

A Perfect Storm or the New Norm

BY DON HENDERSHOT

Botanist Gary Kauffman looks over the burned ground surrounding the Appalachian Trail going north from Wayah Bald. HOLLY KAYS PHOTO

A lightning strike in the Cohutta Wilderness of north Georgia's Chattahoochee National Forest started the fire on Rough Ridge.

It was Oct. 16.

No one knew what kind of harbinger that was.

A week later, the Dick's Creek Fire was burning. Two days after that, the Boteler Fire started.

By early November, the Tellico Fire, the massive Party Rock Fire and the Ferebee Memorial fires were all burning in North Carolina.

Arsonists started a fire along the Chimney Tops Trail in the Great Smoky Mountains National Park on Nov. 13. Park firefighters responded and extinguished the fire within three days.

But on the evening of Nov. 23 another arson-started fire was discovered near the Chimney Tops Trail.

This became the Chimney Tops 2 Fire and park officials decided, because of the steep terrain, it would be too dangerous for firefighters to directly attack the fire. They went to work

building containment lines around the fire.

The fire was slowly backing down the mountain and park firefighters figured it would reach containment lines around Nov. 28.

Mother Nature had a different plan.

A weather front was headed in and, while fire managers were hoping for rain, the leading edge of the front was predicted to bring low humidity plus variable gusty winds.

As the front got closer, predictions became direr.

A weather service alert warned of winds strong enough to down trees and power lines and called for gusts of near 60 mph. The fire started spotting as winds blew embers across the landscape.

Soon the fire had spotted over two ridges and engaged Twin Creeks visitor center facilities.

The winds kept increasing.

Some gusts measured more than 80 mph. Not only did the Chimney Tops 2 Fire rage into Gatlinburg, the high winds downed power lines sparking more fires, soon homes and hotels were burning.

Fourteen people died.

Half a billion dollars in property burned though downtown Gatlinburg, and the main tourism areas, were spared.

Tennessee Gov. Bill Haslam said it was the largest wildfire in Tennessee in the last 100 years.

Fire managers, today, wonder if this was the perfect storm or the new norm.

They are studying last fall's fire season to try to prevent this kind of tragedy from occurring again.

WHY 2016?

Jess Riddle, forest ecologist with Georgia ForestWatch, said the answer has a lot to do with a combination of natural events.

"These recent fires had decades of fuel build-up, extreme drought, low humidity, and windy days—pretty much everything a fire could want," he says.

Records from Asheville's National Center for Environmental Information (NCEI), formerly the National Climatic Data Center, note this fall was one of the driest and warmest on record for Western North Carolina, East Ten-

nessee, North Georgia and other areas across the Southeast.

Most of Western North Carolina was under extreme or exceptional drought from the middle of October to the end of November. Exceptional drought is the highest level. Extreme is the second highest level.

The Coweeta Hydrological Laboratory in Otto, North Carolina, reflects the same trends.

September and October were the driest two months on record since 1934 when record keeping began.

Temperatures for all months, except January, were above average. July and September set heat records.

Josh Kelly, forest biologist at MountainTrue, said the confluence of the warm and very dry weather was unusual.

"It was the first time in my life that anything like this has happened," he says. "Some indices of fire danger reached new records for Western North Carolina during this period."

One of those, the Energy Release Component, measures the amount of fuels in the forest. It reached a record high.

The forest was basically a tinderbox. Any, and every, flame had record high fuels waiting to be consumed.

These fuels accumulated in the forests of the Southern Appalachians due to the past seven or eight decades of fire suppression, some experts say.

Fire has always been a part of the ecosystem that helps shape the forests.

Some forest communities – fire-adapted communities – actually rely on fire.

Pines like table mountain pine, pitch pine and others are highly adapted to fire and the exclusion of fire in those habitats allows shrubs and other hardwoods to move in.

Fire is also very beneficial in oak forests, especially drier oak forests.

The exclusion of normal fire regimes has allowed less fire-tolerant species like maple, poplar and others to encroach.

