RFS firefighter Tim White arived at the start of his shift near Ilford, NSW on 19 December 2019 to find the fire had broken containment lines. Credit: Tim White (RFS)

Charred Country

These unprecedented fires change everything. Climate change is no longer something to worry about in the future; it affects us all here and now.

Words *Megan Holbeck* Additional Reporting *James McCormack*

"It's Australia," you'll hear people say. "There have always been bushfires." And they're right. Fire is hard-wired into our nation's ecological and cultural landscapes. It's been a tool used by Aboriginal people for millennia, and a threat feared since colonisation for its destructive power. Fire is part of us. But that doesn't mean that what's occurred in this last season is in any way normal. Way back in December, before the worst had even hit, Greg Mullins, former commissioner of Fire and Rescue NSW, wrote in the *Sydney Morning Herald,* "The fires we are battling today started earlier, burn more intensely, have destroyed more homes and covered more ground than anything we've seen before in NSW. Fact, not opinion."

> "The scale of these bushfires is unprecedented anywhere in the world."

And it's not just NSW either. Uncontrolled bushfires have been burning since September, with every state and territory impacted, and the huge geographic range of this season's fires, and their simultaneous nature, is unprecedented. When I spoke to pyrogeographer David Bowman, director of the Fire Centre at the University of Tasmania, he was so sick of explaining why this was different (and worse) than any previous fires that he directed me to an earlier quote he'd given to the *Guardian*: "There has never been a situation where there has been a fire from southern Queensland, right through NSW, into Gippsland, in the Adelaide Hills, near Perth and on the east coast of Tasmania."

The results have been devastating.

Half of Kangaroo Island (Australia's third biggest island) has been burnt. It is unrecognisable. The stunning cool temperate forests of Victoria's East Gippsland—gone. Vast swathes of NSW's mid-north, central, and south coasts—continuous stretches of hundreds of kilometres of forest—have been reduced to ashes. And the fires in southeast Queensland's rainforests, which back in September kicked off the fire season, were, according to former Queensland fire commissioner Lee Johnson, "like nothing we've ever seen before."

Here are some numbers, and it's worth remembering the fire season isn't yet done: between September 2019 and late January, the fires have killed 32 people, destroyed more than 2,700 homes and killed a billion or more animals. Flames as high as 70m have been reported. Seventeen million hectares across the country have been torched.

But burnt hectares alone don't tell the whole story; where they've burnt is key. Of the 17 million hectares scorched nationwide by early February, seven million were burnt in

Western side of Mt Toomah (Blue Mountains), NSW, 7 January 2020. This image shows various fire intensities across the ridge; some areas are scorched while others show some canopy burnt but at a lower temperature. Credit: Jamie Plaza van Roon

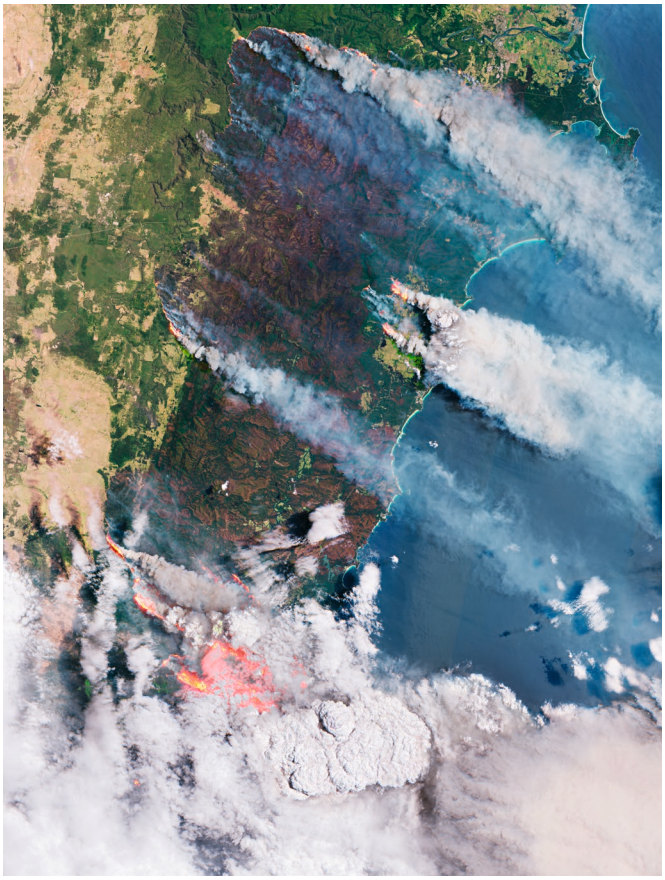
Remains of Delaneys Hut, Kosciuszko NP, NSW. 18 January 2020. Credit: Stefan De Montis

