The Little North Fork of the Salmon River burned at relatively high severity in the Salmon August Fire during extreme fire weather.

The Salmon August Fire burned for over three months in the backcountry of the Marble Mountains Wilderness during the summer of 2017. The majority of acres burned (70% or 46,668 acres) burned in eight days between August 29 and September 5, in an event that could be called “the big western run.” In over 110 days of continuous fire activity in the Salmon August Complex, it was these eight days that left the most lasting impact. This wind-driven weather event sent the fire racing over 10 miles across the Little North Fork of the Salmon River and over Chimney Rock to the headwaters of Morehouse, Steinacher and Crapo Creek.

This demonstrates the ability of relatively short weather and terrain-driven runs to heavily influence fire mosaics and vegetation mortality levels in the post-fire environment. These natural weather anomalies, in turn, heavily influence long-term landscape, vegetation and habitat mosaics in the Klamath-Siskiyou Mountains. They create fire behavior that cannot be contained, controlled, suppressed or even predicted. Although much of the Salmon August Complex burned at low to moderate severity, the fire will be remembered for this dramatic, eight day, wind-driven run, and the lasting impact left on the mosaic of vegetation in the Little North Fork watershed.

No amount of fire suppression or manual fuel reduction could have reduced the effects of this wind and weather-driven event. Suppression crews have little to no ability to stop this kind of high-severity run; it is natural, unavoidable, and weather driven. The Salmon August Fire demonstrates that only recent fire footprints can limit such extreme fire
behavior, as the 2013 Salmon Complex and 2014 Whites Fire footprints did influence the 2017 Salmon August Fire on its southern and western margins.

**Significant Fire Weather and Events**

The Salmon August Fire began with a lightning strike on June 25, 2017 on the North Fork of the Salmon River, deep in the Marble Mountain Wilderness. The fire was reported the next day on June 26, 2017. Fire managers quickly decided to manage the fire under an alternative suppression approach. This allowed fire managers to suppress the fire utilizing Minimum Impact Suppression Tactics (MIST), while using the fire to clean up fuels and thin forest vegetation in an area with no recorded large fire history. The fire was originally called the Island Fire due to its location near Lake of the Island, at the headwaters of the North Fork Salmon River. The region is remote, rugged, dangerous for firefighters and far from the nearest residences on the North Fork Salmon River and at Sawyers Bar.

The Island Fire was surrounded by numerous recent fire footprints to the north, west and south, and the fire presented an opportunity to utilize wildland fire for resource benefit with minimal impact to adjacent communities or forest resources. To their credit, the Klamath National Forest took advantage of that opportunity and declared that the Island Fire would be only minimally suppressed as long as it remained in the backcountry. The fire was backing into the North Fork of the Salmon River where it could be suppressed at the trail or along the river. Other portions of the fire could be “loose herded” into extremely rocky terrain and recent nearby fire footprints for containment. The approach would create minimal suppression related impacts, allow fire to play its important ecological role in the Marble Mountain Wilderness Area, and reduce fuel in an area with no large fire history.

Forest Supervisor Patricia Grantham noted, “These recent fires burned between 2006 and 2014, and serve as natural barriers that will limit this fire’s spread because fuels were reduced when the older fires burned through. The acres burned in this fire will in turn help limit the spread of future fires by reducing the fuels. The lightning-caused Island Fire is playing its natural role in the Wilderness ecosystem, and burning at a low to moderate rate of spread.”

The Salmon River region also received 180% of normal snowpack at high elevations, and near record setting rainfall in the winter of 2016-2017. Burning through wet, green fuels, still moist from the heavy winter snow loads, the Island Fire began spreading slowly, and by July 2, 2017 had burned only 65 acres.

By July 11, 2017 the fire had spread west into sparse rocky terrain near Lake of the Island and English Peak. The south and eastern portions of the fire were backing at low to moderate intensity towards the North Fork of the Salmon River near the Deer Lick and Lake of the Island drainages. On July 11, the fire was 962 acres and continued to burn slowly into the month of August.
By August 10, the fire was 1,468 acres and was burning slowly despite high temperatures and low relative humidity. On August 11, 2017, another lightning storm worked its way through the region igniting five new fires in the Salmon River watershed. These included the Wallow Fire, also in North Fork Salmon River and Marble Mountains Wilderness near Bear Wallow Peak, the Pointers Fire near the Pacific Crest Trail (PCT), the Mary Fire south of Cecilville, the Grizzly Fire southeast of Petersburg, and the Garden Fire in the Trinity Alps Wilderness. All but the Wallow Fire and the Mary Fire were quickly contained despite the remote and extremely rugged terrain.

On August 17, the fires, including the Wallow Fire and Island Fire, were included in what fire managers termed the Salmon August Complex. The Island Fire was holding steady at 1,473 acres after burning for 54 days. The Island Fire was smoldering and creeping internally within a fire perimeter bound by rocky headwalls and craggy ridges devoid of fuel. The Wallow Fire, on the other hand, quickly jumped the Right Hand North Fork of the Salmon River.

From the start, these two fires were very different fires, and by the next day the Wallow Fire had grown to 2,600 acres, nearly twice the size of the Island Fire after only six days.

The Wallow Fire was making uphill runs aided by short-range spotting and group torching as it headed east towards the PCT. Crews began preparing the PCT as the eastern containment line and preparing for planned aerial and hand ignitions. The Wallow Fire was now the focus of suppression efforts due to potential impacts to private industrial timberland above Scott Valley. Meanwhile, the Island Fire was 60% contained, unstaffed, and still only 1,473 acres.

Hand and aerial ignition began on August 19 and continued until August 21. Crews burned from the PCT near the headwaters of Shelly and Timothy Gulch. The ignition of backburns on the Wallow Fire coincided with increased fire activity and less favorable
fire weather conditions. It is likely that backburning compounded those effects. Fire crews lit a large, backing fire that increased fire size to 3,843 acres, creating a big crescent of fire at the north-east perimeter. The idea was to starve the Wallow Fire of fuel by burning from the PCT into the North Fork of the Salmon River. The Wallow Fire had already naturally burned to the PCT at Shotgun Gulch and crews were in full suppression mode, working to keep the fire west of the PCT and in the Salmon River watershed.

