

United States
Department of
Agriculture

Forest Service

**Technology &
Development
Program**

6700 Safety & Health
July 2001
0167-2815-MTDC



Chain Saw and Crosscut Saw Training Course

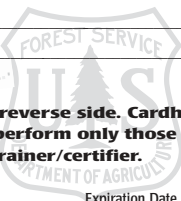

Student's Guidebook 2001 Edition

**FINAL
DRAFT**



Intermediate Sawyer

B Name _____
Unit _____

Qualifications: **See reverse side. Cardholder is approved to perform only those tasks signed by qualified trainer/certifier.**

Issue Date _____ Expiration Date _____



Missoula
Technology &
Development Center

Chain Saw and Crosscut Saw Training Course

Student's Guidebook
2001 Edition

**FINAL
DRAFT**

Intermediate Sawyer

Name _____
Unit _____

Qualification: See reverse side. Cardholder is approved to perform only those tasks signed by qualified trainer/certifier.

Issue Date _____ Expiration Date _____



Chuck Whitlock, Project Leader

R.C. Carroll, Northern Region Chain Saw Program Coordinator

Paul Chamberlin, Northern Rockies Fireline Safety Specialist

**David Michael, Pacific Southwest Region Crosscut Saw
Coordinator and Trails Specialist**

**Winston Rall, Pacific Northwest Region Chain Saw/Crosscut
Program Manager and Occupational Safety and Health Specialist**

Jerry Taylor Wolf, Project Assistant

**USDA Forest Service
Technology and Development Program
Missoula, MT**

7E72E41—Chain Saw and Crosscut Saw Training

July 2001

The Forest Service, United States Department of Agriculture (USDA), has developed this information for the guidance of its employees, its contractors, and its cooperating Federal and State agencies, and is not responsible for the interpretation or use of this information by anyone except its own employees. The use of trade, firm, or corporation names in this document is for the information and convenience of the reader, and does not constitute an endorsement by the Department of any product or service to the exclusion of others that may be suitable.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue SW, Washington, D.C. 20250-9410, or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.



Chapter 1—Course Information and Safety Requirements	1
Forest Service Chain Saw and Crosscut Saw Program	1
Job Hazard Analysis	1
First Aid	2
Emergency Evacuation Plan	2
Personal Protective Equipment	2
General Requirements	2
Specific Requirements	3
Situational Awareness	5
Checklist of Personal Safety Considerations and Attitude	5
Evaluating the Complexity of the Assignment	5
Glossary	6
Sample Job Hazard Analysis	9
Additional Information for Sawyers	13
Chapter 2—Chain Saw Use and Maintenance	14
Chain Saw Operation	14
Chain Saw Components	14
Guide Bar Maintenance	17
Chain Tension	18
Daily Saw Maintenance	18
Cleaning Exercise	19
Chain Maintenance	19
Chain Filing	20
Sharpening Cutters With a Round File	20
How to Set Depth Gauges	21
Chain Filing Exercise	22
Saw Transportation	22
Transporting Chain Saws in a Vehicle	22
Transporting Chain Saws by Hand	22
Safe Chain Saw Use	22
Starting Procedures	22
Starting the Chain Saw on the Ground	23
Operational Safety	23
Handling	23
Reactive Forces	23
Additional Tools	25
Axes	25
Wedges	25
Fuel and Oil Containers	26
Peaveys and Cant Hooks	27
Chapter 3—Chain Saw Tasks and Techniques	28
Safe Chain Saw Use	28
Proper Use of Bumper Spikes (Dogs)	28
Bucking	28
Situational Awareness	28
Safe and Efficient Bucking Techniques	28
Determining Bind	29
Safe Bucking Practices	31
Points to Remember	32



Limbing _____	32
Brushing and Slashing _____	33
Sizeup and Safety Considerations _____	33
Safe and Efficient Brushing and Slashing Techniques _____	33
Basic Felling _____	35
Situational Awareness _____	35
Sizeup _____	36
Escape Routes _____	37
Felling the Tree _____	38
Felling Details _____	39
The Undercut, Holding Wood, and Backcut _____	39
Directional Felling _____	42
Felling Observers and Spotters _____	43
Chapter 4—Crosscut Saw Tasks and Techniques _____	44
Understanding Your Crosscut Saw _____	44
Historical Origin of the Crosscut Saw _____	44
Different Types of Crosscut Saws _____	44
One-Person Crosscut Saws _____	44
Two-Person Crosscut Saws _____	44
Two-Person Crosscut Saw Patterns _____	44
Felling Saws _____	44
Bucking Saws _____	44
Saw Grinds _____	45
Flat Ground _____	45
Straight Taper Ground _____	45
Crescent Taper Ground _____	45
How a Saw Cuts _____	46
Cutter Teeth _____	46
Rakers _____	46
Gullets _____	47
Tooth Patterns _____	47
Plain-Tooth (Peg-Tooth) Pattern _____	47
M-Tooth Pattern _____	47
Great American-Tooth Pattern _____	47
Champion-Tooth Pattern _____	47
Perforated Lance-Tooth Pattern _____	47
Lance-Tooth Pattern _____	48
Saw Handles _____	48
Handle Position _____	48
Handle Attachment Holes _____	48
Types of Saw Handles _____	48
Handle Installation and Maintenance _____	49
Saw Maintenance _____	49
Cleaning the Saw _____	49
Checking for Straightness _____	50
Testing the Saw _____	50
Brief Overview of Saw Filing Procedure _____	50
Storage _____	51
Transporting Saws _____	52
Saw-Related Tools and Equipment _____	52
Lubricants _____	53
Types _____	53
Functions _____	53
Applying Lubricants _____	53



Contents

Axes _____	53
Wedges _____	53
Splitting Wedges _____	54
Lifting Wedges _____	54
Peaveys and Cant Hooks _____	54
Underbucks _____	54
Types of Underbucks _____	54
Bucking and Felling Preparation and Techniques _____	55
Bucking _____	55
Safety Considerations _____	55
Bucking Sizeup _____	55
Planning the Cut _____	56
Single-Bucking Techniques _____	59
Single Bucking With No Bind: Top Cutting _____	60
Single Bucking With Top Bind: Underbucking Required _____	60
Underbucking _____	60
Single Bucking With Top Bind: Top Cutting _____	61
Single Bucking With Bottom Bind: Top Cutting _____	61
Single Bucking With Bottom Bind: Underbucking _____	61
Single Bucking With End Bind _____	61
Single Bucking With Side Bind _____	61
Double-Bucking Techniques _____	62
Felling _____	62
Safety Considerations _____	62
Felling Sizeup _____	63
Establishing Escape Routes _____	64
Placing the Undercut _____	64
Cutting the Backcut _____	67



Acknowledgments

Project leader Chuck Whitlock wishes to thank the following individuals for their contribution to this project.