> "There are the places that have never burnt before. Not in the last hundred years, or thousand years, or million years. Never."

grassland and scrubland fires in the Northern Territory. (This is actually considered a relatively normal fire season for the NT.) But while grassland fires often burn over huge tracts of land, sometimes many millions of hectares, they do so at low intensities, and the ecological damage is usually minimal. Woodland fires, on the other hand, are far more destructive.

Now, when naysayers say we've had bigger fires before, they're comparing apples and oranges because they're referring to grassland fires in Australia's interior. But it's woodland fires that have devastated the eastern seaboard, and they're of a magnitude never seen before. NSW alone has seen five million hectares of forest burnt. To put that in perspective—and remembering the fire season is not yet over, and that it's not including any of the other fire-ravaged states—here are some comparisons: The NSW fires are five times the size of the Amazon fires of 2019 that shocked the world; six times the scale of California 2018 fires, the worst in the state's history. If made into a straight line, early January's fire fronts in NSW alone would have stretched from Sydney to Afghanistan. A sobering statement from Professor John Shine, President of the Australian Academy of Science, perhaps puts it best: "The scale of these bushfires is unprecedented anywhere in the world."

It's not, sadly, the only world-first associated with this fire season. The Gospers Mountain fire is possibly the world's



NSW's South Coast on fire, November 31, 2019. This image, captured by the Copernicus Sentinel 2 satellite, is approximately 140km north to south

largest single ignition-point fire in a mid-latitude forest, according to Ross Bradstock from the University of Wollongong's Centre for Environmental Risk Management of Bushfires. It began from a lightning strike to the northwest of Sydney in late October and was only contained in mid-January after burning more than 500,000ha and eventually combining with other fires on the Central Coast. (In comparison, the Kilmore East fire in Victoria's Black Saturday fires in 2009 burnt 125,000ha.) Bradstock told the *Guardian*, "We can find no evidence of forest fires of that size anywhere. You just don't see fires of this size in these parts of the world because you do not usually get the extreme dryness and unrelenting nature of the weather."

Then there are the places that have never burnt before. Not in the last hundred years, or thousand years, or million years. Never. These are places previously understood to be 'too wet to burn', places like the Gondwana Rainforests World Heritage Area of northern NSW and southern Queensland. Some of the planet's most ancient forests, they link back to the days of the Gondwana supercontinent, when Australia, South America and Antarctica were joined. These forests have been permanently wet for tens of millions of years. When I spoke with Mark Graham, an ecologist at the Nature Conservation Council of NSW, he told me that if during this time they had ever completely dried out or burnt, these forests simply wouldn't exist. Sadly, the latest NSW Government figures show that since September more than 54% of these gazetted World Heritage Areas have burnt. "That is a global tragedy," Graham told me. He went on to explain that in a normal spectrum of fire there would be significant unburnt refuges; these fires, however, have been so extensive, and have systematically burnt such big areas, that few refuges remain.

