

# USDA FOREST SERVICE SAW OPERATIONS GUIDE

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## Acknowledgements

This guide is compiled by the USDA Forest Service (FS) Saw Program Technical Advisory Group (TAG) and derived from recognized industry standards, procedures and practices, as well as appropriate related material contained in Federal standards, Forest Service policy and current training manuals<sup>1</sup>.

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# Chapter 1 Introduction

## 1.1 Purpose

The purpose of this guide is to define common terms and definitions and identify implementation standards for chain saw and crosscut use by Forest Service employees, volunteers, training consultants and cooperators. The FS Saw Program is designed to protect sawyers from accidental injury, illness or death during saw operations.

This guide describes operational procedures to implement policy found in FSM 2358 and are considered the best practices for this activity.

The FSSOG is outside of formal Forest Service policy and resides on the TAG SharePoint site to allow for the timely dissemination of safety information, equipment and technique updates. Contact your Regional Saw Program Manager for recommendations of additions or changes.

## 1.2 Scope

This guide provides operational information for the use of chain saws or crosscut saws by Forest Service employees, including volunteers, training consultants and cooperators.

For the purposes of this guide, the terms “saw” or “saw program” shall refer to both chain saws and crosscut saws, unless specified otherwise.

## 1.3 Goals

- Provide information that will protect sawyers from injury or mishap when operating saws while performing their official duties.
- Provide information on the safe use, handling, and transport of saws in the workplace.
- Provide information on felling, limbing and bucking operations when using saws.

## 1.4 Authority

1. Occupational Safety and Health Act of 1970, Sections 6 (29 U.S.C. 655) and 19 (29 U.S.C. 668).
2. Executive Order 12196. Occupational Safety and Health Programs for Federal Employees.
3. Title 29, Code of Federal Regulations: Part 570, subpart E; Part 1910.95; Part 1910.132; Part 1910.151; Part 1910.242; Part 1910.266; Part 1960.
4. Forest Service Manual (FSM) 2358 Saw Program.
5. Forest Service Handbook (FSH) - 6709.11, Health and Safety Code Handbook; 1509.11, Grants, Cooperative Agreements, and Other Agreements Handbook.

## 1.5 National Saw Program Technical Advisory Group (TAG)

The TAG provides multidisciplinary expertise in saw operations. The TAG consists of the National Saw Program Manager, Regional Saw Program Managers, a representative from the Forest Service



Technology and Development Program, other federal agency (as of 2016 BLM and NPS) saw and safety-related subject matter experts. The purpose of the TAG is to develop, coordinate and provide advice and guidance about training, skills, and safety for all aspects of saw operations to the National Saw Program Manager. In particular, the TAG reviews and recommends Nationally Recognized Sawyer Training Courses (NRSTCs) to the National Saw Program Manager.

**Table 1-TAG Member 2016**

<b>Name</b>	<b>Region</b>	<b>Specialty</b>	<b>Title</b>	<b>Contact</b>
Jake Long	1	Crosscut	Technical Program Coordinator	<a href="mailto:jacoblong@fs.fed.us">jacoblong@fs.fed.us</a> 406.677.3920
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Lisa McClure	2	Crosscut	Program Coordinator	<a href="mailto:lmccclure@fs.fed.us">lmccclure@fs.fed.us</a> 719.657.6019
Tony McWilliams	3	Chainsaw/Crosscut	<b>Chair</b> - Program Coordinator	<a href="mailto:tjmcwilliams@fs.fed.us">tjmcwilliams@fs.fed.us</a> 575.682.5326
Patrick Brown	4	Crosscut	Program Manager	<a href="mailto:pjbrown@fs.fed.us">pjbrown@fs.fed.us</a> 208.634.0659
Robert Burnside	4	Chainsaw	Program Coordinator	<a href="mailto:rburnside@fs.fed.us">rburnside@fs.fed.us</a> 208.587.7961 x7150
Pete Duncan	5	Chainsaw	Program Coordinator	<a href="mailto:pduncan01@fs.fed.us">pduncan01@fs.fed.us</a> 530.394.8100
Mitch Hokanson	5	Crosscut	Program Coordinator	<a href="mailto:mhokanson@fs.fed.us">mhokanson@fs.fed.us</a> 530.226.2888
Aaron Pedersen	6	Chainsaw/Crosscut	Program Manager	<a href="mailto:ajpedersen@fs.fed.us">ajpedersen@fs.fed.us</a> 503.630.8787
Carl Deitz	8	Crosscut	Traditional Tool Coordinator	<a href="mailto:cldeitz@fs.fed.us">cldeitz@fs.fed.us</a> 423.338.3306
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Nate Gogna	BLM	Chainsaw	NorCal Emergency Ops Coordinator	<a href="mailto:ngogna@blm.gov">ngogna@blm.gov</a> 530.226.2831
Roger Semler	NPS	Crosscut	Chief Wilderness Stewardship Division	<a href="mailto:roger_semler@nps.gov">roger_semler@nps.gov</a> 202.513.7220
Robert Wetherell	WO/Technology and Development	Policy	<b>Vice-Chair</b>	<a href="mailto:rwetherell@fs.fed.us">rwetherell@fs.fed.us</a> 406.329.3935



## 1.6 Partner, Cooperator, or Volunteer Training Program Review:

1. Revise, align or review existing cooperative agreement(s) to meet standards in FSM 2358.03 (3)
2. Develop training package and/or certification standards to meet the standards identified in FSM 2358
  - a. Develop a table listing the authorities and any delegations necessary similar to FSM 2358.04 Exhibit 01. These authorities must align with language found in the FSM 1580 agreement (FSM 1509.11 sec. 91.2).
  - b. Describe responsibility of each position within the organization's saw program similar to FSM 2358.04a-2358.04m.
  - c. All Partners, Cooperators, or Volunteers that receive approval for new training courses/programs will be required to use the National Sawyer Certification Database when it becomes available.
  - d. Definitions for critical terms must be developed if they differ from those found in FSM 2358.05.
  - e. Follow or develop similar qualification standards identified in FSM 2358.06, 2358.1 Exhibit 02 and 2358.3 Exhibit 06.
  - f. Follow or develop similar responsibilities and limitations, training, knowledge and skills to meet each skill level identified in FSM 2358.1.
  - g. Follow or develop similar sawyer training and field proficiency evaluation standards identified in FSM 2358.2.
  - h. Follow or develop similar revocation procedure identified in FSM 2358.22.
  - i. Follow or develop similar program monitoring and evaluation procedures identified in FSM 2358.3.
  - j. Follow or develop similar sawyer evaluation forms identified in FSM 23358.3 Exhibit 03 and 04.
  - k. Develop an incident and accident tracking and notification system.
3. How the TAG reviews submitted NRSTCs
  - a. The National Saw Program Manager is the main contact for partners, cooperators and volunteers submission of NRSTCs for review by the TAG
  - b. The TAG will select a subcommittee to review each submittal and make recommendations to the National Saw Program Manager



