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)

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March 15, 2015

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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.

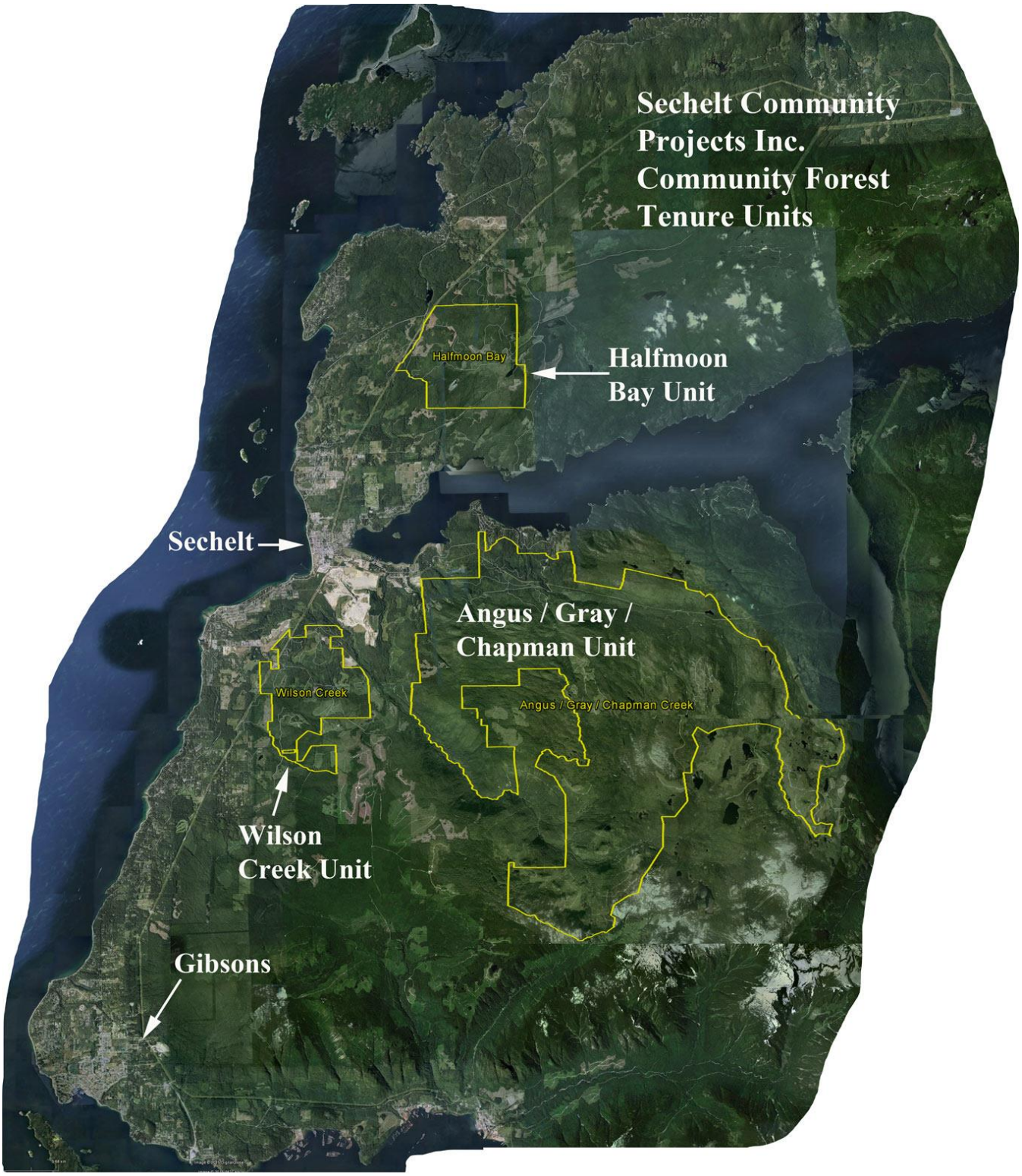
Two of the units, Wilson Creek and the Angus/Gray/Chapman Creeks, are within watersheds with high fish values. All three units, including the Halfmoon Bay unit, also serve as community and domestic drinking water sources. Due to these high values, International Forest Products – SCPI's predecessor forest 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.