Graham offered an example. He described the Antarctic beech forests of the Dorrigo Plateau as an "elfin wonderland", the "top shelf of forest soul food". Now it's a mess of charcoal and ash. But rainforests are not adapted to fire. They are meant to be wet. They don't 'bounce back' when burnt. Nor do the ancient, vulnerable creatures within them—rare lizards and amphibians, invertebrates and more—that live in the leaf litter and can't get out of the way.

WHY SO EXTREME?

So what's happened to make conditions so extreme that we've had the largest forest fire in history, and that rainforest, unburnt for millions of years, has been set alight? First, let's look at the ingredients needed for bushfires: Dry fuel; conducive weather conditions; and an ignition source. Climate change hasn't directly ignited these fires but the climate change effects predicted by scientists for decades—extreme weather, high temperatures and a prolonged, deep drought—have made their mark. In short, anthropogenic (human-induced) climate change is increasing the frequency and size of fires by making the fuel drier and providing perfect conditions for fires to spread.

The bush surrounding this house on NSW's South Coast had been hazard reduced just two years prior. It didn't help

Although others also predicted this, and decades earlier, the 2008 Garnaut Report was perhaps most prescient in terms of timing: "Fire seasons will start earlier, end later and be more intense. This effect increases over time but should be directly observable by 2020."

The Bureau of Meteorology's *Annual Climate Statement for 2019* outlines disturbing climate trends. Australia has warmed by more than 1°C since 1910, resulting in increased frequency and intensity of heat waves. 2019 was the hottest year on record (mean maximum temperatures were 2.09°C above average; a full 0.5°C above the previous record). It was also Australia's driest year on record, with a massive 10% less rain than the previous record set way back in 1902.

That heat increases evaporation, resulting in drier soil and fuel. Combine that with one of the worst droughts on record—with winter rains in much of southeast Australia failing for an unprecedented three years—and you have what Nerilie Abram, associate professor at the Australian National University's School of Earth Sciences, calls "the perfect storm" for bushfires.

One of the key reasons for the current drought is a phenomenon only relatively recently understood: a positive Indian Ocean Dipole (IOD) event. This happens when the sea surface off the east coast of Africa warms up, leading to more evaporation and in turn increased rain on that continent, while colder water temperatures near Australia lead to less evaporation and drier weather or drought here, most notably between May and November. Climate change is again likely part of the story: it's believed to be making positive IOD events stronger and more frequent, with 2019's event the most intense on record.

But expect more. Since records of the IOD began 60 years ago, there have been 23 IOD events, either positive or negative: the 1960s saw four; the 70s two; and the 80s three. The 2010s saw seven, easily the most of any decade. And modelling by the CSIRO's Wenju Cai has projected that extreme positive IOD events will increase from once every 17 years to once every six years over the course of the 21st century as a result of climate change. (BTW, strongly negative IOD events can conversely increase rainfall, leading to more vegetative growth thus providing more fuel ready for the next drying event.)

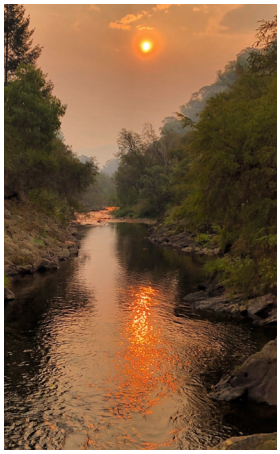
Increased IOD events help explain why winter rainfall has also dropped in many parts of the country, with the southwest of the country receiving around 20 per cent less than in the 1970s, and the southeast getting 11 per cent less precipitation than in the 1990s. Combine the drying out of our country with repeated and more frequent heat waves, and you have the bone-dry fuel needed for huge fires.

There are other climatic factors at work, too. The circular movement of wind around Antarctica known as the Southern Annular Mode—with anthropogenic climate change again a driver—brought dry conditions to Australia, while a badly timed surge of heat in the stratosphere blasted hot, dry air into southern Australia.

