

Wildfire in the Age of Climate Change

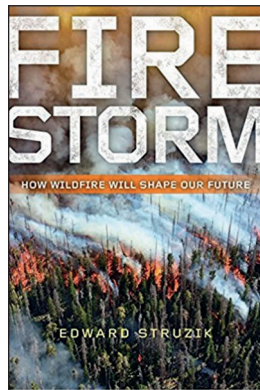
Firestorm: How Wildfire Will Shape Our Future. Edward Struzik. Island Press, 2017. 272 pp., illus. \$30.00 (ISBN: 9781610918183).

What is the ecological role of wildland fire in the age of human-induced climate change? What are the primary concerns? How can human communities become more fire adapted and fire wise? These are the questions that author and environmental writer Edward Struzik attempts to answer in *Firestorm*. The book is at its best when describing the personal stories of the people affected by large wildland fires, such as the 566,000-hectare Horse River fire in the Fort McMurray area of Alberta, Canada, in 2016. *Firestorm* provides a compelling narrative of the firefighters who struggled to understand how they should respond to such a large weather-driven fire that was far beyond their control, and it describes the experiences of the residents and first responders in Fort McMurray who grappled with the decision of whether and when to evacuate the town.

The book also succeeds in its personal accounts of some of the scientists who seek to understand the ecological effects of large wildland fires and the influence of climate change. Throughout the book, Struzik makes a plea for more action in response to climate change, including increased funding for research, a greater number of protected wildlife corridors, and changes in our consumption patterns. This is complemented nicely by frequent anecdotes indicating approaches that could help human communities to live more safely with wildland fire, including a call for greater emphasis on fire-safe home construction and defensible space work in the immediate vicinity of homes to increase their odds of surviving fire. Given the tragic loss of homes and lives in several

wildland fires in California and elsewhere in 2017, these themes are both timely and important.

Firestorm also succeeds in candidly discussing the potential and probably adverse consequences for many ecosystems—including the threat of range contraction for some high-elevation forest types—due to rising temperatures from climate change, supporting these points with citations of the scientific literature and interviews with climate scientists and field ecologists. The book, however, is less successful when it comes to presenting a current understanding of forest and fire ecology. In *Firestorm*'s well-founded eagerness to raise readers' level of alarm regarding climate change, it unfortunately relies frequently on the common popular approach of demonizing disturbance processes such as fire and native insects. In doing so, the book misses an opportunity to ecologically contextualize and convey much of what current science has to tell us about the habitat created by these processes.



This is exemplified in passages that confuse heterogeneous natural forest succession with habitat-type conversion. In one such passage, the book notes abundant postfire conifer regeneration on north-facing slopes in a particular fire, but it laments the preponderance of aspen relative to

conifers on a single south-facing slope at nearly two decades postfire. Rather than recognizing the habitat diversity that comes from multiple successional pathways and the ecological value of different successional rates (Donato et al. 2012, Owen et al. 2017), the book instead tends to assume that such occurrences are examples of damage or loss. Repeated references in the book to wildland fires as “carbon bombs” are not supported by sources and are not tempered by references to scientific research indicating that surprisingly little forest carbon is actually consumed in wildland fires and that forests go from carbon source to carbon sink in a relatively short period of time following fire because of postfire growth spurred by fire-mediated nutrient cycling (e.g., Meigs et al. 2009).

Similarly, *Firestorm* discusses post-fire erosion and sedimentation and impacts on downstream municipal water supplies regarding the Hayman fire of 2002 in Colorado, the Lost Creek fire of 2003 in Alberta, and the Rim fire of 2013 in the Sierra Nevada mountains of California. However, the book does not examine the role that extensive postfire logging played in chronic sedimentation in these and other fires (e.g., Wagenbrenner et al. 2015). With regard to human health impacts, *Firestorm* suggests that the deaths of a few hundred thousand people each year might be attributable to wildfire smoke but fails to note that, according to the primary source of this estimate, these occurrences are overwhelmingly in tropical regions where unnatural anthropogenic burning of rainforests, typically associated with logging and other development, occurs on a massive scale during all seasons, for multiple years (Johnston et al. 2012). This is unlike the relatively brief pulses of smoke during fire season in fire-adapted vegetation communities.

