

# Timber Harvesting Impacts on Water Flows near Clearwater

Complaint Investigation #15022

FPB/IRC/199 March 2016

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## Introduction

#### **The Complaint**

On May 10, 2015, the Forest Practices Board received a complaint from the owners of the Sunset Village Mobile Home Park (the complainant) near Clearwater, about the impacts of timber harvesting by the Wells Gray Community Forest Corporation (the community forest) on the mobile home park.

Following timber harvesting, the complainant noticed more water than usual coming out of a cutbank beside several mobile homes. The water collected around and under some of the homes and the storage yard. He was concerned the increased flows were the result of timber harvesting by the community forest on the hillside above the property.

The complainant was also concerned that the Ministry of Forests, Lands and Natural Resource Operations (FLNR) had cut off access to the Star Lake Road above the cutblock, which local residents had enjoyed for many years, when it constructed a cross ditch on the road to manage the increased water flows.

#### Background

The Wells Gray Community Forest Corporation is owned and managed on behalf of the citizens of Wells Gray area and operates under the direction of a Board of Directors. The community forest was incorporated in September 2004 and forestry operations began in 2006. It has an allowable annual cut of 31 000 cubic metres.

The community forest conducts activities on three operating areas around Clearwater. The operating area involved in this complaint investigation is located about five kilometres west of Clearwater, northwest of the old North Thompson Highway (Figure 2). The hydrology on the hillside has been modified over time by licensed and un-licensed water diversions, beaver dams and many legacy roads and excavated trails within and on the slopes below the community forest's operating area.

The Star Lake Road traverses the hillside above the mobile home park, through private property and up into the community forest. The road was constructed in the 1960s and its historic use is well established. The road is used primarily by locals to access their water system and for recreational activities. The road surface is in poor condition and has not been maintained for about 10 years. It is a single lane road with grades up to 12 percent, an intermittent ditch line, a few waterbars near where the road leaves the mobile home park, and a running surface that is gradually being eroded by water.

In the summer of 2013, the community forest proposed development of a 33.9-hectare cutblock—the first cutblock developed by the community forest within this operating area. The cutblock is located about 300 metres upslope of two mobile home parks and above a private residence (Figure 2). The community forest accessed the cutblock from the north by re-constructing old roads, which allowed it to avoid using the Star Lake Road below the cutblock. To use the Star Lake Road would have required re-construction and upgrades through the private land section and hauling logs through private land and the mobile home park, creating a greater liability for the community forest. The cutblock was harvested between January and June 2014.

In late-winter and spring 2015, three hydrologic events occurred on the area downslope of the harvested cutblock. In February 2015, two small landslides occurred on the hillside just to the north of the mobile home park. Around the same time, the old North Thompson Highway at the bottom of the hillside, adjacent to the mobile home park, flooded. Also in February, the complainant noticed the increased water flows out of the cutbank located beside the complainant's mobile home park (Figure 1). The water seeped under a few of the mobile homes and saturated the mobile home park's storage area.

The landslides were reviewed by FLNR regional geomorphologist, and a consulting geotechnical engineer and a consulting hydrologist hired by the community forest. Reports prepared by FLNR, the engineering firm and the hydrologist concluded that the landslides resulted from a combination of a rain-on-snow event, above-normal temperatures and recent harvesting. The reports also included recommendations, which, if implemented, would mitigate the potential for future landslides.

The complainant filed a complaint in May 2015. Board investigators visited the site on June 2, 2015, and again on August 12, 2015, with a professional hydrologist hired to assist with the investigation.



**Figure 1**. Subsurface flows from infiltration seeped out through openings such as this one in the cut bank beside the mobile home park (piping). The opening shown here is about 20 centimetres x 10 centimetres.



**Figure 2.** Overview of the roads, harvesting and other development features contributing to the hydrologic processes in the area. The cutblock slopes in a south easterly direction.

# **Investigation Results**

In order to address the complainant's concern, Board investigators looked at the hydrology of the hillside and considered how logging may have affected water flows. Although the complaint was not about the landslides and flooding of the highway that occurred, these events may be related to the water flows and hydrology on the hillside, and the investigators considered them as part of the investigation.

In terms of the specific complaint issues, the Board investigated the following questions:

- 1. Did the logging increase water flows and contribute to the water seepage at the mobile home park?
- 2. Did the community forest adequately consider and manage the risks of damage from water flows, and did it meet legal obligations under the *Forest and Range Practices Act*?
- 3. What happened to the residents' access to Star Lake Road?

