Hi Reddit! We're Stefan Doerr, Mike Flannigan and Nicola Jones, and we're talking about the increase in the frequency and intensity of wildfires around the world – Ask Us Anything!

Worldwide$_{W}ildfire^{1}andr/ScienceAMAs^{1}$

[1]Affiliation not available

April 17, 2023

Abstract

My name is Nicola Jones, and I am a freelance science journalist who writes for Yale Environment 360, Nature, New Scientist, Sapiens and more. My scientific background is in chemistry and oceanography, but I have reported and written on stories across the physical sciences, from climate change to quantum physics. I live in Pemberton, BC, where the wildfire smoke was so bad last summer that I had to evacuate my own family to a hotel for a week. In my recent story for Yale Environment 360, "Stark Evidence: A Warmer World Is Sparking More and Bigger Wildfires" [https://e360.yale.edu/features/the-evidence-is-clear-a-warmer-world-means-more-wildfires], scientists Stefan Doerr and Mike Flannigan join me to investigate the factors behind the increasing intensity and frequency of wildfires around the world. My name is Mike Flannigan and I am the director of the Canadian Partnership for Wildland Fire Science and a Professor of Wildland Fire at the University of Alberta. My research interests include wildland fire and weather/climate interactions including the potential impact of climatic change, lightning-ignited forest fires and landscape fire modelling. In Canada, we are already seeing the impact of climate change with longer fire seasons and more area burned. My name is Stefan H. Doerr, and I'm a Professor of Physical Geography and leader of the Environmental Dynamics Research Group at Swansea University in the United Kingdom. My research centers on wildfire impacts, including fire effects on landscape carbon dynamics, on soils and on water quality, as well as global fire patterns, trends and risk. The wildfire season is getting longer—it has increased by 19% from 1978 to 2013. The burned area in the U.S. West has gone from 250,000 acres in 1985 to 1.2 million acres in 2015. Siberia is seeing its worst fires in 10,000 years. In short, there's an increased risk for fire on every continent, and things are only slated to get worse. Many of the causes of these fires are anthropogenic—but climate change isn't the only factor. Other human effects, including forest management policy, have also played a role. Why are wildfires increasing, what should we expect wildfires to look like in the future, and what can we do to help prevent them? We will be answering your questions at 1 pm EST – Ask Us Anything!

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REDDIT

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WORLDWIDE_WILDFIRE R/SCIENCE

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CORRESPONDENCE:

DATE RECEIVED:
November 15, 2017

DOI:
10.15200/winn.151066.63872

ARCHIVED:
November 14, 2017

CITATION:
Worldwide_Wildfire , r/Science , Hi Reddit! We're Stefan Doerr,

Is human intervention in putting out natural wildfires playing a significant role in the number and severity of wildfires in your opinion?

Growing up in California, wildfires were a fact of life. I always wondered why the areas that didn't put people at risk weren't allowed to simply burn themselves out. I'd appreciate your perspective on this.

automatethethings

Nicola here. Just a quick note to add that California (and the western US in general) is one of the best-studied places in the world with regard to fire risk. Last year, John Abatzoglou of the University of Idaho published a paper showing that human-caused warming since the 1970s has been responsible for about half of the increased dryness of western U.S. forests over the last 30 years. And the drier it

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was, the more forest burned. The upshot is that climate change was found to be to blame for doubling the area that burned in the western U.S. between 1984-2015, adding an extra 10 million acres of charred trees. So while human activity and fire management policies are certainly playing a role in fire risk and fire impact, climate is also a big factor.

Is human intervention in putting out natural wildfires playing a significant role in the number and severity of wildfires in your opinion?

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automatethethings

Mike, here, we have to learn to live with fire because our efforts to exclude fire are not working. Where possible, we should let natural fires run their course. The problem is that in some regions there are many things on the landscape that society values. First and foremost, fire management agencies are to protect human life. Fire management is conducted by many agencies in California and some are trying to get fire back on the landscape by prescribed burning and monitoring/managing natural fires.

Bottom line, yes fire management, in some places, has led to increasing severity of fire because the high intensity (generally high severity as well) fires are the ones that escape.

From my personal knowledge, I know some endemic plant species require the forest fire to burn the ground to both activate the seeds and also create am environment for the plants to grow. Also some animals have adapted to growing with the fires.

Also the constant putting out of fire only leads to more dead matter which causes more intense fires.

Why is it that despite all these, we still do our best to put out fires. Wouldn't doing a controlled and periodic burning be good for the environment

JK_Hunting

Hi, Stefan here. In principle, letting areas burn will reduce flammable material in the landscape and thus reduce the risk of future fires. This is of course not always a viable option where lives or important infrastructures are at risk. Controlled ‘fuel reduction’ burns are indeed already carried out in many regions for land management purposes, one of which is reducing the risk of severe future fires. These burns, however, require substantial resources and can only be applied to certain areas and under low fire risk situations to ensure they do not escape. In addition land managers have to weigh up their benefits against the disruption they can cause from smoke production. This can be a particular problem in areas that rely on tourism or with crops that may be smoke sensitive such as grapes.

