Review Paper

California Wildfires: Role of Undisclosed Atmosphere Manipulation (Geoengineering)

ABSTRACT

Aims: In this Review we aim to reveal unacknowledged causality leading to increases in combustibility, intensity, and extent of California wildfires and concomitant harm to human and environmental health.

Methodology: We review literature, including scientific and medical, and evidence, including photographic, of near-daily, near-global jet-spraying particulates in the atmosphere as related to wildfires.

Results: The U. S. Air Force has misled the public by falsely asserting that the observed aerial particulate trails, called chemtrails by some, does not exist, and that the observed trails are harmless ice-crystal contrails from aircraft exhaust. That assertion is refuted by testimony of retired U. S. Air Force Brig. Gen. Charles Jones and photographic evidence. We review the evidence that atmospheric manipulation utilizing aerosolized coal fly ash is a primary factor in the extent and severity of forest fires in California and elsewhere; adverse effects include exacerbation of drought, tree and vegetation die-off and desiccation, and unnaturally heating the atmosphere and surface regions of Earth. Forest combustibility is increased by moisture-absorbing aerosolized particles that damage the waxy coatings of leaves and needles, reducing their tolerance to drought. The aerial climate manipulation using coal fly ash greatly increases the potential for forest fire ignition by lightening. Wildfires dramatically worsen baseline air pollution, emitting harmful gases and volatile organic compounds, and they both concentrate and re-emit toxic elements and radioactive nuclides over a wide area. The type of air pollution created by wildfires is associated with increased all-cause mortality, with the greatest impact on respiratory and cardiovascular disease. Studies have shown that aerosolized coal fly ash is an important risk factor for chronic lung disease, lung cancer and neurodegenerative disease.

Conclusion: Failure to recognize its multifold adverse consequences and halt jet-spraying particulates into the atmosphere, we submit, will continue the progression of ever-accelerating ecological disasters.

Keywords: wildfires, climate modification, atmosphere modification, forest fire health hazard, coal fly ash, geoengineering

1. INTRODUCTION

The California, USA wildfires (Figure 1) are symptomatic of far more serious anthropogenic phenomena adversely affecting flora and fauna, including humans, worldwide. The California wildfires are thus a microcosm of wildfires worldwide. Climate change, specifically increased temperatures and decreased atmospheric water vapor [1-3], is considered a key factor driving California, regional and global wildfire increases. We agree with the assertion [4] that “human-caused climate change is now a key driver of forest fire activity in the Western United States,” but the explanation proffered is grossly insufficient. Although wildfires are to some extent natural occurrences [5], the undisclosed, unnatural manipulations of our planet’s atmosphere and hydrosphere that we describe in this review heat the atmosphere, exacerbate combustibility, and wreak anthropogenic environmental havoc of unprecedented magnitude.