So it's easy to see how, as Jess Riddle says, 2016 had "pretty much everything a fire could want."

It had fuel load build up from decades of fire suppression and those fuels were extremely dry. It had extreme-to-exceptional drought conditions. It had wind, high temperatures and low humidity.

All it needed was ignition.



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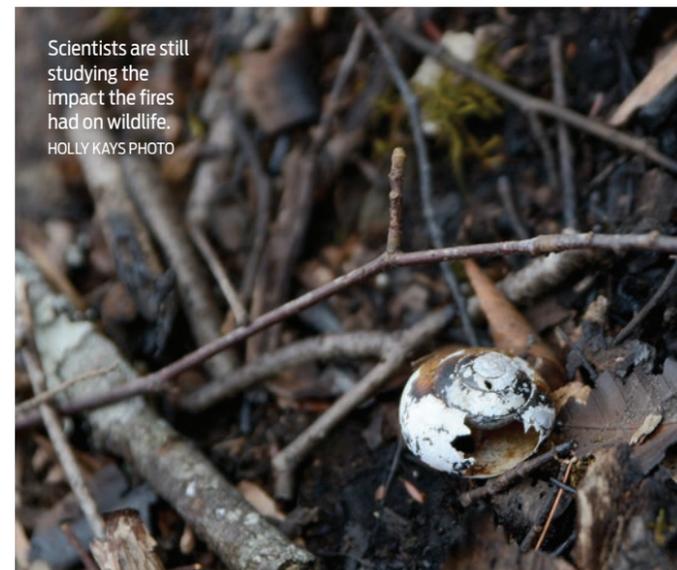
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Forest fires last fall left charred remains of structures throughout Great Smoky Mountains National Park and the national forests.



Scientists are still studying the impact the fires had on wildlife.
HOLLY KAYS PHOTO



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Fire impacts on U.S. Forest Service land

Did the fires hurt wildlife?

Prescribed burning is often used as a tool to benefit wildlife by regenerating their habitat, and in the case of the slowly creeping ground fires that accounted for most of the burned area, wildlife are usually able to get out of the way as flames approach.

However, not all species are that mobile. The noonday globe snail, listed as threatened, is the focus of significant concern. The species is only known to inhabit a 99-acre area of the Nantahala Gorge, and 85 percent of those acres burned. Wildlife biologists are still assessing how the fire might have impacted its population, or if the species has some kind of mechanism — such as burrowing — available to avoid the flames.

In the short-term, other wildlife species could face hardship from the fires

Will the fires increase the chance to flooding and landslides?

The U.S. Forest Service's Burned Area Report identified several areas where there is a high risk of flooding or landslides due to loss of vegetation and water-repellent soil.

However, even with multiple heavy rains this winter, there haven't seemed to be any issues. Many areas that the team completing the report initially observed to have water-repellent soil seem to be absorbing water much more readily.

Is a spring fire season likely?

Typically, spring fire seasons tend to be more severe than fall fire seasons. The humidity is lower, winds are gustier, and the sap flowing through the trees makes them more volatile.

So, while fuels are pretty wet right now, the region is still in drought. The potential for a spring fire season will depend on what the weather does over the coming months.

To a degree, though, the fire season could depend on people. Of the 20-plus fires that burned through WNC last fall, only one is thought to have resulted from natural causes. Humans caused the rest, either accidentally or on purpose.

How did the fires affect the Appalachian Trail?

South of the Smokies, 58 miles of the AT run through North Carolina and are maintained by the Nantahala Hiking Club. Of those 58 miles, 26 miles were part of the burned area, according to the club.

Of those 26 miles, about 90 percent experienced pretty mild burning. About 10 percent burned hot, consuming wooden anti-erosion features on the trail and creating hazards like holes in the ground and dead trees.

What is on the U.S. Forest Service's to do list this spring?

