The Eclipse Complex Fire burned over 100,000 acres in rugged and remote terrain around Happy Camp, California, in the Siskiyou Mountains, from July 25 to September 29, 2017. The Eclipse Complex included the Clear, Oak, Prescott, Buck and Young Fires, which eventually merged into one large conflagration known as the Oak Fire, the largest in the Eclipse Complex at 90,981 acres.

The Oak Fire, although surrounded by relatively recent fire footprints, began burning in watersheds with no recorded fire history since record keeping began in 1900. The fire burned in and around the Siskiyou Wilderness Area on both Klamath National Forest and Six Rivers National Forest land. Much of the Oak Fire was “loose herded” into either designated Wilderness or Inventoried Roadless Area in the Clear Creek and South Fork of the Smith River watersheds. On September 29, when the fire area was opened to the public, the fire had smoldered itself out at 55% contained, rather than being suppressed by firefighting crews.

Two smaller fires far to the east also ended up being managed as part of the Eclipse Complex. These fires included the Cedar Fire burning on Thompson Creek, in the Kangaroo Inventoried Roadless Area, and the Klamath National Forest’s portion of the Abney Fire, above Seiad Valley. This report will cover the Clear, Prescott, Oak, Young, Buck and Cedar Fires. Information regarding the Abney Fire will be included in the Miller Complex Fire Report published by Klamath Forest Alliance and Applegate Neighborhood Network.
The Oak Fire began on July 25, 2017 as a lightning ignition in the South Fork of Clear Creek. The fire began in steep, rugged terrain seven miles southwest of Happy Camp, California and was originally called the Clear Fire.

By July 29, the fire had grown to 1,900 acres and was burning west towards the Siskiyou Wilderness Area. By August 1, the fire had continued to grow significantly, reaching 3,250 acres. Amongst record-breaking heat and lifting inversion layers — aided by topographical alignment — fire behavior significantly increased. That afternoon, the Clear Fire made strong uphill runs from the South Fork of Clear Creek towards Elbow Springs, sending spot fires over the western containment line into the Swillup Creek and Dillion Creek watersheds.

Meanwhile the fire was slowly backing towards the residential area at the mouth of Clear Creek along Highway 96.

In an effort to strengthen the northern and western containment lines, crews began backburning on August 3. Dozers also reopened firelines to the south and firing operations began simultaneously. By August 4, the northern perimeter was holding on the 15N39 road and was in mop-up and patrol status. The Clear Fire had reached 4,495 acres and was now 25% contained. Fire behavior was reported as “moderate” and containment of the fire seemed imminently possible.

On August 6, after three days of strategic firing operations, containment was raised to 35%. The next day, dozers created fireline from Elbow Springs to the boundary of the 2016 Pony Fire on the divide between Swillup and Dillion Creek. By August 8, the Clear Fire was 6,400 acres and 47% contained. Suppression repair activities were beginning on the northern perimeter. Crews began working on a “final” piece of fireline in the Swillup drainage and it seemed the Clear Fire might soon be fully lined and secured. That afternoon winds from a nearby thunder cell sent spot fires over the southern containment line, but they were quickly contained.

The same thunder cell lit numerous fires in the mountains around Happy Camp, including the Prescott Fire deep in the Siskiyou Wilderness, as well as the Cedar Fire, Fourmile Fire, and East Fire in Thompson Creek, east of Happy Camp.

The Prescott Fire was unstaffed due to its remote location at the heart Siskiyou Wilderness Area and an acute lack of resources. The Prescott Fire was burning in steep, heavily forested terrain with absolutely no access, no safety zones and no escape routes.
The location of the fire presented significant safety risks to firefighting personnel, therefore, an indirect approach was taken to suppress the wilderness blaze.

The fire was burning in country with no recorded fire history since 1900, and in abundant fuels; however, it backed down the slope at relatively low severity under favorable weather conditions into the old-growth forests on the West Fork of Clear Creek. The fire backed down from some of the Siskiyou Wilderness Area’s most inaccessible backcountry near Prescott Peak into the Clear Creek drainage. Crews monitored the fire’s growth as it spread into the West Fork of Clear Creek, but had very little opportunity, or need, to suppress this remote, wilderness fire. The Prescott Fire was burning far from any homes or communities and at mostly low to moderate severity. Given the acute need for resources, fire managers had no choice but to “loose-herd” the fire into the Wilderness and focus their energy on more immediate community protection needs.

By August 10, the Clear Fire was 6,503 acres and 60% contained, but the complexity of the situation had significantly multiplied with the ignition of multiple new wilderness fires.

On August 11, the Prescott, Cedar, and Clear Fires were combined under one incident command structure, creating the Eclipse Complex. On that same day, lightning storms moved through the area and lit the Oak Fire on Oak Flat Creek. The Oak Fire began in steep terrain five miles west of Happy Camp in a watershed with no recorded fire history.

The Clear Fire was mostly contained, but crews and equipment began shifting towards the Cedar and Oak Fires. By August 15, the Oak Fire was 200 acres and 0% contained. A heavy inversion blanketed the fire and crews reported fire behavior as moderate. Handline and hoselay on the east side of the Oak Fire were expected to be complete by that afternoon and fire crews hoped to hold the fire in the Oak Flat Creek drainage.

On August 16, the Oak Fire began to burn more aggressively, making short runs that produced long-range spotting. The Oak Fire was 665 acres but growing quickly. Crews worked to protect the Baldy Mountain Lookout by conducting burnout operations. The burnout operations quickly went bad when crews lit strip-head fires that became aligned with a strong east wind. The fire made a hard crown
run through dense forest and spotted across the control line. Due to pretreatment with water and retardant the spot fires were easily contained, but the firing operation now burned at high severity below Baldy Mountain Lookout at the headwaters of Oak Flat Creek, creating one of the largest high-severity, stand-replacing fire patches in the Eclipse Complex Fire.

The next day hot, dry, windy conditions continued and two spot fires from the Prescott Fire jumped Clear Creek. These fires began burning uphill towards Cedar Crest deep in the Siskiyou Wilderness Area.

