





Saw Training For Volunteer Sawyers

Bucking Only

Jan 2018

Course Overview

- Saw Safety Course
 - For Trainee Saw Operators and Saw Operators

Saw Certification Training

- Bind Analysis and Cutting Sequence
 - For Trainee Saw Operators and Saw Operators
- Crosscut Saw Specific Training
 - For Crosscut Trainee Saw Operators and Saw Operators
- Chain Saw Specific Training
 - For Chain Saw Trainee Saw Operators and Saw Operators

Safety Course Overview

- Saw Program
- Safety Requirements
- Situational Awareness
- Case Study with Lessons Learned

Memorandum of Understanding

2009 MOU page 13, item 1, PCTA shall:

“Provide chain and crosscut saw operator safety training, certification and recertification opportunities using PCTA affiliated instructor/certifiers and instructors to meet the needs of the PCTA volunteers and staff to the fullest extent possible.”

PCTA Saw Policy

National Forest Service Saw Policy

- Adopted July 2016
- Allows Volunteer Groups to have their own saw programs
- PCTA saw program approved Feb 2018

Sawyer Certification Levels

A Sawyer – Bucking Only - Trainee Saw Operator

- Demonstrates skills to work at Low Level of Complexity
- Must be supervised during all cutting projects

B Sawyer – Bucking Only - Saw Operator

- May work without supervision
- Demonstrates skills to work at Moderate Level of Complexity
- Supervises A Sawyers

C Sawyer – Bucking Only - Saw Operator

- May work without supervision
- Demonstrates skills to work at High Level of Complexity
- Supervises A Sawyers and B Sawyers
- May be designated by PCTA to Train and Evaluate A Sawyer and B Sawyers

Sawyer Certification Levels

Volunteer Saw Instructor

- C Sawyer, Designated by PCTA to be a Saw Instructor
- Trains and evaluates A Sawyers, and B Sawyers
- Reviews Saw Program Policy

Volunteer Saw Evaluator

- C Sawyer Evaluator, approved by the Forest Service Regional Saw Program Manger
 - C Sawyer – Evaluators can certify C Sawyers – Bucking Only

Volunteer Saw Instructor-in-Training

- B Sawyer or C Sawyer
- Designated by PCTA to be “In Training”
- Assists in training events

Sawyer Cards

New Cards under new Forest Service Policy

- 3 year cards to be issued by PCTA (temporarily)
- All levels, A Sawyer, B Sawyer and C Sawyer

New National Database

- Cards will be issued thru new National Database
- PCTA Trail Operation`s Director will Sign the Evaluations and submit to the Database
- Database will be operational by April 2018

Saw Crew Leader

Each Saw Crew needs a Lead Sawyer

- Must be B Sawyer or C Sawyer
- Often determined prior to project start
- Saw Crew Leader is Responsible for:
 - Cutting Operation and Saw Crew Safety
 - Briefing Swampers on hazards of working around chainsaws, and risks of brushing and limbing (spring poles)
 - Ensures Swampers comply with working with PPE if inside the “blood circle” of running chainsaw
 - Correct equipment for the job, including PPE and First Aid Kit
 - Confirming with crew leader the EAP and TCP are completed
 - Assigning work to swampers and leading each cutting operation

Saw Crew Leader

- There may be 2 or 3 saw crews, on a trail project, each with a Saw Crew Leader
- Saw Crew Leaders work under the organization of the Trail Crew Leader
- Trail Crew Leader responsible for JHA, TCP and EAP
- Each Saw Crew requires their own EAP, when working as separate saw crews on the trail
- Each Saw Crew must have their own First Air Kit

Supervision

- Responsibilities of B Sawyers and C Sawyers
 - Immediate Supervision of A Sawyers during all cutting operations
 - Ensures A Sawyers work within skill level and safely address hazards
 - C Sawyers may provide direct supervision to B Sawyers during highly complex cutting operations
 - Provides useful tips and reviews cutting operation to enhance the training experience
 - Keep Saw Crew Safe

Safety Requirements

Saw crew leaders must be sure that all of the following are covered before beginning a project:

1. Personal Protective Equipment (PPE)
2. First Aid & CPR
3. Job Hazard Analysis (JHA)
4. Trailhead Communication Plan (TCP)
5. Emergency Action Plan (EAP)

Personal Protective Equipment (PPE)

Crosscut *(All equipment must meet USFS standards)*

Hard Hat	Full brim or cap style
Eye Protection	Safety glasses or shield when chopping or driving wedges (ANSI z87.1)
Hearing Protection	Not Required
Long-sleeve Shirt	Required
Gloves	Slip-resistant, appropriate for the weather conditions Cut-resistant, when filing & handling saw
Trousers	Loose fitting
Boots	Heavy-duty, cut resistant or leather, laced, with nonskid soles and adequate ankle support
First Aid	OHSA-compliant kit, one with each saw crew

Personal Protective Equipment (PPE)

Chain saw (All equipment must meet USFS standards)

Hard Hat	Full brim or cap style
Eye Protection	Safety glasses, goggles or shield (ANSI z87.1)
Hearing Protection	Plugs or muffs
Long-sleeve Shirt	Required at all times
Gloves	Slip-resistant, appropriate for the weather conditions Cut-resistant, when filing
Trousers	Loose fitting
Boots	Heavy-duty, cut resistant or leather, 6 inch-high, laced, with nonskid soles and adequate ankle support
First Aid	OHSA-compliant kit, one with each saw crew
Chaps	Meets USFS or ASTM specifications, 2" Overlap at hem

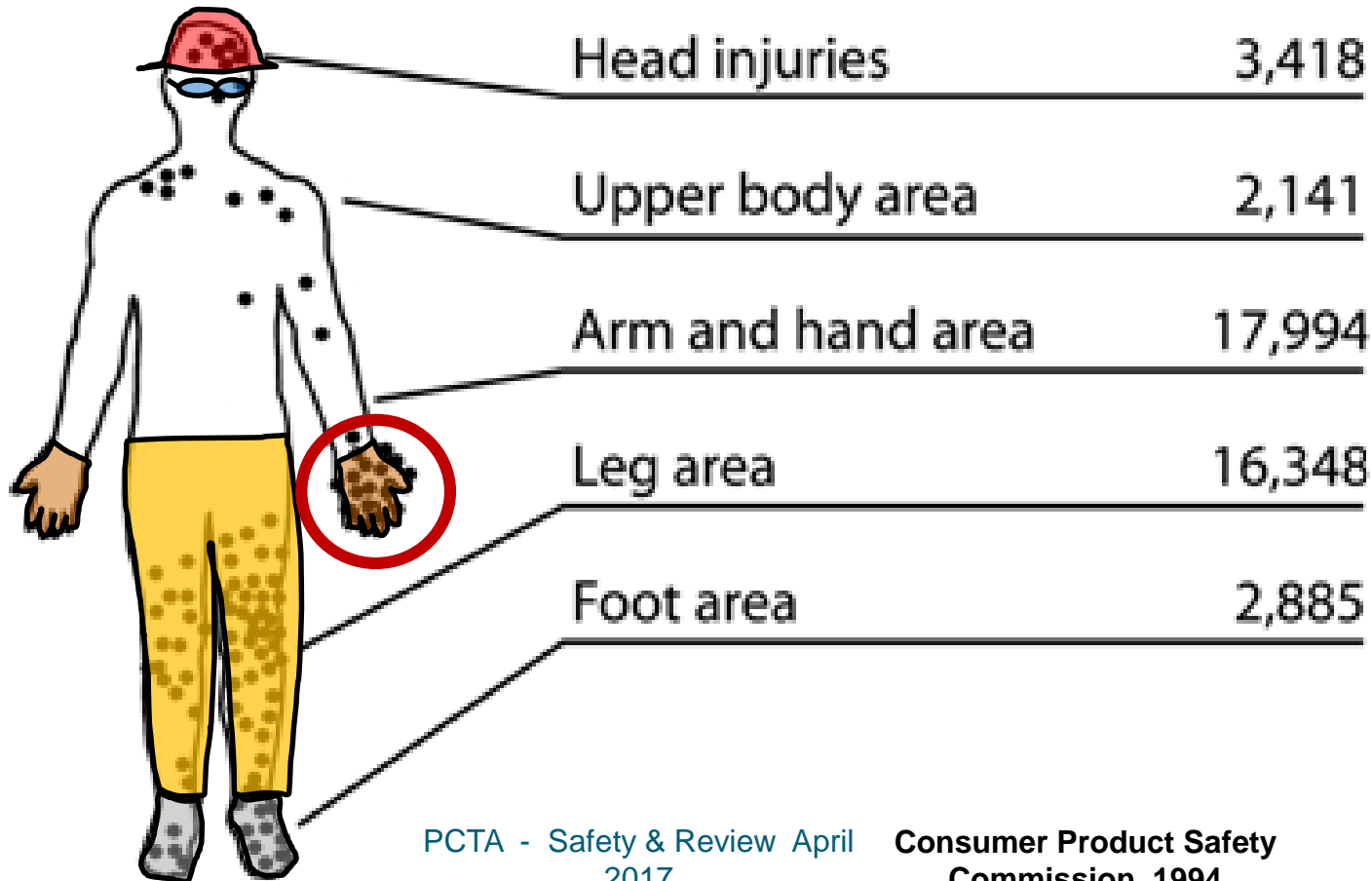
Chain Saw Chaps



- Must overlap boots at least 2 inches
- Use only clean saw chaps (uncut and undamaged by oils and solvents)
- They must meet the current USFS or ASTM specifications



Chain Saw Injury Location & Frequency



First Aid Kit

- OSHA-compliant
- (1910.266 App A)
 - Two large gauze pads (at least 8 x 10 inches)
 - Two elastic wraps
- PCTA Injury Info Packet
- Each Saw Crew must have a First Aid Kit

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9863



Job Hazard Analysis (JHA)

www.pcta.org/volunteer/crew-leader-center

Scroll down to “Job Hazard Analysis (JHA)”

- May need one or more JHA's for the work
- Check with your PCTA Regional Rep to confirm version
- Review and highlight the main points
- Note weather and other special conditions
- Everyone must sign the back page
- Mail with the PCTA Project Report to Sacramento

Safety Requirements Review

1. PPE
2. First Aid & CPR
3. JHAs
4. Trailhead Communication Plan
5. Emergency Action Plan

Sawyer Safety Procedures

1. Operational Safety

- Apply OHLEC Planning Logic to improve safety

2. OHLEC

Objective

Hazards/Obstacles

Leans/Binds

Escape Routes

Cut Plan

Sawyer Safety Procedures

1. Operational Safety

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

OHLEC - Objective

Develop an objective for the cutting operation

Note that the Objective is a very iterative process during a bucking operation

- “Where do you want the cut piece when finished?”
 - Determine cut piece track for log segments
 - Determine sequence and direction of limb removal
 - Determine how brush will be removed and disposed

OHLEC – Hazards and Obstacles

Develop a plan to identify the Hazards and obstacles in the cutting operation

- Overhead – Widow Makers, Dead Trees, Leaners, Loose Bark, Snags
- Upslope & Downslope
- Both Sides of log
- Bearing Points
- Pivots
- Root Wads
- Spring Poles
- Limbs and Branches
- Rotten Wood
- Foreign Objects
- Bees and Poisonous Plants
- People and Animals
- Buildings, Property & Equipment

OHLEC – Leans and Binds

Determine the binds in the log to be bucked, and in the limbing and brushing

- Predict binds based on bearing points and lie of log
- Determine the binds in the Springpoles
- Determine how the binds will change during the cutting operation
- Determine the reactionary forces when the log is cut

OHLEC – Escape Routes

Determine the “Good” and “Bad” side of the cutting operations

Identify the escape route and safety quadrants, and safe zones for crew

- Determine the safe area to work and clear the escape route if needed
- Determine the safe area for the saw crew
- Determine safety quadrant for each sawyer when double bucking

OHLEC – Cut Plan

Develop the cut plan for the cutting operation

- Determine the cutting sequence
- Determine type of cuts required
- Determine what types of supports or prep will be required to move cut pieces
- Communicate plan to saw crew
- Assign tasks to the saw crew and swampers

Situational Awareness



Bucking: Go or No Go

Hazards

Overhead

Up slope

Down slope

Both sides

Pivots

Snags

Foreign objects on
or under logs?

Binds

Top

Bottom

Side

End

Multiple



PACIFIC CREST TRAIL
ASSOCIATION

Do you have your safety gear on?

v. February 2014

Considerations

- People, property & traffic in work area
- Work party safety
- Safe work area
- Good escape routes
- First cut locations
- Release spring poles
- Cut piece track
- Leave a secure work area

Yourself:

What is your gut intuition telling?
Does this cut make sense?

**You must safely address every item
on this list or WALK AWAY!**

People, Property and Traffic

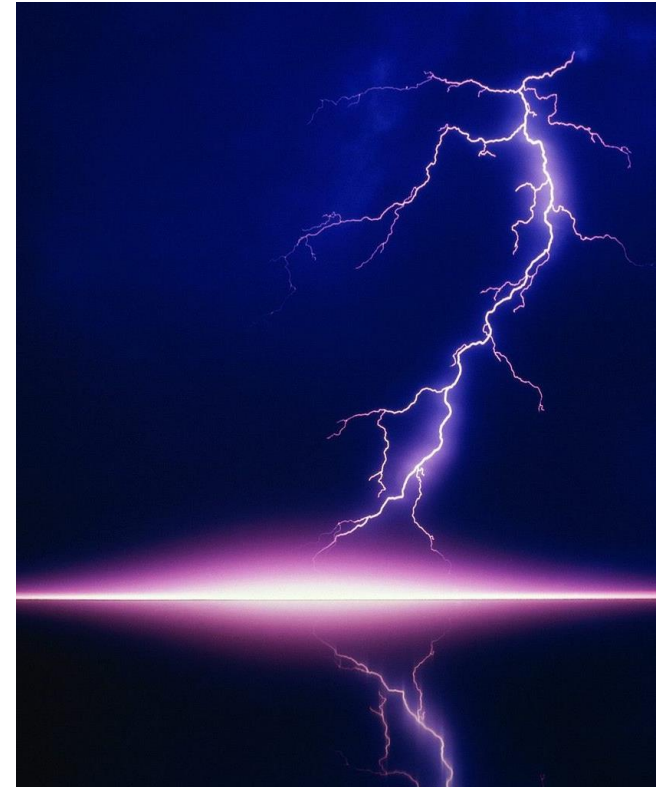
- Control of the Work Area
 - Stopping traffic on the trail
 - Control of switchbacks below the work area
- Considerations for Cut Piece Track
 - Controlled release of cuts
 - Safe cut piece track downhill of work area

Work Party Safety

- Can you Guarantee the Crew Safety?
- Environmental Conditions
- Crew Considerations
 - Tired and Fatigued?
 - Thirsty, Hungry, Hot, Cold?
 - Ample Daylight?
 - Too Eager?
- Safe Area for Crew during Cutting Operation?

Environmental Conditions

- **Wind:** Pinecones and small branches falling - 15 mph boogey
- **Ice:** NO GO on sloped work-site
- **Rain:** Is it too slippery?
- **Heat:** Will heat prevent completion of project?
- **Light:** Is there enough light to finish the project and clean up?



Constantly reassess throughout the day

Situational Hazard Awareness

- Environmental conditions
- Overhead survey
- Ground survey
- Site prep
- Crew and equipment
- Cut analysis and plan

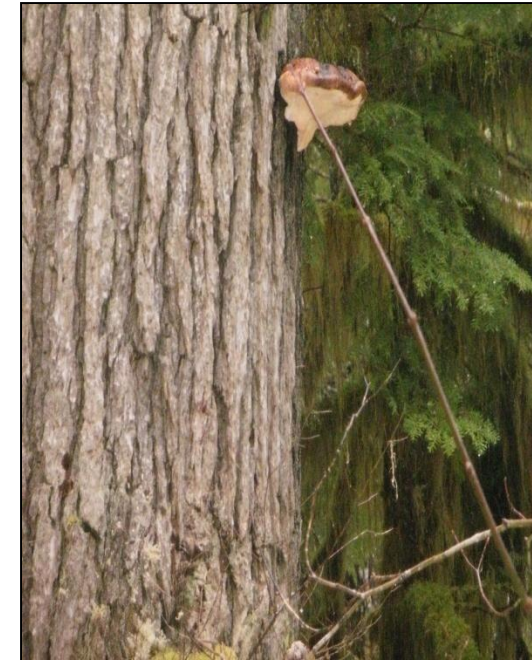
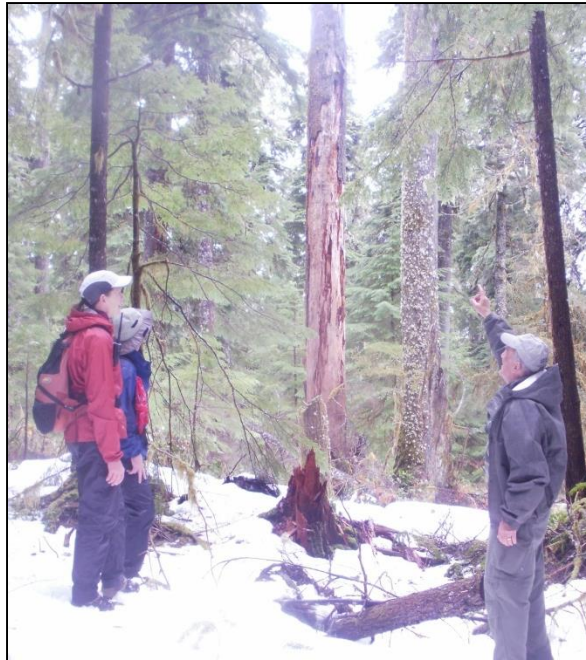


Overhead Hazard Survey

Look at all the standing timber to determine its condition

Check for:

- ✓ Snags
- ✓ Leaners
- ✓ Loose Limbs
- ✓ Loose Bark
- ✓ Feeding Holes
- ✓ Insect Activity
- ✓ Conks and Mushrooms
- ✓ Shelf or Bracket Fungi
- ✓ Sap Rot



Can the wind or your work cause these hazards to fall and harm you, your crew, hikers or equestrians?

Hazards: Snags



Can the cut piece travel where it could hit a snag?

