Forest Practices Board

Salvage Logging and Water Flows at Cooper Creek

Complaint Investigation #110984

FPB/IRC/185

August 2012

Table of Contents

Board Commentary

In dealing with the recent mountain pine beetle epidemic, one objective of government has been to accelerate salvage harvesting as a way to recover economic value from damaged timber and regenerate harvested areas to productive forest as quickly as possible. However, salvage harvesting has created an abundance of recently-logged areas in many watersheds, which has increased potential for unexpected impacts on the landscape and conflict between forest licensees and other Crown land resource users.

As the amount of forest disturbance in watersheds (the 'equivalent to clearcut area' or 'ECA') reaches record levels, forest managers and government should expect to see an amplified need for coordinated, professionally-qualified risk identification and assessment, and, for the cumulative effects of resource use to be managed at the landscape and watershed levels.

This complaint and other Board work continue to illustrate the need for:

- improved knowledge of hydrology in heavily disturbed forested landscapes;
- cautious risk management where the interests of others are likely to be affected;
- coordination of planned forest activities between forest licensees; and
- better approaches to managing the cumulative effects of Crown land use at the landscape and watershed levels.

The Investigation

In March 2011, the Forest Practices Board received a complaint from a rancher that, during the summers of 2009 and 2010, his ranch had run short of irrigation water and out of domestic water. The complainant asserted that salvage logging upstream of the ranch had caused earlier, faster and greater runoff during spring, which damaged ditches and streambanks, removed water from the system, and ultimately led to summer water shortages.

Background

The complainant's ranch is located about 100 kilometres southwest of Williams Lake. The ranch dates to 1917. The complainant, now in his 60s and approaching retirement, purchased the ranch in 1997. The complainant is not aware of any history of severe flooding or water shortages and described summer low stream flows as typically adequate for irrigation purposes.

The complainant has water licences on both Cooper Creek and Ray Creek (a tributary of Cooper) for flood irrigation of the ranch's hay meadows.[1] Two 90-year old ditches carry water from the streams to the ranch, where it is distributed to various meadows through a system of other ditches, swales and dams.

The complainant needs irrigation water through the third week of July to optimize hay growth. If the flow declines early, some hay meadows cannot be irrigated. Normally, the complainant starts to irrigate in June and manages spring runoff by portioning the water between the fields. However, the complainant described spring runoff in recent years as fast, weeks early, and too much for the ditches and Ray Creek to handle, causing flooding, channel change and erosion. The streams at the complainant's ranch flow onto an alluvial fan—a landform generally known as being sensitive to hydrologic disturbance—and nearly a century of private-land use (e.g., ditching and riparian grazing) has likely added to that sensitivity.

Logging upstream of the ranch in the pine-dominated Cooper Creek watershed began in the 1990s. Mountain pine beetle attacked the area in the mid-2000s, killing much of the remaining mature pine. Extensive salvage harvesting of the pine beetle affected stands began in 2006.

Substantive removal or thinning of a watershed's living forest canopy, caused by beetle attack, timber harvesting, or a combination of those or other forest disturbances, can noticeably change the hydrologic conditions of the watershed. A forest in which most of the trees have been killed by pine beetle, but which remains unharvested to fall and decay naturally, still has a moderating effect on hydrology; but removing those dead trees by logging increases the likelihood, and potentially the magnitude, of hydrologic change. However, if rapidly reforested, the harvested areas may hydrologically recover a decade or two sooner than if left unharvested.[2]

[1] The Ray Creek licence includes water for domestic use but the complainant typically gets drinking water from a well.

[2] D. Huggard and D. Lewis, 2007. *Summary of: ECA Effects of Options for Mountain Pine Beetle Salvage – Stand and Watershed Level Reports*, Unpublished Report, Ministry of Forests and Range.

The complainant was not opposed to the initial salvage harvesting, but became concerned in 2007 when the supply of irrigation water declined earlier than usual. In spring 2008, the complainant experienced faster than usual runoff, siltation and reduced quality of domestic water and, by early July, the supply of irrigation water became marginal.