Gary Hoshide, Bert Lindler, Sara Lustgraaf, Emily Ranf, Michelle Beneitone, Bob Beckley, Mark Wiggins, and Ben Croft.

Thanks to everyone who provided input and reviewed the document.



Chapter 1—Course Information and Safety Requirements

Suggested time: 2 hours)

In this chapter:

- Students will receive an overview of the chain saw and crosscut saw training course.
- Students will be provided with information on the requirements for successfully completing the chain saw and crosscut saw training course.
- Students will be able to identify the elements in a job hazard analysis (JHA): the task or procedure to be accomplished, the hazards associated with the task or procedure, abatement actions to eliminate or reduce the hazards, first-aid supplies, and emergency evacuation procedures.
- Students will learn why personal protective equipment (PPE) is used, how it is used, and how it is maintained.
- Students will be able to identify common safety mistakes made by sawyers.

Forest Service Chain Saw and Crosscut Saw Program

As Forest Service employees you must be aware of all laws and standards that must be met before you operate a chain saw.

Why do we have a national chain saw and crosscut saw program?

This course will provide the skills to safely use chain saws and crosscut saws, and serve as a refresher class for persons who have already completed the training. The national chain saw and crosscut saw program was developed to provide all sawyers a solid foundation for safe and efficient saw operation while felling, bucking, brushing, or limbing.

Safety is the most critical objective. Your safety, the safety of your coworkers, the safety of the public, and property protection should be a part of every plan and every action you take. Careful study and practice of saw operations will improve your own abilities and help you identify your limitations to ensure safe saw operation.

This course is designed to train beginning and intermediate sawyers to perform project work safely and efficiently. The chapters for both courses are summarized below.

The Chain Saw Course:

- Chapter 1 (classroom), course information and safety requirements

- Chapter 2 (classroom), chain saw use and maintenance
- Chapter 3 (classroom), chain saw tasks and techniques
- Chapter 5 (field), sawyer evaluation process and sawyer evaluation form

The instructor will describe the certification levels and details of restrictions or endorsements for special uses.

The Crosscut Saw Course:

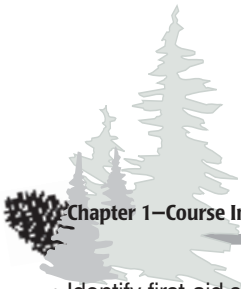
- Chapter 1 (classroom), course information and safety requirements
- Chapter 4 (classroom), crosscut saw tasks and techniques
- Chapter 5 (field), sawyer evaluation process and sawyer evaluation form

The instructor will describe the certification levels and details of restrictions or endorsements for special uses.

Job Hazard Analysis

A JHA (see Sample Job Hazard Analysis section at the end of this chapter) must be prepared (preferably with the assistance of the involved employees) before beginning any work project or activity. The JHA must:

- Identify the task or procedure to be accomplished. Such tasks could include limbing, bucking, or felling.
- Identify the hazards associated with the task or procedure. These hazards may include physical, biological, environmental, chemical, and other hazards. Examples of hazards include:
 - Physical hazards: Rocky terrain, slippery slopes.
 - Biological hazards: Insect bites, hantavirus.
 - Environmental hazards: Weather-related hazards such as hypothermia, wind, lightning.
 - Chemical hazards: Hazardous materials such as fuel mix for chain saws and oil for crosscut saws.
 - Other hazards: Personal security issues, public traffic, hunting seasons.
- Identify abatement actions that can eliminate or reduce hazards. Abatement actions include:
 - Engineering controls: The most desirable method of abatement (such as ergonomic tools and equipment).
 - Substitution: Such as switching to high flashpoint, nontoxic solvents.
 - Administrative controls: Such as limiting exposure by reducing work schedules or establishing appropriate work practices and procedures.
 - PPE: The last method of abatement (such as using hearing protection when working with chain saws).



- Identify first-aid supplies and emergency evacuation procedures. In the event of an emergency evacuation, be prepared to provide the following information:
 - Nature of the accident or injury (avoid using the victim’s name).
 - Type of assistance needed (ground, air, or water evacuation).
 - Location where the accident occurred, best access to the work site (road name or number).
 - Radio frequencies.
 - Contact person.
 - Local hazards to ground vehicles or aviation.
 - Weather conditions (windspeed and direction, visibility, temperature).
 - Topography.
 - Number of individuals to be transported.
 - Estimated weight of individuals for air or water evacuation.

First Aid

Refer to the *Health and Safety Code Handbook* chapter 20, sections 21.21 and 21.22, for information on handling a medical emergency. The onsite first-aid kit must have supplies that meet Occupational Safety and Health Administration (OSHA) specifications and requirements. A Type IV first-aid kit must be available as a minimum (General Services Administration national stock number NSN 6545-01-010-7754). A more complete kit meeting higher standards may be used.

Emergency Evacuation Plan

An emergency evacuation plan is essential for any field project, especially one involving chain saws and crosscut saws. All employees need to be proficient in using a radio. They need to know which frequencies to use and whom to contact in the event of an emergency. The latitude and longitude and/or the legal location for an emergency medical helispot shall be determined and included in the JHA before starting any work. The entire crew shall know where the helispot is located. The emergency evacuation plan needs to be updated when the work location changes.

