

The Paradox of the Mainstream:
Health Parameters of Wildland Fire Management and Cultural Burning in NC

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I. Purpose

The purpose of this project is to better understand the health parameters of wildland firefighters (WFFs) and cultural burners engaged in preventing, managing, and instigating wildland fires in NC (NC). It clarifies the role of cultural and indigenous burning, both historically and contemporaneously, in such wildland firefighting and land management, and potential areas of improvement in the management protocols associated with both wildland fires. My emphasis is on the delivery of usable knowledge as defined—in the context of wildland fires—by Machlis et al (2002) as “research that provides information that managers can use in making decisions, planning programs, and solving problems... usable knowledge to wildland fire managers can also benefit their partners, local governments, stakeholders, and citizens”. My work focuses on WFFs and cultural burners themselves. Such attention addresses a gap in the current body of research, but they are also critical agents of praxis in wildland fire. Finally, the work explores ways the Lumbee Tribe of NC (LTNC) has a unique experience with cultural burning and its interface with health, with potential lessons beyond their own practice.

II. Introduction

Wildland fires are “any non-structure fire that occurs in vegetation or natural fuels, including wildfires [fires out of human control] and prescribed fires [fires following a human prescription]” (NWCG, 2024). In a climate changing world, wildfires are becoming more ubiquitous and more of a public health issue. They can be either non-anthropogenic (“naturally occurring”, such as lightning fires) or anthropogenic (“human-caused”). Some argue that humans have such an impact on the environment that any “naturally occurring” phenomenon occurring without human influence is a misnomer (Hoffman, 2017). Anthropogenic fires have several types which can be categorized by the context of their ignition (Machlis et al, 2002). These categories

include fires manifesting as a *management tool* (prescribed fires,¹ indigenous or cultural burning), as a *technological hazard* (escaped prescribed burn,² inadvertent logging operation ignition), or as a *social hazard* (set accidentally, such as fire ignited by unextinguished campfires, or with the intent of doing harm (military use of fire as a weapon, arson) (Cybersecurity & Infrastructure Security Agency, n.d.). In 2013, more than 4.1 million acres burned in the U.S., about double the amount reported a half century earlier. 2017 saw a record-breaking fire season (Petryna, 2018). According to the National Interagency Fire Center, all 10 of the greatest burned acreage years in recorded history have occurred since 2004 (US EPA, 2023).

While this period coincides with many of the warmest years on record, fire statistics are related not only to climate change but also to evolving American policy around wildland fire suppression and land management. This history begins with sociopolitical changes at the turn into the 20th century when the government defined “forests”, and the modern conservation movement began. This turn of the century era ended with “The Big Burn” of 1910 in Montana, at the time the most lethal fire in our history (and still the largest ever, covering an area about the size of the entire state of Connecticut). This fire assured the future of the United States Forest Service (USFS), which prior to the fire was underfunded and politically orphaned (Egan, 2009). This fire also marked the conversion of the USFS from an environmental protection-oriented agency into a militaristic agency pursuing the utter eradication of fire (Egan, 2009). Furthermore, it cemented the neoliberal role of the agency as managing resources for extraction, consistent with the vision of the Senate of the day, versus its original conservationist/environmentalist role.

But there was a reversion at the next turn of the century. Land managers in the late 20th century began developing the concept of “good fire”. Land management philosophies evolved to

include permissive fires and even intentional prescribed fires. The implications of such philosophical changes aren't abstract: the USFS alone manages land that, in aggregate, would be the second largest state in the U.S. All federal land management agencies put together manage nearly one third of all U.S. land. Nor is this just a question of "wilderness". 71 million homes lie in the "wilderness-urban interface" (WUI), where structures and other human development intermingle with undeveloped wildland or vegetative fuels (NWCG, 2024). This statistic represents about ½ of all U.S. homes (Whitehouse, 2023), and doesn't include smoke exposure.

Wildland fires are an especially pressing public health issue for NC and the Southeast. Fully half of all wildfires in the country occur in the Southeast, many very close to homes (Holifield, 2023). We need look no further than the Great Smoky Mountain Fires of 2016 for local relevance—they enveloped the city of Gatlinburg, killing 14 people and injuring 190. The South is also one of the fastest growing regions in the nation with a corresponding increase in WUIs as homes are built closer to forested lands. More recently, in 2023, the Great Lakes Fire occurred in Croatan National Forest—this entire forest is within 1.5 km of residents (Holifield, 2023). In March 2025, multiple neighborhoods near Myrtle Beach, SC, were evacuated due to the >800-hectare Covington Drive Fire. In the same month, over 200 wildland fires burned simultaneously in NC, totaling nearly 800 hectares (Czachor, 2025). Polk County communities were evacuated due to three separate, simultaneous fires,³ all in Hurricane Helene-affected areas within 50 km of Asheville (Hutchinson, 2025). Indeed, NC has the most WUI acreage in the US, and 60% of all prescribed fires are Southeastern (Holifield, 2023).

WFFs lie at the intersection of these public health, public policy, and land management issues. They are not only the direct agents of governmental policy in these spaces but are also highly skilled operators, with their own culture and perspectives on the natural (or human?)

world in which they work. That work is also exceptionally dangerous: WFFs have the highest governmental employee fatality percentage, including military and law enforcement (Butler et al, 2017). After over a century of relative neglect, in 2022 the USFS established its first-ever emergency medical services (EMS) system and medical director (USDA, n.d.; USDA, 2022). This new EMS system serves USFS employees, particularly WFFs, but is specifically excluded from “scheduled, regular, or on-call” medical care of the public (Chen & Hiram, 2018), which may be inappropriate given how often forests are recreation sites (Hawkins, 2025).

NC is an ideal environment for this anthropological work, having large and diverse coastal, Piedmont, and mountainous forests. Within the state, the USFS manages four national forests,⁴ containing within them eleven discrete wilderness areas. Collectively, this land covers more than 1 million acres, or about 3% of total land area in NC. In total, nearly two thirds of the state’s land is forested—the vast majority being in public or non-industrial private ownership—and forestry is the second largest industry in the state, contributing over \$3 billion annually to the NC economy (ncforestservice.gov, n.d.a; ncforestservice.gov, n.d.b). Indeed, NC claims a “first in forestry” title due to pioneering forestry work done in western NC by George Vanderbilt (Ney, 2013). It is also a frequent site of wildland fires and is a region where fire is ecologically necessary (Pyne, 1997a; Hanson, 2021).

III. Literature Review

Crucial to understanding contemporary literature on wildland fire and firefighters is the recognition that, in most of its parameters, there exists a mainstream and a counter-mainstream. The mainstream, culturally dominant literature about wildland fire at any given time closely resembles Gramsci’s cultural hegemony (Hoare & Smith, 1971). Utilizing the perspective of hegemonic and counter-hegemonic perspectives is very helpful in organizing the literature.

Fire Management Practices

The story of the use of fire is intrinsically linked to the story of *Homo sapiens* evolution and global expansion. Humans have used fire to clear wildlands and for cooking back to our earliest origins as a species, and even in our hominin predecessors, although the precise timing and pathways for this are contested (Alperson-Afil & Goren-Inbar, 2006; Herzog et al, 2022; Parker et al, 2016; Scherjon et al, 2015).

NC Precolonial Management

Pyne (1997a) distinguishes “Asian Fire” (fire practices introduced by precolonial humans coming across the Bering Strait in the Pleistocene) from “European Fire” (fire practices introduced later by colonial Europeans and then managed by neo-European⁵ models).

Precolonial land management was permissive towards lightning fires and utilized anthropogenic indigenous fires for human advantage. While there is no literature *per se* from this era, knowledge of it has been used for differing and often oppositional purposes in the subsequent literature. Pyne’s “Asian Fire” was subsequently more widely known as “indigenous fire”, a terminology that has recently been supplanted, following Roos (2021), with the phrase “cultural fire”. In this paper I use the term “indigenous fire” to describe precolonial Native American burning practices (Pyne’s “Asian fire”), “mainstream fire management” to describe the subsequent neo-European burning practices (Pyne’s “European fire”), and “cultural fire” to describe the specific contemporary phenomenon by which American Indians practice a particular form of burning interventions and rituals which are distinct from mainstream fire management.

In NC, the first Europeans to explore the state found vast acres of longleaf pines as a keystone species, in a forest ecosystem that was once one of the most diverse in the world, with more than 40 plant species per square meter—second only to rainforests (NC Forest Service

2025a). Those pines themselves dominated over 60 million acres in the southeast and mixed with other pines and hardwoods over an additional 30 million acres (Earley, 2004). By the 1990s, only 3 million acres remained, and those existed “in an unhealthy state due to the exclusion of fire” (NC Forest Service, 2025b). This massive ecosystemic change, driven by extractive capitalism, development, and fire management philosophies, has been described as an “indictment of the entire capitalist system (Earley, 2004). In 1931, ecologists opined that “in its pristine condition with millions of trees measuring a yard or more in basal diameter, the [longleaf pine] unquestionably presented one of the most wonderful forests in the world. And today hardly an acre is left in NC to give its citizens a conception of what nature had wrought in an earlier day. The complete destruction of this forest constitutes one of the major social crimes of American history” (Wells & Shunk, 1931). The critical point to understand here, however, is that the forests the Spanish encountered in the Carolinas were in fact not “what nature had wrought in an earlier day” alone. They were intrinsically and extensively adapted to precolonial lightning and, even more, human “Asian fire” land management practices of tribes such as the Chowanoc, Hatteras, Machapunga, Meherrin, and Waccamaw (Frost, 1993; Stewart, 2002; LeQuire, 2009; Johnsen, 2021; Cape Fear Museum, 2024). Indeed, Bonnicksen (2000) argues that there may have been as many as twice as many fires due to Paleoindians and their descendants as would normally burn because of lightning.⁶

Fire Suppression Management

Following European colonization, governmental and professional land managers increasingly abandoned indigenous fire, although it continued as a private landowner practice, in favor of fire suppression (Pyne, 1997a). Prior to the creation of the USFS and in pericolonial times, this was highly linked to racism towards indigenous American practices, interest in

lumber (especially longleaf pines) for commercial timber, and prejudice against “commoner” landowner practices (Pyne, 1997a), practices which were both colonialistic (Thomas, 2020) and a Gramscian hegemony. Later, this phase evolved into the creation of state and national forests and forest services at the turn of the 20th century. As that century went on wildland fire was more and more vilified (Pyne, 1997a; Hanson, 2021). With the onset of world wars, USFS policy increasingly saw fire as an enemy that must be stopped at its first appearance (Pyne, 1997a; Hanson, 2021). Wildland fire and foreign enemies became conflated both symbolically and in actuality.⁷ This era also saw the initiation of the Smokey Bear campaign, by many metrics the most successful US government public health campaign in history, and one that enculturated generations to believe that wildland fire was destructive and must be stopped for public health reasons (Pyne, 1997a). The American southeast in general, and NC in particular, marked a site of internal and external counter-hegemonic literature aligned against this approach. Such resistance was largely due to the fire dependence of southeastern pine forests and their differences from Western American areas where much of the 20th century wildland fire theory was developed (Pyne, 1997a)—in fact, approximately 65% of the rare plant species in NC are fire-dependent (NC State Parks, n.d.).

Contemporary Management

Beginning in the 1980s, literature, public health messaging, and operations from the USFS and other mainstream land managers took a dramatic turn. By that time, land managers came to feel that fire was a necessary part of North American ecosystems. Not only did more permissive practices appear regarding lightning burns and unintentional anthropogenic burns, but the implementation of “prescribed burns” appeared. Prescriptions were written for the characteristics that would be permitted to accomplish land management goals (reduction of

downed vegetation at risk of combustion, reduction of insects, promotion of fire-dependent species, etc.). Following such a prescription, land managers began intentionally setting fires as prescribed burns where (in theory) they controlled the duration, range, and intensity of the fire. This required a staggering turn in public health messaging, with a complete reversal of the prior dismissal of intentional fires. Smokey Bear's catchphrase, unchanged since 1947, was updated in 2001 to specifically clarify that prevention was only directed towards unprescribed wildfires (The Ad Council, 2021). The USFS and other land management agencies launched a social media campaign with the hashtag #goodfire. There and in other media outlets they explained the new mainstream paradigm of "good fires" (anthropogenic fires intentionally set in recognition of ecosystemic need for periodic fire, and some lightning-generated or unintentional fires in deep forests) versus "bad fires" (any fire threatening humans or human interests in some way). Paradoxically, mainstream fire managers now often appeal—with varying degrees of appropriateness—to the same indigenous burning practices as historical evidence of "good fire", despite passionately opposing them in the past (Schelenz, 2022).

The contested nature of "good fire" and "bad fire" over the last century, being dramatically renegotiated now, is particularly amenable to Haraway's positioning of "being" as problematic and contingent, as well as the positionality and negotiability of "rational knowledge" and the role and application of "science" into this topic (Haraway, 1988). The subjective and interactional "webbed connections" she suggests are ideal for analyzing the social role of wildland fire. In other words, fire is typically thought of as an element (classically) or a chemical reaction and environmental condition (currently) which has objective, non-negotiable reality. But as history has shown us, fire's meaning is exceptionally negotiable, even when "science" is invoked. Clifford (1986) might characterize each these manifestations as partial truths—this

anthropological framework helps us understand wildland fire as a subjective, not an objective, phenomenon, which contradicts much of the scientific writing around it. Escobar takes this one step further in his appeal for a pluriversal understanding of a single phenomenon. I'm proposing that the health effects of fire can only be understood in a pluriverse (multiple co-existing realities that accommodate multiple human perspectives as well as more-than-human ones), and that such a pluriverse is epitomized by Escobar's webbed connections and radical interdependence (Escobar, 2018). In other words, any partial truth about wildland fire health engages an unusually high number of human and environmental entities which are deeply interconnected. The government is a prime entity in this as well. Scott's work (1998) on "thinking like a state" also helps inform the strategies and considerations governmental agencies use to manage commodities, people, and resources in a neoliberal political environment, including the pragmatic way "science" can be politically engaged to utterly dismiss fire as beneficial in one century, and then completely reverse that position in a subsequent century.

Jordan Thomas, a WFF-anthropologist, has done pioneering work on contemporary California WFFs as sources of evolving "embodied fire knowledge" (Thomas, 2022). Similar work has been done describing the "place-based environmental knowledge" of Hawai'ian WFFs (Gollin & Tauernicht, 2018). Such putative embodiment could place WFFs as the post-colonial heirs to the legacy of pre-European indigenous burning practices. The embodied knowledge expressed by Thomas (2022) has analogues to Wali's *Economía Indígena* (2020) in the sense of a community of skilled individuals who cycle through valuation and devaluation depending on season or circumstance.

Whether it is fighting fires in the second phase model or managing them through a combination of prescriptions and suppression in the third phase model, WFFs have been critical

to mainstream fire management practice. Within the mainstream literature, WFFs are often characterized as highly skilled operators likened to the military's Special Forces (again continuing the militaristic theme), while at the same time characterized as unskilled and undeserving of more respect or pay by some governmental officials (Thomas, 2022). The disregard for their economic situation belies the economic stressors they face—WFFs made \$13/hour until August 2021, when it was (temporarily) increased to \$15/hour (Weisner, 2023). This temporary increase was made permanent in March of 2025, but many firefighters still felt this was only the beginning of more respectful employment practices, with other needs being mental health attention, adequate housing, improved recruitment and retention practices, and more sustainable employment environments (Friedman, 2025).

Considering further the cultural stressors faced by WFFs and their positionality, Durbin et al (2024) specifically explore “The Big Lie”. The Big Lie is an explicit and ongoing term in wildland firefighting dating back to the infamous and Hollywood-recognized Yarnell Fire of 2013 (Smith, 2016), embodying the idea that actual risks of wildland firefighting are not acknowledged by administrators. Durbin et al (2024) apply discursive risk analysis and anthropological principles of the Sapir-Whorf hypothesis and the “public secret” to a discussion of institutional perceptions of safety and risk—highly meaningful for any inquiry into medical activities within this community.

At nearly the same time as The Big Lie dialogue was evolving, I and others began working on the “Safety Third” paradigm in the EMS and emergency medicine field, with nearly identical themes (Davis et al, 2018; McClure et al, 2020). This paradigm forces an acknowledgement of actual risks in operational environments. It suggests that safety is never first for high-consequence, high-risk operations like EMS or wildland firefighting, and that mission

completion is inherently prioritized over safety. Together The Big Lie and the Safety Third movement show an evolving interest in transparency about health threats in public service.

