



**Forest
Practices
Board**

Forest Harvesting and Streamflows in the Bonneau Creek Watershed

Complaint Investigation #141149

FPB/IRC/201

March 2016

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The Complaint

On June 4, 2014, the Forest Practices Board received a complaint from a private landowner (the complainant) near Echo Lake, asserting that forest harvesting on woodlot licence W2023, held by Boomer Enterprises Ltd. (the woodlot licensee), was having an adverse impact on streamflows through his private land.

The complainant and his family own a farm on the east side of Echo Lake, about 40 kilometres east of Vernon, BC. Part of the farm, including the main residence and other buildings, is situated on an alluvial fan created by the lower reaches of Bonneau Creek.

The complainant said that the woodlot licensee's forest harvesting in the Bonneau Creek watershed during 2010 increased spring runoff, leading to erosion of stream banks and flooding of farmland, threatening buildings on his property. As well, the complainant said that harvesting has decreased summer low flows downstream from his licensed waterworks, used for irrigation, and the stream is completely dry from mid-summer to early spring (i.e., about 8 months).

The complainant said that, in late 2009, he informed the woodlot licensee of his concerns about the downstream effects of planned harvesting during the review and comment period for the woodlot licence plan. However, the woodlot licensee did not address his concerns.

While the complaint was initially about harvesting on the woodlot in 2010, during the investigation, the complainant said that streamflows had been affected since 2004. Therefore, the investigation was expanded to consider all harvesting in the watershed, including by other licensees, since 2004.

The Board investigated: whether forest harvesting contributed to changes in streamflows; whether licensees considered the potential for those effects before harvesting; and, whether the woodlot licensee's public consultation process for the woodlot licence plan was effective.

Background

The Bonneau Creek watershed is located at the southeast end of Echo Lake, east of Vernon, BC (Figure 1). The watershed is about 2000 hectares in size, mostly on Crown land, except for 153 hectares belonging to the complainant and his family. Denison-Bonneau Provincial Park is located in the headwaters of the watershed and has an area of 136 hectares. Forest harvesting is not permitted in the park.

The complainant has two water licences on Bonneau Creek, used for agricultural irrigation on the private land. He told the Board he obtains drinking water from a well located away from the creek.

