Florence Fire Tree Strike Fatality

Facilitated Learning Analysis

Fatality: July 19, 2017 | FLA Release: March 2018
Lolo National Forest, Seeley Lake Ranger District

Background

The Seeley Lake Ranger District on the Lolo National Forest had experienced a wet spring followed by a dry, hot early summer, with above average temperatures and below average precipitation. On Tuesday night, July 18, 2017, lightning struck northeast of Seeley Lake, Montana, eventually starting the Florence Fire. The Florence Fire burned in an area of thick subalpine fir, lodgepole pine, and snags with dense downed woody debris. The local terrain consists of a series of forested, rolling hills and small meadows. Initial attack crews were dispatched to the site on the morning of Wednesday, July 19, 2017 where they found the fire to be approximately 0.5 acre in size.

The Story

On Wednesday, July 19, the Seeley Lake Ranger District's Fire Management Officer (FMO) and Duty Officer (DO) met around 07:00 to discuss the smoke near Florence Lake. There had been a call from the lookout the night before and it had been decided to wait until the morning to send resources to assess the reported smoke. With a new report coming from 911, the FMO and DO decided to send a Type 5 Incident Commander (ICT5) and a 4-person crew to the scene.

The ICT5 was assigned Firefighter Type 2s (FFT2), all brand new firefighters. They set out at 08:25 in an engine and a chase truck. One of the new FFT2s was a Basic Emergency Medical Technician (EMT1). With many of the District's seasoned firefighters off duty, this was a good opportunity for the first-year firefighters to gain some experience on initial attack and they were excited. They found an existing, overgrown logging road near the GPS coordinates they had been given. The crew parked and started clearing the road to make their way in. Upon receiving more accurate GPS coordinates, the crew got back in their vehicles and headed over to the Florence Lake Trailhead. After a short hike up the trail, they saw the smoke. The fire and a meadow about 50 yards beyond came into view below them.

Shortly after 11:00, the ICT5 reported to Missoula dispatch (MIDC) that they were on scene. The ICT5 immediately recognized that the fire environment complexity was extremely high due to the number of snags and they needed more technical help, including sawyers, and other resources. The ICT5 then assessed the fire while the rest of the crew waited on the trail. The ICT5 came back and called in the size-up to MIDC: 0.5 acre in size, spotting, flame lengths: 1 to 3 feet, slope: 10%, rate of spread: moderate, spread potential: moderate, wind: calm, southwest at 1 to 2 mph. The fire appeared to have been started by lightning and there was single tree torching. No structures were in the

> *Yeah, there were snags. It was kind of another day on the job.*
> *- Firefighter*

area. The ICT5 told the crew that there were a lot of snags and to keep their heads up. If anybody felt uncomfortable, they were free to stay in the meadow, which would serve as their safety zone.

The crew hiked down along the southern edge of the fire to the meadow. They would use the meadow's northwest corner as their anchor point, cutting line in two directions to encircle the fire. The crew went to work bucking up and clearing the downed wood and scratching out a line. They kept their heads up, watching as a snag fell into the fire. Every so often, the ICT5 would call out to the crew to ensure they felt comfortable working in the conditions. Eventually, the ICT5 decided to pull everyone back to the meadow. The fire was hot and there were a lot of snags.

Bucket drops, Florence Fire

At 12:30, the ICT5 requested bucket drops. Feeling that the fire's complexity level had exceeded the ICT5 qualification, the ICT5 also requested a Type 4 Incident Commander (ICT4). The ICT4 set out from the office with three firefighters en route to the fire. While en route, a helicopter arrived on scene and did a reconnaissance flight. The helicopter hooked up a bucket at the Seeley Lake Airport and started bucket drops over the fire. During the bucket drops, a separate 4-person helitack crew landed about 200 yards southwest of the meadow and met up with the crew to assist with snag mitigation. At the same time, the ICT4 arrived and tied in with the ICT5 while some members of the original crew worked a small spot fire between the meadow and the trail. At 14:11, the incident transferred from the ICT5 to the ICT4. After a briefing with the ICT5 and completing an assessment of the fire, the ICT4 confirmed with the DO that additional ground resources were needed.

The helicopter's bucket drops knocked down the fire a bit and the ground resources re-engaged. The ICT4 reminded everybody to keep their eyes on the snags and be aware. A tree cut by a sawyer fell into the fire, adding more fuel and increasing the fire's size. Group torching started to occur and the helicopter was requested to return to the fire for additional bucket work. The ground resources in that area disengaged and returned to the meadow and the helitack crew left to provide initial attack to a different incident. When the second cycle of bucket work ended, the local crews combined and went back to cutting and cleaning up the fire line, moving in closer to the fire's edge. As the firefighters continued to work the fire, additional resources began arriving at the District Office.

