



A lesson is truly learned when we modify our behavior to reflect what we now know.



Chainsaw Safety and Snag Falling Lessons Learned

Part 2 of 2

This is a continuation from Scratchline Issue 16

Twelve journeymen chainsaw operators including regional saw program coordinators from the federal fire agencies and the private sector were recently interviewed regarding their notable successes, most difficult challenges, effective practices, and most pressing safety issues in chainsaw operations with respect to Lookout/Communications/Escapes Routes/Safety Zones (LCES) and Situational Awareness (SA). Special thanks are extended to these subject matter experts for sharing their important lessons and practices with the wildland fire community.

Effective Practices

Importance of Sizing Up

Begin the falling process with the most important step, sizing-up-up the tree, which includes evaluating the tree itself and determining hazards in the area. Determine the lean for a felling direction because the tree will go with the lean.

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Establish an escape route running at a 45-degree angle from directly behind the tree, preferably from the “good side of the tree.” When the tree has both a side and front/back lean, make an open-faced notch, a 70%-90% side plunge, and establish holding wood. During this process, remember to be continually aware of the danger of limbs falling down from above.

The Approved Basic Techniques

The sawyer’s first objective should always be to decide whether a tree should come down. Complete a good size-up and look at overhead hazards presented by the snag as well from other trees in the area. Ask yourself, “Do I need to be cutting in this tree?” Weigh the risk. If it is low, cut the tree.

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The Approved Basic Techniques (continued)

If not, mitigation is in order. Another question to ask is, "Do I have good fiber in the tree to establish sufficient hinge height or holding wood?" Although the final decision is up to the sawyer, they need to seek input from other sawyers or a falling boss when they are unsure.



Open
Face

Conventional
Face

Humboldt
Face

If you decide to fall the tree, use one of three approved techniques in the S-212 Wildland Fire Chainsaws course:

1. **Open Face** (like a Pac-Man) The open-face notch is cut to at least 70° (ideally 90°), with the top cut being angled downward 70° and the bottom cut angled upward 20°. The back cut is horizontal and at the same height as the corner of the notch.
2. **Conventional Face** - One of the types of undercut (face) commonly used to fall a tree. The undercut (face) is at least 45° made up of one horizontal cut and one sloping cut that meet each other without overlapping.
3. **Humboldt Face** - One of the types of undercuts (face cuts) commonly used to fall a tree. The 45° sloping cut (face) section is removed from the stump of the tree.

Boring Backcut

The "boring backcut" technique prevents a tree from barber chairing. There is no need to rush, and it is important to take time to examine the tree, because the "boring backcut" is an advanced technique. When falling a tree with a moderate to heavy lean and an unstable top, insert a moderately shallow face cut less than 1/3 of the tree's diameter in depth. The sloping cut should be angled sufficiently, to provide a wide undercut opening. Begin the boring backcut using the tip of the chainsaw bar, and boring through the tree horizontally behind the holding wood. Next, turn the chainsaw over, with the bottom of bar pointed to back of tree and saw toward back of tree when there is adequate space available behind the holding wood and insert a wedge in one or both corners of the backcut. Continue sawing until a couple inches of sapwood remain. Stop sawing, reexamine your escape route, give a warning shout, and then completely saw out the back of the tree and escape the stump.

Remember to complete all cuts from one side of the tree, wherever you are most comfortable. Do not stand under different parts of the tree, as this will increase the odds of getting hurt.

One Good Decision

Safe falling is all about the assessment of the hazard tree. Falling accidents often result from a succession of poor decisions. An accident on the Timber Rock Fire of 2002 provides an example. Someone made a request to fall a large tree after five attempts at cutting it had already been made. Bad decisions compound each other, and the risk increases with each mistake. Sawyers only get one good opportunity to fall any hazard tree, and mistakes that compromise the structural integrity of a tree cannot be fixed. If the assessment is bad from the beginning, the result will not be successful.



Leaner tree before boring backcut
Courtesy of NWCG S212 Course

Swamper Positioning

Many innovative ideas have changed our work environment. The Situational Awareness Worksheet, now standard in falling operations and fire suppression, provides one example. The concept of “two at the stump” represents one area where we are discussing our practices and making innovations. While some veteran sawyers feel they are safest with someone at the stump to assist them, others are generally inclined to have everyone in the safety zone before finishing the falling operation. Of course, many of us follow both systems depending on the specific situation. So, rather than debate the pros and cons here, we will strive to present ideas and lessons learned from a broad group of experienced sawyers.