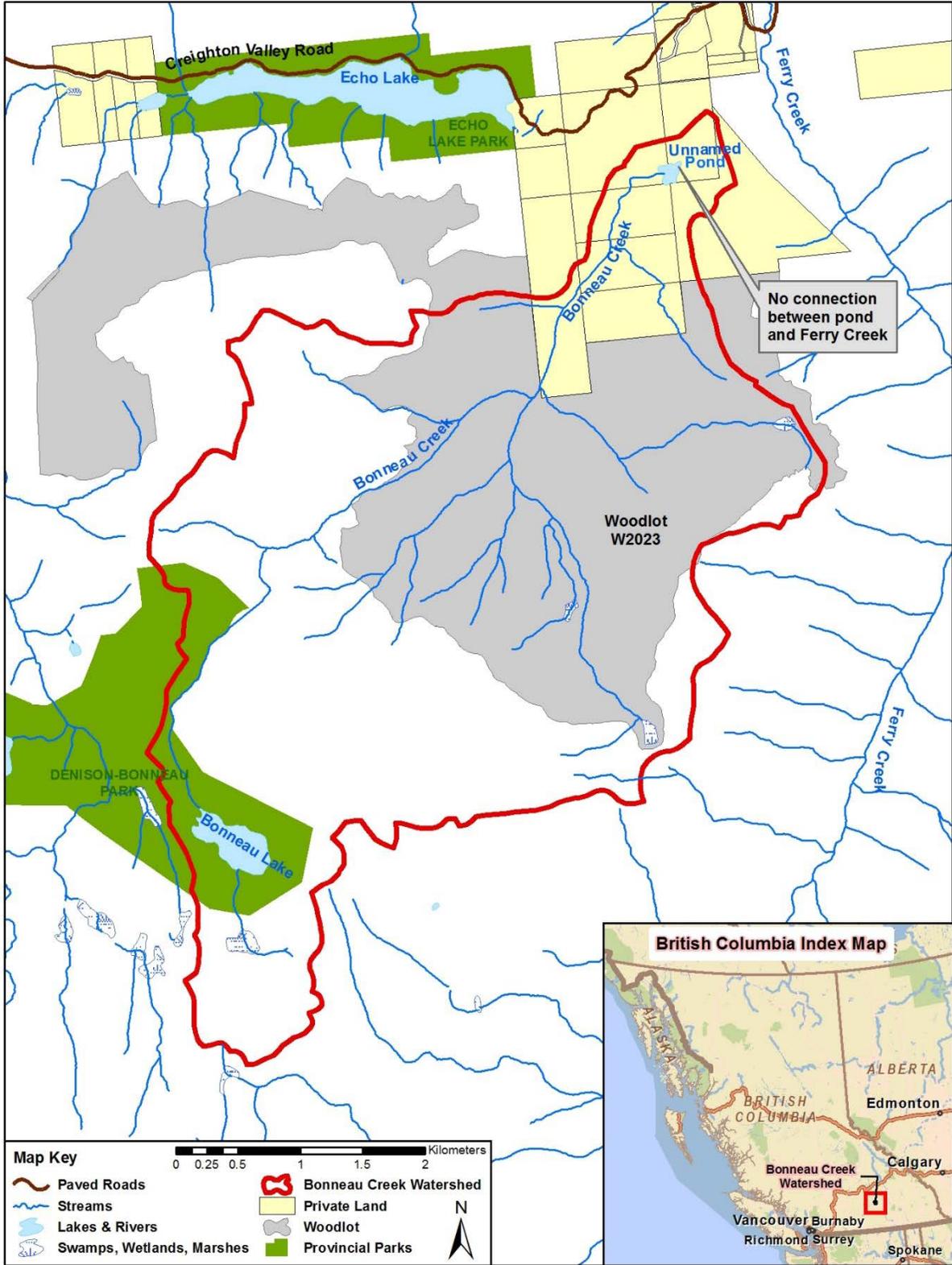


Figure 1. Overview of the Bonneau Creek watershed including woodlot W2023, the complainant's private land and Denison-Bonneau Provincial Park. Harvested cutblock locations are shown in Appendix 1.

Harvesting in the Bonneau Creek Watershed

Tolko Industries Ltd. (Tolko) harvested over 600 hectares in the Bonneau Creek watershed and was the only licensee operating there from the 1960s to 2004. From 2004 to 2011, Tolko salvage harvested an additional 342 hectares of mostly mountain pine beetle (MPB) affected stands in the watershed. Although Tolko has not harvested in the watershed since 2011, it has preliminary plans for two future cutblocks that partially overlap the watershed boundaries.

From 2009 to 2011, two other licensees also harvested in the watershed. Balcaen Consolidated Ltd. held a non-replaceable forest licence (NRFL) and harvested 40 hectares to salvage lodgepole pine affected by MPB. The NRFL expired in 2012. The Ministry of Forests, Lands and Natural Resource Operations (FLNR) awarded woodlot licence W2023 to Boomer Enterprises Ltd. in 2009, of which 860 hectares is within the Bonneau Creek watershed. Between 2010 and 2014 the woodlot licensee harvested 71 hectares in the watershed that was mostly affected by MPB. Additional harvesting is planned over the coming years.

Requirements under the *Forest and Range Practices Act*

Forest Harvesting and Streamflows

Section 48 of the *Woodlot Licence Planning and Practices Regulation* (WLPPR) and section 60 of the *Forest Planning and Practices Regulation* (FPPR) require forest licensees to ensure their practices protect licensed waterworks. This would include the complainant's licensed waterworks used for irrigation.

There are no requirements in FRPA for licensees to specifically address the effects of forest harvesting on private property. There are also no specific requirements in FRPA to manage the effects of harvesting on streamflow, in terms of water quantity or timing of flow, except within a designated community watershed or a fisheries sensitive watershed. Bonneau Creek is neither a designated community watershed nor a fisheries sensitive watershed.

