



Danger tree breaks off, strikes faller

A manual faller was working in a cutblock. He made the cuts to fall a dead hemlock tree (a snag, or danger tree). The undercut left a 5-inch Dutchman, and when the tree started to fall, a 16-foot section broke off. It fell in the direction opposite to that of the intended fall of the tree and struck the faller, causing fatal injuries.



Purpose of this report

The purpose of this online incident investigation report is to identify the causes and contributing factors of this incident to help prevent similar incidents and to support preventive actions by industry and WorkSafeBC. This online version is not the official WorkSafeBC report. It has been edited to remove personal identifying information and to focus on the main causes and underlying factors contributing to this incident.

Notice of Incident information

Number: 2005155980096

Outcome: Fatal

Core activity: Manual tree falling and bucking

Region: Vancouver Island

Date: December 2005

Table of Contents

1	Factual Information	3
1.1	Firms involved in the incident	3
1.2	The incident	3
1.3	The hemlock danger tree.....	5
1.3.1	Condition of the danger tree	5
1.3.2	Faller’s cuts and the intended direction of fall.....	6
1.4	Faller training and supervision.....	8
2	Analysis.....	9
2.1	The faller’s injuries	9
2.2	The decision to fall the danger tree.....	9
2.3	Why the danger tree broke apart when it fell.....	10
2.4	Unsafe work practices in falling the danger tree	10
3	Conclusions	11
3.1	Findings as to causes.....	11
3.2	Findings as to underlying factors.....	11
3.2.1	Unsafe work practices.....	11
3.2.2	Danger tree risk assessment	11
3.2.3	Elimination of danger tree hazards	11
3.2.4	Perceived risk.....	11
4	Health and Safety Action Taken	12
4.1	Licensee	12

1 Factual Information

1.1 Firms involved in the incident

The licensee is a company that holds the provincial forestry tree farm licence to harvest timber in this area of Vancouver Island. The deceased worker's employer is a falling company that provides tree falling services to the licensee through a written falling and bucking contract. The falling company has worked under contract with the licensee for approximately 25 years.

On the day of the incident, the falling crew was carrying out manual falling in the cutblock. After completion of the manual falling work, mechanical falling using timber-processing equipment was to be carried out in the cutblock.

1.2 The incident

A crew of four fallers arrived at the worksite at approximately 0750 hours on the day of the incident. They were carrying out manual falling in the cutblock. The fallers were working in pairs. One pair was dropped off at their work location on the cutblock falling face. The faller involved in the incident and his partner drove to their work area on the falling face (Photo 1).



The cutblock falling face

The partner's approximate work area

Incident scene and the faller's falling face

Photo 1: The cutblock as seen from the road.

The chain saws were started at approximately 0815 hours. The faller and his partner were situated approximately 300 feet apart along the face. The purpose of this was to maintain a safe distance between falling activities and yet, as neither faller had radios for communication, ensure that the fallers were close enough to each other to provide assistance if necessary.

At approximately 1010 hours, the faller approached his partner and requested the use of his partner's chain saw to free his saw, which had become stuck while the faller was bucking (cutting up) a fir that he had felled. The partner returned with the faller to the faller's work location, and the stuck saw was freed. The partner returned to his work location at around 1015 to 1020 hours. He reported a normal, productive morning, with no significant work pressures.

Just before 1030 hours, the partner felled a dead cedar tree that ended up blocking a roadway. He went to get the faller's assistance to remove the fallen cedar. He found the faller lying on the ground adjacent to the falling face, unresponsive and with no pulse. The faller's saw, still running, was nearby. A 16-foot section of a fallen dead hemlock tree was near him (Photo 2). It was later determined that the faller was struck by the 16-foot section of tree.

The partner immediately summoned first aid personnel, who attended the scene within 5 to 10 minutes. The faller could not be revived, however.

