



Crystal Lake Felling Operations

Facilitated Learning Analysis

CA-ANF

R-5 Southern California Geographic Area

On 9/26/2011 an Interagency Hotshot Crew (IHC) was conducting felling operations at Crystal Lake Campground on the Angeles National Forest. The operations were related to a fuel reduction project to improve forest health and campground safety by removing mortality trees.

A saw team consisting of a “B” certified sawyer and “C” certified instructor were attempting to fall a 42 inch, diameter at breast height, Ponderosa Pine (*Pinus ponderosa*). The 100 foot tree setback on the saw team and fell in the opposite direction they had planned. As the team was escaping from the felling tree the instructor was hit by a large branch of the tree and suffered thirty-six stitches to the ear area and six stitches to the back of the head. He was evaluated and released the same night, the sawyer was uninjured.

The IHC began their day at their home base and traveled approximately one hour to the project site. Once at the site they conducted a safety briefing including a job hazard analysis and the instructor dropped a tree. They then formed up into saw teams with the most experienced fallers’ acting as instructors for the less experienced.



One saw team felled a tree and began to size up a second snag. During their size up they determined that there was no predominant lean to the tree so they elected to fell the tree in the clearest path up slope. The tree was bore tested and found to have about 3 to 4 inches of rotting wood along the edges of the bole. The rest of the bole was sound. They also recognized they would be under bared for the tree. Although there was a 42 inch bar available to them the sawyer elected to stay with the 36 inch bar because of the terrain and he needed more experience with the double cut technique.

Under Bared: Bar length was less than the diameter of tree.

Double Cut: Using two horizontal cuts and two sloping cuts from opposite sides of the tree.

The team began to struggle with initial cuts and **the horizontal cut** ended up being over 1/2 the diameter of the tree rather than the desired 1/3.

There was difficulty lining up **the sloping cuts** which led to more than one *kerf*. This caused some confusion for the sawyer as he put the bar into the wrong kerf. While cutting in the wrong kerf, the sawyer severed 3/4 of his intended holding wood. The instructor, standing next to him, did not recognize the holding wood was severed.

The undercut **wedge of wood** took approximately 45 minutes to remove and was not completely cleaned out. The team left a kerf attached which hid the cut into the holding wood.

Because they were under bared they began the **back cut** by inserting a corner cut and set a wedge on the off side. They carried the kerf around, dogged in and continued the back cut and set wedges as there was room. The sawyer squared up and cut to the holding wood he perceived to be in place. At this point the tree set back.

Horizontal Cut



Sloping cuts were not cleaned from the bole.

This prevented the team from seeing how deep the cut went and that it had severed their holding wood.

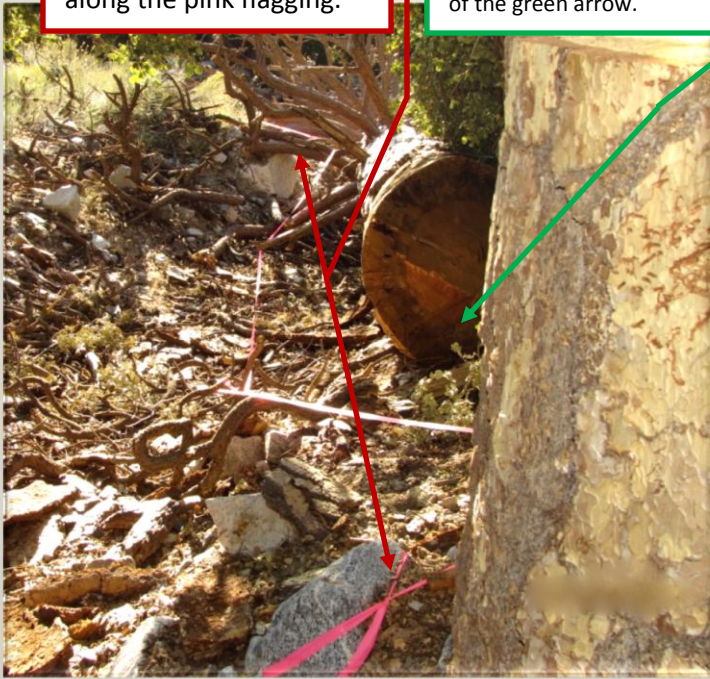


Wedge of wood shows more than one kerf.

Kerf: Width of the saw cut. The void left behind in the wood as the blade/cutter passes.

The instructor escaped along the pink flagging.

Instructor believed the tree was falling in the direction of the green arrow.



When the tree set back they attempted to wedge the tree up but they were “dead wedging”. They then removed some of the center holding wood to see if this would allow them to get more lift with the wedges. The instructor told the sawyer to “tickle” the holding wood. The sawyer had to cut his way in and severed ½ of the remaining holding wood and the tree began to back fell.

Instructor ran 46 feet before impact at this location.