Another example pertains to the spotted owl (*Strix occidentalis*) and fire. To its credit, *Firestorm* mentions research that indicates the benefits of mixed-severity fires for this species: High-severity fire patches create important foraging habitat. However, the book then relates an anecdotal account from one researcher suggesting that 45 spotted owl territories were lost in the King fire of 2014 in the Sierra Nevada mountains and that there are “no signs of the owls coming back.” The published study from this same researcher reported that only 16 spotted owl territories—not 45—were lost in the King fire (Jones et al. 2016). Subsequently, the US Forest Service spotted-owl survey data revealed that many of those territories had lost occupancy in the years prior to the fire in an area with extensive logging and clearcutting and that some new territories were discovered postfire (http://johnmuirproject.org/wp-content/uploads/2016/09/USFWS_Ltr_ReKingFireAndJonesStudy29Aug16.pdf). Other important contexts were missing in the book, such as the recent finding that in the much larger Rim fire of 2013, record-high occupancy levels of spotted owls were found after the fire (higher than in most unburned old forests), before extensive post-fire logging occurred (Lee and Bond 2015), or the large increase in spotted-owl populations in the years following the 90,265-hectare Horseshoe 2 fire in Arizona, where no postfire logging occurred (Moors 2013).

In dozens of locations throughout the book, *Firestorm* states that wildland fires are burning bigger, hotter, and faster but fails to provide scientific citations and does not inform readers about the important nuances of current forest and fire ecology science in the era of climate change. In one passage, a source is provided for the statement that the severity of fires in Alaska is now the highest that it has been in the past 10,000 years, but the cited study pertains only to one localized area of Alaska and concludes that higher levels of fire, determined by charcoal deposits, occurred several hundred

years ago in the study area, during the “Medieval Climate Anomaly” (Kelly et al. 2013). By relying on overly simplified messaging, *Firestorm* misses the opportunity to educate readers about the fact that North American forests generally remain in a fire deficit currently, relative to natural fire levels that occurred prior to fire-suppression policies, as well as the seemingly counterintuitive fact that despite increasing temperatures and longer fire seasons, fire severity is not increasing currently in the great majority of forests (DellaSala and Hanson 2015, Keyser and Westerling 2017). The presence or absence of such content has the potential to fundamentally influence the way the reader views natural disturbance processes in our forests, as well as forest management responses.

Firestorm devotes far too much attention to describing forests that experienced recent natural disturbances by using terms such as “destroyed,” “devastation,” “catastrophic,” and “carnage.” In this context, the author suggests that dense, old forests, after decades of fire suppression, are too susceptible to severe fires and promotes the role of “resource harvesters,” ostensibly to “reduce the risk of severe and catastrophic wildfires.” Once again, though, important scientific evidence is omitted, including studies concluding that old, long-unburned forests do not tend to burn more severely than other forests (Odion et al. 2010, Miller et al. 2012) and landscape-level research finding that increased logging does not tend to reduce fire severity—and generally has the opposite effect (Bradley et al. 2016). Ironically, if increased logging is intended as a measure to curb wildland fire in a changing climate, current evidence indicates that such an approach would have the net effect of substantially reducing forest carbon storage and increasing carbon emissions (Campbell et al. 2012, Hudiberg et al. 2013).

It is not until near the end of the book that readers are informed that the “list of living things that benefit from wildfire is extraordinarily long.” This statement is followed by an

enlightening and hopeful discussion about the important habitat that is created by fire, including patches of high-severity fire, for numerous wildlife species, including owls, woodpeckers, songbirds, bears, elk, and countless insect species. Regrettably, this content is too little too late, because it comes after more than 200 pages of text that uses value-laden pejorative terms to describe patches of snags (standing dead trees) created by natural disturbance processes. Recent research, however, indicates high levels of wildlife abundance, biodiversity, and ecological value in “snag forest habitat” (Lehnert et al. 2013, Beudert et al. 2015, DellaSala and Hanson 2015).

Firestorm is well written, and the personal accounts are interesting and engaging. Many readers may enjoy the book for these reasons alone. It is with regard to the scientific content that the book too often leaves something to be desired. Overall, the book relies too much on selective and sometimes inaccurate assertions that elicit fear rather than presenting a more complex, and likely more hopeful, narrative informed by a broader summary of current science.

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