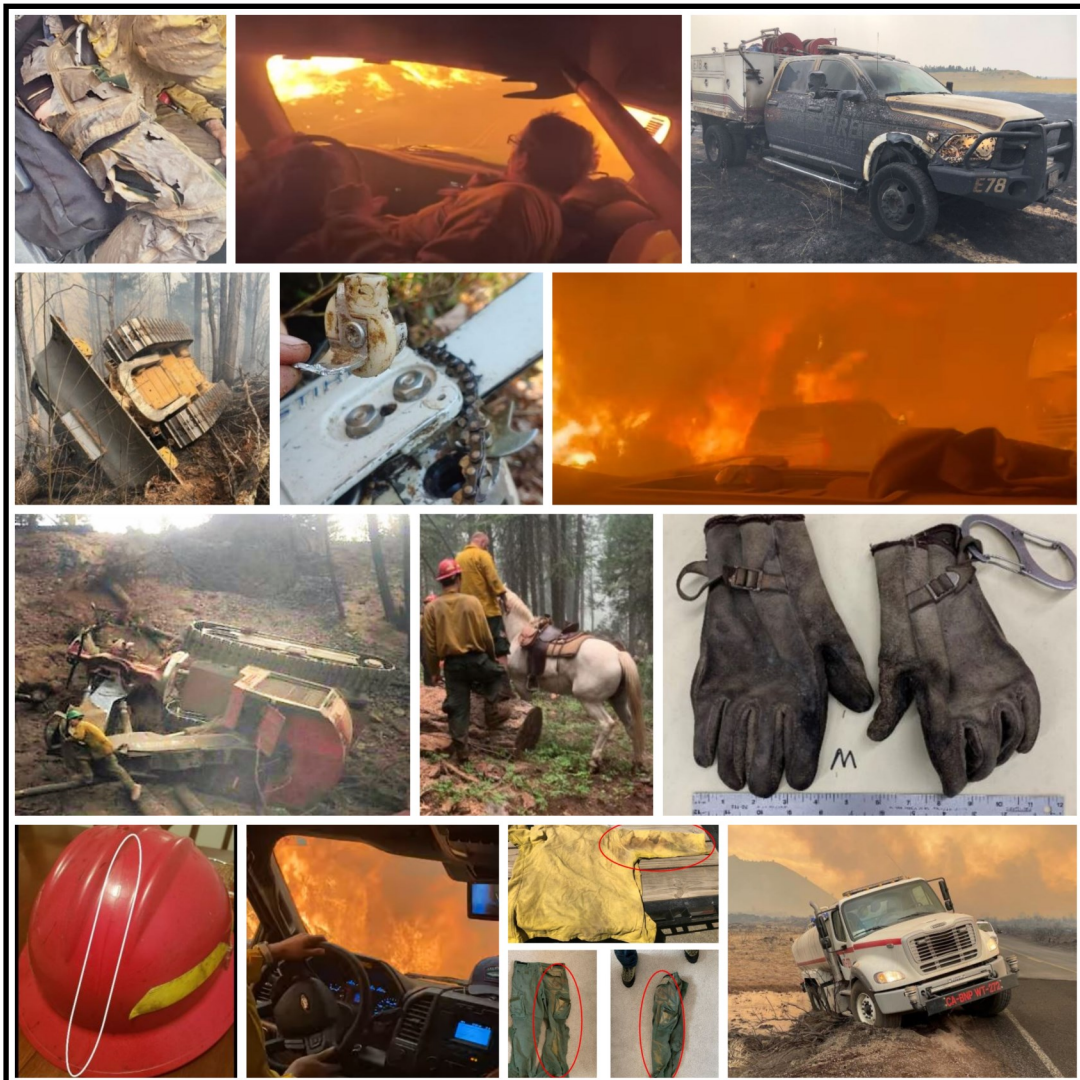




Wildland Fire Lessons Learned Center



2021 Incident Review Summary

“The danger which is least expected soonest comes to us.”

–Voltaire

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Introduction

The information in this report comes from wildland fire incidents—from various entities—submitted to and gathered by the Wildland Fire Lessons Learned Center (LLC) in 2021. The primary source of this data is incident reports (FLA, RLS, SAI, etc.). Most of these reports have been posted to the LLC’s [Incident Reviews Database](#). SAFENETs and other data sources have been included when no full report was produced or could not be located.