Skepticism exists about contemporary mainstream wildland fire management practices (Wuerthner, 2006), and particularly about prescribed burns. The mainstream literature predominately expresses enthusiasm for prescribed burns in the sense they are felt to provide more control over a (what is now believed to be) natural process. This relates to alleged reduced risk of wildland fire expansion past prescribed lines, reduced health risk from smoke, and increased ability to steer fire towards fire-dependent ecosystems and plants. However, there are dissenters that argue all of these are false arguments. They point out that some of the largest uncontrolled wildfires started as prescribed fires, allege at least equal health risk to the public from prescribed burn smoke (this will be discussed further in the section on health later in this thesis), and an over-emphasis on the fire dependency of some species (Tenneman,⁸ 2024).

Others support an approach of “leaving nature alone” that suggests wilderness, parks, and forests are best managed through no management, or only management to protect human life. Some of the writings and philosophical convictions of this counter-mainstream movement can be found in the deep ecology movement (Naess, 1973). Naess, the progenitor of the deep ecology movement, critiques “shallow ecology”, which he describes as a mainstream pro-environment philosophy which seeks to anthropocentrically manage climate change consequences and other environmental challenges with minimal attention to root causes. (Khalfaoui, 2023) Deep ecology instead argues that humans are only part of nature and ecological decisions must be made with the general environmental balance in mind rather than the specific (aside from “vital”) needs of humans (Khalfaoui, 2023). Deep ecology has notable overlap with the anthropological and

public health literature in Escobar's pluriversal model (2018), multispecies ethnography, and, to a lesser degree, One Health principles (CDC, 2023).

In summary, nationally and in NC, the political and theoretical terrain has moved so quickly in recent years that some traditional allies, such as environmental and conservation groups and leaders, are pitted against each other, depending on whether they follow older or newer models of fire valuation, and to the degree that prescribed burns are seen as safe or appropriate (Battaglia 2022; Hodgson 2020).

Fire Management Philosophies

By now it should be clear that culture, as much as allegedly objective science, is integral to an anthropogenic wildland fire regime. And philosophy is integral to culture. The role of philosophical beliefs is more or less explicit in the literature. Naess, for example, in his original exploration of deep ecology (1973) suggests it is "ecophilosophical" and that he is proposing an "ecosophy". The 21st century literature is more interested in grounding its work in traditional science, but basic philosophical and subjective priorities need to be addressed when considering management priorities for the future.

The appeals to precolonial burning for various pragmatic purposes is a good example of the ways fundamentally philosophical beliefs can be leveraged for polemical support. On the one hand, knowing that precolonial burning occurred is important. For opponents of permissive or prescribed burning, this avoids an over-romanticization of precolonial humans which has resulted in the "ecological Indian", "the Noble savage", "mystical, misty-eyed dialogue" about indigenous land connections, the conflation of indigenous knowledge with notions of sacred wisdom and Edenic relations, and the anchoring of Indigeneity in nostalgia, especially in wildland fire dialogue (Ladino et al, 2022; Brosius, 2016; Smith 2021). In contemporary

dialogue, as we've discussed, there are frequent references to a "primeval" precolonial forest. This is largely imaginary, as humans heavily influenced forests (including burning) since the Pleistocene (Stahl, 1996; Pyne 1997a). On the other hand, despite evidence of Pleistocene overkill and biodiversity diminishments wrought by precolonial humans (Harari, 2015), most sources do consider Native American land management practices to be aligned more with natural processes. I acknowledge "land management practices" tethers such an ecosystemic interface with a neo-European term—perhaps Carle's words (2000) better characterize the general perception that indigenous populations "paid close[er] attention to the rhythms and processes of their neighboring landscapes". The bottom line is that when Europeans landed in NC, they found a fire-dependent pine-dominated forest ecosystem dependent on anthropogenic burning.

We must also acknowledge the degree to which mainstream anthropology has in the past (perhaps not as long ago past as we might like to think) represented its own "philosophy" or at least served as a representative of mainstream philosophical beliefs about its own society. Anthropologist Omer C. Stewart completed a book in 1954 that convincingly demonstrated the prevalence and benefit of Native uses of fire in North America. It was only published posthumously (Stewart, 2002), despite multiple attempts to publish it during his lifetime. In an unusual "Anthropological Critique" preceding the text when it was published, Henry T. Lewis (2002) notes that "only his work and an important article by the Canadian anthropologist Gordon Day... raised serious questions within anthropology about public attitudes and governmental declarations, which denigrated the burning practices of hunter-gatherers, pastoralists, and horticulturists across a range of environments." In this critique and a parallel Introduction (Lewis & Anderson, 2002), citations of the language of the publication refusals and descriptions of the highly charged confrontation between Stewart and his former professor Julian Steward

demonstrate that it was largely political considerations that caused his work not to be published.

Richard Stoffle said it most directly:

Omer's data led him to conclude that there were levels of social organization in the Great Basin that were far more complex than those postulated in Julian Steward's new theoretical model. Steward concluded that Omer had broken ranks, thus committing an unforgivable heresy. Despite Omer's attempts to explain away the theoretical disagreement by reference to field data, Steward set about to destroy the young scholar. Omer had an excellent academic record and was one of the most promising anthropologists in the country, yet Steward *blackballed* Omer, making it impossible for him to be employed in any of the major anthropology departments. Omer suspected that Steward also intervened as a professional reviewer of manuscripts to suppress Omer's heretical views... Steward viewed Great Basin Indians as living fossils representing an earlier stage of human evolution. Omer viewed Great Basin Indians who had been moved by his Church to make way for his family to farm. The confrontation between theory and data came when both Julian Steward and Omer Steward testified during the United States Indian Land Claims hearings. Steward took an anti-Indian position when he moved to stop the hearings before they started. According to Omer, Steward felt his model demonstrated that the Indian people never used the land in the highest and best way, so they deserved to relinquish the land to Euro-Americans who represented a socially more advanced stage of evolution. Their debate was formalized in the adversary proceedings of the court. There, Omer's concern with documentable facts held sway over the generalizations provided by Steward and his students. Omer won every case for the Indian groups he represented. Steward and his students lost all the cases in which they were involved testifying against Indian interests. (Stoffle, 1992)

This forms yet another case study in anthropological history where philosophical and internally political anthropological concerns suppressed data-driven interpretations. By the turn of the century, "indigenous uses of fire are neither mentioned in ethnographic description nor considered to be of practical much less theoretical importance... for the majority of anthropologists, the use of fire continues to be a nonissue with respect to the adaptations of foraging societies" (Lewis, 2002). Elsewhere, Lewis & Anderson (2002) support a similar contention by pointing out that "in more than twenty-five years of publication, the editors of the prestigious *Annual Review of Anthropology*—described as the 'serial ethnography of anthropology'—have neither published nor apparently sought a review article on the technology and ecology of hunter-gatherer, pastoral, or agricultural uses of fire". In the subsequent nearly twenty-five years of publication, I still find no evidence of such a review article in the *Annual Review of Anthropology*, now spanning a half century of scholarship.

Wildland fire has also been described as a prototypical case of “runaway change” in a climate changing world (Petryna, 2022). In this model, change outpaces the explanatory structures within which it is defined. For example, change could be the movement from anomaly (“that fire season was long”) but stabilize into a new ecosystemic reality (“fire seasons are getting longer”). Runaway change exceeds capacity for observation and systemic prediction—Pyne’s Pyrocene model (2021a) could be seen as a response to runaway change and the need to radically reconfigure the entire epistemological system. Rapid climate change and its effects on wildland fire suggest a system where “faltering scientific projections [represented by runaway change] interface with the realities of emergency response... and the ground-level actors who are directly caught up in such change and are tasked with trying to contain wildfire proliferation” (Petryna, 2018). “Horizoning work” is proposed as an ethnographically- and theoretically-driven solution: “local and highly practical forms of research that attempt to bring an unknown or runaway future into the present as an object of knowledge and intervention” (Petryna, 2018). This study is a contribution to such horizoning work, especially in the context of bringing new cultural burning data and analysis into the academic dialogue.

In other horizoning work, at the Society for Applied Anthropology 84th Annual Meeting, Du Bray et al (2024) presented a survey initiative asking wildfire managers themselves, via survey, whether approaches to “reduce wildfire risk or build capacity to live with wildfire” were more appropriate. This is a succinct encapsulation of the two divergent approaches that, while not mutually exclusive by logic, are often diametrically opposed in practice. Du Bray’s survey nicely lays out the philosophies underlying the current mainstream and counter-mainstream positions on wildland fire and health. The current mainstream practice of militaristic firefighting designed to stop unexpected wildland fires, prevent them with prescribed burns, and use logging

(both thinning, commercial, and post-burn) to reduce their ecosystemic and human harm reflects a philosophical pragmatism based on reducing wildfire risk. The current counter-mainstream proposals argue that wildland fires are a natural process and are primarily weather-related. They argue that we don't attempt to stop hurricanes or tornadoes when they approach, we accept them as natural processes. We harden our infrastructure against them and try to mitigate their effect on human habitat. This philosophy would argue against any wildland firefighting anywhere outside the WUI (Wuerthner, 2023). Within the WUI, they argue that basic building defensibility measures (such as no vegetation within 30 meters of a home, no wooden roofs, and fireproofing vents) can reliably and relatively inexpensively prevent a home from being consumed in a wildland fire (Hanson, 2018). Los Angeles has extensive experience here, where zoning and building requirements enhancing fire defensibility and resilience dramatically decreased homes damage. For example, in the La Tuna Fire, 1400 homes were within the 60 meters of the fire perimeter, but only five homes were destroyed following fire-resistance modifications (Hanson, 2018). Communities in Idaho show similar experiences (Druzin & Barker, 2008). This would represent a more familiar public health initiative than, say, wildland firefighting in remote areas or prescribed burns.

These two practical reflections of underlying philosophy do have overlying elements. The mainstream literature does promote home defensibility, and the counter-mainstream literature does support traditional wildland firefighting when it threatens homes.

Individual & Public Health

A widespread theme of wildland fire scientific dialogue is the insufficiency of available literature on its effects both on the health of individuals and the public (Hawkins & Stephens, 2023). While chronic exposure is widely believed to be deleterious to the health of individuals

and populations as it is with other pollutants (US EPA, n.d.), intermittent severe exposure such as that experienced by WFFs or low to moderate exposure such as that experienced by populations exposed to large wildland smoke are less well understood.

For WFFs, studies have found effects ranging from short-term changes in lung function and systemic inflammation after working on wildfire incidents and prescribed fire, possible increases in the risk of developing lung cancer and cardiovascular disease from smoke exposure, and effects on mental health (Adetona, 2016; Campbell & McDuff, 2022). In June of 2022, the International Agency for Research on Cancer (IARC) reclassified the occupational exposure of WFFs as carcinogenic to humans (Group 1), the highest hazard category (Miner, 2023). Over a 25-year period, WFFs have additional risk over baseline of 43% for lung cancer and 30% for cardiovascular disease (Miner, 2023). More acutely, wildfire smoke exposure is associated with lower respiratory tract infections such as bronchitis and pneumonia, and the Occupational Safety and Health Administration (OSHA) 8-hour acceptable exposure level was exceeded 3.5% of the time at prescribed fires and 5.6% of the time at project fires (Miner, 2023).

In the general population, numerous studies show potential for injury or illness from wildland fire smoke (Rappold et al, 2012; Liu et al, 2015; Reid et al, 2016; Weittstein, 2018). Most of these studies confirm that susceptible individuals are at higher risk. However, sources differ in what defines a susceptible individual, and the most cited categories can include most of the adult population. For example, the EPA lists “individuals at greater risk of health effects from wildfire smoke” as “cardiovascular or respiratory disease, older adults, children under 18 years of age, pregnant women, outdoor workers, and those of lower socio-economic status” (US EPA, n.d.). Hegemonic statements by the government and large non-governmental organizations suggest that risk is low and extend to non-susceptible individuals. The EPA’s *Wildfire Smoke: A*

Guide for Public Health Officials (2021), citing US EPA (2009) and DeFlorio-Barker et al's 2009-2010 data (2019), state “the scientific evidence does not indicate that particles generated from wildfire smoke are more, or less, toxic than particles emitted from other sources” and that “although a large population can be exposed to smoke during a wildfire event, most healthy adults and children will recover quickly from wildfire smoke exposure”. But this data is more than a decade old. More recent evidence provides a more concerning interpretation that wildfire smoke exposure to any humans, not just susceptible humans, could be significantly harmful (Doubleday et al, 2023) and that wildfire smoke impacts respiratory health more than fine particles from other sources (Aguilera et al, 2021). Observational data from the recent Southern California fires suggests that wildland fire smoke is ten times more dangerous than routine pollution sources (Aguilera et al, 2021). Complicating all these analyses is the recognition, drawn from data in NC and neighboring states, that there are major sources of uncertainty in wildland fire impact methodology, particularly around the connection between air pollution and health responses reported by epidemiological studies (Johnson & Garcia-Mendez, 2022)—precisely the question we need to have answered.

Wildland fire smoke exposure might previously have been perceived as an esoteric risk limited to communities adjacent to woodlands. With climate change, the expansion of WUIs, and widespread recent East Coast urban exposures to smoke, at least one major air filter company the risk is widespread enough to launch direct-to-consumer campaigns selling air filters, stating “as wildfire season approaches, it's crucial to take proactive steps to safeguard your indoor air quality from the harmful effects of wildfire smoke” (Coway, air filter marketing, Apr 18, 2024).

Particularly contentious are the relative public health effects of prescribed fire, since, as the reference to dissenters above indicates, this is felt to be anthropogenic, controllable, and is a

strategy with some controversy. Some of the allegedly scientific literature about public health effects, while frequently cited by counterhegemonic enthusiasts, raises red flags for scientific validity with overuse of metaphor, click-bait essay titling, uncertainty of author positionality, exclusive availability on an advocacy group website (Physicians for Social Responsibility), and tenuous at best representation of cited literature (Honn, n.d.). More scientifically rigorous public health studies show increase in emergency department visits in Georgia with prescribed burning (Hang, 2019) and an increase in daily PM_{2.5} and O₃ concentrations— dangerous particulates and ozone levels—in the southeastern US during prescribed fire periods (Maji, 2023). Analysis of the 2016 prescribed fire season in NCSP showed the air quality benefits of prescribed fires resulting from avoided wildfire pollution exceeded the air pollution effects from prescribed fires (Afrin & Garcia-Menendez, 2022). Speaking as a hegemonic authority, which represents both consensus strength and hegemonic weakness, the American Lung Association’s formal report in 2022 on the role of prescribed fire reads

The report found that using prescribed burns under the right conditions can mitigate the negative impacts of large-scale fires. The research shows that historical fire suppression policies are not sufficient for longer-term fire management. These strategies result in increased fire intensity and an increase in the number of people exposed during a single smoke event. This means that under the right conditions, prescribed fire can be an important tool to protect lung health from worse smoke impacts. While increasing prescribed fire activities may contribute to local air quality impacts, prescribed fire can and should be conducted in ways that minimize harmful smoke exposure. This may be possible if the prescribed burns are implemented under planned, predictable circumstances where additional measures can be taken to minimize exposure to nearby populations. Of course, more research is needed to evaluate comparative risks of prescribed fire smoke and wildfire in an ongoing way. (American Lung Association, 2022)

Acute and chronically intermittent acute exposure to wildland fire is a very active area of research, reflecting both the dearth of current evidence and the need. For example, the Firefighter Cancer Initiative as of April 19, 2024 announced an ongoing research project not only to collect aerosol emissions to better understand exposure (a widely applied research tool), but more

innovatively to distribute wristbands to WFFs to determine individual exposure and to collect exhaled breath samples from WFFs after a prescribed burn. (Firefighter Cancer Initiative, 2024).

