

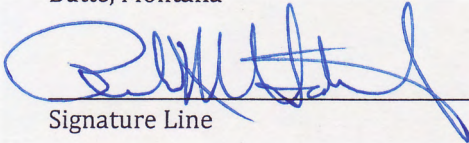
Chainsaw Safety Assessment Team
Final Report

August 4, 2015

CHAINSAW SAFETY ASSESSMENT (CSA) REVIEW

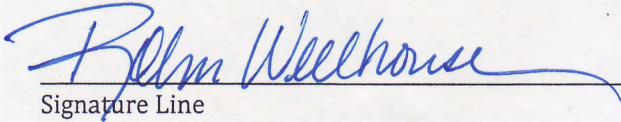
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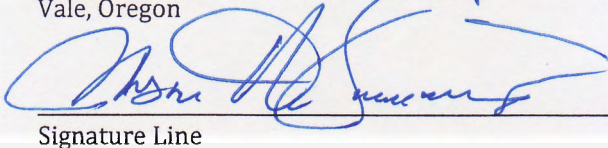
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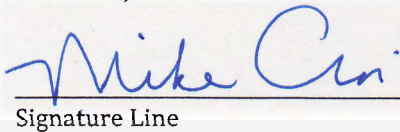
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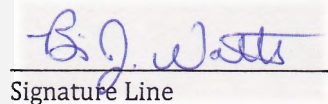
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Executive Summary

There have been several instances in 2015 in which wildland firefighters have experienced pressurized chainsaw fuel tanks spraying fuel on the operators, resulting in injury to operator and/or damage to the chainsaw. While these are the most recent incidents, the geysering of fuel when removing the fuel cap has also occurred in the past. Based on these occurrences, the Chainsaw Safety Assessment Team (CSAT) was delegated to review chainsaw operations, policy and procedures, risk assessments and training.

The CSAT found that fuel geysering is not a common occurrence, though it happens more often than reported. The cause of fuel geysering is over-pressurization of fuel tanks and rapid release of that pressure. All fuel caps have the potential for releasing pressure that would result in geysering. Most of the geysering occurrences discovered during the review involved quick release type caps. The culture and training of chainsaw operations for fuel safety issues deals with fueling requirements. However geysering can occur whenever a fuel cap is removed, no matter the reason for removal (i.e., checking fuel level, remedying vapor lock or refueling). This is a fundamental paradigm shift for chainsaw operators, especially wildland firefighters. The documentation reviewed showed that existing training (S212), risk assessments and written procedures do not address fuel tank pressurization or when and where operators should open the fuel cap.

During the course of our review, inconsistencies concerning some personal protective equipment (PPE) requirements were found between existing policies and regulatory guidance.

The CSAT recommends that the Bureau of Land Management (BLM) participate in the review and findings of the San Dimas Technology and Development Center, San Dimas, California to determine any policy or procedural changes needed for chainsaw operations; add to the Incident Response Pocket Guide a handling and pressurization hazards and mitigations section; develop a warning sticker displaying fuel handling and pressurization hazard mitigation and make it readily available for distribution to the field level; and update S212 to address tank pressure, vapor and fuel release, fuel cap removal and review of specific user manuals.

The CSAT also recommends a review of existing policy guidance regarding risk analysis and PPE requirements for BLM chainsaw operations.

Background

On May 25, 2015, a United States Department of Agriculture (USDA) Forest Service (USFS) firefighter was injured while working the Willow Peak Fire in the Mt. Charleston Wilderness near Las Vegas, Nevada. He sustained second and third degree burns to his upper body when a flash fire occurred while dealing with a

vapor locked saw. Prior to that, documentation shows that other wildland firefighters have experienced fuel sprays when opening fuel caps. In some cases the fuel has ignited, causing injury.

On June 2, 2015, an immediate stand down of all BLM wildland fire chainsaw operations was issued by the Assistant Director, Fire and Aviation which included direction that all chainsaw operators complete a review of a risk management worksheet (also known as a risk assessment) template.

On June 9, 2015, a BLM fire crew member from Upper Colorado River Fire Management Unit experienced a safety issue with an MS 460 Stihl chainsaw while responding to the Dry Creek Fire near De Beque, Colorado. The sawyer said the saw sputtered but did not stay running. While checking the fuel level (standing approximately 11 feet below the fire), he opened the cap a half turn which resulted in fuel spraying out of the tank under pressure. Although deflecting some fuel away, a significant amount got on his chaps, Nomex pants and Nomex shirt. He tossed the saw forward as he stepped back from the saw and fire. The saw landed downslope (approximately 9 feet away). Within seconds the vapor surrounding the saw ignited. This incident was considered a “near miss.”

A CSAT was ordered on Monday, June 22, 2015 and was delegated the authority to conduct a review of United States Department of the Interior (DOI), Bureau of Land Management (BLM) chainsaw operations.

Investigative Process

The CSAT was briefed by the Assistant Director, Fire and Aviation on the morning of June 24, 2015. After reviewing the Nevada and Colorado incidents, the team conducted independent research of chainsaw operations. The research was concentrated on chainsaw fueling and vapor lock remedy procedures that resulted in fuel expelled out of the fuel tank in a rapid forceful manner (geysering.) The team collaborated with the USFS facilitated learning analysis team in order to avoid duplication of efforts. The CSAT also reviewed DOI, BLM and USFS policies and procedures, DOI/BLM specific training requirements for chainsaw operations (and other portable hand tools), the review of chainsaw specific operations for BLM inventoried fire equipment (i.e., technical information and guidance based on owners’ manuals, and interviewing subject matter experts, etc.) and the template of the risk management worksheet/risk assessment for chainsaw operations (issued with the stand down orders issued June 2, 2015.)

The CSAT acquired several chainsaw fuel tanks and caps from different models and styles of chainsaws for evaluation. The team created a survey to investigate the frequency of occurrences, types of operations conducted at time of occurrences and fuel type used. The survey received thirty-two responses. The team also reviewed the current and on-going efforts by the wildland fire agencies to increase the awareness of geysering issue.

When conducting the independent review, the team focused on protocol and mitigation efforts that are learned by all chainsaw operators in the performance of their duties.

Reference manuals and policy reviewed during the course of this review are as follows:

- DOI Safety and Health Handbook (DM-485)
- DOI Occupational Health and Safety Training Guidelines (July 2009)
- BLM Safety Manual (1112)
- BLM Safety and Health Management Manual Handbook (1112-1)
- BLM Safety and Health for Field Operations (1112-2 aka the “Yellow Book”)
- Interagency Standards for Fire and Fire Aviation Operations 2015 (NFES 2724 aka the “Red Book”)
- USDA USFS Health and Safety Code Handbook (FSH 6709.11)
- NFPA 1977 Standard on Protective Clothing and Equipment for Wildland Fire Fighting 2011 Edition
- OSHA 29 CFR 1910.266 – Logging Operations, Standard Interpretations
- OSHA 29 CFR 1910. 95 and ANSI Z87.1 (2010 revision) Protective face and eyewear (shields/goggles)
- OSHA 29 CFR 1910.135 – Head Protection – Standard Interpretation
- Stihl MS 362 C-Q Instruction Manual
(http://www.stihlusa.com/WebContent/CMSFileLibrary/instructionmanuals/MS362C_Manual.pdf)
- Stihl 044 Instruction Manual
(http://www.stihlusa.com/WebContent/CMSFileLibrary/instructionmanuals/044_Manual.pdf)
- Stihl 046 Instruction Manual
(http://www.stihlusa.com/WebContent/CMSFileLibrary/instructionmanuals/046_Manual.pdf)
- Husqvarna Operator’s Manual, 340 EPA II, 345 EPA II, 350 EPA I
(http://www.husqvarna.com/ddoc/huso/huso2003_usen/huso2003_usen_1140114-95.pdf)
- Husqvarna Operator’s Manual, 340 EPA II, 345 EPA II, 350 EPA I, 2008 Edition (http://lawn-garden.needmanual.com/2007-2010-husqvarna-340-340e-345e-350-chainsaw-owners-manual.html?d=df_m_en#prettyPhoto)

Findings and Recommendations

The CSAT findings and recommendations are based on the delegation of authority letter which assigned (but did not limit) duties as follows:

1. Conduct an independent, team-assisted assessment and evaluation of operational activities for chainsaws used on fires at all fire functional areas and other incidents.
 - Completed – findings and recommendations listed below.