#### 4. Approval

- a. The National Saw Program Manager is the responsible authority that will approve each NRSTC that meets the qualifications in FSM 2358

### 1.7 Terms and Definitions

Advanced Teaching Method or Technique - A method or technique for teaching adult learners that takes into consideration different learning abilities, motivations, and life experiences.

American National Standards Institute (ANSI) - is a private non-profit organization that oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States.

A Sawyer (NWCG Equivalent FAL3) - An apprentice sawyer who may saw only in the least complex situations or, for training purposes, at the next higher level and in either case only under the immediate supervision of a B or C Sawyer qualified to supervise the work (FSM 2358.1, ex. 02).

Backcut – The final cut in a felling operation.

Barberchair – Vertical split of a tree during felling procedure. Commonly a result of improper undercutting and/or backcutting, associated with a heavy forward leaning tree characterized by a portion of the fallen tree left on the stump.

B Sawyer – Bucking Only - (not applicable in the fire management context) - An intermediate Sawyer who may independently buck and limb any size material in moderately complex situations and who may saw at the next higher level, but only under the immediate supervision of a sawyer qualified to supervise the work (FSM 2358.1, ex. 02).

B Sawyer – Felling and Bucking. An intermediate sawyer who may independently fell, buck, and limb any size material in moderately complex situations. This person may saw at the next higher level under the immediate supervision of a sawyer qualified to supervise the work (FSM 2358.1, ex. 02). This person may also conduct classroom and field training for A and B Sawyers with prior written approval from the Saw Program Coordinator.

Bind – The two major components of bind are compression and tension. The directional pressures of compression and tension determine the sawing technique and procedure used to release them.

Boring – Method of using the bottom half of the guide bar tip to saw into the tree while felling or bucking.

Brush - Any vegetation less than 5 inches diameter at breast height (DBH).

Brushing - Removing brush and shrubs, either during fire line construction or while clearing out a work area.

Bucking - Sawing logs and limbs into shorter lengths.



Bumper Spikes (Dogs) – Metal spikes mounted on a chain saw near the guide bar designed to stabilize and support the chain saw during felling and bucking.

C Sawyer – Bucking Only (not applicable in the fire management context). An advanced sawyer who may independently buck and limb any size material in highly complex situations based on the Regional Saw Program Manager's or Saw Program Coordinator's written recommendation. The recommendation must be supported by demonstrated advanced saw knowledge, skills, and in most cases certification as a B Sawyer (FSM 2358.1, ex. 02). This person may conduct classroom and field training within that person's skill level for A and B Sawyers, and may conduct field proficiency evaluations within that person's skill level for A Sawyers and B Sawyers – Bucking Only.

C Sawyer – Felling and Bucking. An advanced sawyer who may independently fell, buck, and limb any size material in highly complex situations based on the Regional Saw Program Manager's or Saw Program Coordinator's written recommendation. The recommendation must be supported by demonstrated advanced saw knowledge, skills, and in most cases certification as a B Sawyer (FSM 2358.1, ex. 02). This person may conduct classroom, field training, and proficiency evaluations for A and B Sawyers.

C Sawyer Evaluator. An advanced sawyer who may independently fell, buck, and limb any size material in highly complex situations based on the Regional Saw Program Manager's written recommendation. The recommendation must be supported by the successful completion of training on organizing and conducting advanced sawyer evaluation sessions in the field, demonstrated advanced saw knowledge and skills, and in most cases certification as a C Sawyer – Felling and Bucking for at least 3 years (FSM 2358.1, ex. 02). This person may conduct classroom, field training, and proficiency evaluations for sawyers at all certification levels.

Cat Face – A scar at the base of a tree caused by injury, rot or fire.

Certification. Confirmation a sawyer meets applicable training and field proficiency requirements and can competently saw at the identified skill level by a certifying official based on the requisite sawyer evaluator recommendation.

Certifying Official - The Regional Forester, Forest Supervisor, District Ranger, or, with delegated authority, the Regional Saw Program Manager or Saw Program Coordinator who confirms that a sawyer meets applicable training and field proficiency requirements and can competently saw at the identified skill level based on the requisite Sawyer Evaluator recommendation.

Chain Brake - Safety device that stops rotation of the chain.

Chain Saw - Any power saw that runs on gasoline or electricity and that utilizes a guide bar and chain, other than a power pole saw.

Complex or Complexity. A characterization of the cutting situation that determines the level of sawyer certification needed based on the tree species and crown, amount of material, size, lean,





binds, condition of the fiber, topography, stability, and any other factors that will affect the sawing operation.

Compound Cut – An angled bucking cut.

Cooperator. An individual or entity that voluntarily enters into a challenge cost share, participating, collection, or other agreement with the Forest Service to work on a project under FSM 1580.5 and FSH 1509.11, section 91.2, other than another agency working with the Forest Service on fire management activities (FSH 1509.11, ch. 50).

Crew Leader - The person who conducts immediate supervision of a saw crew and who reports its progress and any problems to the first-line supervisor, if that person is not also the crew leader (FSH 6709.11). Crosscut Saw - Any of various styles of handsaws operated by one or more persons to fell timber or cut logs manually, other than a bow saw, pruning saw, or brush saw.

Crosscut Saw. Any of various styles of handsaws operated by one or more persons to fell timber or cut logs manually, other than a bow saw, pruning saw, or brush saw.

