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The "Editorial"

Jennifer Clarke, P.Geo..

How safe is "safe"?

In March, APEGBC Council approved the *Guidelines for Legislated Landslide Assessments for Proposed Residential Development in British Columbia* (http://www.apeg.bc.ca/library/library/guidelines/landslide_guidelines.pdf). The guidelines establish a standard of practice for Qualified Professionals (QPs) completing hazard assessments and provides assistance to those that rely on the findings of such assessments.

Under the Land Title Act, Local Government Act and Community Charter, for areas subject to instability (flooding, erosion, landslide, and avalanches) a QP must prepare a report that indicates, "the land may be used safely for the use intended". In the Guidelines, this is referred to as the Level of Landslide Safety (LLS), or level of acceptable hazard/risk, and this is where the problem arises.

Currently, there is no national standard for LLS, and only two jurisdictions in BC (Fraser Valley Regional District and the Fraser-Fort George Regional District) have adopted a definition for LLS. The BC Ministry of Transportation, in 2005, rescinded a previous definition of acceptable hazard as a 10% probability of occurrence in 50 years. In the absence of a definition, the QP is required to define "safe" in relation to the Method of Analysis (i.e. Factor of Safety), or by "some other regional, provincial, or national guideline". Recent work in the District of North Vancouver have compared estimates of risk to criteria used in Hong Kong, based on probability of death to an individual ($1X10^{-4}$), but to date there is no other regional, provincial, or national guideline.

QPs continue to be challenged by the lack of definition of "safe" and require that government establish a standard with appropriate public input to ensure consistency in the assessments. APEGBC recognizes this outstanding issue and is, hopefully, lobbying government to this end.

Ed. Note: Please support and acknowledge fellow DEGIFS members nominated as candidates for APEGBC Council:

Tim Smith – Presidential Candidate
Kevin Turner – Council Candidate

Please note: DEGIFS Executive does not necessarily support or agree with the opinions and conclusions indicated in the editorial.

DIVISION OF ENGINEERS AND GEOSCIENTISTS IN THE FOREST SECTOR

Volume 11, No. 2 **June 2006**

2006/07 DEGIFS EXECUTIVE
CALL FOR NOMINATIONS

The DEGIFS terms-of-reference (TOR) specify that the DEGIFS executive shall consist of the Past Chair and 7 members elected by the DEGIFS membership. The term of an executive member is two years. Three executive members are replaced each year with a fourth position replaced every second year. The Chair position continues serving a third year as Past Chair on the executive.
Executive members whom were elected last year and are continuing include:

- *Norman Deverney, P.Eng.*
- *Julian Henley, P.Eng.*
- *Doug Underhill, P.Eng., R.P.F.*
- *Dave Wilford, P.Geo.*

Executive members completing their terms this year are:

- *Bruce Thomson, P.Geo.*
- *Mark Goldbach, P.Eng., L.E.G.*
- *Ron Jordens, P.Eng.*
- *Heather Blyth, P.Geo, Past Chair*

As out-going chair, Mark Goldbach, P.Eng., will continue with the executive for an additional year as Past Chair.

In accordance with the DEGIFS TOR, a Nominating Committee was struck to make nominations for 3 positions on the 2006/2007 DEGIFS Executive. The goal of the nominating committee was to seek nominations for the executive that, when combined with the continuing executive members, is representative of:

- The diverse fields of professional practice within the DEGIFS membership;
- The geographic areas in which the DEGIFS membership practice; and
- Provides government, industry and consultant representation.

The following is the list of the nominees, who have agreed to be nominated for the 2006/2007 DEGIFS Executive:

- ***Irene Weiland, P.Geo***
- ***Tracey M. Raume, P.Eng.***
- ***Ron Arksey, P.Geo.***

Under the TOR, additional nominees can be made, in writing, by a minimum of two DEGIFS members. Such nominations, signed by the members making the nomination and accompanied by written consent of the nominees, must be sent to the DEGIFS Secretary c/o Peter Mitchell, P.Eng., at APEGBC. To be eligible, the nominations must be received no later than 30 days after this publication of the list of candidates nominated by the Nominating Committee. Please note that affiliate members are not eligible to hold executive positions or vote in an election.