Ultimately, for both physical and social risk from smoke to firefighters and the public, risk communication as a public health theory is gaining increased attention. This model focuses on identifying the most effective means of providing information about potential risks to a population that promotes appropriate protective action and not unnecessary fear or misinformation (Steelman and McCaffrey, 2013; McCaffrey et al, 2022). Such communication must include considerations of social acceptability, economic considerations, available evidence and weaknesses of that evidence, and trade-offs of public health interventions (McCaffrey et al, 2022), which makes its application a perfect manifestation of the intersection between applied anthropology cultural brokerage (van Willigen, 2002) and public health.

No discussion of health in wildland firefighting would be complete without addressing mental health. In a recent study of over 2,500 WFFs, 17% reported symptoms consistent with depression and 13% symptoms consistent with generalized anxiety disorder, both of which are about two to three times greater than the general population (O'Brien & Campbell, 2021). Less than half of the respondents who had symptoms representative of PTSD had been clinically diagnosed with that disorder, suggesting very high rates of underdiagnosis and presumed undertreatment (O'Brien & Campbell, 2021).

This mirrors an overall theme of widespread inattention to the psychological risk of wildland firefighting. *Wildland Fire Fighter: Principles and Practice*, the primary textbook for the discipline, dedicates 21 sentences in its nearly 400 pages to mental health, with the summation recommendation that “You must learn how to deal with your specific stress-reaction tendencies” (Lowe, 2021). This is known to be a highly exposed and psychologically threatened

community (Hansman, 2017). One 2015 study of firefighters showed nearly half of all responders reported a career prevalence of suicidal ideation (Stanley et al, 2015), a 2019 doctoral dissertation showed two times or more suicidality in WFFs versus the general population (O'Brien, 2019), and extrapolated data suggests ten times more completed suicides in WFF populations versus the baseline population (DeGrosky, 2018), with all sources suggesting reliable data is lacking and available data likely underreports the situation. There is insufficient understanding of the mental health demographics of this population (Singer, 2021; O'Brien & Campbell, 2021; Singer, 2022; Hawkins, 2024). This lack of awareness further reinforces the importance of potential applied anthropology interventions.

IV. Methods

Mainstream NC wildland fire work is mostly completed by governmental employees of either the state (primarily NC State Parks [NCSP] and NC Forest Service [NCFS]) or the federal government (primarily USFS [USFS] and US Bureau of Land Management [BLM]). I explored wildland fire health parameters via participant observation and focused ethnographic interviews with WFFs employed by the USFS-NC, the NCSP, and with invested community members, scientists, and industry leaders. Interviews with these individuals and initial observation research in these communities indicated that a significant area of health interest was in indigenous and cultural burning practices. Because of this I expanded my research group to include the Lumbee Tribe of NC (LTNC).

Description of Agencies

The USFS is a division of the US Department of Agriculture. The NC unit of this division (USFS-NC) deploys multiple wildland fire personnel, oversees burns conducted in US

Forests in NC, and hosts the elite Asheville Hotshots, a team of about 14 WFFs that deploy throughout the country (USDA, n.d.).

NCSP is a division of the NC Department of Natural & Cultural Resources. The Division Fire Program consists of three Regional Burn Coordinators, an Equipment Coordinator, and a Fire Management Officer. NC State Parks also has over 210 staff with fire training suitable for working on the fireline, with 22 Burn Bosses⁹ throughout the state (DNCR Fire Management Officer, personal communication, May 9, 2024).

My final partner in this thesis project is the LTNC, and specifically the Cultural Burning Association CBA founded within the tribe in 2022. The LTNC is a consolidated tribe, drawn from survivors of tribal nations from the Algonquian, Iroquoian, and Siouan language families who settled along the Lumbee River. It takes its name of “People of the Dark Water” from that river and its associated wetlands. The ancestors of the Lumbee received NC state recognition as a tribe in 1885, and in 1956 the federal Lumbee Act also recognized the Lumbee as a tribe while paradoxically denying it many of the federal benefits normally associated with such recognition (Lumbee Tribe of NC, 2025). An Executive Order from President Trump in January of 2025 ordered the Secretary of the Interior to submit a plan to assist the LTNC in obtaining full federal recognition, acknowledging them as the “largest tribe east of the Mississippi River” (Trump, 2025). American Indians in NC experience significant health disparities, largely driven by adverse social determinants of health (NC Office of Health Equity, 2024). Robeson County, home of the tribal headquarters, is a majority-minority county with nearly 50% Native American identity. It has some of the worst public health metrics in the state, including life expectancy at birth over half a decade below the statewide average, grade-level reading proficiency at only 34% (positioning them in the lowest 1% in the state), less than half the statewide percentage of

individuals with bachelor's degrees, one quarter of the population tobacco smokers (the highest rate in the state), and more than half of the county living at or below the poverty rate (Stebbins, 2021; Cape Fear Collective, 2025). These metrics are offered to suggest it was “off the radar” (a quote from an informant) in ways that proved positive as well as negative.

Study Design

I collected data primarily through participant observation and semi structured interviews. I applied purposeful sampling (Palinkas et al, 2015) to acquire the subjects for these interviews. Recruitment was done using immediately identifiable personnel by virtue of their position, followed by a snowball recruitment strategy. Inclusion criteria included anyone who is an active or former WFF or medical caregiver on wildland fireline; any person with demonstrable knowledge of wildland firefighting, either by profession or personal interest; any administrator or leader in wildland firefighting; any advocacy group or governmental member/official with positions on wildland firefighting; and any scientist who works on wildland firefighting topics. Anyone agreeing to be interviewed signed a consent form (Appendix A and B respectively). Individuals without wildland firefighting knowledge and children were excluded.

Ethical Considerations

As I am discussing private medical and health histories in interviews and analysis, all electronic records were stored in password-protected platforms and paper records were stored in a locked cabinet. All raw data will be destroyed five years after study completion. Pseudonyms were used in written products generated by this research, including this thesis paper.

My own positionality requires some ethical attention.

First, I borrowed trust from the communities and individuals with whom I collaborated. I am not a WFF, a cultural burner, nor have I ever been. As far as I know I have no American

Indian ancestry whatsoever. In sharing their stories and perspectives, I am a student and an interpreter. This may be one of the most significant lessons of my graduate training in anthropology. While my long-standing medical training and newer public health training both lay a claim to expertise, I've learned anthropology does not do so. The expertise lies in the informants being studied, and anthropologists are always students of those experts and their epiphenomena. I am very humble in this regard that my brief investigations into these worlds may get things wrong, even basic things, and those errors are entirely my own... the ongoing effort to better understand a community and its epiphenomena as a student characterizes anthropology as much as the ongoing effort to better understand medical and public health epiphenomena as an expert characterizes the clinical and policy health sciences.

Second, I do have positionality in many of these spaces engaging expertise and authority. I am the USFS Local Emergency Medical Advisor (LEMA) for USFS-NC and the statewide medical director for NCSP. However, both these are contractor roles. I am not an employee of either organization and would make clear to informants and in meetings that my role was that of researcher in this context. And indeed, to the degree that the roles could not be disentangled, I would argue that formal inquiry using the tools of applied anthropology are precisely what both these contracts need at this time. To my knowledge no applied anthropology work has ever been done with the NCSP, the USFS-NC, or the Lumbee wildland fire communities, despite how amenable its topics are to such studies and study-driven interventions. I am also associate medical director of Eastern Band of Cherokee Indians EMS (Qualla Boundary, NC), but my work here did not interface with this tribal entity's EMS or fire-based work aside from references in this manuscript to their tribal presence in NC. I am associate or full medical director of multiple contractor wildland fire medical support teams,¹⁰ but none of these entities have

responded to NC fires during the time I have served as an officer with them. I am also the LEMA for all National Park Service (NPS) properties on the NC coast (the Outer Banks Group and Cape Lookout National Seashore), but those entities were not engaged in fire management during the time frame of this research.

Third, my positionality as an anthropologist *per se* could be ethically and operationally problematic in this topic. I myself was exposed to Stewart's work by a member of the Lumbee Indian tribe. The evidence there of the subjectivity, pettiness, and frank racism of anthropology in the 20th century could not have been lost on Native Americans who had read this book (that in fact I had not). Nor is this ancient history: Stewart submitted his manuscript to a publisher six months before his death in 1992, only to find it rejected even then (Lewis & Anderson, 2002). Nor can any Native American exploring the history of neo-Europeans and the US interaction with tribes fail to note the prominent place Steward holds in anthropological and Indian administrative history and the minor attention paid to Steward.¹¹ Indeed, presuming that Native Americans are not privy to or students of such history is blatantly racist, nor is it fact-based in my own experience of being an anthropology student learning about this anthropological history from a Native American informant. In that context, any anthropologist stepping into this topic as an investigator in the early 21st century must come from a significant position of apology and disciplinary humility even beyond that now encouraged in graduate school training.

Data Collection

Interviews: I conducted semi-structured interviews on a convenience sample of WFFs, cultural burners, and other invested parties, using a structured research instrument (Appendix C). I used standard qualitative research techniques of data analysis, data saturation, and thematic inquiry for the completed interviews (Bernard, 2018).

Permissions & IRB Approvals: This research was approved by the USFS (Appendix D), NCSP (Appendix E), LTNC IRB (Appendix F) and UNC Charlotte IRB (Appendix G).

V. Results & Discussion

This methodological approach yielded thirteen formal interviews and multiple less formal discussions with invested individuals. Table 1 details the demographic characteristics of my interviewees. Interviews were projected to be one hour and in general held very closely to that time frame, with none under 60 minutes, except for the cultural burning interviews that were held on-site in Robeson County and lasted many hours. I also attended conferences (for example, the NC Prescribed Fire Council and Consortium of Appalachian Fire Managers and Scientists Annual Meeting in Brevard, NC in August 2024), training workshops (for example, the NC Forestry Service Wildland Urban Interface Workshop at Turnbull Creek Educational State Forest in May 2024), and field site visits (e.g., the Lumbee Tribe Cultural Center in February 2025).

Table 1: Characteristics of Formal Interviewees*

*Note that these are not all mutually exclusive categories

Wildland firefighters, total	9
Wildland firefighters, retired	2
Wildland firefighters, current	7
Cultural burners	3
Lumbee tribal members	3
Fire-adjacent scientists	4
Men	10
Women	3
Total Individual Interviews	13

Health and Mainstream WFFs in NC

Initial interviews were directed towards WFFs and those invested in their work. Themes that emerged included the health of firefighters themselves and the role in which they served as public health agents for community health in general.

Many observers note that WFFs do not use respiratory equipment like self-contained breathing apparati (SCBAs) like structural firefighters. Indeed, they don't even wear the respirators or masks that might otherwise be recommended for the public on days when air quality is compromised. One experienced WFF who has worked across the country spoke to the "accepted risk" of differences in safety equipment.

It's an accepted risk, I think getting into this, this this environment. I mean, you know, you get like, you work next to agencies like CalFire and, you know, city departments that come out to our same fires and they're, you know, head to toe in their, like, turnouts, and you know, some of them don't even won't even go near our fires without like respirators and you know, shrouds, and we know that, you know, it's impossible for our people to wear shrouds all the time during the day. I mean, that's just, you're talking dehydration and just extreme sweat. And I mean, it's just, you know, we're not in those environments that a lot of the safety equipment you know, we can, we can use. I mean, we try to use as much as we can that make sense, but I mean, respirators and shrouds, I mean, you know, to a point if it gets crazy hot, you're gonna, you know, throw your shroud on just to get you out, but I mean, you're not working in that at all.

That informant also spoke to the challenges of short-term work that has suspected long-term health consequences, but without corresponding coverage.

So, you're, you're breathing in these these particulates and, you know, the strain on your back and your knees going up and down these mountains. I mean, you know what you're signing up for and if you stay in long enough, you know what that means for potential quality of life down the road. But at the same time, you know, combining that with, you know, the concerns of pay and insurance and everything now, it's just, it's kind of a, it's not the best combination knowing that you're getting into a, you know, a career that doesn't necessarily pay as well as others, you know, your going down the line of not the greatest quality of life the longer you stay in it, and it's just, you know, just that, you know, back and forth like is it worth staying in and I think that's kind of where the, the Forest Service's now, currently, you know, or just the fire wildland fire environment is now currently, with just how much wear and tear on the bodies, you know, does to you in the moment and what that means down the road and like, really, how do you bridge that gap to make sure that your people are taking care of, you know, after the fact, even if they're just here for a few years, you know. And I think that's where some of the conversation is having that difficult stalling points, of like, you're only here for three years, I mean, you're still gonna get those three years of detrimental, you know, environment factors that you're there, but, you know, if you're there for 20, then yeah, we'll retire you and you're fine there... if you

if you go the distance and stay in, which is fairly hard to do, you know, to commit for a 20 something year career in such an intense dynamic environment.

Those who do commit might find more typical benefits, but by its very structure it is not a job that is configured to build in that longevity.

It is it is hard, you don't find a lot of people that are able to stay that long just from injuries from, you know, mental exhaustion. There's so many different factors that cause people to just not be able to stick with it for that long of a term. Those that do...their retirement is decent, you know, you're on a federal GS retirement track and the health care that comes along with that. You know, you might need to pay into it, you know, pay a little bit, but you're still you know, connected in that... But yeah, I just think... if you're not going to increase the pay.. then have some sort of like short term ability to cover them... for mental health or physical health... for every, you know, four years that you give us.

Some expressed the belief that this might be based on “machismo” or the culture of wildland firefighting, while others were dismissive of the idea that any such equipment would be feasible given the exceptionally rigorous and prolonged physical demands of a day of wildland firefighting, as noted in the preceding quote. However, informants were more generally unified in the opinion that health risks from air exposure were a red herring or distraction from the real health issue threatening WFFs—inadequate health care in general. A permanent pay increase was announced on March 15, 2025 (US Department of Interior, 2025), but benefits are still poor. While there is the capacity to earn significant income through overtime, by definition this is exceptional and requires arduous overworking. As one informant told me, “We don’t want respirators, we want health insurance and adequate health care”. In this sense there was a unity of interest in mainstreaming the work of wildland firefighting with other traditional capitalist or labor activities with the commensurate benefits, such as a living wage and health insurance.

However, respirators and other health-related technologies are not completely dismissed. Efforts to explore them are met with mixed results. One experienced WFF eloquently described these health risks.

So I think general wear and tear on body stuff. So I know a lot of people that have fused necks,

a lot of people that have, you know, back injuries, a lot of people that have shoulder just posture, wearing packs, carrying chainsaw issues. Knees go out, whether it's chronic, just like hiking the whole time, or I know people that like poses have like, blown up and, like hit people and taking them out now, they can't, you know, jump anymore. They can't, you know, hot shot it, um, it's breathing in smoke, like I have. I had a supervisor, COPD, it literally pushed him out of the job. Couldn't pass the pack test anymore. The cancers, they're definitely coming from somewhere, whether it's like lung cancer or so many different kinds of stuff, you know, all the individual injury stuff, whether it's tree strikes, limb strikes, you know, could be burnovers, like that hose incident. I was talking about car accidents, jumpers, like having hard landings, you know, getting knocked out, or breaking femurs or anything like all that kind of stuff. I mean, yeah, just look back at all the people that have died, like either just falling out of helicopters or any kind of vehicle crashes, helicopter crashes, even, even just doing the pack test, the amount of people that get compartment syndrome or rhabdo, or, you know, have heart attacks and die from our minimum physical fitness standard, I mean...

This informant went on to describe an attempt to distribute respirators to his team on their own initiative:

So this year we actually, last year, we had a guy who bought his own mask and had his own mask, and we're like, wow, that's a really good option, because we do a lot of burning, and we have to hold a lot of line. And so you're just there in the smoke, there's nowhere to go. It's a lot of exposure hardwood leaf litter, smoke like from deciduous trees, is super thick, really bad stuff. And so, we just we saw that mask like, wow, that's a really cool option. It's something we could provide for crew members. So we bought masks. We handed them out. Our safety officer learned about it. He started a lot of research on it, and like looking into it. And basically, what we were told is we cannot hand those out and give them to people. And I'm going to kind of paraphrase, but if basically acknowledges the fact that smoke is bad for you and that the line could go, Well, if smoke is bad for you, and if we recognize it, that means we have to give masks out, and then, if you're not the with the sicknesses and stuff, well, then it's your fault for not wearing the masks. And it kind of came into this really weird, convoluted thing where we basically were supposed to take the masks back from them, because we couldn't hand them out.