The JHA and emergency evacuation plan shall be signed by employees, signifying that they have read and understood the contents, have received the required training, are qualified to perform the task or procedure, and will comply with all safety procedures.

A copy of the JHA, the bloodborne-pathogen exposure control plan, the material safety data sheets for products used on the work project or activity, and the emergency evacuation plan must be kept onsite during the project. The JHA can be reviewed and updated during tailgate safety sessions. These sessions take place before a new project or activity is begun, when changes are made (such as changing location, adding crewmembers, or changing job responsibilities), or whenever employees believe a session is needed. Topics often focus on the hazards associated with the job and methods to eliminate or abate them.

Personal Protective Equipment

(*Health and Safety Code Handbook* chapter 70, section 72)

Items that must be included in the JHA:

(Chain Saw Operations)

- Forest Service-approved hardhat
- Eye protection
- Appropriate gloves
- Heavy-duty, cut-resistant or leather, waterproof or water-repellent, 8-inch-high laced boots with nonskid soles
- Hearing protection (85 decibels and higher)
- Long-sleeved shirt
- Chain saw chaps with a 2-inch boot overlap

(Crosscut Saw Operations)

- Forest Service-approved hardhat
- Eye protection
- Appropriate gloves
- Heavy-duty, cut-resistant or leather, waterproof or water-repellent, 8-inch-high laced boots with nonskid soles
- (Not required)
- (Optional)
- (Optional)

Personal protective equipment (PPE) should be used with engineering controls, substitution, administrative controls, or a combination of them to protect against hazards. Relying on PPE alone is not adequate.

General requirements should be followed for assessing the head, eye, face, hand, and foot hazards of a work project or activity.

General Requirements

- Select PPE based on hazards identified in the JHA.
 - PPE shall fit properly.
 - Defective, damaged, or unsanitary PPE shall not be used.
 - Supervisors shall assure the adequacy of PPE as well as its proper maintenance and sanitation.
- Each employee shall be trained to wear the PPE required by the JHA. Training shall include:
 - The required PPE and when and how it should be worn.
 - Proper care, maintenance, useful life, limitations, and disposal of PPE.



- Before performing any work project or activity requiring PPE, employees need to demonstrate an understanding of their training in its use. Employees are accountable for accidents and injuries that result from failing to use or misusing required PPE.
- Additional training may be necessary. Circumstances in which supervisors should provide additional training include:
 - Workplace changes that make earlier training obsolete.
 - Changes in the PPE to be used.
 - Evidence that an employee's knowledge or use of PPE is not adequate.

Specific Requirements

- **Eye and Face Protection:** Appropriate protection (including side protection) when employees are exposed to eye or face hazards such as flying particles, chemical gases or vapors, or potentially injurious light (such as ultraviolet light). Face shields can be used in saw operations in addition to safety glasses or safety goggles.
- **Noise Protection:** To comply with 29 CFR 1910.95, employees need to be in a hearing conservation program and wear ear plugs or ear muffs or both when working with equipment higher than 85 decibels (*Health and Safety Code Handbook* chapter 20, section 21.13b No. 2).
- **Head Protection:** All hardhats and helmets should be designed to provide protection from impact and penetration hazards from falling objects. Inspect shells daily for signs of dents, cracks, penetration, or any other damage that might compromise protection. Suspension systems, headbands, sweatbands, and any accessories should also be inspected daily.
- **Hand Protection:** Ensure that hand protection protects employees from the specific hazards that will be encountered. Gloves are often relied on to prevent cuts, abrasions, burns, and skin contact with chemicals that can cause local or systemic problems if they contact the skin (29 CFR 1910.138).
- **Foot Protection:** Footwear designed to prevent injury due to falling or rolling objects and objects piercing the soles. Heavy-duty, cut-resistant or leather, waterproof or water-repellent, 8-inch-high laced boots with nonskid soles are required for chain saw use.
- **Additional Protection:** Saw chaps, saw shoulder pads, or other PPE that provide cut resistance or puncture protection.

How Chain Saw Chaps Protect the User—When a chain saw strikes chain saw chaps, Kevlar fibers are pulled into the chain saw's drive sprocket, slowing and quickly stopping the chain.

A back-coated nylon shell covers the Kevlar protective pad inside the chaps. The shell resists water, oil, and abrasions. The protective pad consists of five layers of Kevlar in the following order: woven Kevlar, felted Kevlar, woven Kevlar, woven Kevlar, felted Kevlar. Kevlar is an aramid fiber similar to the Nomex material used in firefighter's clothing. Kevlar is more resistant to flame than Nomex. When chain saw chaps are exposed to temperatures higher than 500 degrees Fahrenheit, the nylon shell may melt, but the protective Kevlar pad will not burn.

Chain saw chaps need to be properly adjusted and worn snug to keep them positioned correctly on the legs. Chain saw users shall wear chaps. The chaps should provide coverage 2 inches below the boot tops. Proper fit and correct length maximize protection!

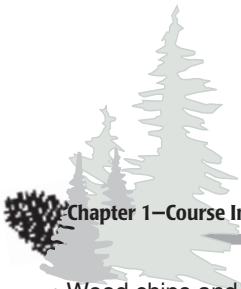
Chain Saw Chaps Specifications (MTDC-6170-4)—The Forest Service has provided cut-resistant protective chaps for chain saw sawyers since 1965. Chain saw chaps have prevented thousands of serious injuries.

The protective pad in the original Forest Service chain saw chaps consisted of four layers of ballistic nylon. Chain saw chaps tests conducted by the Missoula Technology and Development Center (MTDC) concluded that four layers of ballistic nylon offered protection to a chain speed of 1,800 feet per/minute (fpm) without a cut through. In 1981 Forest Service chain saw chaps were redesigned to improve the level of protection to a chain speed of 2,500 fpm without a cut through. The weight of the chaps was reduced by 40 percent, making them more comfortable.