Later in 2008, when Tolko Industries Ltd. (Tolko) proposed to harvest an additional 400 hectares upstream of the ranch, the complainant objected out of concern for his property and livelihood. Tolko and the complainant continued to correspond and Tolko made some changes to its proposal in an effort to help mitigate risk to the complainant, but it would not abandon its plan to log the area.

In mid-July of 2009 and again in 2010, flow from Ray Creek stopped completely for several weeks.

In 2010, BC Timber Sales (BCTS), which also operates in the area, sold about 80 hectares of standing beetle-killed timber from the Cooper Creek watershed upstream of the ranch (BCTS first proposed that harvesting in 2007). The BCTS area is not yet harvested. Tolko completed most of its additional harvesting by May 2011.

During peak flow in spring 2011, Ray Creek changed its channel just upstream of the ranch, causing loss of irrigation control and undesirable flooding of a hay meadow. Also in spring 2011, an increased amount of groundwater seeping from the cut slope of an older road above the ranch made its way to the complainant's Cooper Creek irrigation ditch—enough to irrigate the fields, but with no means of control.

In November 2011, the complainant shut down the Ray Creek irrigation ditch as he usually did at that time of year, but the ditch continued to flow, presumably fed by a rising water table. That water threatened to flood the complainant's farmyard and outbuildings, and so he dug a diversion ditch to flood a hay meadow instead. Since then, that field and another previously dry meadow below the Cooper Creek irrigation ditch, continue to flood (and freeze in winter).

Discussion

1. What was legally required to assess and manage the risk to water from forest activities?

The *Forest and Range Practices Act* (FRPA) requires forest licensees to address specific government objectives in their forest stewardship plans (FSPs). The *Forest Planning and Practices Regulation* (FPPR) contains two government objectives that are applicable to water management in the Cooper Creek and Ray Creek areas:

- The objective set by government for water, fish and biodiversity within riparian areas is, without unduly reducing the supply of timber from British Columbia's forests, to conserve, at the landscape level, the water quality, fish habitat, wildlife habitat and biodiversity associated with those riparian areas.
- The objective set by government for soils is, without unduly reducing the supply of timber from British Columbia's forests, to conserve the productivity and the hydrologic function of soils.

A forest licensee's FSP must either specify a result or a strategy in relation to each objective, or indicate that the licensee will comply with certain default practice requirements (FPPR sections 47 to 53 for riparian and sections 35 and 36 for soils).

FPPR sections 47 to 53 set restrictions that apply to forest practices in riparian management areas; sections 35 and 36 deal with the productivity and hydrologic function of soils, and help to manage water by setting maximum limits on soil disturbance and the amount of permanent access structures. If a licensee specifies a result or strategy in its FSP that differs from a default requirement, and the FSP is approved by government, the licensee is exempted from the default.

The FPPR also contains other practice requirements related to water management that apply regardless of any result or strategy in an FSP. FPPR sections 37, 39, 40 and 55 deal with the prevention of landslides, maintenance of natural surface drainage patterns, re-vegetation of erodible soils, and the construction of stream crossings. Sections 59 and 60(1) require that a forest licensee not allow material harmful to human health to enter water diverted for human consumption by a licensed waterworks and not to damage a licensed waterworks.[3] As well, FRPA section 46 prohibits a person from carrying out a forest practice that causes damage to the environment, unless that person is acting in accordance with a plan, authorization or permit.

So long as a forest licensee complies with the applicable water-related requirements and regulations of FRPA, no further assessment or management of hydrologic impact is compulsory. FRPA does not require a prior assessment of the impact of proposed forest activities on a watershed or licensed waterworks. It is left to the forest licensee to decide whether any hydrologic assessment is necessary in order to understand and address the possible risks of proposed forest activities on a watershed or other downstream values.

2. How did the licensees deal with risks to water and other downstream values?

In 2008, the complainant expressed concern to Tolko and the forests ministry about faster spring runoff, reduced water quality and declining availability of irrigation water in summer. These concerns indicated that the complainant's threshold for undesirable hydrologic change (from all potential causes) had been reached. Under the FRPA framework, it is the forest licensee that decides whether risks arising from its activities are acceptable—there is no government oversight and, other than consultation with the licensee, no meaningful recourse for other Crown resource users or downstream property owners that may be affected.

