Anatomy of the false link between forest fires and anthropogenic CO2

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Summary — In this critical review of the scientific literature about fire, I describe how the false notion of a link between forest fires and anthropogenic CO2 was ignited in 2006 by a fatally flawed article promoted in the science-trend-setting magazine *Science*, and spread like wildfire through the scientific literature and beyond, driven in part by high winds of climate modelling extravagance, while fortunately leaving large unburnt patches. There is no evidentiary basis for such a link. On the contrary, established knowledge about forest fires leads to the conclusion that dedication to teasing out such a link is preposterous: In the present circumstances starting in approximately 1900, the dominant effect is direct human impacts on land use, which causes global fire occurrences to be dramatically less than from the known long-term natural cycles (modern fire deficit). No special circumstances or regions have been correctly identified where forest fire behaviour can be attributed to CO2. Canada's recent Fort McMurray fire is no exception. The claimed 7 g mean birth weight loss arising from mothers' general exposure to CO2-driven southern California wildfires, like all such claims, is a product of statistical and conceptual overenthusiasm. I use concepts from the animal-behaviour scientific literature to explain how some scientists and their followers can get so carried away.

Fire Basics: Drought and Fuel

Basic established facts about forest fires, in hierarchical order, are as follows.[1][2][3]

Forest fires occur on the continents, not on the oceans. Deserts (snow, ice, and sand) and wet tropical forests don't burn; they don't sustain forest fires. Only growing vegetation, subjected to periodic droughts, can sustain recurring fires (Fig. 1).

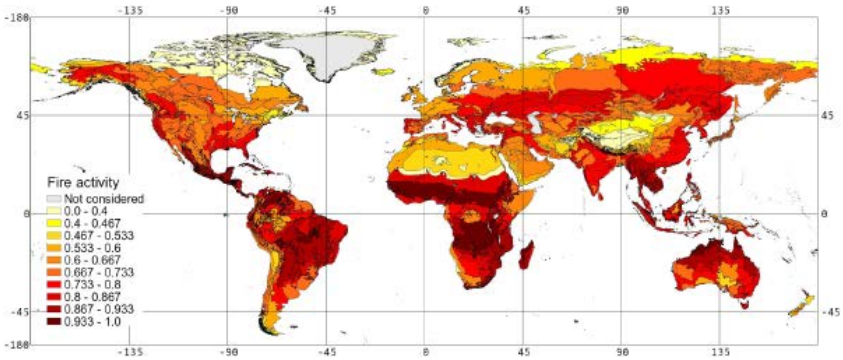

Fig. 1. Global map of fire activity (Pausas and Rebeiro, 2013).

Organic matter is unstable in an oxygen atmosphere and must "burn", either by decomposition (in wet or humid environments) or by fire (in dry environments). Fire is natural and unavoidable. There are currently approximately ten thousand forest fires per year in Canada alone, and approximately one hundred thousand in the USA. Fire regulates the biosphere and bounds evolutionary adaptations in fire-bearing ecosystems. There have been fires since there were plants on the continents.

The dominant determinant of fire occurrence on growth-covered landscapes is drought.[2][3] The dominant limiting control factor on fire extent and severity during drought (or extended dry period) is fuel availability (only the organic-matter fuel can burn, and it only burns once).[3][4][5] Thus, fuel accumulation (growth and aging) limits fire recurrence.

The mechanism whereby drought determines fire occurrence is that flammability of dead or living organic matter is predominantly determined by its water content, which, in turn, is controlled by duration of exposure to dry atmosphere. In chemical terms, both the specific free energy of combustion increases and the free energy barrier for ignition decreases as water-content is lost. Mostly, ecoregion fire occurrences are not ignition limited because there are sufficient ignition events on the spatiotemporal scale of a drought (e.g., lightning, humans). Smokey Bear was fighting a losing battle.[6]

Of course, for individual fires local details will affect fire size and severity, including [7][8][9]:

- water table height and soil humidity
- attained degree of organic matter dryness
- fuel structure, including plant ecology
- history of past disturbances, such as insect attacks (e.g., [10]), animal grazing, past fires, controlled burning, harvesting, and so on
- wind speed during live fire
- terrain, including slope and aspect (slope orientation relative to the sun's path)
- forested-land fragmentation, both natural and anthropogenic
- frequency and spatial distribution of ignition sources
- human fire-fighting response

Known Causes: Climate and Humans

Given the above-described relations, the question of fires becomes: What causes drought? "Climate" is not an answer because droughts are a feature of climate. What causes droughts to occur in the climate?

