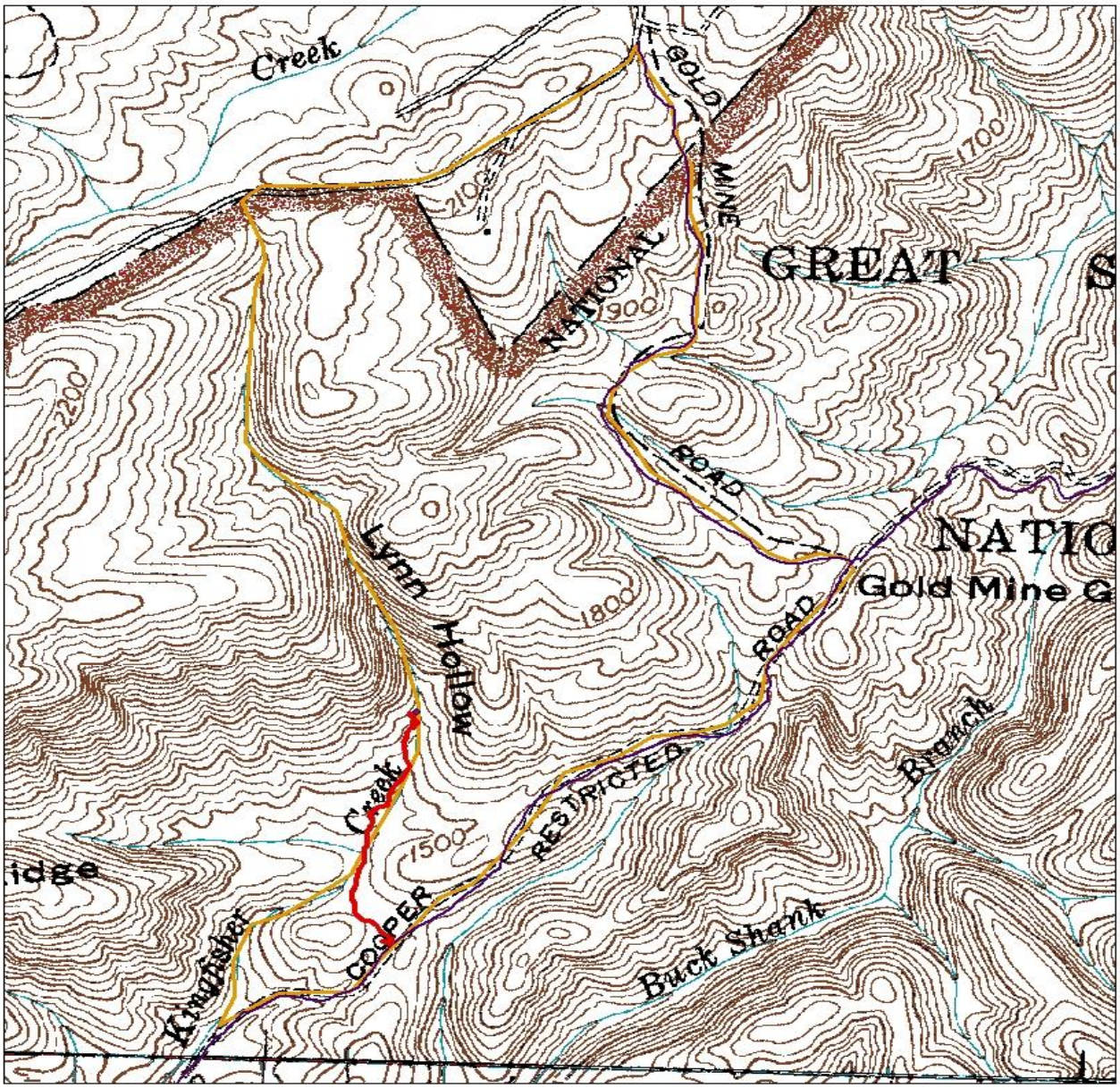
LYNN HOLLOW FELLING INCIDENT
11/07/2009
GREAT SMOKY MOUNTAINS NATIONAL PARK



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I. Executive Summary

On Saturday, November 07, 2009, Firestorm Wildland Fire Suppression Crew (FWFS), a contract fire fighting company, was working in the Lynn Hollow area within the Cades Cove District of the Great Smoky Mountains National Park (GRSM). The FWFS crew was tasked with "prepping" the Lynn Hollow drainage for a planned prescribed burn. The FWFS crew of 15 and one National Park Service employee (NPS 126) arrived at the worksite, briefed as to the day's work assignments, and began work at 0830hrs.