By August 18, the Prescott Fire expanded from 3,036 acres to 7,850 acres. The Prescott Fire was heading northeast up Clear Creek, while the Oak Fire was also burning actively near Baldy Mountain Ridge and Five Mile Creek. The Oak Fire was now 2,260 acres and 0% contained.

On August 19, the southern flank of the Oak Fire was backing moderately into Highway 96 downstream from Happy Camp. At its northern perimeter, the fire was moving more quickly and the Oak Fire burned over Baldy Mountain Ridge into Five Mile Creek. That evening the fire created six major spot fires, some up to one mile south and west, from the main body of the fire. A few of these spot fires crossed Fivemile Creek and began burning uphill toward the Five and Ten Divide.

The fire also spotted east over a ridgetop dozerline near Happy Camp, into Benjamin Creek. The fire was now established above residences at the western edge of Happy Camp. This triggered an evacuation warning for southwest Happy Camp and crews utilized road 17N16 to hold the fire west of Happy Camp.

The fires, especially the Prescott Fire continued to burn aggressively, in rugged terrain under active fire weather. By August 20, the Prescott Fire had burned 16,850 acres and was growing quickly due to roll-out, torching, spotting and the occasional uphill runs. It had also spotted into the headwaters of Dillion Creek where the fire was now well established.

Also on August 20, a new fire was reported at the northern edge of the Siskiyou Wilderness Area in the Siskiyou Fork of the Smith River. The fire was a “holdover” fire that was lit in the same August 11, thunderstorm that lit the Oak Fire. The Young Fire
had likely smoldered unnoticed in the smoky haze until building steam and backing down into the headwaters of the Siskiyou Fork of the Smith River near Twin Peaks.

The Eclipse Complex Fire on August 20, 2017 including the newly established Young Fire at the northwest portion of the Siskiyou Wilderness Area.

Between August 20 and 23, crews worked to contain the southeastern perimeter of the fire near Happy Camp and brought the fire down to highway 96 with tactical firing. On August 23, the Oak Fire spotted across the Prescott Fork of the Smith River, near Jedediah Mountain and continued moving west.

On August 24, the Oak Fire spotted across the ridgetop dozerline west of Happy Camp, threatening the town for the second time. Crews conducted successful strategic firing operations to keep the fire from crossing Highway 96 or moving further east towards Happy Camp.

The Oak Fire was now 40,500 acres and still only 19% contained. That afternoon the inversion began to lift and fire activity responded, sending ash ten miles from the Prescott Fire to downtown Happy Camp. The Oak Fire had stalled briefly on the northern bank of Clear Creek, but on August 24 it crossed Clear Creek and raced south up the No Man’s Creek watershed in a large, high-severity run. The Clear Fire, Oak Fire and Prescott Fires had now merged and became known simply as the Oak Fire. Shortly after the No Man’s Creek run, the fire settled into a heavy inversion moderating fire behavior and severity.

On August 25 crews lit backburns near the mouth of Clear Creek, starving the fire of fuel before it reached the residences below. The operation was successful and no structures were lost.
By August 28, the Oak Fire was 44,800 acres and the Young Fire, located in the northern Siskiyou Wilderness Area was added to the complex. In response, two incident command posts were established: one in Happy Camp and another in Gasquet, California on the Smith River. The Young Fire was backing into the Siskiyou Fork of the Smith River and into Doe Flat Creek in the Clear Creek watershed, roughly three miles northwest of the Oak Fire, which had burned upstream on Clear Creek to Wilderness Falls.

The Oak Fire continued backing into Highway 96 and crews completed firing operations on the slopover in Benjamin Creek above Happy Camp. For numerous days crews had worked to construct fireline around a spot fire near Benjamin Creek and finally reached containment.

Meanwhile, the Young Fire had burned into the Clear Creek watershed, backing at mostly low severity into the lush canyon bottom on Doe Creek. The Oak Fire moved steadily west towards the South Fork of the Smith River, reaching the stream by August 29. Crews began building line on Blue Ridge, west of the South fork, using hand crews and heavy equipment to prepare roads 16N18 and 16N02 as fireline.

On August 30, crews completed the massive Eclipse contingency line west of Happy Camp, using a combination of roads, dozerlines and handlines. This large fireline runs from Kelly Lake near the headwaters of Indian Creek to Happy Camp, a distance of roughly 16 miles.

On September 1, the Young Fire and Oak Fire merged; now only 25% contained, the fire was over 80,000 acres. On September 4, strong northeast winds sent a spot fire over the South Fork of the Smith River and the fire made several runs to Blue Ridge. By evening
crews were able to secure the fire at Blue Ridge on road 16N18. Southwest winds on September 5 aided crews in containment by pushing the fire back in on itself.

On September 6, crews lit backburns from Bear Basin Butte, south on road 16N02. Erratic winds and thunderstorm activity moved into the area, bringing wetting rains to the fire area and reducing fire spread to a crawl. Rains continued until September 8, dropping up to 0.5” of rain on portions of the fire area. The backburns never advanced into the main body of the fire that was now only smoldering in the interior.

Despite the rain, eleven new lightning starts were lit during the thunderstorms and seven were quickly contained. Three remained difficult to access, the most troublesome being the Little Buck Fire near Boulder Peak. By September 15, the Little Buck Fire was nearly 80 acres. Helicopters dropped water on the inaccessible fire and airtankers dropped retardant. The complex was now 98,203 acres and only 28% contained.

On September 16, the fuels had finally dried and the fire began moving again. The fire backed into Harrington Creek and the South Fork of the Smith River, aided by roll-out and short uphill runs.

On September 17, the fire became active and made a small run towards Blue Ridge but was easily contained. For the remainder of the month the fires barely moved and active portions of the fire sustained only low-severity fire effects, and in many places only one-foot flame lengths.

Between September 20 and 21, the Oak Fire along the Smith River received three inches of rain and the fires were, for all practical purposes, out, but only 31% officially contained. In many locations the Eclipse Fire never reached the prepared firelines built for containment; instead, the fire smoldered and burned itself out in the cool, moist marine layer. Due to higher levels of precipitation and relative humidity, the western portions of the fire were extinguished first. The interior portions smoldered until the fire was opened to the public on September 29 and suppression repair work began. The fire was never declared more than 55% contained.