The paradox here is the simultaneous description of astonishingly difficult work environments coupled with the absence of masks/respirators that would be considered a mainstream tool for both firefighters and for anyone exposed to wildland fire smoke. Most WFFs say such tools are simply non-starters due to the operational environment (heat, length of days, exertion, etc.), but even when attempts are made to engage this mainstream intervention, they are blocked by, again paradoxically, risk management analyses.

In terms of health-related reasons for entering wildland firefighting, only a few informants fully endorsed the idea that they were “environmentalists”. More often they

expressed sentiments of land management, which was defined as having separate valences, with “environmentalism” as a One Health or more-than-human value being minimized. As one informant trained as both a biologist and a WFF put the difference:

Um, I don't know how I would define an environmentalist, I certainly see different flavors of it. And so some I would align with, some I would not align with, and I would consider myself a land manager more so than an environmentalist, in that, at least in my job, it's my responsibility to protect, and try to help, the landscapes and my agency be resilient to climate change to be in as healthy condition and function as healthfully as possible. Um, in particular, with focus on a functioning ecosystem that can provide the needs for [a/our] species, we want, we want to be able to try and at least within our properties, have functioning systems that promote biodiversity to the best that we can. We know that the landscapes we have inherited from generations past are completely screwed up. And some of them have been completely hammered and look nothing like what they originally, “originally” were, which is—it's in debate, right? So, my, I kind of look at it as my responsibility is to manage, so that means sometimes having to do timber harvests, or fire or use chemicals to remove invasive plants, to try to make these landscapes function in a healthy way that is promoting diversity that's appropriate there. So, some folks might say that's an environmentalist. I would also imagine that some folks would say that is like, the antithesis!

This perspective also acknowledges, as is common now in WFF communities, that prior land management policies were problematic and even counterproductive to their goals. Another informant with decades of experience put it in the context of WFFs and their administrators being in fact too good at their jobs, or that their jobs were too narrowly defined:

But the Forest Service itself I think, is doing a good job, trying to bring some awareness into like, our mistakes. of the past, which I really appreciate hearing the Forest Service, kind of take a stance on a you know, we're really, really good at fire. We're really, really good at stopping fire. And that is a mistake, right? Like taking fire out of these environments, has caused the crisis that we're in right now, right? And that's because we were so good at it. We can admit, you know, I mean, I think that's a Forest Service ego thing of, you know, they have to admit a problem by saying they're good with something else, but, you know, it is what it is.

In this context, one used Smokey the Bear as a direct proxy for that pivot and redefinition:

Smokey the Bear is being credited as like the number, like the best ever public service. And so overcoming that, or, like, trying to take it back, or parts of it back, now it's just like, so interesting. And now we're like, and let's adapt it. I've been in parades where, like, I've been in the fire engine right before smokey. When people see Smokey, people freak out like there's still a strong you know, it's such an interesting, like, success story, and now we're changing it.

The more abstract and environmental health parameters of wildland firefighting were about stewardship and management. However, there were other perspectives, such as this WFF who saw an environmentalism mission that tied into public health:

I do personally [feel like this was environmentalism work] just because of what I use my fire experience for like I knew early on that fire is extremely necessary that you know, every environment is pretty much interconnected in some way. You know, like, if you got a fire way up high that's impacting the watershed, that watershed affects all these downstream communities and cities... And you know, we had a, we had a fire that almost blacked out some of Las Vegas because of these power poles that were in the fires, you know, path, and they were like, protect them at all costs, like they we cannot lose power to the Vegas, and it was just everything was thrown at this and I mean, that was I mean, we were, I mean, it felt like a world away from Las Vegas. And yet we're, all of our strategies were because of this power supply that's running into Vegas. that's, I mean, hours and hours and hours drive from us. So, I think early on, I was able to, to really see and appreciate that like the fire environment that I was operating in, had a lot of interconnectedness to, you know, everything else around me.

This theme of “protection” was the most unifying thread in terms of both environmentalism and public health, especially at those times when work was being done directly in human spaces rather than wilderness spaces. One retired WFF informant described an experience where 650 homes were lost in a single night:

So, when those things occurred, I was very, very much aware of the fact that I was there, and I was trying to serve the public and try to be someone that would defend homes and try to secure their property for them. And that was very important to me, and it was a job that I wanted to do, and I wanted to do it correctly, to make sure that they had a home to come back to. Although that night I wasn't very successful.

Quotes like this confirmed the meaning WFFs brought from working in areas that seemed remote to (sometimes abruptly) protecting human structures, possessions, and even lives.

Normalizing standard metrics of “healthy work” is a unifying thread: equitable pay (not based on overtime, at least not without more predictability), equitable housing (many firefighters cannot afford to live in the communities to which they are assigned), access to adequate healthcare, and recognition of their role in a land management and public health mission.

As the mainstream WFFs I spoke with discussed their interest in their work as a land management and health-related endeavor, one of the most consistent themes was what the

indigenous land management practices were prior to neo-European management. Such precolonial practices were referenced by multiple individuals in vague terms, with the general assurance that Native communities did use fire as a land management technique, but with little depth or knowledge beyond that assertion. Multiple times I heard, both from podiums at meetings and during interviews, that there was “no way to know” what these practices were as they were so far in the past. However, such inquiries are foundational and routine for many anthropological and related disciplines, so my focused inquiry into the health parameters of wildland firefighting shifted to a subtopic of indigenous and cultural burning.

Precolonial Indigenous Burning in NC

My data collection for this section came from interviewing scientists from archaeology and anthropologically adjacent disciplines to explore these practices, with a question of whether such data was feasible to collect (to challenge what I had heard that it was not). Pre-colonial indigenous burning is clearly not primarily an ethnographic enterprise, aside from oral history investigation. However, as noted earlier, there was such aggressive hegemonic suppression of indigenous burning that such oral histories may be less likely to exist because of the evolution of the Native experience after colonization. It also unlikely that, as some governmental informants in research interviews and public lectures asserted, there is no way to know what these communities were doing as it is such ancient history. In fact, this is precisely the sort of data that anthropologists and related scientists are adept at discovering.

Interviews I conducted with an archaeologist and a geographer about the Lumbee experience in particular, and publications available in the academic literature from environmental geologists, ethnobiologists, archaeologists, paleoecologists, and related fields, confirm that extensive scientific methods exist to explore precolonial land management practices (Fowler &

Welch, 2018). Silicate plant fossils, soil coring, stable isotope analysis, and pyro-dendrochronology can be used to explore such activities, and there are examples in the anthropological literature where these have been combined with oral histories (as available) to build better historical understanding (Lesser, 2022). Other examples serve to demonstrate that primary ethnobiological and archaeological research can generate a historical understanding that undercuts colonial perspectives (Hayashida 2005; Lesser, 2021). Regarding Native communities in NC, the archaeologist I interviewed confirmed he is actively pursuing the potential for analyzing soil for differences between anthropogenic burning and lightning-ignited burns. We agreed that these offer two different pathways to knowledge, and neither oral history nor archaeology necessarily excludes the other form of knowledge, but so far, the archaeological evidence from the pre-colonial experience appears to align with the contemporaneous experience about to be discussed.

A deeper exploration of precolonial land management practices related to fire is beyond the scope of this thesis, but it is important to recognize that it is possible—indeed, it is critical—to explore this topic via modern scientific technologies from multiple disciplines.

Contemporaneous Cultural Burning in NC

The EBCI based in the Qualla Boundary of NC and the LTNC based in Robeson County, NC represent most of the contemporaneous experience of cultural burning in NC. Given the unusual characteristics of the LTNC, this thesis explores the Lumbee experience.

The Lumbee community is unusual in that it pursued a policy of accommodation and integration with colonial authorities. This had a dual consequence—relative to a tribe like the Cherokee, there was some loss of tribal coherence, while at the same time there was increased capability to continue with cultural practices with less interference, although as one informant

advised me the Cherokee experienced a similar accommodation, just many generations later. So, while the Cherokee experienced the Trail of Tears and expulsion of most of their tribe to a reservation in Oklahoma, the Lumbee in many cases have continued living in their ancestral homelands since precolonial times, joining the colonial and then US political structure of counties and cities. So, for example, more than 2/3 of the population of Pembroke, NC, the headquarters of the LTNC, is Native American (World Population Review, 2025), although it is not designated as a reservation or sovereign land like the EBCI's Qualla Boundary. One key element to this that the Lumbee burned their land precolonially, since before written recorded history, and were able to continue this practice in ways other Native communities could not (Rappaport, 2024). For some, this involved continuous land ownership, for others, such as the parents of one of my informants, the relationship was one of sharecroppers. Either way, it involved direct management of the land, in a way reminiscent of the contention that WFFs have particularly valuable “embodied” (Thomas, 2022) or “place-based” (Gollin & Trauernicht, 2018) environmental understanding. The Lumbee take this one step further—multiple times I was told “the fire is in our bones”. This tracks with an identical published statement from the leader of the Sandhills Prescribed Burn Association (Rappaport, 2024). He is not Lumbee, but his family has burned their land for more than 150 years; his ancestors were taught the value of fire by the Lumbee, a common pericolonial pattern then suppressed by the nascent US government (Pyne, 1997). One anthropologist-Lumbee informant I interviewed confirmed the importance of fire, and its likely extension into cultural burning in this way, from the perspective of both a trained anthropologist and a Lumbee Indian:

And we also know that, again, generally, with southeastern tribes, that fire is so important symbolically, and all these other ways... they would have had so much experience with fire, not only in like ceremonial context, like town fires and sacred fires... most tribes still maintain those things. I know we do... And so, like fire is still very important to most tribes, especially

in the southeast, especially in the eastern woodlands... those traditions, they come out of deep time in experiences and relationships with fire and a lot of different arenas. And I think prescribed burning¹² is certainly part of that whole story of fire's cultural importance.

Lumbee informants described burning fields by “slinging” burning tires out of the back of pickup trucks and with pitchforks as children, and indeed, the familial nature of this work is notable. Another informant, an anthropologist, described similar familial patterns in Western cultural burning tribes. This is in stark contrast to the mainstream approach to fire management, where extensive credentialing and protective equipment and Nomex clothing is required. Indeed, as an investigator, I was discouraged by the IRB review of this project from participating in cultural or wildland fire burning events whatsoever as too risky. Lumbee cultural burning is often done barefoot, with women wearing dresses, and with children present. One informant described “pushback” she received when her child was permitted on the fireline but defined acceptance of such activity as a matter of “respect”, and that critiques are seen as disrespectful—in a safety and health parameter of wildland firefighting, “we can think of a different way”.

Lumbee cultural fires are set and allowed to propagate as the Creator (a deity) directs, providing a more-than-human-derived, spiritual guidance system, which has resulted in unexpected burning patterns but ones that have ultimately proven the worth of this approach. Large wildfires have often escaped prescribed burns, so more-than-human features characterize prescribed burns as well but are given more latitude, autonomy, and identity in cultural burning.

That specific identity may provide one of the most important keys to the ways that cultural fire diverges from mainstream fire practices. While mainstream firefighters in my interviews, and in the available literature, do personify fire—it is sometimes described as a “dragon”, or certain fires are given personalities—this is generally implied and accepted to be metaphorical. Multiple cultural burning informants advised that the Lumbee perspective is more

to treat fire as an actual spiritual or natural entity with its own identity, one that transcends personifications. As one informant put it, “we honor fire as synonymous with Creator—we don’t put fire in a box.” This is evidence by the sacred fire circle in the Lumbee Cultural Center. This fire burns eternally in the spiritual realm, but on each solstice and equinox, that fire is given material form in the sacred fire circle. When that fire is burning, no other fires are permitted in the area, and all hearths are cleaned. The positioning of fire in a spiritual realm, that co-exists at certain times in a physical realm when it manifests to accomplish particular known or unknown, planned (human) or unexpected (Creator) goals, speaks to a radically different co-existent perspective when compared to mainstream American society. One of the planned ways that fire is used in this way is for agricultural purposes that bypass modern bioscientific practices. Indeed, one Lumbee informant said,

We don’t need scientific studies, just look around you [at the Lumbee Cultural Center] ... [building controversy or drama around cultural burning] is like making a big deal out of making breakfast.

This perspective indicates the degree to which indigenous (now cultural) burning, and routine experiences involving fire, were a mainstream part of life in Lumbee communities. Such use protects crop areas, manages land, and offers an alternative way to control flora.

You can spray chemicals on them, or you can burn them... Burning leaves an intact biome, high nutrient density, and... when you burn off the swamp, you get the “swamp dirt”, which is like “super-native peat moss”, a “vortex of decomposition and rebirth”.

In another health perspective of “controlling fauna”, CBA has set up a program whereby they have been consolidating seeds stored for generations which are not only local non-invasive, but also tribal legacy seeds. The archaeologist I spoke with identified his appreciation of this food and ecological health intervention.

[CBA has been] creating a seed bank of indigenous plants with the tribe, and those tend to kind of reveal themselves, kind of come back up out of the seed bank after burning, which is, I found really interesting, is not being an ecologist or not knowing a lot about that, that’s really cool that those plants that have been kind of choked out by second growth, you know,

loblolly pines and all that crap, briars and everything, those just pop right back up... And those indigenous kind of, most of them are fire dependent, seeds start coming back up, and so they're building the seed bank that way.

He also linked these seed banks to a novel use of cultural burning for archaeology in the same way as recently burned land was used for replanting tribal seeds.

And then pretty quickly, I figured out that when we're doing Archeological Survey, which is oftentimes like the first step in a project, if you're working again in kind of a an area that hasn't had a lot of archeology done, you do a survey, which is just a you line up on a line, and, you know, use GPS and all these things to stay on a straight line, but you just walk coordinates, basically, and do quad by quad, and You're just looking for artifacts on the ground. Often, if you find a lot of artifacts on the surface, then that will lead to subsurface testing, you know, shovel testing or opening up full excavation units. So you know, if you're working in an area that's it's really choked out in thick ponds, you know, second growth ponds and all that. You can't do a pedestrian survey, right? You can't even there's no ground visibility. So, I realized pretty quickly that we had a natural partnership with the CBA. And so they started, we kind of started the protocol of them coming into areas that we're going to work in and do a do a prescribed burn, and then we could come in and survey behind it, and it increased the ground visibility by quite a bit. So that's kind of how the CBA and burning generally has articulated with the project the archeology.

Indeed, as far as “access”, and noting the aquatic origins of the Lumbee Tribe as “people of the dark water” (the Lumbee River), I was told multiple times about how fire was geographically the best pathway to direct people from the central portions of the communal space to the river. In this way, earth, water, and fire co-existed in a meaningful, mutually interactive, and intersectional way—“we don’t put fire in a box”—such that one informant questioned if it was a more neo-European model to separate them distinctly in the first place.

Alternately, once that integrative, swamp-based vortical ecosystem is compromised, “you lose it all”. Fire was a dynamic and intermittent bridge between earth and water, and a mediator of food and health. One Lumbee informant linked together sovereignty, fire, and health:

We’re lucky we’ve been off the radar for so long that we can do this [cultural burning]. And I know you’re thinking about health with all this. We know how to take care of ourselves, that’s why I always go back to fire. We lost our fire sovereignty, which led to us losing our food sovereignty, which led to us losing our health.

This references back to the Robeson County public health metrics discussed earlier and offers one post-colonialistic explanation for them: the loss of fire as a normalized entity, in its manifestation as a source of food and ecosystem security, led to diminished health.

VI. Summary

Cultural burning narratives suggest a normalization of fire where it is an innate part of culture, society, and lived environments. This was one answer to Dubray's question (2024) as to whether adaptation or resistance was the best strategy for the future. TEK, with cultural burning as a manifestation, would appear to offer pathways towards such integration. One member described the Cultural Burning Association as a "bridge between tradition and science", noting "we don't need these [academic] degrees—this [management of land via fire] is innate in our people". There are valid critiques of whether "indigenous knowledge" is actually indigenous, or just the government "doing what it wants to do" and "not really listening, or maybe ears are plugged", as one Native informant phrased it, with selective knowledge appropriation and superficial collaborations (Martinez et al, 2023). As another non-Native informant pointed out, "if the main goal is fuel reduction by biomass removal, that is not cultural burning", or, as a Native informant put it, "the health reasons for burning is fundamentally not capitalist, but all cultural". There is increased interest in integrating TEK into land and wildlife management, although little of the corresponding literature examines these enterprises or their underlying assumptions critically (rare examples being Nadasdy, 2005 and Wyndham, 2017).