Rehabilitating fire lines will be a big task for the Nantahala Ranger District as the weather warms up. While firefighters made significant headway toward naturalizing the dug-up lines as fire season wound down, there are still about 30 miles of fire line that need to be dealt with.

Especially on steep slopes, non-rehabilitated fire lines lead to erosion, as there are no roots or leaves covering them to stop water from flushing the dirt downhill. They can also open up the forest to invasive plants, whose seeds can easily take root in the bare soil.

Many of the district's roads took a pretty good beating from bearing heavy equipment all fall. And because the fire burned through two timber sale areas that were already sold, the Forest Service will have to make some adjustments to those contracts.

The Forest Service will also be addressing threats from invasive species in areas other than fire lines. Across nine fires, the Forest Service received \$55,000 to prevent their spread, primarily by using herbicide.

— *Smoky Mountain News*

UNNATURAL SPARKS

Only two of the hundreds of wildfires across the region were naturally ignited. The Rough Ridge Fire in the Cohutta Wilderness on Oct. 16 and the Boteler Fire in the Nantahala National Forest near Hayesville, North Carolina, on Oct. 25 were thought to have started from lightning strikes.

The rest were all human-caused.

Some were escaped debris burns, escaped campfires and cigarettes tossed from car windows or other accidental ignitions. But a large number, probably the majority, were arson.



A helicopter drops water on a fire. NPS PHOTO

Forest economist Jeffrey Prestemon is project leader at the Forestry Sciences Laboratory in Research Triangle Park, North Carolina.

His research includes understanding, predicting, and forecasting arson and intentional wildfires.

In a Forest Service report "Wildfire Ignitions: A review of the Science and Recommendations for Empirical Modeling" Prestemon, and others, found 39 percent of fires across most of the Southern Appalachians between 2000 and 2008 were arson.

Prestemon told Smoky Mountain Living that high wildfire indices, like drought and fuel load, are also predictive of arson.

In other words, arsonists know when conditions are good for setting fires.

And one of the highest predictors of arson is simply the fact that arson has recently occurred.

This is because serial arsonists are common.

"If they have success setting one fire, they're likely to try again, plus you have copy cat arsonists," Prestemon says.

Prestemon says access is also a big factor.

He noted that population, coupled with road density, means more fires.

He also noted that arson is more common near forest/urban interfaces where there are large numbers of human lives and property at risk.

To learn more about people who set forest fires please see the sidebar on page 54.

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Burn damage to the Chimney Tops is evident even from the trailhead.

HOLLY KAYS PHOTO



EFFECTS OF THE 2016 WILDFIRES

A large number of wildfires burned across a variety of forest habitats in the Southern Appalachians for more than a month.

These fires burned with different intensities and different severities depending on topography, weather conditions, fuel load and other factors.

There were different intensities and severities even within the same fire perimeter, so effects of the fires varied. Forest Service, Park Service and other organizations will be monitoring the burns and some effects may not be known for years.

One of the major hotspots was the Camp Branch Fire on Wayah Bald in Macon County, North Carolina. It burned the roof

off the Wayah Bald Fire Tower.

Gary Kauffman, fire management specialist with the U.S. Forest Service, says the Camp Branch Fire at Wayah Bald, was the highest intensity fire site that he visited.

He says the fire raced up the mountain, through a high elevation red oak forest with flame lengths greater than 100 feet.

"Many of the red oaks and chestnut oaks had fire scars up their entire stems. I suspect many will die," he says.

He also noted that while the tops of the rhododendron were burned, much of the root mass was still in tact and, depending on the oak mortality, that the bald could perhaps transform to a heath bald.

But many of the fires, probably most, didn't burn with that kind of intensity or severity.

"Many areas had low to moderate intensity

fire that will likely not result in widespread tree mortality," says Adam Warwick, stewardship manager at The Nature Conservancy.

He believes most of the fires were "generally beneficial from an ecological perspective."

Rob Klein, fire ecologist with the Great Smoky Mountains National Park, says fires in the Park burned about 11,000 acres and 16 percent of that was high-severity.