For 2021 we collected information on 171 operational incidents.

We have examined these incident reports and learning documents, compiled a few numbers and extracted specific lessons. It is our aim to present this information in a way that empowers us all to improve future operations. We hope you turn these lessons into learning.

Exercises

This icon identifies specific discussion prompts related to the material.





Fatalities

Based on available records, the Wildland Fire Lessons Learned Center recorded **23** wildland fire-related fatalities in 2021, **eight more** than 2020.



Exercise:

Look up definitions of the words **Risk** and **Exposure**.

Look at the charts on this page and think about the work you do related to wildland fire.

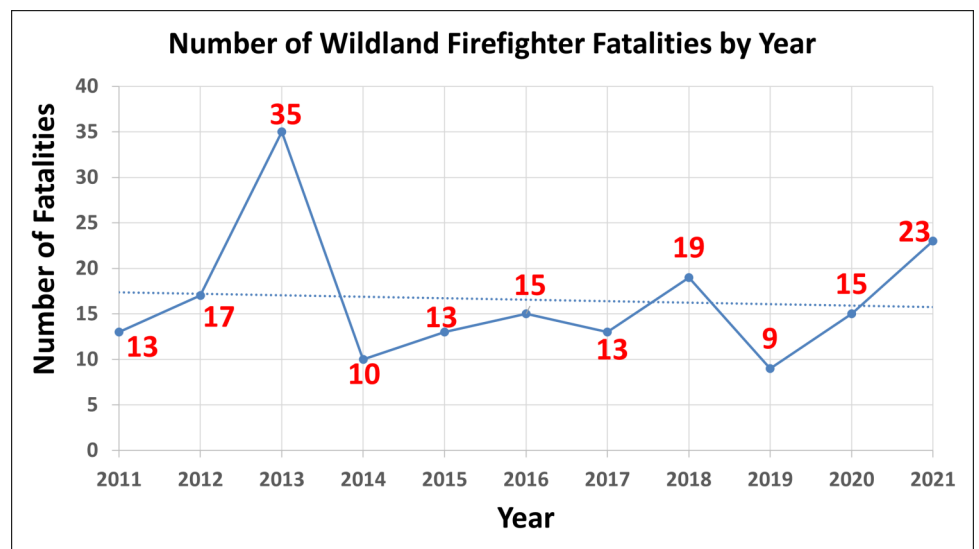
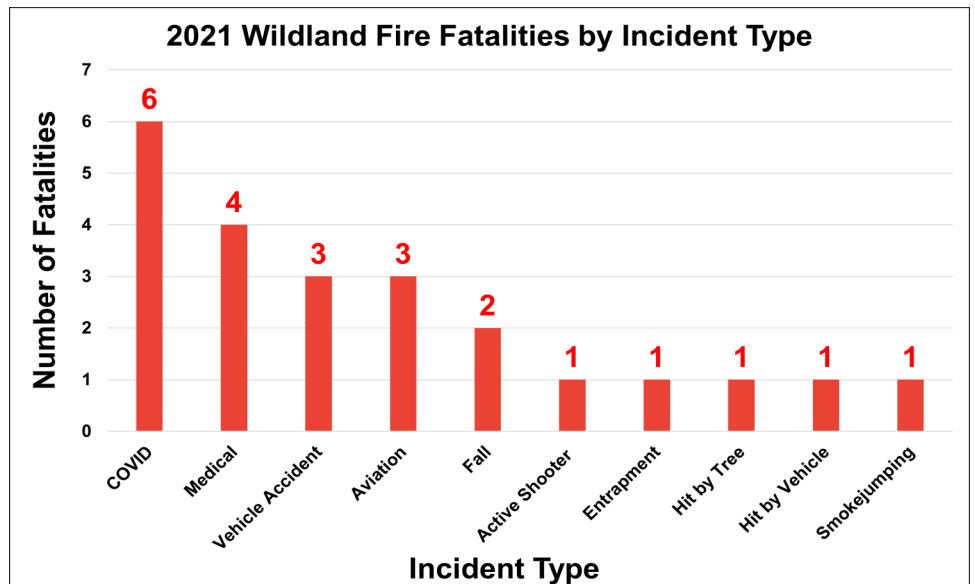
Discuss your personal Risk and Exposure related to the ways people died in this line of work last year.