A two person falling team can position the swamper in different locations. Some veteran chainsaw operators believe the swamper should be next to the sawyer while they are cutting, to enable and maintain good situational awareness. When working this way, the swamper’s eyes should always be on the top of the tree, and the swamper verbally confirms this by telling his sawyer “I’ve got eyes.” The swamper places his hand on the sawyer’s shoulder and, if he taps once, they need to talk. If the swamper pulls on the sawyer’s shirt, it means, “Let go of saw and follow me now!” It is the swamper’s responsibility to direct the sawyer out of the danger zone, using one of the established escape routes.

Other veteran saw experts believe that agencies should adhere to the OSHA logging regulations under which the employer bears the burden to demonstrate why two people, a sawyer and a swamper, are needed at the base of the tree during falling operations. (Note that these OSHA regulations do not currently apply to wildland fire.) Some saw experts agree with OSHA’s regulation, believing that, except for very rare occasions, a professional faller needs to be alone at the base of the tree. These exceptions might include large west coast and Alaskan trees, when two people are needed at the base. Other exceptions include situations where the certifier needs to be at the base of the tree, or when a crosscut is being used which requires two people to operate the saw. The swamper/lookout needs to be 2 and ½ tree lengths away to watch the hand or dozer line and keep personnel away from the area. For more specifics on the safety issues involving swamper positioning go to:

http://www.wildfirelessons.net/documents/Additional_Information_Swamper_Positioning.doc



Courtesy of USFS Fire Operations Safety Council



Courtesy of NWCG S212 Course

Listen to Your Gut

During the Missouri Ridge Wildland Fire Use event in September 2005, firefighters had put in a saw line early in the incident, anticipating that the fire would reach the ridgeline. The line was also in the best place to hold the fire once it reached this area. Three weeks later, the fire had moved to within 100-300 yards of the pre-established line, and the plan for the day was for three saw teams to work the top, middle, and bottom of the control line, removing hazard trees and preparing for burnout operations. They were contour falling, perpendicular to the slope.

One sawyer, in the middle saw team, had cut four trees before approaching the fifth. Three were leaners, two of which were hung up, and two were “cigar butts” (trees that

broke off half-way). For whatever reason, the sawyer had a gut feeling telling him “don’t do it,” but he could not see anything different about this tree in his assessment. Even though his gut instinct told him not to fall the tree, he went ahead. The sawyer released an eight-foot section of tree using the “step cutting” procedure. As the eight-foot section released and hit the ground, the top 21 ft. of the tree broke out, striking him on top of the head, causing injuries that made him lose his memory for two weeks. Looking back on his assessment of the tree, he feels that it was identical to the others, same soundness, same height, same DBH, same cracks. He looked for bugs, rot, and widowmakers too. The position of the leaner in the tree may have been different. The lesson learned is to “listen to your gut, it really means something!”

To Fall or Not to Fall?

With any tree, the faller must first complete a thorough assessment to decide whether the tree needs to come down. As part of this assessment, the sawyer must ask him or herself "Is the tree leaning on another tree?" In many cases, if the tree is well hung-up, it may not come down for 30-40 years. In other words, it does not need to be felled.

The saw team should not only focus on large old snags, but all trees including small trees in the understory. Unfortunately, ninety-five percent of fatalities and serious injuries are from these small-diameter trees. Nineteen saw team fatalities have resulted from small diameter trees. Trainers and examiners must emphasize the dangers of falling understory trees because sawyers, swampers, and other wildland fire personnel tend not to be intimidated by these smaller diameter trees and treat them with complacency.

Determining whether the tree needs to come down is the key factor. Alternatives to falling the tree include blasting or stacking a pile of wood at the base and burning the tree down. Burning works well to remove trees with large cat faces on them. Determine who flagged the hazard trees, let them know which ones you do not plan to fall, and inform them of why you made this decision.

Sim Limb / Top Drop Exercise by Paul Chamberlin

Snags and defective live trees, particularly those weakened by fire, kill or seriously injure forest workers and firefighters every year. Victims report these events occur extremely fast.

Utilizing a flag pole and dummy soft limb, years of close-call experiences will be compressed to an hour. This attention-grabbing demonstration reveals the actual timing of a falling limb or top, making it apparent that a lookout cannot shout over the saw motor. The limb is a fabric tube stuffed with crumpled newspaper, released by a slip knot and trip line.

National saw experts teach direct sawyers to be "looking up", only occasionally checking the saw and kerf. Even when not sawing, seasoned woods workers habitually look up, appearing distracted from polite conversation.

A soft 'limb' is hoisted up the flag halyard and a PPE equipped sawyer operates a chainless saw, pretending to fell the pole, while the saw motor is running. A lookout is assigned to shout when the dummy 'limb' falls. The soft-limb hitting the bar will be the sawyer's first indication that the limb has been released.