Hazards: Sap Rot Indicators



Ground Hazard Survey

Walk the entire length of the log

Look for:

- Spring poles
- Bearing points
- Pivot points
- Root wad
- Up slope
- Down slope
- Both sides
- Foreign objects on or under log



Hazards: Spring Poles



Hazards: Spring Poles



**(Wildland Fire Chain Saws, S-212 Video,
National Wildfire Coordinating Group)**

Hazards: Blow Downs



**(Wildland Fire Chain Saws, S-212 Video,
National Wildfire Coordinating Group)**

Hazard Mitigation

- Overhead Survey
- Ground Survey – walk the length of the log
- Identify spring poles and brush
- Establish bearing points, anchors and binds
- Determine cutting sequence to control release of energy
- Determine how the binds will change thru cutting sequence
- Determine movement of cut pieces
- Establish Safety Quadrants and safe areas for crew
- Announce Plan and Review if things change from plan

Hazard Mitigation - Complexity

Hazard Ranking Guideline

Log Diameter	16" and under	24" and under	Above 24"
Side Bind	Mild	Moderate	Severe
Top/Bottom/End Bind	Mild	Moderate	Severe
Slope	Level	10%	Above 10%
Single Log	On Ground	3' above Ground	Over 3' in the air
Stacked Logs	On Ground	Suspended	On Slope
Other hazards	None	Pivots, Root Wads, not affected by cutting sequence	Root Wads, Pivots, other hazards



Safe Working Area

- Establish Safe Quadrant (or Escape Route if needed)
- Stabilize Work Area for solid footing
- Prepare work site
 - Remove hazards
 - Brush out and limb work area and escape route
 - Remove tripping hazards
- Prepare Cut track routes
- Establish safe areas for crew
- Control traffic on the trail – especially switchbacks
- Secure area around root wad

Site Preparation

- Remove branches
- Remove debris from tread
- Remove spring poles
- Remove bark (crosscut)
- Prep bucking location
- Support aids, if needed



Site Preparation



Ensure stable footing – may need to create bench in slope

Site Preparation



Clear out underneath log

Site Preparation - Support Aids



Use supports (rails) and mechanical leverage to move logs

Site Preparation - Support Aids



Use mechanical leverage wisely – lift with legs

Site Preparation - Support Aids



Plan before you cut – how much do you need to cut?

Site Preparation - Support Aids



Plan before you cut - where to put the cut piece ?

Site Preparation - Support Aids



Proper planning allowed for 2 cuts to clear the entire log

Site Preparation - Support Aids



Support cut pieces and add rails to roll cut pieces off trail

Site Preparation - Support Aids



Build cribbing to support cut pieces or to change binds

Crew & Equipment Considerations

- Do you have the right crew for the job?
- Do you have the proper safety equipment?
- Do you have enough gear? The right gear?
- Do you have enough people to keep trail users clear of the work area?



Don't Start a Project Without the Right Stuff!

Cut Analysis & Plan

- Bind Evaluation and Mitigation
- Action Plan
 - Site preparation
 - Crew assignments
 - Crew communication
 - Cut sequence
 - Cut piece track
 - Cut design
 - Escape routes



Before the Saw Touches the Wood...

Bucking: Go or No Go

Hazards

Overhead

Up slope

Down slope

Both sides

Pivots

Snags

Foreign objects on
or under logs?

Binds

Top

Bottom

Side

End

Multiple



Do you have your safety gear on?

v. Febru

Considerations

- People, property & traffic in work area
- Work party safety
- Safe work area
- Good escape routes
- First cut locations
- Release spring poles
- Cut piece track
- Leave a secure work area

Yourself:

What is your gut
intuition telling?
Does this cut
make sense?

**You must safely address every item
on this list or WALK AWAY!**

Situational Hazard Awareness

- Environmental conditions
- Overhead survey
- Ground survey
- Site prep
- Crew and equipment
- Cut analysis and plan

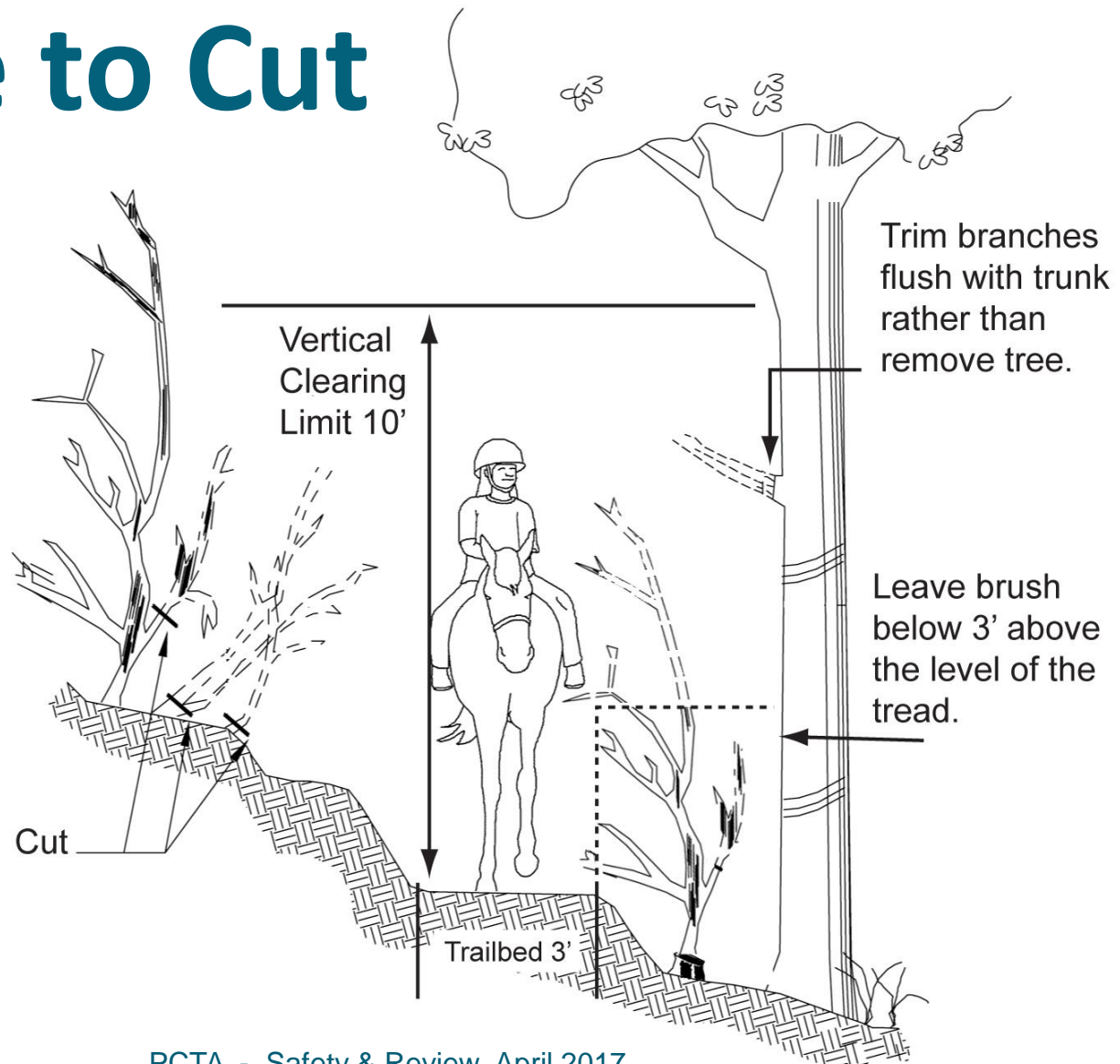


Bucking Only



Which one of these would you or should you cut?

Where to Cut



Leaving the Project Site

- ✓ Is everything secure?
- ✓ Do you have all tools?
- ✓ Is the tread restored?
- ✓ Is the setting restored?

If there is any dangerous condition that you are unable to correct...



If it is a hazard to normal hiker or equestrian safety...

Flag It!

Inform Land Manager As Soon As Possible

- ✓ Note location
- ✓ Condition details
- ✓ Equipment needed
- ✓ Forest condition
- ✓ Landscape conditions

Industrial Fire Precaution

Fire prevention requirement based on fire risks

- Fire Extinguisher (0.5 or 1lb) & Shovel/Combi Tool
- Higher Levels of restriction require cutting operations cease at prescribe time (often 1 pm)
- Watchman – may need to post watch after cutting is completed (1 hour to 3 hour watch)
- Highest fire danger can result in no chainsaw operations allowed – (consider use of crosscut saw)

Contact Land Manager for Local Requirements and information on where restrictions are posted



Lessons Learned

Fuel Pressurization and Fuel Geysering
(Chainsaw Only)

Fuel Pressurization

- Pressure in fuel tanks and fuel bottles
 - Systems are not vented to relieve pressure
 - Fuel blends (summer and winter) behave differently, with winter fuels more volatile and higher risk if used in summer
 - Changes in environment (increased elevation and elevated temperatures) increases risk
- Fuel in tanks and fuel bottles can become superheated
- Fuel will boil or geyser, when cap pressure is released
- High risk of sprayed fuel and highly flammable vapors exist leading to fires due to hot engine or muffler
- Remove any clothing or PPE soaked with fuel

Fuel Pressurization

- Vapor Lock is one symptom:
 - Be aware of poor running saw, or poor starting saw, with ½ tank of fuel
 - Unstable engine speed, loss of power, or feels like running out of fuel
- If Vapor Lock is suspected:
 - Check fuel level without opening fuel cap (see thru tank)
 - Allow saw to cool at least 10 minutes before refueling

Training Video:

<https://www.youtube.com/watch?v=d8gz2iCnGAYk>

2016 WFSTAR: Fireline Fuel Safety from [National Interagency Fire Center](#)

Fuel Pressurization & Geysering



Fuel Tank Pressurization

Fuel sprays out when cap released



Fuel Tank Geysering

Fuel boils as cap is released

<https://www.youtube.com/watch?v=d8g2iCnGAYk>

2016 WFSTAR: Fireline Fuel Safety from [National Interagency Fire Center](#)

Chain Saw ReFueling

- Pressure in fuel tanks and fuel bottles
 - Allow time for saw to cool (at least 5 min) before refueling
 - Aim opening away from body
 - Open cap slowly to relieve pressure
 - Turn cap to unlock, but do not remove cap
 - Stihl Locking Caps require only $\frac{1}{4}$ turn to remove
 - Allow pressure to vent, before removing cap
 - Full thread caps are easier to vent
- Do not Overfill fuel tank
 - Leave enough room for air pocket and fill cap
- Do not start saw within 10 feet of area of refueling
- Do not refuel within 20 feet of ignition sources



Lessons Learned

Review of 2014 Accidents Lodgepole Bucking Injury Accident

Lodgepole Bucking Injury

- Bucking injury associated with felling operation, but pertinent to our trail work
- C Sawyer had felled 8” lodgepole pine and then concentrated on felling 24” Western Larch
- Operations were late in the afternoon, after long day
- Sawyer didn’t evaluate the lodgepole and began bucking cuts without recognizing the lodgepole was under intense side bind
- Sawyer was standing in the wrong location and when the log released, the log impacted and broke his leg, throwing sawyer onto running saw



Lodgepole Bucking Injury

- Lessons Learned:
 - The log was only 8" in diameter. **Small logs can injure and kill – Don't underestimate them!**
 - Although there were two sawyers, they were working independently with no swampers and one first aid kit. **PCTA sawyers never work alone and requires each saw crew have a first aid kit!**
 - Injured sawyer was an experienced "C" level feller-bucker. **This can happen to anyone!**
 - If the full length of the log had been examined, the sidebind would have been obvious. **Never buck a log without performing a thorough size-up!**

Lodgepole Bucking Injury

- Lessons Learned:
 - The accident occurred late in the shift.
Fatigue may have been an issue.
 - In addition to the broken leg resulting from the springback, the sawyer experienced severe cuts on his left wrist and forearm and the chainsaw was still running.
Keep the left thumb firmly wrapped around the handle of the saw to ensure the chain brake is activated.
 - Sawyer may have been “target-focused” on the larger tree and didn’t focus on the lodgepole and the hazards
Keep focused on the task at hand and always assess risks.



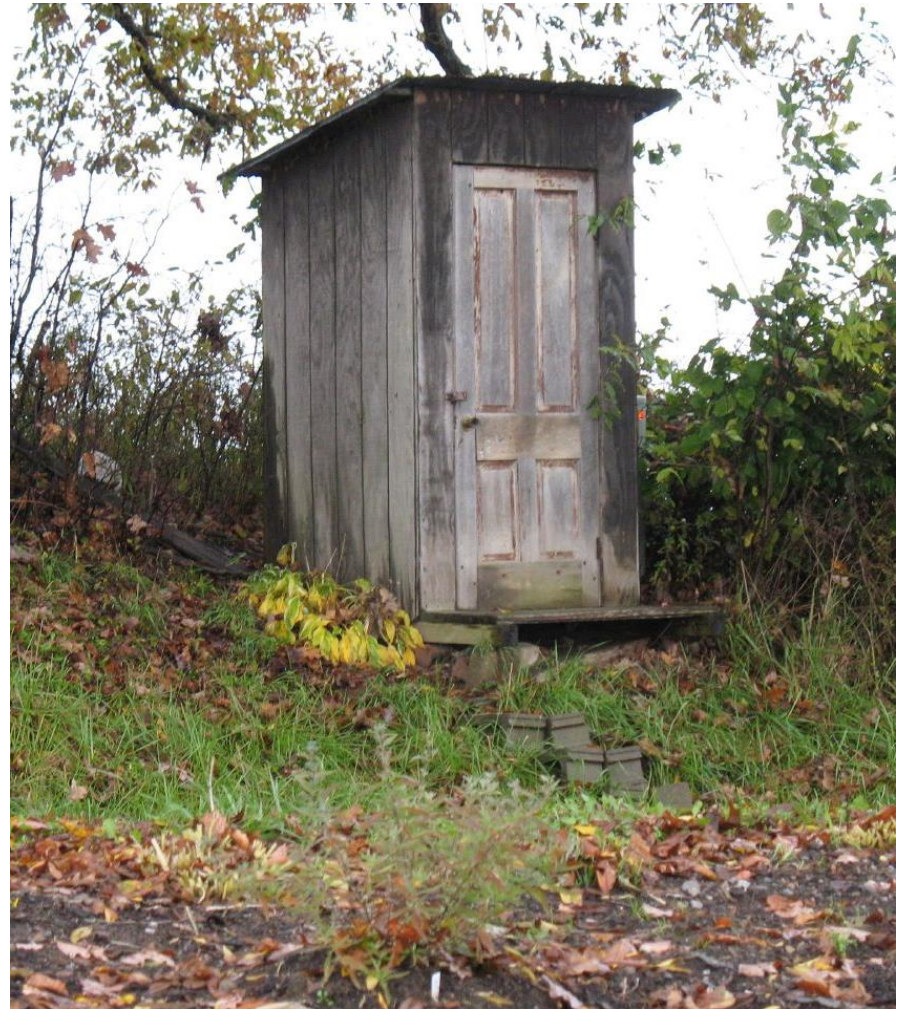
Case Study Lessons Learned

Summary of relevant known incidents and accidents

Course Review

- Saw Program
- Safety Requirements
- Situational Awareness
- Case Study with Lessons Learned

Break Time





Bind Analysis & Cut Sequence

For Trainee Saw Operators and Saw Operators

April 2017

Course Overview

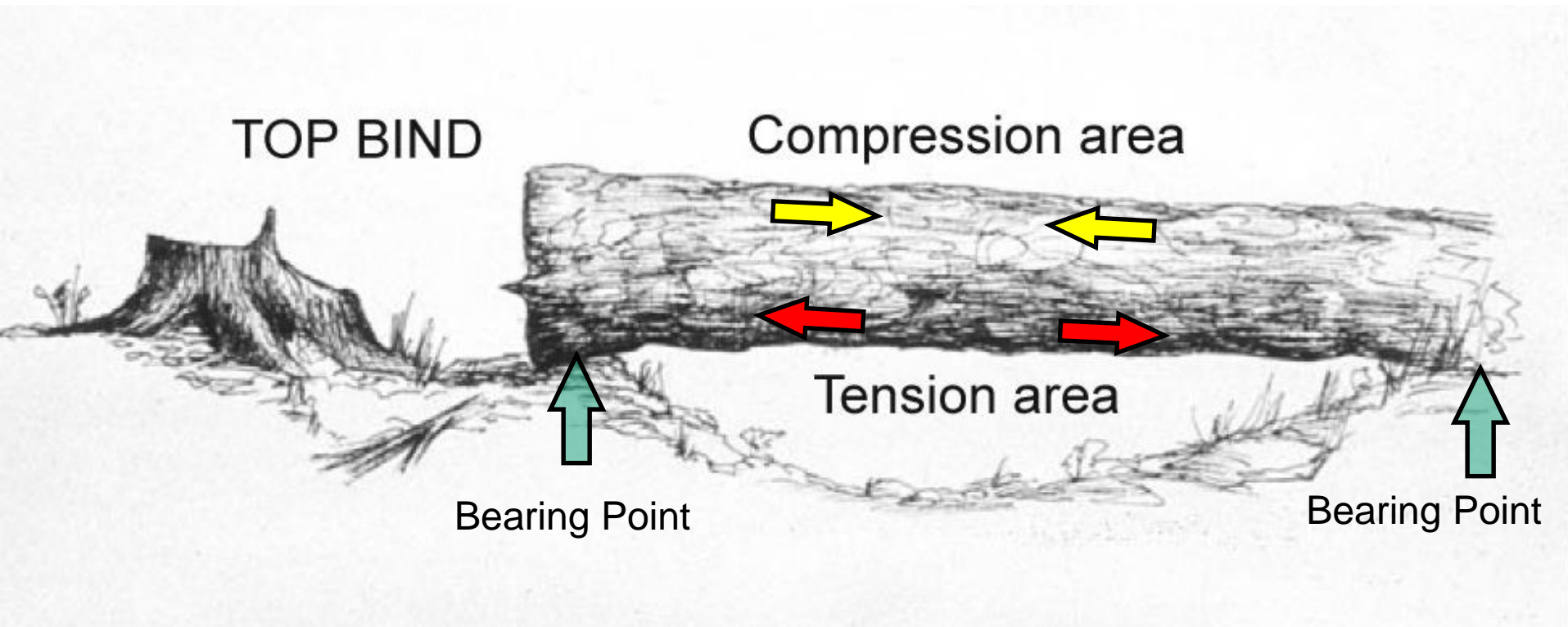
- Types of Binds
- Types of Cuts
- General Considerations
- Hazard Tree Scenario

