



Wildfire

A READER

Edited by ALIANOR TRUE

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edited by 藏书章

ALANOR TRUE

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Introduction: Fire from the Sky

The storm begins with a sharp crack in the sky, electrons streaming up from the earth and down from the volatile atmosphere, meeting in a jagged line. As lumber-sized splinters from a broken ponderosa pine lie scattered outward, the chemical reaction between air, wood, and heat causes licks of flame to flicker in the pine duff. Small wisps of smoke waft up through the dry air. Twigs and needles crackle in the dry heat. Quickly, the flames spread outward, pushed north and east by the coaxing breeze. Brown pine needles in tufts of three, pine cone shavings, fir and spruce needles, and decomposing litter in the soil feed the 4-inch flames, leaving a mosaic of black patches on the forest floor. The flames gain size and speed with the late morning breeze, climbing the lower pine trunks and consuming the twigs and branches piled beneath fallen trees. The smoke rises above the canopy, a whitish gray puff wavering with the wind. On the ground, the fire has taken hold in the parched sawdust of a decomposing log, gaining strength and energy for the run it will make in a few hours, when the humidity plummets and the winds pick up. It has a life of its own now, a breathing energy. A wildfire is born.

My colleague and I stand in ash-covered boots on the North Rim of the Grand Canyon, a two-by-four of fresh pine planted so deep in the soil beside us that the two of us cannot budge it. We can only flex and bend it, and watch the pale yellow trickle of sap ooze toward the ground. We are patrolling the Imperial fire, a 7-acre wildfire that began here, with this ponderosa and the heat from a bolt of lightning that crashed

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from a dark monsoon sky. The fire has been controlled; a line of dirt surrounds the patchy black forest floor, and no puffs of smoke rise from the piles of limbs or the layer of duff we march through. Yellow jackets buzz around us, flies land on our helmets. A young mule deer watches us watch her, not afraid, as she paws through the ash and scrapes her flanks on the blackened standing trunks. The burn has been without active flame for three days. I bend and pick up a ponderosa pinecone, and toss it back over my shoulder onto the ash-covered soil.

Fire has been an active element of this Arizona forest for thousands of years, just as wildfires have been an influential force of nature for hundreds of millions of years, since vegetation began taking root on young continents. Life on this planet, especially in the temperate regions of North America, has evolved under the continual presence of fire. As a selective force, it has altered and impressed itself upon nearly every plant community in every bioregion in America, from the cypress swamps of South Florida to the sagebrush plains of the Great Basin to the immense tallgrass prairies that once filled the Great Plains. These ecosystems evolved under the evolutionary pressure of fire, and thus require it to maintain their health, even in a modern era where wildfires are not always a welcome reminder of the natural world.

As long as people have been in North America, there has been a record of wildfire. Fire is an essential component of many Native American tales and origin myths, and an integral part of ceremonies and rituals. As a tool for manipulating the environment, fire was skillfully used by Native Americans for centuries in every region of America. European settlers moved across the country and brought with them written language. Tales of wildfire were told countless times and were eventually written in fictional and true-life descriptions of the interactions between people and nature. In the earliest accounts of the New World, one can find references to fire, especially "Indian burning." As explorers and settlers moved west, they chronicled both wild and ignited fires in journals of their expeditions. Early writers, with their European view of fire as a destructive force that should be eradicated from wild lands, rarely grasped that fire can have positive values as well.

The attitudes toward wildfire in American literature gradually changed with the advent and evolution of the conservation movement.

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So, too, did the practice and techniques of fighting wildfires in America's great public lands. As national parks and forests were set aside as treasures and stocks of natural resources, the spread of naturally ignited wildfire was halted. Human-ignited fires were suppressed with equal vigilance. The landscape was not without fire, as it likely never will be, but the motions of fire over the landscape were controlled as much as humans could possibly constrain a wild force.

As the growing American population spread across the country, knowledge of wildfire and its suppression expanded. American writers recorded how wildfires changed the land around them, and they documented the relationship between wildfire and firefighters. Attitudes changed as scientific knowledge about wildfire increased and as fire ecology developed as a field. American writers captured conflicting ideas in their works, noting the effects of a Smokey Bear suppression policy as well as the need to control wildfire near human populations. Describing the effects of wildfire on ecosystems became an important part of the literature surrounding wildfire. More recently, wildfires have been documented by those who know the flames and smoke best, America's wildland firefighters. Firefighters are uniquely positioned to portray their intimate knowledge of the environment and fire behavior against the adrenaline-charged backdrop of a wildland fire.

