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Hearing on "The State of Federal Wildland Fire Science: Examining Opportunities for Further Research & Coordination"

Chairwoman Johnson (D-TX), Ranking Member Lucas (R-OK) and distinguished members of the Committee, thank you for the opportunity to appear today to discuss opportunities for further research and coordination as it pertains to federal wildfire science. My name is Dr. Jessica McCarty. As of July 1, I am an Associate Professor of Geography at Miami University of Ohio. I have more than 15 years' experience in applications of satellite and geospatial science to accurately quantify wildland and human-caused fires and related emissions. I have led and contributed to fire fieldwork, most recently during the 2019 NOAA/NASA FIREX-AQ field campaign which measured atmospheric chemistry of smoke across the continental U.S. During my testimony, I will be discussing the relationship between climate change and wildfires, how to reduce fire risk, proposed solutions for satellite-based fire detection and monitoring, and how federal and non-federal partners can better collaborate and coalesce around existing programs. The opinions expressed in my testimony today are that of my own and do not represent views of Miami University.

Climate Change and Wildfires

Climate change means warmer temperatures for the entire U.S., which for many of our western states will cause drier fuel conditions and increase the likelihood of intense burning. For instance, wildland firefighters have historically been able to build fuel breaks during the night, when fires subside during the cooler temperatures. But climate change is increasing nighttime temperatures faster than daytime temperatures, potentially eliminating one wildland fire fighting strategy[1]. Warmer temperatures from climate change also means snowpack melts earlier in the season, causing forests, soils, and plant life to dry out sooner – which is another way that climate change increases dry fuel conditions[2]. As climate change increases droughts, rain patterns will no longer match the seasonal memories that we or the landscape have, leading to large stands of dead trees and increasing the likelihood of extreme fires even in our eastern forests - like the 2016 Great Smoky Mountains fire near Gatlinburg, Tennessee that burned over 17,000 acres and killed 14 people[3] during an "exceptional" drought. Within the boreal and Arctic regions of Alaska, climate change will increase lightning activity, will trigger a transition from boreal

[1] https://www.scientificamerican.com/article/one-climate-change-wildfire-risk-lurks-in-the-dark/
[2] Abatzoglou & Williams (2016). https://doi.org/10.1073/pnas.1607171113.
[3] https://wildfiretoday.com/2016/12/05/analyzing-the-fire-that-burned-into-gatlinburg/

forests to more fire-prone grasslands, and will dry out peatlands[4] – causing long-lasting underground fires that span multiple fire seasons, often referred to as "Zombie fires"[5].

Wildfires contribute to climate change by being a source of carbon dioxide (CO_2) and other greenhouse gas emissions. The California Air Resources Board estimates that approximately 117 million metric tonnes of CO_2 were emitted from wildfires in 2020[6], which is 25% more than total annual fossil fuel emissions for the entire state[7]. Even still, more frequent and intense wildfires can potentially lower our forests' ability to capture carbon in the future by reducing forest density and tree size.[8]

Mitigating future wildfire risk

Mitigating future wildfire risk means reducing carbon emissions and preventing further warming. As we cannot prevent lightning strikes, and we work to limit warming, our remaining options to reduce catastrophic fire risk "are to reduce human-caused ignitions and to modify fuels."[9] Human-caused ignitions in the western U.S. account for 84% of all wildfires while also increasing the length of fire seasons.[10] In a warmer and more flammable future, with many landscapes currently running a fire deficit[11], we must act to reduce arson, accidental fires, and the spread of open burning from agroecosystems to wildlands.

Fire risk can be lowered through fuels reduction, most effectively via prescribed burning and working with Indigenous fire practitioners to return cultural burning to the land. In some landscapes, prescribed burning can be safely done throughout all seasons, while others require more risk management. In all cases, a communities' tolerance for smoke will often dictate when or if a prescribed fire occurs. The choice is ours – do we tolerate a few hours of smoke in the off season every year or do we wait until the sky has turned red and we are forced to evacuate?

