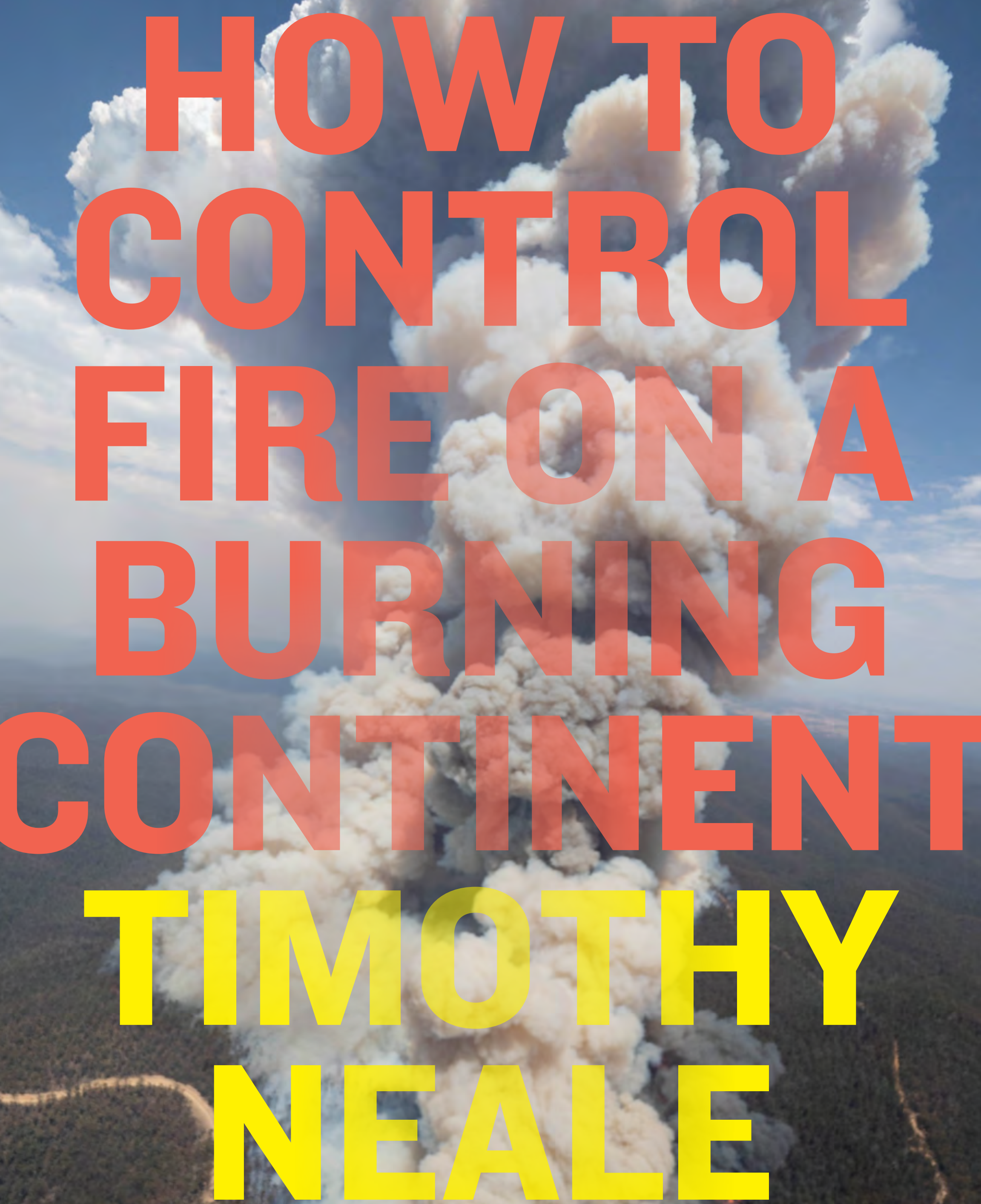

HOW TO CONTROL FIRE ON A BURNING CONTINENT

TIMOTHY NEALE

HOW TO CONTROL FIRE ON
A BURNING CONTINENT

BUY

ELEMENTS *A series edited by Stacy Alaimo and Nicole Starosielski*

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TIMOTHY NEALE

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For Julian, the spark and the light

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all this living is a constant cycle of fire

of ash to shoots to saplings
to life to tinder to smoke to flame
with the beginning begun long ago
and so it goes again

imagine what seeds have been laid here
through all this scorching
imagine what will rise from the ash
—Jazz Money, “the fire inside”

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I begin by acknowledging the Country or place on which much of this book was written and where I am fortunate enough to live and work, which is the city of Naarm or Melbourne on the lands of the Wurundjeri and Bunurong peoples of the Kulin Nation. As an uninvited guest on this sovereign Country, I am continually reminded of the hospitality of the traditional custodians and grateful for the care they have practiced over this place for innumerable generations. This always was and always will be Aboriginal land.

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The time to research and write a book like this does not come about without financial support. Research funding is an ever-diminishing resource

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across academia, but at a time when funding for critical social science research is being not just starved but actively attacked, it feels particularly important to thank the Australian Research Council, the Bushfire and Natural Hazards Cooperative Research Centre, and its successor Natural Hazards Research Australia for their support over the past decade. Specifically, this book would not have been possible without the ARC Discovery Early Career Researcher Award (DE190100233, "Pyrosecurity: Understanding and Managing Bushfires in a Changing Climate") I was awarded in 2018. That said, my apologies to the term *pyrosecurity*, which I abandoned somewhere along the trail returning to camp.

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PROLOGUE

To be constantly aware of fire, to be nervous of it, is
to recognise how precarious is our living in this place.
It makes "nature" far from benign, but it also makes
"Australian nature," in particular, a thing to be constantly
controlled.
—Robert Kenny, *Gardens of Fire*

The control of bush fires is a national problem affecting a
very large number of Australians. Scarcely a season passes
without serious fire damage being suffered in some part
of the continent.
—R. H. Luke, *Bush Fire Control in Australia*

Internationally, wildfires or landscape fires are typically named after where they begin and not the places they devastate downwind. The deadliest wildfire in California's history to date, the 2018 Camp Fire, started under transmission lines on Camp Creek Road but decimated the town of Paradise (Maidu) more than 20 kilometers to the southwest.[1] Such names suggest a forensic search for causes and guilt; that responsibility for a wildfire might be found in a discrete site where disaster unfolded from discrete fault. This contrasts with the identification of storms with first names—a practice allegedly begun by a British Australian meteorologist in the late nineteenth century and popularized in the mid-twentieth century—and often celebrated for supplying these inhuman wonders with coherence and personality. When, in the 1980s, meteorologists stopped using only feminine names for this purpose, some wondered if they might lose their power to hold our attention. Whether named Arthur (2014) or Ada (1970), the personifying nomenclature of storms grants them an uncanny agency that implicitly frames them as both knowing and responsible.

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However, on the continent now known as Australia, the most famous catastrophic wildfires are commemorated in terms of temporality rather than of personhood or place. These are the fires that quickly overwhelm our attempts to control them, towering over the forests they consume, and their rapid speed and erratic behavior have also made them the most immediately impactful. These are the fires that catch people by surprise. These are the fires that we cannot outrun. These are the single-day events—“one-day wonders” or “blowups”—fed by extremely dry and turbulent weather that peaks and then subsides on a particular day. Red Tuesday, February 1, 1898. Black Tuesday, February 7, 1967. Ash Wednesday, February 16, 1983. Black Thursday, February 6, 1851. Black Friday, January 13, 1939. Black Saturday, February 7, 2009. Black Sunday, February 14, 1926. Black Christmas, December 24, 2001.

In Australia, as historian Tom Griffiths (2001, 129) notes, “great fires become secured in folklore, grimly named by their day of terror.” But the origins of this naming convention are unknown. One reading is that such a taxonomy attempts to control or contain the inferno’s wild turmoil. Just as the forenames used for the largest and most damaging storms are formally retired after their use, naming a fire after a day of the week or holiday might be an incantation to try and protect against future calamities ever falling on these days again, a kind of charm that proclaims certain parts of the calendar too full of tragedy to abide any more. If so, their magic is imperfect, as the 1983 Ash Wednesday fires, which killed seventy-five people across the states of South Australia and Victoria, were preceded in 1980 by fires in South Australia that fell on the same day and were also called Ash Wednesday.

Similarly, prior to the 2009 Black Saturday fires in central and eastern Victoria—the nation’s most deadly wildfires to date—there were blazes in Victoria’s Western District also named Black Saturday on February 12, 1977. Starting just before noon, as people were sheltering inside from whipping, arid northerly winds, approximately sixty-nine fires were ignited across Wadawurrung, Eastern Maar, Gunditjmara, and Djaara peoples’ Country.[2] The district’s fire control network of rural volunteers, well trained and widely lauded, had no chance to stop the surging head fires. In total, the inferno would spill over 100,000 hectares in the space of several hours. Among the eleven people believed to have been killed were seven thought to have died from heart attacks induced by panic.