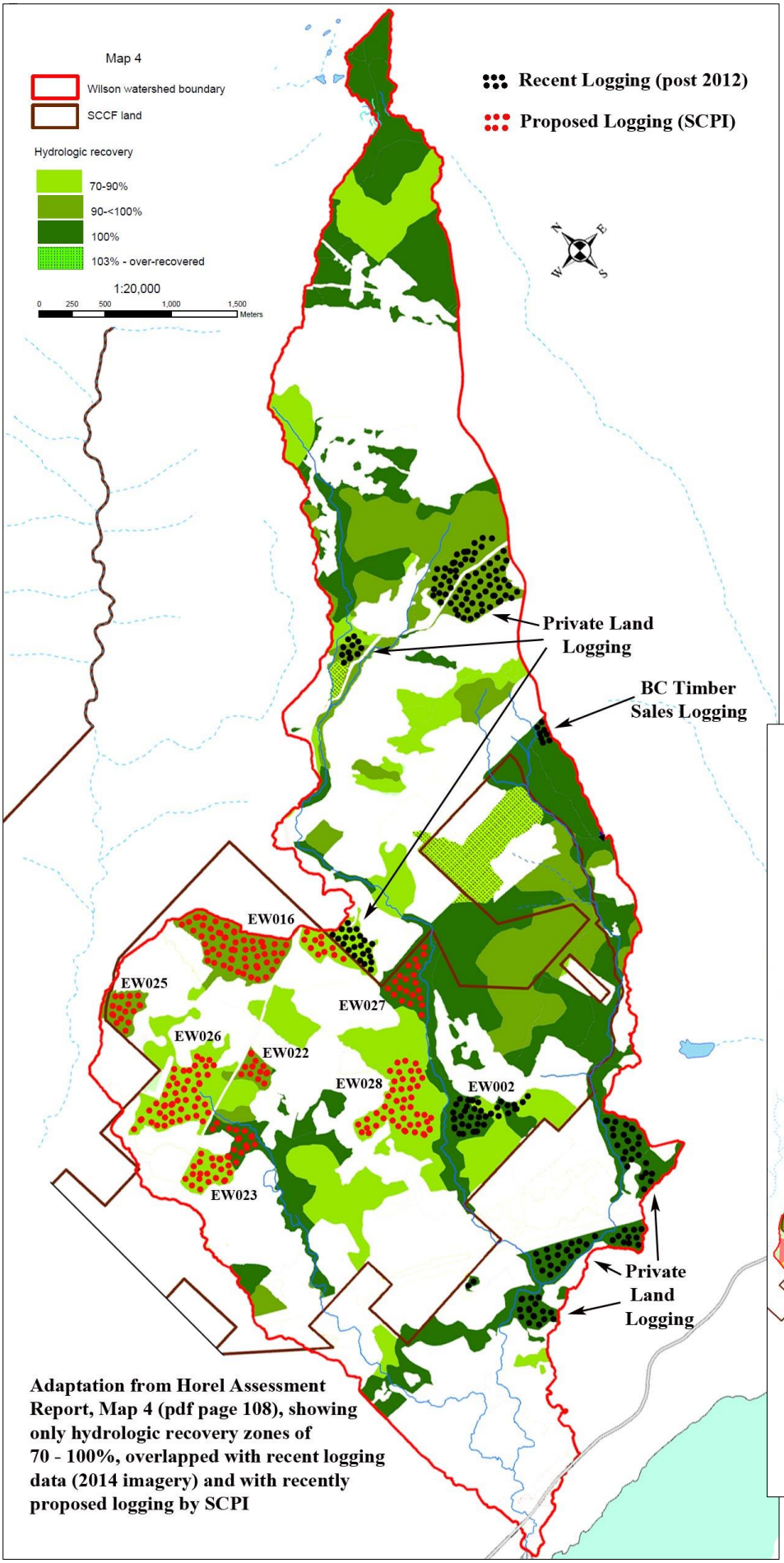
Though Horel's watershed assessment (2012) fails to provide a hydrologic recovery ECA percentage grade for the Wilson watershed (as Dobson attempted to do without backup data), Table 4 of her report nevertheless provides sufficient evidence indicating that Dobson's ECA estimations were well off the mark. 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.