Tolko: Tolko specified in its FSP a strategy to, with certain exceptions, adhere to the riparian management area, soil disturbance, and permanent access requirements specified in the FPPR. Tolko's FSP requires it to do hydrological assessments within fisheries-sensitive and community watersheds; but neither designation applies to Cooper or Ray Creeks. In general, Tolko applies guidance from the province's chief forester[4] when salvage logging within pine-beetle affected landscapes, and it considers hydrologic issues during its cutblock design process.

[3] "Licensed waterworks" means a water supply intake or a water storage and delivery infrastructure that is licensed under the *Water Act* or authorized under an operating permit issued under the *Drinking Water Protection Act*.

[4] *Guidance on Landscape- and Stand-level Structural Retention in Large-Scale Mountain Pine Beetle Salvage Operations*, December 2005. http://www.for.gov.bc.ca/hfd/library/documents/bib95960.pdf

Tolko did not consult a forest hydrologist to assess the hydrologic risk of its proposed forest activities to the complainant's property or water supply; it was not required to. However, it did consult with the complainant and, in 2008, it conducted an informal 'equivalent clearcut area' (ECA)[5] calculation for the Cooper and Ray Creek watershed area upstream of where the two streams meet on the complainant's property. It calculated the existing ECA of the combined watersheds to be 49.5 percent, increasing to 56.9 percent following the then-proposed harvesting. Tolko considered an ECA of between 40 and 60 percent to be moderate risk for the area.[6] Tolko described the 7.4 percent increase in ECA as minimal and predicted no material change to potential peak flow and water yield. Tolko considered that, in the long-term, salvage harvesting would be beneficial to managing peak flows because the clearcut areas would recover faster hydrologically through replanting than if left un-harvested to naturally recover.

Tolko considered the complainant's concerns about forest harvesting causing water shortages in summer but suggested that the shortages were likely the result of recent hot and dry summers. However, despite that opinion, Tolko planned to address the complainant's concerns by:

- Expanding its retention of forested buffers along Ray and Cooper Creeks.
- Adjusting its cutblock and road locations to meet FRPA practice requirements for community watersheds[7] (neither Cooper nor Ray Creeks are community watersheds).
- Relocating its proposed roads to avoid the complainant's irrigation ditch and to reduce the number of stream crossings from four to one.
- Not harvesting any in-block, non-pine areas greater than 0.25 hectares in size.
- Harvesting during winter to reduce the risk of transferring sediment to the streams (harvesting started in early February 2011 and was mostly completed by early May).
- Promptly deactivating and grass seeding its roads after harvesting.

In 2008, Tolko acknowledged that BCTS had also proposed to harvest beetle-killed timber within the Cooper Creek watershed, but Tolko chose not to include that information in its initial ECA calculations. Tolko regularly shares operational planning information with BCTS, but neither coordinates its planned harvest activities nor assesses risk at the drainage or landscape level with BCTS—there is no requirement to. Using Tolko's figures, the addition of BCTS's proposed cutblock raised the post-harvest ECA to 58.5 percent for the Cooper and Ray Creek watershed area upstream of where the two streams meet on the complainant's property. In a December 2008 letter to the complainant, Tolko described the difference between no harvest and post-harvest ECA as "only 9%."

BCTS: In its FSP, BCTS adopted all but one of the FPPR's default practice requirements for riparian management areas, soil disturbance and permanent access structures. BCTS' FSP

[5] *Equivalent clearcut area* (ECA) is the area that has been harvested, cleared or burned, with consideration given to the silvicultural system, regeneration growth, and location within the watershed.

[6] Tolko described its risk range as a relative opinion based on site specific values such as no fisheries sensitive or community watershed designation, relatively gentle terrain, largely dead pine dominated and a lower snowpack area as compared to many of the eastern watersheds in the Cariboo region.