Types of Binds

- Top bind
- Bottom bind
- Side bind
- End bind
- Compound binds



Top Bind



Top cut and finish from bottom – add pie cut if needed

Top Bind



Top cut and finish from bottom

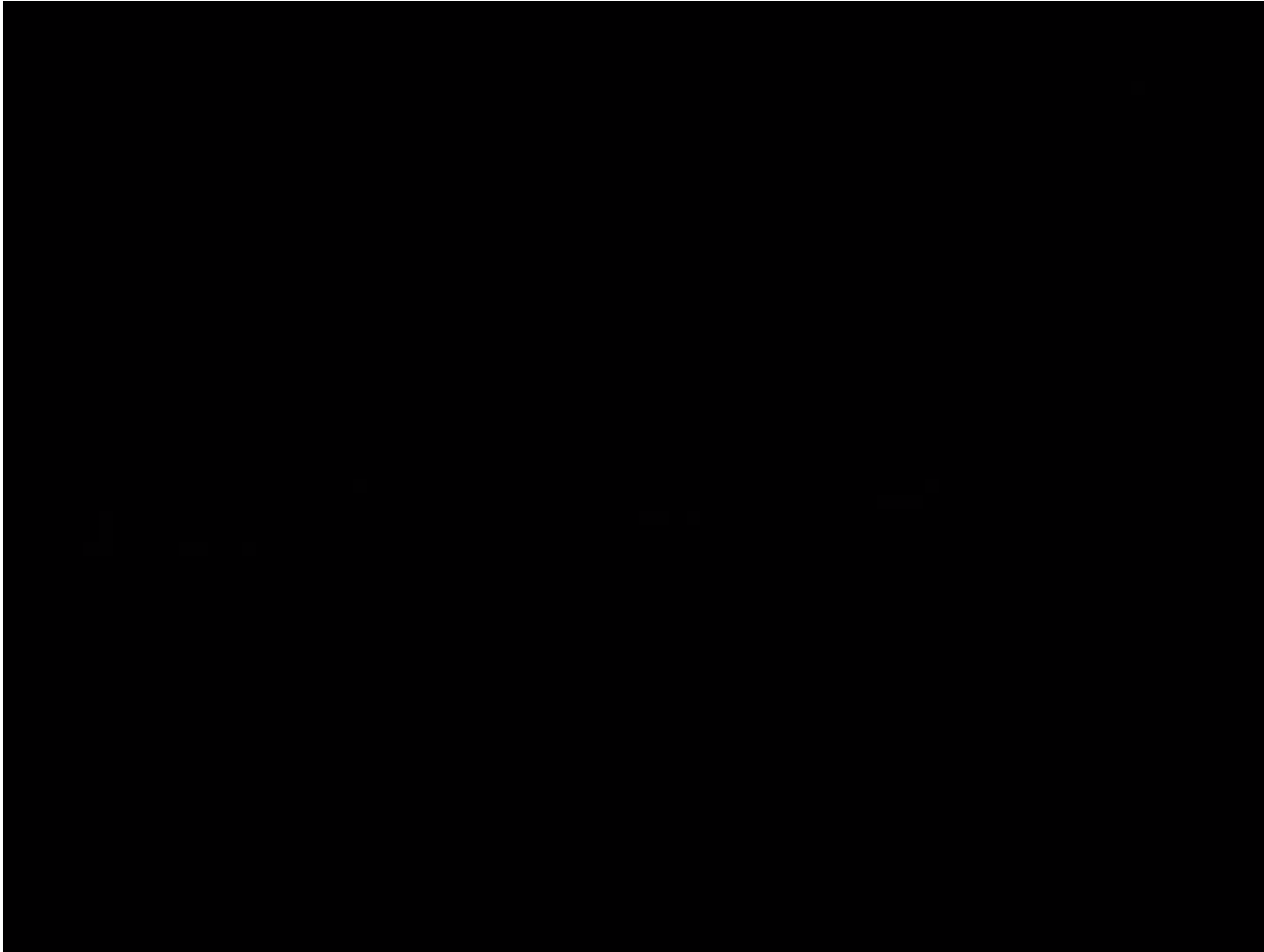
Top Bind



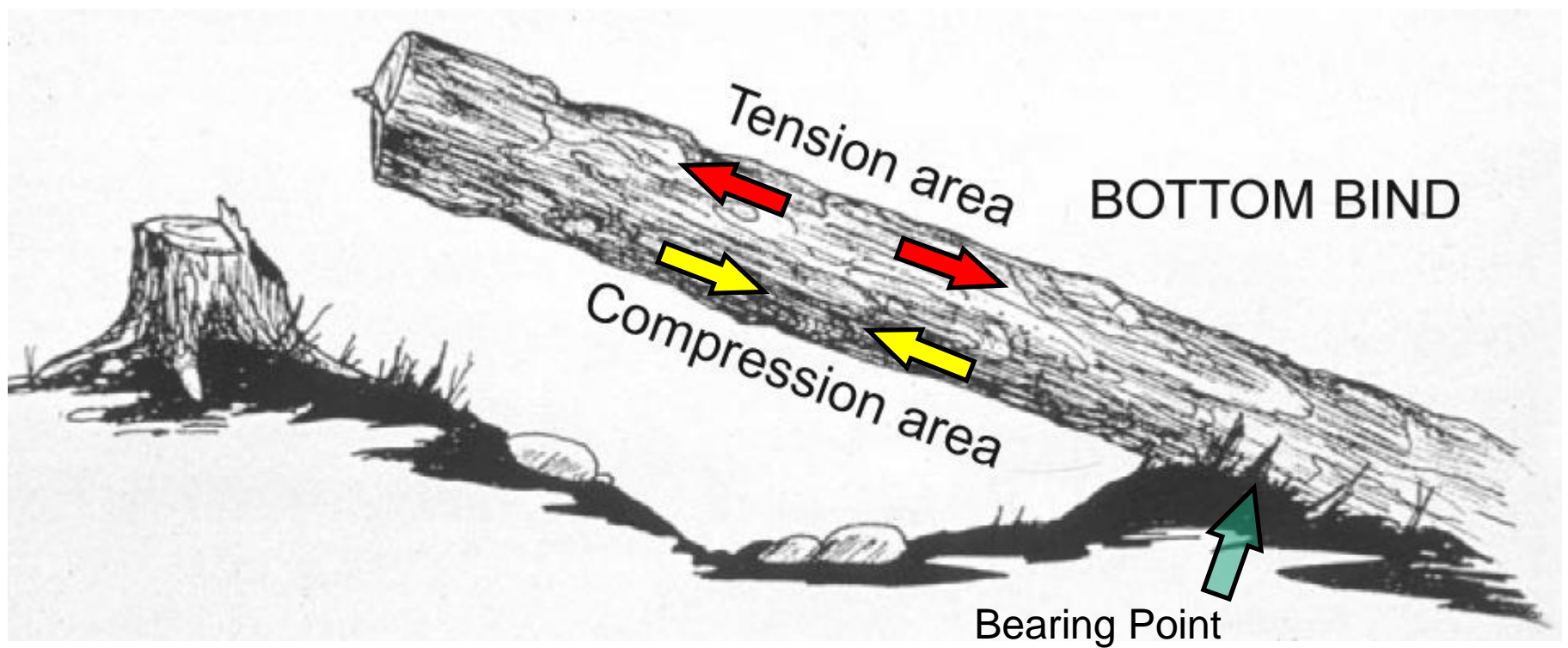
Cut from Top and Wedge

Top Bind

(Wildland Fire Chain Saws, S-212 Video,
National Wildfire Coordinating Group)



Bottom Bind



Underbuck – Then top cut – Be ready for lots of movement

Bottom Bind



Cut at Bearing Point, when possible

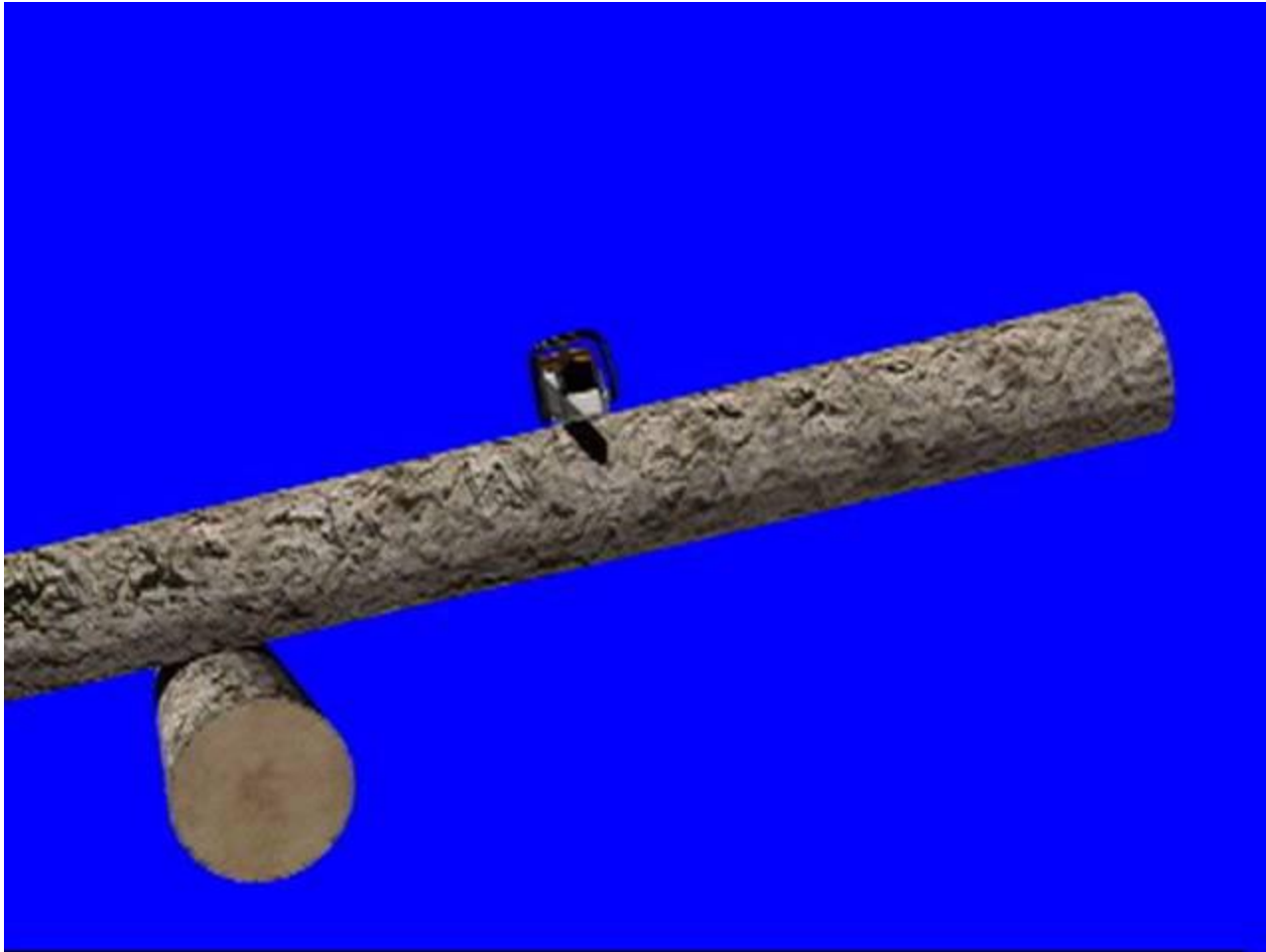
Bottom Bind



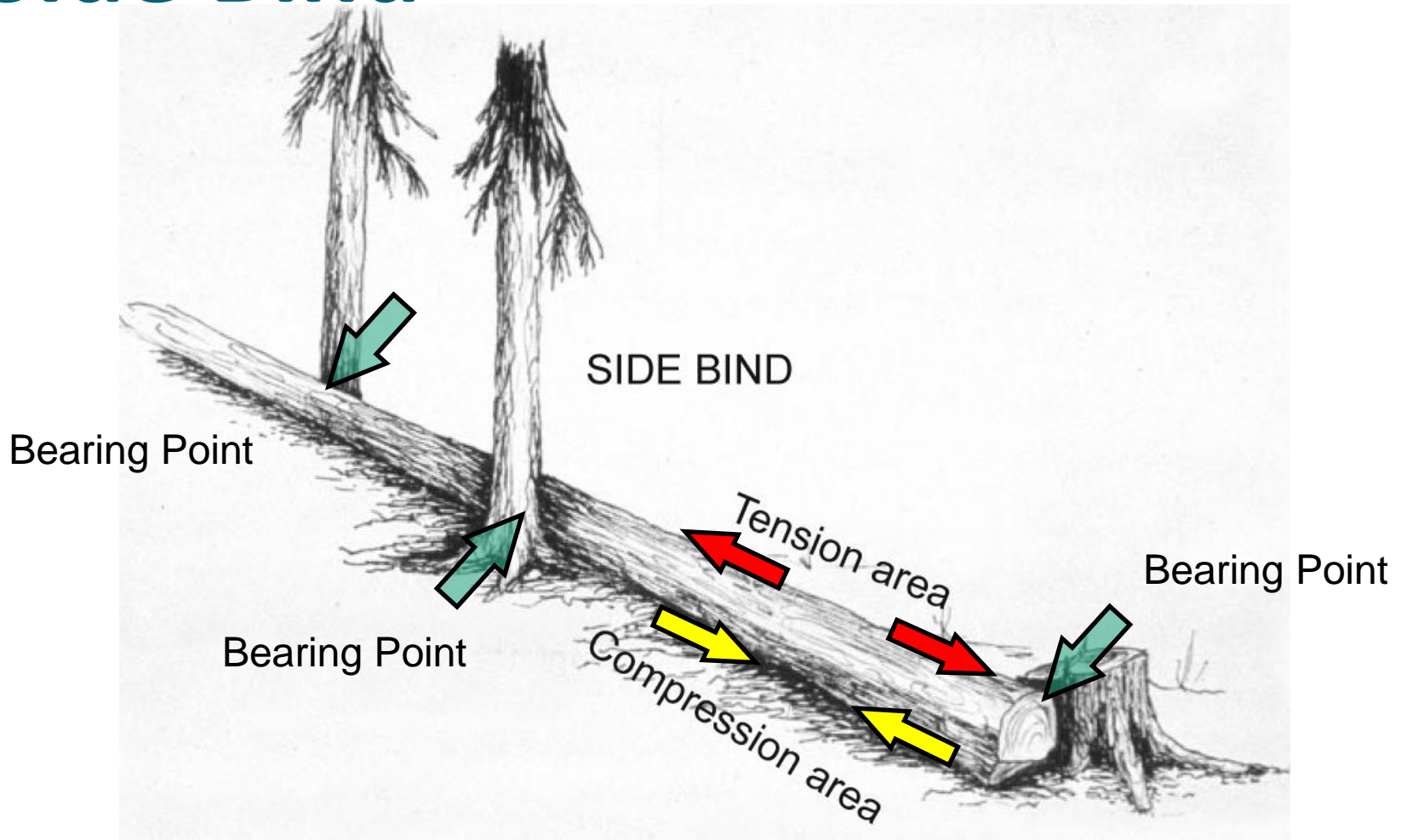
Watch kerf as it opens during release cut

Bottom Bind

(Wildland Fire Chain Saws, S-212 Video,
National Wildfire Coordinating Group)



Side Bind



Safely relieve bind on compression side

Side Bind

- Cut at the point of compression if possible
- This is an example of what not to do...

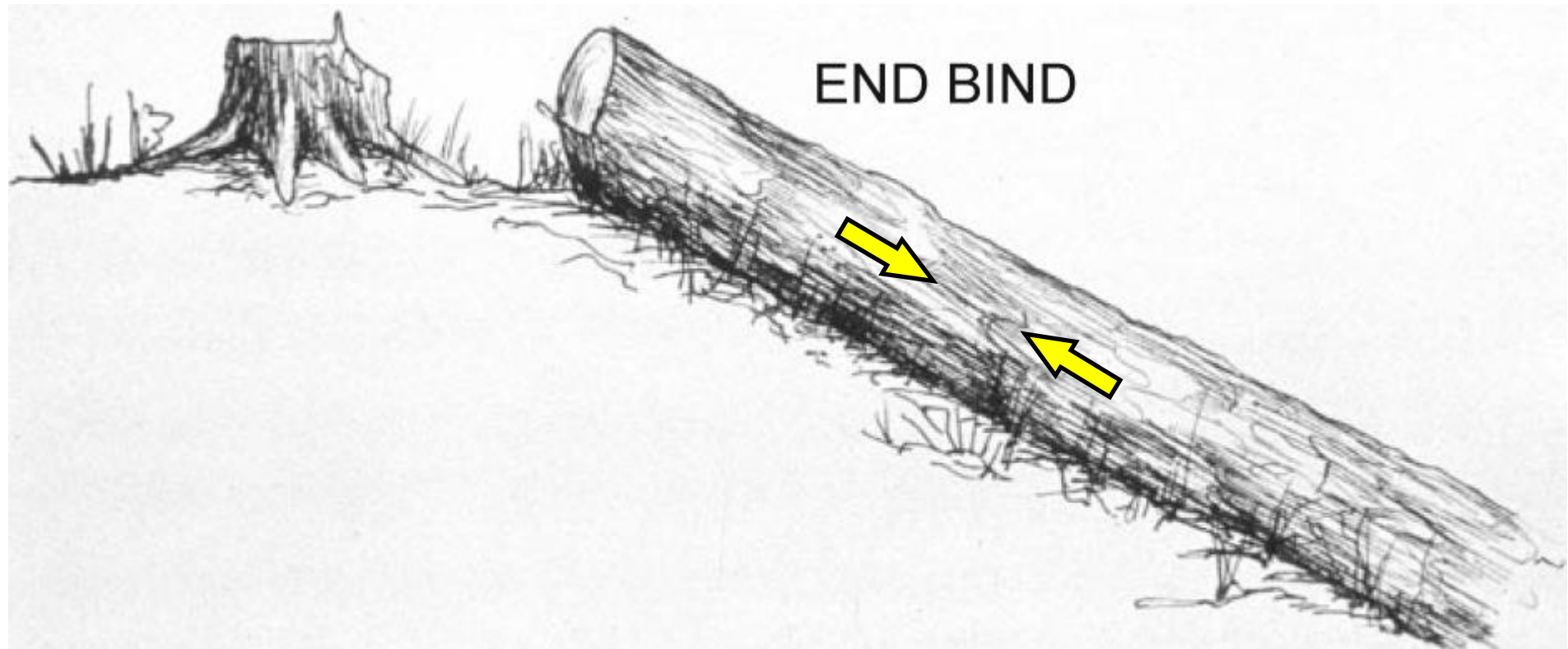


Side Bind

(Wildland Fire Chain Saws, S-212 Video, National Wildfire Coordinating Group)



End Bind



Weight of log causes compressive forces - use wedges

End Bind

(Wildland Fire Chain Saws, S-212 Video,
National Wildfire Coordinating Group)