2. Coordinate with other agencies to obtain current information on any concurrent endeavors to evaluate chainsaw operations/activities and the recommendations gleaned from those efforts.
 - o Completed – findings and recommendations listed below.
3. Provide feedback to the Fire and Aviation Division of Fire Operations concerning observations and research, and offer recommendations for agency policy.
 - o Completed – findings and recommendations listed below.
4. The team should specifically review the following elements:

4a. Existing policies and procedures for chainsaw operations -

Findings –

(1) After initial investigation with academia and technology and development programs; the team concluded that:

- The geysering of fuel is the result of over pressurization of the fuel tank, the amount of fuel/vapor mix within the tank and the rapid release of the pressure.
- All fuel tanks and other fuel storage vessels not vented to the atmosphere have the potential to become over pressurized; however in our research we found only one brand of power equipment that has a fuel cap design that would easily allow the rapid release of the fuel tank pressure.
- The culture and training of chainsaw operations deals with fueling requirements though geysering can occur any time a fuel cap is removed. This is a fundamental paradigm shift for chainsaw operators (especially wildland firefighters).
- Determining the exact factor or combination of factors that could lead to over pressurization is beyond the expertise of the team, however many of the factors are being studied by the USFS Technology & Development Center, San Dimas, California.

Finding (1) Recommendation:

- (a) Since the team does not have the expertise to determine the causal factors in tank over pressurization and the USFS National Technology & Development Program, San Dimas does have that expertise, we recommend that the BLM participate in the review of San Dimas’s findings to determine any policy or procedural changes needed for chainsaw operations.
- (b) Treat all fuel cap removals (fueling or other reason) as if the tank is pressurized.

(2) The team found that manufacturers have identified possible pressurization hazards associated with fuel systems on these models of chainsaws:

- Stihl 036, 044, 046, MS-361, MS-362, MS-441, MS-461, MS-660, MS-880;
- Husqvarna 340, 345, 350

This hazard is identified and labeled as a standard warning pertaining to fuel tanks being under pressure, and the possibility of burn by gas or vapor. Furthermore, all makes and models of saws reviewed included safety mitigations concerning bleeding off tank pressure before opening the fuel system. An example of that warning is contained in the following excerpt from the STIHL MS441 Chainsaw Operator’s Manual, which states, “Fueling Instructions [Warning! Label] Fuel your power tool in well-ventilated areas, outdoors. Always shut off the engine and allow it to cool before refueling. Gasoline vapor pressure may build up inside the fuel tank depending upon the fuel used,

the weather conditions and the tank venting system. In order to reduce the risk of burns and other personal injury from escaping gas, vapors and fumes; remove the fuel filler cap on your power tool carefully so as to allow any pressure build-up in the tank to release slowly. Never release the fuel filler cap while the engine is running. Select bare ground for fueling and move at least 10 feet (2m) from the fueling spot before starting the engine. Wipe off any spilled fuel before starting your machine.”

Finding (2) Recommendation:

- (a) Update the risk analysis from BLM Fire Operations that was sent out during the safety stand down to include potential hazards with gas tank pressurization and mitigations identified in the interagency video (released June 26, 2015), and review the language concerning this issue within the chainsaw owner’s manuals.
 - (b) Add a fuel handling and pressurization hazards and mitigations section to the Incident Response Pocket Guide.
 - (c) Develop a warning sticker displaying fuel handling and pressurization hazards mitigation and make it readily available for distribution to the field level. The sticker should be designed to be placed on chainsaws or other gas powered equipment, Dolmars, Siggs and other approved fuel containers.
 - (d) Develop a safety alert that keeps this tank pressurization (geysering) and fuel cap removal issues in front of all possible users (fire and non-fire) until formal training, the section in the IRPG and the stickers are developed. The team recommends linking the new chainsaw video, Lessons Learned Report and Six Minutes for Safety session to the alert.
- (3) Of the people surveyed, not all chainsaw users are following the manufacturers’ recommended octane rating for fuel. Of the saw manufacturers owner’s manuals that we reviewed, all indicated that you should only use premium fuel mix with a minimum octane rating of 89 or higher. If you use ethanol fuel (E-10), you must use a synthetic high grade 2-cycle oil that is specifically designed for ethanol fuel. The manufacturer also states, “Using fuel with a lower octane rating may result in preignition (causing “pinging”), which is accompanied by an increase in engine temperature.”

How this directly relates to the pressurization issue is still unknown at this time. High engine temperature could lead to higher fuel tank temperature and thereby higher tank pressure.

Finding (3) Recommendation:

- (a) Since the team does not have the expertise to determine the causal factors in tank over-pressurization; we recommend following the findings from the USFS National Technology & Development Program, San Dimas.
- (4) After reviewing the safety policies, standards, regulations and risk assessment, the team discovered the following:
- In the DOI Occupational Health and Safety Guidelines, Appendix A, Occupational Exposure Training by Employee Duties and Responsibilities, part CC. Logging (Chain Saws). “Employees assigned to operate chainsaws will be trained in their safe use and maintenance in accordance with 29 CFR 1910.266.”

- 29 CFR 1910.266 “Logging Industry Standards for Chainsaw Operations” states in part, “PPE requires eye protection or face shield.” This matches USFS policy (Health and Safety Code Handbook) exactly. However face protection is required for BLM employees per the Yellow Book (chapter 12 – Machines and Tools, 3(J), page 103) and Red Book requirements (chapter 07-12, Eye and Face Protection.) However, in the section of the Red Book 07-10 (Fireline PPE) goggles were listed, but face shields were not.
- In chapter 8 of the Yellow Book (1112-2), eye and face protection are required when there is reasonable probability for injury. Chapter 12 is more specific for chainsaws and requires eye and face protection, but the section for wildland fire safety refers to the Red Book for guidance.
 - Chapter 12 Machine and Tools pg. 103, Paragraph J states specifically that required PPE for chainsaw operations are chaps, ear, eye, face, head and hand protection
 - From experience and interviews concerning face protection, it is seldom or almost never used by agency firefighters. However, it is readily used within the contract firefighting industry. It is not clear if face shields would prevent or lessen the severity of burn injuries when fuel is sprayed on operators and subsequently ignites.
- There are inconsistencies with the application of the above policy standards and regulations. These inconsistencies could present a liability and cause confusion to the users.

Finding (4) Recommendation:

These inconsistencies should be reviewed and corrected.

4B. Current chainsaw training and possible recommendations to supplement the training -

Findings –

- (1) The team reviewed the Wildland Fire Chain Saws (S212) training package and found that the following directions are covered to address fueling hazard mitigations:
- Allow the saw to cool for at least 5 minutes before refueling
 - Fill the saw on bare ground or on some other noncombustible, grounded surface
 - Refuel outdoors and at least 20 feet from any open flame or other sources of ignition
 - Do not start the saw closer than 10 feet from the fueling area.

However, there is no mention of any safety precautions when opening the fuel tank for other reasons, where you should open the fuel tank or discussion of pressure in the tank and associated hazards. The S212 training does not address reading and following owner’s manuals and manufacturer recommendations.

Finding (1) Recommendation:

S212 should be updated with an addendum to address tank pressure, vapor and fuel release, associated risk from burn injury, fuel filler cap removal for any reason and review of specific user manuals

- (2) While there is no standard chainsaw training package for non-fire personnel; the 1112-2 requires S212 for all chainsaw operators. There is no indication that all BLM field offices are in compliance. Montana/Dakotas and Oregon/Washington have instruction memoranda which reiterate this requirement. Responses from other state safety managers and state fire management officers indicate their states follow this requirement; but anecdotal information indicates that not all local units adhere to the requirement.