Meanwhile, the Island Fire had spotted to the west, near the confluence of Abbott Creek, but was still in a confinement strategy, allowing the fire to burn itself out in the rocky, fuel limited terrain at the headwaters of the North Fork.

By August 21, thunderstorms again rolled through the region and the winds shifted, sending the Wallow Fire east. Driven by wind and unstable atmospheric conditions, spot fires became established east of the PCT in the Shelly Fork, Babs Fork and Glendenning Fork of Kidder Creek above the Scott Valley. The fire had pushed into the State Responsibility Area, triggering a unified command structure with CALFIRE and USFS managing the fire together. Ground resources began working on the spot fires, but aerial resources were limited due to smoke conditions and visibility concerns. The Wallow Fire was now 6,917 acres and growing, while the Island Fire was in the process of burning itself out.

Bulldozers and CalFire suppression crews began constructing fire line northeast of the fire perimeter and opening old roads in Kidder Creek for access.

On August 22, fire severity increased as a heavy smoke inversion lifted, temperatures increased and winds pushed fire through the steep canyons. Fire crews began bulldozing contingency lines east of the fire to protect the community of Scott Valley and private timberlands. The Wallow Fire was now over 10,000 acres and actively spreading to the southwest.

Strong southwest winds, high temperatures, and low relative humidity increased fire activity on August 27, pushing the fire east of containment lines on the PCT once again. Spot fires became established in Etna Mill Creek, a few miles north of Etna Summit. Eleven helicopters dropped water buckets and retardant in Etna Mill Creek, the Municipal Watershed and source of drinking water for the Massive dozerlines were being constructed on the ridges above

Fire effects in Etna Mill Creek, the municipal watershed for Etna, California.
Kidder Creek, Patterson Creek, Whisky Creek and near Whisky Butte. Another massive contingency line called the Kidder Contingency Line was built from Kidder Creek to Etna Mill Creek west of the Scott Valley. Structural protection was initiated in adjacent communities in Scott Valley. The Wallow Fire was now 14,225 acres and 19% contained.

Fire behavior increased on August 29, burning nearly 3,000 acres and bringing the total to over 18,325 acres. The spot fire in Babs Fork merged with the main body of the fire and dropped into Patterson Creek. Twelve helicopters and five air tankers dropped retardant in Etna Mill Creek and along Sawyers Bar Road, painting the forests a thick rusty red color and potentially impacting the water supply of Etna, California.

While the Wallow Fire burned with intensity, making mixed-severity runs, spotting ahead and rolling out past established firelines, the Island Fire was reported to be 1,692 acres and 60% contained with “very little heat detected.”

With low relative humidity, high temperatures and strong northeast winds, the fire spread over 12,000 acres, burning to the southwest through the Little North Fork of the Salmon River around English Peak, and west to Crapo Mountain and Chimney Rock. By the morning of September 1, the Wallow Fire was 30,556 acres and had surrounded the smoldering Island Fire.

It is possible that the Island Fire slowed fire spread in the North Fork drainage, moderating fire severity, while much of the Little North Fork burned at relatively high severity, in a major weather, plume and wind-driven run. The Wallow Fire ripped through the 2006 Uncles and 2008 Ukonom Fire footprints. The fire was spotting up to 2 miles ahead and had created roughly 40 spot fires west of the fire perimeter. While this massive western run unfolded, the eastern perimeter held steady with little fire growth. At this point, the Wallow Fire had essentially become the entire Salmon August Complex swallowing the Island Fire and burning through the Little North Fork to the edge of the 2013 Salmon Complex and 2014 Whites Fire footprints.

For a few days smoke and visibility conditions precluded aerial resources and IR flights, making accurate fire estimates impossible. By September 3, 48,471 acres had burned and the Little North Fork had sustained significant stand replacing fire. The 40 spot fires had mostly merge, contributing to fire growth. Evacuation orders were issued from Etna Summit to Sawyers Bar and Nordheimer Flat and structural protection implemented.
The Salmon August Fire was 10% contained and a Red Flag Warning for high northeastern winds and low relative humidity was issued on the evening of September 3. A large smoke plume had developed at the headwaters of Crapo Creek, breaking through a thick inversion layer. Fire managers were concerned that the fire could burn down the Salmon River to Sawyers Bar or Forks of the Salmon in a large western push, much like it had the week before. The only problem with this prediction was the 2013 and 2014 fire footprints sitting directly between the Salmon August Fire and the nearby Salmon River communities.

September 3 and 4 were very active, especially in areas south of Yellow Dog Peak, Upper Crapo Creek, west of Bear Wallow Peak and west of Whisky Butte above the Scott Valley. 20-25 MPH winds were reported at Etna Summit and especially affected portions of the fire burning on high ridges. Long-range spotting and roll out continued to facilitate significant fire spread, but the 2013 Salmon Complex Fire and 2014 Whites Fire footprints refused to burn and were acting as natural barriers to the Salmon August Fire.

Heavy smoke was inhibiting aerial support and evening IR flights, making growth difficult to track, but the predicted western run did not occur. Forks of Salmon, Findley Camp, Crapo and the Sawyers Bar communities remained relatively far from the fire’s edge. Recent fire footprints held, but the fire continued growing into the less recent 2006 Uncles and 2008 Ukonom Fires.