# Did the logging increase water flows and contribute to the water seepage at the mobile home park?

Studies have shown that forest canopy removal increases snow accumulation, snowmelt rates and total water yield in watersheds.<sup>i</sup> In this instance, there were a number of additional contributing factors that may have increased subsurface water flows at the mobile home park: harvesting, rain-on-snow and above normal temperatures, permeability of Star Lake Road and subsurface flows from an intermittent pond and elongated depression.

The community forest started harvesting in January 2014 and finished in June. The following winter, the area experienced a rain on snow event and warmer than normal temperatures. These events caused an increase in snowmelt rates and overland flow, which filled the intermittent pond in the cutblock and a 175-metre long depression connected to the pond. The water from the pond eventually spilled over its banks, running down an old man-made channel onto Star Lake Road, and travelled down the road.

The Star Lake Road runs at a continuous grade from the cutblock for 500 metres, where it crosses the hillside about 300 metres upslope of the complainant's mobile home park. The road was constructed 50 years ago and there are no cross drains on the road beyond the mobile home park, so water accumulates and flows down the road surface. The fill of the road is a mixture of large rock, soil and bedrock, and likely is sufficiently permeable to drain surface runoff. This, coupled with any diversion of water off the road onto the ground above the complainant's mobile home park, may have contributed to the higher than average seepage observed by the complainant.

The complainant observed higher than normal seepage into May, after the snow on the hillside had melted and the water from the pond stopped running down the road. This may imply that some or all of the increased seepage could be attributed to subsurface flows from the intermittent pond and elongated depression. However, according to the hydrologist hired by the Board, a detailed geotechnical investigation of the entire hillside would be required to determine, with any certainty, if the water moved from the intermittent pond and elongated depression downslope to the mobile home park through subsurface pathways. In the absence of such information, it is reasonable to

assume that subsurface flow paths would follow similar paths as the slope of the ground surface.<sup>1</sup> In this case, there were no natural surface drainage patterns linking the cutblock to the complainant's mobile home park.

The general manager of the community forest told the Board that the water diversions and beaver dams may also be contributing factors. However, there have been no documented changes to the diversion system or the beaver ponds in several years and the first time the flooding of the highway and the seepage at the mobile home park occurred was after the harvesting by the community forest.

Although there were a number of factors that may have affected the subsurface flows at the mobile home park, the Board did not speculate on the relative significance of each factor or the likelihood of similar factors occurring together in the future.

#### Findings

The harvesting by the community forest contributed to the increased water flows on the hillside, but the Board could not conclude that the increased flows led to the water seepage at the mobile home park.



**Figure 3.** The pond partially filled with water in June 2015. The yellow arrows show the high water line in February 2015. In August 2015 the pond was dry.

<sup>&</sup>lt;sup>1</sup> Scherer, R., Ph.D, P.Eng, Complaint Investigation 15022 – *Hydrology Review above the Sunset Village Mobile Home Park*, August 2015.

# Did the community forest adequately consider and manage the risks of damage from water flows, and did it meet legal obligations under the *Forest and Range Practices Act*?

#### **Management of Risk**

There is a general expectation in BC that forest licensees will adequately manage the impact of proposed harvesting and road construction activities on other resource users and values within and outside a cutblock boundary. Licensees' forest professionals are expected to use specialists when necessary to assess the risk of development on other resource values and to provide advice to minimize impacts. However, there are no set guidelines to determine when a forest professional will seek input from other experts. This decision is largely dependent on the forest professional's knowledge, experience and willingness to seek advice from others.

In situations where there is a potential for an adverse impact to occur and the consequence of the impact is high, forest licensees should take a conservative approach and complete an assessment of the development. However, it is also important to recognize that risks associated with forestry activities can only be minimized, not eliminated.

The community forest regularly uses specialists to assist in operational planning for its operations. In this instance, it did not obtain a formal hydrological assessment for several reasons.

- There were no streams on the cutblock and the general topography within the block is broken with a few small ridges, exhibiting no defined natural drainage patterns.
- An eight-hectare wildlife tree patch had been established around the intermittent pond and a buffer of mature windfirm timber was reserved along the top of the escarpment above Star Lake Road.
- The mobile homes were more than 300 metres downslope from the cutblock and 150 metres downslope from Star Lake Road.

Based on these factors, the community forest did not anticipate any hydrologic impacts on the mobile homes downslope. In the Board's view this was reasonable.