In accordance with the TOR, if no nominations are received from the membership in accordance with the above criteria, those nominated by the nominating committee will be declared elected by acclamation and no letter ballot will be conducted.

In the event that nominations are received from the membership such that the total number of nominees is greater than executive positions available, a letter ballot will be conducted.

Critical dates for the election of Executive members include:

- *Deadline for receipt in writing of nominations: 30 days after the publication of Volume 10, No. 2 of Aspect (Deadline = **July 30, 2006** – assuming a June 30, 2005 release date)*
- *Letter ballots to be sent to the membership eligible to vote: **September 2, 2006***
- *Deadline for receipt of completed ballots: **September 28, 2006***
- *Ballots to be counted by: **October 3, 2006***
- *Membership to be notified of election results at the DEGIFS Annual General Meeting scheduled **for Victoria, October 13, 2005.***

Additional details on the election of executive Members can be found in the DEGIFS Terms of Reference which can be found on the DEGIFS web site at: www.degifs.com.

DEGIFS Executive Nominations

Following, are brief biographies of nominees put forward by the DEGIFS Executive Nominating Committee. As indicated in the previous article, if no additional nominations are received by July 30, then these individuals are declared elected by acclamation.

Ron Arksey, P.Geo.

I am honoured to be nominated for the DEGIFS Executive. 2006 is my 19th year of practicing geology – engineering geology in BC in the private and public sectors. For the last 12 years my focus has been as a consulting terrain stability specialist in the forest industry. This has included slope stability hazard and risk assessment, carrying out terrain stability assessments predominantly relating to opening and road layout and design, landslide and debris flow assessment and mitigation. I have also completed terrain, terrain stability and erosion potential mapping; road deactivation, road reactivation and karst vulnerability assessment projects.

One important issue that has impacted DEGIFS members has been the WorksafeBC investigation report, the application of Regulation 20.78 and the short term solution of issuing a Limited Licence in Professional Engineering to Professional Geoscientists who carry out terrain stability assessments on forest roads and other excavations related to forest development. This has had a significant and direct material adverse affect on members' livelihoods. There is a lot of uncertainty associated with this issue and if elected I would continue to build upon the contributions of the executive.

The release of the Forest Practices Board special investigation into land management and land risk from forest practices indicate landslide frequency has significantly decreased and this is at least in part due to the requirement and incorporation of terrain stability assessments in forestry development plans. However, there are areas of improvement identified in terrain stability report quality, comprehensiveness and use. These issues need to be further explored and addressed by the executive and DEGIFS members.

Landslide risk management is not limited to the forest sector, and expansion into, or inclusion of other resource sectors is a natural evolution of the division. DEGIFS (or some other named division) could provide valued input to these industries (e.g. mining, linear corridor, oil and gas) and benefit from practices and innovations from other land based decision makers.

There are many other issues related to geoscience and engineering in resource industries that exist, or will emerge and I will work to represent the interest of our members. I look forward to the opportunity to continue the work of the executive.

Tracey M. Raume, P.Eng.

Education: BScFE (UNB, 1992); MScFE (UNB, 1995)

I am honoured to be nominated by my peers and colleagues to be part of the DEGIFS council.

I have been working in engineering in the forest sector since I moved to British Columbia in 1995 and took a job for a local consulting firm in Gold River. After a short time on the island, I was hired by the Ministry of Forests. I started as the District Engineer in the Fort St. James Forest District, and then moved to BC Timber Sales as the BCTS Engineer before moving into the Regional office.

I'm presently the Acting Regional Engineering Officer for the Northern Interior Forest Region based out of Prince George. In a month or so, I'll return to my full time position as the Regional Bridge Engineer.

My education and work experience to date has given me the exposure to the many engineering disciplines that work in the forest sector. I've also worked with many professionals over the years at various levels of government and industry.

As part of DEGIFS council, I would like to work towards raising the profile of engineers and geoscientists working in the forest sector. I feel that we under-utilized in this industry, and therefore, we should be striving to work more collaboratively with other professionals in developing technically sound and integrated plans that do more than include engineering as an afterthought. I've seen this trend in some areas of the industry and it is worrisome and weakens our standing in the industry.