At approximately 1305hrs, FALC was felling two beetle-kill snags that were leaning against a large limb approximately 45' above ground level on a healthy Chestnut Oak. FALC's cut on the first pine went as planned. As FALC's second pine began to fall in the intended direction, he began to egress along his planned route and was struck by the large chestnut oak limb that had been broken by the second beetle-kill pine as it fell.

FALA began to administer aid immediately noting that FALC had an altered level of consciousness (LOC) for a few seconds when he arrived at FALC's side. FALA then began to attempt radio contact with a line supervisor on their crew net. FALA was unable to contact his line supervisor (LS1) over the crew net, but Crew member 1 (CM1) answered the call and began a response to FALA's position.
While enroute to FALA and FALC's position, CM1 contacted NPS 126 along the trail and informed him of the incident. NPS 126 and CM1 arrived on scene a few minutes apart and began an initial assessment of FALC's condition. NPS 126 notified the NPS on duty dispatcher of the incident. NPS dispatcher notified area supervisor NPS 601 about the incident. NPS 601 advised NPS 126 not to attempt walking the FALC out due to the possible head and neck injury and turned the rescue effort Incident Command role over to NPS 617.

FWFS EMT (EMT) arrived on scene with the patient at approximately 1430hrs and assumed patient care until NPS 617 could arrive. At 1524 hrs,NPS 617 arrived on the road south of the patient and began moving the rescue litter up to the patient.NPS 617 arrived on scene with the patient at 1606hrs. The FALC was evacuated from the area and arrived at the Abrams Creek Ranger Station at 1817hrs. FALC was transferred to Rural Metro Ambulance Service Care at the Ranger Station and transported via ambulance to Blount Memorial Hospital where he was treated and released on the same date.

Throughout the incident, FWFS experienced communication problems on their radio's crew net. They were unable to contact one another with any consistency on the non-repeater analog system. The FWFS crew did not have an NPS issued radio or the ability to use the NPS digital repeater system. All communication attempts from FWFS radios to the NPS dispatch center were through the analog radio system.

II. Narrative

On Saturday, November 07, 2009, Firestorm Wildland Fire Suppression Crew (FWFC), a contract fire fighting company, was working in the Lynn Hollow area within the Cades Cove District of the Great Smoky Mountains National Park (GRSM). November 07 was the 10th straight day of work for the crew without a lieu day. However, the crew was within the 2:1 work/rest guidelines on the day of the incident. The FWFC crew was tasked with "prepping" the Lynn Hollow drainage for a planned prescribed burn. The FWFC crew of 15 and one National Park Service employee (NPS 126) arrived at the worksite, briefed as to the day's work assignments, and began work at 0830hrs. Prior to beginning the shift, no safety briefing was given to the crew by the crew lead or the NPS contract liaison assigned to the crew for day.

The FWFC crew was tasked with clearing and prepping a perimeter fire line. The sawyers were instructed to fell snags and other trees that may pose a possible threat to the fireline during the prescribed burn. It was stated that any possible problem snags within 1.5 times their total length of the fireline would be felled and moved away from the line. The distance parameters were set by the GRSM FMO office and conveyed to FWFC supervisors.