End Bind



Weight of log causes compressive forces - use wedges

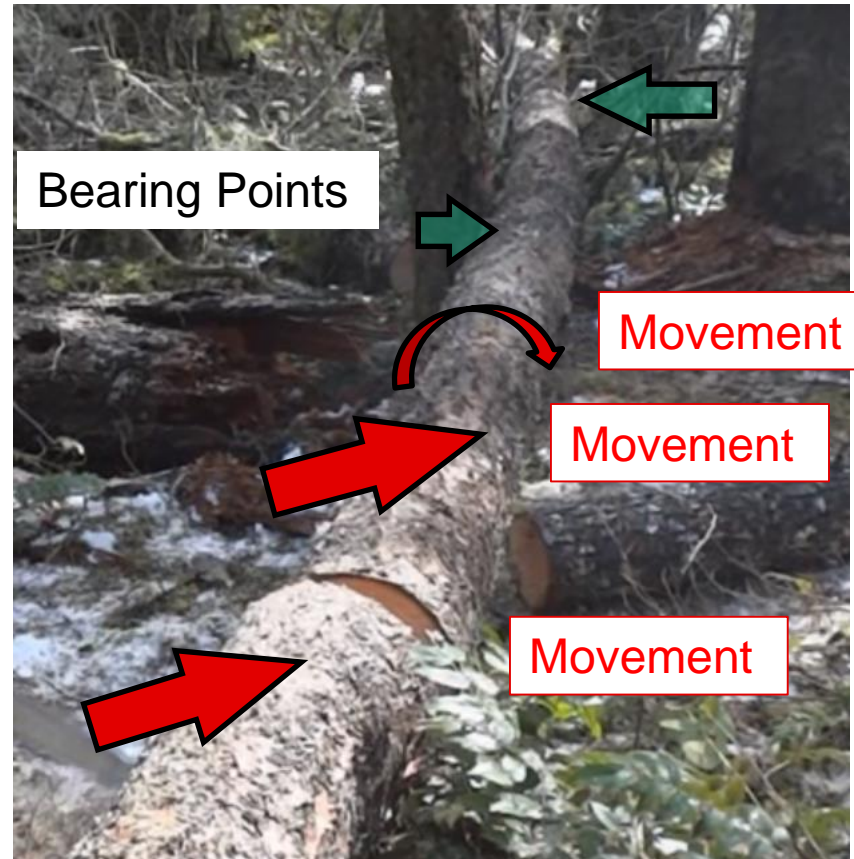
Compound Binds

- Compound binds are a combination of two or more binds
- Binds can move and change during the cutting process
 - Cutting the log reduces weight in sections and changes bind
 - Moving bearing points changes binds
- Side binds usually transition to top or bottom bind as the side bind is relieved
 - Side bind forces add bearing points to the log
 - As side bind is relieved, bearing points change
- Compound binds also include twisting or torsional binds
- Constantly assess log thru the cutting sequence for changes in the binds and the kerf

Compound Binds



Side Bind transitions to more bottom bind
Changes in bearing points
Torsional bind due to holding wood



Binds Review

- Top bind
- Bottom bind
- Side bind
- End bind
- Compound binds

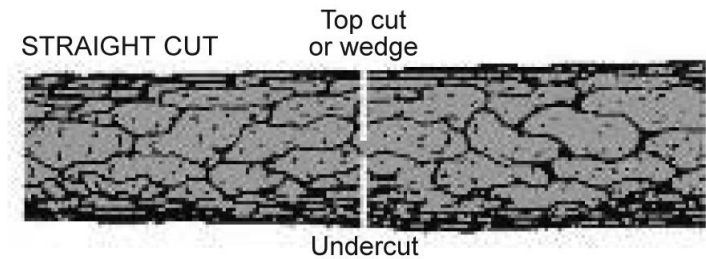


Cut Compression First!

Types of Cuts

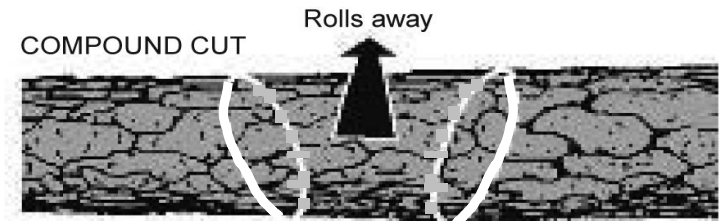
Straight Cuts

- Continuous top or bottom bind
- Small logs, low bind conditions
- Can be angled to allow clearance



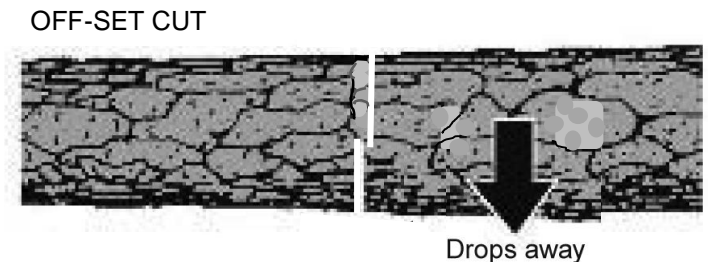
Compound Cuts

- Large logs, hillside logs with end bind



Off-set Cut

- Continuous top or bottom bind
- Straight Cut with offset to fixed end
- Best protection for crosscut saw
- Allows for control of release

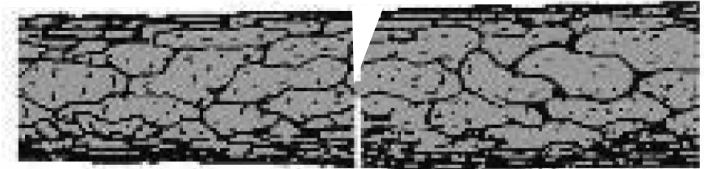


Types of Cuts

Pie Cut

- Use with all binds
- Use to allow for travel and control
- Useful with Chainsaw
- Rarely used with crosscut saw
- Can also be just a series cuts with the tip of the bar

PIE CUT

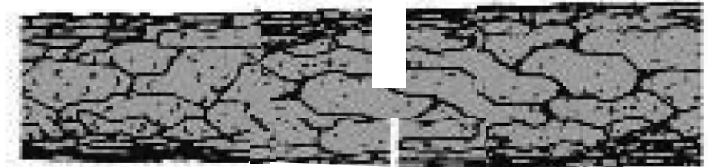


Release Cut

Double Cut

- Severe side bind, large rotten logs
- Logs with torsion, shattered log
- Clean out with Pulaski if needed
- Can be used to relieve side bind for crosscut saw

DOUBLE CUT



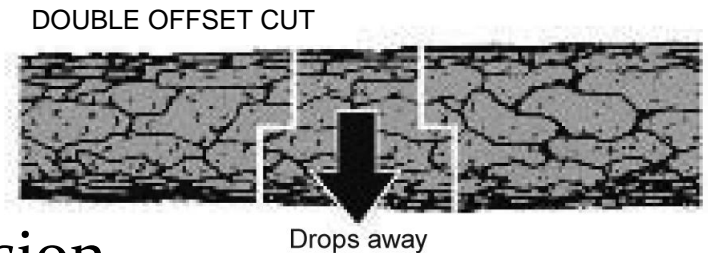
Clean out between
the two cuts

Release Cut

Types of Cuts

Double Off-set Cuts (Crosscut saw)

- Continuous top or bottom bind
- Best protection for crosscut saw
- Allows section to drop out
- Cut compression cuts first, then tension cuts



Straight Cut

- **Sequence:**

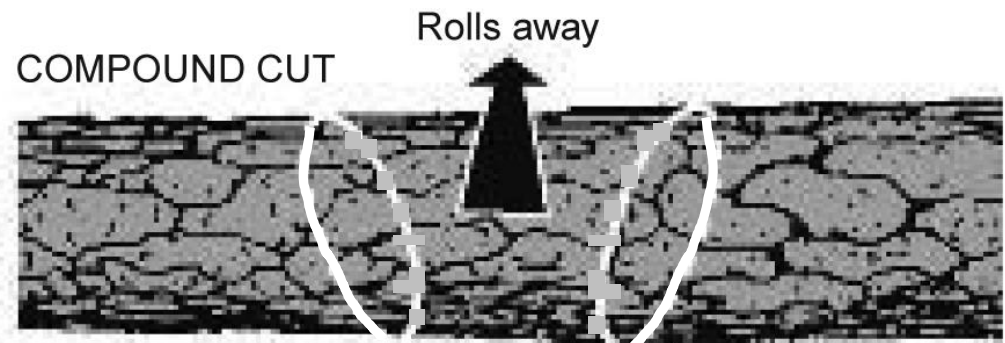
- **Offside Cut:** Remove material on offside of log, when there is ample retaining holding wood
- **Compression Cut:** Cut compression side as early as possible and add pie-shaped cut if needed to allow log to move and relieve bind – Don't go over $\frac{1}{3}$ of the diameter
- **Bucking Side Cut:** Useful to remove additional holding wood on the side of the release cut for large logs (similar to offside cut). Cut from Compression to Tension.
- **Tension (Release) Cut:** Remove holding wood cutting only on the tension side. Use wedge as back up for unexpected change in bind and for end bind.

Straight Cut

- **Offside Cut and Bucking Side Cut:**
 - Not common with Crosscut sawing, but can be used to get more material removed when double bucking
 - Can reduce amount of holding wood to finish when single bucking, especially useful when sawyers are at different heights
 - Very common with chainsaw use to reduce the length of the bar in the log during the release cut

Compound Cut

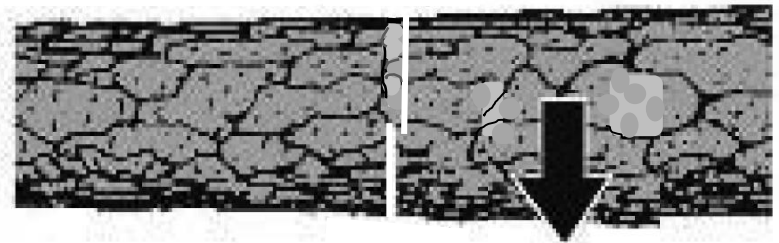
- Face the direction to roll out section and make a “V” with arms
- Two angled cuts allow for clearance to roll out section
- Slight compound angle – Top angle opens outward and is tilted, to be wider on the top than bottom of log
- Straight cut through and back up with wedges when cutting
- Shoot for 5° angles



Off-set Cut

- Allows controlled release of cut section
- **Compression:** Cut compression side
- **Tension Cut:**
 - Off-set top kerf approximately $\frac{1}{2}$ " from bottom kerf
 - Ensure the offset is made correctly to allow the cut piece to drop and the kerfs overlap, to sever the holding wood
- Increasing the width of the offset, up to 6", can lock the cut piece to control twist or torsion

OFF-SET CUT



Drops away

Off-set Cut

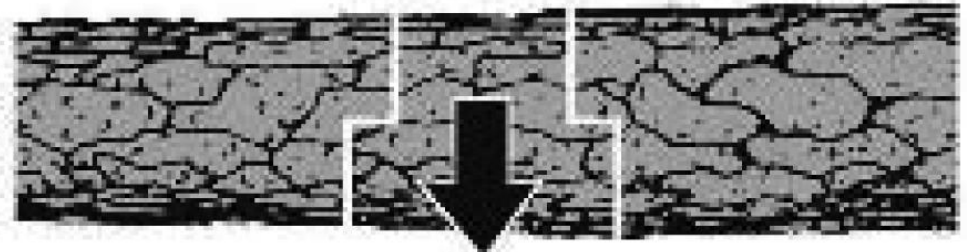
→ ← $\frac{1}{8}$ " to $\frac{1}{2}$ " Offset



Double Off-set Cut

- Allows controlled release of cut section
- **Compression:** Cut compression side
- **Tension Cut:**
 - Off-set top kerf approximately $\frac{1}{2}$ " from bottom kerf
 - Top kerf will be closer to center of trail relative to the bottom

OFFSET CUT

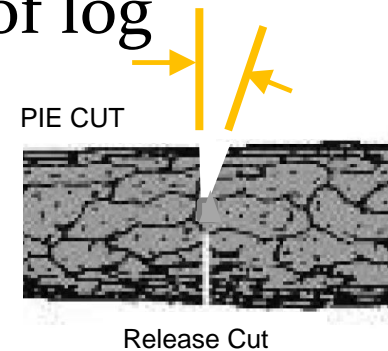


Drops away

Pie Cut

- Useful with heavy bind, to remove material to allow log to move and to control the movement of the log
- Angle of pie cut only needs to match the expected angle the log needs to change, usually 10-30°
- Don't cut deeper than 1/3 of the diameter of log

Max angle of pie cut



Initial log centerline

log centerline after pie cut and release cut

Double Cut

- Single buck from safe (compression) side to cut two parallel top kerfs, the width of a Pulaski
- When saw starts to bind, remove saw, using the adze of the Pulaski, remove wood fiber from between two kerfs
- Repeat until log severed, or bad wood is removed and normal cutting process can be used
- Can be used with compound binds when they are too complex to identify dominate binds

Double Cut

- Can also be used to remove sections, where the wood is split within the log.
- Binds will change across the split sections, and cutting across the splits can bind the saw.
- Cut two parallel cuts, each one a little at time. Continue cutting back and forth and try to align saw to be parallel to the split.
- Use poll of ax to knock out cut sections.
- For chain saw, use tip of bar to minimize amount of bar in the wood, when cutting splintered wood.

Plumb Cut

- Variation of the Straight Cut
- On steep slopes go above the back slope and make a plumb cut
- Used when log is angled and cut piece must drop

Trail Tread





What types of cuts would you use?









Types of Cuts Review

- Straight Cuts
- Compound Cuts
- Off-set Cut
- Pie Cut
- Double Cut
- Double Off-set Cut

Cutting Sequence

- Review Binds, Pivots, Supports, Bearing Points, etc.
- Determine safe areas to work
- Plan cuts to address the level of Complexity in the log or logs
- Don't be target focused – may need to start at end far from trail to safely mitigate hazards
- Use limbs or remaining mass of tree to help secure cut pieces, or remove as needed to reduce hazards
- **Focus on cutting sequence to remove the stored energy in the log in the most controlled manner**

Plan for Release Cut

- How will the log move? What is the safe side?
- Is there room for the cut piece to release? Type of Cuts?
- Where will the cut piece travel?



Cutting Compression Side First



Wedge, Wedge, Wedge



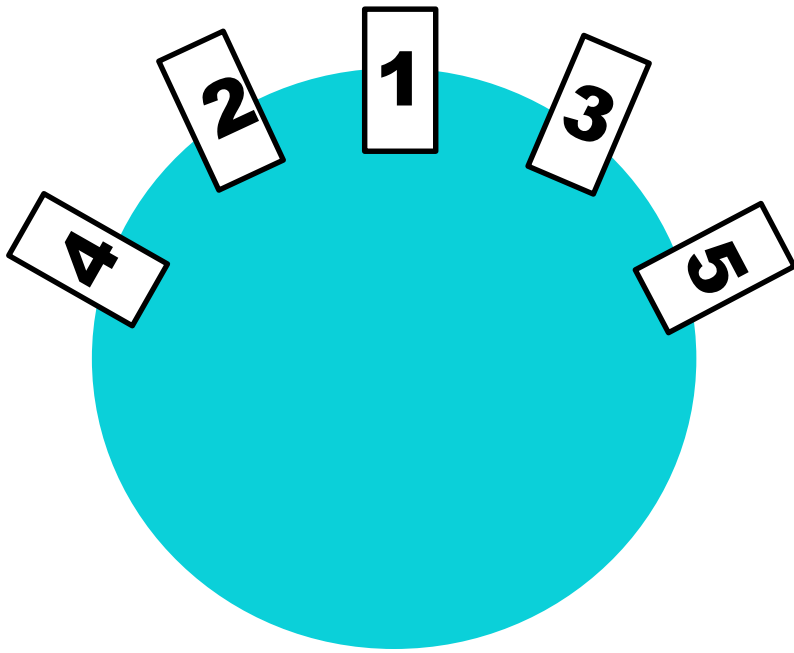
Get a wedge in as soon as the saw is fully in the log

Carry Lots of Wedges



Turn a top bind into a bottom bind with wedges

Wedge Placement



Examples have top compression – Axe used to prevent movement

Cut Piece Track

- Make sure everyone has a safe working area
- Secure switchbacks for trail users, if needed
- Plan for use of added supports to guide or move after cut (rails or pivots)
- Clear path and add supports BEFORE cutting begins



Hazard Awareness

- Overhead Survey
- Ground Survey – walk the length of the log
- Identify spring poles and brush, pivots and root wad
- Establish binds and bearing points
- Determine cutting sequence
- Determine how the binds will change thru cutting sequence
- Determine movement of cut pieces
- Establish Escape Routes and safe areas for crew
- Announce Plan and Review if things change from plan

Course Review

- Types of Binds
- Types of Cuts
- Cutting Sequence
- General Considerations



Hazard Tree Study

Warm Springs Indian Reservation

July 2012

Scenario

- High winds caused two trees to uproot and fall across the PCT.
- On their way down, they collided with the crown of a third tree, just a few feet from the trail, causing its trunk to shatter vertically and the tree to lean over the trail.
- The third tree did not fall because its crown became entangled in the crowns of two trees on the other side of the trail.

Proximity of Trees to Trail



Trail
(facing north)

Condition of Leaner

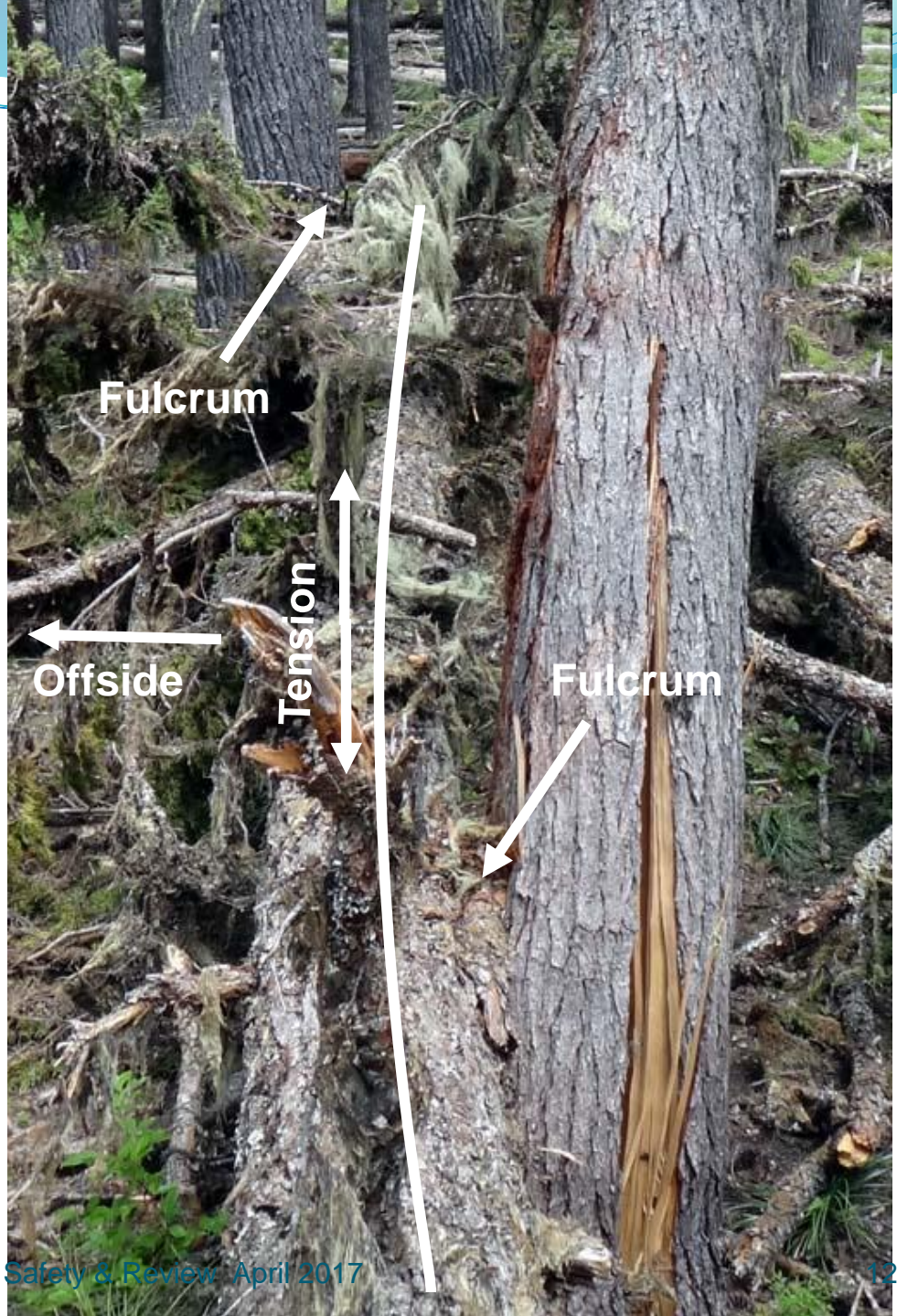


You can see right through the trunk

Side Bind

- Because the northernmost blowdown was wedged between the leaner and a sound tree on the other side of the trail, it developed a severe side bind.
- This tree had approximately 6 feet of horizontal bend over a distance of 50 feet.