The 1977 fires were shocking but also not without precedent. The Western District is flat Country, bracketed by the Grampians (Gariwerd) ranges

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in the west and the Otways ranges in the south, and extensively cleared by European colonists and their descendants to make way for pastoralism in the nineteenth and early twentieth centuries. By the 1970s, the white masculine class of fire managers who oversaw it thought of this grassy dry ecosystem and others like it in eastern New South Wales and southwest Queensland in terms of an eleven-year cycle, building up biomass or fuel ahead of a baking drought. In 1944, weather that was hotter, drier, and windier than that experienced in 1977 had produced fires four times larger in the district. In 1969, almost three hundred fires east of the district and in neighboring regions had broken out and killed twenty-three people. This included seventeen individuals who had been trapped in cars overrun with flames on Wadawurrung Country between the capital of Melbourne and the port city of Geelong.

A fatal pulse of fuel, climate, and weather, beating in unison, the 1977 fires also punctuated other temporalities. They would be the last research assignment of Alan McArthur, the celebrated father of Australian wildfire science, whose laboratory was commissioned to explain the extremity of what had occurred. It was a kind of homecoming for McArthur, who as the son of white wheat farmers had first become enchanted by the stubble burns and grassfires that ranged across places like the Western District from spring to summer. Now an internationally lauded scientist in his late fifties, he came to witness accounts of extraordinary sights bordering on the supernatural: flames leaping and sprinting faster than a speeding car, and houses exploding ahead of any contact with the fire's roaring front. McArthur's team walked the fires' charred imprints, spoke to firefighters, sampled unburned fuels, and put together timelines that might allow them to uncover the objective truth. They focused on the three largest fires, which all grew over 10,000 hectares in a matter of hours.

The Pura Pura fire (see figure P.1) began when a transmission line, prized from its fastening by the storm winds, lashed at a row of sugar gums (*Eucalyptus cladocalyx*). Half an hour later, a fire started 10 kilometers to the north at Streatham, when another transmission line fell into a grassy paddock. Ten minutes later, 100 kilometers to the southeast, a fuse dropped from a transmission pole and started a new fire at Cressy. For the next three hours, stoked by rushing northeasterlies, these fires would each travel over 30 kilometers south, closing the spaces between them. Smoke blanketed towns ahead of the rolling waves of flame and ash. The gusts intensified and the beating roar of the wildfires appeared to be everywhere. Then, in the space of a few minutes, southwesterly winds

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FIGURE P.1. Aerial photograph of the footprint of the 1977 Pura Pura fire on Eastern Maar and Wadawurrung Country in southwest Victoria (image: Department of Crown Lands and Survey, 1977).

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hit and temperatures dropped, transforming the fires' eastern flanks into new heads. The Pura Pura fire now had a flaming front over 21 kilometers long. But these winds were at once cooler, calmer, and more stable. Within another two hours, all three of these comburent spirits ran out of energy or had been arrested in their path.

The team's report affirmed that these "Black Saturday" wildfires had exhibited "world record rates of spread" (McArthur et al. 1982, 10), traveling over 18 kilometers per hour—an easy pace for a car but an impossible pace for most people on foot. Scientifically exciting as this evidence was, it also presented an epistemological challenge. These fires—"the fastest ever recorded" globally—had somehow outpaced others fed by much more extreme weather conditions.[3] The region was not officially in drought, and the day itself, like those preceding it, was not particularly thirsty. Residents woke that day in the midst of a mild heatwave. Dry but not sere. Winds were technically high, or strong enough to make whole trees sway, but only occasionally gusting to the type of gale winds that are capable of ripping them from the earth. On January 14, 1944, for example, stronger and drier winds had somehow produced slower fires in the same places.

McArthur's interpretation of this apparent anomaly made no mention of climate, let alone the "greenhouse effect" then being debated among atmospheric scientists.[4] Rather, these fires were a lesson in the singular power of fuels, or dry biomass, in combating this elemental adversary. These fires were set apart by the volume of fuel they could feed on, his team concluded, affirming his long-held view that this one factor "dominates" the speed, intensity, and height of all such fires (McArthur et al. 1982, 30). Fuel was the guilty party. While others would later contradict this finding, it lastingly influenced fire science and management throughout Australia, underlining the importance of preventatively setting fires outside summer to mitigate against future fires within it. In McArthur's view, this was how Indigenous peoples had prevented wildfires throughout Australia prior to the invasion of European settlers, and every damaging blaze was a salutary warning of the need to mimic their practices (Neale 2023c). Fuel reduction burning and firefighters were the keys to "fire control" (McArthur et al. 1982, 70–72).

The reactions of McArthur's team and others to these world-record fires illustrate several habits of control thinking explored in this book. Faced with evidence of the exceptional, fire managers, scientists, and others did not call into question their foundational assumptions or strategies

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but rather reinforced them. Wildfires were not the dynamic outcome of a range of forces—including changeable climates, colonial exploitation and extractivism, and aging technical infrastructures—but a linear outcome of fuels and weather. Rather than any reconsideration of where and how we live in fire-prone landscapes, such reasoning naturalized the status quo and led narrowly back to fuels as the site of danger and safety. Weather might be anticipated, but it could not be controlled, whereas fuels could be intervened in both epistemologically and materially.

Similarly, as following other major fires since, mounting evidence of firefighting efforts being massively overwhelmed only inspired greater financial and political investment (e.g., Barber 1977). The failures of militarized fire suppression have been chiefly read, time and time again, as signs that we were simply not fighting aggressively or forcefully enough. As the journalist W. S. Noble (1977, 3) wrote in 1977, reiterating well-worn war metaphors (see Pyne 1997), citizens had to commit to "unrelenting vigilance" against this "most terrible enemy." Fire was not a companion, or even an ally, but an eternal adversary whose existence puts us "under almost constant threat of disaster" (Noble 1977). Repeatedly overpowered, governments and publics continue to put their faith in the promise of control. This book is an attempt to break with such enduring habits.

In closing this prologue, we might usefully reconsider the efforts of McArthur and his team alongside the other mental routines with which I began; that is, identifying massive landscape fires with their place of origin or the day of their destruction. Scientists like McArthur and others addressed in this book have assiduously endeavored to measure and plot individual fires—to finely track material inputs and outputs—hoping to hunt down the fundamental rules and nature of their foe. For them, "ever-living fire" is, as the philosopher Heraclitus wrote, "kindling in measures and being quenched in measures" (Graham 2023). Their task is cynegetic (see Keck 2020), or a kind of hunting, pursuing perfected graphs and equations that promise an elusive epistemological mastery over their object. Names like "Black Saturday" and the "Camp Fire" seek to domesticate this element from a different direction; not technically but symbolically. Names specify and historicize. They try to cut an inferno from the flow of history, isolating its chaotic force in time and place and thereby suggesting it is now departed and knowable. But there are always more fires to come.

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INTRODUCTION

> Final control is not, cannot be, an ultimate value.
> —Judith Butler, *Precarious Life*

> Unpredictable encounters transform us; we are not in control, even of ourselves.
> —Anna Lowenhaupt Tsing, *The Mushroom at the End of the World*

It is just after six o'clock in the morning. As I walk out of my home on Wurundjeri Country, in Melbourne's inner northern suburbs, I tentatively place an N95 face mask on. Part of the standard equipment provided during firefighter training, I had stashed them in a cupboard after never seeing a single firefighter use one on a fireground. But today, in the middle of January 2020, the air quality is officially hazardous. Events are cancelled across the city. Acrid wildfire smoke hangs everywhere. Ashy white with dark brown and orange undertones, the fog masks the end of the street and blocks out any trace of the city center only a few kilometers away. It penetrates sealed windows, clings to your clothes, and stings your eyes. In text message threads, friends have anxiously tried to describe the smell to one another. "Ash and wet woodchips?" The debate converges on a blend of eucalyptus campfires, barbecue coals, and house paint, tasting notes clearly informed by knowledge of the smoke's origins over 200 kilometers away in the state's forested east, northeast, and beyond. Over 300 houses and 1 million hectares have been burned in Victoria, and the flames are still on the move. As in several other Australian capital cities, public health authorities warn against unnecessary exposure to the choking and carcinogenic haze.

I take a tram to go to an emergency control center for the day. Usually, the carriages would be thick with city workers, commuting shoulder to shoulder. However, there are only a handful of us this morning. I open my

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phone to find stories about the smoke. Over the past month, journalists have been tracking the air quality and rallying experts to help understand its hazards. Sydney and Melbourne, often competitors in travel magazines and newspaper lifestyle sections for the best quality of life, have instead been jostling for the title of the world's worst air quality. Today, Melbourne takes the prize for the first time on record. In news reports, atmospheric scientists explain how wildfire plumes age like wine as they are exposed to sunlight and other gases, the difference being that smoke becomes two to four times more poisonous with time. Satellite images show this toxicity smearing across the Pacific Ocean, and, we learn, microscopic traces will be scattered globally. Scientific research will later suggest these particulates caused the premature deaths of over 420 people (Johnston et al. 2021). On social media, Melbournians mull comparisons of their city to Shanghai, Delhi, and other places implicitly understood as toxic. As one columnist writes, "We're used to turning our attention briefly, intensely, to 'those poor people' affected by climate change. . . . Now those poor people include us" (Wood 2019).