At approximately 1305hrs, FALC and FALA were working in the southwest corner of the proposed area along Kingfisher Creek. FALC observed two beetle-kill pines leaning against a large limb that was approximately 45' above ground level, 8" in diameter at the junction with the tree, and 25' long in a live Chestnut Oak tree within the 1.5 times total length established parameter. When FALC began to make his first cut, he and FALA were both wearing their proper PPE including hard hats, eye protection, gloves, and chaps. FALC fell the first pine without incident. After explaining the second cut to FALA and sending FALA to a safe area behind another large Chestnut Oak, FALC voiced and physically pointed out his planned egress route to FALA before he started his cut on the second pine. As the second pine rolled off the limb, FALC began moving across his planned egress route when the live limb from the Chestnut Oak fell striking FALC on the upper right side of his back and shoulder. FALC could only remember seeing the smaller branches of the large limb hitting the ground in front of him before the larger section of the limb struck him. FALC may have experienced an altered level of consciousness (LOC) for a brief period before FALA began to render aid. FALA assisted FALC by removing the branch that was covering him. As FALC became more coherent, he stood up and began walking around the area. FALA convinced him to sit down until they could get EMT on scene. FALA began to attempt radio contact with other crew members. FALA was unable to contact his direct line supervisor, LS1, by radio on their crew net. CM1 returned FALA's radio traffic approximately three minutes later and began to respond to his location. After the radio contact FALA stated FALC could not remember the circumstances of the incident. As several minutes passed, FALC began to regain his memory of the incident event.

As CM1 was moving to the incident site, he contacted NPS 126 along the trail and relayed the information about the incident to NPS 126. Both CM1 and NPS 126 began hiking toward the incident site from the southwest corner of the unit. CM1 arrived on scene at approximately 1320hrs and NPS 126 was a few minutes behind CM1. Both CM1 and NPS 126 began an initial assessment of FALC's condition. At 1343hrs NPS 126 contacted GRSM dispatch and advised the

on duty dispatcher of the injury. NPS 126 advised the patient was only a "little woozy" at the time of his exam and that they were planning on getting him down to the trail. The FWFS crewmembers were unsure of the trail system in the area and did not know the best evacuation route for FALC. The FWFC crew also did not know if they possessed the appropriate keys to open the NPS gates along the trails needed for evacuation.

NPS Area Supervisor 601, a park medic, was contacted by park dispatch at 1344hrs via radio and assumed control of the EMS evacuation. NPS 601 advised that FALC should be immobilized and brought out of the area via a wheeled litter. NPS 601 asked NPS 126 if there were qualified medical personnel on scene to continue patient care until an NPS EMT could arrive. NPS 126 stated that he was a Wilderness First Responder, and that they were trying to contact the crew EMT. NPS 126 felt there were sufficient personnel on site to assist NPS 617 with the evacuation once he was on scene. NPS 617 was given the Incident Command (IC) role for the extrication efforts at 1410hrs by NPS 601. NPS 601 and NPS 617 reviewed GRSM EMS Protocols for possible C-Spine injury, immobilization, and extrication from the backcountry prior while other rangers began to load the necessary rescue equipment into NPS 617's vehicle. NPS 617 left the Cades Cove Ranger Station at 1413hrs and began to travel to the incident location.

FWFC crew members were unable to communicate the injury to FALC to their supervisors on their crew net throughout the first period of the incident. FWFC crew members were able to get radio contact with the crew EMT and CRWB at approximately 1410hrs. EMT arrived on scene at approximately 1430hrs and assumed patient care. At the time of EMT contact the patient was alert and oriented to time, place, and event.

NPS 617 arrived in the area at 1524hrs and began to prepare the litter for the evacuation. Once in the area NPS 617 evaluated the proposed egress route along the fireline and opted instead to bring FALC out via a "saddle" along the ridge just southwest of FALC's location. FWFC crew members cleared the path for the egress. NPS 617 arrived on scene and assumed patient care at 1606hrs. The patient was secured in the litter at 1628hrs. The litter crew arrived at NPS 617's vehicle at 1708hrs. Vitals were rechecked by NPS 617 at 1710hrs and found to be consistent with the baseline established earlier. The decision was made to continue the carryout from the area via wheeled litter due to the rough conditions along the road. The crew felt they could more effectively carry FALC from the area than to place him in the back of a pickup. The litter crew arrived at the Abrams Creek Ranger Station at 1817hrs and FALC was transferred to Rural Metro EMS care. FALC was transported via Rural Metro Ambulance to Blount Memorial Hospital.

