Improving the Safety of Resource Access Roads in British Columbia’s Coastal Forest Industry

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Abstract
The forest industry has historically exhibited one of the highest rates of fatalities and serious injuries within the province of British Columbia. From 1997 to 2006, the forest sector averaged a record of 92 serious injuries and 22 fatalities per year (Office of the Auditor General, 2008). During this time span, it should be noted that 43 fatalities and 110 serious injuries were reported in 2005; which brought the unsafe work practices of the industry under significant government criticism (Forest Safety Task Force, 2004). In response to the unacceptably high rates of serious injuries and fatalities, the Office of the Auditor General (AG) conducted an independent review of safety in the forest sector. The 2008 AG report identified many issues contributing to unsafe work practices. Two major recommendations were made: to improve the current attitudes toward worker safety and produce a more unified approach to the regulation of safety in the forest sector.

The frequency and severity of unsafe practices in the forest sector varies significantly by worker occupation and production phase. This report will present ideas, plans and activities which address on-the-ground safety of one specific phase of harvesting. Specifically, the underlying cause for unsafe hauling and road use will be examined. Recommendations and measures to improve hauling and road use will also be discussed.

There are many physical limitations of log hauling that are being pushed to the limit of worker safety. The attitudes around harvest planning and road design and construction standards, as well as on-the-ground work need to be improved if logging roads are to be safely located in complex, steep terrain. Road maintenance, standardized communications and increased safety audits and enforcement of standards are also discussed. Government policy could change standards for the safety of workers, but cannot change the attitudes of the workers and planners. Standards such as road building and truck loading limits could undoubtedly improve worker safety.

There are currently many projects addressing several aspects of safety in the woods and on resource access roads. However, changes to road use standards, improved road construction techniques and stronger government regulations and audits require one more key element to shift the forest sector away from its dangerous safety record. Ultimately, education of forest workers about these improvements is needed to foster an understanding and a realization that the BC forest industry can offer a safe work environment for all its labor force.
Introduction

The forest industry has historically exhibited one of the highest rates of fatalities and serious injuries within the province of British Columbia (Forest Safety Task Force, 2004). From 1993 to 2003, 250 work-related deaths occurred. In 2003, the Forest Safety Task Force was formed with the mandate to prepare an action plan to address worker safety in the forest sector. Released in 2004, the report included an assessment of the state of unsafe practices and extensive recommendations on how to achieve a safer work environment. The following year in 2005, 43 fatalities and 110 serious injuries were reported (BC Forest Safety Council, 2009).

By 2006, it became apparent that the rate of serious injuries and fatalities had not improved since the implementation of the Forest Safety Task Force action plan. While the rate of fatalities declined to 12 in 2006, the number of serious injuries rose to 125. As presented in Figure 1, British Columbia’s forest industry averaged a record of 92 serious injuries and 22 fatalities per year from 1997 to 2006 (Office of the Auditor General, 2008).

Figure 1. Work-related deaths among British Columbia’s forest workers, 1997-2006

(Office of the Auditor General, 2008)

In response to the serious safety record of the forest sector, the Office of the Auditor General conducted an independent review of the forest industry. The 2008 report identified many far-reaching issues contributing to unsafe work practices. However, the Auditor General made two major or key recommendations: one to improve the attitude surrounding worker safety and secondly to create a more unified approach to government regulation and jurisdiction over worker safety.

The forest industry has multiple production phases that range from planning, falling all the way to milling. The frequency and severity of unsafe practices varies significantly by worker occupation and production phase (BC Forest Safety Council, 2009). This report proposes to discuss only one specific phase of harvesting by presenting ideas, plans and activities which address on-the-ground safety of hauling and resource road use. Specifically, the underlying causes for unsafe hauling and road use will be examined. Recommendations and measures to improve hauling and road use will also be discussed.
The AG office identified several risks associated with log hauling on resource roads:

- The effect of overloaded logging trucks on braking capacity;
- The impact of driving at high speed to meet work deadlines on the ability to navigate safely along difficult road conditions;
- Busy haul roads with inadequate signage of road conditions;
- Fatigue in drivers; and
- A lack of clear government leadership and policy on safety (Office of the Auditor General, 2008).

