Mildred Lakes Chainsaw Incident - Description, Analysis, and Recommendation

Overview

Date: 11 June 2023, ~14:00 PDT   Location: Mildred Lakes Trail, Olympic Peninsula, WA
Saw Type: Chainsaw
Saw Team: C-sawyer (lead), A-sawyer, and a non-certified swamper
Injuries: Fractured ankle and left leg contusions

Narrative

The crew was assigned to clear trees from the Mildred Lakes trail in the Mount Skokomish Wilderness. The accident occurred approximately ¼ mile from the trailhead about 40 ft from the trail. While the saw team lead was completing a release cut of the upper of two stacked, 20” DBH trees with a chainsaw, the butt section of the released log moved sideways towards the sawyer, fell off the lower tree and struck the sawyer’s left thigh, knocked the sawyer off their feet and pinned their left thigh, shin, ankle and foot to the ground.

Emergency Response

Both of the other members of the three-person saw team witnessed the incident. The sawyer self-extracted and repositioned to the trail. Saw team members (WFA trained) assessed the patient and applied ice to the contact point on the thigh. The crew lead working on a different saw team nearby was notified and arrived at the scene. About 20 minutes after the injury, the sawyer attempted to bear weight on the leg and reported extreme pain in the ankle. At this point the crew lead initiated emergency notification procedures to request assistance with evacuating the sawyer. Communications methods attempted were an inReach device, VHF radio via repeaters, and dispatching a crew member to return to the trailhead and then drive into mobile phone range to call 911. From the time of the injury, contact with SAR was confirmed after 2.5 hours, EMS and SAR reached the patient at 3.5 hours, and the patient arrived at the hospital at 8.5 hours. At the hospital, the patient was found to have a fractured left ankle and is expected to recover.

Factual Information

Figure 1 shows the configuration of the two trees prior to the cut.

The lower tree (20” DBH) was 120+ feet long lying across the trail. The butt end was completely severed from the standing snag from which it had fallen. About 60’ from the butt end, the lower tree was supported by a 3 ft high stump such that the remaining section past the stump was largely, or entirely, cantilevered. Side bind was present from contact with three standing trees, the stump, and support from the root wad of the upper tree.

The upper tree had a completely detached root wad resting on the ground. The upper tree had fallen on top of the lower tree, though the root wad was trapped under and supporting the butt end of the lower tree. The upper tree was directly above the lower tree as it crossed the supporting stump. The sawyer was working from the near side of the logs as shown in figure 1.

Both trees looked newly fallen, based on moss-growth patterns, similarity in appearance of the bark to that on standing live trees in the area and lack of any new brush growth around the fallen trees.

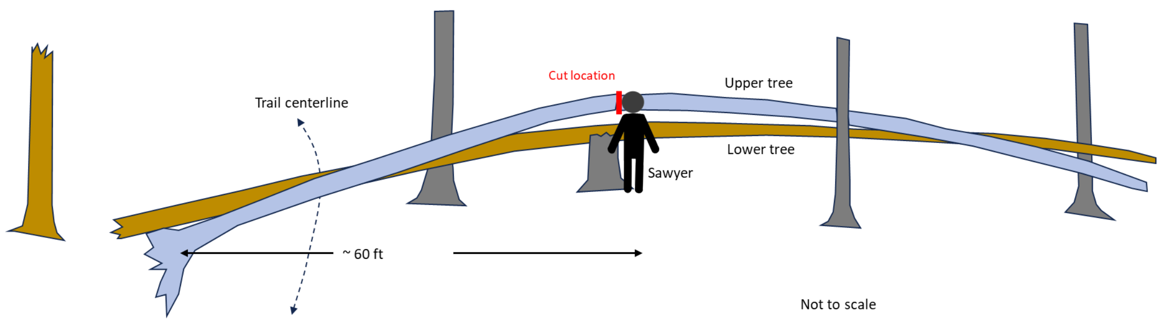

Figure 1 – Configuration Prior to Cut

The upper log had at least four points of contact providing side bind. From left-to-right these were: the weight of the root wad pinned by the lower log, side-to-side contact with the lower log, and two trees to the right of the stump location.

Figure 2 shows the configuration after the cut. Upon release, the left-hand portion of the upper tree moved towards the sawyer and dropped to the ground, striking the sawyer. The right-hand portion moved away from the sawyer, pivoted on the lower tree and rolled down the slope, coming to rest about 40 ft from the cut location.