“I felt my bar get stuck, heard the instructor yell something, I tried to pull my bar out but it was stuck! I looked up saw the tree starting to come right over me and then bailed to my secondary escape route!”

-Sawyer

“ I heard a hoot, saw the wedge squirt out, I looked up and saw the tree falling from its intended lay, I shouted at the sawyer to get the hell out of here, and escaped down our primary escape route. As I was escaping I looked back and I could see the tree was coming down on me... -Instructor

Dead Wedging: Driving on a set wedge with no movement in the wedge, causing the driving tool to bounce back.

Tickle: To cut small amounts of wood with the tip of the bar.

After impact the instructor was treated by two Emergency Medical Technicians and one Paramedic, all of which were IHC members. A medevac air ship responded to the scene and transported the instructor to the hospital.

As instructor, I should recognize complexity level of the operation and assess risk vs. gain. Although the sawyer may feel comfortable with the added risk of having the complexity of the operation raised and to a higher level with small margin for error. I still need to weigh the gain and be prepared to shut down the training session.

- Instructor

Right after I was injured the crew jumped in to treat me. My adrenaline was pumping and I was on the verge of getting foggy. The next thing I knew I was on a backboard, wearing a "C" collar and was being treated by the professionals on my crew, they did a great job.

- Instructor



If I had not taking that second glance back to validate my impression of the direction of fall the outcome would have been much worse. When "WHAT IF" happens, be prepared.

- Instructor

If I'm instructing in the future, I will check each kerf from the saw to ensure presence of actual holding wood, especially when implementing a double cut method where multiple kerfs are present and may be hidden to ensure a completely cleaned out under cut.

- Instructor



On a setback tree, what are my options?

If you find yourself with a tree which has setback you must first reevaluate your escape routes as the primary route may now be compromised.


If you are unable to drive wedges to lift the tree back up into the undercut, you have the option of using a drive tree (nearby tree that can knock the first tree over). Insure there is good holding wood in the corners and wedges are in place for this technique.

Back fell the tree. Fell the tree in the direction it wants to go. Start a new undercut and back cut.

If control is lost on a felling tree, give it an extra second to confirm the direction the tree is committing to before choosing the appropriate escape route.

Observations from the FLA Team

- As an agency, we all have a duty to succession planning by maintaining the integrity of our felling programs. To meet the demands of wildland fire, crews often challenge the comfort level of their troops. Using a bar long enough to fell this snag may have been efficient for the project but not for the sawyer who finds himself on the fireline consistently under bared for the trees at hand. The skills being taught on this project were very much in line with those needed for a “C” faller certification.
- The IHC was conducting felling operations with more than one saw team. At the time of the accident another “C” instructor ceased the lesson, took ownership of the saw, finished the back cut on the tree and fell it safely. The instructor assumed the responsibility to take the saw when it was no longer a learning environment.
- The communications between the sawyer and instructor were strained and were compounded by the use of jargon. Instead of asking the sawyer to “tickle it”, he may have rather used direct language such as, “take another 1-2 inches out”. Crew members noticed the setback occur from a distance and began to “hoot” at the saw team. For this reason, some IHC’s are now exploring the use of sawyers wearing an earpiece attached to their hand held radio.
- Human factors tell us the stress and fatigue built up from the 45 minutes under the tree working to get the undercut in. This added stress may have made them anxious to get the back cut in and get the tree on the ground. A tactical pause would have slowed things down and would have helped to unwind and take the time reevaluate before moving on to the back cut. The importance of cleaning out the undercut and checking the sloping cut kerf left in the bole of the tree to insure that it didn’t affect the holding wood proved critical.

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- When the tree sat back it should have been an indicator something may have been missed. When deadheading the wedges it should have confirmed what the sit back was saying and that it may also be a heavy or severe sit back. If you can't identify an obvious or predominant lean when you size the tree, then in most cases you should be able to fell the tree in any direction as long as you're bringing the wedges while you cut. When you are experiencing a lot of trouble wedging you need to reevaluate the situation and consider some alternatives.
 - It is always important to have escape routes and safety zones. When a tree sets back the escape routes and safety zones should be discussed and reevaluated so that the instructor and trainee are escaping together. If you lose control of a tree you need to take the extra couple of seconds to make sure you know the direction the tree is committing itself to, then escape to your alternate "what if" escape route together to the safety zone. We teach to insure that the tree is committed to the undercut then escape to your safety zone. Taking the couple of seconds to identify where the tree is going before you escape would be doing the same thing. Make sure you are identifying alternative "what if" escape routes and safety zones during your initial size up.
 - Both the instructor and the trainee were qualified for the job they were doing. During the After Action Review and during the stump analysis both the instructor and trainee were able to describe the tree felling procedures and their thought process very well. It was quite apparent that they were both well trained and understood the felling process.

Facilitated Learning Analysis Team Members wish to thank the IHC for their openness and support during this FLA:

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