The number of stakeholders using resource access roads is increasing across the province. Roads, once considered “logging” roads are now more appropriately “resource access” roads because of multiple industrial users. On the coast currently there are users such as, logging, mining and the new onset of independent power projects. Resource access roads are developing into steeper and more remote sites. This has resulted in road standards being pushed to the limit and resulting in less safe driving conditions. Many organizations, such as TruckSafe BC, have tried to address the increasing road dangers by lobbying for safer road standards. Other organizations, such as FPInnovations-Feric have tried to produce on-the-ground driving aids to improve worker safety.

Current Issues Surrounding Road Standards

In coastal British Columbia, harvesting in rugged, remote valleys presents significant and costly challenges for forest planning. One of the more controversial aspects is the construction and design of forest roads on steep and complex terrain. To gain access into these areas or to avoid costly helicopter yarding, there is a concern that roads are being established in unsafe locations and conditions such that safe road construction standards are not being achieved. Vertical and horizontal road alignment is essential for driver safety along resource access roads. Due to numerous truck driver fatalities, Worksafe BC has identified a significant concern for excessively steep road grades. However, this oversimplifies the issues. Horizontal alignment and road width are just as crucial as vertical alignment. An improperly laid out curve can have detrimental consequences, resulting in accidents and truck driver fatalities.

With vertical alignment and the grade of the road breaking becomes a major safety issue. Off-highway logging trucks are constantly being over loaded for economic reasons at the cost of driver safety. Logging truck brakes only have a given rate of heat dispersion even with water-cooled brakes. When a truck is over loaded and then placed on constantly steeper and steeper road; brake failure becomes a serious issue.

The tendency for the rear wheels of any vehicle to follow a tighter radius curve is called off tracking. This is accentuated with the shear size of a logging truck and its length. Not only does the curve have to be made correctly but also the width of the road to accommodate the off tracking of the tractor-trailer tires. Road width then becomes quite important so that inside tires do not track off the road. Roads that have not been built to the correct width have had serious consequences in the past.
With the placement of roads on steeper side slopes it is becoming increasingly difficult to find appropriate locations for switchbacks. When a switchback is built on a steep side slope a balance must be struck between road cut and fills and the grades around the switchback. Moving earth around can be the most expensive part of road building and therefore, there is a pressure to reduce cuts and fills to build the road prism at the cost of road grades. Reducing cuts and fills on roads can reduce slope stability issues surrounding road construction. Cutting deeper with more in the ground can influence the groundwater flow by intercepting it and concentrating the water flow. This can have serious negative effects on the chance of slope instability.

Weather is another issue surrounding the safety of a given grade. A given road grade may be safe on a sunny day, but on a day after a long period of precipitation in the form of rain or snow, different circumstances apply. Road grades do need to be steep enough to have economic gains feasible, but not at the cost of road safety. A road with a saturated surface or covered in snow cannot only reduce tractive effort up a slope but can reduce the braking capacity heading back down causing safety issues.

**Construction Approaches**

There are non-conventional methods available for tough road building that can be cost effective and produce safer road alignments. On November, 2006 there was a workshop organized by FPInnovations-Feric on strategies to improve the safety and competitiveness of coastal forest operations. One of the presenters was StoneCroft Project Engineering who has been responsible for designing different types of backup switchbacks for extreme situations. Backup switchbacks such as adits and slots can be a very safe and cost effective alternative to conventional switchbacks on side slopes in excess of 60% (StoneCroft Project Engineering, 2006). With backup switchbacks the area of the most turning activity happens on a level area making it quite a bit safer than a conventional switchback which can exceed grades of 30% on steep side slopes. They are more cost effective on side slopes in excess of 60% because there is actually less material to move around the site (StoneCroft Project Engineering, 2006). Backup switchbacks are usually built up with the use of geotextiles or keyed in rock. The following is a diagram of how a switchback can be reworked to be a backup switchback.
Conventional roads on steep slopes quite often have the challenge of balance cuts and fills to keep down the movement of material. In the StoneCroft presentation they bring forward a case study where a retaining wall was used to re-align a road in a much safer way to reduce grades and increase the curve radius. Originally the road was built using conventional methods and the timber hauling contractor refused to haul on the road due to a tight 18 meter switchback curve then a section of 32% favourable grade (StoneCroft Project Engineering, 2006). StoneCroft Project Engineering re-aligned the road with a retaining wall, which brought the grades down and increased the switchback curve to 25m. They determined that if the re-alignment had been done with conventional methods including drilling and blasting it would have been $50 000 more expensive than the less conventional retaining wall (StoneCroft Project Engineering, 2006).