Acknowledging that such critique is a strength of the anthropological perspective and that more may be needed here, it does appear, from ethnographic exploration of WFFs' perspective on health as well as policy-makers reference to them, that indigenous and cultural burning

experiences could have high utility as models for a different way of approaching wildland fire. The Lumbee experience is especially compelling because of early integration of Lumbee predecessors into mainstream American culture, while continuously maintaining “off the radar” many features of indigenous burning during 20th century fire suppression culture.

Ultimately, as our governmental, mainstream, and public health agencies move towards a more complex #goodfire and #badfire methodology, exploring Native worldviews of ever-present fire with multiple valences of hazard and benefit seems even more compelling based on my research. Such worldviews could encompass increasing infrastructural defensibility,¹³ to a better understanding of the differences between prescribed fires and wildfires, to stronger and risk communication-informed public health messaging systems about smoke exposures and how to protect more susceptible individuals from their effects. The Lumbee suggest how a fire-sympathetic culture reconciles fire dangers and benefits in a culturally integrated way.

As described earlier in this paper, deep ecology, multispecies ethnography, Escobar’s pluriversal approach, and One Health—which, despite anthropological challenges (Wolf, 2015), remains the prevailing public health example—all offer pathways amenable to the Lumbee TEK regarding fire.

Synthesizing the available literature and the data contributed by my current study, I would propose a “paradox of the mainstream”. The irony here is that, in wildland fire management, the mainstream exists in a marginalized state. WFFs are the mainstream agents of that management, but as described in detail here, their pay, health care, and nearly every metric of health support is marginal, and even their role within firefighting is exoticized. Historical mainstream neo-European land management practice has produced forests that are utterly marginalized in health terms. As discussed earlier, one biologist-WFF says, “We know that the

landscapes we have inherited from generations past are completely screwed up”—although the “generations past” were themselves following the mainstream science of the day. Numerous further examples exist, including the paradox that WFFs are culturally discouraged from using the mainstream technologies available for smoke filtration, as well as operationally banned from using them if they distribute them on their own.

This paradox of the mainstream exists for Native communities as well. As discussed earlier, as mainstream fire management policies were put in place, they lost their fire sovereignty, and ultimately their health was marginalized as a result.

The potential for cultural burning, currently a marginal practice, to inform mainstream practices is both paradoxical and necessary. It is precisely the sort of horizoning work envisioned by Petryna (2018). But many current mainstream citations of indigenous or cultural burning veer towards cultural appropriation or selective knowledge appropriation. It is important to recognize that Native perceptions of the interface of fire with their culture are much more complex and nuanced than simply equating cultural burning with prescribed burning. A re-horizoning of the paradox of the mainstream would normalize fire and its presence in daily life as TEK in the context of the Lumbee experience described in this paper. As with all TEK, intent needs to be scrutinized to not be exploitative as was discussed earlier. An informant who is both a university-based archaeologist and a member of the Lumbee tribe advised me:

On the one hand, you risk over generalizing what, what is, in reality, a very, very varied, you know, intellectual and cultural traditions. But there's also risk, and not engaging with that at all, which is totally discarding native knowledge.

In this case, the complete dismissal of native knowledge in the 20th century, coupled with inattention to it in the 21st, suggests that any attempt to honestly engage with the source material and present it in as close to its original statements (which is ethnography's strength) is

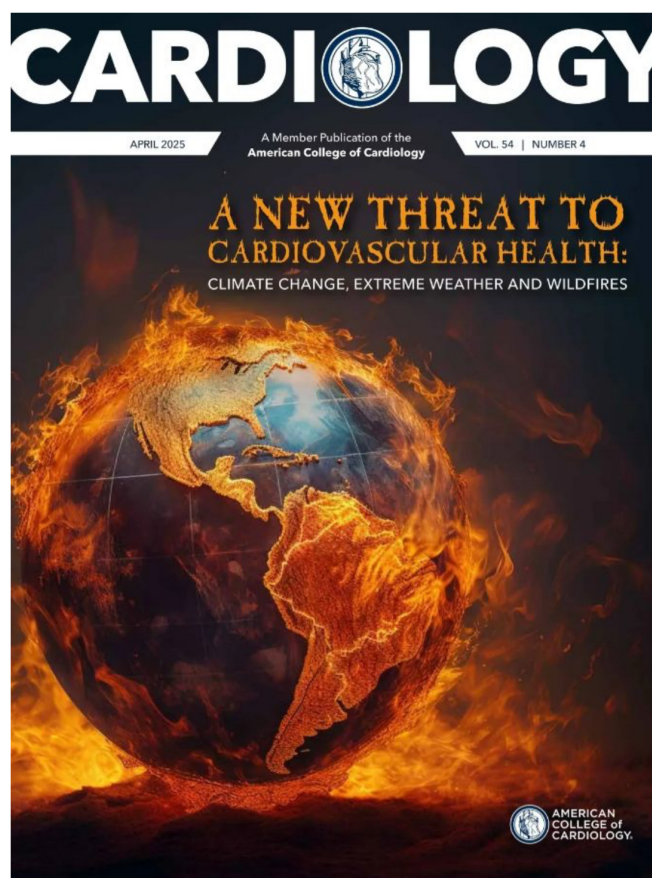
worthwhile. In this syncretic approach, wildland fire would not be seen as consumptive or destructive. Ecological evidence supports this—only about 4% of flora biomass are consumed in fire (DellaSalla & Hanson, 2015), which makes mainstream language of fires that “destroy”, “devastate”, “annihilate”, or “consume” forests are misleading (Hanson & Dorsey, 2022). Instead, fires might be appreciated as an environmental process like tides or monsoons that can be adapted to, or perhaps adjusted, but never go away.

Mainstream neo-European culture seems much better at understanding water as simultaneously an asset and threat, and either way as an ever-present classical element, than it does at understanding fire in this way. Lumbee disrupt the neo-European “box” through intersectionality: People of [Dark] Water who intrinsically need and use fire to maintain that water identity. They describe no epistemological separation of fire as “other” from either material substances or human culture, nor do they catastrophize it.

Indeed, from a health perspective, wildland fire may be a perfect embodiment of the axiom in disaster anthropology that “disasters are never natural” (Cox & Cox, 2016; Hoffman 2017). By constructing wildfires as disasters, even in the era of #goodfire, we are culturally determining our own destruction. The re-horizoning Lumbee statement “we know a different way” points to a model linking wildland fire and health that excludes the cultural construction of “disaster”. This is a fine but very important distinction that harkens back to the counter-hegemonic, deep ecology perspective described earlier in this paper. Catastrophizing wildland fire underlies almost all dimensions of explorations into its health parameters, and in doing so, diminishes the potentials of such work. An example is the cover graphic of *Cardiology* from the month this practicum is being submitted and defended (Figure 1). By linking wildland fire and its health components to “climate change” and “extreme weather” and suggesting it is “new”, the

publication inevitably positions its findings within marginal or extreme disasters and not everyday mainstream health concerns.

Figure 1: *Cardiology* cover, April 2025 (American College of Cardiology, 2025)



The paradox of the mainstream is that, while fire is in so many ways a mainstream component of modern life (combustion engines, heating systems, fireplaces, coal power), “mainstream” management of wildland fire is not. But its normalization would address so many elements of the narratives of WFFs, including “protection”, health benefits, environmentalism balanced with land management, as well as the public health narratives apparent in fire and smoke exposure. Our health in NC—at the level of the WFF, the community, the ecosystem, and

the state—depends on mainstreaming fire management so that we can truly learn to adapt to this ubiquitous ecosystemic feature.

VII. Impact Recommendations

Based on the principles of the paradox of the mainstream and potential lessons from this ethnographic research, the following would be impact recommendations for agencies involved with wildland firefighting:

1. A wildland firefighting wage commensurate to the work's hazard profile, housing opportunities, and effort should be implemented, which would be an increased wage.
2. Extensive and long-term health benefits should be made available to wildland firefighters commensurate with the work's hazard profile.
3. More research should be done on the health hazards of wildland firefighting and smoke exposure in firefighters, cultural burners, and the public, including the differences between cultural burns, prescribed burns, and wildfires. Translational science and health communications should share this research and clinical proposals in a non-catastrophizing way (e.g., not like Figure 1).
4. Public health messaging efforts should be risk communication-informed and should normalize, rather than dramatize, the reality of wildland fires and their ubiquity. Better public health messaging is needed around instances of and risks from prescribed fires, particularly to vulnerable populations living in proximity to those fires or who might be visiting the area.
5. Public health efforts should be directed not only at differentiating #goodfire and #badfire, but also normalizing, promoting, and expanding currently marginalized information

around defensive techniques to harden homes and communities against wildfire damage.

In North Carolina, a good resource to share and build on is the NC Department of Agriculture's "Resist Wildfire North Carolina" website (NC Forest Service, nd).

6. Mainstream wildland fire management by creating a single federal agency to address it (possibly replicated at the state level). This was discussed by some of my informants and, in a recent poll, 74% of subscribers to *The Hotshot Wakeup* supported this initiative (Hotshot Wakeup, 2025). Placing such an initiative within the Department of Interior (DOI) rather than Agriculture would emphasize the pluriversal nature of these spaces rather than their neoliberal "agricultural" identity as agents of material production and would solve some of the EMS and medical care issues raised by informants and recent publications (Hawkins & Alexander, 2025). Neither this nor suggestions to move the USFS into the DOI are radical, and indeed the latter has been considered at least five times over the last fifty years, most recently in 2009 by the US Government Accountability Office, where numerous benefits were identified (GAO, 2009). From an applied anthropology perspective, the key benefit here would be mainstreaming and unifying processes into a management plan rather than simply firefighting and incorporating more mainstream, health-related, and decommercialized interests into that management, consistent with a Lumbee TEK model.

Appendix A: Interview Consent Form

[Version 3]

Title of the Project: Wildland Firefighting

Principal Investigator: Seth C. Hawkins, MD, NREMT, The University of NC at Charlotte

Faculty Advisor: Gregory Starrett, PhD, The University of NC at Charlotte.

You are invited to participate in this research study on wildland firefighting. Participation in this research study is voluntary. The information provided is to help you decide whether or not to participate. If you have any questions, please ask.

- The purpose of this study is to better understand wildland firefighting.
- You will be asked to answer questions regarding wildland firefighting and land management around wildland fires via participation in a recorded interview.
- If you choose to participate it will require about one to two hours of your time.
- Risks or discomforts from this research include psychological risks of sharing personal opinions, perspectives, and experiences; social risk regarding public perception of wildland firefighting; economic risk if anything you disclose threatens funding or employment; legal risk if you disclose anything illegal, especially actions meeting mandatory reporting laws. No specific information is required to be shared and all information is optional and at your discretion to share.
- Benefits may include helping to generate a better understanding of wildland firefighting.
- If you choose not to participate, you may contact the study team for future participation if you change your mind and the study is still in operation.

Please read this form and ask any questions you may have before you decide whether to participate in this study.

Why are we doing this study?

The purpose of this study is to better understand the experiences, opinions, and perspectives of those involved in managing or fighting wildland fires, an increasingly significant aspect of our society with a changing climate and increasing attention to air quality and conservation.

Interviews with those involved in this topic, and observation of those activities, will help us better understand the social and cultural parameters of wildland fire and land management operations.

Why are you being asked to be in this research study?

You are being asked to be in this study because you are 18 or older and are one of the following:

- an active or former WFF or medical caregiver on wildland fireline
- a person with demonstrable knowledge of wildland firefighting, either by profession or personal interest
- an administrator or leader in wildland firefighting
- an advocacy group or governmental members/officials with positions on wildland firefighting
- a scientist who works on wildland firefighting topics

What will happen if I take part in this study?

If you choose to participate in this study, you will be asked to meet with an interviewer for about one to two hours and discuss your perspectives on wildland firefighting and land management. This meeting could be in person, by phone, or via teleconference, and will be situated to be as convenient as possible for you. We will only be collecting information about your experience and perspectives and you will only be requested to share information as you are comfortable doing so.

What are the benefits of this study?

This research will result in a better understanding of wildland fire operations, strategies, tactics, and philosophical underpinnings, as well as the lived experience of WFFs and those impacted by and impacting their work. This could lead to better or more-informed policies surrounding wildland fire-related land management, increased medical care and safety of WFFs and properties and people living near wilderness, forest, park, or other forested areas, and increase in the public health benefit of the spaces potentially impacted by wildland fire.

You yourself will not benefit directly from being in this study. However, others might benefit through the information you provide.

What risks might I experience?

Risks are minimal (<1% anticipated incidence). They include psychological risk of stress from sharing experiences involving wildland fire; social risk if anything shared changes public perception of wildland firefighting in any negative way; economic risk if anything shared changes funding or employment around this subject; or legal risk if anything disclosed is illegal and is traced back to the individual. Every effort will be made through confidentiality and de-identification to prevent social, economic, or legal risk.

How will my information be protected?

Your identity will be kept private and you will never be individually identified by name in any final products generated by this research.

We will do our best to keep study data safe and confidential but we cannot make any absolute promises. The following are the ways we will protect the data:

To protect your privacy, your identifying information will be removed or changed. You will not be identified in any publication from this study. We will protect the confidentiality of the research data by separating your name from your data, by securely storing this data with electronic passwords (for electronic data) and locked cabinets (for physical data), and by destroying all data after five years or at the conclusion of this study and any publication of it, whichever comes first.

Other people may need to see the information we collect about you, to make sure that we are conducting this study appropriately and safely, including people who work for UNC Charlotte as well as other agencies as required by law or allowed by federal regulations.

How will my information be used after the study is over?

After this study is complete, study data may be shared with other researchers for use in other studies without asking for your consent again or as may be needed as part of publishing our results. The data we share will NOT include information that could identify you. There still may be a chance that someone could figure out that the information is about you. The data will not be deposited in any type of public or private archive or repository.

What are my rights if I take part in this study?

It is up to you to decide to be in this research study. Participating in this study is voluntary. Even if you decide to be part of the study now, you may change your mind and stop at any time. If you choose to withdraw or ask that your data not be used, it will be destroyed.

Who can answer my questions about this study and my rights as a participant?

For questions about this research, you may contact Dr. Seth C. Hawkins, the Primary Investigator, at shawki20@charlotte.edu or 828-368-6221. You may also contact his faculty advisor, Dr. Gregory Starrett, at gsstarre@charlotte.edu.

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Office of Research Protections and Integrity at uncc-irb@charlotte.edu.

Consent to Participate

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will receive a copy of this document for your records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I understand what the study is about and my questions so far have been answered. I agree to take part in this study.

Name (PRINT)

Signature

Date

Appendix B: Observation Consent Form

[Version 3]

Title of the Project: Wildland Firefighting

Principal Investigator: Seth C. Hawkins, MD, NREMT, The University of NC at Charlotte

Faculty Advisor: Gregory Starrett, PhD, The University of NC at Charlotte.

You are invited to participate in this research study on wildland firefighting. Participation in this research study is voluntary. The information provided is to help you decide whether or not to participate. If you have any questions, please ask.

- The purpose of this study is to better understand wildland firefighting.
- Your activities regarding wildland firefighting and land management around wildland fires will be evaluated via my observation. Notes will be taken on paper unless you request no note-taking. If audio-recording is done it will only be done with your permission, which will be obtained beforehand.
- If you choose to participate it will not require any of your time, simply agreement to my observation of activities you are already doing.
- Risks or discomforts from this research include psychological risks of sharing personal opinions, perspectives, and experiences; social risk regarding public perception of wildland firefighting; economic risk if anything you disclose threatens funding or employment; legal risk if you disclose anything illegal, especially actions meeting mandatory reporting laws. No specific information is required to be shared and all information is optional and at your discretion to share.
- Benefits may include helping to generate a better understanding of wildland firefighting.
- If you choose not to participate, you may contact the study team for future participation if you change your mind and the study is still in operation.

Please read this form and ask any questions you may have before you decide whether to participate in this study.

Why are we doing this study?

The purpose of this study is to better understand the experiences, opinions, and perspectives of those involved in managing or fighting wildland fires, an increasingly significant aspect of our society with a changing climate and increasing attention to air quality and conservation. Interviews with those involved in this topic, and observation of those activities, will help us better understand the social and cultural parameters of wildland fire and land management operations.