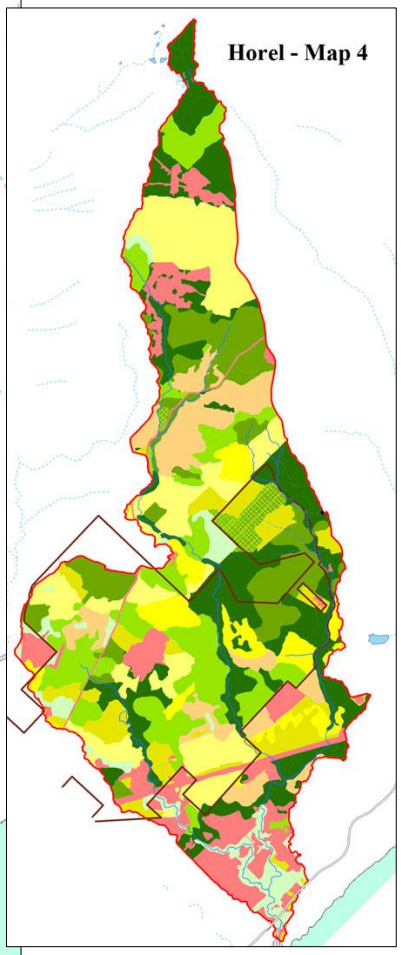


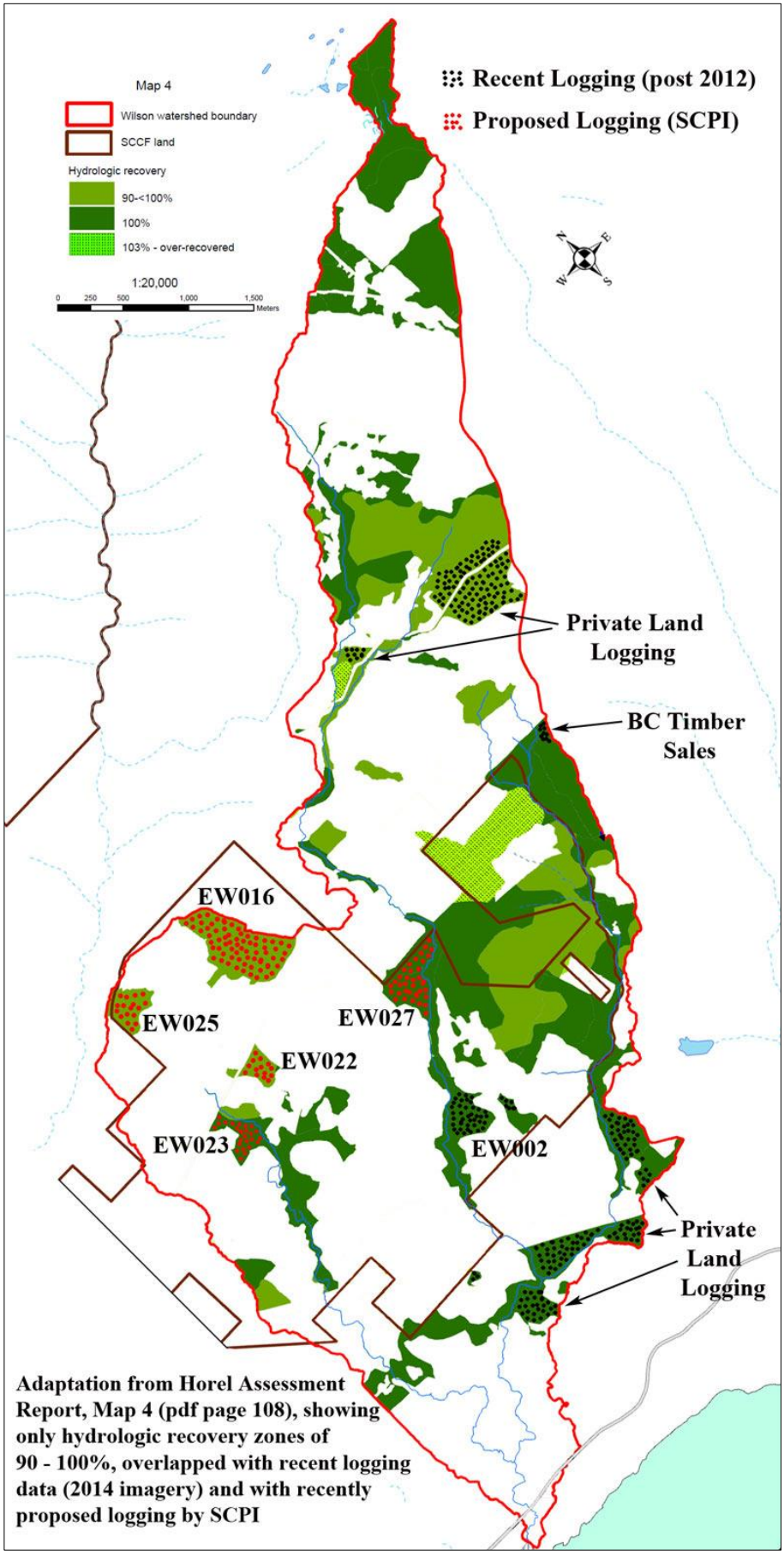
Adaptation from Horel Assessment Report, Map 4 (pdf page 108), showing only hydrologic recovery zones of 70 - 100%, overlapped with recent logging data (2014 imagery) and with recently proposed logging by SCPI