For the last 170,000 years, since the last glaciation (14,000 years), and in the last 1,000 years, on continental and sub-continental scales, droughts are caused by long-cycle planetary orbit and inclination changes and by short-cycle planetary oscillations in ocean-coupled atmospheric

circulations (annual El Nino Southern Oscillations and decadal Pacific Decadal Oscillations).[11][12][13] These causes of historical droughts and forest fire episodes are conclusive. There is no evidence on these timescales that changes in CO2 caused droughts (or prolonged dry seasonal periods). An effect from CO2 on fires would be an emergent phenomenon.

However, recently, in the latest century or so, there has been a dramatic and sustained *decrease* in forest-fire burnt area on earth (order-of-magnitude decrease in coniferous forests), which is unrelated to patterns of occurrences of drought and which is caused by socio-economic changes in human populations (Fig. 2).[14]

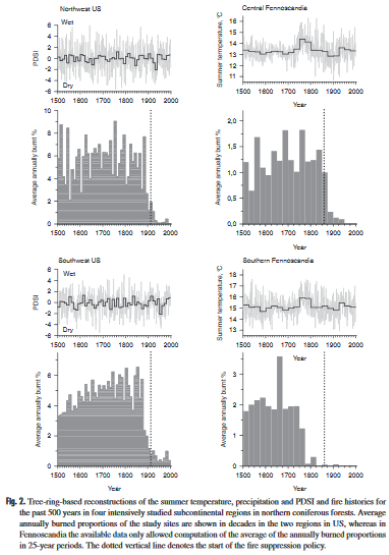

Fig. 2. Modern fire deficit, from tree rings (Wallenius, 2011).

This is an “abrupt climate-independent fire regime change”.[15] The said change is consistent with studies of global human land-use impact on fires, showing supressed fire-burnt areas in association with human population density.[16][17] This is also evident in terms of the largest and most severe fires both documented by humans and recorded in tree rings, which were well above 10,000 km^2 (1,000,000 ha).[18]

A reduced fire occurrence is also detected in preserved charcoal records of lake sediments, although with less resolution and accuracy than with tree rings: “Current fire episode frequency on the west shore of Lake Tahoe is at one of its lowest points in at least the last 14 000 years.”[19]

Thus, human land-use impact has recently moved the global fire regime outside of the natural long-term drought-fire relationship, and into the current period of fire deficit.[3][14][16][17] Human land-use impact is now a dominant determinant of fires on earth and, in special regional

circumstances, can also increase fire-burnt area relative to the newly established deficit value. This occurred in Europe in the mid-20th century, for known socio-economic reasons.[20]

By comparison, the recent efforts to identify an increasing trend or an abrupt increase in forest fire occurrences (occurring after approximately 1900 when the new anthropogenic fire deficit was established) that can be attributed to anthropogenic CO2 appear tenuous at best. Whereas, the long-term natural fire-drought relationship is firmly established, as is the fact that human land-use has (since approximately 1900) permanently supressed fire occurrences far below the natural occurrences, the efforts to tease out an increase that can be attributed to CO2 may not constitute good science, and contain fatal methodological errors (see below).

Setting the Stage to Discover a CO2 Effect

Primates, like other social animals, practice collective detection of danger and cooperative escape. Fearfulness and vigilance are strong evolutionary traits. In addition, human society's dominance hierarchy has developed a multitude of ways to exploit evolutionary traits.[21][22][23][24][25] Scientists, like other humans, are both screaming monkeys and interested members of the societal dominance hierarchy. Such is the relevant animal-behaviour-theory context of establishment-science-genic alarmism.