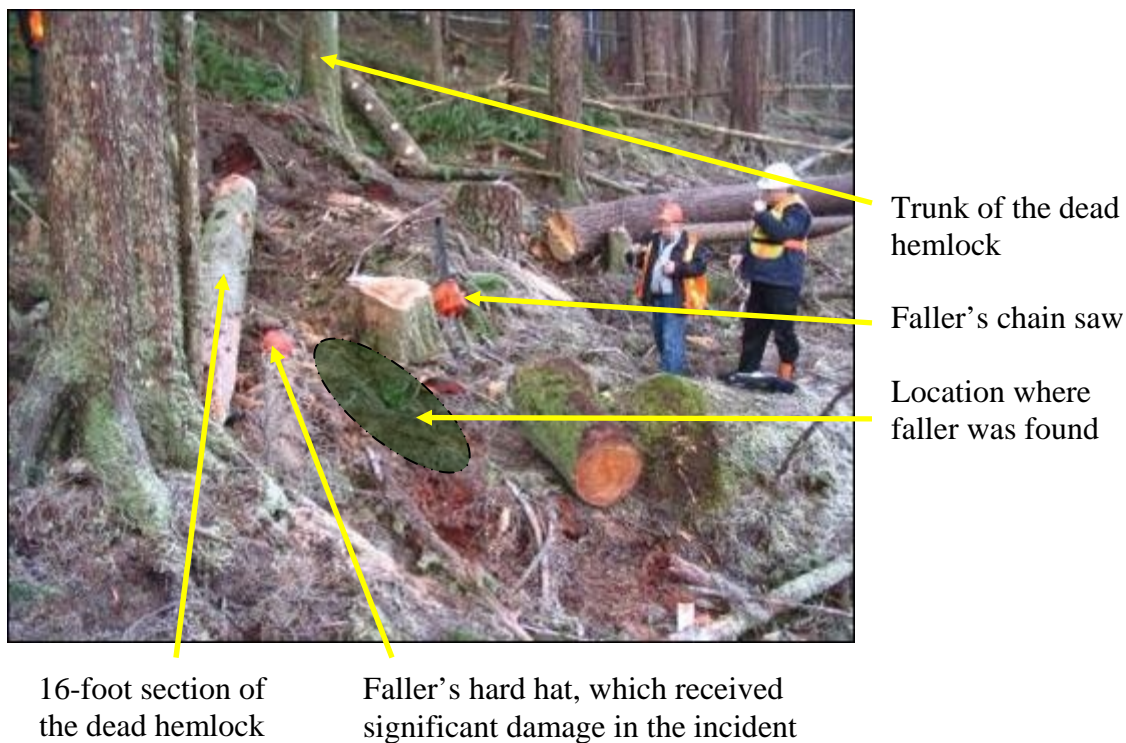


Photo 2: Incident scene.

1.3 The hemlock danger tree

The Occupational Health and Safety Regulation defines the term “dangerous tree” (also called “danger tree”). It includes any tree that is hazardous to people or facilities because of:

- Location
- Lean
- Physical damage
- Overhead hazards
- Deterioration of limbs, stem, or root system
- A combination of the above

1.3.1 Condition of the danger tree

After the incident, the hemlock danger tree was assessed by WorkSafeBC investigators and employer representatives. The tree was estimated to have been 65–70 feet tall and to have stood approximately 12 feet from the stump of the fir tree. It was approximately 22 inches in diameter at the location of the chain saw cuts. It was located just into the standing timber, uphill from the falling face, and likely had an uphill lean into the standing timber. The tree was limbless, was completely rotten above 10 feet, and had white fungus at various locations on the trunk (Photo 3).



Photo 3: The 16-foot section of the danger hemlock tree that struck the faller.

1.3.2 Faller's cuts and the intended direction of fall

The evidence at the incident scene provided some indication of how the falling of the hemlock danger tree was approached by the faller. All persons interviewed in this investigation felt that the faller's approach to this tree was very uncharacteristic of his normal falling practices.

Based on the chain saw cuts, the faller intended the hemlock danger tree to fall uphill into standing timber. In order to accomplish this, the faller stood on the downslope (low) side of the hemlock danger tree (Photo 4). This created a high and somewhat awkward reach to make the saw cuts. In addition, the faller did not provide for a safe means of escape when the tree was committed to fall. The apparent escape route taken by the faller placed him in a potentially high-risk area in the event the hemlock danger tree broke apart (Photo 5).