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.

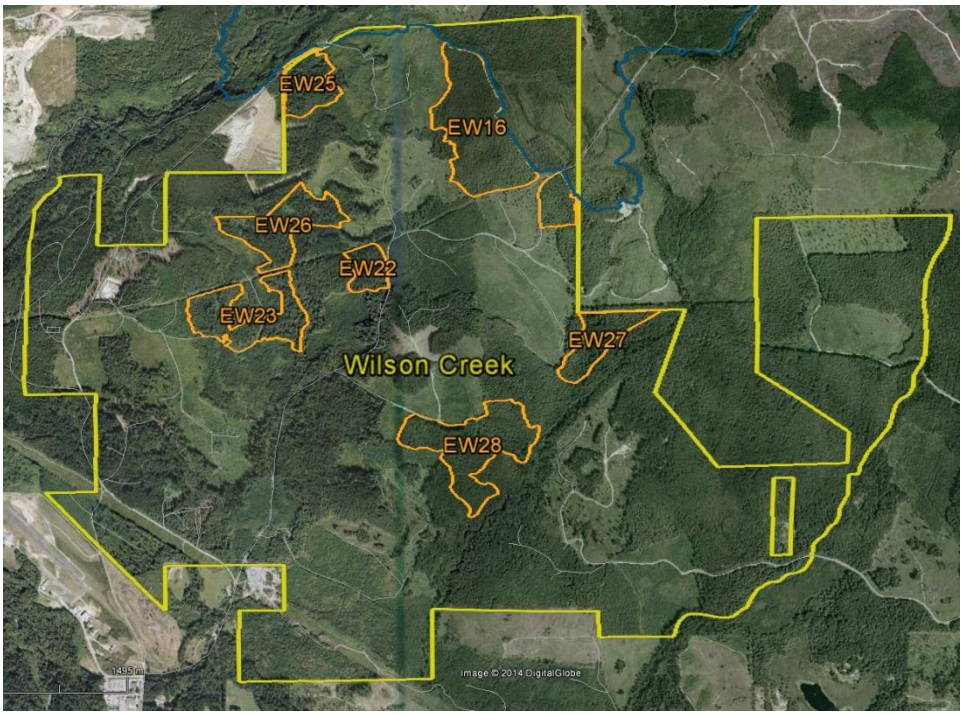
The evidence, as depicted from Horel's findings on the map to the left (black dots and white zones within the red watershed boundaries), clearly shows that the Wilson Creek watershed is in a state of hydrological stress and needs to recover from past logging. This is true for the forest within the operational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

References (chronological orders and web related hyperlinks)