The 2019–20 fire season has already earned the name Black Summer. Friends, knowing that I study fire management, have been asking me if this is a "new normal." Attempts to quantify the season produce numbers beyond any familiar scale, somehow making it feel further out of grasp. Over 24 million hectares will burn nationally by the end of March; a blackened expanse the size of Laos or the United Kingdom.[1] There is a widespread sense that we have leaped from one climate envelope to another more flammable and lethal one. In the preceding years, fires "seemed to be everywhere" internationally (Pyne 2022, 1), to the point that it is hard to know where to start. Perhaps with a lightning strike on Bindjareb Noongar Country in Western Australia in January 2016? Two people die in the resulting Waroona-Yarloop Fire, an inferno so powerful that its plume punches through to the troposphere to form a pyrocumulonimbus storm, resembling an atomic mushroom cloud. In May 2016, social media buzzes with videos of trucks fleeing the Canadian oil town of Fort McMurray (Cree, Dene, Métis) amid walls of flame and ember, before other startling images follow in June, as fires devour exotic tree plantations in Portugal and displace thousands of people.[2] In October 2017, the Tubbs Fire in California's Napa and Sonoma Counties (Wappo, Coast Miwok, Pomo) claims twenty-two people, and then, in July 2018, wildfires in southwest Greece kill one hundred more. In January 2019, climate activist Greta Thunberg (2019) insists at the World Economic Forum, "I want you to act as if our

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house is on fire." Later that year, over 6 million people globally march in support of climate action, many of them holding signs bearing images of Earth and Thunberg's words: "Our house is on fire."

But inside a range of emergency control centers a year later, in the midst of Black Summer, I experience a different sense of time and history. Beyond the security gates of one center, I pass a senior response controller's office and massive maps showing the footprints of the state's largest fire seasons since Europeans began invading this flammable corner of the continent in the 1830s. Splashes of black on a white state, 2003 shows 1.3 million hectares of fire painted over the state's east, while 1939 reveals 2.1 million hectares of fire sprayed like shotgun pellets across the center and west. At 5 million hectares, or a fifth of the state, 1851 appears as a blob across the west. Through the season, I have been using the maps to start conversations with staff about how large this unfolding event could ultimately be. "Maybe 2 million," one tells me. "We could get to 1939," says another, "but not much further." My colleagues are skeptical of statements about any fire or season being novel or "unprecedented"; such talk tends to raise smirks and objections rather than talk of paradigm shifts or altered horizons (cf. Petryna 2022). People are tired, emotionally stretched, short of time, and cramped for space, but amid the disorder the mood is nonetheless managerial and calm. The ritual rhythms of emergency management are maintained. As some joke, using one of many borrowed military terms, they are working through a SNAFU (or "situation normal, all fucked up").

This disjunction between popular and professional understandings of Black Summer makes my critical nose twitch, to borrow a phrase from anthropologist Susan Leigh Star (2010, 605). I have the uncanny feeling of noticing an anomaly in plain sight; an aperture in the smooth surface of normality that calls for investigation. From an air-conditioned meeting room, I join center staff as they look down on a stream of thousands of protesters filling the road beneath us and marching toward a nearby park. Like parallel protests in city centers across Australia that month, these protesters' chants and signs criticize government inaction on wildfire management and climate change. Their signs declare "Our house is on fire" and "This changes everything." For months, journalists have reinforced a similar sense of this fire season as a historic break, rupture, or crisis. Searches of Australian newspapers dating back to November 2019 reveal over two thousand hits for *fire* and *crisis*. "NSW 'Living in Fear' in Horror Fire Crisis" (*Daily Telegraph*, December 6, 2019). "Bushfire Crisis,

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Australia Burns" (*Herald Sun*, January 4, 2020). But alongside fire professionals, following them in control centers and on fire lines, I find this same event framed as both fucked up and normal. This crisis may set some records, they explain to me, but the politics and practices of fire control are resilient and will endure. State-led command and control are treated as an intractable fact of life. The crisis even feels ordinary at times (Berlant 2011).[3]

Then the smoke cleared.[4] Black Summer's fires were officially contained by the beginning of March 2020, though their personal and ecological impacts will reverberate for decades to come, and in the years since I have come to understand fire managers' perspectives differently. For them, the presence of immense and deadly conflagrations is not itself novel or alien. If "our house" is on fire, then it has been burning for over a century. Their Pyrocene or "age of fire" (see Pyne 2022) is older than anthropogenic climate change, or the settler colonial nation, even if its intensity has escalated significantly in recent decades. Each new firestorm is a familiar echo of those that have preceded it and those that are inevitably to come. Climate change realists, their understanding of the climate emergency is modulated by the norms of institutionalized emergency management, which focuses on government-led interventions in impacts rather than causes. It preaches order, readiness, and a return to the status quo after crisis (Collier and Lakoff 2021; B. Anderson et al. 2020). As my fire colleagues predicted, official and popular criticisms of fire agencies and activists' insistence that "this changes everything" have often led to substantial reinvestments in firefighting agencies and infrastructures. After Black Summer, Australia's federal and state governments pledged record budgets totaling over $1.5 billion to new firefighting agencies, aircraft, and technologies. Like many others, in disaster's aftermath we recommitted to the impossible promise of environmental control.

This is a book about control. Or, more specifically, it is a book about how and why we endeavor to turn living and lively environments into legible objects of control, the systems we put in place to achieve control, and the social significance and effects of those systems. Central to my argument is an understanding of control systems, such as those developed around flammable landscapes, as characterized by both self-regeneration and spiraling. As demonstrated in the aftermath of Black Summer, evidence of our inability to dominate the vast inhuman force of wildfires has not typically led to disenchantment with control itself. Rather, crises and failures

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of control systems in affluent nations such as Australia seem only to reproduce the status quo. Strategies and institutions may change over time, ostensibly demonstrating reform in the wake of criticism; however, the broader systems and paradigms become more embedded. Management becomes more centralized. Risk analyses proliferate. Control thinking spirals. As this book explores, these characteristics have many parallels in critical understandings of governmental power (e.g., Foucault 2008; Scott 1998), modernity (e.g., Koselleck 1985), late industrialism (e.g., Fortun 2012), risk management (e.g., Beck 1992), and domains such as the military (e.g., Masco 2014), biosecurity (e.g., Lakoff and Collier 2008; Wanderer 2020), and migration (e.g., Amoore 2006), where life's uncontrollability has similarly inspired expanding techniques and infrastructures of control.

The title *How to Control Fire* is therefore an ironic response to the continual search for fixes to environmental problems such as wildfires, both in Australia and elsewhere. Like my interlocutors, I have often been asked how we might stop the next inferno. How can we make forests, grasslands, and other ecologies bend to our needs? How can we be safe? These questions tend to come from concerned people who, informed by breathless news reports, quite reasonably look to drones, robots, logging, prescribed burning, buried power lines, or other interventions as a source of hope or even salvation. In other words, avowed how-to solutions are socially and politically powerful, and each major fire brings a renewed flush of them. After Black Summer, for example, texts suggesting Indigenous fire management might "save Australia" (e.g., Steffensen 2020) vied for public attention alongside tech entrepreneurs proffering unproven ideas for investment that would allegedly save lives, while tech lobbyists joined climate activists in calling for millions to be spent on new aircraft, satellites, and artificial intelligence. With much fanfare, one philanthropist founded a $70 million tech incubator to combat this "adversary" and ensure that by 2025 "all dangerous fires" would be extinguished within an hour of ignition (Thompson 2021). The incubator was quietly dissolved in 2024.