The Center monitors chain saw injuries. Because chain saws require right-hand operation, the majority of chain contact injuries occur on the left leg. In 2000 the Forest Service chain saw chaps were redesigned. The new design provides protection to a chain speed of 3,200 fpm without a cut through and increases the area of coverage for the left side of the left leg by about 2½ inches, and for the left side of the right leg by about 1½ inches. The higher level of protection and larger area of protection increased the weight of each pair of chaps by 6 to 8 ounces, depending on the length (32, 36, or 40 inches). **Only** saw chaps provided by the General Services Administration meeting MTDC specifications 6170-4 are approved for purchase and use.

Inspection and Replacement—Chain saw chaps need to be inspected and replaced when appropriate. Replace chain saw chaps when:

- The outer shell has numerous holes and cuts. Holes in the outer shell allow bar oil to be deposited on the protective pad. The oil acts as an adhesive, preventing fibers in the pad from moving freely, decreasing the protection.



- Wood chips and saw dust are evident in the bottom of the chaps.
- Repairs have stitched through the protective pad. Machine or hand stitching the protective pad prevents the fibers from moving freely, decreasing the protection.
- Cleaning has been improper. Detergents with bleach additives decrease the protection.
- High-pressure washing has destroyed the protective pad.
- The chaps have a cut in the first layer of yellow Kevlar that is more than 1 inch long.

Caring for Chain Saw Chaps—Treat your chain saw chaps as a **CRITICAL** piece of safety equipment. Keep them as clean as possible. Appropriate and timely cleaning reduces the flammability of the chaps and keeps your clothing cleaner. **Do not use your chaps as a chain stop.**

Use Citrosqueeze, a commercially available citrus-based cleaning product, to clean chain saw chaps. Citrosqueeze has been tested and approved by Dupont for cleaning Nomex and Kevlar. Do not machine wash or machine dry chain saw chaps.

Cleaning Chain Saw Chaps—Hose and brush off chain saw chaps to remove dirt. Citrosqueeze must be diluted before use.

- For light soiling, use a Citrosqueeze solution in a spray bottle, mixing 1 part Citrosqueeze concentrate to 10 parts water. Spray solution on the area to be cleaned and brush the solution into the chaps with a bristle brush. Wait one-half hour, thoroughly rinse the chaps with cold water, and allow them to air dry.
- For heavy petroleum contamination, soak chain saw chaps in Citrosqueeze solution for a minimum of 4 hours, overnight if possible. Brush the chaps with a bristle brush, rinse them thoroughly with cold water, and allow them to air dry. Many pairs of chain saw chaps can be cleaned in a single soak tank. Use 10 to 15 gallons of solution in a soak tank.

A United States manufacturer for Citrosqueeze is:

Emco Industries
No. 118–2930 Norman Strasse Rd.
San Marcos, CA 92069
Phone: 888–727–3230

Repairs—Clean all chaps before repairing them. Repair cuts and holes in the outer shell as soon as possible to prevent the protective Kevlar pad from becoming contaminated with bar oil and petroleum products.

When repairing damage to the chaps' nylon shell, use a commercially available product called Seam Grip. Seam Grip provides a flexible, waterproof, and abrasion-resistant patch that will prevent petroleum products from contaminating the protective Kevlar pad.

Remove chain saw chaps from service if they have a cut longer than 1 inch in the top layer of Kevlar.

To repair holes and tears in the nylon shell:

1. Cut a piece of notebook or printer paper that extends about 2 inches beyond the edge of the damage.
2. Slip the paper inside the hole or tear so the paper lies on top of the protective Kevlar pad.
3. Lay the chaps on a flat, level surface and press the nylon shell down onto the piece of paper.
4. Squeeze Seam Grip onto the paper and onto the sides of the tear so that there is good coverage on all sides of the tear or hole.
5. Allow the patch to dry for at least 12 hours before using the chaps.

Seam Grip is available through outdoor retailers. To learn of retailers close to you, contact:

McNett Corp.
Box 996
Bellingham, WA 98227
Phone: 360–671–2227
Fax: 360–671–4521
Web site: <http://www.mcnett.com>



Situational Awareness

The situational awareness checklist can be used for self-assessment during sawing operations. It can also be used for discussions, tailgate safety sessions, or one-on-one problem solving (performance or skill deficiency) in the field.

Checklist of Personal Safety Considerations and Attitude

- ✓ How **do** I feel about this sawing assignment?
- ✓ Am I exercising sound judgment and awareness?
- ✓ Is my attitude influencing me to go against my better judgment (gut feeling)?
- ✓ Is my mind on my work project or activity?
- ✓ Do I have self-confidence?
- ✓ Am I overconfident?
- ✓ Am I doing this against my will? (*Health and Safety Code Handbook* chapter 20, section 22.48)
- ✓ Is peer pressure a factor?
- ✓ Am I professional enough to decline the assignment and ask for assistance?
- ✓ Do I have all of the required PPE and sawing equipment to do the job safely? Am I committed to using the PPE and equipment correctly?
- ✓ Am I complacent?
- ✓ Am I violating any safe operating procedures?
- ✓ Do I feel hurried or unusually stressed to get the tree on the ground or bucked?

- ✓ Have all options been considered and discussed with others?
- ✓ Am I in an unfamiliar environment and timber type?
- ✓ Do I watch out for my coworkers, contractors, and the public?

Evaluating the Complexity of the Assignment

The individual sawyer must determine the complexity of the assignment.

Your evaluation of the complexity of the assignment must be based on your individual skill, knowledge, and your understanding of your personal capabilities and limitations. The final decision to cut any tree is left up to the individual sawyer. You have the responsibility to say **no** and walk away from any sawing situation that is beyond your capabilities.

If a thorough job of assessing the complexity of the specific situation has been completed, the decision to cut or not to cut will be determined by the following Go, No-Go process.



Deciding Whether to Cut a Tree

Go! I feel comfortable with the sawing situation—I will cut the tree.

No Go! I don't feel comfortable with the situation—I will walk away from the tree.