Dobson Engineering Ltd. *Hydrologic Assessment of the Wilson Creek Watershed (Sunshine Coast Forest District)*. March, 2010. http://209.15.218.187/~sccfca/wordpress/wp-content/uploads/Wilson-Creek-Watershed-Assessment-2010-Dobson.pdf

Sunshine Coast Community Forest Completed and Planned Blocks, 2010. Operational Plan, 2010-2030. Sechelt Community Projects Inc. website. http://209.15.218.187/~sccfca/wordpress/wp-content/uploads/OpPlan-Map-2010-East-Wilson.pdf

Daniel Bouman, Sunshine Coast Conservation Association. *Logging, Deregulation and Hydrology in the Wilson Creek Watershed.* April 8, 2011. http://www.thescca.ca/documents/WC-LoggingDeregulationHydrology-8APR11final.pdf

Glynnis Horel, G.M. Horel Engineering Ltd. *Wilson Creek Watershed Assessment.* August, 2012. http://209.15.218.187/~sccfca/wordpress/wp-content/uploads/Wilson-Creek-Watershed-Assessment_erratum_web.pdf

David Bates, FSCI Biological Consultants. *Evaluation of Salmonid Populations in Wilson Creek (900-119900)*. October 30, 2012. http://209.15.218.187/~sccfca/wordpress/wp-content/uploads/Evaluation_of_Salmonid_Populations_in_Wilson_Creek_-_2012_FSCI.pdf

Minutes of Meeting of the Board of Directors, Sechelt Community Projects Inc. July 22, 2013. http://209.15.218.187/~sccfca/wordpress/wp-content/uploads/BOD_Minutes_2013-07-22.pdf

---

H.J. Hodgins. *Report on Burns & Jackson Logging Co. Ltd*. March 6, 1950.

B.J. Clark. *Salmonid Populations of Wilson Creek*. BC Ministry of Environment, Fish and Wildlife Management, Regional Fisheries Report No. LM111, 1985.

Leslie M. Reid. *Research and Cumulative Watershed Effects*. United States Department of Agriculture, General Technical Report PSW-GTR-141, 1993. http://www.fs.fed.us/psw/publications/reid/reid_141.pdf

G.E. Grant, and J.A. Jones. *Peak Flow Responses to Clearcutting and Roads in Small and Large Basins, Western Cascades, Oregon.* Water Resources Research, Volume 32, No. 4, pages 959-974, April 1996. http://www.geo.oregonstate.edu/classes/geo582/week_7_1_forest_harvest_roads_peaks/jones_grant_wrr_96.pdf

Channel Assessment Procedure Guidebook. Forest Practices Code of British Columbia. December 1996. http://www.geog.ubc.ca/~beaton/images/Ch_Assess_Guide_field.pdf

P.A. Slaney, and A.D Martin. *The Watershed Restoration Program of British Columbia: Accelerating Natural Recovery Processes.* Water Quality Resources Journal of Canada, Volume 32, No. 2, pages 325-346. 1977.
http://digital.library.mcgill.ca/wqrj/pdfs/WQRJ_Vol_32_No_2_Art_07.pdf

P.A. Slaney, and D. Zaldokas. *Fish Habitat Rehabilitation Procedures.* BC Ministry of Environment, Watershed Restoration Technical Circular No. 9, 1997.
http://www.env.gov.bc.ca/wld/documents/wrp/wrtc_9.pdf

Martin Carver, Patrick Teti. *Illuminating the Black Box: A Numerical Examination of British Columbia's Watershed Assessment Procedures (Level 1).* Ministry of Environment, 1997.
http://www.for.gov.bc.ca/hfd/pubs/RSI/FSP/Cariboo/Misc030.pdf

Walter F. Megahan, and Robert B. Thomas. *Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon: A second opinion.* Water Resources Research, Volume 34, No. 12, pages 3393-3403, December 1998.
http://andrewsforest.oregonstate.edu/pubs/pdf/pub2616.pdf

Dobson Engineering Ltd. *Interior Watershed Assessment Procedure for the Mission Creek Watershed: Update Report*. December, 1998.
http://www.people.okanagan.bc.ca/lburge/Mission%20Creek%20Reports/Mission%20Creek%20Watershed%20Assessment%20Report%201998%20Dobson.pdf