[7] Essentially, to control the transfer of sediment harmful to human health to water used for human consumption and to not harvest timber or construct roads within 100 metres upslope of a licensed waterworks where water is used for human consumption, unless the forest activities will not increase sediment delivery to the intake.

required it to do hydrologic assessments in some watersheds, but the conditions specified did not apply to Cooper or Ray Creeks. However, BCTS said its cutblock planning process considered the amount of forest development present in the drainage, all comments received during the stakeholder review, and where to optimally place riparian and other tree retention in the harvesting area.

BCTS considered the amount of previous forest development in the watershed by examining available aerial photography, forest cover and forest tenure information. In 2007, BCTS mailed a referral letter to the complainant but did not receive a reply. The complainant explained that, in 2008, he advised the forests ministry about his water supply concern, not knowing that the ministry and BCTS were operating as separate entities. Unaware of any concern, BCTS decided that the small area it planned to harvest was not significant to the Cooper Creek watershed, so it did no formal assessment of the risk to water or other downstream values. BCTS did not deal with Tolko to coordinate planned harvest activities or assess risks at the drainage or landscape level—it was not required to.

In August 2011, BCTS consulted a forest hydrologist to help identify whether more of the Cooper Creek watershed could be harvested. The consultant considered whether peak flow changes from further harvesting might impact fish habitat in the lowest reaches of Cooper Creek. The review classified 61 percent of the watershed as 'hydrologically equivalent disturbed area.'[8] This resulted in an extreme peak flow hazard rating but, because of the physical and climatic nature of the watershed, the risk of increased peak flows to fish habitat was low. The consultant concluded that some well-planned additional harvesting could be conducted. The assessment did not consider or acknowledge whether the complainant's private property or licensed waterworks might be sensitive to further hydrologic change, as this was not the objective of the assessment.

To sum up, neither licensee assessed the sensitivity of the stream channels—or the complainant's property, waterworks or ranching operation—to increased peak flows or any other potential change in hydrology; they were not required to. Both licensees complied with the water-related requirements of FRPA[9] and their respective forest stewardship plans as a way to deal with risks to water and other downstream values. Tolko went beyond legal requirements by planning its harvesting and roads in Ray Creek as if it were a community watershed, and by applying other strategies intended to reduce risk to the complainant. BCTS did not consider its proposed harvesting to be a hydrologic risk to water or other downstream values.

3. What was the likely cause of reduced streamflow in 2009 and 2010?

Flow in a stream is a function of the balance between precipitation, evaporation, transpiration, soil moisture and groundwater storage and release. In a forested watershed, disturbance of forest stands due to timber harvesting, severe fire, or beetle attack can influence these factors

[8] A hydrology concept similar to ECA.

[9] To the extent assessed by the Board investigator; not all forest activities are completed. For example, the BCTS cutblock is not yet harvested and Tolko has not finished deactivating its roads.

and consequently affect streamflow. Studies in BC and elsewhere indicate that removal of the forest canopy from 20 percent or more of a watershed area can measurably increase:

- snow accumulation
- timing and rate of snowmelt
- peak flows
- soil moisture
- (potentially) groundwater levels[10]

In general, water managers consider that more water will be available year-round as runoff following significant forest disturbance. Summer low flow volumes are generally found to increase or not to change with forest cover removal,[11] [12] but there are some factors that could influence summer streamflow and potentially lead to water shortages:

Drought: Changes in precipitation, both long- and short-term, can affect runoff and aquifer storage and thus summer streamflow. Unfortunately, there is no weather data specific to the Cooper and Ray Creek area. The closest data is from Williams Lake (100 kilometres northeast), Riske Creek (61 kilometres northeast) and a neighbouring ranch (about 25 kilometres north). While these are the best available data, they may not accurately represent the weather in Cooper and Ray Creeks.

Precipitation at Williams Lake was near average in 2009, but 2010 was the fifth driest on record (1961-2011) and the driest year of the past twenty (299 millimetres compared to an average of 435 millimetres). Summer precipitation[13] at Williams Lake was well below average in both 2009 and 2010 (104 and 100 millimetres compared to an average of 150 millimetres). At Riske Creek, 2006, 2008, 2009 and 2010 were four of the six driest summers on record (1980 to 2011), with between 60 and 70 millimetres each, compared to an average of 129 millimetres. Data from the neighbouring ranch indicated that 2008, 2009 and 2010 were the driest of the six years recorded (2006 to 2011). Precipitation at the nearby ranch in 2011 was about average (313 millimetres compared to an average of 306 millimetres).