The Forest Service Handbook - FSH 6709.11 requires participation in a “national training program” such as S-212 in whole or part with certified operator/instructor documentation of ability and oversight of new operators.

Finding (2) Recommendation:

States should review how they are complying with 1112-2 requirement for S212 training of non-fire personnel.

(3) Several states conduct some form of refresher training for their fire personnel.

Finding (3) Recommendation:

Develop an annual chain saw refresher which incorporates:

- Changes to technology and standards
- Safety trends
- Uses a format that allows for flexibility tailored to the local unit

(4) It is unknown the extent to which the current information, videos and mitigations regarding the issue with chainsaw fueling is being distributed to other entities such as local fire departments, contractors, logging industry, etc.

Finding (4) Recommendations:

Explore how contractors, local fire departments and other entities associated with federal agencies can receive safety updates.

4C. Research and verify any issues reported for chainsaw operations –

Findings –

(1) After completing the review, the team found the following scope and scale:

- Chainsaw fuel tank geysering has occurred more than the few reported instances, but it is not a common occurrence.
- Our survey resulted in 32 responses, with 11 reported instances of fuel spraying. Of those 11 responses, 2 reported fire ignition.
- Based on the number of chainsaw operators and use, our survey is not statistically valid because of the limited number of responses. However, it does validate underreporting of fuel geysering/spraying incidents.
- Chainsaw fuel tank geysering incidents are probably under reported because of incidents that did not result in an injury and/or property loss and relative infrequency of occurrence.
- Some of the factors that could lead to fuel tank over pressurization would include:
 - outside or ambient air temperature
 - elevation changes
 - type of fuel used (blend of fuel – winter vs. summer)
 - ethanol additive, level of fuel in tank
 - grade of fuel (87, 89, or 91 octane)
 - age of the tool
 - maintenance and/or damage of tool
 - length of time tool is in continuous or near continuous use

- The over pressurization of fuel tanks is a probable cause of vapor locking the chainsaw due to vapor being forced into the fuel line rather than the fuel itself. Release of the tank pressure would remedy the vapor lock situation.
- The interagency chainsaw operations video (released June 26, 2015) addresses the most probable cause of fuel tank over pressurization and provides effective mitigation of the situation.

Finding (1) Recommendation:

- (a) Since the team does not have the expertise to determine the causal factors in tank over-pressurization and the USFS National Technology & Development Program, San Dimas does have that expertise, we recommend that the BLM participate in the review of San Dimas’s findings to determine any policy or procedural changes needed for chainsaw operations.
- (b) Since the interagency chainsaw video addresses the most probable causes of over-pressurization and provides mitigation/awareness of the situation, it is recommended that the video continue to be promoted throughout the firefighting community.
- (c) Encourage employees to report near misses to appropriate level supervisors for inclusion to accident reporting databases (e.g. SAFENET, Safety Management Information System, etc.)

4D. Evaluate and make recommendations for current risk management worksheets/ risk assessments for chainsaw operations –

A deliberative risk analysis process was used by the CSAT. The CSAT was assigned to review chainsaw operations, training, policy and procedure. The team reviewed the risk management worksheet/risk assessment and verified each section using regulatory guidance, policy and standards. We reviewed all chainsaw user groups, including high risk/low frequency operators. Based on this, all of the team’s recommendations would apply to all fire and non-fire chainsaw operators.

Findings –

- (1) It is not known if all operators are being briefed nationwide on the risk management process, although the risk management worksheet/risk assessment template was sent out Bureau-wide with the stand down document.

Finding (1) Recommendation:

All supervisors brief chainsaw operators on the risk management process while going over the inherent hazards identified on the risk assessment.

- (2) It is not known if all supervisors/operators are using a complete risk management worksheet/risk assessment.

Finding (2) Recommendation:

Use the attached risk management worksheet/risk assessment as a template for all chainsaw operations.

Other Ongoing Efforts

1. Rapid Lessons Learned Sharing – USFS

2. Six Minutes for Safety (both chainsaw gas tank pressure and fuel handling) - USFS
3. Short interagency video clip outlining the issue to increase awareness of the conditions that lead up to this outcome.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

RISK MANAGEMENT WORKSHEET

| | | | | | |
|---|--|---|---------------|---|---------------------------------|
| 1. Organization and Location: [SPECIFY LOCATION – STATE/DISTRICT/FIELD OFFICE OR UNIT] | | | 2. Page 1 of: | | |
| 3. Operation / Task: Chainsaw Operations [fire and non-fire] | | 4. Beginning Date: Initial Briefing date - DD/MM/YYYY | | 5. Ending Date: [SPECIFY – If not 12 mos out, then FY or CY; but not less than 3 yrs] | 6. Date Prepared: DD/MM/YYYY |

7. Prepared by (Name / Duty Position): **[LIST NAME(S) AND TITLE(S) – e.g. Jane Doe, AFMO in coordination with John Smith, FAL3]**

| 8. Identified Hazards: (Be Specific) | 9. Assess the Hazards: (Initial Risk) | | | | | 10. Control Measures Developed for Identified Hazards: <i>(Specific measures taken to reduce the probability of a hazard)</i> Include all PPE | 11. Assess the Hazards: (Residual Risk) | | | | | 12. How to Implement the Controls: (May Be Filled in By Hand) | 13. Supervisors and Evaluation by: (Continuous Leader Checks, Buddy System, etc.) |
|--|--|-------|----------|---------|----------|--|--|-------|----------|---------|----------|--|---|
| | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | (Be Specific) |
| Transporting Fuels to Job Site [using approved containers or in the power tools themselves] (fire, accidental poisoning, environmental spill, [pressurized tanks may expand]) | | | | X | | Transport each day's supply of fuel/mix only in approved containers. The BLM approves the use of dolmars and Sigg bottles as day-use (one shift) containers for saw fuel supply. Fuel remaining in such containers at the end of the shift must be returned to approved storage containers. Tightly sealed Sigg bottles may be carried by the operator in a daypack/belt pack. Carry to the job site only a quantity of fuel sufficient for one | | X | X | | | Discuss during project and shift safety briefings. 29 CFR 1910.266, Logging Operations and BLM Handbook 1112-2, Topic 12.3.J. Note: To justify how to mark minor or moderate residual risk, it is dependent upon location, elevation, temps, weather, type of fuel used (winter, summer, or special blends), additives, type of equipment – age, maintenance, damages, | Supervisor spot checks. Crew leader/crew chief continuous checks. Crew chief can ban any crew member from use of saw if, in his/her judgment, the crew member is an unsafe operator. Always team inexperienced operators with experienced personnel. Buddy back-up system. End of shift AAR. |

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|---|---------------------------------------|-------|----------|----------|----------|---|---|----------|----------|---------|----------|---|---|
| (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | (Be Specific) |
| | | | | | | work shift. Do not carry fuels in the same daypack or gear bag as food and water. Wash hands before eating. | | | | | | or length of time in service. | Post project reviews. |
| Improper Fueling (fire, explosion, spills, hazardous vapors, geysering or spraying) | | | | X | | <p>[Use required PPE.] After running - stop and allow hot saws to cool for *5 minutes before refueling. Never attempt to fuel a running or HOT saw.</p> <p>[Open fuel cap SLOWLY after cooling for slow release of vapor.]</p> <p>Fill the saw on bare ground or on other noncombustible, grounded surface.</p> <p>No smoking while fueling or while saw is running.</p> <p>Do not start saw within **10' of the fueling area.</p> <p>Fuel at least **20' from any open flame or other source of ignition. Wipe spilled fuel off saw prior to re-starting.</p> | | X | X | | | <p>Same as above, plus</p> <p>PPE – Face Shield in compliance with ANSI Z87.1 (per BLM Handbook 1112-2 and NFES 2724 Redbook)] Note: VIDEO DOES NOT SHOW FACE SHIELD BEING USED.</p> <p>*Note: In our collective experience, no one follows a time consideration. They estimate if the equipment is cool enough and proceed with refueling. Different models' owner's manuals vary in time, between 1 and 5 minutes for recommended cool down periods.</p> | Same as above. |