Coastal Watershed Assessment Procedure Guidebook (CWAP) / Interior Watershed Assessment Procedure Guidebook (IWAP). Forest Practices Code of British Columbia. Second Edition, April 1999. https://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/wap/WAPGdbk-Web.pdf

BC Ministry of Environment. *Environmental Risk Assessment: An Approach for Assessing and Reporting Environmental Conditions*, July 2000. http://www.env.gov.bc.ca/wld/documents/era.pdf

Robert Hudson. *Assessing Snowpack Recovery of Watersheds in the Vancouver Forest Region.* Forest Research Technical Report, TR-004, BC Ministry of Forests, November 2000.
http://www.for.gov.bc.ca/rco/research/hydroreports%5Ctr004.pdf

G.E. Grant, and J.A. Jones. *Comment on "Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon: A second opinion" by R. B. Thomas and W. F. Megahan.* Water Resources Research, Volume 37, No. 1, pages 175-178, January 2001.
http://andrewsforest.oregonstate.edu/pubs/pdf/pub2656.pdf

Robert O. Hudson and Brian D'Anjou. *Roberts Creek Study Forest: the effects of shelterwood harvesting and blowdown on sediment production in a small zero-order creek.* Forest Research Extension Note, EN-004, BC Ministry of Forests, March 2001.
http://www.for.gov.bc.ca/rco/research/hydroreports/en004.pdf

Robert O. Hudson, and John Fraser. *Roberts Creek Study Forest: Pre-harvest chemical characteristics of three S6 creeks, Flume Creek Experimental Watershed.* Forest Research Technical Report, TR-013, BC Ministry of Forests, March 2001.
http://www.for.gov.bc.ca/rco/research/Hydroreports/tr-013.pdf

Robert Hudson. *Roberts Creek Study Forest: Preliminary Effects of Partial Harvesting on Peak Streamflow in Two S6 Creeks.* Forest Research Extension Note, EN-007, BC Ministry of Forests, March 2001. http://www.for.gov.bc.ca/rco/research/hydroreports/en007.pdf

Brian D'Anjou. *Roberts Creek Study Forest: Effects of Dispersed Retention Harvesting on Stand Structure and Regeneration in a Coastal Mixed-Conifer Forest: Summary of Year 6 Results.* Forest Research Technical Report, TR-006, BC Ministry of Forests, March 2001. http://www.for.gov.bc.ca/rco/research/projects/rcsf/tr006.pdf

Brian D'Anjou. *Roberts Creek Study: Forest Effects of Alternative Silvicultural Systems on Windthrow and Conifer Regeneration in a Coastal, Douglas-Fir-Dominated Forest: Summary of Year 3 Results.* Forest Research Technical Report, TR-007, BC Ministry of Forests, March 2001. http://www.for.gov.bc.ca/rco/research/projects/rcsf/tr007.pdf

Fidel W. Fogarty, Shannon Berch, and Brian D.Anjou. *Effects of Alternative Silvicultural Treatments on the Diversity of Forest Fungi in the Roberts Creek Study Forest.* Forest Research Extension Note, EN-006, BC Ministry of Forests, March 2001. http://www.for.gov.bc.ca/rco/research/projects/rcsf/en006.pdf

Watershed Assessments: Skill Sets for Qualified Registered Professionals. Overview descriptive by the ABCPF/APEGBC Joint Practice Board. APEGBC Innovation magazine, June 2001. http://www.degifs.com/pdf/Watershed%20Assessments%20JPB.pdf

Dobson Engineering Ltd. *2002 Interior Watershed Assessment Update for the Mission Creek Watershed (Penticton Forest Service)*, January 2003, from Final Watershed Assessment Committee (WAC) Meeting Summary Notes, November 25, 2002. http://www.regionaldistrict.com/media/20138/2002%20Mission%20Creek%20IWAP%20Final%20Report.pdf

Brian D'Anjou. *Roberts Creek Study Forest: Harvesting, windthrow and conifer regeneration within alternative silvicultural systems in Douglas-fir dominated forests on the Sunshine Coast.* Forest Research Technical Report, TR-018, BC Ministry of Forests, March 2002. http://www.for.gov.bc.ca/rco/research/projects/rcsf/tr018.pdf