In hindsight, redirection of water by Star Lake Road may have been one of the major factors contributing to the increased seepage in the cutbank adjacent to the mobile homes. However, the community forest does not have jurisdiction to maintain the portion of the Star Lake Road on private land.

The Board investigators and the consulting hydrologist reviewed the geotechnical and hydrological reports prepared after the landslides, but could not determine the contribution harvesting of the cutblock made to the excessive seepage. Therefore, it is unlikely that the increased seepage from the cutbanks adjacent to the mobile homes could have been foreseen.

Since the landslides occurred, the community forest has been implementing the recommendations in the reports prepared for it by the consulting geotechnical engineer and hydrologist. These actions include:

- Inspecting the portion of Star Lake Road on the community forest operating area.
- Completing remedial work in May 2015 on the road sections above the cross ditch.

- Notifying the Ministry of Transportation and Infrastructure (MOTI) that the shoulder of the Star Lake Road at the landslides may be a public safety issue and should be repaired.
- Notifying MOTI that the drainage along the Star Lake Road leading up to the community forest should be assessed and drainage control measures should be implemented.

In addition, the community forest has committed to:

- reviewing the operating area above Star Lake Road with a geotechnical engineering firm;
- reviewing all future cutblock development and road deactivation plans with a hydrologist; and
- conducting round table meetings with local landowners for any future development in this operating area or when adjacent to private land residences.



**Figure 4.** Continuous grade of Star Lake Road. Note the lack of drainage control and minor erosion of the running surface.

#### Findings

- The community forest's assessment and management of the risks associated with the development was reasonable, considering the site conditions, observed patterns of water flow and the complexity of past development and ownership on the hillside.
- After the landslides occurred, the community forest took appropriate steps by starting to implement the recommendations contained in the reports prepared by the consulting geotechnical engineer and hydrologist.

#### **Compliance with Legal Obligations**

There are two relevant sections in the *Forest Planning and Practices Regulation* (FPPR) that apply in this case:

- Section 37 of the FPPR requires licensees to ensure that their practices do not cause landslides that have a material adverse effect on soils, water and other forest resources.
- Section 39 of the FPPR requires licensees to maintain natural surface drainage patterns on the area both during and after road or temporary access construction.



**Figure 5.** Water flowing from the pond down the man-made channel in February 2015. The pond is out of sight at the top of the photo near the tree line.

#### Section 37, FPPR

The specialists' review of the landslides that occurred following harvesting indicated that the harvesting was one of three main contributing factors. There were no cross ditches on Star Lake Road, so the water from the pond and other sources ran down the road until ice redirected it off the road onto steep slopes, where the landslides initiated. Section 37 of the FPPR requires licensees to ensure that their practices do not cause landslides that have a material adverse effect on soils on Crown land. The phrase "must ensure" means that a person must take positive steps to make certain of these outcomes, including putting a system of checks and balances in place. In this case, the positive steps included an eight-hectare wildlife tree patch established around the intermittent pond and a buffer of mature windfirm timber reserved along the top of the escarpment above the Star Lake Road. An assessment of hydrological risk by a qualified professional was not completed; a reasonable decision at the time in the Board's opinion, considering the lack of streams on the cutblock and the generally dry conditions in and around the cutblock.

Even though the two landslides occurred, in the Board's view, the slides did not have a material adverse effect. There is no definition of material adverse effect in the legislation, but the effect on soil must be both adverse and material, and not every adverse effect will be material.<sup>2</sup> The landslides were approximately 80 metres and 95 metres in length and both about 15 metres in width. The Board investigators estimated that the total area of Crown land impacted by the slides is about a third of a hectare. The landslides did not impact riparian features or other identified resource features on Crown land.

#### Section 39, FPPR

There are no streams or wetlands on the cutblock and the community forest established a wildlife tree patch around the intermittent pond and retained a buffer along the escarpment above the Star Lake Road. The man-made channel draining water away from the pond is less than 100 metres in length and is not classified as a stream.<sup>3</sup> The community forest did not construct any roads that would impact this feature. The Board investigators observed that natural drainage patterns were maintained on roads re-constructed by the community forest.

#### Findings

- Section 37 of the FPPR was met. In the Board's opinion the community forest's management of risks on the hillside was reasonable at the time to "ensure" that their practices would not cause a landslide. Although harvesting was a contributing factor, the Board investigators did not determine that the landslides had a "material" adverse effect on soils on Crown land.
- Section 39 of the FPPR was met, since the community forest maintained natural surface drainage patterns during and after road re-construction.