Crosscut Sawyer Trainee - A sawyer who performs crosscut bucking tasks as part of on-the-job training, but only under the immediate supervision of a B or C Crosscut Sawyer.

Cutting Area - The area that may be affected by the direct or indirect actions of the sawyer and the material being cut.

DBH – Diameter of the tree at breast height (typically 4'-6")

Danger Tree - A standing tree that presents a hazard to personnel due to conditions such as deterioration, or physical damage to the root system, trunk, stem, or limbs or the direction or lean of the tree (29 CFR 1910.266(c); FSH 6709.11, glossary).

Dutchman – Result from the two cuts of an undercut not meeting (bypass).

Domino Felling – The partial cutting of multiple trees, which are left standing and then pushed over with a driver tree. Domino felling is prohibited.

Drop Start – Starting the saw by dropping an unsupported saw with one hand while pulling the starting cord with the other hand. Drop starting is prohibited.

eSafety - The Forest Service mandatory use injury and illness reporting and recording application.

Escape Route – A predetermined route of exit used by sawyers when felling or bucking. The essential components of an escape route are selection of the desired direction and distance, prior to felling or bucking, and a well cleared route through which to escape to a safe area.



Evaluation - A determination in the certification process by a Sawyer Evaluator that indicates whether a sawyer is proficient in the safe use of a saw in the field and that is documented using the “Sawyer Training and Field Proficiency Evaluation” form (FSM 2358.3, ex. 03 and 04).

Evaluator - C Sawyer or C Certifier who actually observes the task(s) being performed and documents sawyer field evaluation/reevaluation performance. See Saw Field Proficiency Evaluation form (FSM 2358.3 Exhibits 03 and 04).

Felling - Safely cutting down a tree, including making a series of cuts that causes a tree to fall to the ground.

First-Line Supervisor. An employee who is responsible for the planning and implementation of a saw project that involves one or more other employees, who typically verifies the other employees’ time and attendance records for the project, and who may also be the crew leader for the project.

Forest Service Approved – An item that meets Forest Service specifications and/or drawings, or is procured under Forest Service authority.

Formal Instruction - Instructor-led sawyer training in a classroom, online, or field setting that includes, at a minimum, an NRSTC.

FSH – Forest Service Handbook.

FSM – Forest Service Manual.

Formal Instruction - Instructor-led sawyer training in a classroom, online, or field setting that includes, at a minimum, a nationally recognized sawyer training course.

Guide Bar – Extension of saw that supports and guides the saw chain.

Gunning – Technique of aligning the gunning mark of a chain saw or the handles of a crosscut saw with the desired falling lay.

Hanging Wedges – A pair of metal wedges, tied together with a lanyard or cord for use with crosscut saws.

Hinge Wood/ Holding Wood – Section of wood located between the undercut (face) and the back cut that directs where the tree will fall. The hinge prevents the tree from separating from the stump until it is committed to the lay.

Immediate Supervision - On-site supervision with a clear view and control of the sawing operation that allows the supervisor to warn, advise, or assist the sawyers being supervised, when needed.

Instructor - A competent sawyer with the specialized skill to conduct training within their skill level if approved by the Forest/Zone/Sub-unit Saw Program Coordinator. Additionally, instructors assist training to their level of expertise. This definition may include volunteers and training consultants designated by the Forest Service. See FSM 2358.1 (including Exhibit 02) for further information.



Job Hazard Analysis (JHA) - A systematic process for the identification of safety and health hazards associated with a project or activity and the development of abatement actions for those hazards. The resulting documentation (using form FS-6700-7 or its equivalent) specifies required procedural and personal protective equipment, qualifications, training, safety practices, and emergency evacuation procedures for that project or activity.

Kerf – Space resulting from a saw cut.

Kickback – A strong thrust of the saw back toward the sawyer resulting from improper use of the tip of the guide bar or pinching of the bar in a cut.

Knowledge Training - Training method(s) using approved curriculum that includes, but not limited to, a group: lecture, multi-media presentation, flip charts, discussion, demonstrations, written tests, and question and answers. Training may be accomplished in the field or an indoor setting.

Lean – Refers to the directional tilt of a tree away from its vertical position in relation to the intended lay of the tree. Many times two lean forces may be in play in the same tree. Lean is described as head lean, back lean and side lean.

Limbing - Cutting branches off a tree.

Line Officer - Any employee who carries out line authority (FSH 6709.11.05).

Lodged Tree (hung tree) - A tree leaning against another tree or object which prevents it from falling to the ground. Hung tree removal is considered a complex cutting operation and should be carefully planned **PROCEED CAREFULLY AND CONSIDER OTHER REMOVAL METHODS** as an option for safe removal.

National Fire Protection Association (NFPA) - A United States trade association, albeit with some international members, that creates and maintains private, copyrighted, standards and codes for usage and adoption by local governments.

Nationally Recognized Sawyer Training Courses (NRSTCs) - A training course that satisfies the formal instruction requirements for a particular level of sawyer certification (FSM 2358.1, ex. 02). The National Saw Program Manager maintains a list of approved courses.

Currently approved courses:

- NWCG, Wildland Fire Chain Saws S-212
- MTDC, Chain Saw and Crosscut Saw Training Course
- Soren Eriksson's Game of Logging curriculum

National Sawyer Certification Card - The certification card issued by the Forest Service or a cooperator to a sawyer that qualifies the sawyer to work on all NFS lands (FSM 2358.3, ex. 05). This card is issued to all sawyers, sawyer instructors, and sawyer evaluators upon the successful completion of training and field evaluation.



Off Side – The opposite side of the tree from where the sawyer stands while bucking or felling and is often the side of the tree or log where hazards have been identified.

PPE – Personal Protective Equipment.

Occupational Safety and Health Administration (OSHA): An agency of the United States Department of Labor. OSHA's mission is to "*assure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance*".

Qualified Sawyer - A sawyer who has been certified in compliance with FSM 2358.06.

Reactive Forces – 1. Push-back - Cutting with the top of the bar will push the saw back toward the sawyer. 2. Pull in – cutting with the bottom of the bar will pull the saw away from the sawyer. 3. Kickback – Cutting with the top quarter of the bar nose will cause the tip of the saw to thrust up or sideways toward the sawyer.