FALC was treated and released from Blount Memorial with soft tissue injuries to his back and shoulder with instructions not to return to work for three days. FALC also sustained minor cuts and abrasions to his face, neck, and upper back.

III. Investigation Process

On November 10, 2009 an interagency investigation team was assigned to investigate the limb strike incident in the Lynn Hollow drainage that occurred on November 7, 2009 at approximately 1305hrs. The team was comprised of five GRSM NPS employees and one USFS safety officer. The team conducted interviews with all pertinent FWFC personnel and visited the incident site on the same date. Human, material, and environmental factors were considered in the team's conclusions.

The human factors determined to contribute to the incident and incident response were the absence of a daily safety brief that included the JHA's of working under snags, the lack of a medical evacuation plan, and the lack of knowledge of the road and trail system in the expanded area of the worksite.

The material factors determined to be a contributing factor in the incident consisted of the lack of compatible radios between the FWFC crew and the GRSM communications division. The poor line of site reception of the FWFC crew net radios also contributed to the delay in getting an EMT to the incident site.

The environmental factor that was determined to contribute to the incident is the live Chestnut Oak limb. The limb had supported the two beetle kill snags for an unknown amount of time prior to FALC'S removal of the trees. The limb broke and fell from approximately 45' above ground level after, or as a result of, the weight of the two pines being removed from it.

IV. Findings

Finding 01

FWFC supervisors did not conduct safety briefing prior to shift start.

Fact: FWFC crews were only briefed on the work assignment for the day at the beginning of the shift.

Finding 02

FWFC crew members were all working within their certifications and within the work to rest guidelines.

Facts: FALC was within his certification for felling

FWFC crew had ended shift at approximately 1730 on 11/06/09 and started shift at 0830hrs on 11/07/09

FALC is a C faller instructor with 20 years of experience and no previous reportable power saw incidents

Finding 03

A healthy limb approximately 8" in diameter and approximately 25' in length fell from approximately 45' above ground level and struck FALC after, or as a result of, the weight of two beetle-kill pines being removed from it.

Facts: An examination of the limb that struck FALC revealed the limb did not have any recognizable health issues.

The Chestnut Oak the limb fell from did not have any recognizable health issues.

Finding 04

Poor line of sight radio reception among on FWFC's analog crew net contributed to delayed notification of on duty Supervisors and FWFC EMS personnel.

Facts: FWFC crew members were unable to contact their supervisors on the ridge above them using the analog line of sight radios issued by FWFC.

FWFC did not have a repeater for their analog crew net.

Finding 05

FWFC crew did not have the capability to contact National Park Service Dispatch via the digital repeater system.

Facts: FWFC radios are not digital capable

FWFC supervisory personnel were not issued digital capable radios by the NPS FMO office prior to beginning work.

FWFC supervisory personnel utilized the back-up analog system when attempting to contact the NPS directly

The analog repeater system in the NPS was not as reliable as the newer digital system

Finding 06

Crew members were unaware of possible evacuation routes in the area other than the way they walked into the plot.

Facts: FWFC crew members did not have large scale maps of the trail or road system covering the area of their work assignment.

FWFC crew members were not aware they had the proper keys to access closed gates inside the park.

V. Recommendations:

- Ensure criteria for prescription of cutting is comprehensive, concise, well defined, and understood by all parties.
- NPS should provide radios and other needed communication equipment to allow contract crews to communicate in the most efficient manner available with NPS dispatch and require crews to continually monitor communications throughout assignments.
- Ensure daily tailgate safety meetings are conducted, relevant to the task at hand and documented.
- Contract crews should be familiar with and discuss during daily briefs, emergency medical plans including evacuation routes from the work site and directions from the work site to definitive care providers.
- Require agency fire management to obtain a working knowledge of the contract from agency COR (contracting officerepresentative).
- While there were no specific issues identified during the investigation that indicated non-compliance with the contract, it is recommended that the Agency COR visit the site before or during the contract period. Continue to ensure that a quality agency liaison is assigned to any work activities of visiting resources.
- Crew EMT's should be equipped with medic bag that contains basic immobilization equipment including cervical collars and Sam splints.
- Crew EMT's should be assigned in close proximity to the more hazardous job tasks being performed.