As abruptly as “the big western run” began, it stopped as the weather shifted. With a little rain and a significant increase in relative humidity, the raging fire smoldered itself out in the dense forests and montane chaparral at the headwaters of Crapo, Morehouse and Steinacher Creek. On the evening of September 5, with the fire now at 63,743 acres and only 14% contained, tropical moisture moved into the fire area bringing scattered showers and lightning. After numerous days of pyrocumulous development, no columns were documented on September 5 and fire behavior had significantly moderated.
By September 7, under a red flag warning with strong easterly winds, smoke inversions had finally lifted enough to bring in aerial support. The fire was now 65,193 acres and fire managers brought in a Very Large Airtanker (VLAT) capable of carrying and dropping up to 19,600 gallons of fire retardant per load. Over 100,000 gallons of retardant were dumped into the Whisky Butte area “reinforcing” containment lines on the eastern margin of the fire. Retardant was also dumped into the Etna Mill Creek Municipal Watershed for Etna, California. With fire officials dumping huge volumes of retardant and calling in four National Guard crews, rain fell across the fire area, cooling the flames, slowing fire spread and washing the recently applied fire retardant into the surrounding landscape, rendering it useless.

On September 8, temperatures remained cool and fire spread was minimal on the Wallow Fire. The Deep Fire was also reported in extremely remote and steep terrain within the Marble Mountains Wilderness, apparently after smoldering since the thunderstorm three days earlier. The Deep Fire was estimated at 150 acres and was included in the Salmon August Complex. Five helicopters, plus four additional Blackhawk helicopters were used to dump water and retardant on both the Wallow and Deep Fires.

Crews began preparing fireline around the Deep Fire, tying into natural barriers and Canyon Creek Road to protect upcoming timber sale projects and high use recreation areas.

Over the course of the next five days the Salmon August Fire grew only minimally. By September 12, the main body of the fire showed very little heat and only small sections of the fire smoldered and smoked internally.

With continued cooperation from the weather, crews began suppression repair and on September 16, began removing hose from the State Responsibility Area above Scott Valley. With private timberland no longer threatened CALFIRE began removing resources. The Wallow Fire was 65,800 acres and only 32% contained, but smoldering out within its large perimeter.

On September 19 crews removed 30,000 feet of hose from the eastern perimeter adjacent to private timberland. A light rain fell over the fire area and that evening snow fell in the high country, extinguishing the remaining hotspots. On September 25, although only 75% contained, the Klamath National Forest lifted the fire closure. The Deep Fire was out at 217 acres and the Wallow Fire was mostly out at 65,323 acres.

In the end, fire suppression activities had little influence on the spread of the Salmon August Fire. Much of the fire mosaic and fire spread was predicated by a series of complex interactions between local fire weather and recent fire footprints. Changing weather conditions were most responsible for extinguishing the Salmon August Fire, not suppression actions, dozerlines or backburns.
Fire Severity & Mosaic

Weather was the single largest driver of fire severity in the Salmon August Fire. When the wind and the rugged canyons came into alignment, fire severity and spread responded, creating some large mortality patches and hot re-burns in previous fire footprints. Much of the mosaic was influenced by “the big western run,” a single, continuous, eight-day run to the west. This run funneled wind and fire up the Little North Fork of the Salmon River and into the area around English Peak and Chimney Rock. Numerous pyrocumulus plumes developed in this area further influencing fire severity.

The Salmon August Fire burned for 110 continuous days, the vast majority of those days sustained mostly low and moderate-severity fire effects. In eight days, between August 29 and September 5, 2017 the fire burned 46,668 acres, or 70% of the fire area. It was in these eight days that the majority of stand-replacing fire took place. It is also in these eight days, that the Salmon August Fire left its most lasting impact.

### Salmon August Fire Severity

- **Low**: 60%
- **Moderate**: 25%
- **High**: 15%

In all, 60% of the fire was unburned or burned at low or very low severity, including large portions of the North Fork of the Salmon River. Typical of burn patterns in the Klamath Mountains, burn severity was lowest in canyon bottoms, on very rocky substrates, and on north-facing slopes. In many canyon bottoms throughout the fire area, old-growth forests burned in the understory, maintaining canopy conditions and late-seral habitat characteristics.

An additional 25% burned at moderate severity and 15% burned at high severity. Moderate and high-severity effects were most commonly associated with the upper third of south-facing slopes in montane chapparal, knobcone pine, and white fir plant communities. Despite significant wind-driven runs for eight continuous days, the fire burned within the range of variability for a mixed-severity fire in the Klamath Mountains.
On the hot side of that range, the Salmon August Fire was heavily influenced by the large, wind-driven western run and steeply dissected topography. When the terrain and the weather came into alignment, the fire responded with significant uphill runs. On August 29, when the big western run began, the fire was 18,325 acres and had been burning in the Marble Mountains for over 60 days. By September 5, the fire had burned 63,743 acres. The Little North Fork had been largely burned with the fire being pushed up the canyon under high winds and low relative humidity, creating some large mortality patches.

On September 5, as tropical moisture poured into the area and scattered showers fell across the fire area, the fire died down, the big western run was over, and the fire began smoldering itself out in the brushfields at the headwaters of Crapo, Morehouse, and Steinacher Creek, as well as the rocky slopes on the Scott-Salmon Divide. For all practical purposes the fire was out and very little fire growth occurred after September 5.

Although portions of the fire burned at high severity, the general mosaic of burning followed characteristic patterns for the Klamath-Siskiyou Mountains with weather, terrain and existing vegetation all influencing fire severity. Those portions of the landscape more adapted to high-severity fire tended to sustain higher severity effects, while habitats adapted to low-severity fire supported more understory fire.

Also in characteristic manner, numerous significant fire refugia within the fire area were spared, as unburned islands within the fire area. These areas were protected by rocky outcrops and/or cool, moist habitat conditions that slowed or halted fire spread. According to Martin and Sapsis (1992) the incredible conifer diversity in the Klamath Mountains is partially sustained by the region’s highly variable fire regime. Often the diversified conifer stands and high mountain relicts are associated with significant fire refugia.

