



S-112 Unit 12: Chainsaw Components, Maintenance, and Repairs

Summary

This unit reviews the personal protective equipment (PPE) needed for chainsaw operations, chainsaw components, how to maintain a chainsaw, and how to start and stop a chainsaw, which was covered in the online portion of the S-112 Introduction to Chainsaw Operations training course. The first portion of this unit focuses on a combination of lectures, videos, and discussions. In the second portion of this unit, students will move to a large enough area (e.g., an outdoor area with picnic tables or bays) where they can receive demonstrations from their coach and perform activities.

Please note that this course uses a common language based on the *NWCG Standards for Wildland Fire Chainsaw Operations*, PMS 212, but you may hear different terms depending on local dialects.

It is recommended that copies of these instructions be provided to each coach to assist them with facilitating the activities in small groups.

Incident Position Description (IPD) Alignment

This unit aligns with the following Basic Faller IPD-specific duties located at <https://www.nwcg.gov/positions/basic-faller/incident-position-description>.

- Ensure individual and equipment readiness.
- Comply with all standards for chainsaw operations as defined in *NWCG Standards for Wildland Fire Chainsaw Operations*, PMS 212, and established agency standards for saw operating procedures.
- Ensure equipment is in good working condition for the next assignment and resupply used or damaged equipment as necessary.
- Demonstrate a basic knowledge of chainsaw components, maintenance, and repair.

Unit Objectives

- Wear proper PPE.
- Identify chainsaw components.
- Perform chainsaw maintenance.
- Perform a safety check.
- Start and stop a chainsaw.

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Unit at a Glance

Topics	Method	Duration
Unit Introduction	Lecture	2 minutes
Preparing to Use Your Chainsaw	Discussion	5 minutes
Chain Components	Lecture	4 minutes
Types of Chains	Lecture	3 minutes
Safety Check Video	Video	8 minutes
Avoiding Fuel Geysers	Video	3 minutes
Personal Protective Equipment	Discussion	5 minutes
Overview of Activities	Lecture	5 minutes
PPE Activity	Demonstration/Activity	10 minutes
Chainsaw Components Activity	Demonstration/Activity	15 minutes
Chainsaw Maintenance Activity	Demonstration/Activity	70 minutes
Safety Check Activity	Demonstration/Activity	10 minutes
Starting and Stopping a Chainsaw Activity	Demonstration/Activity	20 minutes
Preparing for Field Day	Lecture	5 minutes
Total Unit Duration		165 Minutes (2 hours 45 minutes)

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Slide 1



- ☐ Tell students that during this unit, they will learn how to wear personal protective equipment (PPE) needed for chainsaw operations, identify chainsaw components, maintain a chainsaw, and start and stop a chainsaw.

Slide 2

Objectives

Students will be able to:

- **Wear proper PPE.**
- **Identify chainsaw components.**
- **Perform chainsaw maintenance.**
- **Perform a safety check.**
- **Start and stop a chainsaw.**

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- ☐ Review the unit's objectives.

Slide 3

Preparing To Use Your Chainsaw

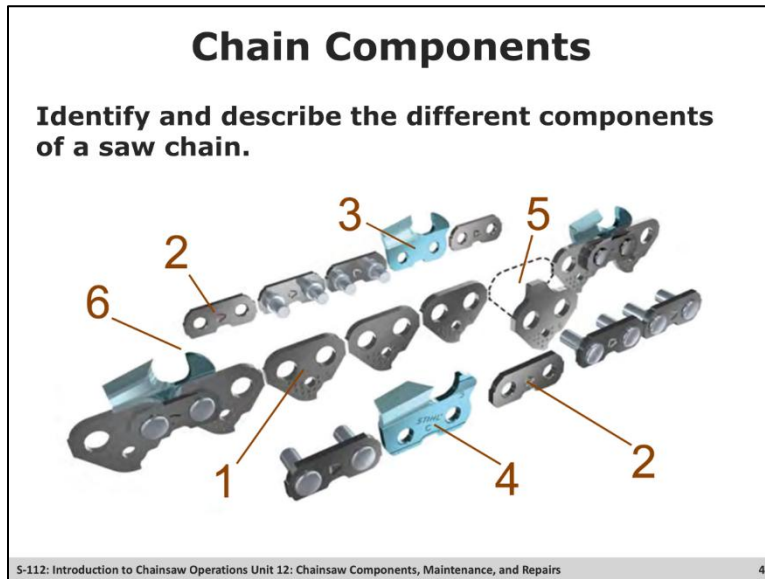
- **What items should be part of your chainsaw kit?**