For access to available reports on 2021 wildland fire fatalities please use our Incident Review Database:

[2021 wildland fire fatalities](#)



Word Cloud: This word cloud represents all the fatality incident types from the year. The larger the word, the more often that incident type occurred.



“Face/neck shrouds and gloves are intended to allow us to engage in wildland fire operations with its inherent risk of burn injury. There is reason to believe that the use of gloves and face/neck shrouds by all personnel in this incident could have reduced burn injuries.”

[McFarland Entrapment](#)

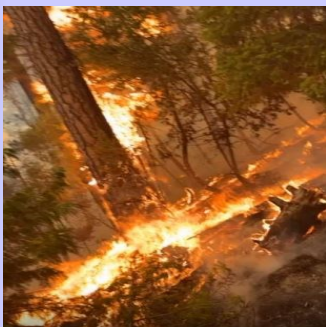


Exercise:

Multiple reports describe how firefighters did not have time to put on PPE in emergent situations.

Discuss all the different approaches to using and storing gloves and shrouds.

How can you best prepare for the moment you need them?



Multiple incidents in 2021 highlighted how important PPE can be.

[Koffman Road Fire Burn Injury](#)

A firefighter was overrun by fire while in the back of a moving vehicle. “Fire resistant clothing is designed to prevent ignition of the clothing itself. This lessens a burn injury in a situation where the designed performance standards are exceeded, **as they were in this incident.**”

[Deep Creek Canyon Fire - Bucking Incident](#)

A firefighter was struck by a rolling log, cracking their helmet. “All involved agree that the firefighter’s helmet provided significant head protection under a very heavy load.”

[Elbow Creek Fire Feller-Buncher Rollover](#)

A Feller/Buncher was involved in a rollover accident. “The design of cab and lap/shoulder seat belt system most likely saved the operator’s life”

[Soda Bear Rx ATV Rollover](#)

An ATV rider was thrown 17 feet downslope where their helmet/head struck a rock. “A proper DOT helmet was worn with chinstrap fastened. This significantly reduced injuries.”

“The log jammed his face and head into the ground. He could feel the sides of his helmet squeezing his head.”

[Deep Creek Fire Log Roll Injury](#)



Burns & Hits

In 2021 there were numerous burn injuries to wildland firefighters. Several of the injuries occurred while using a drip torch OR while mopping up.



Exercise:

Discuss the following questions in a small group:

What are some dangers associated with drip torch use?

What are some dangers associated with mop up?

What are some actions you can take to mitigate the risk associated with these routine activities?



Suggested method for Re-fueling Drip Torches

[Payette NF Drip Torch RLS](#)



Burn Injuries

- 26 Different Burn Injury incidents
 - 10 associated with entrapments
 - 5 associated with firing operations
 - 5 associated with mop up
 - 2 associated with chainsaw operations
 - 4 unknown (burn injury reported—no activity listed)

[Clear Creek Burn Injury Incident](#)

A firefighter was severely burned when the locking ring on their drip torch popped off, spilling fuel which ignited.

Key Lesson: Make sure ALL drip torch parts are from the same manufacturer.

Hit by Incidents

- 23 Different “Hit by” incidents
 - 17 Hit by Tree incidents
 - 3 Hit by Rock incidents
 - 3 Hit by Vehicle incidents

[Rough Patch Tree Strike Incident](#)

A tree strikes a vehicle when a tree falls an unexpected direction.

Key Lesson: Single resource positions such as Felling Boss are crucial to communication, situation awareness, and hazard mitigation. Take extra precautions when work is being done without these positions in place.



Evacuations

Multiple reports from 2021 describe evacuation efforts involving tough decisions. Several of these reports highlight the benefit of continually updating the common operating picture of everyone involved. This is best achieved through effective communication.



Exercise:

Discuss the following questions in a small group:

How do you know when it is time to implement an evacuation?

What are some tools or best practices that can help you make decisions on when or how to get yourself or others out of danger?



