

Pyrosociality

The Power of Fire in Transforming the Blue Ridge Mountain Ecoregion

Cynthia Twyford Fowler

ABSTRACT: Pyrosociality is a framework for theorizing the simultaneous production of forests and fires while discerning who is powerful and who is vulnerable in multi-species encounters mediated by fire. This article reviews literature about fire science and situates academic dialogue about the ecological consequences of social processes within real-world goings-on in the Blue Ridge Mountains. Pyrosocial theory draws from posthumanism, science and technology studies, and feminist anthropology to assess fire management. Qualitative data from properties managed by the Nantahala-Pisgah National Forests, North Carolina Forest Service, and South Carolina Forestry Commission ground pyrosocial theory in shifting ideas and practices related to excluding, suppressing, fostering, and igniting fires. When centering fire, what facts, truths, complexities, and subtleties come to light? The pyrosocial approach reveals pyropower, or individual variabilities and structural hierarchies related to controlling or influencing more-than-human communities. Focusing on power and vulnerability within habitats co-constructed by multispecies agents and biophysical forces accentuates meaningful relationships.

KEYWORDS: anthropology, Blue Ridge Mountains, ethnography, fire, National Forests, prescribed burn, Southern Appalachia, theory

Pyrosocial Contours and Compositions

Wildland fires affect people, animals, plants, soils, waters, and atmospheres in ways that are distinctive and impactful enough to warrant the development of a theoretical framework for explaining it as a worldmaking phenomenon. “Pyrosocial” is offered here as a frame for theorizing the webs of relationships constituted by multispecies encounters mediated by fire and for discerning the systemization of power and vulnerability in the generation of relationships and the construction of ecosystems within specific burn incidents and during extended fire histories. “Pyropower” is a pivotal device for evaluating pyrosociality due to its ability to focus our

attention on individual variabilities and structural hierarchies related to controlling or influencing more-than-human communities. Pyrosocial theory provokes crucial questions, such as: What is made visible when we focus on relations of power and vulnerability within habitats co-constructed by multispecies agents and biophysical forces? When centering fire in studies about the environment and society, what facts, truths, complexities, and subtleties come to light?

Viewing pyrosocial collectives as more than human (Haraway 2015) could lead to better caretaking of their abiotic and biotic constituents and a more holistic approach to ecosystems health. As a concept, pyrosocial is meant to evoke conceptualizations of multispecies collectives of ecological processes, environmental components, and living creatures that are pyrogenic in the sense that they emerge through fire. The multispecies network described in this article includes people, plants, animals, and fire—cast here as a metaphorical “species”—and serves to illustrate the explanatory potential of pyrosociality. Evaluating the current state of science and management is my priority in this article because *Environment and Society* publishes annual reviews. However, the relationality of people and fire, people and plants, people and animals, fire and plants, fire and animals, and plants and animals are also presented in this article via an ethnographic case study as a means for advancing the pyrosocial case. Moreover, bringing ethnographic material into this review article bolsters the goals of, first, showing that fire scientists and fire managers (i.e., workers in institutionalized federal and state forest management agencies whose duties include but are not limited to both igniting and suppressing fire) constitute a subculture and, second, of depicting science and management as culture.

The volume of literature on fire science and the vigor of fire management attest to not only the dynamism and intrigue but also the massive influence of fire scientists and fire managers in society and over ecosystems. Fire scientists and fire managers brandish a type of pyropower that comes from producing, possessing, and deploying the information and skills through which fire is known. With roots in social theory, ecological theory, and fire ecology, the genealogy of pyrosociality is traceable. Although a novel term, pyrosociality borrows from two academic trends: one attaches “pyro” to disciplinary terms. Pyrogeography (Bowman, Balch et al. 2011; Roos et al. 2014) is an example. The other links “sociality” with domains of study, such as biosociality (Rabinow 2005) and chemosociality (Shapiro and Kirksey 2017). Pyrogeography is an interdisciplinary and holistic framework for understanding the relationships between people and fire through time with strong theoretical and empirical bases. Pyrogeographers move beyond the natural, anthropogenic, climate, and culture explanations for understanding the ways fire regimes change. Their research fills crucial lacunae in fire management regarding the vulnerability of people, weather and climate, smoke and air quality concerns, carbon cycles, and debates about the role of fire in conservation (Bowman, O’Brien, et al. 2013). Drawing on the links to sociality, terms such as “biosocial” have histories within social science that date back to the late nineteenth century (Nerlich 2017) when scholars began using it to frame their studies of the links between psychological illusion and objective reality (Roberty 1893 cited in Nerlich 2017) as well as metaphysics and sociology (Izoulet 1894 cited in Nerlich 2017).

Turning to anthropology, when did “biosocial” appear and how has it been understood within the discipline? In 1975, the feminist scholar Lila Leibowitz mentioned “biosocial” in her contribution to the edited volume *Toward an Anthropology of Women* (Reiter 1975). Leibowitz and the authors of other chapters in that edited volume used evolutionary and Marxist theories to analyze the construction of gender identities across cultures and also to grapple with women’s oppression due to structural inequalities. In exploring the evolution of sex differences, Leibowitz shows that sex roles vary across societies and primate species, which supports the proposition that they are culturally constructed. Leibowitz proves that evolution has selected for behavioral plasticity in humans; and, contrary to many opinions, evolution did not select for

universal dimorphic social roles. In writing “anatomy is not destiny” (Leibowitz 1975: 20), she was arguing that culture has a bigger influence than genetics on gender roles. Leibowitz uses the term “biosocial evolution” in her essay to identify a post–World War II reactionary trend within anthropology whose agenda was proving that men and women (as well as blacks and whites) do indeed have genetically determined physiological, psychological, emotional, and intellectual differences. “Biogenetic” and “sociobiology” are other terms for that school of thought. Leibowitz positions herself as a proponent of cultural constructionism (Leibowitz 1975: 22) in opposition to this trend and presents a strong counter-argument. To be clear, “biosocial” may be the same word that I use in this article, but it does not have the same meaning as it did in the sexist, racist, and violent forms of mid-twentieth-century sociobiology. Since that time, other scholars have revived and repurposed the term.

Notable recent adoptions of “biosocial” come from science and technology studies (STS) and global health. Gisli Pálsson noticed by 2015 a “biosocial turn” and adopted the biosocial concept as a way to consider political, economic, and technological interventions into life that create hybrid forms and porous bodies. Similar to STS, global health takes a critical stance and disrupts disciplinary boundaries (Meek and Fontanilla 2022) while attempting to be more holistic and not shy away from the complexity of real-world processes nor expecting easy answers to wicked problems. Global health is solidly grounded in some of the same social theories underlying the other authors whose work I draw upon to build the pyrosocial framework; namely, to quote Paul Farmer and his colleagues, “Foucault’s ‘biopower,’ Berger and Luckmann’s ‘social construction of knowledge’ [and] Merton’s ‘unintended consequences of purposive social action’” (Farmer et al. 2013: xiii–xix). Particularly appealing features of the biosocial framework within global health are the critique of institutionalized forms of management (medicine is one example within global health, and fire is the form in this article) and the advocacy for rights and equity along with the desire to maximize flourishing (for humans in global health’s case, and for multispecies communities in pyrosociality’s case).