There are alternative building methods available especially with geotextiles. The use of geotextiles can allow building contractors to build up fills in a safer and more aggressive manor while reducing the amount of material required to be moved along the road, especially in end-haul situations.
Communications

On the coast there are still many issues surrounding the communications between road users, which includes industrial and non-industrial users. With Crown-owned resource access roads all members of the public are allowed road access. This can produce a situation with not all road users communicating on the same radio channel or not communicating at all. Industrial users normally broadcast their road locations, direction (up or down, loaded or empty) as well as the category of vehicle (low bed, pick-up etc). Historically dedicated radio frequencies are licensed to forest companies and BCTS. On the coast different users have not necessarily utilized the same frequencies, although this is less seldom the case now. Nonetheless, inconsistent calling and the use of descriptive call points such as “over the fill” rather than kilometer points can result in a breakdown in communication between road users. There still exists confusion of road signage being in miles or kilometers in some areas. The need for improved and standardized signage is considered instrumental in achieving safe hauling and other usages of forest resource access roads (BC Forest Safety Ombudsman, 2007)

The Bat

Driver’s aids have been developed to enhance the safety of road users. A company called RFAD Inc. has developed a warning system for drivers on forest roads. This system relies on a device called “The Bat”, which is a radio transmitter-receiver that establishes levels of proximity of other vehicles to forest road users to prevent collisions. The Bat uses a protected radio frequency, which sends signals to other road users utilizing The Bat units to establish the relative proximity to each other. There are three simple buttons on The Bat; one to activate it, another to initiate a convoy mode and one emergency button. When road users utilizing The Bat system approach each other within certain distance a series of lights show the proximity to each other. To reduce confusion with multiple vehicles there is the convoy setting. The emergency button is for stationary vehicles to demonstrate their location.

There are some issues with The Bat. Thick rock can impede or block the signal such that a delayed warning occurs. The Bat has a wide sweep of ranges where it will recognize other Bat users approaching within 400-1400m (FPInnovations-Feric, 2008). This inconsistent range in alert distance is due to a lack of transmitting power in The Bat units and to environmental interference with the radio waves. The largest issue with The Bat is its minimum range of 400m, which could create a problem for truck drivers. According to FPInnovations-Feric (2008) it takes an estimated average of 15.6 seconds to bring a logging truck to a complete stop. At 400m it would take an estimated average of 10 seconds to bring a truck to a stop, therefore if this situation were to occur convergence would be inevitable (FPInnovations-Feric, 2008). The chance to not give sufficient warning is a major flaw with The Bat on resource access roads, especially in coastal situations with more extreme terrain. The following is an image of the simple layout of the Bat:
There has been a similar system developed using GPS in the interior of BC (BC Forest Safety Council, 2005). Like The Bat this system is sensitive to the proximity of other equipped vehicles, but would have reduced negative effects The Bat has with environmental influences and the minimum amount of warning given to the driver.

**Resource Radio Frequency Pilot Project**

British Columbia Timber Sales’ (BCTS) Resource Radio Frequency Pilot Project is trying to create a uniform and consistent radio network. The project is attempting to resolve inconsistent calling procedures, signage and area frequencies. With multiple user situations on resource roads there can be times where trucks are switching between frequencies. One issue that BCTS brings forward is the mobility of trucks to move around the province (British Columbia Timber Sales). This is due to factors such as, shutdown weather, seasonal changes, BCTS contracts, transient contract workforce and different haul situations.

The project is trying to create standardized signage with the radio frequency posted around the province. This creates the need for all possible resource road users to have all the channels programmed into their radios. More stationary activities such as loading and unloading will not be used on these road channels.
Vehicle Identification Number Program

Around the province, there is the Vehicle Identification Number (VIN) Program, which is a program to enforce the placement of large metal identification plates on the front of vehicles (BC Forest Safety Safety Council). These plates have a standardized format with a unique serial number and company name. Contractors and licensees enforce this program to their contractors or subcontractors (BC Forest Safety Safety Council). The point of the VIN Program is to make drivers more accountable for their actions on the road.