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The 10-person module parked at the Seeley Lake Ranger District Office around 15:00 and jumped out of the rigs. They had been working as part of an initial attack 20-person crew with the Lolo National Forest and had been asked to break up into two modules of ten that morning. This module had been staged at

the Sapphire Complex when they got the call to come up to the Florence Fire. After a couple of days of staging, they were happy to go on loan for the day to the Seeley Lake Ranger District. This would be their first initial attack of the season – for some, their first initial attack ever – and the excitement spread throughout the crew.

The Module Leader and Squad Boss headed into the District Office while the rest of the module hung out by the rigs. The Module Leader and Squad Boss met up with the DO, who briefed them on the incident, helped clone their radios, and gave them directions to the incident location. The module got back in their vehicles and drove up to the incident, about five or six miles away along a mostly dirt road. They arrived at the Florence Trail Trailhead a little before 16:30, and called the ICT4 before gearing up and hiking in.

As the module approached the fire, they noticed many snags – some smoking – on the slope below them. They were "hyperaware," trying to get a good understanding of this new territory. They passed warnings down the line, pointing out the potential dangers and reminding each other to keep their heads up. It was relatively calm, not much wind, so they weren't overly concerned. They were surprised to see a couple of firefighters working below a snag, but there were so many snags it was unavoidable.

Fuel types, Florence Fire

When they got down to the meadow, they met with the ICT4, who briefed them on the incident's objectives, mission, and hazards, as well as what had been accomplished. The vegetation was dense and would require a lot of saw work, although there wasn't a lot of line to dig. The module's assignment was to help the local combined crew secure the line. They would work along the line to the north from the anchor point, starting from where the local crew had ended. They would go direct, following the black edge to get a line around the fire. The ICT4 emphasized that there were a lot of snags in the area. If a snag was going to be dropped, the ICT4 wanted to know so everyone could be moved out of harm's way. The module went up the line to where they would start, and the Module Leader called over the two sawyers and their swampers to give them direction. The Module Leader assigned the more experienced sawyer as lead with the second sawyer following. They would buck and clear the downed wood and brush. The rest of the module would come up behind them, digging line. The sawyers had switched swampers that day, so they took time to discuss the role and what to expect.

The module lined up about five feet behind the sawyers, waiting for them to start. They were a little jumbled up in the small area at the anchor point, but would spread out once the sawyers got going. A crack split the air and the Squad Boss looked up. The top of a nearby smoking snag lurched. "Snag!" The firefighters "fell like bowling pins," some falling back and some to the side, while others dove behind trees. The top third of the 70 foot snag "whizzed by like a fastball," brushing against one firefighter's shoulder as it hit the back of another firefighter's helmet, knocking him to the ground and pinning his legs.