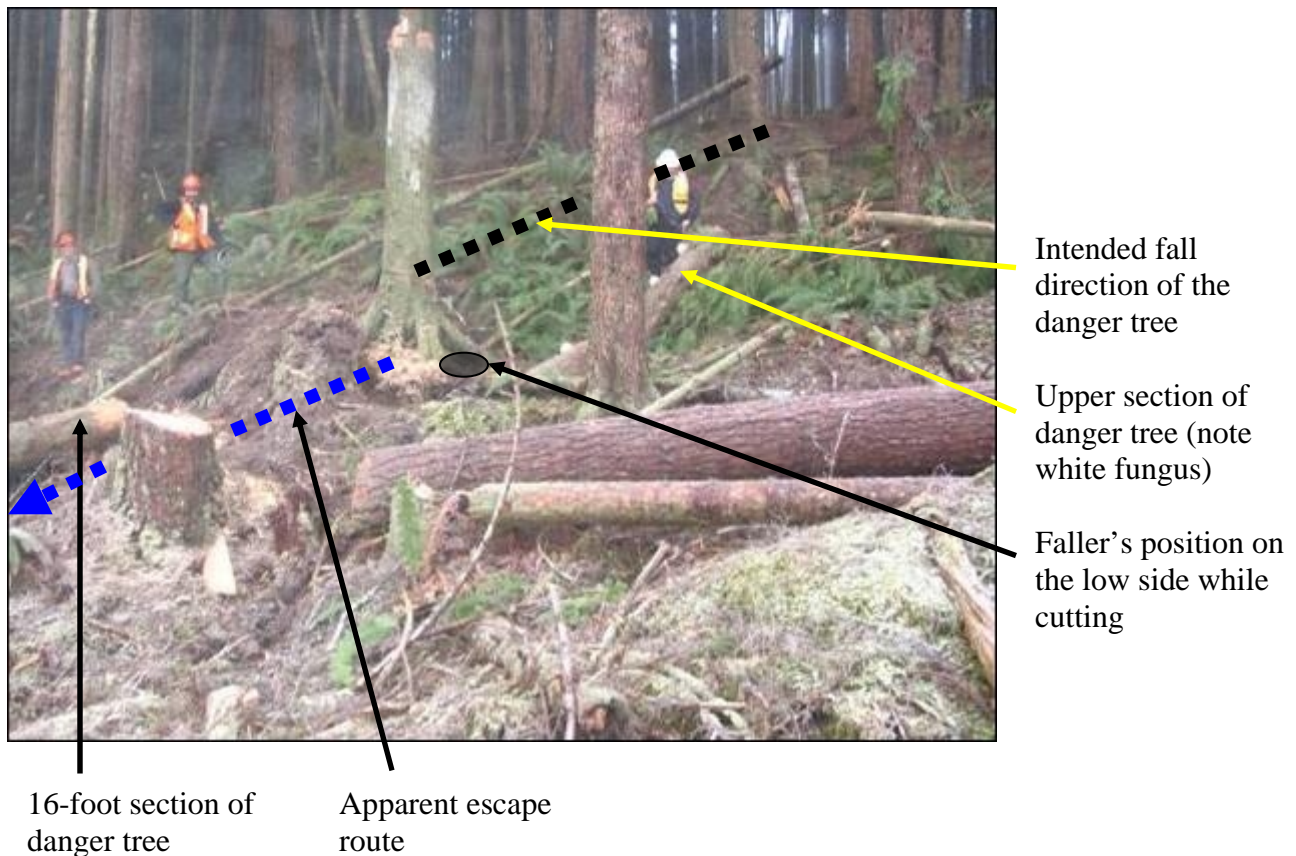
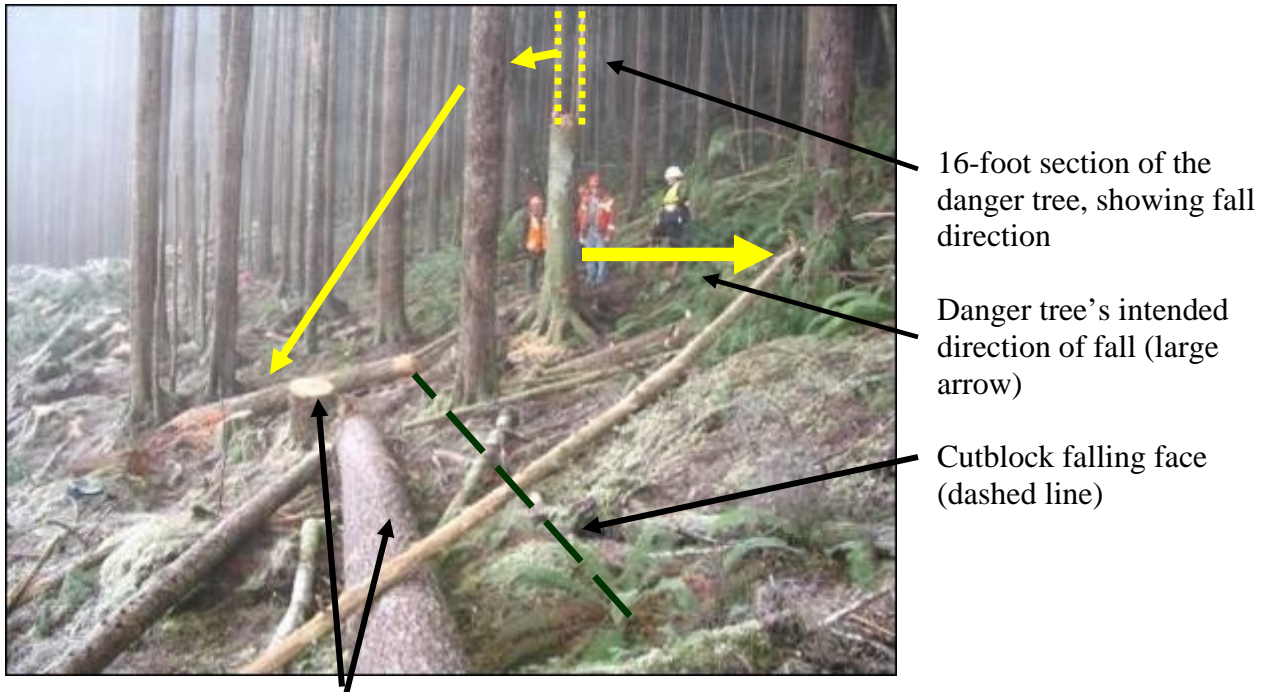