Side Bind



Go or No-Go?

- Using established Go/No-Go criteria, the initial volunteer saw crew decided this situation was beyond their capability.
- The crew clearly marked the hazard area and reported the situation to the USFS, the agency managing this section of the PCT.

Marked Hazard Area



Two Weeks Later...

- A second crew of volunteers plus a USFS recreation manager returned to site.
- Decision was made to temporarily reroute trail 15 feet west to avoid leaner.
- Area was cleaned up. Log with side bind severed (with 3 feet of springback). All logs bucked, opening temporary bypass.
- Long-term plan: return trail to original route after subsequent winter winds take down leaner.

Reroute



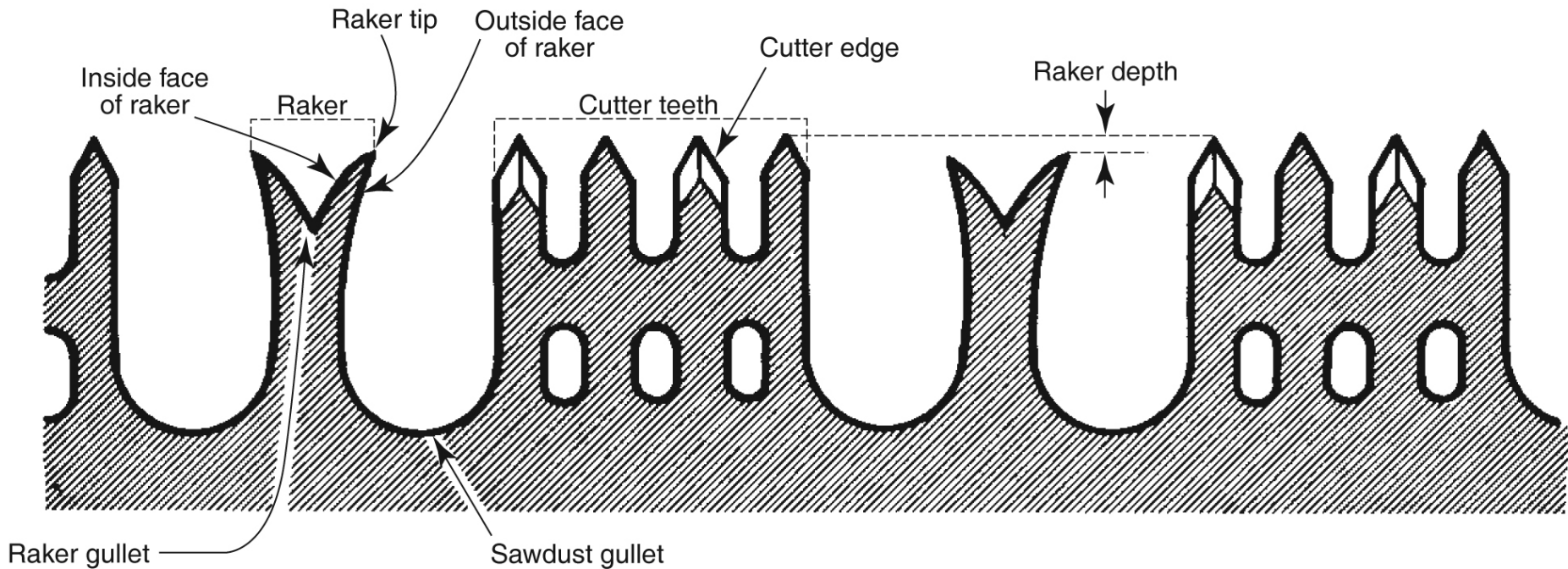


Crosscut Saw Specific Training

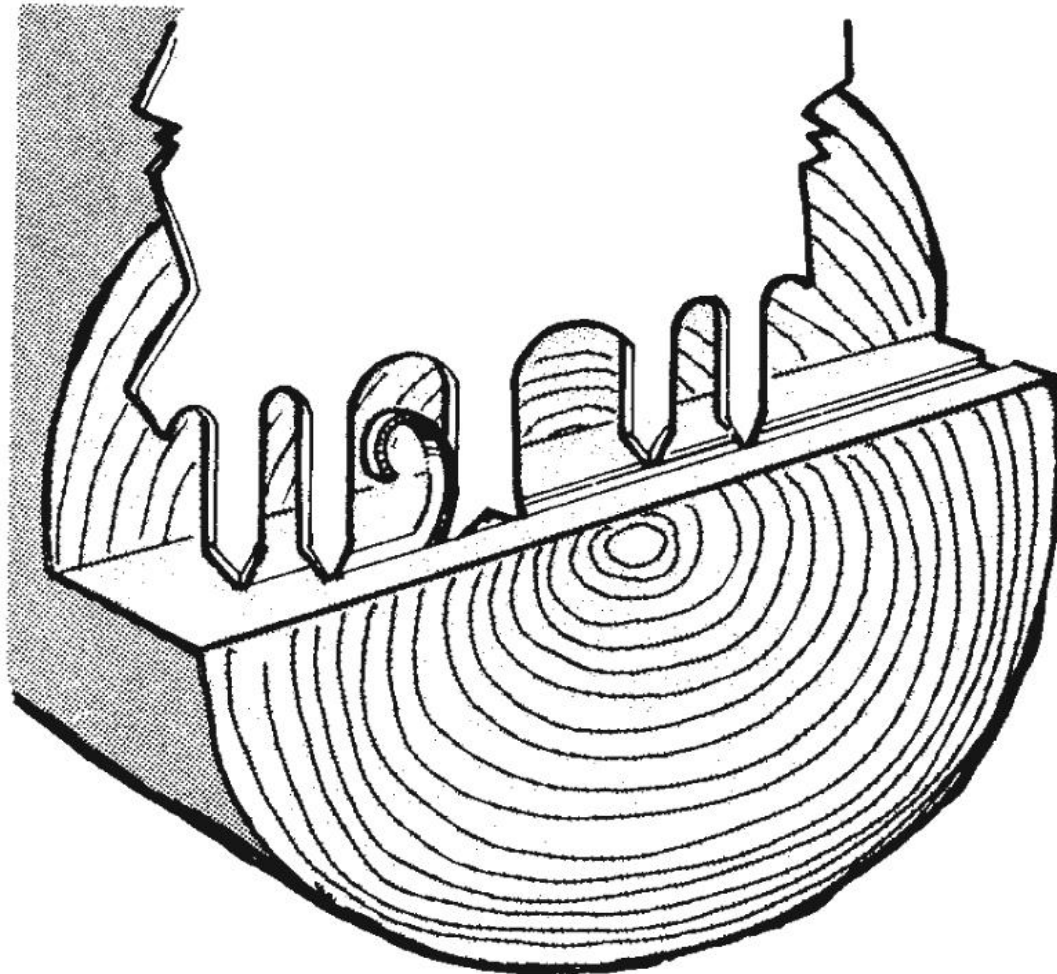
For Trainee Saw Operators and Saw Operators

April 2017

Crosscut Saw Parts



The Kerf



- Two cutters score each side of the kerf
- Rakers peel out the middle
- The set of the cutters makes the kerf wider than the saw blade

Crosscut Saw Tools

Required

- PPE
- First aid kit
- Communications
- Crosscut saw(s) + handle(s) + sheath(s)
- Single-bit, straight-handled axe + sheath
- Crosscut bucking wedges
- Solvent/lubricant
- Pruning saw + sheath
- Flagging

Underbucking



Underbucking





Drive Underbucker into wood, using axe. Set Underbucker in line with intended kerf. Keep hand behind the pulley for added protection when driving into log.

Saw pivots on underbucker, so downforce at the handle, translates into contact pressure as the saw teeth cut into the wood. This can be an awkward movement, easier to accomplish on the pull stroke (blue arrows) and more difficult skill to acquire on the push stroke (yellow arrows).



Underbucking



Install the underbucker on the side of the log that will not drop when the cut releases

Saw Handles

- **Placement:**

- Keep track of all hardware and don't lose the pin
- Ensure all hardware is properly installed and stays tight
- Use the upper hole on side of saw blade
- Keep hand on top side of handle for increased power
- Flip handle when underbucking to gain clearance
- Use spare hand on bottom side of bar only when needing additional control, such as starting the saw

- **Removal:**

- Remove offside handle to finish single bucking
- Remove one handle when transporting saw

Crosscut Saw Tools

Recommended

- Small shovel or combi-tool
- Underbucker
- Loppers
- Clippers
- File, hone
- Bark spud + sheath
- Solvent (Bio-diesel or orange based solvent)

Crosscut Saw Tools

Project Dependent

- Pulaski
- Peavey, cant hook
- Log carrier
- Double-bit axe + sheath
- Basic rigging: strap, rope, come-along



Questions

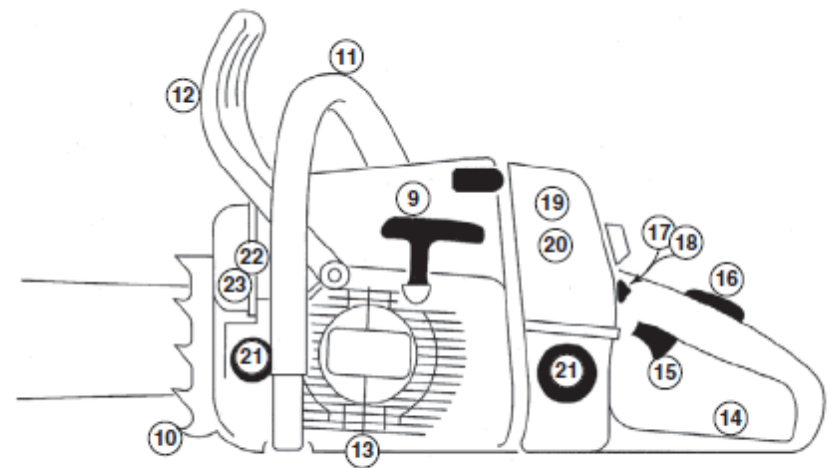
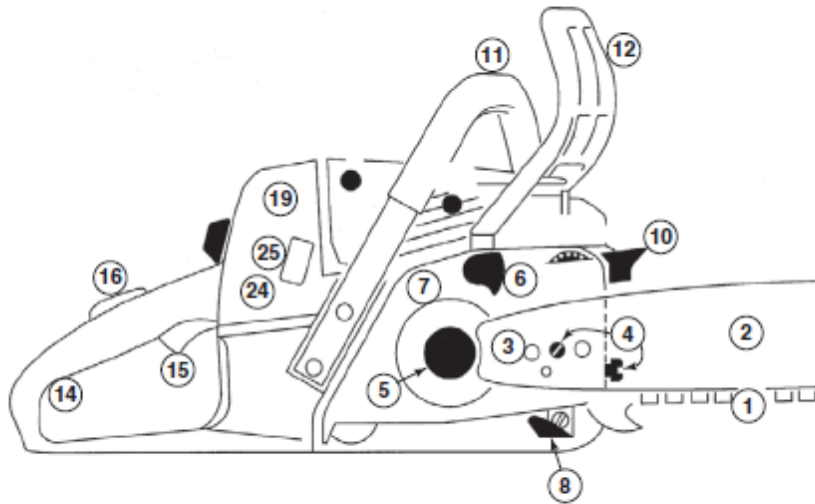


Chain Saw Specific Training

For Trainee Saw Operators and Saw Operators

April 2017

Parts of a Chain Saw



- | | | |
|-----------------------------------|-------------------------|---------------------------|
| 1 Saw chain | 9 Starter grip | 18 Choke |
| 2 Guide bar | 10 Bumper spikes (dogs) | 19 Air filter cover |
| 3 Bar studs | 11 Handlebar | 20 Air filter |
| 4 Front and side chain tensioners | 12 Hand guard | 21 Oil and fuel caps |
| 5 Chain sprocket | 13 Gunning marks | 22 Muffler |
| 6 Chain brake | 14 Throttle handle | 23 Spark arrester |
| 7 Clutch | 15 Throttle trigger | 24 Spark plug |
| 8 Chain catcher | 16 Throttle interlock | 25 Carburetor adjustments |
| | 17 On/off switch | |

Chain Saw Safety Components

- Chain brake
- Chain catcher
- Bumper spikes, aka dogs
- Bar cover (protection from chain and dogs)
- Throttle Interlock
- Muffler, with Spark Arrester

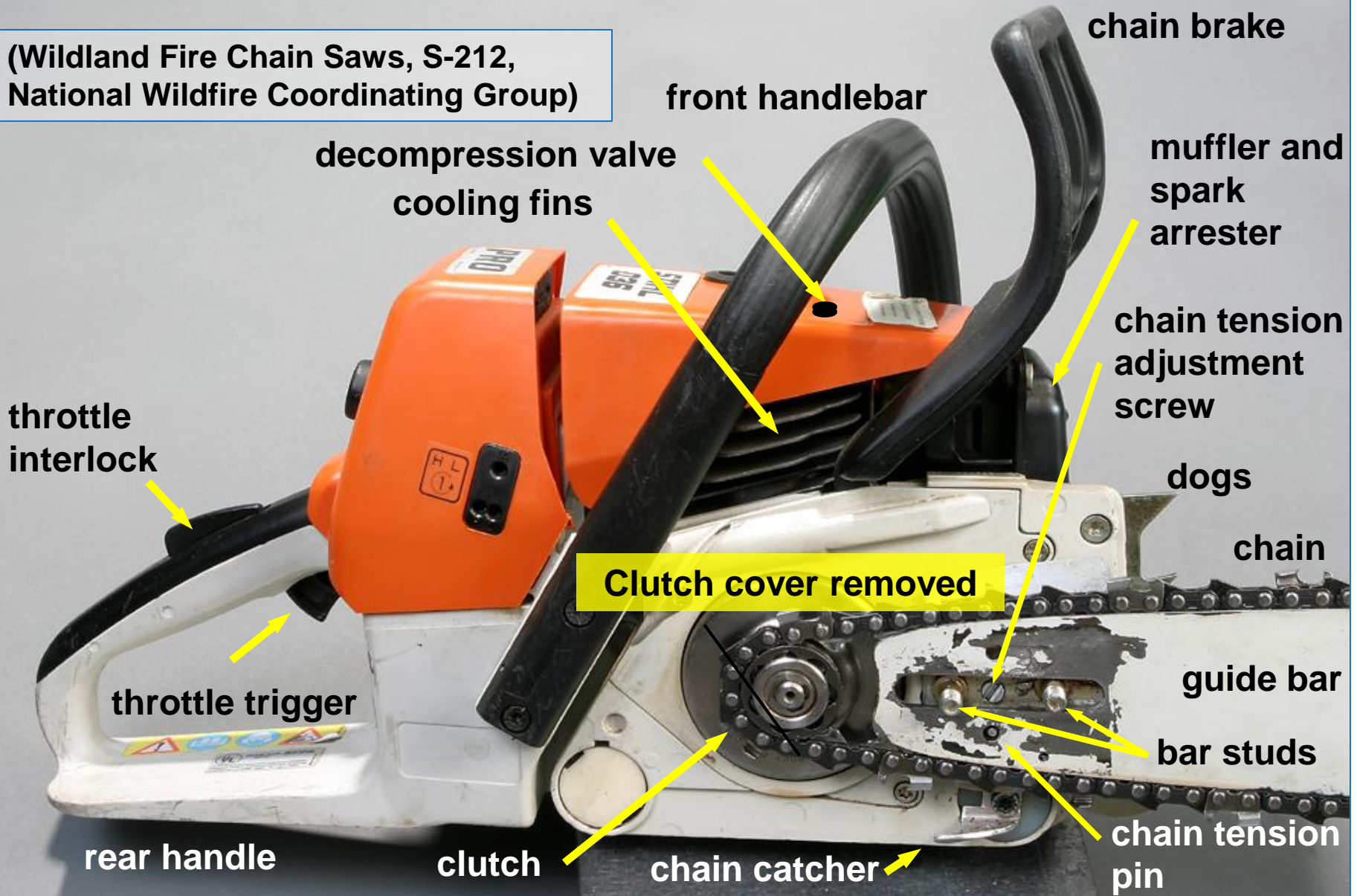
Note: Saw Safety & Maintenance Components color coded