VI. Conclusions and Observations:

The two beetle-kill pines that FALC removed from the Chestnut oak fell just as FALC had intended. The reason for the Chestnut Oak limb breaking and falling could not be conclusively determined through investigation. Neither of the pines actually struck the limb during the falling process. Each of the two pines was already resting against the limb when FALC conducted his size-up prior to cutting. As the second pine fell, FALC moved along his planned escape route and was struck by the falling limb.

In Finding #1, FWFC supervisors did not conduct safety briefing prior to shift start. A safety brief at the start of the shift reinforces potential safety issues and mitigations practices.

In Finding #2, FWFC crew members were all working within their certifications and within the work to rest guidelines. FWFC and NPS employees should always be performing wildland fire functions only to the extent they are qualified and carded.

In Finding #3, a healthy limb approximately 8" in diameter and approximately 25' in length fell from approximately 45' above ground level and struck FALC after the weight of two beetle-kill pines were removed from it. The FWFC crew is a western United States crew and may not be as familiar with eastern fire behavior as personnel from the east. The area where the incident occurred is in a rhododendron thicket and next to Kingfisher Branch. The chance of the pine snags burning in that forest type during a prescribed burn was low though fires in the Smokies have carried through leaf litter under rhododendron. It is important to ensure that the agency liaison has knowledge of local fire behavior who can advise with the crew when choosing which snags may be a threat to the fireline during a fire event.

Findings #4 and #5 address communications issues. The FWFC crew experienced communication problems with the GRSM communications center and also had problems within their own crew with their crew net. Line of sight communication with radios is often problematic in any location where distance and topography create more separation than the equipment is designed for. The investigative team feels that a "human repeater" being stationed along a ridgeline during the course of the day would grant an added measure of safety when the crew is scattered throughout the work site and begins to encounter radio reception problems. The investigative team also feels that the FWFC crew would have benefitted from being issued a digital portable radio to use when contacting the GRSM communications center or the GRSM liaison working with the crew on any given day.

In Finding #6 the FWFC crew had not been briefed and did not have adequate maps of the larger area surrounding the proposed burn area. If FWFC had been issued park trail maps, full quad maps, and a general road map of the area, the crew would have had a better working knowledge of the area's egress routes. Also, the FWFC should have been aware of locked gates requiring keys in the event of a needed extrication.

Any crew (contract or otherwise) would also benefit by having an EMS protocol for their work group. The protocol would outline response mechanisms, evacuation routes and trigger points for patient care pertinent to each job site. Their crew EMS pack should also contain the necessary equipment to manage the most commonly anticipated injuries including C spine immobilization equipment.