Howdy, Colorado resident here. I've heard forest regrowth has not been what scientists expected after fires in recent years, with some areas around here turning from pine to sage brush after a burn. If true, is this attributed to climate change, the removal of nutrients due to increased intensity of fires, or other contributing factors like beetle kill? Is this a new norm, or is there a way to support healthier reforestation?

BryCart88

Mike here, not exactly my area of expertise and it depends on the area of interest. Disturbances, like wildfires, can be a catalyst for change but many ecosystems are resilient and those that are used to

wildfire often have strategies to survive and even thrive in fire-dominated regimes. However, when you have multiple impacts – fire and bugs, fire and drought, harvesting then fire (call these double whammies) it can be difficult to return to the pre-disturbance state. So it is possible with climate change and fire (or other disturbances) ecosystems will change faster than expected and there is a potential for novel assemblages.

and what can we do to help prevent them?

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Thanks.

2cats2hats

Mike here, the answer really depends where you are. Fires are natural in many ecosystems and that is the case in the boreal where Fort McMurray is located. Prevention of human-caused fires is a good thing as these fires are not natural. Suppression of lightning-caused fires is necessary sometimes to protect societal values such as communities.

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Thanks.

2cats2hats

Nicola here. The people I spoke to when researching my article definitely said that yes, decades of hyper-active fire suppression in the US has "added fuel to future fires". On the other hand many said that this doesn't have a huge effect on the number of fires each year, so it isn't necessarily a major factor in fire increase.

Given the recovery cost, damage caused, and manpower required to fight these fires, is there a possible link of terrorism in the form of arson?

shadywhere

Apparently so! https://medium.com/homeland-security/unleashing-hell-fire-as-a-terrorists-weapon-4fa5912a9adb

I live in Northern California, Sonoma County to be more specific. The area here has been plagued by wildfires the last 3 years. Lake County has been decimated by them and just last month Sonoma, Napa, Mendocino counties lost 43 lives and an estimated 6,000 homes/structures. When the Tubbs fire started in Sonoma County the winds were approximately 50 mph and the embers landed on random houses, burning them to the foundation. Do you have an opinion on why this part of California has been ravaged by fires even though we had a record breaking rain fall last winter? Do you have any knowledge on how 20 city blocks could be burned to ash except for the trees surrounding the homes

and properties (which are still green and look undamaged)?

jennyjefner

Mike here, fire needs fuel, ignition and hot dry windy weather. Despite the rains and flooding in winter and spring you can have a severe fire season in summer as most fuels can dry out in a week to 10 days. In fact, a wet winter may mean a more severe fire season as grass growth is promoted by a wet winter and then dies during the summer drought so there is more fule to burn in the summer and it will burn at a higher intensity making it more difficult to extinguish.

An area within a fire with standing and even living trees is possible. Extreme fire behaviour is erratic and some areas may escape the flames.

What is the ideal way to stop wild fires

Gadget-man1284

Mike here, Progressive Fire management determines if a fire is unwanted or wanted. If unwanted, the philosophy is to hit it hard and hit it fast while it is still easy to put out. Once a fire is large and intense it can be difficult to impossible to extinguish until the weather changes or the fuel changes. I think Ontario, Canada has a great approach called appropriate response that determines whether a fire is wanted or unwanted and then takes the appropriate response.
https://dr6j45jk9xcmk.cloudfront.net/documents/4801/wildland-fires-english-revised-2015-06-30.pdf

What is the ideal way to stop wild fires

Gadget-man1284

Nicola here. Once a decision has been made to tackle a fire, agencies are pros at deciding how to go about it. There are lot,s of possible strategies, but the basic idea is to deprive a fire of air and/or burnable fuel, by cutting or burning fire breaks, or dumping water or retardant to make the trees less burnable. Fire fighters take a lot of things into consideration, including slope (firest move faster uphill), wind and weather. Often a fire won't be completely out until winter comes, and nature douses it with snow.

I live in Williams Lake, British Columbia and was evacuated for about a month this summer because we had wildfires on almost all sides of the town. I've heard we are at even higher risk for fires next summer because there will be less moisture held by the surrounding burnt areas, and there is still a lot of fuel left, even in the burnt areas. Could that be true?

hotdoggos

Mike here, there are three ingredients for a wildfire – fuel, ignition and weather. Weather influences the other two ingredients as lightning is a function of the weather and fuel moisture is a function of the weather. Fuel moisture is a critical factor as it determines if a fire will start and how readily it spreads.