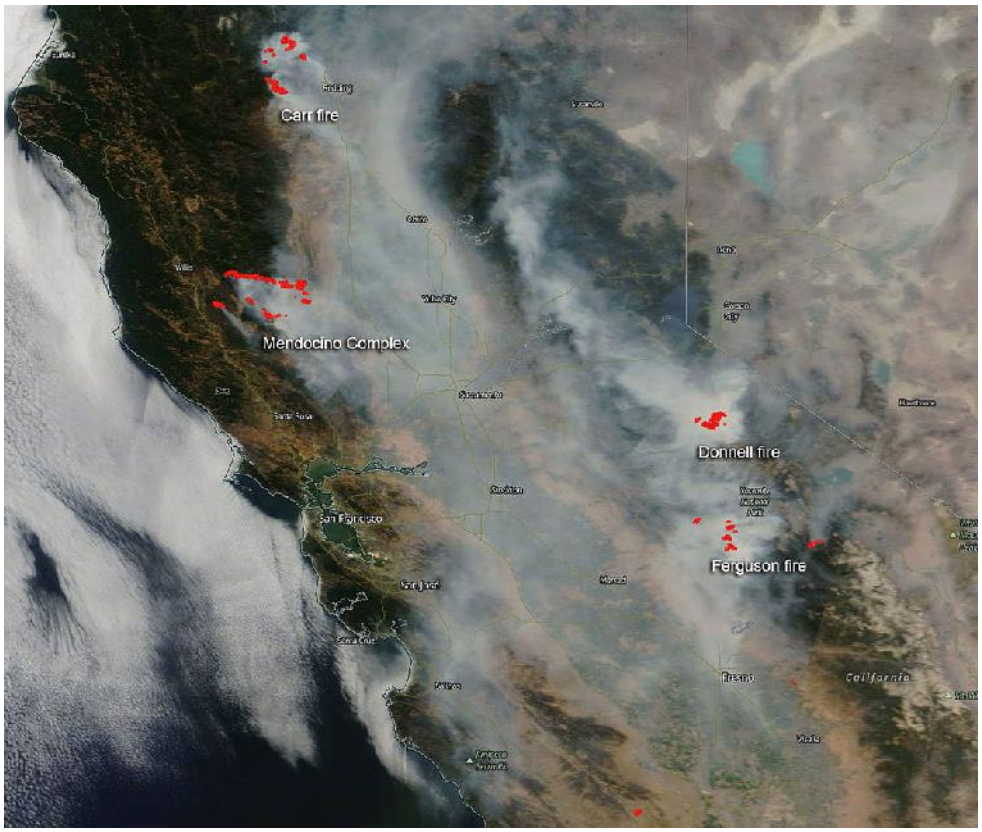

Figure 1. August 7, 2018 NASA image of the California wildfires, the largest in state history [6].

On December 12, 2017, the U. S. Forest Service reported that an additional 27 million trees, mostly conifers, died throughout California since November 2016, bringing the total number of trees that have died to a historic record of 129 million on 8.9 million acres [7]. Forest die-offs, with concomitant wildfires [8], are not confined to California, but are occurring globally [9]. The usual explanations given for the die-offs are combinations of global warming, drought, and bark beetles [10,11]. These explanations, however, are just consequences of a more fundamental human-caused attack on Earth's natural processes that has not been reported by academic scientists [12], but is the subject of this review.

The unprecedented numbers of tree deaths, while providing ready fuel for wildfires, is just one adverse consequence of the unnatural environmental manipulations that exacerbate the potential for major destructive wildfires whose occurrences are increasing in California and, indeed, globally. Here we review the consequences of those unnatural and unreported climate manipulations with particular emphasis on their adverse implications to wildfires and to human health.

2. AEROSOL PARTICULATES SPRAYED WHERE CLOUDS FORM

Those who have lived in Southern California for many years, like author JMH, may remember when the skies were cerulean blue, often devoid of clouds, and when soon after sunset the air temperature would plummet. But no longer; now California skies are filled with jet-laid particle trails, the state is experiencing its own form of 'global warming', and the air temperature very slowly lowers a bit after sunset. These are the consequences of the deliberate jet-laid particulate pollution trails. After exiting the jet as trails, they spread out, briefly resembling cirrus clouds, before becoming a whitish haze in the sky. Heavy aerial spraying can make the sky artificially overcast, sometimes with a brownish hue. Figure 2 shows examples of the consequences of such aerial particulate spraying in San Diego, California, USA on days devoid of natural clouds.

Figure 2. Examples of deliberate jet-sprayed particulate pollution of San Diego skies on days devoid of natural clouds. From [13] with permission.

An article published December 6, 1958 in *The Bulletin* newspaper (Bend, Oregon, USA) reports one Congressman's complaint to the U. S. Air Force and describes jet trails in the sky over Palm Springs, California, USA as *"so thick that they are beginning to blot out the sun"* and are *"not disappearing but are breaking down into a haze and creating a cloud-like appearance in the sky"* [14]. Subsequently, observations with ever increasing frequency of similar aerial jet-laid trails have been made by thousands of concerned citizens in California and around the world [15-17]. Sometime about 2010 the aerial particulate spraying became a near-daily, near-global activity, presumably through secret international agreement [18].

Initially the aerial particulate spraying was conducted in the United States by U. S. Air Force jets, like the one shown in Figure 3 spraying over Palm Springs, California (USA). As the intensity, duration, and geographical area progressively increased undisclosed contractors became involved in the aerial pollution.

Figure 3. U. S. Air Force jet spraying particulate trails in the air above Palm Springs, California (USA). Photos courtesy of Dan Dapper.