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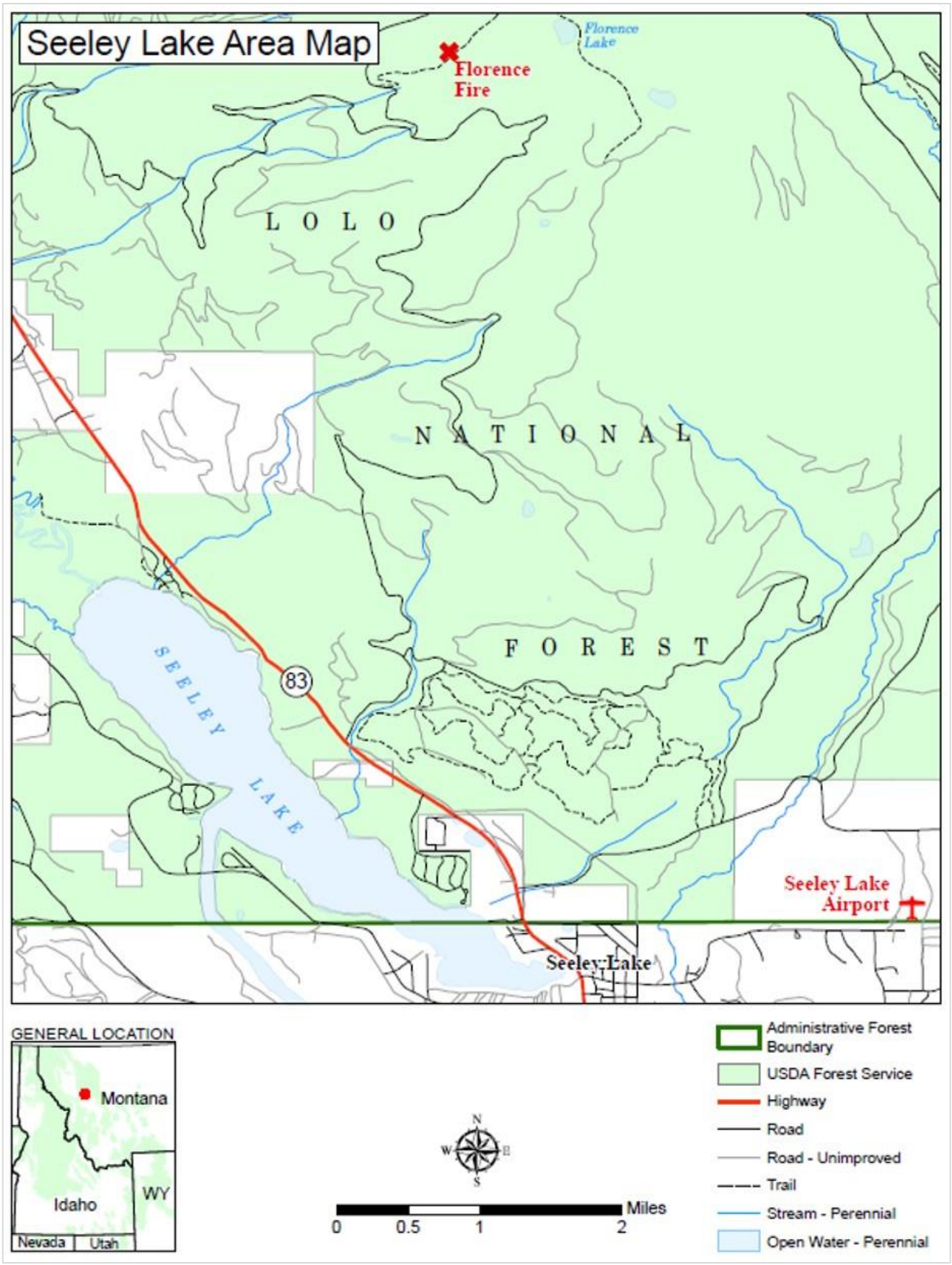
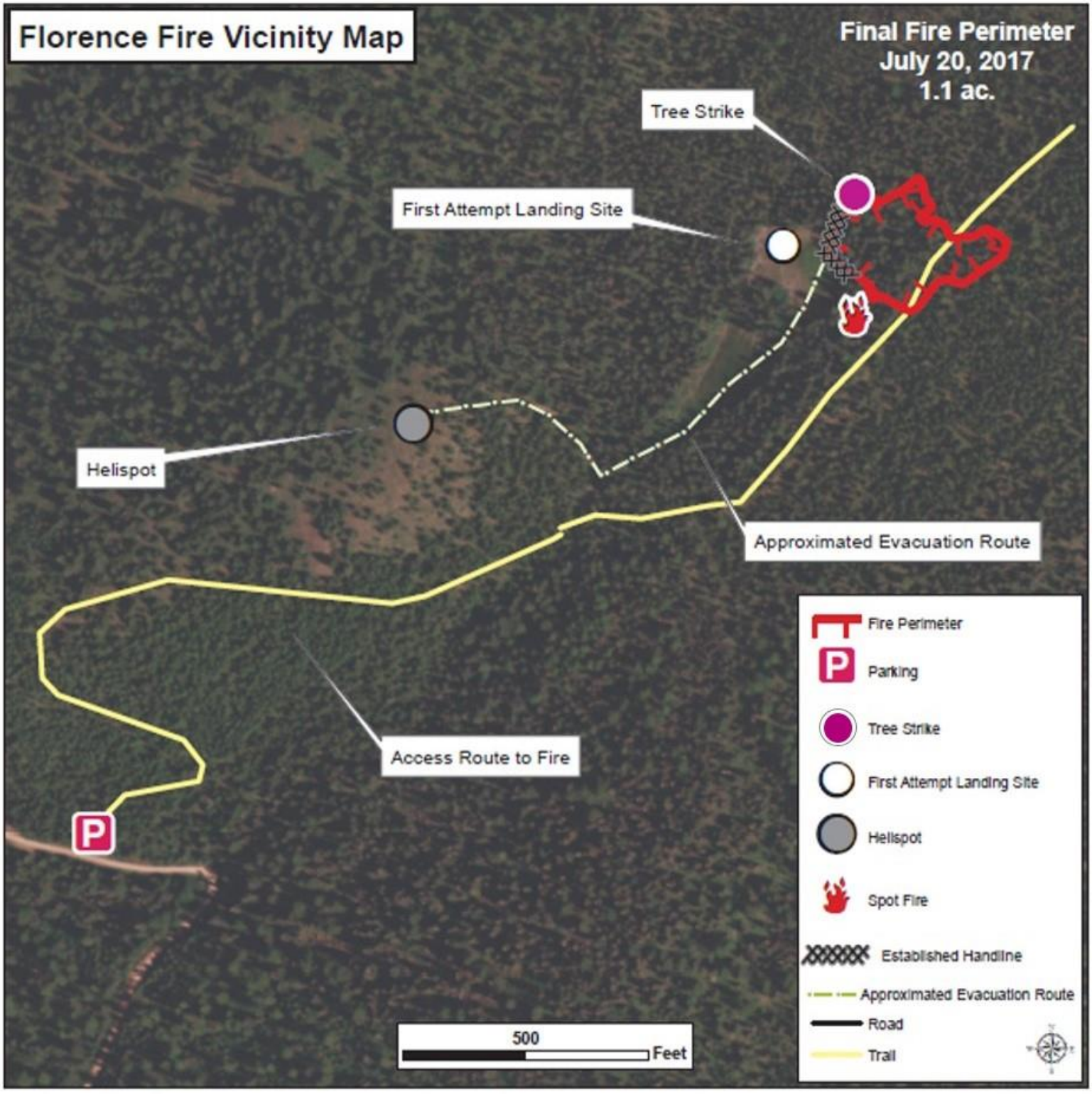


