

WITHHOLDING WATER FLOW SCIENCE IN THE WILSON WATERSHED

An Examination of the Sunshine Coast Community Forest's Wilson Creek Watershed Assessments (2010 - 2012)



Above: Provincial Crown land old growth logged area in 1991, upper Wilson Creek watershed, in the 780-920 meter elevation snowpack zone. (July 2007 photo by author)

Left: Coho spawning, Lower Wilson Creek. (Photo by Rick O'Neill)

By Will Koop

B.C. Tap Water Alliance (www.bctwa.org)

March 15, 2015

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Foreword

The origin and recent short history of the Sechelt Community Forest license is full of controversy and slippery politics. We wrote at length about these origins seven years ago in our May 20, 2008 report, ["The Community" Forest Trojan Horse. The Sunshine Coast Community Forest Proposal and Probationary License in Two Watershed Reserves: A Case History \(2003 – 2008\).](#)

Though this, our second report, is a technical critique of the Community Forest's watershed assessments, it is merely a continued narrative of this rather strange and sordid history.

The first draft of this report, was completed on November 20, 2013. During this first phase, Elphinstone Logging Focus contributed seed or minor funding. Further work and updating of the report resumed in December 2014 to March 15, 2015.

The bulk of time taken for research, composition, imagery, formatting, editing and production of this report was done voluntarily, gifted freely by the author.

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Report Summary

Background

Sechelt Community Projects Inc. (SCPI), commonly referred to as Sunshine Coast Community Forest (SCCF), headquartered in Sechelt, BC, and owned by the municipality operates a Crown land Community Forest Licence tenure (since 2006) over three discrete operating units on the Sunshine Coast, including lands within the political boundaries of the Sunshine Coast Regional District and within the traditional territory of the Sechelt First Nation.

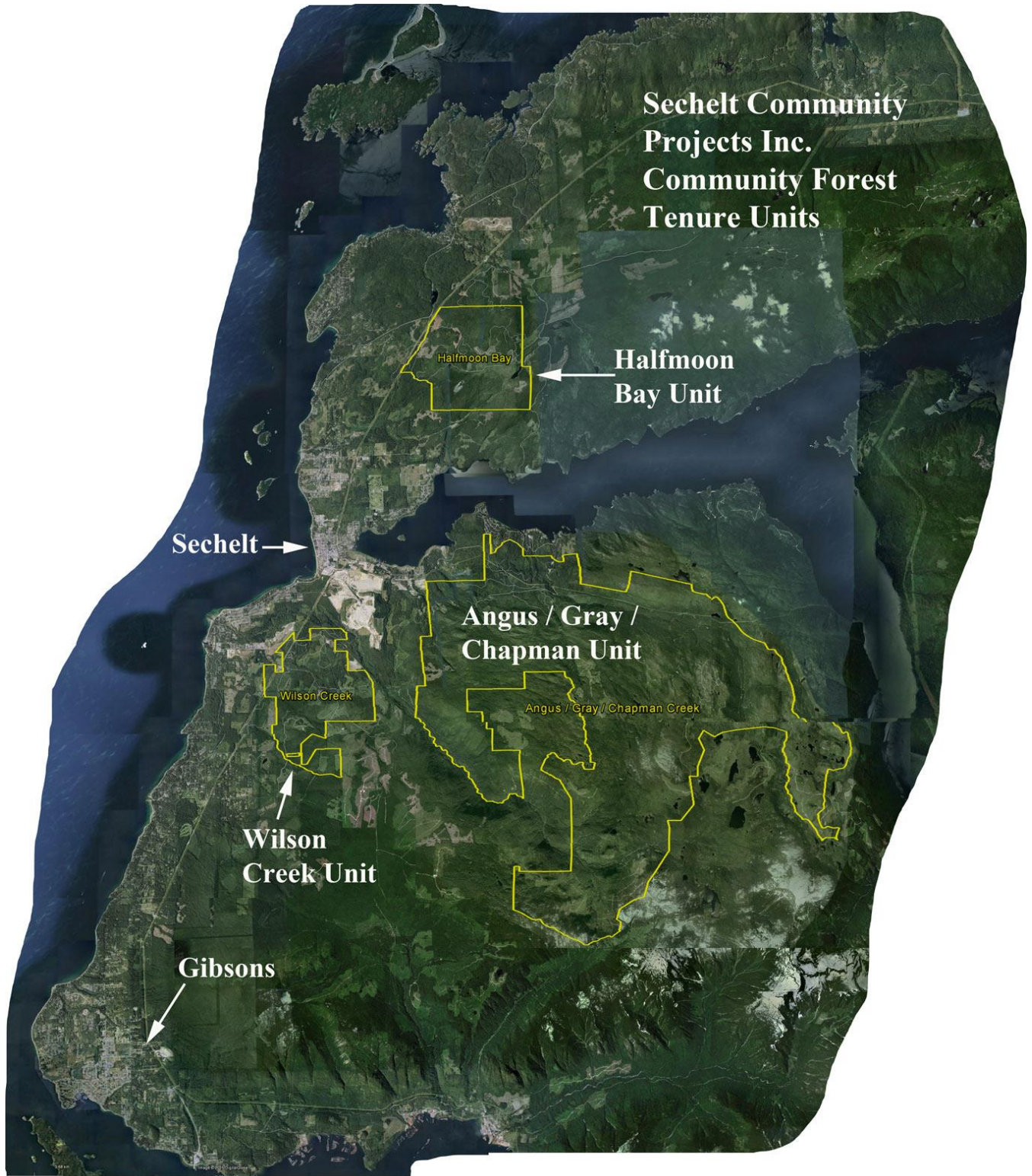
Two of the units, Wilson Creek and the Angus/Gray/Chapman Creeks, are within watersheds with high fish values. All three units, including the Halfmoon Bay unit, also serve as community and domestic drinking water sources. Due to these high values, International Forest Products – SCPI's predecessor forest licensee in the Wilson Creek unit – was ordered by the BC Ministry of Forests in July 2001 to undertake a Coastal Watershed Assessment Procedure (CWAP), a former legal requirement under the *Forest Practices Code Act*. Until accomplished, the company was not to proceed with any more logging.

Fisheries Canada and the BC government fisheries agency have long identified and collected data on the diverse fisheries and habitat in both Wilson and Chapman Creeks. Nevertheless, when the BC government amended the *Forest Act* in 2005, it since failed to include both Wilson and Chapman Creek (along with a host of other watersheds) as *Fisheries Sensitive Watersheds* in the *Forest Planning and Practices Regulation (FRPA)* thereby bypassing legal watershed assessment requirements in candidate fisheries sensitive watersheds.

In documents as early as 2005, and again in 2006, when SCPI applied for its Community Forest tenure, the Sunshine Coast Conservation Association (SCCA) reminded SCPI of the former legal requirement to conduct a Watershed Assessment prior to operational planning in the Wilson watershed. Stated in SCCA's 2006 document:

In 2001, logging was stopped in the Wilson Creek watershed, pending completion of a Coastal Watershed Assessment Procedure. This watershed was becoming hydrologically unstable

because of excessive harvesting. At the time, the district manager was obligated under law to ensure that all forest values were being “adequately managed and conserved”.



Google Earth imagery, from SCPI's consultants, Chartwell Consultants Inc., showing SCPI's community forest tenure units in the Sunshine Coast Regional District boundaries.

Today, under the new legislation contained in FRPA, neither the district manager nor SCPI have this legal obligation. It is noteworthy that since 2001, private land owners have logged large tracts in this watershed and have probably aggravated the threat to fish.

In the absence of a specific commitment in this FSP [Forest Stewardship Plan], there are no legal conditions limiting the scale of disturbance in the Wilson Creek watershed. We note that the draft Operational Plan identifies numerous areas for new harvesting in this watershed. This is simply not acceptable.

We recommend that SCPI develop verifiable strategies outlining measurable results for all the salmon and cutthroat bearing streams of the SCPI landbase. At the very least, this should include a Coastal Watershed Assessment Procedure for Wilson Creek.

SCPI eventually contracted Dobson Engineering Inc., a reputable forest engineering company, to conduct the first Watershed Assessment of Wilson Creek in 2009, with a final written report, *Hydrologic Assessment of the Wilson Creek Watershed (Sunshine Coast Forest District)*, submitted to SCPI in March 2010. That report was made public in October 2010 and published on SCPI's website, by which time SCPI had already begun logging operations in the Wilson watershed.

On April 8, 2011, after reviewing the Dobson report, the SCCA published a four-page critique about the report's limitations (see Appendix B). The public attention generated from the SCCA's critique and from significant follow-up concerns and attention by Elphinstone Logging Focus (a local forest watch group) resulted in SCPI deferring lucrative cutblock EW002 (scheduled to be logged in 2011) and the ultimate public relations decision to conduct a second watershed assessment, including a separate fisheries assessment of Wilson Creek. In August 2012, Glynnis Horel (G.M. Horel Engineering Ltd.) submitted a final Watershed Assessment report to SCPI, *Wilson Creek Watershed Assessment*, which was presented at a public meeting on August 27, 2012. SCPI's fisheries assessment report for Wilson Creek, *Evaluation of Salmonid Populations in Wilson Creek (900-119900)*, was completed by David Bates (FSCI Biological Consultants) in late October, 2012.

Our report critique examines the methodologies and subsequent findings of the three watershed assessments of 2010 and 2012. The main finding of our report is that although the second August 2012 Horel Watershed Assessment deviated from the author's own methodology (in a 2007 research report, TR-032), and made an error in the boundary tenure area of upper private forest lands, and although it included simple table data (Table 4) describing the age and overall hectares of "forest age ranges," it failed to provide an itemized polygon reference map (though partly completed as Map 4) and associated statistical tables to pinpoint the physical locations and detail the many components behind the hydrological state of the Wilson Watershed. Such standardized complex data is used to calculate hydrological thresholds, and is the basis for a final recommendation on whether or not logging can continue.

Further complicating the findings in the 2012 Horel Assessment, 2014 aerial imagery (shown in this report in chapter 14) reveals that significant additional logging has since occurred in the Wilson Creek watershed on both private and Crown lands. Watershed mapping and polygon specific data assembly should be undertaken to determine up-to-date (and transparent) hydrologic recovery. SCPI has, to date, failed to provide the needed information to the community.

SCPI's 2010 and 2012 Wilson Watershed Assessments

At a re-calculated 2,207 hectares in total area, the Wilson watershed is categorized as a small, south coastal watershed consisting of three distinct sub-watersheds, the main Wilson Creek stem, with the East Wilson Creek and Hudson Creek basins flanking the Wilson Creek stem in the lower regions. Most of SCPI's Wilson Creek logging unit – 899 hectares – is located within the hydrologic boundaries of the lower Wilson Creek watershed.

As revealed by historic aerial imagery provided in this report (chapters 6 – 8), logging has occurred in all three sub-basins, with the majority having occurred over the last 50 years in the mid to upper elevation regions. Logging is occurring for the second time or rotation in immature 40 year-old stands in numerous locations. Additionally, about 25% of Wilson watershed consists of private forest lands under separate and less regulated provincial logging constraints, with areas not stocked or replanted.

Dobson, confusingly, provided two separate findings of the Wilson watershed: that historic logging occurred in either 46% or 52% of the total watershed area; and that the state of hydrologic recovery (Equivalent Clear-cut Area, ECA) was at either 31% or 35%. Despite criticisms by the SCCA in 2011, Dobson's appendix reference map seems to have overlooked recent areas logged in the upper elevation zone of the Wilson watershed. His estimations about historic logging and ECA are therefore in doubt. (Horel appears to show the correct logging status of these areas in Map 4 of her report.) Because Dobson failed to provide an accurate and detailed rendering of historic logging and forest age class data, it is difficult to understand how Dobson came to his assessment conclusions.

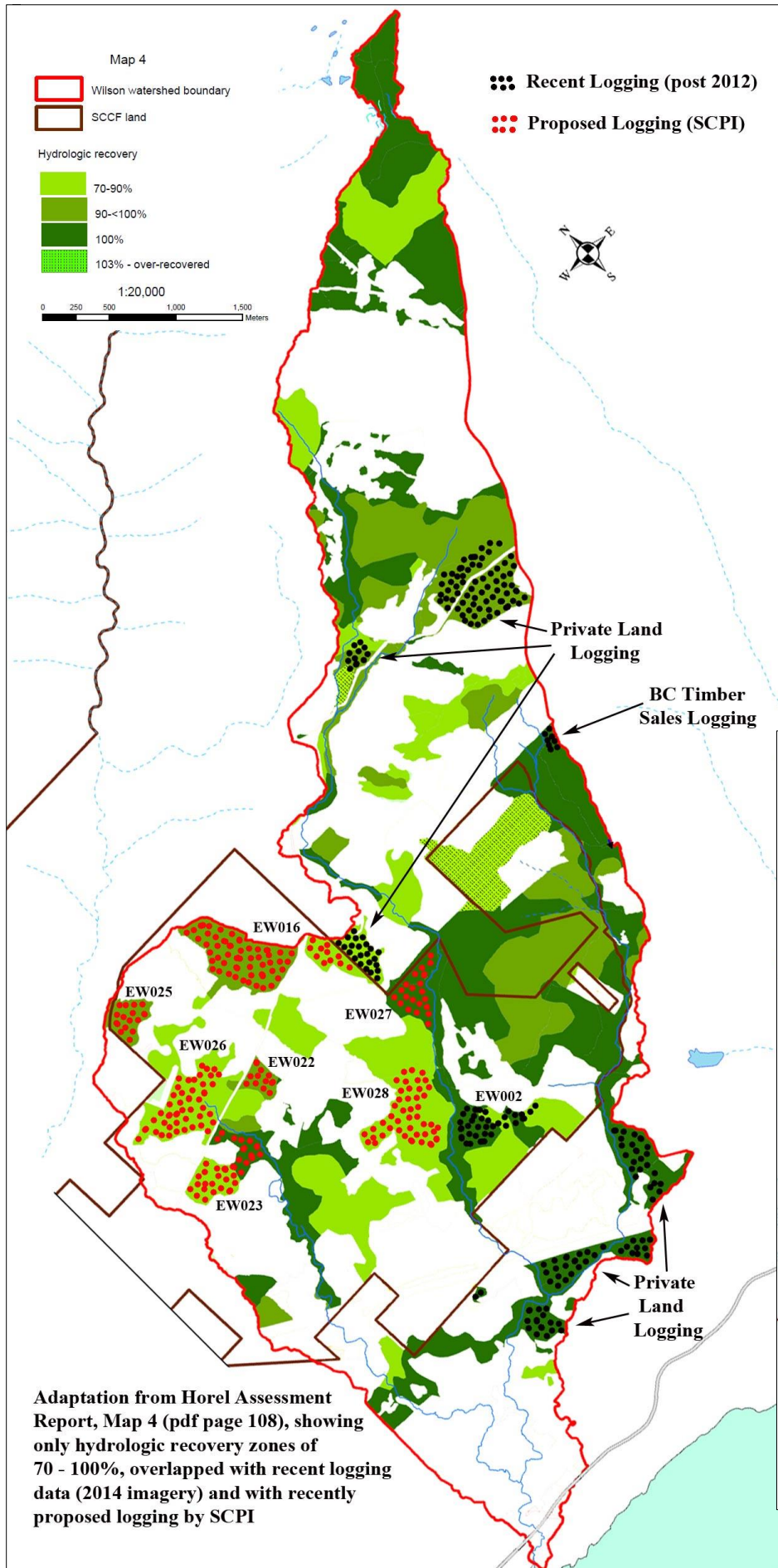
Though Horel's watershed assessment (2012) fails to provide a hydrologic recovery ECA percentage grade for the Wilson watershed (as Dobson attempted to do without backup data), Table 4 of her report nevertheless provides sufficient evidence indicating that Dobson's ECA estimations were well off the mark. Table 4 summarizes that 1,130 ha of the Wilson's 2,207 ha watershed has forest stands less than 35 years of age, meaning that about 50% of the Wilson Creek watershed has been logged within the last 35 years. 607 ha (includes 165 ha of non-forest), or 58% of those stands less than 35 years old are less than 10 years of age. This translates into significant hydrologic recovery concerns.

Table 4

Forest age range*	Area, ha	%
Forest <10 yrs	442	20%
Forest 10-35 yrs	523	24%
Forest 40-59 yrs	94	4%
Forest 60-95 yrs	610	28%
Forest 105-165 yrs	243	11%
Forest >200 yrs	130	6%
Nonforest	151	7%
Nonforest, partly treed	14	<1%
Total watershed area	2,207	100%

*Stand ages from VRI Rank 1 inventory, or estimated from imagery for recent harvesting.

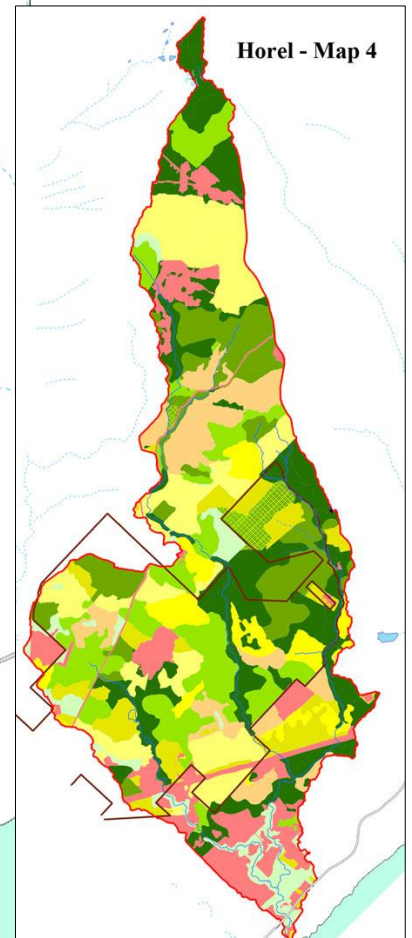
By way of various color schemes, Map 4 of Horel's Assessment report is a pictorial rendering of the hydrologic status of the Wilson watershed, according to Horel's interpretations and undisclosed definitions of hydrologic recovery. When the confusing medley of color-coded information is removed to reveal only 70 – 100 percent hydrologic recovery information (as shown in the following two pages), it is easier to decipher why the decision was made by SCPI not to clearly inform the public.

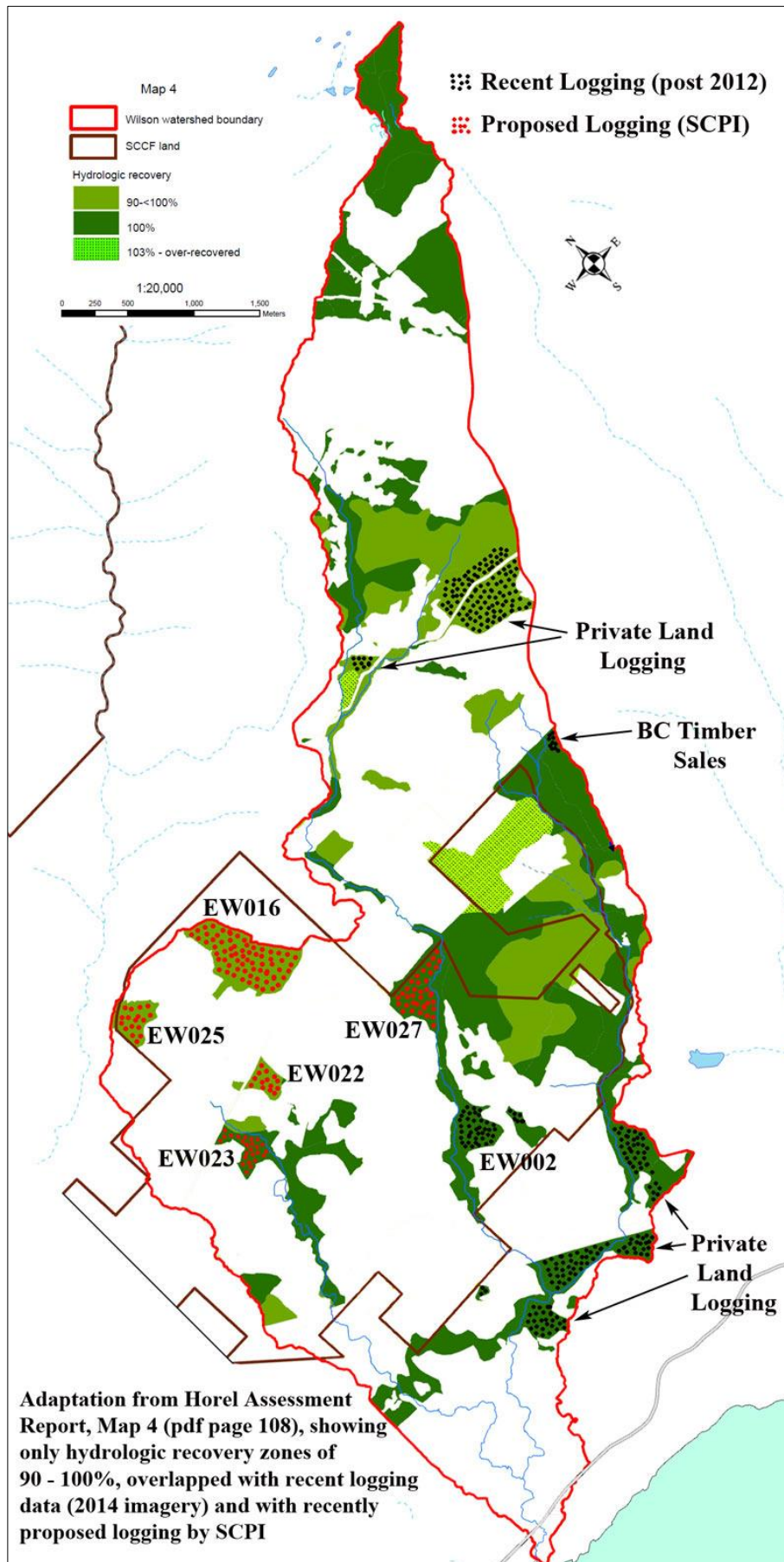


Left: Map 4 from Horel's Watershed Assessment report, showing only areas of hydrologic recovery groupings (in four shades of green): 70-90%; 90-100 %; 100%; and something called "over-recovered."

Also shown on this map are areas recently logged (black dots) and areas proposed for logging by SCPI (red dots).

Below: Map 4 in the Horel report, showing 10 color grouping schemes depicting interpretation of hydrologic recovery stages in terms of forest age and height.





Left: Map 4 from Horel’s Watershed Assessment report, showing only areas of hydrologic recovery groupings (in **three** shades of green): 90-100 %; 100%; and something called “over-recovered.”

According to a 2007 technical report (TR-032), which Horel co-authored with BC hydrologist Robert Hudson, 90% hydrologic recovery is equivalent to forest stands having reached 20 metres in height (information which is not stated or revealed in the Horel report.) These forest stands are denoted on the map to the left in the solid medium-green color. As shown, a percentage of both medium and dark green areas (90-100% recovered) have since been logged (black dots) following the release of the August 2012 Horel report (which relied on 2009 imagery), significantly reducing her estimated hydrologic recovery zones of 90% or greater.

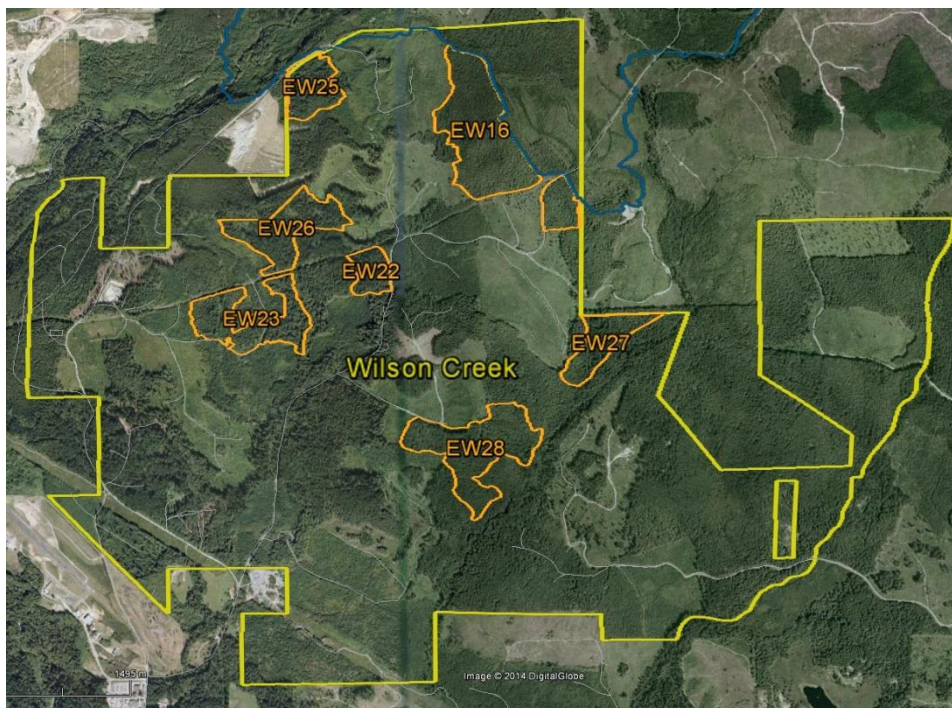
The evidence, as depicted from Horel’s findings on the map to the left (black dots and white zones within the red watershed boundaries), clearly shows that the Wilson Creek watershed is in a state of hydrological stress and needs to recover from past logging. This is true for the forest within the operational boundary of SCPI’s tenure in the Wilson watershed, and for the complex of private forested areas within the hydrological boundary of the Wilson watershed.

The Wilson Creek Politics

The most likely reason why SCPI's second Wilson Creek Watershed Assessment of August 2012 failed to provide a science-based figure representing the state of hydrologic recovery is because it would have resulted in a cessation of logging for an undetermined period of time. SCPI's mature timber supply shortage is "forcing" it to continue logging in its Wilson Creek Community Forest unit. Unfortunately for the community, attempting to cloak current conditions within this valuable watershed from public discernment is consistent with a number of other SCPI's operational decisions made about highly sensitive provincial forest lands.

From an operational standpoint, forgoing logging in the Wilson Creek unit, while waiting for hydrologic recovery coupled with political constraints against future logging in the Chapman and Gray Creek community drinking watersheds, SCPI would have to focus its twenty year logging plans within the Angus Creek watershed and in the tiny Halfmoon Bay unit alone, which would only serve to accelerate public criticism in these sensitive areas.

SCPI's central problem is that it chose sensitive and therefore local forest lands: watersheds serving two primary purposes; significant fisheries and community drinking water supply.



This is further evidenced in SCPI's updated, December 2014, twenty year logging plan for the Wilson Creek unit (image to left), where seven additional cut-blocks are proposed (EW 16, 22, 23, 25, 26, 27, and 28). The logging plan visual on SCPI's website is deceptive, as the imagery used by SCPI is out of date (2009), and fails to show recent logging in SCPI's unit, or the logging on adjacent private forest lands, which is complicating the political landscape in the Wilson watershed. The private lands make up about one

quarter of the watershed area.

Most of these private lands are located in the middle or mid-elevation zone of the watershed, where, over the last ten years, wide swaths of extremely young stands have been clear-cut logged, for the second time. This logging, and more recent logging in the lower southeast area of the watershed, have significantly offset hydrologic recovery objectives of the Wilson watershed, so much so that SCPI noted in its Board Minutes of February 10, 2014: "**AJB** [the private forest lands owner] *has recently logged a significant amount off their private lands above our license which could impact perceptions when we are ready to harvest our new cutblocks in the Wilson Creek area.*"

SCPI's term of choice – perceptions – is a loaded word that explains why a concluding figure on the state of hydrologic recovery remained undisclosed in the August 2012 Wilson Creek Watershed Assessment. For, if a final figure for hydrologic recovery had been produced, as it should have been, then public “perceptions” would have been replaced by public “understanding” or “knowledge.” It is not just SCPI that has benefitted from what it calls “perceptions.” Private forest land owners have also benefitted from SCPI's withholding of science, allowing the private forest landowners to continue to log while diminishing hydrologic recovery objectives in a fisheries sensitive watershed. Though not currently unlawful, the amount of logging in the Wilson watershed nevertheless ought to be, whether occurring on provincial or private lands.

In fact, there is no correlation made between private land and public land ownerships as it relates to maintaining a safe hydrologic recovery threshold for fish, a critical recommendation absent from the August 2012 Watershed Assessment. Such a remedy must become a provincially lawful and binding objective in fisheries sensitive watersheds. Ever since the formation of Regional Districts (third order) in BC in the 1960s, there have been numerous attempts by them to control and regulate private land logging in sensitive watersheds, but often without success.

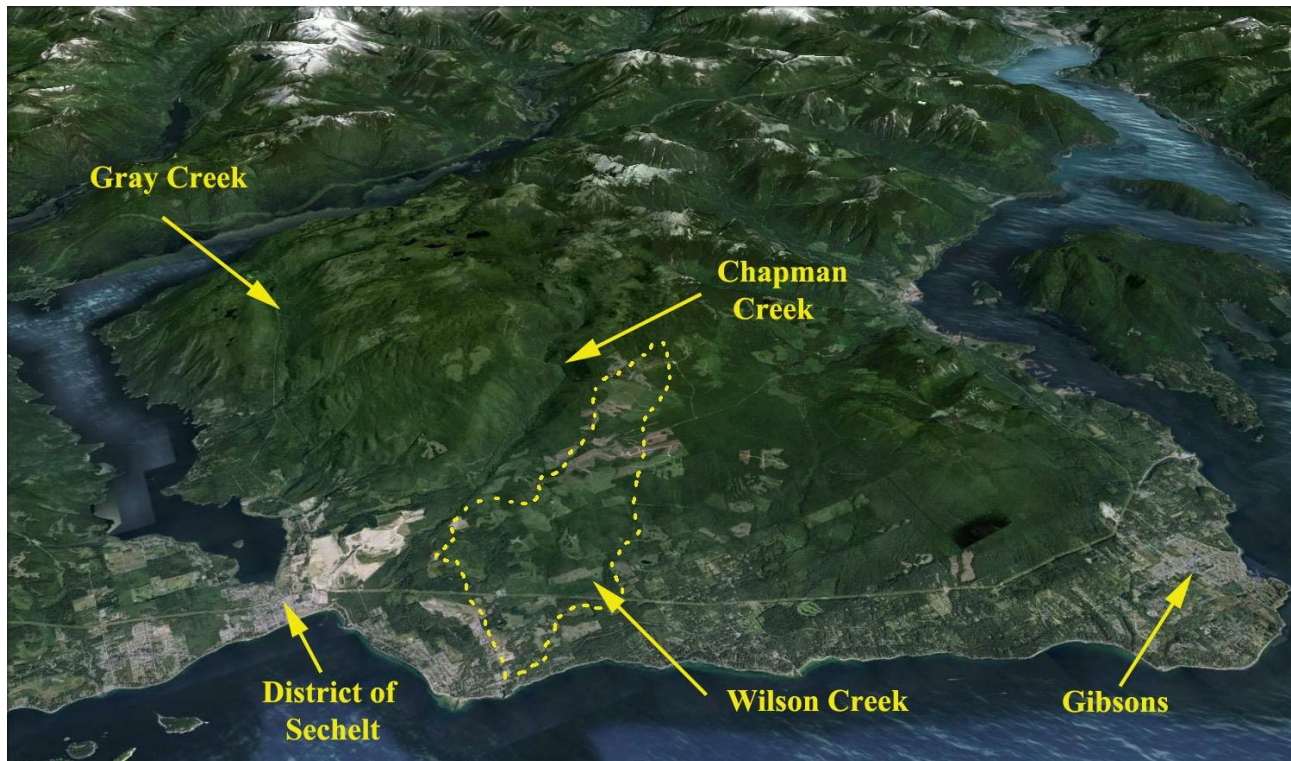
Although the Wilson Creek watershed is acknowledged as having significant fisheries values, the provincial government has failed to continue acknowledging this critical category under significant policy amendments (the *Forest and Range Practices Act*). In fact, the BC government failed to do so for many similar fisheries sensitive watersheds, under cover of the “not unduly” clause. It was a serious step backward, scientifically and legislatively. In doing so, known fisheries sensitive watersheds are no longer candidates for appropriate watershed assessments as previously required since 1995 under the then new *Forest Practices Code Act*.

Of the many issues, among other matters, discussed in this report concerning SCPI's management of the Wilson watershed, an overarching recommendation to government is to immediately declare the Wilson Creek watershed a Fisheries Sensitive Watershed under the *Forest Act* (and related *Acts*). Secondly, this recommendation should not be confined to the Wilson watershed alone, but is inclusive of all BC watersheds with high fisheries values. Their legal protection, in terms of maintaining or rehabilitating water quality, quantity and timing of flows according to unbiased scientific research and through the application of enforceable Watershed Assessments, must be regarded as fundamental and obligatory in all resource extraction and use planning.

Hopefully, the questions that this report raises about the Wilson watershed will aid the public in discussing these matters with the elected officials of the District of Sechelt, who are signatory shareholders of Sechelt Community Projects Inc., the community forest decision makers. In the anticipation of such an undertaking, it is recommended that any further logging in the Wilson watershed be postponed.

1. Introduction

This report examines, primarily, the use of two scientific / science-based watershed assessment tools, “hydrologic recovery” and “Equivalent Clearcut Area,”¹ that were applied in the August 2012 report, *Wilson Creek Watershed Assessment*. The 2012 Watershed Assessment report was contracted by Sechelt Community Projects Inc. (SCPI),² otherwise known as the Sunshine Coast Community Forest (SCCF), the name of the logging company with a Community Forest License issued since 2006 on the Sunshine Coast near the Town of Sechelt.³



Though aggressive logging and road access practices conducted since 1980 have altered and degraded forest hydrology catchment regimes in the relatively small 2,200 hectare, fish bearing, Wilson Creek watershed over a thirty-year period, and though the BC government has failed to list the Wilson watershed since 2005 as [a Fisheries Sensitive Watershed](#) in the *Forest and Range Practices Act*, and though private forest land ownerships in the watershed have created, and may continue to create, problematic conflicts for future hydrologic recovery, water runoff and water quality objectives in Wilson Creek, no resulting recommendations are provided in two 2012 SCPI Assessment reports to temporarily halt logging while the Wilson watershed reassumes a state of hydrologic recovery, with no accompanying recommendations for strategic negotiations with private forest landowners on a joint vision for the future integrity of water flows in the Wilson watershed.

According to the July 22, 2013 Minutes of SCPI (which were only made public at the beginning of October 2013 on SCPI’s website, under the auspices of “website under construction”), SCPI

¹ See Appendix A for a brief history of these terms.

² Formerly, Sechelt Community Forest Inc. The Terms of Reference for the report contract are nowhere stated.

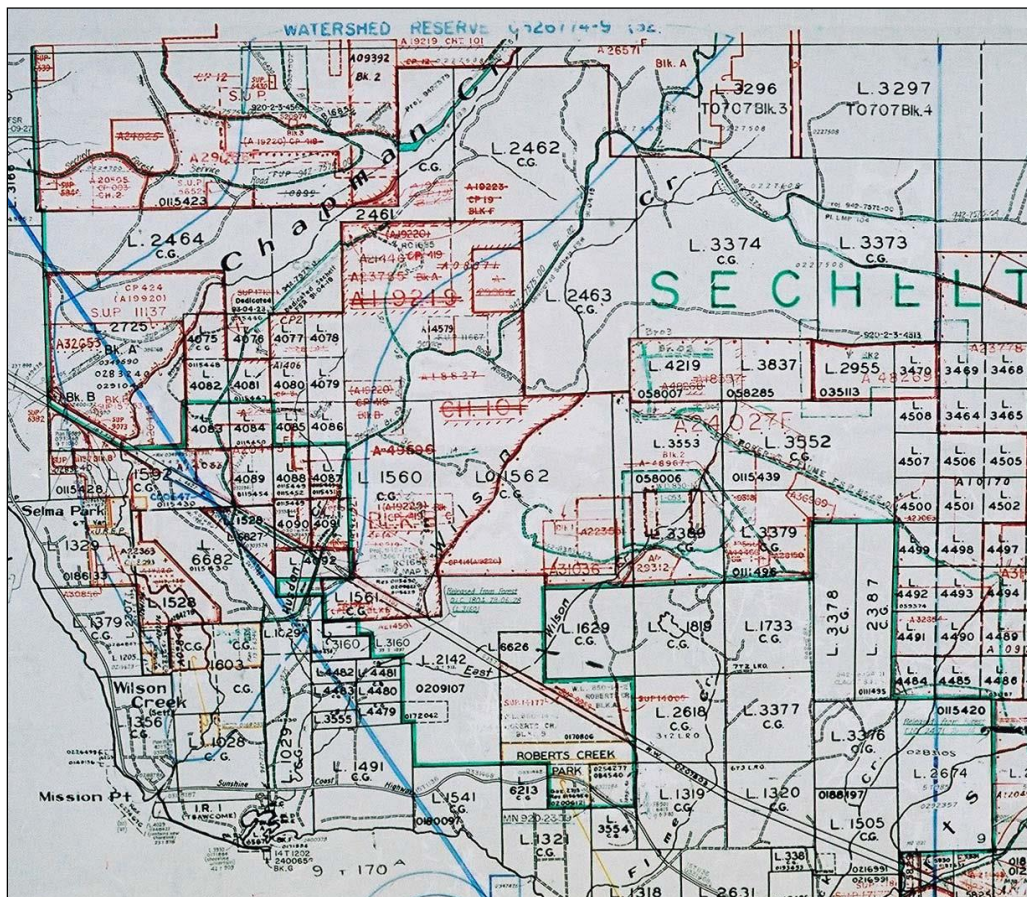
³ For a history of the community forest company, see Will Koop’s *The Community Forest Trojan Horse* report of May 20, 2008. (<http://www.bctwa.org/TrojanHorse-May20-08.pdf>)

initiated another watershed assessment in two community Watershed Reserves, Chapman and Gray Creek, large sections of which the Ministry of Forests wrongly included in the Community Forest License when it was issued in 2006, and when the two Reserves were statutory Map Reserves: ⁴

2.2. *SCRD/BCTS [BC Timber Sales] Protocol Agreement - An idea was presented that SCPI should have a protocol agreement with SCRD [Sunshine Coast Regional District]. It was noted that SCRD has no legal authority over any forest industry activities on Crown Land. SCPI could be proactive by providing a list of our processes to SCRD and other local bodies rather than having a formal agreement. Notification should be given to the shareholder of our intention to provide such a listing to SCRD.*

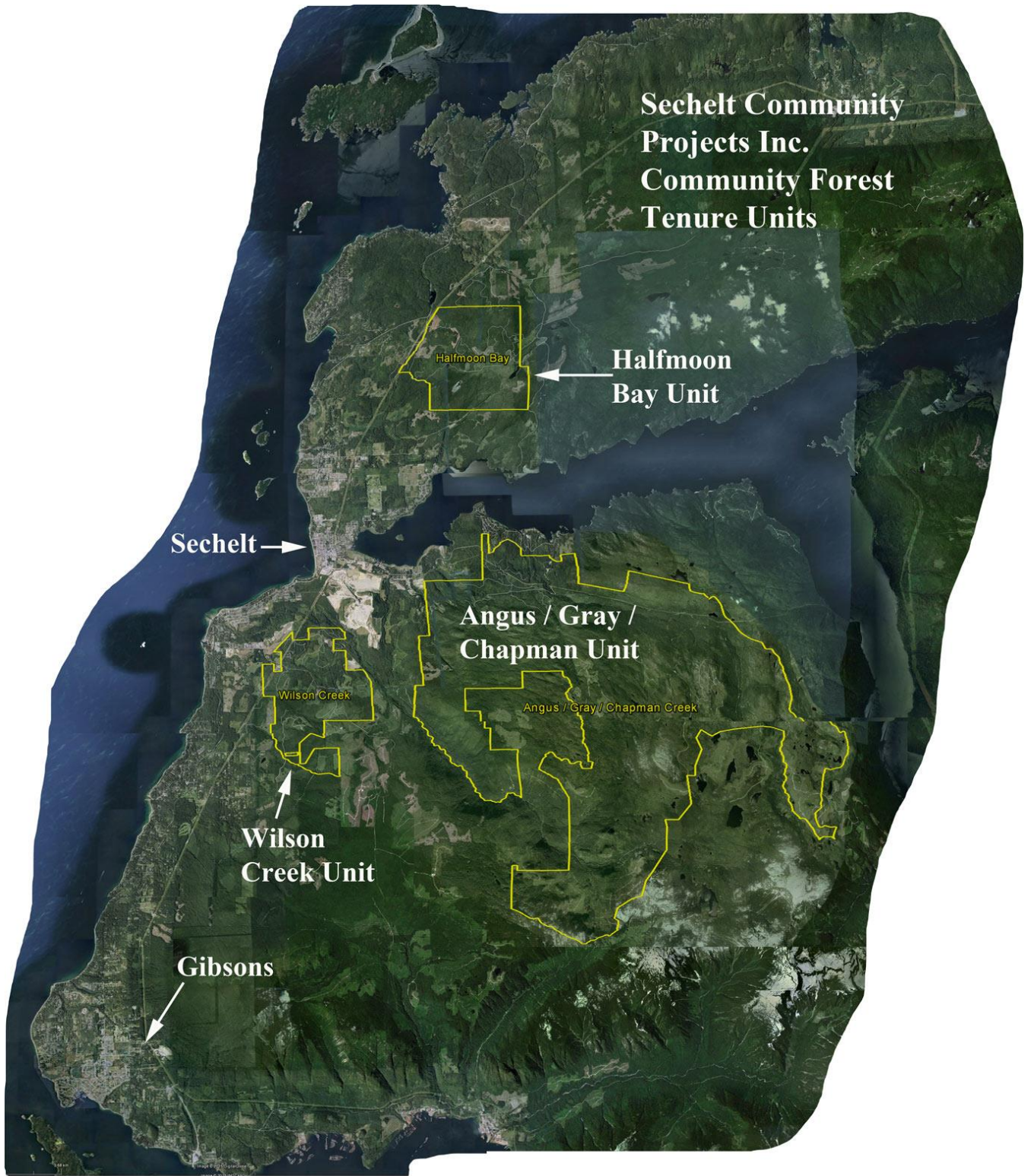
2.3. *Chapman/Gray Watershed Assessment - Glynnis Horel and Denny Maynard are expected to be in the watersheds early August. Much "office" preparation has already been done. A draft report should be ready by late October. SCRD/SIB, [Sechelt Indian Band] DOS [District of Sechelt] and public presentations are to be scheduled separately. It was noted that a Ministry of Forests representative should be invited to the DOS presentation.*

One outcome of the assessment will be the zoning of the watershed into 5 levels based on potential risk of future harvest activities on water quality. It will also give us a benchmark for future years to assess growth and health of the forest.



1970s Forest Atlas Map showing the Wilson Creek watershed in the middle area, and legal land title information. Note the reference at the very top of the Map, and the thin blue boundary line below it, showing the statutory Watershed Map Reserve over the lower Chapman Creek.

⁴ See BC Tap Water Alliance March 21, 2013 media release (<http://www.bctwa.org/PrRel-Mar21-2013-DemotingReserves.pdf>) for information on the underhanded fate of the Watershed Reserves.



Google Earth imagery, from SCPI's consultants, Chartwell Consultants Inc., showing SCPI's community forest tenure units in the Sunshine Coast Regional District boundaries.

2. Recent Assessments

In 2009, SCPI contracted the services of Dobson Engineering Ltd. to conduct a non-comprehensive, limited and crude hydrologic assessment of the Wilson Creek watershed. A final 37-page report, called *Hydrologic Assessment of the Wilson Creek Watershed (Sunshine Coast Forest District)*, was submitted to SCPI in March 2010, and released some six months later for public consumption in October, 2010. Despite its limitations, this was the first watershed assessment conducted of the fish-bearing Wilson Creek watershed. The previous Crown forest licensee, International Forest Products (Interfor), chose not to conduct a formal Coastal Watershed Assessment Procedure (CWAP) after the Ministry of Forests notified the company in writing in July 2001 against further logging in the Wilson Creek watershed because of fish habitat and domestic water license concerns.

In a four-page April 8, 2011 critique of SCPI's 2010 Assessment report by Dan Bouman, the former chair of the Sunshine Coast Conservation Association (SCCA), he states the following:

It [the March 2010 Dobson report] concludes that the watershed is functioning normally, riparian (stream-side) areas are intact, additional retention of forest cover is unnecessary, logging has had little impact on the hydrology of the watershed, and there is no hydrological reason to prevent proceeding with 124 hectares of additional harvesting.

In order to understand how such a tiny amount of fieldwork is sufficient to dismiss longstanding concerns and constraints in a watershed recognized for its highly significant fisheries values, we need to consider how forestry regulation has changed over the last 10 years.

The FRPA [Forest and Range Practices Act] regime provides for a new land-use designation: Fisheries Sensitive Watershed (FSW). This designation is intended to establish restrictions on the extent of hydrological disturbance (logging) at any given time such that logging does not adversely impact fisheries resources. There are currently no FSWs designated in British Columbia, meaning that there are no legally binding restrictions on the extent of hydrological disturbance in fish bearing watersheds anywhere in BC unless some other designation is in effect (park, ecological reserve or community watershed). There are nominal protections for forest cover that is immediately adjacent to a fish-bearing stream. As with most non-timber values, FRPA only requires protection to the point that would "unduly restrict the flow of timber".

The Wilson Creek watershed is not, but should be, a Fisheries Sensitive Watershed. SCPI is exploiting this loophole to log timber that was previously constrained for good reason. In effect, SCPI is practicing a lower standard of environmental stewardship than was required of the previous licence holder.⁵

Due to statements of concern regarding the Dobson report addressed in Bouman's critique,⁶ SCPI later hired the professional services of G.M. Horel Engineering Ltd. to conduct a second, but, not thorough, Watershed Assessment of Wilson Creek. I.e., the following accounts by SCPI:

⁵ See Appendix B.

⁶ See Appendix C, May 31, 2011 Press Release, for SCPI's response to SCCA's critique.

*The decision to undertake a more thorough watershed and fisheries assessment in Wilson Creek [underline emphasis] was made in May. A sub-committee was formed to discuss the processes involved. As a result of that work, Glynnis Horel (PEng, M.Eng) and Dave Bates (RPBio, PhD) were hired in November to conduct the work. We expect them to have a draft report in the next few weeks.*⁷

*The area of the deferral in 2011 is known as EW002, above Roberts Creek near Wilson Creek. In previous years we had done a watershed study of the area, for our tenured area only, and the criticism was that it did not include private lands. SCPI commissioned another study for water and fish habitat that included the private lands above and below the tenured area. The results were presented in August 2012 and are now available on our website. It was a thorough report and we have adopted its recommendations.*⁸ [Underline emphasis]

The resulting August 2012 report, *Wilson Creek Watershed Assessment*, is 115 pages in length, with numerous maps, photos, tables, figures, with about one half of the report, or 63 pages, devoted to Appendixes. Though Dobson's 2010 assessment report is referenced three times in the August 2012 Horel report (pages 1, 2, and 20), the Dobson report is nevertheless omitted as a citation reference in *Appendix C, Information Sources*. Similarly, another report written by Dr. David Bates about fish populations and streamflow in Wilson Creek, which is referred to three times – with the report's title unnamed (on pages 8, 24, and 26) – is also not included as a draft reference in Appendix C.⁹

According to SCPI's Minutes of January 30, 2012, the Horel Watershed Assessment was to undergo a formal "peer review." However, there is no follow-up mention of a peer review in the Horel report. According to the Minutes of July 23, 2012, a peer review had apparently been "started": "field visit with 2 of 3 reviewers next Fri/Sat: Peer review reports by early August" 2012.

As stated in SCPI's Press Release of May 31, 2011, and in SCPI's Minutes of August 22, 2011, SCPI sought to:

- undertake a "Coastal Watershed Assessment Procedure (CWAP) or equivalent hydrological survey," stating later that the CWAP-3 was "outdated;"
- "meet and satisfy both our regulatory obligations and community concerns;"
- defer cutting in cut block EW002;
- properly plan for forest management "based on detailed research and science;"
- develop a Terms of Reference for a Watershed Assessment.

From 2013 – 2014 emails between Ross Muirhead, of Elphinstone Logging Focus, and Community Forest officer Glen Bonderud, the Terms of Reference for both the Horel and Bates Assessment reports were never formalized as a legal contract, merely as "objectives" outlined in each report.

Following the final August 27, 2012 pdf version of the Watershed Assessment by Horel to SCPI, SCPI held an open house event the same evening at the Seaside Centre in the Town of Sechelt,

⁷ See Appendix C, SCPI Annual Report, 2011.

⁸ See Appendix C, SCPI Annual Report, 2012.

⁹ David Bates' report, *Evaluation of Salmonid Populations in Wilson Creek*, through his company, FSCI Biological Consultants, has a final published date of October 30, 2012, some two months after the Horel report was dated. Horel most likely had a draft or an advanced copy of Bates' report. Bates' report was not released to the public until late November to early December, 2012. Logging began in the Wilson watershed, block EW002, on November 27, 2012.

where Horel made a lengthy power-point presentation on her report findings.

According to SCPI's Minutes of July 23, 2012, the Assessment report was withheld from being published on SCPI's website before the public event of August 27th, evidently because the "*final report will be released after the presentation, just in case any issues are raised at the public meeting that need to be addressed / included.*" In other words, the public did not have an opportunity to evaluate and assess the Horel report before the only public meeting that SCPI convened concerning the Wilson watershed Assessment, and therefore the public was unable to ask informative questions during the question and answer period.

In an August 31, 2012 article published by the Coast Reporter, *Watershed Researcher Makes Wilson Creek Recommendations*, it states that "*geo-engineer Glynnis Horel made a number of recommendations to help mitigate the impacts of forestry and development on Wilson Creek.*"

"Probably the biggest concerns with stream flows in the Wilson are likely to be low flows, not peak flows," she argued. "The absence of water storage in Wilson Creek suggests to me that for water extraction and fish, low flows are likely to be the critical problem."

With regards to managing the forest, Horel said the focus should be on the age and distribution of trees, in addition to cut allowances.

Horel, however, made no final summary statement or conclusion at the public meeting from her report data on hydrologic recovery regarding the overall health or state of the entire Wilson watershed resulting from cumulative logging activities over the last 30 years on public and private forest lands, and therefore made no recommendations at the meeting about possibly curtailing future logging. No such conclusion / statement was made because nothing was stated about this critical component in Horel's report. And, no one asked any relevant questions about this matter at the public meeting, namely because no one had access to the report to discover this missing component.

Moreover, the Bates Watershed Assessment report on salmonids in the Wilson watershed, which also avoided making a similar recommendation from Horel's hydrologic recovery data, was still pending, and was not released to the public until late November to early December 2012.