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|------------------------|---------------------------------------|--------------|-----------------|----------------|-----------------|--|---|--------------|-----------------|----------------|-----------------|---|---|
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| (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | (Be Specific) |

| | | | | | | | | | | | | |
|---|--|--|--|----------|---|--|----------|----------|--|--|--|--|
| | | | | | Mix fuel and/or fuel saws in open areas, not in garages, storerooms, quarters, etc. Use a funnel or a flexible hose when pouring fuel into the saw. | | | | | | <p>**Note: Video shows it, but mostly it's a "common sense" rule. If no spill occurs, they step a couple feet away and start the engine.</p> <p>***Note: We recommend elevating residual risk to moderate versus minor as listed on the national template.</p> <p>Note: Stihl manuals for chainsaws recommend when using fuel containing ethanol to have equipment serviced annually by a certified (Stihl) chainsaw mechanic. We recommend all saws be inspected annually by a certified mechanic.</p> | |
| Starting Saw (cuts from chain, sprains/strains from pulling starter rope) | | | | X | Employees and volunteers are required to complete S-212 training prior to working with chainsaws. Follow BLM supplemental requirements for Chainsaw Operators and Fallers. [This is required per BLM Handbook 1112-2 for all | | X | X | | | Same as above [, plus] BLM Standards for Fire Training and Workforce Development, Appendix C. [only shows final evaluation process only] | SAME AS ABOVE + Supervisor/crew chief will verify completion of S-212 and ensure that appropriate operator's information specific to saw is available. |

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|------------------------|---------------------------------------|-------|----------|---------|----------|--|---|-------|----------|---------|----------|---|---|
| (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | (Be Specific) |
| | | | | | | <p>chainsaw operators.]</p> <p>[Use required PPE.]</p> <p>Inspect saw for proper operating condition prior to the shift, and at least once more during the shift:</p> <p>Chain is properly tightened.</p> <p>All handles and guards are in place and tight.</p> <p>Chain brake is operational.</p> <p>Muffler and spark arrester are in place.</p> <p>Start the saw at or close to where you will be operating it to avoid traveling with a moving chain.</p> <p>*Do not start the saw if you aren't wearing the PPE required to operate it (see PPE/Training Summary below.)</p> <p>*Do not start the saw while fueling.</p> <p>Start the chainsaw on the</p> | | | | | | <p>[BLM PPE Requirements per BLM Handbook 1112-2 for chainsaw operators are:</p> <ul style="list-style-type: none"> • Cut Resistant Chaps • Hearing Protection • Eye Protection ANSI Z87.1 • Face Protection ANSI Z87.1 • Hard Hat ANSI Z89.1-1986 • Foot Protection • Hand Protection] <p>Saw operating manual.</p> <p>6 Minutes for Safety-Chainsaw Safety.</p> <p>Note: None of the research we have done shows frequency of training; incl review of DOI Occ Health & Safety Trng Guidelines 07/2009; BLM Handbook 1112-2; and NFES 2724.</p> <p>*Note: Saw should not</p> | |

| 8. Identified Hazards: | 9. Assess the Hazards: (Initial Risk) | | | | | 10. Control Measures Developed for Identified Hazards: (<i>Specific measures taken to reduce the probability of a hazard</i>) Include all PPE | 11. Assess the Hazards: (Residual Risk) | | | | | 12. How to Implement the Controls: (May Be Filled in By Hand) | 13. Supervisors and Evaluation by: (Continuous Leader Checks, Buddy System, etc.) |
|--|---------------------------------------|-------|----------|----------|----------|--|---|----------|----------|---------|----------|---|---|
| (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | (Be Specific) |
| | | | | | | <p>ground or where otherwise firmly supported.</p> <p>A well tuned saw will start more quickly and smoother than one that isn't, reducing the risk of strain from stiff or repeated pulling of the starter rope.</p> | | | | | | <p>be started without PPE or while fueling. S212, OJT, or other instructional guidance (e.g. video, RA, etc.) does not allude to showing or teaching removal of hearing protection, so you can "hear the hiss" when slowly removing the fuel cap to release pressure.</p> <p>Note: Operators' manuals are usually kept with other records – not likely taken to the field for various operations.</p> <p>Note: We recommend elevating residual risk to moderate versus minor as listed on the national template.</p> | |
| Operation (body contact with cutting chain, potential for severe wounds) | | | | X | | <p>Saw must be in good operating condition, with anti-kickback devices and chain brakes in fully operational condition.</p> <p>Always grip the saw firmly during cutting, with the thumb and fingers completely encircling the</p> | | X | | | | <p>Same as above, plus</p> <p>BLM PPE Requirements per BLM Handbook 1112-2 for chainsaw operators are:</p> <ul style="list-style-type: none"> Cut Resistant Chaps | <p>SAME AS ABOVE + Supervisor/crew chief will ensure that proper PPE is provided and maintained in a serviceable condition by employee.</p> |

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| (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | (Be Specific) |
| | | | | | | <p>handles.</p> <p>Cut-resistant chainsaw chaps are required for all chainsaw operators to protect legs from accidental contact with the cutting chain.</p> <p>Never cut overhead.</p> <p>Always keep saw away from your body and never saw in-line to any part of your body when cutting through an object.</p> <p>Keep a sharp chain on the saw.</p> <p>Efficient cutting is safer and requires less effort than forcing a dull chain to cut through wood.</p> <p>A dull chain will drift off your intended cut line more readily than a sharp chain.</p> <p>A dull chain will overheat rapidly.</p> | | | | | | <ul style="list-style-type: none"> • Hearing Protection • Eye Protection ANSI Z87.1 • Face Protection ANSI Z87.1 • Hard Hat ANSI Z89.1-1986 • Foot Protection • Hand Protection] | |
| Operation (sprains, strains, falls) | | | X | | | Always ensure proper and adequate footing in the area you will be cutting in; remove debris and obstacles that could cause tripping. | | X | | | | Same as above | Same as above |

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|------------------------|---------------------------------------|--------------|-----------------|----------------|-----------------|--|---|--------------|-----------------|----------------|-----------------|---|---|
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| | | | | | <p>Ensure that you ALWAYS have a clear escape path for safely retreating from the cutting/felling area.</p> <p>Saw must be held away from the body, but never operate it with your arms fully extended (i.e. never unduly stretch your reach to make a cut.)</p> <p>Keep chain sharp to avoid bearing down too hard on bar.</p> | | | | | | | | |
| Fatigue (injuries, sprains/strains) | | | | X | <p>Operators should not exceed 5 hours of constant saw operation per day.</p> <p>Operators should rest every hour for a few minutes, but at minimum must take at least two 10 minute breaks + one 30 minute meal break within their 5 hour operating stint.</p> <p>Operators should rest whenever they feel that fatigue is causing them injuries or decreasing safe operation of the saw.</p> | | | | X | | | <p>SAME AS ABOVE +</p> <p>6 Minutes for Safety-Fatigue and Stress</p> | Same as above |
| Carrying Saw (falling onto stationary or moving cutting chain) | | | | X | <p>Chainsaw must always be shut down or the chain brake engaged whenever a saw is to be carried further than 50' (even</p> | | X | | | | | Same as above. | <p>SAME AS ABOVE +</p> <p>Supervisor/crew chief will ensure that all saws have</p> |