Seeley Lake Area Map



Florence Fire Vicinity Map
Note that the fire did not cross the Florence Lake Trail until after the incident described in this FLA.

As the dust clears, the local crew's EMT (EMT 1) yells to a firefighter to grab the EMT fire pack and sprints to the firefighter under the tree. EMT 1 sees that Trenton Johnson is unconscious, and instructs the Module Leader to get the best sawyer to cut the tree off of him. EMT 1 asks a nearby firefighter to hold Trenton's head steady while his shoes and pack are removed. The module's EMT (EMT 2) pulls out a 10-person first-aid kit and rushes over to Trenton; EMT 1 has EMT 2 begin a pulse/motor/sensory (PMS) check, otherwise known as a "head to toe assessment," at his feet removing his clothes as he goes and EMT1 begins at his head. They roll Trenton with spinal precautions onto his back and continue assessing, working towards each other. EMT 1 takes lead while EMT 2 assists and takes the role of scribe.

Trenton quickly returns to consciousness and his vitals show rapid pulse and respiration. He is alert and speaking, he knows his name, where he is, and the year. The ICT4 clears radio traffic at 17:03 to report that an individual has been hit by a snag and approaches the EMTs. Two firefighters are directed to run back to the vehicles at the trail head to retrieve the trauma kit, transverse rescue stretcher (TRS) and the back board. Due to the mechanism of injury, EMT 1 requests a helicopter to get the patient off the hill as soon as possible. The ICT4 makes the request through MIDC, adding a ground ambulance as backup.

As soon as MIDC hears that someone has been hit by a snag, the staff springs into action. They call 911 dispatch and order a Life Flight for an injured firefighter. They also request that the helicopter that had done bucket work earlier return to the scene as backup. The Lolo National Forest is listening to the radio traffic and orders a third helicopter and launches Air Attack to coordinate the helicopters. The helicopter that had been on scene earlier responds to the request and reports a 12 minute estimated time of arrival. The Seeley Lake Rural Fire Department receives the call from 911 dispatch to respond to the Seeley Lake Airport for a firefighter struck by a tree with unknown injuries. They are told that they will tie in with Life Flight at the airport. Life Flight is in the air 9 minutes later and estimates that they will arrive in 23 minutes. Hearing the various estimates of arrival times, the ICT4 decides to accept the closest helicopter – the one that had performed bucket work – to the incident to transport Trenton to Seeley Lake Airport where it will meet up with ground paramedics and Life Flight. Several firefighters start clearing and marking the meadow for the helicopter to land.

The helicopter arrives and does a reconnaissance flight of the scene. The Helicopter Manager had been asked to land in the meadow, but there are snags leaning in and fire behavior is picking up. The Helicopter Manager lets the ICT4 know that the meadow is not a safe place to land and elects to go to the nearby helispot, a few hundred yards away. The helicopter lands and shuts down its rotors while waiting for the patient. ICT4 radios MIDC and reports that this is a code red, possible chest injury, and that the patient needs to be extracted as soon as possible. ICT4 asks dispatch to look into ordering short haul. If they make it to the helicopter first, they will cancel the short haul.