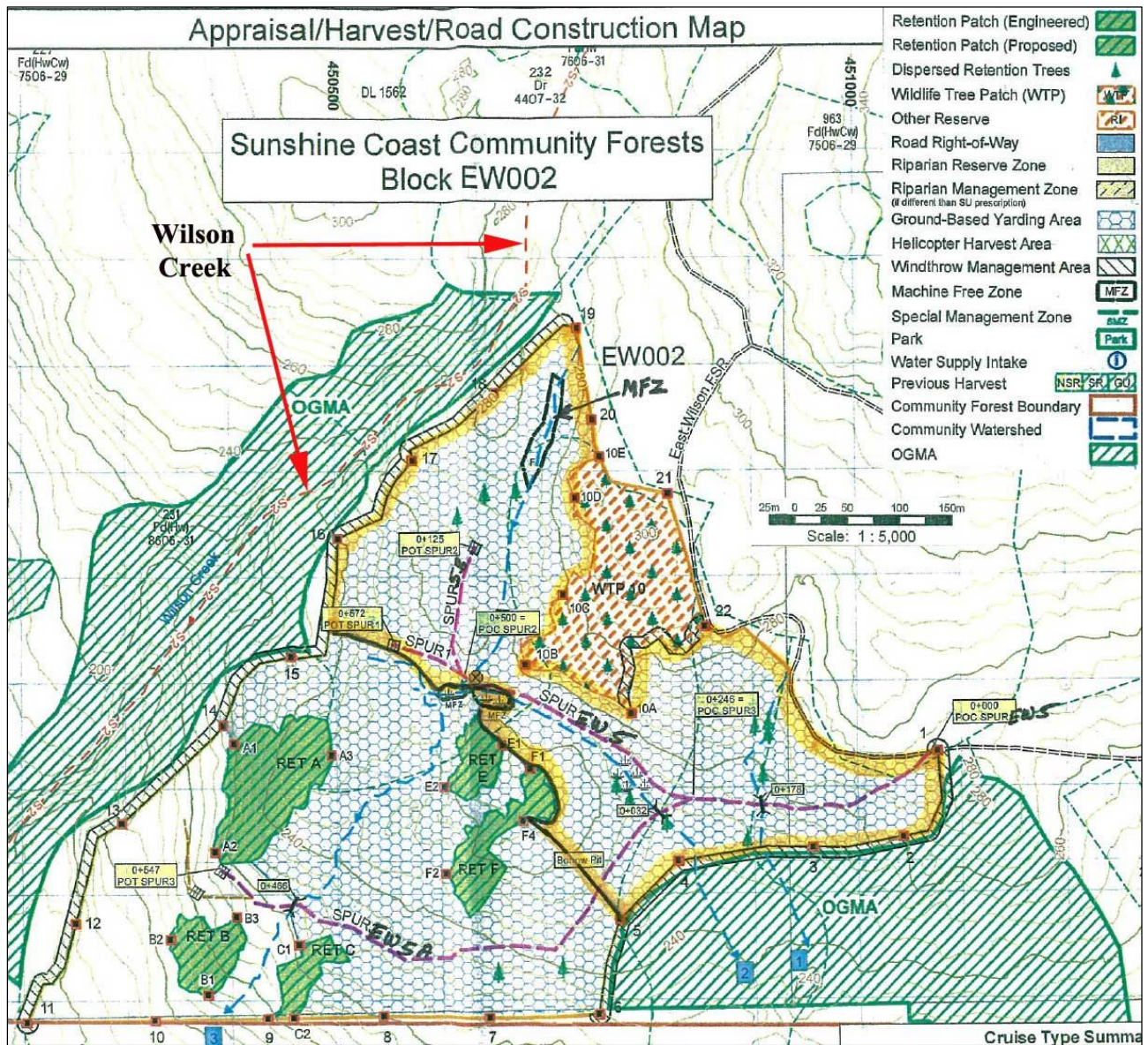
SCPI's executive decision not to harmonize the two Assessment reports as a co-presentation unit before holding a public forum, and SCPI's avoidance to release the reports well in advance of a public meeting, was, in hindsight, indicative of the Community Forest's underlying motivation to log 7,500 cubic metres of mixed forest in cut block EW002 in the lower Wilson watershed.

3. EW002 and the Bottom Line

*Upon completion of the Wilson Creek assessments, the Board of Directors approved the harvesting of Block EW002.*¹⁰

Appendix C contains informational insights from SCPI's Board Minutes about the high priority and financial value the SCPI placed on cut-block EW002 alone, estimated at close to one million dollars of gross revenue. But, SCPI was also making incremental profits from logging in other cut block sites in the Wilson watershed.

¹⁰ SCPI Annual Report, 2012.



Segment from SCPI's map harvest cut block showing the layout of EW002.

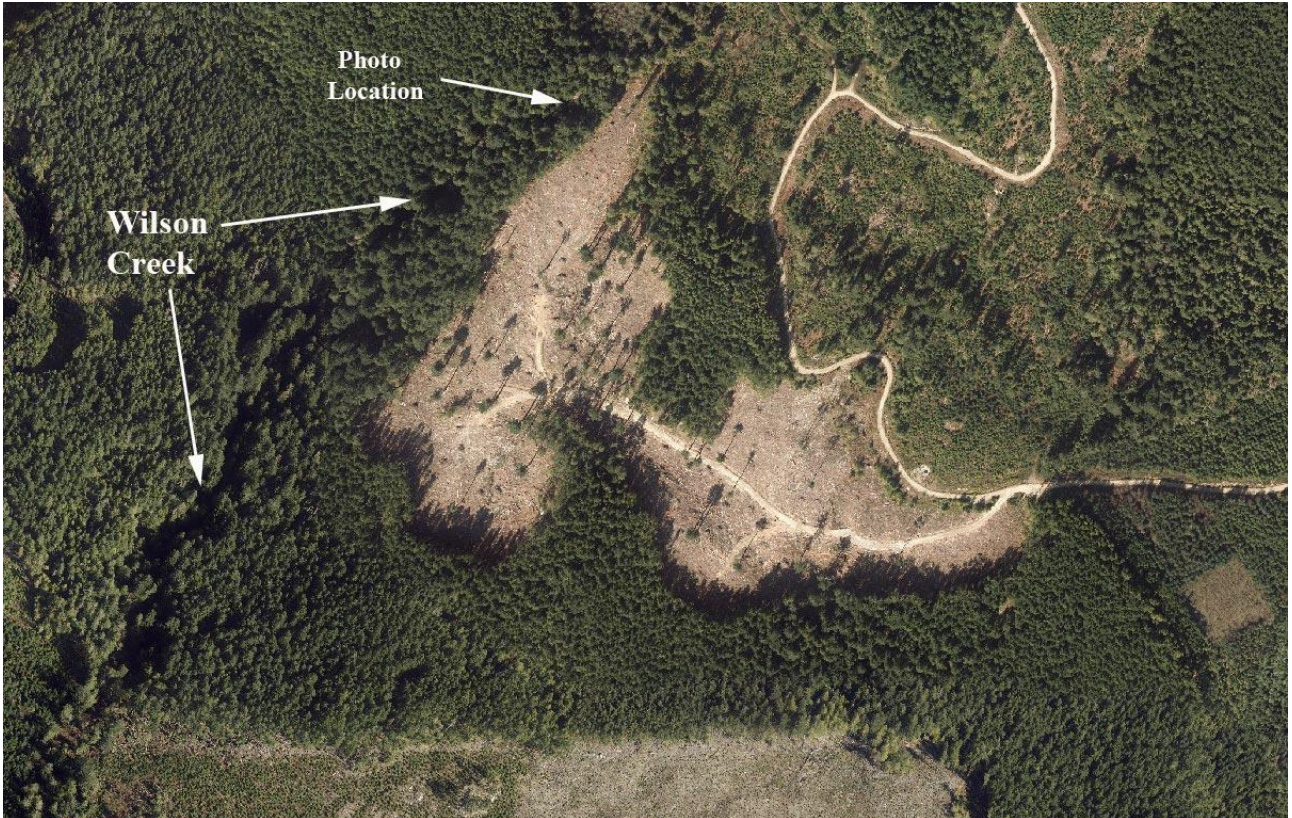
There were two matters that had specifically kept EW002, the largest and most profitable cut block, from being logged from early 2011 to October 2012, namely: the operational challenge from the Sunshine Coast Conservation Association about conducting a Watershed Assessment in a fish bearing, and domestic water licensed, watershed before any logging could commence; and public protests, concerns and walking tours raised and organized by Elphinstone Logging Focus members about protecting older forests and habitat in the Wilson watershed, particularly in EW002.

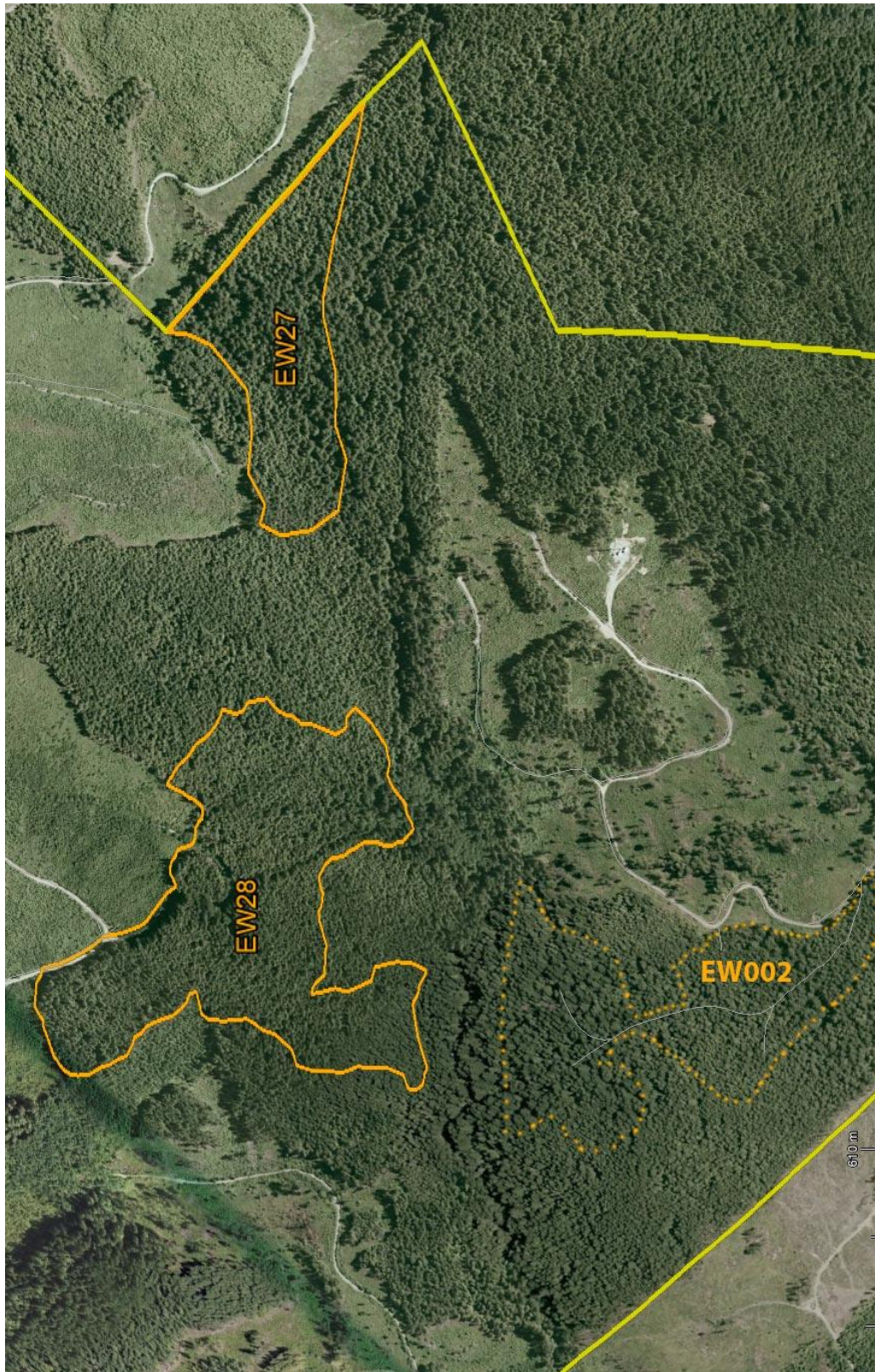
These two public forest conservation resource champions and watchdogs form the political backdrop for understanding the sneaky business of SCPI behind the reporting and delivery of the two Watershed Assessments in 2012. Had the two groups properly understood or discovered the Wilson watershed's poor health in terms of its hydrologic state from data in Horel's Assessment, and had SCPI's two Watershed Assessments of 2012 properly reported on the watershed's state of health, logging would most likely have been postponed for a number of decades in EW002, including the other proposed cut blocks in the Wilson watershed.



Above: 2009 Google Earth image of EW002 cutblock area before logging road access and clearcut logging of 2012.

Below: April 2014 Sunshine Coast Regional District aerial flight imagery showing logging block EW002.





2009 Google Earth imagery by SCPI's planning consultant, Chartwell Consultants Inc., drawn in late 2014, showing 2 of 7 proposed cutblocks, EW27 and EW28, in SCPI's Wilson Creek unit boundary area. Chartwell Consultants chose not to use the SCRD's aerial imagery of 2014, which would have shown the logging area of EW002, the boundaries of which are indicated in yellow dots by this report's author. EW28 is currently proposed for logging in 2015, an age class 7 forest, and is larger in total area than EW002.



Photo (by Ross Muirhead) taken directly below the northwestern edge of cutblock EW002, next to Wilson Creek, at bottom of photo (see location arrow on the top photo on page 10 of this report.). The edge of the cutblock is visible at the top of this photo, where a thin buffer of standing forest has exposed a steep escarpment composed of glacial lacustrine clay/silt materials deposited during the last ice age.

4. Map and Aerial Information Shortfalls

There are at least four examples of informational hydrologic assessment tools absent in the August 2012 *Wilson Creek Watershed Assessment* report:

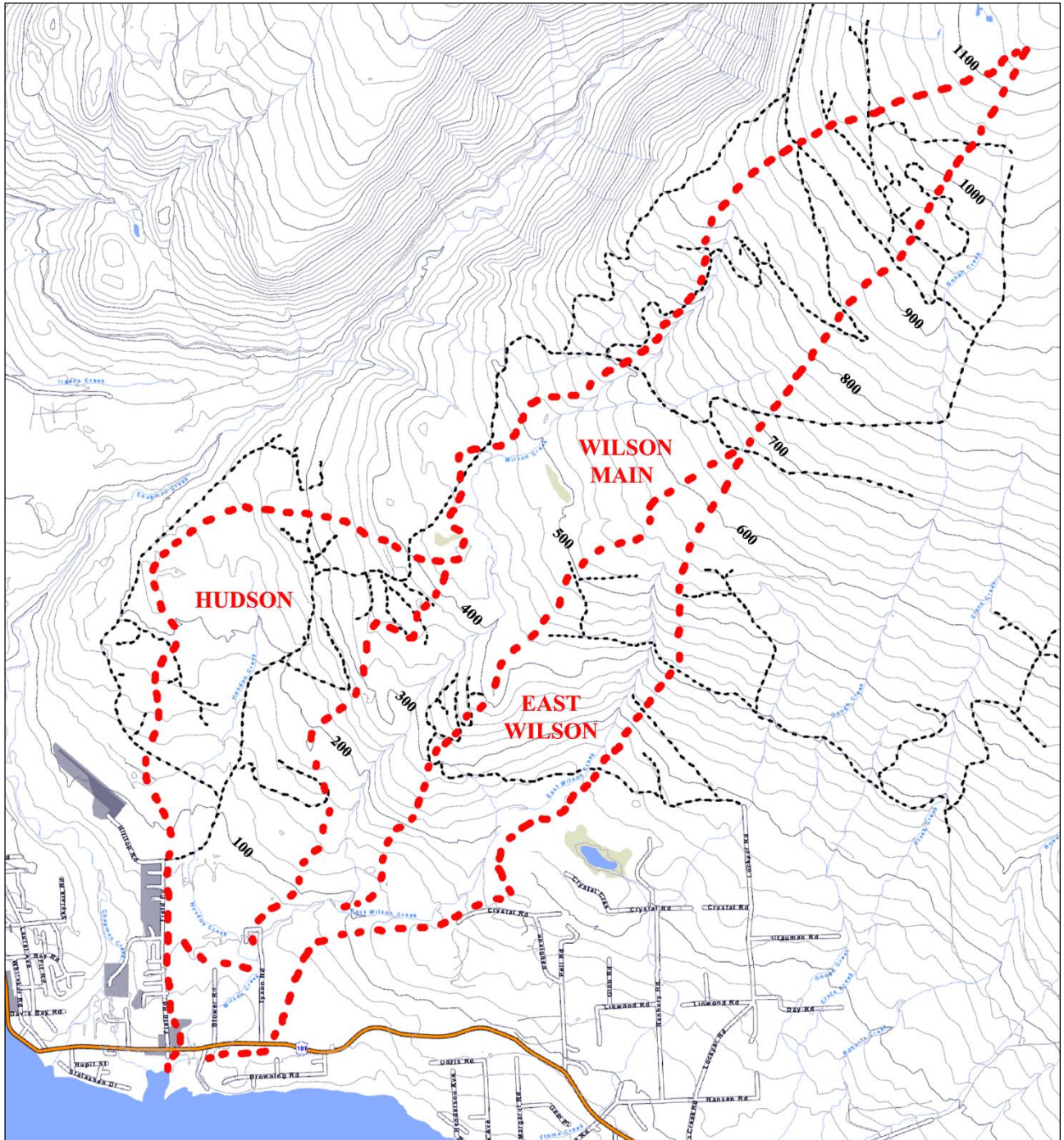
- Unlike the Dobson report, no contour map of the Wilson Creek drainage is included. Contour mapping is a simple and basic tool regularly used for showing slope gradients, water drainage courses, and tributary basin boundaries;
- There is no map information, contour or otherwise, delineating the location area boundaries of the three primary drainages, catchments or sub-basins of the Wilson Creek watershed: Wilson Creek main stem, Hudson Creek, and East Wilson Creek;
- There are no comparative, early aerial photograph overlays showing disturbance or land use activities in the Wilson Creek watershed.¹¹ The only such information used repeatedly is recent Google Earth satellite imagery, dated 2009, which fails to show logging area locations after 2010 by the SCPI in the Hudson Creek and East Wilson sub-basins;
- Other than Map 11 showing 2 cutblocks, there is no map showing the locality and area of all proposed logging cutblocks from the SCPI's 20-year operational logging plan (2010-2030), information that had been posted and available on the SCPI website since about 2010.

All of these four missing informational aids/tools are included in the present report.

As conditionally stated on page 32 of the Horel report:

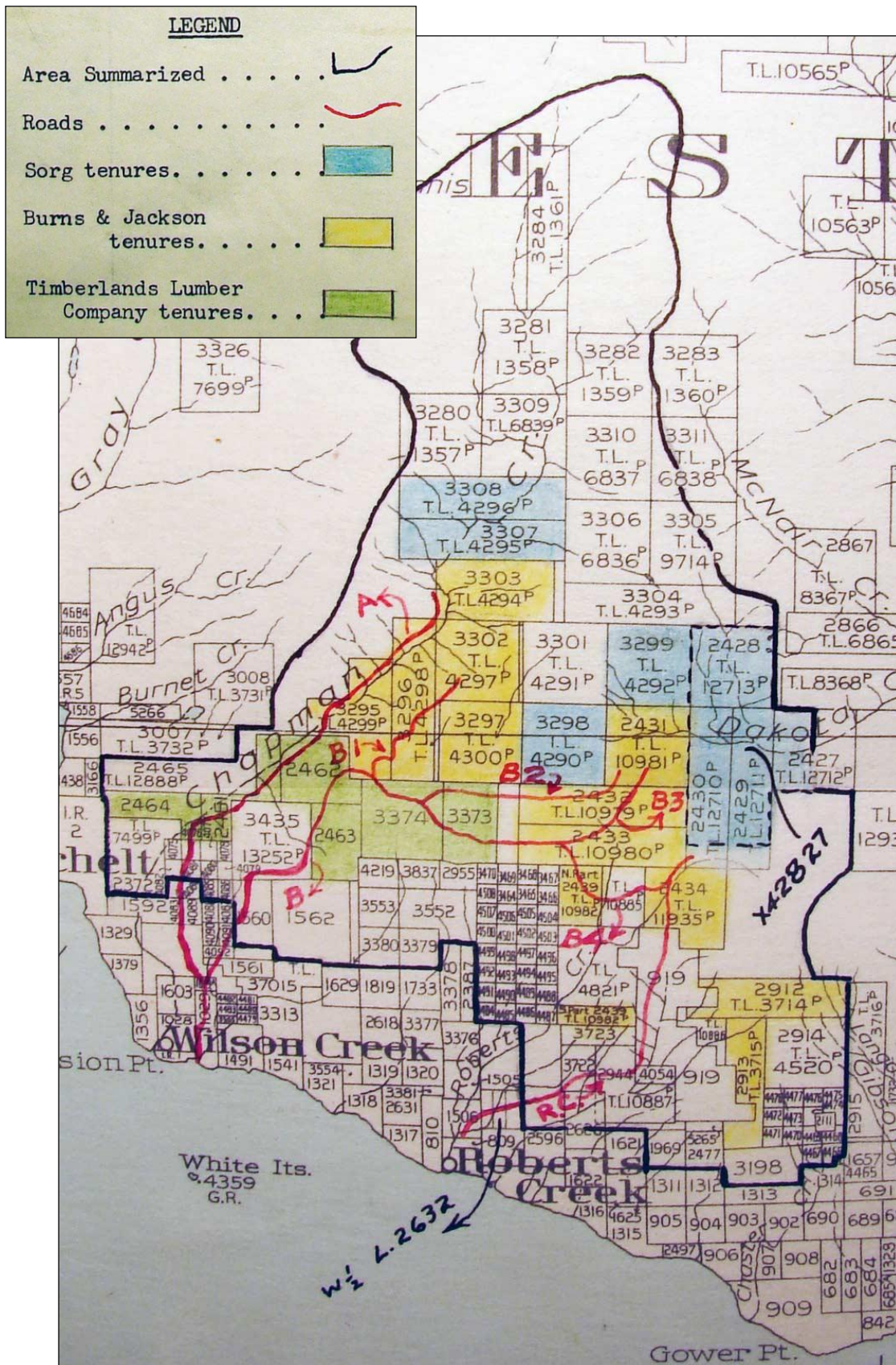
This assessment has been undertaken in accordance with generally accepted methods of watershed assessment for forestlands in British Columbia. No other undertaking is given.

¹¹ I.e., in Dobson Engineering Ltd.'s December 1998 report, *Interior Watershed Assessment Procedure for the Mission Creek Watershed (Update Report)*, prepared for Riverside Forest Products Ltd., where Historic Airphoto Comparisons are incorporated in Appendix C.



100 meter gradation contour map and rough boundary of the Wilson Creek watershed (as drawn by this report's author), showing three of four basin or catchment drainages. The Hudson and East Wilson basins are almost equal in area, with each representing about 25% of the Wilson watershed. The Wilson main stem basin represents about 50% of the Wilson watershed. The fourth basin is a small area below the confluence of Hudson and Wilson main stem basins. Elevation gain in the Wilson watershed rises from sea level to 1,161 metres, over a bird's-eye / horizontal distance length of about 11.5 kilometres, or an actual slope-angle-length distance of about 13 kilometres.

5. The 1950 Hodgins Report and Early Maps



Map excerpt from the March 6, 1950 Report on Burns & Jackson Logging Co. Ltd., by H.J. Hodgins, Consulting Forester, showing old roads, tenures, and District Lots in the greater Wilson watershed area.

BURNS & JACKSON HOLDINGS

The Burns & Jackson Logging Co. Ltd. holdings comprise twelve timber licences and a small amount of felled and bucked on Crown land. These holdings, corrected for logging to date by Mr. S. Forbes and revised by him, are as follows:

VOLUMES in M. feet board measure.

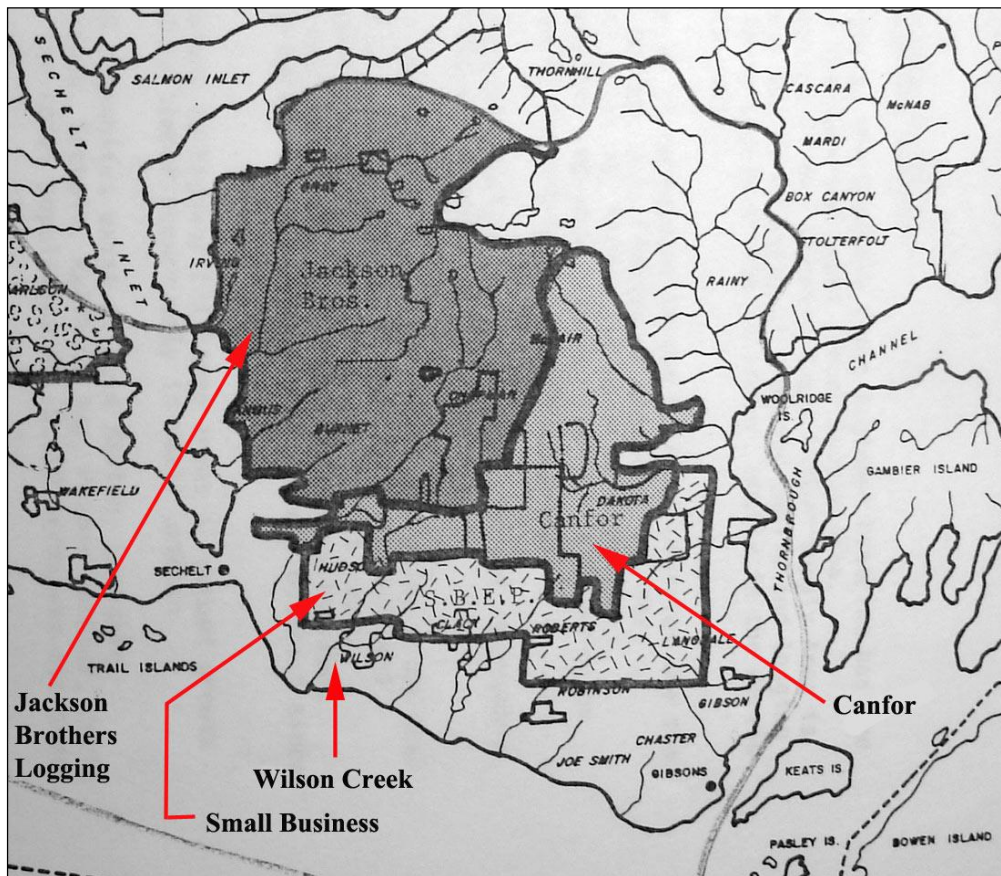
Lot No.	Balsam	Western Hemlock	Red Cedar	Yellow Cedar	Douglas Fir	White Pine	Totals	Basis for cruise
Lot 2912	3,000	3,000	1,000	-	-	-	7,000	Forbes-estim.
Lot 2913	2,500	2,500	-	-	-	-	5,000	" "
Lot 2431	1,307	89	2,065	2,781	-	-	6,242	Qually x
Lot 2432	-	-	-	-	-	-	minor	-
Lot 2433	30	160	450	110	130	-	880	Qually x
Lot 2434	379	741	2,427	40	1,495	-	5,082	"
Lot 2439	-	-	-	-	-	-	logged	
Lot 3295	-	75	-	-	15	-	90	Evans
Lot 3296	-	-	-	-	-	-	logged	
Lot 3297	1,441	960	1,419	1,789	27	167	5,803	Evans
Lot 3302	1,959	1,917	2,330	926	328	89	7,549	"
Lot 3303	2,337	1,374	3,110	729	-	22	7,572	"
Totals	12,953	10,816	12,801	6,375	1,995	278	45,218	
Felled & Bucked								
Lot 2431	97	545	235	799	25	-	1,701	Scaled
Lot 3296	-	-	100	-	100	-	200	Est.
Lot 3303	125	200	400	-	500	-	1,225	Scaled: Spec. Est.
Crown Land		100	100		200		400	Scaled: Spec. Est.
Totals	222	845	835	799	825	-	3,526	
Grand Total	13,175	11,661	13,636	7,174	2,820	278	48,744	
%	27.0%	23.9%	28.0%	14.7%	5.8%	0.6%	100%	

(Note: original maps only available at camp office.
Assumed acreage of (1) timber: 1850 acres.
(2) logged: 3600 acres.)

Information on timber type volumes on District Lot tenures in the March 6, 1950 *Report on Burns & Jackson Logging Co. Ltd.*, by H.J. Hodgins, Consulting Forester. Burns & Jackson sold their logging interests to MacMillan Bloedel in the early 1950s.



Above: 1974 map of Macmillan Bloedel's former operations in its Wilson Creek Division area (see accompanying map on the following page showing the road network in the Wilson Creek Division). *Source:* University of British Columbia, Special Collections. Below: Subsequent map showing the logging chart areas for Jackson Brothers Logging, Canadian Forest Products (Canfor), and Small Business.



OPERATION MAP
WILSON CREEK DIVISION

BOUNDARY	
Water	—
Outing Mile	---
BOUNDARY AREA	
Water	—
Other	---
BOUNDARY LINE	
1.	---
2.	---
3.	---
4.	---
5.	---
6.	---

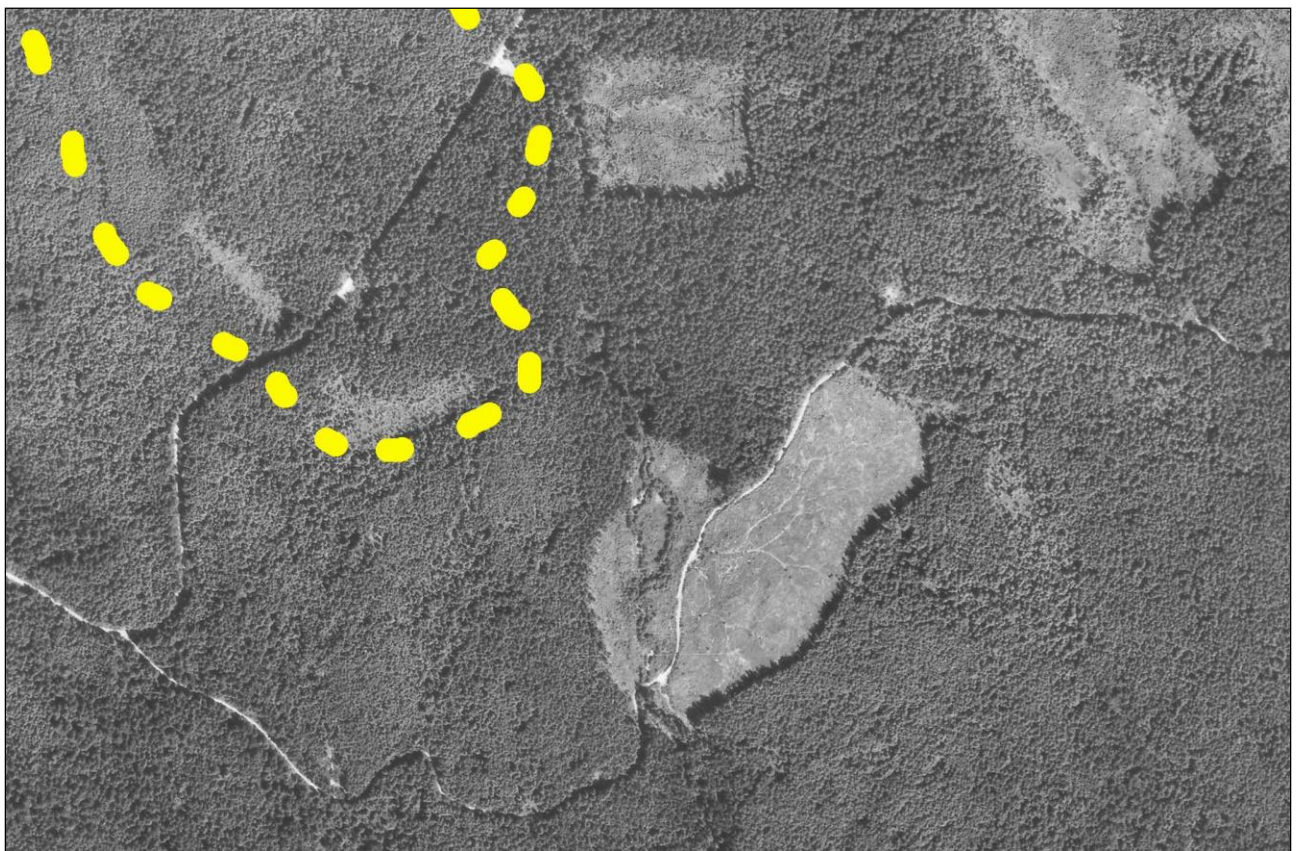


6. Early Aerial Photos: 1980

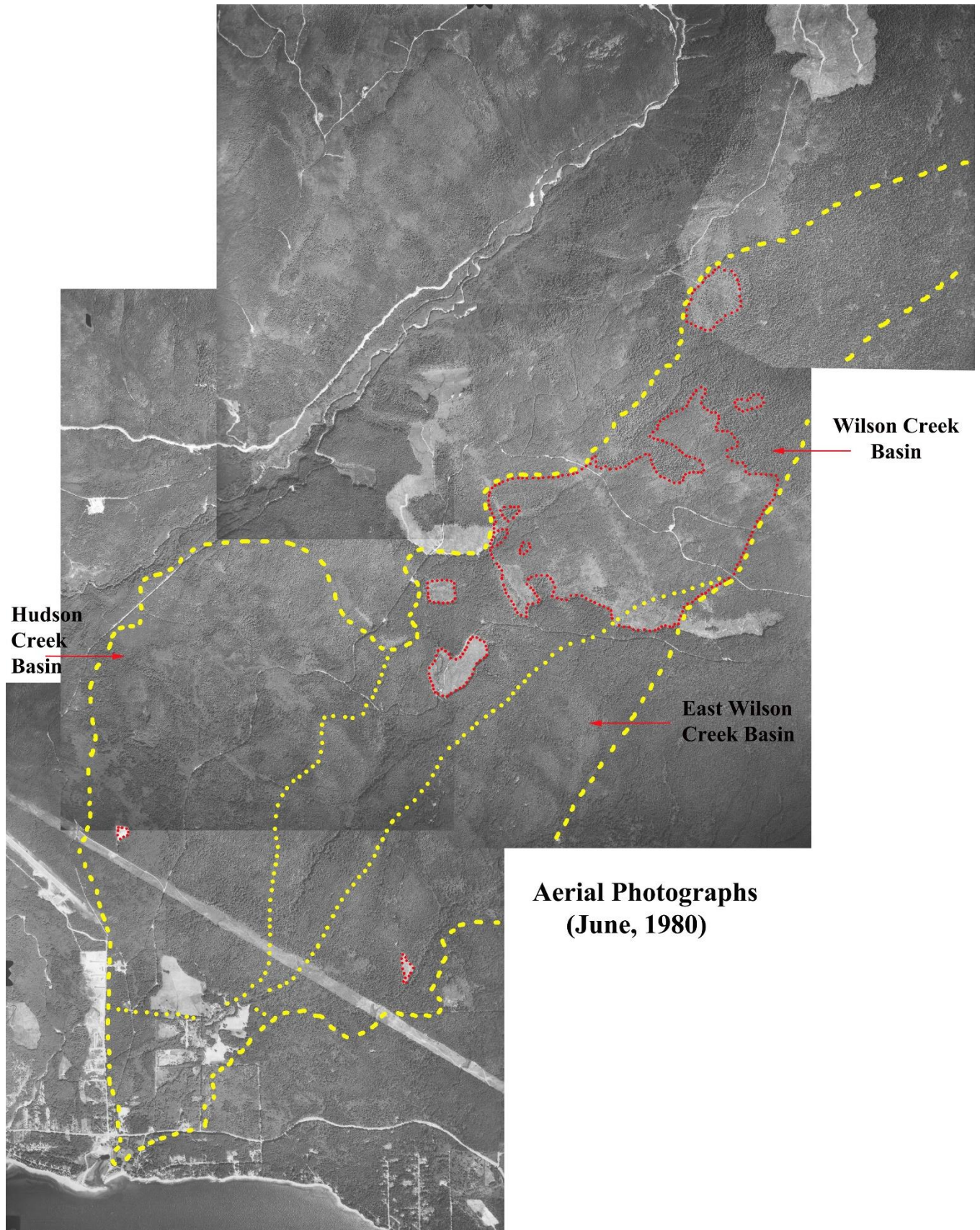
As shown on the following page in the composite overlay of June 1980 aerial photos, about one third of the mid Wilson Creek main stem basin had recently been disturbed by clearcut logging and road access, with no recent logging or disturbances in the Hudson and East Wilson Creek basins.

In the Hudson Creek basin, the only, or primary, disturbance is the East Road logging access road. Much of the forest in the Hudson Creek basin is in a state of regeneration (natural wildfire or logged), and was undergoing “hydrologic recovery.”

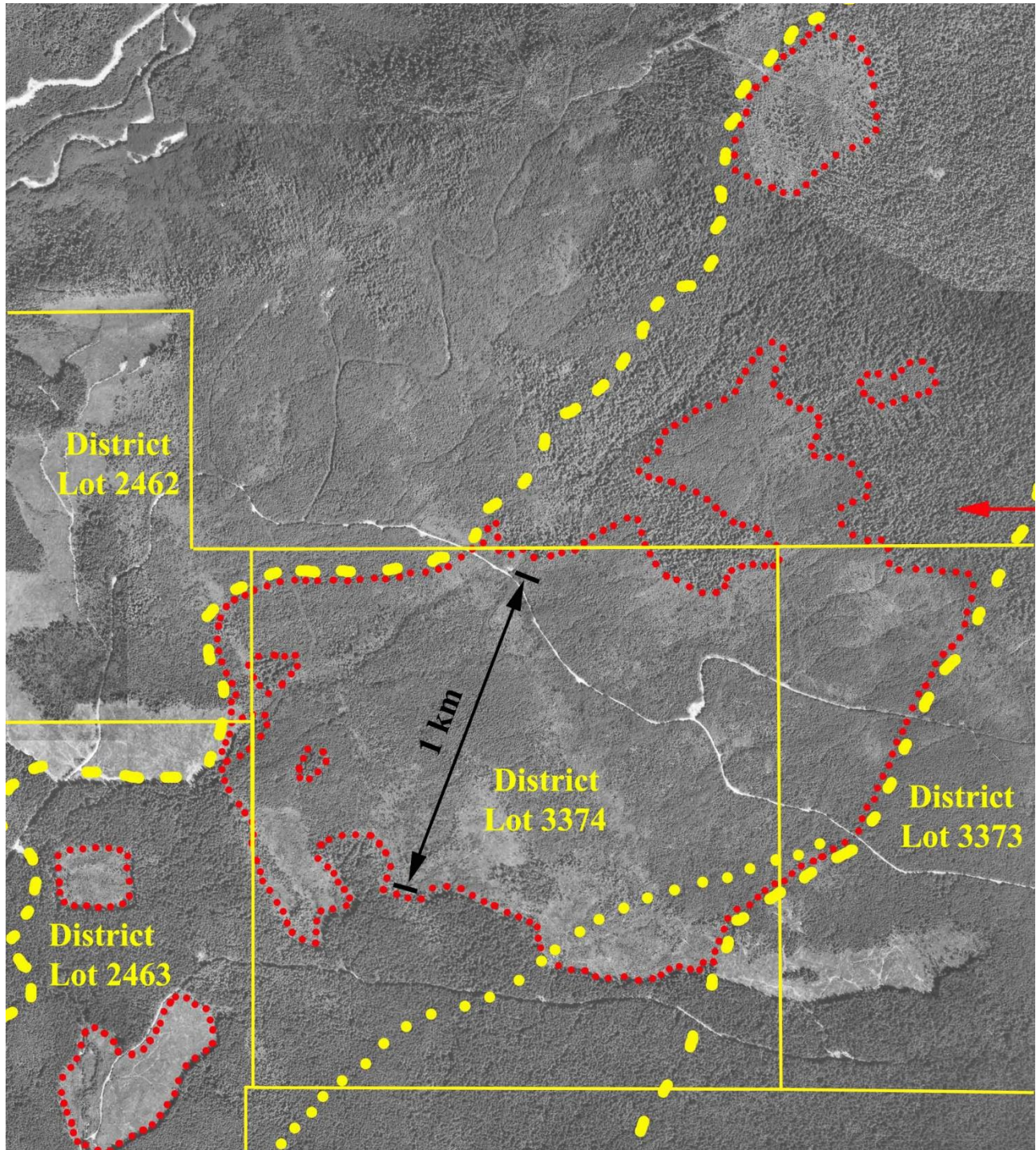
In the lower mid-section of Wilson Creek main stem, a new logging road branch had recently been constructed east of the “East Road” main access route, and across the entire width of the Wilson main stem, to also access mid-elevation timber east of the Wilson drainage.



In the first cutblock on this new access road, note how the Wilson Creek riparian area was logged on either side. There are at least two visible, minor scar areas (in white) on the logged areas around the creek within this cutblock, suggesting erosion of the streambank. Note also that within the small older and rectangular cutblock above, that logging had proceeded to the eastern edge of Wilson Creek.

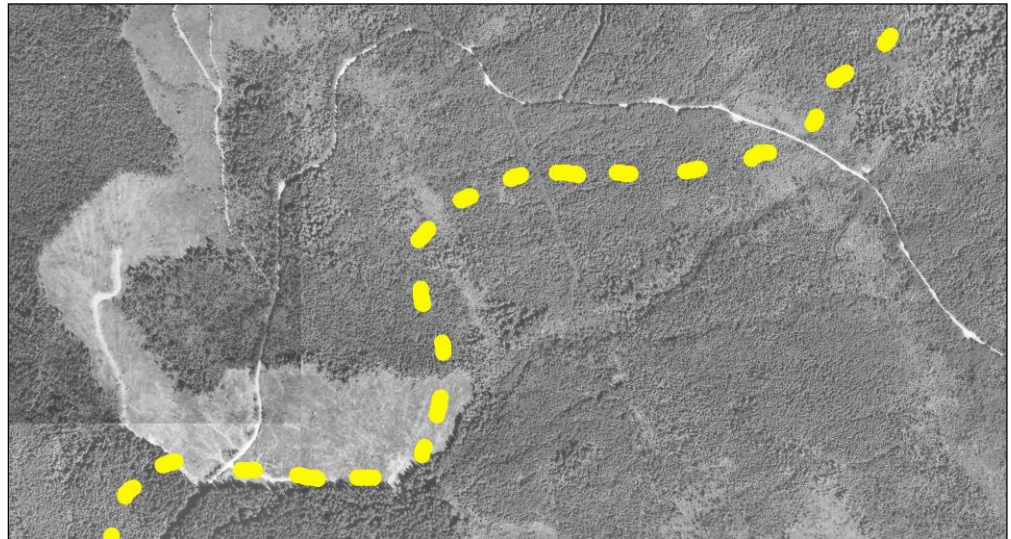


The East Road, identified on the map in the previous pages, was the only access road to log the areas outlined in red in the mid upper limits of Wilson Creek prior to 1980.



Close-up of the June 1980 aerial photo of former logging in the mid-elevation, and mid-Wilson Creek main stem watershed basin. The logging access road that crosses the middle of the watershed, from left to right, is the old East Road of the former Wilson Creek Division of MacMillan Bloedel Ltd. All of the logging outlined in red dots represents about 15 percent of the Wilson Creek watershed area, and over 25 percent of the Wilson Creek main stem basin. The yellow round dots show the upper boundary of the East Wilson Creek sub-basin. The yellow solid lines show the approximate location of four District Lots, the private forest lands described later in this report. According to the 1950 report by H.J. Hodgins on the timber holdings, these District Lots, outlined above, were once owned by the Timberland Logging Company.

Note that in the upper reaches of East Road, as it proceeds eastward across the Wilson Creek watershed, logging came, in varying degrees, to the edge of Wilson Creek. Wilson Creek wanders diagonally across the photo from bottom left to upper right.




Segment from an old provincial government contour map obtained from the Sunshine Coast Regional District files. Note that the upper reach of the Hudson Creek drainage is exaggerated and incorrectly shown, as the upper section of Hudson Creek in blue does not extend as far as indicated (see map below showing the Hudson Creek sub-drainage basin). Rather, it is the Wilson Creek main stem that actually extends into the upper section where Hudson Creek is here shown.



An interesting note on the bottom left of the map states that Wilson Creek was formerly referred to as Simpson Creek, after the owner of District Lot 1028, W. Simpson.

7. Lower Wilson Watershed: 1984 – 1990

 Fisheries and Oceans Pêch. et Océans
Field Service Branch

Box 10
Madeira Park, B. C.
V0N 2H0

January 28, 1985
Your file / Votre référence
F.L. A19219 General
Our file / Notre référence
5915-1 (85-5)

B. C. Forest Service
Sechelt Forest District
Box 4000
Sechelt, B. C.
V0N 3A0

Re: Jackson Brothers Logging Co. Ltd., Chart Area
Vicinity of Wilson and Hudson Creek. F.L. A19219

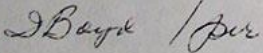
Dear Sirs:

Our department has recently received the aforementioned referral for status clearance.

As Wilson and Hudson Creek are both very good producers of chum and coho salmon, our department has very great concerns on the methods of logging and how much will be logged.

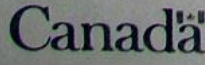
While we do not object to the area being cleared for status purpose, we request the opportunity to view all of the appropriate development plans.

Thank you for your continued co-operation.

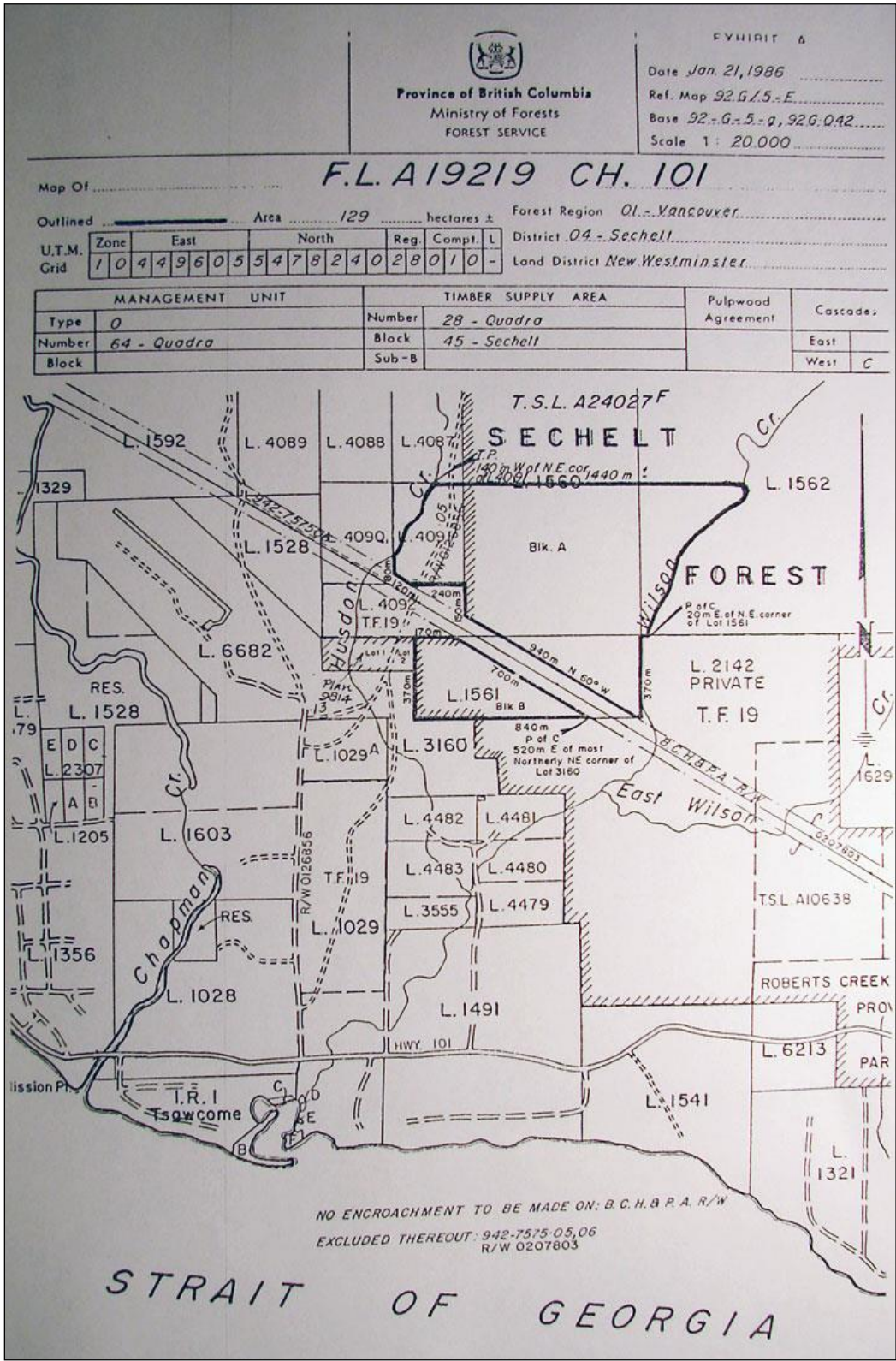
Yours truly,

R. B. Tancock
Fishery Officer

RBT/1b

DISTRICT MANAGER
RECEIVED
JAN 29 1985 *fem*
SECHELT, B.C.

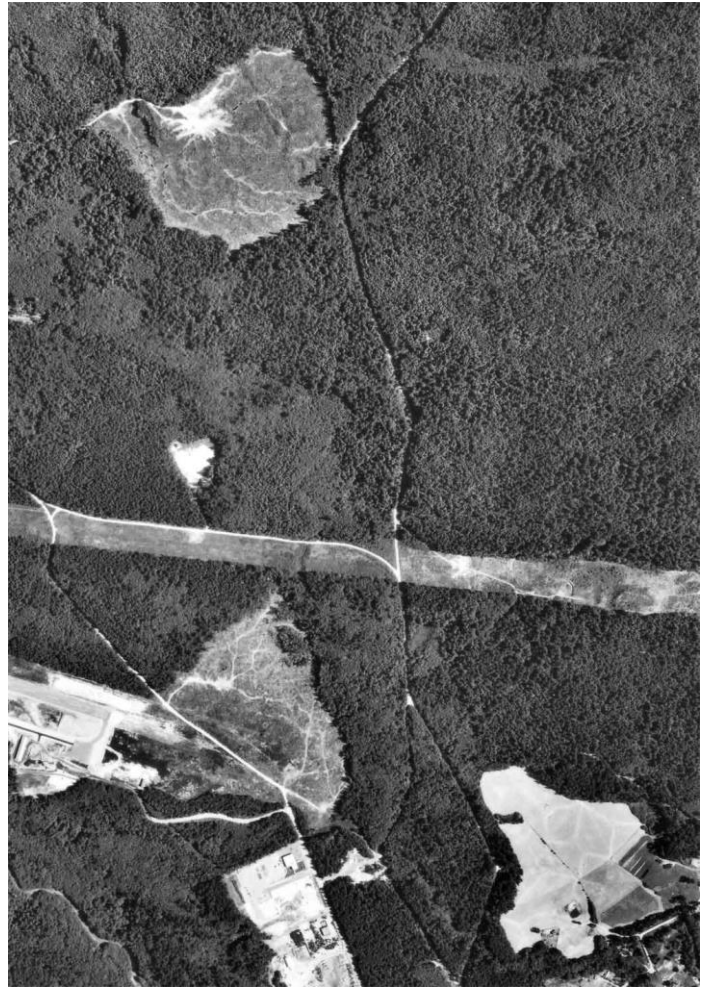


As interests to log more of the Wilson Creek watershed began in earnest in the mid-1980s, the federal department of Fisheries and Oceans became concerned about the future impacts of logging on fish habitat and water runoff.