Here, the development of "awareness" of negative consequences from anthropogenic CO2 has had a palpable influence on forest fire research, and the history of this influence is recorded in the scientific literature.

One example, prior to forest fires becoming part of the anthropogenic CO2 folklore, is the 1996 paper entitled "What is a dangerous climate change?"[26] The paper is typical of many such papers and reports intended to guide the perceptions and interpretations of scientists, while thus providing scientists with a path towards increasing perceived importance of their work. The paper is not anchored in any body of work in the earth sciences. In particular, it makes three forays.

First, it defines "dangerous" [26]:

"A dangerous action is one that may lead to harm. In the context of Article 2 of the [UN Framework Convention on Climate Change] 'dangerous interference with the climate system' may be defined as that leading to climate change within a time frame that is insufficient to allow ecosystems or socioeconomic systems to adapt thus leading to significant damage to those systems."

This is already of concern because many actions "may" lead to harm. For example, investing in and implementing alternative technology on mass scales may lead to harm. More importantly, in terms of the logic, if "ecosystems or socioeconomic systems" do not "adapt" to increasing

CO2 because of slow response times or weak responses, then those systems have, by definition, not changed and not suffered harm from changes.

Second, it redefines "dangerous" as "critical" [26]:

"Closest in meaning to 'dangerous' and having scientific currency is the term 'critical': a condition at or relating to a turning-point or transition. Thus (again in terms of Article 2) a critical level of a climate change is that beyond which further change would have a significant effect on ecosystems or socioeconomic systems."

Here, the authors build-in the notion of a "turning-point" that can occur anytime as atmospheric CO2 concentration increases, and point scientists towards being on the lookout for such "turning-points" or "transitions". Well, some fire researchers found one… (see below).

Third, it clarifies that it's all about the weather [26]:

"We may now define a dangerous or critical climate change as that leading to exceedance of threshold values of weather and climate events (again, defined either in terms of their magnitude or frequency)."

Presumably, a "climate event" in exceedance is a weather event (or several weather events) that, in magnitude, is (are) outside of the climate norm. We see that scientists are being asked to detect precursor events that announce a dramatic change in climate regime (a fireball earth if you like, or an earth of constant and generalized extreme weather devastation), and that the detection of such precursor events, by its nature, is at the limit of statistical analysis using a needed suitable historic database.

It is well known, in medical research for example, that when threshold detection of harm or benefit relies on statistical analyses using imperfect datasets, in an area of human importance, "most published research findings are false" ([27], and see [28][29][30]). Forest fire research provides good examples of this phenomenon (see below).

Impetus from Modelling that is Intended to Detect a CO2 Effect

Next, some Global Circulation Model (GCM) users had a go.

In 2000, Flannigan *et al.* published "Climate Change and Forest Fires" in which they conclude: "The two GCMs in this study suggest increases in [Seasonal Severity Rating] SSR of 10-50% across much of the United States by 2060."[31] There are more methodological caveats and errors with their paper then one can shake the proverbial stick at, such as:

(a) The SSR is not "a final component of the Canadian forest fire weather index (FWI) system". Rather, it is a fire-season average of the daily FWIs, each to an exponential

power, which weighs "the FWI sharply as it rises, in a manner deemed to reflect the control difficulty" of fires.[32]

(b) The FWI is entirely based solely on (local) weather measurements, without including fuel structure or soil properties or evolutions of fuel structure and soil properties or any of the known dominant non-weather factors.[32]

(c) The GCMs do not provide local weather parameters, for correct calculation of FWI. Rather, they provide large-scale (cell-average) weather variables.

Flannigan *et al.* reported only ratios and percent changes of SSR between 2060 and present, without reporting the actual magnitudes of SSR that are obtained from GCM cell-average weather parameters. Without the magnitudes it is impossible to judge the degree to which the GCMs can provide a realistic FWI. Flannigan *et al.* are silent on this foundational aspect of their calculation. So much for science-journal peer review.

Indeed, there are two fundamental problems with any attempt to use a GCM to predict future fire occurrences.

