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Chamise | Photo by Joan Hamilton

Harvest of Fire

Joan Hamilton

A journalist spends two years documenting the dramatic changes that the Morgan Fire brought to Mount Diablo.

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On a hot afternoon in September 2013, a spark from a gun fired on private property on Mount Diablo ignited a foothill pine. The pine exploded, and soon the east and south sides of the mountain were on fire. By that night, flames and smoke filled the sky. From Walnut Creek, it looked as if a volcano was erupting.

What came to be called the Morgan Fire spent five days roasting 3,100 acres of wild open space, an area almost three times the size of Golden Gate Park. On the sixth day, a friend and I went out to see what was left. We parked along Morgan Territory Road beside a blackened meadow at the base of Perkins Canyon, near where the fire had originated.

North Peak | Photo by Joan Hamilton

The air felt hot, heavy. A post had burned through, taking down a fence. Across the meadow, a few ashen oaks were still smoking. Above them were barren slopes pierced by crooked sticks—the remains of thousands of torched chaparral shrubs. Attracted by the smoke, black charcoal beetles bit our necks and arms as we headed up toward North Peak for a better view. But after half an hour, I stopped and sat down, woozy from heat and smoke—or maybe just sadness. I tried to remember what had been along the trail before. Chorus frogs in the creek, yes. But what were the crooked black skeletons around me? Charred chamise? Or were they manzanita or buckbrush? Where had the rare Brewer's flax grown? And how about the delicate Mount Diablo globe lily, found almost nowhere else on earth?

For the previous two months, I'd been visiting this little-known east-side corner of Mount Diablo State Park, working on a guide to Perkins Canyon. Now my project was toast—and so was my favorite mountain. Or so it seemed.

Thirty-five miles east of San Francisco, Mount Diablo is rich biologically, with plants and animals representative of coastal, Central Valley, Pacific Northwest, and even desert habitats. It's a refuge for 10 percent of California's native plant species. It's wild enough to host wide-ranging wildlife such as mountain lions and golden eagles. It has months-long, rotating displays of wildflowers worthy of impressionist paintings.

In that first visit following the fire, I worried about torrential rains stripping soil from steep slopes, about the fate of the blackened old oaks and the foothill pines, about the survival of the mountain's rare plants, including two that don't grow anywhere else on earth. But soon rodents began turning the meadow soil from black to brown. The first grass came up, followed by soap

plant and mustard. Woodpeckers and hawks returned. Within weeks, the mountain's dominant chaparral species, chamise, was re-sprouting from stored energy in its root crowns. Toyon, elderberry, yerba santa, coffeeberry, coyote bush, poison oak, bay laurel, and other stump-sprouting native shrubs were, too, securing the soil and pushing up new stems and leaves.

Suddenly, the mountain was alive again. Far from the "toast" I had feared, it had become the most exciting natural laboratory in the Bay Area. Every hike offered something new; every observation seemed worth pondering. Even the most knowledgeable biologists and land managers didn't know exactly what to expect. "There was an interesting shift in people's attitudes in the first six months," says Seth Adams, the land conservation director for Save Mount Diablo. "We went from tragedy to excitement. It wasn't a tragedy in any way."

In November 2013, Save Mount Diablo called a meeting with California State Parks and invited more than a dozen biologists to encourage and plan post-fire research efforts. Save Mount Diablo staff explained a new mini-grant program, which would later aid the efforts of a handful of biologists in attendance. This was the "perfect fire," some said—no significant damage to people or property. In a region where fires have tended to come every 40 to 70 years, it also might be a once-in-a-lifetime chance to watch the mountain respond, as well as learn some valuable lessons about California's fire ecology in the process. "Nature is pulling back the curtain," said Nomad Ecology botanist Heath Bartosh at the time. "Let the play begin. We'll see who shows up and gives the best performance."

Chamise was central to the drama. Deep-rooted, with an affinity for hot, rocky slopes, it had once covered more than a quarter of the area burned with mile after mile of impenetrable shrubbery. Now, though, the sight of its wiry green shoots poking up at the base of the black stumps was cheered as a sign of rebirth, a measure of the mountain's recovery.

While chamise sprouts were still tiny, adventuresome hikers could roam all over the mountain, not just on the usual well-worn trails. Bartosh, who'd studied the Basin Complex Fire in Big Sur a few years earlier, predicted "a fleeting abundance" of colorful wildflower displays, including many rare plants. The resurgence and eventual takeover of chamise would signal a return to normalcy, he said. But he didn't know how long the process would take, nor how it would unfold.

Lindsey Hendricks Franco, a graduate student at the University of California at Berkeley, lost no time scooping up soil samples inside and outside areas of burned chaparral. Within each handful of soil were hundreds of chamise seeds. She took the samples to a greenhouse and watered them three times a week. As expected, chamise sprouted vigorously in the burned soils. But it refused to sprout in the unburned samples. "Chamise requires cues from fire to repopulate," Hendricks Franco says. "Some like it hot!"