**Fire Severity & Mosaic**

The Oak Fire was a grouping of fires burning in the Klamath National Forest and Six Rivers National Forest. Each fire was subjected to its own local weather patterns, unique topographical conditions, and vegetative patterns, which all influenced fire behavior. Eventually, numerous fires in and around the Siskiyou Wilderness merged, creating the Oak Fire. The Oak Fire burned for 66 days in the western Siskiyou Mountains. The western portion of the fire was influenced by a pronounced marine influence on the South Fork of the Smith River that moderated fire behavior. Eastern portions of the fire burned in hotter, drier conditions and subsequently sustained higher levels of fire severity during extreme weather events. The eastern portions of the fire also burned much later into the fall, smoldering in some places into October.
The Oak Fire burned at characteristic levels of fire severity, including 74% low severity, 18% moderate severity and 8% high severity. The fire effects in the Oak Fire created a diverse and highly beneficial fire mosaic with characteristic patterns of fire severity. The lower 2/3 of the canyons, north-facing slopes, and old-growth or late successional forest burned at predominantly low severity.

Low severity fire effects were also more prevalent on the western end of the fire in the Smith River watershed, where the marine influence significantly moderated fire severity, especially late in the fire season. The Clear Fire also burned at predominantly low severity between July 25-August 10, early in the fire season.

The severity of the fire was largely predicated by weather conditions, topography and slope position. When topography and weather came into alignment, fire behavior responded with increased fire severity, an increased rate of spread, and more stand-replacing fire effects.

The majority of the high and moderate severity fire burned between August 16 and September 6 in response to more active fire weather, including extreme heat, lifting inversion layers, high winds, and low overnight humidity recovery. High and moderate severity effects were concentrated on the upper third of the slope in montane chaparral, knobcone pine stands and high elevation white fir forests. The Oak Fire sustained large hot runs at the headwaters of Red Hill Creek and in the No Man Creek drainage where the fire made high-severity, weather- and terrain-driven runs.

The area around Baldy Mountain also sustained a fairly large concentration of high-severity fire effects. This portion of the fire was influenced by strong east winds and discretionary backburning operations.
At the same time, heavy atmospheric inversions moderated fire behavior throughout large portions of the fire area. Dense smoke inversions trapped humidity, decreased ambient air temperatures and reduced air movement, creating vast understory fires in Clear Creek, the South Fork of the Smith River, and at the headwaters of Dillion Creek. Periods of precipitation and high relative humidity also reduced fire behavior after September 6, 2017.

Although the region surrounding the Oak Fire has an abundance of recent, overlapping fire footprints, the Oak Fire mainly burned in adjacent unburned watersheds. The Clear Fire, for example, started in an unburned watershed virtually surrounded by recent fire footprints. Contrary to popular belief, long-unburned watersheds, like the South Fork and West Fork of Clear Creek, did not demonstrate elevated levels of fire severity; instead, they burned at predominantly low to moderate severity.

The Oak Fire began in Oak Flat Creek a watershed with no recent fire history. Although fire behavior and rate of spread in the long-unburned fuels were low to moderate, no fire footprints existed in the Oak Flat Creek watershed to halt the spread or slow its growth.

Directly west of Oak Flat Creek is the 1987 Ten Bald Fire footprint. The Oak Fire burned into the Ten Bald Fire footprint from the east out of the Oak Flat Creek watershed. The Oak Fire burned into Five Mile Creek and the Ten Bald Fire footprint in a patchy mosaic of low, moderate and large areas of unburned habitats. Thirty years after the Ten Bald Fire, the regrowth of fuels and deposition of fire-killed snags onto the forest floor still refused to carry a fire. The fire smoldered itself out before reaching Ten Mile Creek, leaving a large, unburned island at the fire’s northern perimeter. This unburned island is largely within the 1987 Ten Bald Fire, which the 2017 Oak Fire could not penetrate.

The fires also burned into numerous recent fire footprints in the Dillion Creek watershed. The upper portion of the Dillion Creek watershed has repeatedly burned, with fires in 1987, 1994, 1999, 2001, 2008, 2016 and now again in 2017. The fire burned at predominantly low severity at the headwaters of Dillion Creek through these overlapping fire footprints and fire adapted plant communities.
On the other hand, the No Man’s Creek drainage burned at high severity despite being located within the more recent 1994 Bear Fire footprint. The fire made strong uphill runs in No Man’s Creek with weather and terrain reaching alignment. The vast majority of No Man’s Creek was scorched at high and moderate severity and mortality is nearly complete throughout the entire watershed.

Much of the area burned in the Oak Fire contains intact native ecosystems, including old-growth forests, deciduous woodlands, serpentine woodlands, montane chaparral and highly diverse, enriched conifer stands at higher elevations in and around the Siskiyou Wilderness Area.

These enriched high elevation conifer stands often include fire sensitive species in highly pronounced fire refugia. The Oak Fire burned through the Bear Peak Botanical Area surrounding Bear Lake and Lower Bear Lake. The Botanical Area was designated to protect an isolated population of Alaska yellow-cedar (Callitropsis nootkatensis). The stand is one of the largest and most well developed in the Siskiyou Mountains and exists as an extension of its southern range.

**Bear Lake Botanical Area**

![Viable populations of Alaska yellow cedar survived the Oak Fire in the Bear Lake Botanical Area.](image)

The Bear Lake Alaska yellow-cedar grove is located in a cirque bowl below Bear Peak in the Siskiyou Wilderness Area. The multi-tiered cirque includes Bear Lake, Lower Bear Lake and a small seasonal pond. Rocky summits drop into the basin from the 5500’ ridgeline above. Fire sensitive species such as Brewer’s spruce and Alaska yellow-cedar colonize cool, moist locations and small pockets of soil, protected from fire by rock faces and bedrock slabs in the Bear Lake cirque basin.