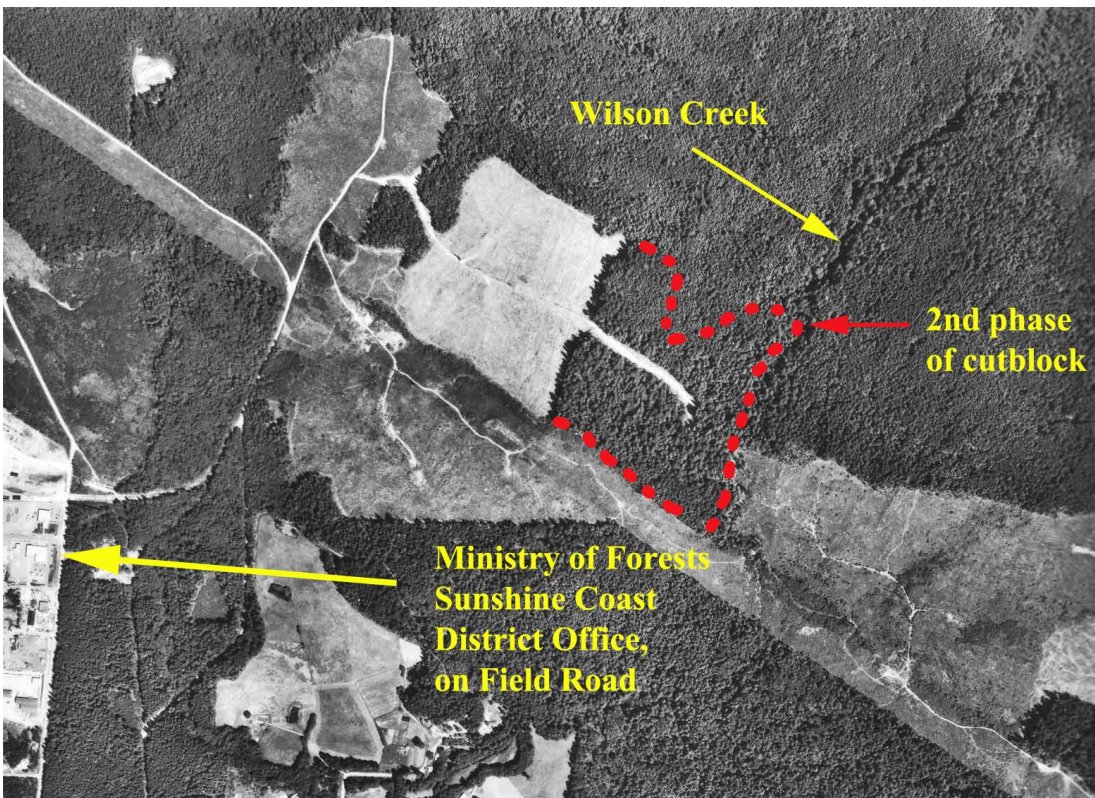


Location of Block A, outlined in bold black line in the harvesting proposal map above, is shown on aerial photo on following page.

Right: July 16, 1984 aerial photo showing new cutblock north of BC Hydro right-of-way.



Below: 1990 aerial photo showing same area in lower section of the July 16, 1984 aerial photo, with added logging activities. The red dotted-lined area is part of Cutblock A as shown on the previous page, showing the January 21, 1986 map location of proposed logging of forest license A19219. Note the new main haul route to Field Road, where the new Ministry of Forests Sunshine Coast District office is located.



8. Upper Wilson Watershed: 1994 Aerials



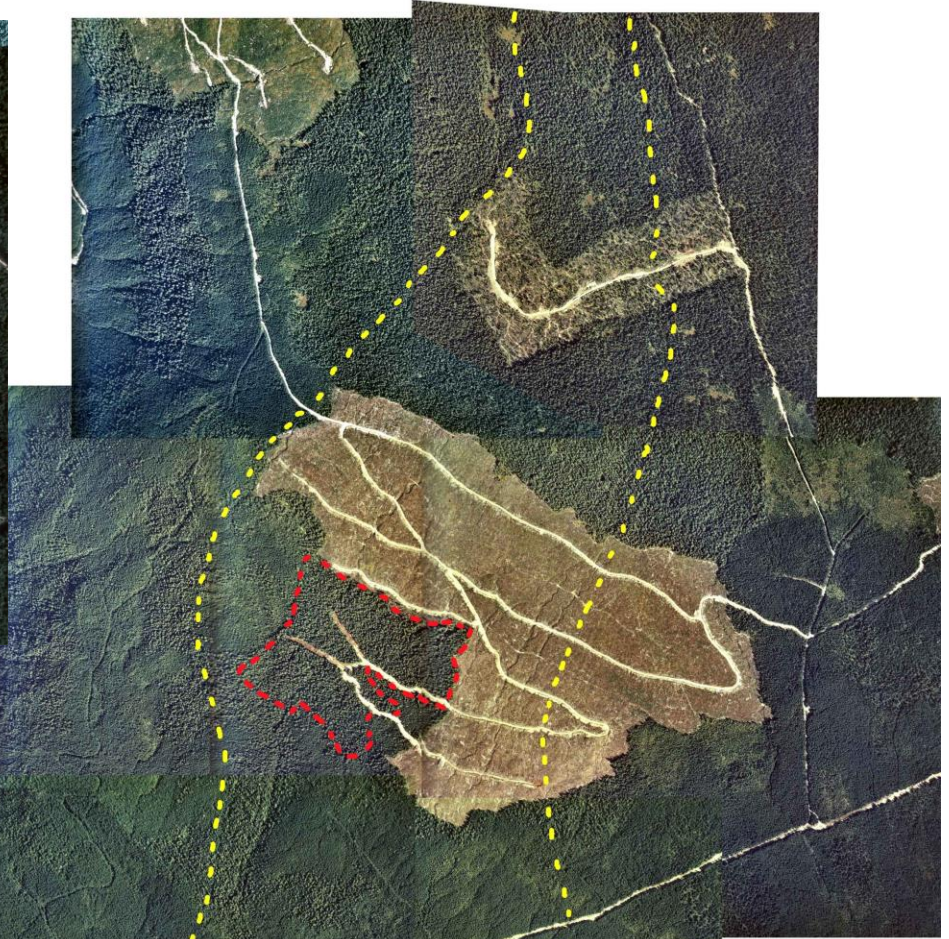
In 1991, a large block of mid-elevation forest was clearcut logged in the Wilson watershed between the 780–920 meter elevation levels. As shown in these 1994 color aerial photos, the upper Wilson Creek (top left photo, far left) was logged on both sides, and tributary streams to the east were also logged.

The slope distance length of exposed streambank on top left photo (far right), from top to bottom, is about 900 metres, with four road branch crossings, and two skid roads. On photo to right, the slope distance length of exposed streambanks measure, from top to bottom, is about 1,400 metres (or, 11.5 percent of the total slope length of the Wilson watershed), with five road branch crossings, and two skid roads.





1994 Aerial Photos



The red dotted area next to the large clearcut was later logged. *Top left:* enlargement of area in bottom centre of aerial photo.



Above: October 2007 photo, overlooking the upper Wilson watershed main stem showing the large cutblock prominently featured in the 1994 aerial photo. After some 16 years there is sparse regeneration of this 'new forest'. Above the clearcut, new logging roads and clearcut logging of ancient old growth forest by Western Forest Products.



Right: Looking southwest, down the Wilson watershed toward the District of Sechelt in far distance.

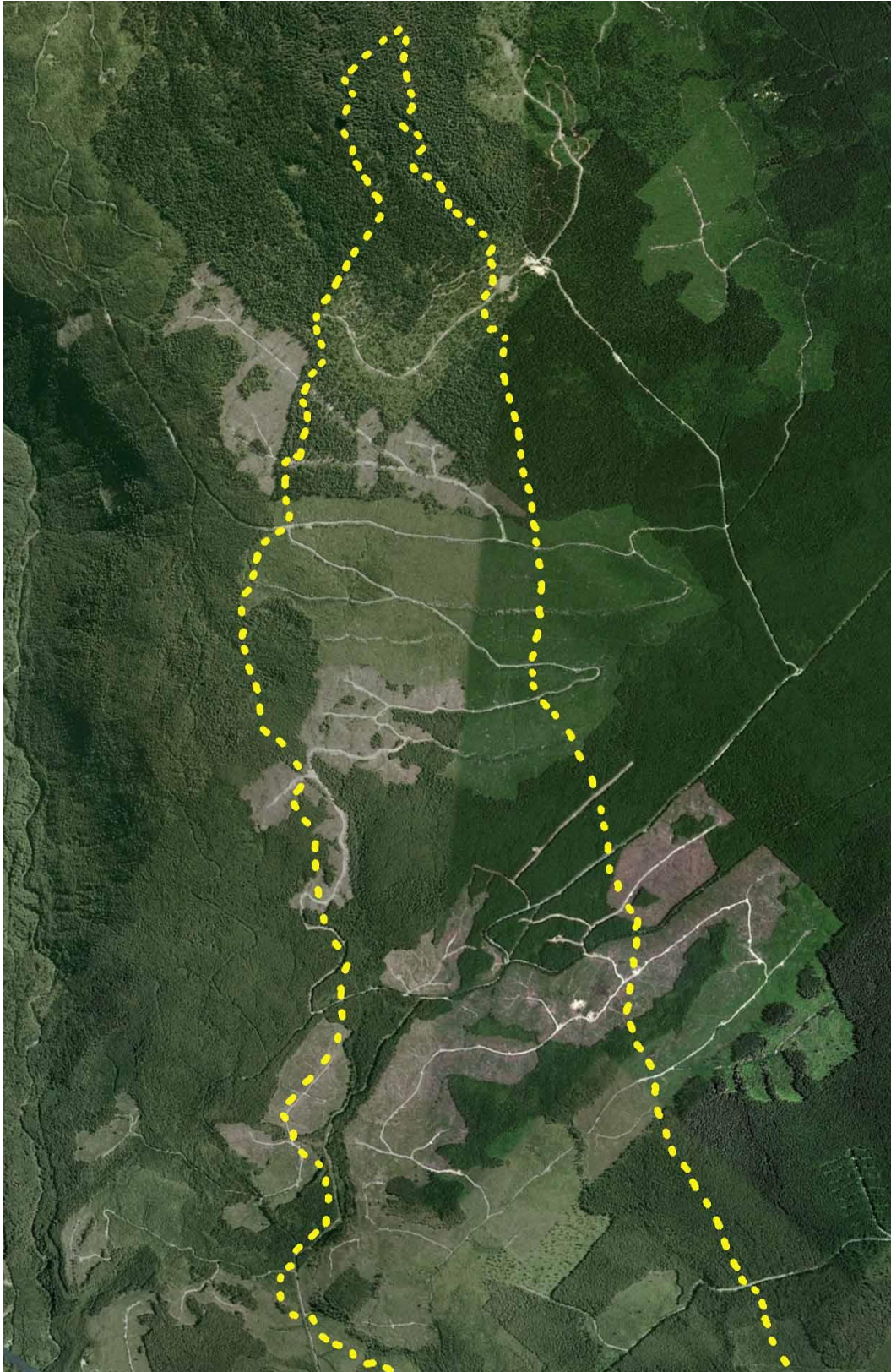


Above: April 2008 snowpack on upper block at 900 meter elevation. The serious repercussions concerning increased water runoff from rain-on-snow events during cool and warmer temperature conditions on this exposed extensive cutblock have been ongoing since the early 1990s.

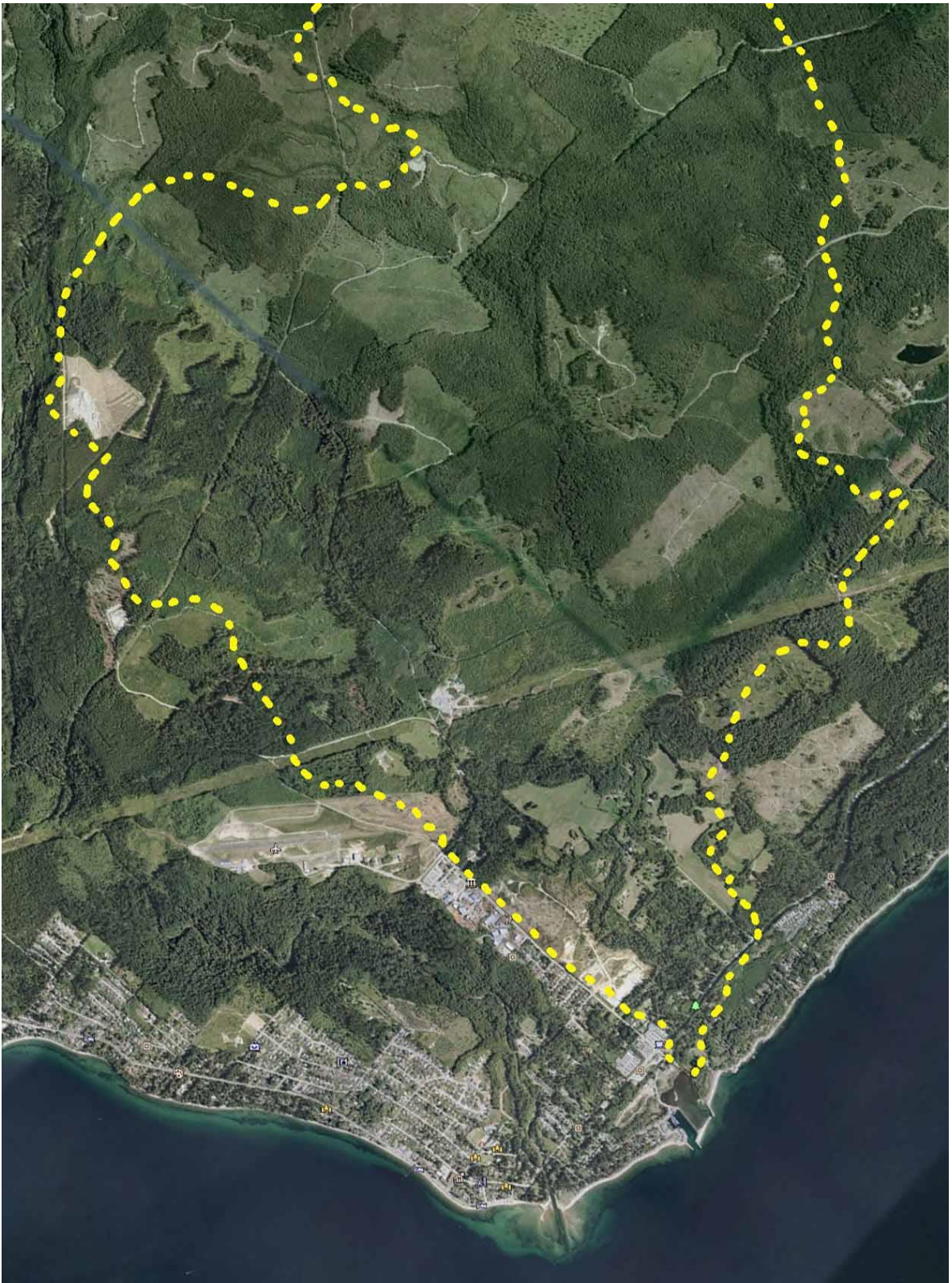
Right: October 2007 on same upper block. Note small tree height, and sparse distribution.



9. Wilson Watershed: 2009



Upper Wilson Watershed boundaries, as re-determined by Horel.
Google Earth satellite imagery, 2009. Chapman Creek, far left.



Lower Wilson Watershed, Google Earth imagery, 2009. Very bottom of photo shows the large alluvial deposition debris and sediment fan of Chapman Creek. Chapman Creek was rerouted a few decades ago, and used to flow where Wilson Creek now flows into the ocean, located just to the right.

10. Assessing Dobson's Damage Assessment

Unlike the 2012 Horel Assessment, and despite the limitations in Dobson's bare-bones March 2010 report assessment, Dobson manages to pull a few numbers out of his hat on the state of the Wilson watershed as it relates to hydrologic recovery. That is, according to his understanding and definition of hydrologic recovery, and despite some mistakes Dobson made in his forest cover and ECA (Equivalent Clear-cut Area) interpretative map, "Current Condition 2009."

On page 3 of 17, Dobson states that the Wilson watershed's ECA is about 31 percent:

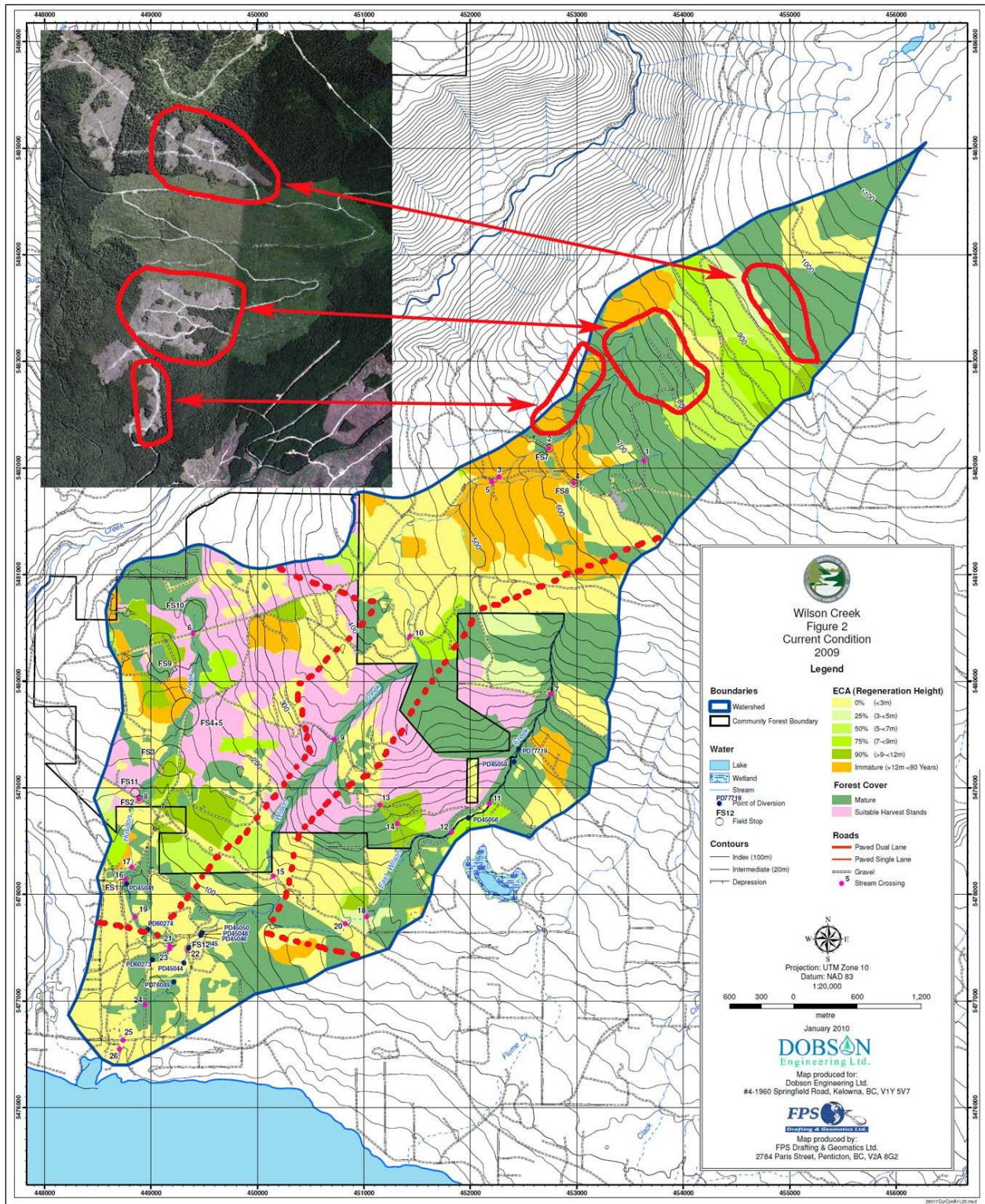
The Wilson Creek watershed has a historical total harvested area of approximately 46%. Currently due to hydrologic recovery in the watershed, the current equivalent clear-cut area (ECA) is approximately 31%. The SCF operating area accounts for 34%¹² of the watershed and is located primarily within the 100-400 m elevation band with a small area between the 400-540 m elevation band. The historical total harvest area within the SCF is 351 ha or 14% of the watershed area. Refer to Appendix A for data summaries and to Figure 2 for the current condition map [Tables A3-A7].

Dobson also, and confusingly, states the following on page 13 of 17, "the total historical harvested area was calculated at approximately 52%" and "the current ECA is calculated to be approximately 35%." The two figures are different than his 46% and 31% figures on page 3. It is not known what Dobson was referring to on page 13, or which of the two data summaries are correct.

That said, there are two important problems with the Dobson report with respect to data used to assess forest harvesting history, the first problem of which is also a problem found in the Horel Assessment:

1. There is no central reference map carefully detailing forest age / logging polygons and a corresponding table itemizing each polygon regarding area in hectares, tree height, age class, tree species. Nor is there a corresponding table itemizing road length / area per polygon. Nor is there a corresponding table estimating total areas of stream channel width. Nor is there a corresponding table itemizing private land information and areas, including harvesting and road construction. Without this information, the reader cannot understand or research how the author came to his conclusions about hydrologic recovery. It is an issue of transparency.
2. In Dobson's forest cover and ECA interpretive map on pdf page 24, it overlooks or fails to include at least three separate and recent logging activities in the upper elevation zone of the Wilson watershed (which are properly identified in Map 4 of the 2012 Horel report). These missing components are shown on the following page, where on a copy of Dobson's map are added red highlighted areas showing these missing observations in relation to a 2009 satellite photo. In other words, it appears as though Dobson's total harvesting figures, and his ECA figures, are incorrect and lower than in actuality. Had Dobson provided the logging block details in a polygon map and table, as outlined in point number 1 above, the reader would have been able to find these errors.

¹² Using Dobson's Wilson watershed total area figure of 2,473 hectares, SCPI's operating area of 34% of the Wilson watershed translates to 841 hectares. Horel states that the correct figure of SCPI's Wilson tenure is 899 hectares.



Contour / ECA (regeneration height) / forest cover map on pdf page 24 in the March 2010 Dobson report. (Horel's August 2012 Assessment report corrected and altered Dobson's hydrologic boundaries of the Wilson watershed.) Three errors, noted by red circles in the upper limits of Wilson Creek, where old growth forest was incorrectly shown and recent logging showing immature growth (as correctly shown in 2009 Google Earth imagery, upper left), should have been colored in pale green or yellow in Dobson's ECA interpretation Legend. The bold black and straight lines denote SCPI's Community Forest License boundaries, the area which was formerly under forest license tenure of International Forest Products (Interfor). The lower area red dotted lines have been added to show the rough boundaries of the Hudson and East Wilson sub basins which were not provided on Dobson's contour map.

Dobson begins his report in sections 2.3 and 2.4 by summarizing the important ecological and resources values associated by fresh water runoff for both fish and 14 domestic water licenses in the Wilson watershed: “the Wilson Creek watershed is recognized as having very high fisheries and biodiversity values.”

In section 4.0, Dobson states that the “two key management issues” for the entire Wilson watershed “are the condition of the riparian areas and the sensitivity of channels and banks to disturbance that would subsequently result in increased rates of sedimentation to the stream channels.”

*It is important to the hydrologic health and high fisheries and biodiversity values of the watershed to protect stream channels. The age and type of stands in the watershed are conducive to the current condition of the watershed and more importantly, to maintaining healthy, functioning riparian zones and stream channels.*¹³

That is true when protecting fish and drinking water concerns. However, there is another key issue sidelined from the assessment table, namely the rate and timing of surface and groundwater flow resulting from cumulative logging and road practices over the entire watershed area, not just in specific areas, which Dobson states as his interpretation of having the greatest impact or emphasis:

*It is important to note that forest development is acceptable from a hydrologic perspective because it is not the loss of forest cover and the corresponding ECA value that results in impacts, but where in a watershed harvesting and road construction activities take place. The loss of riparian vegetation along stream banks that are sensitive to disturbance and harvesting on unstable slopes that may increase the likelihood of landslides are the main issues for forest development on the BC coast.*¹⁴

In Dobson’s discussion (in his report section 3.4, following) about his understanding and application of hydrologic recovery and Equivalent Clear-cut Area (ECA), he begins with referencing the findings in a recent 2007 research report co-authored by Robert Hudson and Glennis Horel, Technical Report TR-032, *An Operational Method of Assessing Hydrologic Recovery for Vancouver Island and South Coastal BC*, and proceeds to summarize how forest hydrologists in BC are reinterpreting the science from that as espoused in the United States:

Hydrologic recovery of coastal forest stands is an index of the degree to which a regenerating forest stand is similar to an old growth stand in its interception characteristics and influence over snowmelt [Hudson and Horel, 2007]. In the past, there was a linkage between hydrologic recovery and ECA where many considered ECA to be an index of a potential change in streamflow. This is an important distinction to make. This is not how ECA is understood or applied to coastal watershed hydrology today. Watershed ECAs are calculated and used as an overview indicator prior to the site visit to gain an understanding of how the watershed may be functioning in terms of the extent of past forest development, and forest stand hydrologic recovery.

Our experience from conducting watershed assessments on the coast, and supported by research [Alila, Y.],¹⁵ has shown us that peak flows are rarely affected by the loss of forest

¹³ Page 11 of 17.

¹⁴ Page 14 of 17.

¹⁵ Younes Alila. *Forest Management in Interior British Columbia: Moving Beyond Equivalent Cut Area.*

cover, and are more related to the removal of riparian vegetation and harvesting on unstable terrain. Therefore, a greater emphasis is placed on field observations and the presence or absence of field indicators. As described above, the ECA value is used as an overview guide prior to the field assessment.

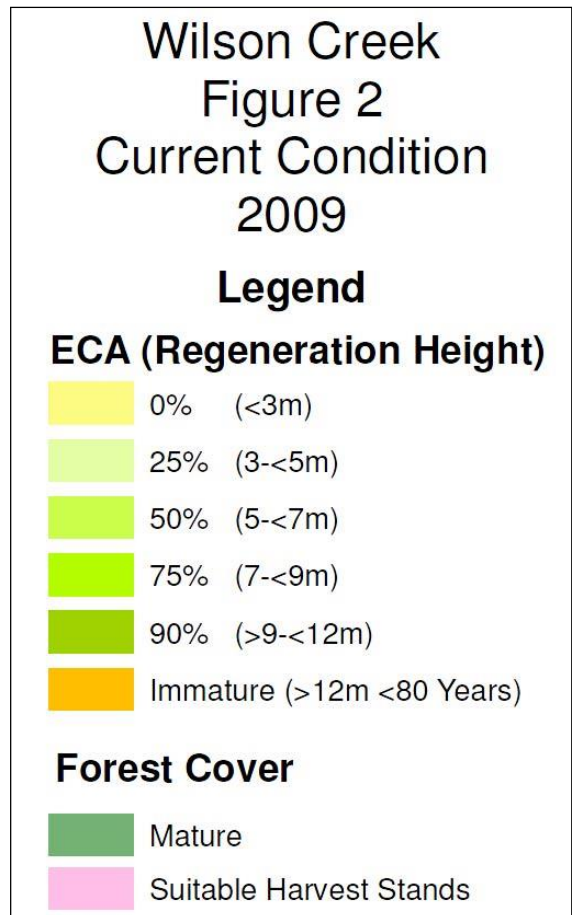
As mentioned previously, based on the results of extensive watershed assessment work on the coast since the early 1990s by DEL [Dobson Engineering Ltd.], forest hydrology researchers from the MoFR, MoE and UBC, and other consultants and forest licensees, it has been determined that the critical factors affecting stream channel stability is not ECAs but rather the condition of the riparian areas along stream channels and the stability of slopes connected to streams.¹⁶

Though not explained in Dobson’s report, he adopted the 2007 methodologies and findings of the Hudson / Horel TR-032 report in his application of ECA’s. Those findings include the following two methodologies:

- dividing a coastal BC watershed into three elevation zones for separate ECA determinations: 0 – 300 meters, 300 – 800 meters, and 800 meters higher;
- where a 20 meter tree height is equivalent to about 90% hydrologic recovery.

What is interesting about both the Dobson and Horel reports, is that each applies an unexplained deviation from these two methodologies:

- In his assessment, Dobson shows in his map legend (for the map on pdf page 24) that 90% ECA regeneration height represents (in dark green color) forest stands with a height greater than (>) 9 meters and less than (<) 12 meters. This is between 11 and 8 meters less than the new standard developed from the Hudson / Horel technical report, data based on earlier reports. Dobson, however, does apply the other methodology: “ECAs were determined for the watershed and for the 0-300m, 300-800, and >800m elevation bands.”
- In her assessment (discussed below), Horel unexplainably uses a new determination, using 300 – 900 meter, and > 900 meter elevation bands to interpret ECAs. Horel fails to make reference to the 20 meter tree height as a reference point for 90% hydrologic recovery.



¹⁶ Pages 5 – 7 of 17.

11. Discussion of the Horel Report

A detailed hydrographic boundary analysis and evaluation of the Wilson watershed in the Horel report determined that the watershed is actually 2,207 hectares in total area, a difference of about 266 hectares less in total area as reported in the March 2010 Dobson assessment. This more accurate finding likely means that there are slightly more statistical constraints or pressures regarding the time it will take for full hydrologic recovery of the relatively small Wilson watershed, particularly given its present state and condition with respect to historic forestry practises.

The aerial photos from 1980, 1994, and the 2009 Google Earth imagery in the March 2015 Koop report portray the progression of recent logging over a thirty year period in the Wilson watershed. These revelations are aided by showing boundaries of three primary watershed sub-basins, Wilson main stem, East Wilson, and Hudson, showing the progression of logging within each.

According to Table 4 in the Horel report, 44% of the Wilson watershed was logged over a 35 year period to 2012, and that an additional area of 8% is mostly non-forest. Missing in the Horel report is map and table data itemizing logging history per cutblock: year of logging, area logged, seedling restocking year, and years for and length of road access construction. A copy of a forest cover polygon map of the Wilson watershed complimented with itemized data could have provided this disturbance history as a map-appendix to help pinpoint the progression of hydrologic fragmentation over time. The data behind Horel's figure of 44% was not made fully transparent.

The August 2012 Horel report neglects to map-identify the three drainage sub-basins or catchments in the Wilson watershed, and neglects to provide statistics and evaluations within each. According to the April 1999 revised *Coastal Watershed Procedure Assessment Guidebook*, such sub-basin or catchment mapping and evaluation for fish bearing streams in watersheds greater than 1,000 hectares is a standard procedure. For instance, the gathering of:

- Statistics on the total length and density (area in hectares) of logging road access;
- Statistics and discussions on ECAs and hydrologic recovery;
- Statistics on private forest land and Crown land ownerships and conflicts.

Though general land ownership statistics are provided in Table 9 and Figure 19 of the Horel report, there is no further breakdown analysis of these statistics. For instance, the total area in hectares of the upper private forest lands are not identified, making it impossible to understand the statistical relationship of private and Crown total forest cover in the Wilson main stem basin (see below), and the relationship of those private lands to the entire Wilson watershed. The same is true of the lower private managed forest lands that make up a large proportion of the East Wilson sub-basin. After all, ECA and hydrologic recovery analysis is all about crunching numbers and issues thoroughly, accurately, and transparently.

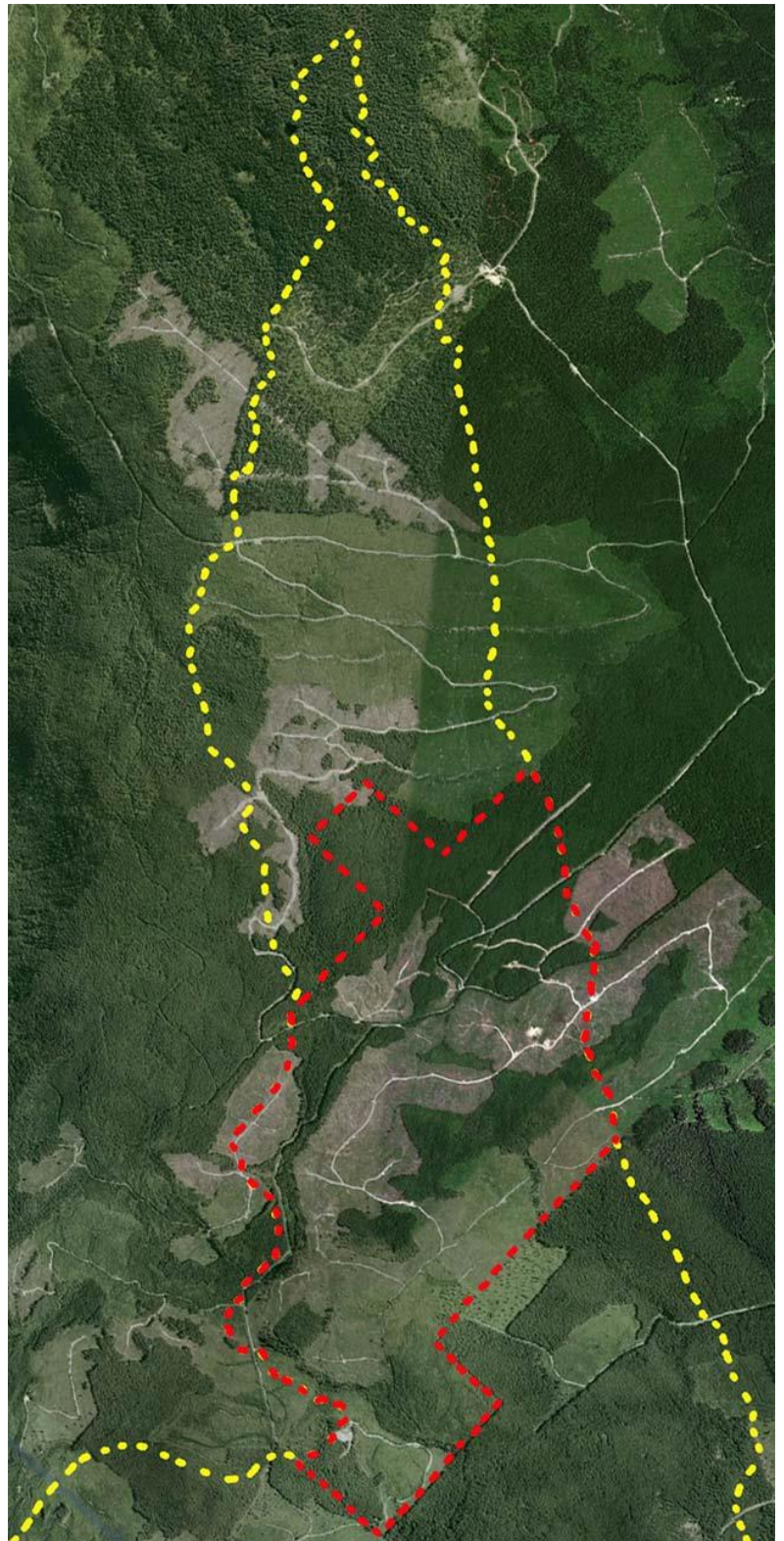
The Horel report only makes brief reference to the land ownership conflicts and the comparative future hydrologic recovery goals of the Wilson watershed, without providing a longer discussion and evaluation of these critical conflicts, i.e.:

Ideally, in managed forest lands, forest stands have age ranges evenly distributed over the landscape and the cut is similarly distributed. In this way, sudden large changes in forest cover concentrated in one area are avoided. When land ownership and tenure is fragmented

*this is difficult to achieve [underline emphasis] because each owner/tenure holder will be managing stands and timber flow across the entirety of their holdings, rather than apportioning the cut over individual blocks of property.*¹⁷

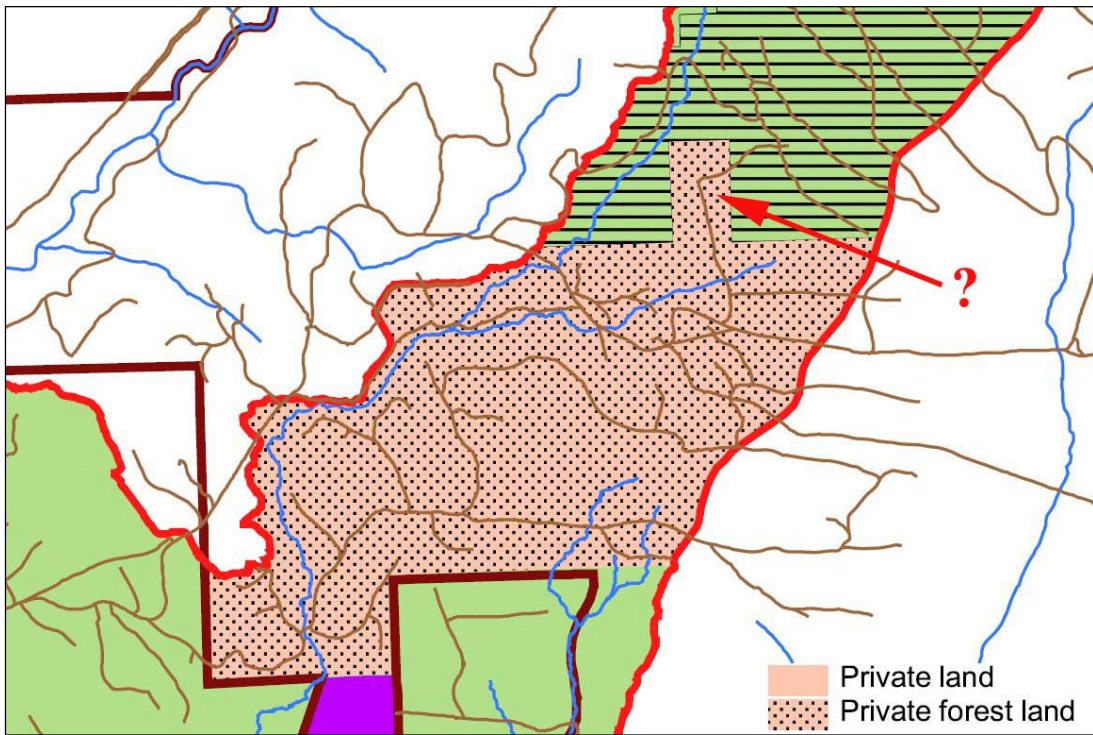
There remain significant problems and conflicting land ownership issues in the upper and majority watershed area of the Wilson Creek main stem basin:

1. The slow regeneration of Crown forest stands in the mid-elevation zones clearcut logged above the private forest lands, and the slow and snail-paced hydrologic recovery. Does the condition of these extensive logged areas detract the downstream water runoff benefits of few remaining intact old growth stands above the clearcut zones?
2. The problematic presence of lengthy logging access roads on Crown lands complicating and offsetting hydrologic recovery goals.
3. The recent clearcut logging of private forest lands and new access roads. When will the remaining forest lands be logged in this large upper private lands section, further complicating and offsetting the goals of hydrologic recovery in the Wilson watershed? Provincial legislation controls over private forest lands are extremely limited regarding how and when private forest land owners can harvest their stands.
4. What if these private lands are destined for other uses, such as housing or other developments?

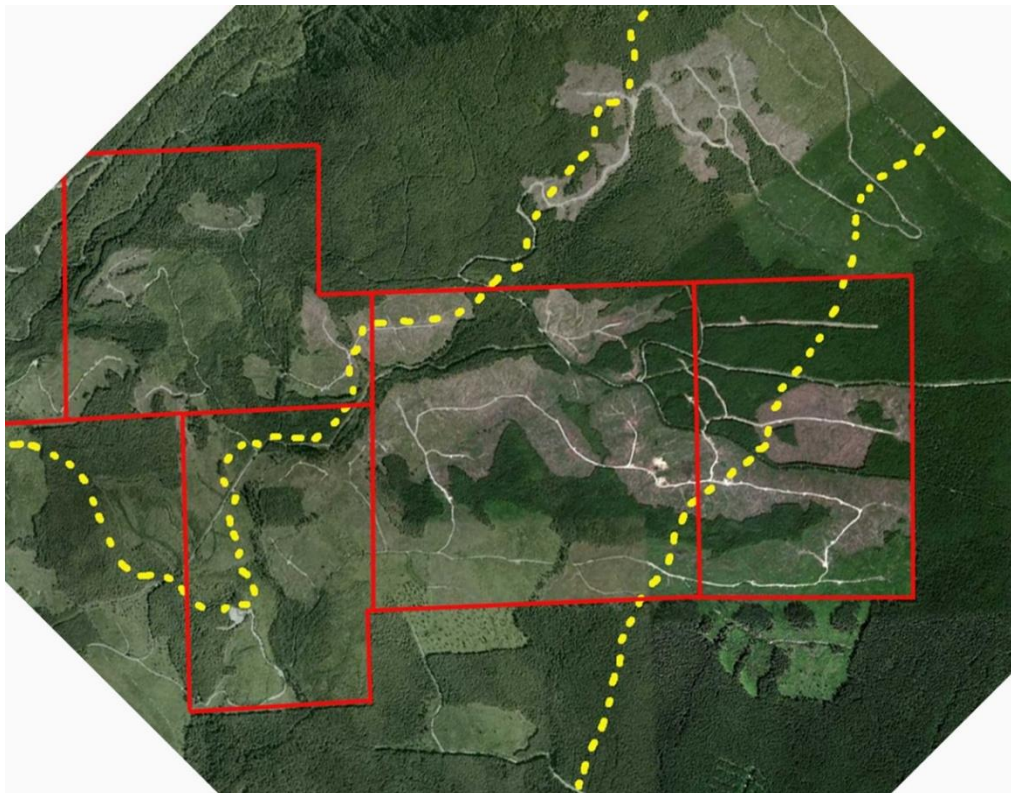


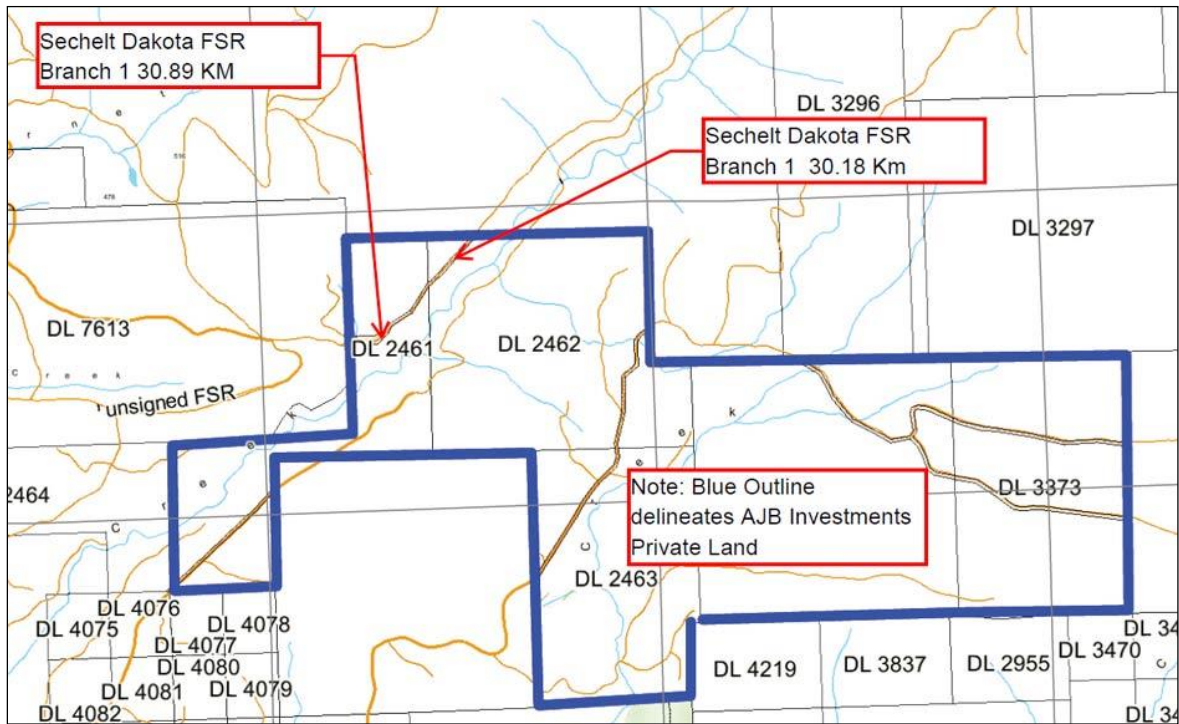
Red area shows private forest lands.

¹⁷ Page 29.



Above: map information from Figure 19 of the Horel report. According to land ownership information from IMAP BC, and from A.J.B. Investments (Surespan holdings) website, which register the location boundaries of the private lands, as shown below, **those maps do not correspond with information in the Horel report**, as shown in the top section of the map above. **Bearing this error in mind, the map information in the Koop report nevertheless abides by or continues to show this error from the Horel report.**





Verification of AJB private forest land boundaries.

Above: August 26, 2014 map from A.J.B. Investments and Surespan Construction Ltd., included in the SCRD Community Services Committee amended agenda of October 9, 2014, re AJB Logging in the Chapman Creek Watershed, found on page 1r.

Left: SCRD website, 2014 aerial photo of A.J.B. private lands boundary, with ownership layer in blue.



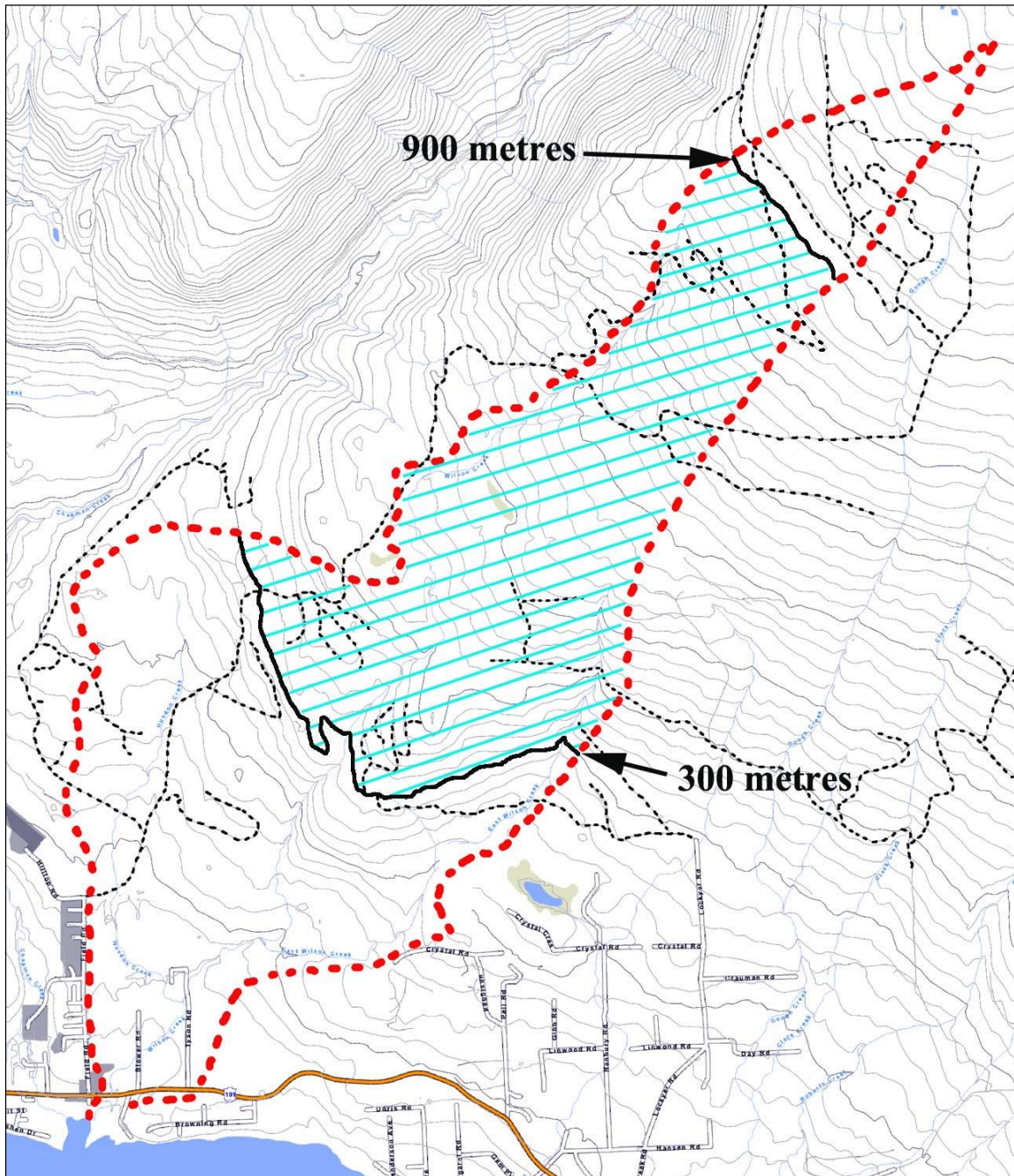
Photos by author of private lands in upper Wilson watershed, October 2007.