Stihl – Black

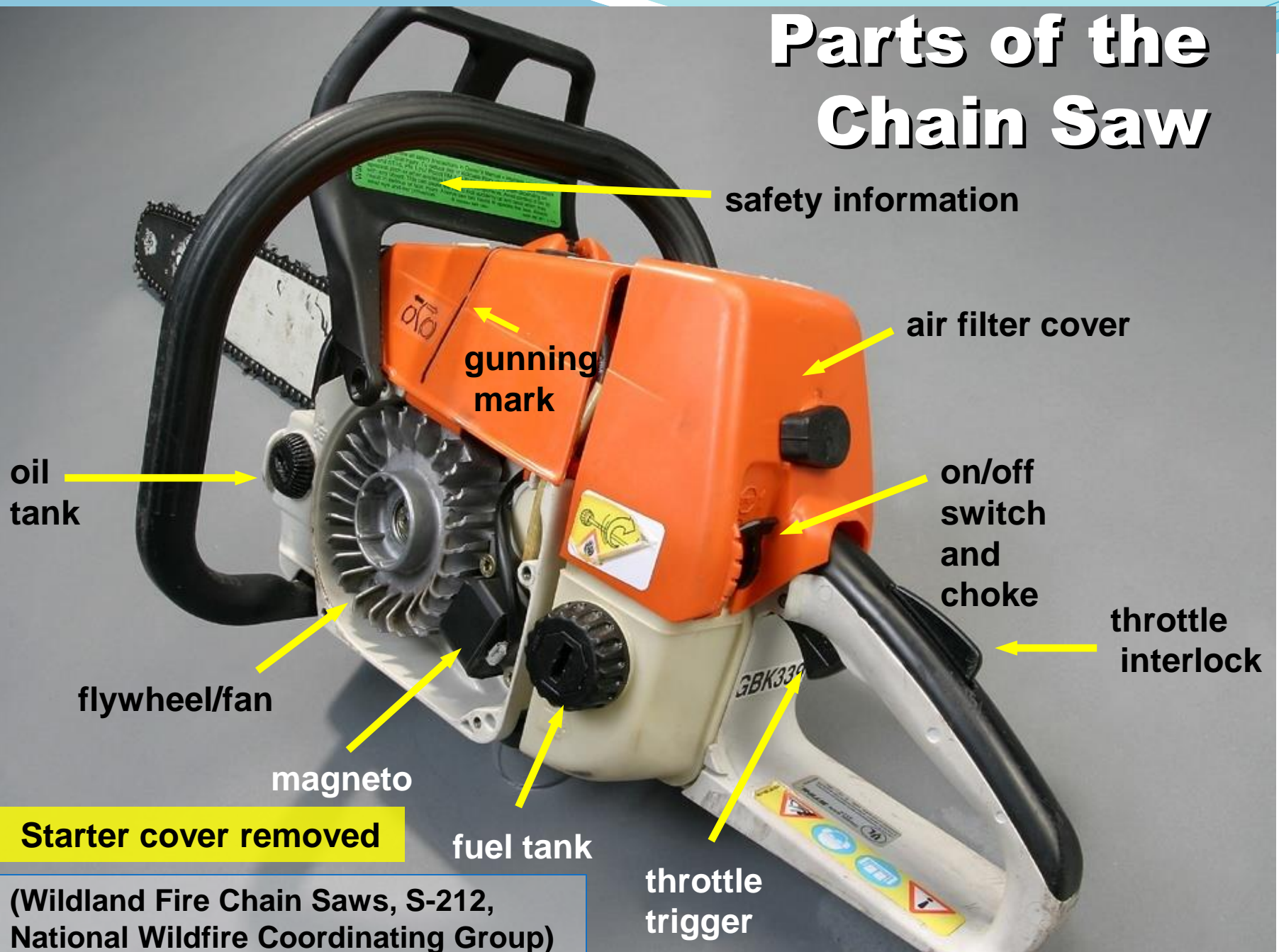
Husqvarna - Gray

Parts of the Chain Saw

(Wildland Fire Chain Saws, S-212,
National Wildfire Coordinating Group)

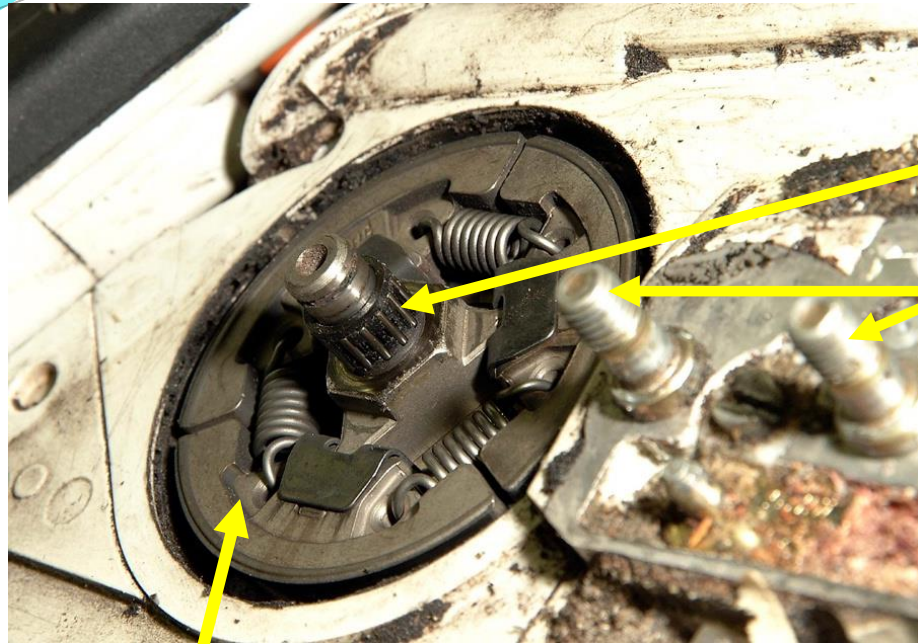


Parts of the Chain Saw



(Wildland Fire Chain Saws, S-212,
National Wildfire Coordinating Group)

Clutch and Flywheel Bearings



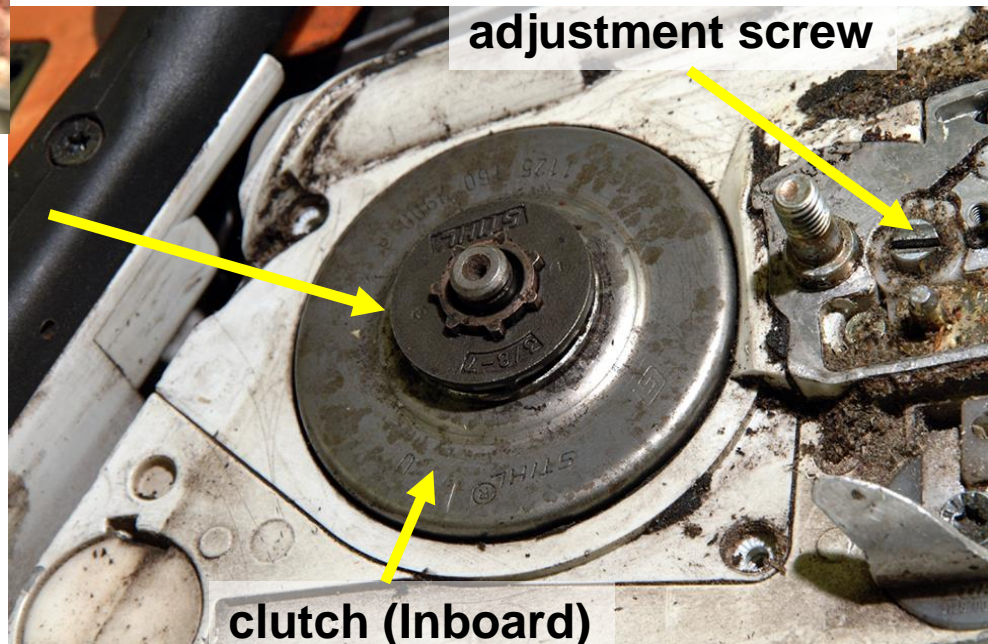
needle bearings

bar studs

clutch assembly
(clutch cup removed)

drive sprocket
(rim sprocket shown – sprocket pitch must match chain pitch)

Sprocket and Clutch Cover



chain tension adjustment screw

clutch (Inboard)

(Wildland Fire Chain Saws, S-212,
National Wildfire Coordinating Group)

Carburetor

throttle plate
and choke

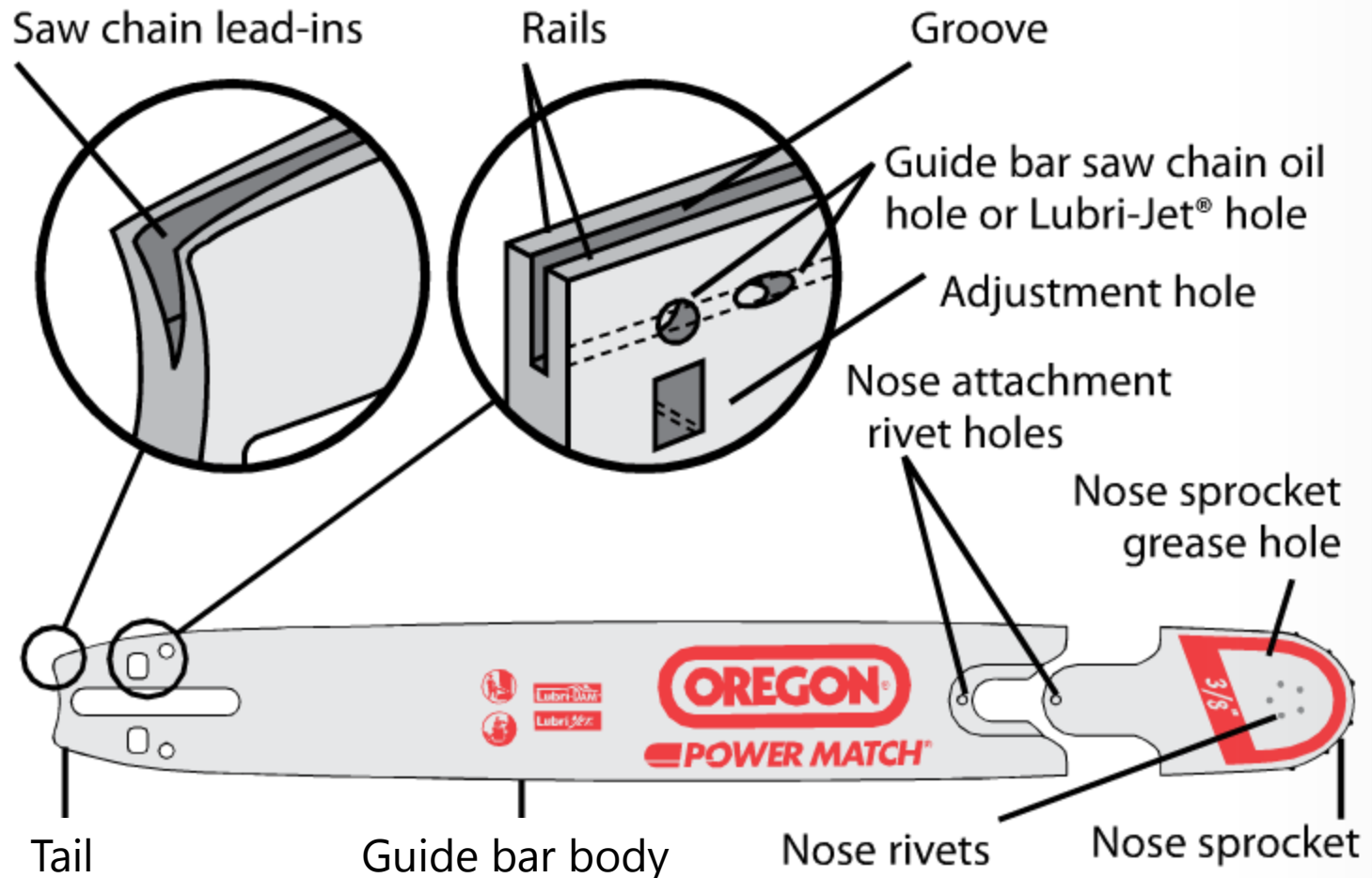
Air filter removed
and choke not applied

carburetor

adjustment
screws

(Wildland Fire Chain Saws, S-212,
National Wildfire Coordinating Group)

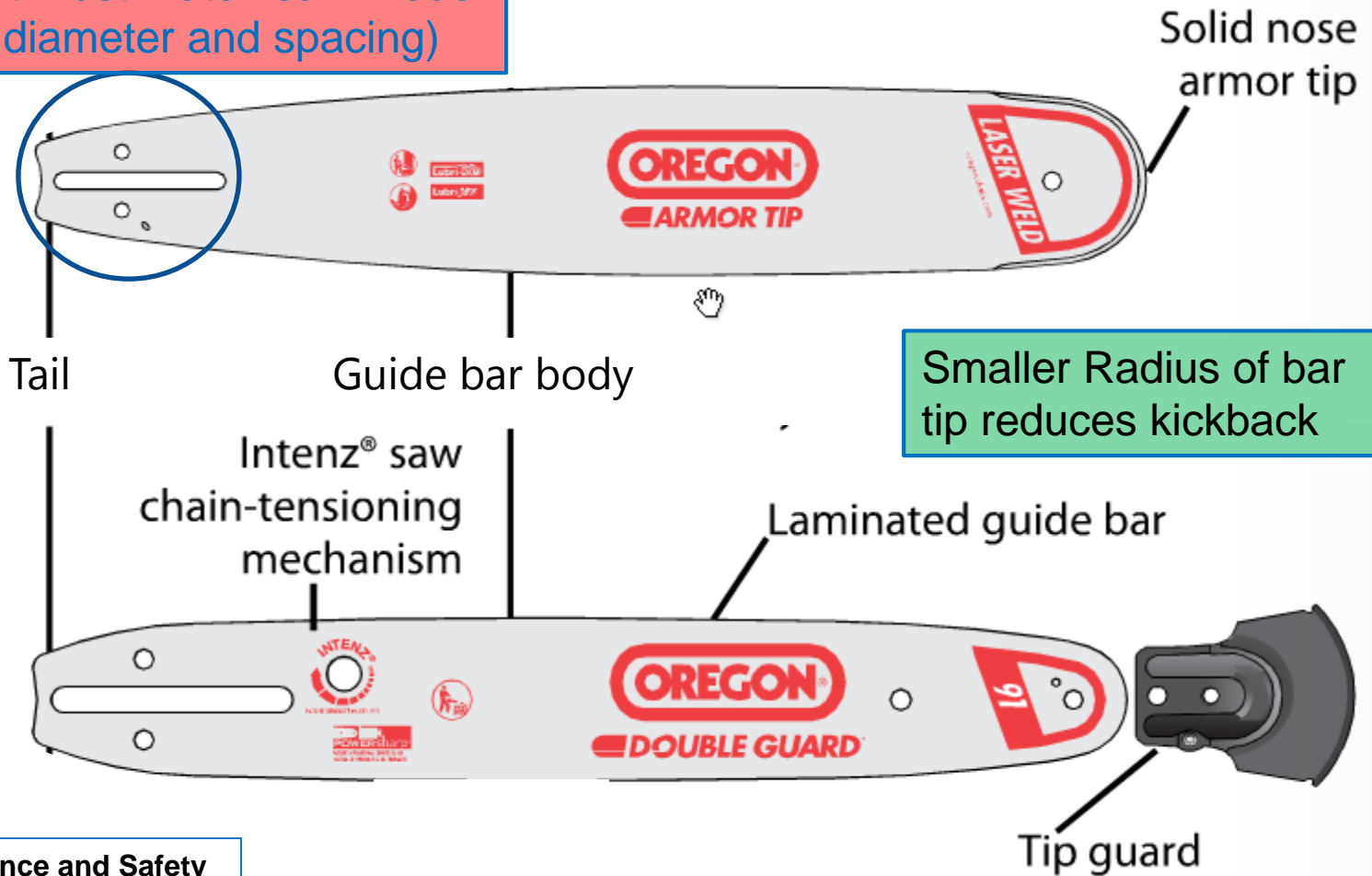
Chain Saw Bar Terms



Reduced weight bars have hollow body (laminated) or are milled and filled with aluminum or polymer

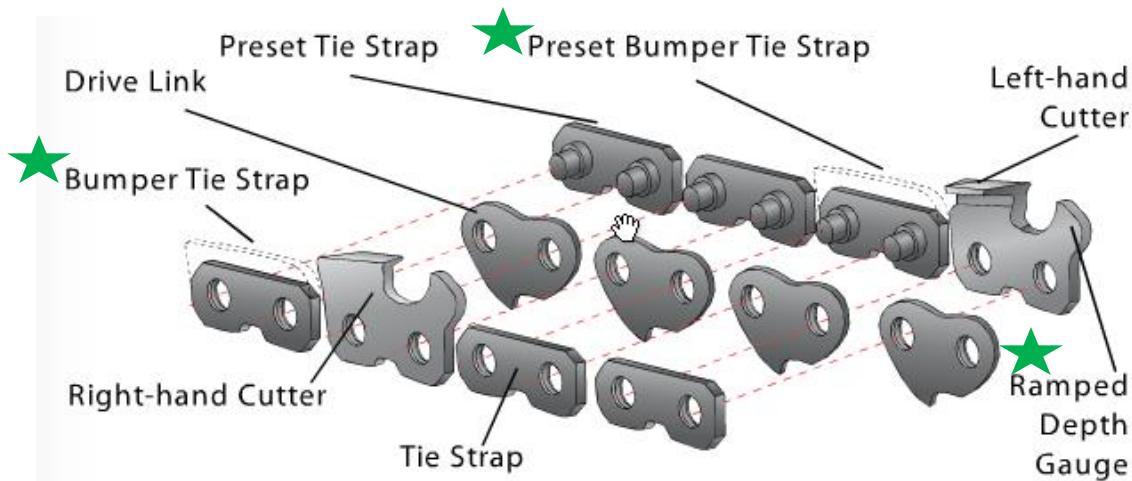
Chain Saw Bar Terms

Bar mount must match saw model
(bar stud diameter and spacing)

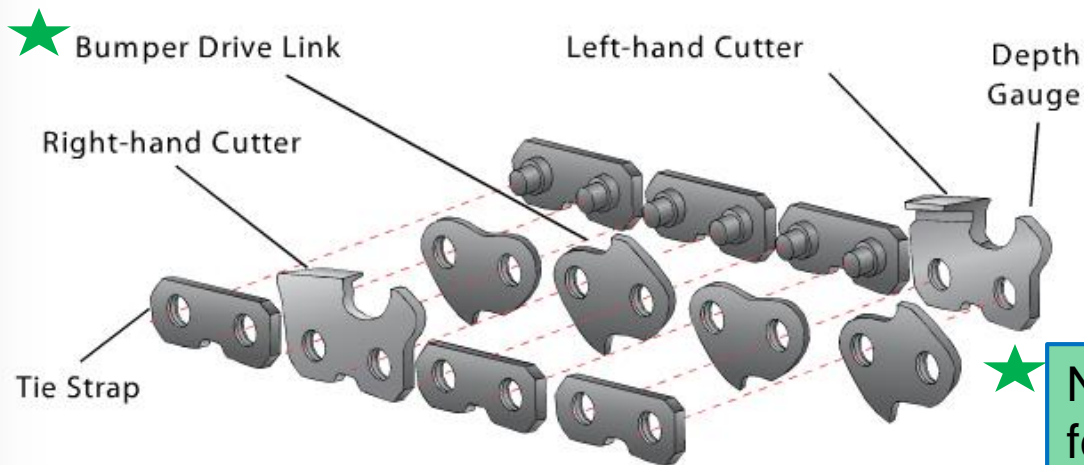


Oregon Maintenance and Safety
Manual, Blount, Inc

Saw Chain



Tie Straps and Cutters held together with rivets



Note: These parts of a chain are features that can reduce kickback

Kickback

What is Kickback?