Alaska yellow-cedar, at the southern end of its range, is particularly fire sensitive. They have very thin, flaky bark that provides little insulation against the heat of fire. The trees often grow in low-statured colonies, with foliage reaching to the ground. Cedar foliage is also quite flammable and easily scorched, even in low and moderate severity burns. In disjunct stands on the John Day River, even low-severity prescribed fires have been reported to create significant mortality in Alaska yellow-cedar stands.
At the southern extent of its range, Alaska yellow-cedar relies on effective micro-refugia to avoid the impact of wildfire. Fire frequency in the Klamath-Siskiyou Mountains is much higher than any other portion of Alaska yellow-cedar’s range, except perhaps John Day. The species has survived the test of time by finding habitats that are likely to remain largely unburned in wildfire events. The lack of fire and cool, moist habitat conditions mimics more northern conditions on the micro-site scale.

The Prescott Fire burned through the Bear Peak Botanical Area at mixed severity, including high, moderate and low severity fire effects. Some portions also remained entirely unburned. The fire appears to have burned in a series of uphill runs as the fire moved upstream along Little Bear Valley Creek. At the same time, the upper portions of Red Hill Creek burned just over the ridge in what was perhaps the Eclipse Complex Fire’s largest high-severity run. On August 15, the massive Red Hill Creek high-severity run poured over the western cirque walls, dropping to the shores of Bear Lake and into the Bear Peak Botanical Area.

The Alaska yellow-cedar populations are centered on Bear Lake and Lower Bear Lake, growing from rocky cirque walls and moist mountain terraces. The populations were known as particularly large and robust before the fire. Despite the discontinuous fuel beds, significant portions of the stand did burn, and given its minimal resistance to fire, those areas that did burn, sustained high levels of mortality. Other locations did not burn at all, and viable populations of Alaska yellow-cedar remain in the post-fire environment.

Another large population of Alaska yellow cedar grows in the headwall between Bear Lake and Bear Peak in the highest of the hanging valleys. This portion of the stand also contains large populations of a fire-sensitive endemic conifer known as Brewer’s spruce (Picea breweriana). The fire burned through this upper terrace, killing portions of the stand and leaving unburned, rockbound islands with viable populations of Alaska yellow cedar and Brewer’s spruce.

In some locations, the Oak Fire scorched off these dense fir stands, reducing competition and the likelihood of severe fires in the future. Fuel connectivity and competition is now extremely minimal, perhaps opening up opportunities for both Alaska yellow-cedar and Brewer’s spruce populations to thrive and reproduce.
Impact of Past Forest Management on Fire Behavior

The impact of past forest management on fire behavior in the Oak Fire was minimal. In fact, forest management, for the most part, has been minimal throughout large portions of the Oak Fire, especially in and around the Siskiyou Wilderness Area. The region contains intact habitat mosaics, abundant biological legacies and uniquely intact plant communities that encourage fire resilience.

The largest impact to plant communities throughout the fire area has been fire suppression. There is no doubt that fire frequency has been altered in the Eclipse Fire area due to aggressive fire suppression. In fact, a large portion of the Oak Fire burned in watersheds that had no recorded fire history since 1900. Yet, based on actual fire effects in the Oak Fire, the region experienced characteristic fire behavior and natural, weather-dominated fire effects. Many of the long-unburned areas sustained significant levels of low-severity fire despite over 100 years of fuel accumulation.

Fire Suppression Impacts

Fireline Creation
According to the Burned Area Emergency Response (BAER) Report for the Eclipse Complex Fire, 93.6 miles of fire suppression line was built as contingency and direct containment line. It is unknown how much suppression line was built specifically in the Oak Fire area. It is also unknown how much dozerline was created in the Oak Fire area, but Operation Maps show extensive dozerlines, especially on the eastern fire perimeter.

For example, an estimated 16 miles of dozerline were created in what fire managers called, the “Happy Camp Contingency” line. The vast majority of this dozerline was never used to suppress the Oak Fire, but was crudely built from Kelly Lake to Highway 96, west of the Indian Creek, as a highly damaging precautionary measure.

Another particularly egregious dozerline was built on the Kelsey National Recreation Trail adjacent to the Siskiyou Wilderness Area. The dozerline starts at the Elbow Springs Trailhead and continues west across the Kelsey Range, impacting the first two miles of the Kelsey National Recreation Trail. From the Elbow Springs Trailhead this dozerline quickly crosses the Kelsey Range.
National Recreation Trail, creating significant impacts to the area’s scenic character and intact plant communities. Shortly, the trail swings back to the ridge and the dozerline merges with the trail for roughly one-quarter mile. Virtually no suppression repair was conducted to restore tread to the Kelsey Trail. Currently no definable tread exists and it is difficult to follow the trail west towards Bear Lake. Dozers not only scrapped back topsoil, wildflowers, trees, shrubs and all forms of vegetation, badly damaging the recreational experience and natural habitats, but they also completely destroyed the trail.

The dozerline continues, leading to a large safety zone over 100’ wide. The safety zone was scraped into the slope with dozers, creating a massive landing where crews staged equipment. The soil is exposed, raw and compacted by heavy equipment use. Large waterbars have been scraped into the landing, and although they may reduce erosion, they also further impacted the natural topography and further compound the extensive scenic impacts to the Kelsey National Recreation Trail. Ironically, this particular dozerline did not hold and the Oak Fire burned into the headwaters of Dillion Creek despite the heavy impacts.

**Backburning**

Backburning and tactical firing operations on the Oak Fire appear to have been implemented throughout the fire area, but were most prominent on the south and eastern fire perimeter near Highway 96 and Happy Camp. Portions of the fire that burned deep in the wilderness were not subjected to discretionary backburning.

The most extensive backburning occurred along the eastern fireline between Oak Flat Creek and Happy Camp. Much of this burning took place between August 19 and 26 and was conducted responsibly with low-severity fire effects.

Crews also intentionally lit backburns below Baldy Mountain Lookout at the northeastern fire perimeter. This backburn was intended to contain the fire and protect the Baldy Mountain Lookout. Unfortunately, the backburning operation literally backfired when the wind shifted and a strong east wind came into alignment with the strip-head fires lit by suppression crews. The backburn made a crown run through dense forest and spotted across containment lines. Due to pretreatment with water and retardant the spot fires were easily contained and Baldy Mountain Lookout was spared, but the firing operation triggered one of the fire’s largest high-severity fire events at the headwaters of Oak Flat Creek.

Large portions of the southern fireline along Highway 96 were backburned from Clear Creek to Wingate Creek between August 24 and 25, protecting the residential properties along Highway 96. These fires burned at mostly low and moderate severity.