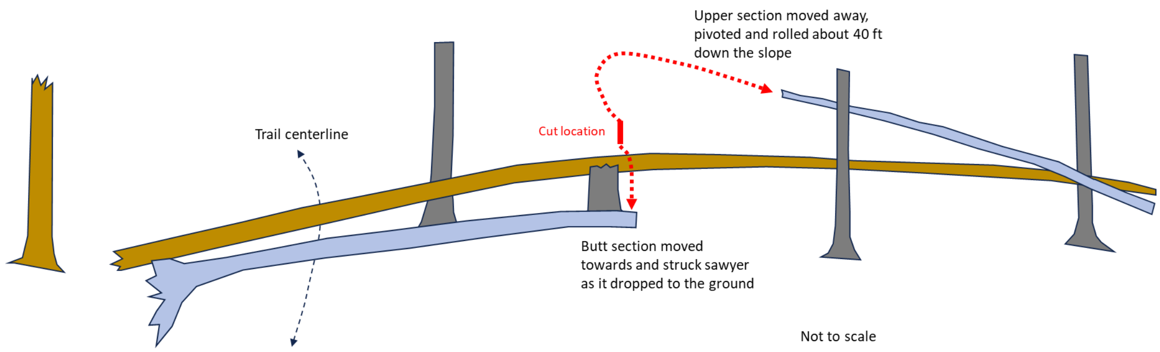

Figure 2 – Configuration After Cut

Scene Photos

Note: Photos have been altered to redact identifying information.

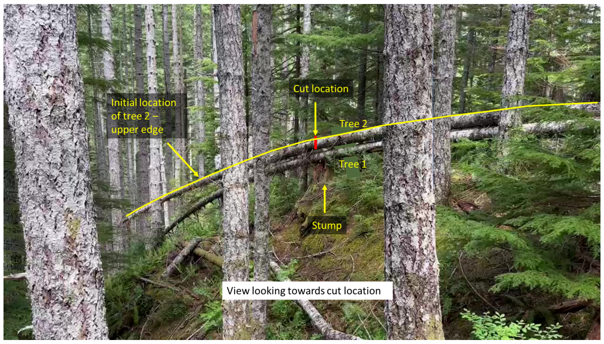

Figure 3 - Cut location prior to cut. Sawyer is located on the far side of the trees in this view.

Figure 4 - Initial motion at release

Figure 5 - Subsequent motion of cut sections

Figure 6 - Final location of cut sections

Analysis

At the moment of release, the sawyer was in the path of the upper log as it released and fell to the ground. Although not one of the named steps in the OHLEC process, motion of the tree post-release is relevant to four of the five steps.

Hazard: The motion of logs after the cut is one of the hazards that must be considered anytime a cut is being planned.

Leans and Binds: For bucking, evaluation of binds is central to Thinking Sawyer training. Binds are the result of residual stress within the log. The same residual stresses contribute to post-release motion. However, analysis of the binds alone is not sufficient to predict the motion of logs. See more detailed discussion below.

Escape Plan: The escape plan must consider the potential motion of the log (or logs) post-release.

Cut Plan: The resulting cut plan needs to consider all the knowledge gained during the OHLEC process, including the potential motion of logs post-release.

One purpose of the OHLEC process is to aid in determining the overall complexity level of the cut - which the saw team should then compare to their ability level in making the proceed or walk-away decision. Potential motion of the cut segments is an important consideration in determining the overall complexity level.

Recently wind-thrown trees often have a significantly higher degree of stored energy, which requires a great deal of caution as it often results in more motion after each cut is made.

During the OHLEC process prior to the incident, the saw team discussed the side bind in the log and the resulting potential for motion. However, they were surprised by the magnitude of the motion that occurred. Their surprise may have been primarily due to the limited experience of the A Sawyer and the uncertified swamper, but it could be reasonably expected that a C sawyer would have knowledge of variation in bind dynamics in freshly fallen trees versus trees that have been down a long time. The C Sawyer involved in this incident acknowledged that he knew the tree could move toward him, but in the adrenaline of the moment, stepped into the "bad" side of the cut.

The release of the side bind was only one of the forces acting on the log. As the butt section of the cut log slipped off the lower tree, it was accelerated towards the sawyer by a combination of gravity and continued contact with the lower tree as it pivoted around the root wad.