Pyrosociality puts forth a model of “shared” and “shifting” networks of humans and nonhumans (Shapiro and Kirksey 2017: 484) and prioritizes change as the focus of study. Pyrosocial extends biosocial thinking beyond the social constructionist approach by seeing more-than-humans as social beings who themselves have (pyro)power. Wrangling with change is an integral part of managing fire, as Adriana Petryna (2018) shows for the US West. Pyrosociality is an effective term for organizing information and theorizing fire. The term emerged out of the exercise of composing this literature review on fire ecology in the Blue Ridge Mountains (United States), setting it beside an assessment of fire management in the region and, furthermore, commenting on the implications for multispecies ecologies.

Positionality in Pyrosocial Collectives

Rather than being equitable in its treatment of beings along its paths, fire has variable effects on the diverse living and nonliving components of ecosystems. Burn severity depends upon numerous interconnecting factors, including a fire’s behavior and intensity as well as the characteristics of the entities that fire encounters. Some entities are more vulnerable to harm than others. Fire itself wields power. Fire has the power to harm and nurture, to cause death and growth, to destroy and produce, to create healthy or unhealthy forests. We might think of fire’s power as a form of biopower exercised by a series of chemical reactions that constitutes a pyrological process. The entities in fire’s path have more or less power to protect themselves from harm or to respond in productive ways. Pyropower as a form of biopower evokes a multitude of responses within the

widely diverse universe of living species. In pyrosocial collectives, a diversity of beings with multiple subjectivities negotiates their power within multispecies communities that include plants, animals, birds, creeks and lakes, dirt and rocks, forests and fields, mountains and valleys. The positionalities of individual humans and nonhumans within any given emergent pyrosociality are similar to the ways they are in all social collectives; that is, individuals and subgroups are differentiated in their relative power which is negotiated through the access they have to deploying the strategies and tactics through which power is acquired and exercised.

Fire is a distinctive actor whose prominence in a bioculturally diverse world means that it generates an immense amount of information some of which is site-specific and some of which is more widely occurring. Fire thus presents people with a multitude of opportunities to describe unique manifestations of its activities and to tell stories about the patterns it yields—stories within which humans are entangled. The abundance of ethnographic and scientific information about fire demonstrate its narrative productivity. This productivity is evident in the persuasiveness of the current discourse promoting more prescribed burning as it has led many people to change their opinions about the roles of fire in wildlands and it has also led to an actual increase in fire frequencies in some landscapes (Fowler 2021). Fire, people, ecosystems and all of their biotic and abiotic constituents are entangled in the sense that approaching a problem from any of the agents' positions reveals the links between them. As a complicated and interconnected enterprise, fire deserves a robust evaluation.

Powerful Changes Configured by Fires

Blue Ridge Mountain ecosystems are pyrosocial assemblages, meaning they are collections of organisms brought together through long-term, pyrosocial interactions. Pyrosocial assemblages are similar to Amelia Moore and Jerry Jacka's (2021: 4) "hydro-social assemblages," which fuse social and natural dynamics into entities capable of study by social scientists." Rather than focusing on water in studies of assemblages, "pyrosocial" prioritizes fire and its entanglements with ecological processes. As you read the following section about the Blue Ridge ecoregion, keep in mind that, regardless of how narrow or broad the discussion is focused, fire is integral to this context.

The Blue Ridge Mountains are located in the southern sector of the 480-million-year-old Appalachian Mountains. Fire has historically been an active agent in the biosocial networks that occur in the Blue Ridge ecoregion. But fires' presences have fluctuated both spatially and temporally over time. Human communities have occupied the region for 10,000–12,000 years as far as we know at this point in science's history. During that period of time, significant shifts have taken place in demography, subsistence, economy, land use, ignition patterns, policies, regulations, and people's perceptions of fire. Moreover, fires' variable interactions with climate, weather, topography, botany, biology, hydrology, geology, and humans have created complex outcomes. The effects of current and past managers' activities will be unfolding in the Blue Ridge Mountains for many years to come.

The temperate, broadleaf forests covering the Blue Ridge Mountains are complex and diverse with 1,500 grass and herb species, 130 tree species, 200 shrub and vine species, 225 land vertebrates, 130 bird species, 100 fish species, 80 reptiles and amphibians, and more than 70 mammal species (Berner et al. 2014). Blue Ridge ecosystems contain the highest number of endemic species in North America. With 34 species of lungless salamanders, the Blue Ridge Mountains have the greatest Plethodontid diversity in the world. Forested land is widespread but is interspersed with other land-cover types, including the spaces modified by human activities.

The integrity of the Blue Ridge Mountains is threatened. The majority of the forests in the ecoregion have already been altered (Anderson et al. 2013). Writing for The Nature Conservancy, Mark Anderson and colleagues (2013) identify “fire suppression” as one of the threats to the further degradation of Blue Ridge forests. In other words, the deliberate, policy-driven efforts made by the staff of governmental and nongovernmental agencies to prevent and extinguish wildfires—known as fire suppression or fire exclusion—is understood to be detrimental to the well-being of Blue Ridge ecosystems. Repeatedly and across sectors, the perception of fire suppression as a significant problem is a key theme in some conservationists’ and most managers’ discourses about fire in Appalachia. The following quote from a report by The Nature Conservancy, a nongovernmental organization, aligns with federal and state agencies. The report’s authors present fire suppression as being equivalent to “agriculture, pasturing . . . and logging . . . [increased] human population . . . increased densities of roads and other urban environments . . . greater forest fragmentation . . . habitat fragmentation . . . increased pests and pathogens, soil acidification and global climate change” (Anderson et al. 2013: 3) in the harmful transformations it causes to Blue Ridge forests.

Many interlocutors in conversations about the Blue Ridge ecoregion perceive the fire exclusion era to be the cause of current problems with forests and fires today, including an undesirable change in plant communities. In response to this perception, professional managers employed by federal, state, and nongovernmental organizations have been driving a shift toward fire use. Thus, over the past 100 years, since the early twentieth century, government policies have transitioned from little-to-no concern with fires, to prohibiting and suppressing fires, to promoting fires. These policy moves from fire suppression to fire use have been powerful shapers of the Blue Ridge ecoregion.

Evaluating Fire’s Power in Managers’ Minds and Words

Keeping in mind that pyrosociality is more than human (Haraway 2015), this section of the article evaluates managers’ “discourses, affects, and tactics” (Povinelli 2016: 4) and illustrates the ways managers perceive the connections between fire, ecosystems, and themselves. Special focus is paid to describing managers’ understandings of changes in fire ecologies—particularly their causes and effects—and the ways managers enact assumptions of causality. “Managers” are those people whose work includes prescribed burning and wildland firefighting and who are also called in this article “fire managers” or “land managers.” Learning how managers think about the current fire ecology of the lands they manage and also what they want the fire ecologies of those ecosystems to be in the future advances our understanding of the anthropological nodes in the contemporary Blue Ridge pyrosocial network as well as our awareness of how our landscapes are changing in the hands of today’s managers.

Managers are skilled personnel who have educational experiences at the high school, community college, four-year college, or graduate and post-graduate levels. Managers have training in multiple practical areas, such as firefighting, prescribed burning, law enforcement, emergency response, equipment operation, and additional fields. They are often credentialed holders of Incident Qualification Cards known as Red Cards that license them to perform as wildland firefighters and to work on prescribed burns. As Red Card holders, they have varying levels of training and specialization beginning with the first level of Wildland Firefighter Type 2 and often moving beyond that to higher skills levels. Managers are also often qualified to participate in prescribed burns, depending on their agency’s regulations, either through their Wildland Firefighter training and/or prescribed burn certification, or simply practice.