| 8. Identified Hazards: | 9. Assess the Hazards: (Initial Risk) | | | | | 10. Control Measures Developed for Identified Hazards: (<i>Specific measures taken to reduce the probability of a hazard</i>) Include all PPE | 11. Assess the Hazards: (Residual Risk) | | | | | 12. How to Implement the Controls: (May Be Filled in By Hand) | 13. Supervisors and Evaluation by: (Continuous Leader Checks, Buddy System, etc.) |
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| (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | (Be Specific) |
| | | | | | | <p>less in difficult terrain.)</p> <p>If more than 50', or if in rough or hazardous terrain, shut saw down and put blade scabbard in place prior to carrying the saw to the next work area or fueling spot.</p> <p>OSHA suggests that the chain brake be engaged whenever the operator takes more than two steps.</p> | | | | | | | <p>scabbards and that they are available at all times.</p> |
| <p>Head Injuries (saw kickbacks, falling deadwood from trees)</p> | | | | <p>X</p> | | <p>Always wear protective headgear when operating a saw for felling/clearing purposes.</p> <p>[BLM will provide h]ardhats - must meet ANSI Z89.1–1986 standards.</p> <p>Saws must never be operated above shoulder height, to protect neck and head from accidental contact with cutting chain.</p> | <p>X</p> | | | | | <p>Same as above, plus</p> <p>BLM PPE Requirements per BLM Handbook 1112-2 for chainsaw operators are:</p> <ul style="list-style-type: none"> • Cut Resistant Chaps • Hearing Protection • Eye Protection ANSI Z87.1 • Face Protection ANSI Z87.1 • Hard Hat ANSI Z89.1–1986 • Foot Protection • Hand Protection] | <p>SAME AS ABOVE +</p> <p>Supervisor/crew chief will ensure that proper PPE is provided and maintained in a serviceable condition.</p> |

| 8. Identified Hazards: | 9. Assess the Hazards: (Initial Risk) | | | | | 10. Control Measures Developed for Identified Hazards: (<i>Specific measures taken to reduce the probability of a hazard</i>) Include all PPE | 11. Assess the Hazards: (Residual Risk) | | | | | 12. How to Implement the Controls: (May Be Filled in By Hand) | 13. Supervisors and Evaluation by: (Continuous Leader Checks, Buddy System, etc.) |
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| (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | (Be Specific) |

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| Foot Injuries (ankle injuries, contact with saw chain, struck by falling objects) | | | | X | | <p>Operators should wear heavy-duty, water-proof or water resistant work boots or loggers boots which should provide some protection from contact with cutting blade, i.e., leather boots with [safety capped, composite] reinforced toes are recommended, rubber boots with [composite] toes are minimally acceptable. [See NFES 2724 (Red Book) requirements for wildland firefighting boots.]</p> <p>Wildland firefighting boots must be a minimum of 8 inches high, lace-type exterior work boots with lug, melt-resistant soles (per NFES 2724 requirements) to protect ankles from contact with saw blade, and to provide adequate ankle support for walking on uneven terrain.</p> | | X | | | | <p>SAME AS ABOVE+</p> <p>BLM will not supply non-specialized boots, but does require their use.</p> <p>PPE: HEAVY-DUTY WORK BOOTS.</p> <p>[See NFES 2724 (Red Book) requirements for wildland firefighting boots requirements.]</p> <p>Note: Composite toed (versus steel toed) boots are now required by BLM Manual 1112-1.</p> | Same as above. |
| Operation (eye injuries from flying chips and debris]]) add closing parenthesis | | | | X | | <p>Always wear eye protection when operating any type of saw. [Per 29 CFR 1910.266, Logging Operations: employee does not have to wear a separate eye protection device where face protection covering both eyes and face is worn.]</p> | | X | | | | <p>Same as above], plus</p> <p>BLM PPE Requirements per BLM Handbook 1112-2 for chainsaw operators are:</p> <ul style="list-style-type: none"> • Cut Resistant Chaps | Same as above. |

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| (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | (Be Specific) |
| | | | | | | Goggles must meet ANSI Z87.1 standard [REMOVE this part, or be of the mesh “bug-eye” type or mesh face shield type.] | | | | | | <ul style="list-style-type: none"> • Hearing Protection • Eye Protection ANSI Z87.1 • Face Protection ANSI Z87.1 • Hard Hat ANSI Z89.1–1986 • Foot Protection • Hand Protection] | |
| [Face Injuries (from flying debris or other hazards, including vapors/spray which may cause fire)] | | | X | | | Always wear face protection when operating any type of saw. Face shields must meet ANSI Z87.1 standard | X | | | | | Same as above[, plus BLM PPE Requirements per BLM Handbook 1112-2 for chainsaw operators are: <ul style="list-style-type: none"> • Cut Resistant Chaps • Hearing Protection • Eye Protection ANSI Z87.1 • Face Protection ANSI Z87.1 • Hard Hat ANSI Z89.1–1986 • Foot Protection • Hand Protection] | Same as above. |

| 8. Identified Hazards: | 9. Assess the Hazards: (Initial Risk) | | | | | 10. Control Measures Developed for Identified Hazards: (<i>Specific measures taken to reduce the probability of a hazard</i>) Include all PPE | 11. Assess the Hazards: (Residual Risk) | | | | | 12. How to Implement the Controls: (May Be Filled in By Hand) | 13. Supervisors and Evaluation by: (Continuous Leader Checks, Buddy System, etc.) |
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| Hand Injuries (contact with chain, struck by falling debris, blisters from gripping saw) | | | | X | | Wear heavy-duty work gloves of leather or cut resistant fiber. Wear vibration-dampening gloves if you routinely operate chainsaws. | | X | | | | Same as above, plus BLM PPE Requirements per BLM Handbook 1112-2 for chainsaw operators are: <ul style="list-style-type: none"> • Cut Resistant Chaps • Hearing Protection • Eye Protection ANSI Z87.1 • Face Protection ANSI Z87.1 • Hard Hat ANSI Z89.1-1986 • Foot Protection • Hand Protection] BLM will supply heavy-duty work gloves. | Same as above. |
| Engine Noise (hearing damage, inability to hear shouted warnings, alerts to falling trees/branches, bear presence, fire, etc., or other emergency or job communications) | | | | X | | All crew members working within 100 feet of a running saw must wear ear muff type ear protection or insertable earplugs (with minimum noise reduction factor of 20 dB) when operating the saw. [Depending upon saw type and length of use, employee may be required to use dual hearing protection.] | | X | | | | SAME AS ABOVE + BLM will supply hearing protection meeting ANSI S3.19-1974 standards. PPE: EAR MUFFS [AND/OR] EARPLUGS WITH NOISE REDUCTION FACTORS OF > 20dB's. | Same as above. |

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| (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | (Be Specific) |
| | | | | | | New types of hearing protection are now available that allow crew communication, either through radio transmission or electronic sound filtering. Perform field tests of various types for applicability/practicality. | | | | | | NOTE: COMBINATION HELMET, FACE SHIELD AND EAR MUFF DEVICES ARE AVAILABLE. | |
| PPE/Training Summary | | | | X | | BLM PPE Requirements per BLM Handbook 1112-2 for chainsaw operators are: <ul style="list-style-type: none"> • Cut Resistant Chaps • Hearing Protection • Eye Protection ANSI Z87.1 • Face Protection ANSI Z87.1 • Hard Hat ANSI Z89.1-1986 • Foot Protection • Hand Protection] | | | | | X | Required Training: S-212, Wildland Fire Chain Saws BLM Handbook 1112-2, Topic 12.3.J. [for] PPE use. [Operational Risk Management and Understanding Risk Assessments for Supervisors or regular employees] [Review of owner's manuals for various types of equipment being used.] Tree felling (depends on type of project.) | Supervisors are responsible for ensuring that all training is provided and documented, and that all PPE is provided [(with the exception of "condition of hire" items)] , maintained in a servicable condition and consistently used. |
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| (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | Negligible | Minor | Moderate | Serious | Critical | (Be Specific) | (Be Specific) |

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| 14. Remaining Risk Level After Control Measures Are Implemented: (INDICATE HIGHEST REMAINING RISK LEVEL WITH "X") | NEGLIGIBLE (Supervisor) | | | | | MINOR (Associate/Assistant Mgr. / Branch Chief) | | | | | MODERATE (Field Manager) | | | | | SERIOUS (District Manager) | | | | | CRITICAL (State Director/Associate) | | | | |
| | [INDICATE] | | | | | [INDICATE] | | | | | [INDICATE] | | | | | [INDICATE] | | | | | [INDICATE] | | | | |