While air and ground resources are on their way, the EMTs continue their patient assessment, searching for broken bones or other injuries. The patient assessment finds no indication of broken ribs or spinal injury. Trenton is struggling to breathe, but says he doesn't feel any pain. EMT 1 feels a small contusion on the back right side of Trenton's head. EMT 1 uses a SAM splint secured with a compression bandage as a temporary cervical collar while the two firefighters run the 0.25 mile to the engine to collect the supplies. They return to the incident with the trauma kit and Sked about 15 minutes later, winded from the trip. The EMTs instruct others to begin packaging Trenton for extraction. EMT 1 starts a non-rebreather with oxygen at 15 liters before working with EMT 2 to apply the cervical collar and roll Trenton with spinal precautions onto the Sked. EMT 1 continues to instruct the other firefighters on packaging Trenton. Two blankets are put on

We were lucky that the EMT was out there with us.
- Firefighter

him and the oxygen bottle is placed between his legs. When he is ready for extraction, the crew and module join together to move Trenton toward the helicopter.

The local crew and module work to carry Trenton to the helicopter. Several firefighters lead the way, clearing a path for the others carrying the Sked behind them. The terrain is difficult and steep at points, and littered with downed logs. The firefighters take turns carrying the Sked, ensuring that nobody gets too tired and they can move as quickly as possible. As they near the helicopter, the ICT4 yells out to the helicopter crew, asking where they are. The helicopter crew responds and starts cutting a path from the helicopter, working towards the patient. They arrive at the helicopter about fifteen minutes after leaving the accident scene and load Trenton into the back seat, placing a pack under his back to facilitate breathing. The helicopter's back doors had been removed for the season and the Helicopter Manager decides that it won't be safe for the EMTs to accompany the patient in the helicopter. With Trenton occupying the back bench seat, there are no seatbelts available for the EMTs. The Helicopter Manager leaves one crew member behind and asks the most experienced helicopter crew member to kneel down in the back, facing and talking to Trenton during the short flight to the airport.

Things were going like clockwork.
- Firefighter

Just prior to takeoff, the EMTs conduct one more assessment. Trenton is alert and talking, and knows his name. Radial pulse is dropping and respiration is difficult and slow. EMT 2 hands the pilot a piece of paper with the patient assessments and updates and instructs the pilot to give the information to Life Flight. By 17:43, 40 minutes after the tree strike, the helicopter is en route to Seeley Lake Airport.

The Seeley Lake Rural Fire Department and Life Flight are waiting at the airport when the helicopter approaches for landing at 17:46. They are still unaware of the nature of the firefighter's injury. The Seeley Lake Rural Fire Department medics off-board the patient, who is unresponsive and without a pulse. The Helicopter Manager jumps out of the helicopter and hands the written patient assessment to Life Flight. The medical staff begin high performance CPR, insert breathing tubes, and load Trenton into Life Flight. Life Flight leaves for St. Patrick's Hospital at 18:08.

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Upon hearing of the incident, Seeley Lake Ranger District Staff arrange for drivers to go up to the Florence Lake Trailhead. When the crew and module hiked out from the fire, the drivers were there to bring them down the hill and to the District Office. The firefighters were optimistic – the extraction had been quick and Trenton had been talking as the helicopter left.

When the firefighters arrived at the District Office, they were devastated to hear that Trenton had succumbed to his injuries at the hospital. Forest Leadership and dispatch arranged for drivers to caravan the module back to their home base, and District Staff coordinated rides home for the local crewmembers.

Over the next several days, those involved in the incident processed the event and grieved in their own ways. Administrative leave was granted to the local crewmembers and the module took a few days of down time. Several Critical Incident Stress Management (CISM) sessions were held.

LESSONS LEARNED

Interviews were conducted with personnel involved with the Florence Fire incident. While the Facilitated Learning Analysis (FLA) team attempted to speak with all key participants, not everybody was available. At the conclusion of each interview, the participant was asked what he or she learned from this experience and what fire personnel and the agency could learn from this event. Although the Florence Fire was managed according to normal standards, participants identified the following as lessons to inform future trainings and incident responses.

MEDICAL

- Trauma kits should be located close to personnel in the field to ensure prompt and timely treatment.
- In light of this incident, 10-person first-aid kits carried by crews (standard in National Crew Contracts) are inadequate for treating cases of severe trauma in the field.
- While this extraction went well, not all ground-based resources have a high level of exposure to and extensive training on loading medivac patients and helicopter operations. Continued efforts to teach air-based skills and knowledge to ground-based resources are needed to help ensure efficient and safe extractions.

COMMUNICATION

- Communication is generally fluid up and down the chain on-scene at the fire; however, in some cases a culture exists in which it is difficult to discuss peer-to-peer items that some personnel deem risky or dangerous.
- During the Incident within the Incident, communication gaps occurred. It was unclear who the Incident Commander was for the medical emergency. 9-Line protocol was not fully communicated between the incident, Missoula dispatch, 911 dispatch, agency aircraft, and air/ground medical responders. These gaps prevented medical responders from clearly understanding the type of injury they were responding to.

