



HANGING ON FOR DEAR LIFE

Mount Graham red squirrels are rare. A subspecies of the American red squirrel, they were stranded atop the Pinaleño Mountains some 12,000 years ago, when the last ice age retreated. Their existence has always been tenuous, but in 2017, it got even worse when the Frye Fire decimated their habitat. Now, after eons of surviving in a rare coniferous forest 10,000 feet above the desert floor, the Mount Graham red squirrel is on the brink of extinction.

BY ANNETTE MCGIVNEY
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HEN TIM SNOW, an Arizona Game and Fish Department terrestrial wildlife biologist, drove to the top of Mount Graham in September 2017, he was expecting devastation. But the scene was far worse than he had anticipated. Two months earlier, the 48,000-acre Frye Fire had ravaged the tallest summit in Southeastern Arizona, replacing an ancient boreal forest with barren slopes punctuated by black toothpicks. From an ecological standpoint, it was an apocalypse.

“We all cried,” Snow says of his reaction and that of the scientists who had joined him on the trip. They wept not only for the forest, but also for the endangered

A Mount Graham red squirrel clings to a tree trunk atop the animal's namesake Eastern Arizona peak. After a devastating 2017 wildfire, the species faces an uncertain future.

Mount Graham red squirrel, which depends on the one-of-a-kind “sky island” environment for its survival. Crying about a squirrel is not something you’d expect from a man with a camo jacket and a Skoal ring etched into the back pocket of his jeans, but Snow had grown fond of the rare animal. He’d been methodically tracking the species for nearly two decades, as part of an annual fall census aimed at trying to protect the vulnerable squirrel from extinction.

A subspecies of the American red squirrel, the Mount Graham variety exists nowhere else in the wild. It’s the southernmost red squirrel in the United States, stranded at the top of the Pinaleno Mountains some 12,000 years ago, when the most recent ice age retreated.

Climate change, drought, bark beetle infestations, invasive species and development in its limited habitat have made life especially tough for the squirrel over the past few decades. In the late 1990s, biologists counted some 550 squirrels on the mountain. In some of the years before the Frye Fire, that number had dropped to about 220. And when Snow and his colleagues surveyed the charred forest in September 2017, they counted only 35 squirrels. After eons of adapting and surviving in a rare coniferous forest 10,000 feet above the desert floor, the Mount Graham red squirrel was on the brink of extinction.

Now, it’s September 2018, and Snow, along with the team of

BELOW: Marit Alanen, a U.S. Fish and Wildlife Service biologist, checks a map during a 2018 survey of Mount Graham red squirrel middens.

RIGHT: University of Arizona wildlife biologist Melissa Merrick searches for squirrels in the trees atop Mount Graham.

biologists, is back for another census. The scientists are hopeful there will be something left to count.

“This is our first effort since the fire to see where we are with the population,” Snow says. He spreads topographic maps on the tailgate of his truck as staff from Game and Fish, the Coronado National Forest and the U.S. Fish and Wildlife Service gather around. The census, along with a variety of other programs to help the squirrel, is a year-round, multi-agency endeavor. Rather than counting actual squirrels, the census process is to count their middens — the big piles of debris where a squirrel stores its cones for the winter. One active midden equals one adult squirrel, plus possible babies.

Since he started counting, in 1999, Snow and his colleagues have mapped nearly 1,500 red squirrel middens on Mount Graham. In 2016, the census team tallied approximately 200 middens that were in use. Many of those likely went up in flames, but perhaps some, along with their caretakers, survived. There are 10 of us, and we split into groups to divide and conquer, each armed with maps from previous years. Our mission is to survey sections of forest that escaped high-intensity fire to see which active middens still exist — and scope out any new ones.

I follow Snow and Coronado National Forest biologist Bonnie Woods into a lightly burned section of forest near the Columbine Visitor Center. Closely spaced spruce and fir trees form a dense canopy overhead, while blackened trunks show how the fire swept through on the ground.