Fire management is a socially constructed, legally structured, and institutionally defined category of relationships between people and fire. Governmental fire management is a culturally specific collection of ideas about the value and legitimacy of particular types of fires. Some fires are considered good and beneficial while others bad and destructive. Some fires are deemed licit and therefore fostered while others are perceived as illicit and therefore suppressed. In institutionalized discourse, fire management includes both prescribed fires, which authorized people intentionally ignite, and wildfires (or wildland fires), which include lightning-ignited fires, accidentally lit fires, escaped intentionally lit fires, and fires lit by unauthorized burners (so-called arson fires). Fire management includes suppression efforts (firefighting). Fire suppression is performed by trained staff who are equipped with skills, finances, protective gear, and both low- and high-tech tools. The size and complexity of the fire suppression team is scaled according to the size of the incident. Local departments manage smaller incidents while Incident Management Teams (IMTs) handle larger fires. The larger the fire, the more complex the IMT in terms of the number and types of personnel and other resources and the number of levels. IMTs are hierarchical organizations that were originally designed to enable efficient and effective responses to wildfires, but the Incident Management System is also employed to respond to other disasters such as hurricanes and large events such as parades. Suppression strategies and prescribed burn programs are tailored to each incident's characteristics and are designed to accomplish the goals set forth for each operation. Fire managers are employed by government agencies from the federal to the state, county, and municipal level; nongovernmental and non-profit agencies; and private and for-profit businesses.

To evaluate the type and amount of influence that managers have in shaping the Blue Ridge Mountain ecoregion, I conducted a discourse analysis using ethnographic data with an eye toward expressions about: (1) the goals of management efforts in relation to fire and (2) expectations for and observations about the outcomes of management activities. The analysis included managers' goals and expectations or observations expressed and impacts anticipated or observed before, during, and after fire incidents. The data analysis process included sorting statements related to the causes and effects of fires; directives about using fire to affect landscape change; descriptions of ecosystems that have or have not been burned; plans to induce change by burning or not burning; ideas about techniques for manipulating fire to behave in specific ways, to prevent, contain, suppress, mop up, and generally manage fire; and statements about methods for putting fire out or letting it burn. Questions posed for these data include: what do managers say caused the current fire regimes, and what do they predict will change fire regimes in the future? What are managers' views of the roles of fire (in its absence and presence) in composing, structuring, and effecting Blue Ridge Mountain ecosystems? These qualitative analyses link managers' logic with the perceived outcomes of management across narrative types and temporal intervals.

In their spoken words and written texts, managers convey ideas about the power of fire; views about the power of humans relative to fire; ideas about human power when humans leverage fire's power; and beliefs about the power of science and management relative to fire, people, animals, and plants. Managerial discourses about fire contain interlocutors' perceptions of the places burned and the constituent components of those places as well as the relationships they (human and nonhuman entities) have with fire. Key questions that I have explored through the data are: what do managers think they can use fire to do to landscapes, and what do they try to do with fire?

To ground these inquiries about pyrosociality in who is doing what in the Blue Ridge Mountain ecoregion, I gathered qualitative data from the employees of federal and state forest management agencies. From the federal government, the ideas and activities of employees working

for the United States Forest Service in the Nantahala and Pisgah National Forests are reflected in this article. From the state level, the perceptions and practices of rangers and officers working for the North Carolina Forest Service and the South Carolina Forestry Commission inform the development of the concept of pyrosociality. In all cases, individual managers' stories demonstrate historical depth for the active use of fire in the ecoregion's public lands. Subsequently, their stories show changing understandings of and approaches to fire use over time. Moreover, at all governance levels, the stories reveal how enthusiastic managers are about using fire as a tool for changing Blue Ridge ecosystems. From the anthropological perspective, understanding managers' roles in pyrosocial networks is crucial because they are key drivers of social and ecological change through their authorized production and application of fire-related knowledge and skills.

The Causes and Effects of Fire in Managers' Discourses

The power of managers in shaping the habitats and lives of diverse creatures is consequential and therefore should be evaluated within a pyrosocial framework. Pyrosociality effectively points to the role of power in fire management. One way to assess power in management is by analyzing people's communicative activities to uncover their causal models. Deploying causal models in verbal and nonverbal ways equates to wielding power. Whether intentional or unintentional, the deployment of one's understanding of causality affects the world. Expressions of power have differential effects within biosocial communities such that some entities benefit more than other entities. With pyrosociality's interest in power, the power of managers who have great actual impact on our more-than-human world can be assessed.

In the institutional culture surrounding the Blue Ridge ecoregion's public lands, distinctive understandings of fire ecology circulate. Managers' perceptions of the causes and effects of fire are particularly interesting. The fire ecology of their home bases and the surrounding ecoregion result, in their minds, from a combination of anthropogenic and non-anthropogenic causes. They imagine fire to cause particular chains of events. Equipped with a set of causes and effects in mind, managers handle fire in particular ways to the extent that they can within the conditions of both human and ecological allowances and barriers. One overarching example of cause-and-effect in management logic is that people and lightning are ignition sources. Another example is that human activities—including both lighting and extinguishing fire—affect fire regimes. These logics connect to the paired beliefs that managers can change fire regimes and that managers can use fire to change ecosystems. Digging down into managers' conceptualizations of cause and effect and the ways in which they enact assumptions of causality are worthwhile, because we the people as well as animals, plants, and the Planet's geological, hydrological, and atmospheric components are inheriting the results.

Transitioning from Fire Suppression to Fire Use

For both the federal and state land management agencies who manage lands in the Blue Ridge ecoregion, fire ranks high on the list of priorities. That fire has top priority is apparent in state agencies' operations as it is in the federal agencies' projects described elsewhere in this article. As an example of a state agency that owns and manages properties in the Blue Ridge Mountains, protection (e.g., from fire) has priority in the North Carolina Forest Service's mission "to protect, manage and promote forest resources for the state" (NCFS n.d., paragraph 1). Elaborations upon this short, simple mission statement commonly feature fire, such as this statement from

Steve Troxler, the five-time elected Commissioner of Agriculture: “NCFS is responsible for protecting the 18.3 million acres of state and privately owned forestland from forest fires, forest pests and diseases; regulating certain open burning; and providing forestry services and advice to owners and operators of forestland” (Troxler n.d., under Mission and Responsibilities). In the same report where Troxler identified fire protection first among the NCFS’s work, he listed these notable events in the institutionalization of fire management at the state level: “In 1777 the first North Carolina forest fire protection law was enacted . . . In 1921, the North Carolina Legislature appropriated the first funds—less than \$3,000—for fire protection. In 1955, North Carolina signed a compact with other southern states for mutual aid in fighting forest fires” (Troxler n.d., under History of Division).

The North Carolina General Assembly requires the NCFS to protect its properties from destructive fires, to oversee water quality, and supervise logging operations. Brody Owen¹ began working for the NCFS in 1994, left to work for the Bridge Program for nine years, and then returned to the NCFS. In 1994, the “main thing we did was fire,” Owen said. “We did logging, but there wasn’t as many [logging operations].” In June of 2014, there were about 20 active logging operations in the county. As Owen put it, “A lot has changed. Lots more people [live here]. We have more regulations and better pay.” Regardless of the many changes, Owen said, “Fire is still fire.”