Informed by the scholarship of science and technology studies (STS), this book follows existing technical control systems rather than magical techno-fixes to understand the future possibilities of environmental management. It is thereby also an empirical response to the question of controlling fire, based in a contention that there is much to be gained in turning our attention to the epistemologies and devices used today to know and shape wildfires, their impacts, and their affordances. Fire management is a highly technical field, rife with acronyms, statistics, and

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indexes in which insiders become fluent through years of training and experience, acquiring an intuitive sense of which measures and numbers matter where and when. Asked any question about fires, their habitual response is to say, "It depends." They are sensitized to the exactitudes of place and the policing of its epistemological boundaries. The concentration of expertise is such that even insiders often say colleagues do not "know" fire because they have less experience of the heat and mess of firegrounds, or do not have experience of a particular ecology, while fire-prone communities "don't have a clue." Though I am an outsider, this book nonetheless seeks to understand our persisting commitment to controlling fire by accompanying these experts, drawing on ethnographic research conducted over the past decade (2014–24) with fire managers in Australian landscapes.[5]

Ethnography is one strategy I use to militate against the "boundary work" (Gieryn 1983) of my interlocutors, immersing myself in their work and worlds, while another is comparative analysis. Wildfire science and management in Australia, as noted, can be highly localized and parochial; however, it is in many senses a transnational enterprise. Since World War II, fire control agencies in Australia, the United States, and Canada have engaged in a range of collaborations including regular study tours, conferences, research projects, and exchanges of firefighting personnel and equipment. Australian fire management was self-consciously established in the 1950s in opposition to its North American "cousins" (Pyne 1991, 350–52), although the three nations remain closely bound by many institutional and personal ties. Further, since the 1990s, Australia and its fire allies have also established closer links with other countries with significant wildfire-prone landscapes, facilitated through a growing number of formal agreements, shared standards, and firefighter deployments. This includes growing links with nations with established significant wildfire hazards, such as Portugal and Chile, but also those with rapidly escalating hazards, such as in southern Europe, sub-Saharan Africa, and Southeast Asia. Drawing attention to these transnational networks, and the traffic of approaches and ideas they support, I want to trouble the boundaries of "Australian fire."

Another resource for comparison is cognate domains where governments and others have sought to control environments understood as dynamic, lively, and hazardous. Fields such as military security and biosecurity share with fire management not only an explicit commitment to control but also a common set of concepts, metaphors, and discourses. In

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each case, as in fire (see Pyne 2016), the space of control is frequently conceived as a masculinist battlefield and the object of control as an enemy. We fight fires, until they are officially under control, mobilizing weapons such as aircraft to bomb them and boots on the ground to attack them. Fire emergencies have a battle rhythm and utilize command-and-control arrangements. Arsonists are terrorists and firefighters are heroes (Kosek 2006; Griffiths 2009). These semantic connections can be traced back, at one level, to a mutual grounding in the logic of what the philosopher Gilles Deleuze (1992) called "control society." As against disciplinary societies, focused on enclosing and punishing disorderly subjects, control societies are governed through pervasive quantitative modulation, coding, and training open environments. These are domains also historically connected in practice. The systems and structures to manage fire emergencies in Australia and internationally were, to a great extent, taken from the US military (Collier and Lakoff 2021), and wildfire science has benefited from significant military funding (e.g., Eden 2004). Like biosecurity and border security, fire management relies on a number of military technologies, particularly for enemy surveillance, and has directly involved military personnel and aircraft in recent decades.

This book explores these comparisons and connections in order to elucidate not only the deep and creeping militarization of fire management in Australia and elsewhere but also the justification, practice, and effects of environmental control systems more generally. In each case, these systems are presented as the necessary and moral response to an external threat, a hazard that cannot itself be easily contained materially or discursively. To remedy this, in part, those seeking control turn to centralized administrations and models of their objects (see Scott 1998). Fabricating closed worlds within digital platforms—nuclear impact models, fire behavior simulators, timber production models, species distribution models, infectious disease models, and so on—they seek to anticipate future threats and plan interventions (Edwards 1996; e.g., Özden-Schilling 2024; Doganova 2024). Complementarily, following Deleuze, they strive to train reality to more closely resemble a closed-world model. Coded categories such as "fuel" become practiced and naturalized, turning living plants into quantified inputs for management. Surveillance becomes more ubiquitous, granular, and instant. Government agencies project and perform their technical mastery over their respective "theatres of operations" (Masco 2014), publicizing a "technopolitical imaginary of containment" set against open worlds of peril and disaster (Suchman 2023, 780).

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Such control systems are in fact fragmented and fraught with ignorance (e.g., Caduff 2015; Keck 2020), inevitably exposing their lack of omniscience as they encounter uncontrollable forces and beings they cannot anticipate or arrest. They are overwhelmed. They retrospectively appear "unprepared" (Lakoff 2017). And then they propagate. For decades, government fire control budgets have reliably grown to the pulse of landmark wildfires, just as massive investments in military surveillance follow military intelligence failures and investments in biosecurity follow epidemics and pandemics. Crises are rarely decisive breaks or turning points but rather work to "stabilize an institution, practice, or reality," as dominant groups emphasize the urgency of restoring normality and divert attention from the historical underpinnings of an event (Roitman 2013; Masco 2017, S73). This is the self-regenerative and spiraling character of control. Rather than seeking to understand these patterns purely in abstraction, *How to Control Fire on a Burning Continent* parallels the empiricism of fire scientists by looking to materiality and practice for answers, encountering control as it is both imagined and applied by professionals and persists across a rising number of avowed fire crises. As I show, what persists are institutions, epistemologies, and devices tasked with knowing and shaping fire's potential. What persists are social and political dramas that rehearse criticisms of government while sedimenting this status quo. Amid signs of the mounting impacts of wildfires, there is a pressing need to understand how our commitments to control might be meaningfully altered.

Endeavors to control wildfires today are entangled with more ageless concerns about the shaping of materiality and combustion generally. As philosophers and theorists have argued (e.g., Bachelard 1964; Clark 2018), fire stands out among the elements of classical European thought because, unlike water, earth, or air, fire is not a material but a medium of transformation; an "exchange," as Heraclitus of Ephesus argued. Nature's "great dialectician," burning is the "subtractive technique" through which biomass is irreversibly transmuted into light and heat energy, carbon dioxide, water vapor, and char (Peters 2015). Since the Carboniferous period, over 300 million years ago, the Earth's atmosphere has contained enough oxygen for the plants that proliferated during the prior Devonian period to freely burn. Archaeologists suggest that the predecessors of *Homo sapiens* brought this process into their homes to form hearths more than 1 million years ago, and as human populations spread across the planet in the last 200,000 years, many burned the landscapes around them to clear

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space, hunt, and stimulate the growth of desirable plants. Repeatedly lit, by both human and inhuman forces, many environments and species came to tolerate burning, desire it, or even need it (see Scott 2018). We have coevolved with fire, and, contrary to widespread fears, intentionally burning the land has long been a vital means "to forge and hold territory that befits a dynamic planet" (Clark 2018, 83).

But just as we might attend to how humans "appropriated and advanced" this elemental technique over millennia (Clark 2012, 269), creatively experimenting with our environs, recent and harmful changes to the Earth's terrain, oceans, and climate can also be traced back to (certain) humans' attempts to manipulate combustion. The paramount contributor to anthropogenic climate change is emissions from the burning of fossil fuels such as coal and oil, utilized in greater and greater amounts for the past three centuries in order to sustain industrialized "fossil capital" (Malm 2016). Ancient sunshine has been exchanged for abundant energy, just as ancient forests have been exchanged for pasture and croplands through the power of combustion; true to fire's nature, there is little prospect of undoing these processes. Its protean alchemy is not reversible. Consequently, while approximately 340 million hectares—or 4 percent of the planet's terrestrial surface—burns on average each year, wildfire patterns and behaviors are changing. Globally, areas once too cold and wet to burn are becoming flammable. Over the last forty years, fire seasons in Australia, the United States, Canada, western Europe, and elsewhere are lengthening, and fires are growing in size, intensity, and frequency (see Jones et al. 2022, 2024). Rather than the Anthropocene, some suggest, combustion is now feeding combustion to produce a "fire age" (Pyne 2022).

Among fire scientists, the tendency is to present climate change as a significant stressor—"a pervasive upwards pressure" (Jones et al. 2022)—rather than the cause of contemporary wildfire threats. One mental model they use to understand these threats is to think of fires as the output of four inputs or "switches": fuel growth, fuel dryness, weather, and ignition sources (Bradstock 2010). Scientists seek to understand these inputs, fire managers seek power over them, and so we might usefully take the same approach to frame the material trajectories that converge in fires today. Fuel growth is a matter of what plants grow where and how quickly. To begin with the Australian example, at the time of first European invasion in the late eighteenth century, much of the southeast and southwest of the continent were dry temperate forests dominated by eucalyptus trees, such as brown stringybark (*Eucalyptus baxteri*) and blue gum (*E. globulus*), with canopies

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over 20 meters tall; the vast majority of these trees are now the cutover regrowth of more ancient ancestors. Along the southeastern coast, traveling north from Tasmania to southeast Victoria and the New South Wales coast, wet temperate forests were more frequent, often with taller canopies over 40 meters high and populated at higher altitudes by giants like the mountain ash (*E. regnans*) and alpine ash (*E. delegatensis*). Tropical rainforest and woodlands were also common through northern New South Wales, and continuing into Queensland they prevailed with a mix of broad soft-leafed trees and shrubs. Across the continent, annual rainfall precipitously falls, and average temperature precipitously climbs further inland, with arid shrublands and woodlands grading into desert vegetation toward its red sandy center.