Figure 4 is a time-sequence of photographs showing the particulate trail evolving from jet-spraying to natural spreading and thinning in the air on the way to becoming a white haze in the sky. All images were taken with the same magnification. The “t = 0 min.” image was photographed in Coronado, California (USA) at 10:59 PDT on August 19, 2018 and shows one trail that was just emplaced; 13 minutes later the trail has somewhat spread out; at “t = 31 min.” a second trail appears; and, at “t = 105 min. the two trails have considerably spread out on their way to contributing to the white haze in the sky.

Figure 4. Time sequence of photographs taken at the same magnification of particulate-trail spreading. Photos by author JMH.

This spreading is characteristic of particulate matter being sprayed and is wholly uncharacteristic of ice-crystal contrails, which potentially can form under certain very unusual conditions, i.e., if the aircraft exhaust contains appreciable moisture, the atmosphere is very cold and very humid, and the plane is flying at lower altitudes where air pressures are higher and ice-crystal evaporation time is reduced [19,20]. In usual circumstances, especially with modern jet aircraft, ice-crystal contrails, if they do form, quickly evaporate to become invisible water gas. Jet engine-exhaust ice-crystal contrails do not produce long trails across the sky and do not produce a white haze in the sky.

2.1 Systematic Misrepresentation of Aerial Particulate Spraying

The 2005 U. S. Air Force Document AFD-0561013-001 lied about the aerial spraying and set forth the "contrail" basis for public deception. A section of that document entitled *The Chemtrail Hoax* states in part: *"There is no such thing as a 'Chemtrail'* [a term some use to describe the aerial spraying] … *Contrails* [ice crystals from aircraft exhaust moisture] *are safe and are a natural phenomenon. They pose no health hazard of any kind"* [21].

About contrails, retired U. S. Air Force Brig. General Charles Jones reportedly issued in part the following statement [22]: *"When people look up into the blue and see white trails paralleling and crisscrossing high in the sky little do they know that they are not seeing aircraft engine contrails, but instead they are witnessing a manmade climate engineering crisis facing all air breathing humans and animals on planet Earth.... Toxic atmospheric aerosols [are] used to alter weather patterns, creating droughts in some regions, deluges and floods in other locations and even extreme cold under other conditions...."*

Concerned citizens have taken numerous photographs showing that the particulate trails observed are physically inconsistent with being ice-crystal contrails [17]. Figure 5 consists of four photographs

of a Qantas passenger jet taken over a period of less than two minutes. These four images conclusively demonstrate that the aerial particulate spray-activity undertaken by this commercial jetliner flying over Palm Springs, California is impossible to be confused with ice-crystal contrails.

Figure 5. Photographs of a Qantas passenger airliner spraying erratic and interrupted particulate-trails wholly inconsistent with ice-crystal contrails without the aircraft having crashed from engine failure. Photos courtesy of Dan Dapper.

The upper-left, high-magnification photograph shows the Qantas passenger-jet engaged in aerial particulate spraying. The upper-right, low-magnification photograph shows the very long particulate trail, but note: The particulate density is not uniform along the trail length. Part of the particulate trail seems either to be missing or greatly reduced, indicating a malfunction. The lower-left photograph, like the upper-left, taken about one minute apart, shows the particulate spray mechanism to be still operational. But less than one minute later, the particulate spray mechanism ceases to operate, as shown by the lower-right photograph. Such a circumstance would be impossible for contrails. If those were ice-crystal contrails, their stoppage would have indicated engine failure; the airliner would have crashed.

Figure 6 shows two images of the same FedEx cargo aircraft spraying particulate trails in the sky over Palm Springs, California. Note that one of the trails is not associated with an engine. Spray outlets are typically located near engines so as to give the (false) illusion that the trails are coming from the engines. In the instance shown in Figure 6, one trail is not associated with an engine at all, demonstrating that the aerial spray cannot be a contrail; genuine contrails, which are rare with modern jet engines, must have engine exhaust and can form only under very special cold and humid conditions, if they can form at all.

Figure 6. A FedEx cargo plane displaying one particulate trail not associated with engine exhaust and therefore not a contrail. Photos courtesy of Dan Dapper.

There has been no publically available information as to what substance(s) is being sprayed. Absent reliable information, citizens took post-spraying rainwater samples and had them analyzed at commercial laboratories. In most cases, they requested only aluminum analysis, sometimes also barium, and rarely, strontium as well. The detected presence of these elements dissolved in rainwater was mistakenly assumed to mean that those three elements were being sprayed into the air as metals. That is not the case. What the data mean is that moisture in the air dissolves and extracts some elements from the main jet-sprayed substance.