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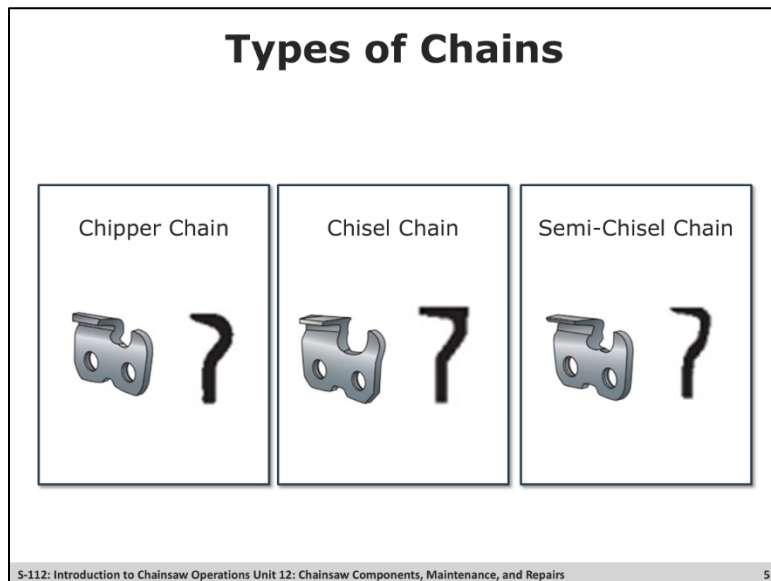
- ☐ Ask students to answer the following question: “**What items should be part of your chainsaw kit?**”
- ☐ As students respond, take notes on flip chart paper or a whiteboard.
- ☐ When debriefing, make sure that the following items are covered:
 - PPE
 - Chainsaw
 - Felling Axe
 - Wedges
 - Sheath or scabbard (ideally, covers the guide bar, chain, dogs, and muffler)
 - Chain file, filing guide, and raker file/depth gauge file (appropriate to the size of the chain being used as specified on the guide bar)
 - Plumb bob
 - Spare parts
 - Srench
 - Filters
 - Fuel
 - Maintenance tools

Slide 4



- ☐ Tell students that a saw chain comprises several parts that work together and must be adequately maintained for maximum performance and safety.
- ☐ Ask students to volunteer to identify and describe different parts of the saw chain in the diagram (or on an actual chain on a chain saw) based on their prior experience.
- ☐ When debriefing, make sure students correctly identify and describe the following components of their chainsaws:
 1. **Drive link** – fits in the bar groove so the bar can guide the chain around to the chain sprocket, allowing the power head to drive the chain. It also draws oil from the bar groove to lubricate the bar and chain. Explain that there is also a master link that joins both ends of the chain.
 2. **Tie-strap** – holds the chain together.
 3. **Left-hand cutter** – cuts the wood. The depth gauge (or raker) determines the depth of the cut.
 4. **Right-hand cutter** – cuts the wood. The depth gauge (or raker) determines the depth of the cut.
 5. **Humped drive link** – a low-kickback feature not found on all chains. Note that this should be in front of the cutter.
 6. **Depth gauge (raker)** - the depth gauge determines the height at which the cutter enters the wood and, thus, the thickness of the chip removed. The depth gauge setting is the difference between the top of the depth gauge and the top plate.

