Central Kootenay's mosquito control contractor and BC Hydro's former mosquito monitoring contractor/modeler. **At this time, we are not recommending a specific performance measure** due to information gaps that prevent a confident understanding of how discharges from the Duncan Dam affect mosquito presence and related health risks and quality of life in the area surrounding the Lower Duncan River.

Our current understanding of the issues surrounding the performance measure is summarized as follows:

- The performance measure used in the [Duncan WUP Consultative Committee](#) process was concerned only with post-freshet dam releases (i.e., mid-July to September), as, if substantial enough, these releases can cause downstream river levels to exceed those of the freshet, which wets unhatched mosquito eggs, causing them to hatch, and extending the typical mosquito season beyond its natural limits (BC Hydro, 2005). Post-freshet releases remain the primary concern of the mosquito control contractor (D. Morrow, pers. comm.). The contractor has conducted research into the relationship between post-freshet dam releases and mosquito control treatments, finding that “Between 2004 and 2014 53% of MBL mosquito treatments that took place greater than three weeks after the natural peak in the freshet were conducted on Duncan River influenced sites, during the same time that a Duncan Dam release was occurring” (Sternberg, 2016, p. 6).
- However, since 2015, when there was a change to the WUP Order guiding Duncan operations, a new concern has emerged regarding pre-freshet dam releases. The Order change allows BC Hydro to release higher volumes of water in April and May, which reduces the potential for downstream flooding during the freshet and also avoids fish stranding by smoothing out peaks in the discharge curve (M. Coules, pers. comm.). The RDCK has observed that this change causes earlier mosquito hatches than in previous years (A. Watson, pers. comm.).

Due to this being a new issue, there is little related information or research. It is unknown whether earlier releases extend the mosquito season, make it more intense, or simply shift the start and end dates earlier. BC Hydro research indicates that peak flows are naturally shifting earlier in the season, therefore the new operational regime may reflect a more natural flow pattern (M. Casselman, pers. comm.). Passing more water earlier in the season can also mean fewer instances of late-season releases that cause mosquito production (M. Coules, pers. comm.).

- Over a seven-year period ending in 2016, BC Hydro engaged a contractor to conduct a mosquito monitoring study in the Lower Duncan River. This study generated a predictive model that could be used to project mosquito productivity based on various environmental and temporal

variables. It did not establish a threshold for a mosquito productivity value that is considered by the community to represent a nuisance (Jackson et al., 2016).

The RDCK expressed concern about the sampling timelines and methodologies used by the BC Hydro contractor, especially in the early years of the study. For example, due to challenges coordinating work between the RDCK and BC Hydro contractors, the BC Hydro contractor occasionally sampled following an RDCK mosquito control treatment. A representative of the mosquito monitoring study modeling team believes these ‘compromised’ data were used in development of the model, though the sheer amount of data collected over the course of the study would likely mask minor inaccuracies (C. Phelan, pers. comm.).

The model outputs are challenging to interpret as there is little ‘readme’ documentation available, however the representative of the modeling team has offered assistance should it be needed.

There are a number of uncertainties that the research team feels need to be addressed before making a recommendation for a Duncan mosquito PM. These are:

- Whether/how higher pre-freshet dam releases influence mosquito productivity in the spring and over the remaining course of the mosquito season (this would likely involve an additional interview with the RDCK’s mosquito control contractor)
- How to interpret the BC Hydro mosquito productivity model results in a way that would allow the research team to use the model to inform a performance measure (this would involve consultation with BC Hydro’s former contractor and input from the CRT Socio-Economic Integration Team’s modeling lead)
- What mosquito productivity value could serve as a threshold for nuisance for the performance measure (this could involve a comparison of RDCK mosquito control sampling/treatment data with model outputs, though it is possible a clear threshold will be difficult to determine.)

The level of research needed to address these uncertainties is beyond the scope of the current phase of the CRT Socio-Economic Integration work.

References:

BC Hydro (2015). Duncan Dam Water Use Plan Consultative Committee Report.
<https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/environment-sustainability/water-use-planning/southern-interior/wup-duncan-consultative-committee-report.pdf>

Jackson, M.; Phelan, C.; Patterson, K. (2016). Lower Duncan River Mosquito Monitoring and Management Plan Development Implementation Year 6. Culex Environmental Ltd.
<https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/environment-sustainability/water-use-planning/southern-interior/ddmon-9-Yr6-2016-10-27.pdf>

Sternberg, M. (2016). Meadow Creek – Duncan Dam, BC Mosquito Development Site Influences. Morrow Bioscience Ltd. Not available Online.