Finally, portions of the western fireline adjacent to road 16N02 on Blue Ridge were also backburned. Suppression crews also tried to backburn the headwaters of South Fork near Bear Basin Butte on September 6, but the fire failed to carry because of high humidity and precipitation.
Riparian Impacts

Riparian impacts associated with fire suppression activities were minimal. Firelines were not created along riparian areas, no streamside snagging occurred, and very little if any high or moderate-severity fire affected riparian areas in the Oak Fire.

Although fire suppression related impacts were minimal, it is currently unclear if fire retardant was applied within riparian avoidance areas during suppression operations.

Fire Retardent Use

Although the KNF does not adequately track the amount of retardant used and the cost of those applications, it is clear that retardant was utilized in a number of locations in the fire area, including the slopes near Baldy Mountain Lookout.

Fire retardant is toxic to aquatic life and can cause significant fish kills if applied to fish bearing streams. Hundreds of steelhead were killed in Clear Creek when crews misapplied fire retardant during the 1987 Ten Bald Fire by dropping retardant directly into the stream. Misapplication of fire retardant in avoidance areas is likely much more common that reported by suppression crews.

For example, little is known about fire retardant application in avoidance areas during the Eclipse Complex because Forest Service staff failed to adequately report application in avoidance areas as directed by national policy.

Based on FOIA information, fire retardant application in avoidance areas was not adequately tracked in the Eclipse Complex 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. Internal emails received through FOIA by KFA following the Eclipse Complex Fire disclosed the following:

“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 in the area.

Noxious Weeds
According to the Eclipse Fire Burned Area Emergency Response (BAER) Report published by the Klamath National Forest:

“Native plant communities on NFS lands where invasive or noxious weeds are absent or present in only minor amounts is a BAER critical value. Such areas are present in each of the fire areas, and in particular “pristine” areas in the Siskiyou Wilderness on Klamath and Six Rivers Forests. Despite being Wilderness, there was significant suppression traffic to wilderness trailhead and hand-lines constructed in wilderness. Most or all of this suppression traffic originated from fire camps that are highly-infested with every problem weed along the Klamath and Scott River corridors. Thus these areas that are not currently infested are threatened with new vectors of introduction, with large areas of bare mineral soil exposed for colonization. The probability of damage is likely with a consequence of major for Wilderness to moderate elsewhere; Risk is High to Very High.”

The BAER Report recommends monitoring and mitigation through treatment of new noxious weed infestations. Hand pulling is the recommended form of noxious weed treatment. Detection surveys will be implemented at appropriate seasonal times for detection of target noxious species. These surveys will be conducted in high priority areas along firelines, trails, and existing roads where invasion by noxious weeds is most probable. Newly documented populations will be treated and mapped in the National Resource Inventory System.

KFA supports these activities and encourages the agency to provide similar noxious weed treatment outside the Wilderness Area.

Historic/Cultural Resources
The Oak Fire likely burned through numerous Native American cultural sites unknown to the general public or perhaps even the Forest Service. If damage was done to these important cultural resources while suppressing the Oak Fire, it is unknown to KFA. It is our hope that Resource Advisors (READS) from local tribes were able to advise fire officials and on-the-ground fire crews, in order to maintain respect for these cultural sites in their work and minimize or eliminate discretionary fire suppression impacts.
According to the Eclipse Fire BAER Report, one prehistoric and historic site was exposed when fire consumed its protective cover (e.g. duff, leaf litter and vegetation). Given this site’s location the potential for looting is significant. Suppression repair crews have concealed the one-acre site. KFA supports these efforts.

**Analysis of community protection measures**

Much of the fire burned in remote areas far from residential properties or rural communities. Large portions of the fire burned in the interior of the Siskiyou Wilderness Area and posed very little threat to nearby communities. In these more remote portions of the landscape firelines were not established, instead the fire was allowed to either smolder itself out or be contained on road systems or ridgelines outside the Siskiyou Wilderness Area.

The eastern and southeastern firelines were utilized to protect rural communities, isolated residences and private property from the effects of wildland fire. The southeastern fireline protected rural residential property at the mouth of Clear Creek. The eastern fireline protected the community of Happy Camp, numerous private residences up Indian Creek, and along the Klamath River.

The fire burned to the edge of Happy Camp, along the Klamath River and adjacent to homes in the Clear Creek area between August 20 and August 29. Crews utilized dozer line, roads as fireline, and tactical firing to bring the fire down the mountainsides to Highway 96 and around private property. These operations were highly successful and no homes or structures were lost.

Much of that area adjacent to Happy Camp burned at low severity, acting like a large fuel treatment around homes and adjacent to the WUII. The effects of the Oak Fire will provide benefits to surrounding communities by reducing fuels on a massive landscape scale, providing nearby fire footprints that act as natural fuel breaks and building fire resilience in nearby forest habitats. The effects of the Oak Fire will positively influence fuel loading and community wildfire safety for many years to come.

Fire suppression crews responsibly protected homes and community values with an appropriate suppression response. The backburning adjacent to the community behaved like a large prescribed fire, burning in understory fuels and armoring the southwestern margin of Happy Camp.
Cedar Fire:

On August 8, thunderstorms rolled through the Klamath River canyon, bringing lightning to summer-parched fuels. The Clear Fire had been burning since July 25 in the South Fork of Clear Creek and now new lightning ignitions lit deep in the Siskiyou Wilderness complicated suppression efforts. Another series of ignitions occurred in Thompson Creek, east of Happy Camp in the Kangaroo Inventoried Roadless Area, adjacent to the Red Buttes Wilderness Area. What eventually became the Cedar Fire was originally three separate fires: the Cedar Fire on the slopes above Cedar Creek, the Fourmile Fire on the western flank of Fourmile Butte, and the East Fire in the East Fork of Thompson Creek below Pyramid Peak.

The Cedar, Fourmile and East Fires were burning in the 1987 Thompson Fire footprint, burning through old-growth forest and thirty years of understory regrowth at mostly low severity. The fires burned through steep, heavily forested terrain dominated by old-growth conifer forests on west-facing slopes. The area has little to no access, no safety zones or escape routes, and is generally inhospitable to firefighting personnel.