The complainant acknowledged that recent years prior to 2011 have been generally dry with reduced rain and snow, but noted that in 2009 and 2010 only two area streams dried out and both had a history of recent and extensive salvage harvesting in their watersheds. Streams in other watersheds, not recently harvested, continued to flow. Though not all streams behave similarly, summer streamflow in monitored streams west of Williams Lake declined over the past few years—an indicator of drought conditions.[14]

---

[10] R. Winkler et al, 2008. *The Upper Penticton Creek Watershed Experiment: Integrated Water Resource Research on the Okanagan Plateau*, In: One Watershed-One Water Conference Proceedings, Kelowna, BC, October 2008.

[11] R. Pike and R. Scherer, 2003. *Overview of the potential effects of forest management on low flows in snow-melt dominated hydrologic regimes*, BC Journal of Ecosystems and Management, Vol. 3, No. 1

[12] Uunila, L, B. Guy and R. Pike. 2006, *Hydrologic Effects of Mountain Pine Beetle in the Interior Pine Forests of British Columbia: Key Questions and Current Knowledge*. Streamline. Watershed Management Bulletin vol.9 (2).

[13] Summer precipitation includes the months of June, July and August.

[14] MFLNRO, Williams Lake.

Reduced Ground Infiltration of Rainfall and Snowmelt: Soil compaction or disturbance, accelerated snowmelt, and soil frost could redirect and reduce infiltration of rainfall and snowmelt causing it to runoff instead of recharging soil moisture and area aquifers.

Tolko's recent road construction and harvesting practices were within FRPA's limits for soil disturbance. BCTS' timber sale is not yet logged. The complainant reported earlier and more rapid snowmelt. Clearcut openings tend to accumulate more snow and melt earlier and more rapidly than treed areas. Should the top soil layers become saturated by meltwater during rapid snowmelt, the ability for water to infiltrate the soil would be reduced and further meltwater might run off. Similarly, an unusually low snowpack could increase the extent and depth of frozen ground (through lack of insulation) and thus an early thaw could result in available snowmelt running off rather than soaking into the ground.

Changes to Natural Drainage Patterns: If natural drainage patterns were disrupted in the watershed such that water normally held in the soil was intercepted (e.g., by road cut slopes and ditches) and discharged from the drainage early, less water might be available during low flow periods.[15] Section 39(1) of the FPPR requires a forest licensee to maintain natural surface drainage patterns during and after construction of roads and other access structures. There was some minor interception of groundwater by road cut slopes but, overall, recently built roads were constructed properly with regard to the installation of culverts and subsequent deactivation. At the time of review, some roads were active but shut down due to inclement weather. Tolko intends to complete its Ray and Cooper Creek road deactivation (and grass seeding) measures in 2012. Roads within the BCTS timber sale cutblock in upper Cooper Creek are not yet built.

Water Extraction: If a large amount of water were extracted from the watersheds upstream of the complainant's water intakes, water availability at the ranch could be reduced. The complainant is the only water licensee in the area. There is no indication that any other major water extraction occurred.

Stream Channel Change: Changes to the stream channel, such as aggradation, widening or other erosion could affect water depth. Channel aggradation occurs when materials deposit in the stream channel. If the material is sufficiently porous, flows may go subsurface. If not, the stream channel may overfill and widen, ultimately reducing water depth as flows return to seasonal normals. The complainant reported some siltation and bank erosion at the ranch starting in 2008, but no substantive stream channel changes were obvious to the complainant in either stream prior to Ray Creek changing its course in 2011.

Forest Re-growth: Some hydrologists consider that the use of soil moisture by vigorously growing trees in areas recovering from extensive disturbance may be sufficient, in some circumstances, to depress stream low flows. However, there is no indication this has happened in either the Cooper or Ray Creek watersheds.

[15] Carver, M, 2001. *Using indicators to assess hydrologic risk.* In: Watershed Assessment in the Southern Interior of British Columbia: Workshop Proceedings, Penticton, March 9-10, 2000. Ministry of Forests working paper 57.