Robert Hudson. *Using Combined Snowpack and Rainfall Interception Components to Assess Hydrologic Recovery of a Timber-Harvested Site: Working Toward an Operational Method.* Forest Research Technical Report, TR-027, BC Ministry of Forests, March 2003. http://www.for.gov.bc.ca/rco/research/hydroreports/tr027.pdf

Smartwood. *Forest Management Public Summary or Inlailawatash Holdings Ltd*, September, 2004. http://www.rainforest-alliance.org/forestry/documents/inlailawatash.pdf

Jos Beckers, Younes Alila, and Eugene Hetherington. *Peak flow responses to clearcutting and roads in the maritime regions of the Pacific Northwest: a preferential hillslope runoff perspective.* For submission to Water Resources Research. 2004. http://www.for.gov.bc.ca/hfd/library/FIA/2004/FSP_R04-017d.pdf

J.M. Buttle, I.F. Creed, and R.D. Moore. *Advances in Canadian Forest Hydrology, 1999-2003*. In Hydrological Processes, Vol. 19, pages 169-200, 2005. http://www.forestry.umn.edu/prod/groups/cfans/@pub/@cfans/@forestry/documents/asset/cfans_asset_291833.pdf

Sunshine Coast Conservation Association. *Critique by the Sunshine Coast Conservation Association of the Community Forest Timber Supply Analysis Prepared for the District of Sechelt by Brian Smart*. 2005. http://www.thescca.ca/pdf_files/cfp_timber_supply_analysis.pdf

Alan A. Ager, and Caty Clifton. *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. http://www.fs.fed.us/pnw/pubs/pnw_gtr637.pd

Watertight Solutions Ltd. *Hydrological Effects of the Preferred Forest Management Scenario in the C5 Forest Management Unit.* February 2006. http://srd.alberta.ca/LandsForests/ForestManagement/ForestManagementPlans/documents/ForestManagementUnitC5/Appendix6C-HydrologicalEffects.pdf

Mike Fenger and Associates. *An Assessment of Mountain Pine Beetle Implications to the Kamloops Land and Resource Management Plan*. March, 2006. http://www.mikefengerandassociates.com/reports/docs/KLRMP-Communications-report_MPB-implications_Final-July19-06.pdf http://www.mikefengerandassociates.com/reports/docs/KLRMP-MPB-implications_Final-July19-06.pdf

Markus Weiler, Georg Jost, David Gluns, Kim Green, Younes Alila. *Designing Experimental Watersheds to Understand and Quantify the Influence of Land-use Management and Natural Variability on the Hydrological Response at Multiple Scales.* Powerpoint presentation, 2006. http://www.for.gov.bc.ca/hfd/library/FIA/2006/FSP_Y062294b.pdf http://www.for.gov.bc.ca/hfd/library/FIA/2006/FSP_Y062294c.pdf

BC Ministry of Environment. *Evaluating and Designating Fisheries Sensitive Watersheds (FSW): An Overview of B.C.'s New FSW Procedure.* Draft. August, 2006. http://www.env.gov.bc.ca/wld/documents/fsw/FSW%202006%20Information%20Paper%20v1.1.pdf

Sunshine Coast Conservation Association. *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. http://www.thescca.ca/pdf_files/review_forest_stewardship_plan_0609.pdf

Younes Alila. *Forest Management in Interior British Columbia: Moving Beyond Equivalent Cut Area.* Forest Investment Account (FIA) - Forest Science Program FIA Project Y073294. 2006. http://www.for.gov.bc.ca/hfd/library/FIA/2006/FSP_Y062294a.pdf

Dobson Engineering. *2006 Hydrologic Assessment for Selected Sub-basins in the Horsefly River Watershed*, February 2007. http://horseflyriver.ca/reports/2008%20Report-Watershed%20Profile/Appendix%20H/LBIP_4653009.pdf

Robert Hudson, and Glynnis Horel. *An Operational Method of Assessing Hydrologic Recovery for Vancouver Island and South Coastal BC.* Forest Research Technical Report, TR-032, BC Ministry of Forests, March 2007. http://www.for.gov.bc.ca/rco/research/hydroreports/tr032.pdf