Klein says a small portion of the high-severity burns could see complete stand replacement.

Most of that happened on steep, dry, slopes populated with pine and oak.

Klein noted that table mountain pine, one of the species in that habitat, is quite adapted to fire.

Some table mountain pines produce serotinous cones that require heat, generally from

fire, to open and disperse seed.

Klein cautioned that it will take years for these forests to reestablish themselves but noted that kind of regeneration is a natural part of forest ecology – or, at least, used to be before widespread fire suppression.

Many of the 2016 wildfires burned across fire-adapted communities. But many of these fires were unusual in the fact they burned into more moist areas.

There were instances like the Tellico Fire and the Rock Mountain Fire, where the fire burned all the way to the edge of streams in cove forests.

Kauffman said half of the burns he surveyed were in areas with less fire-adapted vegetation, but noted the fires within these areas were low in intensity and severity.

Initially there should be little negative impact on wildlife.

Klein says most medium to large mammals and birds simply move out of the fire's path. Most reptiles and amphibians were already dormant beneath the soil. Of special concern, however, is the noonday globe snail, *Petera clarkia* Nantahala.

This federally threatened snail is endemic to the Nantahala Gorge in Western North Carolina and much of its known habitat was within the perimeter of the Tellico Fire. Effects of the fire on the noonday globe will not be known until this spring when biologists survey the area.

Any large areas of tree mortality could mean less mast available next fall. The flip side of that is high-intensity and stand-replacing fires could be beneficial to wildlife that depends on herbaceous vegetation and early successional habitat.

The largest immediate negative impact associated with the 2016 fires was smoke pollution.

Many towns and urban areas as far away as Charlotte, and Atlanta, and Chattanooga and Knoxville experienced code orange and code red air quality alerts.

Other ongoing concerns include erosion and flooding primarily in those areas where the duff layer was burned away, leaving bare soil exposed.

Moderate to heavy rains could not only cause erosion but because there is no duff to absorb and slowdown runoff, flooding could occur.

"Many areas had low to moderate intensity fire that will likely not result in widespread tree mortality."

— Adam Warwick, stewardship manager at The Nature Conservancy

Profile of a forest arsonist

Paul Steensland has more than 40 years experience with the U.S. Forest Service, CalFire and in private practice investigating forest and wild land arson. He is past chair and a current member of the National Wildfire Coordinating Group's Wildfire Investigation Working Team.

To begin with, forget all that TV and the movies would have you believe about pyromania and pyromaniacs, he says.

Steensland doesn't believe pyromania comes into play when dealing with arsonists.

He noted that the mental illness pyromania is an impulse control disorder. The patient can't help himself from starting fires.

The forest arsonist, on the other hand, will certainly change his mind about setting a particular fire should he think there is a high possibility of being discovered.

And, Steensland says, sometimes arsonists simply stop setting fires.

"Most [arsonists] know what they are doing is wrong but choose to do it anyway," he says.

Steensland cautioned that statistical profiles are based on majorities and averages and that a particular arsonist may not fit the profile exactly but it provides a good starting place.

Profile:

- Most likely male
- High school education at most
- Usually unemployed or underemployed
- Single, divorced or estranged
- Lives alone or with a parent or parents
- Generally low socioeconomic standing but often from middle class parents
- Age 16 – 35.
- Mostly white or reflective of the majority ethnicity of the area.

Steensland noted that forest arson generally falls in one or more than one of six categories or typologies.

- Vandalism – usually associated with brush fires. Mostly juvenile offenders.
 - Excitement – thrill seeker, looking for recognition or attention. Often hangs around the scene. Often videos or photographs the fire. Steensland said of 65 cases he worked that fell in this typology, 33 percent of the arsonists were firefighters – mostly volunteer.
 - Revenge – Could be revenge against an individual or an organized group. Steensland said he feels a lot of these types of arsonist are lashing out at society. They're angry – frustrated – and it's a way for them to feel good about themselves.
 - Crime concealment.
 - Profit.
 - Extremism – fires set in hopes of furthering some kind of political, social or religious cause.
- Steensland said it's often difficult to catch a one-time arsonist. However, most arsonists are serial arsonists and tend to get careless over time.