To review; many hydrologists describe climate as the primary variable affecting streamflow. During dry periods, less water is available to runoff or infiltrate to groundwater and so, in time, streamflow declines. Indications are that the Cooper and Ray Creek area was in drought-like conditions leading up to and including the water shortages.

Drought conditions aside, defoliation by mountain pine beetle and salvage harvesting should make more water available in the system, not less.[16] However, under the appropriate conditions, accelerated snowmelt in harvested openings could cause early water loss from the system, reducing the amount available to infiltrate the soil. During years of 'normal' precipitation, the effect of reduced infiltration on groundwater supply might be masked by the increased soil moisture made available through reduced interception and water uptake by live trees. But in a drought situation, there would be little or no additional input of precipitation and an earlier loss by accelerated runoff would potentially compound the problem of declining groundwater. Unfortunately, there is no way to know what occurred with soil infiltration at Cooper and Ray Creeks, but there is sufficient uncertainty to acknowledge the possibility that soil moisture recharge was reduced.

On balance, a series of dry years likely depleted available soil moisture and groundwater, resulting in reduced summer streamflow in 2009 and 2010. Salvage harvesting may have compounded the problem by increasing the potential for accelerated runoff, further reducing the amount of replenishing input to soil moisture and groundwater that would otherwise have been available to support later streamflow.

4. What is the expected effect of beetle attack and salvage harvesting on stream hydrology at the ranch?

Studies in BC and elsewhere indicate that removal or thinning of the forest canopy through fire, beetle attack or clearcut harvesting increases snow accumulation, advances the timing and rate of snowmelt, increases peak flows and—because there are no longer live trees that use the water—raises soil moisture and potentially groundwater levels.[17] In 2008, the complainant indicated that his threshold for undesirable hydrologic consequence had been reached. Though the complainant did not know it at the time, ECA above the ranch in 2008 was approaching 50 percent.

Many hydrologists consider ECA an effective indicator of forest disturbance and thus one factor in assessing the risk of hydrologic change in a watershed. The higher the ECA, the greater the probability of measureable change in streamflow. The Board investigator confirmed that the current ECA above where Ray Creek meets Cooper Creek, including the effect of beetle-killed standing pine, is now in excess of 50 percent in each stream sub-basin (52 to 60 percent depending on the basin). Another tributary, one that enters Cooper Creek just downstream of Ray Creek, but that also influences streamflow and flooding at the ranch, has a current ECA of 70.5 percent. ECA above the ranch will continue to increase as the beetle-killed trees decay and

[16] Through increased snow accumulation and reduced water use by live trees.

[17] R. Winkler et al, 2008. *The Upper Penticton Creek Watershed Experiment: Integrated Water Resource Research on the Okanagan Plateau*, In: One Watershed-One Water Conference Proceedings, Kelowna, BC, October 2008.

topple. Any additional harvesting or other unexpected disturbance will hasten and expand the ECA further.

Clearcut harvesting causes an immediate and maximal increase in ECA and thus increases the probability, and potentially the magnitude, of hydrologic change over pre-harvest conditions. Natural forest regeneration and the growth of planted trees will offset this increase in time and thus reduces the risk of undesirable hydrologic effects, but full recovery can take several decades.[18]

A recent study of a watershed in south central BC that lost 50 percent of its forest cover to wildfire indicated that, as expected, annual water yield increased and peak streamflow came earlier. Unexpectedly, the return to low streamflow also occurred earlier and summer low flows were lower than before.[19] This is not typical; other BC research has indicated that low streamflows are either maintained or increased following forest disturbance. Another study of a different watershed, also in south central BC, modelled a 50 percent ECA using computer simulations. That study determined that the frequency of floods previously expected every ten years were doubled, while floods expected every 100 years became at least five times as frequent. That modelling study also found that the larger the flood, the more its magnitude was increased by forest disturbance.[20]

Other than reduced summer low flows and Ray Creek going dry during the summers of 2009 and 2010, the complainant's observations of earlier, increased and faster peak flows, erosion and bank damage, increased soil moisture, and a rising water table are consistent with published research results on expected impacts to watershed hydrology after extensive beetle attack and salvage harvesting. The complainant's description of earlier and reduced summer low flow is consistent with one as yet unpublished study where the amount of forest disturbance was apparently similar to that of Cooper and Ray Creeks.