A dry fall stunted the mountain's nonnative annual grasses. When rains finally came in February, herbaceous plants had plenty of sunshine and space. Some species were familiar, but others hadn't shown themselves on the mountain for a long time. Their seeds had lain dormant

since the last fire nearly four decades ago, just waiting for the smoke, char, or ash they needed to germinate. Called “fire followers,” these plants are part of the fleeting botanical abundance that flourishes after a fire and then disappears.

After extensive surveys that spring, Bartosh and his botanist colleague Brian Peterson found 17 such fire followers on the mountain. These were the hallowed plant species that everyone involved was looking for. Finding a knee-high blanket of pale yellow whispering bells was no problem. They were everywhere. A little sparser and more difficult to spot were the golden eardrops, with their bright yellow flowers on tall stalks. But the biggest prize for fire-following humans, the Holy Grail, was the fire poppy.

A fire poppy has an open orange blossom like the wind poppy’s, but without the purple center. Fire poppies famously blanketed the mountain’s northside slopes after a big fire in 1977. But they hadn’t been seen on the mountain since—until May 3, 2014, when botanists Steve Edwards and Chris Thayer decided to hike cross-country above Perkins Canyon.

“The slopes were treacherously steep and I had to follow Chris, who is a better mountaineer than I am,” Edwards recalls. “We kept seeing big swaths of wind poppies, but no fire poppies. We decided to go just a little bit farther, and we emerged on a spur that was loaded with interesting plants. Chris said, ‘Ah, the promised land.’ I thought, ‘Well, darn it, if this is the promised land, then fire poppies ought to be here.’ I looked down at my feet. I was standing right beside one!”

Word traveled like, well, wildfire. A few days later Bartosh found a big patch of fire poppies higher on the mountain. On May 17, a message from Seth Adams of Save Mount Diablo popped up on my phone. It contained no text—just a photo of him triumphantly crouching beside a big orange clump of the elusive flower.

The next spring, Bartosh helped his 10-year-old son clamber across the same slope to see the fire poppies. He figured he himself might be too old to see them with his son the next time they appeared. “It was a tough hike,” Bartosh says, “but we were determined to see them together.”

When I asked biologists how the fire might change the mountain, a surprising fact emerged. No one had a complete picture of what had been there before the fire. No comprehensive baseline studies had been done. Mary Bowerman’s 1944 classic *Flowering Plants and Ferns of Mount Diablo*(revised and updated in 2002) provided a good list of plant species to expect after a fire, but little indication of how abundant they might be. As to mammals, nobody knew whether reclusive ones like the Berkeley kangaroo rat or the ring-tailed cat were still present. Insects are an even greater puzzle, with new species being recorded in Contra Costa County with some regularity. “We are still very ignorant about life,” says UC Berkeley entomologist Kipling Will. “Right here and now, even in our own backyards.”

Will hopes to develop baseline information on Mount Diablo’s insects and other arthropods—creatures with external skeletons and no backbones. Each month around the time of the new

moon (when the darkness makes arthropods more active), he traps arthropods for four days. In five years, he hopes to have the best record yet of which ones live on the mountain and how they've responded to the fire.

Will's first year of post-fire work yielded 16 species of moths never before recorded in Contra Costa County. One was a moth that feeds on manzanita. With a wingspan of almost four inches, the "elegant sphinx," *Sphinx perelegans*, is likely the mountain's largest insect. Probably present on the mountain all along, Will says, it hadn't been recorded because no one had looked consistently.

Will found that beetles were twice as numerous in burned as in unburned areas, regardless of whether he was looking at grassland, woodland, or chaparral. Many beetles were no doubt killed in the fire, but insect activity boomed soon after, probably a result of newly available resources, including fresh new growth, fallen branches, and charred wood. Also, "the fire created open canopy areas, so there is probably a lot of shuffling going on as open- and closed-canopy species seek their preferred habitats," Will says. He was especially pleased to have collected a "minute moss beetle," which hadn't been seen on the mountain for almost 40 years.

Even 18 months after the fire, habitats were still changing. "About six large dead trees have fallen in our sample site in the last two months," Will reported at the time. "It's a very dynamic process. As these sites change over the seasons, I expect we'll learn a lot about the insects of Mount Diablo."

In late winter 2015, 18 months after the fire, chamise was coming on strong. The stump sprouts were significantly taller, and seedlings were numerous too. But the spectacular wildflower displays continued, with exciting new twists.

Bulb plants, such as Fremont's star lily and globe and mariposa lilies, had seemed larger and more numerous the first year. Golden eardrops and fire poppies, on the other hand, were more abundant the second. Wild cucumber dominated some slopes the first year. Other vines took over in the second: clematis, poison oak, and—festooned among the chaparral skeletons—acres and acres of native morning glories. In fact, the morning glories made off-trail botanizing so hazardous that Bartosh and Peterson dubbed them "trip vines."

On one jaunt near Rhine Canyon, I explored a year-round creek, a part of Mount Diablo's circulatory system that had been invisible behind the dense chaparral curtain before the fire. Its banks hosted a mini-forest of giant chain ferns—some burned to the ground, some sporting graceful new five-foot-long fronds. Along the creek itself were yards and yards of the delicate red and yellow seep monkey flowers. This was hot, dry Mount Diablo? I felt as if I'd been transported to a rain forest in the Pacific Northwest.