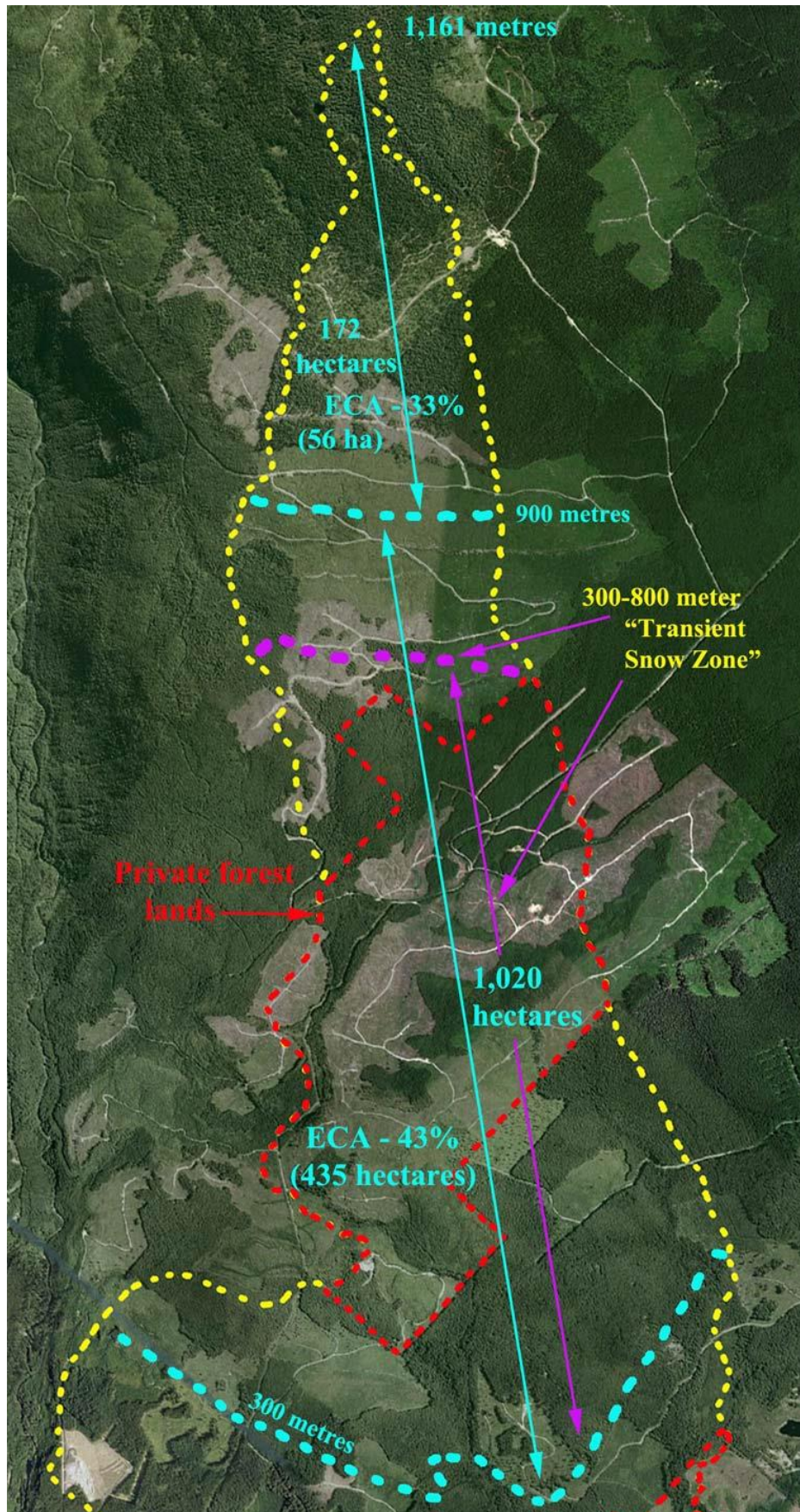


Photos by author of private lands in upper Wilson watershed, July 2007.





Contour map visualization of Equivalent Clearcut Area (ECA) zoning from data table 5 in Horel report, dividing the Wilson watershed into three component categories: 0-300 metres, 300-900 metres, and 900-1161 metres. The 300-900 zone was adapted from the 2007 Hudson/Horel TR-032 report, where, however, this zone is described on page 7 of that report as a “transient zone” **under a different category of 300-800 metres**. The Horel report **does not provide an explanation of why a new zone category of 300-900 metres was adopted**. Hydrologist Hudson introduced the **300-800 meter category** throughout his TR-004 report published in 2000, i.e.: “Snowpack recovery can have a strong influence on hydrologic recovery at elevations above 300 m, and it is the dominant factor above 800 m where peak runoff generally occurs as the result of spring snowmelt;” and “It is generally true that above 800 m elevation in the southern part of the Region, the dominant process responsible for generating peak flows is snowmelt; this elevation band is known as the “snowpack zone.” Thus for elevations above 800 m, the recovery threshold is equal to the long-term mean peak snow depth. For the 300-800-m elevation band, the dominant process for generating peak flows is rain-on-snow, this elevation band is known as the “transient snow zone”.”



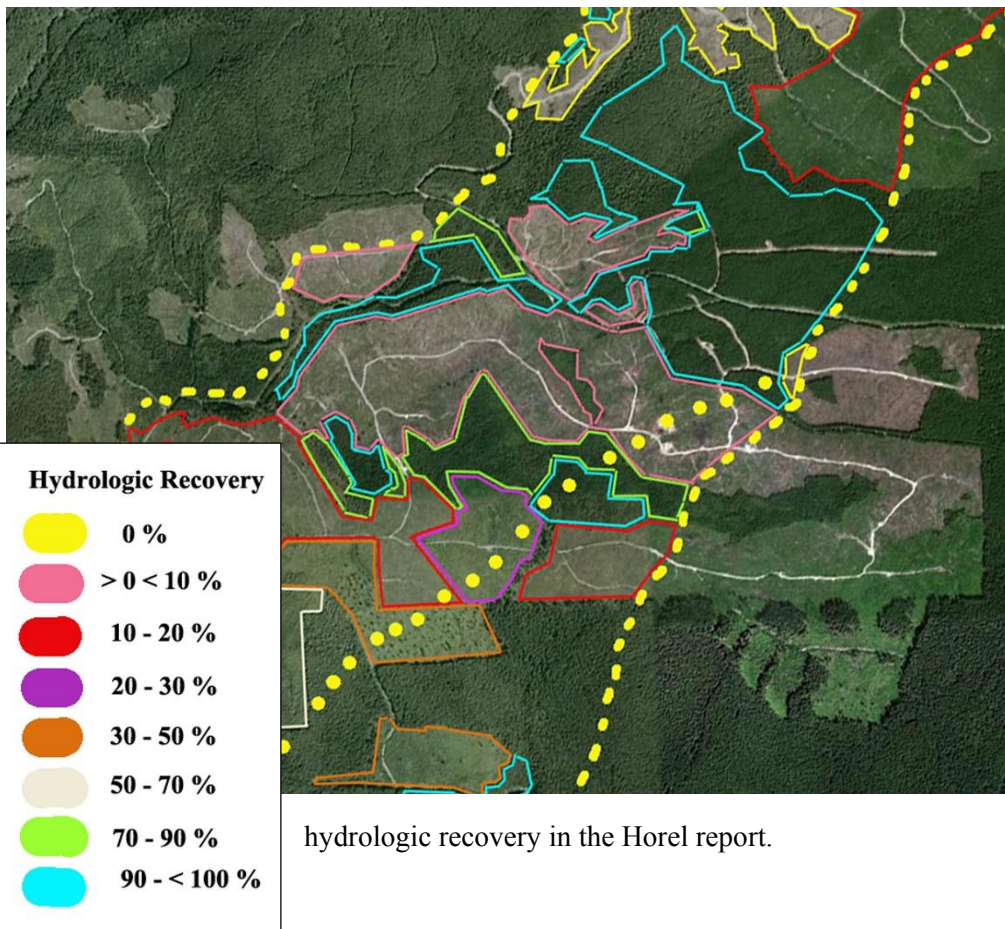
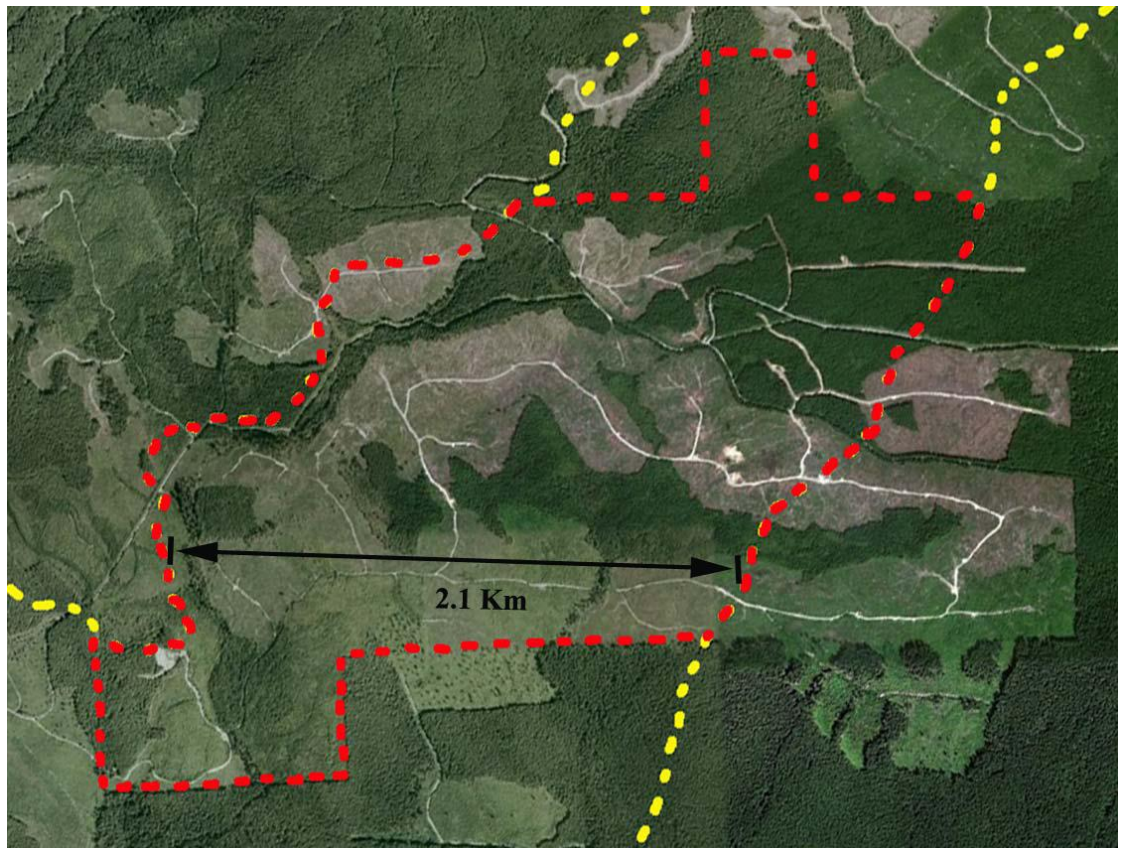
The summary conclusion data from technical modelling determinations of Equivalent Clearcut Area (ECA) presented in Table 5 of the Horel report are visually presented here in the 2009 Google Earth image of the upper Wilson watershed.

The Horel report divides the Wilson watershed into three ECA criteria zones according to elevation groupings: 0-300 metres; 300-900 metres; and 900-1161 metres. Only the upper two elevation groupings are provided in this image, showing the conflicts between Crown and private forest lands. Complicating these conflicts are the slow forest regeneration areas above the private lands in the upper elevation and large clearcut zones, the snowpack zone area which is primarily above the 800 meter upper “transient snow zone,” which the Horel report **shifts** to the 900 meter elevation level.

What are the statistical ECA differences had the 300-800 meter been adopted in the Horel report? Are there other interpretations for ECA calculations that can be made for the Wilson watershed in the Horel report? Should someone have a peer-reviewed second look?

There are many kilometres of logging access roads in these two elevation zones. No one has conducted long-term studies on the impacts of these roads on water runoff and water quality in Wilson Creek.

**Upper
Private
Managed
Forest
Lands**



hydrologic recovery in the Horel report.

Above: Upper private forest lands (in red) of Wilson watershed (Google Earth imagery, 2009), which includes Horel's boundary error. *Left:* Hydrologic recovery zones identified in, and adopted from, the Horel report (in Map 4) for upper private forest lands.

The Horel report (see Map 4) does not use the Google Imagery, as adopted here, to overlay the hydrologic recovery area zones. Areas not outlined with color lines are areas determined to have full or 100%



Photos by author of private lands in upper Wilson watershed. *Above:* October 2007. *Below:* July 2007.



12. Hydrologic Recovery and ECAs

The 2012 Horel report states that all of the underlying assumptions and calculations adopted concerning hydrologic recovery and ECA assessments within the Wilson watershed are set forth from and based upon a 19-page March 2007 Forest Research Technical Report, *An Operational Method of Assessing Hydrologic Recovery for Vancouver Island and South Coastal BC*, which contains complicated modelling equations from recent experimental research findings in southwest BC. It is repeatedly referred to as TR032 in the main body of the Horel Report, the sequential numerical name from a list of technical reports published by the BC Ministry of Forests since 1999:

*For the purpose of this assessment, the recovery models in TR032 (Hudson and Horel 2007) were used to determine hydrologic recovery and ECAs.*¹⁸

In other words, without first reading, and then understanding, a highly technical and complicated TR-032 report, the reader will not understand what guides the underlying assumptions and findings concerning hydrologic recovery and ECA's in the August 2012 Horel report, which in turn fails to summarize or describe for the reader how the information from TR-032 is being applied. Moreover, the Horel report makes an important qualification: "*I note that scientific debate continues around methods of analysis and interpretation of results with respect to stream flow effects.*"¹⁹

Understanding these concepts from the TR-032 are fundamentally critical, because as stated in the outset of the Horel report:

The purpose of the assessment is to determine the present condition of the entire watershed and make recommendations to SCCF for forest management for the SCCF tenure in the watershed. ... SCCF's tenure within the watershed is 899 ha, or 41% of the watershed area.

*The resource of interest to this assessment is fish habitat and water quality. ... Resident fish are found throughout the watershed above the limits of anadromous habitat. Overall fish values in this watershed are considered to be high.*²⁰

*Changes in stream flows are of interest in watershed assessment for two reasons. One is the potential physical effects on channel characteristics. The second is the potential effect on fish and aquatic ecosystems of changes in magnitude, frequency and timing of flow events. See Dr. Bates's report for a discussion on stream flows on fish populations in Wilson Creek.*²¹

In the Introduction section of the 2007, TR-032 report, it states that, "*For purposes of this report, hydrologic recovery of forest stands has been defined as the process by which the hydrologic conditions of a harvested site are restored to near pre-harvest conditions with the re-growth of a new forest at the site.*" TR-032 states that, "*the authors recognize that our understanding of this complex subject is incomplete, and the model has certain limitations.*"

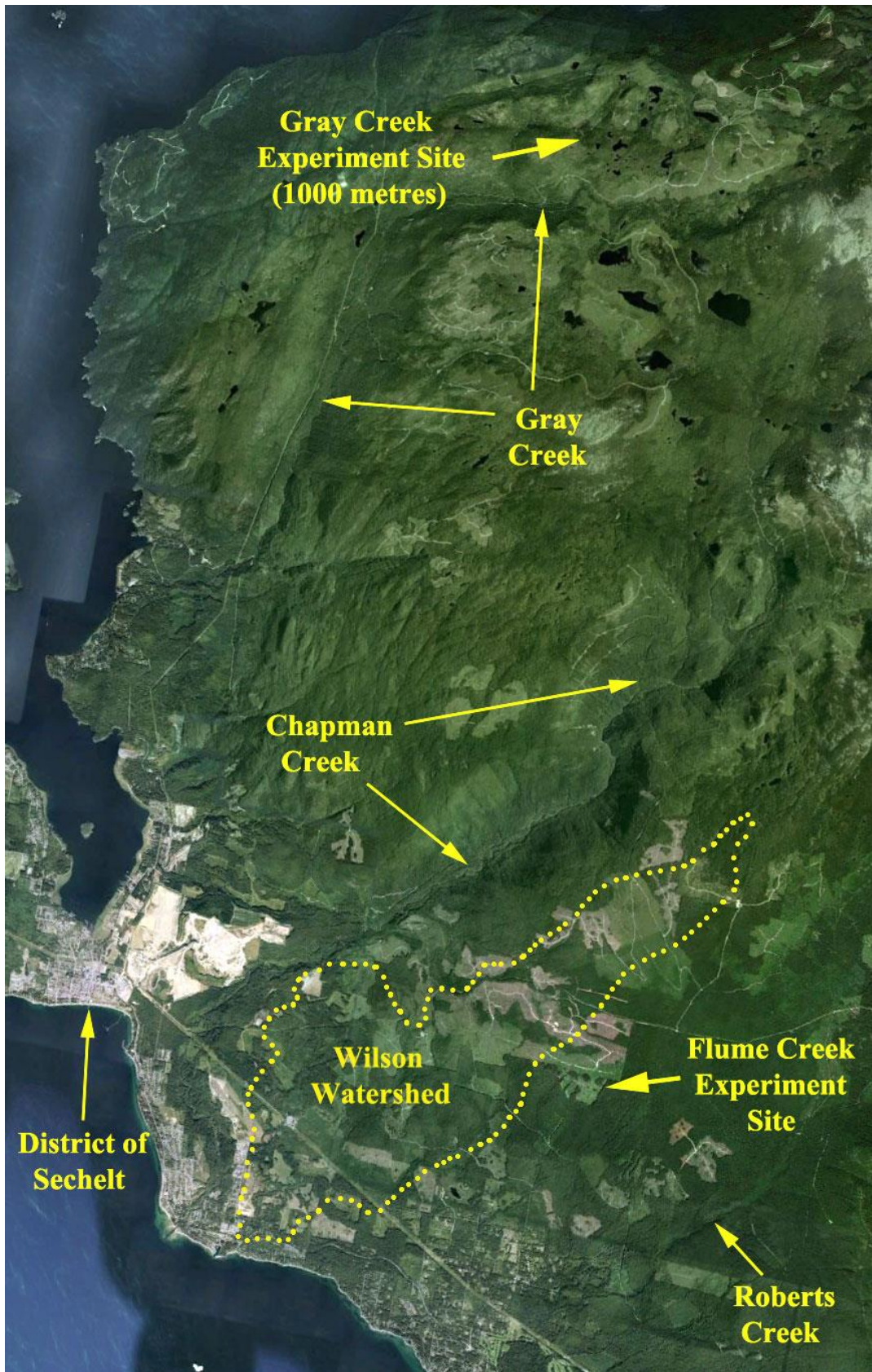
In turn, the findings of TR-032 were based on earlier report, TR-027.

¹⁸ Page 10, or Adobe page 26.

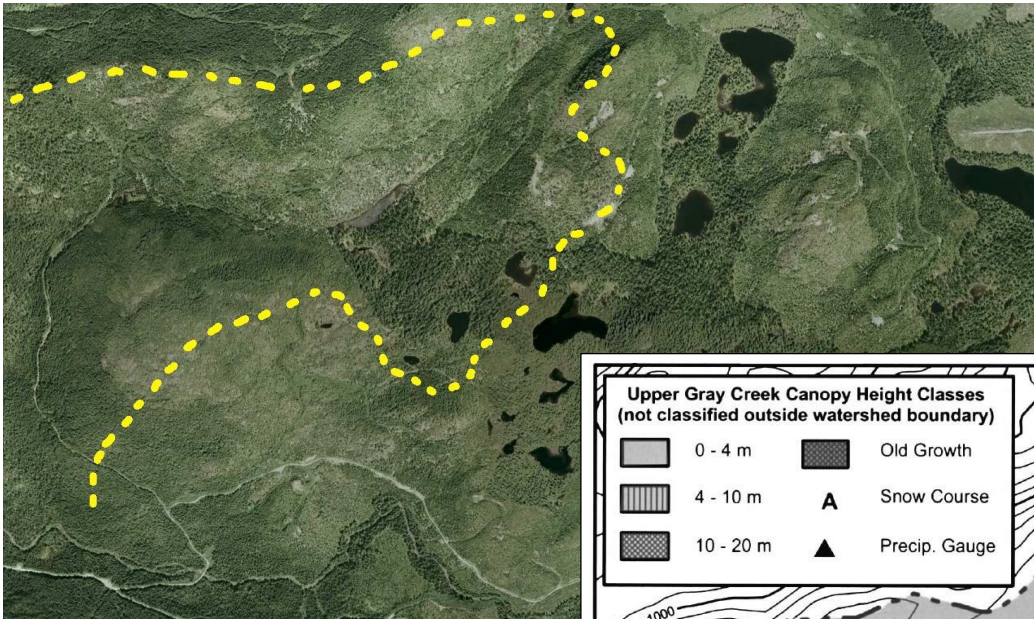
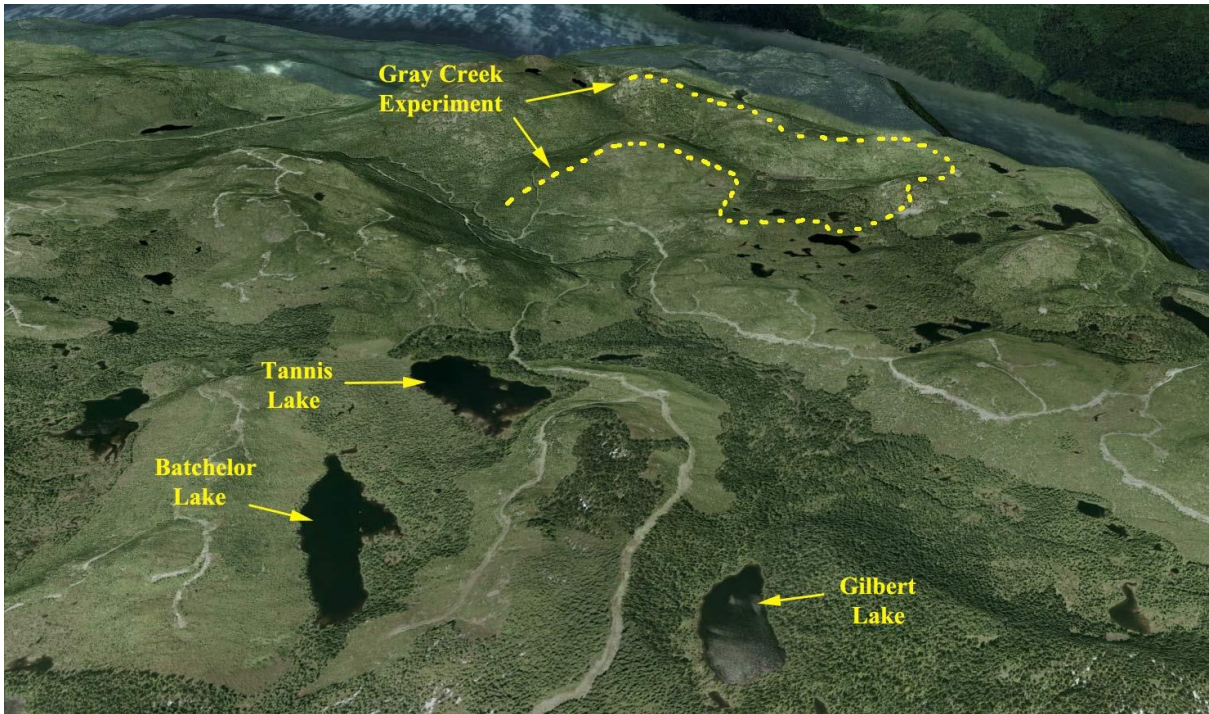
¹⁹ Page 9, or Adobe page 25.

²⁰ Opening paragraph of 1. Introduction in the Horel report.

²¹ Page 8, or Adobe page 24. Dr. Bates' report title is not given, nor cited in the reference section of the Horel report.



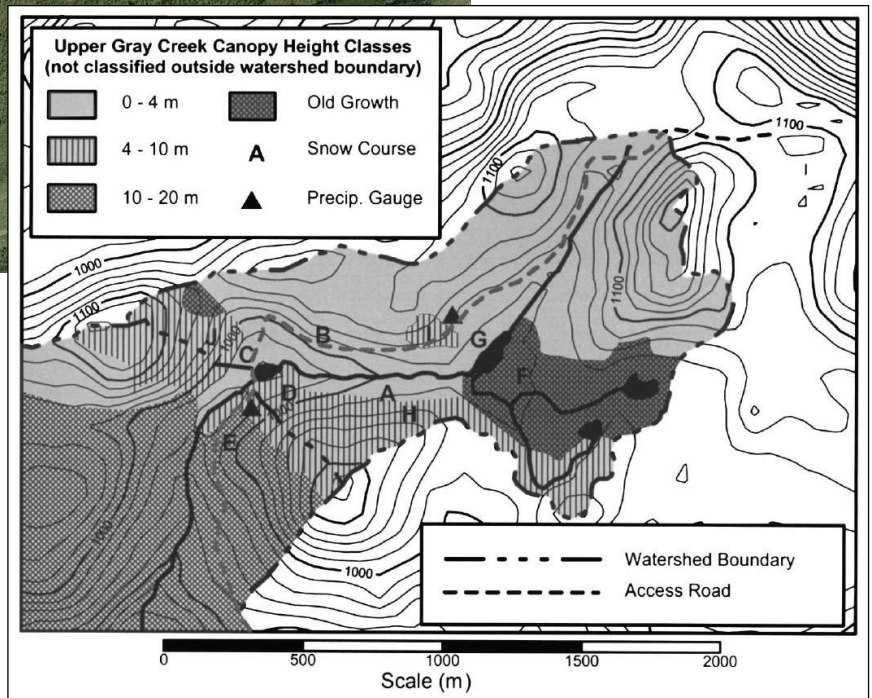
2009 Google Earth imagery showing the locations of the two forest hydrology experiments.



Above and left: 2009 Google Earth image showing location of upper Gray Creek experiment. Below: Map location image from Hudson's 2000 report on his Gray Creek experiment.

Unlike other forest hydrology experiments, Hudson's reports on Gray Creek

experiment do not include a map showing its perspective location in the Gray Creek watershed. Hudson wrote his 1996 PhD Thesis on another forest hydrology experimental site in the headwaters of the City of Penticton's drinking watershed, and collaborated with University of BC Associate Professor of Forest Hydrology, Doug Golding, on that site. Golding also supervised a twin basin forest hydrology experiment in Metro Vancouver's Seymour Creek drinking watershed from the late 1970s to the mid 1990s.



With respect to forest hydrology studies and experiments on BC coastal watersheds, as categorically but not necessarily separate from experiments conducted in BC interior watersheds, author Robert Hudson developed a new concept of “rainfall recovery of forest stands” in a 37-page 2003 research report, TR-027, *Using Combined Snowpack and Rainfall Interception Components to Assess Hydrologic Recovery of a Timber-Harvested Site: Working Toward an Operational Method*. It was this research that provided the basis for TR-032. Hudson conducted research not far distant and northwest of Wilson Creek, in the high elevation forest limits of the Sunshine Coast Regional District’s community Watershed Reserve, Gray Creek,²² where he examined areas that had been clearcut logged by Jackson Brothers Logging in the 1980s. What Hudson set out to accomplish was to augment experimental data for high elevation logging areas, because low elevation hydrologic experiments on logging areas had already been assessed by other researchers on Vancouver Island.

In Hudson’s 2003 TR-027 report, he states: “According to the concept of hydrologic recovery, a harvested site is considered fully recovered when its potential influence on runoff becomes indistinguishable from that of a mature reference stand that represents the hydrologic characteristics of the stand prior to harvesting.” Of note in the 2003 Hudson report, the author hypothetically challenges the criteria and relationship to “old-growth” as being / having the reference or threshold goal for hydrologic recovery:

*It has been shown that old growth might not always be the most appropriate reference stand to use as a benchmark against which to measure recovery. In the case of Gray Creek, there is a clear tendency for the second growth to become **over-recovered** because it is more efficient at intercepting rainfall than the old growth. The stand in question is a managed stand, having been subject to juvenile spacing. The noted tendency might be generally true of managed stands because they are maintained at a higher and more uniform stocking density than old growth. For this reason, in areas of extensive second growth (e.g., the east side of Vancouver Island) **the use of old growth as a reference stand to judge recovery might be inappropriate.** ²³ [Bold emphases]*

Once again, the TR-027 report is predicated on an earlier 38-page, November 2000, TR-004 report by Hudson, *Assessing Snowpack Recovery of Watersheds in the Vancouver Forest Region*. In it Hudson describes the origins of the Gray Creek study. But, he also states the following:

Hydrologic recovery is the process by which a regenerating forest restores the hydrology of sites to near-pre-harvest conditions.

*During the harvest planning stages, forest managers use the Coastal Watershed Assessment Procedure (CWAP) as a tool to help them understand the type and extent of current water-related problems in a watershed, and to help them recognize the possible hydrologic implications of proposed forestry-related development (BCMOF and BCMOE 1999). **The CWAP, which is part of the Forest Practices Code of BC, requires that forest managers calculate equivalent clearcut area (ECA).** [Bold emphasis]*

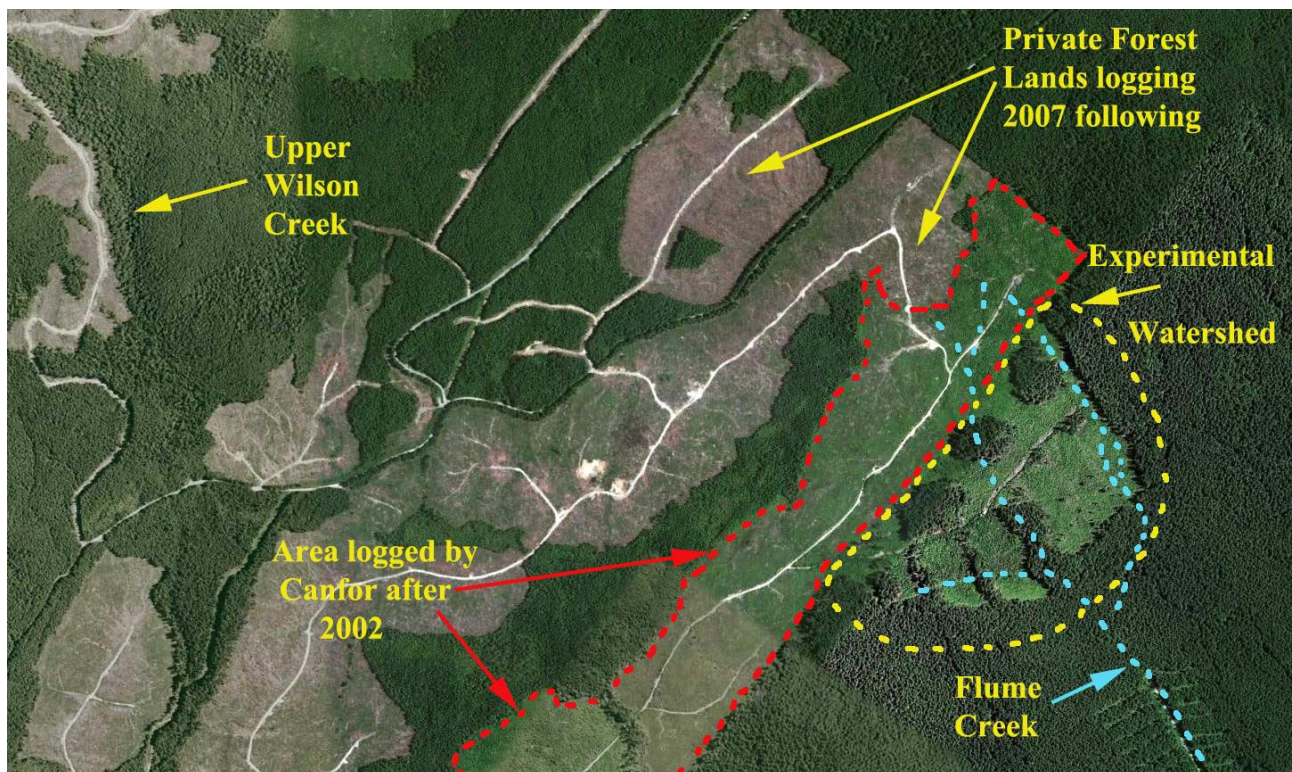
*ECA is the area that is clearcut, but with a reduction factor to account for the hydrologic recovery due to forest regeneration. **In many cases, ECA may be a factor in limiting forest harvesting in watersheds that are sensitive to potential changes in peak streamflow** [bold*

²² Hudson refers to Gray Creek as a “Snow Accumulation Zone 4 watershed.”

²³ Page 26.

emphasis] (e.g., community watersheds or important fish streams) or in watersheds with a long history of harvesting. However, the current method of determining hydrologic recovery, as described in the watershed assessment procedure guidebooks (BCMOF and BCMOE 1999 [Forest Practices Code of BC, Coastal Watershed Assessment Procedure Guidebook, Interior Watershed Assessment Procedure Guidebook, April 1999] – and hereafter referred to as the “Interim Method” – is a best-guess approximation for the combined effects of rainfall, rain-on-snow melt, and radiation snowmelt.²⁴

What Hudson and research hydrologists in BC set out to determine is how much logging can occur in a given watershed over a given period of time, in small to large-based variable watershed areas, without upsetting water flow values.²⁵ Of significance, following about the year 2000 onward, a fundamental and attitudinal shift began in the conceptual thinking and application of hydrologic recovery and ECAs for government and academic forest hydrology researchers in BC. The shift largely and originally emanated as a politically charged response to a United States Forest Service 40-year report study on logging and peak flows published in 1996, a report that dramatically upset the American and BC forest industry and its minions. The findings of the G.E. Grant and J.A. Jones report, *Peak Flow Responses to Clearcutting and Roads in Small and Large Basins, Western Cascades, Oregon*, upset and challenged the concepts of government and industry which previously applied and quasi-rationalized the rate of logging that had occurred in coastal and interior watersheds, and it now jeopardized the bottom line, **logging profits**. And, of importance, the Grant and Jones report was released just when the *BC Forest Practices Code* had come into effect.



Above: Area in yellow dots showing general location of the Flume Creek experiment conducted since 1992 (pre-treatment in 1992-1993) by a number of government and non-government researchers.

²⁴ Page 5.

²⁵ Government researchers make determinations for Crown forest land guidelines, whereby other pseudo guidelines are adopted for private forest lands.



Photo from Hudson's 2001 EN-007 report, showing a part of the experimental logging area. A section of the logged and exposed Flume Creek can be seen as a white line to right of photo, and an exposed tributary branch can be faintly seen to left bottom area of photo. Some melting snow cover is visible on top right. Whatever goals that may or may not have been achieved in this hydrologic experiment, they were later eradicated with the advent of clearcut logging on private lands directly above, once again drawing attention to the conflicts that arise between activities on Crown and private lands. According to the March 2001 Forest Research Extension Note, EN-004, *Roberts Creek Study Forest ...*, following a fire in the 1860s the remaining self-regenerated Douglas Fir in this photo reach up to 55 metres in height.

*There is still a relative shortage of empirical studies on disturbance impacts (both natural and anthropogenic) on water yields and peak and low flows in Canada's various forest landscapes. This contrasts with the lively and ongoing debate regarding the influence of forest management on peak flows in the Cascade Mountains of western Oregon (Jones and Grant, 1996; Thomas and Megahan, 1998; Beschta et al., 2000), and the recent call in the USA to examine harvesting impacts on flooding during extreme events under a range of management practices, physiographic conditions, and event types (DeWalle, 2003). **The absence of studies specific to the Canadian environment means that inferences about forest disturbance impacts on a basin's hydrological regime are often drawn from work conducted in other parts of the world.** Thus, Scherer's (2001) review of research on the impacts of forest-cover removal on peak flow magnitude and timing, water yield and low flows relevant to conditions in the central and southern interior of British Columbia showed that only five of the 18 studies were conducted in Canada, with the remainder from Arizona, Colorado, Idaho, Montana, Oregon and Utah. **The issue of importation of research results to the Canadian context is an important one.*** ²⁶ [Bold emphases]

Strong sentiments concerning findings in the Grant and Jones report of 1996 are expressed in a report by Robert Hudson in March 2001, *Roberts Creek Study Forest: Preliminary Effects of Partial Harvesting on Peak Streamflow in Two S6 Creeks*, published by the Ministry of Forests' as Forest Research Extension Note EN-007. ²⁷ (Hudson's paired watershed study of partial logging (variable

²⁶ *Advances in Canadian Forest Hydrology, 1999-2003*, page 183.

²⁷ There are a number of research reports published by the Ministry of Forests concerning the Roberts Creek Study Forest. TR-006, *Effects of Dispersed Retention Harvesting ...*, TR-007, *Roberts Creek Study Forest ...*, and TR-018, *Roberts Creek Study Forest ...*, all written by Brian D'Anjou, share descriptive histories of the project. Stated in TR-006, the Ministry of Forests "commenced a study of dispersed retention harvesting in the Roberts Creek Study Forest ...

retention and strip shelterwood) occurred in the headwaters of Flume Creek, just east of the mid upper section of the Wilson watershed.) In the EN-007 nine-page report, Hudson states the following:

*The issue of whether or not forest harvesting actually affects peak flows has been the subject of much debate in the literature recently. **In a highly controversial paper**, [bold emphasis] Jones and Grant (1996) proposed that older studies failed to detect logging-induced increases in peak flow due to inappropriate analytical techniques. In a follow-up paper using the same data, Thomas and Megahan (1998) reported that the analytical methods used by Jones and Grant were inappropriate or incorrectly applied. Both papers agreed that the peak flows that were most affected by logging were the smallest ones, and that as event size (hence return interval) increases, the effect of logging on the size of the peak flow diminishes. Jones and Grant claim that even events with a return interval as large as 50 years are increased by as much as 50% after logging, although Thomas and Megahan suggest that this claim does not appear to be supported by their data or their analysis. They could find no change in peak flow for events with return intervals of greater than 1.5 years. Accordingly, one might then conclude that large peak flows of a magnitude that might be related to stream channel stability or aquatic habitat, such as the 2-10-year event, could be unaffected by forest harvesting.*

As a result of the advent of partial logging systems in British Columbia, forest managers are now beginning to ask how such methods affect peak flows, compared with clear-cut logging. The purpose of this paper is to provide some preliminary answers to those questions, based on data obtained from the Flume Creek Paired Watershed Experiment.

In January 2001, Grant and Jones wrote a four-page paper, *Comment on “Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon: A second opinion”*, as a response to a paper written by R.B. Thomas and W.F. Megahan in December 1998²⁸ which was written in response to the 1996 Grant and Jones study report:

We believe T&M’s [Thomas & Megahan’s] reanalysis of our data confirms and, in some cases, strengthens the conclusions of the original paper, while highlighting critical areas for future work. Seemingly contradictory findings of J&G [Jones & Grant] and T&M are a direct result of different decisions about sample sizes, critical statistical significance levels, and data transformation; these decisions may tip the balance between findings of “significance” or “non-significance” in statistical analyses of a single data set. In this comment we examine the objectives and conceptual approaches of the two studies and differences and similarities in statistical approaches, findings, and interpretation of findings.

Conclusions

to address an increasing interest in using alternatives to clearcutting.” In TR-013, Roberts Creek Study Forest ..., which Hudson co-authored, it states: “Water quality has long been a concern to residents of the Sunshine Coast. In particular, Roberts Creek area supports a large rural community, and many residents depend on small creeks for their water supply. There is a perception that forest harvesting and related activities might alter water quality in those creeks.... In an effort to address those concerns, the Flume Creek Paired Watershed Experiment was implemented.”

²⁸ *Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon: A second opinion.*

The legacy of clear-cutting and road-building

■ A study based on 40 years of data concludes that past harvesting practices markedly increased streamflows

Swollen streams tied to logging

By PETER D. SLEETH and HAL BERNTON
of The Oregonian staff

Study: Findings contradict earlier works

The effects of past logging practices on mountain streams are far more extensive and enduring than previously thought, federal researchers have declared in a study that reviews more than four decades' worth of data gathered in the Willamette National Forest.

Clear-cutting forests and building roads were found to increase peak flows in mountain streams by as much as 50 percent, a finding that establishes a long-disputed link between logging and swollen streams.

While the findings might seem trussed in common sense, the bulk of past studies has not supported such a conclusion. Extensive clear-cutting and road-building have been a staple of timber harvests in the Northwest for 50 years.

Should the research be widely accepted, it could accelerate a movement in place within the U.S. Forest Service that calls for the obliteration of many old logging roads and a move away from clear-cutting.

The researchers' work found that in some cases streamflows increased by as much as 20 percent to 50 percent after a watershed was logged. The effects diminished gradually but were apparent 25 years after clear-cutting.

Perhaps the most significant finding is the apparent synergy between logging roads and clear-cutting. The logging roads appear to act something like a pipeline — rapidly injecting flows of rain and snowmelt running off clear-cuts into streams.

The study by Gordon E. Grant, a Forest Service hydrologist at the Pacific Northwest Research Station, and Julia A. Jones of Oregon State University is to be published in the April issue of *Water Resources Research*, the journal of the American Geophysical Union.

The study does not speak to what happens in major events such as the February floods, because of a lack of sufficient records on large floods to allow a valid study.

"What we're looking at is a legacy of clear-cutting and roads over the past 40 years," Grant said. "There is a strong component of history here, and we are noting there are long-term legacies from

past practices that continue into the future."

The authors work at two of the nation's most prestigious centers of forestry research. They have compiled one of the most exhaustive studies on the subject yet, taking in more than 40 years of data. It has been "extensively" reviewed by other scientists who checked for flaws in methodology, Grant said.

But it already is proving controversial.

Its findings contradict some previous studies that showed logging and road-building had little or no effect on peak flood flows in large drainages. And critics, both from industry and the Oregon Department of Forestry, say that the new study is badly flawed.

"I felt that the conclusions in this study far overreach the data that is presented," said Kate Sullivan, a hydrologist with Weyerhaeuser.

Sullivan said that none of her studies of about 60 drainages showed that logging had any major effects in big floods. She said she thought that the information cited in the new report did not show significant effects in big floods.

"She has never published any of her data," Grant said of Sullivan's comment. "So it is impossible for me to react."

The question of the relationship between logging and major floods became a political hot potato after February's high waters. Environmentalists tried to condemn all logging because of its contribution to the floods, while the timber industry pooh-poohed those claims.

"We don't know," Grant said. "I don't know of anyone that can answer that question, no matter what they're political persuasion is."

Increasingly, scientists and others are pointing to land management practices in forests as the culprit for damage to stream beds and fish habitat, as well as increased runoff and flooding. But little definitive science has been available.

To get at the question, Grant and Jones studied stream-flow data from three small basins — those less than 250 acres — and three large basins

up to 250 square miles in size.

The three small basins were monitored beginning in the 1950s, before any logging was done, and then afterward. One valley was left alone, a second was 25 percent clear-cut with roads and a third was logged completely with no roads in it.

What the study showed was that for five years after clear-cutting, peak flows in streams in the basins were 50 percent higher than before logging. Twenty-five years after the logging, the flows are 25 percent higher than they were before logging took place.

In the larger valleys, Jones and Grant relied on records of past timber harvesting and streamflows to do their study. But the results were virtually the same as in small basins. Past studies found that large basins didn't have the same impacts from logging.

"Previously, we had thought the effects of small basins would cancel out downstream" as they flowed into large basins, Jones said.

But large basins showed the same effects from logging, the study showed.

Clear-cut logging is down to a fraction of post-World War II levels in federal forests in the Pacific Northwest. Road-building also has declined as environmental restrictions have eased the pressure to log forests.

But extensive networks of old roads and clear-cuts may pose problems for flood management in the future.

In summary, both T&M and J&G showed that forest harvesting has increased peak discharges by as much as 50% in small basins and 100% in large basins. Both J&G and T&M, not surprisingly, obtained similar results from the same data set, but T&M claimed that the only valid increases were for small events in small basins, whereas J&G argued that increases had occurred in all event sizes and in both small and large basins. In both studies, statistically significant increases were harder to detect for large events because they are relatively rare. T&M dismissed their own statistically significant models showing increases in peak discharges in large basins because their models failed to meet a special, additional statistical criterion for predictive power. T&M did not refute that the road network may contribute to increased peak discharges; instead, a variety of field and modeling efforts have supported J&G's hypothesis that roads can affect flow peaks. Both T&M and J&G speculate as to whether forest harvest and roads affect extreme floods, but while increases in smaller floods are suggestive, the issue cannot be resolved with statistics based on a mere handful of extreme flood events. Future physical process-based modeling and field studies will improve our understanding of forest harvest effects on these rare big floods and also should address the geomorphic and ecological consequences of changes in all sizes of peak discharge events.

As stated in Chapter 7, *The Effects of Forest Disturbance on Hydrologic Processes and Watershed Response*, in the 2010 *Compendium of Forest Hydrology and Geomorphology in British Columbia*, published by the BC government as a Land Management Handbook (also referenced in the Horel report), the 1996 Jones and Grant report experiment from the H.J. Andrews experimental watershed in the Oregon Cascades exhibits “hydrologic regimes similar to those in British Columbia.” The six co-authors of Chapter 7 state that unlike “long-term research sites in the United States,” British Columbia is not blessed with similar sites,²⁹ and given this limitation, BC research “results are extrapolated to larger watersheds through hydrologic modelling.”

The 2010 *Compendium's* Chapter 7 also summarizes the “stand scale” experimental results from Hudson’s research and modelling from Gray Creek as follows, which was later set forth in the TR-032 report by Hudson and Horel, and then later applied in the 2012 Horel report:

Hudson (2000) used tree height as a predictor variable and space-for-time substitution to develop snow recovery curves for the coast ... Hudson (2000) found that maximum SWE [Snow Water Equivalent] recovery was 50% in 4 m [meter] tall mixed subalpine fir, western hemlock, and cedar stands with 20% crown closure, and 75% in 8 m tall stands with 50% crown closure. The author suggested that complete recovery would occur when trees were 20 m tall and crown closure exceeded 95%. Hudson and Horel (2007) subsequently incorporated changes in rainfall interception in young stands into their estimates of recovery, which also considered differences in elevation, precipitation regimes, and storm types. The authors suggested that for a stand at 550 m elevation, recovery during a 35-mm rain-on-snow event was approximately 65% in 10 m tall stands and 90% in 20 m tall stands.

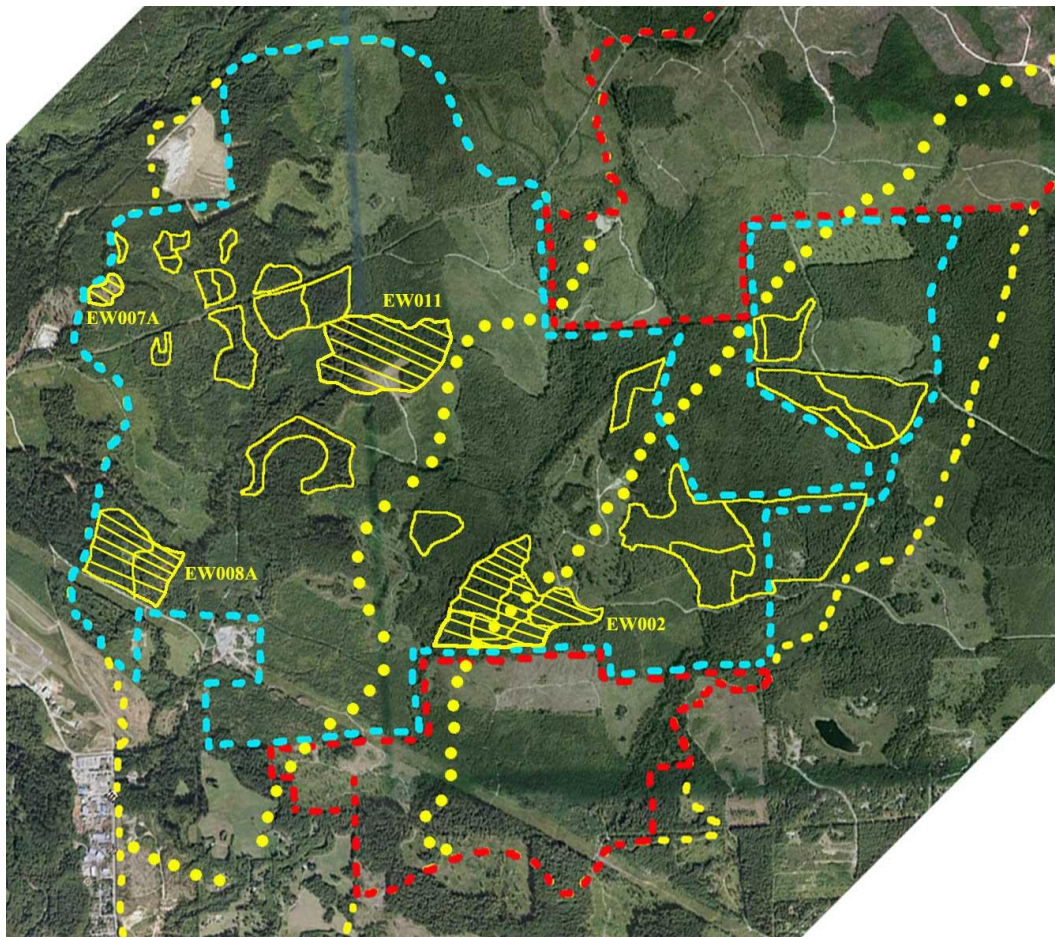
The 2010 *Compendium on Forest Hydrology* summarizes the statistical fabric in Hudson’s and Horel’s 2007 TR-032 report, namely that **second growth forests in the Wilson watershed, at 500 meter elevation, show 90 percent hydrologic recovery when they exhibit uniform heights of about 20 metres.** This summary finding reveals the fabric behind ultimate recommendations to SCPI which are not clearly stated or summarized in the Horel report.

²⁹ Page 199.