To your question, it is difficult to say what the weather will be like next summer but as to the fuel, if the area around you is grassland or very open forests then these can burn again next year (but not an increased probability of burning). However, if the area close to you is a closed-canopy forest then it is unlikely to reburn for another 10-20 years.

Even though lightening will be causing catastrophic fires, do worry about threats of eco-terrorism? For example, I can think of a lot of ways to start forest fires using drones and less sophisticated tricks to remove myself from the attack site. Also seems like dry forests would be a good military target.

01-MACHINE_GOD-10

Nicola here... apparently so! https://medium.com/homeland-security/unleashing-hell-fire-as-a-terrorists-weapon-4fa5912a9adb (you're not a terrorist, right ;)

After a bad fire, what are the ideal ways to help a forest recover, and are those methods currently used by any governments? Is it best to stand back after a fire and "let nature take its course"? Intervene and replant certain species? Something else entirely? Thanks!

kiri-kin-tha

Hi, Stefan here. In regions where fires are a naturally recurring phenomenon, flora and fauna will normally recover over time. That said, where a fire has been particularly severe, some of the seedbank may be destroyed, there may be the risk of accelerated soil erosion and of water contamination from ash washed into rivers and reservoirs. In those cases replanting programs or erosion prevention measures can be used to aid recovery, and reduce erosion and contamination risks. The US Forest Service has an excellent response program for treating severely burned areas, which is being adapted in other countries: https://forest.moscowfsl.wsu.edu/BAERTOOLS/

RA and science student in Honours at the University of Winnipeg. Research interests are climate change risk communication and particularly Dr. Flannigan's work on fire modelling under future climate scenarios.

It seems wildfires are incredibly difficult regarding risk management decisions due to their innate complexity. With the rise of fire severity expected under climate change, what do you see as the most effective means to communicate risk from wildfires in the future?

We know many populated areas in Canada and the US will be affected in the future, how do we prepare those areas for more intense fire seasons? Is it raising resources in forest management and fire response, or in fire prediction tools and early warning systems?

Also, for Dr. Flannigan, is there an United States equivalent of your work re large scale fire modeling & climate change?

Thank you!

Jamides

Mike here, we expect fire intensity to increase in Canada in the future (see link for a recent paper in ERL). I believe we have to change our way of fire management and concentrate on communities and let fire take its' natural course elsewhere where possible. We need improved early warning systems. http://iopscience.iop.org/article/10.1088/1748-9326/aa7e6e/pdf Communication – this event. Recent nature of things episode on fire. http://www.cbc.ca/natureofthings/episodes/into-the-fire

In the US, people like Matt Jolly and Leroy Westerling have done a lot of climate/ climate change research.

In your intro, y'all said, "Other human effects, including forest management policy, have also played a

role [in increasing the intensity and duration of fire season]." What are some of the policies that have worsened fire seasons across the globe? And which countries/agencies are "getting it right" in terms of implementing policies that won't worsen an already-awful trend we're seeing?

Thank you both!

kiri-kin-tha

Hi, Stefan here. Fire and associated problems are not the same across the globe and there is no single policy that has affected fire everywhere. Two policies or management decisions do stand out: 1. In areas where fires occur naturally, the land management approach of preventing fires, applied over many decades in many regions, can cause the accumulation of flammable vegetation and litter. This often leads to more extreme and damaging fires when they eventually occur, as has been the case in parts of the western USA. This is now widely understood and increasing efforts are being made to “getting it right”, for example, in Australia, Canada and the USA to let fires burn where possible, but there is a long way to go. 2. In many regions, native vegetation or intensely managed cultural landscapes have been replaced with fast growing and highly flammable conifer or eucalyptus forests. Whilst this can bring economic benefits, it has led to a substantial increase in fire risk. This has been a key factor, for example, in the devastating fires in Chile and Portugal this year. A more detailed evaluation of this phenomenon in Portugal is here: https://theconversation.com/what-links-portugals-deadliest-wildfire-to-grenfell-tower-economics-and-neglect-79815

Hi guys, 2017 is one of the worst years in terms of forest fires in Portugal, with the loss of many human lifes. One of the deadliest fire was in a region having large forests created for industrial ends (pines and eucalyptus). Due to historical reasons, these forests are crossed by roads and are next to small towns. Here is my question : do you think relevant the eventuality of implementing CEVESO regulations on industrial forest properties as it's the case for chimicals plants located near urban sites ?

Thank you.

Juzephe

Stefan here. I assume you mean the Seveso directive (http://ec.europa.eu/environment/seveso/). Applying its principle to industrial forests could be an very effective way in enforcing safer forestry practices in relation to fire. Whether there is the political will to do this remains to be seen. The tragic 2017 fires in Portugal are certainly a sufficient reason to do so (see also my related answer to kiri-kin-tha above).