I am excited about this opportunity and look forward to working with my colleagues.

Irene Weiland, P. Geo.

I am pleased to accept the nomination as candidate for the DEGIFS executive.

I am a geoscientist, working as a self-employed consultant in the forest sector. I obtained a Masters degree in geology in 1988, before immigrating to Canada in 1989 from Germany. From 1990 to 1995, I gained valuable work experience as a geomorphologist with the BC Ministry of Forests in Smithers. Working as a consulting geomorphologist for the past 11 years, I have been involved in terrain stability and terrestrial ecosystem mapping projects in coastal and interior settings of northwest BC. In 2001, I completed the Diploma in Forest Engineering offered through the Forest Management Institute of BC. Over the past 6 years, TSFAs on the BC North Coast have become an additional focus of my work.

As a sole practitioner living and operating outside the Lower Mainland, I value DEGIFS for the opportunities it provides to its members, such as networking with peers, continuing education and input into standards and guidelines developed by government, APEGBC and other agencies. Now that my daughter will be six years old, I believe I will have the time to participate and contribute to the DEGIFS executive.

Research Profile of Russell Creek: Implications for Professional Practice

Rob Hudson[1] and Axel Anderson[2]

[1] Dr. Rob Hudson, P.Geo.; Research Hydrologist, Coast Forest Region; Adjunct Professor, Forest Resources Management, UBC
[2] Axel Anderson, E.I.T., R.P.F.; Ph.D. Candidate, Forest Resources Management, UBC

Introduction:
Watershed management is based on the application of models to predict the probable outcome of hypothetical management scenarios. There is enormous variability in the type and complexity of models that are used; in research we like to use process based distributed hydrologic simulation models such as “Distributed Hydrology-Soil-Vegetation Model” (DHSVM), while the professional community in BC bases much decision making for forested watersheds on the application of the Coastal and Interior Watershed Assessment Procedures (CWAP and IWAP). Despite their obvious differences these two types of model share a common problem: both must be based on a complete and accurate understanding of the dominant hydrological processes that govern the response of the watershed for which a decision is needed. In the absence of full understanding most models are based on the wrong theories and as a result, management decisions based on application of those models may fail to produce the desired results.

Research at Russell Creek has been underway for fifteen years. Russell Creek is a 31 km^2 sub-basin of the Tsitika River watershed on northeastern Vancouver Island, with active ongoing forest management and a logging history dating back to the early 1980’s. The Tsitika River drains an area of 370 km^2 into Robson Bight in the Strait of Georgia. Access to the watershed is gained by way of the Island Highway about half way between Sayward and Woss. Primarily a sediment budget research project, we are currently in a phase of the research that has led us to instrument the watershed very intensively in an effort to develop a hydrological simulation model that represents the variability among the dominant processes accurately. Our long-term objective is to develop an integrated, process-based model that can be used to investigate the effects of forest harvesting and roads on rain-on-snow (ROS) and sediment production processes. Funded by the Forest Science Program (FSP), the Tsitika River Sediment Budget Project (of which Russell Creek is the currently active phase) is applied research in that its primary aim is to produce a model that is operationally focused at the watershed scale, but conceptually accurate and based on commonly available data. We are involved in process-based studies to the extent that we need to fill in knowledge gaps in order to build a model that is theoretically correct.

Along the way we have learned a lot about how coastal watersheds behave and these findings can be translated into information that can lead to better-informed decision making for management of coastal watersheds. We have passed on much of this information in existing publications and at conferences in Canada and the USA. Our findings can be broken down into three categories: sediment production and transport (sediment budget), water quantity processes and technical and innovative methods.