PERFECT STORM OR NEW NORM

This is an issue that will likely be answered in hindsight a few years down the road.

There was certainly a confluence of events that came together in the Southern Appalachians in the fall of 2016, which precipitated this unprecedented fire season: Decades of fuel buildup, drought, warm temperatures, low humidity, wind and then ignition.

Many scientists, ecologists and forest managers believe climate change may have played a part and may continue to do so though no scientist would point to this fire season and say, "climate change caused this."

There is no way to know for sure at this point.

But Steve McNulty, director of the USDA Southeast Regional Climate Hub, believes climate variability likely played a large part and that climate change plays a part in climate variability.

Climate change refers to gradual, long-term change – the heating of the Earth and the Earth's atmosphere over the past century or so and climate variability refers to changes in weather patterns from month to month or year to year.

More greenhouse gasses in the atmosphere, like CO₂, trap more heat in the atmosphere creating more energy and that translates into more extreme weather patterns.

McNulty noted that rain events producing more than 2 inches of rain over a 24-hour period have increased by 20 percent since 1950.

But with a warmer atmosphere drying and evaporation occur faster, which can lead to more drought.

There are also more subtle climate variability changes that can impact wildfire. McNulty noted growing seasons that last two to three weeks longer. They produce more biomass, which can increase fuel load.

And adding more people into the mix also increases the chances of wildfire.

More people equal more campers, more hikers, more hunters and that means more campfires and more opportunities for accidental ignitions.

More property owners equal more lot clearing and more debris burning, which also adds to the chances for accidental ignition. And sadly, more people and more access lead to more arson.

This fire season could have been a perfect storm, the experts say. But it appears the conditions that created that storm are becoming the new norm.

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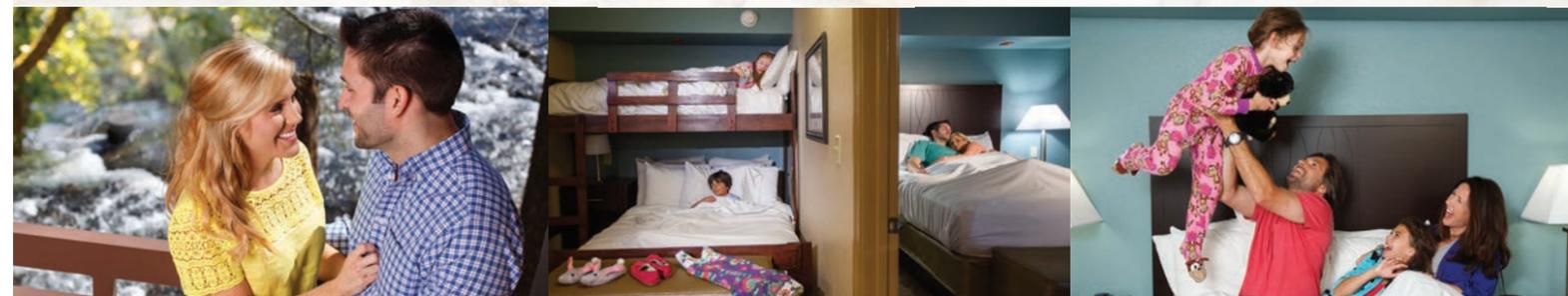
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‘Be part of our comeback’

Ron Crivellone has a simple answer when customers call about getting married in the Smokies this spring.

“I’m pretty much telling them that we are open for business,” he says. “The best way you can help the area is to come spend money.”

He’s the president of the Smoky Mountain Wedding Association and owner

an image problem.

The wall-to-wall news coverage of the fire left the impression that Gatlinburg was destroyed, says Logan Coykendall, president and CEO of Hospitality Solutions, Inc.