To understand by analogy the chemical process involved, consider the hypothetical example of finely powdered tea leaves being sprayed into the region where clouds form. Atmospheric moisture would

"brew" the tea, extract tannin and other chemicals, which would come down as rain, with chemical signatures of tea. The rain would indeed be tea, albeit very weak tea.

3. Evidence Consistent with Toxic Coal Fly Ash Aerial Spraying

As the aerial spraying became a near-daily activity in San Diego (USA), one of us (JMH) began a series of investigations aimed at ascertaining the composition of the aerosolized particles. Comparing Internet-posted 3-element rainwater analyses to corresponding experimental water-extract analyses of a likely aerosol provided the first scientific forensic evidence that coal combustion fly ash is consistent with the main particulate-pollutant substance being jet-sprayed into the atmosphere [23]. Later, comparison of 11 similarly-extracted elements validated that result [24]. Further consistency was demonstrated by comparing coal fly ash analyses to 14 elements measured in air-filter trapped outdoor aerosol particles [25] and to 23 elements measured in aerosol particles brought down during a snowfall and released upon melting [24,26].

During formation, coal traps chemical elements present in the environment, many of which are harmful to human and environmental health [27]. When coal is burned by electricity-producing utilities, about 10% remains as ash. Burning coal thus concentrates the harmful elements in the ash. The heavy ash that is formed settles beneath the burner. The light ash, called coal fly ash (CFA), forms by condensing and accumulating, typically as tiny spheres (Figure 7), in the hot gases above the burners [28,29]. This is an alien environment with no counterpart in nature, except in coal-deposit fires. Consequently, many of the elements present in CFA, including aluminum, are readily extracted by exposure to moisture [30]. Coal fly ash, newly formed above the burner, would exit smokestacks, if not trapped and sequestered, as required by Western nations.