Courtesy of NAFRI Audio/Visual

This is the most powerful moment, when everyone immediately understands the timing reality of falling limbs and tops, and the absurdity of trying to out-shout a chainsaw.

Experts advocate looking up. Period. This exercise is perfect for comparing the actual times and safety margins. A lone individual will be able to side step a falling limb or top, but the margin is measured in a very few feet. Any extra steps for recognition, communication and reaction quickly negate that margin. Other lookout strategies may be tested, such as whistles, air horns, stones and pinecones, etc.

We hope firefighters nationwide will participate in this outside, interactive, and fun simulated exercise. Ski bags or rifle scabbards stuffed with newspaper can be assembled at each unit; fortunately, all stations sport a flag pole!

For more information, look at the complete issue paper at:

<http://www.wildfirelessons.net/documents/Soft-Limb-Synopsis-1-30-06.pdf>



Rope Technique
Courtesy of John Elliott, USFS



Rope Technique
Courtesy of John Elliott, USFS

The Rope Technique

The “rope technique” keeps the sawyer away from the base of the tree when the butt of the tree can come back at the faller. When the sawyer needs to remove a hung-up tree or leaner, it is best that the sawyer make the face cut in the direction they want the tree to go before using the rope technique. Once their face cut is in, the sawyer ties a rope around the lower section that they plan to release. The faller begins their backcut, paying particular attention to the rope now tied around the lower section, and continues their backcut until they see the kerf starting to close. When the kerf begins to close, the faller removes their saw. The sawyer must remember to look up as they move a safe distance away with their rope. Once the faller is a safe distance away, they and their saw partner give the rope a firm pull, which should remove the section of the tree in which the faller made their face cut. This technique works extremely well to remove the faller and their saw partner from a potentially hazardous situation.

Pressing Safety Issues

Understanding Complexities

A pressing safety issue involves keeping sawyers and swampers working only within their abilities based on their training and practical experience. Sawyers need to understand the complexity of various tree falling operations, and relate those complexities to their training and personal abilities. Saw teams need to know when to explore other options, such as using heavy equipment, blasting, or creating a “no work zone.” They also need to know when to walk away, realizing that it was the right and safe thing to do.

Do not depend on a spotter for overhead hazards. It is unlikely that a sawyer falling a tree will hear a warning shout or signal from someone serving as a spotter in time to react to an overhead hazard. Having the swamper at the base of the tree creates unnecessary exposure to additional personnel. Reference the “Sim-Limb” video;

http://www.fs.fed.us/fire/safety/council/newsletters/may06/FS_SIMLIMB_25_MEGS.wmv

(this takes a few seconds to load)

Gaining Cutting Experience

It is usually during fire season that chainsaw operators have the occasion to improve their skills. This lack of year

round opportunity presents a continuous safety issue. We must stay vigilant and realize that the environment in which we work is dynamic. The U.S. Forest Service does not do as much thinning as it used to, reducing practice opportunities. However, the post-hurricane clean up opportunities are giving everyone experience and young sawyers are encouraged to take advantage of opportunities presented by hurricane cleanup details. When the opportunity presents itself, sawyers should also cut during their own time to stay proficient.

Considering Environmental Factors

The southern beetle infestation of Yellow Pine in the southeast presents sawyers with a serious safety concern. Be cautious because many trees are damaged and they can be difficult to assess. Gypsy moths in the Lake and Mid-Atlantic States, and the pine bark beetles in the Western states, also present similar concerns.