First, fires are known primarily to be controlled by drought (sustained dry weather) and droughts, from a climate perspective on yearly to millennial timescales, are known primarily to be controlled by planetary oscillations in ocean-coupled atmospheric circulations (see above); whereas GCMs do not and cannot model planetary oscillations in ocean-coupled atmospheric circulations. In terms of realistic planetary oscillations, GCMs are toy models.

Second, a specific fire regime (frequency, severity, coverage renewal period) results from a convolution of climate-scale drought cycles and local ground-level conditions because ignition and propagation are a local phenomenon that sensitively depends on local conditions (see above); whereas GCMs do not provide local weather conditions, but only cell-average values.

None of this has deterred GCM enthusiasts.

In 2004, Fried *et al.* published "The Impact of Climate Change on Wildfire Severity: A Regional Forecast for Northern California" in which from their doubling-of-CO2 GCM scenario they concluded a projected doubling of fire frequency and doubling of annual burnt area. Their creative approach involves [33]:

"To capture the direct influence of climatically-induced changes in weather, [Changed Climate Fire Modeling System] CCFMS (1) adjusts local, daily, historical weather data according to percentage changes in the relevant climate statistics predicted on a monthly, regional basis by the [Goddard Institute for Space Sciences] GISS GCM."

This means that they fabricated local-weather conditions by scaling present real local weather data following percentage changes in the scenario-generated GCM cell-average values. Nothing to see here folks… Move along. Actually, there is no *prima facie* justification for this fabrication. One cannot on the one hand appeal to non-linearity and impending "turning-points" while on

the other hand arbitrarily apply linear scaling between dissimilar values, without any expressed and tested reason.

CO2 Effect Found (But…)

Gillett *et al.* (with co-author Flannigan, of GCM prediction fame [31]) in 2004 appear to have been the first to claim an observed forest fire increase that unambiguously can be attributed to anthropogenic CO2: "Detecting the Effect of Climate Change on Canadian Forest Fires".[34] Time again for the proverbial shaking stick. This one is incredible even by current CO2 enthusiasm standards.

Their main figure (Fig. 3) is convincing enough, on its face. It shows total area burned, from 1920 to 2000, with a systematic increase starting at approximately 1970, which follows both an "observed" temperature anomaly and a GCM-calculated temperature anomaly, all three curves displayed on the same graph for the temporal range 1920 to 2000.

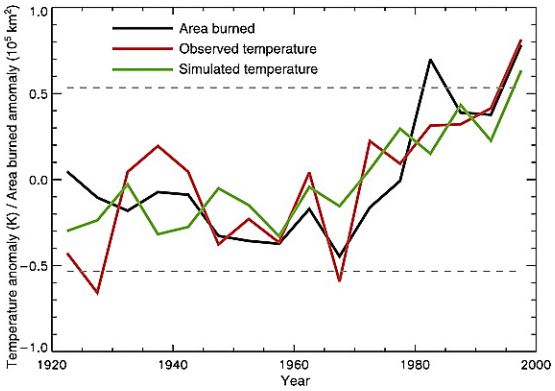

Fig. 3. (Gillett *et al*. 2004)

The problem is: None of the data is what it appears to be. On close examination, we find that the plotted variation in area burned is an artefact. The authors themselves admit:

"Although an attempt was made to account for fires in provinces and territories with incomplete records, prior to the advent of satellite monitoring in the early 1970s some fires may be missing from the record due to lack of observations or incomplete record-keeping. However, the fact that the largest increase in area burned has occurred since 1970 indicates that it is unlikely that the upward trend is purely an artifact of under-reporting …"

In fact, despite it being stated also by others in 2002 [40], it is nonsense to assume that satellite detection of fires suddenly turned on in 1970 to give reliable archival records of continent-scale fire occurrences. The truth is that satellite detection has a continuous history of improvement, that satellite detection itself has significant limitations, and that fires did not start to be reliably detected by satellite programs until specialized infrared bands came on-line in 1984. [35][36]

[37][38][39] Furthermore, paper records kept by government agencies, in the time period of interest since 1900 or so, are notoriously and systematically incomplete (more below).[40][41] Thus, a "trend" like the one proposed by Gillett *et al.* is likely the result of improving fire detection and record keeping.