Why are you being asked to be in this research study?

You are being asked to be in this study because you are 18 or older and are one of the following:

- an active or former WFF or medical caregiver on wildland fireline
- a person with demonstrable knowledge of wildland firefighting, either by profession or personal interest
- an administrator or leader in wildland firefighting
- an advocacy group or governmental members/officials with positions on wildland firefighting

- a scientist who works on wildland firefighting topics

What will happen if I take part in this study?

If you choose to participate in this study, your activities will be observed and recorded by an investigator.

What are the benefits of this study?

This research will result in a better understanding of wildland fire operations, strategies, tactics, and philosophical underpinnings, as well as the lived experience of WFFs and those impacted by and impacting their work. This could lead to better or more-informed policies surrounding wildland fire-related land management, increased medical care and safety of WFFs and properties and people living near wilderness, forest, park, or other forested areas, and increase in the public health benefit of the spaces potentially impacted by wildland fire.

You yourself will not benefit directly from being in this study. However, others might benefit through the information you provide.

What risks might I experience?

Risks are minimal (<1% anticipated incidence). They include psychological risk of stress from sharing experiences involving wildland fire; social risk if anything shared changes public perception of wildland firefighting in any negative way; economic risk if anything shared changes funding or employment around this subject; or legal risk if anything disclosed is illegal and is traced back to the individual. Every effort will be made through confidentiality and de-identification to prevent social, economic, or legal risk.

How will my information be protected?

Your identity will be kept private and you will never be individually identified by name in any final products generated by this research.

We will do our best to keep study data safe and confidential but we cannot make any absolute promises. The following are the ways we will protect the data:

To protect your privacy, your identifying information will be removed or changed. You will not be identified in any publication from this study. We will protect the confidentiality of the research data by separating your name from your data, by securely storing this data with electronic passwords (for electronic data) and locked cabinets (for physical data), and by destroying all data at the conclusion of this study and any publication of it or after five years, whichever comes first.

Other people may need to see the information we collect about you, to make sure that we are conducting this study appropriately and safely, including people who work for UNC Charlotte as well as other agencies as required by law or allowed by federal regulations.

How will my information be used after the study is over?

After this study is complete, study data may be shared with other researchers for use in other studies without asking for your consent again or as may be needed as part of publishing our results. The data we share will NOT include information that could identify you. There still may be a chance that someone could figure out that the information is about you. The data will not be deposited in any type of public or private archive or repository.

What are my rights if I take part in this study?

It is up to you to decide to be in this research study. Participating in this study is voluntary. Even if you decide to be part of the study now, you may change your mind and stop at any time. If you choose to withdraw or ask that your data not be used, it will be destroyed.

Who can answer my questions about this study and my rights as a participant?

For questions about this research, you may contact Dr. Seth C. Hawkins, the Primary Investigator, at shawki20@charlotte.edu or 828-368-6221. You may also contact his faculty advisor, Dr. Gregory Starrett, at gsstarre@charlotte.edu.

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Office of Research Protections and Integrity at uncc-irb@charlotte.edu.

Consent to Participate

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will receive a copy of this document for your records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I understand what the study is about and my questions so far have been answered. I agree to take part in this study.

Name (PRINT)

Signature

Date

Appendix C: Research Instrument

[Updated May 5, 2024]

Tell me your story. What brought you into wildland firefighting in the first place, and what roles do/did you serve?

[Confirm if not already included how many years, in any capacity, working in wildland fire]

Tell me about your experiences with medical care on the fireline, either of yourself or others.

What do you most appreciate as effective about the healthcare you experienced or saw directed towards WFFs? What could be/have been improved?

What health risk do you think WFFs face from their work? How are those risks being addressed, if at all? What more do you think could be done to address those health risks?

What impact do you think wildland fires have on the health of the public?

What public health role do you think WFFs serve?

What do you think of prescribed burns? Are you familiar with the public debate around prescribed burns? If so, what is your understanding of this debate - what are the various positions? What position, if any, are you more likely to support? Why?

How would you define what an environmentalist is? Do you consider yourself an environmentalist?

Do/did you feel you work(ed) in a human space (a space controlled by humans) or a wilderness space (a space where humans don't control the environment) when you are/were fighting wildland fires?

What are the primary challenges you see for WFFs now and in the future?

Is there anything we have not discussed you'd like to talk about, or would you like to loop back to any topic to discuss it further?

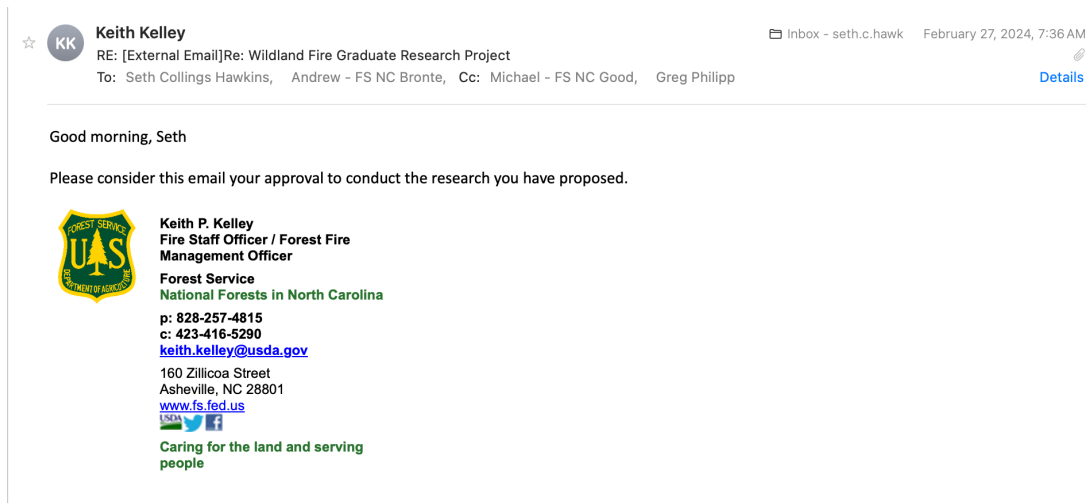
Can I reach back out if I have questions about something in our interview?

[Thanks. Mechanism to reach back out to me.]

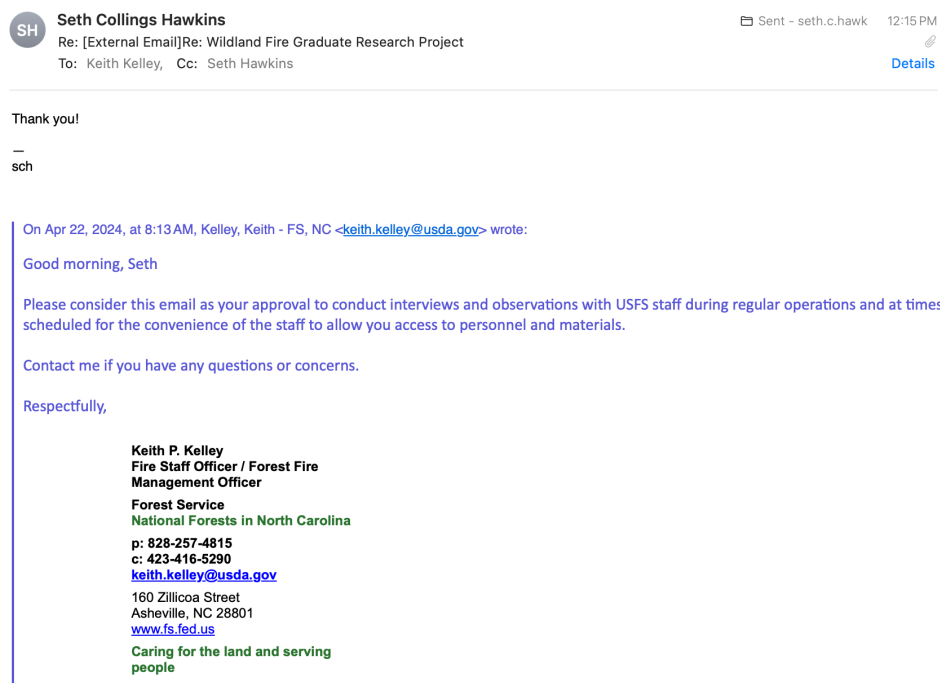
Appendix D: USFS Permissions

I received permission for this research from Keith Kelley, Fire Staff Officer, on February 27, 2024. UNC Charlotte IRB required further clarifications to this approval, and that secondary level of permission was granted by USFS on April 22, 2024 (as below).

First Approval, Feb 27, 2024



Second Approval (requested by UNC Charlotte IRB), April 22, 2024



Appendix E

I received a Research Activity Permit (RAP) from Katherine B. Capps, Deputy Director of Operations, on May 19, 2024 (Permit Number 2024_0795).

PERMIT NUMBER: 2024_0795

DATE ISSUED: 2024-05-19

North Carolina Division of Parks and Recreation Scientific Research and Collecting Permit

Project Title: The Anthropology of Wildland Fire

Principal Investigator: Seth C. Hawkins

Institutional Affiliation: The University of North Carolina at Charlotte

Address: 108 Riverwoods Drive, Morganton, NC 28655-0012

Phone: 828-368-6221

Email: shawki20@charlotte.edu

Project Director or Major Advisor (if applicable): Gregory Starrett

Contact Info - phone: (704) 687-5126? email: gregory.starrett@unc.edu

Park Unit where Research is to be Conducted:

Research Schedule - Project Start Date: 2024-03-04 Project End Date: 2025-05-30

Note to the Applicant:

* The permittee must notify the park superintendent prior to initiating any research activities.

* The permit may be used ONLY by the person(s) to whom it is issued.

* Principal investigators will provide the division with two copies of a research report within 60 days of the project's conclusion and two reprints of any publication resulting from studies conducted on state park property.

* An annual report, due on January 31, is required for any project exceeding one year. Reports are to address the project's goals, methodology, results, and conclusions. Progress reports may also be specified as a condition of the permit. The reporting requirement may be waived for classes that use a park as an outdoor classroom.

* This permit is issued subject to the conditions specified below. The permittee shall and hereby does waive and release any and all claim against the North Carolina Department of Environment and Natural Resources, or its employees, or the State of North Carolina for any and all damages, loss or cost to person or property arising either directly or indirectly from the use of said premises and/or from the exercise of the privileges granted by this permit.

Signature of Principal Investigator: _____ Date: _____

Staff Coordinator: Ed Corey - Email: ed.corey@ncparks.gov

Conditions/Comments: Please consult with the park staff in advance of your visit, and carry a copy of your permit and your Project Description with you while on-site.

Appendix F



Lumbee Tribe of North Carolina Institutional Review Board

LTNC Institutional Review Board
6984 NC Hwy 711 West
Pembroke, NC 28372
910.521.7861 or 1.855.801.9738

Date: 2/23/2025
 Recipient Contact Information
 Seth Hawkins
 Title: Wildland Firefighting
 Company: UNC-Charlotte

Dear Mr. Hawkins

The Lumbee Tribe of North Carolina Institutional Review Board has reviewed your proposal, entitled *Wildland Firefighting* and has made the following decision:

- ☒ Approval (please see comments below)
☐ Disapproval (please see recommendations below)
☐ Deferred (please see recommendations/comments below)

Comments: N/A

Recommendations: Please provided findings upon completion of your project.

Note: If approved, please submit an annual report on the progress of your project and a summary of findings at the end of your project to the Health and Human Services Committee.

If you have any questions, please contact Name, IRB Administrator, at name@lumbeetribe.com.

Sincerely,

Jody Bulford, MPA
 Chair, LTNC Institutional Review Board

Appendix G

UNC Charlotte IRB Approval: This study was approved by the UNC Charlotte IRB on May 23, 2024 (protocol #IRB-24-0843), with amendments approved on December 17, 2024 (to use interviews conducted as a student during the completion of ANTH 5122) and March 20, 2025 (identifying Native populations as a particular subject of inquiry).

References

- Adetona, O., Reinhardt, T. E., Domitrovich, J., Broyles, G., Adetona, A. M., Kleinman, M. T., Ottmar, R. D., & Naeher, L. P. (2016). Review of the health effects of wildland fire smoke on wildland firefighters and the public. *Inhalation toxicology*, 28(3), 95–139. <https://doi.org/10.3109/08958378.2016.1145771>
- Afrin, S., & Garcia-Menendez, F. (2022). Comparing the costs of an operational prescribed burning program to those of unplanned wildfires. Joint Fire Science Program. Available at https://gaftp.epa.gov/AIR/aqmg/baker/info/19-1-01-40_final_report.pdf. Accessed May 9, 2024.
- Aguilera, R., Corringham, T., Gershunov, A., & Benmarhnia, T. (2021). Wildfire smoke impacts respiratory health more than fine particles from other sources: observational evidence from Southern California. *Nat Commun* 12, 1493. <https://doi.org/10.1038/s41467-021-21708-0>
- Alleway, H.K., Gillanders, B.M., Connell, S.D. (2016, Jan). ‘Neo-Europe’ and its ecological consequences: The example of systematic degradation in Australia’s inland fisheries. *Biol Lett* 12(1). Retrieved November 25, 2022 from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4785918/pdf/rsbl20150774.pdf>
- Alpers-Afil, N., & Goren-Inbar, N. (2006). Out of Africa and into Eurasia with controlled use of fire: Evidence from Gesher Benot Ya’aqov, Israel. *Archaeology, Ethnology and Anthropology of Eurasia*, 28, 63-78.
- American College of Cardiology. (2025, April). A new threat to cardiovascular health: Climate change, extreme weather and wildfires. *Cardiology* 54(4).
- American Lung Association. (2022, Jun 8). Prescribed burns vs. wildfires. American Lung Association. Available at <https://www.lung.org/blog/costs-benefits-prescribed-burns>. Accessed Mar 23, 2024.
- Arnoldi, J. (2009). *Risk: An Introduction*. Polity Press.
- Baker, B., & Bevington, D. (2022, March 24). Myths of prescribed fire: The watering can that pretends to be a river. *Earth Island Journal*. Retrieved November 25, 2022 from <https://www.earthisland.org/journal/index.php/articles/entry/myths-of-prescribed-fire/>

- Battaglia, R. (2022, July 7). Four environmental groups threatening to sue federal agencies over a new forest treatment plan. *Oregon Public Broadcasting (OPB)*. Retrieved November 25, 2022 from <https://www.opb.org/article/2022/07/07/environmental-groups-threaten-lawsuit-blm-forest-treatment-plan/>.
- Bernard, H.R. (2018). *Research methods in Anthropology: Qualitative and quantitative approaches*, 6e. Rowman & Littlefield.
- Boholm, Å. (2015). *Anthropology and Risk*. Routledge.
- Bonnicksen, T. (2000). *America's Ancient Forests: From the Ice Age to the Age of Discovery*. John Wiley.
- Brosius, J. Peter. (2016). "Endangered Forest, Endangered People: Environmentalist Representations of Indigenous Knowledge." In *The Environment in Anthropology: A Reader in Ecology, Culture, and Sustainable Living*. NYU Press.
- Butler, C., Marsh, S., Domitrovich, J.W., Helmkamp, J. (2017). Wildland firefighter deaths in the United States: A comparison of existing surveillance systems. *J Occup Environ Hyg* 14(4):258-270
- Campbell, M., & McDuff, Erin. (2022). *A New Study Gives Federal Wildland Firefighters an Opportunity to Inform the Development of Health and Wellbeing Programs*. Retrieved April 21 from <https://www.doi.gov/wildlandfire/new-study-gives-federal-wildland-firefighters-opportunity-inform-development-health-and>
- Cape Fear Collective. (2025). Robeson County. Healthy Communities NC. Available at <https://healthycommunitiesnc.org/profile/county/robeson-county>. Accessed April 4, 2025.
- Cape Fear Museum. (2024). The Land of the Longleaf Pine. [Museum Exhibit].
- Carle, D. (2002). *Burning Questions: America's Fight with Nature's Fire*. Praeger Publishers.