Photo 4: Faller's position while cutting the danger tree.



The previously felled fir and stump

Photo 5: Hemlock danger tree.

In addition to the poor body position when making the saw cuts, the faller did not perform a proper undercut by leaving a 5-inch Dutchman on the high side of the cut (Photos 6 and 7). A Dutchman, created from insufficient removing of wood in the undercut, can significantly affect how a tree falls, including jarring the tree as it begins to fall. There was also a misalignment of the undercut and backcut (Photo 8).

The top approximately 45 feet of the hemlock danger tree landed more or less in the intended location. Due to its rotten condition, it broke apart into a number of pieces of various sizes. As the tree was falling into standing timber, it knocked down a few smaller trees. Approximately 9 feet of the tree directly above the saw cuts remained vertical on the stump. A 16-foot section immediately above the bottom 9-foot section was pushed backward downslope.

Backcut Undercut



Photo 6: Low side of tree

Undercut 5-inch Dutchman Backcut (black arrows)



Photo 7: High side of tree, showing Dutchman



Undercut showing poor sighting relative to backcut (dotted line)

Photo 8: Undercut showing poor alignment

1.4 Faller training and supervision

The faller had been employed as a manual tree faller for more than five years, most of the time as a faller for his employer at the time of the incident. He was a certified faller. He was described by his co-workers as conscientious, meticulous, and cautious as a worker.