Conclusions

The higher the ECA, the greater the probability of measurable change in streamflow. Though the complainant did not know it at the time, when he indicated in 2008 that his threshold for undesirable hydrologic consequence had been reached, ECA upstream of where Cooper and Ray Creeks meet on the ranch was approaching 50 percent. The complainant's ranch includes an alluvial fan, a landform generally known as sensitive to hydrologic disturbance, and nearly a century of private-land ranching (e.g., ditching and riparian grazing) had likely made the streams there all the more sensitive to peak flow increases.

[18] D. Huggard and D. Lewis, 2007. *Summary of: ECA Effects of Options for Mountain Pine Beetle Salvage – Stand and Watershed Level Reports*, Unpublished Report, Ministry of Forests and Range.

[19] Pers. Comm., Philip Owens, UNBC, regarding an as yet unpublished study of Fishtrap Creek, north of Kamloops.

[20] Kuras′, P. K., Y. Alila, and M. Weiler (2012), Forest harvesting effects on the magnitude and frequency of peak flows can increase with return period, Water Resour. Res., 48, W01544, doi:10.1029/2011WR010705

However, despite these indicators of hydrologic sensitivity downstream, neither forest licensee undertook to obtain a professionally-qualified assessment[21] of the risk further harvesting might pose to the complainant's property and livelihood—FRPA did not require it.

Both licensees met FRPA's water-related legal requirements. BCTS did not perceive any potential risk to the complainant. Tolko informally considered the possibility and took some protective steps, but decided that mountain pine beetle had already had a serious effect and that hydrologic recovery would be faster if it cut and planted rather than left the watershed to recover naturally. Long-term watershed recovery is cold comfort to the complainant, who, in his 60s and looking toward retirement, is more concerned about the immediate impact of salvage harvesting on his property value and assets.

Reduced summer streamflows at the ranch in 2009 and 2010 were likely the result of depleted soil moisture and groundwater following a series of dry years, but salvage harvesting may have added to the problem by increasing the potential for accelerated runoff. The earlier, increased and faster peak flows, erosion and bank damage, increased soil moisture, and rising water table are consistent with published research results on expected impacts to watershed hydrology after extensive beetle attack and salvage harvesting.

The complainant's business and property faced an almost certain likelihood of significant hydrologic change (e.g., flooding) from prior beetle attack in the watershed, to be compounded to some degree for some time by extensive salvage harvesting. With so many shifting environmental variables, quantifying the contribution of salvage harvesting to hydrologic change at the ranch is impractical (i.e., it is impossible to assess accountability), but it is reasonable to conclude that salvage harvesting added to the likelihood, and possibly the magnitude, of change.

It was the forest licensee's decision that additional salvage harvesting was the best forest management option in the circumstances. One result of that decision is that the complainant faces the possibility of several decades of added incremental and uncertain water problems.

The ECA above the ranch now ranges from 52 to 60 percent depending on the stream sub-basin.[22] The complainant had no say in that outcome and no place to appeal the licensees' management decisions. From the complainant's perspective, salvage harvesting has made a bad situation worse. From Tolko's perspective, salvage harvesting did not significantly contribute to changing stream flows. In the Board's view, as the amount of forest disturbance increases in a watershed, so does the importance of licensees taking care to identify factors at risk and to consider when to conduct professionally-qualified hydrologic assessments that take full account of those values.

[21] For example; an assessment including a field reconnaissance by a professional forest hydrologist.

[22] ECA in another tributary stream that enters Cooper Creek downstream of Ray Creek but that also influences streamflow and flooding at the ranch has an ECA of over 70 percent.

PO Box 9905 Stn Prov Govt
Victoria, BC V8X 9R1 Canada
Tel. 250.213.4700 | Fax 250.213.4725 | Toll Free 1.800.994.5899
For more information on the Board, please visit our website at: www.fpb.gov.bc.ca