That’s far from the truth.

The downtown, arts and crafts community, and many other places, suffered no damage.

Coykendall, like others here, sees a bright future for business in Gatlinburg. The company is investing \$30 million this year in new hotels and \$30 million more in the next three years.

But the business has to come back to make it a real success story, he says.

“The best way to help us recover is to come visit us and see how beautiful the area still is,” he says.

Even the places that burned inside Great Smoky Mountains National Park, like the Chimneys trail, present new opportunities. Watching how the environment rebuilds will be something visitors can count on again and again.

“I think it’s going to be neat to see what happened to those areas that did burn as they rejuvenate,” he says.

Jackie Leatherwood, general manager of Greystone Lodge on the River, shares Coykendall’s concerns, but she’s also optimistic.

“We are booming with new opportunities,” she says. “If you come to town, and you just drive through the center of town, you don’t even really know there has been a fire in our area, because our downtown is still intact.”

Like many hotels here, her 241-room inn suffered smoke damage. It has since been professionally cleaned.

She made sure to take the time to do the job right.

“When my guests walk in the front doors, I want them to have the experience they had prior to the fires,” she says.

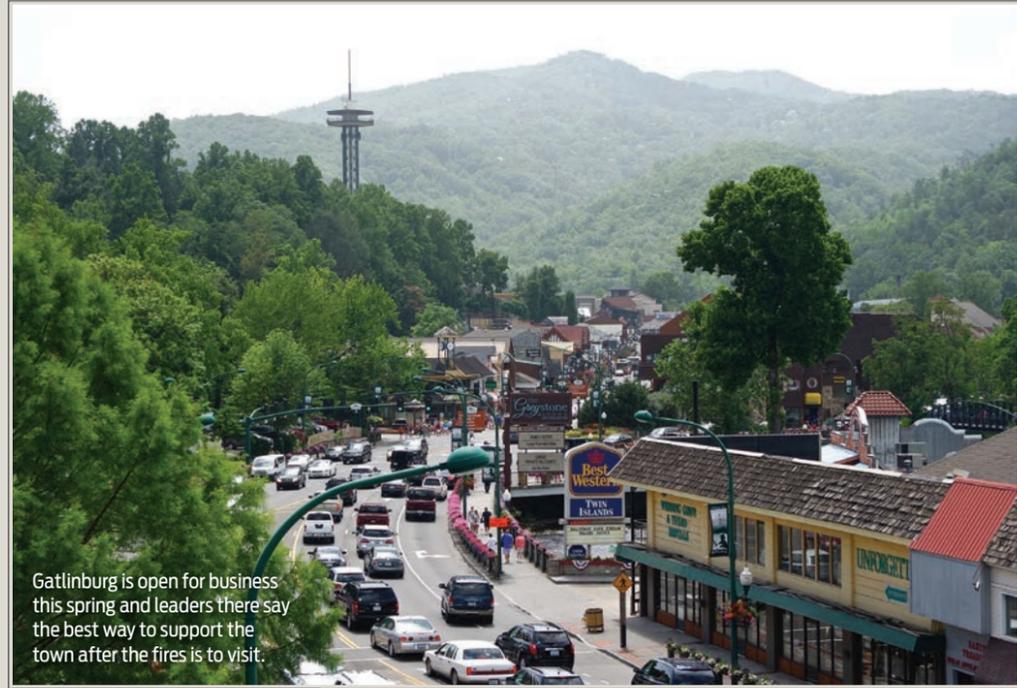
She’s telling customers they can expect the same great experience across Gatlinburg when they call asking about the aftermath of the fire.

“You just ask people to come and see for themselves,” she says. “Come and see it, come and experience it and be part of our come back.”

Right now the focus is on attracting the spring break crowds.

Leatherwood’s confident but, like Coykendall, she worries about the long-term impact on the workforce if the spring season is soft.