**Devils Canyon Colosuss**

In Devil’s Canyon, at the southwestern portion of the fire area is the world’s largest incense-cedar (*Calocedrus decurrens*), known as the Devil’s Canyon Colossus. The Devil’s Canyon Colosuss is 12’4” DBH and 165’ tall. The tree grows from an alder glade at the headwaters of Devil’s Canyon, a tributary of Little North Fork. The moist alder glades act as an effective fire refugia. Given the tree’s significant size and age, it is clear that many fires have burned in the area. It is also clear that high-severity fire effects have not influenced this portion of the canyon for hundreds and hundreds of years. The cool, moist habitat was an unburned island within the Salmon August Fire, protecting the world’s largest incense-cedar from mortality. The moist alder glades dampened and extinguished the fire.
Brewer’s Spruce

In many locations, high on the rocky ridges, clinging to north and east-facing slopes, grow populations of the endemic Brewer’s spruce (*Picea breweriana*). The Brewer’s spruce is poorly adapted to fire, with generally low resistance to fire effects. It is an “avoider” species that depends on cool, moist, and rocky microclimates to dampen or exclude the influence of fire for long periods of time. Brewer’s spruce often colonizes north-facing slopes with a low-frequency fire return interval. Brewer’s spruce is often located in areas that hold snow and maintain high levels of fuel moisture, late into the summer months. These stands are often directly adjacent to hot, dry, south-facing slopes and plant communities adapted to relatively frequent, high-severity fire effects, such as montane chaparral and knobcone pine. The abrupt transition from hot, dry to cool, moist habitat conditions is part of the highly variable fire regime and is indicative of diversified conifer forests in the Klamath Mountains.

Significant populations of Brewer’s spruce survived the Salmon August Fire protected by the rocky, moist habitats they tend to populate.

Subalpine Fir

Near Shelley Meadows, at the northeast portion of the fire area, grows one of only ten populations of subalpine fir (*Abies lasiocarpa*) in the Klamath-Siskiyou Mountains. Although common in cool, moist habitats from Central Oregon to the Yukon, this is one of California’s rarest conifer species. It is also a fire sensitive species. Subalpine thrives in locations that avoid fire with late-season snowbanks and high levels of fuel moisture into the summer months. Subalpine fir have very thin bark and generally grow with low canopies and low limbs, creating significant ladder fuels. When they do burn, they tend to sustain high levels of mortality.

The small population between Shelly Lake and Shelly Meadows grows mostly within wet meadows that did not burn in the Salmon August Fire. Although fire surrounded the
meadow system, including high-severity, stand-replacing fire, the wet meadows provided a fire-free environment and no subalpine fir sustained mortality during the fire. The population remains viable and could even potentially expand into newly opened habitats at the meadow’s margins.

Pacific Silver Fir

At the northwest perimeter of the fire, in the area between Diamond and Hancock Lake, grows the southernmost stand of Pacific silver fir (*Abies amabilis*). These are trees of the north, adapted to cool, moist habitats and very sensitive to fire. The majority of Pacific silver fir populations throughout its range, have very long fire return intervals. The tree’s thin bark provides little insulation from sustained heat and trees are easily killed by fire.

Although Pacific silver fir is very sensitive to fire, it also grows in highly effective fire refugia. The southernmost population exists within a cool, moist island of forest surrounded by rocky cliffs and ledges. Populations of mountain hemlock, red fir and Pacific silver fir grow in dense, mature groves embedded within rock outcrops, wet meadows and small lakes. Numerous recent fires have burned to the edge of this stand, but have yet to penetrate the rocky kingdom in which this population exists. The Salmon August Fire burned all the way around the population, demonstrating the effectiveness of the fire refugia in which the Pacific silver fir live and persist.

Pacific silver fir and many of our other fire sensitive species such as subalpine fir and Brewer's spruce have developed an avoidance strategy, clinging to the very habitats fire cannot penetrate. They do not develop thick, insulating bark or high, fire resilient canopies; they do not thrive in the face of fire like knobcone pine, lodgepole pine or montane chaparral, instead they avoid fire by exploiting cool, moist and rocky, high mountain habitats. The effects of a given fire can be judged on how well the most fire sensitive species persist in the post-fire environment. In the case of the Salmon August Fire, significant viable populations of subalpine fir, Brewer's spruce and Pacific silver fir survived the fire, avoiding the flames in their rugged mountain haunts. Clinging to the
rocky, north-facing slopes where fire struggles to burn, our ancient relict conifer species seem to be doing just fine.

**Impact of Past Forest Management on Fire Behavior**

The Salmon August Fire burned predominantly within the Marble Mountains Wilderness and the surrounding Inventoried Roadless Areas; the impact of past forest management on fire behavior was negligible. Road building and commercial timber extraction have largely not occurred within the Salmon August Fire area. The main impacts to the area are cattle grazing and discretionary fire suppression.

The steep, rugged and highly inaccessible terrain, along with the high occurrence of lightening has always generated a relatively active fire regime and significant resistance to control in this portion of the Klamath Mountains. Nonetheless, many locations have missed numerous fire cycles due to fire suppression. The increase in fuel loading and vegetation density due to fire suppression has likely been significant in some locations and insignificant in others. The effect of fire suppression on vegetation has been evident, but less pronounced than in many other regions.

Compared to many other portions of the West, fire suppression has had limited success in this portion of the Klamath Mountains. Although it has surely limited the frequency and extent of wildfire over the years, fire footprints abound on this landscape and numerous portions have burned multiple times in the last 30 years.

The lack of logging within most of the Salmon August Fire footprint has also contributed to fire resilience by maintaining old forests and diverse canopy structures. The retention of closed-canopy, old-growth forest has reduced understory fuel development by shading out woody understory species. Large, old trees are also the most fire-resistant vegetation on the landscape.

Additionally, most of the Salmon August Fire area did not contain highly flammable plantation stands embedded within otherwise resilient forest habitats. It is likely that forest density has increased from historic times, but forest mosaics, fuel conditions, and fire resilience have been less altered in the Marble Mountain Wilderness than the vast majority of the surrounding landscape.

It is likely that the environments most affected by fire suppression and densification are dry meadows, ridgelines and low-elevation forests that have filled in with trees due to fire suppression. Although vegetative conditions have suffered somewhat from fire suppression, weather nearly always overrode fuel in the Salmon August Fire.