<sup>&</sup>lt;sup>2</sup> Guidance to C&E Program staff and delegated decision makers on interpreting the words "material adverse effect" and

<sup>&</sup>quot;material adverse impact". December 2009. https://www.for.gov.bc.ca/ftp/hen/external/!publish/web/bulletins/ceps40.pdf

<sup>&</sup>lt;sup>3</sup> The *Forest Planning and Practices Regulation* defines a stream as "...a watercourse that contains water on a perennial or seasonal basis, is scoured by water or contains observable deposits of mineral alluvium, and that has a continuous channel bed that is 100 m or more in length, or flows directly into a fish stream, a fish-bearing lake or wetland, or a licensed waterworks..."

#### What happened to the residents' access to Star Lake Road?

Following the two landslides that occurred off Star Lake Road, a geotechnical engineer working under contract to the community forest recommended that Star Lake Road be cross ditched just below the switchback in the cutblock to drain water away from the road, onto a small bench and then over an escarpment, to prevent further landslides. However, it wasn't clear to the community forest who had responsibility for the road.

When the community forest was developing the area for harvesting, it assumed that Star Lake Road was a non-status road, meaning no one had responsibility for maintaining it.

Although responsibility for the road was unclear, FLNR went ahead and upgraded the old man-made channel from the pond and constructed a cross ditch across Star Lake Road to drain the water. When FLNR constructed the cross ditch, it also inadvertently restricted access for the local residents.

When the Board investigators visited the site in June 2015, someone had installed a culvert in the cross ditch and backfilled it, re-establishing access for the local residents.

The community forest and the Board have since determined that the road is the responsibility of MOTI. MOTI maintains roads based on the estimated vehicle use per day. MOTI maintains the portion of Star Lake Road that services the mobile home park, but does not maintain it to any explicit standard past the mobile home park because of its low use. In addition, MOTI only manages the running surface on the private land portion, so any alteration of the subsurface, ditch line or the cut and fill slopes would require approval of the private land owner, and an agreement on who would carry liability for any work completed.

The Board investigators contacted MOTI and were told the ministry was planning to have one of its specialists review the site. MOTI acknowledged that Star Lake Road is its responsibility and therefore, it wanted to confirm the cross ditch location, ensure that redirection of the runoff would not lead to further landslide issues, and to design an appropriate crossing that would address future runoff and maintain access. In October 2015, MOTI installed a cattleguard at the cross ditch location. In the Board's view, this resolves the complainant's concern about access.

## Conclusions

# 1. Did the logging increase water flows and contribute to the water seepage at the mobile home park?

The harvesting by the community forest contributed to the increased water flows on the hillside, but the Board could not conclude that the increased flows led to the water seepage at the mobile home park.

2. Did the community forest adequately consider and manage the risks of damage from water flows, and did it meet legal obligations under the *Forest and Range Practices Act*?

The Board expects that licensees will address potential impacts of their activities on other resource values within and outside of their operating area, when those potential impacts can be reasonably foreseen.

There were no obvious warning signs prior to development that would cause the community forest to anticipate that harvesting would have a significant hydrological impact on the mobile home park. As well, there was, and still is, uncertainty around the cause of the seepage. The community forest's assessment and management of the risks associated with the development was reasonable, considering the site conditions, observed patterns of water flow and the complexity of past development and ownership on the hillside.

The community forest met its legal obligations. Although two landslides occurred further downslope from the cutblock, the community forest could not reasonably have anticipated them and the landslides did not cause a material adverse effect to a forest resource on Crown land.

The hydrologic processes in the area are complex and the risk of unusual flows and slides still exist. It is in everyone's best interests to manage future activities on the hillside using the best available information. After the landslides, specialists conducted two assessments and provided recommendations. The community forest has begun implementing those recommendations and has committed to further actions that may avoid further exacerbating the current situation.

#### 3. What happened to the residents' access to Star Lake Road?

FLNR's cross-ditching work did cut off residents' access to the road. However, when Board investigators visited the site, someone had restored the access. The Ministry of Transportation and Infrastructure has since installed a cattleguard at the cross ditch location, which will address future runoff and maintain access.

#### **ENDNOTES**

<sup>&</sup>lt;sup>i</sup> Winkler, R.D., D.L. Spittlehouse, and D.L. Golding, *Measured differences in snow accumulation and melt among clearcut, juvenile, and mature forests in southern British Columbia*, 2005.



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