On August 11, the Cedar Fire was combined with other nearby fires, including the East, Fourmile, Oak and Clear Fires to create the Eclipse Complex. On that same day, lightning storms moved through the area and lit the Oak Fire, burning in Oak Flat Creek. The Oak Fire began in steep terrain five miles west of Happy Camp in a watershed with no recent fire history. Due to its location near Happy Camp, the Oak Fire became the top priority and received the lion’s share of available resources. Despite a lack of resources, crews did begin opening old dozerline and building handline to contain the Fourmile and Cedar Fires. The goal was to keep the fire east of Thompson Creek and west of the Figurehead Mountain/Tim’s Peak ridgeline.

Experienced hotshot crews established a remote spike camp near Fourmile Butte. Crews began building handline along the ridgeline in preparation for burnout operations. On August 17, 20-25 MPH winds affected ridgetops and by the next day crews abandoned the Fourmile Butte spike camp, as the fire reached the summit and forced crews to head south. A new spike camp was established on Tim’s Peak south of the Fourmile Fire.
By August 19, crews began burning the Fourmile Butte/Tim’s Peak ridgeline from north to south starting at Fourmile Butte.

By August 20 the Cedar and the East Fires had merged, creating a 2,141-acre blaze. Meanwhile, the Prescott Fire had burned 16,850 acres and was growing quickly due to roll-out, torching, spotting and the occasional uphill run. The Oak Fire was still the highest priority as it advanced towards Highway 96 and Happy Camp. Residents southwest of Happy Camp were placed on evacuation warning and very few resources were available for the Cedar Fire.

The fires remained mostly under inversion for the next three days, but the Cedar and Fourmile Fires continued growing slowly in rugged terrain. Burning in the understory beneath massive old forests, the fire crept through understory fuels and expanded north into the East Fork of Thompson Creek and east towards Figurehead Mountain. The rocky slopes below Pyramid Peak and Figurehead Mountain were acting as natural barriers, slowing, stalling and naturally holding the fire in the Thompson Creek watershed. Meanwhile, crews on the Fourmile Fire reopened firelines built for the 2012 Fort Goff Complex Fire and began backburning operations to keep the fire west of the Goff Creek canyon.

From August 20 to 25 crews used tactical ignitions to stay ahead of the fire as it backed down from Tim’s Peak to Thompson Creek along a series of dozerlines and handlines. On August 25, the Fourmile Fire got ahead of fire crews and south of containment lines, leading to major readjustments, the development of additional dozerline between Bug Creek and Fourmile Creek, and two more days of backburning.

By August 28, the southern and eastern perimeter of the Fourmile Fire was black-lined and burning back into the Cedar Fire in Bear Valley Creek. The Cedar Fire was still holding in the sparse, rocky fuels at the Red Buttes Wilderness boundary near Pyramid Peak and Figurehead Mountain. Within two days the Cedar and Fourmile Fire had merged, creating an 8,450-acre wildfire (ICS 209 & Inciweb).

On August 31, under gusty 20 MPH winds, the Cedar Fire made its final run. Surging forward into the Applegate watershed near Pyramid Peak and the Red Buttes Wilderness Area boundary, the fire burned into patchy fuels and the rocky ridges of the Siskiyou Crest. Despite heavy winds, the fire stalled in the sparse fuels, smoldering in isolated patches of brush. Unable to burn through the rocky slopes, the forward momentum of the Cedar Fire was halted by natural barriers. As the wind died down, the fire smoldered and continued slowly back into Thompson Creek.

On September 6-8, the Cedar Fire received wetting rains and for all practical purposes was extinguished. Rain fell again on September 20-21, with the Cedar Fire area receiving about a half inch of precipitation. Although the fire was essentially out, it never reached its prepared containment lines and was never officially declared 100% contained. The Cedar Fire area was opened to the public on September 29.
In total, 9,371 acres burned in the Cedar Fire. Nearly the entire blaze was confined to the Kangaroo Inventoried Roadless Area east of Thompson Creek and west of the Figurehead Mountain/Tim’s Peak Ridge.

**Fire Severity & Mosaic**

The Cedar Fire burned through a variety of habitat types ranging from lush Douglas fir forest, to old-growth sugar pine, montane chaparral, knobcone pine, Jeffery pine savanna and mixed hardwood stands on the mid and upper slopes. The fires started on the mid-slopes, burning both uphill towards the rocky ridgelines above and backing downhill into the lush old-growth forests on Thompson, East Fork Thompson, Cedar, Bear Valley and Fourmile Creeks.

Overall, fire severity was mixed with higher severity fire effects on the upper 1/3 of the slope in montane chaparral and knobcone pine plant communities, and especially on south-facing slopes. In these plant communities, vegetative mortality was high but regeneration will be vigorous and abundant; shrubs will sprout back and fire-dependent knobcone pine, will drop seed from serotinous cones, facilitating a flush of conifer reproduction.

Small portions of the fire burned in the Applegate River watershed near Pyramid Peak. Although being pushed by heavy winds the rocky slopes and lack of fuel continuity slowed the fire as it burned into unusual plant communities on the north-facing slopes. The high-elevation slopes contain a mixture of montane chaparral and enriched conifer stands. Brewer’s spruce, mountain hemlock, knobcone pine, incense cedar and true firs grow from the ridgeline. Many of the conifers are low statured, open grown and windswept with widely scattered reproduction. These small groupings of conifers are broken by bands of montane chaparral and rocky, mountainous terrain. The fire skipped around the landscape burning into rocky outcrops that limited fire spread. Many of the conifers survived the fire, including many fire-sensitive Brewer’s spruce and mountain hemlock. Although the fire burned at relatively high severity on the southern slopes, even with 20 MPH winds, the north slopes refused to burn, protecting fire-sensitive species like Brewer’s spruce from burning.
On north-facing slopes in Thompson Creek and in tributary streams such as East Fork, Cedar, and Fourmile Creek, the fire burned at predominantly low severity. The result is the maintenance of fire-adapted forests, with sparse understory fuels, tall canopies, and large, old, fire resistant trees.