Reevaluation - Confirmation a sawyer still meets applicable training and field proficiency requirements and can competently saw at the identified skill level by the certifying official based on the requisite sawyer evaluator recommendation.

Regional Program Instructor (RPI) - Individuals holding current C Sawyer Certifier Advanced Sawyer Certifier Certification, who have demonstrated communication skills, the ability to transfer and relate concepts to others and current working knowledge of policy and regulations pertaining to saw use, saws and related equipment. Regional Program Instructors may be delegated by the Region/Station/Area Saw Program Managers to qualify and sign cards for, applicants who have successfully completed the training requirements as C Certifiers.

Risk Assessment (RA) – A risk assessment is an objective identification and evaluation of threats to employee safety. Level of risk (high, moderate or low) is determined by the probability that a hazard, danger or threat will occur and how severe the consequences are if it does.

Saw Operations - Any activity using a chain saw or crosscut saw.

Sawyer - The primary operator of a saw.

Sawyer Evaluator - A C Sawyer or C Sawyer Evaluator, including a volunteer or Training Consultant, who determines as part of the certification process whether a sawyer is proficient in the safe use of a saw in the field and who documents that determination using the Sawyer Training and Field Proficiency Evaluation form (FSM 2358.3, ex. 03 and 04).

Sawyer Instructor - A Qualified Sawyer, including a volunteer or Training Consultant, who has the requisite skill to conduct or assist with training at the sawyer's skill level and who has received written approval to conduct that training from the Saw Program Coordinator (FSM 2358.1, ex. 02).



**Sawyer Trainee (Crosscut only)** – A person who has not had formal training (see Nationally Recognized Sawyer Training Courses). May occasionally serve as the second person on the end of a crosscut saw in a double buck situation or as a single buck. No felling. **Sawyer Trainees may not use a crosscut saw unless under immediate supervision of a (B or C) crosscut sawyer.**

**Situation Awareness** - An individual's perception of a given situation that results from an ongoing process of gathering and integrating information by observation and communication with others.

**Skill Training** - Training method(s) using approved curriculum that includes but not limited to hands-on demonstration. Skill training is usually held in an outdoor or field setting, using tools and equipment required for learning.

**Snag** – Any standing dead tree or remaining standing portion thereof.

**Specialty Saw Use** - Any use of a saw requiring additional training beyond the requirements of the NRSTCs, such as using a saw in a tree canopy or using a saw to mill lumber.

**Spring pole** – A tree, segment of a tree, limb, or a sapling, which is under stress or tension due to the pressure or weight of another object. A spring pole is potentially dangerous until properly mitigated.

**Stump Analysis** - The process of examining the stump of a tree to determine how the tree was cut.

**Stump Shot** - The height difference between the horizontal cut of the undercut (face, or notch) and the back cut. The difference in height establishes an anti-kick-back step that will prevent a tree from jumping back over the stump toward the faller.

**Swamper** – Individual(s) directly assisting a sawyer.

**Trainee** - A sawyer working to gain skills for a higher qualification level.

**Training Consultant**. A professional sawyer instructor or sawyer evaluator who supplements Forest Service sawyer instructors or sawyer evaluators and who is deemed qualified in writing by the Regional Forester to instruct and evaluate sawyers at all certification levels. The qualification determination is based on the written recommendation of the Regional Saw Program Manager or someone who is deemed qualified in writing by the Regional Saw Program Manager, acting with delegated authority (FSM 2358.01, ex. 01).

**Tree** – Any vegetation with a bole greater than 5" DBH.

**Underbuck** - Tool used when bucking, to hold a crosscut saw in position when the saw is cutting from underneath the log.

**Undercut** – A notch cut in a tree to guide the direction of fall.



Volunteer - A person who gives time and talent to advance the mission of the Forest Service and who receives no salary or wages from the Forest Service for that service, including for purposes of this section sponsored volunteers and international volunteers as defined in FSM 1830.5.

Wedge – A plastic or metal tool used to assist the sawyer to prevent a tree from falling backwards, lift the tree to redistribute its weight, or to prevent the bar from pinching while bucking.

Widow-Maker – a loose limb or debris lodged in a tree, which may fall on anyone working beneath it.

Work Leaders - Individuals involved in day-to-day immediate supervision of field personnel. Work leaders report the progress and problems of their personnel to the first-line supervisor (FSH 6709.11).

## **1.8 Qualification**

All sawyers must be trained, evaluated, and certified through a training program that meets the intent of FSM 2358.03 Policy. Sawyers must have a current National Sawyer Certification Card and meet any other specified qualifications to perform assigned saw work, including currency in first aid CPR training when engaged in sawing activities. The National Sawyer Certification Card is issued with a three-year expiration date, which can be subject to review any time prior to expiration.



## Chapter 2 Personal Protective Equipment (PPE)

Maintain PPE in a clean and fully functional condition (see FSH 6709.11, 21.13).

Table 2-Non-fire PPE requirements for saw use

PPE	Chain Saw Operations	Crosscut Saw Operations
<b>Hard Hat</b>	Hard hat or cutting helmet meeting ANSI Z89.1	Same as chain saw
<b>Safety Glasses</b>	ANSI Z87.1 (clear safety glasses, at a minimum) or equivalent (mesh “bug-eye” type or mesh face shield type) (OSHA 1910.266(d) (1) (vii) (B) Note)	Same as chain saw
<b>Hearing Protection</b>	Hearing protection required for gasoline powered chain saw use	None required
<b>Gloves</b>	Gloves or chain saw mitts are required for all chain saw operations. Leather required for sharpening. Alternative style of gloves may be used for inclement weather conditions, based on JHA.	Same as chain saw
<b>Shirt, Pants<sup>2</sup></b>	Long sleeved shirt and long pants	Long sleeved shirt and long pants.
<b>Leg Protection</b>	Chaps or cut-resistant pants for chain saw use shall meet the requirements of Forest Service 6170-4 or ASTM F-1897 (current version). Chaps shall overlap boots at least 2”.	None required
<b>Boots</b>	Cut-resistant or leather, laced 8 inch (204mm) high boots that provide ankle support and nonskid soles (hard toes are optional). OPTIONAL-Use JHA to determine proper footwear for the environment and/or related tasks.	Cut-resistant or leather, laced boots that provide ankle support and nonskid soles (hard toes are optional). Use JHA to determine proper footwear for the environment and/or related tasks..
<b>Specialized PPE</b>	Wear additional PPE as identified by local conditions, safety data sheets (SDS), or JHA/RA	Same as chain saw