Public Consultation for a Woodlot Licence Plan

Before submitting a woodlot licence plan to government for approval, FRPA requires woodlot licensees to make their plans available for public review and comment for at least 30 days (section 17, *Woodlot Licence Planning and Practices Regulation*). The minister may also require woodlot licensees to refer a copy of their plan to an agency of government or a specific person.

The licensee must review all written comments received during the 30-day period and make any revisions to the plan the licensee deems necessary. The licensee is required to consider the comments received, but not necessarily to change the plan as a result of those comments. When the plan is submitted to government for approval, it must include a copy of the newspaper notice, written comments received from the public during the 30-day period, if any, and a description of any changes made to the plan as a result of those written comments.

Investigation Findings

Focus of the Investigation

Initially, the investigation focused on the complainant's assertion that harvesting by the woodlot licensee caused changes in streamflows that damaged the portion of the Bonneau Creek channel on his private property. However, during an initial examination of the complainant's property on June 20, 2014, the complainant told investigators he has observed changes in streamflows from harvesting dating back to 2004—well before 2009 when the woodlot licence was issued.

Based on this information, it became apparent that, in addition to the woodlot harvesting, other forest harvesting in the Bonneau Creek watershed could be a factor contributing to streamflow-related concerns identified by the complainant since 2004. Consequently, the investigation was broadened and focused on the following questions:

1. Did forest harvesting in the Bonneau Creek watershed cause or contribute to the streamflow-related problems?
2. Were the potential risks associated with forest harvesting on watershed hydrology and streamflows considered by licensees and FLNR?
3. Did the woodlot licensee's public consultation meet requirements and was communication between the woodlot licensee and complainant effective?

Did forest harvesting in the Bonneau Creek watershed cause or contribute to the streamflow-related problems?

Investigators conducted two field examinations on Bonneau Creek. On June 20, 2014, the investigators examined Bonneau Creek where it flows through the lower portion of the complainant's private property, observing areas of active stream bank erosion and channel deposition. Investigators also observed that Bonneau Creek flows into a small pond on the complainant's private land (shown as 'unnamed pond' on Figure 1). There is no surface outflow of water from the pond, indicating the only flow out of the pond is underground. The complainant told investigators that the lower reaches of Bonneau Creek were diverted into the pond about 60 years ago by the previous property owner (the complainant's concerns relate to the portion of Bonneau Creek on his private land upstream from the pond.)

On September 12, 2014, investigators conducted an overview examination of the Bonneau Creek watershed with a FLNR hydrologist and the complainant. The group traversed a 2.5-kilometre section of Bonneau Creek, extending upstream from the pond on the complainant's private land and a further 500 metres upstream on Crown land. Additional segments of the stream channel were observed at random stream crossings on the Crown land portion of the watershed. The field examination also looked at the general status of hydrologic recovery in previously harvested cutblocks and the condition of the complainant's licensed waterworks.

On the Crown land portion of the watershed, there were no apparent indicators of channel disturbance related to peak streamflows immediately upstream or downstream of the random stream crossings assessed, nor along the section of Bonneau Creek that was traversed (Figure 2). However, the FLNR hydrologist noted that a more detailed examination of the headwater and main stem channels would be required to conclude whether harvesting has contributed to channel disturbance on Crown land.

On private land, investigators observed indicators of channel disturbance. These included stream bank erosion (Figure 3); down cutting of the stream channel; and significant amounts of bedload being deposited in some areas. Board investigators also observed that natural riparian vegetation had been cleared, which increases the vulnerability of the channel to such disturbance. The stream channel in the area of the complainant's licensed waterworks is occasionally modified by the complainant to accommodate the intake pipe. As a result, it was not possible to determine if forestry activities were affecting the licensed waterworks.

Investigators also observed that Bonneau Creek gradually dewatered¹ downstream of the licensed waterworks, with no streamflow reaching the pond. This seems to support the complainant's observation that, since about 2004, this section of stream typically dries from mid-summer to the following spring.

Following the field examination, the FLNR hydrologist conducted a GIS (or geographic information system) analysis of the watershed as a whole and its three sub-basins (see map of the Bonneau Creek watershed and sub-basins in Appendix 1). As part of the analysis, the



Figure 2. Several sections of Bonneau Creek on Crown land were traversed, just upstream of the complainant's private land. No indicators of channel disturbance were observed. The channel width at this point is about 2.5 metres.