Slide 5

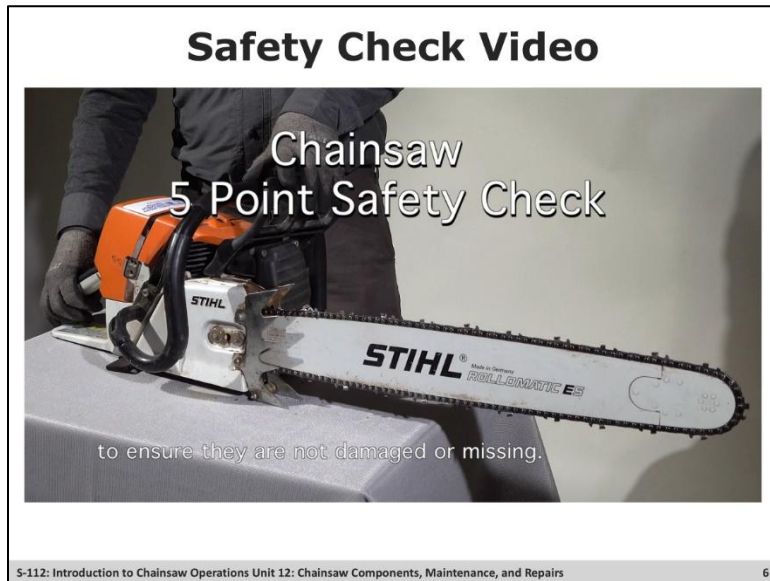


- ☐ Tell students that the part of the chain called the cutter, also referred to as “teeth,” severs wood fibers. The saw chain has left-hand and right-hand cutters so that the saw chain will cut evenly through the wood.
- ☐ Tell students this slide displays the three most common types of saw chain cutters (chipper, chisel, and semi-chisel). Ask students to identify the type of cutter on their chainsaws.
- ☐ Tell students that it is common for units to only purchase one type of chain; however, they should be aware of the different types of chains available to them. Note that they would not, under most circumstances, change to a different type of chain in the field based on their assignment.
- ☐ Explain what the different types of chains are used for:
 - **Chipper:** The most versatile cutter type, the easiest to file, and tolerates dirt and dust. Cuts smoothly and is well-suited for most wildland fire chainsaw operations.
 - **Chisel:** The most aggressive cutter type. Chisel comes in both round and square ground types.
 - The round ground chisel requires the proper-size round file for proper sharpening. The square-ground chisel requires a double-bevel, hexagon, or single-bevel file to sharpen it.
 - The square ground chisel is designed for production-type felling for cutting clean wood. This is the fastest type of cutter in clean wood; however, it dulls the fastest in dirty or fire-hardened wood and requires special training to sharpen.
 - **Semi-chisel:** A less aggressive cutter type than a chisel cutter. A round file is used when filing a semi-chisel chain. The semi-chisel cutter is more tolerant of dirt and dust and stays sharp longer than the other cutters.

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- ❑ Explain there are also low-kickback chains available with chipper, chisel, and semi-chisel cutters. These are used for training inexperienced sawyers. The chain cuts smoothly and is ideal for cutting brush, small-diameter material, dimensional lumber, house logs, and other materials that aren't usually cut with chainsaws. Less aggressive cutting angles and features added to the depth gauge and drive links provide a lower kickback response.

Slide 6



- ☐ Remind students that it is essential to conduct a chain saw safety check before starting operations.
- ☐ Play the video about performing a safety check.
- ☐ After the video finishes, ask students to describe how to perform a safety check. Responses should include:
 - **Chain brake:** Confirm the chain brake locks and unlocks properly.
 - **Throttle trigger and interlock:** ensure the throttle trigger cannot be squeezed without first depressing the throttle interlock on the top of the handle. This keeps the throttle from being activated by sticks or branches when you are not holding the rear handle.
 - **Chain catch:** Confirm the chain catcher is present.
 - **Anti-vibration system:** Check that the anti-vibration system and fasteners are tight by turning the chainsaw upside down and confirming nothing is loose.
 - **Spark arrester screen:** check that the spark arrester screen is present.
- ☐ Ask students if there are any questions.

Slide 7

Avoiding Fuel Geysers



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- ☐ Ask students to share what they think a fuel geyser is.
- ☐ After students have a chance to respond, tell them you will play the video describing a fuel geyser.
- ☐ After playing the video, tell students that when refueling their chainsaws in the field, they need to be careful to avoid fuel geysers.
- ☐ Explain that a fuel geyser is the forceful expulsion of liquid and vapor fuel from the fuel tank caused by the rapid depressurization of the tank. Heat and agitation cause the pressure in the tank to increase. A delayed fuel geyser can occur after opening the fuel container.
- ☐ Tell students that fuel geysers can occur any time fuel, heat, and pressure are combined in fuel transport containers or small, gas-powered engines, such as chainsaws, leaf blowers, and portable pumps. Fuel geysers can result in injury when fuel is sprayed and comes in contact with an operator's skin and eyes.
- ☐ Tell students to take the following precautions and mitigations when fuel, heat, and pressure are present or suspected:
 - Always assume fuel tanks and fuel containers are pressurized. Shut the saw off to allow it to cool. Restart the equipment when it is cool.
 - Always check fuel levels before opening the fuel tank or filler cap. Fuel levels greater than half a tank are more likely to geyser.
 - Always move away from the fireline or any ignition source. This includes moving at least 20 feet or more from any heat source and 10 feet from the fueling area.
 - Cover the fuel cap with a rag when opening to contain potential fuel geyser spray. While maintaining downward pressure on the cap, slightly open it to allow excess pressure to escape and listen for the sound of gas releasing. Once the pressure subsides, continue fully opening the cap.