What is clear is that climate change is doing what it was predicted to do: make bushfires more frequent and more intense. Of course, some people will look anywhere else for explanations, despite these being debunked from factual, scientific perspectives: Exploding cow manure; grazing bans in the High Country; greenies preventing the necessary controlled burns…

On that final point, the Greens have never been in power at a state or federal level to be able to stop sensible, strategic hazard reduction burns even if they wanted to (which they don't). It's also worthwhile noting the actions of one government that actually has power: NSW's Berejiklian Government. In its 2019/20 budget, it cut operating expenses for the Rural Fire Service—which oversees hazard reduction—by $26.7 million, and slashed capital expenses for it by 75%. Even so, there's actually another bigger factor that's making controlled burning more problematic, a factor that no amount of funding will overcome: climate change. Hazard reduction burns need very precise conditions to be carried out safely, without risk of escalation. Winds must be low and fuel loads not too dry. (Burns also can't be carried out in the pouring rain.) There are surprisingly few available windows for hazard reduction, and these are being reduced by the effects of climate change: longer fire seasons and warmer, drier winters.

Even when they can be carried out, controlled burns only minimise bushfire risk; they don't remove it entirely. Vast swathes


CAPTIONS (Clockwise from top left):

Three weeks after the fire, charred and empty forest is all that's left on the headlands at Bendalong, NSW. 25 January, 2020. Credit: Chris Firth

Smoky orange sunsets became the norm. Ovens River, VIC. 17 January, 2020. Credit: Alicia Crossley

Plumes of smoke as far as the eye can see. Snowy River NP (between Mallacoota and Bairnsdale), VIC. 12 January, 2020. Credit: Bronni Bowen

Burnt forest near Mt Tomah, NSW. 12 January, 2020. Credit: Autal Farkas

Embers fly causing small spot fires ahead of the main front. Ilford, NSW. 19 December, 2019. Credit: Tim White

> "What is clear is that climate change is doing what it was predicted to do: make bushfires more frequent and more intense."

of bush burnt in these fires had undergone relatively recent hazard reduction burns. They didn't help. And while Scott Morrison has touted hazard reduction as the answer to addressing fire risk, modelling by Simon Baker—Professor of Silviculture and Forest Ecology at the University of Melbourne—suggests otherwise. While Baker doesn't discount the efficacy of hazard reduction entirely, it's situation-dependent, and his analysis of the recent fires showed that "when the fires are that extreme, under such terrible fire conditions, fuel reduction burning doesn't seem to have had much of an effect."

And then there's arson. No matter how dry the fuel is, or how much there is, it still needs to be ignited. But while arson has definitely been responsible for the ignition of some fires, its role has been systematically overstated by several politicians (Deputy PM Michael McCormack, for instance, insisted that "most of the fires have been caused by Little Lucifers running around with matches,") and by sections of the media, notably the Murdoch-controlled press. For example, in mid-January the *Australian* claimed a 'national arson toll' of 183 people. But this was a misrepresentation, including people charged with ignoring total fire bans by lighting barbecues or cigarettes, as well as those charged with lighting fires. Of 184 people charged or cautioned for bushfire-related offences in NSW since November 2019, only 24 were charged with lighting bushfires. Of course, that's 24 too many, but to put it in perspective, the ABC revealed, "Only about one per cent of the land burnt in NSW this bushfire season can be officially attributed to arson, and it is even less in Victoria."

In early January NSW Rural Fire Service Inspector Ben Shepherd said lightning was predominantly responsible for the bushfire crisis. "I can confidently say the majority of the larger fires that we have been dealing with have been a result of fires coming out of remote areas as a result of dry lightning storms," he said.

Even then, let's assume arson has been understated, although it's likely we'll never know the true cause of many of the blazes. Well, much like the argument that Australia's always had fires, it's always had arsonists too. But arson only addresses one factor in a terrible fire season: ignition. All other necessary factors—dry fuel, drought, high temperatures—are exacerbated by climate change. As Janet Stanley, a director at Australia's National Centre for Research in Bushfire and Arson, says, arson in the past "wasn't considered such a problem because fire could fairly easily be put out. But because of climate change, this is not the case now."