Table 3-Fireline PPE requirements for saw use<sup>3</sup>

PPE	Chain Saw Operations	Crosscut Saw Operations
<b>Hard Hat</b>	Hard hat meeting NFPA 1977	Same as chain saw
<b>Safety Glasses</b>	ANSI Z87.1 (clear safety glasses, at a minimum) or equivalent (mesh “bug-eye” type)	Same as chain saw
<b>Hearing Protection</b>	Hearing protection required for gasoline powered chain saw use	None required
<b>Gloves</b>	Leather gloves are required for all chain saw operations and sharpening.	Same as chain saw
<b>Shirt, Pants</b>	Nomex® long sleeved shirt and Nomex® long pants	Same as chain saw
<b>Leg Protection</b>	Chaps meeting the requirements of Forest Service specifications 6170-4. Chaps shall overlap boots at least 2”.	None required
<b>Boots</b>	Leather, laced 8 inch (204mm) high boots with nonskid soles	Leather, laced 8 inch (204mm) high boots with nonskid soles

<sup>2</sup> Short sleeved shirts may be used based on a JHA

<sup>3</sup> See FSH 6709.11 ch. 25.12



PPE	Chain Saw Operations	Crosscut Saw Operations
Specialized PPE	Wear additional PPE as identified by local conditions, safety data sheets (SDS), or JHA/RA	Same as chain saw





## Chapter 3 Saw Equipment and Handling Requirements

### 3.1 Chain Saw, Guide Bar and Saw Chain<sup>4</sup>

1. Required Features
  - a. Functional throttle trigger interlock that prevents the throttle from engaging unless the interlock is depressed on the handle.
  - b. Functional anti-vibration system.
  - c. Functional chain brake.
  - d. Functional chain catch pin.
  - e. Functional spark arrestor screen.
  - f. Proper length bar and power head sized for the specific sawing project or activity
  - g. Properly filed and maintained chain that is appropriate for the sawyer's certification level and the specific sawing project or activity. For example, a reduced kickback chain is appropriate for less experienced sawyers. Longer bars and chisel or full/semi- skip chain is appropriate for more experienced sawyers.
  - h. Bar guard that is adequate to cover the muffler, chain, and bumper spikes when the saw is carried on the shoulder.
  - i. Scabbard that is adequate for carrying the saw at the side.
2. Recommended Features
  - a. Bumper spikes ('dogs') for felling and bucking operations.
  - b. Full wrap around handle bar or  $\frac{3}{4}$  wrap around handle bar for felling operations.
3. Required Additional Equipment
  - a. First aid kit that meets OSHA standards<sup>5</sup>.
  - b. Chain saw bar wrench.
  - c. Chain file with handle and guard.
  - d. Approved safety container for chain saw fuel.
  - e. Proper wedges for the specific work project or activity (wooden wedges are not permitted).
  - f. A 3 to 5 pound single bit axe for driving wedges. Custom tools (pounders) are not acceptable.
4. Optional Additional Equipment
  - a. Pruning saw.
5. Handling
  - a. Carry the saw in a way to prevent contact with the chain, hot muffler, or bucking spikes. Carry the saw on the downhill side. Walk last in line if you are the person carrying the saw.
  - b. When carrying a chain saw on your shoulder, take extra care due to the sharpness of the chain and 'dogs'. Cover the bar, chain and dogs. Wear a long-sleeved shirt, gloves, and a shoulder pad. Use of a manufactured bar and chain guard is recommended.
  - c. Set the chain saw at idle speed and activate the chain brake before taking more than two steps or taking one hand off a running chain saw.

<sup>4</sup> Use and maintain according to the manufacturer's recommendations including matching proper guide bar and saw chain to the powerhead.

<sup>5</sup> OSHA 1910.266 Appendix A



- d. Shut off the saw when carrying it for a distance greater than from tree to tree or in hazardous conditions, such as slippery surfaces or heavy underbrush, and, in all cases, when carrying it more than 100 feet.
  - e. Refer to FSH 6709.11, sec 12.2 and 12.5 and the [Technology and Development Program Fuel Transport website](#), for further direction on equipment requirements for vehicles and for transporting saws and fuel.
6. Starting<sup>6</sup>
- a. Always inspect the saw before each use.
  - b. Engage chain brake prior to starting.
  - c. Start the saw on the ground, or where otherwise firmly supported. (It is acceptable to start the saw with the bar on a branch or log if the tip of the bar extends over supporting object).
  - d. Do not "drop start" a chain saw.
7. Operation
- a. Maintain a secure grip on the saw at all times.
  - b. The chain saw shall be held with the thumbs and fingers of both hands encircling the handles during operation.
  - c. The sawyer shall be certain of footing before starting to cut. The chain saw shall not be used in a position or at a distance that could cause the sawyer to become off-balance, to have insecure footing, or to relinquish a firm grip on the saw.
  - d. In general, throttle up to full speed before letting the chain contact the wood. In general, do not throttle down before the cut has been completed.
  - e. Do not cut with power head above shoulder height.
  - f. Clear away brush or other potential obstacles that might interfere with cutting or using the escape route.
8. Fueling
- a. Review owner's manual fueling process.
  - b. Choose an outdoor fueling area at least 20 feet from an open flame or other sources of ignition.
  - c. Wear safety glasses meeting ANSI Z87.1.
  - d. **If saw exhibits low fuel, vapor lock characteristics, check fuel level through opaque side of fuel tank before opening fuel tank cap.**

### **Be wary of tank pressure if tank is more than ½ full**

- e. Fuel from the upwind side to reduce exposure to spilled fuel and vapors.
- f. Allow saw to cool at least 5 minutes before opening fuel cap.
- g. Clean debris away from fuel/oil tank openings.
- h. To avoid any possible pressurized fuel spray, assume fuel tank is pressurized and direct fuel cap in a safe direction before slowly opening and to release built up fuel tank pressure.
- i. Fill the tank on bare ground or other noncombustible, grounded surface.
- j. Immediately clean up spilled fuel.
- k. Start the saw at least 10 feet from the fueling area.