15. RISK DECISION AUTHORITY: (Approval/Authority Signature Block) *(If Initial Risk Level is CRITICAL, SERIOUS or MODERATE: Brief Risk Decision Authority at that level on Controls and Control Measures used to reduce risks)*
 (Note: if the person preparing the form signs this block, the signature indicates only that the appropriate risk decision authority was notified of the initial risk level, control measures taken and appropriate resources requested; and that the risk was accepted by the decision authority.)
STATE OR LOCAL LEVEL SUPV/MGR MUST SIGN ACKNOWLEDGEMENT OF RESIDUAL RISK

 Printed Name / Signature

INSTRUCTIONS

1. Organization conducting the Risk Assessment and the location of the operation.
2. If more than one page is used, indicate number of pages. (For example: Page 1 of 3)
3. In general terms, identify the operation/task(s) to be performed.
4. Enter the date that the operation/task(s) is/are to begin.
5. Enter the date that the operation/task(s) is/are to end.
6. Enter the date that the Risk Assessment was prepared.
7. Enter the name and duty position of the person completing the form.
8. Identify specific hazards associated with the operation/task(s.) It is important to be specific and start at the beginning, the preparation phase (equipment draw/transportation of equipment) of the operation. (For example: unfamiliar equipment, inexperienced operators, improperly configured equipment, challenging terrain, natural hazards, hazardous chemical use, span of supervision, location of work, types of roads, confined spaces, pinch points.)
9. Assess the initial risk using the risk assessment matrix.
10. Identify control measures for each identified hazard in block 8.
11. Assess the residual risk, the risk remaining after control measures are taken into consideration, using the risk assessment matrix.
12. Identify how the controls will be implemented (For example: SOPs, tailgate safety briefings, written/oral policy statements/directions, familiarization training, Right to Know training, use of PPE, use of spotters.)
13. Enter the specific individual(s) or method(s) used to supervise and evaluate the provisions of the Risk Assessment. (For example: supervisor/leader on site, buddy system, employee crosstalk.)
14. Check the appropriate remaining level of risk.
15. The authority accepting the risk should sign this block; however, if the authority is notified and accepts the risk, the person completing the form can note same sign block 15. (See "Note" in block 15.)

| Year of Event | What type of saw operation was being performed? i.e. Fire Suppression, Prescribed Fire, Natural Resource, etc. | Was there injury or property loss? | Saw Make | Saw Model | What was the octane rating of fuel that was being used? | | Please provide a brief summary of the event. | Should we have any additional questions may we contact you? If so please fill in your contact information. | | | What agency do you work for? |
|---------------------|--|--|---------------------|---------------------|---|---|--|--|--------------|------------------------|------------------------------|
| Open-Ended Response | Open-Ended Response | Open-Ended Response | Open-Ended Response | Open-Ended Response | Response | Unknown | Open-Ended Response | Name | Phone number | Email | Response |
| 2003 | Fire suppression | no | stihl | 38 | Unknown | unknown what the mix rate was at the time | spray back while fueling a hot saw. | Daniel Cannon | 541-823-3025 | dcannon@blm.gov | BLM |
| 2015 | Fire | No | Stihl | MS 440 | 87 | | A sawyer stopped to refuel while cutting a medivac site. Gas erupted into the air, while the remaining gas boiled in the tank. Did not result in injury. | Ariel Fick | 575-499-8047 | afickridgebear@blm.gov | BLM |
| 2013 | Fire | No | Stihl | MS 440 | 87 | | Crewwmber stopped to refuel. Has erupted into his face. We rinsed his eyes and face with all the water we had. | Ariel Fick | 575-499-8047 | afickridgebear@blm.gov | BLM |
| | | | | | | | | Dario Archuleta | 970-826-5008 | darchule@blm.gov | BLM |
| 1976 | Fuels reduction | It really burned my eyes for a few hours | Homeight | Super XL-12 | Unknown | REgular gas, circa 1976. Full of lead, I'm sure | Cutting during a very hot day' when I released the cap to refuel, it geysered directly into my face. I was allowed to 'rest' in the crew buggy for a little while to recover, after flushing my eyes with water. | | | | BLM |
| 2015 | Wildfire | No | Stihl MS-441 | MS-441 | 91 | | A crewmember was flush cutting a stump that was about 33" in the vicinity of burning logs, duff, etc. The saw died and would not start. I approached the crewmember to see what was wrong with the saw. I thought that it may be flooded so I attempted to start the saw for him. It seemed as though it was out of fuel so I opened the fuel cap to see and fuel sprayed everywhere. I directed the saw away from me and only got a little on my shirt and chaps. I also quickly realized that I was in the black and ran to the green. When I looked in the tank air was venting out of the fuel line/filter to the point that it seemed as though it was boiling. After that the saw started fine. This occurred with a Stihl 461. Fuel was 92 octane mixed at a ratio of 50:1 with Stihl mix. | Timothy Gibilisco | 541-591-6000 | tgibilisco@blm.gov | BLM |
| 2000 | Clearing survey lines in forest | No | Stihl | 34 | 89 | | <<<<AS WITH ALL SMALL ENGINES USING GASOLINE AND FUEL CONTAINERS; WHEN EXPOSED TO HEAT; GASOLINE VAPORIZES AND EXPANDS CAUSING PRESSURE IN THE CONTAINER ,USE CAUSION When I opened my cap on the saw, yes under pressure vapors escaped when I opened the cap, I was not near any flame or heat source that could ignite the gasoline. Plus I released the pressure slowly so that only the vapor escaped and not the liquid, I never position myself where gas of fumes will directly cont me. I also never open the cap while holding the saw, always place the saw on the ground away from any sources that could ignite the gas or fumes. This gasoline safety 101. I have over 40 years experience with small engines powered with gasoline and never have had a incidence with gas fire or explosion. | Kyle Scholl | 970-724-3018 | kscholl@blm.gov | BLM |

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|----------------|---|--------------------------|--------------------------|-------------------|---------|--------------------------|---|---------------------------------------|--------------|------------------------------|----------------------|
| | | | | | | | Chainsaw operations cutting P&J active torching. Roughly 6500', 95+ Degrees F, RH under 18%. Operator stepped away from fires edge approximately 10-15' with back to fire. Pulled gas cap off to refuel when gas sprayed out. Operator fell backward initially and was partially covered by gas spray. 1-2 seconds later fumes ignited over operator about 10' high in a cloud and then traveled to catch a small portion of the operators nomex shirt on fire. Operator rolled and also crew member assisted to put out the fire. Chainsaw also ignited. No injuries occurred and the saw was undamaged. | | | | |
| 2012 | Prescribed Fire Slopover | No | Stihl | | 46 | 89 | | | | | BLM |
| NA | All | NO | STHIL | Varied | | 87 | No event is this survey for real? Read and follow proper procedure and training-no issue CSAT? This is way over the top! This survey is loaded as if there is/was a problem I have thousands of hours on saws and 1/C faller and have had no problem. Please let this go and let folks continue their duties. Follow owner manual and read labels gas is really flammable and is not inert like water. | | | | BLM |
| N/A | ALL OPERATIONS | NO | STHIL 044, 440, 460, 066 | | | 91 | IT IS MY BELIEF THAT THE INCIDENTS REFERING TO FUEL SPRAYING OUT OF THE TANKS WITH THE NEW STYLE CAPS ARE DUE TO OPERATOR ERROR. THE PRESSURE CAN BE SAFELY BLED OFF IF THE OPERATOR IS MINDFUL THERE IS A POSSIBILITY THE TANK COULD BE PRESURIZED. OPERATORS SHOULD SLOWLY CRACK THE CAP OPEN TO RELEASE THE PRESSURE. I AM A FALC AND HAVE BEEN OPERATING STHILS SAWS BOTH PROFESSIONALLY AND PERSONALLY FOR 17+ YEARS AND HAVE NEVER HAD FUEL SPRAY OUT OF THE TANK WITH OLDER AND NEW MODEL SAWS. THIS IS PREVENTABLE. | TED HARGRAVES | 425-888-8764 | THARGRAVES@FS.FED.US | Other Federal Agency |
| 2012 | Thinning | Fuel Spray into the eyes | Stihl | MS440 | Unknown | The fuel was non ethanol | While teaching saw operations on a detail out of Lander WY, I was experiencing frequent vapor locks. The altitude was around 8,000ft and the temps were in the 90's. While opening the fuel cap, the fuel sprayed out and hit me in the face. Thankfully I was wearing safety glasses, not the mesh goggles. Additionally, I was in close proximity to a stream and was able to wash all of the fuel off. | Jeff Pricher | 541-490-2252 | jpricher@srfd.us | Other Federal Agency |
| 2015 | tree cutting | no | sthil | O20 | Unknown | regular gas with mix | removed gas cap to top fuel tank off was able to see fuel filter in tank purging air excessively which would have resulted in a pressurized tank had it been empty. | abraham contracting inc Mike Jones | 541-479-0554 | mikej@abrahamcontracting.com | Contractor |
| 1985-2015 | Suppression, project work and prescribed fire | no | Stihl | 036, 044, 440,446 | | 87 | My experience over the years has been the number of incidents have lessened after the fuel caps have changed from the screw caps to the flip caps as saws have improved. I have also noticed the chainsaws fuel spray have been reduced when utilizing a quality brand mix like husquevarna or Stihl than a cheap brand. | Dave Nalle | 509-548-2582 | dnalle@fs.fed.us | Other Federal Agency |
| No events have | | | | | | | | Stephanie Bauer | 435-636-3620 | sbauer@blm.gov | BLM |
| 2015 | Fire Suppression | yes | still | ? | Unknown | erfaf | On a fire someone opened a saw when it was vapor locking. It vented up on the man, catching him on fire. | | | | BLM |