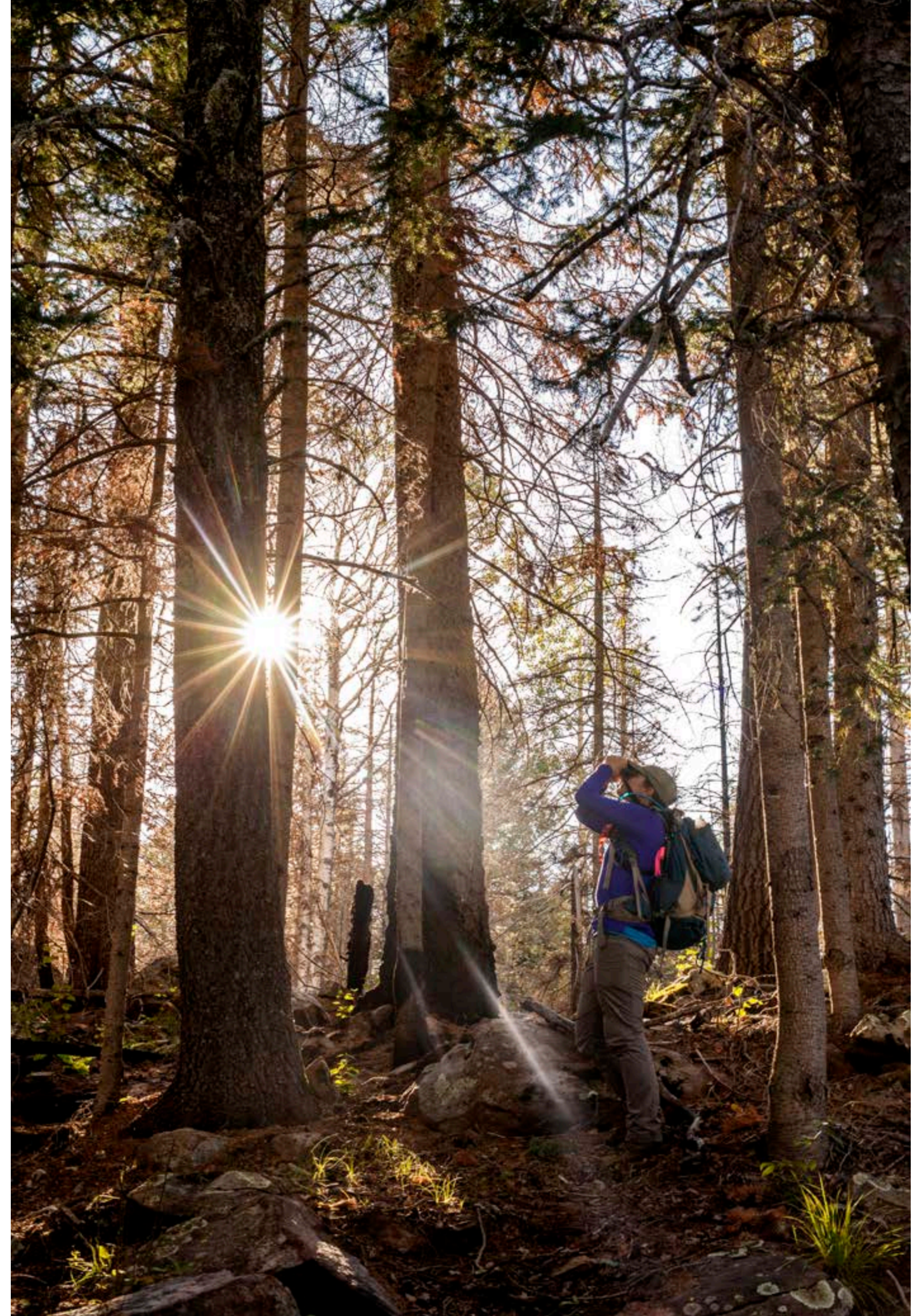
Mount Graham red squirrels have very specific requirements for survival: They need plenty of downed logs and thick canopies for cover from avian predators. They also need an abundance of cones from the spruce and firs, which are nurtured by winter snowpack. And these highly territorial animals need plenty of space to build their middens — and space is in short supply, since the Frye Fire took the cover and food from a large portion of the squirrel’s known habitat.

Despite these seemingly catastrophic circumstances, Woods quickly spots signs of recent red squirrel activity. “I see cone cobs,” she says, as she stares at the base of a corkbark fir, a favorite food source for the squirrel. The cones get nibbled down like an ear of corn, then tossed to the ground when the squirrel is done. There’s no midden in the vicinity, but neat rows of purplish-green cones have recently been stacked in a depression at the base of the tree.

“I’m calling this a new midden,” Snow says,



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as he checks the map to make sure there's nothing indicating squirrel activity in the spot in previous years. As Woods and Snow take GPS coordinates to mark the site and put a metal tag on the tree, the apparent owner of the cones stares down at us from a high branch. It noisily nibbles on a cone, sending debris flying in all directions.

FOR SCIENTISTS such as Snow and Woods, the Mount Graham red squirrel is fascinating for the traits that have allowed it to survive for so long in one environment. But for members of the San Carlos Apache Tribe, the small but mighty squirrel is a sacred part of their spiritual heritage. So is the mountain that sustains the species — the Apaches call Mount Graham *Dzil ncha si'an*, which means “big seated mountain.” “Mount Graham is the centerpiece of our religion; it is our Mount Sinai,” says Wendsler Nosie, a San Carlos Apache who has served as tribal chairman and currently fights to protect Mount Graham through his activist organization, Apache Stronghold. The Apaches believe that deities called *gaan* reside at the top of the mountain, and many of their ceremonies revolve around communicating with these spirits.

Nosie says the first blow to his people came when they were forced onto tribal land in the 1880s and banned from their sacred mountain. The second blow came a century later, when the federal government approved building the Mount Graham International Observatory at the top of the mountain, in the middle of precious red squirrel habitat. Construction began in 1989, even though the red squirrel had been added to the federal endangered species list two years earlier. The observatory complex now houses three telescopes that are managed by the University of Arizona and the Vatican, and plans to expand the facility have been discussed.

“The Apache are like the squirrel,” Nosie says. “We are both endangered and fighting for our survival.”