Cattle grazing, especially historic cattle grazing, may have reduced the bunchgrasses that once carried fire throughout the landscape. This favored the development of woody vegetation in some formerly dry upland meadows and compounded the effect of fire suppression on forest encroachment. Despite these impacts, it appears that neither historic
or contemporary cattle grazing significantly influenced fire behavior in the Salmon August Fire.

Although the fire was likely not affected by cattle grazing, the behavior of grazing cattle was heavily influenced by the fire. Cattle were never removed from grazing allotments during the fire and they likely survived the fire by staying in wet meadow habitats that would not burn. Due to the fire, cattle were concentrated in unburned areas during much of the summer season. The fire also eliminated forage in much of the dry meadow habitat surrounding Shelley Meadows and Timothy Gulch. This further forced cattle to congregate in the riparian areas and wetlands, damaging water quality, wetland and meadow plant communities, and riparian values.

The influence of past forest management on the Salmon August Fire was very limited. Fire behavior and subsequent fire severity in the Salmon August Fire was largely predicated by weather and terrain. The vast majority of the fire area and stand replacing fire effects occurred during the big western run, an eight-day, terrain, plume and wind-driven run.

**Fire Suppression Impacts**

**Fireline Creation**

Due to the remote location, rugged terrain, wind-driven fire conditions and sudden natural change in weather that extinguished the fire, large sections of the fire burned out on their own, without firelines or fire suppression efforts halting the fire’s spread. This is especially true on the inaccessible northern and western margins of the fire, where virtually no fireline was built and the fire extinguished itself.

Significant portions of fireline were created on the southern margin of the fire above the community of Sawyers Bar, including a long, dozer line on Yellow Jacket Ridge above Forks of Salmon and the North Fork of the Salmon River. This dozer line has been utilized and reopened in numerous relatively recent wildfire events as fireline or contingency line.

Fire crews also built short sections of handline and dozerline in the area around Tanner Peak in the Snoozer 1 Inventoried Roadless Area. These firelines were built, but never utilized as the natural fire was controlled by a combination of favorable weather and the 2014 Whites Fire footprint above the...
community of Sawyers Bar. The Salmon August Fire never came closer than 1.5 miles to these firelines and they provided no benefit to fire containment.

Another large section of handline was built on Snoozer Ridge in the Snoozer Inventoried Roadless Area adjacent to the Marble Mountains Wilderness. This section of fire line was utilized as direct containment line, halting the fire’s spread over Snoozer Ridge to North Russian Creek. The line was tied into the North Fork of the Salmon River Trail between Mule Bridge and The Cedars.

The vast majority of fireline built to contain the Salmon August Fire was associated with the eastern fire perimeter and the vast private timberlands above the Scott Valley and adjacent to the Marble Mountains Wilderness. CalFire crews were instrumental in building this unfortunate series of dozerlines. CalFire crews also built fireline through private timberland and into the Babs Fork Inventoried Roadless Area on the east side of the Marble Mountains.

An estimated 30 miles of dozerline were built on the eastern margin of the fire between Mill Creek and Kidder Creek. This includes the Kidder Contingency dozerline built to protect the community of Etna and residences in the Scott Valley. The dozerline was built on private land adjacent to the valley floor, as a contingency line. The Kidder Contingency line was never used for containment and remained at least 2.5 miles from the actual fire perimeter.

Other dozerlines built on the fire’s eastern perimeter include a series of dozerlines built on either side of Patterson Creek up steep, rocky ridges to nearly the Wilderness Boundary. In numerous situations dozerline was built into the Snoozer 2 Inventoried Roadless Area near Whisky Butte, as well as the headwaters of Patterson Creek and Bab’s Fork in the Bab’s Fork Roadless Area.

Yet another dozerline appears to have been built in the riparian area adjacent to Bab’s Fork. This fireline extends from private timberland to the National Forest boundary.

Significant damage was done to tributary streams of the Scott River from dozerline creation, especially in Kidder Creek where dozerline was built along streams and in mid-slope positions that tend to generate more turbidity. Dozerlines were also punched into the Roadless and Wilderness landscape, impacting wildland values and intact native plant communities.

**Backburning**

The Klamath National Forest Letter of Delegation documents signed by Forest Supervisor Grantham state very clearly, “Please track any tactical ignitions the team may implement. My expectation is that a map will be produced on a daily basis, showing the area of ignition, why it was necessary to ignite and the location of the main fire with respect to the ignition actions. This includes any and all ignition activity.” Despite this clear requirement of fire managers, no maps or information regarding the timing or
location of burnout operations were provided via Freedom of Information Act requests with the KNF.

We inquired with the Klamath National Forest regarding this matter, and to their credit, they responded with the information they did have and an admission that proper documentation was not kept during the 2017 fire season. KNF, Forest Supervisor Patricia Grantham, admitted that no records were kept to document the timing or location of burnout operations on the Salmon August Fire.

Supervisor Grantham also discovered that Type 3 teams working under the authority of the District Ranger have not been required to document backburning operations. Again, to Supervisor Grantham’s credit, she assured KFA: “I will put in place the expectation that this information is collected during Type 3 events in the future. As you know, it was an unusual year for us in the extensive use of Type 3 teams, so this is one of the learning pieces from 2017.” We strongly support this effort and hope to see all fire teams track their use of tactical firing and backburning operations. We also hope to see the KNF follow through with these recommendations.

Despite failing to track these records, review of InciWeb updates (https://inciweb.nwcg.gov/) and ICS 209 forms shows that significant backburning operations occurred on the Salmon August Fire. Much of the backburning took place on the northeastern portion of the fire along the PCT between August 19 and 21. Ignitions were conducted by hand with drip torches and with the aid of aerial support and Plastic Sphere Dispensers (PSD) between Shelly Meadows and the headwaters of Timothy Gulch. These backburns may have contributed to increased fire severity, but the general pattern in the area is mixed with mostly characteristic fire effects.