In the midst of change, fire has consistency for Owen. Fire is such a consistent theme in his life that he can narrate his biography and connect to key kin by recounting his work with fire. Owen’s grandfather was the leader of a firefighter crew and a warden for a nearby County in North Carolina. He remembers the “Warden” sign (see figure 1) that hung on the wall of his grandfather’s barn and his grandfather answering summons to fires on his rotary phone. When his grandfather was a warden, they practiced two kinds of fire use by (1) letting lightning fires burn rather than suppressing them and (2) setting fires on the tops of mountain ranges to decrease snake and bug populations. For lightning fires, Owen’s grandfather and fellow crew



Figure 1. A Historical Warden Sign (photo by the author)

members would watch as [the fire] moved around the landscape for as long as “several days” until it extinguished itself. Following in his father’s footsteps, Owen’s father was employed by the US Forest Service (USFS) and worked for fifteen years as a firefighter and smoke chaser. Owen recalls working on fires with his father when he was 12 or 13 years old. Owen’s older brother was part of their team too, and Owen remembers trying to outrun him as they competed to be the first to reach a fire. Together, they would “rake line,” meaning clear a fire break or fire line by using firefighting tools to remove the organic matter (especially leaf litter) from strips of land where they wanted to stop fires.

This Warden sign is displayed in the Nantahala National Forest Visitor Center as a historical artifact. A similar sign hung on the barn at Brody Owen’s grandfather’s house to signify him as a firefighter so neighbors knew who they could call in case of a wildland fire.

At 16 years old, Owen became a volunteer standby firefighter for local crews. Then, in 1994, he started doing seasonal, temporary jobs as a smoke chaser on wildfire crews around the country. That was when he shifted from wearing blue jeans and T-shirts to wearing the required wildland firefighters’ PPE (Personal Protective Equipment) (see figure 2) consisting of yellow shirts, green pants, and boots made out of fire-resistant materials, hard hats, and gloves. Over the years the US government contracted Owen to be a smoke chaser, firefighter, Supply Unit Leader, Ordering Manager, and Logistics division staff member for wildfire suppression operations elsewhere in North Carolina as well as in Florida, Texas, and “every western state except New Mexico” (Owen, personal communication). Once Owen landed a permanent job with the NCFS, his time working for national Incident Command System (ICS) teams decreased. However, the federal government continued hiring him to work on wildfires during the summer season, which is when the majority of large wildfires occur at the national scale.

Owen’s home base while he worked for the NCFS was near the place where he grew up in the Blue Ridge Mountains. In his work with the NCFS, managing fires in his home district was Owen’s primary occupation during the dormant season for trees from October through May. This was also when most prescribed burning occurred in the Blue Ridge ecoregion during the first two decades of the twenty-first century, but managers have been attempting to extend that time range into additional months and season. The bioregion’s climate sets an annual rhythm for prescribed burning and wildfires, and thus for Owen’s job routines. The work rhythm varies, however, from year to year depending on the weather and fuel moisture as Owen described when he said, “It’s been wet for five years [through 2013]. Before [2013], we were constantly running fires.” The number of incidents varies with precipitation, as Owen pointed to when he said, “It was semi-dry for my first several years [working for NCFS]. From 1998 through the first decade of the twenty-first century, it was extremely dry. The last five years have been wet” (Owen, personal communication). In 2012, Owen reported that his NCFS office responded to 15 fires that burned 75.70 acres in Owen’s county.

Fire remained a significant part of Owen’s life as he worked for NCFS. In the context of the nearly-250 years that NCFS has been involved with fire management, Owen emphasized the continuing importance of fire in 2013 when he said, “The main reason we’re here is for fire. In the district, everybody is tied to fire from the secretary, to [the people who provide] meals, to [the people with a] rake who are actually working the fire line” (Owen, personal communication). With such significant power and authority, land and fire managers who work for federal and state institutions, such as the three generations of Owens, have long-term influence on Blue Ridge ecosystems.

The typical set of Personal Protective Equipment that firefighters are required to wear can be seen here on the author (left) and fellow crew member (right) who are conducting a prescribed burn at the Tall Timbers Research Station outside of Tallahassee, Florida.



Figure 2. Wildland Firefighters' Personal Protective Equipment (photo by the author)

A Relationship with Fire Is Part of Being a Career Forester in the South

What changes do managers perceive when they think about fire, interact with fire, witness burning landscapes, and evaluate ecosystems before, during, and after fires move through them? Managers have layers of socially constructed ideas about change—the changes that lead to and result from fire. They have culturally specific understandings about the ways social and ecological conditions impact fire behavior. They learn from the communities within which they work and live as well as through their own personal direct experiences about the changes that cause fires and about fire effects. Through fire, they learn to recognize, define, and judge ecosystems, people, and themselves as well as change itself. Managers construct understandings of ecosystems and form pyrosocial communities through fire.

Dan Norman directly influenced ecological change over the 29 years he worked in the Nantahala National Forest. Although now retired, fire management was part of his work in the larger arena of forestry since Norman was in college. Norman estimated that he managed 20–25

smaller fires per year and a larger fire (300–500 acres) every few years in his home Ranger District. He also worked as a wildland firefighter on numerous Incident Management Teams in other parts of North Carolina and in states across the nation. Norman's ideas about how to manage the Nantahala National Forest came from a combination of, among other influences, his education in forest resource management from a large southern university and his long career working for the USFS.

Norman's first position with the USFS was as a Timber Management Assistant. He recollects back then—in the 1980s and 1990s—the USFS was using fire to clear the land by burning up low-quality oaks prior to planting higher-value pines. Their routine was to “cut the timber, burn the woody debris, and replant the site with [white pine], pitch pine, and shortleaf pine,” said Norman (personal communication). “Back in the 1980s, the Forest Service wasn't ‘understory burning’ like they do now where the overstory trees survive” (Norman, personal communication). Instead, they “were burning after a clearcut” to make it easier to replant timber trees. In the 1990s, the Forest Service decided that they did not want to continue replacing the oaks with pines anymore. So, while they were doing prescribed burning in Nantahala for decades, the technique was labeled as “site prep” burns. Now, the “only thing that is new is the emphasis on uplands in oak hickory . . . white oak and red oak are good for timber” (Norman, personal communication). Nantahala's managers continue to grow yellow pines (e.g., pitch pine and shortleaf pine), but the emphasis has changed to oaks and hickories or mixed pine-hardwood stands.

Through 29 years of applied forestry, Norman left his legacy on the Nantahala by way of an approach to management that involved using multiple types of intervention to meet multiple objectives. Norman combined managing for timber, fire, and wildlife, but he determined which technique or combination of methods to use at the smaller scale. On the temporal scale, his timber management planning style involved a “150-year horizon” (Norman, personal communication) and his fire management plans operated on multiple time scales. The temporal scales he dealt with were not always plannable because they were in response to phenomena that were beyond his control, including things such as weather events (e.g., ice, flooding, drought) and wildfire. On the spatial scale, his burning plans were tied to elevation and moisture gradients. Norman's former Ranger District is “50 percent coves and 50 percent oak hickory on drier ridges” (Norman, personal communication). In other words, half of his district has ecosystems that, in typical years, are too moist to burn and contain fire sensitive species while the other half of the ecosystems have fuels that will carry fire and would be expected to contain fire-adapted species.