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|---------------------------------------|---|------|----------------------------|-----------|---------|---|--|----------------|------------------|-----|--|
| | | | | | | | Another pertinent issue to point out and educate fire personnel and crews about is: "How not to un flood a chainsaw". (From the boots on the ground) crews are still teaching (either formally or not), to remove the spark plug and light off the fuel in the chamber, in order to fix a flooded saw. If there were (as many times there are) overspill of fuel onto the exterior of saw or ground this can easily ignite the area, because igniting excess fuel would be embarrassing to the operator. It would not surprise me if a cover story were used to the effect of "The fuel just lit off, it was extremely pressurized". That is what I would only suspect if the problem with the caps pressure igniting could not be duplicated under controlled testing. Safe alternative (and faster) way to un flood a chainsaw (or any similar small engine) : Have throttle pinned to full throttle using your boot on the trigger, pull start 10-20 times and it will start. Both faster and safer than igniting chamber. While we are hammering chainsaw safety, we should seize the moment to inform all to not use a lighter on a chainsaw. | | | | |
| 2008 | unflooding a chainsaw | no | stihl | 66 magnum | 87 | | John Basulto | 760.885.5863 | jbasulto@blm.gov | BLM | |
| 2012 | Fire Supression | No | Stihl | MS 440 | 87 | Removed saw from truck used for 15 min to cut hot ends off a log no excessive heat on saw or fuel tank. Saw quit running as if no fuel. Looked full of fuel. Walked to green, placed saw on ground and removed cap. Ruel sprayed up my sleeve and leg. Flagged saw, replaced black take vent, fixed issue. | Justin | 209-709-2448 | jjammers@blm.gov | BLM | |
| 13 years both on and off the fireline | Campground, trails, fire suppression and personal use | none | Homelite, Stihl, Huskvarna | | 87 | Why the hell are people fueling near the fireline? Every safety briefing I've ever heard or training I've attended as well as plain common sense teaches that close proximity of fuel and ignition sources is an accident looking for a place to happen. Do these same individuals smoke while fueling their cars at the gas station? Duh... | | | | BLM | |
| 2013 | Fire Suppression | No | Stihl | 440 | 91 | Saw was running low on fuel. Gases were building up in the tank and would vapor lock. Only would occur when running the saw for long, continuous periods of time. | Jesse Cottrell | (208) 251-7534 | | BLM | |
| N/A | | No | Stihl EPA Compliant saws | | Unknown | Ethanol blended fuels | J.W. McCoy | 208-732-7248 | jwmccoy@blm.gov | BLM | |
| | | | | | | | | | | BLM | |
| 2009 | fire suppression, Natural resource, Prescribed | no | Stihl | 044, 046 | 87 | Several times during the 2009 season while working for the NPS on the North Rim of Grand Canyon we had this issue. The saw would act like it had run out of gas(high rev), when gas cap was removed fuel and vapor would come out at pressure and the gas remaining in the saw would appear carbonated. This would never happen on the first tank of the day. We were able to remedy this by frequently changing our tank vents. | Zachary Palmer | 435-636-3649 | zpalmer@blm.gov | BLM | |
| 2015 | Stihl 440 | no | Stihl | 440 | 91 | none | Justin Fenton | 541-216-38-71 | jrfenton@blm.gov | BLM | |

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|----------------------|--|--|---|----------------------------|---------|------------------|--|-----------------|---------------|------------------------------------|------------|
| | | | | | | | I have never has a serious accident with a chainsaw and have never used on while "on the job." | | | | BLM |
| 1975-present none | Cutting poles, general ranch work, professional logging camp ground maintenance | no no | STIHL stihl | 650 26 | | 91 91 | The survey is flawed. It does not consider the thousands of safe operations. It does not provide for a private or other selection. No question for skill level. no event | robert Berasi | 208-756-5458 | rberasi@blm.gov | BLM |
| 2013 | Natural Resource/Fuel Reduction | No | STIHL | 362, 440, 460 | | 91 | During times of high temperature and extended saw use, we had multiple incidents of fuel bubbling or spraying out gas tanks when the caps were opened for refueling. No fuel ignited during these events. We put a policy in place that requires operators to turn off the saw and set it in the shade for a few minutes to cool off before refueling. Since then, we have no reported incidents of bubbling/geysering beyond minor vapor pressure release when opening fuel caps. | Miguel Gonzales | 775-674-5492 | rgonzales@thegreatbasinstitute.org | Contractor |
| Never | Fire Suppression, Prescribed Fire, Natural Resource, etc. | No | Stihl | 044/440/441/046/ 460461 | | 87 | | | | | BLM |
| N/A | N/A | N/A | | | | | N/A | | | | BLM |
| 1981-1988 | Logging | almost a loss of full log deck which could have moved to adjacent forest land. | Experienced it with Echo, Homelite, Jonsred | Various | Unknown | | I do not remember. Gas boiling out of tanks when shutting down and opening screw caps. I also ran Stihl saws in 85 (038 AV Mag), 91-94 (044, 038, 036), 95-2003 (044, 046), 2004-2012 (044,046,440, 036) and did not have issue with Stihl saws until recent years. | | | | BLM |
| 2014 | Fire Suppression: Line Prep. | no | Stihl | 362 | Unknown | Premium Unleaded | Type II IA Crew operating 3 saws for multiple shifts prepping fire line for burnout operation. Crew did not experience any problems with the fuel systems or caps. | AJ Arritola | | aarritol@blm.gov | BLM |
| 2009 | Thinning | no | Stihl | 46 | | 91 | Cutting on a thinning project on a hot day in southern Nevada. Chain saw acted as though it was out of fuel, Chain saw operator opened the fuel cap and was sprayed with fuel. Operator removed yellow shirt that was soaked in fuel and switched to a spare. Chain saw was used after with no incident | | | | BLM |
| N/A | N/A | N/A | N/A | N/A | | | N/A | Robert Stapp | (928)505-1275 | rstapp@blm.gov | BLM |
| 2010 | RX and Wildfire | No | Stihl | MS461 | | 91 | Pressure behind the Gas Cap has ALWAYS been an issue with running saws on fires. Common sense has the operator "cracking" the cap to release pressure. Exactly like what you do when opening a Sigg. Boiling gas has also been an issue but most folks try to use a High Octane / No ethanol fuel. Sometimes you just have to let the saw cool before fueling. | | | | BLM |