“You have workers that are working in these restaurants who need to make a living through the winter,” she says. “So we need the people to come back to help. I think people want to be a part of that and they will come back.”



Gatlinburg is open for business this spring and leaders there say the best way to support the town after the fires is to visit.

of Smoky Mountain Sounds, a wedding DJ business.

The wedding industry is huge in the Gatlinburg-Pigeon Forge-Sevierville area. Sevier County, Tennessee, is third in the nation for the number of chapel weddings – right behind Las Vegas and New York, he says.

Barn weddings are a big draw here.

Crivellone once did a country wedding, complete with cowboy hats, for a couple from New York. They told him they could have done it back home, but it wouldn’t have looked right.

Like many business owners in this tourism-dependent community, Crivellone is worried about the lingering impact of last fall’s forest fires.

The Chimney Tops 2 fire killed 14 people in the Gatlinburg area and destroyed half a billion dollars in property. Entire neighborhoods were wiped out.

As if the tragic loss of life and property wasn’t bad enough, Gatlinburg now has

“Our two real gems of tourism were left untouched and they are ready, willing and able to take care of visitors,” he said.

His company owns the Hilton Garden Inn, the Courtyard by Marriott and the Hampton Inn in Gatlinburg. It manages the historic Gatlinburg Inn. In Pigeon Forge, the company manages a second Hampton Inn and Hilton Garden Inn.

The company suffered \$2.5 million in smoke and wind damage. Seventeen employees lost everything.

Taking care of those employees has been a top priority for his company, and many others, in town.

Hospitality Solutions assigned a full time staffer to help workers find housing. It raised \$50,000 internally to help staff get resettled.

The money paid for the first few months of rent and furnishings among other needs.

Today, everyone has a place to live and is ready to work.

“They may not be the same as they were the day before the fire but they will recover to become the forests of tomorrow.”

— Josh Kelly

LESSONS FOR THE FUTURE

Josh Kelly, of MountainTrue, and Adam Warwick, of TNC, both credit the Grandfather Restoration Project, which uses prescribed fire to restore forests on the Grandfather Ranger District, with greatly reducing the risk of the Paddy’s Creek Fire and the Buck Creek Gap Fire.

In a fire season briefing last fall, Warwick noted these two fires, in areas that had been previously treated through prescribed burns, were caught small and resulted in little to no damage.

“It’s a little counter-intuitive, but forests that burn more frequently burn with less severity,” says Kelly. “This is because frequent fires do two things. First, they consume some of the fuels that would be more dangerous during drought conditions. Second, they

change the vegetation over time. In our area, that means trees that are wider spaced and a transition from dangerous shrubby fuels, like mountain laurel, to herbaceous and grassy fuels that don’t burn so severely.”

But prescribed burns are not a landscape-wide panacea.

There are areas of the forest where, due to topography and human habitation, prescribed burns aren’t prudent. And much care must be taken to manage smoke during a prescribed burn.

Environmentalists, ecologists and fire managers across the country are reaching out to stakeholders to prepare for, and mitigate, the effects of increasing wildfire on the landscape.

Programs like the National Cohesive Strategy and Fire Adapted Communities offer agencies, organizations and stakeholders ways to address issues like managing fuel loads,

protecting homes and communities, managing human-caused ignitions and effectively and efficiently responding to wildfire.

Kelly noted two main takeaways from the 2016 wildfires.

“First, the Southern Appalachians are not immune from large wildfires,” he says. “Second, it’s critical that people take fire into consideration when planning development. Everything from the vegetation of the site, to the steepness of the slopes, to the building materials used, to the difficulty or ease of fire fighter access during an emergency.”

Rob Klein of the Park Service says it’s important for people to understand that fire is a natural process.

“Fire has been on the landscape for thousands of years and forests will recover naturally,” he says. “They may not be the same as they were the day before the fire but they will recover to become the forests of tomorrow.” SML

Management experts say the forests will recover from last fall’s fires but people should take fire into account when planning development across the region. HOLLY KAYS PHOTO