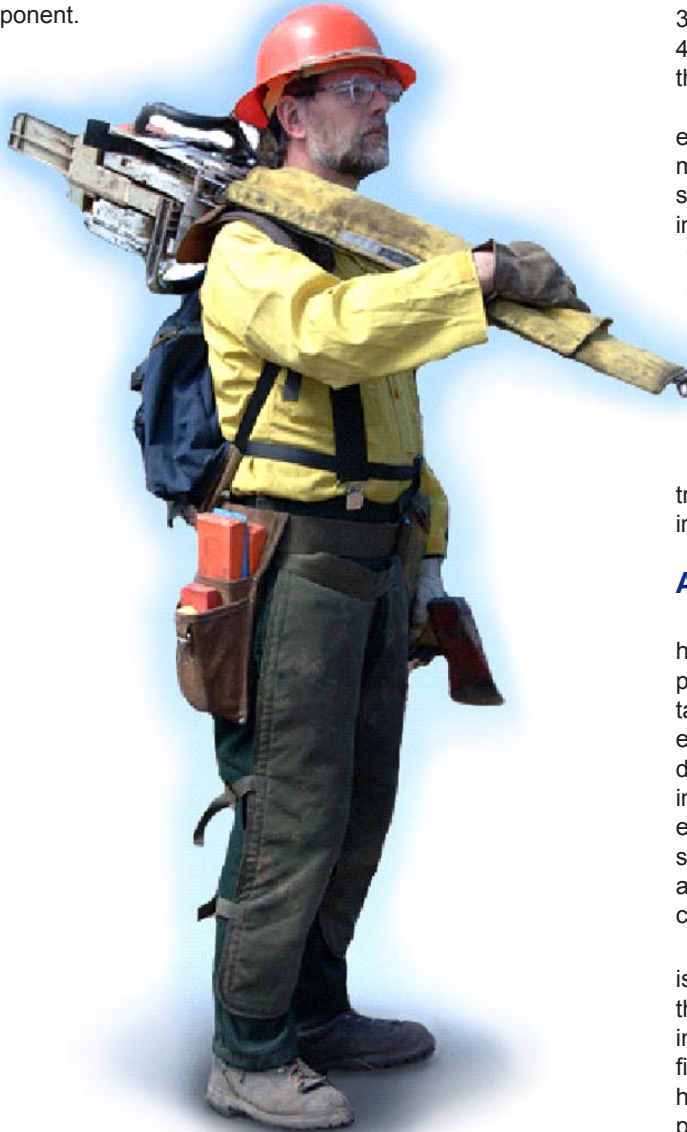
It is necessary to realize that each geographic area may differ from what you are used to, and it is extremely important to gather information from local people once you arrive on your assignment. It is particularly important to gain local information about the stability of the trees. For example, a person with local knowledge would know that some trees, such as Aspen and Black Locust, only take root in the duff and are susceptible to falling over unexpectedly.

Ensuring Proper PPE

There are three principles that help ensure that sawyers always wear the proper personal protective equipment (PPE).

1) Getting in a hurry will cause the sawyer to forget one or more part of their PPE, 2) Have all of the proper PPE with you, every time, on every incident and 3) Take the time to always put your PPE on. Always wear safety chaps and ear/eye protection. “Bug Eyes” are goggles with a fine mesh screen instead of the plastic lens. They are extremely useful because they do not steam-up, as the plastic goggles did.

If the chainsaw operator fails to comply with one of these principles, they may miss a critical safety component.



Failure to Properly Assess Hazard Trees

The removal or avoidance of “danger trees” is required by OSHA, the Department of Agriculture’s Health and Safety Code, some U.S. Forest Service regional policies and State law. Trees that are likely to fail exist to some degree, in every part of the United States. If the work to be performed is within an area where one or more trees may endanger workers, only two options exist; either the trees must be removed or avoided. We no longer consider using lookouts as an acceptable practice. Reaction time, both by the lookout, and by those in the tree’s impact area, is often not quick enough to avoid an accident, and lookouts are not always dependable.

When a tree falls, the impact zone may be influenced by:

1. Steepness of the ground
2. Direction of the lean
3. Height of the tree
4. Another tree being struck and uprooted or a portion of the top being broken out

A mature qualified person with knowledge, and experience in identifying “danger trees” and their failure zones must decide on the strategy and tactics. This limits the possibility of personal injuries to the people who are working in the area.

The responsibility for danger tree identification and response rests with the immediate supervisor and possibly others, including Incident Commanders and Burn Bosses. Essentially, danger tree identification, removal or avoidance is not unlike adhering to LCES or the Ten Standard Fire Orders. It remains everyone’s duty and responsibility, even the rookie firefighter. Just say “no” if directed to work near danger trees. Use the procedures for properly refusing risk found in the Incident Response Pocket Guide.

Avoid the Hero Complex

People working beyond their capabilities and having a hero complex, or an “I can take that down” attitude is a pressing safety issue in chainsaw operations. It is important to know when to step back and say that someone else, with more experience, needs to fall this tree. When in doubt, rope it off and walk away. On one wildfire in Washington, the fire burned the roots off many trees. An experienced sawyer was called in and after a quick assessment said, “Go around this, I’m not going in there.” This provides a good example of knowing when to say no. No one has to cut anything; cut more line if needed.

Anything can happen – expect the unexpected. This is a key lesson. In the vicinity of standing dead trees, things fall from the sky. Even when you are not involved in the falling, dangerous conditions exist. In one case, a firefighter had the hero complex, thinking nothing would happen to him. But something did happen, and he was paralyzed by a falling snag. For more information on this 2001 accident on the Daniel Boone National Forest go to: <http://krstofer.org/poplar/>