Never base your decision on what you think you might be able to do. Remember...your safety and the safety of your coworkers depends on the decisions you make.



This glossary is adapted from the *S-212 Wildfire Power Saws* training course.

Ax—A part of the faller's safety equipment used for pounding and chopping. It can also be used to plumb the lean of a tree.

Backcut—The last of the three cuts required to fell a tree. It is located on the opposite side of the tree from the undercut (face) and at least 2 inches (the stump shot) above the horizontal cut of the undercut (face). The backcut must never be continued to a point at which no holding wood remains.

Barber Chair—A tree that splits vertically when it is being felled. This is generally a result of improper facing or backcutting. A portion of the fallen tree is left on the stump.

Bind—A series of pressures in a felled tree resulting from objects (such as terrain or stumps) that prevent the tree from lying flat on the ground. The two major components of bind are compression and tension. Binds determine the technique and procedure used while bucking.

Blowdown—An area of timber blown over by strong winds or storms.

Bole—A tree stem thick enough for saw timber or large poles.

Boring—Using the nose or tip of the guide bar to saw into the tree while felling or bucking.

Bottom Bind—One of the four basic tree positions commonly encountered while bucking. A tree in a bottom bind is tensioned on top and compressed on the bottom.

Brushing—Removing the brush and shrubs while swamping out a work area.

Buck—Sawing through the bole of a tree after it has been felled.

Butt—The base of a tree stem.

Calks—Heavy boots containing numerous steel calks or spikes.

Conventional Undercut—The type of undercut commonly used to fell a tree. The undercut is taken from the butt of the tree.

Corners—The holding wood on either outside edge of the tree.

CPR—Cardiopulmonary resuscitation.

Danger Tree—A standing tree that presents a hazard due to conditions such as deterioration or physical damage to the root system, trunk, stem, or limbs, and the direction and lean of the tree.

Dogs (Bumper Spikes)—Chain saw accessory designed for felling and bucking. Medium-size saws will generally have an inside dog while larger saws will have an inside and an outside set of dogs. Chain saw dogs increase the sawyer's efficiency in felling and bucking operations.

Dolmar—Container for holding saw fuel and oil.

DOT—U.S. Department of Transportation.

Double Jack—A long-handled sledge hammer used to drive splitting and steel wedges.

Dutchman—A portion of the undercut that is not removed. A dutchman generally results when the horizontal and sloping undercut do not meet or extend beyond each other. A dutchman is very hazardous because it can change the felling direction.

End Bind—One of the four basic tree positions commonly encountered while bucking. An end bind situation occurs on steep terrain where the force of gravity closes the bucking cuts.

EPA—U.S. Environmental Protection Agency.

Escape Route—A predetermined path used by fallers when felling or bucking. Determine the direction and distance of the escape route and clear the route before cutting.

Face Cut—See undercut.

First-Aid Kit—A kit that includes bloodborne pathogen protective equipment (as a minimum, rubber gloves, face masks, eye protection, and CPR clear-mouth barriers) in addition to standard first-aid supplies.

Forest Service Approved—An item that meets Forest Service specifications or conforms to Forest Service drawings.

Guide Bar—The part of the chain saw that the saw chain travels on. Improper use of the bar (particularly the top and bottom of the bar at the end of the bar's nose) results in kickbacks and saw cuts.

Gunning (Sighting)—Aligning the handlebars or gunning mark with the desired felling direction. Because the handlebars or gunning mark are at a 90-degree angle to the bar, the exact position of the undercut can easily be established in relation to the desired felling direction. Some handlebars are not designed for gunning.

Hanging Wedge—A fan-shaped metal wedge.

Hangup—A situation in which a tree is lodged in another tree and does not fall to the ground.



Head Lean—One of the two natural leaning forces found in most trees. Head lean is more pronounced than side lean.

Holding Wood—Section of wood located between the undercut and the backcut. Its purpose is to prevent the tree from permanently slipping from the stump before it has been committed to the undercut. It also helps direct where the tree will fall. The holding wood must never be completely sawn off.

Hinge Wood—Same as holding wood.

Horizontal Undercut—The first of the two cuts required to undercut a tree. This level cut is at least one-third the diameter of the tree.

Humboldt Undercut—A type of undercut that is not recommended by the Forest Service for felling trees.

Itinerary—Planned route of travel, date of travel, destination, and estimated times of departure and arrival.

Jackstraw—Area where trees have been blown or fallen down in crisscross fashion.

JHA—Job hazard analysis.

Kerf—The slot saw-chain cutters make in the wood.

Kickback—A strong thrust of the saw back toward the faller generally resulting from improper use of the nose of the guide bar or from pinching the bar in a cut.

Lay—Refers to either the position in which a felled tree is lying or the intended location of a standing tree after it has been felled.

Lead—The established direction in which all trees in a quarter or strip are to be felled, usually governed by the terrain of the area, its general slope, or the skid road system.

Lean—The tilt of a tree away from its vertical position. Many times two leans may affect the same tree, such as head lean and side lean.

Leaner—A tree that leans heavily.

Limbing—Removing the branches from a felled or standing tree.

MSDS—Material safety data sheet. A compilation of information required under the Occupational Safety and Health Administration's Hazard Communication Standard that outlines the identity of hazardous chemicals, health, physical, and fire hazards, exposure limits, and storage and handling precautions.

NIOSH—National Institute on Occupational Safety and Health.

Offside—The opposite side of the tree from where the faller stands while bucking or felling.

OSHA—Occupational Safety and Health Administration.

Pie Shape (Wedge) Cut—A section sawn from a tree during bucking to allow for the directional pressures of various binds. Removing a pie-shaped section minimizes splits and slabs.

PPE—Personal protective equipment and clothing, respiratory devices, protective shields, and barriers.

Pistol-Grip Tree—A tree with a curve at the base of the trunk that makes it difficult to identify the tree's lean.

Safety Container—As defined by NFPA 30, an approved container with less than 5-gallon capacity, having a spring-closing lid and spout cover designed so that it safely relieves internal pressure when during a fire.