The VIN Program has proven to work around the province, but the issue surrounding the coast is that quite often no other road users can be in the area to report dangerous driving. There are many small road systems in remote drainages all over the coast that no other road users even have access to these roads. Many areas do have urban centers near the places of activity so the VIN Program could continue its success there.

Government Policy

Currently it is very unclear who has legislative responsibility over resource access roads. The Royal Canadian Mounted Police (RCMP), the Insurance Corporation of British Columbia (ICBC), the Ministry of Forest and Range (MoFR), the Ministry of Transportation and Infrastructure (MoTI) all have a stake in the jurisdiction over the roads used for resource access. A large body of regulations and Acts have jurisdiction over hauling and roads:

- Motor Vehicle Act – licensing
- WorkSafeBC's Regulation Part 26 – safety
- MOFR Resource Road Legislation - forest roads
- National Safety Code
- Commercial Vehicle Safety & Enforcement Branch of the Ministry of Transportation & Infrastructure – public roads

In spite of the regulations, in 2007 The Auditor General identified a number of shortcomings (Office of the Auditor General, 2008).

- No Compliance and Enforcement on safe hauling;
- Lack of training or testing to ensure driver competence in difficult driving environment of haul roads; and
- Lack of leadership and direction on use of Forest Roads as well as overall safety standards and policies for the industry as a whole.

The findings of the auditor general suggest that neither ICBC nor WorksafeBC had changed regulation or channelled additional resources into auditing logging trucks travelling on public roads or the MoFR on...
forest roads. Since the 2007 report, however, revisions to Part 26 of the OHS regulations have captured some new requirements to hauling. These include amendments to safe driving, fatigue and the requirement for a driving log:

26.71.1 Operating procedures
(1) The operator of a log transporter must follow safe operating procedures.
(2) Without limiting subsection (1), the operator referred to in subsection (1) must
   (a) not overtake another moving industrial vehicle, except on a signal from the other vehicle operator,
   (b) use extreme caution when approaching vehicles coming from the opposite direction,
   (c) keep a safe distance when following crew transportation vehicles, having due regard for road and grade conditions and visibility,
   (d) drive at a speed appropriate to the log transporter’s capabilities, the road design and condition, the traffic, the visibility and the weather conditions, and
   (e) not operate the log transporter while impaired by
      (i) fatigue, or
      (ii) any other cause, substance or matter that could prevent the operator from operating the log transporter safely.

26.71.2 Daily log
(1) In this section, "hauling cycle" means the time allowed for each round trip.
(2) The operator of a log transporter must maintain a daily log into which must be entered the following information:
   (a) the date of the entry;
   (b) the printed name of the operator;
   (c) the truck licence plate or unit number;
   (d) the odometer reading of the truck at the beginning of the day, if the truck has an odometer;
   (e) the name of each contractor or employer for whom the operator worked during the day;
   (f) the start and stop time of each trip the operator makes;
   (g) the distance driven for each trip the operator makes;
   (h) the total distance driven by the operator during the day;
   (i) the total driving hours during the day;
   (j) the hauling cycle

(WorkSafeBC, 2008)

The auditor general suggests that the MoFR has not; but should play a stronger leadership role and that as of 2008 the Ministry was remiss in acknowledging this role. Some of the issues included:

- Inconsistent safety and road uses standards between government agencies;
• Companies may have several different administrative and maintenance responsibilities over different sections of the same road due to cross-boundary jurisdiction of government agencies.
• Overlapping road users have different design standards and maintenance schedules (Ministry of Forests and Range). (AGM report 2007)

In terms of hauling, the Forest Service Road Use regulation addresses certain safety aspects of road use such as speed, vehicle maintenance and radio controls. More recently, the Resource Road Act was drafted with more far-reaching jurisdiction and content in terms of safety and road standards, but has yet not been debated in the Legislative Assembly.