Fire suppression crews lit backing, mixed severity fires that burned downhill from the PCT, while the Wallow Fire made uphill runs from the steep canyons below. The mosaic contains complex patterns of fire severity.
Crews also conducted night burning operations on September 1 and 2, from Patterson Ridge to Bab’s Fork, burning along handline at mostly low severity.

Firing operations in the Salmon August Fire appear to have been conducted responsibly, but so little information is available that the true extent of backburning in the Salmon August Fire may never be known. More documentation of backburning operations should be required in future fires for both Type 2 and Type 3 Teams.

**Riparian Impacts**

In general, fire severity was minimal in riparian areas throughout the fire area. The majority of canyon-bottom forest burned at low to moderate severity. At the headwalls and upper third of the slope, fire effects included more high-severity runs that could trigger debris flows. To date, no significant turbidity has occurred in the fire area. Impacts to riparian areas and water quality from the Salmon August Fire have been minimal.

Impacts to riparian areas from discretionary fire suppression tactics, on the other hand, were severe in the Bab’s Fork of Kidder Creek, where fire crews built dozerline adjacent to the riparian area. The creation of this dozerline will surely increase surface erosion and turbidity. It may also create a long-term “legacy” sediment site adjacent to Bab’s Fork.

Crews also built fireline along Etna Mill Creek, snagging at least two miles of stream. At times, massive old trees were felled, both green or living trees and dead standing snags. Some of the living trees were “catfaced,” indicating they had survived many previous fires. The felling of these old trees will impact the abundance of standing snags and large wood recruitment in the stream for hundreds of years. This will in turn impact fisheries, water quality and pool ratios in Mill Creek.

**Fire Retardant Use**

Although the KNF does not adequately track the amount of retardant used and the cost of those applications, it is clear that huge volumes of fire retardant were used on the eastern perimeter of the Salmon August Fire, in an attempt to protect private timberlands from wildfire impacts. In many cases, fire retardant use was extreme with over 100,000 gallons of retardant dropped on September 7 near Whisky Butte. Large volumes were also dropped into Etna Mill Creek which is the municipal watershed for the town of Etna in Scott Valley. That afternoon rain fell across the fire area, washing away the retardant which was reapplied by fire crews the following day.

The cost of retardant use and the associated aerial resources to taxpayers was significant, with costs at times up to hundreds of thousands of dollars per hour for retardant use and delivery. In total, according to the Forest Service, $638,643 was spent on retardant throughout the fire period, yet this estimate does not include the cost of mixing, delivering and aerial application. It simply reflects the cost of buying fire retardant.
Likewise, based on FOIA information, fire retardant application in avoidance areas was not adequately tracked in the Salmon August Fire or other fires on the KNF in the 2017 fire season. Fire crews and Forest Aviation Officers failed to report retardant usage or misapplication in avoidance areas or ESA habitat. According to internal emails received through FOIA by KFA following the Salmon August Fire disclose:

“Because the fire retardant consultation is national, we have been directed to field recon anything that looks to be a drop in avoidance area and notify by reporting in the online tool.

From my experience... fire personnel are often not forthcoming with information on retardant drops, and that has not changed. For example, on our other big fire complex (Eclipse) on the KNF, they gave READs no information at all for weeks even after lead READs asked, and I reminded our forest aviation officer that they need to provide READs and me this info (because I was tasked with doing the online reporting). When I reminded our forest aviation officer to get me this information he just basically shined me on and said they were keeping it all to the ridges... kinda hard to believe, but that’s what he said about a month into the fires. When they finally did provide hand drawn maps to the lead READ, and disconnected tables with volumes, it looked as if no retardant was dropped in avoidance areas, so we did not enter any misapplications for the Eclipse Fire (which seems hard to believe). Fire personnel are often not forthcoming with misapplication information... as a READ and specialist, it feels like if you chase it long enough you might get some information... but is that the best use of our time?? Probably not. From my perspective, until fire personnel are pressured to do this reporting and understand that its required reporting for their action, things won’t change.”

We cannot agree more with this ethical, honest public employee. The locations, amounts, and cost of retardant use should be more accurately documented and available for public review. More regulation and tracking of retardant use is necessary on the KNF, especially given the large number of avoidance streams and ESA fisheries.

**Noxious Weeds**
The spread of noxious weeds is a concern in the Salmon August Fire area, as noxious weed spread into the fire area would be difficult to treat or control given the remote and extremely rugged terrain found in the Marble Mountain Wilderness. The BAER Report for the Salmon August Fire identified noxious weed spread as “likely to occur” with potentially “major” impacts and a “high” risk rating. The BAER Report recommends Noxious Weed Detection Surveys and concurrent hand pulling treatments conducted by either the Salmon River Restoration Council and/or the KNF Weed Program. KFA supports these activities.
Historic & Cultural Resources
The Salmon August Fire burned through numerous Native American cultural sites unknown to the general public. If damage was done to these important cultural resources while suppressing the Salmon August Fire, it is unknown to KFA. It is our hope that Resource Advisors (READS) from local tribes, along with fire officials and on-the-ground fire crews respected these cultural sites in their work and minimized or eliminated discretionary fire suppression impacts.

Following wildfires, exposure of mineral soil can bring cultural artifacts to the surface. Numerous incidental archeological sites were located while fighting the Salmon August Fire. There is concern for looting in some of these sites. The BAER Report recommends Cultural Resource Storm Patrol to reduce the potential for looting and protect the cultural resources disturbed or exposed by the Salmon August Fire. KFA supports Cultural Resource Storm Patrol to protect important cultural and archeological sites.

The Salmon August Fire also threatened numerous historic structures in the Marble Mountain Wilderness, dating back to the historic period. These include English Peak Lookout, Tom Taylor Cabin, and Ahgren Cabin. Despite having active fire in the area since late June, fire crews failed to protect these historic structures with protective wraps or other forms of physical fire protection, leaving them vulnerable to fire impacts. When the fire finally picked up during the big western run, the Salmon August Fire raced through the area leaving fire crews no time to prepare and creating extreme fire behavior that precluded an opportunity for structural protection measures.