The Cedar Fire burned at 58% low severity, 36% moderate severity and 6% high severity effects. The patterns of severity in the Cedar Fire are well within the range of variability and demonstrate healthy, mixed-severity fire effects.

Heavy atmospheric inversions moderated fire behavior throughout large portions of the fire area. These inversions trapped copious amounts of wildfire smoke, reducing ambient air temperatures, increasing humidity and minimizing air movement. Heavy smoke inversions reduced fire severity throughout the fire area, but especially in the canyon bottoms where the inversion effect was most persistent.

High-severity fire effects and active fire behavior was largely predicated by weather conditions, topography and slope position in the Cedar Fire. When topography and weather came into alignment fire behavior responded with increased fire severity, intensity and rate of spread. These weather conditions were most prevalent above the inversion layer in the headwaters of Cedar, Bear Valley and Fourmile Creek. Although intensity increased as the fire worked its way upslope, the rocky ridgeline largely contained the fire with natural, rocky barriers.

Impact of Past Forest Management on Fire Behavior

The impact of past forest management on the Cedar Fire was minimal. The Cedar Fire burned almost entirely within the Kangaroo Inventoried Roadless Area, a large block of undisturbed habitat adjacent to the Red Buttes Wilderness Area. The Kangaroo Inventoried Roadless Area contains intact plant communities, old-growth forests and a diverse, patchy habitat mosaic that naturally provides fire resilience. Rocky ridges extending from the Klamath River to the Siskiyou Crest also limit fire spread and check fire severity.

Fire Suppression Impacts

Fireline Creation

The impact of fireline creation on the Cedar Fire was minimal. A relatively small amount of dozerline was built on the southern end of the fire near Bug Creek.
To the west of the fire on Thompson Ridge crews built dozerline as “contingency” line, meaning the fireline was built as a precautionary measure rather than for direct containment. Roughly six miles of contingency line was bulldozed on Thompson Ridge. Roughly 1.5 miles was built on Thompson Ridge itself, while the remaining approximately 4.5 miles of dozerline was built on spur ridges running east from Thompson Ridge into Thompson Creek.

Apparently, the idea was to compartmentalize watersheds from ridge to ridge with dozerline. If the fire burned into one of these watersheds crews would contain the fire between Thompson Ridge Road and the east-west tending dozerlines. Although the fire never jumped Thompson Creek, numerous ridges were impacted with new dozerlines.

For much of the eastern fireline firefighting crews utilized either natural rocky barriers or handline built using Minimum Impact Suppression Tactics (MIST) in the Kangaroo Roadless Area and designated Backcountry Area.

Although we applaud the Klamath National Forest for implementing MIST in this specific location, MIST was unfortunately not implemented throughout the Kangaroo Backcountry Area, as directed in the Klamath National Forest Plan. For example, along Thompson Creek in the Kangaroo Roadless Area. Fireline along Thompson Creek was snagged of old growth trees for numerous miles, where fire crews utilized the stream as a fireline.

**Backburning**

Significant backburning did occur in the Cedar Fire, especially on the Fourmile Fire August 19-27. Much of the firing occurred on the ridgeline dividing Bug Creek from Fourmile Creek. Extensive backburning also occurred at the headwaters of Fourmile Creek from Tim’s Peak to Fourmile Butte. It appears that much of the backburning was conducted responsibly, creating mostly low to moderate severity fire effects.

Although implemented responsibly, the backburning and fireline creation on the eastern perimeter of the fire may have been unnecessary and even detrimental to adjacent fire-adapted plant communities in the Kangaroo Inventoried Roadless Area. Crews utilized significant public funds and risked the safety of firefighting personnel attempting to limit the fire’s eastern spread. Unfortunately, the Fort Goff Creek watershed and 2012 Fort Complex Fire footprint would have benefited from a rather timely reburn.

Only five years after the 2012 Fort Complex Fire, it is highly likely that the fire would have extinguished itself in the vast fire footprint to the east and could have been loose herded into the wildlands with positive effects. The fire would have likely extinguished itself in the rocky fuels or backed slowly into Fort Goff Creek. The probability of the Cedar Fire spreading through the over 30,000-acre Fort Complex Fire footprint was highly negligible and did not justify the environmental impacts or public expense of fighting the Cedar Fire on this particular ridgeline.
Riparian Impacts

It is clear from agency documentation that significant snagging of large, old trees along Thompson Creek occurred during fire suppression operations. Riparian snagging can have a severe impact to habitat for native fisheries by removing large woody debris, impacting pool structure and bank stability. Snagging can also remove large numbers of snags within the riparian corridor limiting habitat availability for cavity nesting species. The removal of large snags in mass, can in turn, impact natural snag and large woody debris recruitment for many years to come. According the District Ranger Jeff Marszal at the Happy Camp Ranger District, snags were felled into the stream when possible and removal was generally minimal, but over six miles of stream were impacted, all within relatively intact forest in the Kangaroo Inventoried Roadless Area.

Fire Retardant Use

Similar to the Oak Fire, fire retardant application in avoidance zones was inadequately tracked during the Cedar Fire. It is highly likely that applications to avoidance areas could have occurred, but blatant disregard for reporting makes verification of fire retardant use and impacts nearly impossible to document on the Eclipse Complex.

Noxious Weeds

Fire camps utilized by suppression crews were heavily infested with noxious weeds. According to the BAER Report the risk of irreversible noxious weed spread is high throughout the fire area. The exposed mineral soils, extensive soil disturbance and unusually high level of human activity in the remote areas burned in the Eclipse Complex elevates the risk of noxious weed spread. Unfortunately, the BAER Report only recommends and provides funding for noxious weed mitigation in and around the Siskiyou Wilderness. Detection surveys, and if needed noxious weed removal, should also occur in the intact plant communities found throughout the Kangaroo Inventoried Roadless Area and the Cedar Fire Area.

Historic/Cultural Resources

The Cedar Fire likely burned through numerous Native American cultural sites unknown to the general public or perhaps even the Forest Service. If damage was done to these important cultural resources while suppressing the Cedar Fire, it is unknown to KFA. It is our hope that Resource Advisors (READS) from local tribes were able to advise fire officials and on-the-ground fire crews, in order to maintain respect for these cultural sites in their work and minimize or eliminate discretionary fire suppression impacts.