Kickback is the violent backward and/or upward motion of the chain saw guide bar occurring when the saw chain near the nose or tip of the guide bar contacts any object, such as another log or branch, or when the wood closes in and pinches the saw chain in the cut.

Avoiding Kickback Injury

Kickback Awareness

1. Be alert at all times to guard against a possible kickback reaction. Always be aware of the position of your guide bar's nose.
2. Different models of saw chain are available for most cutting tasks. Use the saw chain, suitable for your type of cutting, with the lowest kickback potential.
3. Narrow-nose guide bars such as our Double Guard® guide bars are recommended for maximum kickback safety.

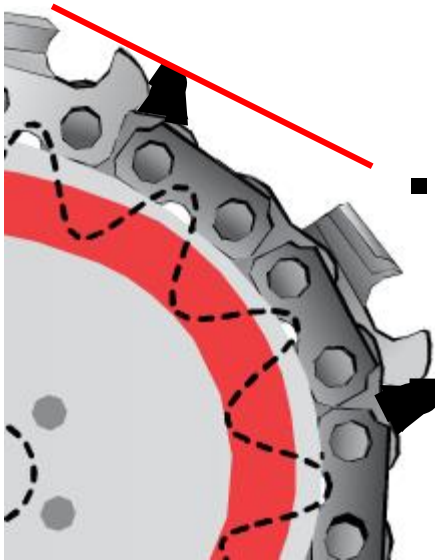


Oregon Maintenance and Safety
Manual, Blount, Inc

Low Kickback Saw Chain



- Bumpers increase raker height as tooth passes thru bar tip, reducing kickback potential
- Most low kickback chains do not allow for boring into wood

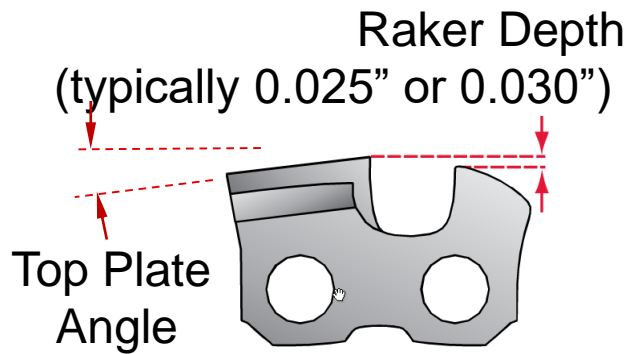
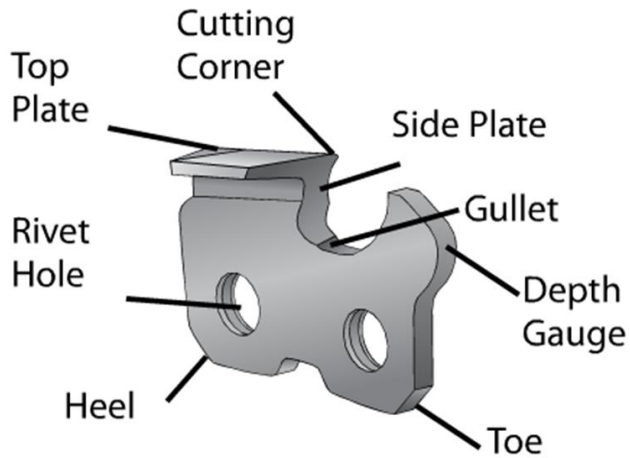


These parts of a chain are features that can reduce kick back of the chain

Low kickback chain often designated by a green drive link or green label on box

Chain Saw Cutter

Parts of a Cutter

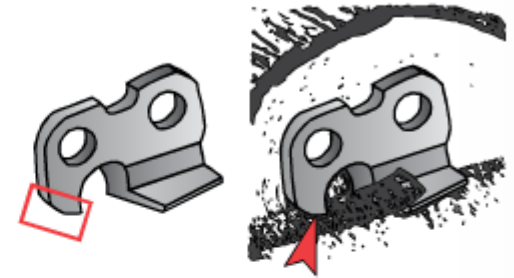


Oregon Maintenance and Safety Manual, Blount, Inc

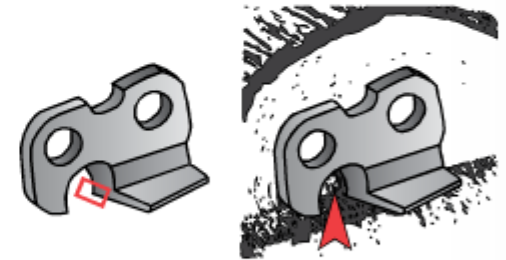
How a Cutter Works

Understanding how cutters work can help you see why proper saw chain maintenance is so important.

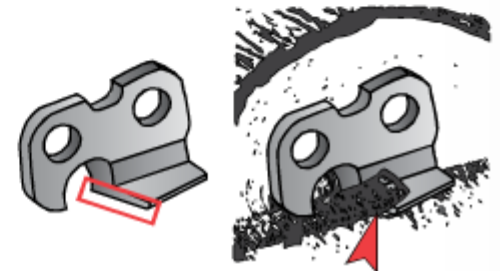
1. The depth gauge rides on the wood and controls the depth at which the working corner bites in.



2. The working corner and side plate sever the wood fibers across the grain. This is the hardest part of the work.

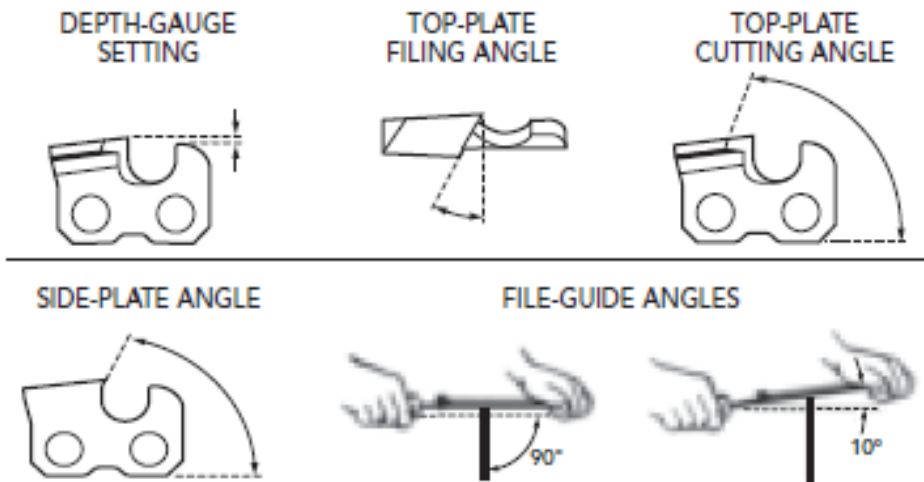


3. The top plate cutting angle chisels out the severed wood fibers, lifting them up and out of the kerf.



Chain Saw Cutter

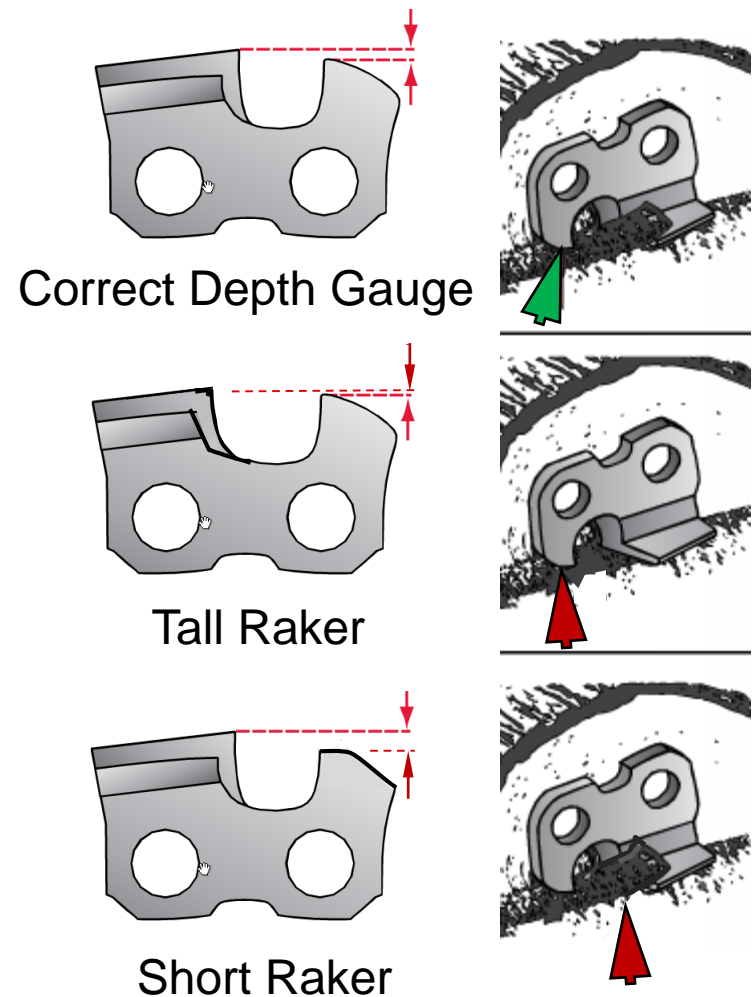
CUTTER MAINTENANCE TERMS






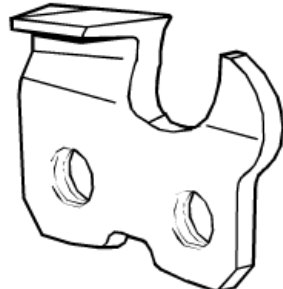
- Correct raker height is key for cutting performance and safety
- Tall raker will not cut wood
- Short raker has higher kickback potential due to aggressive cut

Oregon Maintenance and Safety
Manual, Blount, Inc

Depth Gauge



Types of Saw Chain

Semi-Chisel	
	
Chisel	
	

- More Durable in dirty conditions
- Becoming less common to find

- Available in Square Ground and Round Ground
- Round ground easier to file in the field with round file
- Square ground cuts faster, but harder to file

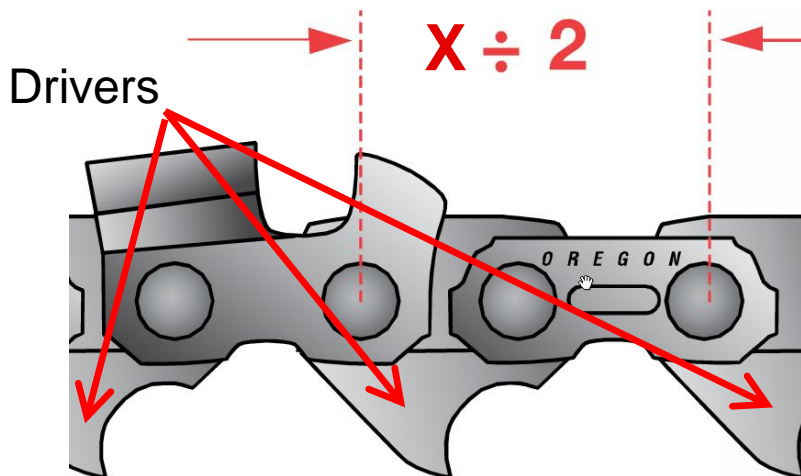
Types of Saw Chain

Pitch

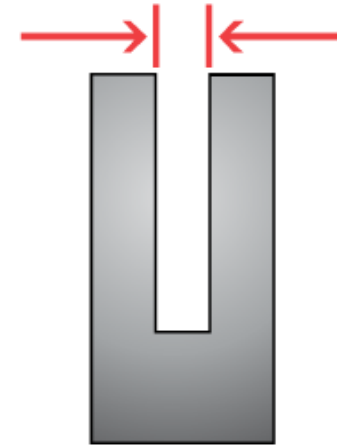
Pitch = (Distance of Drivers) / 2

Standard Pitches: 0.325" & 3/8"

Chain length determined by
number of drivers



Gauge



Width of groove in Bar

Standard Gauges:

0.050" (1.3 mm), 0.058"
(1.5 mm) & 0.063" (1.6 mm)

Oregon Maintenance and Safety
Manual, Blount, Inc

Types of Saw Chain

Saw Chain Cutter Sequence Terms

Standard



Semi-Skip



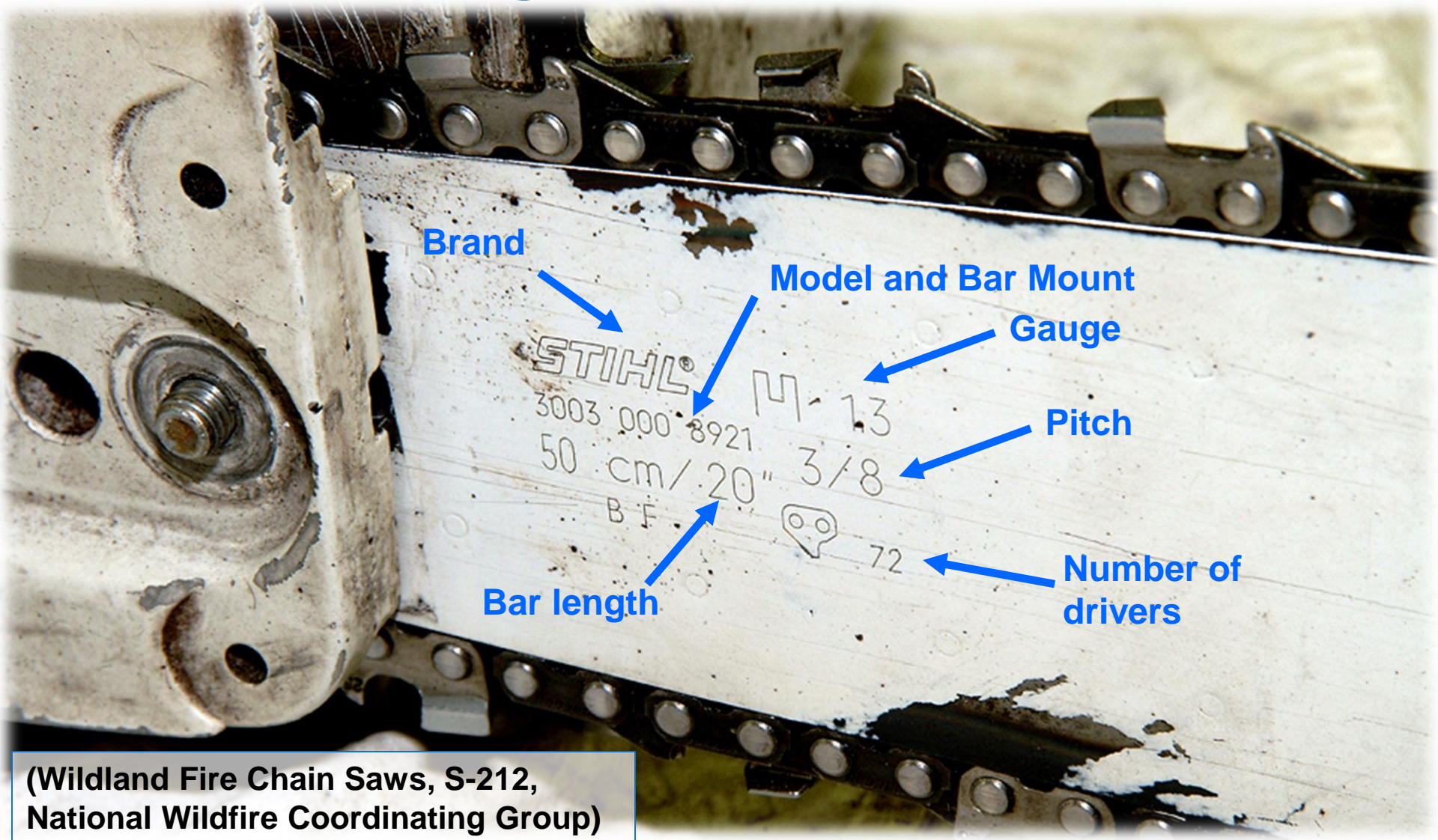
Skip



- Standard Chain (or Full Comp) recommended up to 24” bars
- Skip chains recommended for 28” bars and longer, especially when cutting softer wood (more room for chips)

Caution – Skip Chains are not recommended for brushing with higher kickback potential and harsh operation, due to wide tooth spacing

Markings on Chain Bar



Chainsaw Size

- Become familiar with the chain saw size
- Chainsaw size is usually referenced in engine displacement (usually “cc” or cubic centimeter)
 - Larger saws have more power and are heavier
 - Smaller saws are easier to handle and learn skills
 - 45 cc – 75 cc saws are typically used for trail work
- Saw bar length is matched to saw size and power
 - Smaller saws use shorter bars (16-20”) and larger saws use longer bars (20-28”).
- Only operate chainsaws with bars and chains that you have experience and can operate safely

Filing a Saw Chain

- Square Ground chains can be filed with a double bevel flat file, 3 Corner file, or a Square Grinding Wheel
- Requires specialized equipment and requires advanced filing technique
- Round ground chains can be hand filed in the field using a round file with the diameter specified by the chain manufacturer
- File guides allow for precise control of height of file in the cutter tooth and also filing angle – some include raker files
- Bar mounted file guides allow for more precise hand filing
- Round wheel grinders are also available for high volume chain sharpening

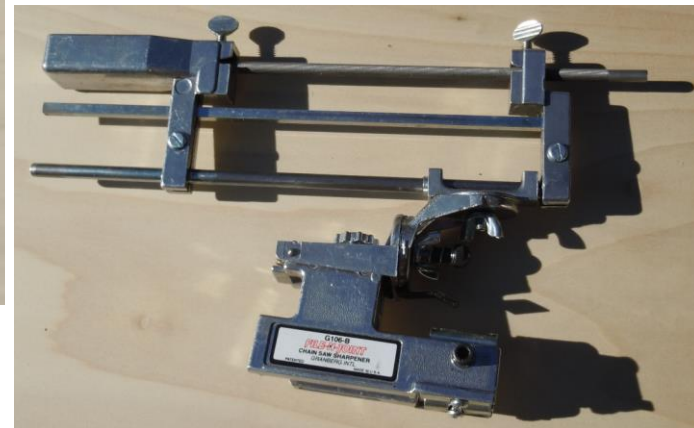
Filing Tools



Round file, raker file, depth gauge, roller guide, file guide, file guide with raker file (single and dual side)