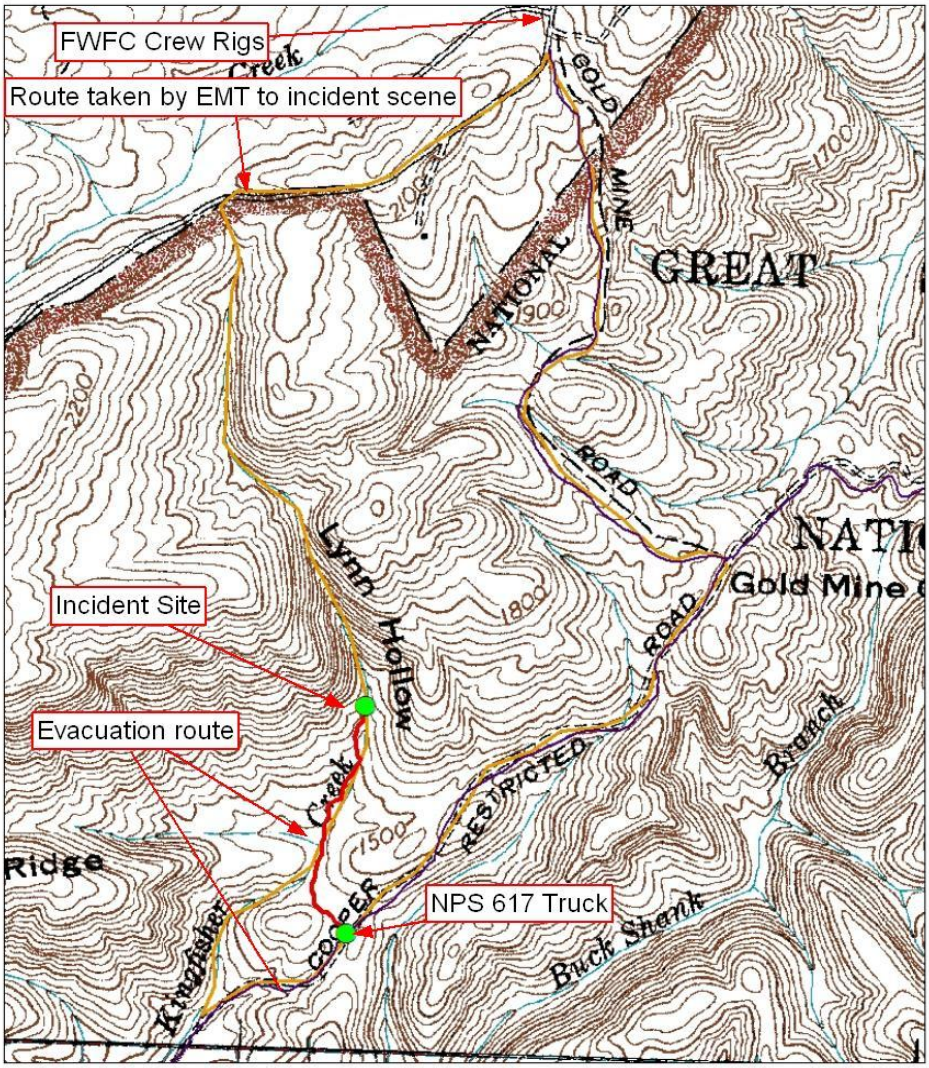
Better pre-planning and adherence to the 18 Watchout Situations by the FWFC and Smokies FMO Office would have resulted in a faster, smoother EMS response.

VII. Commendations

- FWFC Crew
  - Were working within work to rest guidelines
  - All personnel were working within their rated qualifications
  - Refreshers and Certifications were current
  - All PPE was worn by FALC and FALC
  - FWFC chain of command was clear
  - EMT provided quality care until immobilization equipment arrived

- National Park Service
  - Response time from Cades Cove Rangers appropriate for nature of call and travel distance
  - NPS had a liaison working within the crew who was able to facilitate communications to effect a response from NPS and other EMS resources.