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- Be extra vigilant when equipment is running poorly, and the fuel level is above half a tank. If you notice that the tank is bubbling, this is an indicator of the potential for future fuel geysering and vapor lock.
 - Vapor lock refers to how the vaporization of gas in the fuel tank and fuel lines build pressure so that the tank is deprived of fuel. The chainsaw may not start or may get bogged down despite having a full gas tank.
 - Do not use fuel older than one month; winter fuel is believed to be a contributing factor.
- ❑ If time allows, review an incident from the Lessons Learned Center about fuel geysering.

Slide 8

Personal Protective Equipment

- **What types of personal protective equipment (PPE) should you wear for chainsaw operations?**

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- ☐ Ask students to answer the following question: **“What types of personal protective equipment (PPE) should you wear for chainsaw operations?”**
- ☐ As students respond, take notes on flip chart paper or a whiteboard.
- ☐ Make sure that the following items are covered:
 - Chaps
 - Gloves
 - Helmet
 - Eye/Face protection
 - Boots
 - Hearing protection
 - Long pants and long sleeve shirt for unit exercises
- ☐ Note that this is the same set of PPE as for when using chainsaws generally. The only difference is that the PPE for fire use is made of Nomex, a fire-retardant fabric.
- ☐ Tell students to check to make sure their equipment is in good working order. For example, they should ensure their PPE doesn't have holes and that the chain on their chainsaw is sharp.

Slide 9

Overview of Activities

- **Students will participate in activities where they need to:**
 - **Wear proper PPE.**
 - **Identify chainsaw components.**
 - **Perform chainsaw maintenance.**
 - **Perform a chainsaw safety check.**
 - **Start and stop a chainsaw.**

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- ☐ Tell students that they will now go outside (or to a designated area) to practice the following tasks:
 - Wearing proper PPE.
 - Identifying chainsaw components.
 - Performing chainsaw maintenance.
 - Performing a chainsaw safety check.
 - Starting and stopping a chainsaw.
- ☐ Tell students they will work in small groups with a coach for each activity.
- ☐ Tell students that their assigned coach will provide a demonstration before they perform each task.
- ☐ Instruct students to use the *IRPG* and *NWCG Standards for Wildland Fire Chainsaw Operations*, PMS 212, as resources for completing the activities.
- ☐ Ask students if there are any questions before you head outside.
- ☐ Tell students to meet with their assigned coach at a pre-identified location.

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PPE Activity

Purpose: Ensure students have and wear PPE properly.

Time: 10 minutes (5 minutes for coach to demonstrate, 5 minutes for students to perform)

Materials:

- *NWCG Standards for Wildland Fire Chainsaw Operations, PMS 212*
- Chainsaws (1 instructor and 1 for each student)
- PPE (1 instructor and 1 for each student; see list in coach guidance for specifics)

Coach guidance for facilitating the PPE Activity:

- ☐ Remind students that they need the following PPE when performing chainsaw operations:
 - Chaps
 - Gloves
 - Helmet
 - Eye/Face protection
 - Leather boots with lugged soles
 - Hearing protection
 - Long pants and long sleeve shirt
- ☐ Demonstrate how to wear PPE properly by wearing your own PPE.
- ☐ Tell students to put on their PPE.
- ☐ Observe whether students have the correct PPE and if they are wearing their PPE correctly.
 - If students have missing equipment, provide them with extra equipment that you have with you and ask them to return it at the end of the day.
 - If there is no extra equipment, explain that they will need to borrow what they need from another student in their group before they begin their activity.
- ☐ Remind students to bring the correct PPE (fireline PPE if necessary) and general equipment with them for the next two days of field exercises.

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Chainsaw Components Activity

Purpose: Identify different parts of a chainsaw.

Time: 15 minutes

Materials:

- *NWCG Standards for Wildland Fire Chainsaw Operations, PMS 212*
- Chainsaws (1 instructor and 1 for each student)

Coach guidance for facilitating the Chainsaw Components Activity:

- ☐ Explain that it is essential to be familiar with the different parts of a chainsaw before going into the field. Using knowledge of chainsaw components to maintain the chainsaw (both before going into the field and while working in the field) and troubleshooting problems will help avoid potential safety incidents. Maintenance will also keep the saw in good condition.
- ☐ One at a time, point to each component and have the students identify them and their function. Add to or correct their answers as necessary. You should point out the following components:
 - Saw chain – Consists of several parts that work together to cut through wood.
 - Guide bar – Guides chain around bar.
 - Bar studs with bar nuts – Holds bar and chain sprocket cover in place.
 - Front and side chain tensioner – Moves guide bar to maintain proper chain tension.
 - Chain sprocket – Notched wheel that drives the saw chain around the bar.
 - Chain brake – Stops the saw chain if it is activated by the sawyer's hand or inertia during kickback.
 - Clutch – Couples the engine to the chain sprocket when the engine is accelerated above idle speed.
 - Chain catcher – Helps reduce the risk of the saw chain contacting the sawyer if the chain breaks or if the chain is thrown off the bar.
 - Starter grip – A rubber or plastic handle attached to the starter pull rope.
 - Bumper spikes (dogs) – Holds the saw steady against the wood and provides a pivot point for leverage during cutting.
 - Handlebar – Used to control the orientation of the chainsaw.
 - Hand guard – Activates the chain brake and prevents the sawyer's hand from contacting the chain.
 - Gunning sights – Used to aid in aiming the tree during felling.
 - Throttle handle – Used to hold the rear of the saw.
 - Throttle trigger – Controls the speed of the engine.
 - Throttle interlock – Prevents the throttle from being activated unless it is depressed.
 - On/off/choke switch – Turns the saw on and off.

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- Air filter cover – Holds the air filter in place and covers the carburetor.
 - Oil and fuel caps – Seal the bar oil and fuel tanks.
 - Muffler – Reduces exhaust noise.
 - Spark arrester – Prevents hot sparks from leaving the muffler.
 - Carburetor adjustments – Used to adjust the fuel and air mixture at high and low chain speeds.
 - Cooling Fins – Disperses heat from the engine to keep the saw from overheating.
- ☐ Explain that, in some cases, the components of their own chainsaw may be in a different location than in the diagram. This is because some models have different features.
- ☐ Ask students if there are any questions.
- ☐ Add to the discussion that components may have different names based on local dialects.
- The “guide bar” may be referred to as the “bar.”
 - The “handlebar” may be referred to as the “wrap around” or “wrap.”
 - The “starter grip” may be referred to as a “pull cord.”

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Chainsaw Maintenance Activity

Purpose: Perform chainsaw maintenance.

Time: 70 minutes (for each component, coaches will have 5 minutes to demonstrate and students will have 9 minutes to perform)

Materials:

- *NWCG Standards for Wildland Fire Chainsaw Operations*, PMS 212
- Chainsaws (1 instructor and 1 for each student)
- PPE (1 instructor and 1 for each student) (see list in coach guidance for specifics)

Coach guidance for facilitating the daily maintenance component:

- ☐ Tell students that there are different maintenance tasks they will need to do to ensure their chainsaw operates effectively.
- ☐ Tell students that *NWCG Standards for Wildland Fire Chainsaw Operations*, PMS 212, provides details on performing general chainsaw maintenance.
- ☐ Demonstrate and have students perform the following maintenance items:
 - Fill fuel and bar oil.
 - Sharpen the chain using a file guide.
 - Use the depth gauge tool to check the depth gauge.
 - Remove the side cover plate and clean all built-up debris.
 - Clean bar grooves and chain oil hole on the bar.
 - Inspect the bar for wear and burs and file if needed.
 - Flip the bar.
 - Check the drive sprocket for wear.
 - Inspect and either clean or replace the air filter per the manufacturer's recommendation.
 - Report any damage to your supervisor.
 - Replace any broken or worn parts.
 - Store the saw with the switch in the STOP position.
- ☐ As time permits, you can also have students complete the following daily maintenance items:
 - Inspect anti-vibration mounts to ensure they are tight.
 - Inspect the fuel filter for blockages or debris buildup.
 - Use a brush to thoroughly clean out the built-up debris on the saw body.
 - Visually ensure the spark arrestor is in place.
 - Clean fins on flywheel.
 - Clean fins on the cylinder head.
 - Tighten all spline and pan head screws.

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- ❑ More maintenance items are in the *NWCG Standards for Wildland Fire Chainsaw Operations*, PMS 212 and may require a higher experience level.

Coach guidance for facilitating the guide bar maintenance component:

- ❑ When demonstrating how to maintain the **guide bar**, walk students through these steps:
 - Clean the bar daily as debris buildup in the bar grooves prevents the chain from spinning freely and the bar and chain from getting properly lubricated with bar oil.
 - Rotate the bar each day to promote even wear.
 - Rails should be inspected daily to prevent premature wearing of the bar and chain. If cutting problems occur, including thrown chains, inspect for the following issues:
 - The rails are worn down, and the groove is shallow. If the tie straps do not touch the rails, replace the bar.
 - The outside edges of the rails develop burs. Use a flat file to remove them.
 - The rail is worn low on one side. This causes the chain to cut at an angle. The bar will have to be ground on a specialized bar grinder.
 - Blue discoloration. This is caused by a lack of lubrication, poor cutting methods that push the drive links to the side, a chain that is too tight, or a dull or improperly filed chain.
 - The bar shows excessive wear only behind the sprocket-on-sprocket nose, caused by heavy use near the nose of the bar, such as limbing or by a chain that is too loose. You can reduce this wear by periodically turning the bar over.
 - The bar is bent. This can be caused by improper cutting techniques, getting the saw pinched or bound in the cut, or improper transportation. Some bars can be straightened at a shop that has the proper equipment.
 - Chain sprocket wear is normal, but is also accelerated by a loose chain. A worn sprocket can cause additional wear to both the chain and guide bar. Replace when worn beyond 0.5mm or as indicated in the wear guide.
 - Rim sprockets are frequently overlooked but should be checked regularly by either measuring or looking at the built-in wear guide.
 - One bar typically lasts for about four chains and two sprockets.
- ❑ Ask students if they have any questions about the demonstration they observed.
- ❑ Have students demonstrate how to maintain the guide bar.
- ❑ Observe students, offer assistance or correction if needed, and provide feedback.

Coach guidance for facilitating the adjusting tension component:

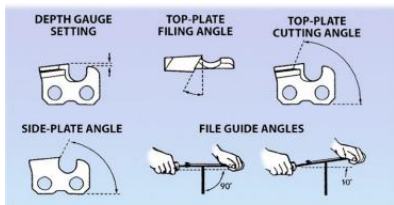
- ❑ When demonstrating how to **adjust the tension** on a chainsaw, walk students through these steps:
 1. Before adjusting the tension of the chainsaw, make sure the chainsaw is turned off, you are wearing protective gloves, and the bar and chain are cool enough to touch.
 2. Disengage the chain brake.

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3. Slightly loosen the bar nuts on the side of the saw (1 to 1.5 revolutions).
 4. Pull the nose of the bar up and keep the nose up as you adjust the tension.
 5. Turn the guide bar's chain tension adjustment screw until the bottoms of the lowest tie straps and cutters just touch the bottom of the bar.
 6. While still holding the nose up, tighten the rear bar stud, then tighten the front bar stud.
 7. Pull the chain by hand along the top of the bar several times from the powerhead to the tip. The chain should feel snug but pull freely.
 8. "Snap test" the chain tension by pulling down on the chain and letting it snap back into the bar groove, ensuring roughly 1/8 inch of free play.
 9. If the chain tension is too tight, make sure to loosen the bar nuts before adjusting the chain tension adjustment screw. Otherwise, the chain tensioner may be damaged. The tension can be tighter on a sprocket nose bar than on a solid nose bar.
- ☐ Ask students if they have any questions about the demonstration they observed.
 - ☐ Have students adjust the tension on their chainsaws.
 - ☐ Observe students, offer assistance or correction if needed, and provide feedback.

Coach guidance for facilitating the filing or sharpening of a chain component:

- ☐ When demonstrating how to **file a chain**, walk students through these steps:
 - A dull chain forces a sawyer to work harder, contributing to sawyer fatigue and increasing the risk of kickback, accident, and injury.
 - Explain that certain angles must be maintained when filing: the top-plate filing angle, the top-plate cutting angle, and the file guide angle or tilt.



- Explain that there are four methods used by sawyers to sharpen chains:
 - File with a jig – the preferred method for beginner sawyers and sawyers needing to occasionally correct variation in filed angles. File jigs are relatively easy to use and helpful in correcting improperly filed chains.
 - Depth gauge guide – used to maintain the correct depth gauge height by keeping the filing angle parallel with the chain.
 - File only – after learning the correct way to sharpen with jigs, sharpening free-hand out in the field offers the most convenience.
 - Grinder – an electric grinder can quickly sharpen chains damaged from rocks, debris, or incorrect filing. When using a grinder, caution must be taken to avoid overheating the metal on the cutting teeth.

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- Tell students to select a file that is the proper diameter for the chain.
- Be sure that the chain is tensioned properly.
- Assuming that all chain teeth are relatively close in length, begin with the cutter that is the most damaged or the most worn and count the number of strokes it takes to file out all irregularities. Then, sharpen all other cutters with the same amount of file strokes.

Hold the file handle firmly with one hand and guide the file with the other hand across the cutter on the forward stroke from the guide bar outward. If one tooth has been broken or is significantly shorter than others, start with a tooth closer in size to the rest of the chain. The shorter tooth can be maintained last.