In 2021 there were several reports related to a variety of evacuation efforts. These events highlighted multiple lessons related to time-sensitive decision making, crisp communication, and efficient follow through. These reports cover fire-driven evacuations of a Wilderness Recreation Crew, an entire Incident Command Post, a [Logistics Driver with a flat tire](#), over 50 firefighters in deteriorating conditions, and an [injured firefighter via horse-back](#).

Several of the reports emphasize the critical nature of timing.

“Timing was critical. When it’s time to make the decision, make the decision.” [McFarland Fire ICP Relocation](#)

“All the options delivered uncertainty and some level of risk to the crew. All the possibilities and unknowns were postponing a decision that had to be made.” [Dixie Fire Imperiled Crew](#)

“...the decision is made to cancel all remaining logistical deliveries and get everyone out.” [Mud Lick Burned Gear](#)

“Around 0900 the decision is made: ‘The bug-out is a go!’ This decision is communicated via a preidentified text string. The atmosphere is one of urgency without panic, everyone is moving with purpose yet there is an air of calm organization.” [McFarland Fire ICP Relocation](#)



Entrapments

The top three activities associated with entrapments in 2021 were:

- Working Spots
- Engine IA
- Scouting



Exercise:

Discuss the following questions in a small group:

Based on the fire work you do, what activities likely pose the most threat of entrapment?

What are some lessons you can use to AVOID entrapment?

What are some lessons you can use DURING an entrapment?



In 2021 the LLC recorded 18 different events that meet the NWCG definition of entrapment. Of note this year were several instances of firefighters needing to quickly jump into any available vehicle to escape.

- 6 while suppressing spot fires (2 Initial Attack, 4 Extended Attack)
- 4 during initial attack with engines
- 3 while individuals were scouting (2 Initial Attack, 1 Extended Attack)
- 2 during logistical missions
- 1 during firing operations (Initial Attack)
- 1 while installing a hoselay (Extended Attack)
- 1 during suppression operations involving a train.

“In light flashy fuels, remaining in your vehicle during a burnover may be the best option.” [Harris Fire Entrapment](#)

“Using a fire shelter as a heat shield is a perfectly acceptable use, and it may help prevent burn injuries. Deploying a shelter does not need to be treated as an unquestionable, last second, lifesaving event. If you feel your situation is uncertain and can be improved by deploying a shelter, do so.” [Antelope Fire Entrapment](#)

“The burns ranged in severity from superficial to third degree but could have been much worse had firefighters not had proper PPE.” [Devils Creek Entrapment](#)



Lessons from the Learners

This section includes quotes and lessons from those who were directly involved in the incident.



[Tractor Fire- Dozer Swamper Broken Leg](#)

During initial attack operations at night, a dozer swamper suffered a broken leg after being entangled in brush being pushed by the dozer.

Lesson: Staging EMS

While we want to release our volunteers and downsize resources as the incident dictates, the use of local knowledge and the ability to rapidly request EMS ultimately led to a positive outcome and quick extraction time on this incident.

Are we releasing our resources too soon?

Do we have the ability to request an EMS unit to stage on location during initial attack fire operations?



[Harris Fire Entrapment and Burn Injury](#)

About 7 minutes after arrival on a grass fire, an engine crew noticed a change in wind direction and speed causing a dramatic increase in fire behavior. The Engine Boss, who was on foot at the end of the hose line, tried to retreat to the black but was not able to reach it before 20-foot flames reached him. The result was 2nd and 3rd degree burns on 45% of his body.

Lesson: Remember the importance of PPE and wearing it correctly.

Dan's injuries would have been much worse had he not been wearing his Nomex, a layered shirt, gloves, and a helmet in the appropriate manner



[KNP Complex Tree Strike](#)

While hauling hose down along a handline four firefighters were struck by a 28-36" DBH (diameter at breast height) white fir about 150 feet in length. The tree was estimated to be standing approximately 130 feet from the line in the black when it broke free at its base.

Lesson: Get a "Carry-All"

"The carry-all came out of nowhere and was great when we had to move the first 2 patients out of the hazard area; that thing rocked."



A MegaMover™ is an example of a carry-all device like the one used to move patients during the KNP Complex Tree Strike.