Figure 3. Evidence of stream bank erosion was observed on most sections of Bonneau Creek that flow through the complainant's private land.

¹ Little to no streamflow is visible because sediment accumulation has elevated the channel bed above the water's surface.

hydrologist provided an estimate of harvested area in the watershed that has not likely reached full hydrologic recovery.ⁱ The hydrologist also provided opinions about the extent of historical and future harvesting, including the potential effects on the hydrology of the Bonneau Creek watershed.²

- Over 60 percent of the total area in the watershed upstream of the private land boundary has been logged since 1965, with harvesting over most of the headwater area in each sub-basin.
- Since all sub-basins have been heavily harvested and full hydrologic ‘recovery’ is limited in many openings, it is most likely that harvesting across the entire headwater portion of the watershed has resulted in hydrologic change. This opinion is consistent with findings in Green and Alila 2012ⁱⁱ, and Winkler et al. 2014.ⁱⁱⁱ
- It is also possible that harvesting has advanced the timing of spring streamflows. As well, during the snow-free season, loss of forest cover over a large area generally results in more rapid streamflow response to rain storms.
- The only remaining ‘buffers’ to hydrologic changes in the watershed are the unharvested woodlot portions of the watershed upstream of the private land and the provincial park.

What is hydrologic recovery?

It is a process by which the hydrologic characteristics of a regenerating forest stand are gradually restored to their full potential in terms of the stand’s capacity to intercept precipitation and modify snow distribution and melt.

The hydrologist’s opinion about advanced timing of peak streamflows supports observations by the complainant that summer flows have decreased. Also, harvesting in the watershed since 2004 likely contributed to increases in the magnitude, frequency and duration of high streamflow events on Bonneau Creek.³ However, the impact of these changes in streamflow on erosion and flooding on the complainant’s private land were likely compounded by the clearing of riparian vegetation and channel disturbance by owners of the private land (the complainant and/or previous owners).

On the Crown land portion of the Bonneau Creek watershed, the hydrologist recommends that forest professionals carefully consider the risks of harvesting on streamflows and downstream values. The need to manage these risks may decrease over time as young stands approach full hydrologic recovery.

² It is important to note that the GIS analysis completed by the hydrologist was preliminary in nature and is not sufficient to base future management decisions. More detailed field review is necessary to validate hydrologic recovery estimates, confirm sub-basin boundaries, identify other contributing or mitigating factors such as the role of wetlands, Bonneau Lake and Dennison-Bonneau Park, the effects of roads and drainage, and channel condition throughout the watershed.

³ Determining the full extent in which forest harvesting has affected streamflows and their effect on private land requires a detailed professional assessment of the watershed including, but not limited to, a review of relevant precipitation, snowfall and other weather records.

Finding

It is likely that the cumulative effects of harvesting by all licensees in the watershed contributed to changes in the timing and magnitude of peak streamflows, and a prolonged period of low streamflows after mid-summer in Bonneau Creek. In part, such changes to streamflow likely contributed to the disturbance of the Bonneau Creek channel on private land. However, historical removal of riparian vegetation, diversion of water and channel disturbance by owners of the private land has also contributed to the problems.

Were the potential risks associated with forest harvesting on watershed hydrology and streamflows considered by licensees and FLNR?

Under FRPA, it is up to individual licensees to consider the potential risks of harvesting on values like water and private property. The Board believes that responsible forest stewardship involves forest professionals routinely considering the risks of harvesting on a variety of values. But *considering* the potential risks does not necessarily mean that comprehensive assessments are required. Rather, it requires forest professionals to be reasonably informed about the values and risks as the basis for deciding whether further assessments are warranted. Being reasonably informed could involve making enquiries with other licensees harvesting in the area, consulting downstream property owners and reviewing publicly available information.

Tolko Industries Ltd.