All of these ecologies present a volume of biomass or fuel, as do the croplands, pasture, deforested scrub, and exotic plantations that surround remnant and regrown native forests. More than a third of the Australian continent is desert, making it the more shocking that over 10 percent of its landmass has been cleared and converted to croplands and pasture since colonization. Like Aotearoa New Zealand and Spain, Australia also now has enormous plantations of pine (e.g., *Pinus radiata*) endemic to the western United States, while endemic Australian pyrophiles such as blue gum have been planted widely and at an industrial scale in California, Uruguay, Chile, Portugal, and Greece. For fire scientists, any calculation of the mass that plants make available to a wildfire needs to be accompanied with an understanding of their vertical arrangement. Fires often start in litter, leaves, grasses, bark—the fuels found at the surface or near surface—where they can spread rapidly, reaching over a meter in height and thereby the edge of our ability to suppress them with even large aircraft. Only if they can find a ladder fuel to the bushes and saplings above can fires make it to the canopy, now crowning. “It’s over the gods then,” as one firefighter told me during training. A forest’s mass is then fully involved. Flames reach tens of meters into the air. The heat output per square meter can exceed that of a nuclear bomb by two orders of magnitude. Plumes of ash boil and heat the atmosphere hundreds or thousands of kilometers above.

But biomass is nothing to a fledgling spark if it is not dry enough to burn. This is the second sense in which fuels need to be available. Green grass can be burned, but it will not sustain burning, whereas grass that has shaken off half of its moisture will begin to carry a fire. In some regions of the world, biomes simply have too much moisture to burn, whereas others are exposed to both enough rainfall to become verdant and enough sus-

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tained heat and sunshine to become flammable. In tropical regions, such as northern Australia and southeast Asia, savanna grasslands annually flourish under steamy monsoons before desiccating in cooler dry periods. In southern Australia, as in southern Europe, a Mediterranean climate of cool rainy winters and hot parched summers metes out a different rhythm of growth and drying.[6] This was illustrated for me one day in Black Summer, as a fire analyst and I paused in a patch of green eucalypt forest on Gunaikurnai Country (East Gippsland) as yet untouched by the fires. He stooped down and, with a cigarette lighter, lit some scattered leaves on the ground. They curled as they caught and quickly passed their flames on in a widening circle. We stomped them out. As our other tests confirmed, these fuels contained less than 10 percent moisture, meaning they were as dry as if they had been baking in a hot oven. Most years, he reminded me, this area was too damp to burn. "But that's what ten years of drought will do," he concluded.

A range of human and inhuman forces pull the moisture from landscapes and their plant populations. In many of the planet's most combustive regions, solar radiation combines with hot drying winds, typically Foehn or adiabatic winds traveling from higher to lower elevations, like the sirocco that flow north from the Sahara or Arabian deserts to the Iberian Peninsula, and the Santa Ana coursing west from the Mojave and Sonoran deserts through Northern California.[7] The thirsty gales that pour from the red heart of Central Australia to the continent's coast do not have a common name; however, people do pay close attention to the presence of El Niño (the boy), the playfully named Pacific Ocean pattern that can drastically reduce rainfall over the continent's south, east, and north. The boy came for a visit before Black Friday (1939), Black Saturday (2009), and Black Summer (2019–20). This is not to ignore the force of anthropogenic interventions, such as drainage and irrigation, which remove vast volumes of moisture from soil and aquifers for conversion into crops and mammalian mass. Like the Central Valley watershed in California, for over a century the vast rivers and tributaries of Australia's Murray-Darling Basin have been widely exploited for agricultural irrigation with significant environmental consequences, including the exacerbation of droughts (O'Gorman 2012). In northwestern North America, particularly British Columbia, infestations of beetles have diligently killed vast swaths of lodgepole pine (*P. contorta*) and other species, leaving behind standing dead trees to desiccate in the Chinook winds.

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And then even available fuels still need a light. Internationally, politicians and others beset by large wildfires have sought to blame their ignition on remote natural forces or proximate human actors. Implacable storms, malicious arsonists, and ignorant campers are common targets for blame. But historical data produced by wildfire agencies are often significantly limited in their contributions to these accusations, due to variability in reporting standards and coverage. Studies in Australia and the United States are littered with confounding findings, where some datasets distinctly show strong correlations between increasing human populations and increasing ignitions (e.g., Collins et al. 2015), while some others show the opposite (e.g., Keeley and Syphard 2018). In one landmark southeast Australian study, government datasets on all fire starts varied between 40 percent being from arson and a third from "unknown" sources to, in another state, 3 percent from arson and three-quarters "unknown" (Clarke et al. 2019). This study nonetheless supported a wider consensus that, while globally only 10 percent of all fires start from lightning, the largest and most destructive tend to emerge from this source. The infernos that raced across 117 million hectares of central Australia in 1974–75, just like those that consumed over 180 million hectares of Canada in 2023, started above in crackling clouds.

Thinking in terms of the fire's "switches," scientists have discursively categorized their different articulations as kinds of pyromes, pyrogeographies, or "syndromes of fire regimes" (Archibald et al. 2013). Temperate forests—like the coniferous forests found in the western United States, the sclerophyll forests of southeast and southwest Australia, and boreal forests found in Canada and Russia—tend to produce the world's most intense and large fires but only relatively rarely. In an "unprecedented" season, like 2019–20 in southeast Australia and 2023 in Canada, roughly a tenth of these temperate forests burned. Alternately, tropical grasslands and shrublands, like savannas in central South America and northern Australia, very frequently produce larger but much less intense fires. On average, a third of tropical northern Australia is affected by intentional and accidental fires every year. In tropical shrublands and forests, high-elevation grasslands, and arid shrublands, the switches are all configured differently, producing patterns in which wildfires may be expected rarely or frequently but are all relatively smaller and cooler than those in temperate and boreal forests. It is from this diagnostic point of view that the Australian continent represents a "pyrogeographic laboratory" (Cunningham et al. 2024), boasting a range of climate gradients and

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ecosystems in which wildfires have flourished, pulsed, and perhaps even become pathological amid the overlapping rhythms of sunlight, plants, rain, wind, and lightning over millions of years.

The preceding account has likely given readers some doubt about such mechanistic explanations of contemporary wildfires. This is because these explanations occlude not only the influence of Indigenous peoples' fire practices, profoundly shaping the distribution of plants and biomass over centuries and millennia (David et al. 2024; Fowler and Welch 2018; Lake and Christianson 2019), but also the entangled material legacies of colonial expansion, neoliberal marketization, and late industrialism that have been persistently flicking the switches and turning the dials (Mathews 2022; Pyne 2022). These legacies are in some ways embodied in the force we call anthropogenic climate change, forced through the industrial mining and exploitation of natural resources, and now generating climates that not only are more extreme, hotter, and drier but also produce more lightning. However, this is an incomplete analysis. The 2018 Camp Fire in California and 2009 Kilmore East fire in Victoria, like many other deadly fires, started from power lines built to service communities living amid temperate forests. When those power lines faulted, it was not just because of the duress of the day's strong winds but also because of years of disinvestment in maintenance by profit-maximizing energy retailers, decades of underfunded state and private land management, and centuries of colonial dispossession (Chatti and Randle 2023). Similar stories of entwined causes and cumulative pressures have been told about Spain's 2009 Catalonia fires (González-Hidalgo et al. 2014) or Indonesia's 1997 Kalimantan and Sumatra fires (Tsing 2005, 43–45); there is just no such thing as a "natural disaster" (Davis 1995; Smith 2006).

Reporting on wildfires tends to deploy familiar categories of impacts, starting with human lives lost, alongside houses destroyed, area burned, and financial losses. It is a routinized anthropocentric litany to which others have labored to add other losses and comparisons in an effort to make other material effects matter, such as the estimate that Black Summer prematurely ended the lives of over 420 people through smoke exposure and directly killed or displaced over 3 billion animals. This was ecological devastation, one ecologist commented, on the level of the 2010 Deepwater Horizon oil spill (Slezak 2020). But figuring fires in terms of quantifiable impacts has its limits. First, loss categories inevitably mask meaningful differences and inequalities. In Australian government datasets, for example, insured luxury holiday houses occupied for a slim

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portion of the year count as a house, tangible within the official impacts of a fire, whereas uninsured informal structures and caravans inhabited year-round by poor rural residents do not. Second, such quantification is itself a habit of control, turning fires into a matter of mutable and discrete inputs and outputs. Contrary to this impulse, this book attends to the particular knotted histories that shape what becomes flammable, when, and where, and whose bodies and bloodstreams are situated in the interstices of fires and its transformations. On this burning continent, on this flammable planet, all life is differently enrolled in and affected by this elemental force.