As the basis for their attribution of the burned area to anthropogenic CO2, Gillett *et al.* state:

"Although forest fires are influenced by a range of climate parameters, such as temperature, humidity, precipitation, wind speed and lightning occurrence, in long term means, temperature is perhaps the best predictor of area burned."

Actually, there is no evidence that "long term means" of temperature is a predictor of area burned, and this very notion is contrary to established knowledge about the causes of fire occurrences. Of course fire-causing droughts (or extended dry periods) are often associated with higher or lower temperatures relative to a longer-term regional average, but this has everything to do with the very nature of a drought and nothing to do with global atmospheric concentration of CO2. A positive or negative correlation between drought and temperature will exist irrespective of CO2.

Next, Gillett *et al.* apply a creative data manipulation that, by design, artificially creates an enhanced correlation between their area burned values and their mean "temperature" values. In their own words, here is how it works:

"In order to give greatest weight to temperature anomalies in fire-prone regions, the temperature in each $5^{o} \times 5^{o}$grid cell ***is then weighted by the total area burned in that grid cell*** over the 1959–1999 period (Figure 1), and a mean is computed over available data, shown by the red line in Figure 2." [Emphasis added]

And the same was done to create GCM "temperatures":

"Five year May–August mean temperature anomalies from an ensemble of three integrations forced with historical greenhouse gas and sulfate aerosol changes were interpolated onto the observational $5^{o} \times 5^{o}$ grid, sampled where observations exist, ***weighted by total area burned in each grid cell*** (Figure 1), and averaged. The resulting ensemble-mean anomalies are shown by a green line in Figure 2." [Emphasis added]

This means that the average fire-season temperature in a cell where fires were occurring was weighted by the burned area in that cell to calculate the final "average". This creates an artificially amplified correlation, which only tells the reader that fire-prone dry areas (cell and season specific) were also hot areas (cell and season specific). It does not relate fire to global climate. Global atmospheric CO2 can affect global climate but it cannot affect temperature in specific cells and selected seasons where fires occur.

The fatally flawed paper of Gillett *et al.* is considered the first finding of a link between forest fires and anthropogenic CO2, and it is cited by several authors as such. But the incorrect notion that forest fires have been shown to be linked to anthropogenic CO2 did not catch on and "go viral" until the research-trend-setting magazine *Science* got involved (see below).

CO2 Breakthrough Reported and Advertised in *Science* (But…)

Any public relations body, such as a government agency or the renowned Union of Concerned Scientists NGO, which has an interest in there existing a link between forest fires and anthropogenic CO2 [42], will prominently cite [43] the most influential paper that reports the said link [44]: The 2006 paper by Westerling *et al.* published in *Science* "Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity". The paper was featured in a Perspectives article in the same issue of *Science* [45], and it has been positively cited extensively by scientific authors who have an interest in global warming. It is therefore important that the article by Westerling *et al*. be critically examined.

Westerling et al.'s main result is a stunning graph shown in their Figure 1(A), which shows wildfire frequency (bars) for large fires (> 400 ha) versus time from 1970 to 2005, compared to mean March through August temperature for the western United States (line) (Fig. 4). There is not a correlation with temperature but, more importantly, there is a notable break at 1984-1985 to higher values in frequency of large wildfires.

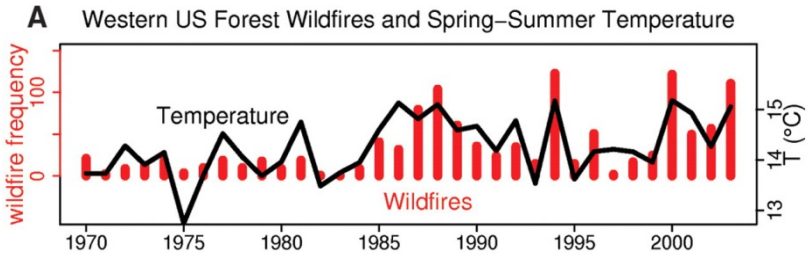

Fig. 4. (Westerling et al. 2006)

Such a sudden break, with constant low and high values on either side of the break, irrespective of the frequent El Nino episodes known to have occurred both prior to and after the break, is suggestive that something new has occurred. Namely, a CO2-induced "transition", or at least an increase that should be attributed to increasing anthropogenic CO2, since higher values of CO2 occur after 1984-1985 compared to the values of CO2 prior to 1984-1985.