Stump Vise

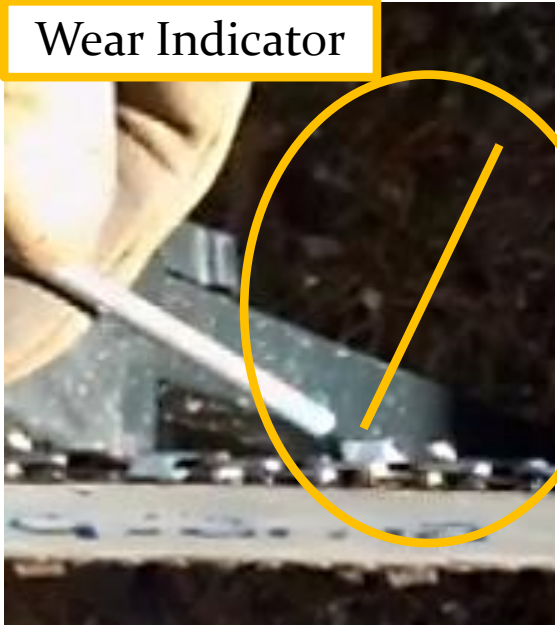


Bar Mount File Guide

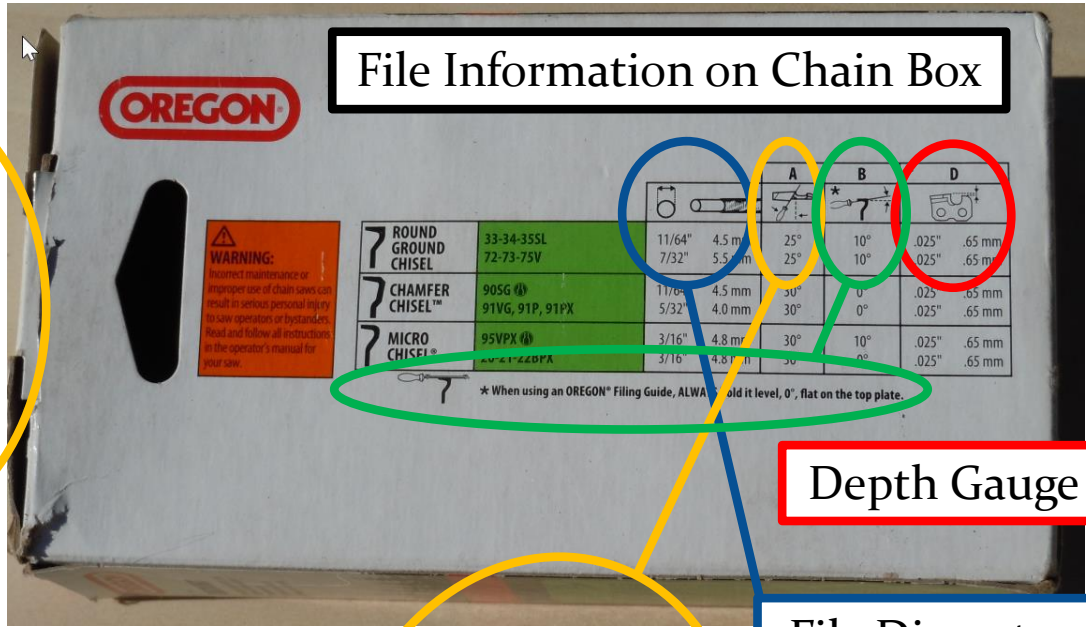
Filing Technique

- MUST match file technique to the chain manufacturer instructions and guidelines:
 - File Diameter
 - File Angles
 - Raker Depth
 - File Depth
 - Cutter Angle
 - File Guide
- Only file in the direction, from the inside to outside, and only file cutters on one side, then switch to other side
- File cutters that are accessible, then roll chain forward to reveal unfiled cutters
- Ensure bar is supported when filing – use vise when possible, use kerf in log, or control with spare hand
- Increase the tension on the chain to improve control to restrain each tooth when filing

File Instruction



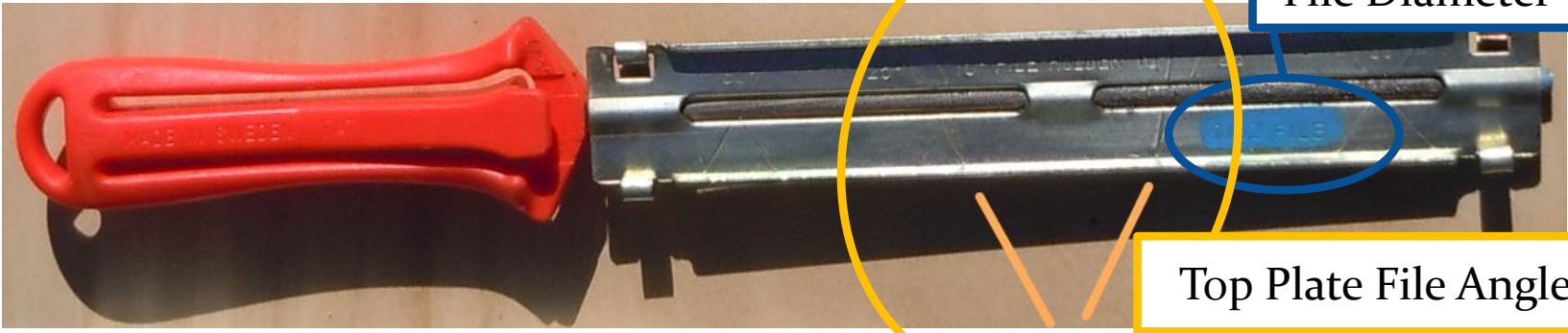
Wear Indicator



File Information on Chain Box

Depth Gauge

File Diameter



Top Plate File Angle

Filing Technique

- Always match the angle of the file to the recommended Top-Plate filing angle – use the marked angles in the file guide aligned to the bar, as an aid
- Top-Plate file angle is usually 25° or 30°
- The Top Plate and Side Plate Cutting Angles are reference, very difficult to measure, and are achieved when following the recommended filing guidelines
- When hand filing, the file guide is held 90° to the bar
- Throw away chain when filed down to the wear indicators on the cutter
- **ALWAYS WEAR CUT-RESISTANT GLOVES** when filing and handling chain

Filing Technique

Useful Video's

Stihl Chain Saw Maintenance and Operation – Chapter 3

<https://www.youtube.com/watch?v=qvcCh2XqEPc>

Husqvarna Chain Saw How to Use Videos – Getting Started -6

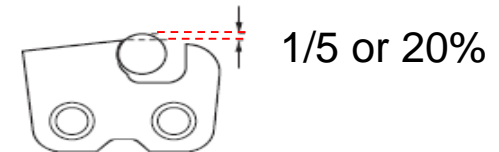
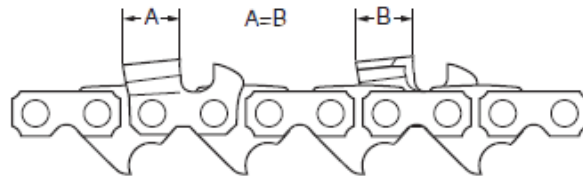
<http://www.husqvarna.com/us/support/how-to-videos/chain-saw-videos-how-to-use/>

Filing Technique

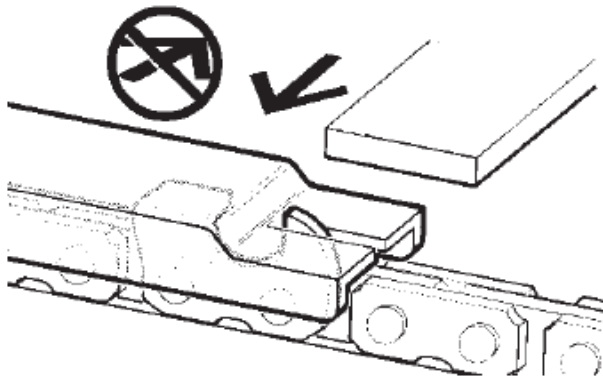
- Match file technique to type of file guide used:
 - **Free hand** – use slight rotation of file, rotate upwards along the cutter, to help keep the proper file height
 - **Roller Guide** – ensure guide sits on tie straps, with correct orientation, so the roller angle matches the top plate angle (high end of guide towards power head). File in direction of arrow on the guide
 - **File Guide** – Ensure file guide sits on both top plate and raker (usually at 90° to bar, per instructions)
 - **File Guide w/ Raker File** – File only in the proper direction to match side of cutters. Follow instructions. Does not work with Skip Chains.

Filing Technique

- Ensure cutters are filed to the same length with proper file height



- Repair any damaged cutting surfaces during filing
- Check raker depth using depth gauge and file with raker file to required height



- Use proper Depth Gauge - ensure it rests on all the cutters
- Only file Inside to Outside
- Use raker file with no teeth on edges
- Dress to round off sharp corner of raker

Oregon Maintenance and Safety
Manual, Blount, Inc

Chain Saw Starting Procedure

- Chain brake MUST be on when starting
- NO DROP STARTING
- Find the best method that works for you
 - Ground Start (kneeling or bent over), or Leg Start
- MUST have 2 points of control when starting
- Follow starting procedure in manual
 - Apply Choke, or Half Choke as described in operator manual for cold and warm starting
 - Use decompression valve (if saw equipped with feature)
 - Remove Choke, once saw “burps” or partially fires, then continue pulling starter cord until saw starts

Chain Saw Starting Procedure




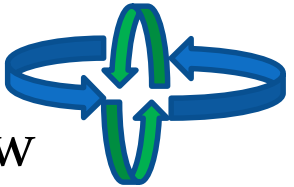
Starting Between Legs



Starting on the Ground

**(Wildland Fire Chain Saws, S-212 Video,
National Wildfire Coordinating Group)**

Chain Saw Operation

- Left Hand MUST wrap around handlebar with thumb locked
 - Saw should be balanced in left hand so that bar is vertical and cuts straight, not at angle
 - Watch position of left hand on bar, so it returns to balance point on handlebar
 - Keep comfortable and firm, but relaxed grip on handlebar
 - Left hand controls roll of chainsaw 
 - Right hand controls pitch and yaw of chainsaw 
- Right Hand MUST wrap thumb around rear handle
- Be prepared for reactive forces of saw and for Kickback

Chain Saw Operation

- Stand Perpendicular to the log, with the saw in front of the body to allow room to move saw in and out of log
- Keep out of the plane of the saw, incase of kickback
 - Can look down the bar to align cuts
- Don't overreach arms – Stand close to log and saw
 - Arms should be bend slightly
 - If possible, rest saw handlebar or rear handle on thigh or support forearm on knee to relieve weight of saw
- Don't move feet when transitioning between cuts to ensure the cuts remain aligned
- MUST be prepared for kickback and reactive forces

Chain Saw Operation

- Don't apply throttle with the chain engaged in the wood
 - Lift bar so the chain is not contacting the wood to reduce reactive forces (push back/pull in)
- Balance the throttle to increase the engine speed as the chain engages the wood – use finesse over force
- Keep engine speed high 75%-100% throttle when in the wood
 - Time the release of the throttle as the saw stops cutting to reduce fuel consumption and reduce wear
 - Allow inertia of saw motor to finish cut and clear chips
 - Don't bog down motor – this is a sign of forcing the cut or binding or twisting the saw bar

Chain Saw Operation



**(Wildland Fire Chain Saws, S-212 Video,
National Wildfire Coordinating Group)**

Chain Brake

- Apply Chain Brake with the back of the Left Hand
- Don't use Right hand to apply chain brake
 - Get comfortable applying and releasing brake with left hand without having to look at hand
 - Keep left hand tethered to handlebar, with left thumb
 - Can use right hand to set brake, only when saw is not running (such as setting brake before starting saw)
- Apply brake when moving around log or brush, or when distracted during cutting operation
- Apply brake when setting saw on the ground
- Apply brake when shutting off, so it's ready to start

Kickback

- Kickback occurs when the upper corner of the bar nose contacts wood
- Commonly occurs when cutting on top side of bar (such as undercutting) or boring
- Can occur when bar is extended beyond the log and strikes other objects on other side of log
 - Be sure to inspect offside of log and brush out clearance before cutting on log
 - Be aware of bar and how much is exposed on far side
- Kickback can occur when brushing, with risks of striking hidden objects and overreaching the bar

Chain Saw Operation

- Keep Chain Sharp
 - Monitor as cutting performance decreases
 - Replace dull chain or file in field with proper file guide
 - Using dull chain will increase wear on chain & bar
- Keep air filter clean
 - Frequently remove and tap off excess dirt
 - Clean per instructions in manual (usually wash in soap or detergent and water)
 - Apply choke when removing filter to prevent dirt and saw chips from being ingested into carburetor
 - Check for dirty air filter if saw does not start

Chain Saw Operation

- Maintain proper chain tension
 - Chain will stretch as it warms with use, and lose tension
 - New chains will stretch on initial use – watch closely
 - Loose chains increase wear on bar and chain
 - Loss of lubricant
 - Increased contact wear on bar near drive sprocket
 - Loose chain tension can result in a thrown chain
 - Most likely to throw chain when Brushing, Cutting small diameter trees and Spring poles
 - Increased risk when kerf closes and catching loose chain
- Check tension when refueling

Chain Saw Operation

- Maintain proper chain tension
 - Thrown chain will be caught in chain catcher,
 - Inspect thrown chain for burrs and tight links
 - Remove burrs on drivers of thrown chain with flat file, before reusing chain
 - Ensure chain has no tight links, fits properly in bar groove and moves freely around bar nose
 - Be aware of chain tension when saw cools
 - Tension will increase and can cause high loading
 - Reduce tension when storing saw

Chain Saw Operation

- Use srench to adjust chain tension
 - Loosen bar nuts and tighten chain to be snug to bar
 - Long bars will appear to have less tension on chain
 - Solid nose bars require less tension
 - For bars with a drive sprocket nose and cold saw:
 - Hold bar up with spare hand
 - Tighten chain until the middle of chain just contacts bar
 - Check tension - pull on chain and it should snap back
 - Check tension - chain moves freely without any drag
 - Tighten Bar Nuts, while supporting bar
 - Know the proper tension needed for the saw that you use

Chain Saw Operation

- Ensure Adequate Bar and Chain Lubrication
 - Chain and bar require lubrication with oil
 - Never operate a saw without bar oil in tank
 - ONLY use designated Bar and Chain Oil with chain saw
 - Many saws have adjustable oil flow
 - Match flow to bar length – longer bars require more flow
 - Set oil flow to run out of bar oil after running out of fuel
 - Allow oil to flow to chain - Clean bar of debris
 - Clean oil passage and Groove in bar
 - Use groove cleaning tool (multi-tool or depth gauge)
 - Monitor oil flow - watch for oil splatter off chain

Chain Saw Operation

- Replacing the Chain
 - Release chain brake, set saw on stable surface, with clutch cover oriented up
 - Loosen bar nuts and turn chain tension adjuster all the way to increase slack in the chain
 - Remove bar nuts (DO NOT LOSE!!) and remove clutch cover
 - Remove chain from bar nose end or drive sprocket (latter only possible with inboard clutch)
 - Remove bar by raising bar to clear chain adjuster and the lift over bar studs (notice what side of bar was facing out)
 - Clean out groove in bar to ensure proper flow of bar oil

Chain Saw Operation

- Installing the Chain
 - Flip saw bar so opposite side is facing out
 - Slide the bar over the bar studs put bar in the rearmost position in the chain tension adjustment pin
 - Put chains over drive sprocket and feed into top groove working toward bar nose and then around bar nose
 - Ensure chain is seated properly in drive sprocket and bar groove and is not backwards (top cutting teeth facing forwards is correct)
 - Install clutch cover and snug up bar nuts to secure cover
 - Set tension on chain and ensure chain moves freely
 - Tighten bar nuts, confirm proper chain tension, set brake

Chain Saw Fuel and Bar Oil

- Bar and Chain Oil
 - Only use approved Bar and Chain Oil
 - Recommended to use Biodegradable Bar and Chain Oil
- Fuel
 - Use of ethanol fuels can cause costly repairs
 - Use Non-Ethanol Premium and add a stabilizer, like Sta-Bil, for storage
 - Store only in full container and store unmixed only
 - Mix with approved Two-Stroke Oil at required ratio, usually 50:1 and only mix when needed
 - Drain fuel tanks at end of season, and run saw dry.
 - Can use Pre-mixed fuel, but is more costly

Fuel Pressurization

- Pressure in fuel tanks and fuel bottles
 - Systems are not vented to relieve pressure
 - Fuel blend (summer and winter) behave differently, with winter fuels more volatile
 - Changes in environment (increased elevation and elevated temperatures)
- Fuel in tanks and fuel bottles can become superheated
- Vapor Lock is one symptom, be aware of poor running saw, or poor starting saw, with ½ tank of fuel
- Fuel will boil or geyser, when cap pressure is released
- High risk of sprayed fuel and highly flammable vapors exist leading to fires due to hot engine or muffler

Chain Saw ReFueling

- Pressure in fuel tanks and fuel bottles
 - Allow time for saw to cool (at least 5 min) before refueling
 - Aim opening away from body
 - Open cap slowly to relieve pressure
 - Turn cap to unlock, but do not remove cap
 - Stihl Locking Caps require only $\frac{1}{4}$ turn to remove
 - Allow pressure to vent, before removing cap
 - Full thread caps are easier to vent
- Do not Overfill fuel tank
 - Leave enough room for air pocket and fill cap
- Do not start saw within 10 feet of area of refueling
- Remove any clothing or PPE soaked with fuel

Chain Saw Operation

- Working with Swampers
 - Saw Crew Leader is responsible to ensure Swampers are briefed about hazards of working around chainsaws
 - Don't reach in to grab cut pieces with running chainsaw
 - Kickback and blood circle – maintain clearance
 - Methods to get Sawyer's attention and to direct swampers, when saw is running
 - Full chainsaw PPE is required for swampers if they are working within 10' of Sawyer
 - Volunteers have full range of experience levels as swampers, but expect inexperience
 - Apply chain brake or shut off chainsaw when swampers are clearing cut brush, limbs or logs

Chain Saw Tools

Required

- PPE
- First aid kit
- Communications
- Fire extinguisher
- Chain saw + bar cover
- Fuel + chain oil
(in approved containers)
- Bar wrench (Scrench)
- Single-bit, straight-handled axe + sheath
- Bucking wedges
- Pruning saw + sheath
- Flagging

Chain Saw Tools

Recommended

- Extra chain(s) and/or filing kit with file guide and gauge
- Saw maintenance kit (air filter, fuel filter and spark plug)
- Extra bar
- Multi-tool
- Chain saw pack, or padded saw cover
- Loppers, Pruners and/or Clippers
- Small shovel or combi-tool
- Spare bar nuts, & pull cord
- Extra fuel and bar oil

Chain Saw Tools

Project Dependent

- Pulaski
- Peavey, cant hook
- Log carrier
- Double-bit axe + sheath
- Basic rigging: strap, rope, come-along



Questions