When a reader attempts to look for a summary descriptive of this specific benchmark – a 20 meter tree height at the 500 m elevation – in the narrative of the Horel report that was adapted from the 2007, TR-032 report, a benchmark representing 90% hydrologic recovery, it is merely described in general or vague terms, but nevertheless used for hydrologic recovery interpretative data in Map 4:

*Tree height is used as a surrogate for canopy density in most hydrologic recovery models. This is because tree height is routinely available in forest cover inventories, and is an easily repeatable measurement.*³⁰

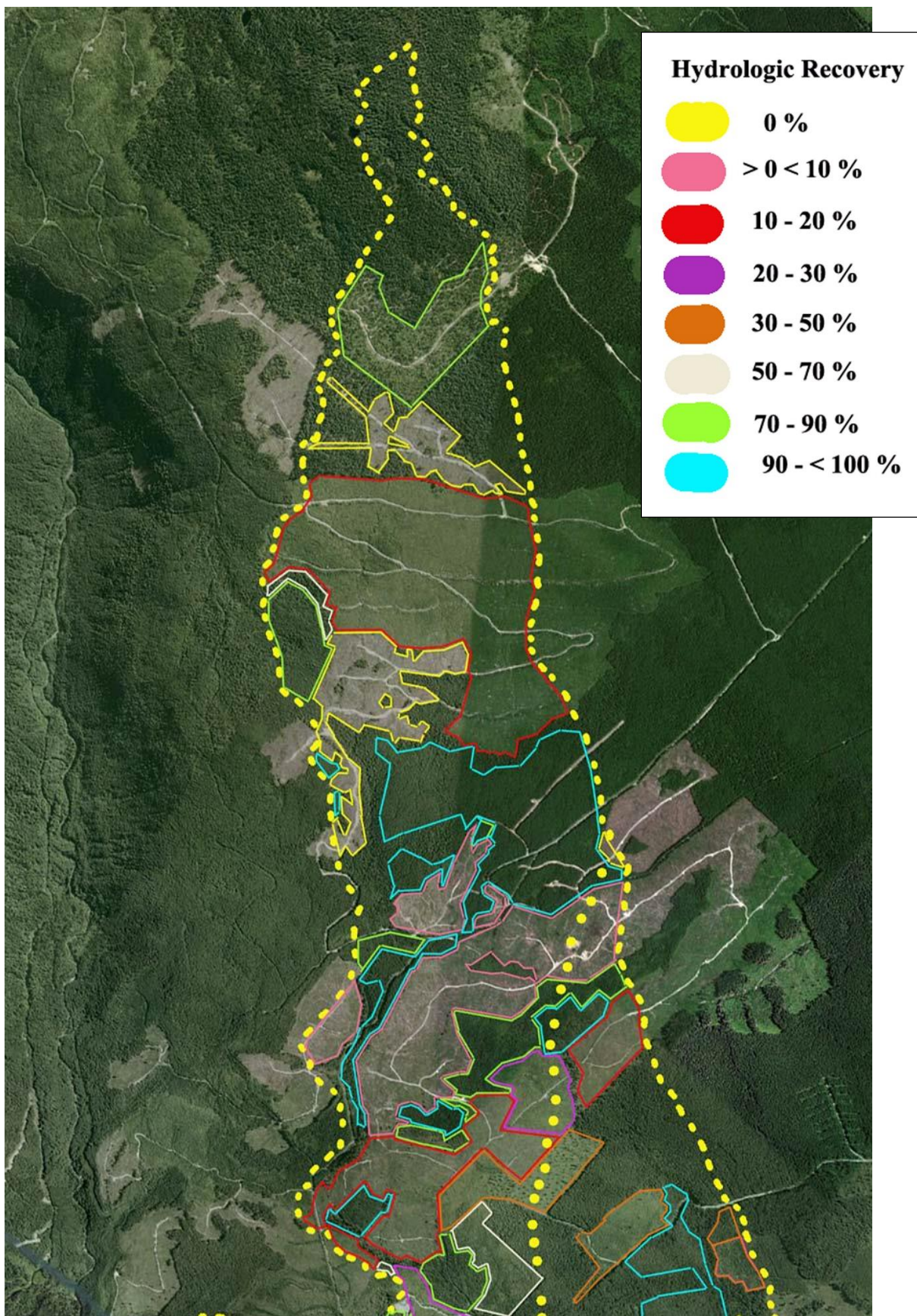
*Tree heights for this assessment were obtained from LIDAR data. ... The LIDAR heights have not been calibrated by field measurements. The LIDAR tree heights were compared to the available imagery (2009-2010) to check that they made sense and were adjusted where needed. Where no LIDAR data were available, tree heights were estimated from similar adjacent stands where data were available.... Hydrologic recovery determined by the TR032 method is displayed on Map 4.*³¹



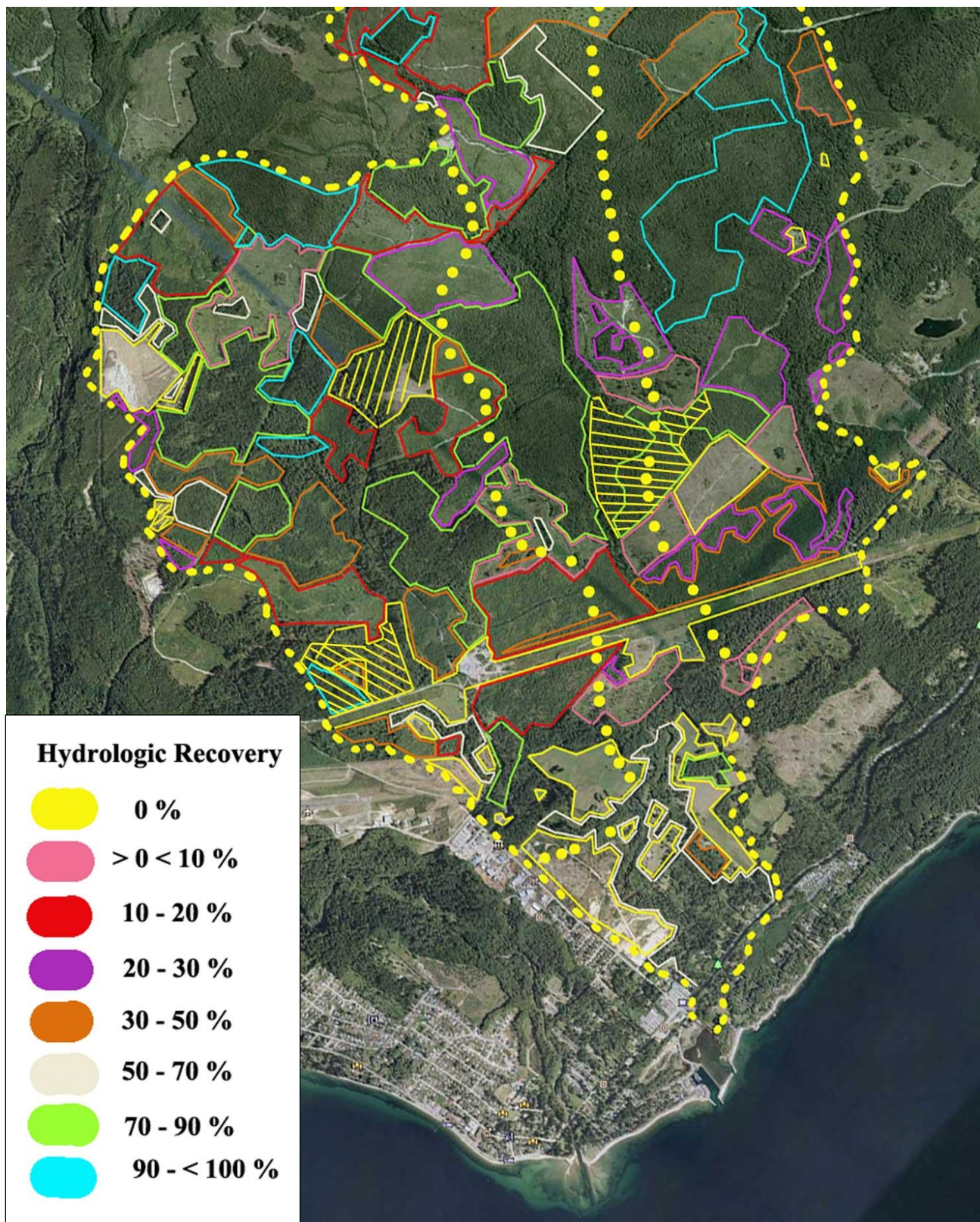
Proposed (solid yellow lines) and logged (cross-hatched yellow lines) 2010-2030 cutblocks in the lower Wilson watershed, within the 899 hectare boundary of the SCPI Community Forest License area (blue dotted line). Yellow round dots are sub-basin boundaries for Hudson Creek (left), East Wilson (right), and Wilson main stem (middle). Red dotted lines are private land boundaries: logging recently occurred in each sub-basin. (Note: the actual logged areas for EW002 and EW008A are smaller in size than shown in the above image.)

³⁰ Page 10, or Adobe page 26.

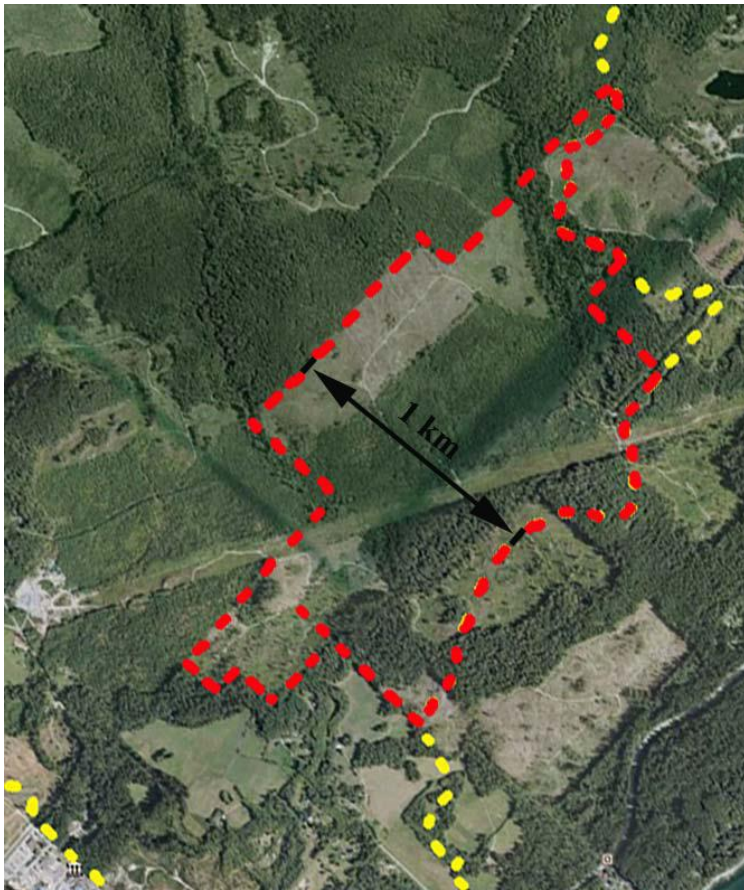
³¹ Pages 11-12, or Adobe pages 27-28.



Upper Wilson watershed showing hydrologic recovery polygons adapted from Map 4 in the Horel report, drawn overtop Google Earth 2009 imagery. Round yellow dots show East Wilson basin boundary.

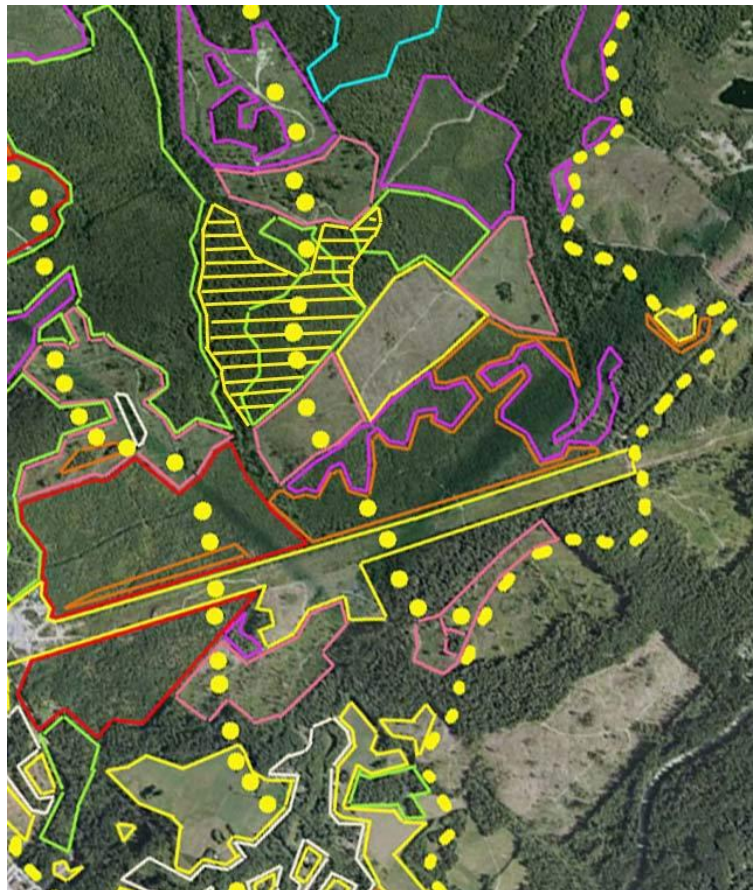
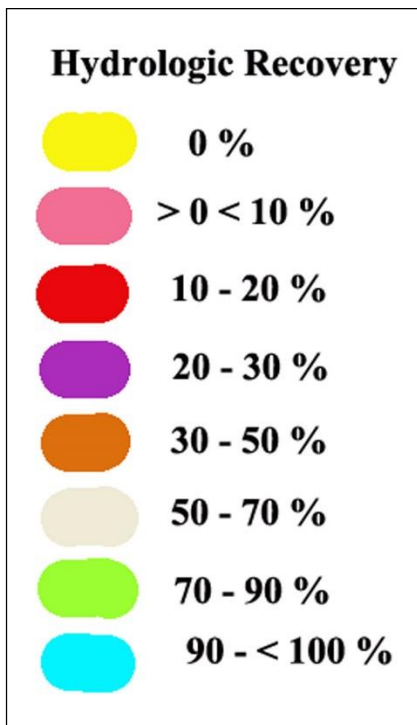


Lower Wilson watershed showing hydrologic recovery polygons adapted from Map 4 in the Horel report, drawn otop Google Earth 2009 imagery. Round yellow dots show Hudson Creek basin boundary to left, and East Wilson basin boundary to right, with Wilson Creek main stem basin in middle. The solid yellow line hatched areas are the 4 cutblocks logged by SCPI, two of which have different or zero hydrologic recovery ratings than those shown in the Horel report: the Horel recovery percentages need to be reviewed.



Left: Lower private managed forest lands in the Wilson watershed, located in the East Wilson basin.

Below: Same area showing hydrologic recovery zones adapted from Map 4 in Horel report. Yellow round dots show sub-basin boundaries. The solid yellow line cross-hatched area is cutblock EW002, recently logged, is drawn overtop of area in Horel report now incorrectly identified as 70-90% and 100% hydrologically recovered (light green lines, and no line boundaries).



12. 1. The following relevant questions address the issues at hand from the discussion above:

- Are the Hudson and Horel modelling assumptions in their 2007 TR-032 report reliable, whereby a 20 metre benchmark is the correct assumption of tree height for interpreting an early 90% stage of hydrologic recovery for logging clearcut sites on the South Coast of BC?
- Following a ‘key finding’ comment in the Horel report on page 25 – “ECA’s in Wilson watershed are high” – why is there no final recommendation in the 2012 Horel report prohibiting future harvesting in the Wilson watershed based on a current and thorough Wilson watershed tree height inventory on hydrologic recovery?
- What does an accurate and current analysis of tree height in the Wilson watershed mean for the fish-bearing, and domestic water licensed, Wilson watershed? I.e., as soon as assumptions for hydrologic recovery are realized, how long does hydrologic recovery achievement need to continue in terms of years before limited logging can resume again?

13. Wilson Watershed Salmon Habitat Assessment Report

A 67-page assessment report by David Bates on salmon and fresh water fish habitat, *Evaluation of Salmonid Populations in Wilson Creek*, was submitted internally to SCPI in late October 2012, two months after the final August 29, 2012 version of the Horel hydrological assessment report.

Of importance, the Bates report reiterates the following:

It is agreed that Wilson Creek (and its tributaries) is “high value fish habitat” that supports a variety of salmonids including; Coho (Oncorhynchus kisutch), Chum (O. keta) and Pink (O. gorbuscha) salmon; anadromous and resident Cutthroat trout (O. clarki clarki); and Steelhead trout (O. mykiss) (FISS).

As stated in the outset of the Bates report, this was a “limited” assessment conducted during the months of August and September 2012, with “randomly selected areas” of habitat data, what was referred to on page 13 of the Bates report as a “modified Fish Habitat Assessment” Procedure, unlike a full assessment procedure that is described in a 1996 Ministry of Environment report: ³²

In the summer of 2012, FSCI Biological Consultants conducted an overview and limited-detail fish and fish habitat assessment of the Wilson Creek watershed. This assessment addresses the distribution and current standing stock of rearing salmonids and an assessment of the aquatic habitat found in the Wilson Creek watershed.

.... This project is not intended as a detailed and comprehensive assessment; but rather, provides an update on the existing conditions and compares these conditions to past data.

Noted on page 10 of the Bates report, only selective field reviews were conducted of East Wilson and the main Wilson Creek catchments, but not of the Hudson Creek catchment. The Bates report summarized the separate characteristics of the Wilson watershed by each basin or catchment: the main Wilson Creek stem is about 11 kilometers in length and is rated as a third-order stream;

³² *Fish Habitat Assessment Procedures*. Watershed Restoration Technical Circular No. 8. Watershed Restoration Program, 1996, by N.T. Johnston and P.A. Slaney.



Above: photo of BC government fisheries biologists setting up stop nets to sample fish populations within Wilson Creek in October 1985. Source: *Salmonid Populations of Wilson Creek*, Regional Fisheries Report No. LM111, 1985.

Hudson Creek is about 6 kilometers in length and is rated as a first-order stream; and East Wilson Creek is about 5 kilometers in length and is rated as a second-order stream.

Due to fish habitat assessment limitations under the contract with SCPI,³³ Bates undertook “alternate ways of determining the “value” of the aquatic fish habitat in Wilson and east Wilson Creeks,” and provided a “qualitative score” and “outcome” to “describe the current condition of habitat.” Bates concludes that though his “his method of comparison is coarse” it “does support the opinion that the current condition of salmonid habitat in Wilson Creek is generally good:”

The condition of existing habitat and salmonid populations in Wilson Creek and its tributaries is generally good. There are areas in the watershed that have been impacted through development, but overall the quality and complexity of habitat and salmonid productivity is high.

In addition to a series of limitations of fish habitat assessment in the Wilson watershed, the central weakness of the October 2012 Bates report is its failure to report and comment on the watershed’s present state of hydrologic recovery. That was supposed to be the objective of the August 2012

³³ The Terms of Reference for the contract with SCPI is unknown and undisclosed.

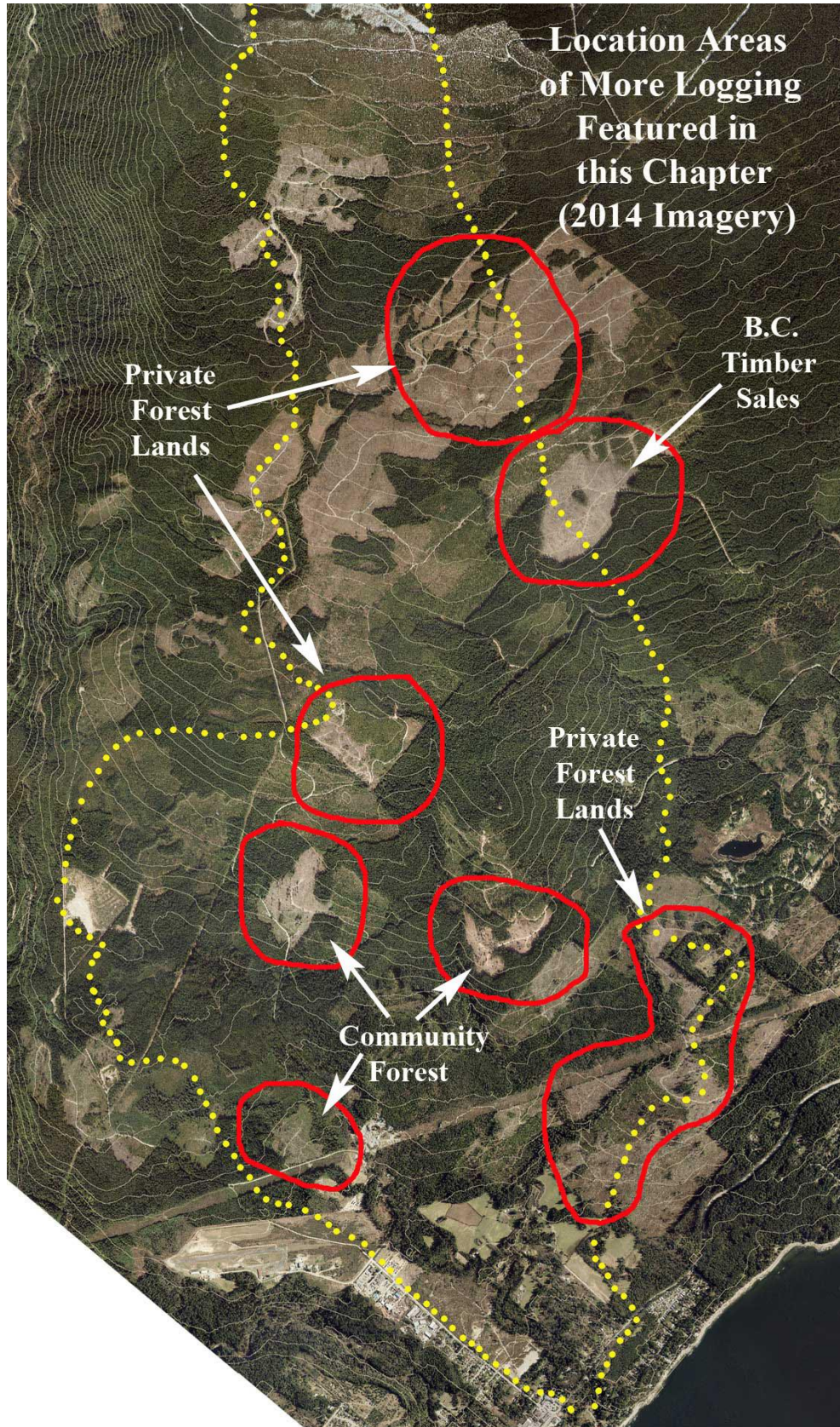
Horel report which was referenced twice in the Bates report. As Horel states on page 12, under the sub-section, Determining Hydrologic Recovery and ECA, “*These ECAs indicate an overall high potential for hydrologic change.*”

As with the Horel report, in the Conclusion and Recommendations sections of the Bates report (pages 28-31) no recommendation is made to SCPI to halt its logging operations until the Wilson watershed achieves hydrologic recovery to an appropriate threshold according to a professional rating given to a small and sensitive Coastal watershed of 2,200 hectares. I.e., where Horel states on page 13 that “*research indicates that changes in forest cover have the greatest effect on watersheds smaller than 1,000 ha,*” what does this mean for the Wilson watershed, which is close to this watershed area category sensitive rating?



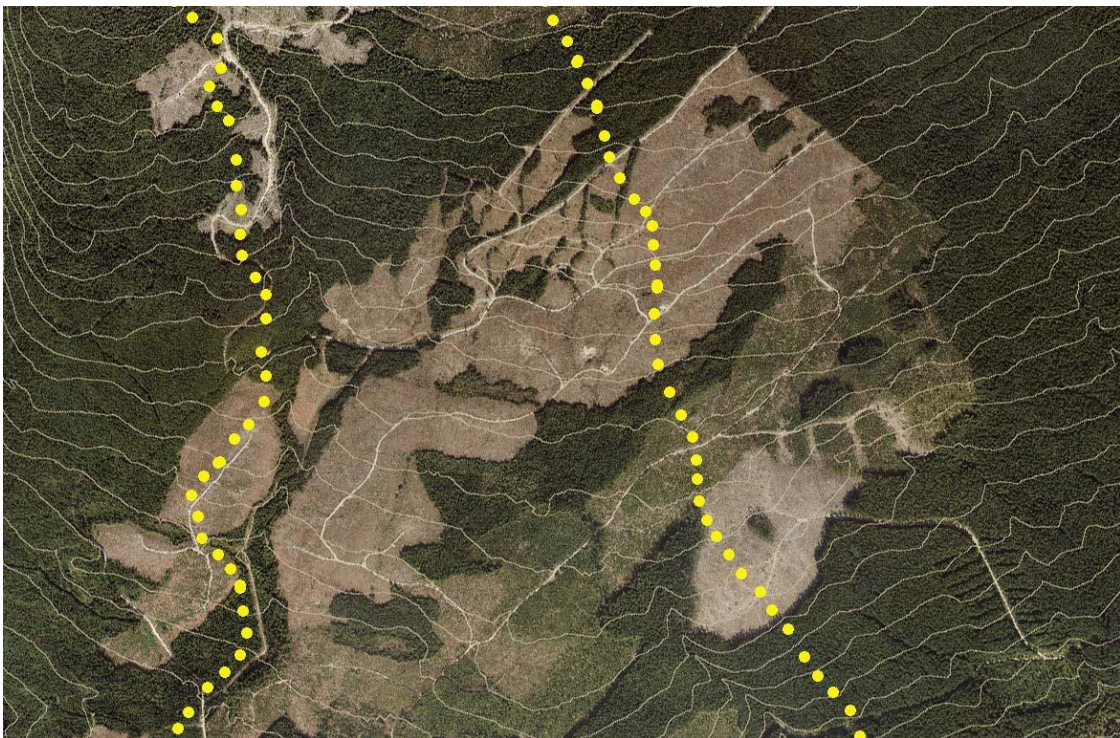
Photo from figure 15 of the Bates report, showing private forest land logging in 2006 of, and overtop of, Wilson Creek. Red arrows point to water flowing in Wilson Creek channel. See Reference section for the July 2007 private lands assessment report by Shawn Hamilton & Associates, *Block Assessment of MF 360 East Wilson Creek*, for more information.

14. Aerial / Satellite Imagery Comparisons, 2009, 2013 and 2014: The Changing Landscape and the Changing Assessment





Above: 2009 Google Earth imagery, used in the Horel Assessment report to assess hydrologic recovery (ECA determinations), showing private forest lands owned by SeaSpan (formerly, AJB Investments) at the 500-700 meter elevations. *Below:* April 2014 Sunshine Coast Regional District imagery, of same area, showing additional and recent logging in the private lands. Inside the yellow boundary is the Wilson Creek drainage.

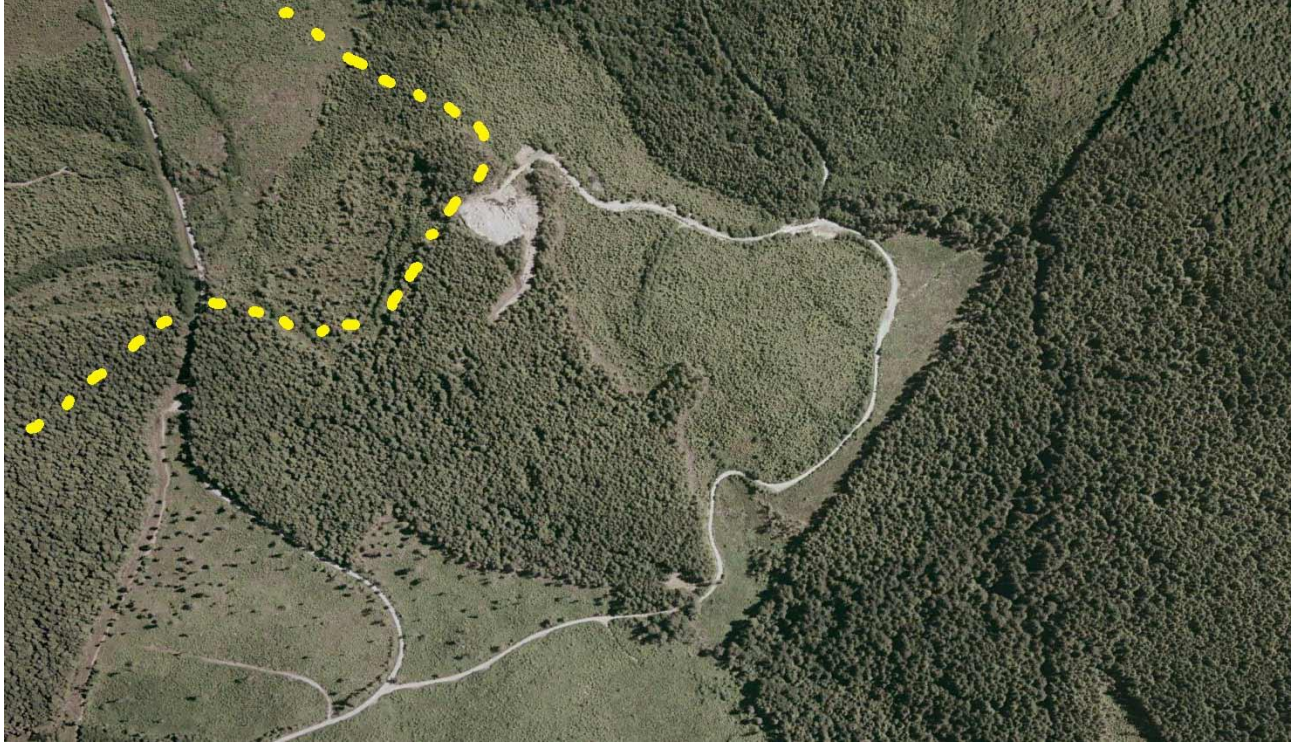


Since the release of the Horel Assessment report, which used 2009 Google Earth imagery to render hydrologic recovery data (in Appendix D, Maps), the Wilson Creek watershed has seen more logging and clearing by SCPI, private forest land owners, and BC Timber Sales in the mid and lower elevations. This logging has upset or hindered hydrologic recovery assessments made by Horel for the Wilson watershed in late 2012, tipping the scale well into the zone of logging deferral. SCPI board members are aware of this impending upset and its consequences for the Wilson Watershed community forest Unit, so much so that SCPI's meeting minutes of February 10, 2014 state the following: "AJB [the private forest lands owner] *has recently logged a significant amount off their private lands above our license which could impact perceptions when we are ready to harvest our new cutblocks in the Wilson Creek area.*" As shown in this report, it is more than just public "perceptions" at stake, as hydrologic recovery information has thrown a sobering curve ball over home plate, with the umpire calling: strike three, you're out!

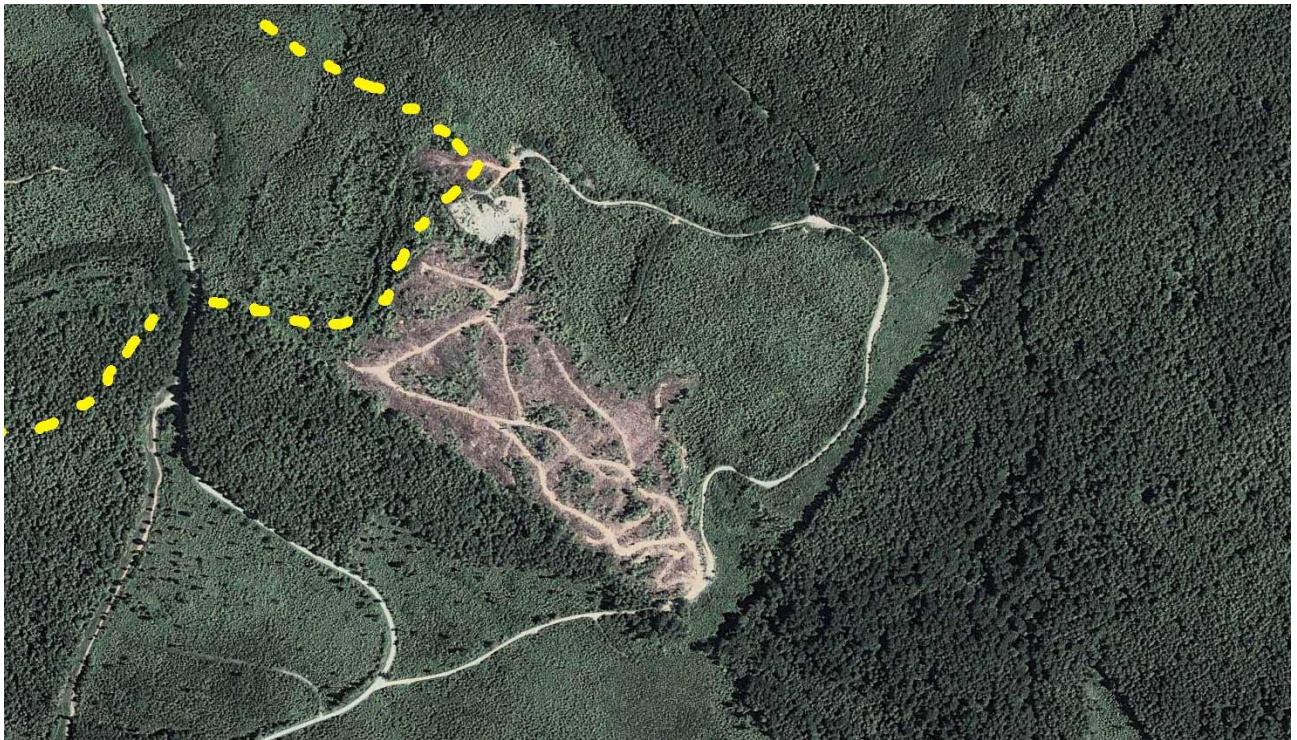


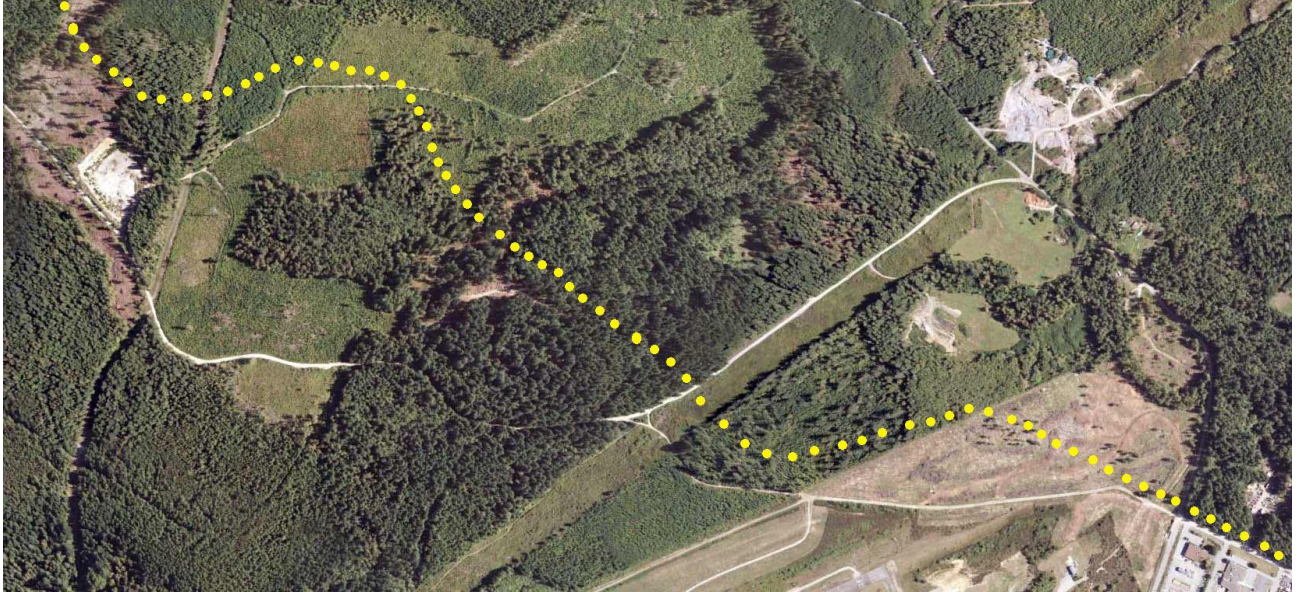
Above: 2009 Google imagery showing the lower Wilson watershed, with Wilson Creek in the centre, and early logging by SCPI on block EW011. *Below:* 2013 Google imagery, showing SCPI's logging of EW011 and EW002. SCPI's new proposed block for 2015, EW028, is located between EW011 and EW002 (larger in area than EW002).



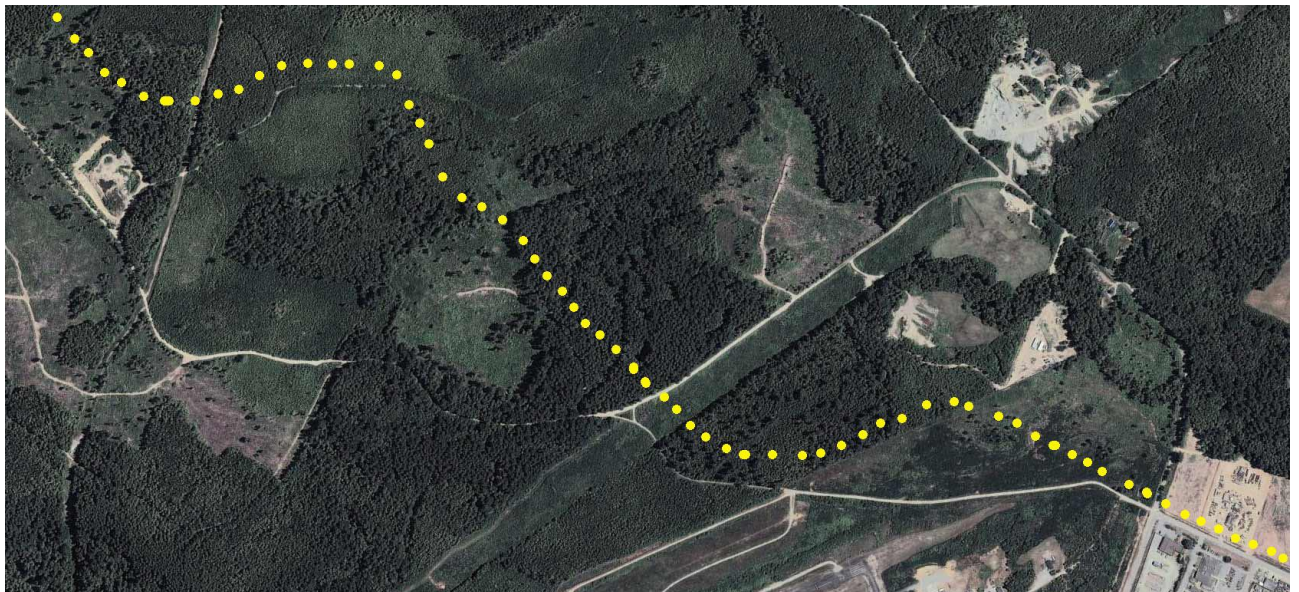


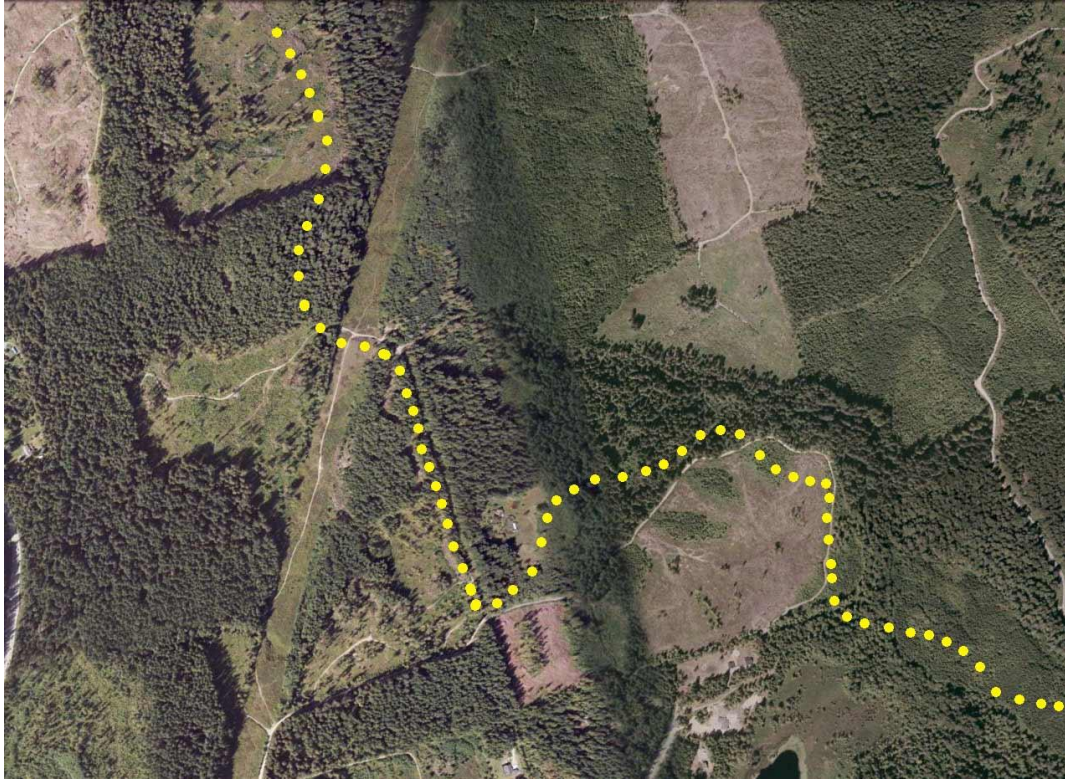
Above: 2009 Google Earth imagery of lower western-most area of private lands just above, or north of, EW011.
Below: 2013 Google Earth imagery showing recent logging, the length of which is one half (0.5) kilometres.





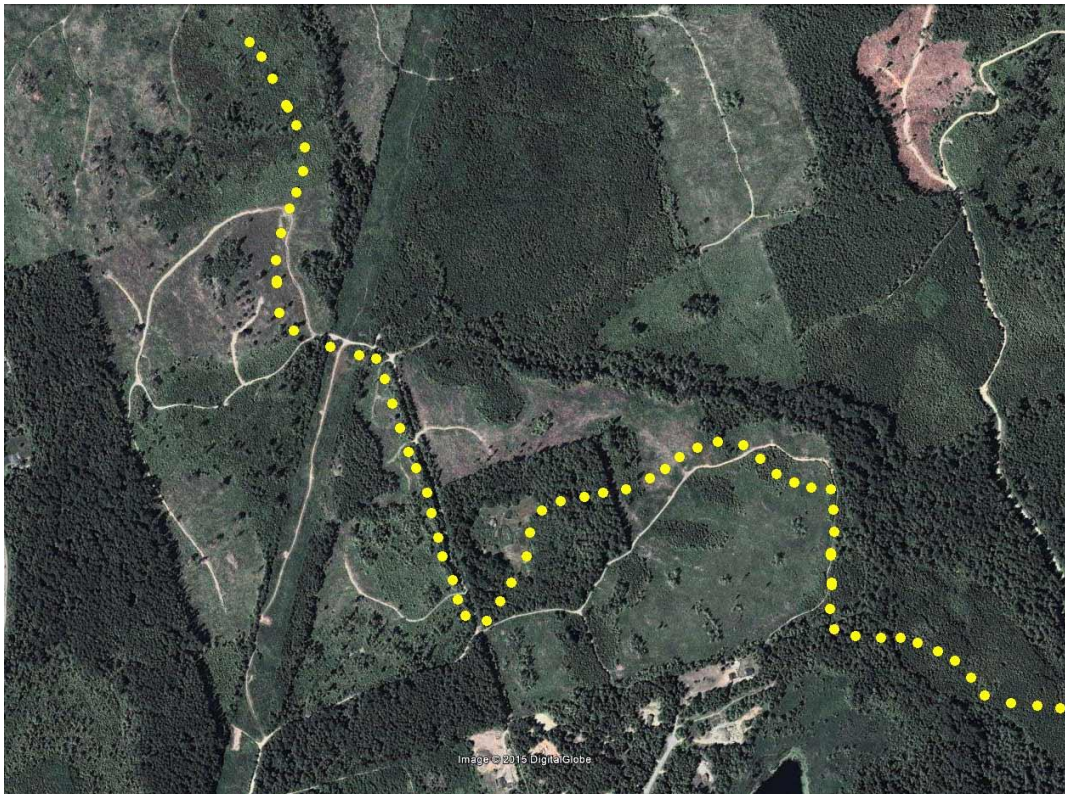
Above: 2009 Google Earth imagery of lands just north of the Wilson Creek area airport.
Below: 2013 Google Earth imagery showing recent community forest cutblock, EW008.

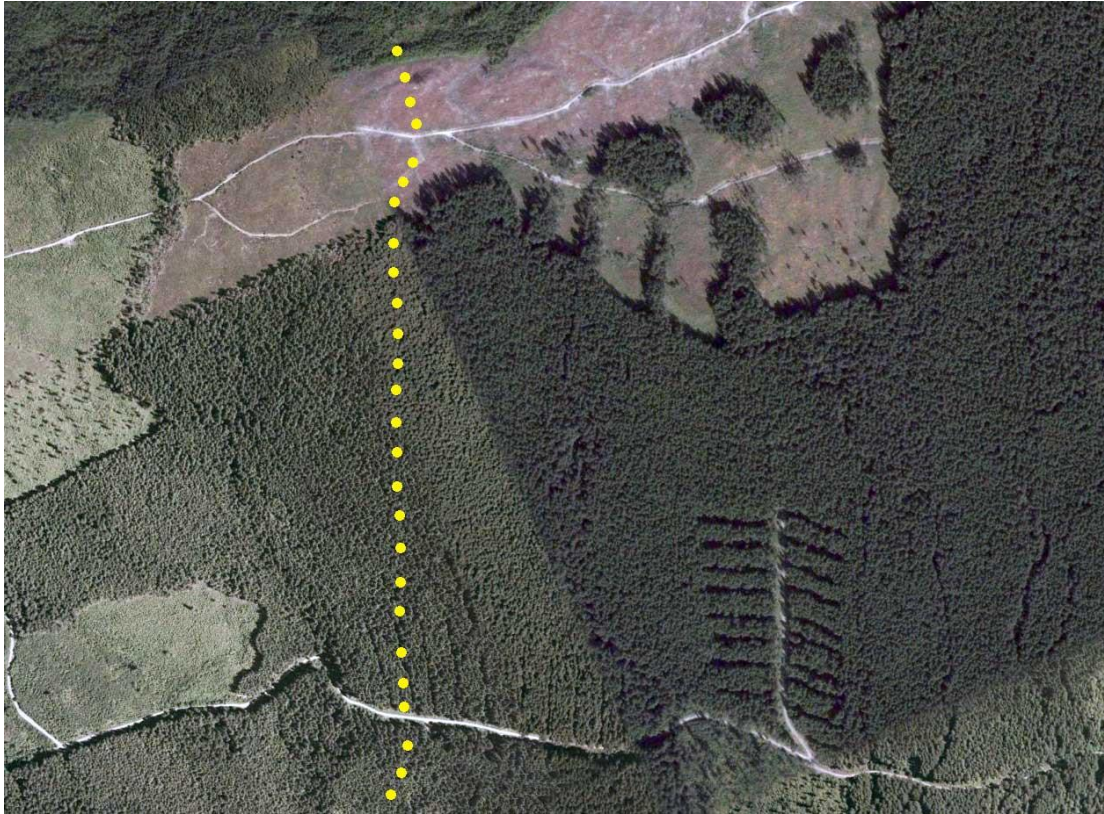




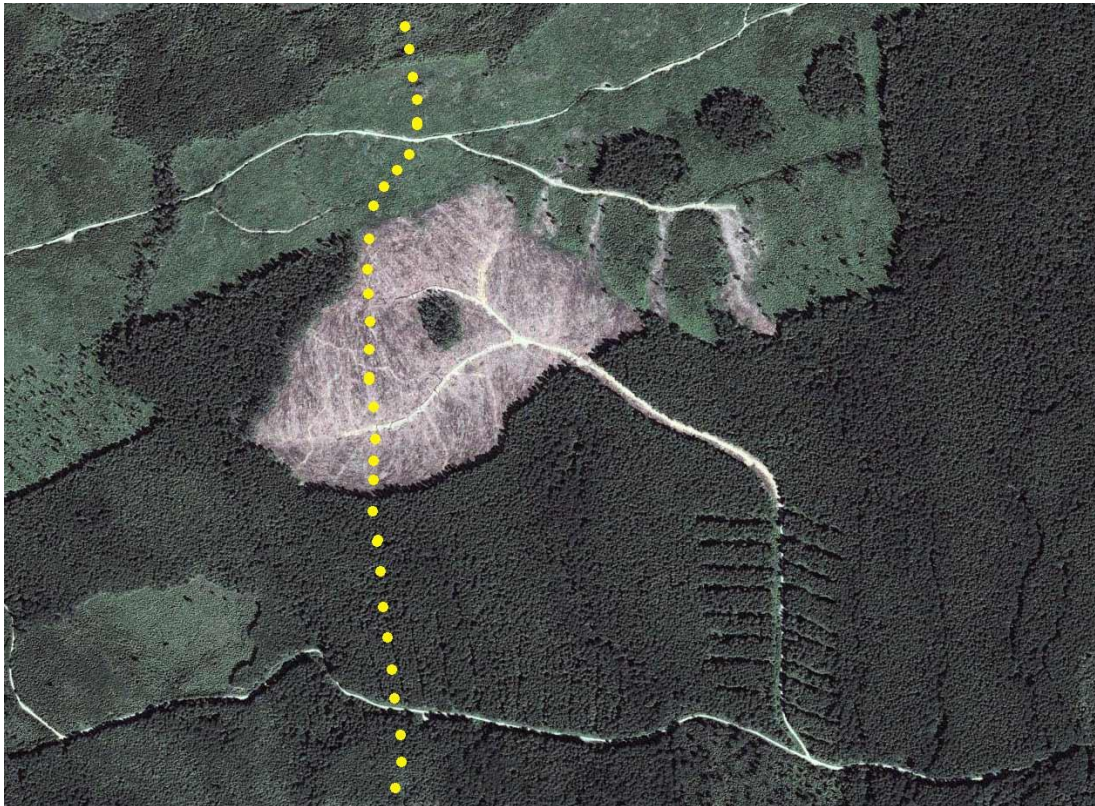
Above: 2009 Google Earth imagery of lower southeastern-most area of the Wilson watershed showing private forest lands along the watershed boundary area.

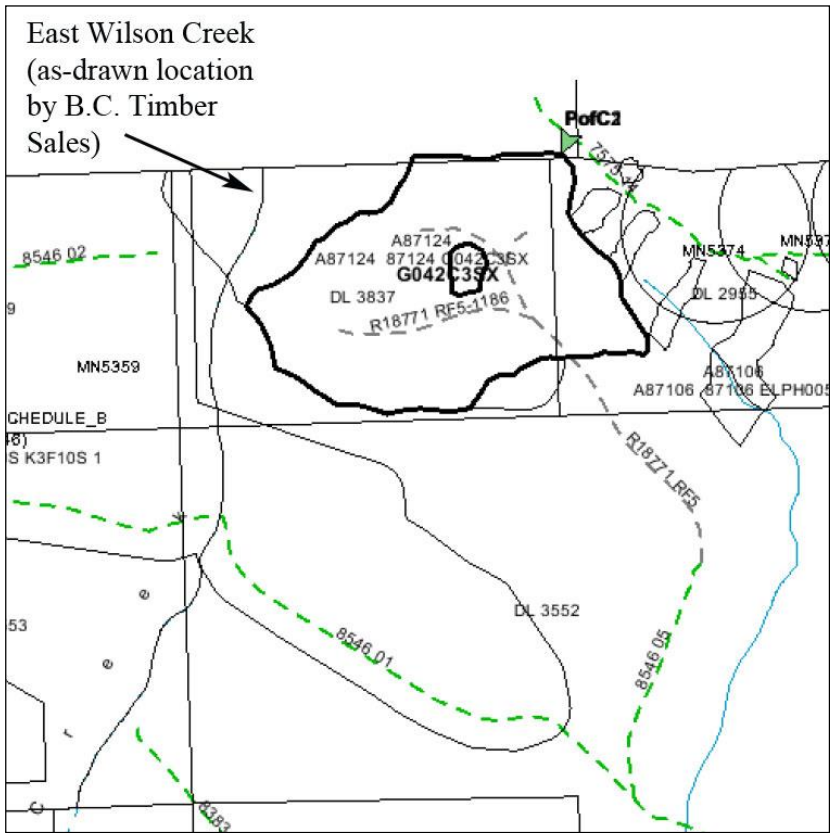
Below: 2013 Google Earth imagery showing recent logging of private forest lands.