Irrespective of any preferred interpretation, the graph (Fig. 4), if it contains good data, must give one pause. The whole package was enough to cause palpable and on-going celebration in the global warming scientific literature. The *Science* Perspectives article emphasized the unprecedented quality of the data [45]:

“Westerling *et al*. used the most comprehensive data set of wildfire occurrences yet compiled for the western United States to analyze the geographic location, seasonal timing, and regional climatology of the 1166 recorded wildfires with an extent of more than 400 ha.”

Note that despite their remarkable data, Westerling *et al*. in their second-last paragraph expressed a caveat, which most citers have ignored [44]:

“Whether the changes observed in western hydroclimate and wildfire are the result of greenhouse gas–induced global warming or only an unusual natural fluctuation is beyond the scope of this work.”

A third possibility is that their wildfire frequency data is unreliable to establish the said break at 1984-1985. In fact, this third possibility is undeniably the case.

Westerling *et al*. identify the sources of their wildfire data in the *Science* on-line material [46]:

“A large-fire history for western U.S. forests was compiled from individual fire records for units of the U.S. Department of Agriculture’s (USDA) Forest Service (**USFS**) and the U.S. Department of Interior’s (**USDI**) National Park Service (NPS) west of 102°W Longitude for which data on large fires were available beginning in or before 1970. Together these National Forests and Parks contain most of the montane and sub-alpine forest area in the contiguous western US (Fig. S1). Fire records were obtained from multiple sources, including point fire records from WIMS/NIFMID (S1) and large fire perimeter records obtained directly from [Geographic Information Systems] **GIS officers** of individual National Forests and Parks.” [Emphasis added]

It turns out that the government databases that Westerling *et al*. used are systematically skewed and notably unreliable for studying time-wise trends. In particular, Short’s in-depth critical review of databases shows that the USDI system was methodologically distinct from the USFS system and superseded the later in 1983 [41]:

“The figures for 1983–2014 are attributed to the Situation Reporting system that generates the estimates of wildfire numbers and area burned in the NICC annual reports described under ‘Data sources’ (see also Fig. 1). However, the same footnote explains that ‘before 1983, sources of these figures are not known, or cannot be confirmed, and were not derived from the current situation reporting process. As a result the figures before 1983 shouldn’t be compared with later data’.”

In addition, dependable satellite-derived fire data is only available dating back to 1984, which is when the Landsat-4 Thermal Mapper (TM) infrared band technology first came on-line [41]:

“For recent decades, remotely sensed fire data are also available, including satellite-derived perimeters, or burn scars, of large (i.e. >405 ha) fires dating back to 1984, from the Landsat-based Monitoring Trends in Burn Severity (MTBS) project (Eidenshink et al. 2007).”

Presumably, the unnamed "GIS officers" that Westerling *et al*. consulted were working from the post-1983 TM satellite data for large fires.[47] As such, this too would create a bias towards more large fires counted after 1983.

Short's review, together with the difficulties in collecting continent-scale field data and the known limitations of satellite measurements of fires [35][36][37][38][39], are devastating for any author who has used government statistics that include data for fire events prior to 1984 to study frequency and burned-area trends. These studies must be considered fatally flawed and unreliable at best, or even negligent in overlooking systemic time-bias.

Consequently, many researchers have, since the forays of Gillett *et al.* and Westerling *et al*., limited themselves to post-1983 satellite-validated fire data in searching for trends. For example, Dennison *et al*., in citing Westerling *et al*.'s study, commented [48]:

"While MTBS data are limited in temporal extent due to a lack of 30 m resolution satellite data prior to 1984, the data have important advantages over longer, less complete fire databases previously used for trend analysis."