Analysis of Community Protection Measures

The vast majority of the Cedar Fire burned in the backcountry of the Kangaroo Inventoried Roadless Area and designated Backcountry Area. One relatively small non-
residential parcel on lower Thompson Creek burned in the Cedar Fire. Otherwise all land within the fire perimeter was remote public land with high ecological function.

If anything, fire crews could have allowed the fire to smolder itself in the 2012 Fort Complex Fire footprint, rather than utilizing full suppression tactics at this location. The probability of fire spread to the east was extremely minimal and the benefit of suppression at this particular ridge system negligible at best.

No homes or communities were directly threatened by the Cedar Fire, but residential property at the bottom of Thompson Creek and along the Klamath River could have been affected had the fire continued expanding into unburned, plantation stands in lower Thompson Creek.

Adequate measures were taken and a reasonable balance was struck throughout the fire between backcountry values and the desire to restore fire to the landscape, while protecting communities and resources at risk from the effects of wildfire.

Cost of suppression in the Eclipse Complex
The Eclipse Complex began on July 25 and ended on September 29 when the Forest Service opened the area to the public. Despite spending $45.9 million dollars fighting the Eclipse Complex it was actually weather conditions that naturally extinguished the fire. The fire was never officially declared more than 55% contained; meaning much of the fire perimeter had no actual “containment” features. In total, the fire burned for 66 days with a cost of $695,545 per day.

It is unknown how much of that cost can be attributed to each individual fire in the Eclipse Complex. It is clear however, that the Oak Fire was by far the largest and likely the most expensive of the fires due to its size, remote location, reliance on helicopters and high travel/access related expenses. The Oak Fire also burned into the WUII in Happy Camp, requiring a heavy concentration of resources.

Although large portions of the fire were unstaffed, it is possible that costs could have been reduced if fire managers had allowed larger portions of the fire to burn naturally, without suppression actions. In some circumstances, fire suppression efforts were not only ineffective and unnecessary, but they also created substantial environmental impacts.

An example includes the firelines built to suppress the southwestern perimeter of Clear Fire near Elbow Springs, on the divide between Clear Creek and the headwaters of Dillion Creek. Suppression crews bulldozed fireline and safety zones deep into the roadless areas surrounding the Siskiyou Wilderness Area and over the top of the Kelsey National Recreation Trail to secure this southwestern fireline. This particular suppression action was ineffective in that the fire jumped the fireline, burning southwest into the headwaters of Dillion Creek. The fireline was also unnecessary because the Dillion Creek watershed is partially located within the Siskiyou Wilderness Area; the remaining
portions of the Dillion Creek watershed are extremely rugged, remote and mostly inaccessible.

The entire upper Dillion Creek watershed has also been affected by overlapping fire footprints from 1987, 1994, 1999, 2001, 2008 and 2016. Given the recent fire footprints and the minimal fuel loading the fire was very likely to either burn itself out or burn at very low severity in remote backcountry far from any homes. The results of the Oak Fire validated these assumptions because nearly the entire southern portion of the fire in the Dillion Creek watershed smoldered around at low severity.

On the Cedar Fire, the eastern fireline near Fourmile Butte and Tim’s Peak was similar in that crews spent considerable time and expenses suppressing the fire instead of allowing it to burn into the 2012 Fort Complex footprint and naturally extinguish itself in the sparse fuels and rocky slopes.

Despite these examples, the decision to leave remote, inaccessible portions of the fire unstaffed, likely saved millions of dollars. The decision did not compromise community fire protection in any way, but it did reduce significant safety risks to firefighting personnel.

**Conclusions:**

The Klamath National Forest Plan recommends utilizing managed wildfire to restore habitat conditions in Wilderness Areas, Inventoried Roadless Areas, Late Successional Reserves, and other conservation-based land management designations. It is our belief that managed wildfire is the most effective means of restoring fire-adapted habitats and reducing fuel loads on the landscape scale. It is also our belief that a concerted strategy to allow natural ignitions to burn in backcountry areas will ultimately provide the most effective wildfire protection to communities on the Klamath River.

To effectively utilize managed wildfire in remote backcountry areas, community wildfire protection treatments should be prioritized near communities and homes, providing safe and effective locations for firefighting personnel to suppress wildland fires as they approach communities. These same locations can be used to light prescribed fires between residential communities and wildlands. Fuel load reduction thinning should also be utilized where it is most necessary and effective, directly adjacent to residential communities.

In the Middle Klamath River watershed, wildfire is a part of life. The rugged, inaccessible terrain and high occurrence of lightning will continue bringing fire to the backcountry, and at times, to the edge of communities. The region provides fire managers with a unique opportunity to utilize managed wildfire as a fuel reduction and forest restoration strategy. The region is remote, sparsely populated, relatively intact, contains abundant recent fire footprints and vast wilderness landscapes where fire can be loose-herded with little impact to surrounding communities.
Managed wildfire is the only tool available to land managers that can effectively “treat” the vast, inaccessible Mid-Klamath River watershed. In both the long term and short term, utilizing managed wildfire will reduce fire suppression costs while building fire resilience and providing important and effective community fire protection.

The Eclipse Complex demonstrates the potential of managed wildfire to restore fire as a natural process to vast tracks of land, even in those areas with no recent fire history. The Oak Fire and Cedar Fire burned at characteristic fire severities, providing substantial benefit to fire-affected habitats and building fire resilience. Much of the Eclipse Complex was loose herded into the Wilderness, protecting human communities, while restoring process and function to roughly 100,000 acres of otherwise inaccessible land. The large fire footprints of the Mid-Klamath River will provide benefits to natural ecosystems and opportunities for future fire managers to utilize wildland fire for resource benefit.

The headwaters of Dillion Creek burned at mostly low severity in the Eclipse Fire. The numerous overlapping fire footprints served to moderate fire severity and minimize fire effects and encouraged the heavy forest in upper Dillion Creek to burn in the understory.

Low elevation forest in the Clear Creek canyon burned at mostly low severity.

The large brushfields on the Kelsey Range burned in a patchy mosaic of burned and unburned vegetation.
Endnotes


4 Email from undisclosed Forest Service personnel during the Eclipse Complex Fire.