- Carrington, D. (2024, March 22, 2024). Geologists reject declaration of Anthropocene epoch. *The Guardian*.
<https://www.theguardian.com/science/2024/mar/22/geologists-reject-declaration-of-anthropocene-epoch>
- CDC. (2023). One health: One health basics. Centers for Disease Control and Prevention. Available at
<https://www.cdc.gov/onehealth/basics/index.html>. Accessed May 5, 2024.
- Chen, V., & Hiram, P. (2018). Scope of Forest Service EMS program. US Department of Agriculture.
 Available at <https://www.fs.usda.gov/sites/default/files/EMS-Scope-BP-OGC.pdf>. Accessed January 31, 2023.
- Clemmer, R.O., Myers, L.D., & Rudden, M.E. (eds). (1999). *Julian Steward and the Great Basin: The Making of an Anthropologist*. University of Utah Press.
- Clifford, J. (1986). Introduction: Partial Truths. In J. Clifford & G. Marcus (Ed.), *Writing Culture*. Berkeley: University of California Press.
- Cox, P., & Cox, S. (2016). *How the World Breaks: Life in Catastrophe's Path, From the Caribbean to Siberia*. The New Press.
- Cruzen, P. J., & Stoermer, E.F. (2000). The "Anthropocene". *Global Change Newsletter*, 41, 17-18.
- Cybersecurity & Infrastructure Security Agency. (n.d.). Fire as a weapon. Available at
https://www.cisa.gov/sites/default/files/2022-11/Fire%20as%20a%20Weapon%20Action%20Guide_Final%20508%20%2804.12.21%29v.2_1.pdf.
 Accessed April 19, 2024.
- Czachor, E.M. (2025, March 6). Carolina fire maps show where wildfires burn in North and South Carolina. *CBS News*. Available at <https://www.cbsnews.com/news/carolina-fires-map-where-wildfires-burn-2025/>, accessed March 15, 2025.
- Davis, C., Abo, B., McClure S.F., & Hawkins, S.C. (2018, Nov 13). Safety is third, not first, and we all know it should be. *Journal of EMS*. Available at
<https://www.jems.com/operations/safety-is-third-not-first-and-we-all-know-it-should-be/>. Accessed April 19, 2024.

- DeFlorio-Barker S, Crooks J, Reyes J, & Rappold AG. (2019). Cardiopulmonary effects of fine particulate matter exposure among older adults, during wildfire and non-wildfire periods, in the United States 2008-2010. *Environ Health Perspect* 127(3):37006. doi: 10.1289/ehp3860.
- DeGrosky, M. (2018, Feb). Time to understand and act on wildland fire suicide. *International Association of Wildland Fire*. Available at <https://www.iawfonline.org/article/time-to-understand-and-act-on-wildland-firefighter-suicide/>. Accessed May 5, 2024.
- DellaSalla, D.A., & Hanson, C.T., eds. (2015). *The Ecological Importance of Mixed-Severity Fires: Nature's Phoenix*. Elsevier.
- Doubleday, A., Sheppard, L., Austin, E., & Isaksen, T.B. (2023). Wildfire smoke exposure and emergency department visits in Washington State. *Environmental Research: Health* 1(2). doi: 10.1088/2752-5309/acd3a1.
- Druzin, H., & Barker, R. (2018, Aug 10). Fire wise series part one: Are we wasting billions fighting wildfires? *Idaho Statesman*.
- Du Bray, M., Kennedy, E.B., Kurtz, L.C., Toman, E., & Cowan, S. (2024, Mar 26). Perceptions of wildfire science, policy, and management among expert scholar/practitioners. *Society for Applied Anthropology 84th Annual Meeting*. Santa Fe, New Mexico. Available at https://whova.com/portal/webapp/sam_202403/Agenda/3692047. Accessed March 26, 2024.
- Durbin, T.J., Bendixsen, C.G., Neely, A.A., & Strauss S. (2024). The big lie: Discursive risk analysis and wildland firefighter safety in the Western United States. *Environ. Res.: Health* 2. doi 10.1088/2752-5309/ad00d5.
- Egan, T. (2009). *The Big Burn: Teddy Roosevelt and the Fire That Saved America*. Mariner Books.
- Eriksen, C. (2014). *Gender and Wildfire: Landscapes of Uncertainty*. Routledge.
- Escobar A. 2018. *Designs for the Pluriverse: Radical Interdependence, Autonomy, and the Making of Worlds*. Durham NC: Duke University Press.

- Firefighter Cancer Initiative. (2024, April 19). FCI at a controlled burn. Available at <https://www.facebook.com/fcifightscancer/posts/pfbid0N7NyzgP7RXhup8VxtM8N87KoHFFYqzuNSLep7161xQgA39MSamFwDN3QoeK4885vI>. Accessed May 7, 2024.
- Fowler, C.T., & Welch, J.R, eds. (2018). *Fire Otherwise: Ethnobiology of Burning for a Changing World*. University of Utah Press.
- Friedman, D. (2025, Mar 20). Federal wildland firefighters secure permanent pay raise, but work is ‘far from over’. Federal News Network. Available at <https://federalnewsnetwork.com/workforce/2025/03/federal-wildland-firefighters-secure-permanent-pay-raise-but-work-is-far-from-over/>. Accessed April 4, 2025.
- Frost, C.L. (1993). Four centuries of changing landscape patterns in the longleaf pine ecosystem. In *Proceedings of the Tall Timbers Fire Ecology Conference 18*. Tall Timbers Research, Inc.
- GAO (Government Accountability Office). (2009). Federal land management: Observations on a possible move of the Forest Service into the Department of the Interior (GA-09-223). Available at <https://www.gao.gov/assets/gao-09-223.pdf>. Accessed April 10, 2025.
- Gardiner, SM. (2006, Aug). A perfect moral storm: Climate change, intergenerational ethics and the problem of moral corruption. *Environmental Values* 15(3), 397-413.
<http://www.jstor.org/stable/30302196>
- Gollin, L.G., & Trauernicht, C. (2018). The critical role of firefighters’ place-based knowledge in responding to novel fire regimes in Hawai’i. In Fowler, C.T., & Welch, J.R., eds. *Fire Otherwise: Ethnobiology of Burning for a Changing World*. University of Utah Press.
- Hang, R., Hu, Y., Russell, A.G., Mulholland, J.A., & Oddman, M.T. (2019). The impacts of prescribed fire on PM2.5 Air Quality and Human Health: Application to asthma-related emergency room visits in Georgia, USA. *Int J Environ Res Public Health*, 16(13), 2312.
- Hansman, H. (2017, Oct 29). A quiet rise in wildland-firefighter suicides. *The Atlantic*. Available at <https://www.theatlantic.com/health/archive/2017/10/wildland-firefighter-suicide/544298/#Study>. Accessed May 5, 2024.
- Hanson, C.T. (2018, Aug 10). Safety lessons from the La Tuna Fire. *Los Angeles Times*.

- Hanson, C.T. (2021). *Smokescreen: Debunking Wildfire Myths to Save Our Forests*. University Press of Kentucky.
- Hanson, C.T., & Dorsey, M. (2022, July 30). The case against commercial logging in wildfire-prone forests. *New York Times*. <https://www.nytimes.com/2022/07/30/opinion/california-wildfires-oak-fire-yosemite-sequoias.html>. Accessed May 7, 2025.
- Harari, Y.N. (2015). *Sapiens: A Brief History of Humankind*. New York, NY: Harper Perennial.
- Haraway, D. 1988. Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist Studies* 14(3), 575-99.
- Hayashida, F. M. (2005). Archaeology, Ecological History, and Conservation. *Annual Review of Anthropology*, 34, 43–65. <http://www.jstor.org/stable/25064875>
- Hawkins, S.C., & Alexander, A.A. (2025, May). The United States Forest Service should care for the public. *Emergency Medicine News*. Available at <https://journals.lww.com/em-news/blog/BreakingNews/pages/post.aspx?PostID=633>.
- Hawkins, S.C. (2024, March 27). *Wildland Fire: Transformation & Slow Violence in the Carolinas*. Society for Applied Anthropology 84th Annual Meeting, Santa Fe, New Mexico.
- Hawkins, S.C., & Stephens, A. (2023, Oct 19). Risk Management of Wildfire Smoke. *30th Annual Wilderness Risk Management Conference: 2023*. Portland, Oregon.
- Herzog, M.H., Pruetz, J.D., & Hawkes, K. (2022). Investigating foundations for hominin fire exploitation: Savanna-dwelling chimpanzees (*Pan troglodytes verus*) in fire-altered landscapes. *Journal of Human Evolution* 167:103193. doi: 10.1016/j.jhevol.2022.103193
- Henson, C. (2023). *The Fire Within: A History of Women Wildand Firefighters in the United States*. Bookbaby.
- Hoare, Q., & Smith, G, eds. (1971). *Selections from the Prison Notebooks*, by Gramsci, Antonio. International Publishers.

- Holifield, S. (2023, Oct 25). Prescribed fire versus raging wildfire. *US Forest Service Feature Stories*. Available at <https://www.fs.usda.gov/features/prescribed-fire-versus-raging-wildfire>. Accessed May 13, 2024.
- Hodgson, M. (2020, Feb 26). Fuel breaks, prescribed burns controversial wildfire tools. *Lompoc Record*. Retrieved on November 25, 2022 from https://lompocrecord.com/news/local/fuel-breaks-prescribed-burns-controversial-wildfire-tools/article_a7897fff-64e3-58b1-a0e3-f84f0bb05a98.html
- Hoffman, S. M. (2017). Disasters and Their Impact. In H. Kopnina, & Shoreman-Ouimet, Eleanor (Ed.), *Routledge Handbook of Environmental Anthropology*. Routledge. doi: 10.4324/9781315768946.
- Honn, M. (n.d.). *Hidden health costs of forest fires and control burns*. Retrieved April 20, 2024 from <https://web.archive.org/web/20130419012403/http://www.psr.org/environment-and-health/environmental-health-policy-institute/responses/hidden-health-costs-of-forest-fires.html>
- Hotshot Wakeup, The. (2025, Apr). It takes a tragedy to change anything in wildfire: The grim reality to create a national wildland fire agency. Available at <https://open.substack.com/pub/thehotshotwakeup/p/it-takes-a-tragedy-to-change-anything>. Accessed April 10, 2025.
- Hutchinson, B. (2025, Mar 23). 3 wildfires prompt evacuations in NC's Polk County. ABC News. Available at <https://abcnews.go.com/US/north-carolina-wildfires-evacuations-polk-county/story?id=120078000>. Accessed March 24, 2025.
- Isola, S. & Al Khalili, Y. (2023, Jan 30). Protected health information. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing-. Available at <https://www.ncbi.nlm.nih.gov/books/NBK553131/>.
- Johnsen, K.H. (2021). Introduction to the special issue on Longleaf Pine. *Forests*, 12, 1472. doi.org/10.3390/f12111472.
- Johnson, M.M., & Garcia-Mendez, F. (2022). Uncertainty in health impact assessments from a wildfire event. *Geohealth*, 6(1). doi: 10.1029/2021GH000526
- Juillerat, Lee. (2003). Mitchell Monument: A place remembered. *Service & Sacrifice: Klamath Basin Life Through Two World Wars (Journal of the Shaw Historical Library)*, 17.

- Khalfaoui, M. 2023, Jul 28. Deep ecology: An often misunderstood theory. *earth.org*. Available at <https://earth.org/deep-ecology-an-often-misunderstood-theory/>. Accessed May 5, 2024.
- Kodas, M. (2017). *Megafire: The Race to Extinguish a Deadly Epidemic of Flame*. Houghton Mifflin Harcourt.
- Ladino, J, Kobziar, LN, Kredell, J, Cohn, TC. (2022, April 13). How nostalgia drives and derails Living with wildland fire in the American West. *Fire* 5 (2): 53. doi: doi.org/10.3390/fire5020053. Available at <https://www.mdpi.com/2571-6255/5/2/53>. Accessed Nov 6, 2023.
- LeQuire, E. 2009. Restoring fire to the longleaf pine forest. *JFSP Briefs*, 34. Available at <http://digitalcommons.unl.edu/jfspbriefs/34>. Accessed May 5, 2024.
- Lesser, C.N. (2021). Underdeveloped ecologies: Puerto Rico’s forest transition and the cultivation of colonial authority. *Journal of Latin American Geography* 20(1):185-216. doi 10.1353/lag.2021.0007
- Lesser, C. (2022). Another “education by stone”: An archaeological case study in Brazil’s environmental law. *American Anthropologist* 124(4):670-87.
- Lewis, H.T. (2002). An Anthropological Critique. In Stewart, O.C. *Forgotten Fires: Native Americans and the Transient Wilderness*. University of Oklahoma Press.
- Lewis, H.T., & Anderson, M.K. (2002). Introduction. In Stewart, O.C. *Forgotten Fires: Native Americans and the Transient Wilderness*. University of Oklahoma Press.
- Liu JC, Pereira G, Uhl SA, Bravo MA, & Bell ML (2015). [A systematic review of the physical health impacts from non-occupational exposure to wildfire smoke](#). *Environ Res* 136:120-132. doi: 10.1016/j.envres.2014.10.015.
- Lowe, J., & Pricher, Jeff. (2021). *Wildland Fire Fighter: Principles and Practice* (2nd ed.). Jones & Bartlett Learning.
- Luhmann. (1989). *Ecological Communication*. The University of Chicago Press.
- Lumbee Tribe of North Carolina. (2025). History and culture. Available at <https://www.lumbeetribe.com/history-and-culture>. Accessed March 23, 2025.

Lupton, D. (1999). *Risk*. Routledge.

Machlis, G., Kaplan, A.B., Tuler, S.P., Bagby, K.A., & McKendry, J.E. (2002). *Burning Questions: A Social Science Research Plan for Federal Wildland Fire Management*. University of Idaho.

Maji, K. J., Stowell, J.D., Milando, C., Hu, Y., Wellenius, G.A., Kinney, P.I., Russell, A.G., Vaidyanathan, A., & Odman, M.T. (2023). *Contributions of prescribed fire to air quality and health* HEI Annual Conference 2023. <https://www.healtheffects.org/research/ongoing-research/contributions-prescribed-fire-air-quality-and-health#:~:text=%60,for%20respiratory%20and%20cardiovascular%20disease>

Martinez, D.J., Seraphin, B., Marks-Block, T., Nelson, P., & Vinyeta, K. (2023). Indigenous fire futures: Anticolonial approaches to shifting fire relations in California. *Environment and Society: Advances in Research* 14:142-161. doi:10.3167/ares.2023.140109

McCaffrey, S.M., Rappold, A.G., Hano, M.C., Navarro, K.M., Phillips, T.F., Prestemon, J.P., Vaidyanathan, A., Abt, K.L., Reid, C.E., & Sacks, J.D. (2022). Chapter 7: Social Considerations: Health, Economics, and Risk Communication. In Peterson, D.L, et al, (eds). *Wildland Fire Smoke in the United States: A Scientific Assessment*. Springer. doi: 10.1007/978-3-030-87045-4_7

McClure, S.F., Hawkins, S.C., Davis, C.A., & Abo, B.N. (2020, Apr 18). It’s always ‘safety third’ in emergency medicine—COVID-19 or not, the first priority is patients. *MedPageToday*. Available at <https://www.medpagetoday.com/infectiousdisease/covid19/86197>. Accessed January 31, 2024.

Miner, T. (2023, July 18). Wildland Fire. Wilderness Medical Society Annual Meeting. Spokane, WA.

Möller, N. (2012). The concepts of risk and safety. In *Handbook of Risk Theory*. Roeser, S., Hillerbrand, R., Sandin, P., & Peterson, M., eds. Springer.

Mott, N, & Angle, J. (2023). *This is wildfire: How to protect yourself, your home, and your community in the age of heat*. Bloomsbury.