At the 2005 TruckSafe Summit the RCMP stated that their analysis showed that up to 90% of reported accidents were the result of driver error, with 8% environmental and 2% mechanical (BC Forest Safety Council, 2005). The majority are then the result of driver attitude, training and workplace pressure. Currently all that is required to operate a log hauling tractor-trailer is a Class 1 with Air Brakes. The attendees at the June, 2005 Forestry TruckSafe Summit I (2005) felt that a Class 1 with Air Brakes was insufficient training for driving on gravel and icy roads, especially with higher load weights that off-highway trucks experience. Currently there is a lack of driver accountability, professionalism and safety taught with driver training. The Summit members thought a graduated training with competency levels would be a way to ensure the competency of drivers in the industry (BC Forest Safety Council, 2005).

With industry driver shortages, driver training could be viewed as a barrier to the industry and could make the shortage even worse (BC Forest Safety Council, 2005). Similar training programs that exist are quite costly, such as the Faller Certification program.

In 2007, The Forest and Range Evaluation Program assessed the relationships and potential impacts of legislation, policy, planning and harvesting activities on worker safety. FREP Report #12 found that there was little to no communication between forest planners and loggers during the planning stages of cutblock and road design and layout (B.C.Ministry of Forests and Range, 2007). In this report, loggers were included with log truck drivers. This type of communication could be very effective in helping planners understand safety concerns at the ground level. Seventy-seven percent of loggers felt that design changes could improve unsafe situations (B.C.Ministry of Forests and Range, 2007).

The FREP report also recommended that the Joint Practices Board should consider aiding the Association of BC Forest Professionals (ABCFP) and the Association of Professional Engineers and Geoscientists of BC (APEGBC) in creating guidelines for forest roads (B.C.Ministry of Forests and Range, 2007). The FREP report recommended the following in developing these guidelines:

• Describe professional accountability and responsibility in the design, construction, safety standards and maintenance of forest roads;
• Include relevant policy that incorporates limitations and opportunities for flexibility; and
• Include the “best safety practice” recommendations that the report identifies in the safety surveys (B.C.Ministry of Forests and Range, 2007).
Conclusion
There are many on-the-ground aspects of road safety that need improvement. The AG identified a serious concern for the industry’s acceptance of its serious safety records. The largest challenge towards achieving a safe forest industry is better education of how to improve and accept worker safety within BC coastal operations. Education is considered the key to changing the attitudes and acceptance surrounding unsafe work practices. Attitudes must change across all stages: from forest planning, the log hauling contractor expectations and to the attitudes of the general log hauling driver. Awareness and knowledge of how to ensure a safer work environment must originate with forest planners who design and oversee harvest areas and resource access roads. However, it is also perceived that many log truck drivers just accept that the type of work in which they are employed is dangerous. Thus, worker safety awareness needs to be improved. The RCMP has shown that the majority of accidents surround resource access roads have been driver error. It is uncertain whether a more rigorous training program would help; but a form of education must occur to change the attitudes of the drivers and their acceptance of the dangers of the job.

FREP Report #12 identified that improvement in communication between planners and workers is essential in order to develop a better understanding of safety issues. Through education, forest planners and those responsible for the design of resource roads will gain the necessary knowledge about more progressive and safer road building techniques. Companies such as StoneCroft Project Engineering are helping by bringing forth their successful work around the coast. It is the exchange of information about such operational applications that will further promote safe work environments for truck drivers and other users of resource access roads.

Government policy can change standards for the safety of workers, but it solely cannot change the attitudes of the workers and planners. Standards such as road building and truck loading limits could undoubtedly improve worker safety, but it cannot change aspects like reckless driving. A program such as the VIN program could assist with reckless driving where there are many road users. As the Auditor General’s report suggests, a more unified government approach is required surrounding log hauling over highways because there is too much confusion between all the regulating bodies. There have already been improvements made like the Occupational Health and Safety Regulations surrounding log hauling.

There are currently many projects addressing several aspects of safety in the woods and on resource access roads. Standardization of road signage and radio communications are a few of the strategies to promote safer use of the roads. Ultimately, education of forest workers about these improvements will foster an understanding and a realization that unsafe work practices need not be the “norm”. With the combination of education, improved communications and clearer legislation perhaps the BC forest industry will emerge with a safer work environment for all its labor force.
Bibliography


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