Norman acknowledged that a debate existed about whether or not to intentionally burn hardwood forests containing oak and hickory. His own position in the debate was, in his words, on the “East, South, and West slopes burning opens [the forest canopy and understory] up” (Norman, personal communication). In these types of locations, he advocated for fire use to, “reduce fuels, thin the understory, get rid of junk shade intolerant species, such as red maple, that will just get thicker and thicker if you don't burn. [By burning], they are helping lush green vegetation, like forbs and grasses. [By] knocking back the understory, you'll get better regeneration of oak . . . then we cut the timber” (Norman, personal communication). Figure 3 illustrates a tree stand sculpted with fire in his district. As the region's main producers of hard mast, oaks and hickories are valuable sources of food for native wildlife. Figure 4 displays a photo of black walnut, another native mast producer, growing in a prescribed burn site in Norman's District. Nantahala's oak hickory forests are accustomed to burning, according to Norman, because they are subjected to lightning-ignited fires and, he said, Native Americans burned them in the pre- and early-colonial era. More recently, in 2012, the USFS burned 1,200–1,400 acres. In a “good year” (Norman, personal communication), the USFS burns 2,000–2,500 acres. Ideally, Norman would have burned 4,000–5,000 acres per year, but he found money and weather to be prohibitive barriers to accomplishing this goal.



Figure 3. A Stand Sculpted into an Ideal Forest by USFS Fire Managers (photo by the author)

A former Fire Management Officer called the stand in the Nantahala National Forest portrayed here an “ideal forest.” A prescribed burn crew used fire to select preferred tree species and eliminate unwanted species in this stand. They sculpted the forest’s structure to have an upper canopy, a lower canopy, and a green herbaceous layer.

The Power of Managers to Configure Blue Ridge Mountain Ecosystems

For more than 100 years, professional managers have had great power in shaping the fire ecology of the Blue Ridge Mountains. Taking Western North Carolina (WNC) as a case for illustrating this point, Nantahala and Pisgah, the two National Forests in WNC, cover 1.44 million acres, or 22 percent, of the region’s land area and 27 percent of forested land in the region. All or parts of 18 counties are within the boundaries of Nantahala and Pisgah National Forests. More than 77 percent of the area within the Pisgah and Nantahala National Forests is forested with mixed hardwoods and pines predominating. Land cover in the remaining 23 percent is a mixture of shrubland, grassland, cropland, water, and other land-cover types (Berner et al. 2014). Of the forested land, 61 percent of the forests are 60 to 100 years old (reflecting the time since last logging) and 16 percent are more than 100 years old (Berner et al. 2014). State-wide, 7.7 percent of the North Carolina’s land is owned by the federal government. The percentage of land owned by the State of North Carolina is 0.44 percent. Of the 18.1 million acres of forests in the state, 61 percent are privately owned, 21 percent are owned by private corporations not in the forest industry, 18 percent are owned by federal, state, and local governments, and <5 percent are owned by businesses in the forest industry.

Pisgah National Forest was created following the 1911 Weeks Act when Edith Vanderbilt sold 86,700 acres to the federal government for \$433,500 (Anonymous 1914). The adjoining Nantahala National Forest was established in 1920. The original Pisgah tract was admired for its beautiful forests, scenic waterfalls, valuable timber, and scarcity of fire scars. “Less than three-tenths of one percent can be classed as burned-over land,” according to an *American Forestry* report about the condition of the property at the time of the land sale (Anonymous 1914: 429). The Weeks Act granted the federal government the money to purchase land for the purpose of protecting forests and watersheds and authorized the development of a fire protection infrastructure, thereby marking the birth of National Forests as well as the commencement of the fire suppression era. Fire protection was incrementally applied to sites in the Blue Ridge ecoregion as the government purchased land during the decades after the Weeks Act was passed. Fire suppression is another term for fire protection and refers to the policy, established by the USFS in the early 1900s, of “preventing fires, and suppressing a fire as quickly as possible” (Forest History Society n.d., paragraph 3). Fire suppression as a policy was strengthened in 1935 when the USFS established the 10 a.m. rule that directed managers to contain every fire by 10 a.m. the morning after it was reported.

In the early twentieth century, USFS leaders believed that “any and all fire in the woods was bad because it destroyed standing timber” (Forest History Society n.d., paragraph 3). The USFS invested a great deal in sharing this belief with the American public—for example, through the infamous Smokey Bear campaign—in the attempt to convince them of its verity. Moreover, their vilification of fire was the basis for most governmental land management agencies’ decisions about most of their properties.

Regardless of the Weeks Act and the 10 a.m. rule, some federal land managers were not suppressing all wildfires and, in practice, were letting lightning-ignited fires burn. In the 1930s, land and game managers were advocating for fire use in the Southeastern United States on the basis of its benefits for longleaf pine (*Pinus palustris*) and bobwhite quail (*Colinus virginianus*) (Chapman 1932; Ryan et al. 2013; Stoddard 1931). By 1968, Bruce Kilgore and his team at the Sequoia-Kings Canyon National Parks were following a “let burn” response to lightning-ignited wildland fires in remote areas (Kilgore 2007). Their practice was in line with a National Park Service policy, passed in 1968, to let wildfires burn when their ecological, economic, and other benefits outweigh the costs and feasibility of suppressing them (Wagtendonk 2007). Many other National Parks and other federal agencies’ land managers adopted wildland fire use (WFO) under various monikers. Early examples are when the Saguaro National Park began a program called Natural Prescribed Fire in 1971, Yosemite National Park began practicing Natural Fire Management in 1972, and the Selway-Bitterroot and Bitterroot National Forests established a Fire Management Area in 1972. In 1978, the USFS replaced the 10 a.m. rule with a new fire management policy that allowed for wildland fire use.

Meanwhile, as wildland fire use was being developed and debated, managers in the US South were carrying out prescribed burns and scientists were studying prescribed fire. Under various guises, federal, state, and private agencies in the Blue Ridge Mountains and across the South have been using prescribed burns for decades. Nevertheless, today’s managers and scientists alike perceive the fire suppression era as the cause of many of the current problems with forests and fires today, including an undesirable shift in plant communities. Many employees of governmental land management agencies vilify the fire suppression strategy itself. They argue that the policy was misguided by incorrect understandings of fire ecology and today’s managers now have to correct the problems created by mistaken past land management practices. The disruption of historical fire regimes, they argue, has caused serious problems, such as the diminution of fire-adapted communities and species as well as the accumulation of dangerous amounts of vegetative fuels. As they work to identify, catalog, and map these and many additional problems

caused by malfunctioning fire regimes, managers recommend plans for solving the problems via management techniques and support their recommendations via a culturally specific logic.

In the Blue Ridge Mountains ecoregion nowadays, correcting the problems caused by fire suppression is a recurring issue when managers discuss the ways they want to manage land. Fire management (in contrast to fire suppression) is frequently the recommendation given for solving the problems created by the malpractices of the past. As Charles Lafon and colleagues (2017: ii) put it, “fire exclusion has enabled mesophytic plants to expand from fire-sheltered sites onto dry slopes that formerly supported pyrogenic vegetation. These changes underscore the need to restore fire dependent ecosystems.” In other words, managers and scientists identify the mistakes of the past as the cause of today’s problems in a way that is analogous to the recognition that introducing kudzu for erosion control was an unintentional consequence of incorrect knowledge that led to ecological disaster. This sentiment is evident in the following statement from Lafon and colleagues:

Forest density and canopy closure have increased to the point that fire-favored trees, especially oaks and pines, are failing to reproduce and are being replaced . . . These genera are important for wildlife habitat, timber, and aesthetics, and as the canopy dominants die, they are being replaced by mesophytic species such as red maple that have colonized the shaded forest understory in the absence of fire. Other desirable plants, such as blueberries (*Vaccinium* spp.), have also waned while thickets of mountain laurel and rhododendron (*Rhododendron* spp.) have expanded. (Lafon et al. 2017: 6)

Overabundant vegetation, unhealthy forests, and catastrophic wildfires are seen to be among the effects of a misunderstanding of the role of fire in landscapes—of incorrectly thinking that fire is not an essential process in native forests. As Lafon and colleagues (2017: 6) say, “fire exclusion has been more successful than early foresters might have expected a century ago. But this success has its drawbacks, as recognized by many researchers and resource managers.” Managers and scientists see the errors of the past and are working to change them, but they feel as though many people in the general public as well as policy makers and budget allocators do not yet understand that fire needs to be put to work to restore ecosystems health. Burning can repair the ill effects of historical mistakes. This is the opinion behind the fire advocacy work that managers are doing now. Managers and their scientist-allies are “aiming to” (Petryna 2018: 571) figure out how to use fire to achieve their goals and how to convince others (the public, homeowners, funding agencies, lawmakers, other scientists and managers, conservationists, etc.) to believe them.