- Be sure that $\frac{1}{4}$ of the file is above the top plate to ensure the gullet is properly filed.
 - Set the depth gauges by using a depth gauge tool with the correct built-in setting for the chain. Place the tool on top of the chain so one depth gauge protrudes through the slot in the tool. If the depth gauge extends above the slot, use a flat file to file the depth gauge level with the top of the tool. Never file a depth gauge lower than the top of the tool.
 - Crooked saw cuts are typically due to improper filing. Many sawyers will favor one side, resulting in different angles on the right and left cutters.
 - A clean bar in good condition guides the chain through a straight and true cut. Because the bar is a softer metal, it wears more quickly than the chain. Generally, one rail will wear more than the other, causing the saw to cut at an angle if the bar and the chain are not maintained.
- ☐ Ask students if they have any questions about the demonstration they observed.
 - ☐ As time allows, students can file a chain on their chainsaw (explain that they only need to sharpen a few teeth). More opportunities to practice maintenance will be provided during the field days.
 - ☐ Observe students, offer assistance or correction if needed, and provide feedback.

Coach guidance for facilitating the troubleshooting component:

- ☐ Have students open and review the Chainsaw Troubleshooting Checklist in the Activity Packet, which describes symptoms, causes, and remedies for common troubleshooting issues.
- ☐ Warn students that if they are uncomfortable repairing their chainsaw themselves, they can bring it to a qualified repair shop.
- ☐ When demonstrating how to check the **fuel**, walk students through these steps:
 - Check for an appropriate fuel mix ratio since an incorrect ratio could make the engine run too rich or too lean.
 - Check the fuel filter and replace it if it is clogged. Ideally, you should have a spare fuel filter in your pack.
 - Check the fuel line to make sure it is not cracked or broken.
 - Tell students that sometimes a chainsaw becomes flooded with too much fuel due to improper starting.

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- ☐ When demonstrating how to check the **airflow**, walk students through these steps:
 - The air filter on a chainsaw removes airborne contaminants from entering the combustion chamber. When the air filter becomes clogged, the amount of air reaching the combustion chamber is drastically reduced. This can result in poor performance, sputtering, and failure to start.
 - If applicable, ensure the butterfly valve is closed by switching your saw to full choke.
 - Remove the air filter.
 - Hold the air filter to the light. If you can see through it, it is not clogged.
 - Replace the air filter if necessary.
 - Ensure that the muffler and spark arrestor screens are clean and secure. Debris buildup could restrict exhaust flow.
 - Check that all hoses and gaskets are secure and are not leaking.
- ☐ When demonstrating how to check the **spark**, walk students through these steps:
 - Place the on/off switch in the on or run position.
 - Remove the spark plug from the cylinder and attach the spark plug wire to it.
 - Touch the spark plug's electrode tip to a metal surface on the engine and slowly pull the starter cord.
 - If you can see a spark, your electrical system is working.
 - If you do not see a spark, check the spark plug electrode for carbon buildup, damage or wear, and correct gap spacing.
 - Explain that if the spark plug or ignition wires are faulty or shorted, they must be repaired or replaced. It is advisable to carry a spare spark plug in the field.
- ☐ Tell students that if their chainsaw is still not working properly, they should get assistance from someone more experienced.
- ☐ Ask students if there are any questions.
- ☐ Tell students to perform each of these troubleshooting activities:
 - Fuel
 - Airflow
 - Spark
- ☐ Observe students, offer assistance or correction if needed, and provide feedback.
 - Ensure students do the following when demonstrating how to troubleshoot **fuel**:
 - Check for an appropriate fuel mix ratio since an incorrect ratio could make the engine run too rich or too lean.
 - Check the fuel filter and replace it if it is clogged.
 - Check the fuel line to make sure it is not cracked or broken.

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- Ensure students do the following when demonstrating how to troubleshoot **airflow**:
 - If applicable, close the butterfly valve by switching your saw to full choke.
 - Remove the air filter.
 - Hold the air filter to the light. If you can see through it, it is not clogged.
 - Replace the air filter if necessary.
 - Ensure that the muffler and spark arrestor screens are clean and secure. Debris buildup could restrict exhaust flow.
 - Check that all hoses and gaskets are secure and are not leaking.
- Ensure students do the following when demonstrating how to troubleshoot **spark**:
 - Place the on/off switch in the on or run position.
 - Remove the spark plug from the cylinder and attach the spark plug wire to it.
 - Touch the spark plug's electrode tip to a metal surface on the engine and slowly pull the starter cord.

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Safety Check Activity

Purpose: Perform a chainsaw safety check.