Understanding fire in America begins with an understanding of fire ecology and how fire has altered plant and wildlife communities in nearly every portion of the continent. Fire history is measured in millions, not thousands, of years. While combustion and fire have almost certainly been present on this planet since its inception, wildfire has been known to affect the environment for at least the past 350 million years. In fossil charcoal records, fire can be traced back through the millennia to Carboniferous times, where ash is found in what are now coal deposits. Given the historical significance of wildfire, understanding the role of fire in today's ecosystems requires a long-term perspective.

Distinct fire environments are composed of climatic characteristics, atmospheric conditions, fuels, and human cultural activities that may change through time and from region to region. In addition, a wildfire that lasts for only days or weeks can produce effects that endure for decades and longer. Fire is episodic by nature, appearing at irregular

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intervals that may be influenced by external factors, like accumulation of plant debris on the forest floor or the presence of drought conditions. For these reasons, placing a wildfire into an ecological worldview involves knowledge of how fire fits into this complex working environment.

Wildfire is a natural disturbance to the environment, similar in magnitude to hurricanes, tornadoes, floods, volcanic explosions, or insect invasions. Flames sweeping through a forest or prairie disturb the established community and create new open space for plant species to colonize. How much new space is created depends on the nature of the fire itself, and external conditions, such as drought, that may be conducive to the spread of fire. Once the community has been altered, new species may colonize and prosper where before they would have had to compete for resources with the dominant species. Fire may also allow fresh new growth of dominant species, their success ensured by the nutrient-rich ash and access to sunlight and other resources.

The lack of fire can also dramatically alter a community's structure. Some plant communities require fire and are adapted to resist fires, reseed quickly after fires, or both. These fire communities include the chaparral shrublands of California, grasslands, and some coniferous forests. Without fire, dominant species may be overtaken by opportunistic species that could not survive the heat of a wildfire. An example is the thickets of white fir that sprout up around ponderosa pine stands in the absence of periodic fire. Without fire, the structure of the forest can gradually shift from an open ponderosa stand to a thick stand of white fir. When a wildfire does sweep through, the firs provide ladder fuels from the ground to the branches of the ponderosas, allowing fire to damage the mature trees. Before the thick growth of white fir, fires would have burned through the surface litter, emitting enough heat to release nutrients in the soil and create open space for the growth of shade-intolerant ponderosas. These fires would not burn hot or high enough to cause lasting damage to the mature ponderosas.

Wildfires exist in nearly every North American ecosystem, from wetland swamps of the Southeast to palm oases of the Mojave Desert, and they affect vegetation distribution within each region. Vegetation distribution is the arrangement of different plants within an ecosystem. Many

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external factors can affect distribution, including water, sunlight, and proximity to other plant types. Fire is the one factor that can create new spaces for growth, influence soil fertility, and increase range and dominance of species. That fire affects change did not go unnoticed by our forebears. In fact, Native Americans and peoples worldwide used fire to influence plant communities that provided needed food or other resources. In the Pacific Northwest, the Salish tribes used fire to encourage growth of bracken, camas, and nettles for food and utilitarian purposes. Frequent fires eliminated competitive plants and provided nutrient-rich soil to foster new growth. By using fire to encourage growth of particular species, this Native American group altered the previous distribution of vegetation to their advantage.

Fire is a focused agent of natural selection, applying tremendous pressure on the evolution of plant species across the continent. It can be said that fire is the most influential force in determining the history of North American forests. For a plant to survive in a fire regime, it must be adapted to the regular passage of fire through the ecosystem. The unique adaptations are multifold, and include developing a thick bark, releasing seeds soon after a fire passes, and storing nutrients underground in roots and tubers, safe from the heat of a fire. High-temperature tolerance in vegetative buds and the ability to reproduce from underground structures, like quaking aspen trees, are characteristics of plants that are exposed to frequent fires. Seed dormancy and fire-stimulated germination are common in these plant groups, especially when germination and establishment are unlikely in the absence of fire. In the case of the giant sequoia trees of California, seeds are held tight inside closed cones for up to twenty years. The hot air from a fire dries the cones, and a few days afterward, the cones open and release tiny seeds upon soil burned clean of duff and litter. This fresh earth is crucial for the success of a sequoia, for in order for the seeds to prosper, they must fall onto bared mineral soil. Only cleared post-fire ground is free of the undergrowth that competes with a young sequoia for valuable resources, such as sunlight and water.