Lynn Hollow Map

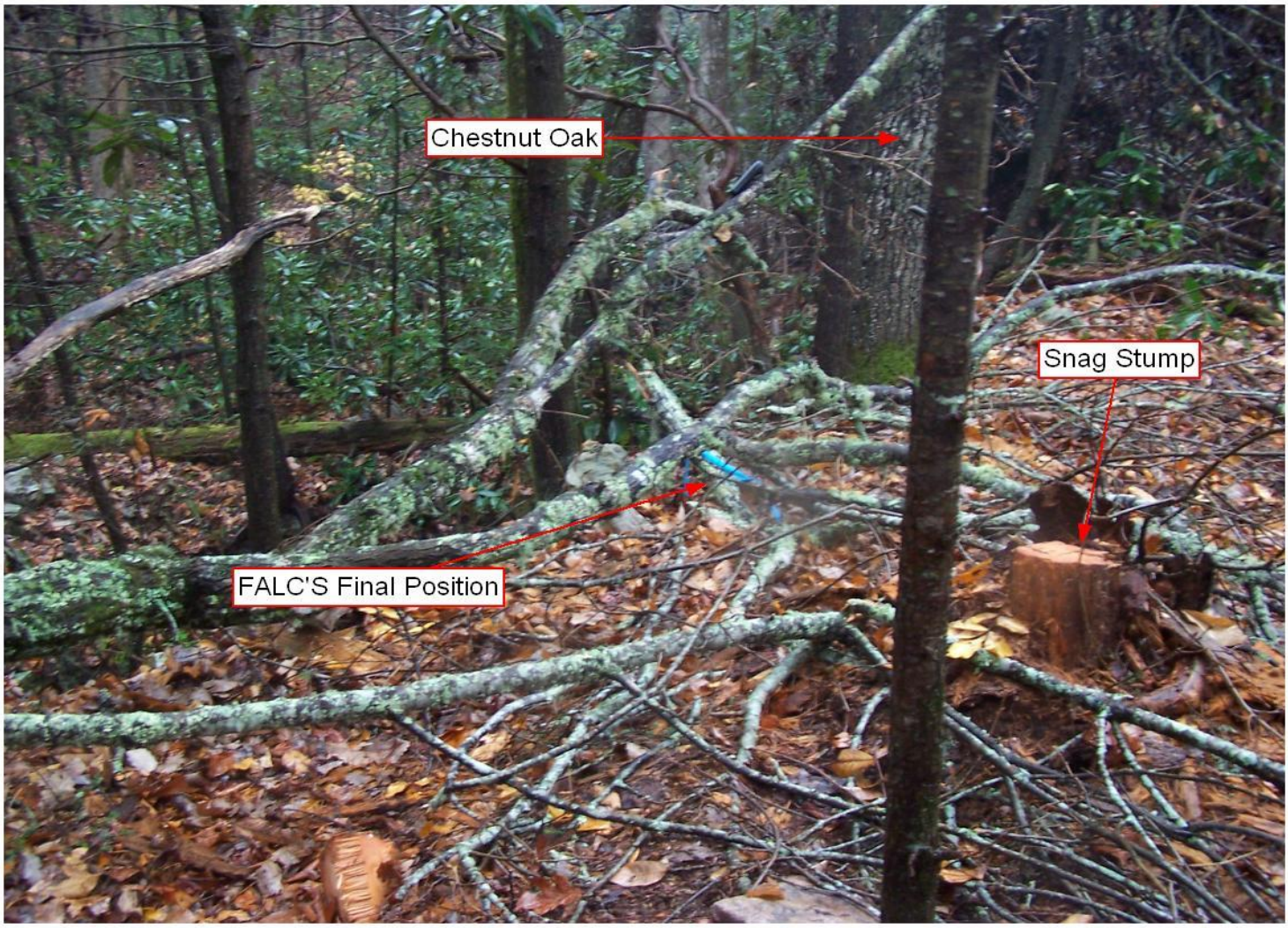


Overall Area

End of Chestnut Oak Limb

End of Chestnut Oak Limb

Final Position of Chestnut Oak Limb



Investigation Team:

Name	Agency/Division	Position
Chuck Hester	GRSM Resource and Visitor Protection	Team Lead
Laney Cutshaw	USFS Interagency Coordination Manager	Safety (SOF1)
Charlie Daniels	GRSM Staff	Safety
Drew Page	GRSM Fire Use Module	Subject Matter Expert
Heather Wood	GRSM Resource and Visitor Protection	Records

Glossary of Acronyms

FALC	C Faller certification injured party
FALA	A Faller certifications swamper for [redacted]
EMT	National Registry EMT patient care
NPS 126	NPS liaison First Responder certification
LS1	Line Supervisor for [redacted] and [redacted] Crew Boss certification
CM1	Crew member Crew Boss certification
NPS 601	Area Supervisor NPS Park Medic certification
NPS 617	Park Ranger Rescue Incident Command EMT certification
CRWB	Crew Boss Crew Boss certification
FWFC	Firestorm Wildland Fire Suppression Crew
GRSM FMO	Great Smoky Mountains NP Fire Management Officer
COR	Contracting Office Representative