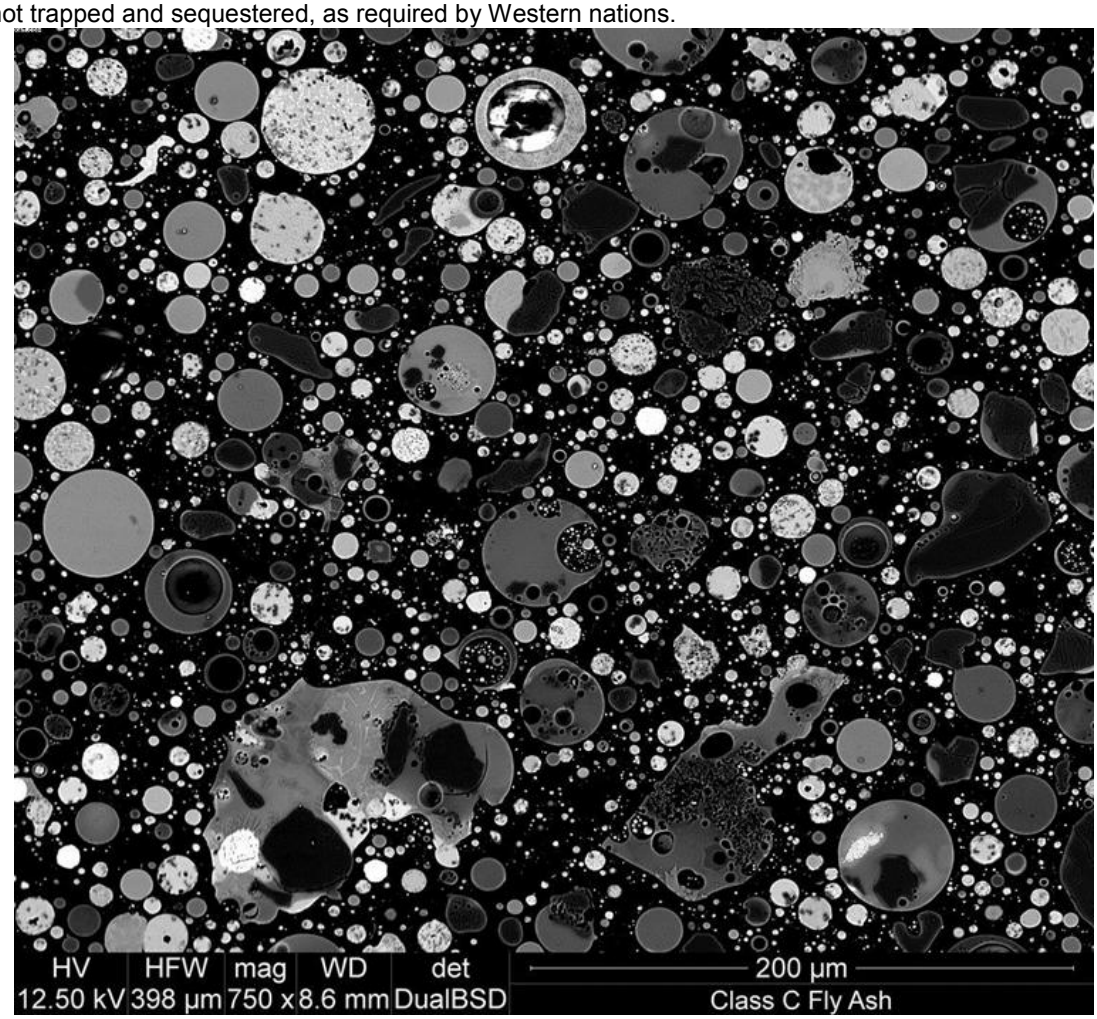

Figure 7. Polished cross section of ASTM C 618 Class C coal fly ash embedded in epoxy. The image was obtained from back-scattered electrons which show differences in atomic density represented by variation in gray scale. Photo courtesy of Wabeggs: CC BY-SA 3.0.

Being one of the world's largest industrial waste products, the annual global production of CFA in 2013 was estimated to be 600 million metric tons [31]. Coal fly ash is a cheap waste product that requires little additional processing for use as a jet-sprayed aerosol as its particles form in sizes ranging from 0.01 – 50 microns (μm) in diameter [32]. Moreover, CFA's ability to be partially extracted into atmospheric moisture, thus making moisture droplets more electrically conducting [30], is both unique and highly desirable for some purposes.

From time to time, other substances may be used for specific purposes or added to the CFA, for example, to minimize clumping caused by van der Waals forces. Nevertheless, the ubiquitous presence of CFA-extractable elements found in rainwater in California and around the world indicates that the main substance sprayed into the regions where clouds form is consistent with CFA. Coal fly ash – cheap, widely available, and with useful properties – is thus an ideal aerosol, if one has absolutely no concern for human and environmental health.

4. CONSEQUENCES OF AERIAL PARTICULATE SPRAYING

The purposes of the aerial spraying, like the composition of the aerosol particulates, are closely held secrets. The physical behavior of the aerosol particles, however, is known or can be deduced. Thus, one may not know the intentions, but one can reveal the consequences of the aerial spraying.

4.1 Inhibiting Rainfall

The aerosol particles being jet-sprayed into the regions where clouds form are in fact pollution particles. In 2003 NASA [33] produced a webpage animation entitled "Particulates Effect on Rainfall" which contained the following explanation: "*Normal rainfall droplet creation involves water vapor condensing on particles in clouds. The droplets eventually coalesce together to form drops large enough to fall to Earth. However, as more and more pollution particles (aerosols) enter a rain cloud, the same amount of water becomes spread out. These smaller water droplets float with the air and are prevented from coalescing and growing large enough for a raindrop. Thus, the cloud yields less rainfall over the course of its lifetime compared to a clean (non-polluted) cloud of the same size."* NASA thus provided an easy to understand explanation of one of the principal consequences of the aerial spraying, preventing rainfall, although it is an incomplete explanation as it does not mention the downpours, deluges, and storms that may occur when clouds become too overburdened with moisture.

4.2 Heating the Atmosphere

Among other reasons, life on Earth is possible because its natural processes maintain a very delicate thermal balance. Our planet continuously receives a vast amount of energy from the sun, through a broad energy spectrum, as well as producing some heat energy internally. Essentially all of that energy must be continuously radiated into space as heat (infrared radiation). Pollution particles sprayed into the region where clouds may reflect some solar radiation, but they also absorb radiation, become heated, and then transfer that heat to the atmosphere by collisions with atmospheric molecules. Coal fly ash is known to be an efficient radiation absorber [34]. The consequence is that the surrounding atmosphere is heated, its pressure increases, and Earth fails to lose the requisite amount of heat thus leading to global warming.