Natural burn intervals exist in every environment that sees fire on a regular basis. A burn interval is the period of time a naturally occurring fire would burn through an ecosystem, and can vary from region to

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region. In Florida's wetland environments, the sawgrass between cypress stands can be expected to burn every three to five years. In the lodgepole pine forests of Yellowstone, the burn interval is much longer, from 100 to 300 years. These intervals between fires allow ecosystems to adapt and recover.

Plant communities are not the only aspects of ecosystems that are affected by wildfire. The physical environment, including air, water, and soil quality, can be affected by the impacts of fire. Airborne smoke and ash can travel hundreds of miles, leaving a swath of gray skies and smoky air across states. Any late-summer visitor to northern Nevada may see smoke from fires that burn as far away as the rugged mountains of Northern California. Smoke from fires in northern Arizona has been seen as far away as Salt Lake City. And closer to a wildfire, residents and firefighters must regularly breathe air that falls far short of clean-air requirements. On a positive note, wildfire smoke can have a detrimental effect on the fungus that causes root rot in trees, an organism that affects the health of trees across the West. Ash can affect water chemistry, upsetting the delicate pH balance that so many organisms depend on. Soil, as the nutrient base for plants, depends on the recycling effect of fire to release nutrients; this tenet is the basis for slash-and-burn agriculture techniques used worldwide. However, water often carries away ash and nutrient-rich soil before vegetation can secure the topsoil, as in the Southwest, where monsoon rains are blamed for washing away inches of crucial topsoil before new growth can claim it. For a region hit particularly hard during a wildfire season, the effects of severe soil degradation, decreased water quality, and higher particulate matter in the local atmosphere can leave a lasting mark on the local environment.

Fire can influence wildlife communities as well. The endangered Kirtland's warbler, a tiny dark-gray and yellow bird, nests in thickets of young jack pine scattered across the Michigan upcountry. The few remaining stands of native jack pine require periodic fires to spur reproduction. The pinecones stay closed on the branches until heated, and when they open, the seeds drop onto fertile ash to germinate. Kirtland's warblers only nest and raise their young in pine stands that are eight to eighteen years old. They depend on fires to produce the conditions needed for the growth of new stands. Without wildfires consuming and

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renewing these jack pine forests, there is a continual loss of species habitat as well as the loss of a native plant community.

Suppressing fires, as has been the human tradition of the past century, often has unforeseen consequences in environments where fire plays a large role. In the absence of fire, flammable fuels accumulate and fuel structure changes. Fire severity increases as a result, often in a way that has detrimental effects on those species that evolved in the presence of less intense fire. As forests become denser with more growth, not all trees can gain adequate access to water or sunlight. As thick stands of stunted or dead standing trees remain, insects may move in, further weakening defenses against fire. When the forest ignites, especially under drought conditions, the effect is a catastrophic fire. It may be effective in clearing out the dead and downed forest litter and collected debris, but it is also of immense size and strength and virtually impossible to extinguish, even using all the tactics of modern firefighting. These fires are often quelled only by winter snows or rain, suppressed by the same entity that started them: Nature. In ecosystems where more frequent low-intensity fires are a natural part of the community, these high-intensity fires may have a longer lasting and unhealthy impact on the environment, decreasing soil fertility and drastically changing the composition of flora and fauna.