Improving fire detection and monitoring

Spaceborne fire detections used by the U.S. Forest Service relies on 1 km (MODIS) to 375 m (VIIRS) spatial resolution polar orbiting satellite systems that are overhead two to four times per day[12]. A higher resolution satellite, like 30 m Landsat that is only overhead every 16 days but provides before and after fire assessments with pixels approximately the size of a baseball diamond. Geostationary systems, like NOAA's Geostationary Operational Environmental Satellite (GOES)-R series, have 0.5 to 2 km resolution (ranging from three-by-three city blocks to 11-by-

[4] McCarty et al. (2021; pre-print). https://bg.copernicus.org/preprints/bg-2021-83/.
[5] Scholten et al. (2021). https://doi.org/10.1038/s41586-021-03437-y.
[6] https://ww3.arb.ca.gov/cc/inventory/pubs/ca_ghg_wildfire_forestmanagement.pdf
[7] https://news.mongabay.com/2020/09/off-the-chart-co2-from-california-fires-dwarf-states-fossil-fuel-emissions/
[8] Pellegrini et al. (2021). https://doi.org/10.1038/s41559-021-01401-7.
[9] Flannigan et al. (2013). https://doi.org/10.1016/j.foreco.2012.10.022.
[10] Balch et al. (2017). https://doi.org/10.1073/pnas.1617394114.
[11] Parks et al. (2015). https://doi.org/10.1890/ES15-00294.1.
[12] https://firms.modaps.eosdis.nasa.gov/usfs/

11 city bocks), but capture images every 5 to 15 minutes[13]. What is needed for improved wildland fire detection and monitoring are higher spatial and temporal resolution sensors. NOAA's Geostationary Extended Observations (GeoXO)[14] is such a system, but the first GeoXO launch is currently planned for the early 2030s. We need this now. In my opinion, being able to see new fire ignitions every 15 minutes within 30 m baseball diamond-sized grids from geostationary satellites would be a game changer for science, for fire management and incident command, and for community education and engagement – including improved warning systems – giving us specific rather than general information.

Utilize existing partnerships to improve fire science collaboration and coordination

I would be remiss to not mention the Joint Fire Science Program (JFSP)[15], established by Congress in 1998 and jointly funded by the Department of the Interior (DOI) and the U.S. Forest Service (USFS). The JFSP is a solutions-oriented federal research collaboration that provides scientific funding for practical results that improve wildland fire policy, management, and solutions at local, regional, and nation levels[16]. The JFSP funds and manages the Fire Science Exchange Network[17]. These fifteen regional fire science exchanges provide the most relevant, current wildland fire science information to Federal, Tribal, State, local, and private stakeholders within ecologically similar regions – across all 50 states[18]. Currently, the funding for and future of the JFSP is in question. NOAA[19] and NASA[20] seek to and deliver applied wildland fire and smoke knowledge, science, data production, and satellite missions within the needs of the DOI, USFS, and join. We should not re-invent the wheel when a functioning and successful federal mechanism exists.

Thank you for giving me the opportunity to testify before you today. I look forward to answering your questions.

[13] https://www.goes-r.gov/#MissionDescription
[14] https://www.nesdis.noaa.gov/GeoXO; the website details the partnership as "NASA will manage the development of the satellites and launch them for NOAA, which will operate them and deliver data to users worldwide."
[15] https://www.doi.gov/wildlandfire/joint-fire-science-program & https://www.firescience.gov/
[16] https://www.doi.gov/wildlandfire/joint-fire-science-program
[17] https://southernfireexchange.org/about-us/jfsp-fire-science-exchange-network/
[18] https://southernfireexchange.org/wp-content/uploads/Consortia_map1.gif
[19] https://www.nesdis.noaa.gov/GeoXO/fire
[20] https://appliedsciences.nasa.gov/what-we-do/disasters/fires