The previous year, Bartosh and Peterson had produced a list of 28 herbaceous native plants benefiting from the fire. These opportunists didn't need fire to germinate, as the fire followers did. But they flourished in the extra space, sun, and nutrients that the fire provided. I found

numerous examples on my own—including a huge swath of Mount Diablo's endemic sunflower, which generally shows up in parsimonious bunches. The hairy purple blossoms of Mount Diablo's rare endemic jewelflower were unusually easy to find that second year. So were the violet-blue flowers of another "rare" species, Kellogg's climbing snapdragon, which hadn't been recorded on the mountain for 80 years. The biggest surprise of all was sleepy catchfly, a flowering plant that traps insects with sticky resin. Discovered by Susan Bainbridge of the Jepson Herbarium, the species hadn't been recorded in the area for 125 years.

More rain arrived that second year, but most of it came in two big events in the fall and winter. Apparently that was no problem for Mount Diablo's "seed banks," which have evolved to take advantage of a wide range of conditions. "Some plants have tough-coated seeds that show up only after a fire. Some seeds with different characteristics only show up in a light-rain year—others in a heavy-rain year," Save Mount Diablo's Seth Adams says. "I used to think of rare plants as fragile. Now I think of them as tough."

Chamise chaparral is especially good at seed banking; Bartosh and Peterson found more rare plants there after the fire than in any other plant community. They're not sure why, but Bartosh has some theories. Perhaps chamise's dense cover reduces erosion from rain and wind, keeping seed banks intact. Perhaps seeds in its rocky soils are less likely to be eaten or disturbed by small animals. Or perhaps it's less hospitable to nonnative grasses and other plants, so there's more room for natives, even if it takes 125 years for them to come out of hiding.

As I moved from chaparral to woodlands, I was happy to see that most of the craggy old oaks were awakening. Twigs on the ends of their branches were dead, but the trees themselves were vigorously sprouting from the trunks and thickest limbs. On the other hand, many foothill pines were dead. Unable to stump sprout, they reproduce from seeds, which is a slower process. But in some places where cones had landed, blue-gray pine seedlings already were inching up from the ground.

The future of those seedlings will depend on the future of fires in this area. If fires keep coming every 40 to 70 years, the pines will probably reestablish themselves. If the fire cycle speeds up, however (as is happening elsewhere in California, likely due to climate change), seed-obligate trees and shrubs could be at risk. Even stump-sprouters could be hurt by too-frequent fires. When wildfire hit some areas in San Diego County two years in a row, for example, even hardy chamise was overcome by invasive weeds.

The Morgan Fire came at a good time for amphibians, most of which would have been underground in September, the height of the dry season. The first spring, however, the ponds where they would normally go to mate and lay eggs were alarmingly dry. Fortunately a big rain in December 2014 filled those ponds and by April researchers' dip nets were wriggling with tiger salamanders and red-legged frogs (both federally listed as "threatened" species), as well as more common native amphibians, such as western toads and chorus frogs. "Our amphibians

survived and are thriving," declared state park environmental scientist Cyndy Shafer. "It's another example of how quickly nature rebounds."

Some Like It Hot

The Morgan Fire brought a fleeting abundance of wildflowers, including many "fire followers" whose seeds had lain dormant for decades. Other plants and animals also flourished in the fire-cleared landscape.

Perkins Canyon during Spring 2015 | Photo by Joan Hamilton

In early June 2015, at the close of what Save Mount Diablo's Adams calls "two of the best wildflower seasons we have ever seen on Mount Diablo," I made one last walk through the burn. As usual in early June, grasses and most leafy plants were crisp and brown. But a large stand of pearly everlasting was sending out the plant's characteristic maple-syrup scent, likely taking advantage of the bonuses provided by the fire. A fire-following shrub called bush mallow was in full bloom, too, with large pink flowers topping towers of felted gray leaves. More humbly, a few wizened whispering bells were making a valiant last stand. With less char in the soil, fewer of these fire followers had germinated in the second spring.

Where the bells once rustled, chamise was flourishing. Since last summer, its bright green, foot-high stump sprouts had doubled, tripled, or even quadrupled in size. And there were numerous

seedlings, forming thick stands almost a foot high in some places. There was still room for other plants, but the chamise curtain was closing.

Friends and I have joked about becoming "fire chasers," like those people of questionable sanity who follow tornadoes or other kinds of storms. "Anyone who has experienced regeneration after a fire is ready to run to the next fire," Adams says, "because it's such an amazing show."

Video: Perkins Trail after the Morgan Fire

But I'm not ready to run just yet. Visits to Mount Diablo are still intense and engaging: "wild, loud—like in a city," as Peterson describes it. The pace of change has slowed, but there'll still be mysteries to ponder next spring; I'll brave the trip vines and wander as widely as I can.

And when the chamise curtain finally closes, I'll nod appreciatively as I walk by. Because we know what lies behind it.

Joan Hamilton *is an environmental writer and editor who produces Audible Mount Diablo (audiblemountdiablo.com), a series of mobile audio tours. Click on "Perkins Canyon" for her post-fire tour of the area.*

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