Raised in Aotearoa New Zealand, where large wildfires are comparatively rare, my first encounter with their heat and force was during research fieldwork in 2012. I was driving through a tropical woodland on Kaanju Country in Queensland's remote Cape York Peninsula. A murky haze puffed from a block of scrub, lit within by orange glowing flames, blanketing the road and wafting up above the treeline. There were no firefighters and no sense of emergency, just a man in shorts and a fluorescent vest waving me past, but I stopped to anxiously ask him what was happening. "Just a fire, mate," he responded. The everyday familiarity with fire and lack of concern stayed with me. Two years later, when I had the opportunity to study wildfire management in practice, I set out informed by this sense that wildfires were not necessarily a mortal risk or emergency. Since then I have come to understand myself as miseducated by colonial prejudices, a perspective that has been deeply shaped by the work of Indigenous scholars (e.g., Pascoe 2014) and collaborations with Indigenous friends and colleagues (e.g., Neale et al. 2019). Humans are "fire people," as Djaara elder Uncle Rodney Carter has often reminded me, but too many have become estranged from it to the point that they only fear it. The result is a "perverse economy," in the words of Bundjalung fire practitioner Oliver Costello, in which "warfare" against nature makes wildfires worse.

These critiques have driven me both to work with Indigenous communities and to closely study the institutions, infrastructures, epistemologies, and logics through which government agencies and scientists seek to control flammable landscapes. This book draws upon a range of research projects, including those focused on the revitalization of Indigenous peoples' fire management practices and knowledge, but its primary aim is to understand the dominant systems and critique their dominance. The state's ability to appear in control is underpinned not simply by its monopoly on lawful violence and emergency powers but also by

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its monopoly on systems of technoscientific resource management (Hansen and Stepputat 2001). Fire control agencies have been established, financed, and legally entrusted to protect the public, and yet historically they have been rarely studied or analyzed. They conduct analysis but resile from being analyzed.[8] Subsequently, my work has required engaging with agencies and scientists over several years, finding allies interested in what conversations with an anthropologist might produce. Over the past decade, I have talked to and accompanied fire professionals in all Australian states and territories, trained as a firefighter and fire analyst, walked firegrounds, worked in agency offices, and been deployed in their incident control centers. The resulting account is inevitably the partial view of a companion both within and without Australia's sprawling infrastructures of wildfire control.

A useful synonym for partiality is patchiness. In fire ecology, a patchy site or landscape is a robust one with a range of fuels, including the recently burned, the long unburned, and lots of variation in between. Patchiness is a virtue (Nyquist 2023). Similarly, anthropologists have sought to reframe patchiness in two senses. First, while some academics emphasize the irreducible particularity of context, it is evident that contexts are both distinct and linked by transnational histories of imperial industrialism. Recent debates about the existence of the Anthropocene index a widespread acceptance that industrialism has irrevocably impacted every environment on Earth (see Davis and Todd 2017), and so while these impacts are uneven, they have nonetheless helped produce common patterns or structures of human and nonhuman relations and, alongside them, common systems to understand and manage these relations (Tsing et al. 2019). Each temperate forest is different, in other words, but to the extent they sit within comparable histories of appropriation and exploitation, then they can be generatively thought together. Second, the patchiness of a multiply sited ethnography itself can therefore be understood as methodologically aligned with the world's patchiness (see Marcus 1995; Günel and Watanabe 2024). As against closed-world imaginaries, which move toward a forensic knowledge of context, it is the contention of anthropologists like myself that a social field can be better understood by engaging across several sites in different modes and at different times over a number of years. My aim is not to produce a precise model of fire management, or catalog its differences, but to find out how it holds together across time and place. As crises emerge, as control systems spiral out of control, fire professionals maintain their position.

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Thereby, I follow a tradition of academics who have sought to study technoscientific control systems anthropologically, not just in the hope of reframing these systems as social fields but also to argue that their social character is pervasive if not determinative. Inspired by others who have taken a similar approach to military and biosecurity control systems (e.g., Keck 2020; Masco 2017), one aim of this form of analysis is to reveal how systems that are popularly represented and represent themselves as highly rationalist and objective are in fact regulated by cultural norms and values. They depend on myths and rituals. They maintain kinship structures regulated by patrilineal descent from "fathers" of the field. They morally defend their field from criticism and police its borders. These matters are pursued not to expose rationalist systems as irrational—an underwhelming conclusion—but rather to highlight the depth and breadth of human labor within control systems. Alongside technical devices, making existing and potential wildfires into objects of knowledge and intervention depends upon the intuition and embodied knowledge of a vast range of professionals. As Andrea Ballestero (2019a, 32–33) suggests, approaching technical devices and practices with a sense of wonder can help us come to a different appreciation of how technical devices and practitioners "make the sublime measurable, the sacred regulatable."[9] It can also, critically, help us begin to imagine and sketch out an "otherwise" to the gridlock and inequity of the present (Calvert 2023; Haraway 1988).

As I have been implying, control systems are composed of different configurations; different discourses and logics of intervention, performed through different material institutions, devices, actors, and sites (Suchman 2012). Each chapter in this book presents a configuration of control systems—technical control, communicative control, epistemic control, and moral control—focusing on a particular site or set of sites within Australian fire control that illustrates a given configuration rather than typifying it. This set of examples is not intended to be exhaustive but is rather, I hope, sufficient to the analytical task of thinking through and beyond our attachments to the promise of control. Chapter 1 explores technical control through perhaps the most public form of fire management, namely the emergency response infrastructures put in place over the past century to respond to and eliminate wildfires at their emergence. Such infrastructures borrow their forms and reasoning from globalized models of vital systems security, popularized through the late twentieth century, enacting norms of centralized and hierarchical power that are both foundational to the power of modern states and increasingly important to the

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governing of everyday life (Collier and Lakoff 2015; Adey 2024). Spending time in emergency control centers in southeast Australia as they respond to wildfires, this chapter explores their persistence through myths and rituals of technical control as they regularly "fail" at the impossible task of eliminating impactful wildfires.

Chapter 2 moves deeper into the bureaucratic administration of combustive landscapes, turning our attention from existing wildfires to the anticipation of their risks. While quantitative risk analysis—making future potential impacts and their likelihood "palpable in the present" (Adams et al. 2009, 258)—has formed a key heuristic across financial, military, and environmental domains since the mid-twentieth century, it found limited application in Australian fire until the last two decades. But now risk techniques and audits have grown and accrued unprecedented authority, in large part due to ongoing public and political pressure for the state to appear efficiently and effectively in control. Measures of risks have been created not simply to enable government strategies to be refined, or audited, but also to convince publics, politicians, and news media of their power and performance. Following the work of a government wildfire risk assessment team, this chapter illustrates how the generative nature of risk analysis both stimulates and threatens control systems. If, on the one hand, attempts to place reality within closed-world calculations produce useful numbers, they also, alternately, produce new uncertainties, rogue interpretations, and questions demanding finer and deeper analysis (Zaloom 2004; Power 2007). Risk analysis spirals as it grows in importance, begetting political risk as agencies vainly try to exercise communicative control over fire's futures (Rothstein et al. 2006).

What underpins fire agencies' strategies of anticipating and intervening in wildfires and their threats? In chapter 3, the focus falls on wildfire science in Australia, its twentieth-century fathers, and the epistemological figure of fuel. This latter term for all flammable biomass has played a central role in scientists' attempts to turn the diverse more-than-human actors and unruly matter of combustive landscapes into a single regular entity capable of being governed. As with all other plant biomes, the continent's many biodiverse forests and grasslands can theoretically be abstracted into the universal language of fuel. However, fuel has been central not only to scientific models like those used in emergency response and quantitative risk analysis, but also to long-running and ongoing political controversies about who is ultimately responsible for disastrous wildfires. Moving between the history of these controversies, the scientific

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study of fuel, and fire managers' uses of fuel's affordances, this chapter argues that the search for epistemic control over wildfire has significantly narrowed discussions about the tricky business of living in places that burn. Naturalized imaginaries and discourses of fuel direct our attention toward knowing and controlling biomass as our best (or only) evacuation route from peril. Consequently, an epistemic fixation on fuels leads to the obscuring of the other temporalities and forces at work in damaging infernos and therefore the other possibilities of mitigating them.

When control systems inevitably fall short of the "technopolitical imaginary of containment" (Suchman 2023, 780), and crisis is declared, their spiraling regenerates established forms. More technical infrastructures, more risk analysis, and more research and data. But amid their ostensible failure, awash with criticism, recommitments to control systems rely not only on their existing incumbency but also on their masculinity and moral status to maintain their dominant position. Firefighters and soldiers, like wildfire and military agencies, have continued to be framed as heroic even in periods of public scandal and disgrace. Chapter 4 examines the exercise of moral control through the example of firefighters in northern and southeast Australia. Nationally, male-dominated agencies draw on a pool of 150,000 volunteers and 30,000 paid firefighters to curtail the thousands of intended and unintended ignitions that start annually. Among themselves, these individuals find ideals of heroism repellent or dangerous, preferring to frame their work as a community service performed with precaution according to clear rules. When things go wrong, when harms occur in the line of duty, individuals become internally responsible (see Desmond 2007). Alternately, when external criticisms emerge, such as when the psychological and physical harms of firefighting are publicly revealed, agencies conjure the mythic sacrifices of the fire line. A double morality of responsibilization and heroism thereby also works to deflect critique and substantial change.