Sapwood—The outer layers of wood in growing trees that contain living cells and reserve material.

Side Bind—One of the four basic tree positions commonly encountered while bucking. A tree in a side bind is compressed on one side and tensioned on the other.

Side Lean—One of the two natural leans found in many trees. Side lean is less pronounced than head lean.

Sitback—Refers to a tree that settles back on the stump, closing the backcut's kerf. Sitback usually occurs because of improperly determining the tree's lean or by the wind.

Slabbing—A lateral split generally caused by improper technique or an improper sequence of bucking cuts.

Sloping Undercut—The second of the two cuts required to undercut a tree. This cut must be angled to allow a wide opening for the undercut.

Snag—Any standing dead tree.

Sound—Wood that is not rotten.

Spider—A gauge used for setting crosscut saw teeth.

Spike Top—A live tree that has a dead top.

Spring Pole—A limb or sapling that is bent under a tree or other weight.



Glossary

Stump Shot—Two inches or more height difference between the horizontal cut of the undercut (face) and the backcut. The difference in height establishes a step that will prevent a tree from jumping back over the stump toward the faller.

Swamp Out—To clean out brush and other material around the base of trees and where trees are to be bucked to protect against saw kickback and to provide safe footing.

Top Bind—One of the four basic tree positions commonly encountered while bucking. A tree in a top bind situation is compressed on top and tensioned on the bottom.

Undercut (Face Cut)—A section of wood sawn and removed from a tree's base. Its removal allows the tree to fall and helps

direct where the tree will fall. The face is comprised of two separate cuts that have constant relationships. The horizontal cut must be at least one-third the diameter of the tree; the sloping cut must be angled enough to allow a wide opening, and the two cuts must not cross each other.

USDA—U.S. Department of Agriculture.

Wedge—A plastic or magnesium tool used by a faller to redistribute a tree's weight in the desired direction and to prevent a tree from falling backward. It is also used to prevent the guide bar from being pinched while bucking.

Widow Maker—A loose limb, top, or piece of bark that may fall on anyone working beneath it.



Sample Job Hazard Analysis

U.S. Department of Agriculture Forest Service	1. WORK PROJECT/ACTIVITY	2. LOCATION	3. UNIT
JOB HAZARD ANALYSIS (JHA) References: FSH 6709.11 and 6709.12 (Instructions on reverse)	4. NAME OF ANALYST	5. JOB TITLE	6. DATE PREPARED
7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS (Engineering controls • substitution • administrative controls • PPE)	
Chain Saw Operation	<p>Falling objects Flying or spraying objects Noise Sharp or pointed objects</p> <p>Ergonomics, fatigue</p>	<p>Qualifications</p> <ul style="list-style-type: none"> • Current certification by a nationally recognized organization to render first aid and perform CPR. Participation in an approved crosscut/chain saw program (Classroom and field training encompassing in part or in total a national training program, such as Wildfire Power Saws S-212). Supervisors—Ensure that saw operators receive training or retraining in first aid and CPR before certifications expire. <p>Elements include:</p> <ul style="list-style-type: none"> • Demonstration of sawing ability (to a certified operator or certified instructor) in functional areas. • Supervision by a certified instructor or certified operator of saw work by new operators. Supervisors—Monitor proficiency of sawyers to recognize the need for recertification (additional training) in less than 3 years. <p>Personal Protective Equipment (PPE)</p> <p>Employees—Maintain PPE in a clean and fully functional condition.</p> <p>Required PPE:</p> <ul style="list-style-type: none"> • Forest Service-approved hardhat. • Eye protection. • Hearing protection (85 dB and above). • Appropriate gloves (cut-resistant gloves for chain filing). • Long-sleeved shirt. • Chain saw chaps (Forest Service—approved, minimum of 2 inches boot overlap). • Heavy-duty, cut-resistant or leather, waterproof or water-repellent, 8-inch-high laced boots with nonskid soles (hard toes are optional). • Fire shelter (wildfire and prescribed-burn assignments). <p>Required chain saw features:</p> <ul style="list-style-type: none"> • Throttle interlock. • Felling and bucking spikes for felling and bucking operations (full set of two). • Antivibration system. • Chain brake, fully functional. • Proper saw for the job, fully operational (full wraparound handle bar for felling operations is required, three-quarter handlebars are allowed for bucking and limbing only). • Proper bar length for the specific work project or activity. • Bow bars with top and bottom chain guards and stingers. • Chain, filed and maintained. <p>General equipment:</p> <ul style="list-style-type: none"> • First-aid kit. • Fire extinguisher. • Chain saw wrench. • Chain file with handle and guard. • Approved safety container for fuel. • Chain and bar oil container, clearly marked. • Proper wedges for the specific work project or activity (wooden wedges are not permitted). • Single-bit ax or maul, 3 to 5 pounds 	<p>FS-6700-7 (03/00)</p>