Unfortunately, not all researchers are alive to the fatal inadequacies of government databases for fires occurring prior to 1984, and the journal reviewers don't seem to know a lot about satellites or about administrative and practical limits to field-data collection. One nasty example is provided by Litschert *et al*. who claim [49]: "Our summary of historical wildfire records from the national forests of the [Southern Rockies Ecoregion] SRE from 1930 to 2006 revealed an order of magnitude increase in the annual number of fires recorded over the full time period and in the number of large fires since 1970." An examination of their paper, and of their Figure 3(b), in light of the above discussion, shows that their claim is untenable.

Recently, Higuera *et al*. have even gone so far as to conclude, assuming (in particular) that the break at 1984 is real, that the very "strength and nature" of the "fire-climate relationship" changed…[50] Scientific creativity is boundless, if you can get away with it.

CO2 Climate Trends in Post-1983 Fire Data?

Next came the authors who limited themselves to post-1983 data and claimed to detect real increasing trends in this data, in the perspective of attributing these trends to anthropogenic CO2.[48][51] The said increasing trends are statistically weak and result from limited data and from not applying rigorous error analysis on the trend values. Studies using larger datasets on the same geographical regions, with more rigorous statistical analyses, find that the conclusion of any increasing trend cannot be substantiated.[52][53]

More importantly, these "trend wars" don't matter. As reviewed above, the direct effect of humans on the landscape, in determining fire occurrences and extent, is the dominant current-era anthropogenic effect. Given that the direct human effect has caused such a dramatic

change since approximately 1900 in real fire behaviour (seen in tree rings and lacustrine sediments, not government archival records) and given that this direct human effect changes geographically and in time at the same time that atmospheric CO2 is increasing, it is unreasonable to expect that one might tease out an effect from anthropogenic CO2 on the time-scale since 1984.

It generally makes little sense to attribute any recent trends (increasing or decreasing or suddenly changing) to CO2 since we are incontrovertibly in a fire-deficit modern era in which direct human land use dominates and is constantly changing. For example, in the words of Marlon *et al*. [54]:

"Consequently, a fire deficit now exists and has been growing throughout the 20th century, pushing fire regimes into disequilibrium with climate. Hence, while current levels of large-scale biomass burning remain within the realm of natural variability during the past 1,000 y, if levels of burning were to come into equilibrium with climate, they would exceed the natural range of variability experienced in at least the last 3,000 y."

But the Thing Has a Life of Its Own

At this stage, unfortunately, it does not seem to matter that there is no evidentiary justification for thinking that there is a link between forest fires and anthropogenic CO2, and that there are incontrovertible reasons to conclude that the causes of fire phenomenology are to be found elsewhere. None of this matters to pundits and interested scientists. Ever since the promotion in *Science* of the Westerling *et al*. study the spin has been stratospheric.

Millar *et al*., without referencing any sources, exclaimed [55]: "The earth has entered an era of rapid environmental changes that has resulted in conditions without precedent in the past no matter how distantly we look."

The *Science* reviewers and commentators went berserk.[56][57]

GCM users saw a golden opportunity. It's perfect. One simply postulates that fire regime changes will occur on regional levels from increased "climate variability" (i.e., permanent regional weather regime changes), in turn postulated to arise from CO2-driven global warming. Then one simulates global warming using GCMs that cannot calculate local weather or any of the realistic natural cycles that are known to have determined fires in the past, while not providing any testable justification for the further postulates that one uses to fabricate a connection between what GCMs can calculate (cell-scale parameters) and what actually matters in causing fire (weather).

This results in often dire predictions of a future burning planet, based on nothing more than unsubstantiated postulates. Such modelling studies deserve to be called "modelling porn" (e.g., [58][59][60][61][62][63]).