The high-intensity fires of recent years are not only the result of management practices in America's forests for the past century. Climate change and global warming can also impact the dynamics between wild-fire and flammable forests. The twentieth century has seen worldwide temperatures rise more dramatically than in the past 1,500 years. As human activities increase levels of carbon dioxide and other greenhouse gases in the earth's atmosphere, gradual rises in temperature occur across all seven continents and oceans. According to climatologists, warmer temperatures worldwide lead to more frequent heat waves. As warmer temperatures increase evaporation, more common and severe droughts are likely. Regional droughts are always a factor in severe fire seasons, as the summer of 1998 proved in Florida. Dry conditions brought the worst fires in more than fifty years, burning over 500,000 acres of forest, more than 17 times the annual average. Global warming has also been linked to more intense and frequent El Niño events. The

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1998 event was the strongest of the century, bringing severe drought to the eastern and southern United States. El Niño also brought enough precipitation to the West that plant growth, due to the moist conditions, drastically increased, and supplied even more fuel for the fires of the following summer.

With increasing residential zones near public lands, a century of fire suppression, and the added threat of climate change due to global warming, the wildfires of the future are a frightening prospect. The summer of 2000 saw the worst fires to sweep the West since 1910, when an unseasonably dry summer fueled torching fires across the Northwest, sparking the modern practice of fire suppression and instilling fear of wildfire in the American consciousness. Any force of nature that works outside of human control and with the ability to wreak so much change to the environment naturally imparts a sense of fear and mistrust. Such is the case with wildfire, a tricky element to restore in natural ecosystems without losing control and causing harm to people and property nearby.

In the case of wildfire in America, history can illuminate the future. Recent years have showcased the results of a century-old suppression policy, as well as the added complexity of human occupation near fire zones. Add weather cycles and the increased propensity for drought in the face of global warming, and the firestorms that occur once or twice a century could become as common as hurricanes battering the Caribbean every fall. This presents a modern predicament for America's land managers and the general public. Annual property damage from wildfires approaches billions of dollars, and every recent summer has seen injured and killed firefighters on the firelines throughout the country. Wildfire may be the most important environmental issue facing our country today, as homes continue to burn, and runaway fires make headlines from coast to coast.

Tracing the role of fire ecology and the history of wildfire inevitably leads us to Native American populations, who used fire in many ways to alter the landscape and maintain the natural place of fire in the environment. There is scant written evidence recorded by Native Americans about the uses and practices of fire, but their role in developing modern firefighting methods, especially prescribed burning, is not to be overlooked. Tribes across the country used fire for hunting, communication,

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and clearing excess plant growth. As more European settlers populated the country, especially the South, knowledge and experience with periodic “Indian burning” grew. The tradition developed over generations into seasonal burning by backcountry settlers, who realized the value of regular fire in rejuvenating grass, reducing insect populations, clearing underbrush, and attracting game. The practice of burning southern long-leaf pine forests and pastures was passed down through generations and eventually came to be known as controlled burning. By the early twentieth century, the U.S. Forest Service began to take note. With the emergence of fire ecology as a scientific discipline in the 1960s and the gradual recognition of the rightful place of fire in the environment, what was once backwoods burning had developed into a working knowledge of prescribed fire. By the close of the century, prescribed burns had become an integral part of fire management in America’s public lands.

Without the initial knowledge and experience that Native American tribes imparted to settlers, the modern practice of prescribed fire might have been longer in coming. When Europeans came to America, they brought with them an intense fear and mistrust of wildfire; they viewed it as a wholly destructive force. This feeling is often portrayed in records documenting early experiences with fire between settlers and explorers and Native Americans. Only through witnessing the beneficial uses of wildfire in ecosystems were the newcomers convinced of fire’s ability to enhance and enrich the natural environment.

Thus no collection of works concerning wildland fire can be complete without the inclusion of Native American voices. Finding written record of fire history in that voice, however, is a daunting task. In my search to accurately represent the perceptions of wildland fire in America, remarkably little record emerged that was derived from the Native American community. This lack of written information is due to several factors. One, most Native American tribes recorded oral histories about wildfire. European settlers and explorers recorded the written history of precolonial-era fire practices and imparted their own bias against wildfire to their writings. In addition, it is possible that most Native Americans considered fire a useful, though unremarkable, tool and did not make a concerted effort to pass knowledge of history and practice down through generations. Settlers and their descendants, who viewed

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fire as a dangerous and destructive event, would have had reason to record and retell their memorable experience with fire. Finally, with the considerable loss of their land and destruction of their heritage, perhaps the Native American voice of fire history did not survive to the present day. What has survived are Native American voices from the early 1900s recounting the origin myths of fire in specific tribes, and a body of modern Native American poetry where fire is an integral element. The origin myths are included in this collection to represent the role Native Americans played in determining this country's fire history and to illustrate how important fire is to Native American cultures across the country.