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<sup>6</sup> The methods to safely start and operate a saw can vary with the model and size; follow manufactures recommendations. The following basic precautions generally apply regardless of the saw model



- I. Select an area with bare ground for storing fuel and oil.

### 3.2 Crosscut Saw

1. Required Features
  - a. Proper length for the sawing project or activity
  - b. Proper type, tooth pattern and length of saw for task that is also properly sharpened and set
  - c. Handles
  - d. Sheath
2. Required Additional Equipment
  - a. A first aid kit that meets OSHA standards<sup>7</sup>.
  - b. Proper wedges for the specific work project or activity (wooden wedges are not permitted).
  - c. A 3-5 pound single bit axe for driving wedges. Custom tools (pounders) are not acceptable.
3. Optional Additional Equipment
  - a. A double bit axe
  - b. Crosscut saw lubricant
  - c. An under-buck tool
  - d. A pair of hanging wedges
  - e. A pruning saw
  - f. Digging tools
4. Handling
  - a. Vehicle
    - i. When transporting saws in a vehicle secure them from movement and guard teeth (sheath or box).
  - b. Pack animal
    - ii. When transporting a crosscut saw on a pack animal, take extra care. Adequately guard and secure the saw.
    - iii. Select the most gentle, experienced animal to carry the saw, based on the discretion of the packer.
    - iv. Carry short saws sheathed, guarded, or in a scabbard, and positioned in a manner so that the action of removing the saw is away from the animal's head.
    - v. Carry long saws sheathed. Bend a saw into a horseshoe shape over an adequate sized load. Secure the saw to the center of the packsaddle with teeth facing the rear of the animal.
  - c. Aircraft
    - i. Fixed wing
      - a. Properly sheathe the saw.
      - b. Secure the saw from movement in a separate compartment, cargo bay behind net, or on the floor with tie-down straps.
    - ii. Rotor wing
      - c. Properly sheathe the saw.
      - d. Secure the saw to the floor or in a net compartment.
      - e. In an external cargo sling net, keep the saw straight and secured to a larger object.

<sup>7</sup> OSHA 1910.266 Appendix A



- f. In an external basket, keep the saw properly secured with appropriate tie straps.
  - d. Personal transport
    - iii. Guard and balance the saw on your shoulder.
    - iv. Remove the rear handle.
    - v. Rest the saw over your shoulder with the teeth facing away from your neck.
    - vi. Carry the saw on the downhill side.
    - vii. Walk last in line if you are the person carrying the saw.
- 5. Operation
  - a. Always inspect the saw before use.
  - b. Use only saws that are properly set and sharpened.
  - c. Wear cut-resistant gloves when handling a saw. Carefully sheathe and unsheathe the saw with the teeth facing away from your body .
  - d. Pick up the saw with teeth away from your body. Rotate the teeth toward your body before handing the saw to another employee.
  - e. When attaching handles, keep the teeth away from your body and secure a firm grip on the saw.
  - f. Check and tighten screws in the handle of the saw as needed.
  - g. Establish primary and secondary escape routes, safety zones, and alternates.
  - h. Prior to cutting, remove vegetation. Clear the cutting area to provide firm, stable footing.
  - i. When using a two-person crosscut saw for bucking, check that any employee placed downhill is in a safe position. If it is not certain that the downhill partner would be in a safe position, always single buck.
  - j. When using a two-person crosscut saw, always predetermine who will remove the saw and the direction of the saw movement before starting the cut.
  - k. Do not push the saw when beginning to cut.
  - l. Do not reach across a moving saw.
  - m. Maintain control and safe body position while sawing.
  - n. Maintain communication with your partner at all times about holding wood, binds, limbs, and knots that might affect safety.
  - o. When situations are unsafe, use alternate methods or terminate the task.



## Chapter 4 Sawyer Safety Procedures

Saw operations include, but are not limited to, felling, bucking, brushing, limbing, and specialized uses. Sawyers have the obligation to say "NO" and walk away from any situation they determine to be an unacceptable risk.

### 4.1 Operational Safety

1. If the tree cannot be safely cut or does not need to be cut-leave it. **Saw only if safe.**

**Consider other alternatives to hand felling if you are not comfortable with the assignment. See Appendix A for additional information.**

2. Sawyers should not operate outside of their comfort zone and shall not operate outside of qualifications.
3. Personnel must be alert and physically capable before operating the saw.
4. Do not engage in saw operations when working alone except in emergencies. Follow guidelines as outlined in FSH 6709.11 22.48e.
5. Develop appropriate evacuation plans and provide appropriate first aid equipment at the work site.
6. Develop and hold safety briefings that address saw safety before beginning work projects or activities.
7. Provide immediate supervision for A Sawyers by a B or C Sawyer.
8. Maintain cutting area control to mitigate potential hazards. Space employees and organize their duties so they do not create hazards for others.
9. All work shall terminate and each employee shall move to a place of safety when environmental conditions, such as but not limited to, electrical storms, strong winds which may affect the fall of a tree, heavy rain or snow, extreme cold, dense fog, fires, mudslides, and darkness, create a hazard for the employee in the performance of the job<sup>8</sup>.

### 4.2 Felling, Bucking, Brushing and Limbing Plans

Apply the following planning logic (OHLEC) to all phases of saw operations:

#### Objective

Regardless of task, develop a plan to determine where you want the cut piece to end up.