Discussion

The evaluation of binds is central to Thinking Sawyer training for bucking operations. Binds are the result of residual stress within the log. The same residual stresses can also lead to post-release motion. However, analysis of the binds alone is not sufficient to predict the motion of logs. The example below shows two situations where the motion of the log segments differs even though the bind state at the point of the cut is similar. Figure 7 shows a side bind configuration resulting from three points of contact.

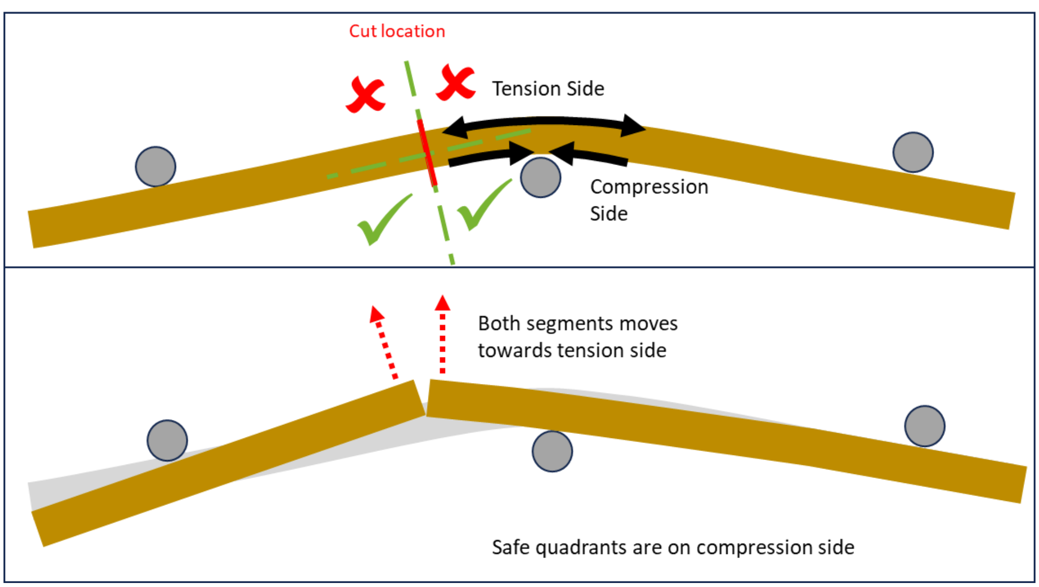

Figure 7 – Side bind with three points of contact and resulting log motion

In figure 7, the motion of the log segments will be towards the tension side of the bind. For this simplified situation, there are two safe quadrants, both on the compression side of the bind. Further, the kerf will begin to open on the tension side before the cut is complete, providing an advance indication of what's about to happen when release is complete. In sawyer training, the compression side is sometimes referred to as the "good" side of the log - which may lead students to conclude that potential motion of the log will always be towards the tension side. In this situation, that is indeed the case, but it is not a valid generalization.

Note that there may be other factors not shown in this simplified example (such as slope) which may affect the determination of the safe quadrant(s). As a result, there may be only one or perhaps no safe quadrants. If you can't positively identify a safe quadrant, that's one indication of a walk-away situation.

Figure 8 shows a more complicated situation with four points of contact.