In the fall of 2005, the licensee had undertaken observation surveys of manual falling activities of both company and contractor fallers, including the falling company involved in this incident. This was performed by a qualified supervisor trainer employed by the licensee. The surveys were made available to the company and contractor falling operations that were observed.

The surveys identified significant deficiencies in the manual falling practices of some of the companies that were evaluated. Although deficiencies were addressed in the weeks following the survey, a formal written response from the licensee was sent to its operations and contractor fallers on in the week preceding the incident. The licensee considered the overall level of compliance with the BC Faller Training Standard was considered to be poor. To remedy this, it was felt that strong, effective, on-site supervision was required through properly trained and qualified bullbuckers.

The bullbucker for the contract falling company involved in this incident has approximately 40 years of experience in the forest industry, 20 of these as a bullbucker. He supervises the falling activities and was the supervisor on the day of the incident. In the two months prior to the incident, the bullbucker had made consistent observations of the falling practices. When deficiencies were identified, the bullbucker discussed them with the fallers. No significant falling practice deficiencies were recorded for the faller involved in the incident.

2 Analysis

The analysis focuses on the faller's selection, risk assessment, and falling of the hemlock danger tree. Supervision was ruled out as a factor in this incident.

2.1 The faller's injuries

The faller's injuries were consistent with being struck on the head by the 16-foot section of the hemlock danger tree as he moved downhill on his escape route. Some of the damage to the hard hat may have resulted from crushing by the section of the hemlock danger tree once the hat had fallen to the ground. It appeared the faller was heading toward a grove of trees, approximately 10 feet further downhill. The location and position of the faller's chain saw indicated he probably dropped it at the same time as or just before being struck by the tree.

2.2 The decision to fall the danger tree

At 1010, the faller asked his partner for help in freeing his chain saw from fir tree he was bucking. The faller likely chose to fall the hemlock danger tree immediately after he received this assistance.

There are some issues that may have influenced the faller's decision. A small cedar he previously felled may have brushed the hemlock danger tree. From the access road just prior to beginning work, the faller had discussed the hemlock danger tree with his partner as a possible source of firewood. Fallers sometimes have a fire at lunchtime for warmth, and this may have been the intended use of the tree when firewood was discussed.

The hemlock danger tree stood uphill of the falling face in standing timber, likely with an uphill lean into the standing timber. The tree could have been bypassed and left for the mechanical falling process. It is not known how thoroughly the tree was assessed by the faller, although it ought to have been evident from its physical condition, including deterioration of limbs, the lean, and fungus growth, that falling it would entail high risk. It may have been because of the tree's poor condition and/or the

possibility that it had been brushed by the previously felled small cedar that the faller decided not to leave it as a risk to others. Use of the tree for firewood cannot be ruled out as a possible reason.

2.3 Why the danger tree broke apart when it fell

Although the tree may have begun to break apart before the faller's cuts were completed, it is likely that the tree began to fall in the intended (uphill) direction as planned by the faller. The normally steady motion of the falling tree would have been almost immediately impeded by the 5-inch Dutchman. With a Dutchman, the unclean portion of the cut closes at the forward edge and the tree might hesitate or rock, thus generating a significant shock or jarring up the length of the tree and initiating the breakup of the tree. The top portion fell substantially uphill as planned, but the middle 16-foot section, supplied with a large amount of energy by the movement of the upper section, kicked back in the opposite direction, striking the faller. The bottom 9-foot section, which acquired very little energy or experienced very little movement in the process, simply sat back upright on the stump.

2.4 Unsafe work practices in falling the danger tree

The qualified supervisor trainer who carried out the licensee's observation survey in the fall of 2005 conducted an evaluation of the deceased faller's practices following the incident. Overall, the falling cuts and falling and bucking processes that the faller carried out on the day of the incident were found to be acceptable to good. However, the survey identified significant deficiencies in the process of falling the hemlock danger tree. These included falling into standing timber, planning an inadequate escape route, falling from the low side of the tree, and making improper cuts (for example, creating the Dutchman).