This photo shows the lush regrowth of vegetation two months after managers burned an old home site in the early spring

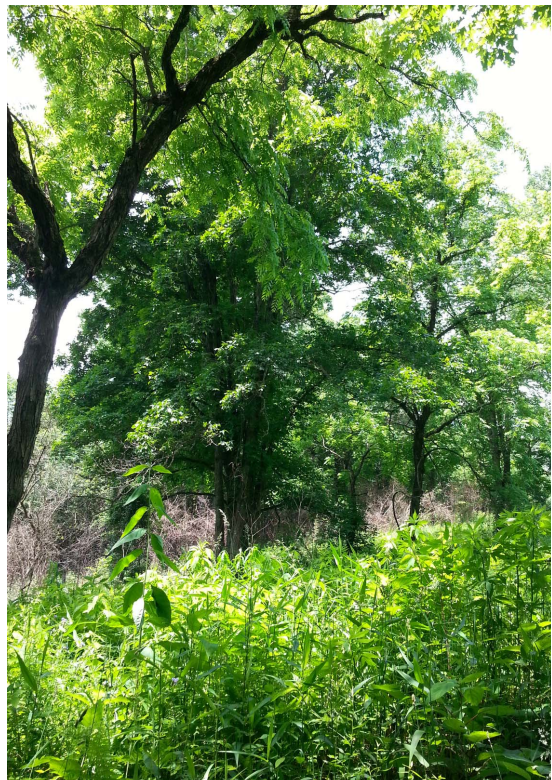


Figure 4. An Old Homesite in a Burn Unit within the Nantahala National Forest (photo by the author)

of 2013. Notice the black walnut tree with its shaggy bark and pinnate leaves with leaflets that opened up in the warm months following the prescribed burn.

The Transformative Power of Fire Management

Through their choices about how to handle fire, managers are able to direct the course of change for the short and long term. Thinking about managers' perceptions of cause-and-effect brings light to their recommendations for and implementation of land management activities. Because cause-and-effect models are socially constructed and they contain subjective judgments, the cultural context within which managers operate has significant influence on the ways people think about and handle fire and the associations they make between fire, people, and ecosystems. Managers engage with certain ideas about the forces and factors that influence fire regimes and understandings about the ways fire affects the ecosystems within which they burn. Fire management has direct transformative effects on landscapes.

What agency do managers have when they leverage the agency of fire? They have the power to change the pyrosocial communities within the boundaries of the properties where they work in ways that reverberate far beyond those boundaries. With fire, managers can control everything from the types of tree species to the number of individual representatives of each species in a stand. Managers have the ability (within limitations) to design the boundaries of a burn and whether those will consist of existing natural features (e.g., river, rock face) or a one- to three-foot wide fireline hand-built by a team of wildland firefighters, a 20- to 30-foot wide cut cleared by bulldozers, or a fuel-free zone blackened with an intentionally lit fire. Fire managers determine who to exclude and include in their burnings—who can or cannot be physically present and who is or is not privileged with access to information about burnings. Managers have the power to use fire to care for the assets they value more and to ignore or harm the assets they value less (Shrinivasan 2014).

Managers have been fostering the pyrosocial collectives that occur in Southern landscapes today and that will manifest as time proceeds. The ecosystems making up the public lands of today are the legacies of historic practices. The managers who work on government-owned properties have the power and authority to determine the constitution of our ecosystems as well as citizens' rights within them. Managers have been leaving their legacies on our landscapes for several generations at this point in time. They deserve much of the credit for creating the gravel roads and trails, culverts and put-ins, gates and signs, picnic areas and parking lots, pit toilets and fire rings, clearcuts and overlooks, old growth and early succession, forests and meadows, and other aspects of the state and national parks and forests that constitute the character of the Blue Ridge Mountains. We are living with the consequences of the changes managers have made. Future generations face the same situation.

Fire managers have particular types of power within the broader ecological world because of their peculiar relationships to ecological processes and, moreover, they leverage fire and other phenomena in ways that grant them power within human societies and within multispecies communities. Our current ecosystems are partly manifestations of managers' understandings of change and the actions they take that extend from their understandings. Because perceptions of the environment are consequential, inquiring into how managers think about fire and ecology, and how they talk about the fires themselves and the spaces already burned or envisioned as burning in the future is worthwhile.

Blue Ridge Mountain landscapes emerge from complex networks that surround managers who are themselves enculturated within complex contexts. Managers' culture influences the ways they

perceive their landscapes and their interactions with their fellow inhabitants in the places where they work, such as the state and federal agencies that socialize their employees to adopt a particular mindset toward fire. Managers' concerns about the changing composition of their landscapes are socially constructed. As they reference their concerns in discourses about fire, they act upon their concerns in their fire management activities. Managers have numerous mechanisms, of course, for shaping the wildlands where they work. So many mechanisms exist that they could not all be listed here but they include advising federal, state, and local lawmakers; writing and enforcing rules on the land units that they manage or own; regulating the users of their land units; collaborating with neighboring landowners; designing and implementing management plans; developing priorities and dealing with them in chosen orders; and responding to unplanned events.

In relationship with fire, managers' biopower—or pyropower—comes from producing, possessing, and deploying the information and skills through which fire is known (to paraphrase Shapiro and Kirksey 2017). Managers have the power to select which information they use to support which technologies they use and how they use them. They get to decide which lay opinions to accept or support and which ones to reject by, for instance, sorting through public comments, forming partnerships, and issuing decision memos. Managers have the power to label some cultures as being barriers to fire use (e.g., the risk-averse “public,” as they are portrayed by some), to label other “cultures” as exemplary burners as they do with commonplace references to pre-settlement North Americans, or to position social scientists as allies who can figure out how to resolve the “cultural problem.” To the extent that the information they deploy through managerial activities influences on-the-ground practices and multilevel policies, managers participate in pyropower, which, like biopower, involves the “governance of life and tactics of death” (Povinelli 2016: 4). Defining and leveraging the ways fire causes life and death is the business of the managers who work in the Blue Ridge ecoregion.