Control systems try to appear both comprehensive and inexorable. And yet there are alternatives. Chapter 5 departs from the dominant systems of fire management, led by government agencies, to instead consider the recent revitalization of Indigenous environmental stewardship. Internationally, megafires in Australia, Canada, the United States, and elsewhere in the past two decades have renewed calls for greater investment in Indigenous fire management (see Nikolakis and Roberts 2020), with some arguing that Indigenous practices and knowledges could "save lives and homes," "stop megafires," or even "save the world" (e.g., Fuller 2020;

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Tripp 2020; Yunkaporta 2019). But while such widespread interest and enthusiasm have been politically useful in Australia, spurring direct investment and policy changes, many Indigenous practitioners are wary of the high expectations that may come with recognition (see Whyte 2018). Having fought for hundreds of years against dispossession, and continuing to fight ongoing colonialism, they feel the weight of others' hopes of salvation now that Country has been cruelled by late industrialism and the climate it has created.[10] Contrary to the urgency of emergency, the narrowing visions of risk and fuel, and the conceit of heroism, Indigenous practitioners instead stress the importance of thinking with Country according to its temporal and spatial rhythms. Rather than safety, I suggest, such an approach requires responsibility to and for the material forces that meet in combustive places.

Between each chapter, and inspired by others' examples (e.g., Lea 2020; Mathews 2022; Tsing 2005, 2015), I have included short interludes as ethnographic counterpoints. With the exception of the final interlude, these are all drawn directly from my fieldwork with fire professionals and have been included to serve a double function. First, these interludes act as a bridge between the chapters by expanding on or illustrating a key argument from the preceding section. In miniature, each presents a view of a chapter's argument from a particular context. In this way, second, these interludes hopefully provide readers with an additional layer of ethnographic texture, transporting them into a few of the numerous sites and scenes in which fire's management is articulated and performed. This includes singing songs with political elites as fires unfold, searching with fire analysts to unearth signals of a landscape's flammability, conversing with fire scientists about the merits of empirical measurement, or sitting with emergency managers as they digest tragic news from the fire line.

As noted earlier, technology has appeared as another salvific agent in the aftermath of recent major wildfires and the heralding of the Pyrocene. Drones, robots, artificial intelligence, machine learning, "Moneyball" analytics, satellite networks, and other technologies have all sought support as technofixes for the next wildfire. Surveying the emergence of these technologies, as well as their flaws and failures, *How to Control Fire on a Burning Continent* concludes by arguing against the magical thinking of control. An ethic of control cannot be our "ultimate value" (Butler 2003, xiii). Instead, I suggest, the rising intensities and impacts of wildfires in Australia and elsewhere call for us to escape the gravity of spiraling control systems. This may mean defunding and abolishing certain institutions

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alongside, crucially, finding common cause with the individuals currently entrusted to govern combustive landscapes. Bringing attention to their practices offers ground for better fire futures based on new alliances and coalitions capable of new responsibilities. It is only by understanding the ways that we have come to know fires—their pasts, their causes, their impacts—that we can realistically hope to live with them differently. If wildfires are a "great dialectician," to recall Peters's (2015) phrase, then our best hope is to reattune ourselves to its material grammar and arguments. The fires to come are not momentary crises but echoes of an ongoing catastrophe.

Every analysis or text falters in its attempts to enclose its object.[11] When its object is something like fire, which can fascinate us to the point of distorting close study of it (Bachelard 1964, 4), there is all the more need to acknowledge analytical limits. Confronting these two facts has required me to make my own terminological choices, and at least four of these choices merit some explanation. The first is that while I often use English-language place names, I also deploy an anticolonial practice of using or including Indigenous names for places whenever possible. I do so acknowledging that place names themselves encode a raft of spatial meanings and so are never neatly translatable. In recent years, the city of Melbourne in which I live has increasingly been referred to as Naarm as a way of recognizing it as Indigenous peoples' sovereign Country. This has been embraced by many, though local Traditional Owners have been clear that in their respective languages *Naarm* corresponds to different areas, signifying the scrublands that the center of the city now occupies for Wurundjeri peoples and the surrounding large shallow bay for Bunurong peoples.[12] In other instances, even approximate translated names are not available or are not to be publicly shared by Indigenous custodians. Subsequently, when using and including Indigenous names for places is not feasible, I use and include the names of the Indigenous peoples connected to the relevant site. There are no perfect terms and no guarantees against giving offense when writing in non-Indigenous languages about contexts afflicted by colonial dispossession (Clifford 2013, 10), but there is no justification for not seeking to use better terms.[13]

This raises a related choice in how I describe the nation of Australia and others like it founded on colonial dispossession, such as Aotearoa New Zealand, Canada, and the United States. These nations were all founded through the imperial invasion of exogenous European others who, unlike

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in many other places, attempted to permanently replace native peoples. Therefore, these nations have been theorized as exhibiting a distinct form of colonialism called *settler* colonialism, premised on a logic of settler elimination of Indigenous peoples (Wolfe 2006). Scholars of settler colonialism have differentiated their analysis from theories of postcolonial contexts where the social and environmental legacies of colonization also endure but colonists left or were expelled (Carey and Silverstein 2020). However, settler colonial theory has its limitations, particularly in accounting for the growing recognition of Indigenous peoples' distinct rights, culture, and nationhood by majority non-Indigenous publics and governments (Merlan 2022). To contend that the partial recognition that Indigenous peoples manage to wrest from states amounts to elimination seems nonsensical and ethically unsupportable. For these reasons, I prefer to frame periods between invasion and Indigenous peoples' formal recognition as settler colonial, and subsequent periods as postcolonial. Following the Jamaican British theorist Stuart Hall (1996), a postcolonial situation is not one in which colonialism is superseded but rather one in which it persists "under erasure" (see Anderson 2020).

Just as some conservative Australians argue that their nation has surpassed its colonial origins, transforming into a model multicultural democracy, some who read this book will argue that wildfires are no longer governed through the language and logics of control. But the word *control* itself has been embedded into efforts to grapple with flammable landscapes for over a century in Australia, the United States, and elsewhere (Pyne 1991, 1997). In Australia, this is evident in early fire control manuals and the creation of agencies explicitly charged with fire control (e.g., Luke 1949), and the formalization of controlled burning in the 1950s and '60s as a strategy to address excessive fuel accumulation in forests and other biomes (e.g., McArthur 1962). Through the late 1970s and '80s, these terms were adulterated by the parallel discourse of fire protection and the more moderate and holistic discourse of fire management; however, fire control terminology and concepts persisted throughout official documents and remain widely in use today. Firefighters still work within command-and-control arrangements, directed by senior controllers positioned within control centers. In instances where agencies and scientists within dominant institutions now resile from the language of control, I argue, then to the extent that they remain committed to logics of containment and quantitative modulation, they remain committed to control systems. Control ideologies, like colonialism, still endure under erasure.

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Finally, despite my local commitments, in this book I tend to use the word *wildfire* rather than *bushfire* to describe the unplanned fires that burn through forests, grasslands, and other vegetated environments. Since the late nineteenth century, *bushfire* is the term most commonly used in Australia, whereas *wildfire* is the more common English-language term in the rest of the world.[14] However, their meaning is essentially identical, and Australian fire managers use them interchangeably in my experience. In choosing to write about wildfires, my intention is not simply to make this text more comprehensible to international readers but also to signal my resistance to the boundary work that seeks to maintain a sui generis position for Australian fires. The idea that these fires are unique, of their own incomparable kind or class, is in part a historical effect of field formation (see chapter 3), providing Australian scientists and bureaucrats with some semantic and conceptual autonomy from their North American and European colleagues (and vice versa). The active and long-established transnational traffic of fire professionals and concepts between Australia and other regions contradicts any claims, sometimes by these same professionals, that bushfires are somehow radically different from the wildfires found throughout the rest of the world. Insisting on their comparability, as I do, is done to insist that scrutiny of Australia is of wider interest and benefit.

This book therefore approaches the differences of Australian wildfires as opportunities to think expansively about their meaning. Wildfire is elemental to life on Earth (Kelly et al. 2020; Scott 2018), and elements, as Nicole Starosielski (2019) argues, "never fully stand alone" but rather "attach, bond, and transform." The elemental is always situated somewhere and somewhen, and by attuning to such fundamental forces and actors—by pursuing "performative experiments in elemental thinking"—we can gain new insight into contingent political and social formations that have been naturalized or normalized (Neale et al. 2022, 8–14; Phan 2022). The Australian continent may be distinct in the frequency and variety with which its biomes burn; however, it exists on a planet that burns, made up of diverse combustible landscapes, many of which are becoming ever more flammable under the influence of industrialism and anthropogenic climate change. Wildfires are a more natural presence throughout the continent and, consequently, a more naturalized feature of social and political life, and so Australian fire managers may differ from their colleagues in other countries, just as Australian publics in fire-prone areas may differ from publics elsewhere. The 2019–20 Black Summer season was

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unprecedented in numerous ways (Abram et al. 2021), but Australian fire managers' "situation normal" includes extreme fire weather, vast megafires hungrily feeding on tall forests, and immense impacts to complex networks of human and nonhuman life. Here in southeast Australia, friends in fire agencies describe a summer when fires destroy dozens of houses, hundreds of people are evacuated, and several heat waves force park closures as "about average." They are acculturated to a very high level of emergency and unpredictability; their "situation normal" is "fucked up."