- If felling, plan the most desirable placement or lay for the tree
- If bucking, plan where you want the bucked log or round to go
- If limbing, determine sequence and direction for large branches when cut
- If brushing, particularly in thick brush, plan how you will remove the brush when it is cut

<sup>8</sup> (29 CFR 1910.266(d)(5))



## Hazards/obstacles

Develop a plan to identify the hazards/obstacles:

- That are overhead (fire, rotten top, widow makers and loose bark)
- That are in the piece of wood being cut (fire, rot and hinge wood integrity, hollow, bar/saw length compared to diameter, bees or poison plants)
- Springpoles
- Buildings, equipment or other trees you don't want damaged
- That are associated with people and cutting area control

## Leans/binds

Since lay, cut piece placement, sequence or removal was determined in O develop a plan to:

- Determine lean of a standing tree and calculate, in feet, the amount of head/back lean and side lean
- Determine binds in log to be bucked, springpoles, limbs or brush to be removed

## Escape routes

Since leans and binds were determined in the previous step develop a plan to:

- Determine the 'good' and 'bad' side of the tree, log, springpole, limb or brush
- Determine and clear an escape route (or 2 routes if necessary for crosscut saw/axe work or situations that require two routes)

## Cut Plan

Develop a cut plan to determine which technique will be used to remove wood fiber to achieve the desired result including:

- Face notch construction type (conventional, Humboldt or open face)
- Hinge position, length of hinge, depth of hinge and amount of stump shot needed
- Back cut type (straight in from the back or chase, boring back cut and out the back, boring back cut with release or holding wood or strap)
- Wedge placement including number of wedges and axe placement
- Sawyer communication to crew members, swamper or crosscut sawyer partner

### 4.3 Felling Process Specifics

1. Perform a Size up/Risk Assessment to Create a Felling Plan.



- a. Consider the location of personnel, structures, power lines, other obstacles including roads, trails and other routes of travel in the cutting area.
- b. Determine and plan for issues with tree characteristics and weather conditions (lean, overall soundness, widowmakers, spiked top and/or schoolmarm, burning top or portion of tree, moisture in the form of rain, snow, or ice) including problems with soundness or defects anywhere in the tree or trees that may be struck by the tree being felled.
- c. Determine wind direction and velocity such as steady versus gusting and/or changing directions.
- d. Know and understand the characteristics of the tree species, both live and dead.
- e. Understand how the diameter, height and limb distribution of trees being felled or affected will react when cut.
- f. Determine and plan for issues with surrounding terrain.
- g. Considering all the information in items a. – g., determine the “good” and “bad” sides of the tree. While performing the rest of the falling operation make a conscious effort to stay on the “good” side of the tree to prevent becoming a “target”.
- h. Determine optimal felling direction, lay or bed.
- i. Walk out and thoroughly check the intended lay or bed of the tree. Look for dead tree tops, missing tree tops, widowmakers, snags, and ground debris that may cause kickbacks, rolling, or result in another tree or limb becoming a hazard.
- j. Identify an escape route that extends diagonally away from the expected felling line and always have an alternate escape route to a safety zone. Remember, the quadrant opposite the planned fall of the tree is one of the most dangerous.
- k. Felling on any slope where rolling or sliding of trees or logs is reasonably foreseeable shall be done uphill from, or on the same level as, previously felled trees.
- l. Always watch the top of the tree and any identified overhead hazards throughout the felling operation.
- m. If you have to leave a partially cut or hung up tree, (because hazards are unusually significant) flag the area with danger tree or hazard tree flagging to later be removed by other methods or by someone with a higher skill level.

**Consider other alternatives to hand felling if you are not comfortable with the assignment. See Appendix A for additional information.**

2. Establish Cutting Area Control
  - a. The sawyer (or lead sawyer of a crosscut saw team) is solely responsible for establishing cutting area control including communication plans with other personnel controlling access to the cutting site. For crosscut saw operations determine who will take the saw when exiting the cutting site as the tree commits.
  - b. Make sure the felling operation never endangers nearby personnel.



- c. Establish a secure felling area to the extent necessary; maintain a minimum 2 ½ tree length cutting area around tree being felled regardless of diameter<sup>9</sup>.
- 3. Clear the worksite of vegetation and removable hazards
  - a. Remove obstacles and clear vegetation at the base of the tree.
  - b. Remove obstacles and clear vegetation in escape route(s), safety zone(s) and around trees or objects you plan to use to shield you once the tree commits to the fall.
  - c. Remove obstacles and clear vegetation in lay if needed to prevent fly back of debris or uncontrolled movement of tree as it falls or once it meets the ground.
- 4. Make an Undercut
  - a. An undercut shall be made in all trees 5" DBH and greater before making a back cut.
  - b. Before initiating the undercut warn nearby personnel that a tree is about to fall.
  - c. Start undercut from a location to minimize sawyer's exposure to overhead hazards.
  - d. Use gunning sights on chain saw or saw handles on crosscut saw to aim the tree into the lay.
  - e. Start the undercut at a comfortable level that provides adequate footing and balance throughout the cutting sequence.
  - f. Make the undercut opening large enough to control the tree. Conventional, Humboldt, and Open-faced undercuts are all appropriate to use dependent on the situation encountered and the type of saw used.
  - g. Maintain adequate hinge wood for the type of undercut used.
  - h. Undercuts must meet cleanly and not cross one another (creating a Dutchman/bypass).
- 5. Making the Backcut and Wedging
  - a. Properties of holding wood are dependent on tree species and condition.
  - b. Before initiating the backcut, stop cutting, shut the saw off and warn nearby personnel that a tree is about to fall.
  - c. The backcut shall leave sufficient hinge wood and stump shot based on the type of undercut used, tree diameter, tree species and wood fiber condition.
  - d. Insert wedges into backcut kerf as necessary.
  - e. Continue cutting until the desired amount of hinge wood is obtained.
  - f. If wedging a tree over, observe how the top of the tree reacts to each blow to the wedge and recognize that widowmakers can be easily dislodged at any time.
- 6. Exiting Safely
  - a. Exit the tree from the diagonal escape route to the safety zone, generally not less than 20 feet away.
  - b. Do not cross behind the tree after the backcut has released the tree from the stump.
  - c. As soon the tree commits to the fall, apply the chain brake and immediately proceed down the escape route to the chosen safety zone, shielding tree or obstacle. If using a crosscut saw, the predetermined sawyer takes the saw out of the cut and proceeds down the escape route.
  - d. If carrying the saw down the escape route prevents you from escaping quickly, leave the saw at the stump.

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<sup>9</sup> OSHA 29 CFR 1910.266(h)(1)(iv) - No employee shall approach a feller closer than two tree lengths of trees being felled until the feller has acknowledged that it is safe to do so, unless the employer demonstrates that a team of employees is necessary to manually fell a particular tree.