Consequence and Justice in Multispecies Habitats

Many generations of humans have belonged to Blue Ridge pyrosocial collectives (Fowler and Konopik 2007). This article focuses on merely a few going back to the enclosure of the Blue Ridge Mountains in the 1910s and extending up through the increase in prescribed burning in the 2010s. Pisgah and Nantahala National Forests are genealogically tied to the Fire Suppression era. As the US government moved to own, commodify, and design forests, its agencies were working to exclude, and suppress, and control fire. At the national scale, as an imagined geography of National Forests was materializing, the vision of controlling fire was being codified. On the ground in the Southern Appalachians, federal and state foresters in at least some districts in the region had the freedom to choose whether to extinguish or to light fires. Enclosing the Blue Ridge commons (Newfont 2012) was a pretext for controlling fire. Forestry agents chose when and where to play the role of smoke chaser, fuel raker, fire lighter, or fire extinguisher. The question of how to extinguish fires has become the question of how to light fires, while the premise of controlling them remains. All along, humans are engaging with fires' agency and ecosystems' agency in the struggle over pyropower.

Fires emanating from human activities, tectonic processes, and meteorological phenomena foster the emergent collectives of animals, plants, soils, waters, and atmospheres that surround us. What has emerged in the Blue Ridge landscape at this stage in history? Culturally among managers, a consensus of opinion about fire exclusion as a historical error together with nearly unanimous agreement about prescribed burning as the way to correct past mistakes has emerged. Socially, a powerful group of wildland firefighters and prescribed burners has emerged. A demo-

graphic emergent dimension is the increase in human populations in wildland urban interfaces along the boundaries between public lands and private properties where wildfire frequencies have increased along with risks of damage to human property and lives from wildfires. Ecologically, plant communities have emerged that are overloaded with shrubs, fire sensitive species, logging slash and other hazardous fuels, and that are undersupplied with fire-adapted species, wildlife forage, and fire. These are some of the emergent dimensions of today's pyrosocial networks.

In this article, I have endeavored "to understand the active role of human agency not only in the construction of facts, but also in the very existence of the phenomena those facts are trying to document" (Latour 2014: 2). I have attempted to describe the understandings of Blue Ridge ecosystems held by fire and land managers through the analysis of their stated ideas and practices with special attention to their causal models of change. I have situated ethnographic data about the "technology through which [fire is] known" (Shapiro and Kirksey 2017: 484) within the larger pyrosocial collective that includes plant and animal communities configured by fires as well as the habitats that fire, plants, animals, water, air, and geology collectively construct. I ask readers of *Environment and Society* to consider pyrosociality as the more-than-human communities shaped by fire.

Recall the feminist writers, mentioned earlier in this article, who proved the necessity of using social theory to understand biological and ecological worlds. Of course, feminism has grown over the past 50 years in necessary, crucial ways; notably, by becoming more ethnically and racially diverse and more inclusive of LGBTQI2SMahu+ genders and sexualities, in contrast to its early predominantly white, heterosexual, gender-binary iterations. The inclusivity of today's feminist anthropologists is demonstrated by Laura Meek and Julia Alejandra Morales Fontanilla in their 2022 essay "Otherwise" that promotes the engagement in ethical relations through collaborating with collocutors; protesting alongside activists in the streets, for example, as these authors imply. Beyond this, Meek and Fontanilla push forward the transformation of anthropology's ontologies. They write, "The power of the otherwise thus lies in its ability to potentiate inchoate forms of relationality, politics, and ethics that are creeping there, here, all around us in the quotidian, the 'unremarkable' . . . , and the interstices of worlds that are increasingly destructive, precarious, even unlivable" (Meek and Fontanilla 2022: 5). In the opening chapter of *Fire Otherwise* (Fowler and Welch 2016), James Welch and I employ otherwise thinking to support arguments for opening up institutionalized and globalized fire management and fire science to Indigenous fire ecologies. Welch and I credit Eduardo Restrepo and Arturo Escobar (2005) with calling upon anthropologists to open up space for the otherwise by pluralizing and decolonizing the discipline. Pyrosociality further extends the thinking in that book by pleading for an inclusiveness that extends to all species (and is therefore less anthropocentric) in terms of considering their perspectives with regard to habitat transformations, preventing direct or indirect harm, and maximizing care and compassion. Where Welch and I discussed fire otherwise as a means for advocating for epistemological justice in 2016, now I advocate for multispecies justice with pyrosociality.

Finally, I circle back to Leibowitz's essay with her calling out mistaken commonplace assumptions about sex and gender and its implications for scholar-advocates. In presenting her argument for the evolution of sex and gender flexibility, Leibowitz describes the behaviors of four nonhuman primates: gibbons, orangutans, chimpanzees, and baboons. To liberate the nonhuman, nonprimate beings who inhabit the Blue Ridge Mountains, I recommend turning to them. In strategizing and planning for fire management in the future, consider the fire-adapted species that are emphasized in prescribed burn plans as a justification for burning: for example, Table Mountain pines (*Pinus pungens*), mountain golden heathers (*Hudsonia montana*), golden wing warblers (*Vermivora chrysoptera*), Indiana bats (*Myotis sodalis*), and so forth. Additionally, in the effort to ramp up prescribed burning in the region (Fowler 2021), remember to design fire

management around the region's remarkable diversity, which means that some species are fire sensitive and do not prefer burning in their habitats. Examples, according to Pittillo (Friends of Panthertown Board of Trustees and Staff 2019), include the native kalmias (*Kalmia buxifolium*, *K. latifolia*), rhododendrons (*Rhododendron catawbiense*, *R. caroliniana*, *R. maximum*, *R. vaseyi*), vacciniums (*Vaccinium altomontanum*, *V. corymbosum*, etc.), huckleberry (*Gaylussacia baccata*), red maples (*Acer rubrum*), twisted-hair spikemosses (*Bryodesma tortipilum*), corydalis (*Capnoides sempervirens*), upland dwarf iris (*Iris verna*), serviceberries (*Amelanchier laevis*, *A. spicata*), chokeberries (*Aronia arbutifolia*), and more. In sum, I want to insist upon extending the advocacy for rights to the more-than-humans with whom we coexist. Leibowitz (1975: 35) writes, "We must familiarize ourselves with the data and deal with it in a sophisticated framework that accounts for its variability." In her critique of scholars who search for evidence that "conforms to their cultural model of how things were, are, or ought to be" (Leibowitz 1975: 35), she shares the fundamental premise with STS that humans' perspectives (e.g., those related to fire ecology as taken up in this article's story) are shaped by their political, economic, and historical contexts and that our practices (e.g., fire management) are consequential.

■ ACKNOWLEDGMENTS

To the staff members of the US Forest Service, North Carolina Forest Service, and South Carolina Forestry Commission, I offer my gratitude for your generosity in sharing your knowledge about fire. My appreciation is extended to the editors of *Environment and Society*, the guest editors of the special issue on *Flood and Fire*, and two anonymous peer reviewers.

■ **CYNTHIA FOWLER** (PhD University of Hawai'i at Mānoa 1999) is Chair of the Sociology and Anthropology Department at Wofford College. She is co-editor of the monograph series *Global Change/Global Health* published by the University of Arizona Press as well as the *Contributions in Ethnobiology* monograph series published by the Society of Ethnobiology. Fowler studies the anthropology of social and environmental change in two research sites: the Blue Ridge Mountains in the US South and the Kodi region on Sumba Island in Eastern Indonesia. As an ecological anthropologist, Fowler's work is informed by the findings of scholars in many disciplines especially fire science, geology, geography, freshwater ecology, oceanography, forestry, botany, and agronomy. ORCID: 0000-0002-0592-6430. Email: fowlerct@wofford.edu

■ NOTES

1. Pseudonyms are applied to all managers for the sake of privacy and to protect their identities.

■ REFERENCES

Anderson, Mark, John Prince, D. Ray, Meghan Sutton, and Angela Watland. 2013. "Southern Blue Ridge: An Analysis of Matrix Forests." The Nature Conservancy. <http://www.conservationgateway.org/Files/Pages/SouthernBlueRidgeAnAnalysisofMatrixForests.aspx> (accessed 22 April 2023).