1. WORK PROJECT/ACTIVITY	2. LOCATION	3. UNIT
4. NAME OF ANALYST	5. JOB TITLE	6. DATE PREPARED
7. TASKS/PROCEDURES	9. ABATEMENT ACTIONS (Engineering controls • substitution • administrative controls • PPE)	
<p>U.S. Department of Agriculture Forest Service</p> <p>JOB HAZARD ANALYSIS (JHA) References: FSH 6709.11 and 6709.12 (Instructions on reverse)</p>		FS-6700-7 (03/00)
<p>Transporing the Saw</p>	<p>8. HAZARDS</p> <p>Darkness Walking</p> <p>Vehicle</p>	<p>9. ABATEMENT ACTIONS (Engineering controls • substitution • administrative controls • PPE)</p> <p>Safety Practices:</p> <ul style="list-style-type: none"> • No felling at night. • Carry so the bar (teeth) point downhill and away from the body—cover the bar if carrying on your shoulder. Prevent injury from cutters, dogs, and muffler. • Shut down the saw when carrying farther than tree to tree, or when slippery surfaces or brush create additional hazards. • Activate the chain brake for shorter distances. • Do not carry saws or fuel (including empty fuel containers) in the passenger compartment. • Do not store fuel and food together. <p>Analyze the cutting area by considering:</p> <ul style="list-style-type: none"> • Location of people, structures, powerlines, and other obstacles. • Roads and travel in the cutting area. • Topography and steep ground. • Nearby hazards such as trees, low-hanging and dead limbs, rocks, and brush. • Primary and secondary escape routes, safety zones, and alternates. • Wind direction and velocity such as steady versus gusting and/or changing directions. • Tree species, both live and dead. • Diameter and height of trees. • Soundness of tree (split, lightning struck, broken-off top, rot, deterioration or physical damage to the root system, trunk, stem, limbs, or bark). • Lean direction. • Limb distribution. • Widow makers. • Spiked top. • Burning top. • Moisture (rain, snow, or ice).
<p>Situational Awareness and Sizeup</p>		
<p>Chain Saw Operation</p>	<p>Slips, trips, and falls</p> <p>Walking surfaces</p> <p>Falling objects</p>	<p>Primary and Secondary Escape Routes, Safety Zones, and Alternates</p> <ul style="list-style-type: none"> • Select and prepare the work area by clearing a primary escape path and an alternate path before starting the cut. • Walk out and thoroughly check the intended lay of the tree. • Plan the route from the stump to the safety zone, generally not less than 20 feet away; the farther the better. • If possible, stand behind another tree, preferably quartering back from the planned direction of fall. Wait and watch for at least 30 seconds after the tree hits the ground for branches and other broken tree parts to fall. The shielding tree should be sound and large enough to provide protection.
<p>Bucking, Brushing, and Limbing</p>	<p>Kickback Bind Rolling logs</p> <p>Tension</p>	<ul style="list-style-type: none"> • Know where the tip of the bar is at all times. • Anticipate log tensions (binds) and compressions and plan mitigation. • Use wedges and/or the pie cut. Initiate the cut slowly to observe the bind. • Use caution when cutting limbs supporting the log off the ground. Do not saw from the downhill side. On steep ground, prevent bucked sections from rolling or sliding. Limb from the top of large logs. • Watch for and carefully reduce tension on saplings and limbs with a series of small cuts on the tensioned side.

1. WORK PROJECT/ACTIVITY	2. LOCATION	3. UNIT
4. NAME OF ANALYST	5. JOB TITLE	6. DATE PREPARED
9. ABATEMENT ACTIONS (Engineering controls • substitution • administrative controls • PPE)		
U.S. Department of Agriculture Forest Service		FS-6700-7 (03/00)
JOB HAZARD ANALYSIS (JHA) References: FSH 6709.11 and 6709.12 (Instructions on reverse)		
7. TASKS/PROCEDURES	8. HAZARDS	
Felling	Human factors Other hazards (kickback, bind, rolling logs)	<ul style="list-style-type: none"> • Consider your mental and physical condition. • Saw from a safe standing height. Be alert and look up frequently. The undercut must be clean with an opening large enough to control the tree neatly to the ground. Do not use corner or side cuts in hollow trees unless adequate holding wood can be maintained. Give a warning shout before beginning the backcut. Give another warning shout just before the tree falls. Insert a wedge into the backcut as soon as possible. In small-diameter trees, wedge into a corner cut. Do not cut off all of the holding wood. As the tree commits to the undercut, watch the top as you get quickly way from the stump. If the tree moves in a direction that compromises the primary escape route, use the alternate route. Do not leave a partially cut tree without marking it and warning others. When situations are deemed unsafe, use alternate methods or cancel the task.
Handling Flammable and Combustible Liquids	Burns, flammability, and toxic fumes	Safety Practices <ul style="list-style-type: none"> • A hazard communication training program provides information related to general awareness, hazard chemical inventory, and MSDSs. • A hazardous-chemical inventory shall be maintained and shall be readily accessible to all employees. • Never handle hazardous chemicals that do not have an MSDS. An MSDS is required from the manufacturer/supplier of each chemical used onsite and shall be readily accessible to employees at all times. Transportation <ul style="list-style-type: none"> • All containers (safety cans, drums, tanks, or tank trucks) used for transporting hazardous materials must be correctly labeled or placarded to ensure quick identification of the materials in an emergency. Dispensing <ul style="list-style-type: none"> • General Safety—All handling and dispensing of flammable liquids shall be done in a well-ventilated area free of sources of ignition, with bonding between the dispensing equipment and the container being filled. Procedures <ul style="list-style-type: none"> • Teach all employees who are subject to exposure, especially those known to be highly sensitive, to recognize poisonous plants. When possible, do not assign allergic employees to jobs that expose them to poisonous plants. • Provide and apply a skin protectant or barrier cream. Fasten pant legs securely over boot tops (adhesive tape may be necessary). • Wear gloves and keep them away from the face and other exposed parts of the body. Do not touch skin with hands, clothes, or equipment that may have contacted poisonous plants. • Whenever the skin contacts a poisonous plant or noxious weed, wash the area with cold water within 1 to 3 minutes or as soon as possible. Use liberal amounts of water to ensure that all poisonous oils are washed off. While working around poisonous plants, do not wash with soap and/or hot water because they can remove natural protective oils from your skin. • Destroy poisonous plants around improved areas. • Avoid the smoke of burning poisonous plants. Inhaling this smoke can cause fever, malaise, respiratory problems, and severe rash. • Upon returning from the field, use rubbing alcohol to cleanse skin that contacted poisonous plants. • Clean tools with citric-based solvent before storing (use appropriate gloves and adequate ventilation). • Avoid exposure through mishandling contaminated clothes. Wash contaminated clothing separately from other clothes in hot water and detergent.
Working Around Poisonous Plants	Accidental contact	