There's one factor that has exacerbated these fires that has nothing to do with climate change, however, and that's logging. Put simply, logged, immature regrowth forests (and previously burnt forests for that matter), are more flammable than mature forests. Open to the sun and wind, evaporation is increased in logged forests, leading to drier fuel loads. And canopy fires are more likely in immature forests. This affects wildlife too; in the past, koalas, for instance, could simply climb to the top of a 60m tree to escape the flames. When their escape trees are only 20m high, they're not above the flames; they're in them.

ON THE GROUND

Wherever you go, all conversations turn to the fires: so many people have stories to tell. Here is mine. My parents live near Batemans Bay. For the best part of two months there were fires within ten kilometres of their home. Often there were two or more active fronts in different directions. My folks evacuated to the beach on New Year's Eve, and we didn't hear from them again for 36 hours. While I was sure they'd be OK, the not knowing was tortuous. My family also had to cancel holiday plans, and ended up spending most of the break in Sydney. I know that in terms of direct effects, we've been lucky.

And yet… I'm incredibly upset by the fires, by this summer, by what it means for the future. When I see a fire map all I see is the destruction of places I love, places I feel deep connections to, places I've adventured in. From the Blue Mountains to the High Country, the Budawangs to Bright, these landscapes and nearby communities will be affected for decades to come. Some will not recover.

Initial reports into the damage done to NSW National Parks have been released and make sobering reading. More than one-third of the State's National Park land was burnt, including 80 per cent of the Blue Mountains World Heritage Area and more than half of the Gondwana Rainforests. About two-thirds of the 251 parks and reserves managed by the National Parks & Wildlife Services were at least half burnt, with 55 of these at least 99% affected. More than one-third of NSW's rainforests burnt, as did half the State's heathland.

Extinctions are all but inevitable, for both flora and fauna. The wildlife may never recover: these fires were too hot, too fast and too big to allow escape. Surviving animals had nowhere to go: no food, shelter or water. Mass starvation is a reality. Extinctions are expected. Boots for burnt koala feet are lovely, but when farmers run out of bullets to euthanise their own animals I hate to think about what happened to the fauna trapped in burning wilderness areas for months. Professor Chris Dickman's estimate that a billion animals have perished in these fires by mid-January is believed to on the conservative side. One widely noted loss was 30 per cent of NSW koala populations in their main habitat. But while our iconic species—the kangaroos, koalas, wallabies and wombats—make the news, what about the smaller things in the leaf litter, the burrowers and rodents, the frogs and invertebrates? With respect to the last of these, the repercussions have been staggering. Chris Reid, an entomologist at the Australian Mueum, has estimated 240 *trillion* insects and other arthropods have been impacted. One species that suffered heavily was the Kaputar slug—a neon pink slug found only on the slopes of Mt Kaputar. Ninety precent of its population has been wiped out, and food sources for the survivors were burnt.

Another less-iconic animal affected is the pouched frog living in northern NSW's rainforests. It's a small creature with a globally unique development strategy: the male scoops tadpoles into pockets on his hips where they gestate, the pouch 'unzipping' to release tiny, fully-formed frogs. The species dwells, says Mark Graham, "in these islands in the sky, these mountaintop refuges that have been permanently wet. Each little colony or each population of them has been isolated for millions—and in some instances potentially tens of millions—of years." But now the pouched frog's strongholds have been severely impacted by fire. Whole populations have been potentially destroyed.

These are just the direct results, without factoring in health and economics. Around half of the Australian population has been affected by smoke. In Sydney alone the economic cost was estimated at being up to $50 million a day. This season's fires are predicted to be one of the most expensive national disasters on record in terms of insurance claims, with the costs predicted to affect long-term living standards.