In 1999, Tolko retained a consultant to assess the potential effects of harvesting on streamflows in the Bonneau Creek watershed using the Interior Watershed Assessment Procedure (IWAP). This procedure is used to identify the type and extent of water-related problems that exist in a watershed, and the possible hydrologic responses to proposed forest harvesting (for the consultant's assessment, proposed harvesting by Tolko up to about 2004 was included). The assessment did not consider the potential effects of harvesting on certain elements at risk, including the complainants licensed waterworks used for irrigation. The consultant's assessment report was published in 1999^{iv} and, in 2006, was posted by government to EcoCat⁴—a publicly available ecological reports catalogue.

The assessment identified some minor sediment production issues on forest roads, some channel instability and sediment production issues on private land near the Crown/private land interface (note: the assessment on private land was done by helicopter only). The report's author concluded that the response of peak streamflows to both existing and proposed harvesting by Tolko was acceptable (at the low end of moderate). Also, the author identified a debris flood/flow originating from a road on private land immediately adjacent to Bonneau Creek and concluded that the most significant problem in the watershed was activities by the landowner on private land in the stream channel and adjacent riparian zone.

⁴ EcoCat can be accessed at <http://www.env.gov.bc.ca/ecocat/>

Tolko told investigators that it used the results of the consultant's assessment to guide harvesting operations in the watershed up to 2011, and that it plans to update the report to guide future activities by adding harvesting completed by other licensees, as well as any other relevant information. Tolko also said that it was not aware of the complainant's concerns about harvesting effects on streamflows (the complainant told investigators he did not communicate his concerns to Tolko). Tolko also commented that none of the other licence holders operating in the watershed or FLNR approached them about available information on watershed hydrology.

FLNR woodlot program

FLNR district staff told investigators that they did not consider the risks of harvesting on streamflows when they were developing the woodlot in the Bonneau Creek watershed and approving the woodlot licence plan. FLNR staff also said Tolko was notified of the plans to establish a woodlot in the watershed, but Tolko did not inform FLNR that it had completed a watershed assessment for the area. The complainant was also aware that the woodlot was being planned but did not inform FLNR of his concerns about it.

FLNR staff in the Okanagan Shuswap district's woodlot program told investigators that, in the future, for all new woodlots, they will search for available information and speak to other licensees about potential issues related to harvesting and watershed hydrology.

Woodlot licensee and NRFL holder

Neither the woodlot licensee nor the NRFL holder considered the potential effects of harvesting in the Bonneau Creek watershed on streamflows. The woodlot licensee told investigators he was not aware that Tolko had completed a hydrological assessment. He also said that neither FLNR nor the complainant raised any concerns about the effects of harvesting on streamflows.

The woodlot licensee told investigators he is now aware of the complainant's concerns about the effects of harvesting on streamflows and committed to retaining a professional to assess the potential risks of future harvesting. The NRFL holder said its licence has expired and it has no future plans to harvest in the watershed.

Finding

Tolko was the only licensee operating in the Bonneau Creek watershed that considered the potential risks of harvesting on watershed hydrology and streamflows.

Did the woodlot licensee's public consultation meet requirements and was communication between the woodlot licensee and complainant effective?

The Board has previously stated that public consultation is most effective when it incorporates eight principles, including early and meaningful efforts at dialogue; providing sufficient, accessible, and understandable information to facilitate dialogue; inclusive consultation with those whose interests are potentially impacted; and continuous communication through the planning and implementation processes.^v

The woodlot licensee published two notices in the local newspaper stating that the woodlot licence plan was available for public review and comment for 30 days. The first notice was published on October 9, 2009, but the due date for receipt of comments was incorrectly identified as May 2007. As a result, the licensee published a second notice in the same newspaper on October 23, 2009, with a due date for receipt of comments of November 23, 2009. The woodlot licensee submitted the plan to government for approval on November 16, 2009. A total of 38 days had elapsed from when the plan was first advertised to when it was submitted to government for approval (October 9 to November 16, 2009).

The complainant told investigators he telephoned the woodlot licensee during the review and comment period and asked to be mailed a copy of the plan. The complainant said he was not provided with a copy of the plan, but was instead invited to review the plan and maps at the woodlot licensee's office.

The complainant said he met with the woodlot licensee at the their office, reviewed some maps and told the licensee his concerns about the effects of harvesting on streamflows and the potential for damage to his property.