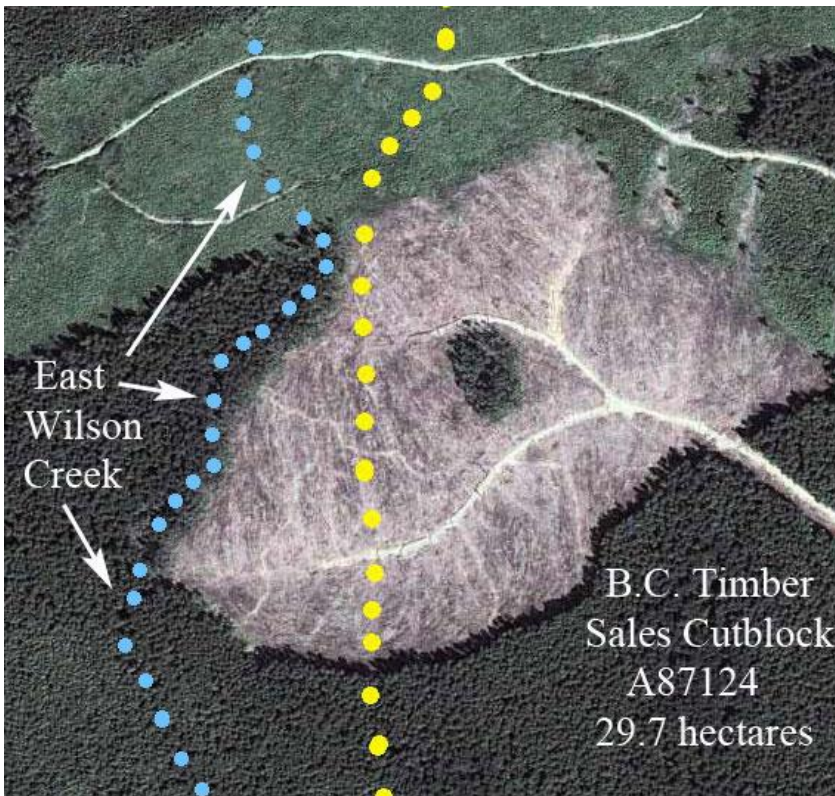


Above: 2009 Google Earth imagery showing the state of the Flume Creek forest hydrology experiment (refer to pages 46-48, and the Reference section for 2001 document TR-013.) near the 600 meter elevation. *Below:* 2013 Google Earth imagery showing the fated end of the Flume Creek experiment, a cutblock approved by BC Timber Sales at the eastern edge of East Wilson Creek. Wilson watershed located left of yellow dotted, hydrographic boundary line.



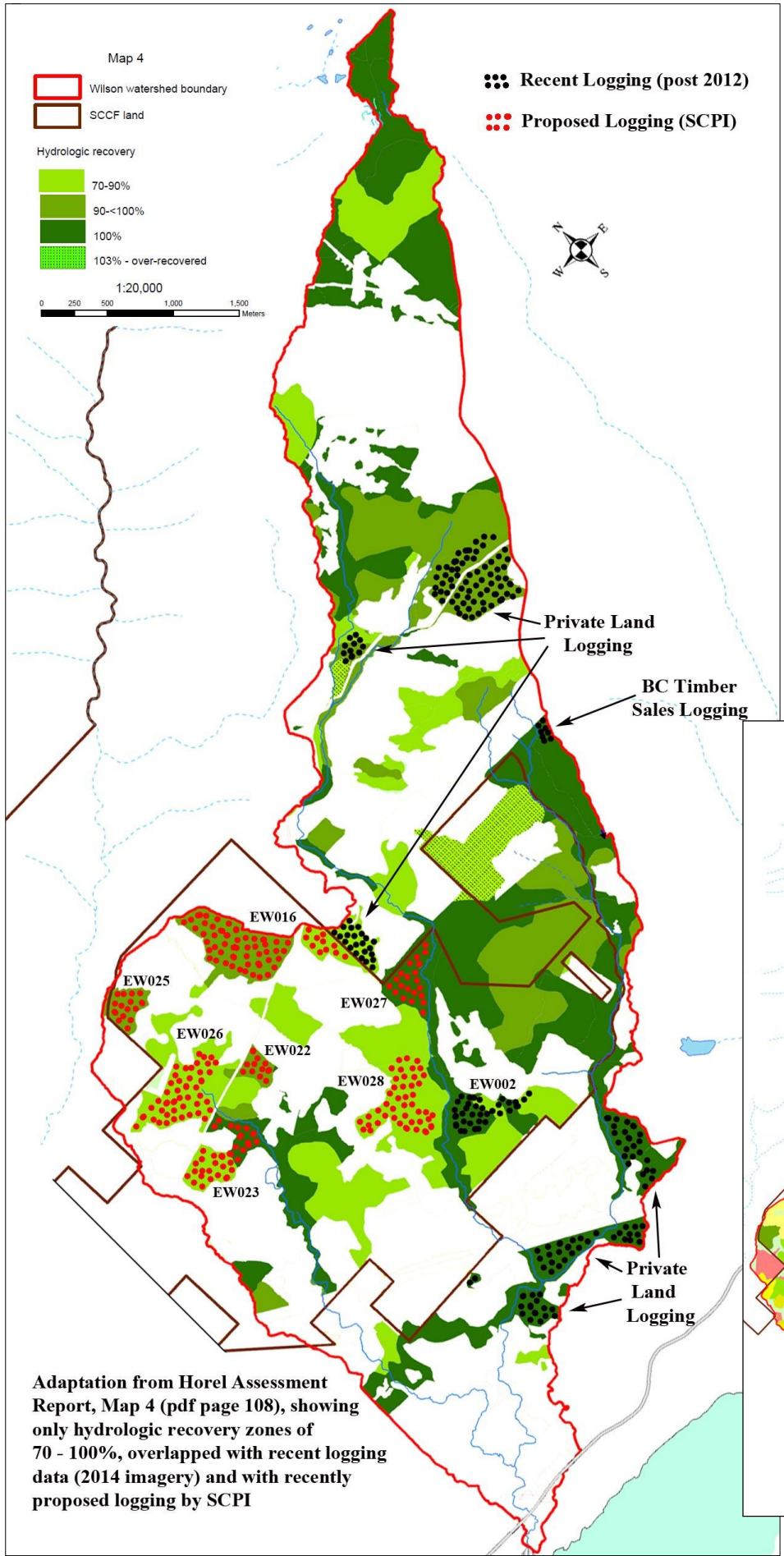


Above: January 18, 2012 B.C. Timber Sales map of proposed cutblock A87124, located on District Lot 3837. Note how the location of East Wilson Creek on that map was moved/manipulated about 300 meters westward in contrast to actual location in 2014 aerial imagery below.



According to Ross Muirhead (Elphinstone Logging Focus), a B.C. Timber Sales representative told him that cutblock A87124 was **not** located in the Wilson watershed, which about one third of its area is. In 2014, after logging, over one hundred trees were blown down by strong winds along the eastern edge of the East Wilson Creek. Photos below by Ross Muirhead, showing trees blown down and into East Wilson Creek.

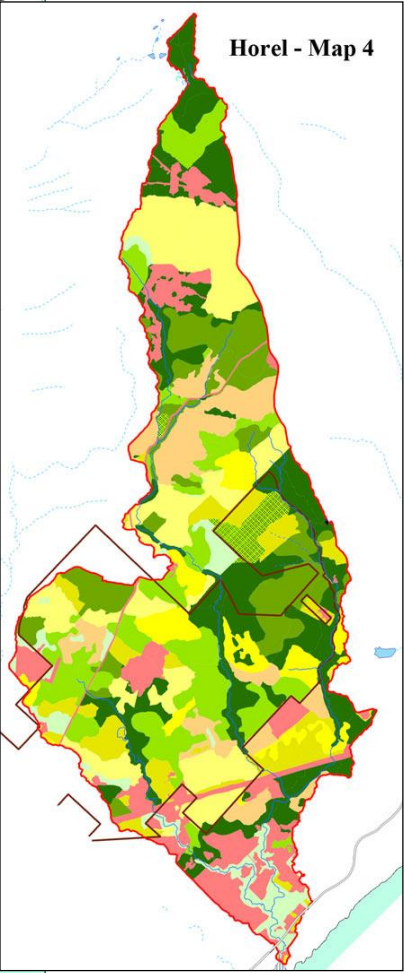


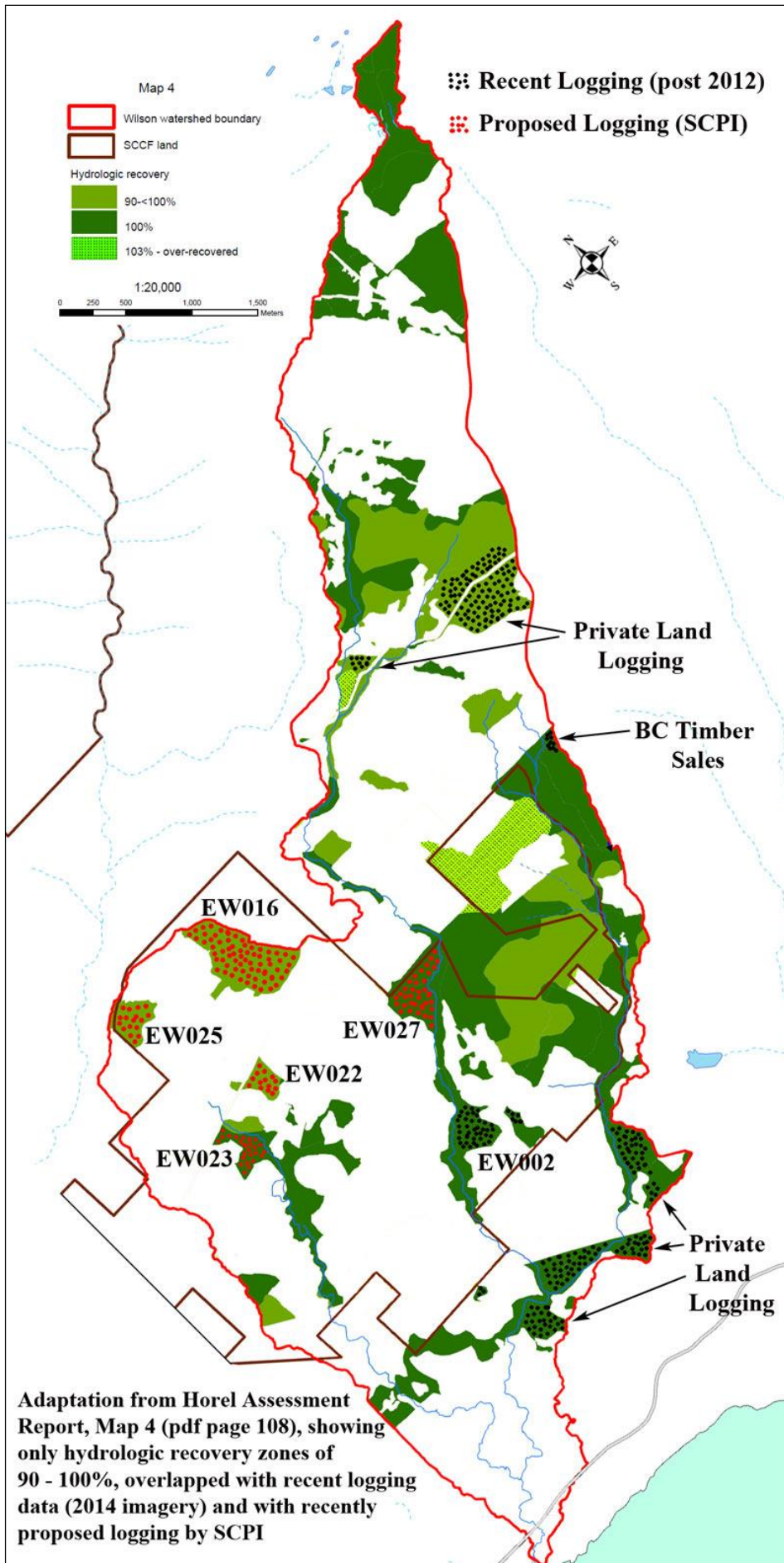


Left: Map 4 from Horel's Watershed Assessment report, isolating areas of four hydrologic recovery groupings: 70-90%; 90-100%; 100%; and something called "over-recovered" (in four shades of green).

Also shown on this updated map are areas recently logged (black dots) and areas proposed for logging by SCPI (red dots).

Below: Map 4 in the Horel report, showing all 10 color grouping schemes depicting interpretation of hydrologic recovery stages in terms of forest age and height.





Left: Map 4 from Horel's Watershed Assessment report, isolating areas of three hydrologic recovery groupings: 90-100 %; 100%; and something called "over-recovered" (in three shades of green).

By removing all of the confusing color information representing phases of hydrologic recovery, as shown here, we begin to see the picture on the actual state of hydrologic recovery in the Wilson watershed.

With the more recent logging after the 2012 Horel report (black dots), and the updated proposed logging (red dots) by SCPI for Provincial (Crown) lands only, it is strikingly obvious that the watershed is in a significantly 'unrecovered' state of hydrology, which leads to the inevitable conclusion that logging should be discontinued for some undetermined period of time. Only the dark green, and the light cross-hatched green, are areas representing 100% hydrologic recovery.

15. CONCLUSION

According to narratives in at least three written submissions in 2005, 2006, and 2011 by the Sunshine Coast Conservation Association (SCCA), they report that in a July 10, 2001 Forest Development Plan approval letter, former Ministry of Forests Sunshine Coast Forest District Manager Greg Hemphill ordered International Forest Products (Interfor) – Sechelt Community Project Inc.’s (SCPI’s) Community Crown Forest License area predecessor in the Wilson watershed – to conduct a CWAP (Coastal Watershed Assessment Procedure): “*prior to proposing future development in the Wilson Creek watershed a CWAP must be carried out.*”

This originating legal instruction – never referenced in any of SCPI’s three Assessment reports – which the SCCA repeatedly publicized, formed the social impetus of why SCPI reluctantly conducted ‘Watershed Assessments.’

*The Wilson Creek tenure area is highly controversial. Wilson Creek residents objected to the loss of Community Watershed status for this drainage in 2001. Interfor harvested extensively in this area between 1997 and 2001. The Ministry of Forests imposed a moratorium on logging development in 2001 pending results of a Coastal Watershed Assessment Process. Also of note, AJB Investments and Weyerhaeuser own large tracts of private land in the Wilson Creek watershed which can be logged without regard to cumulative effects on the watershed. Realistically, there is no timber land available for responsible harvesting in this watershed in the foreseeable future.*³⁴



This FSP [SCPI’s 2006 Forest Stewardship Plan] states that there are no Fisheries Sensitive Watersheds designated in the Sunshine Coast Forest District and declines to establish any strategies and/or results for fish beyond the minimum requirements for riparian management in the Forest Planning and Practices Regulations. This approach is consistent with the minimum legal requirements of Section 5b of FRPA as there are no “fisheries sensitive watersheds” designated in the SCFD.

Considering such major fish-bearing rivers as the Brittain, Deserted, Skwawka, Tzoonie, etc., that were once major contributors to the fishing industry and now have only residual runs, this a disturbing situation. There are a number of important salmon and cutthroat streams within the SCPI operating area, including the Angus, Chapman, Gray and Wilson creeks, yet no results or strategies are incorporated in the FSP for these drainages. Wilson Creek is of particular concern.

³⁴ Critique by the Sunshine Coast Conservation Association of the Community Forest Timber Supply Analysis Prepared for the District of Sechelt by Brian Smart. 2005.

In 2001, logging was stopped in the Wilson Creek watershed, pending completion of a Coastal Watershed Assessment Procedure. This watershed was becoming hydrologically unstable because of excessive harvesting. At the time, the district manager was obligated under law to ensure that all forest values were being “adequately managed and conserved”. Today, under the new legislation contained in FRPA, neither the district manager nor SCPI have this legal obligation. It is noteworthy that since 2001, private land owners have logged large tracts in this watershed and have probably aggravated the threat to fish.

In the absence of a specific commitment in this FSP, there are no legal conditions limiting the scale of disturbance in the Wilson Creek watershed. We note that the draft Operational Plan identifies numerous areas for new harvesting in this watershed. This is simply not acceptable.

We recommend that SCPI develop verifiable strategies outlining measurable results for all the salmon and cutthroat bearing streams of the SCPI landbase. At the very least, this should include a Coastal Watershed Assessment Procedure for Wilson Creek. ³⁵

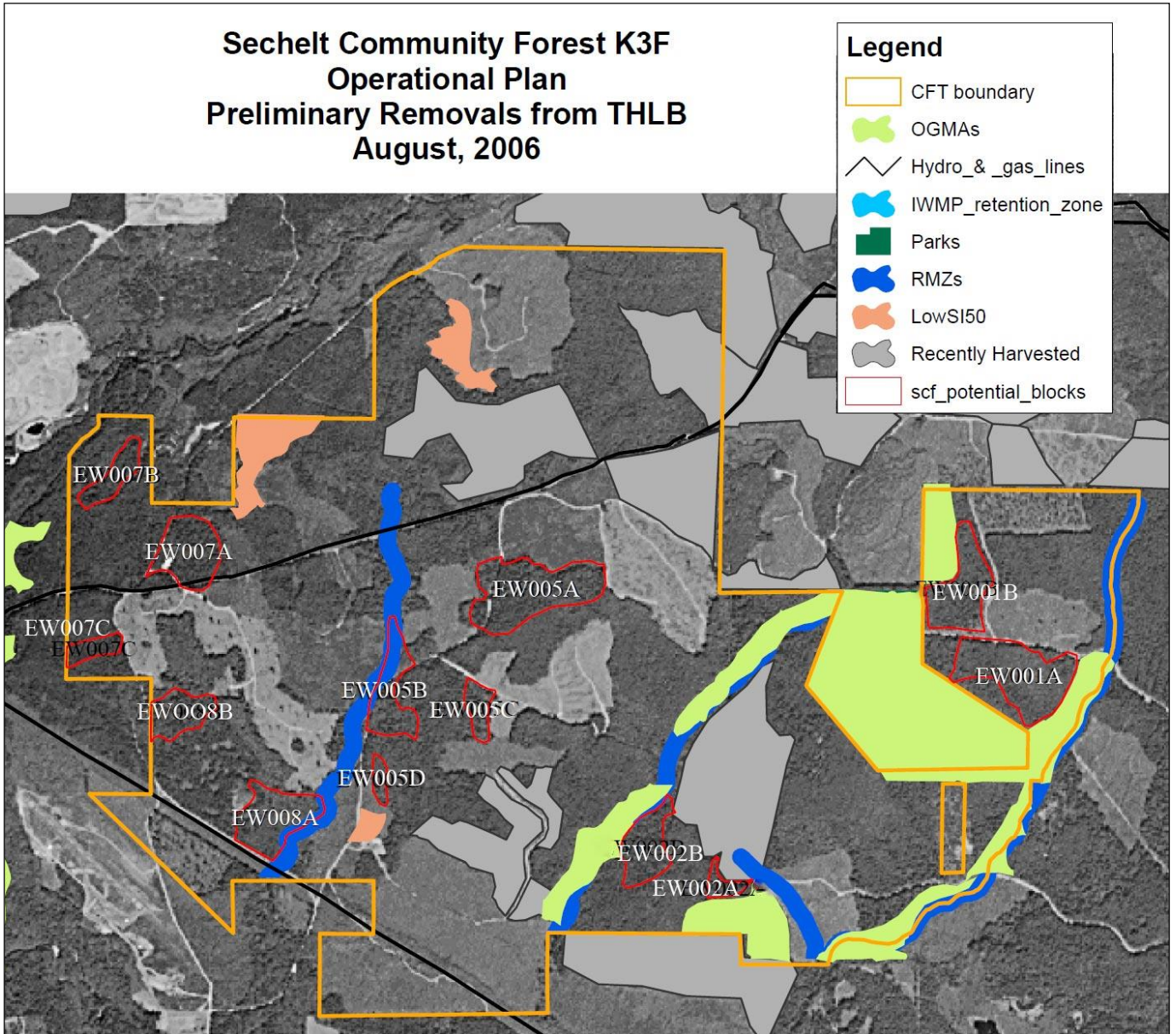
One of the originating and long-term officers of SCPI/SCCF was the former CEO and president of International Forest Products (Interfor), Robert (Bob) M. Sitter. ³⁶ If anyone understood the gritty politics of logging practices in British Columbia – especially the short and long-term impacts of logging practices on water flows and water quality, and the many skirmishes about logging in riparian habitats – it was he. When Interfor acquired the controversial logging rights from Jackson Bros. in the late 1980s, namely forest tenure in the Sunshine Coast Regional District’s Chapman and Gray Creek Watershed Reserve tenures, it encountered strong and uncompromising community resistance and criticism, even the first legal court challenge in BC history concerning Watershed Reserves filed in November 1992 (settled out of court in 1993). As a transitional representative figure from the influential reign of power associated with Interfor – a corporate captain and champion, if you will – to the localized ‘community’ interests of SCPI and its aspirational strategy to influence community forest politics in British Columbia, Sitter well understood the scientific necessity and requirements for conducting a technical Watershed Assessment in a fish-bearing and domestic licensed watershed when SCPI hired the services of Dobson Engineering in late 2009. By sometime in 2012, Sitter left the SCPI having then served as its president and vice chair.

Some three years following the government’s approval of SCPI’s Probationary Community Forest License in 2006, SCPI undertook a bare-bones, limited Watershed Assessment on Wilson Creek in 2009-2010 by Dobson Engineering Inc. Thereafter and thereupon, SCPI prepared a logging rationale and created its 20-year logging plan proposal for the Wilson Creek watershed. Following a scathing critique and challenge of this limited 2010 Watershed Assessment by the Sunshine Coast Conservation Association a year later in early 2011, with follow-up action protests by Elphinstone Logging Focus, SCPI deferred its logging plans for EW002 in the lower East Wilson sub-watershed and proceeded to conduct a second, but not thorough, professional Watershed Assessment of August 2012. Despite the deficiencies in the 2010 Assessment, between 2010 and 2012 SCPI nevertheless proceeded to log within areas of its Wilson watershed operational boundaries.

³⁵ *Sunshine Coast Conservation Association Comments on the 2006 Forest Stewardship Plan of Sechelt Community Projects, Inc.* Submitted to Sechelt Community Projects, Inc. September 22, 2006.

³⁶ Sauder Industries, with a controlling interest in Interfor’s former holdings, changed the name to International Forest Products in 1988. In 2014, the name was again changed to Interfor Corporation. Wikipedia states that this Vancouver headquartered new entity, with operations in northwest USA, is now “one of the largest lumber producers in the world,” with a 2014 revenue of \$1.2 billion. Sitter left Interfor as its CEO and president by the late 1990s.

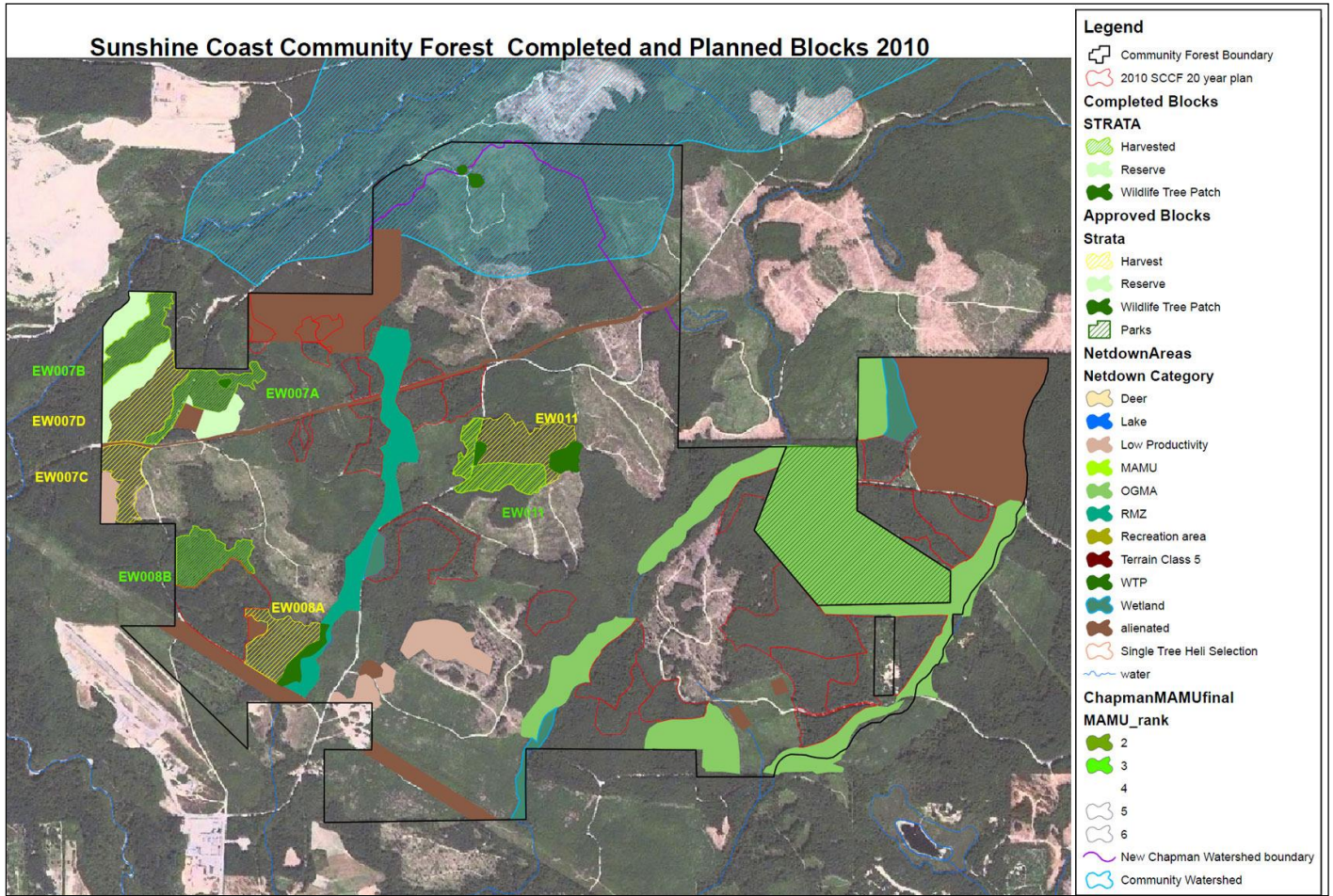
**Sechelt Community Forest K3F
Operational Plan
Preliminary Removals from THLB
August, 2006**



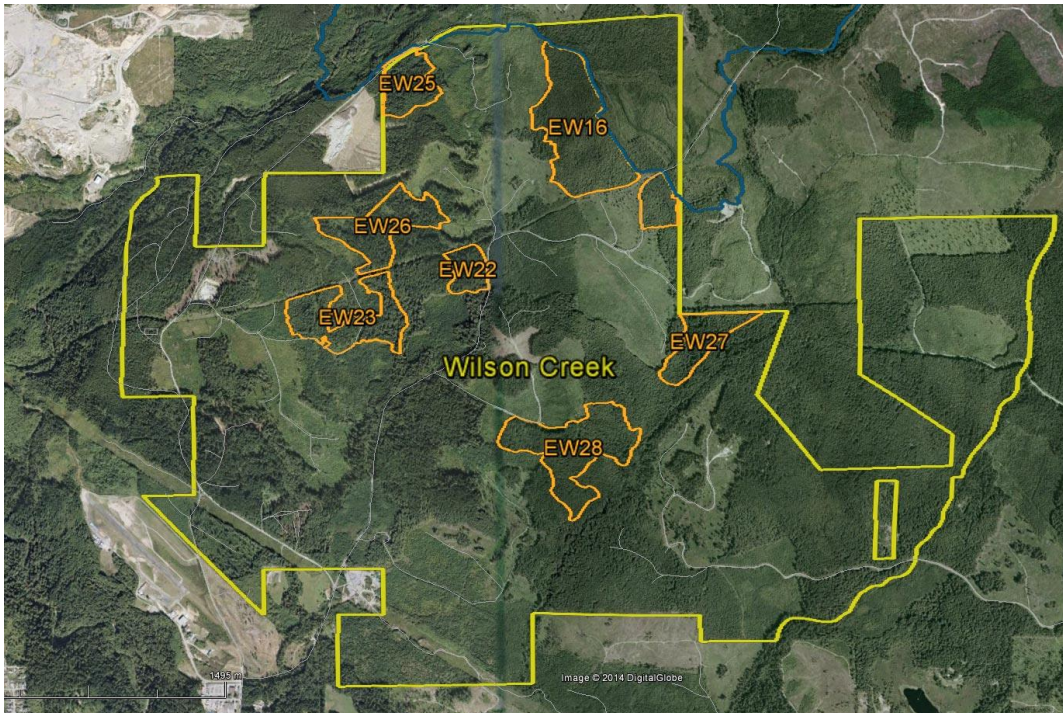
Above: Map from SCPI's pdf map, created on August 4, 2006, showing early, initial logging proposal interests in the lower Wilson Creek community forest unit. 13 logging blocks are shown here, bounded by red lines, well before conducting a watershed assessment.

The August 2012 Watershed Assessment report by G.M. Horel Engineering Ltd. concludes by way of vague, conditional language that the Wilson watershed has a “*high potential for hydrologic change.*” However, the Horel report, unlike the 2010 Dobson report, fails to interpret the hydrologic recovery data by way of a concluding figure, thereby avoiding a final prohibitive recommendation to SCPI about future logging: i.e., if it had been found and stated that the Wilson watershed has an Equivalent Clearcut Area (ECA) rating of about 50 percent or more. The forest hydrology literature suggests that a logging threshold for a small, sensitive salmon bearing watershed, such as the Wilson watershed, ranges from 20 to 25 percent of total disturbance. I.e., “*Research indicates that changes in forest cover have the greatest effect on watersheds smaller than 1,000 ha.*”³⁷

³⁷ August 2012 Horel report, page 13.



Above: SCPI's pdf map, originally created on July 23, 2010 and modified on August 23, 2013, showing forest blocks logged by SCPI (in green with diagonal lines) and those about to be logged (in yellow diagonal lines) in the lower Wilson Creek community forest unit. 26 proposed logging blocks are bounded by red lines. This map proposal was published following the Dobson watershed assessment presented internally to SCPI.



Left: SCPI map, created in late 2014, showing 7 proposed logging blocks in the lower Wilson Creek community forest unit, the total hectares of which have not been publicized. In contrast to the 2010 map above, the 2014 map fails to show recent SCPI logging history in this unit, failing to use updated 2013 Google Earth or 2014 Sunshine Coast Regional District imagery that would have shown SCPI's cutblocks. The imagery date of this SCPI map is from 2009.

In contrast, other Watershed Assessments, such as the July 2008 *Chase Creek Hydrological Risk Assessment* by Grainger and Associates Consulting and Streamworks Unlimited, conducted for the Chase Creek Community Association, provide the following conclusions and recommendations for its client in the report's Executive Summary:

It is concluded that in Chase Creek watershed, MPB [Mountain Pine Beetle] tree mortality and salvage logging have likely increased Equivalent Clearcut Area (ECA) values from between 20 to 25% at the start of widespread MPB attack around 2000, to 45% near the end of 2007, or within a few years thereafter. Without further salvage logging, ECA levels are not expected to increase appreciably, and in about 25 years will decrease to a level where significant incremental peak flow effects are unlikely to be experienced (<20% ECA).

Salvage logging since 2000 in the watershed has likely increased the ECA in the upper watershed area contributing to freshet peak flows to 45%, from the level it would have reached (~35%) had no salvage harvesting occurred in the watershed. This incremental salvage harvesting ECA is expected to last for at least 10 to 15 years, before planted stand re-growth results in watershed ECA values similar to those which would have existed had no salvage harvesting occurred....

The findings that salvage harvesting has resulted in a 10 to 15 year period of increased ECA are different than previous assessments of MPB and salvage-related watershed hydrological impacts in Chase Creek, where it was concluded that initial peak ECA would be the same but "harvested and planted areas would recover ~25 years sooner" (Dobson 2005). That conclusion was based primarily on the assumption that the hydrological function of clearcuts and dead pine stands are similar, which was the accepted state of knowledge at that time. The ECA analysis in this report, which is based on stand data gathered in the local area, including in Chase Creek, shows initial ECA values for the types of dead pine stands in Chase Creek watershed are significantly lower than clearcut ECAs, and never get as large as clearcut ECAs.

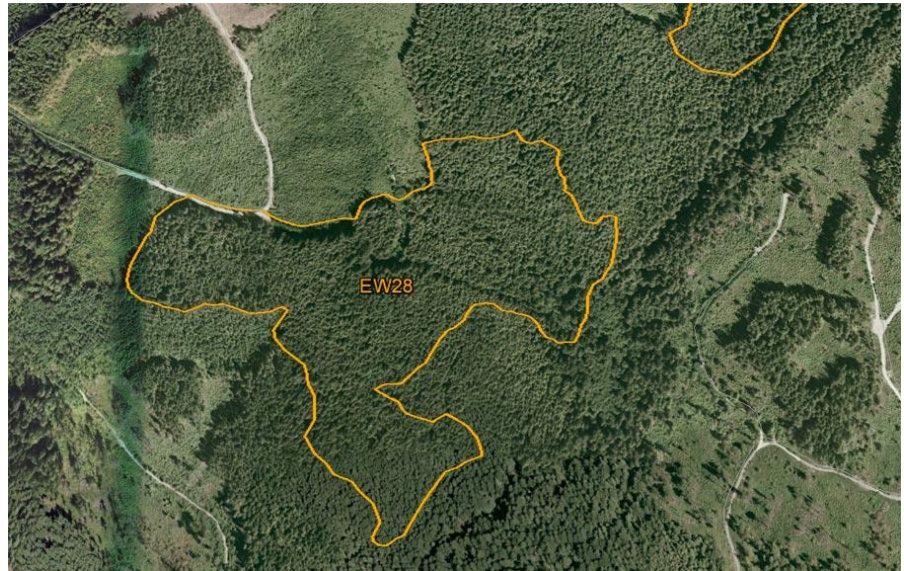
The risk analysis undertaken here shows that there are considerable values at risk from MPB and salvage-related hydrologic hazards in Chase Creek; and that the level of salvage harvesting has likely increased that risk.

Complimenting and co-completing SCPI's second Watershed Assessment of August 2012, SCPI instructed a "limited" professional Assessment audit on salmonid habitat, completed in late October, 2012 by FSCI Biological Consultants. Abiding and consistent criticism about a missing final prohibitive recommendation is also relevant for the October 2012 Bates report on salmonids, whereby no interpretations were extended or transferred from data presented in the Horel report about watershed hydrologic recovery thresholds as a percentage for fish habitat protection.

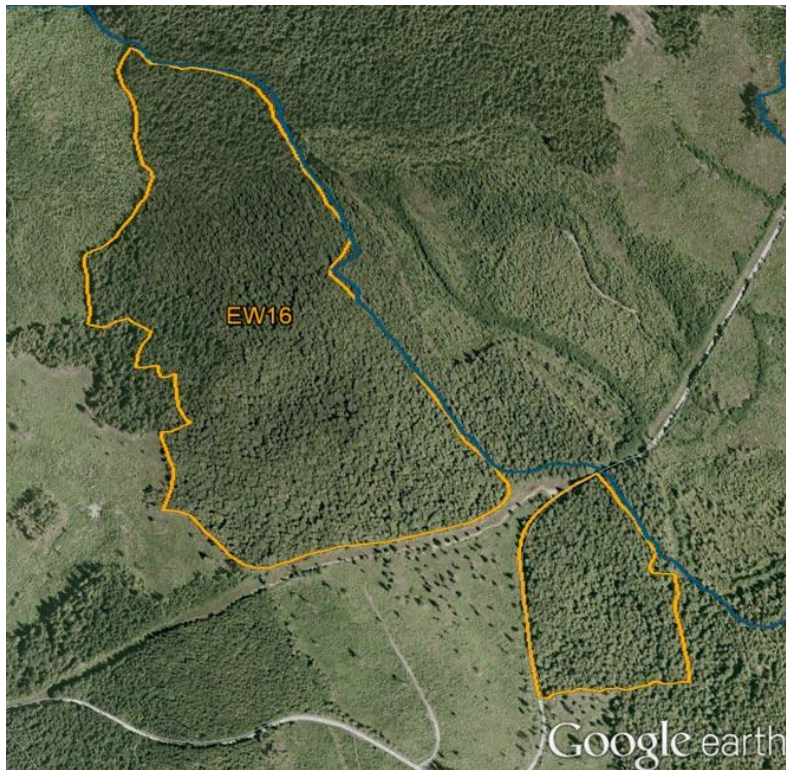
In aid of a final recommendation discovery about hydrologic recovery, the August 2012 Horel Assessment did not include descriptive data cataloguing Crown and private forest land harvesting and road building data over time, critical for pinpointing and developing overall statistics for peak flow by way of ECA and complex water runoff attributes related to hydrologic recovery in regenerating forest stands: cutblock year and area, reforestation date, accurate species re-forestation tree height per block, etc. Fundamentally, no specific tree height values were identified in the August 2012 Horel Assessment which were used to determine hydrologic recovery modelling and

assumptions, merely a reference given to a 2007, TR-032 government report, which Horel co-authored with R. Hudson.

Due to persistent disturbance problems of water runoff from logging roads highlighted and examined in numerous Canadian and American forest hydrology reports, no attempts were reportedly made in the August 2012 Horel Assessment to examine logging road field reports conducted by the Ministry of Forests, or other government agencies, in the



Wilson watershed over time, as no limited, careful experiments were set up to study the effects of roads in the watershed.



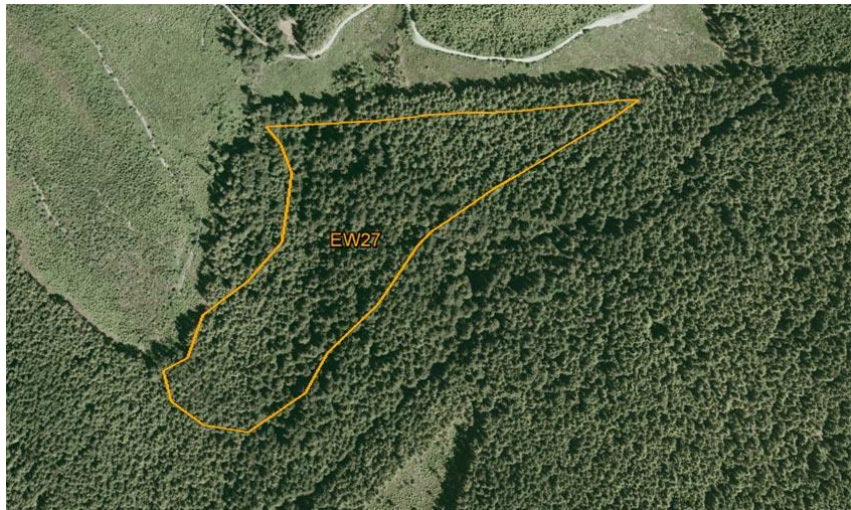
Key to all or any recommendations about hydrologic recovery in the Wilson Creek watershed are the attending conflicts from logging and road access on private forest lands, which make up a large proportion of forest lands in the watershed. I.e., the two representative photos in the October 2012 Bates report (in figure 15) dramatically display the blatant disrespect of riparian habitat by private forest landowners. Without a formal binding agreement with the private forest land owners on the future water flows in the Wilson watershed as they relate to fish habitat and domestic water licenses, combined with attending concerns about the slow recovery of Crown forest stands logged above the 750 meter elevation contour and within

the snowpack zone, the fate of SCPI’s Community Forest License lands in Wilson Creek as candidate logging areas may be in peril for quite some time. I.e., in SCPI’s meeting minutes of February 10, 2014: “**AJB [the private forest lands owner] has recently logged a significant amount off their private lands above our license which could impact perceptions when we are ready to harvest our new cutblocks in the Wilson Creek area.**” [Bold emphasis]

The problems underlying the failures in providing final recommendations concerning watershed threshold hydrologic recovery in SCPI’s 2012 Assessment reports, as noted above, and other data,

most likely stem from poor or politically restrictive and constrained Terms of References (written or otherwise), Terms that were not included for public scrutiny in the Assessment reports, Terms that may remain in a state of confidentiality. The other deeply-rooted problems relate to recent provincial legislation and regulations.

For the first time in BC's administrative history, the *Forest Practices Code Act*, established in June 1995 following, helped to establish and initiate prescriptive forest harvesting objectives about managing watersheds for fish habitat and fresh water runoff under associated guideline documents developed by the scientific and professional community. Since about 2005, the BC Liberal Administration has controversially severed those prescriptions under the implementation of the de-regulatory *Forest and Practices Range Act (FRPA)*, rendering the various service professionals in the field of watershed assessment³⁸ more or less as self-interpreters under loose guidance of the Professional Reliance Model, or the *FRPA* Delegation Model.³⁹ The initiating *Forest Practices Code* guideline documents and the science that set out to descriptively define what rates or thresholds of combined logging and road developments could occur in a fish-bearing drainage according to many evolving findings made by the science of forest hydrology in the United States and Canada



The screenshot shows the website for Sunshine Coast Community Forest. The header includes the organization's logo and name. A navigation menu at the top lists: Home, Who We Are, Forest Stewardship, Forest Operations, and Publications. The main content area is titled 'forest operations > watershed management' and 'Watershed Management'. It contains the following text: 'Over the years several watershed studies have been completed within the Community Forest tenure area. These include:' followed by a bulleted list of four reports: 'Wilson-Chapman Boundary Assessment 2009 Madrone', 'Wilson Creek Watershed Assessment 2010 Dobson', 'Wilson Creek Watershed Assessment 2012', and 'Evaluation of Salmonid Populations in Wilson Creek - 2012 FSCI'. A note states: 'Each of these reports is quite large and could take some time to upload to your computer.' Below this, it mentions a presentation by Ms. Glynis Horel, P.Eng on March 10, 2014 at 6:30 pm at the Seaside Centre.

³⁸ Professional engineers, geoscientists, hydrologists, biologists, technicians, etc.

³⁹ The University of Victoria's Environmental Law Centre released a background report, *Reliance on Registered Professionals*, on November 29, 2010, which examines the role of government deregulation and the new responsibilities and practice of registered professionals and technologists. Ongoing debates and consultations on this subject have been conducted by the Applied Science Technologists & Technicians of BC (ASTTBC) and the Association of Professional Engineers and Geoscientists of BC (APEGBC).

are now merely reference materials that professionals making watershed assessments may or may not choose to incorporate or make use of.

Specifically, under the January 2004 *Forest Planning and Practices Regulation* of the *FRPA*, a controversial nest of “*Objectives*,” set out under the “*not unduly reducing the supply of timber from British Columbia*” political theme framework, removed operational references to conduct a binding “watershed assessment,” and replaced the framework for doing so into a state of nebulous purgatory by the following three words, “*cumulative hydrologic effects*”:

Objectives set by government for fish habitat in fisheries sensitive watersheds

8.1 (1) *In this section, “fisheries sensitive watershed” means an area identified in Schedule 2 of this regulation (a) with significant downstream fisheries values continued under section 180 (f) of the Act and significant watershed sensitivity continued under section 180 (g) of the Act, and (b) for which there is no fisheries sensitive watershed objective.*

(2) *Until December 31, 2005 the objective set by government for fish habitat in fisheries sensitive watersheds is to prevent to the extent described in subsection (3) the cumulative hydrological effects of primary forest activities in the fisheries sensitive watershed from resulting in a material adverse impact on the habitat of the fish species for which the fisheries sensitive watershed was established.*

(3) *The objective set by government under subsection (2) applies only to the extent that it does not unduly reduce the supply of timber from British Columbia’s forests.*

(4) *If satisfied that the objective set out in subsection (2) is not required to provide special management, the minister responsible for the Wildlife Act must exempt a person from the requirement to specify a result or strategy in relation to the objective.*

(5) *If satisfied that the objective set out in subsection (2) is addressed, in whole or in part, by an enactment, the minister responsible for the Wildlife Act must exempt a person from the requirement to specify a result or strategy in relation to the objective set out in subsection (2) to the extent that the objective is already addressed.*⁴⁰

Nowhere does the *FRPA* purposely set out to define, in a glossary or elsewhere, what the definition of those three critical words mean – *cumulative hydrologic effects* – thereby providing a registered professional in the field of watershed assessment in British Columbia with a zero binding, legislative / regulatory reference point.

In addition, *FRPA’s Forest Planning and Practices Regulation*, which includes a current list of 44 BC watersheds as Fisheries Sensitive Watersheds, does not include the Wilson watershed – described as “*high value fish habitat*” in both the August 2012 Horel report and in the October 2012 Bates report – on this list.

As reflected in the written submissions by the Sunshine Coast Conversation Association since 2005, the BC government has so far failed to register the Wilson Creek watershed, [and many additional candidate watersheds on the Sunshine Coast](#), such as Chapman and Gray Creek Community Watersheds, on this list, and should do so, promptly.

⁴⁰ *FRPA, Forest Planning and Practices Regulation, “amendments up to BC Reg. 157/2012, June 25, 2012.”*

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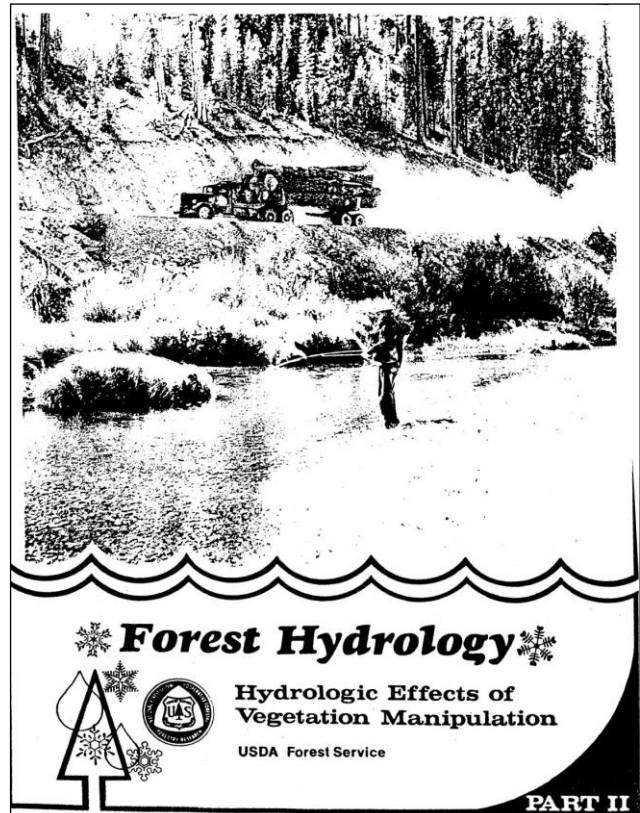
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Appendix A: ECA, Hydrologic Recovery, Peak Flow Primer

Clear-cut logging of forests on public and private lands in the United States and Canada, and the resulting effects to water runoff increases and deteriorating water quality, has been an ongoing, contentious and political issue since the 1800s when timber barons uniformly and indiscriminately clear-cut logged excessively large and contiguous tracts of intact forestlands. Due to later controversies less than a century later about cumulative large-scale logging operations and the construction of linked and lengthy logging road access networks on U.S. federal forest lands during the 1950s and following, cumulative watershed effects studies began to be applied following the implementation of the *Environmental Policy Act* of 1969.¹

As a result, in the early 1970s federal government researchers, who conducted cumulative watershed effects forest hydrology studies on logging operations in Montana and northern Idaho, created the term Equivalent Clearcut Area (ECA). The resulting procedures and particulars behind the ECA working formula was carefully described for U.S. Forest Service managers overseeing federal forestlands in a 1974 document, *Forest Hydrology: Hydrologic Effects of Vegetation Manipulation, Part II*.

Formula II	
$I = \frac{(ECA \times R)}{A} F$	where:
I = Percent Increase in Average Annual Water Yield Due to Vegetative Manipulation.	
ECA = Existing Equivalent Clearcut Area in Acres.	
R = Ave. Runoff of Treated Area in Feet.	
F = On-site Water Yield Increase Factor in %.	
A = Average Annual Water Yield of Subdrainage in Acre Feet.	
$\frac{ECA \times R}{B} = Y$	
$\frac{B}{F} = Y$	
(Y)F = B = Water Yield Increase Volume in Acre Feet.	
(R)F = B ₁ = Water Yield Increase, Feet-Depth.	



*ECA procedures were originally developed in the early 1970's in Idaho by hydrologists with the USDA Forest Service (Silvey et al., 1973) [Forest Hydrology: Hydrologic Effects of Vegetation Manipulation, Part II]. Initially, the ECA model was conceived as a means of estimating the hydrological impact of additional forest harvesting in watersheds where previous harvesting or other land disturbances had already occurred. The objective was not to produce a detailed, highly accurate simulation of streamflow, but rather a projection of streamflow changes over time assuming average climatic conditions in the region.*²

The primary impact of concern was channel disruption, and this was assumed to be caused primarily by increased peak flows from reduced transpiration due to logging.

¹ Leslie M. Reid, *Research and Cumulative Watershed Effects*, General Technical Report PSW-GTR-141, United States Department of Agriculture, 1993, page 11.

² *Hydrological Effects of the Preferred Forest Management Scenario in the C5 Forest Management Unit*, Watertight Solutions Ltd., February 2006, page 92.

Application of the model first requires calibration for an area. The extent to which each management activity increases water yield is determined as a function of vegetation type, elevation, and age of the activity. Although these relationships could be defined for many land uses, only those related to timber management are usually included. Values for each land type and use category are then compared to values for a clearcut to calculate the area of clearcut that would produce the same change, and this is used to calculate the equivalent clearcut area (ECA) coefficients for the category. The amount of monitoring data required for full calibration of model coefficients is usually prohibitive, so professional judgment is often used to define ECA coefficients.