Tom Taylor Cabin was burned to the ground in the Salmon August Fire during the big western run. Only a pile of rubble and the foundation stones remain. For many in the local community, loss of this cabin was devastating. Many memories have gone up in smoke and it seems that the situation could have possibly been avoided with some forethought and a little protective wrapping.

The English Peak Lookout was spared on its rocky perch as the fire passed by at low severity, leaving the tall, rocky summit unburned.

The Aghren Cabin at the headwaters of Crapo Creek was also spared because the fire failed to burn into the previous fire footprint and stopped a few hundred yards shy of the small log cabin.
Analysis of community protection measures

It is clear from the suppression actions taken during the Salmon August Fire that the main emphasis was the protection of private timberland. Huge expense and significant environmental damage was sustained during fire suppression actions to keep the Salmon August Fire out of private timberlands to the east. Fire managers pushed by CalFire dumped incredible volumes of fire retardant, built roughly 30 miles of damaging dozerline, and utilized significant fire resources to protect these private timberlands.

In general, few homes were directly threatened by the Salmon August Fire and the vast majority of the fire burned in remote portions of the Marble Mountain Wilderness. The massive Kidder Creek Contingency Line built by bulldozers adjacent to private residential land in the Scott Valley created environmental impacts and is likely to spread noxious weeds due to its location adjacent to agricultural lands. The fireline was never used and all active fire remained at least 2.5 miles to the west.

Dozerline was also created above the Salmon River on Yellow Jacket Ridge above the Salmon River, but much of the fireline was never used and the fire naturally extinguished itself 1-3 miles to the north.

In the North Fork of the Salmon River, the isolated community of Sawyers Bar and scattered homesteads continuing downstream to Forks of Salmon and along the mainstem of the Salmon River were perceived as threatened and even evacuated during the Salmon August Fire. Although at first glance these communities appeared very vulnerable to the Salmon August Fire, much of the community was protected by recent 2013 Salmon Complex and 2014 Whites Fire footprints, which refused to burn in the Salmon August Fire.

Although some local residents knew that the fire was unlikely to burn through the 2013 and 2014 fire footprints, significant time, money and resources were spent preparing structures from Etna Summit to Nordheimer Creek. Apparently fire managers believed the fire could burn through the 2013 and 2014 fire footprints. Local residents proved to be correct and the 2013 and 2014 fire footprints provided highly effective natural fuel brakes that halted the southern and western spread of the fire.

The Forest Service and CalFire should work with landowners in the Scott Valley to maintain the Kidder Creek Contingency Line with prescribed fire and thinning treatments. This will aid future fire suppression efforts adjacent to Etna, California. Federal and state fire managers should incentivize fuel treatments on private lands to protect communities from natural ignitions backing down from the mountains above. This is particularly important because the adjacent private timberland is likely to sustain heavy fuel loads and slash into the future.

The Forest Service should also work through the Western Klamath Restoration Partnership to maintain fuel brakes on Yellow Jacket Ridge. This fireline, although not utilized in the Salmon August Fire, has been utilized in multiple wildland fires to protect
Salmon River communities. If it was maintained with prescribed fire and nearby plantations were thinned, it could be utilized for fireline without the impact of recreating dozerline.

**Cost of suppression**

The total cost of suppression in the Salmon August Fire from August 11 to October 5, was $39,858,565. This total does not include expenses incurred for the first eighteen days of the Island Fire. Over $700,000 was spent each day fighting the Salmon August Fire. The single most expensive day of fire operations was September 21, long after the fire had stop growing. The expenses were associated with demobilization of the fire camp. Over 4.3 million dollars was spent on September 21, 2017 mostly in the line item “Facilities/Other.”

Fire managers spent tens of millions of dollars fighting the Salmon August Fire, which naturally put itself out on its northern, western and most of its southern perimeter. Most of this fire perimeter was not surrounded by firelines, but was managed under a confinement strategy by loose herding the fire into the wilderness and previous fire footprints. This strategy was chosen partially because of the remote, inaccessible terrain, the extreme fire behavior during the big western run, suddenly changing weather conditions that halted fire spread, and recent nearby fire footprints. Large portions of the fire perimeter were essentially not suppressed. The decision to leave remote portions of the fire, deep in the Marble Mountain Wilderness unstaffed likely saved many millions of dollars and did not compromise community fire protection in any way. It did so while reducing safety risks to wildland firefighters.

The eastern portion of the fire adjacent to private timberland was heavily suppressed and was also very expensive to taxpayers. Huge volumes of fire retardant were dropped on the eastern perimeter, roughly 30 miles of dozerline were created, backburning operations conducted and enormous human resources expended to keep the fire out of private timberland.

In total, nearly 40 million dollars were spent to suppress this wilderness fire. A large portion of this investment was provided by the public for the benefit of the private timber industry.

Significant sums of tax money will likely always be spent suppressing large fires that threaten communities. Each year, the Forest Service and CalFire spend more and more money suppressing large wildfires. It seems the more we suppress fire and the more we build in fire-prone areas, the more expensive and dangerous suppression becomes.

In remote wilderness locations such as the Marble Mountains, fire should be allowed to maintain a more natural role for the benefit of ecosystems and wildlife. In wilderness locations we should embrace the unique opportunity by restoring and maintaining the role of fire in the wilderness landscape.
In both the long-term and short-term, utilizing managed wildfire will reduce fire suppression costs while building fire resilience and providing important community protection by managing wildfire for resource benefit.

**Restorative Fire Management**

Restorative Fire Management (RFM) utilizes MIST tactics, wildland fire use, forest restoration principals and a realization that wildfire can be utilized for resource benefits if managed correctly. Restorative Fire Management seeks to restore the process of fire to as many acres as is responsible, necessary, safe and beneficial in each fire event.