The woodlot licensee, on the other hand, told investigators no such meeting took place in his office. He said he did have a phone conversation with the complainant, who made some general comments about harvesting in the watershed. The woodlot licensee said he suggested to the complainant that, if he had concerns about harvesting, to send him those in writing (as stated in the published notice), but he didn't receive anything. No further communications have taken place between the two parties.

It is not possible for investigators to verify whether the complainant communicated his concerns about streamflows to the woodlot licensee. In addition, there is no evidence indicating that the complainant discussed his concerns with any other licensee or FLNR since he first observed issues in 2004.

Finding

The woodlot licensee met FRPA's requirements to provide an opportunity for public review and comment on the woodlot licence plan. However, communication between the woodlot licensee and the complainant was not effective. This is because the parties disagree about what was communicated and nothing was documented.

Conclusions

The complainant is concerned that harvesting in the Bonneau Creek watershed is affecting streamflows. During the spring, the complainant says high streamflows are causing damage to his property and, from mid-summer onwards, the stream is dry downstream of the licensed waterworks. The complainant also said that the woodlot licensee did not address his concerns about streamflows in the woodlot licence plan.

To address the complainant's concerns, the Board investigated the following questions:

1. **Did forest harvesting in the Bonneau Creek watershed cause or contribute to the streamflow-related problems?**

It is likely that the cumulative effects of harvesting by all licensees operating in the watershed contributed to streamflow-related problems. However, disturbance to the riparian area by owners of the private land contributed to the problem.

2. **Were the potential risks associated with forest harvesting on watershed hydrology and streamflows considered by licensees and FLNR?**

Only one licensee operating in the Bonneau Creek watershed, Tolko, considered the potential risks of harvesting on watershed hydrology and streamflows.

3. **Did the woodlot licensee's public consultation meet requirements and was communication between the woodlot licensee and complainant effective?**

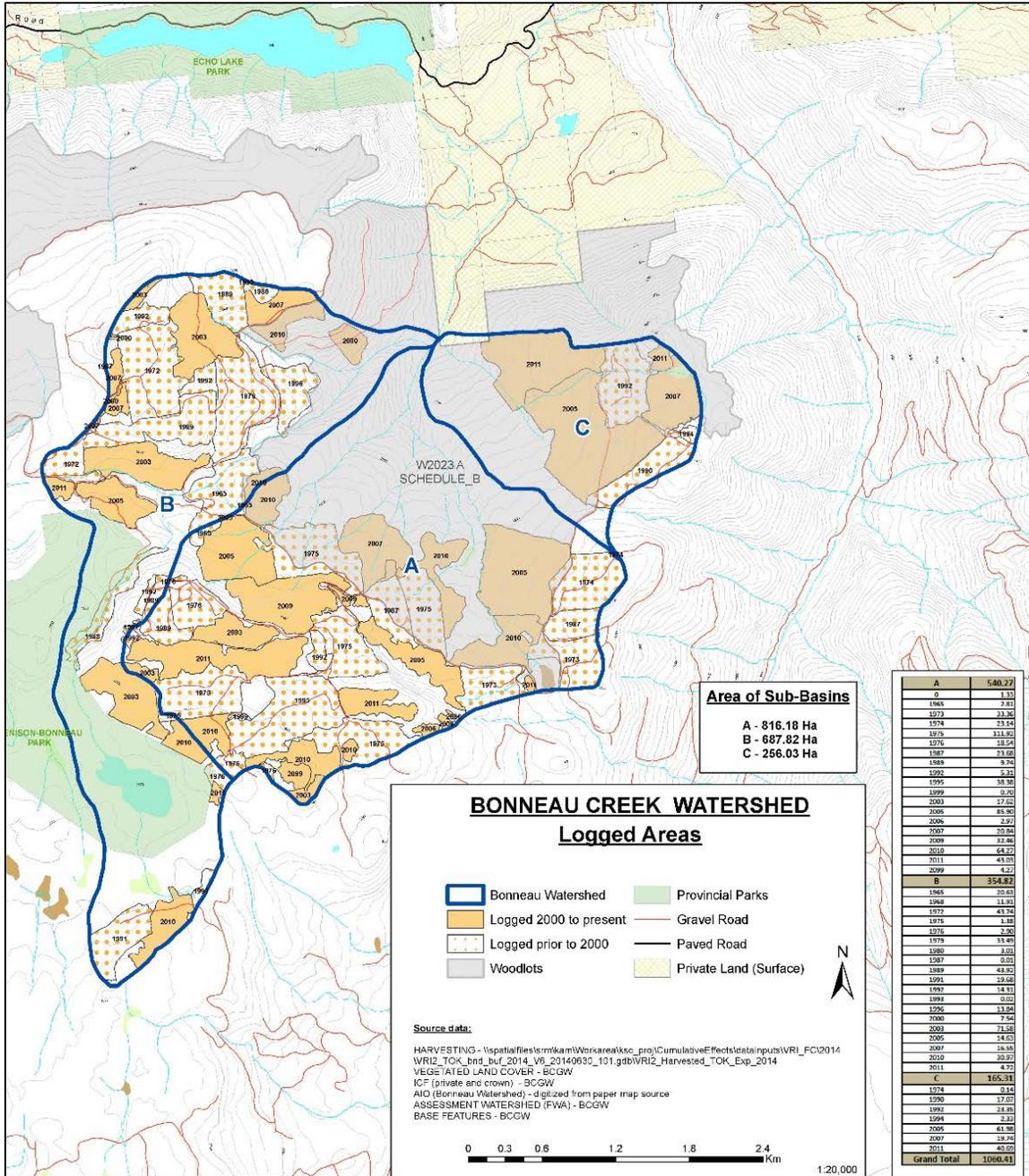
The woodlot licensee met FRPA's requirements to provide an opportunity for public review and comment on its woodlot licence plan. However, communication between the woodlot licensee and the complainant was not effective.