Time: 10 minutes (5 minutes for coach to demonstrate, 5 minutes for students to perform)

Materials:

- *NWCG Standards for Wildland Fire Chainsaw Operations, PMS 212*
- Chainsaws (1 instructor and 1 for each student)

Coach guidance for facilitating the safety check component:

- ☐ Tell students that you will demonstrate how to conduct a safety check:
- ☐ Walk students through the following.
 1. **Chain brake:** Confirm the chain brake locks and unlocks properly.
 2. **Throttle trigger and interlock:** ensure the throttle trigger cannot be squeezed without first depressing the throttle interlock on the top of the handle. This keeps the throttle from being activated by sticks or branches when you are not holding the rear handle.
 3. **Chain catch:** Confirm the chain catcher is present.
 4. **Anti-vibration system:** Check that the anti-vibration system and fasteners are tight by turning the chainsaw upside down and confirming nothing is loose.
 5. **Spark arrester screen:** check that the spark arrester screen is present.
- ☐ Ask students if they have any questions about the demonstration they observed.
- ☐ Have students complete a safety check on their chainsaws.
- ☐ Observe students, offer assistance or correction if needed, and provide feedback.

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Starting and Stopping a Chainsaw Activity

Purpose: Start and stop a chainsaw.

Time: 20 minutes (5 minutes for coach to demonstrate, 15 minutes for students to perform)

Materials:

- *NWCG Standards for Wildland Fire Chainsaw Operations, PMS 212*
- Chainsaws (1 instructor and 1 for each student)

Coach guidance for facilitating the starting of a chainsaw on the ground:

- ☐ Remind students that the two most common ways to start a chainsaw safely are on the ground and standing up. Never drop start a chainsaw since you will not have control of the saw.
- ☐ Tell students that you will now demonstrate how to start a chainsaw on the ground while walking them through these steps:
 - Set the chain brake.
 - If your saw has a choke, turn the choke on.
 - Place the saw on firm ground. Make sure that the saw's bar and chain do not contact anything.
 - Put your foot in the rear handle and keep a firm grip on the front handle with your hand.
 - Pull the starter handle with your other hand. Repeat until the engine fires. If available, shut the choke off once saw fires.
 - Accelerate so that the engine idles and then release the chain brake.
- ☐ After stopping your chainsaw, ask students if they have any questions.
- ☐ Select one student from your group to demonstrate how to start a chainsaw on the ground.
- ☐ Observe whether the student completes the steps you demonstrated.
- ☐ Select another student to begin and repeat until all students have completed the activity.
- ☐ When all students have completed the activity, provide feedback on what went well and what could be improved, and answer any questions the students may have.
- ☐ Let them try again as time allows. Provide feedback and continue to practice chain break and on/off switch functions.

Coach guidance for facilitating the starting of a chainsaw standing up:

- ☐ Tell students that you will now demonstrate how to start a chainsaw standing up while walking them through these steps:
 - Always begin the starting procedure with the chain break in the on position.
 - Place the rear handle between your thighs. Hold the front handle firmly with one hand.
 - Ensure that the saw's bar and chain do not contact anything.
 - Start your saw according to the chainsaw's owner's manual.

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- ☐ After stopping your chainsaw, ask students if they have any questions.
- ☐ Select one student from your group to demonstrate how to start a chainsaw standing up.
- ☐ Observe whether the student completes the steps you demonstrated.
- ☐ Select another student to begin and repeat until all students have completed the assignment.
- ☐ When all students have completed the activity, provide feedback on what went well and what could be improved, and answer any questions the students may have.

Ask students if they have any questions.

Preparing for the Two Days in the Field

- ☐ Explain that students will need to bring all the required PPE and equipment.
- ☐ Ask students if they have any questions about what PPE and equipment they should bring.
- ☐ Identify any students who will need equipment for the field exercises.
- ☐ Share the location and time students should meet for the field exercises.
- ☐ Remind students that the NWCG Course Skill Assessment (Skill Assessment) contains the performance assessments.
- ☐ Tell students that during the field day:
 - They must take an active role in all activities.
 - The instructor or coach will complete and review the Skill Assessment with each student at the conclusion of training.
 - Students who do not receive at least a “Meets Expectations” will require remediation and reassessment. The instructor will notify students if they do not meet expectations.

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Slide 10



☐ Close with the following summary points:

- Always wear the appropriate PPE and check that it is in working order before starting and operating the chainsaw.
- Always complete the safety check before operating the chainsaw, and keep your chainsaw and other tools maintained.
- Keep both hands on the saw and make sure you are well-balanced when operating a chainsaw.

☐ Ask students if they have any questions.