1. Sediment Budget Component:

Every project has to start somewhere – in early November of 1991, Rob Hudson worked with Water Survey of Canada (WSC) to install streamflow and turbidity instrumentation at three sites in the Tsitika River watershed. One of those sites was dubbed by WSC as "Russell Creek near the Mouth". Each site had the WSC standard of the day for continuous water level measurement, a nitrogen-bubbling site feed measured by a mercury manometer and recorded by pen on a clock driven chart. The turbidity was measured by D&A instruments OBS-3 probes and recorded by the old low resolution Unidata PDL loggers, and the sampling was done by ISCO 3700 automatic samplers. Rob went back later that same month and installed a tipping bucket rain gauge near the site. Thus began Russell Creek; a sediment budget project based on one stream gauge and one tipping bucket rain gauge.

In 1994, our team consisted of Rob Hudson and various technical assistants. We began to build a network of nested stream gauge sites to facilitate the sediment budget work. We built five mainstem sites to measure streamflow and turbidity/suspended sediment and three meteorological sites including total precipitation, rainfall, temperature, solar radiation, humidity and wind. In 1997, we took over operation of the main stream gauge at Russell Creek (which became known as "Russell Main") as well as the Catherine Creek gauge. John Fraser joined the team as the principal technician. We then created a secondary network of sites at the sediment source scale within Russell Creek watershed to measure sediment production from a variety of natural and man-made sources. At that time the secondary sites were all monitored and sampled manually. Working with M.Sc. student Ryan Hanson we succeeded in sampling a series of storms in the fall of 1998 that resulted in a sediment budget model where inputs and outputs agreed to within 10% (Hudson, 2001b). Since then we have continued to monitor and sample and to take advantage of prevailing conditions to learn what we can about the effects of roads on sediment production and transport processes, effectiveness of road deactivation, and the relative importance of roads in relation to other sediment sources.

Results:

- Our sediment source inventory for Russell Creek included about 150 significant sources: 47 stream crossings, more than 30 gullies and 70 slope failures (Hudson, 2001b).
  - The most significant sources are landslides on the sidewalls of incised stream reaches, which generally supply up to 60% of the sediment produced during storms in Russell Creek watershed.
  - About 40% of the sediment production from landslides is derived from two features in Stephanie Creek; both are unlogged.
  - Gullies supply about 25% of the sediment; about 60% of that comes from one large feature, also in Stephanie Creek and also unlogged.
- The detailed sediment budget work in Russell Creek was done at a time when the road network was not in active use. Sediment delivered to streams at road crossings under conditions of non-use varied from 0 to 12% of the total sediment production for storms ranging in size from 20 to 80 mm (Hudson, 2003).
- Factors controlling sediment production:
  - Lithology and connectivity:
    - Sediment production on basaltic lithology is 6 times that of granitic lithology.
    - Similar ratio for terrain directly connected to stream network as opposed to terrain disconnected by valley flat (Hudson, 2001c, Hudson and Tolland, 2003).
  - Road construction and use: effect is variable depending on density of new road, lithology of terrain where roads are constructed and magnitude of the event responsible for sediment production.
  - We have documented up to 100 times increase in sediment yield for small events with peak flows less than 10 m^3/s, 10 times increase for events with peak flow between 10 and 20 m^3/s (return interval between 0.3 and 0.5 years) and no change for larger events.
  - Sediment production and transport events involving road sediment effects tend to be dominated by fines. The fines greatly augment yield for smaller events, which are dominated by fines naturally. Large events tend to be increasingly dominated by transport of sand, which tends to overwhelm the excess fines produced by roads.
  - This information was derived from results obtained in fall of 2004 following accelerated rate of cut in anticipation of tenure change (Hudson, 2006).

2. Water Quantity Modeling Component:
Russell Creek is a typical coastal watershed: it is wet, rain-on-snow dominated, with shallow soils and steep topography. This is arguably one of the least understood types of watershed. Rain-on-snow processes are driven by parameters that are highly variable spatially and difficult to measure under wet freeze-thaw conditions. Our studies have shown that the combination of high precipitation, steep slopes and shallow soils result in dominance of preferential flow processes over matrix flow under Darcy's law as the primary process governing storm runoff. Similarly, at Carnation Creek, Beckers and Alila (2004) had to include subroutines to simulate vertical and lateral preferential flow in a distributed model in order to simulate measured hydrograph responses. The current challenge facing us at Russell Creek is to extend that work to a ROS environment. This involves modeling the different process groups at scales that represent the variability of the processes, using elements of a size such that their interaction will accurately represent the watershed scale process. We are currently involved in building and testing distributed networks within the watershed and its sub-catchments to provide input to process-based studies that will eventually be integrated into the distributed model.