Tactical firing conducted during suppression activities should be conducted with natural fire-generated patterns and mosaics in mind. Backfiring operations under adverse weather conditions or that include ignition from the bottom of steep slopes and facilitate large, high-severity runs should be avoided. Irresponsible backburning often creates unacceptable impacts to forest habitats, increased fire severity, and it threatens nearby communities.

The concept of “loose herding” is especially useful to fire managers interested in restoring fire-adapted habitats. A “confinement” strategy could also be useful in smaller roadless areas, in areas that are bound by major forest roads or prominent ridges, or in areas that border private land. These strategies can be used on a variety of scales based on the conditions and needs. Full suppression and direct attack could also be utilized under severe conditions, when communities are threatened or other considerations encourage minimizing acres burned.

Major forest roads, prominent ridges, and locations with a high probability of success and a low potential for impact should be utilized for fireline construction, protecting firefighter safety and environmental quality. In general, fires could be suppressed with direct attack if deemed necessary, or contained within a predefined area based on available resources, weather and land management objectives. Once a given fire outflanks direct attack and “goes big,” it should be managed largely with indirect line construction, utilizing features that bolster and facilitate successful containment while allowing fairly sizable areas to burn largely unimpeded inside containment lines.

Wildland fire use should be considered in fires burning in more remote backcountry locations, roadless areas, wilderness areas and other areas far from homes and communities. This would free up resources to facilitate the protection of homes and communities, while encouraging fire-adapted forest communities in backcountry areas and moderating the severity of future fires.

When wildfire events burn within proximity of homes or communities, proactive structural protection measures should be implemented well ahead of a fire threatening the community. Communication with communities and landowners about risks, home site defensible space needs, ingress and egress concerns and evacuation levels during a wildland fire are of specific importance and should be implemented “early and often.”
Fire management should focus on protecting communities and residences as well as providing for firefighter safety while incorporating the principals and objectives of forest restoration, fire restoration, and in many cases fuel reduction into a Restorative Fire Management Strategy. Prescribed fire and prescribed natural fire should be encouraged. Fire suppression needs to be balanced with the need for characteristic fire effects on a landscape scale. Agency firefighting personnel should steer fire away from areas and resources likely to be negatively impacted by fire and encourage areas that may benefit from fire to burn at characteristic fire severity levels. If these objectives were integrated into fire management, more homes could be saved and more fire could be restored to the landscape.

Conclusions

The KNF should consider utilizing wildfire for resource benefit and fuel reduction in the Marble Mountains Wilderness and throughout the Salmon River watershed. In remote portions of the wilderness, natural ignitions should be quickly assessed for potential fire use and classified as either suppression fires or should be monitored and allowed to burn under prescribed conditions. At the edge of the wilderness, fires could be suppressed using a loose herding strategy, if possible, confining the fire in the backcountry and encouraging a relatively natural fire regime. Crews could provide protection for nearby communities while allowing fire to play a positive role in more remote portions of the watershed. This approach was effectively utilized in much of the Salmon August and Island Fires.

MIST should be implemented in all firefighting operations and natural features or existing fire footprints should be used to contain fires when possible.

The Klamath National Forest, Land and Resource Management Plan supports these recommendations: “A primary objective of the Fuel Management Program is to allow fire to play its regulating role in the ecosystem. Prescribed fire and Prescribed Natural Fire (PNF) will be emphasized. PNF will be used in Wilderness, the larger LSRs and in Backcountry.” (Forest Plan Pages 3-18, 3-1). The Standards & Guidelines for Wilderness also state, “All lightning-started fires will be wildland fires managed for resource
benefits, unless the fire does not meet the goals and objectives (it then will be declared a wildfire). Permit lightning-caused fires to play their ecological role, as nearly as possible, within the wilderness.” (Forest Plan, 4-74). Standards & Guidelines also require the implementation of MIST in Wilderness Areas throughout the KNF.

The Marble Mountain Wilderness and the Mid-Klamath watershed provide a rare opportunity to utilize managed wildfire for resource benefit. The combination of large, inaccessible, wilderness and roadless landscapes, vast blocks of federal land, limited human populations, and an abundance of recent wildfires will allow fire managers more ability to utilize fire as a management tool in future ignitions.

Recent fire footprints are already beginning to positively influence fire behavior, fire size and fire severity in portions of the Mid-Klamath Watershed. Many recent fires including the Dillion Fire, Happy Camp Fire, Salmon August Fire, Abney Fire, and many others have utilized recent fire footprints for portions of their containment strategy. In many situations fires could be “loose herded” into the vast wildlands of the Mid-Klamath and the Marble Mountains Wilderness using recent fire footprints, natural barriers and low impact firelines for containment as firelines. Over time, this strategy will create highly fire-adapted landscapes, relatively low fuel loads, natural mosaics, patterns, and stand structures, and provide exceptional protection to nearby communities. It is not only the most feasible option in the rugged Marble Mountains Wilderness, but it is also the most appropriate given the natural values and amenities the area provides.

Wildland fire use is consistent with the values and management objectives of the Marble Mountain Wilderness. Utilizing wildland fire for resource benefit will only enhance the wilderness and wildland values of the region, while maintaining healthy, fire-adapted landscapes and plant communities. Wildfires have always, and will continue to burned in this rugged region; we simply cannot safely and effectively suppress them all, nor should we. The region and its forests were born in fire and maintained by its influence. If we are serious about restoring the important role of fire in the Klamath-Siskiyou Mountains, wildland fire use must be part of the equation, and places like the Marble Mountain Wilderness are the best habitat we have for semi-free ranging fire.

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A view east down the Little North Fork of the Salmon River from the summit of Chimney Rock and across the “big western run.”

A view down Pointers Gulch on the North Fork of the Salmon River following the Salmon August Complex.

Understory fire in the Timothy Gulch watershed at the headwaters of the North Fork Salmon River.
Endnotes:


13. Personal email from Klamath National Forest, Forest Supervisor, Patricia Grantham. 12/28/17