Can termites reduce the frequency of forest fires?

Alimbiquated

Nicola here. I'm not an expert on this by any means, but your question intrigued me so I did some digging. This paper suggests that termites are a force for good in forests, helping to improve soils and, yes, possibly reduce fire severity. https://www.fs.usda.gov/treesearch/pubs/38737 The good news is that apparently termite populations can survive through a large wildfire. Interestingly, there has been a theory that pine beetles (a scourge more common in BC now thanks to warmer winters) can leave damaged trees that act like tinder to a fire; however, research seems to suggest that pine beetle damage does NOT increase fires https://beta.theglobeandmail.com/news/british-columbia/pine-beetles-not-responsible-for-wildfires-research-shows/article29795652/?ref=http://www.theglobeandmail.com&

If the world is getting warmer by 2 degrees Celsius until 2100, how much of a difference would this have on wildfires? Can you quantify this, like 20% more wildfires or so? How much carbondioxide would these wildfires release then, could it create a runaway effect or is this not possible at all? Thank you for your time!

Platypusbreeder

Hello, Nicola here. In my research I could not find one, single, concise estimate for future fires; I think there are too many factors at play to do that. Here's the best over-arching numbers I could find: One 2008 study predicted that the area burned across Alaska and Canada might increase 3.5–5.5 times over 1990 levels by 2100. http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2486.2008.01679.x/abstract This global assessment is also very good (not many hard numbers, but good graphs showing in general which regions are expected to have more fire, and which regions less): http://onlinelibrary.wiley.com/doi/10.1890/ES11-00345.1/abstract

Given that we are currently in a period of interglaciation that is on par with the data concerning glaciation cycles of the Quaternary, pretty much the last ~2.5M years, is there anything significant about this warming period other than humanity's interest in preserving an unsustainable way of life at current population growth?

From what I understand, fire is a means of returning organic matter to the soil. Is there any evidence that wildfires are negatively impacting soil productivity through sterilization or any other means? Is there any evidence that wild fires are complicating the issue of global warming? Again, as I understand it, particulate matter (smoke) tends to block solar IR leading to cooling, ie. "volcanic winters" (on a large scale at least), etc. Is this wrong?

What I am about to say I do not mean in a derogatory manner. I genuinely want to know if my perception doesn't fit the data, so here it is:

It seems as though too many "authorities" try to get people to believe something is wrong with the Earth. Is the problem not in humanity's inability to strike a balance with the natural cycles and processes therein? Is the problem not an inability to use these processes for our benefit instead of attempting to stem the tide of a geologic process that may or may not be outside humanity's control?

Example: methane production by livestock. This is a well known, "man-made" contributor to Green House gases, however, is it not at least *somewhat* analogous to explosions of life (population numbers, new niche species, etc) that tend to happen during periods of interglaciation?

My logic may be flawed, as I am not a geoscientist, nor am I a paleontologist. These just seem to be logical conclusions to me. I am open and welcome input from those who research these things as a way of life, so please give me your insights to these questions and maybe even some places where I could find more data.

Thanks for your time!

cmason249

Nicola here. I'm not sure if this directly addresses your points, but your thoughts here remind me of an interesting shift in the environmental movement to make a greater consideration for / allowance for humans in the landscape. For example, Emma Marris's book "Rambunctious Garden" looks at how wildlife and plants can thrive in urban spaces. The goal with many conservation projects today (eg re-establishing otters on the west coast, or fish stocks) is not to re-create nature as it would have been without any human influence, but to help nature re-establish a good balance in the presence of humans. People are part of the ecosystem too.

With regards to wildfire, fire is a natural process that cannot and should not be stamped out; it becomes a problem for us when it is too close to human landscapes. I don't think it has a negative impact on soils (if anything I think there is a positive effect), though I'll let the scientists correct me if I'm wrong. The climate impacts of smoke is complicated: fires produce CO2, which has a warming effect; they produce black soot, which at low atmospheric levels has a warming effect; they produce brown carbon, which in the high atmosphere can have a cooling effect (like volcanoes); and if black carbon lands on ice sheets, like in Iceland, it reduces albedo and has a warming effect. So it's complicated! I believe the overall effect is a cooling one.

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Thanks for your time!

cmason249

Stefan here. Yes - the Earth's climate has changed over geological periods and in some cases even over shorter timescales. The current warming period, however, is highly significant in occurring at a much faster rate than would be the case without human interference. That means that ecosystems (and societies) have little - if any - opportunity to adapt effectively. This contrast with the slower rate of most changes that have occurred naturally over geological timescales (bar catastrophic events such as major meteorite impacts).