It gets better. Allen *et al*. concluded that there is an emergent increasing risk of increased forest fires, on the sole basis of an analysis of the increasing numbers of scientific papers that predict a future with increased forest fires.[64] There you have it. Baseless alarmism is a reason to be alarmed. The feedback mechanism of collective escape from falsely detected danger, identified in birds and monkeys, is exemplified in the "scientific" literature of forest fires.

And on and on. A recent reviewer in 2015 decided to comprehensively evaluate the "evidence base for observed impacts of climate change", and relied on the study of Allen *et al*., among others.[65] This reviewer gave forest fires the second highest grade of 4 out of 5 for "extent of evidence base". It would be comical if there were not real negative consequences from the practice of alarmism (see below). The reviewer gives lip service to the caveats in attributing environmental changes to anthropogenic CO2, but then does not critically examine any of the reported actual evidence and does not find a single specific attribution to be in question.

Conclusion

There is no evidence-based likelihood that there is a link between forest fires and anthropogenic CO2. On the contrary, established knowledge about forest fires leads to the conclusion that expecting to find such a link is preposterous in the present circumstances in which the dominant effect causing fires since approximately 1900 to behave outside of the long-term natural cycles is direct human impacts on land use, which vary and increase with increasing population. No special circumstances or regions have been identified where forest fire behaviour can be attributed to CO2.

The on-going flurry of alarmism in fire research is traced to a fatally flawed 2006 publication that was promoted in the research-trend-setting magazine *Science*. The authors of that paper failed to recognize the systematic errors present in government archival records of fires, and the fact that satellite detection and characterization of fires was virtually impossible without field confirmation until infrared sensors were implemented in Landsat-4 in 1984.

Too many scientists in the fire research community (and beyond) were overly enthralled by the news and allowed themselves to over-interpret data and to overstate the potential that CO2 could affect modern-era fire behaviour. The spectacle, recorded in the scientific literature, is worthy of the wildest rush of screaming monkeys for the trees to avoid a falsely detected predator.

As with all such rushes, the waste of resources and the loss of attention for valued activities harm the society and the individual. The waste and loss in this case are substantive, since research budgets don't grow on trees. The thus depreciated science is then used in designing expensive management, education, health and safety policies.

Here are a few examples of ridiculous excess, to make the point. In their review paper exploring the risk caused by climate change to children's health, Berntein and Myers describe potential health effects from the added stress on availability of clean air and cite the said fatally flawed paper and followers.[66] In the same line, Holtius *et al*. claim a 7 g mean birth weight loss arising from general exposure to Southern California wildfires, again by citing the said fatally flawed paper.[67]

The alarmism may also be damaging in more subversive ways. It may contribute to making us stupid? In a sociological study, Brenkert *et al*. found conclusively that, among urban-forest interface inhabitants, the more one believed in global warming the less one is likely to take the promoted and recommended practical steps to protect one's home and family from forest fire.[68]

Given the magnitude of systemically funded, career-rewarded and promoted climate alarmism, it is also possible that widespread institutional alarmism is intended to deceive and manipulate the Western middle-class.[69]

Author's Relevant Experience

I am a former Full Professor, tied to both physics and earth sciences departments, University of Ottawa, Canada. I have published over 100 scientific articles in a wide range of areas, including on the following relevant topics: the boreal forest, lacustrine and marine sediment profiles, the Chinese loess-paleosol climate sequence, spectroscopy, organic molecules, theory of organic-matter decomposition, mechanisms and thermodynamics of chemical reactions, soil science, Bayesian statistical theory, error methods in non-linear fitting of data with models (link) (link). For five years I was the lead scientist of a large government-funded research group (6 to 18 members) focussed on the boreal forest. I have direct experience with the research-trend-setting journals *Science* and *Nature*, as an author, avid reader, and by interaction with a recruiter of potential authors. I have lectured government scientists about spectroscopy for remote (satellite) sensing. I have made calculations of planetary radiation balance and CO2 sensitivity (link). My father was a forest worker and I am a wild-forest camping enthusiast. I have seen many recent and old forest fires. I am old enough to have known Smokey Bear. I have never received funding or benefits from an energy industry, and have no conflicts of interest. My contributions to the climate change debate are listed here: Link.

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