- Nadasdy, P. (2005). The anti-politics of TEK: The institutionalization of co-management discourse and practice. *Anthropologica* 47:215-232.
- Naess, A. (1973). The shallow and the deep, long-range ecology movement. A summary. *Inquiry*, 16(1-4), 95-100. doi.org/10.1080/00201747308601682. Available at <https://iseethics.wordpress.com/wp-content/uploads/2013/02/naess-arne-the-shallow-and-the-deep-long-range-ecology-movement.pdf>. Accessed May 5, 2024.
- NC Forest Service. (n.d.a). History of the NC Forest Service. *ncforests-service.gov*. Available at https://www.ncforests-service.gov/ncfs_history.htm
- NC Forest Service. (n.d.b). NCFS-Home: Forest Health: About Our Forests. *ncforests-service.gov*. Available at https://www.ncforests-service.gov/forest_health/about_our_forests.htm
- NC Forest Service. (n.d.c). Resist wildfire North Carolina. Available at <https://www.ncagr.gov/divisions/nc-forest-service/resist-wildfire-north-carolina>. Accessed April 10, 2025.
- NC Forest Service. (2025a). Longleaf Pine Forests. NC Longleaf Pine Coalition. Available at <https://www.nclongleaf.org/llPineForests.html>. Accessed Mar 25, 2025.
- NC Forest Service. (2025b). Longleaf History. NC Longleaf Coalition. Available at <https://www.nclongleaf.org/llhistory.html>. Accessed March 18, 2025.
- NC Office of Health Equity. (2024). North Carolina Health Disparities Analysis Report 2024. NC Division of Health and Human Services. Available at: <https://www.ncdhhs.gov/2024-health-disparities-analysis-report/download?attachment>. Accessed March 23, 2025.
- NCPFC. (2024). Glossary of fire terms. NC Prescribed Fire Council. Available at <https://ncprescribedfirecouncil.org/glossary-of-fire-terms/>. Accessed May 9, 2024.
- NC State Parks. (n.d.). Conservation: Prescribed fire. Available at <https://www.ncparks.gov/conservation/prescribed-fire>. Accessed May 14, 2024.
- Ney, A. (2013, Jul). First in forestry. *Carolina Country*. Available at <https://www.carolinacountry.com/carolina-stories/first-in-forestry#>

- Nikirk, J. (2024). *The future of fire is female*. US Department of Agriculture. Retrieved April 20 from <https://www.fs.usda.gov/features/future-fire-female>
- NWCG (National Wildfire Coordinating Group). (2024, April 25). NWCG Glossary of Wildland Fire, PMS 205. Available at <https://www.nwcg.gov/publications/pms205/nwcg-glossary-of-wildland-fire-pms-205>. Accessed May 7, 2024.
- O'Brien, P.A. (2019). An examination of Type D personality, depression, and cardiovascular health risk behaviors among wildland firefighters. *Graduate Student Theses, Dissertations, & Professional Papers*. 11445. <https://scholarworks.umt.edu/etd/11445>
- O'Brien, P., & Campbell, D. (2021, May 26). *Wildland Firefighter Psychological and Behavioral Health: Preliminary Data from a National Sample of Current and Former Wildland Firefighters in the United States*. International Association of Wildland Fire 6th Annual Human Dimensions Conference, https://www.researchgate.net/publication/352466544_Wildland_Firefighter_Psychological_and_Behavioral_Health_Preliminary_Data_from_a_National_Sample_of_Current_and_Former_Wildland_Firefighters_in_the_United_States_Conference_session#fullTextFileContent
- Palinkas, L.A., Horwitz S.M., Green, C.A., Wisdom, J.P., Duan, N., Hoagwood, K. (2015, Sep). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Adm Policy Ment Health*.;42(5):533-44. doi: 10.1007/s10488-013-0528-y. PMID: 24193818; PMCID: PMC4012002.
- Parker, C.H., Keefe, E.R., Herzog, N.M., O'Connell, J.F., & Hawkes, K. (2016). The pyrophilic primate hypothesis. *Evolutionary Anthropology* 25:54-63.
- Petryna, A. (2018). Wildfires at the edges of science: Horizoning work amid runaway change. *Cultural Anthropology*, 33(4), 570-595.
- Petryna, A. (2022). *Horizon Work: At the Edges of Knowledge in an Age of Runaway Climate Change*. Princeton University Press.
- Pyne, S.J. (1997). *Fire in America: A Cultural History of Wildland Fire and Rural Fire*. Seattle: University of Washington.

- Pyne, S. J. (2021a). *Pyrocene: How We Created an Age of Fire and What Happens Next*. University of California.
- Pyne, S. J. (2021b, August 18, 2021). Welcome to the Pyrocene. *Grist*. <https://grist.org/wildfires/welcome-to-the-pyrocene/>
- Rappaport, B. (2024, Jul 29). Lumbee tribe returns fire to the soil to restore cultural and ecological heritage. *Border Belt Independent*. Available at <https://borderbelt.org/lumbee-cultural-burn-association-aims-to-prevent-wildfires/>. Accessed March 17, 2025.
- Rappold AG, Cascio WE, Kilaru VJ, Stone SL, Neas LM, Devlin RB, Diaz-Sanchez D. (2012). [Cardio-respiratory outcomes associated with exposure to wildfire smoke are modified by measures of community health](#). *Environ Health* 11:71. doi: 10.1186/1476-069x-11-71
- Rasmussen, M. (2000, March/April). The long reach of humanity. *Forest Magazine*.
- Reid CE, Brauer M, Johnston FH, Jerrett M, Balme JR, Elliott CT. (2016). [Critical review of health impacts of wildfire smoke exposure](#). *Environ Health Perspect*, 124(9):1334-1343. doi: 10.1289/ehp.1409277.
- Roos, D. (2021, Jul 30). Native Americans used fire to protect and cultivate land. *History.com*. Available at <https://www.history.com/news/native-american-wildfires>. Accessed Feb 22, 2024.
- Schelenz, R. (2022, Apr 6). How the indigenous practice of “good fire” can help our forests thrive. *University of California News*. Available at <https://www.universityofcalifornia.edu/news/how-indigenous-practice-good-fire-can-help-our-forests-thrive#>. Accessed January 31, 2024.
- Scherjon, F., Bakels, C., MacDonald, K., & Roebroeks, W. (2015, June). Burning the land: An ethnographic study of off-site fire use by current and historically documented foragers and implications for the interpretation of past fire practices in the landscape. *Current Anthropology* 56;(3):299-325.
- Scott, J. (1998). *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. New Haven: Yale University Press.

- Singer, D. (2021, August 17). Burning out: The silent crisis spreading among wildland firefighters. *The Guardian*. <https://www.theguardian.com/world/2021/aug/17/mental-health-crisis-spreading-wildfire-fighters>
- Singer, D. (2022). On the line: Inside the lives of Wildland Firefighters. *Sierra*, 107(4), 14-23.
- Smith, L. S. (2021). *Decolonizing Methodologies: Research and Indigenous Peoples*, 3e. Bloomsbury.
- Smith, M. (2016, June 16). Mission-centered solutions: Honor the fallen essay: The big lie. Wildland Fire Leadership. Available at <https://wildlandfireleadership.blogspot.com/2016/06/the-big-lie.html>. Accessed January 31, 2024.
- Stahl, Peter W. (1996). Holocene biodiversity: An archaeological perspective from the Americas. *Annual Review of Anthropology* 25, pp. 105-26.
- Stanley, I.H., Hom, M.A., Hagan, C.R., & Joiner, T.E. (2015). Career prevalence and correlates of suicidal thoughts and behaviors among firefighters. *J Affect Disord* 187:163-71. doi: 10.1016/j.jad.2015.08.007.
- Stebbins, S. (2021, Jul 28). This is the worst county to live in North Carolina. 24/7 Wall St. Available at <https://247wallst.com/state/this-is-the-worst-county-to-live-in-north-carolina/>. Accessed March 23, 2025.
- Steelman, T.A., & McCaffrey, S. (2013). Best practices in risk and crisis communication: Implications for natural hazards management. *Nat Hazards* 65:683-705.
- Stewart, O.C. (2002). *Forgotten Fires: Native Americans and the Transient Wilderness*. University of Oklahoma.
- Stoffle, R.W. (1992). Epitaph for Omer Call Stewart. *High Plains Anthropologist* 11(2):ix-xxiii.
- Tenneman [pseudonym]. Personal communication. Facebook Messenger, April 20, 2024.
- The Ad Council. (2021). The Story of Smokey: About the Campaign. Available at <https://smokeybear.com/en/smokeys-history/about-the-campaign>. Accessed May 5, 2024.

- Thomas, J. (2020, Oct 21). A note from the fireline: Climate change and the colonial legacy of fire suppression. *the drift* 2. Retrieved November 25, 2022 from <https://www.thedrifthmag.com/a-note-from-the-fireline/>
- Thomas, J. (2022, Fall). Feeling the fireline: The social formation of embodied wildfire knowledge. *Human Organization* 81(3): 193-202.
- Trump, D.J. (2025, January 23). Fact sheet: President Donald J. Trump directs administration to advance Lumbee Tribe recognition. The White House. Available at <https://www.whitehouse.gov/fact-sheets/2025/01/fact-sheet-president-donald-j-trump-directs-administration-to-advance-lumbee-tribe-recognition/>. Accessed March 22, 2025.
- UNC Charlotte Office of OneIT. (2021, Dec 2). Guideline for data handling. Available at <https://oneit.charlotte.edu/iso/guideline-data-handling/>. Accessed April 24, 2024.
- US Department of Agriculture; Forest Service. (n.d.) Emergency medical service program (EMS program). Available at <https://www.fs.usda.gov/about-agency/emergency-medical-serviceprogram>. Accessed January 31, 2024.
- US Department of Agriculture, Forest Service. (n.d.). *Interagency hotshot crews (IHC)*. Available at <https://www.fs.usda.gov/science-technology/fire/people/ihc>. Accessed February 22, 2024.
- US Department of Agriculture; Forest Service. (2022, Jan 28). On the move: Jan 28, 2022. Available at <https://www.fs.usda.gov/inside-fs/out-and-about/move-jan-28-2022>
- US Department of Interior. (2025, March 15). The Department of the Interior Announces Permanent Pay Increase for Wildland Firefighters to Bolster the National's Wildfire Response. Available at <https://www.doi.gov/pressreleases/department-interior-announces-permanent-pay-increase-wildland-firefighters-bolster>. Accessed March 17, 2025.
- US EPA. (n.d.) Wildfire smoke and your patients' health. Why wildfire smoke is a health concern. Available at <https://www.epa.gov/wildfire-smoke-course/why-wildfire-smoke-health-concern>. Accessed Feb 22, 2024.

- U.S. Environmental Protection Agency. (2009) Integrated Science Assessment (ISA) for Particulate Matter (Final Report, Dec 2009). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/139F, 2009
- US EPA. (2019; document series stamped 2021, Sep). *Wildfire Smoke: A Guide for Public Health Officials*. Available at https://www.airnow.gov/sites/default/files/2021-09/wildfire-smoke-guide_0.pdf. Accessed Apr 24, 2024.
- US EPA. (2023, Nov 1). *Climate change indicators: Wildland fires*. <https://www.epa.gov/climate-indicators/climate-change-indicators-wildfires#>). Accessed January 31, 2024.
- Vaillant, J. (2023). *Fire Weather: A True Story from a Hotter World*. London: Hodder & Stoughton, Ltd.
- Van. Willigen, J. (2002). *Applied Anthropology: An Introduction, 3e*. Bergin & Garvey.
- Wallace-Wells, D. (2024, Feb 14). Fires are the sum of our choices. *The New York Times*. Available at <https://www.nytimes.com/2024/02/14/climate/wildfire-climate-change-urban-firestorm.html>. Accessed Mar 23, 2024.
- Wali, A. (2020). “Complicity and Resistance in the Indigenous Amazon: *Economía Indígena* under Siege”. In *Terrestrial Transformations: A Political Ecology Approach to Society and Nature*, ed. Thomas K. Park and James B. Greenberg. Lexington Books.
- Weisner, M. (2023, Mar 16). Biden pitches “premium pay” for federal firefighters. *Federal Times*. Available at <https://www.federaltimes.com/management/pay-benefits/2023/03/16/biden-pitches-premium-pay-for-federal-firefighters/>. Accessed February 22, 2024.
- Wells, B.W., & Shunk, I.V. (1931, Oct). The vegetation and habitat factors of the coarser sands of the NC coastal plain: An ecological study. *Ecological Monographs* 1:465-520.
- Wettstein ZS, Hoshiko S, Fahimi J, Harrison RJ, Cascio WE, & Rappold AG. (2018). [Cardiovascular and cerebrovascular emergency department visits associated with wildfire smoke exposure in California in 2015](#). *J Am Heart Assoc*;7(8). doi: 10.1161/jaha.117.007492.

- Whitehouse, S. (2023, Mar 8). A burning issue: The economic costs of wildfires. Senate Committee on the Budget. Available at <https://www.budget.senate.gov/imo/media/doc/3.8.23%20SW%20Opening.pdf>. Accessed January 31, 2024.
- Wolf, M. (2015, Mar). Is there really such a thing as “one health”? Thinking about a more than human world from the perspective of cultural anthropology. *Soc Sci Med*, 129, 5-11. doi: 10.1016/j.socscimed.2014.06.018
- World Population Review. Pembroke. US Cities > NC. Available at <https://worldpopulationreview.com/us-cities/north-carolina/pembroke>. Accessed April 4, 2025.
- Wuerthner, G. (2006). *Wildfire: A Century of Failed Forest Policy* (G. Wuerthner, Ed.). Foundation for Deep Ecology & Island Press.
- Wuerthner, G. (2023). The fire suppression myth. *Counterpunch*.
<https://www.counterpunch.org/2023/10/20/the-fire-suppression-myth-2/>
- Wyndham, F.S. (2017). The trouble with TEK. *Ethnobiology Letters* 8(1):78-80.

ENDNOTES

- ¹ Prescribed wildland fires are intentional fires originating from a planned ignition in accordance with applicable laws, policies, and regulations to meet specific objectives (NWCG, 2024).
- ² An escaped prescribed fire has exceeded the prescription for acceptable characteristics of a prescribed fire.
- ³ The Black Cove Fire, the Deep Woods Fire, and the Fish Hook Fire.
- ⁴ The Croatan, Pisgah, Nantahala, and Uwharrie National Forests.

⁵ Following Crosby (2004) and Alleway (2016), I replace “Western” with “European” and “neo-European”. When using geographic terms for cultural phenomena, the Western Hemisphere includes many cultures and peoples not representative of the values and world views that are more precisely grounded in European experience. Moreover, by typically excluding South America, it perpetuates an exclusionary, Eurocentric linguistic paradigm.

⁶ This estimation has been contested by some environmentalists (e.g., Rasmussen, 2000) and other mainstream authors who downplay the contribution of indigenous burning versus lightning-initiated burns (e.g., Johnsen, 2021).

⁷ Japanese fire balloon bombs were a highly feared WWII stratagem whose specific purpose was to start fires. Japan launched more than nine thousand balloons in 1944 and 1945, which have been found in 26 states. Indeed, six Americans were killed in Oregon by a Japanese fire balloon in 1945, the only Americans killed in action in the continental United States during WWII (Juillerat, 2003).

⁸ For example, I have been involved in a Facebook dialogue—not initiated by me—about wildland fire with a married couple, Jim and Carolyn Tenneman (pseudonyms). Every time USFS-NC posts an announcement of a prescribed burn, Jim is always the first commenter and posts a stock announcement he has written to counter these posts, usually addressing its public health risks. This announcement is often followed by a second one challenging the narrative that fire is good for wildlife. The Tennemans declined to be interviewed for this study citing my apparent (and indeed actual) partnership with governmental agencies in this research, but the Facebook posts referenced here are public.

⁹ A Burn Boss is a person trained in application of prescribed fire who will oversee planning and executing a prescribed burn; different agencies have different training requirements for burn bosses reflecting agency policy, and in NC, most burn bosses are trained and certified as “NC Prescribed Burners” (NCPFC, 2024).

¹⁰ Aerie Backcountry Medicine (Montana), Minuteman EMS (South Dakota), Timberline Medical (Oregon), and Precision Rescue (Oklahoma).

¹¹ Steward’s position began to be challenged by the very end of the century (see, for example, Clemmer et al, 1999). It is notable that Stewart did receive the Malinowski Award, a prestigious recognition from the Society of Applied Anthropology, in 1983, but again this potentially reinforces the diminutive role of applied anthropology in the 20th century (and perhaps even now) versus the more traditional academic and institutional recognitions and positions held by Steward.

¹² The informant here uses the terminology “prescribed fire” for instances that this paper would describe as “cultural burning” or “indigenous burning”.

¹³ For example, the La Tuna Fire evidence showing benefit of engineering the built environment to be more fire resilient, or the NC Forestry Service WUI Workshop showing home renovation opportunities. Mott (2023) offers practical advice about defensibility as well.