- Anonymous. 1914. "Pisgah Forest Purchased." *American Forestry* 20: 425–429.
- Berner, Ruth, Michelle Aldridge, Dan Belanger, Diane Bolt, Sheryl Bryan, Karl Buchholz, William Coates, et al. 2014. *Nantahala and Pisgah National Forests Assessment*. Asheville: USDA Forest Service, Southern Region, The National Forests of North Carolina.
- Bowman, David M. J. S., Jennifer Balch, Paulo Artaxo, William J. Bond, Mark A. Cochrane, Carla M. D'Antonio, Ruth DeFries, et al. 2011. "The Human Dimension of Fire Regimes on Earth." *Journal of Biogeography* 38: 2223–2236.
- Bowman, David M. J. S., Jessica A. O'Brien, and Johann G. Goldammer. 2013. "Pyrogeography and the Global Quest for Sustainable Fire Management." *Annual Review of Environment and Resources* 38: 57–80.
- Chapman, Herman Haupt. 1932. "Is the Longleaf Type a Climax?" *Ecology* 13: 328–334.
- Farmer, Paul, Jim Yong Kim, Arthur Kleinman, and Matthew Basilico. 2013. *Reimagining Global Health: An Introduction*. Berkeley: University of California Press.
- Forest History Society. n.d. "U.S. Forest Service Fire Suppression." <https://foresthstory.org/research-explore/us-forest-service-history/policy-and-law/fire-u-s-forest-service/u-s-forest-service-fire-suppression/> (accessed 22 April 2023).
- Fowler, Cynthia. 2021. "The Goodfire Campaign: Swaying Opinions about Prescribed Burning." *Hot Spots. Firestorm: Critical Approaches to Forest Life and Death*. <https://culanth.org/fieldsights/the-goodfire-campaign-swaying-opinions-about-prescribed-burning> (accessed 22 April 2023).
- Fowler, Cynthia, and Evelyn Konopik. 2007. "The History of Fire in the Southern United States." *Human Ecology Review* 14(2): 165–176.
- Fowler, Cynthia T., and James R. Welch. 2016. *Fire Otherwise: An Ethnobiology of Burning for a Changing World*. Salt Lake City: University of Utah Press.
- Friends of Panthertown Board of Trustees and Staff. 2019. "Comments on Prescribed-Burn-Proposal for Little Green and Blackrock in Panthertown." <https://panthertown.files.wordpress.com/2019/05/friends-of-panthertown-2019-comments-prescribed-burn-proposal-for-little-green-and-blackrock-in-panthertown.pdf> (accessed 22 April 2023).
- Haraway, Donna. 2015. "Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin." *Environmental Humanities* 6: 159–165.
- Izoulet, Jean. 1894. *La Cité Moderne . . . Métaphysique de la Sociologie*. Paris: ALcan.
- Kilgore, Bruce M. 2007. "Origin and History of Wildland Fire Use in the U.S. National Park System." *The George Wright Forum* 24(3): 92–122.
- Lafon, Charles W., Adam T. Naito, Henri D. Grissino-Mayer, Sally P. Horn, and Thomas A. Waldrop. 2017. *Fire History of the Appalachian Region: A Review and Synthesis*. General Technical Report SRS-219. Asheville, NC: United States Forest Service, Southern Research Station.
- Latour, Bruno. 2014. "Agency in the Time of the Anthropocene." *New Literary History* 45(1): 1–18.
- Leibowitz, Lila. 1975. "Perspectives on the Evolution of Sex Differences." In *Toward an Anthropology of Women*, ed. Reyna R. Reiter, 20–35. New York: Monthly Review Press.
- Meek, Laura A., and Julia Alejandra Morales Fontanilla. 2022. "Otherwise." *Feminist Anthropology* 3 (2): 274–283. <https://doi.org/10.1002/fea2.12094>.
- Moore, Amelia, and Jerry J. Jacka. 2021. "Introduction Oceans." *Environment and Society: Advances in Research* 11: 1–4.
- NCFS (North Carolina Forest Service). n.d. "About the N.C. Forest Service." *N.C. Forest Service*. https://www.ncforestservice.gov/about_ncfs.htm (accessed 22 April 2023).
- Nerlich, Bridgette. 2017. "Biosocial: A Brief Conceptual History." *Making Science Public*. University of Nottingham Blogs. <https://blogs.nottingham.ac.uk/makingsciencepublic/2017/04/21/biosocial-brief-conceptual-history/> (accessed 22 April 2023).
- Newfont, Kathy. 2012. *Blue Ridge Commons: Environmental Activism and Forest History in Western North Carolina*. Athens: University of Georgia Press.
- Pálsson, Gisli. 2015. *Nature, Culture, and Society: Anthropological Perspectives on Life*. Cambridge: Cambridge University Press.

- Petryna, Adriana. 2018. "Wildfires at the Edges of Science: Horizonizing Work Amid Runaway Change." *Cultural Anthropology* 33 (4): 570–595.
- Povinelli, Elizabeth. 2016. *Geontologies: A Requiem to Late Liberalism*. Durham, NC: Duke University Press.
- Rabinow, Paul. 2005. "Artificiality and Enlightenment: From Sociobiology to Biosociality." In *Anthropologies of Modernity: Foucault, Governmentality, and Life Politics*, ed. Jonathan Xavier Inda, 181–193. Malden, MA: Blackwell Publishing Limited.
- Reiter, Reyna R, ed. 1975. *Toward an Anthropology of Women*. New York: Monthly Review Press.
- Restrepo, Eduardo, and Arturo Escobar. 2005. "'Other Anthropologies and Anthropology Otherwise': Steps to a World Anthropologies Framework." *Critique of Anthropology* 25 (2): 99–129.
- Roberty, Eugene de. 1893. *La Recherche de l'Unité*. Paris, France: Hatchette-Livre BNF.
- Roos, Christopher I., David M. J. S. Bowman, Jennifer K. Balch, Paulo Artaxo, William J. Bond, Mark Cochrane, Carla M. D'Antonio, et al. 2014. "Pyrogeography, Historical Ecology, and the Human Dimensions of Fire Regimes." *Journal of Biogeography* 41: 833–836.
- Ryan, Kevin C., Eric E. Knapp, and J. Morgan Varner. 2013. "Prescribed Fire in North American Forests and Woodlands: History, Current Practice, and Challenges." *Frontiers in Ecology and the Environment* 11 (1): e15–e24. <https://doi.org/10.1890/120329>.
- Shapiro, Nicholas, and Eben Kirksey. 2017. "Chemo-Ethnography: An Introduction." *Cultural Anthropology* 32 (4): 481–493.
- Shrinivasan, Krithika. 2014. "Caring for the Collective: Biopower and Agential Subjectification in Wildlife Conservation." *Environment and Planning D: Society and Space* 32: 501–517.
- Stoddard, Herbert L. 1931. *The Bobwhite Quail: Its Habits, Preservation and Increase*. New York: Charles Scribner's Sons.
- Troxler, Steve. n.d. "North Carolina Forest Service." http://www.ncforestservice.gov/publications/NCFS_One-Pager_2021.pdf (accessed 22 April 2023).
- Wagtendonk, Jan W. van. 2007. "The History and Evolution of Wildland Fire Use." *Fire Ecology* 3 (2): 3–17.