Give me more information. I would have left the helicopter spooled up if I had known it was that bad.
- Helicopter Manager

TRAINING

- Training should not be a one-time event. Mentors and/or coaches are needed throughout employee careers.
- The quality and depth of training received by first-year firefighters of all kinds, on all different types of resources, varies greatly. The following topics were identified as inconsistently and, in some cases inadequately presented: various medical situations, snag awareness and identification, helicopter boarding protocols, patient loading and unloading, victim transport, recognition of hazards created by bucket work, and the Incident within an Incident command structure. Firefighters indicated that training gave them some of the information, but lacked in total preparedness of what is required on the job.

We talk about snags, but until you experience it, you don't fully understand.
- Firefighter

- Basic Firefighter Training (S-130) and Introduction to Wildland Fire Behavior (S-190) could be updated to better meet the needs of entry-level firefighters. Many significant changes have occurred in strategy, strategic risk evaluation and assessment, and risk and hazard identification since the last rewrites of these courses (S-130 – 2003, standard and 2008, blended; S-190 – 2008, on-line and 2006, standard). Some individuals' S-130 consisted of in-class or online training only and lacked a field component. This resulted in some employees learning basic skills, such as how to use a Pulaski, while on the job.

Personnel

- Qualifications must be considered when staffing a fire and/or modules. The ICT5 was on scene with four new FFT2s, which prevented the ICT5 from delegating tasks such as snag mitigation and bucket drop coordination with helicopter.

After the Incident

- Everyone grieves in their own way. Recognize that time and space are needed for individual grieving. It can't be scripted or scheduled.

- The Critical Incident Stress Management (CISM) was received differently by everyone. Some found valuable insights while others felt it missed the mark. For some personnel, the FLA was more effective in assisting their processing of this incident.

- Implementing an employee welfare check-in would have been helpful in caring and accounting for employees while on administrative leave.

Cultural Observations

In the firefighting environment, culture guides many of the decisions made on the fire line and during strategic planning. While many culture-based decisions are appropriate, we must recognize that each fire has its own inherent complexities that should drive tactical and strategic decision-making. While not directly tied to specific management actions on the Florence Fire, discussions between participants and FLA team members touched on the points below. To understand the following cultural observations, it is important to define what is meant by "complex." The Oxford Dictionaries define complex as "Consisting of many different and connected parts. Not easy to analyze or understand."

- Throughout the fire industry, there is a culture of doing what we know and to immediately embark on initial attack. "This is what we do here. We IA fires." Every fire environment is different and difficult to understand, and relying on what we have always done in the past ignores the fact that every initial attack operation has its own set of unique factors and unknown hazards that require individual analysis. It should be clearly understood by each individual assigned to the incident why he or she is there, and what risks exist in that particular environment. It is not enough to rely on the cultural norm of "This is what we do."

- Agency-wide, fires are assigned a Type and a complexity based on information collected on the size-up card and through the complexity analysis (e.g., a Type 5 fire is considered low complexity). The size-up and complexity analysis, by design, are simplified and linear, addressing visual observations, such as fire size and fire characteristics, and taking into account resource needs and other

management complications. The environment into which we send firefighters, however, is 3-dimensional, full of unknowns and questions that are difficult to understand and answer. To accurately evaluate the situation and assign an IC, time must be taken to assess the complexity of the 3-dimensional fire environment and associated hazards, prior to engaging in initial attack. Fire Type should not be only the result of fire size, number of resources assigned, or values-at-risk; it should include a measure of fire-environment complexity.

- ICs at all levels are often managing higher complexity fires than they have in the past. For example, Type 4 ICs can find themselves managing what used to be considered a Type 3 fire. This makes it difficult for the IC to perform safely due to limited training and experience at the higher complexity level, and with inadequate resources and support on the ground.

Additional Considerations

The following is a non-exhaustive list of recommendations that were suggested by interviewees and FLA team members based on lessons learned during the review process. Several of these have been identified in past FLAs. They can be used as discussion points for individuals and groups reviewing this tragedy, such as in training sessions and refreshers.

- Recommend that ICs be assigned to initial attack fires based on the complexity of the fire environment rather than on management type, and that management types be categorized as Initial Attack, Extended Attack, or Large Fire management rather than the current 1-5 system.

- A tactical tool should be developed that can quickly assess the complexity and risk of an initial attack fire, and be used to determine the IC Type best suited for that particular fire. The output (IC Type) would be driven by an assessment of the 3-dimensional fire environment, rather than by linear organizational or logistic considerations, such as fire size or number of personnel needed. Separating management type from fire complexity is crucial if we are to have appropriately trained and experienced ICs and resources on complex incidents, regardless of size or management type.