The effects of the fires have been felt by people across the country, even those within 'safe' urban bubbles. It's late January. Sydneysiders have already been inhaling smoke for a few months. The air quality here has been among the worst in the world, at 30 times safe levels—people have been wearing face masks to walk their dogs. Cars are covered in a film of particles, as are lungs—Sydneysiders have apparently been inhaling the equivalent of 37 cigarettes a day. The ocean is full of ash and charred leaves; schools around the city have closed due to fire risk. While my experiences (and those of millions of others) are minor in the big picture, none of this is 'normal'. Ask any 70 year-old if they've ever seen Sydney like this before.

And for young people across Australia today, there's the existential angst caused by these fires. Climate change has become the uncontrollable, apocalyptic threat that nuclear war was in the 1980s, only with this one you can smell in the air and watch it advancing on a government app.

My brother dousing spot fires that kept popping up from the smouldering peat bog in the swamp area on my parents' property. Hartley Vale, NSW. 22 December 2019. Credit: Daniel Hutchins-Read

"Climate change has become the uncontrollable, apocalyptic threat that nuclear war was in the 1980s, only with this one you can smell in the air and watch it advancing on a government app."

MYTH BUSTERS

YOUR GUIDE IN BRIEF TO DEBATING THESE FIRES

MYTH: AUSTRALIA HAS ALWAYS HAD FIRES LIKE THESE.
Yes, Australia has always had fires, but not like this. The scale is unprecedented, not just nationally but globally, and areas of rainforest that have not burnt in *millions* of years, if ever, have been affected.

MYTH: AUSTRALIA HAS HAD BIGGER FIRES.
Only grassland fires have been bigger. This is likely the largest woodland fire event in global human history.

MYTH: IT'S THE DROUGHT, NOT CLIMATE CHANGE.
Yes, drought is a factor in these fires, but the drought itself is related to climate change. Positive Indian Ocean Dipole events, a major driver of drought in Australia, are increasing in frequency and severity; climate change is likely the culprit.

MYTH: IT'S ARSON, NOT CLIMATE CHANGE.
Arson has been systematically overstated as a cause for these fires. And Australia has always had arsonists; in the past, however, it was much more difficult for them to do this level of damage.

MYTH: IT'S GREENIES STOPPING HAZARD REDUCTION.
The overwhelming factor impacting hazard reduction is unfavourable weather. In NSW, cuts in funds for the Rural Fire Service didn't help. And in any case, hazard reduction doesn't eliminate the risk of bushfire.

MYTH: IT'S NOT CLIMATE CHANGE, IT'S EXPLODING MANURE.
That's just, to pardon the apt pun, bullshit.

THE FUTURE

Whether through bushfires, extreme weather, sea level rise or a depressingly long list of other impacts, climate change will affect us all. These fires demonstrate that the consequences of climate change are no longer something urban folk can donate money, sympathy and a ten-minute window of attention to while remaining insulated from their reality. The climate is already changing; without strong action soon, it's going to get worse. And possibly a lot worse than we imagine; there are so many effects we simply can't predict. It's incredibly complex, with all manner of feedback mechanisms and loops and multiplier effects. But one thing that everyone with expertise agrees on, from fire experts to the Intergovernmental Panel on Climate Change (IPCC), is that climate change is increasing the number and severity of blazes. In November Greg Mullins spoke on behalf of the Emergency Leaders for Climate Change, a coalition of 23 fire and emergency leaders from every state and territory. He said, "We're former commissioners, chief officers of every urban and rural fire service in Australia…All of us have seen conditions change over the years, supercharging the bushfire problem, and it's all down to climate change, the burning of oil, coal and gas."

Banksia pods popping open after the fire, ready to release their seeds. Mt Wilson, NSW. Credit: Autal Farkas

Once the emergency passes, there will be long-term economic effects to deal with: Increased insurance premiums; more expensive produce at the supermarket; taxes levied for recovery efforts. From Mallacoota to Thredbo to Stanthorpe, small towns rely on holiday trade to stay in business. Even in neighbourhoods that didn't burn, many businesses will fail, communities will be weakened, and people will be traumatised from the on-going psychological effects of living through months of fire-related stress, as well as the visible reminders of trauma. International tourism will also be affected by the visions of smoke and fire, of navy ships rescuing holidaymakers from burning beaches and of tennis players choking: It's now not only our wildlife that's dangerous, but our bushland as well.