- e. Remain in your safety zone and watch for overhead hazards, other trees, tops and limbs that may fall in an undetermined direction for at least 30 seconds after the tree hits the ground.
  - f. Give an “All Clear!” shout when it is safe for personnel to return to the cutting site.
7. Roadways, Trails, Utility Lines, and Firelines
- a. Use personnel as road guards on active travel routes within the cutting site. Establish additional traffic control measures, such as signs or barriers, to control traffic as needed.
  - b. Do not cut trees within 2-½ tree lengths of utility lines unless utility companies have certified that lines are de-energized.
  - c. If a tree contacts a utility line, keep personnel clear until utility companies certify it is safe to proceed.
8. Prohibitions
- a. Never leave a tree partially cut without flagging off a safety zone at least 2-1/2 times the height of the tree (or posting a guard) and arranging for removal by other methods or by someone with a higher skill level.
  - b. Never climb a lodged tree. Flag off, notify nearby personnel and your immediate supervisor if the lodged tree presents a hazard.
  - c. No felling shall take place when the top of the tree, intended lay and escape route are obscured by darkness, smoke, fog or other obstruction or when wind can affect the control of the fall of the tree.
  - d. Domino felling.
  - e. Pushing of trees while actively cutting.

#### 4.4 Bucking, Brushing, and Limbing Process Specifics

1. The sawyer is responsible for cutting area control throughout the operation. Anticipate the log's reaction when severed during bucking. Evaluate and secure all areas down slope of the bucking site where a log could roll.
2. Select the bucking cut location based on evaluation of overhead hazards, side, top, bottom, end, and internal binds due to natural unevenness of the ground and objects, such as stumps, windfalls, and rocks.
3. Know where the tip of the chainsaw bar is at all times; beware of other logs, branches, or rocks immediately behind the area where you are bucking, brushing, or limbing for possible kickback potential or rocking of the chain. Be aware of the ground, rocks, or other obstacles that can dull or snag a crosscut saw or impeded safe sawing motion.
4. Plan and clear an escape route.
5. Remove limbs and brush before bucking. Exercise caution when cutting any tree held off the ground by its branches especially on hillsides where cutting branches could release the tree to roll downhill.
6. Walk on top of large downed logs while limbing (if possible) instead of working on the downhill side to prevent the log from rolling onto the sawyer.
7. Make bucking cuts slowly. Observe kerf closely to determine any movement and change bucking plan as appropriate.
8. Use wedges to prevent pinching chain saw bar or crosscut saw.
9. When trees on sloping ground are bucked, block them or specialized cuts/techniques that prevent bucked sections from rolling or sliding.



10. Always work from the uphill side unless tree is supported to prevent rolling. Always use **EXTREME CAUTION** when working on downhill side.
11. Buck windfalls only after examining each tree to be cut for strains, breaks, binds, and the chance of root wads falling, rolling, or setting upright when the weight of the tree is removed. Be aware of trees that are underneath the one you are bucking as they may be under pressure and could move in any direction when the overhead weight is removed.
12. Cut a sapling or branch (spring pole) that is bound down only when it is necessary. Make a series of small cuts on the compressed side of the sapling or branch to release the bind.



## Chapter 5 Fireline/All Hazard Operations

Saw operations in any emergency response environment require constant attention to situational awareness, communication and work distances. Diligent supervision of sawyers and saw teams is required relative to the proximity of other personnel and fire ground hazards to assure the safety of all involved.

1. Fireline construction and post storm saw operations require saw teams to work in close proximity to one another; communication, whether spoken or hand signals, is critical to providing for a safe work environment.
2. All saw operations in the wildland fire and post storm environments involve elevated risk.

**Consider other alternatives to hand felling if you are not comfortable with the assignment. See Appendix A for additional information.**

3. During limbing and brushing swampers will stay outside of the “danger zone” of the sawyer. The “danger zone” is where the nose of the sawyer’s bar can reach in any direction. Typically this zone is a 10-15’ diameter circle around the sawyer.
4. Swampers should not hold material that is being cut.

## Chapter 6 Saw-Related Accidents and Near Misses

1. Share near miss incidents with other sawyers or at an AAR.
2. Reviews of accidents involving saws must follow established procedures.
3. Saw Program Coordinators must be involved in investigations of saw accidents in their administrative unit.
4. Regional Saw Program Managers must be involved in investigations of all saw accidents in their region that result in serious injury or fatality.
5. The National Saw Program Manager must be involved in investigations of all saw accidents on NFS lands that result in serious injury or fatality.

## Chapter 7 Program Monitoring and Evaluation

It is critical to monitor correct saw operation procedures by sawyers, Sawyer Instructors, and Sawyer Evaluators (FSM 2358.04h and 2358.04i) and assess trends in saw accidents, near misses, and changes in learning techniques. Saw program monitoring and evaluation may include the following:

1. Reviewing a sawyer’s certification level and, if needed, training records to verify that the sawyer is cutting within the sawyer’s certification level.
2. Reviewing a sawyer’s felling methods, felling or bucking tools, escape routes, felling cuts and their relationship to each other, and other critical points of saw use.
3. Reviewing the use of PPE.
4. Reviewing JHAs and safety briefing records.
5. Taking corrective actions when unsafe practices are observed.
6. Reviewing supervision and instruction of sawyer trainees or sawyers.



7. Tracking the number of certified sawyers, Sawyer Evaluators, Sawyer Instructors, and completed saw-related projects and identifying trends in saw accidents and near misses.
8. Reporting results of monitoring and evaluation, including any recommendations, to the Saw Program Coordinator, Regional Saw Program Manager, or National Saw Program Manager, as appropriate.
9. Annually reviewing eSafety data associated with saw use to determine trends in saw accidents and possible corrective actions.
10. Reviewing recordkeeping procedures for currency and accuracy.



## **Appendix A – Danger Tree and Manual Felling Alternatives Information**

[“Danger Tree Indicators-Video”](#)

[“Visual Danger Tree Indicators-Poster”](#)

[“Danger Tree Mitigation Guidelines for Managers”](#)

[2014 Incident Response Pocket Guide](#)

How to Properly Refuse Risk, page 19

Hazard Tree Safety, page 22