- Consider a tactical pause before engaging: “Stop, Think, Talk…then Act.” This should be done on the strategic and tactical levels by leadership and operators.

- Plan, practice, and brief on protocols for an Incident within an Incident, including the 9-Line protocol. Include various medical scenarios in the annual fire refresher training and throughout the year.

- Under the leadership of an EMT, educate all crew members about medical equipment. Ensure members have a knowledge of names, uses, and locations of items in the first-aid kit.

- Work with your cooperators to improve medical responses to include mutually beneficial training exercises, equipment capabilities, and interagency communications.

- Stage trauma kits and other medical supplies where they can be easily accessed.

- Rotate personnel carrying the Sked to maximize strength and endurance during transport as was done during this incident.

- Order Life Flight to the incident and allow the pilot to decide where and when to land. Life Flight may be able to off-board medical personnel at the incident to provide advanced medical care.

- National Crew Contracts' minimum medical equipment requirements should be upgraded to meet the needs of more severe trauma.

- Consider post-incident logistics. Forest/District leadership, together with dispatch, coordinated transportation for all affected crews, not only back to the Administrative Unit, but to the Module's home base and to the employees' homes.

- Recommend that the Region provides a copy of this FLA and additional context to the Deputy Chief of State and Private Forestry with the request that the agency review national fire training standards to ensure that the standards meet the current fire environment on the ground. Review Basic Firefighter Training (S-130) and Introduction to Wildland Fire Behavior (S-190) for content and presentation style to include field work and hands-on training to mirror Guard Schools, academies, and apprenticeship programs.

- Provide additional training oversight, including on-site monitoring for quality and content, of our contract equipment and crew vendors. We currently depend heavily on vendors to self-certify that their training meets the intent of the National Wildfire Coordinating Group (NWCG) training requirements.

- Ensure minimum staffing for initial attack fires has appropriate personnel to allow for delegation of tasks, and the experience levels that can assist in the management of the fire.

- Include direction in the Forest Fire Suppression Plan to utilize heavy equipment for initial attack where feasible, especially when there is significant personnel exposure to potential tree strikes. Heavy equipment is designed with Roll Over Protective Structures, Falling Object Protective Structures, and Operator Protective Structures that provide the operator with maximum protection from tree strikes and other environmental hazards that exist on the fire line.

FLA Team and Process

The Regional Forester of the Northern Region commissioned an FLA Team to review and analyze the circumstances surrounding this incident. A team was assembled and reported to the Northern Region's Office in Missoula, MT on Friday, August 4, 2017, where they received an in-brief and delegation of authority. The FLA Team's charge included identifying opportunities to strengthen our safety culture, without fear of reprisal and with the focus on learning, which is vital to accomplishing our mission safely and successfully.

The initial start of this review was delayed due to on-going fire activity in the immediate vicinity of the incident. The events and timeline chronicled in this report are based on the best recollections of those interviewed. The team greatly appreciates the time and candidness of those who participated in the FLA.

Chris Hartman	U.S. Forest Service, Intermountain Region, *Team Lead*
Linda Donner	U.S. Forest Service, Flathead National Forest
Amanda Egan	U.S. Forest Service, Intermountain Region
Terry Eller	U.S. Forest Service, National Forests in North Carolina

Ken Maas	U.S. Forest Service, Humboldt-Toiyabe National Forest
Eric Zanotto	U.S. Forest Service, Pike & San Isabel National Forest
Steve Zachry	U.S. Forest Service, Northern Region, *Local Liaison*

The training records provided by the respective agencies and organizations indicate that the personnel dispatched to the Florence Fire were qualified in the positions in which they were functioning.

APPENDIX A: TIMELINE

Date	Hours	Description
7/18/2017	22:40	District advised of smoke.
7/19/2017	08:07	Local engine + chase en route to incident
	11:03	Local engine and chase on scene (IC-5)
	11:23-12:32	Requested 4 additional firefighters; bucket drops, type 4-IC
	12:33	Local helicopter assigned bucket drops
	13:48	Helitack crew on scene, provided sawyers
	14:11	Transition from IC-5 to IC-4; IC-5 remains contact for aircraft
	14:47	Local helicopter released
	15:08	10-person module en route
	15:17	Request local helicopter return, affirmed at 15:26
	15:42	Helitack crew released
	17:03	Individual hit by snag
	17:07	Local helicopter, Life Flight, Air Attack sent
	17:10	Local helicopter closest to incident, heading to meadow, will fly patient down to airport to meet Life Flight
	17:21	Ambulances on ground at airport
	17:24	Local helicopter landing at alternate helispot, too many snags at original LZ. ICT4 advises dispatch “this is an absolute emergency”
	17:37	Life Flight short and final into airport
	17:38	Local helicopter has patient and will meet Life Flight at Seeley Lake Airport
	17:46	Local helicopter short and final into airport
	17:49	Patient transferred to ground medical staff at the airport
	18:08	Life Flight en route to hospital
	19:09	Patient in emergency room; patient passed away