In August 1997, Nosie was arrested by UA police for trespassing on observatory grounds. He says he had gone to the top of the mountain to pray, and when a lightning storm moved in, he cut through the telescope area to reach cover.

“When you go to the top of the mountain, you want to be able to send your prayers up to the Creator without any interference,” he says. “The reflections from the telescopes dilute our prayers.”

Government biologists believe various science-based strategies can mitigate the damage caused by the development. That said, “I am worried about what happens if the observatory expands,” Snow says. “There is just not much red squirrel habitat left.”

We traipse over blackened downed logs and dried ferns as we venture into a section of forest that was more heavily burned. Woods finds another pile of green cones inside a stump. Nearby, there's a cushy midden that appears abandoned, but a new squirrel is moving in.

“This is not a good home,” Snow says, noting the lack of

tree cover. The small squirrels have always been vulnerable to predators, such as the northern goshawk and the Mexican spotted owl, but after the fire, they became especially easy pickings. Because of predation and other factors, Mount Graham red squirrels live, on average, only two and a half years — one-third of their natural life expectancy. And only 25 percent of juveniles survive. Further compounding the problem, female red squirrels are in estrus for only one day a year.

Fortunately for the red squirrel, an army of scientists is trying to help the animal overcome these seemingly insurmountable hurdles. As Snow, Woods and I walk back to the road, we check a feeder, made from PVC pipe, that was filled during the winter with “squirrel chow” to supplement the sparse cone diet. But in some areas, bears decided they, too, liked the alfalfa pellets. For that and other reasons, the feeders were decommissioned after a year. In an effort to protect the area from post-fire beetle infestations, the U.S. Forest Service nailed thousands of pheromone packets to tree trunks to repel the insects. Game and Fish has removed the plentiful and non-native Abert's squirrel from the area because it indirectly competes with the red squirrel for food. And the Fish and Wildlife Service has used satellite imagery to locate red squirrel habitat that may have escaped the fire. Meanwhile, the UA has its own, extensive red squirrel research and monitoring programs, which track radio-collared squirrels to better understand the species' behavior.

After a full day of squirrel tracking, the team members gather around a roaring fireplace in the Columbine Visitor Center and compare notes. Everyone observed red squirrel activity, but not in the usual ways: The animals now are caching cones on the ground, instead of in middens, and some have moved to lower elevations.

“These squirrels evolved in a fire regime, and they are more adaptive than we give them credit for,” says Fish and Wildlife Service biologist Marit Alanen, who's been participating in the annual census since 2000. “We are seeing them do things we didn't know they would do.”

Maybe it isn't all doom and gloom for the squirrel.

As the team discusses the tracking plan for the next day, Woods passes around a Tupperware container of squirrel-shaped sugar cookies. It's time for the annual census ritual. “OK, who wants to make the first guess?” she asks. “How many?”

Every team member gives their best estimate on what they think the year's squirrel count will be. The prize for the winner: a glass paperweight in the shape of a squirrel, and many kudos from the group. But they won't know the final number until Snow has a chance to analyze the data collected on the trip.

THE NEXT DAY, I hike in a mixed-conifer forest above Riggs Flat Lake with Alanen and Forest Service biologist Angela Dahlby. Once we get past a severely burned slope, we enter a wooded area full of mature trees that escaped the fire. Our goal is to visit old midden sites and see if red squirrels have



A Mount Graham red squirrel nibbles on a corkbark fir cone while perched on a log burned in the 2017 Frye Fire.

moved back in. Given the lack of viable habitat elsewhere, it would make sense. What we encounter instead is a red squirrel ghost town: Midden after midden is empty and decaying.

“This is confusing to me,” Alanen says. “What is keeping them away from here?”

There are many things about the red squirrel that scientists are still trying to understand. As a safeguard against extinction, a captive breeding program was started at the Phoenix Zoo in 2014, but it's going much slower than anticipated. After five years of trying with three adult males and two females, there still are no offspring.

Scientists say without a successful captive breeding program, another catastrophic event like the Frye Fire could spell the end for the Mount Graham red squirrel. But Alanen has hope. She points out that scientists thought the squirrel had gone extinct in the 1950s, but it reappeared a decade later,

eventually climbing to a population of more than 500. “These squirrels are proving more resilient than we thought,” she says.

The census numbers arrive in late October, and the red squirrel lives up to its plucky reputation: The population has more than doubled, from 35 to 75. Alanen wins the squirrel paperweight for the closest prediction.

Snow is surprised by the good news. “I expected the number would be less than 50,” he says. Even after so many years of tracking the red squirrel, he's learning new things about its behavior: “We think we know where their habitat is, but that could be changing.”

Later, there's more good news for the squirrel: The winter of 2019 brings above-average precipitation and a healthy snowpack to the top of Mount Graham. The increased moisture will produce a bounty of cones and guard against wildfires. But 75 is still a precarious number for the survival of any species. The scientists will keep up their efforts to give the squirrel a fighting chance.

Wendsler Nosie is doing his part, too. “I believe in prayer and sacred places,” he says. “I am praying for the squirrel.” **AH**