Once the model is calibrated, application to particular sites requires measurement of the area of each land-use activity in each elevation zone and vegetation type. Areas are multiplied by ECA coefficients and summed to calculate total change in water yield, and altered water yield is assumed to be proportional to altered peak flows. Allowable thresholds for flow modifications are specified by law in northern Idaho, and calculated values are compared to the mandated thresholds. Allowable increases may be modified according to the perceived stability of channels in an area.³

Due largely to forest industry-based political pressures, ECA applications for clearcut logging and road access operations on Crown or Public lands in British Columbia were ignored and lagged for some twenty long years until the early 1990s until the arrival of the *Forest Practices Code Act* in 1995. The *Act* only implemented watershed assessment and procedure reports and associated formal recommendations for logging controls on identified fishery sensitive and community drinking watersheds.

ECAs, however, were not implemented by BC private forest land logging owners, companies and corporations, a serious and contentious planning issue for conflicting ECA goals on a given watershed where there is/was a mix of private and public forest land ownerships, or, as the case on southeast Vancouver Island, where entire contiguous drainages and watersheds are privately owned, where many watersheds are the sources for domestic drinking water and associated uses, and where watersheds have high fishery values.

Until recently, in British Columbia, there was no mechanism to ensure the rehabilitation of resource values adversely impacted by logging-induced landslides, erosion from logging roads, and harvesting of mature riparian trees to the streambank. In 1994, the Watershed Restoration Program was initiated under the province's Forest Renewal Plan to provide an opportunity for diverse stakeholder partnerships to accelerate the recovery of watersheds impacted by logging practices of the past. Several decades of research on watershed processes, limitations to salmonid production in streams and rehabilitation techniques, combined with provincial training initiatives, provide the technical basis for application of a set of integrated restorative measures linked to the new [1995] Forest Practices Code.... The program provides an opportunity for innovation and evaluation, as well as a challenge to cost-effectively implement rehabilitation on a sufficient scale to accelerate the recovery of watershed processes to the benefit of fisheries, aquatic and forest resource values in British Columbia's forested watersheds.

³ Ibid, page 28.

*There is little argument that the more restrictive logging practices of the Forest Practices Code are necessary to protect what is remaining in watersheds still dominated by old-growth, as well as those watersheds that will be logged in the near future as second growth forests.*⁴

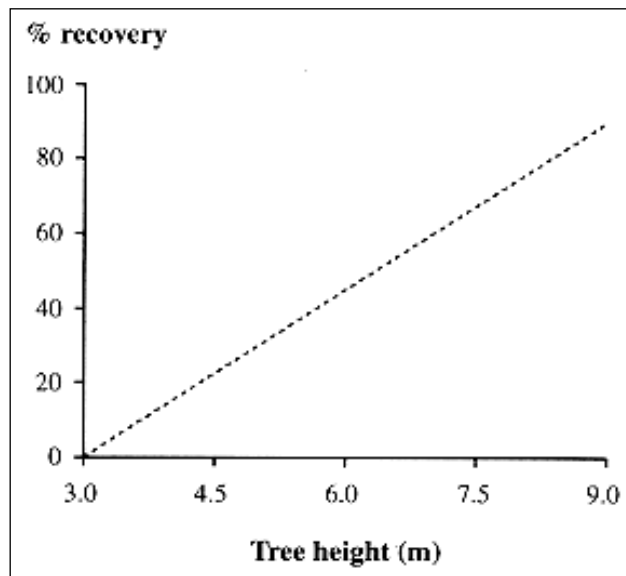
In about April 2003, the BC Liberal administration began dismembering ethically driven initiatives that regulated the forest industry and stripped away the governing principles and legislation of the *Forest Practices Code Act* – by removing the *Act*'s Preamble legislated since about June 1994⁵ – and disabled binding *Forest Code Act* procedures for watershed assessments on Crown lands.

*With the Forest Practices Code being replaced by the Forest and Range Practices Act, watershed assessment requirements in the future are not known at this time. As the new Act is brought into force, more information will be available.*⁶

ECA Definitions and Discussions

Definitions and discussion about ECA's abound in Canadian and American government and academic glossaries, and in professional watershed assessment reports:

1. The BC Forest Practices Code *Community Watersheds Guidebook*,⁷ published in October 1996, describes ECA in easier or plainer language than in most other documents and reports, despite its skewed, "low end" interpretation of 9 meter tree height denoting 90% hydrologic recovery, which was later redefined as 12-15 meter Interior forest tree heights with 90% hydrologic recovery.



Equivalent clearcut area (ECA) describes a second-growth block in terms of its hydrological equivalent as a clearcut. As second growth develops, the hydrological impact on a site is reduced. The rate of reduction is expressed in proportion to the height of the second growth (Figure 3). For example, a 20 ha [hectare] block with 6 m [meter] tree heights is 50 per cent recovered so the ECA of the block is 10 ha (20 ha x 50 per cent). On average, a stand must be at least 9 m tall before it can be considered 90 per cent hydrologically recovered (Figure 3). The ECA is used in calculating the peak flow index.

⁴ *The Watershed Restoration Program of British Columbia: Accelerating Natural Recovery Processes*, by P.S. Slaney and A.D. Martin, Water Quality Resource Journal of Canada, Volume 32, No. 2, 1997.

⁵ BC Tap Water Alliance November 26, 2002 press release, *BC Liberals Strip Key Legal Principles from Forest Laws*, and background.

⁶ *2002 Interior Watershed Assessment Update for the Mission Creek Watershed (Penticton Forest Service)*, Dobson Engineering Ltd., January 2003, from Final Watershed Assessment Committee (WAC) Meeting Summary Notes, November 25, 2002.

⁷ Note: BC government policy forbade logging in community watersheds, whereby provisions were enabled under the *Land Act* to protect community watersheds as statutory Reserves. I.e., the B.C. Tap Water Alliance September 20, 2013 report, *The Big Eddy*, Appendix A. The government later underhandedly included these statutory Reserves in the *Forest Practices Code Act* Community Watersheds' list.

Peak flow index describes the risk of a change in peak flows for an entire watershed. It is calculated as part of the watershed assessment procedure (WAP), one component of the peak flow hazard. All the cutblocks in a watershed are tabulated with their ECAs. A weighting factor then is applied, based on the elevation band of the cutblock. All the weighted ECAs are added to arrive at the peak flow index for the watershed. This number is further increased depending on the amount of road in the watershed.

In summary, the ECA is a measure of the site hazard for peak flows in a cutblock. The peak flow index is a measure of the watershed hazard for peak flows. A stand that is 9 m tall is 90 per cent recovered – the maximum that a second growth stand will attain in a normal rotation (Figure 3).

2. BC Ministry of Forests Glossary, 2008 (adopted and quoted in its entirety from The Coast Information Team's March 2004, *Ecosystem-Based Management Planning Handbook*):

An index of potential watershed-level hydrologic impacts (e.g., increased peak runoff) due to forest cover removal, normally expressed as a percentage of the naturally forested area of a watershed; areas where forest cover has been completely removed by harvesting, fire, or other disturbances are assessed as full percentages (e.g., clearcuts, intensive burns); areas with partial stand removal are pro-rated according to the percentage of the crown cover removed (i.e., equivalent to clearcut); areas partially recovered through forest regeneration are pro-rated according to the degree of crown closure and tree height.

3. BC Integrated Land Management Bureau.

The area of a cutblock weighted to estimate an equivalent effect on snow hydrology as the area of a clear-cut unregenerated block. As examples, a ten hectare clear-cut unregenerated block has an ECA of ten hectares; if a fully stocked stand has regenerated to a height of six metres, the block now has an ECA of five hectares. If, instead of being clear-cut the block was selection logged with thirty percent volume removal, the ECA is estimated to be three hectares.

4. BC Ministry of Environment, in *Environmental Risk Assessment: An Approach for Assessing and Reporting Environmental Conditions*, July 2000.

In this assessment, the concept of Equivalent Cleacut Area (ECA) was used as a general indicator of a variety of potential impacts of forest harvesting. The ECA was calculated from estimated tree height as a function of seral stage using professional judgement and personal experience. Additional assumptions were needed to associate seral stages and private land with ECA. These were:

- 85% ECA on private lands (i.e., 15% hydrologic recovery);
- 85% ECA for early seral stands (i.e., < 40 years old);
- 40% ECA in mid seral stands (i.e., 40-100 or 40-120 years old depending on species); and,
- 0% ECA in mature and old stands (i.e., 100% hydrologic recovery for stands > 100 or 120 years old depending on species).

It was acknowledged that where private land ownership was substantial (> 10%), the 85% ECA assumption may over-estimate the removal of timber from private land over the next 20 years. It was also acknowledged that actual risk to fisheries in any given watershed can be better estimated by using more detailed inventory and analysis such as the Interior Watershed Assessment Procedures (IWAP). The seral stage method allowed the estimate of cumulative impacts in 1996 and in the year 2016 due to the 20 year spatial forecast of the timber harvest which was available from other timber supply modeling.

5. BC Forest Practices Board, in *Salvage Logging and Water Flows at Cooper Creek*, August 2012.

The area that has been harvested, cleared or burned, with consideration given to the silvicultural system, regeneration growth, and location within the watershed.

6. In Cariboo Envirotech Ltd.'s March 31, 2009 report, *The Horsefly River State of the Watershed Report, Volume II-Stage II of a Watershed Based Fish Sustainability Plan* (pages 43-44):

While timber harvesting is still the greatest contributor to the local economy, the industry can contribute negatively to the local fish and fish habitat. Timber harvesting regulations have improved over the last several decades however current practices can still be improved upon to limit negative influences to a watershed. Specifically rate of harvest, road construction, the lack of bridges on streams, buffer zones on small streams, altered hydrological processes and sediment delivery, and equivalent clearcut areas are of prime concern.

Of the potential negative impacts presented above, the equivalent clearcut area (ECA) may be the most problematic for fish and fish habitat in the Horsefly River watershed.

Generally speaking, the major licensees harvesting within the Horsefly River watershed are required to hire the services of a hydrologist to provide expert opinion in the form of a watershed report on the effects increased timber extraction will have on a sub-basin if the ECA is above 25% of the affected watershed.

With an increased ECA comes the risk of a multitude of related problems that may affect fish and fish habitat in a watershed. A high level of ECA may allow for quicker spring melt and runoff on exposed areas previously forested. This potentially earlier and stronger freshet can cause a cascading flood effect downstream that may affect stream bank stability resulting in flooding, sediment delivery onto spawning substrate, and bed load movement that may damage rearing and spawning habitat.

During the information collection process of this document it was discovered that a watershed assessment was being undertaken on Woodjam Creek by Tolko Industries Ltd. of Williams Lake.⁸ This watershed assessment report was deemed to be the responsibility of the licensee and not being funded by government and as such the author has been unable to acquire this updated critical information at this time for the preparation of this report. Additionally, a request to the BC Integrated Land Management Bureau for the provision of mapping related to historic and current harvest levels in the Horsefly River watershed was denied. This lack of information from the licensee noted above and the government is

⁸ Tolko Industries Annual Report for 2009 reported an ECA of 32% in Woodjam Creek.

troubling as the author feels that this sector of the economy could potentially be the one that has the most negative effect on fish and fish habitat in the watershed.

7. The February 2007 report by Dobson Engineering, *2006 Hydrologic Assessment for Selected Sub-basins in the Horsefly River Watershed*, for Tolko Industries, describing interior forest attributes.

Tree species, age/size, stem density and canopy closure all affect how a forested stand can intercept snow and affect peak flow response. Healthy mature spruce and fir stands can be more effective at intercepting snow and affect peak flow response. Healthy mature spruce and fir stands can be more effective at intercepting snow than pine stands. Snow survey research has shown that clear-cut harvesting in mature mixed spruce stands can result in up to 32% more snow water equivalent (SWE) than in adjacent forested mixed spruce stands. Clearcut harvesting in mature pine stands can result in up to a 22% increase in SWE. In addition to changes in SWE, clearcut areas typically melt up to two weeks earlier than adjacent forested areas. Clear-cut effects diminish as the forest regenerates and as trees grow, canopy closure increases. For every 10% increase in canopy closure there is approximately 6% reduction in SWE. This is typically referred to as hydrologic recovery, which increases with increasing tree height (refer to Table 1).

Table 1 – Equivalent Clearcut Area (ECA) and Hydrological Recovery

Tree Height Category (m)	ECA (%)	Hydrological Recovery (%)
0 – 3	100	0
3 – 5	75	25
5 – 7	50	50
7 – 9	25	75
9 – 12	10	90
> 12	0	100

Ministry of Forests Range and research at upper Penticton Creek suggests that ECA's over 20% can change the magnitude of the annual peak flow event. The increase depends on the area harvested and the return period of the peak flow event, but with 100% ECA, the maximum peak flow increase is 47% for the 50-year return period event.

Table 2 – Changes in Peak Flows with Increased Forest Harvesting (Adapted from MoFR Extension Note 67)

% Area Harvested	Peak Flow – 2 Year Return Period % Increased Flow	Peak Flow – 10 Year Return Period % Increased Flow	Peak Flow – 50 Year Return Period % Increased Flow
0	0	0	0
10	0	2	5
20	< 1	4	10
30	1	7	15
40	4	10	19
50	7	15	23
100	36	40	47

8. Smartwood September 2004 report, *Forest Management Public Summary or Inlailawatash Holdings Ltd.*, in the Indian River watershed.

6.5.10. Consistent effort is evident to minimize increases in peak flow resulting from management activities, including in snowmelt-dominated watersheds, maintaining weighted equivalent clearcut area (ECA) to less than 25%, unless recommended otherwise by peer-reviewed hydrologic assessment.

9. Bussel 484 *Final Environmental Impact Statement, Idaho Panhandle National Forests, St. Joe Ranger District, Snowshoe County, Idaho*, May 2008, Appendix E, Glossary.

Equivalent Clearcut Area is an indicator of basin condition and is calculated from the total amount of crown removal that has occurred from harvesting, road building, and other activities based on the current state of vegetative recovery.

10. September 17, 2010 *Environmental Impact Statement, Montana Department of Natural Resources and Conservation Forested Trust Lands Habitat Conservation Plan.*

The total area within a particular watershed or sub-drainage that does or will exist in a clearcut condition. An ECA value is determined by adding the area actually in a clearcut condition with an equivalent clearcut area for roads, and partial or selective cut units.

11. *Tolko Sustainable Forest Management Plan, Tolko Cariboo Woodlands Defined Forest Area*, May 15, 2008.

The maximum Equivalent Clearcut Area (ECA) allowed before a qualified hydrologist must be consulted has been reduced to 25% from 35%.

Within identified fisheries sensitive watersheds maintain Equivalent Clearcut Area at less than 25% except where an assessment indicates a higher Equivalent Clearcut Area will not be detrimental to natural flow regime.

The degree of canopy closure is determined by tree species, height, and stocking density. Since tree height data is readily available and is closely correlated with canopy closure, it is the variable used to evaluate hydrologic recovery. (Appendix 2, Interior Watershed Assessment Procedure Guidebook, September 1999).

The equivalent clearcut area (ECA) is defined as the area that has been clearcut, with a reduction factor to account for the hydrological recovery due to forest regeneration. To estimate this value, determine the height of regeneration in each logged polygon below the H60 line on the 1:20 000 forest cover map.

Tolko will ensure that within identified hydrologically sensitive watersheds in the Tolko Cariboo Woodlands DFA that Tolko activities do not cause an (equivalent clearcut area) of 25% to be exceeded except where an assessment by a qualified professional has determined that higher ECA will not be detrimental to the watershed and the values it supports.

12. Hydrological Effects of the Preferred Forest Management Scenario in the C5 Forest Management Unit, published by Watertight Solutions Ltd. in February 2006.

Equivalent Area Clearcut (ECA) is a measure or index of hydrologic recovery. It is a measure of the disturbed area (i.e. harvest blocks) in a watershed that is in a condition to contribute extra water to streamflow. ECA is at a maximum at the time of harvest and then decreases with the re-establishment and growth of trees. The physical model supporting ECA is that vegetation removal changes water yield in rough proportion to the leaf surface area or basal area removed from a site (Ager and Clifton 2005, Software for Calculating Vegetation Disturbance and Recovery Using the Equivalent Clearcut Area Model). ECA is defined as the area harvested times a reduction factor that describes the recovery of evapotranspiration losses. ECA is usually expressed in hectares of harvested area and as a percent of the harvested area. ECA can also be expressed as a percent of watershed area, which is hydrologically more informative. (Page 2)

ECA refers to “equivalent clearcut area” which describes the current “effective” area that an old or recovering disturbance (e.g. clearcuts, burns, insect defoliation or extensive disease mortality) represents in terms of hydrologic effects. The concept can also be used to express the partial state of recovery from disturbance of individual forest stands, or the cumulative effects of multiple disturbances across large landscapes (net effect of multiple disturbances at different stages of ecological recovery) over long periods of time. In addition to an estimate of ECA or the partial state of hydrological recovery of individual disturbances or entire watersheds, the technique can also be used to predict changes in annual water yield relative to baseline annual water yields. The main application of the model is to evaluate the effect of disturbances on streamflow in a watershed, and to project the cumulative effect (net combined effect) of both past and proposed forest harvesting and/or natural disturbance on streamflow.

Overall, the ECA-AB model provides a relatively simple framework for evaluation of hydrologic effects of forest harvesting with more modest input data requirements. However, the accuracy of model outputs depend primarily on accurate information on hydrologic recovery of forest stands after disturbance, and the availability of representative regional streamflow and precipitation data. (Page 92)

13. Robin G. Pike, Todd E. Redding, R.D. Moore, Rita D. Winkler, and Kevin D. Bladon, editors, Compendium of Forest Hydrology and Geomorphology in British Columbia. Volumes One and Two. 2010. In the long 23-page Glossary, ECA is not included or defined. What is defined are the following:

Hydrologic Recovery. *Process in a forest where regeneration restores the hydrology of an area to approximate pre-logging conditions.*

[Note: the text states in that the definition of hydrologic recovery was summarized from page 25 of the 1999 Forest Practices Code Coastal and Interior Watershed Assessment Procedure Guidebook. Here is that definition:

Hydrological recovery is the process by which regeneration restores the hydrology of an area to pre-logging conditions. Complete hydrological recovery incorporates many hydrological components, including the recovery of snow accumulation and melt characteristics, recovery of precipitation interception during storms, and recovery of evapotranspiration. In British Columbia, the most important component of the hydrological

recovery involves snow accumulation and melt characteristics (snowmelt recovery) because peak flows in both interior and coastal areas tend to be generated by conditions of radiation snowmelt and rain-on-snow. Therefore, snowpack recovery is used as an index of true hydrological recovery.]

Watershed Assessment. *A process for evaluating the cumulative impacts, over time and space, of all land use activities within a given watershed on variables such as streamflows, sediment regime, riparian health, and landscape and stream channel stability. The process can also be used to assess the potential impacts of proposed future land use activities.*

14. Coastal Watershed Assessment Procedure Guidebook (CWAP) / Interior Watershed Assessment Procedure Guidebook (IWAP). Forest Practices Code of British Columbia. Second Edition, April 1999.

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.

Appendix 2: Peak flow factors: equivalent clearcut area (ECA) and road density. The ECA methodology used here to estimate changes in peak flow produces an approximation based on limited data; it must not be used in isolation, but can be useful in combination with other factors to assess the impact of timber harvesting on stream channels. There is little evidence to link channel disturbance with ECA alone, in isolation from other effects such as riparian logging and changes to sediment supply. ECA values should not be a management target.

ECA and road density are the two primary factors considered in an evaluation of the potential effect of past and proposed forest harvesting on peak flows. This appendix suggests a method of collecting and presenting the appropriate information for interpretations.

Table A2.2 shows snowpack recovery factors resulting from forest regeneration. Research is currently being conducted in British Columbia to better understand and quantify snowpack recovery. This work is exploring the relationship between tree canopy development, stand canopy height and snow accumulation and melt. Revisions to Table A2.2 will be considered as new information becomes available.

Table A2.2 indicates that below a height of 3 m, trees are not effective at providing interception storage or at providing a buffer from radiation snowmelt or rain-on-snow processes. Thus, recovery starts at a stand height of 3 m. At a canopy height above 9 m, the regenerating stand begins to approach full recovery. However, full recovery is unlikely in second-growth plantations, because canopy structure will be different than in old growth, even at rotation ages. Note, too, that the recovery relationship given in Table A2.2 assumes full stocking. Often, regeneration is patchy, particularly at heights below 7 m. If this is the case, then the coverage of that regeneration must be taken into account.

Location of harvested, cleared or burned areas within a watershed is the third key factor in determining ECA.

For the CWAP, three elevation bands are chosen to represent the dominant streamflow generation processes operating in the watershed being assessed. In the lower elevation band, peak flows tend to be generated by rainfall (the rain-dominated zone); in the middle

band, by rain-on-snow (the transient snow zone); and in the upper band, by a combination of radiation snowmelt and rain-on-snow (the snowpack zone).

The hydrologist must determine the elevational ranges of these bands for the area in which the watershed is located. For example, studies at Russell Creek on northeast Vancouver Island and at Chapman, Gray and Roberts creeks on the Sunshine Coast have shown that the rain-dominated zone corresponds to the 0- to 300-m band, the transient snow corresponds to the 300- to 800-m band, and the snowpack zone corresponds to the area above 800 m. Different elevational bands may apply on other parts of the coast. For instance, on the west coast of Vancouver Island, the elevational bands are generally higher and lower on the North Coast. Farther north (e.g., in the Kitimat area), the highest instantaneous peak flows are generated by autumn rain-on-snow events. In this area, snow is characteristically present at sea level, so there is no rain-dominated zone. The hydrologist may choose to weight the ECA calculated within each elevational band differently, depending on the important peak flow generating mechanism, but the weighting factor must be justified.

For the IWAP, watersheds are also divided into elevational bands to account for the vertical variability in runoff generating mechanisms. Although this is commonly based on the location of the “H60” line—defined as that elevation above which 60% of the watershed lies (the watershed area above the H60 line is considered to be the source area for the major snowmelt peak flows)—other values can be used, provided the hydrologist justifies the decision.

Form 2. ECA calculations by sub-basin for the CWAP.

Sub-basin name	Rain-dominated zone			Transient snow zone			Snowpack zone			Snow melt index (C+F+I)
	A ECA (km ²)	B ECA + total sub-basin (km ² /km ²)	C Weighted ECA (B X C1)	D ECA (km ²)	E ECA + total sub-basin (km ² /km ²)	F Weighted ECA (E X C2)	G ECA (km ²)	H ECA + total sub-basin (km ² /km ²)	I Weighted ECA (E X C3)	

Note: The C_n is a factor that accounts for the vertical variability in runoff generation mechanisms within the watershed. The C value used must be justified by the hydrologist.

Form 1. ECA calculations by sub-basin for the IWAP.

Sub-basin name	Below specific elevational line			Above specific elevational line (major snowmelt zone)			Snowmelt index (C+F)
	A ECA (km ²)	B ECA + total sub-basin (km ² /km ²)	C Weighted ECA (B X I1)	D ECA (km ²)	E ECA + total sub-basin (km ² /km ²)	F Weighted ECA (E X I2)	
Residual							
Total watershed							

Note: The I_n is a factor that accounts for the vertical variability in snowmelt within the watershed. The I value used must be justified by the hydrologist.

15. Software for Calculating Vegetation Disturbance and Recovery by Using the Equivalent Clearcut Area Model, United States Department of Agriculture, General Technical Report PNW-GTR-637, April 2005.

Understanding and modeling the cumulative watershed effects of management and natural disturbance is a significant challenge for land managers (U.S. Council on Environmental Quality 1997). Cumulative watershed effects can result from minor actions taking place over a period of time that collectively are thought to alter hydrologic response (FEMAT 1993). A wide variety of qualitative and quantitative methods for analyzing cumulative watershed effects have been developed over the past 25 to 30 years (Berg et al. 1996, Reid 1993). One of the earliest quantitative approaches used by the Forest Service was the equivalent clearcut area (ECA) method, which accounts for past and future effects of different types of disturbances by standardizing the effects and modeling the recovery over time. It was originally developed for use in northern Idaho and Montana (King 1989, USDA FS 1974) where it was used to measure the potential impacts of alternative timber harvesting schedules. A more encompassing model, equivalent roaded area (ERA), was later developed in the Pacific Southwest Region by using the same framework, and was extensively used in the Sierra Nevada Ecosystem Project (Menning et al. 1997).

Both models assume a direct linkage between vegetation disturbance and hydrologic response (i.e., peak flows and water yield) (Bosch and Hewlett 1982, Stednick 1996). Despite conflicting literature on the existence of these linkages and other limitations (Beschta et al. 2000, Menning et al. 1997), the model is still required for consultation with the National Oceanic and Atmospheric Administration (NOAA) Fisheries Department and the U.S. Fish and Wildlife Service (USDC NMFS 1995, USDI FWS 1998) for all proposed management actions in the Blue Mountains national forests and elsewhere within the range covered by PACFISH (USDA USDI 1995a) and INFISH (USDA USDI 1995b) policies. An ECA analysis is typically applied at the subwatershed scale (10,000 to 40,000 acres) as part of analyzing alternative management actions developed in the National Environmental Policy Act (NEPA) project analysis. Equivalent clearcut area measures are also relevant to standards and guidelines for many of the current national forest plans that specify maximum treatment acreages on a subwatershed basis over time. For the Umatilla National Forest, there is no explicit ECA standard in the forest plan, but an ECA of 15 percent is used as a surrogate for a forest plan standard that allows a maximum of 30 percent of the forested area in a subwatershed to be in the 0 to 10-year age class.

The ECA model uses one set of coefficients to describe the proportion of the total basal area removed for different disturbance types, including harvest prescriptions, wildfire, prescribed fire, roads, and insect mortality. A second set determines how fast the treated acres recover to 100 percent of potential leaf area or canopy closure, at which point the acre is assumed to have hydrologic function the same as an untreated acre. The physical model behind ECA as a cumulative-effects measure is that vegetation removal changes water yield characteristics (peak flow, timing, total yield) in rough proportion to leaf area, or basal area removed from a site. Several studies have shown that timber harvest affects water yield by reducing water loss associated with interception and evapotranspiration, or by changing snow distribution and melt rates (Hicks et al. 1991, Scherer 2001, Stednick 1996). The hydrologic changes may lead to destabilized stream channels and other adverse ecological effects (Reid 1993). The ECA statistic (percentage of area in equivalent clearcut condition) is typically used in conjunction with climatic data to evaluate the cumulative effects of

vegetative removal on water yields and peak flows. The ECA statistic also may be used as a general guide to overall watershed condition when coupled with site-specific evaluations. Calculation of the ECA statistic can be a time-consuming process for watersheds that have received multiple disturbances over time. Calculations are complicated by the consideration of multiple treatment alternatives and revision of treatment intensities in the process of project development. This paper describes the program Equivalent Treatment Area Calculator (ETAC) that vastly simplifies calculation of the ECA statistic. The ETAC program is intended to provide a consistent approach to measuring harvest and other impacts to forest vegetation. This paper describes the most recent version of the program, methods for preparing data, considerations for use of the model, and includes an example analysis.

16. Mike Fenger and Associates. *An Assessment of Mountain Pine Beetle Implications to the Kamloops Land and Resources Management Plan*, March 2006.

ECA is defined by the Ministry of Forests as “the area that has been harvested, cleared or burned, with consideration given to the silvicultural system, regeneration growth, and location within the watershed”. Consideration of the ECA was done because higher peak flows result from significant areas of early seral forest, and this effect diminishes as the forests age. To account for aging of forests in the forecasts, forested areas between 21 and 40 years of age were considered to be 75 percent recovered as compared to older forests. Forests less than 20 of age years were not considered to have recovered. Some larger community watersheds are composed of several smaller watersheds, and the 3rd order watershed ratings show which portions of community watersheds and larger fish RMZs are most affected.

The ECA was calculated by determining the area in the forested portion of the watershed covered by dead pine, plus the area of recent fires, plus the area in age class 0 (NSR) and age class 1, plus 25 percent of the area in age class 2 (21-40 year stands). Included spreadsheets of this analysis allow managers to separate projected cumulative impacts of MPB from other factors like fire, historical logging etc. While all watersheds and stream channels vary greatly, the average effects of ECA changes were related to watershed risks as described below:

** **0-20 percent ECA:** In this ECA range there are no detectable changes in water quantity or timing of flows. With good roads and riparian areas, and care on unstable slopes, no significant impacts will be seen.*

** **21-30 percent ECA:** In this range there are noticeable increases in peak flows that begin at around 20 percent ECA, and these are usually statistically significant by around 30 percent ECA. Streams nearing 30 percent ECA that have significantly weakened riparian areas may begin to experience localized bank erosion, minor changes in stream morphology, and some loss of pool depth, with some siltation during higher flows. Streams with a history of flooding may have increased flooding in higher flow years during the first 20 years after salvage.*

** **31-50 percent ECA:** In this range of ECAs, peak snow melt flows become noticeably earlier and more rapid, and with expanded road systems rain storm runoff is also*

increasingly higher and more rapid. There is a moderate risk, growing to high, as ECA rises above 40 percent, that even in reaches with well established riparian areas an increased mean annual flood flow will cause significant channel changes, and significant loss of fish habitat will occur. Increasing bed loads will increasingly result in loss of pool depths, and in the infilling of alluvial reaches, with flow moving out of the established channel (avulsion). In streams with historically weakened or heavily MPB impacted and salvaged riparian zones avulsions are more likely to occur, and more likely to be major. Streams with a history of flooding will experience more extreme flooding in high flow years. Older dams or marginally designed road crossings will be increasingly stressed and more likely to fail in high flow years due to increased bedload and higher peak flows as ECAs rise above 40 percent.

** **51-70 percent ECA:** In this range of ECAs, it is probable that, even in watersheds with strong riparian areas, many channels will erode out or down to accommodate an increased mean annual flood flow, resulting in bed load movement infilling downstream pools and alluvial channels, and siltation impacting spawning gravels and water quality. Many channels in this range will suffer major losses in fish habitat, and in water quality during higher flows. Peak flows will usually be much more rapid and weeks earlier. Low flows may retreat to sub-surface flow. Flooding problems in high flow years may occur even in streams that have not had a history of damaging floods. With increasing ECA in this range, the risk to road crossings, lower-standard dams, and problems with water treatment or intakes that cannot accommodate increased bed movement and peak flows becomes high, and failures in some become likely.*

** **>70 percent ECA:** major impacts to water quality, quantity, and timing of flows, fish low flows and habitat, and damaging flooding in high flow years.*

17. ESSA Technologies Ltd. *Tier I watershed-level fish values monitoring protocol rationale, Draft Version 3, September 2012.*

A fundamental role of forest hydrologists throughout British Columbia is to assess forested watersheds with the intention of predicting and detecting changes over time. Among the many different methods to quantify these changes, a watershed assessment procedure (WAP) is a key step in the initial evaluation of an identified watershed. A WAP classifies net effects of past land-use and disturbance events (including forest fires, mass wasting, erosion, windthrow, etc.) and projects future effects of continued forest development and natural disturbance (Pike et al. 2007). The purpose of a WAP is to provide watershed-level recommendations for forest development plans, based on an assessment of the potential for cumulative hydrological effects from past and future forest development (BC MOF 2001). In effect, a WAP evaluates a watershed's current functioning condition and its likely future state as a result of human and natural activities.

In 1999, the British Columbia watershed assessment procedure was redefined as, "...an analytical procedure to help forest managers understand the type and extent of current water-related problems that may exist in a watershed, and to recognize the possible hydrologic implications of proposed forestry-related development or restoration in that watershed" (BC MOF 2001). Water-related issues within a watershed are largely influenced by the cumulative effects of landuse indicators such as road density, riparian disturbance, stream crossing density, landslide occurrence, equivalent clear-cut area,

surface erosion, etc. Water assessment procedures provide information on the status of these indicators; information that can be used to inform integrated watershed management planning and operational programs and that can help guide watershed restoration activities. Using the results from a WAP, forest managers can develop approaches to mitigate or even prevent the impacts of forestry-related activities in a watershed.

Equivalent clear-cut area (ECA): *the underlying metric that effects changes in peak flow throughout a watershed and is used to inform the peak flow index. The ECA includes the area of land that has been harvested, cleared or burned, with consideration given to the silvicultural system, regeneration growth, and location within the watershed (BC MOF 2001). ECA explicitly relates to forest management as it is a direct response to operational forestry decisions in respect to harvesting rate and location of logging in watersheds (Gustavson and Brown 2002). It should be noted, however, that the ECA methodology produces an approximated outcome based on limited data (MOF 2001). The results should always be considered alongside other metrics and indicators when the impacts of timber harvesting within watersheds is evaluated (BC MOF 2001). Table A2.1 in MOF (2001) highlights the range of assumptions required for ECA calculations.*

The hydrological recovery taken into account during an ECA calculation refers to the process by which regeneration restores the hydrology of an area back to pre-logging conditions (BC MOF 2001). Complete recovery involves numerous hydrological factors including the recovery of snow accumulation and melt characteristics, precipitation interception during storms, and the recovery of evapotranspiration. In British Columbia, the most crucial factor in hydrologic recovery incorporates snow accumulation and melting characteristics because peak flows throughout the province are typically generated by snowmelt and rain-on-snow conditions (BC MOF 2001). Table A2.2 in MOF (2001) shows snowpack recovery factors resulting from forest regeneration growth.

The Pine Beetle and FRPA's (Forest and Range Practices Act's) "Not Unduly" Political Shift Implementation and Adaptation in BC Forest Hydrology Science

In about 2006 following, an inter-disciplinary team of British Columbia (BC) hydrology / forest hydrology researchers with government and university began reinterpreting and reformatting the applications of ECA (alternatively referred to by the team as Equivalent Cut Area). This created a new shift or slant in the application of ECA's primarily for BC's Interior watershed regimes, with implications for BC's Coastal watershed regimes.

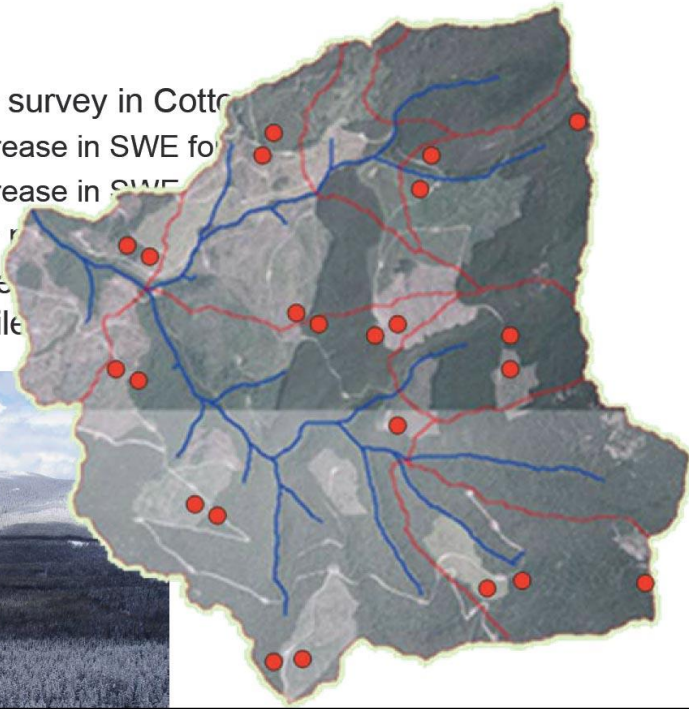
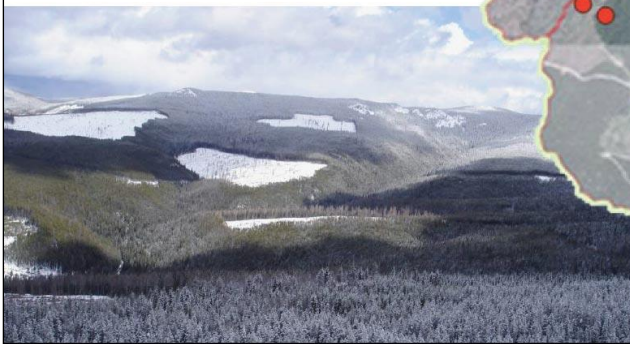
This revision of ECA scoping for Crown land forest harvesting policy planning purposes under British Columbia's Ministry of Forests was elaborated in a sixty-page long, BC government funded, 2006 pilot report, *Forest Management in Interior British Columbia: Moving Beyond Equivalent Cut Area* (FSP Project Number Y052294). The new ECA concept was steered and developed through a new set of complex methodologies based on theoretical and experimental-based modelling equations adapted from stream measurements conducted in a number of "experimental watersheds," including the Cotton Creek watershed experiment that recently began in 2004, located on the eastern slopes of Moyie Lake, about 18 kilometres south of the City of Cranbrook.

Assumptions for modelling hydrological input and response

Designing experimental watersheds

Input – Snow melt

- April 1, 2005 snow survey in Cotton Creek watershed
 - 34 mm/100m increase in SWE for clearcut
 - 20 mm/100m increase in SWE for juvenile forest
 - Snowline at 1000 m
- 50% lower snowmelt in clearcut and juvenile forest



Above: Slide from 2006 Powerpoint presentation, *Designing Experimental Watersheds to Understand and Quantify the Influence of Land-Use Management and Natural Variability on the Hydrological Response at Multiple Scales*, showing the snow-dominated, Cotton Creek experimental watershed.

Local area (a)
 $=A(a)-A(b)$ [km²]

Specific discharge (a)
 $=Q(a)/A(a)$ [l/s/ km²]

Local specific discharge (a)
 $=[Q(a)-Q(b)]/\text{Local area (a)}$
 [l/s/km²]

EC (lateral supply) [μs/cm]
 $= \frac{EC(a) \cdot Q(a) - EC(b) \cdot Q(b)}{Q(a) - Q(b)}$



Stated at the beginning of the 2006 report, the catalyst for this new applied thinking about ECA was directly related to fundamental questions, associated problems and politics of logging large and extensive areas of forest stands affected by the Mountain Pine Beetle in British Columbia's

Interior, areas often over-lapping with earlier logging cutblocks situated within the same catchments:

*Although the relation between Equivalent Cut Area (ECA) and hydro-geomorphology at the watershed scale is not well understood **ECA continues to be used to constrain forest management in BC.** [Bold emphasis] **Until this relation is understood in a quantitative manner we may be unduly restricting forest development at great cost to the industry....** [Bold emphasis] *This study uses an original and innovative ecosystem approach that supplements field based results with long-term numerical modelling to address the linkages between changes in upland hydrology and the effects on channel condition/stability.**

Hydro-geomorphic analysis of Cotton Creek together with several other experimental watersheds will be combined to provide forest managers and professionals with guidelines, tools and models to link in an original way watershed hydro-geomorphology with forest management and to apply these results to watersheds with a wide range of physiographic, climatic, and hydro-geomorphic characteristics in BC's southern interior.

This shift in creating a new ECA formula, based on a fundamental dilemma about whether, or how much, logging should occur in a given watershed affected by the disturbance of Mountain Pine Beetles, is well summarized in the following quote from a December 2008 Ministry of Environment report:

*Watersheds in the interior of British Columbia with a large component of mature lodgepole pine leading forests may experience significant impacts to hydrology due to tree mortality resulting from the current mountain pine beetle infestation. Key to this problem is debate about the relative hydrologic value of dead pine forest, both short and long term, compared to a salvage harvested stand and artificial regeneration. Significant uncertainty, primarily due to a lack of existing scientific information on the subject, exists regarding the hydrologic value of MPB killed stands related to non-pine overstory and understory forest structure, an intact shrub and ground layer, a lack of roads or logging related disturbances and the rate and quality of natural regeneration. Thus, forest managers are currently faced with difficult decisions to proceed with aggressive salvage harvest of MPB killed forests and risk future uncertain consequences (i.e. elevated peak flows, change in timing of peak flows, increased flood frequency, low flows, probability of erosion) associated with high levels of harvest, or to use a more precautionary approach to retain large tracts of MPB-killed pine forests, forfeiting short term economic gain from salvage, to obtain uncertain hydrologic benefits from the retained forest stands. [Underline emphasis] *To exacerbate this problem, the accelerated rate of MPB salvage operations to utilize the short shelf-life of dying pine will not allow managers sufficient time to incorporate research results prior to proceeding with salvage harvesting. Consequently, decisions on how much and where to proceed with harvesting must be made quickly, often within the next 2 years, without the benefit of improved information currently being collected by researchers throughout the province.**

The goal of this project is to provide forest managers with some interim guidance on how to deal with uncertainty around the hydrologic value of dead pine when planning forest operations in watersheds. The project synthesizes existing research information, to explore how uncertainty around imperfect information, various assumptions around uncertain states of knowledge, and the values used in the assumptions could potentially influence stand-level

*Equivalent Clearcut Area (ECA) and hydrologic recovery of forests with a large amount of dead pine. This information will be critical for forest managers to consider the most appropriate management actions to balance resource objectives, particularly in watersheds with hydrologic concerns and high percentages of MPB-killed forests where minimizing watershed ECA has been a management priority. To emphasize these considerations, the project will use the Chase-Charcoal Creek watershed as a case study in order to compare and contrast how various assumptions and management actions utilizing retention of MPB-killed forests could potentially influence short and long term hydrology and affect other forest management objectives.*⁹

⁹ *Effects of Salvage options for beetle-killed pine stands on ECA: December 2008 Update.* Dave Huggard, Ministry of Environment.

APPENDIX B: Three written presentations by the Sunshine Coast Conservation Association: April 8, 2011, September 22, 2006, and 2005.

Logging, Deregulation and Hydrology in the Wilson Creek Watershed

April 8, 2011

Introduction: On September 1, 2009, an individual with credentials in the field of hydrology was shown a series of locations in the Wilson Creek watershed. A consulting forester working for Sechelt Community Projects Incorporated (SCPI) selected the locations. The resulting paper, “A Hydrological Assessment of the Wilson Creek Watershed”, was released in October, 2010. It concludes that the watershed is functioning normally, riparian (stream-side) areas are intact, additional retention of forest cover is unnecessary, logging has had little impact on the hydrology of the watershed, and there is no hydrological reason to prevent proceeding with 124 hectares of additional harvesting.

In order to understand how such a tiny amount of fieldwork is sufficient to dismiss longstanding concerns and constraints in a watershed recognized for its highly significant fisheries values, we need to consider how forestry regulation has changed over the last 10 years.

The Old Regulatory Regime: British Columbia’s original *Forest Practices Code Act* contained a statement in its preamble that the purpose of the *Act* was to “adequately manage and conserve all forest values”. District managers of the Ministry of Forests had the authority in law to approve Forest Development Plans (logging). The test they were required to apply in their decisions was whether or not the logging plan “adequately managed and conserved”. District managers could also direct licensees to ensure that the test was satisfied. In fact, this is exactly what happened in July 2001 when the Sunshine Coast district manager approved Interfor’s logging plan for the Sechelt and Chapman Landscape Units. In his approval letter he advised Interfor not to propose new logging in the Wilson Creek watershed until a Coastal Watershed Assessment Procedure (CWAP) had been carried out.

The decision maker was concerned that fisheries values could be put at risk because of extensive hydrological disturbance from recent logging, and he acted to ensure that the timing of any future logging activity would be determined by the results of a CWAP. Interfor never carried out the CWAP, and didn’t propose new logging either. The Wilson Creek watershed became part of the community forest land base in 2006.

The New Regulatory Regime: In 2006 government implemented new legislation; the *Forest and Range Practices Act* (FRPA). The broad “adequately manage and conserve” statement did not survive into the new *Act*, and many of the powers of district managers were taken away and given to Registered Professional Foresters (RPFs), most of whom work for the major logging companies. This transfer of authority is referred to as “professional reliance” and it means that RPFs, because they are professionals, are allowed to approve logging without government oversight.

Foresters are required to practice “due diligence”, which means that they must be able to justify

their decisions with regard to current standards of professional practice. Under the new regulatory regime, "due diligence" is accepted as a defence in any case involving a charge of professional incompetence or of liability arising from environmental damage.

Fisheries Sensitive Watersheds: The FRPA regime provides for a new land-use designation: Fisheries Sensitive Watershed (FSW). This designation is intended to establish restrictions on the extent of hydrological disturbance (logging) at any given time such that logging does not adversely impact fisheries resources. There are currently no FSWs designated in British Columbia, meaning that there are no legally binding restrictions on the extent of hydrological disturbance in fish bearing watersheds anywhere in BC unless some other designation is in effect (park, ecological reserve or community watershed). There are nominal protections for forest cover that is immediately adjacent to a fish-bearing stream. As with most non-timber values, FRPA only requires protection to the point that would "unduly restrict the flow of timber".

Wilson Watershed: An Example. Despite comprehensive documentation of a high value fishery in this watershed, there is no FSW designation in place. Consequently, the standards of professional due diligence that apply in this situation are basically the same as would apply in a non-fish bearing situation. The licence holder (SCPI) did not commit in its Forest Stewardship Plan to anything much more than the minimum requirements of law and cannot be held accountable for impacts to fish populations. The forester of record, in approving this logging, has met his "due diligence" requirements. In fact, he exceeded these requirements by bringing in an outside "expert" who has credentials in the field of hydrology. In a regulatory sense, whether this expert is thorough or negligent, right or wrong, etc., is irrelevant because the forester is the statutory decision maker and he has demonstrated "due diligence". Whatever the outcome may be, it is impossible to hold the forester or SCPI accountable for the cumulative impacts of logging on fish in this watershed, under the current regulatory regime.

The Wilson Creek watershed is not, but should be, a Fisheries Sensitive Watershed. SCPI is exploiting this loophole to log timber that was previously constrained for good reason. In effect, SCPI is practicing a lower standard of environmental stewardship than was required of the previous licence holder.

Scope of the Hydrological Assessment: In seeking to evaluate the significance of this assessment, it is important to look at the scope of the fieldwork and the assumptions that underlie the analysis. The actual fieldwork supporting this assessment was entirely carried out in one day. The hydrologist was guided to various points of access. There was no effort to gain permission to traverse private land. As a consequence, the hydrologist did not view many of the stream reaches that illustrate impacts to spawning, rearing and over-wintering habitat. Many of the impacted low-elevation stream banks and collapsed riparian zones were not inspected either. The report contains numerous statements, which are basically disclaimers, that in total state that the validity of the report is limited by the extent of fieldwork and the accuracy of data provided by the client.

Assessment Assumptions: As with any study, we can gain perspective by looking at the assumptions that underlie the work. The major underlying assumptions in this report are that:

- removal of forest cover, by itself, does not significantly alter watershed function;
- retention of riparian vegetation alone is sufficient to maintain watershed function;
- retention of riparian vegetation alone is sufficient to maintain stream bank and channel integrity;
- retention of riparian vegetation along small streams need not include the trees;
- a riparian area along a small fish-bearing stream may be as simple as a five-meter buffer that is off limits for machine traffic;
- stream bank integrity is the most important indicator of hydrological stability.

Given these assumptions, it is doubtful that any watershed in British Columbia would ever have enough logging related hydrological disturbance to justify an interruption in timber harvesting. With regard to the key indicator of stream bank and channel impacts, by the time these impacts appear, irremediable damage has occurred and further impacts to fish populations are unstoppable. Basically, the assumptions of the study guarantee that “hydrological considerations” will not delay logging in the Wilson watershed.

Are the assumptions ‘scientifically’ based? Empirical science clearly shows that the cumulative impacts of forest cover removal parallels the decline of fisheries in all our region’s major salmon and trout rivers. Science recognizes that the biggest plants in the landscape, and in riparian areas, are trees and that these trees play a major role in moderating flows and maintaining stream temperatures.

What we see in the assumptions and in this superficial assessment is the forest industry’s *position* that trees don’t have a significant hydrological function, and government’s position that near-term social and economic considerations take precedence over ecological problems. Basically the Provincial Government’s position is defined by the use of the phrase “unless unduly restricting the flow of timber...” and by its refusal to actually designate Fisheries Sensitive Watersheds.

Assessment Findings: The Dobson Engineering, Limited report correctly identifies, on the basis of a map exercise, the condition of this watershed as equivalent to more than 30% clear-cut area. This is a very compelling fact showing that far too much logging has occurred in a very short period of time. The general "rule of thumb" is that when watersheds have between 20% and 30% Equivalent to Clear-cut Area (ECA) peak flows become observably more violent and low flows are typically depressed. These exaggerated flow patterns increase risks to fisheries and impact water quality and timing of flows. The extent of disturbance in the Wilson Creek watershed is scientifically verifiable grounds for extreme caution at this point in time.

The report correctly establishes that *all* creek banks in this watershed are sensitive and vulnerable to disturbance. As well, the report correctly recognizes that maintaining riparian areas is of critical importance for hydrology stability. There is no fieldwork indicating that trees are unnecessary in a riparian zone. The bulk of the study is a superficial offering of opinions that are

not substantiated by actual fieldwork in the Wilson Creek watershed. As well, the conclusion that riparian areas are “intact” is only true for the part of the watershed that is in SCPI’s operating area. The conclusion that there is no evidence of stream bank or channel instability reflects the observer’s failure to examine the watershed in its entirety.

Discussion: Sechelt Community Projects Incorporated is not to blame for the degraded condition of the Wilson Creek Watershed. The blame rests with government for allowing a variety of licensees and private managed forest land owners to operate in an uncoordinated manner without regard to cumulative impacts.

From the very beginning of the community forest application process, the District of Sechelt was insistent that its primary purposes were to engage in “watershed restoration” and “environmental protection”. Over the last five years, at least \$100,000 has been spent on publicity promoting the company’s environmental stewardship role. However, in the Wilson Creek watershed, we see that Sechelt Community Projects Incorporated intends to log without regard for the overall condition of the watershed or its highly significant environmental assets.

Sechelt Community Projects Incorporated has enjoyed four profitable years during which time it did not undertake a genuine Coastal Watershed Assessment Procedure for Wilson Creek, did not invest in habitat restoration, and did not use its status as a “community” licensee to foster cooperation among the various vested interests.

Given SCPI’s self-proclaimed capacity for stewardship, we believe the public has a legitimate expectation that the company will practice what it promotes, and not merely add to existing environmental problems. We certainly hope that SCPI directors and councilors of the District of Sechelt (the sole share holder) view the situation as an opportunity to pursue meaningful consultation and undertake a new standard of genuine stewardship.

Daniel Bouman, Executive Director

Sunshine Coast Conservation Association

Sunshine Coast Conservation Association comments on the 2006 Forest Stewardship Plan of Sechelt Community Projects, Inc.