In terms of considering the potential risks of harvesting on streamflows, the Board believes that professionals should ensure they are well informed so they can decide if hydrological assessments are warranted—even in watersheds, like Bonneau Creek, where there are no requirements in FRPA to do so.

A positive outcome in this investigation is that the woodlot licensee has committed to using a consulting hydrologist to help guide future harvesting in his woodlot. The FLNR district woodlot program will also ensure it considers available information on watershed hydrology in areas where it plans to establish new woodlots. And finally, licensees and FLNR are now aware of the complainant's concerns about forest harvesting and streamflows.

Appendix 1 – Harvest History in the Bonneau Creek Watershed

The following map shows the Bonneau Creek watershed upstream of private land, including individual sub-basins and location of areas harvested. The woodlot licensee provided input in refining the location of the sub-basin boundaries and forest inventory within his woodlot area (includes area harvested by the woodlot licensee up to and including in 2014).^{vi}



i The estimates of hydrologic recovery calculated by the hydrologist in the GIS analysis (using data from the VRI database) were based on the assumption that areas logged prior to the year 2000 were either 'partially' or 'fully' recovered in relation to snow accumulation or melt.

ii Green, K. C. & Alila, Y. 2012. A paradigm shift in understanding and quantifying the effects of forest harvesting on floods in snow environments. *Water Resour. Res.* **48**, W10503, doi:[10.1029/2012WR012449](https://doi.org/10.1029/2012WR012449).

iii Winkler, R., S. Boon, D. Spittlehouse and B. Zimonick. 2014. Forest disturbance effects on snow and water yield in interior British Columbia. *Hydrology Research* doi:10.2166/nh.2014.016. In press.

iv EBA Engineering Consultants Ltd. (1999). Interim Interior Watershed Assessment Procedure: Upper Creighton Creek and Ferry Creek. Project 0808-98-90481. Prepared for Tolko Industries Ltd., Lavington BC.

v Forest Practices Board, 2003. Opportunity for Public Consultation under the *Forest and Range Practices Act*. Board Bulletin, Volume 3. Available at <https://www.bcfpb.ca/reports-publications/reports/bulletin-003-opportunity-public-consultation-under-frpa-2003>

vi The woodlot licensee told the Board that, based on his ground-based knowledge of the watershed, the area of the sub-basins calculated by the hydrologist may require refinement. For example, the licensee says that 62 hectares of sub-basin C is outside of the watershed boundary.



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