Sample Job Hazard Analysis

U.S. Department of Agriculture Forest Service	1. WORK PROJECT/ACTIVITY	2. LOCATION	3. UNIT
JOB HAZARD ANALYSIS (JHA) References: FSH 6709.11 and 6709.12 (Instructions on reverse)	4. NAME OF ANALYST	5. JOB TITLE	6. DATE PREPARED
7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS (Engineering controls • substitution • administrative controls • PPE)	
Working Around Insects	Ticks	Safety Procedures <ul style="list-style-type: none"> • Spray clothes with an insect repellent, which may provide an additional barrier against ticks. Repellents, such as diethyl metatolamide (DEET), do not kill ticks. Some sprays do contain permethrin, which kills ticks on contact. Always follow the manufacturer's application instructions for insect repellents and treatments. • Wear light-colored clothing that fits tightly at the wrists, ankles, and waist. Each outer garment should overlap the one above it. Cover trouser legs with high socks or boots and tuck shirttails inside trousers. • Search the body repeatedly (such as during rest periods and lunch), especially hairy regions and inside clothing, as ticks seldom attach themselves within the first few hours. • Remove ticks with fine-tipped tweezers or fingers. Grasp the tick as close as possible to the point of attachment and pull straight up, applying gentle pressure. Wash the skin with soap and water then cleanse with rubbing alcohol. Do not try to remove the tick by burning it with a match or covering it with chemical agents. If the head pulls off when the tick is being removed, or if the tick cannot be removed, seek medical attention. • Once the tick has been removed, place it in an empty container so it can be given to a physician if you experience a reaction. Record the dates of tick exposure and removal. An early warning sign to watch for is a large red spot on a tick bite. Reactions within 2 weeks include fever, chills, headache, joint and muscle ache, significant fatigue, and facial paralysis. 	
Evacuation Plan (see attached Emergency Evacuation Plan)		12. DATE	
10. LINE OFFICER SIGNATURE	11. TITLE		
Field Site EMERGENCY EVACUATION PLAN			
Work project/activity: <u>General saw use</u> Location: _____ Legal description: _____			
To prepare for an emergency that requires first aid and/or immediate evacuation of personnel due to serious injury, the following information shall be available to all crewmembers:			
<ul style="list-style-type: none"> • Designated first-aid provider(s): at least one person on each crew should be designated to provide first aid. • Communication procedures to follow in the event of an emergency. • Means of communication during duty hours: Forest radio to contact forest fire dispatch. 			



Additional Information for Sawyers

Chain Saw and Crosscut Saw Documents

Oregon Maintenance and Safety Manual. Blount, Inc., Oregon Cutting Systems Division; 4909 SE. International Way; Portland, OR 97222-4679; (or) P.O. Box 22127, Portland, OR 97269-2127.

Falling and Bucking Training Standard and Fallers and Buckers' Handbook. Workers Compensation Board of British Columbia, Films and Posters Section; P.O. Box 5350; Vancouver, BC V6B5L5.

An Ax to Grind (9923-2833-MTDC). Missoula Technology and Development Center; Bldg. 1, Fort Missoula; Missoula, MT 59804-7294.

Chain Saw and Crosscut Saw Videos

An Ax to Grind (99-01-MTDC). Missoula Technology and Development Center; Bldg. 1, Fort Missoula; Missoula, MT 59804-7294.

Be Smart—Be Sharp—Be Safe. Blount, Inc., Oregon Cutting Systems Division; 4909 SE. International Way; Portland, OR 97222-4679; (or) P.O. Box 22127, Portland, OR 97269-2127.

Chain Saw and Crosscut Saw Presentations

Situational Awareness Exercise for Chain Saws and Situational Awareness Exercise for Crosscut Saws. PowerPoint presentations. Missoula Technology and Development Center; Bldg. 1, Fort Missoula; Missoula, MT 59804-7294.

Chain Saw Videos

Chain Maintenance Clinic: Oregon Cutting. Workers Compensation Board of British Columbia, Films and Posters Section; P.O. Box 5350; Vancouver, BC V6B5L5.

Principles of Safe, Correct, and Efficient Chain Saw Use in All Tree Felling Operations. D. Douglas Dent, Inc.; P.O. Box 1099; Prineville, OR 97754.

Chain Saw Presentations

S-212 Wildfire Power Saws. Slide presentation. This training course is scheduled for revision fall of 2001. National Inter-agency Fire Center; 3833 S. Development Ave.; Boise, ID 83705.

Crosscut Saw Documents

Crosscut Saw Manual (7771-2508-MTDC). Revised May 1988. Missoula Technology and Development Center; Bldg. 1, Fort Missoula; Missoula, MT 59804-7294.

Lightly on the Land: The SCA Trail-Building and Maintenance Manual. Birkby, Robert C., ISBN# 0-89886-491-7, The Mountaineers, Seattle, WA, 1996.

Now You're Logging. Griffiths, Bus, ISBN# 1-55017-072-4, Harbour Publishing, Madeira Park, BC Canada, 1992.

Handtools for Trail Work. (8823-2601-MTDC). Revised February 1997. Missoula Technology and Development Center; Bldg. 1, Fort Missoula; Missoula, MT 59804-7294.

Northeastern Loggers' Handbook. Simmons, Fred C., USDA Agricultural Handbook No. 6, Northeast Forest Experiment Station, January 1951.

Food and Agriculture Organization of the United Nations, Basic Technology in Forest Operations. FAO Forestry Paper #36, ISBN# 92-5-101260-1, Rome, 1982.

Saws and Sawmills for Planters and Growers. Morris, John, ISBN# 1-871315-11-5, Cranfield Press, Bedford, UK, 1991
Logging Principles & Practices in the U.S. and Canada. Brown, Nelson Courtland, John Wiley & Son, Inc., 1934.

Country Woodcraft. Langsner, Drew, ISBN# 0-87857-200-7, Rodale Press, Emmaus, PA, 1978.

Crosscut Saw Reflections in the Pacific Northwest. Deaton, Jim, ISBN# 0-87770-675-1, Ye Galleon Press, Fairfield, WA, 1998.

Crosscut Saw Videos

Handtools for Trail Work (98-04-MTDC). Missoula Technology and Development Center; Bldg. 1, Fort Missoula; Missoula, MT 59804-7294.