Shawn Hamilton, R.P. Bio. and Associates. *Block Assessment of MF 360 East Wilson Creek, Columbia National Investments Ltd*. July, 2007. http://www.pmflc.ca/docs10/CNI-Block-Assessment-Report-July-27.pdf

Private Managed Forest Land Council. *Investigation Report: Stream Protection Dakota Ridge Block*. July 23, 2007. http://www.pmflc.ca/docs10/CNI-Investigation-Report.pdf

Bussel 484 Final Environmental Impact Statement, Idaho Panhandle National Forests, St. Joe Ranger District, Snowshoe County, Idaho. US Department of Agriculture, May 2008. http://www.fs.fed.us/outernet/ipnf/eco/manage/nepa/stjnepa/bussel484/feis.pdf

Tolko. *Tolko Sustainable Forest Management Plan*, May 15, 2008. http://www.tolko.com/certification/cariboo_sfmp_2008.pdf

Will Koop. *"The Community" Forest Trojan Horse: The Sunshine Coast Community Forest Proposal and Probationary License in Two Watershed Reserves. A Case History (2003-2008).* May 20, 2008. http://www.bctwa.org/TrojanHorse-May20-08.pdf

Grainger and Associates Consulting Ltd., and Streamworks Unlimited. *Chase Creek Hydrological Assessment.* July, 2008. http://www.degifs.com/pdf/Chase%20Creek%20Hydrological%20Risk%20Assessment.pdf

Dave Huggard. *Effects of Salvage options for beetle-killed pine stands on ECA: December 2008 Update*. BC Ministry of Environment. http://www.thinksalmon.com/reports/FSWP_08_LR_91_FinalReport.App1.pdf

Cariboo Envirotech Ltd. *The Horsefly River State of the Watershed Report, Volume II-Stage II of a Watershed Based Fish Sustainability Plan*, March 31, 2009. http://www.horseflyriver.ca/reports/2009%20Report-State%20of%20the%20Watershed/Horsefly-State-of-the-Watershed-Report2.pdf

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. http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/Lmh66/LMH66_volume1of2.pdf http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/Lmh66/LMH66_volume2of2.pdf

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

Pascal Szeftel. *Stream-Catchment Connectivity and Streamflow Dynamics in a Montane Landscape.* Phd Thesis, Forestry Faculty, University of BC, November, 2010. https://circle.ubc.ca/bitstream/id/102627/ubc_2011_spring_szeftel_pascal.pdf

Reliance on Registered Professionals. Environmental Law Centre, University of Victoria, November 29, 2010. http://www.elc.uvic.ca/associates/documents/Reliance-on-Registered-Professionals-Backgrounder-Nov29.10.pdf

BC Forest Practices Board. *Salvage Logging and Water Flows at Cooper Creek*, August 2012. http://www.fpb.gov.bc.ca/IRC185_Salvage_Logging_and_Water_Flows_at_Cooper_Creek.pdf

Sunshine Coast Regional District. Planning and Development Committee Agenda, September 20, 2012. Annex A, AJB Investments Ltd., Rezoning Application for District Lots 2461, 2462, 2463, 3373, 2274. http://www.scrd.ca/files/File/Administration/Agendas/2012/2012-SEP-20%20PDC%20Agenda%20Package%20Part%201-Website-.pdf

ESSA Technologies Ltd. *Tier I watershed-level fish values monitoring protocol rationale, Draft Version 3*, September 2012. http://www.for.gov.bc.ca/HFP/frep/values/watersheds/Tier-1-watershed-monitoring-rationale_V3_DRAFT_Sept.-27_2012.pdf

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Sunshine Coast Conservation Association Newsletters: **Fisheries Sensitive Watersheds**

- Winter, 2012, Issue 23, pages S1-S4, Fisheries Sensitive Watersheds on the lower Sunshine Coast.

- Spring, 2013, Issue 24, page S1, Wild and Free: The rivers of the Bute and Toba watersheds.

- Summer, 2014, Issue 25, pages 8-10, Fisheries Sensitive Watersheds.