This collection gathers together for the first time some of the finest stories and essays ever written about wildfire in America. Each selection examines in a different way the relationship between wildfires and the American landscape, both natural and cultural. From Lewis and Clark to Native American origin myths, to modern stories of firefighting, there are works that are historically, geographically, and culturally significant. Realizing how many of America's most beloved and recognized authors have written of wildfire represents just what a timely and important event it is in so many of our lives. From Henry David Thoreau to Mark Twain, and Norman Maclean to Edward Abbey, writers across the country have depicted and recorded wildfire with depth and clarity. An ecological perspective is well represented through the words of John Muir, Aldo Leopold, and John McPhee. Stephen Pyne, a noted fire historian, offers a historical perspective on the 1910 fires that set the stage for the modern firefighting movement. Other voices include Ed Engle, Louise Wagenknecht, and Gretchen Yost. These firefighters from the front lines give us exciting accounts from a first-person perspective and relive the personal encounter with a forest fire. Such a diverse assemblage of voices is long overdue in a country that has had such an intense and lasting relationship with wildfire.

What strikes me most about this literary collection is how much, as Americans, our relationship with and attitudes toward wildfire have changed over the past 200 years. This collection is organized around shifts in thinking about wildland fire. The earliest accounts in this book

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were written at a time of discovery and exploration. Meriwether Lewis captured the bestial quality of wildfire in his journals, and with the exception of John Muir, writers of the nineteenth century continued to record fire as a destructive event in their fiction and nature writing. Not until the 1920s did thinking begin to shift in terms of the possibly beneficial role of fire in natural ecosystems. Beginning with Aldo Leopold and others, the next 50 years were times of argument and trial, as traditional theories of fire suppression conflicted with newly emerging and contrary views. In the nature writing of the time, differing opinions are offered as to the value and place of fire, of Smokey Bear, and of the role of fighting fire in ecosystems that were meant to burn. A new day in wildfire writing was born with the Yellowstone fires in 1988, which brought increased attention and focus upon wildfires. The conflagrations of that drought-scarred summer left Americans reeling and anxious to effect change with the tools of fire ecology, prescribed burning, and a shift away from complete suppression. Writing from this period reflects the new acceptance of fire in the natural world, from the perspective of naturalists and firefighters, and addresses the problems encountered from a century of fire suppression.

Even as this book is published, yet another shift in thinking about wildfire is on the horizon. The waves of wildfire that swept through Los Alamos, through suburban Colorado, across every Western state, and raged through Montana, left a lasting impression of the power and presence of fire on Americans from coast to coast. After the severe fire season of 2000, lauded as the worst in recorded American history (worse even than 1988 or 1910), new thinking about wildfire is emerging. No longer is prescribed fire sufficient to cleanse the forest of crowding deadfall and debris. Prescribed fire did not prevent the firestorms of 2000. In some cases, it even prompted them. With the complex dynamics of an increasing population in rural and forested areas, of patchy logging properties where timber stands grow thick and close, of protected forests in public lands that have been robbed of fire, the pressures on America's land managers have become heavier than ever. The cost of firefighting efforts in the season of 2000 also spawned new interest in controlling the problem. With financial costs in excess of one billion dollars, and environmental and health costs too great to quantify, the country clearly cannot

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continue the present efforts. What is next for America's forests and rangelands remains to be seen. Much depends on policies set by the nation's largest landholders, the U.S. Forest Service, the National Park Service, and the Bureau of Land Management. Certainly prevention, suppression, and prescribed fire will still play a role, but so will new efforts, such as the mechanical thinning of thick forests. One thing is certain, though, and that is that the new policies and wildfires will continue to be recorded by authors from all walks of life and experience. Writers will continue to capture the fury and heat of the great flames or the quiet reflection of wildflowers sprouting from ashes, so long as fires burn through forests and prairies, inspiring us, and reminding us of the eternal power of Mother Nature and her role here on Earth.

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