APPENDIX B: WEATHER SUMMARY

The Lolo National Forest experienced a very hot and dry summer with a high level of fire activity beginning in early July. The ERC values were running in the 90th to 97th percentile. The Fuel Models were also trending low with 1000 hour fuel moisture (FM1000) at 11-12%, getting close to the 3rd percentile for dryness. 100 hour fuel moisture (FM100) was at or below the 3rd percentile for dryness.
The Seeley Lake Remote Automatic Weather Station (RAWS) provided the FLA Team with the following data, including weather trends that indicate fire activity on both July 18th and July 19th was increasing as expected during the peak burning period starting around 12:00 and continuing into the 19:00 to 20:00 timeframes. Fire behavior conditions were peaking around the time of the tree strike with an increase in wind speeds as the afternoon progressed. Fire personnel indicated that they did not experience wind on the fire, but based on the weather data from the Seeley Lake RAWS, there was some wind in the area.

Seeley Lake RAWS, Number SEEMB

Latitude: 47.175972 Longitude: 113.444389

	July 18, 2017	**July 19, 2017**
Time	17:12	17:12
Temperature	87°f	90°f
Relative humidity	15%	13%
Winds	6 mph	6 mph
Wind gusts	14 mph with gusts to 17 mph at 19:12	15 mph with gusts to 17 mph at 18:12
Fuel moisture	4	3

The Fire Weather Planning Forecast issued at 03:42 on July 19 for East and West Lolo planning zones indicated that maximum temperatures would be 85°F to 90°F in the valleys with 75°F to 85°F on the ridges. The minimum relative humidity would range from 11% to 16% with 12% to 22% on the ridges. The 20 foot winds were predicted to become upslope in the afternoon, between 8 MPH and 10 MPH. As evident in the readings recorded at the Seeley Lake RAWS, wind gusts were higher than predicted by the 03:42 forecast.

An updated Fire Weather Planning Forecast issued at 14:43 on July 19 indicated that a dry cold front would move through northwest Montana the morning of July 20 and into southwest Montana by mid-afternoon. This frontal passage indicated an uptick should be expected in fire activity due to breezy southwest to west winds combined with low relative humidity to produce critical fire behavior. The FLA Team was unable to confirm the significance of the predicted weather event and the impacts it may have had on the decisions that were made on the ground to engage the Florence Fire on July 19.

APPENDIX C: RELATED LESSONS

Reviewing previous FLAs allows for additional learning. Each FLA listed here shares common themes with the Florence Fire Tree Strike Fatality FLA. A brief overview of primary discussion points is provided below.

- Freezeout Ridge Fire (2014)
  Training and the importance of simulations and drills; inadequacy of the 10-person first-aid kit; importance of trained and designated family liaisons; difficulties communicating with air ambulances; implied expectations from overhead to crews.

- Strawberry Fire Fatality (2016)
  Risk management (how fire and agency administrations address and manage risk and tradeoffs between safety and efficiency); saw operations (complexity, motivation to engage, and can you say no?); human dynamics observations on inter-crew communication; short-haul recovery (lack of general knowledge and understanding of time and equipment requirements, effect on tactical and strategic decisions).

- Sierra Tree Strike (2015)
  Danger-tree risk process; the influence of cultural and social norms on decision-makers; effectiveness of the Forest Service as a learning organization; pressures to get the work done and acceptance of risk in order to get the job done; how cultural pressures affect risk, intent, actions, and safety.

- Incident 398 Hazard Tree Fatality (2013)
  Importance of training for medical emergencies; communication with crewmembers' families.

- Chamberlain Project Felling Incident (2016)
  Awareness of overhead hazards; importance of proper trauma equipment on-site; training for medical incidents for all Forest Service activities.

- Steep Corner Fire Fatality (2012)
  Inherent risk, whether we engage or not; complexity and risk when working with different agencies/cooperators.

- Hastings Fire (2011)
  Risk can only be managed, not eliminated; clear Incident within an Incident plans.

- French Fire Night Time Hoist Extraction Lessons Learned (2014)
  Importance of having qualified medical personnel and equipment to facilitate prompt patient care; choosing extraction site.

- Marble Yard Snag Incident (2012)
  Importance of considering forest conditions in future fire and vegetation management activities to address snag-related public and employee safety.