This investigation was not able to clearly establish why the faller approached the falling of a tree in such an unsafe manner. The chain saw cuts performed by the faller on the hemlock danger tree were clearly identified as substandard. His escape route, on the tree's low side, took him through a high-risk area in the event the tree broke apart. This faller was known for his quality and safe work. Observations of his work practices—even up to the last tree that he felled before approaching the hemlock danger tree—did not identify any significant or consistent deficiencies in his work.

However, the hemlock may have represented an interruption in what was otherwise a productive morning of felling marketable timber. There was also the work interruption, when he had to call his partner to free his chain saw while he was bucking the fir, but there is no evidence of time constraints on the fallers on the day of the incident.

The faller may have assessed some of the hazards but made assumptions about how the tree would fall based on his previous experiences. A human factors specialist involved in the investigation stated that previous experiences can have a strong influence on a person's ability to make decisions. Falling is guided by rules, planning, and judgments. The faller may have believed that the condition of this particular tree was similar to another that he had successfully felled and he therefore chose and applied the same strategy to fall it. Even if the characteristics of the tree had been misinterpreted or the plan was

inappropriate, plans of this nature are conducted with a high level of confidence and once set there is a strong reluctance to deviate from the original plan.¹

Considering the frequency with which fallers deal with danger trees, it is likely that the faller's level of perceived risk is lower than the actual risk.² If the faller had not experienced any serious negative consequences on previous occasions when falling danger trees, it is unlikely that he anticipated the possible things that could happen to this tree when he formulated his plan to fall it.

3 Conclusions

3.1 Findings as to causes

The faller was struck by a section of a hemlock danger tree that broke off and did not fall as intended.

3.2 Findings as to underlying factors

3.2.1 *Unsafe work practices*

The faller performed unsafe work practices and used a high-risk escape route when falling the hemlock danger tree.

3.2.2 *Danger tree risk assessment*

The faller may not have performed an adequate risk assessment to identify all the hazards inherent in the hemlock danger tree.

3.2.3 *Elimination of danger tree hazards*

The faller may have identified some of the hazards inherent in the hemlock danger tree, but if so, he failed to take the appropriate actions to mitigate or eliminate the hazards.

3.2.4 *Perceived risk*

The faller had successfully felled many danger trees in the past. He may have made some assumptions of risk based on his previous experiences in falling similar danger trees. The faller may have perceived his risk to be lower than the actual risk.

¹ J. Reason, *Human Error* (Cambridge: Cambridge University Press, 2003). p. 90.

² S.E. Geller, *Working Safe: How to Help People Actively Care for Health and Safety*, 2nd edition (Florida: CRC Press, 2001), p. 59.

4 Health and Safety Action Taken

In addition to the specific actions below, employers, workers, or others in industry may have taken measures to prevent a recurrence of this type of incident. Employers are expected to comply with any orders issued. At WorkSafeBC, the Lessons Learned committee examines recommendations from incident investigations to see what can be done to prevent similar incidents.

4.1 Licensee

As a result of this and other incidents involving danger trees, the licensee established a group of company and external individuals, including a representative from WorkSafeBC, to support the licensee's "Snag Team" in its review of the danger tree management by company and contract fallers. A comprehensive report with recommendations, the *Management of Dangerous Trees*, was released in September 2006 and is available on the B.C. Forest Safety Council's web site:

http://www.bcforestsafe.org/content-nav-alerts/alerts-06-09-05-wft_bulletin.pdf

Copyright

© 2007 Workers' Compensation Board of British Columbia. All rights reserved.

WorkSafeBC (Workers' Compensation Board of B.C.) encourages the copying, reproduction, and distribution of publications to promote health and safety in the workplace, provided that WorkSafeBC is acknowledged. However, no part of this publication may be copied, reproduced, or distributed for profit or other commercial enterprises or may be incorporated into any other publications or product without written permission of the Workers' Compensation Board of B.C.