The Team:
To accomplish this challenging task we have adopted a team approach. The senior members, Drs. Rob Hudson, Younes Alila and Markus Weiler have broad and complementary skills in field data collection and analysis, model development and process based field studies. We have three Ph.D. students and one post-doc each studying different aspects of the problem described above. Axel Anderson joined the group in 2003 and has focused on a detailed study of preferential flow paths. In May of 2005, Dr. Markus Hrachowitz came onboard from Austria for a 2-year post-doctoral position to investigate the variability of the precipitation regime and to design a supplementary network to measure meteorological parameters at an appropriate spatial resolution. More recently, Bill Floyd has undertaken a study to investigate interactions between the precipitation regime and forest canopies, and Rabin Bhattarai has undertaken a model development study to integrate and upscale the various process-based studies. John Fraser continues to contribute technical expertise to the project and is responsible for primary network operation and sediment budget data collection.

Results:

- Preferential flow network is a term commonly used in the literature to define a connected group of individual preferential flow features. We have documented that individual preferential features can have a finite capacity to carry flow, but when one feature has reached its capacity another feature can join the network and carry additional flow. This means that, at least for our study site, these networks may be considered to have almost an infinite capacity to transport subsurface water (Anderson and Weiler, 2005).
  - Subsurface flow rates: The rate of water movement through the preferential flow network is in the order of 10^{-3} m/s, compared to the 10^{-6} m/s typical of matrix flow under Darcy's Law.
  - During most storms, about 80% of hillslope water is derived from preferential flow. We expect that the contributions of preferential flow will vary with storm size but more analysis is still required.
- Runoff response: defined as the rate at which a land segment delivers water into stream channels. Our groundwater data show that hollows stay saturated most of the time, the ridge top wells rarely show a saturated zone, and the wells on the hillslopes show a transient response pattern. Areas with fast runoff response would include hollows, riparian zones and ridge tops where high water tables or shallow soils might produce overland flow, and areas dominated by preferential flow. Areas with slow runoff response include areas of groundwater recharge. On a hillslope the runoff response would generally increase down-slope.
- Effects of roads on peak streamflow: Given the above, we expect the effect of roads on peak flows to be small compared to a watershed where subsurface flow is dominated by matrix flow. Where preferential flow is dominant, conversion of subsurface flow to ditch flow has little effect on peak flow because there is not a large difference between the subsurface and surface flow velocities (Beckers and Alila, 2004).
- Effects of forest harvesting on peak streamflow: If runoff response were uniform there would be a direct relationship between proportion of area logged and change in peak flow. In a watershed where runoff response is mixed (such as Russell Creek), the effect of harvesting depends entirely on where you log. We would expect a greater

change in peak flow and timing of the peak if we harvest areas with high runoff response. Conversely, harvesting areas of slow runoff response may increase groundwater recharge, low flow or soil storage, but may not affect peak flow as much.

3. Technical developments:

We are still using some of the original instrumentation that we started with in 1991, but technically we have come a long way since then in developing methods better suited to harsh conditions. During the course of this work we have tested state-of-the art off-the-shelf technology and developed several alternative methods and technologies:

- The original OBS-3 turbidity probes are still in use at Russell Main and elsewhere, as are the original ISCO samplers. We began using this technology when it was still in its infancy and found it necessary to develop methods and protocols for handling the probes and for interpreting the data (Hudson, 2001a).
- We no longer use the old WSC system to measure water level. Primarily we use submersible transducers to measure stage at mainstem sites and capacitive probes at many of the smaller sites where we monitor streamflow.
    - Due to the active nature of stream channels and the relatively high frequency of "channel forming" events we have found that a heavily armoured submersible transducer provides the most effective high-resolution solution to continuous monitoring of stage for situations where we really want the high flow data no matter what. A future publication will describe this technology.
    - Smaller streams have been temporarily gauged (2-3 seasons) using weirs constructed from plywood and UV resistant plastic. To gauge many streams while keeping costs at a minimum, we have used standalone "Odyssey" capacitive water depth probes combined with small dedicated data loggers.
- Salt dilution gauging: we developed an operational method to measure streamflow in steep turbulent channels where traditional current metering cannot be applied accurately (Hudson and Fraser, 2005).
- Total precipitation gauging: We wrestled with the operation of standpipe gauges for a long time. Eventually we developed an alternative method of operating standpipe type gauges – the "displacement type" gauge is a high resolution and virtually maintenance free solution to a traditionally high maintenance and not-very-accurate-or-reliable-but-essential measurement (Hrachowitz et al., 2005).
- Natural tracers: in addition to applied tracers we started an experiment that uses natural ions as tracers to determine the sources of stream water during storms. These techniques are well established in the literature and combining them with our intensive hydrometric measurements will help us to determine the types of runoff response found at Russell Creek.

References:

Most of the references below can be obtained from our web site at:
http://www.for.gov.bc.ca/rco/research/index.htm

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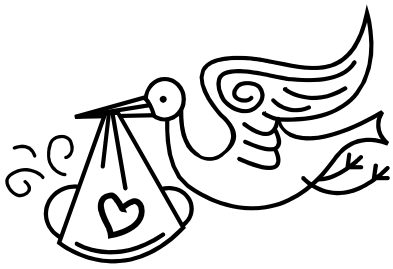

DEGIFS BABIES!!

ANNOUNCING…..

DEGIFS member **Deepa Spaeth-Filatow**, together with her husband Mark and son Nikhil, were pleased to welcome a baby girl…

Jasmine Tatiana Spaeth Filatow (7 lb 12 oz) on March 9, 2006.

DEGIFS members **Julie Orban** and **Doug Dewar** announced the purchase of a "new" minivan and the arrival of a baby boy…

Elias Loughlin Dewar (7 lb 15 oz) on May 25, 2006

CONGRATULATIONS TO BOTH FAMILIES!

CWRA – BC Regional Conference Call for Abstracts

The BC Branch of the CWRA is organizing their BC Regional conference for October, 25-27, 2006. The theme of the conference is "Water Under Pressure - Balancing Values, Demands and Extremes". As part of the conference, two half days of the conference are being planned to include a Geomorphology-themed stream of concurrent talks. This stream is being organized by the Geomorphology Sub-Committee of the CWRA BC Branch. The call for Abstracts came out April 15, 2006 and the Sub-Committee is soliciting papers with a geomorphology emphasis. For more information please see www.cwra.org or contact Channa Pelpola (Sub-Committee Chair) at 604-436-3014.

BC Ministry of Forests and Range

Engineering Equipment and Services (EES) Directory

All consulting firms that wish to provide professional and technical services to the Ministry of Forests and Range for engineering activities within Operations Division, Revenue and Tenures Division, or BC Timber Sales (BCTS) must be registered in the ministry's provincial Engineering Equipment and Services (EES) directory. Self-registration instructions are available at the following ministry website: http://www.for.gov.bc.ca/hth/engineering/EES-Consultants.htm

Don't forget to put this on your calendars….

APEGBC 2006 Annual Conference and AGM
October 12-14, 2006
Victoria, BC

DEGIFS is facilitating a technical field tour of the Capital Regional Watershed, two days of technical sessions, and division AGM. Check out the program and register on-line at:

http://www.apeg.bc.ca/ac2006

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Do Not Forget!!!

ASPECT SUBMISSIONS

LAST DATE FOR SUBMISSIONS TO ASPECT	NEWSLETTER RELEASE DATE
SEPTEMBER 15, 2006	SEPTEMBER 29, 2006
DECEMBER 1, 2006	DECEMBER 15, 2006

Electronic submissions in **Word format (only)** should be made to Jennifer Clarke (jclarke@eba.ca) by the date listed above.

Refer to *Guidelines for Submission* on the website http://www.degifs.com/guidelines.doc for submission requirements.