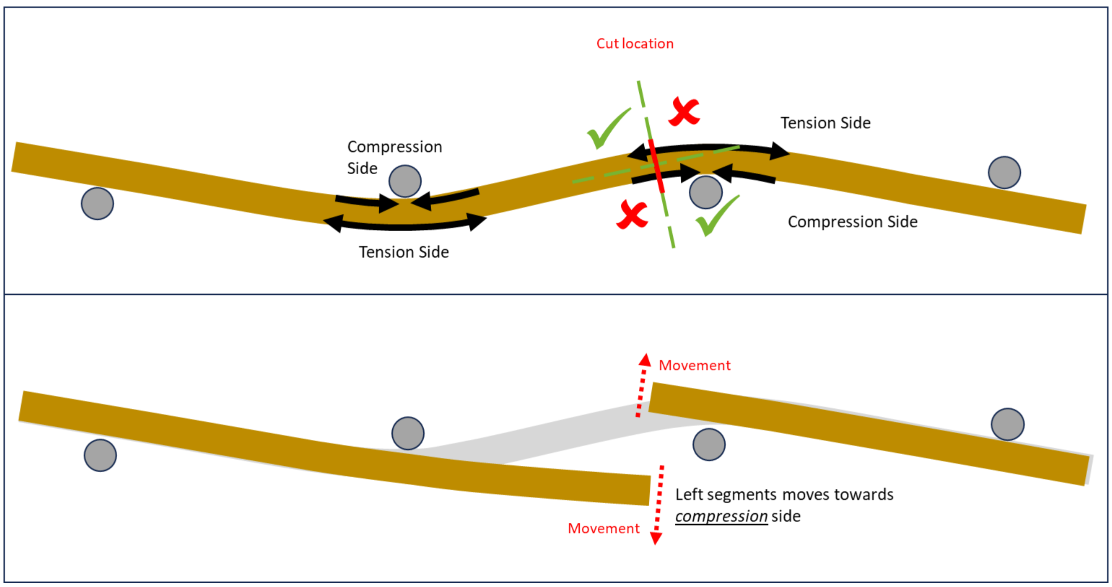

Figure 8 – Side bind from four points of contact

In figure 8, any cut between the two center contact points will result in the left-hand segment of the log moving downward. At the specific cut location illustrated, the left-hand segment will move towards the compression side of the bind, which in this case is not the safe side of the log. At certain locations between the two center contact points, there may be no side bind present, no tendency for the kerf to open more on one side or the other, and no tendency for the log to begin moving until the cut is completed. The sawyer may misinterpret the lack of apparent side bind as an indication that motion is unlikely or will be limited.

Again, there may be other factors not shown in this simplified example (such as slope) which affect the determination of the safe quadrant(s).

For the situation confronting the incident saw team, predicting the post-release motion required a careful analysis of the binds, the potential for increased stored energy due to the recently-downed, wind-thrown nature of the trees, the geometry of the two trees, the location of supports, weight distribution, the potential for the upper tree to fall off the lower tree, and how all those factors would change as the release cut was made.

Of course, the identification of unsafe quadrants and safe zones is only the first step. If these zones are not respected by the saw team during the cut, and especially to the moment of release, fatalities or injuries are likely to occur.

Lastly, it is also important to consider the total experience level of the saw team when making cut/no-cut decisions. With a high complexity B scenario, one C sawyer and a less experienced saw team may be sufficient. However, with a high complexity C scenario, a more experienced saw team including experienced B sawyers or another C sawyer may have identified the newness of the windfall and suggested steps that resulted in a safer outcome.

Lessons Learned

Because of the importance of explicitly considering potential motion of the logs post-release, there may be advantages to explicitly including motion when completing an OHLEC analysis. The natural place to begin a discussion of motion is in the Leans-and-Binds section as the analysis for binds is an important part (but not all) of the analysis necessary to predict motion. One proposal is to consider that the "L" stands for Leans, Binds, *and Motion*. Then the potential motion can be considered in the Escape Plan and Cut Plan portions. This provides two potential benefits for bucking. First, it includes an explicit reminder that analysis and discussion of motion is integral to OHLEC. Second, by separating it from Binds, it may help dispel the incorrect assumption that bind analysis alone is sufficient to predict motion – for example, there is no consistent "good side" of the cut when considering side bind. For felling, the idea of motion is already central to the operation of felling, so the addition of "motion" to the "L" step may not provide the same level of benefit. However, it does no harm either.

The geometry of the two entangled trees, including the supporting stump, and multiple side binds created a complex bind situation and the potential for significant motion at the moment of release. Recently fallen, wind-thrown trees often add significant stored energy to the situation which often results in dynamic motion upon release.

After the complexity of the cut has been determined taking into account the factors described above, the capabilities, experience level, and fatigue level (both physical and mental/emotional) must be honestly evaluated when making the cut/no-cut decision.

Lessons Learned:

1. When conducting the "L" step of OHLEC, explicitly include a discussion of the potential motion of logs post-release. "L" can be considered "Leans, Binds, *and Motion*".
2. Consider that recently fallen, wind-thrown trees often have a significantly higher degree of stored energy, adding to the complexity of the cut.
3. After completing the OHLEC analysis and determining the complexity of the cut, the sum of the team's knowledge should match the complexity of the log and should be considered when making cut/no cut decisions.