Given the scale of the loss—to our forests, to wildlife, to people's homes, to their lives—it almost seems trivial to discuss how these fires will impact outdoor activities. However, given wilderness adventure is at the heart of *Wild*, I'm betting it matters deeply to you, as it does to me.

Firstly, there's the big issue: That people die out there, caught in flames while doing what they love. But that's not all. When I asked David Bowman about the future effects on outdoor activities, he said that summers will be ruined for adventure (with some exceptions). When national parks are regularly closed due to fire danger, Bowman said, you can't reliably plan trips. And, he continued, even if you can, summers won't be fun; they'll be too hot, they'll be too dangerous. Mark Graham pointed out that it's not just the direct threat of fire that closes parks; in the wake of a burn, parks and tracks can remain shut for months afterwards while risks are assessed and addressed. And here's a smaller impact: If you think freeze-dried meals are bad now, wait until you begin eating them cold. More frequent total fire bans will mean gas stoves often can't be used.

More frequent fires will also change the vegetation. Although many Australian plants are fire-adapted, repeated burns within short time frames will impact plant species' diversity, changing the very composition of our bush. One example is the Blue Mountains, famed for the diversity of its vegetation and home to around one-third of the world's eucalypt species. Six years ago, there was a huge fire in the Blueys. This season saw another catastrophic fire, with 80% of the World Heritage Area affected. It's a dangerously short gap. John Merson, executive director of the Blue Mountains World Heritage Institute, told the *Guardian*, "The eucalypts can be very badly reduced in diversity if fires come through in too short and intense intervals. Their numbers will virtually collapse."

There'll also be structural changes to the forest. "Burn it and it'll recover," Bowman told me. "But keep burning it many, many times—as is going to happen—and...soon there'll be areas that used to be scrub or forest that people will be able to ride mountain bikes around on because it'll be so open."

Bowman then introduced me to a new term: *solastagia*. It's 'the distress produced by environmental change impacting on people while they are directly connected to their home environment', or the more catchy 'existential distress caused by environmental change'. He told me that he's suffering from it. Badly. He'd just returned from the Franklin River, where part of the appeal is that it remains the same—he's been going there for the last seven years, with one of his companions making around 80 trips. "The fact is," he said, "it's not going to be the same soon. There's going to be fire in there."

Bowman also posed a pair of interesting questions, which I'll paraphrase: The jury's out, he said. Is it tougher for the boomers who have experienced these wet, cool places as they were, and will suffer the pain of knowing what was lost? Or is it tougher for the younger generation who will never know these places as they used to be?

His advice? "We're going to have to allow those national parks to adapt. But we've also got to allow ourselves to adapt . . . . For the sake of the younger generation, we've got to say, 'Look, the rocks are beautiful, the form of the land is beautiful. The valleys are beautiful, the openness, the sky, there's so much beauty in this.'"

"But the suffering is the transformation that we're experiencing. Transformation is always painful."

Welcome to the future, painful though it may be. **W**

ACKNOWLEDGEMENTS: *Wild* would like to thank, most importantly, our nation's courageous fire fighters. We also want to thank the members of the *Wild* community who contributed imagery for this story.

WHAT CAN *YOU* DO?

If we act strongly and soon, we can still avoid the worst effects of anthropogenic (human-induced) climate change. Get active however you can. A list of organisations that are members of the Climate Action Network Australia can be found at cana.net.au – there are plenty to choose from, for both donations and action.

Personal ways to reduce your impact include: Changing where you have your mortgage, super and investments; voting according to the climate; eating less red meat; driving less; and energy efficiency at home and work.