On a planet that burns—and does so more intensively and frequently today than when I started researching this topic a decade ago—what do stories from a continent that burns have to tell us? First, as I have argued above, they show that attempts to turn living and lively environments into objects of control will persist even as evidence mounts of control's ultimate impossibility. Even the largest and hottest megafires will not destroy the dream of control. The fact that the dominant logics and institutions of control systems endure through repeated and regular failures and crises of prevention, preparedness, and response should lead us to think of their avowed failures and crises differently (see Roitman 2013). Exposed as inadequate, insufficient, or unprepared, representatives of these systems will promise to do better next time; to continue to reach toward perfect containment. And so, control spirals, pulling more interests, agents, and authority to its cause. Second, the stability of control systems through time challenges commonsense narratives of climate change as a phenomenon whose terrible and disastrous novelty will necessarily elicit novel responses. Everything should change because a deranged climate changes everything. And yet, examination of fire control in Australia suggests otherwise. It suggests that when crisis becomes ordinary and extremity is expected—when we become accustomed to periodic dangers and disasters—our horizons of thought and action narrow. In an emergency, the goal is not to radically alter our normality but rather to return to it, and so hopes for something other than the status quo need to start elsewhere.

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NOTES

PROLOGUE

1. As discussed in the introduction, as an anticolonial practice throughout the book I have endeavored to include the Indigenous names of places alongside their English or non-Indigenous names. When including Indigenous place names has not been feasible, I use and include the names of the Indigenous peoples connected to the relevant site. This is a limited practice in that, among other issues, it can lead to the occlusion of other peoples and names connected to a given place. While there are no guarantees against giving offense when writing in non-Indigenous languages about contexts afflicted by colonial dispossession (Clifford 2013, 10), I feel there is also no justification for not seeking to use better terms.

2. Throughout this book, I often use the Indigenous Australian English term *Country*, which is commonly used to refer to Indigenous peoples' ancestral territory, including all of its lands, waters, and nonhuman species. As Deborah Rose (2000, 220) explains, *Country* has many deeper and more situated meanings than this. However, the above is a workable definition for those new to the term.

3. The fastest grassfire recorded in Australia is thought to have sustained a speed of 62 kilometers per hour, which is much faster than a sprinting human or even a sprinting kangaroo (Cruz et al. 2022).

4. Alan McArthur died quite suddenly of pneumonia in November 1978, prior to the completion of the team's report. However, he is credited as the lead author of the report, and it is widely held that it was mostly complete at the time of his death.

INTRODUCTION

1. The specific size of the fires included in Black Summer are a matter of debate. The figure of 24 million hectares that is often used includes fires that occurred in northern Australia between mid-2019 and mid-2020, which some contend risks conflating a disastrous season of fires in southeast Australia with a less drastic season of fires in northern Australia. My account of Black Summer tends to focus on the continent's southeast, where approximately 7 million hectares burned between September 2019 and March 2020 (Collins et al. 2021).

2. For more on the 2016 Fort McMurray fire, read *Fire Weather: A True Story from a Hotter World*, by John Vaillant (2023); see also Mamuji and Rozdilsky (2019).

3. In *Cruel Optimism*, the US cultural theorist Lauren Berlant (2011, 117, 196) contrasts the radicality and decisiveness of trauma with "crisis ordinariness," in

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which people are so overwhelmed as to make life “more like desperate doggy paddling than like a magnificent swim out to the horizon.” Berlant’s caution about the deadening effects of entering “livable crisis ordinariness” have informed my argument about the narrowing of thought and action amid worsening wildfire conditions. Another touchstone, identified more clearly in chapter 5, is the critique of crisis narratives presented by Citizen Potawatomi political theorist Kyle Powys Whyte (2020; see also Whyte 2018), which warns against taking “presumptions of unprecedentedness and urgency” at face value.

4. See Daniel Fisher (2021) for more on the meaning of encounters with fire’s qualia (e.g., smoke, ash) in the aftermath of Black Summer. Critical on how fire is “produced, scaled, and animated for screens,” Fisher troubles the idea that the material traces of wildfires can act as reliable witnesses to the drastic changes of our anthropogenic climate.

5. For the sake of a genealogy, my period researching fire management began with the Scientific Diversity, Scientific Uncertainty and Risk Mitigation Policy and Planning (2014–17) project funded by the Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC). It was through this project that I first got to meet, interview, and follow fire managers and scientists in Victoria and the Northern Territory. I then co-led the Hazards, Culture and Indigenous Communities (2017–20) project, which was also funded by the BNHCRC, as well as several other projects funded by its successor, Natural Hazards Research Australia. Besides this, I was fortunate in 2016 to move to Deakin University on a series of postdoctoral fellowships, where I was able to develop my research on emergency and risk management, before being awarded a Discovery Early Career Researcher Award (DE190100233, “Pyrosecurity: Understanding and Managing Bushfires in a Changing Climate”) from the Australian Research Council in 2018. Between 2019 and 2023, thanks to this award, I was able to continue to conduct fieldwork with fire managers and scientists in several Australian jurisdictions.

6. It is Eurocentric, of course, to refer to ecologies found in other parts of the world as Mediterranean. However, this is the term used widely within the relevant academic fields.

7. Another Eurocentrism, the term *Foen*, *Föhn*, or *Foehn* winds originates in the ancient Roman name (Favonius) for the warm westerly winds that move down from the European Alps.

8. In comparison to the literature on fire-prone communities globally, there are relatively few studies of fire managers’ perceptions and practices and even fewer that take an ethnographic approach to this field. However, interested readers should turn to Matthew Desmond (2007), Ariele Milkman (2024), Jon Nyquist (2019, 2023), Colin Sutherland (2019), Jordan Thomas (2025), Alex Zahara (2024), and others.

9. This is not to take a naive view of wonder as a disposition that is necessarily benevolent or positive. “Wonder carries some intellectual baggage,” as Laura Ogden (2021, 7–9) writes, and has sometimes been associated historically with acts of acquisition and dispossession as people seek to capture their objects of wonder.

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10. The term *cruelled* is used in Australian English as a transitive verb meaning to spoil, ruin, or negatively affect.

11. Almost two decades ago, I first encountered the argument that every written text is the prologue of a book which will never be written, and every book is "the counterfeit of a book which cannot be written" (Agamben 1993, 3). This koan helped me finish this book, and I hope it helps others in their endeavors.

12. *Traditional Owner* is a term commonly used in Australia to designate Indigenous people who hold some cultural rights in relation to a particular area or Country. These individuals typically have a documented or well-recognized genealogical connection to a precolonial ancestor born in that area or Country, and this position has been progressively sedimented throughout Australia both socially and politically since the legal recognition of land rights within settler law since late 1970s. The role of Traditional Owner is so widely understood that it is often designated colloquially through the acronym TO (pronounced "tee-oh").

13. This approach is in part inspired by the call to question the "givenness" of settler or non-Indigenous names, categories, affects, epistemologies, social trajectories, and more (e.g., Rifkin 2013; Smith 2012; Tuck and Yang 2012).

14. The term *bush*, used in *bushfire*, itself was imported to Australia from South Africa by European settlers in the nineteenth century. This exogenous origin also troubles any claims to the unique Australian character of this word.

CHAPTER 1. TECHNICAL CONTROL

A version of chapter 1 was originally published in Neale (2023b).

1. E.g., Victoria's Country Fire Authority Act 1944 and New South Wales's Bushfires Act 1949.

2. The National Emergency Services College, founded in 1975, was renamed the Australian Counter Disaster College in 1978. This later became the Emergency Management Australia Institute and is now the Australian Institute for Disaster Resilience.

3. Readers will no doubt understand that, like so many others, I have been inspired by Hugh Gusterson's (1996, 116) call for ethnographers to engage in "polymorphous engagement," accessing interlocutors and their contexts however possible and also "collecting data eclectically from a disparate array of sources in many different ways." Nonetheless, it was apparent to me from my early research that not only were emergency control centers not entirely forbidden to me (unlike, say, nuclear weapons laboratories) but also that some experience of them would be required for fire managers to receive my research as more than another external audit.

4. David Mosse's (2006) analysis of the misalignment between sole-authored ethnographic research and development organizations resonated very strongly with my experience of government agencies in Australia. Where my project was amorphous, prolonged, and individual, all projects in their context had defined objectives and timelines, clear reporting lines, and were communally authored. The prospect of my having autonomy over not only my analysis but also its final

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