Lessons From The Learners

This section includes quotes and lessons from those who were directly involved in the incident.



[Devils Creek Entrapment](#)

During a burnout operation along a two-track road, a sudden and intense wind gust caused instant ignition of trees. The instant crown fire sent overwhelming convective heat through a 70-yard-wide area where firefighters were working. This blast of heat resulted in multiple burn injuries.

Lesson: One Medical Incident Report With Multiple Patients

As the Incident Within-an-Incident Commander (IWIC) began providing the information to dispatch, more patients began to arrive. For efficiency's sake, he provided one complete MIR and numbered the patients 1 through 5 as he relayed their status to dispatch.



[Twin Peaks IA Crew Vehicle Rollover](#)

The crew convoy had to pull over onto the shoulder due an oncoming semi-truck. As the convoy began moving again, after traveling only a few feet, the right rear dual tires began to catch the soft shoulder and the vehicle was pulled over the embankment rolling twice, landing on its wheels in an upright position.

Lesson: Leave Room and Assume a Soft Shoulder

Be mindful of convoy impacts. Just because the front vehicle is in a safe spot, doesn't necessarily mean all are. Leave room for all convoy vehicles to safely park while in a holding pattern.

Assume all gravel roads, especially with high banks, have very soft shoulders.



[Hazard Tree Removal](#)

After sounding the hinge and boring the tree, I determined it had about 2 inches of rot all around the tree, but had solid heartwood. After leaving a trigger for a release cut on the rear of the tree, I placed a wedge on my off-side and gently tapped it in. I heard a pop and assumed that the trigger had released prematurely. The tree fell 90 degrees off its intended lay.

Lesson: Using Available Tools

I was overconfident that this was a straightforward tree that didn't present much technicality. Additionally, there were ropes and mechanical advantage gear available that would have aided in felling the tree.



11 Years of Water Tender Rollovers

“I didn’t see any reason for watering. I was just trying to help in any way I could.” [First Creek Water Tender Rollover RLS](#)

While watering roads is a legitimate need, it can also become the default task assigned to “keep folks busy” or avoid “sitting around.”



Exercise:

Discuss the following questions in a small group:

Consider the quote above about “keeping folks busy.”

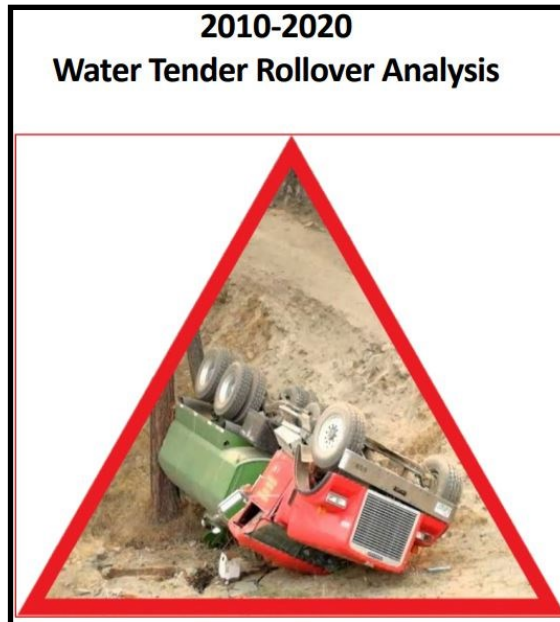
What are the pressures that make “busy work” so common?

How do you evaluate risk related to “busy work?”



In 2021 the LLC released the [Water Tender Rollover Analysis](#).

“We have taken the initiative to conduct this analysis and compile this report based on the alarming frequency of water tender rollovers. We have collected and analyzed 27 events over 11 years – including seven fatalities.”



Excerpts from the Water Tender Rollover Analysis:

40% of the rollovers occurred on paved surfaces—including all seven fatalities.

When making decisions about water tender assignments, do not focus solely on the hazards of the unpaved surfaces. Make a mental note of the fact that ALL fatal wildland water tender rollovers in recent years occurred on pavement.

The Soft Shoulder

25% of the rollovers occurred when a soft shoulder gave way.

This is a very specific road condition that can be looked for and identified.

Brief regularly on the dangers of the soft shoulder. We all need to be routinely reminded of this deceiving hazard.