CSAT-Interviews that were conducted

| Name of persons interviewed, (Dealer/Company, Contractor or persons or groups) | Contact Information | Name of Person Interviewed | Date Interviewed | Comments |
|---|--|---|---------------------|---|
| NIFC-SAW Shop | 3833 S. Development Ave, Boise 83705-5354 | Ken Booth, and Jonny Ford-small engine mechanics | 6/25/2015 | Service 600-700 saws per year. Stihl is the main saw model serviced. Have never witnessed this geysering affect, but common is pressure that is bled off the when opening the fuel cap. |
| NIFC-Branch Chief Site and Facilities Management | 3834 S. Development Ave, Boise 83705-5354 | Paul Naman | 6/25/2015 | Rick Hotaling interviewed Paul, and got our contact information for San Dimas D&T |
| Burns District BLM | Hines, Oregon | David Toney FMO | 6/29/2015 | Dave elaborated on saws always building some pressure in fuel system, however has never experienced the guysing effect. However will ensure this gets to all chainsaw operators both fire and non-fire. |
| Vale District BLM | 100 Oregon Street, Vale Oregon 97918 rmarus@blm.gov | Bob Narus FMO | 6/29/2015 | Bob would ensure that mitigation efforts would be widely distributed to all saw operators covering fuel handling, and fuel system pressurization issues. Furthermore, mitigations discussed in video, 6 minutes for safety and LLR's would be incorporated into the district safety program as a whole. |
| Wilkins Saw & Power Equipment | www.drapersaws.com/201 SE 2nd St, Ontario, OR 97914 (541) 889-9250 | Seth Wilkins (certified multiple manufacture chainsaw mechanic) | 6/26/2015 | Has scene this happen on several makes and models, but not quite at the extent of the arborist video. (He specifically noted: Husqvarna, Stihl, Jonsered, Pulan, and Homelite. Full Service Dealer, and is a primary for BLM, in western Treasure Valley |
| Legacy Feed & Fuel | 3100 South Meridian Road Meridian, ID 83642 TEL (208) 888-3003 legacyfeed.net | Certified Stihl Mechanic | | Full Service Dealer, and is a primary for BLM, and USFS local units. (not contacted) |
| High Desert District Helitac Supervisor | High Desert District, Helitac crew supervisor, Rawlins Wyoming (307)710-1094, rmcconch@blm.gov | Scott (Robert) McConchie | 6/28/2015 | No issues at high elevation were every witnessed or heard of. They do hear a small pressure release when open new gas cap lid. Older saws they don't. |
| Vale District Assistant Helitac Supervisor | 100 Oregon Street, Vale Oregon 97918 jhorstma@blm.gov | Jason Horstman | 6/28/2015 | Experienced build up of pressure in tanks on MS-362, however not guysing. But did elaborate on overfilling and putting new cap style back in can spray fuel. |
| Vale District Hot Shot Superintendent | 101 Oregon Street, Vale Oregon 97918 b1yeager@blm.gov | Bart Yeager | 6/27/2015 | No issues at high elevation were every witnessed or heard of. They do hear a small pressure release when open new gas cap lid. Older saws they don't. However have changed training protocol and train for this hazard. |
| USFS Vegas FLA (Humbolt Toiyabi) | FLA Team Led by , Randy Draeger, Ralph Gonzales (San Dimas), Larry Sutton | Randy Draeger | 6/25/2015-7/01/2015 | See attached notes identified from that conference call was at 1530. We had a follow up conference call with this group again at 1530 on 6/29/2015 |
| OR/WA Crew 7 Superintendent | Fire/Fuels Module Leader Lakeview BLM Veterans Training Crew 2795 Anderson Ave. BLDG 25 Klamath Falls OR, 97603 Desk 541-885-4187 Cell 541-591-6000, tgibilisco@blm.gov | Mike Girr/Timothy Gibilisco | 6/29/2015-6/30/2015 | Most recent incident. Talked with Mike Girr and he referred us on to Tim who actually had this incident. Only had email with Tim who is still on the fire in Crater Lake NP. San Dimas would like to set up follow up questions with Tim if possible. |
| Fire/Fuels Program Leader | San Dimas USFS Development and Technology Center | Ralph H. Gonzales | 6/29/2015-6/30/2016 | Was consulted by Rick Hotaling Team Lead |
| Twin Falls District BLM-FOS | Desk (208)732-7248 | J.W. McCoy | 6/28/2015 | Follow-up on Survey Monkey submission |
| Idaho Falls District BLM - Engine Captain | Cell (208)709-2448 | Justin Lammers | 6/27/2015 | Follow-up on Survey Monkey submission |
| Patrick Forestry | | | | Shelby solicited information on issue from contract world started on 6/29/2015. Started to see survey monkey responses from the contract world. |

CSAT-Interviews that were conducted

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|--|---|----------------------------------|----------------------------|--|
| Grey Back Forestry | | | | Shelby solicited information on issue from contract world started on 6/29/2015. Started to see survey monkey responses from the contract world. |
| NW Contractors Association | | | | Shelby solicited information on issue from contract world started on 6/29/2015. Started to see survey monkey responses from the contract world. |
| NRCG Contractor Liaison NIFC Chief, Preparedness/Suppression Standards | 406-829-7324 or timmurphy@fs.fed.us. 3833 S. Development Ave, Boise 83705-5354 | Tim Murphy Jeff Arnberger | 6/26/2015 6/29/1930 | Requirements for fuel tenders is only for the equipment, actual fuel requirements set by contracting officer for fire. Confirmed efforts to address potential problem within fire community. |
| Montana Tech of the University of Montana | | Todd Burt, Ph.D. | 6/25/2015 | Temperature increases with constant volume (a closed system) would increase pressure within the system. Need to talk with other engineering department to validate testing methods. |
| Bordges Logging/California Logging Association | | Tim Bordges | 6/29/2015 | Operated Husky saws for many years and never had the a problem unless the fuel vent was clogged. Had not operated a new saw with a closed fuel system and was unaware that those type of saws existed. |
| BLM-Wyoming, State Fire Management Officer | 5353 Yellowstone Road, Cheyenne WY 82009; Desk: 307-775-6100, Cell: 307-214-5955; email kcowen@blm.gov | Kyle Cowen | 6/30/2015 | Confirmed that BLM WY has no separate chainsaw operation policy; we use Red Book and safety manual guidelines. He also gave feedback from his counterparts and crew members that they do not think it would be prudent to add additional training requirements to the mix. He believed that policy requirements were adequate. |
| BLM-WY, Rock Springs Field Office, AFM for Resources | 280 Hwy 191 North, Rock Springs, WY 82932; Desk: 307-352-0246, Cell: 307-389-3425; email g75lovel@blm.gov | Gavin Lovell | 6/29/2015 | Stated that all MLR staff at the RSFO are required to take S212 and that not only fire but the RSFO keeps track of training rosters. Refresher training is only done with the fire employees, and with resources for those whom the supervisors feel may need extra guidance for whatever reason. |
| BLM-WY, (acting) Assistant State Fire Management Officer | 5353 Yellowstone Road, Cheyenne WY 82009; Desk: 307-775-6086, Cell: 307-399-1422; email j1miller@blm.gov | Jay Miller | 6/29/2015 | Called to verify Lovell's statement re: fire personnel getting annual refreshers (although not required by policy.) He confirmed that was true (at least for Wyoming.) |
| BLM -WY, HPD and WRBHB District Occupational Safety and Health Manager | Cell: 307-277-0329; email jbeason@blm.gov | Jim Beason | 6/30/2015 | Called to verify if all chainsaw operators (fire and non-fire) are receiving required S212 training. He stated that he is not sure how that is tracked, but confirmed that his 2 districts' non-fire operators (that he was aware of) did not receive the full course - only a brief version. |
| Great Basin Institute | Cell: 775-674-5492; Email: rgonzales@thegreatbasininstitute.org | Miguel Gonzales | 6/29/2015 | Follow-up on Survey Monkey submission |