Introduction and Background

Sechelt Community Projects, Incorporated (SCPI), is the newest logging license holder on the Sunshine Coast and is wholly owned and operated by the District Municipality of Sechelt. There are many sensitive and ecologically important lands within its operating areas including the Chapman and Gray *Watershed Reserves*, which provide 23,000 people with drinking water. The Sunshine Coast Conservation Association and many other citizens groups and other municipal governments, objected to the establishment of this “Community Forest” on the grounds that adequate and meaningful consultation with the public and public stakeholders did not take place.¹

Under the new Forest and Range Practices Act, SCPI is required to have an approved Forest Stewardship Plan (FSP) prior to start up of operations. The purpose of this paper is to provide input by examining the commitments made in this plan to see if they provide adequate management and conservation of the public’s environmental assets. We also wish to consider whether or not the level of environmental protection promised by the District of Sechelt during the approval process is reflected in the content of the FSP.²

FSPs and the Forest and Range Practices Act

The purpose of the new Forest and Range Practices Act (FRPA) is to streamline the approval process for cut-blocks while maintaining the environmental protections of the province.³ FRPA is a results-based code, meaning that government sets goals and objectives and licensees develop strategies to achieve the required results. The FSP is the document in which licensees outline these strategies and commit to measurable results which then become legally entrenched. Written strategies and results are mandatory for most of the goals and objectives of government. An FSP must also detail how compliance with government orders, notices and higher level plans are to be achieved.

¹ See the Community Forest Briefing Note and the SCCA submission to the Minister’s Community Forest Advisory Committee on the SCCA website; www.thescca.ca

² Sechelt Mayor Cam Reid frequently asserted that the purpose of the community forest was to achieve a higher level of environmental protection and stewardship than that practiced by private licensees.

³ Statements to this affect we made repeatedly by the Minister of Forests in the legislature and in numerous government press releases and publications.

An FSP may opt to use default results (specified in the Forest Planning and Practices Regulations) instead of developing strategies and results of its own. Default strategies and statements of intent to comply with government orders and notices are the minimum requirements needed to make an FSP approvable. FRPA states that if the minimum requirements of Section 5⁴ of the act are met, the FSP *must* be approved. Virtually everything in FRPA is qualified by the phrase “...without unduly restricting the flow of timber from crown lands...”. In other words, all forest values are secondary to timber supply considerations, under the FRPA regulatory regime.⁵ This does not mean that environmental protections can not be created, just that these protections must be considered in the context of impact to timber supply.

It is important to note that an FSP is not restricted to the “minimum requirements” of the Act. A licensee may choose to write strategies and results for any environmental value and may exceed the minimum requirements of the Act as well as the minimum indicators of government notices, if it so chooses⁶. Licensees also have the right of direct appeal to the Forest Appeals Commission if they believe that any decision of the Ministry of Forest and Range, in regard to their license, was made in error.

In essence, the holder of a forest tenure has considerable latitude to establish measures of environmental stewardship in an FSP. Whether or not a licensee exercises these rights, is a matter of choice. The public is entirely justified in holding the District of Sechelt and its consultants, accountable for the contents of SCPI’s Forest Stewardship Plan.⁷

Results and Strategies: Old Growth

Section 1.5.1.1 of this FSP⁸ relates to the government order requiring that a small inventory of old growth be maintained on a landscape unit level. We note that the FSP

⁴ Section 16 of FRPA says “the minister must approve a forest stewardship plan or an amendment to a forest stewardship plan if it conforms to section 5.”

⁵ The term “unduly restricting” is not defined in FRPA or any other relevant legislation.

⁶ The BC Government publication, *FSP Guidebook*, outlines the proper procedures and requirements for writing verifiable strategies and measurable results. These guidelines constitute a major policy statement on implementation of FRPA. It is available on line at the Ministry of Forest and Range website.

⁷ The District of Sechelt owns SCPI and maintains a majority on its board of directors. The public has no direct control over SCPI other than through municipal electoral process.

⁸ I am referring to government’s *Order Establishing Provincial Non-Spatial Old Growth Objectives*.

commits only to meeting the minimum indicators required by law. As noted above, the FSP could set higher standards of old growth retention as long as these measures do not “unduly” impact the flow of timber.

We note that old growth retention is a critical component of biodiversity protection in BC’s forests and that the original guidebooks supporting the Forest Practices Code called for much higher levels old growth retention than are required by the current government order. It is also important to note that even the currently required minimum levels of old growth retention have, in many cases, been impossible to meet because of excessive harvesting in the past. All the low elevation ecosystems in the community forest’s operating area⁹ are in old growth deficit condition.

Considering that veteran trees¹⁰ are the only old growth elements left throughout much of the low and mid-elevation landscape¹¹, it is entirely reasonable to take steps to protect them. We suggest that the FSP be amended to require 100% veteran tree retention, unless these trees pose a genuine risk to worker safety. As well, a clear commitment not to harvest any stands or remnants stands of old growth in the low and mid-elevation ecosystems is clearly warranted.

Results and Strategies: Wildlife

The Government’s goal and objective for wildlife (the Wildlife Order) is, without unduly reducing the flow of timber, to insure the survival of species-at-risk and regionally significant wildlife. The Wildlife Order provides *indicators* of the minimum amounts of land required for this purpose. There is no claim in FRPA or its associated policy that these amounts are actually sufficient to ensure the survival of any of the identified species and there is no prohibition against strategies and results that exceed the minimum indicators as long as these measures do not unduly restrict timber supply.

⁹ Coastal Western Hemlock- dry maritime (CWHdm) and extra dry maritime (CWHxm) ecosystems currently have inventories of less than 3% old growth. The old growth order calls for 9% retention. These forest types are among the most biologically diverse in Canada.

¹⁰ Veteran trees on the Sunshine Coast trees, generally speaking, are those that survived the major fires between 1870 and 1910.

¹¹ In the situation that insufficient old growth is available to meet Landscape Unit retention targets, the general practice is “recruit” from younger age classes. In making Old Growth Management Area selections, priority should be given to the next oldest stand, ie, if no Age Class 9 exists, then Age Class 8 stands should be selected. In terms of old growth inventories in SCPI’s operating area, any remaining Age Class 8 stands in the CWH dm or xm ecosystems, should be protected as OGMA. If this is not the case, the Landscape Unit Plan should be amended.

The SCPI FSP does not commit to protective measures of any species identified as at-risk or as regionally significant, beyond the minimum indicators specified in the Wildlife Order. As well, the FSP claims that because other licensees have indicated that they will seek Wildlife Habitat Area designations, this FSP does not need to develop strategies and results of its own in regard to several species. The following is a general description of measures that can be taken in this FSP to meet the goals and objectives of government for wildlife.

Marbled Murrelets.

This species is recognized, both federally and provincially, as critically imperiled and threatened.¹² It is an offence under several federal statutes to take, kill, harass or destroy or disturb the residence of this species in any way whatsoever.¹³ Even the accidental destruction of a residence (nest) is an offence, unless a permit for such is issued. The Marbled Murrelet is known to occur in SCPI's operating area.

The best currently available scientific information on the needs of this species has been assembled by the federal Marbled Murrelet Recovery Team (MMRT). The recommendations of this body call for much greater amounts of land to be protected than the minimum indicators of the Wildlife Order. Consequently, it is reasonable to expect this FSP to exceed the minimum requirements of the provincial order.

We recommend that the SCPI FSP commit to "meeting the goals and objectives of government for wildlife" by adopting a strategy, in its FSP, of not proposing logging or road building in any Class I, II or III Marbled Murrelet nesting habitat. This strategy would also be consistent with the recommendations of the Forest Practices Board.¹⁴ Note that measures to comply with federal statutes, Forest Practices Board and MMRT recommendations could not possibly be considered as "unduly restricting the flow of timber....".

Tailed Frogs.

¹² This species is listed on Schedule 1 of the federal Species-At-Risk Act (SARA) as *threatened* and is also listed provincially as *threatened* at the BC Conservation Data Tracking Center.

¹³ SARA and the Migratory Birds Convention Act as well as the provincial Wildlife Act carry the noted prohibitions.

¹⁴ The Forest Practice Board is the public's independent forest industry watch dog. Complaint findings, special reports, audits and investigations can found on its website: www.fpb.bc.ca

The approach to conservation of the Tailed Frog¹⁵ in this FSP is similar to that taken in regard to the Marbled Murrelet. The stated assumption is that the planned protection of a small parcel of land in BC Timber Sales' operating area near Roberts Creek satisfies the Wildlife Order and releases all licensees from any obligation to Tailed Frog conservation anywhere in the timber harvesting landbase of the forest district. Whatever the legal implications of such a statement maybe, this position is ecologically absurd as it can not be said that this measure will "ensure the survival of the species".

A more respectable approach would involve a commitment to identify the streams that support Tailed Frog populations, determine where the core areas are and apply special management considerations to ensure that the most critical of these areas remain ecologically functional. This is not a radical idea; Terminal Forest Products also operates in the Sechelt Landscape Unit and has this level of inventory information for its operating areas. We recommend that SCPI satisfy the Wildlife Order by actually devising a strategy to ensure the survival of this species in the community forest operating area.

Queen Charlotte Goshawk

Again, the FSP evades responsibility for this species through reference to the planned efforts of other licensees. By establishing only the barest legal requirements of FRPA, SCPI is signaling the public that it intends to practice forestry that is less than mediocre.

Other species and plant communities at-risk

There are no strategies or results specified for any of the other listed species of the Identified Wildlife Management Strategy or any of the plant communities recognized as at risk by the province's Conservation Data Center or the Committee on the Status of Endangered Wildlife (COSEWIC). Considering that one of the main purposes of the Community Forest Initiative, as promoted by the District of Sechelt during the application process, was to achieve environmental protection, this minimalist approach to stewardship is entirely unacceptable.

Results and Strategies: Fisheries

This FSP states that there are no Fisheries Sensitive Watersheds designated in the

¹⁵ The Tailed Frog is a "blue listed" species on the Conservation Data Center and is also listed as a species of management concern by the federally mandated Committee On the Status of Endangered Wildlife in Canada (COSEWIC).

Sunshine Coast Forest District and declines to establish any strategies and/or results for fish beyond the minimum requirements for riparian management in the Forest Planning and Practices Regulations. This approach is consistent with the minimum legal requirements of Section 5b of FRPA as there are no “fisheries sensitive watersheds” designated in the SCFD. Considering such major fish-bearing rivers as the Brittain, Deserted, Skwawka, Tzoonie, etc., that were once major contributors to the fishing industry and now have only residual runs, this a disturbing situation. There are a number of important salmon and cutthroat streams within the SCPI operating area, including the Angus, Chapman, Gray and Wilson creeks, yet no results or strategies are incorporated in the FSP for these drainages. Wilson Creek is of particular concern.

In 2001, logging was stopped in the Wilson Creek watershed, pending completion of a Coastal Watershed Assessment Procedure.¹⁶ This watershed was becoming hydrologically unstable because of excessive harvesting. At the time, the district manager was obligated under law to ensure that all forest values were being “adequately managed and conserved”¹⁷. Today, under the new legislation contained in FRPA, neither the district manager nor SCPI have this legal obligation. It is noteworthy that since 2001, private land owners have logged large tracts in this watershed and have probably aggravated the threat to fish.

In the absence of a specific commitment in this FSP, there are no legal conditions limiting the scale of disturbance in the Wilson Creek watershed. We note that the draft Operational Plan identifies numerous areas for new harvesting in this watershed. This is simply not acceptable.

We recommend that SCPI develop verifiable strategies outlining measurable results for all the salmon and cutthroat bearing streams of the SCPI landbase. At the very least, this should include a Coastal Watershed Assessment Procedure for Wilson Creek.

Results and Strategies: Community Watersheds

The goals and objectives of government for management of community watersheds is to protect publicly owned water treatment plants and human health , from “materially

¹⁶ Forest Development Plan approval letter from MoF District Manager Greg Hemphill to Interfor, July 10 2001: “prior to proposing future development in the Wilson Creek watershed a CWAP must be carried out”.

¹⁷ The Preamble as well as Section 41-b of the original Forest Practices Act established these broad obligations to conservation. The current act, FRPA, contains no such requirement.

adverse impacts” of logging and road building, unless this unduly restricts the flow of timber from BC forests. Almost anyone, on a moments reflection, can see that this goal and objective is seriously flawed, legally suspect and an affront the principals of democratic and administrative justice. We know of no part of the FRPA regulatory system that begs for strategies that exceed the minimum legal requirements, more than this.

The idea that an industrial interest could be established in law to take priority over the broad public interest in drinking water protection is deeply disturbing. Fortunately, the writers of this FSP are not restricted to the minimum requirements of Section 5 of FRPA. In fact, a precedent has already been set that establishes the right of the license holder to undertake measures to correct this situation.

In Interfor’s approved FSP for the Sunshine Coast Forest District, there is a strategy to achieve the goals and objectives of government for community drinking watersheds by not proposing logging or road building in 6 community drinking watersheds. The fact that the Interfor FSP was approved clearly shows that this strategy is acceptable and does not “unduly restrict the flow of timber”.

As well, it is important to note that a major agreement between the Sechelt Indian Government and the Sunshine Coast Regional District that relates to governance of the drinking watersheds was signed October 1, 2005: the Joint Watershed Management Agreement. The owner of the probationary community forest license, the District of Sechelt, is a signatory to this agreement, which strongly implies that SCPI can not undertake an activity in the Chapman and Gray watersheds without first securing the agreement of the Joint Watershed Management Committee, as specified in the signed agreement.

We suggest that, for the purpose of establishing a measure of protection for the public’s resources, equity and safety, that SCPI satisfy the goals and objectives of government for community drinking watersheds by adopting the strategy of not proposing logging or road building in the Chapman or Gray community watersheds during the term of the probationary license.

Summary

The managers of the District of Sechelt’s Probationary Community Forest Agreement have chosen, in its Forest Stewardship Plan, to adopt the barest legally enforceable levels of environmental stewardship permissible under the Forest and Range Practices Act. This

outcome is in stark contrast to the frequent assurances given by the District of Sechelt to the public during the application process, that the purpose of the Community Forest Initiative was to achieve environmental protection. Instead of achieving environmental protection in the areas that are critical for the well being of Sunshine Coast communities, District of Sechelt consultants have established an FSP containing the lowest standard of environmental stewardship of any licensee in the Sunshine Coast Forest District. We believe that the people of the Sunshine Coast deserve better than this.

**Critique by the Sunshine Coast Conservation Association of the
Community Forest Timber Supply Analysis
prepared for the District of Sechelt by Brian Smart
Introduction**

On July 19, 2005, SCCA Executive Director Daniel Bouman appeared before the Council of the Town of Gibsons to discuss the Town's *in-camera* motion to support the District of Sechelt's application for a Probationary Community Forest Agreement. During this presentation the statement was made that the District's Timber Supply Analysis for the proposal area, did not confirm a sustainable timber supply outside the community watersheds after the initial five year term of the proposed license. The question was raised; if the watersheds are not going to be logged in the next ten years, where is the timber supply going to come from? A recommendation was made that the Town retain its own expertise to advise on the implications of the timber supply situation in the proposal area. The purpose of this paper is to give local elected people and others, some direction in considering timber supply information and all the implications of allowing the community drinking watersheds to become part of a new logging license.

Executive Summary

The Timber Supply Analysis commissioned by the District of Sechelt for its Probationary Community Forest Agreement application shows that there is sufficient wood available, outside the community drinking watersheds, to satisfy the requirements of the license for 5 years. It does not show that there is sufficient wood beyond the first 5 year term to achieve a sustainable operation over the midterm. This situation is static and will not change even if it is assumed that watershed logging will occur. If this license is awarded, there will be enormous pressure, after the first 5 years, to compromise environmental standards everywhere within the community forest land base, or face operational deficits and/or investment losses. In essence, the District's application for a logging license is not economically or environmentally sustainable and as presently written, is not in the public interest .

Background

In the course of developing forest land for sustainable harvesting, Timber Supply Analysis is a key level of consideration because it examines the physical condition of the land, its capacity to produce timber over time and the

impacts of a range of constraining obligations and influences.

The Sechelt Community Forest Tenure Timber Supply Study (March 12, 2005) was commissioned by the District of Sechelt (DOS) to also determine “what potential areas would be required to meet a community forest allowable annual cut (AAC) of 20,000 cu. Meters per year, both in the short and the long term”.

The land base of the proposed tenure is made up of five separate and distinct areas, including portions of the Gray Creek drinking watershed, the Chapman Creek drinking watershed, and areas on the community's urban interface in West Sechelt, Wilson Creek, and Sandy Hook (Angus/Burnett)¹.

Timber Supply Assumptions and Questions

This analysis was based on Ministry of Forest's (MOF) data and is preliminary in nature. It considers mostly gross data and does not include an analysis of environmental regulation and its impact at a spatial level.² This analysis first calculates the total productive land from all five contributing areas, then establishes a figure to represent the average amount of wood fiber that is grown per year and per hector. This figure is called the Mean Annual Increment (MAI). Given proper forest management (and a history of same), an AAC that is set below the product of the MAI multiplied by the number of productive and available hectors, should be sustainable (assuming that lands needed for other biological services and the needs of species at risk are "not available").

In this analysis, the District has asked the question; is there sufficient unconstrained timber available now, outside the Gray and Chapman drinking watersheds, to meet the AAC during the five-year probationary period (the short term) and is there also sufficient timber supply to fullfill license obligations in the mid and long terms? The SCCA has raised additional questions;

- Is there sufficient available timber to meet the AAC requirement outside the drinking watersheds during a second five-year period?
- What are the environmental and economic impacts of satisfying an AAC that is based on the productivity of 5081 hectors, in an area of only 2737

¹ Note: in the past the Ministry of Forests (MOF) maintained a policy of not logging crown lands that fell within urban interfaces. This policy was changed when insufficient short-term timber supply became apparent. The 1990 Timber Supply Options Report predicted conflict with community values.

² Green-up requirements, for example, are a spatial constraint. There may be land with mature timber that is not available for harvesting because it is adjacent to fresh harvesting that hasn't greened up.

hectars?³

- Is it reasonable to assume that the District will be able to meet its commitment not to log in the Chapman drinking watershed and the Gray drinking watershed for 100 - 150 years and 10 - 15 years, respectively? ^{4,5}.

To answer these questions, it is necessary to examine the data of the analysis and consider the condition of the areas proposed to contribute to the license.

Timber Supply Analysis - Age Class Distribution.

Summary of the proposal area's age class distribution table for all five proposed tenure areas, which covers 5698 hectares of productive forest in total:

Age Classes	Hectares	Percentage of Whole
1	1723	30.2%
0, 1, 2, 3 (immature)	3881	68.1%
4, 5, 6, 7, 8, 9 (mature)	1617	28.4%

This table clearly shows that extensive over-cutting in the proposed tenure areas has already occurred and that recent logging has outstripped annual productive capacity by many decades. This can be seen from the fact that the area occupied by age class 1 stands (10 - 20 years old) is larger by itself than

³ The net productive area outside the Chapman and Gray areas is, according to the analysis, 2737 hectares.

⁴ The District of Sechelt had previously stated it would not log in the Chapman watershed for 20 - 40 years.

⁵ Under the terms of a "Community Forest" license, would the DOS have the authority to commit to not logging in these community watersheds? In August 2004, Forests Minister Abbott wrote to the SCRD that, "The Province is not seeking further protection of lands in the watershed. The balance of Crown land in the watershed and in the Provincial forest is available for sustainable resource development." Does the DOS have written indication from the Minister or the Ministry of Forests that its commitment not to log in drinking watersheds is acceptable to government? This is a key question for Sunshine Coast residents.

the entire area occupied by mature⁶ age classes 4, 5, 6, 7, 8 and 9 (60 - 250+ years old). Also, the license area's recently logged land base is 234% larger than the entire mature productive area.

Obviously, there is a severe age class imbalance in the proposal area that will have a major negative impact on timber supply for at least the next 60 years. Consequently, timber supply over the short and intermediate term will always be problematic. The intention of the District to log outside the community watersheds for a 10 year period means that the AAC will be concentrated in 2637hectars instead of 5081 hectars. Again, it should be obvious that this concentration of harvesting will aggravate an already problematic timber supply situation by converting more land to younger age classes.

It is notable that the analyst confirms that there is a 5 year timber supply available in the proposal area and outside the watersheds but offers only speculation on timber supply in the following 5 year period. As well, a fall down in timber supply for the intermediate term is predicted by the analyst.

Currently Available Wood

In order to better understand the reality that is summarized in the proceeding table it is necessary to consider individually the condition of each of the five areas of the proposal.

Current Wood Availability With Net Downs (from Timber Supply Study)

⁶ In the early 1990's timber on the Sunshine Coast was not considered harvestable prior to age 120 years. This was later changed to 80 years and has now been reduced again to 60 years (age class 4). This shifting figure is supposed to represent the optimum age (culmination) at which to log, i.e. at the peak age where annual fibre growth (MAI - maximum annual increment) begins to fall off. The changes appear to have little to do with a substantive change in calculating this optimization and more to do with maintaining the level of cut in the face of dwindling, short-term mature timber supply. While this can maintain the AAC in the very short term, it has an adverse environmental effect on forest stands (more disturbance), and substantially increases the cost of harvesting, while producing product with diminished economic value.

Tenure Area	Gross Area (ha)	Net Productive (ha)	Current Wood Availability (ha)	As % of Gross Tenure
Angus/Burnett	3434	1099.9	91.3	2.6%
West Sechelt	1146	900.9	188.8	16.5%
Wilson Creek	1117	736.4	144.0	13.0%
Chapman Creek	3063	740.4	24.2	0.8%
Gray Creek	3047	1603.6	142.6	4.6%
	11807	5081.2	590.9	5%

7

The **Angus/Burnet** tenure area contains a major tributary to Gray Creek, Nailor Arm, which is a potential addition to the regional water system. Interfor abandoned 4 cutblock approvals in this drainage in 2003 and deactivated its road access system. The area of these former cutblocks has significant stands of Marbled Murrelet nesting habitat⁸ that may not be available in the short or mid-term.⁹

The **West Sechelt** tenure area has available timber. However, this timber is mostly in one contiguous stand adjacent to Crowston Lake. Green up requirements will limit the rate at which this stand can be harvested. As well, there are constraints related to visual quality, fish habitat and recreation.

The **Wilson Creek** tenure area is highly controversial. Wilson Creek residents objected to the loss of Community Watershed status for this drainage in 2001. Interfor harvested extensively in this area between 1997 and 2001. The Ministry of Forests imposed a moratorium on logging development in 2001 pending

⁷ The distinction between Available Timber and Available Wood is unclear.

⁸ The Marbled Murrelet is recognized as a *Threatened* species by both federal and provincial governments. It is an offense under the Species at Risk Act to disturb the residence of this small seabird

⁹ The Identified Wildlife Management Strategy (IWMS) is the provincial process that deals with the needs of at-risk species in British Columbia. To date, the needs of at-risk species in the Chapman Landscape have not been addressed

results of a Coastal Watershed Assessment Process.¹⁰ Also of note, AJB Investments and Weyerhaeuser own large tracts of private land in the Wilson Creek watershed which can be logged without regard to cumulative effects on the watershed. Realistically, there is no timber land available for responsible harvesting in this watershed in the foreseeable future.

It is significant to note that of the total proposed tenure area; only 5% currently meets the minimum age and volume requirements for logging. When Chapman and Gray Creeks are subtracted from the total available area, this percentage shrinks to a mere 3.6%. It should also be noted that the calculation for "mature timber" includes Age Class 4 (60-80 years old). Stands of this age have not reached the Age of Culmination¹¹. Logging in this age class is not prohibited but is highly wasteful and clearly not "sustainable"¹².

Timber Supply - Economic and Ecological Implications

Sustainability is the key concept within a timber supply analysis. It ties the amount logged on an annual basis to the amount of wood that is estimated to grow per hectare per year, or mean annual increment (MAI). This results in an estimate of how much wood fibre is accumulating within an area with the goal of logging no more each year than the amount that grows each year. Based on that, this study concludes that an Annual Allowable Cut of 20,000 cubic metres per year is 'sustainable' for the initial five year "probationary period, and likely for another eight to ten years after that"¹³. "The long term timber supply ... will face a shortfall beginning approximately 2020 for about two decades."

Considering the condition of the proposal areas and the environmental constraints that are already in effect it is readily apparent that a large investment in planning will be required prior to any harvesting activity. As well

¹⁰ Forest Development Plan approval letter from MoF District Manager Greg Hemphill to Interfor Forester Jeff Pollock, July 10,2001; "prior to proposing future development in the Wilson Creek watershed a CWAP must be carried out."

¹¹ The Age of Culmination is reached when a stand has developed its maximum volume. Subsequently stands tend to loose volume but the surviving stems tend to increase in value. Age Class 7 stands (120-140 years) generally tend to contain the best mixture of volume and log grade in coastal low and mid slope ecosystems.

¹² The term "sustainability" is broad term referring to the maintenance of forest productivity and a range of biological values and services over time. Harvesting of stands that have not reached at least the Age of Culmination is a strong indication that the timber inventory has been substantially degraded.

¹³ The word "sustainable" is mis-used in this context. It may be appropriate to say that there is "wood available ". The fact that some wood is available over a 5 years does not necessarily imply sustainability.

there is more environmental regulation coming into effect in the near future that will affect timber supply.¹⁴ All these factors combined indicate that after the initial 5 year period of harvesting and investment, timber supply will be problematic and constrained. The analyst recognizes these constraining factors;

- Accuracy of the inventory data,
- Market prices for hemlock and balsam,
- Greenup rates affecting adjacency constraints,
- Commercial thinning viability, and
- The community's opinion regarding selective harvesting within Chapman and Gray Community watersheds."

What are the options for resolving these timber supply difficulties? One obvious solution is to reduce the ACC to a level that is suitable for the areas outside the community drinking watersheds. A more reasonable volume for the Community Forest during the first 15 year period is approximately 10,000 cu. m/year, based on the study's Long Term Productivity Results for the West Sechelt, Wilson Creek and Angus/Burnett tenure areas. Unfortunately, a cut of this size is insufficient to justify the necessary investment. In other words, a community forest based on harvesting only 10,000 cu/m per year may be ecologically sustainable but is not economically viable.

Another solution may be to add additional land to the tenure area. Unfortunately, the Ministry of Forests has been very clear that (except for the West Sechelt portion) none of the productive land base surrendered to the crown as part of the "tenure take back" program will be made available to the Sechelt proposal.¹⁵

The last option is the most likely and also the most disturbing. That is to seek relief from existing and future environmental regulation and pursue logging in the community watersheds, especially Gray Creek and its tributaries.

As this proposal currently stands, it is difficult to imagine that there is any short or intermediate term economic benefit for Sunshine Coast residents.

¹⁴ Both federal and provincial governments have committed to a recovery program for the Marbled Murrelet. This will involve old growth retention for nesting habitat. Currently there are no Wildlife Habitat Areas in the Chapman Landscape Unit for any at-risk species.

¹⁵ With exception of Canfor's West Sechelt chart area, none of the lands made available to the Sechelt CF are from the "take back" program. The Chapman, Gray, Sandy Hook and Wilson Creek areas are currently Interfor chart areas and part of their dead license. Interfor has not been able to harvest to the terms of their license in these areas for at least the last 15 years.

It should be noted that there is a significant economic benefit to the major licensees of this forest district inherent in community forest proposal. If a new logging license can be established over this landbase, these areas will continue to contribute to the timber supply calculations of the entire forest district ensuring that a downward adjustment in cutting rates does not occur.

Timber Supply - Social and Ecological Implications

The AAC calculation for the land base of the District of Sechelt Community Forest proposal has been significantly inflated in the short and intermediate term with the inclusion of the Chapman and Gray Creeks' annual growth increment. This will result in excessive harvesting and concentration of harvesting in the three remaining tenure areas, creating environmental degradation in forested areas close to the respective communities. The socially significant ecological benefits that are currently provided to the public from these areas include; community water supply, fish and wildlife habitat and recreation.

The timber supply analyst asserts that there is sufficient timber to meet the AAC for the five-year probationary period but provides only speculation about further timber supply.

One of the speculations involves the "The community's opinion regarding selective harvesting within the Chapman and Gray Community watersheds". The community's opinion on the issue of watershed logging has been remarkably consistent for over a generation and is not going to change. It is the often expressed will of the public that the watersheds not be subjected to an industrial license of any kind.

The main social implication arising from the Timber Supply Analysis is that if this license is established, within 10 years the public will be asked to either support watershed logging and other degrading practices or sustain the loss of a large publicly funded investment. We submit that all elected people have a duty to ensure that this situation does not arise.

Questions Raised

No logging in Chapman for over 100 years would mean: no logging for the entire duration of even the longest community forest tenure license available (99 years). Under what authority would that be permitted? What role would a licensee have where logging operations are not scheduled?

Chapman Creek is shown on the study's Short Term Timber Availability Table as having just 24.2 ha. of currently available wood, which begs the question: why is this community watershed considered for a community forest logging tenure? Gray Creek has 1328 ha of age classes 1, 2 and 3 stands with just

142.6 ha of currently available wood largely in age class 5 stands. Again, why is it being considered?

The overlapping of the Community Forest land base with the BC Timber Sale chart areas that are still prominently displayed on the DOS tenure areas map has not been addressed. How were the small timber licenses (ownership 70-N) that existed at the time of the IWMP (1990's) expanded into timber sale tenures and under which Ministry authority was this done?

There has been a recurring rumor that the Timber Sale tenures in the watersheds will be reassigned to the community forest if the District's probationary license is awarded. Does this mean that the community forest could be assigned a larger AAC? If so, would this new tenure area be subject to logging proposals?

Conclusions

The inclusion of the community watersheds in the calculations used to determine the community forest AAC will result in a significant overcut in the other three tenure areas every year.

An acceptable case has not been made for including the community watersheds in the Community Forest license tenure areas. Their inclusion has caused the 'productivity' of the license area to be overstated in the short term with the result that the Allowable Annual Cut is approximately 10,000 m³/year too high.

The Timber Supply Study states in its first sentence that it is a preliminary view of what areas would be needed to meet the Sechelt Community Tenure Cut of 20,000 m³/year. It works with gross inventory figures, and does not net down for decay, waste, breakage, operability or predictable future environmental constraints. By working at preliminary gross inventory levels the study is incapable of accurately predicting whether the 20,000 m³/year cut AAC requirements could be met after the first 5 year period even if logging in the watersheds were to be undertaken immediately.

Adjacency is a severe constraint in West Sechelt, where almost all the 'accessible wood' is located in a contiguous stand on the east side of the tenure area near Crowston Lake. The Wilson Creek watershed also has adjacency issues and is in a highly disturbed condition. There is currently no timber available for harvesting in this watershed. Generally speaking, existing environmental regulation poses a significant obstacle to forest development planning and the condition of the proposal area is best described as *logged out*.

Although the Ministry verbally says it is up to the District of Sechelt, whether the watersheds are logged over the next 15 years, it has never said the assigned AAC does not have to be met. Community decision makers need to retain their own expertise in order to understand the legal status of the District of Sechelt's

motion to defer harvesting development in the Chapman and Gray community drinking watersheds.

A little understood and highly contentious issue is the legality of Ministry of Forests control over community watersheds. The land status *Watershed Reserve* has never been revoked. In previous Timber Supply Reviews, conducted by the Ministry of Forests for the whole district, these watersheds were assigned the ownership code of 70N indicating non-contributing Watershed Reserve. There are disturbing questions about the legality of assuming that these reserves can contribute to the AAC of a new logging license.

This community, through strong public support has stopped industrial activities in the Chapman and Gray Creek community drinking watersheds for 13 years. So far, there is no clear indication that inclusion of these watersheds in a community forest license will produce any benefit to the community whatsoever.

The pending Watershed Management Agreement (to be signed at a special ceremony in September) between the Sunshine Coast Regional District and the Sechelt Indian Band Government does offer a benefit to the public. In this agreement, the parties agree to assume and pursue joint management authority over the drinking watersheds. It is implicit in the agreement that any signatory to the agreement seeking to undertake an activity in the Chapman/Gray watersheds, would be obligated to seek the approval of the SCR/D/SIBG Joint Management Committee. Perhaps the Town of Gibsons should ask the District of Sechelt what their view of Watershed Management Agreement is.

Recommendations

- Maintain support for the SIBG/SCRD Watershed Management Agreement,
- Retain independent expertise to evaluate timber supply information and other forestry related issues,
- Continue to support the public will that the watershed be managed without obligation to industrial interests,
- Allow the public to express its concerns with the Community Forest application through open public meeting,
- Do not become a supporter or partner in this enterprise unless it is the

expressed will of the residents of the Town.

Brad Benson
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For the

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APPENDIX C. SCPI MINUTES, ANNUAL REPORTS, PRESS RELEASES

The following are a series of quotations from Sechelt Community Project Inc.'s Board Minutes and Annual Reports regarding the Wilson Creek watershed and the Watershed Assessment Procedure initiative.

Annual Report: 2009

Research

Watershed management studies continue in the Wilson Creek drainage. We are currently collecting temperature data using water monitoring instruments in Hudson Creek.

We contracted a hydrological firm to study the terrain and soils in part of our chart area to give us more tools to better manage forest lands and protect water quality and quantity.

We had some areas in Wilson and Chapman Creek surveyed by a professional hydrologist to accurately determine the watershed boundaries. This will be done wherever we have to work near any Community Watershed boundaries.

Press Release: May 31, 2011

Deferral of Work in East Wilson Creek Cut Block EW002

SECHELT - After careful deliberations of all the submissions made to Sechelt Community Projects Inc. (SCPI) regarding plans for logging in cut block EW002, SCPI is deferring cutting in this block in order to study various proposals and suggestions made regarding this area.

"We would like to emphasize this is a deferral to allow us to undertake an updated review of this area including a Coastal Watershed Assessment Procedure (CWAP) or equivalent hydrological survey. Our public consultation will include listening to input from all sources, including our Community Forest Advisory Committee (CFAC). Our goal is to meet and satisfy both our regulatory obligations and community concerns," said Glen Bonderud, Chairperson of SCPI.

The deferral decision was reached in consultation with the District of Sechelt Council. SCPI, is a subsidiary of the District of Sechelt, and operates the Sunshine Coast Community Forest under a 25 year renewable tenure from the Ministry of Forests, Lands and Natural Resource Operations, with a mandate to maintain a healthy, sustainable forest for future generations.

"Concerns have been raised by members of the public regarding forest harvesting in the EW002 area. Sechelt Council supports SCPI's approach to planning for forest management in this area based on detailed research and science about the best way to maintain a healthy forest environment in this area," said Sechelt Mayor Darren Inkster.

For further details on cut block EW002, SCPI and the Sunshine Coast Community Forest, visit www.sccf.ca.

Minutes: August 22, 2011

A Wilson Creek Watershed Assessment Subcommittee comprised of technical expertise and local interest parties has been formed. The purpose of the subcommittee is to educate participants on the content of a watershed assessment using current best methodologies vs the outdated CWAP3 [Community Watershed Assessment Procedure 3] process, to advise on selection of a specialist to conduct the study and to get buy-in from the local interest parties. This is to be a one-time consultative process only. Expectations of the subcommittee are to be formalized and Terms of Reference for the study generated.

Minutes: October 24, 2011

Wilson Creek Watershed Subcommittee

Dave Lasser listed the subcommittee attendees and explained his selection criteria when inviting them to participate. A good, open, professional discussion took place at the one meeting which has been held. A budget for the study will be created.

Minutes: December 12, 2011

The Wilson Creek assessment process has been awarded to Glynnis Horel, who will start in the new year and provide a draft report by March 2012. Dave Bates will be doing the fisheries portion of the project.

Annual Report: 2011

As we look back over 2011 it was truly a year of changes and challenges. After our annual meeting in April our Chair stepped down and I assumed the office. At the same time we hired Dave Lasser, RPF to be our Operations Manager. Our plan for harvesting our usual logging volume of 20,000 cubic meters for the year was not achieved. The area planned for logging was in Wilson Creek and as we all know there were calls from various organizations for a coastal watershed assessment.

As a board we made the very difficult decision to postpone cutting in Wilson Creek, until an assessment could be completed recognizing this was going to impact our annual volumes and financial results. Instead of our usual annual 20,000 cubic meters, our harvested volume was slightly over 5,000 cubic meters. The financial results speak for themselves. Our first, and hopefully our only, loss was \$170,000.

The Sunshine Coast is our community. As such we felt the watershed assessment was the right decision, even knowing there would be financial consequences. We felt comfortable with our original plan to harvest 20,000 cubic meters however, the assessment, at considerable cost, would bring forth the science and facts in a manner which would alleviate concerns. We would like to thank the subcommittee Dave brought together to shape the assessment, which is currently underway.

OPERATIONS REPORT - Dave Lasser, RPF, Operations Manager

2011 was a disappointing year for the Community Forest financially, but it has resulted in our being able to focus on a number of initiatives to build a better foundation for our business going forward.

The delay of harvesting two cut blocks that were already in Cutting Permit removed all of our engineered volume in inventory and forced us to start over with new planning and engineering. We have made some significant progress.

The decision to undertake a more thorough watershed and fisheries assessment in Wilson Creek was made in May. A sub-committee was formed to discuss the processes involved. As a result of that work, Glynnis Horel (PEng, M.Eng) and Dave Bates (RPBio, PhD) were hired in November to conduct the work. We expect them to have a draft report in the next few weeks.

Minutes: January 30, 2012

Glynnis Horel is set to begin the Wilson Creek assessment process. Her report will focus on the entire watershed. Glynnis will peer review her report and is open to participating in a public meeting. Dave Bates portion of the project may take several months as he is tied to fish cycles. A suggestion was made to give a presentation to both SCRD and DOS when the reports are complete.

MOTION:

UPON MOTION DULY MADE AND SECONDED IT WAS RESOLVED that due to the deferral of harvesting in Wilson Creek there is no profit in 2011, therefore, the 15% dividend on invested capital will not be paid to the shareholder, District of Sechelt.

Minutes: February 27, 2012

A meeting of the Wilson Creek Watershed Assessment subcommittee was held February 8. Glynnis Horel presented her plan which was well received by participants. The necessary LIDAR data has been received and compiled which will facilitate the process. The draft report should be complete by mid April. Access through private properties may be required by Glynnis and/or Dave Bates. Dave Lasser will attempt to contact homeowners to request access.

Minutes: May 28, 2012

The total volume expected out of the Angus Creek blocks (AN9 and AN10) is far less than the cruise estimate of 20,000 m³ and less than the budget estimate of 15,250 m³. Expected volume is 12,000-13,000 m³. This has affected our predicted cut and profitability forecasts for the year. The estimated 3,000 m³ being logged in Wilson Creek will make up the volume difference. We will not be cruising the upcoming blocks as it is not worth the cost.

Logging operations in East Wilson will be wrapping up this week.

The Wilson Creek watershed assessment is ongoing. The field work has been completed. The estimated total cost will be \$30,000.

Minutes: July 23, 2012

As the self imposed five year moratorium on harvest operations in Gray Creek will be ending in two years it was felt that a watershed assessment will most likely have to be done before proceeding with any operational plans. The Board agreed they would like to hire Glynnis Horel to conduct this study if deemed necessary.

Watershed Assessment

August 27, 2012 has been selected to present the Wilson Creek watershed assessment findings to the public. Coast Cable is to be contacted regarding filming.

SCPI received a communication from Arcadia Entertainment in Halifax requesting an opportunity to film the Community Forest. The footage would be included in an episode of their television series Canada Over the Edge. The Chair has spoken to the Producer of show and has suggested they look at the entire Sunshine Coast. DOS has also been contacted and a representative will coordinate further contact with Arcadia.

DOS is conducting a survey which will be directed at the Sechelt population. The SCPI Board previously stated a public opinion survey would be conducted every two years, the last one being done in 2010. This means one should be done in 2012. Content was discussed. It was suggested that the same questions as the previous two polls be asked for the sake of continuity and also add a few new questions. It was also suggested that we wait until the Watershed Assessment has been presented to public. This will be discussed in more depth at a future meeting.

Logging the additional Wilson Creek volume reduced our overall AMV as we cleaned up the "slum" part of 2 blocks that were previously 80% logged with the poorest wood remaining. We were faced with CP expiry and regen delay issues on these blocks. High volume of Hem Plp @ \$42 and Pine Peeler @ \$62 in EW7C and EW7D.

Logging - Wilson/Lower Chapman Creek

- *Ron Casey finished at the end of May;*
- *modified his rate to do all 3 blocks at once; did a good and quick job for us*
- *EW8A, EW7D, EW7C (est was 3000m³, actual was 3387m³)*
- *EW8A roads are cross ditched, block is hay-stacked, it looks better now*
- *planting completed in all 3 blocks*

6. *Wilson Creek WAP [Watershed Assessment Procedure]*

a. *Glynnis Horel and Dave Bates have completed the field work*

b. *Draft report and draft PowerPoint presentation finished*

c. *Presentations to date:*

- *SCPI Board and Mayor and Council on June 27th*
- *Sub-committee (Donna Shugar, Dan Bouman, Jason Herz, Jeremy (SCCA), Bob Sitter), Warren Hansen and me on July 13th; well received*
- *SCRD directors and SIB council (2) on July 16th: very well received; they all clapped when the presentation ended*
- *Glynnis made extensive use of our LiDAR data; VERY helpful to her: everyone has been very impressed with the “power” of LiDAR*
- *Peer review has started, field visit with 2 of 3 reviewers next Fri/Sat: Peer review reports by early August*
- *public presentation to be done by Glynnis and Dave Bates of the final report on August 27th in Sechelt*
- *final report will be released after the presentation, just in case any issues are raised at the public meeting that need to be addressed/included.*

Minutes: October 15, 2012

Falling of right-of-way began in EW011 today. It should take about three weeks to build road into the block. 7,500 m³ is expected to be logged from block. Road building into Block EW002 can begin right after EW011 road building is finished, approximately Nov 12.

Approximately 50 Fir vets are marked and will be left standing in Block EW002. Dave and the Chartwell engineer have rewalked the entire boundary of EW002 to assess viability. Dave wants to revise the boundary to eliminate the steeper, cable logging portion of the block. Question from BOD: Would the eliminated area become a reserve or an OGMA? Response: The purpose of the eliminated portion has not yet been determined, however, it is not eligible to become an OGMA. It was stressed that the public should be made aware of its elimination. It was suggested that weevil free spruce seed may be desired by some. Dave is to make inquiries into this premise.

Elphinstone Logging Focus (ELF) has stated that Wilson Creek could be an alternative water source to Chapman. The watershed assessment details why that is not feasible.

It was stated that, over the years, the CFAC committee had evolved into an industry based committee rather than a fully diverse committee. It has not met since November 2011. It was pointed out that the Community Forest license states a need to interface with public. A past recommendation of convening ad hoc committees was brought forth. A recommendation of just having an open door policy rather than a formal public liaison committee was also made. If the public is coming in to the office for informal meetings each one should be documented for future reference.

Minutes: November 19, 2012

Wilson Creek

An injunction has been given to parties found on site in EW011 and EW002. A copy has also been posted in each site. The copy in EW002 has been removed twice by persons unknown.

All of the engineering ribbons in EW002 have been removed by persons unknown (falling boundary, road centre line, retention zones). The estimate of original cost is \$10,000 - \$15,000. The boundary will have to be re-ribboned prior to the start of falling. Dave Lasser will hang the ribbons as close to falling start as possible. It cannot be proven whether the ribbons were removed before or after the injunction was presented. Our lawyer is going back to court to attempt to get a permanent injunction. Dave would like the protester camp to be removed prior to falling starting as it is a safety hazard. Every person must be at least two tree lengths away from falling activity. During a discussion between a director and an ELF trail walk participant it was stated that, on a walk through the "trail", Hans Penner clearly told the participants not to touch any of the ribbons.

MOFLNRO had issued an eviction notice to Penny Singh and occupants of Camp 1 in the past. The occupants have not left. Our injunction cannot be used as an enforcement tool on that eviction notice.

Costs that SCCF are incurring as a result of the protest are being tracked. Road builders and fallers have lost many hours which SCCF may have to pay for.

Many opinions were expressed regarding the continuation of SCCF's public relations campaign in the newspaper. It was generally agreed that we should continue with the campaign for the short term.

Operations Report

Dave Lasser, in his capacity as Operations Manager, provided a verbal report on the following issues:

The road building is complete in EW011 and 20 loads have been delivered to Howe Sound. The rain has not been an issue so far, the road is holding up well. It is anticipated that 4,000 m³ will be invoiced (by COLL) by December 31. The contractor should start falling EW002 soon. A detailed plan is to be made by the contractor and Dave about the timing of activities. Dave is to inform the board when falling does begin.

Dave Bates' final report is now complete and will be posted on the website. It was suggested that an executive summary of the report be created as a separate document or as an introduction to the main document. It was further suggested that this executive summary not use a lot of technical data.

Dave has finally obtained a final copy of the SARP report commissioned by SCRD. He will review it to ensure that the possibility of logging in Chapman Creek has been stated.

There was a discussion about the merits of commissioning a watershed study on the remaining watersheds in the SCCF tenure area. The Forest Practices Board will be conducting an audit on 20 watersheds in the province including Chapman/Gray.

Minutes: December 17, 2012

Dave Lasser, in his capacity as Operations Manager, provided a written report on the operational events since the last meeting. He provided a verbal update on the following issues:

EW011 - 2,400 m³ has been scaled. COLL working to get it sold before year end. There have been some delays (extra road ballasting, scaling delay) in getting the production out.

EW002 – Approximately half of the block has been felled. Dave has been reribboning and recontouring the block boundary over the last few weeks. Protesters had removed 90% of the ribbons and painted over most of the markings.

Dave stated that the RCMP handled all events with great dignity and tact. He will write a letter to the RCMP to thank them for their integrity.

The FSP has been amended to clarify activity in Chapman and Gray watersheds. The pending salvage cutting permit application has been withdrawn. SIB is not comfortable with any activity occurring in the Chapman/ Gray. It was reiterated that a meeting between BOD and SIB Chief should be arranged.

Operations Report

1. 2012 Harvesting

a) Logging - 2012 Q4

- i) logging block EW011; finish in 2013Q1*
- ii) good wood, est. 7,500m³ at est. AMV \$85/m³*
- iii) volume scaled in Dec 2012 was 2400 m³; our sorting date was moved up 1 week*
- iv) roads are built*
- v) started falling EW002 on Nov 27th and start road construction this week*

b) Logging 2013 Q1

- i) log EW002*
- ii) good wood, est. 10,000m³ at est. AMV \$85/m³*
- iii) not harvesting entire block; timber quality, slope and soils issues in bottom third of block*
- iv) we've modified the boundary near FC#17 and moved it uphill a bit.*
- v) we're finalizing adjustments to block boundary.*
- vi) we'll be reducing the amount of road to be built as well.*
- vii) finish EW011, approx. 5000m³*

5) *Wilson Creek WAP*

a) *Dave Bates has finished his final report and it's on our website.*

Annual Report: 2012

Message from the Chair, Glen Bonderud, Chair & President

The area of the deferral in 2011 is known as EW002, above Roberts Creek near Wilson Creek. In previous years we had done a watershed study of the area, for our tenured area only, and the criticism was that it did not include private lands. SCPI commissioned another study for water and fish habitat that included the private lands above and below the tenured area. The results were presented in August 2012 and are now available on our website. It was a thorough report and we have adopted its recommendations.

Unfortunately, the study was not accepted by all and in the fall of 2012, when we announced we would be commencing operations in this area, protests broke out demanding we cease operations and vacate the area. A proposed park was the main reason for the opposition despite no word from the Ministry of the Environment they are considering new parks. One statement going around was we had only 3% of the Sunshine Coast Forest District in parks; however from Howe Sound to Egmont the actual percentage of provincial, regional and municipal parks, wildlife reserves and old growth management areas added up to 20.5% of the land. A report is available on our website which details this finding.

Despite the costs associated with the protests, we have closed 2012 with a stronger balance sheet and are looking to the future with cautious optimism.

Operations Report, Dave Lasser, RPF, Operations Manager

The Wilson Creek Watershed and Fishery Assessments also got underway in the spring. This project was in response to a commitment by the Board of Directors of the Community Forest to undertake a more comprehensive watershed assessment than was previously undertaken. Glynnis Horel (P.Eng.) and Dr. Dave Bates (PhD, RPBio) undertook the assessments. Their work was very thorough and a number of presentations were made in the community to explain their findings. Horel and Bates were provided access to the entire watershed, including the large private land holdings. Our LiDAR data played a very important role in assisting Horel in her geological and terrain assessment work.

Upon completion of the Wilson Creek assessments, the Board of Directors approved the harvesting of Block EW002. This decision was met with protests by some in the community. Many of the arguments presented by the protesters weren't factual. Road construction and harvesting began in Block EW011 in October and falling started in EW002 in late November. EW011 was completed in January 2013 and planted in April 2013. EW002 harvesting will be completed in April 2013 with planting in early May.

The financial results shown elsewhere in the Annual Report include all of the Sandy Hook volume and about 20% of the volume from EW011. The remaining 80% of the volume from

EW011 and 100% from EW002 will be shown in our 2013 financial report and will be very positive.

[Note: According to SCPI's 2012 annual report, SCPI logged 72 hectares of forest land in the Wilson watershed from 2007-2012.]

Minutes: January 28, 2013

Board of Director's Meeting Operations Report

1. Harvesting

a) Logging - EW011

i) logging will finish in 2013Q1

ii) budget volume estimate = 7,500m³ at an estimated AMV of \$85/m³

iii) volume scaled to date = 6,718 m³ (includes 2 loads, 66m³, from CP 6)

v) estimated volume yet to be hauled = 40 loads @ 40 m³ =1,600 m³

b) Logging - EW002

i) entire block is felled (approx 14 ha)

ii) good wood; estimate = 10,000m³ at an estimated AMV of \$85/m³

iii) road construction has started; approx 300m built

iv) we've modified the boundary between FC-14 and FC-17 and moved it uphill a bit.

v) fallers have completed 80% of the wind-firm pruning and topping along the boundary

c) Logging 2013

i) considering doing an extra 5000m³ this spring and 10,000m³ in fall depending on markets

d) Protesters

i) costs directly attributable to the protests so far are \$48K

Minutes: February 25, 2013

Dave Lasser, in his capacity as Operations Manager, provided a verbal report on the operational events since the last meeting. Harvesting is now complete in Block EW011. Realized volume is higher than the original budget. EW002 should be complete by end of March. Road will have to be ballasted due to wet weather to facilitate trucking of logs. A question was posed about the level of deactivation expected on the roads in EW011 and EW002. Dave responded that it is possible to fully rehabilitate the roads to a plantable state but will take additional funds if the machinery has moved off site.

It was noted that the contractor's safety signs are continually being stolen from Block EW002.

Dave explained that a windfirm assessment was done prior to harvesting EW002, as is normal practice in any susceptible location. Where the block edge could be subject to windfall, pruning was completed to reduce the "sail" factor. So far no trees have blown over.

The actual cost of the protest in Wilson Creek has reached \$50,000, plus the value of Management's time.

Minutes: June 3, 2013

Logging of EW002 is now complete and has resulted in higher than expected volume. Wind firming in EW002 has been completed and has proven very effective. The few trees which have blown over are ones which were not pruned/topped.

Dave gave a Power Point presentation which showed the 5 and 20 year plan maps from 2010 highlighting the areas which have been logged and which new ones are still viable.

He reported that the Chapman Watershed Assessment should be completed by the fall. It was noted that all public presentations should be done by November 1, 2013 and that we should try to have all government agencies at the same meeting.