Some in the scientific/academic community, while ignoring the ongoing aerial particulate spraying, promote the fallacious idea that at some time in the future it might be necessary to place particles into the atmosphere to block some sunlight, 'sunshades for the Earth,' to counteract supposed greenhouse gas global warming [12,35]. That is a simplistic proposition that is misleading and incorrect, a circumstance not unlike dousing a fire with gasoline to cool it down. Instead of global cooling, the on-going aerial particulate spraying is causing global warming. Even the increased jet traffic exacerbates global warming [36].

4.3 Heating the Surface Regions

The aerosol particles, jet-sprayed into the atmosphere where clouds form, do not remain there, but are circulated by atmospheric convection currents, eventually settling to ground where they absorb solar radiation. If they happen to land on ice or snow they change the reflective properties (albedo) causing less light to be reflected and more to be absorbed, thus adding to global warming [37].

4.4 Making Atmospheric Water More Electrically Conducting

Coal fly ash, which formed in the unnatural environment above coal-burners, when subjected to water results in many of its chemical elements to some extent being dissolved in the water. Laboratory studies have shown that as many as 38 such elements are dissolved to some degree and cause the water to become quite electrically conducting [30]. Making atmospheric moisture more electrically conducting may potentially be exploited to further heat the atmosphere with microwaves, like heating water in a microwave oven, or using electromagnetic energy to facility movement of weather masses.

4.5 California Drought Caused by Aerial Particulate Spraying

Our planet rotates and some of its rotational energy is transferred to the atmosphere; that is the primary mover of weather masses. Additionally, weather masses move, driven by differences in pressure, from high pressure to low pressure regions; not the reverse. The near-daily, year-after-year aerial particulate spraying along the California coast and off-shore in the Eastern Pacific Ocean heats the atmosphere. The nearly continuously heated atmosphere results in nearly continuously elevated atmospheric pressures. That artificially-created high-pressure zone along California's coast acts like a wall to prevent the flow of Pacific Ocean moisture-laden weather masses from coming ashore (Figure 8). The consequence is a persistent artificial drought for California. As one author (JMH) observed, sometimes after a weather forecast predicting rain in a few days, the spray-jets intensify their spraying thus often preventing the predicted rain.

Figure 8. NASA Worldview of the California coast on December 11, 2017.

4.6 Causing Tree Death

Aluminum is one of the major elements of Earth's crust, but it is locked up tightly with other elements, especially oxygen. Consequently, neither plants nor animals developed the ability to live well in an environment with aluminum in a 'chemically mobile form' in which it is dissolved in water [38]. One of the consequences of the aerial spraying of CFA is that atmospheric moisture extracts aluminum in a 'chemically mobile form' [30]. Trees, especially conifers, all along the coast of California, are watered by fog that is contaminated with dissolved aluminum and other toxins. The fog-water condenses on the needles, where the toxins become concentrated by partial evaporation. Eventually, the toxin-bearing fog water drips to the ground and slowly poisons the trees thus weakening their defenses to bark beetles and other pathogens [39]. Figure 9 shows two dead Torrey Pines silhouetted against the toxin-sprayed sky that, we submit, is the primary underlying cause to tree-death along the coast of California.

Figure 9. Dead endangered Torrey Pines in San Diego backlighted by sky perverted by toxic aerial spray. From [39] with permission.

Coal fly ash, jet-sprayed into the atmosphere, contains substances, such as chlorine, that can damage Earth's atmospheric ozone which shields the surface from the sun's deadly ultraviolet light. Exposure of trees to increased levels of ultraviolet radiation is capable of further weakening the trees' natural defenses [39-42].

In addition to facilitating wide-spread tree-death, CFA jet-sprayed into the atmosphere may be a primary cause of the global, dramatic decline of bee and insect populations and diversity [43]. Pollinator and tree die-offs have major adverse impacts on the agricultural and forest-products industries.

5. AERIAL PARTICULATE SPRAYING EXACERBATES WILDFIRES

The following circumstances contribute to the proclivity for wildfires in California. Coal fly ash persistent aerial spraying, near-daily, year-after-year, along the coast and in the Eastern Pacific Ocean offshore of California causes:

- The widespread and persistent aerial particulate spraying, especially along the coast of California, has created an long-term artificial drought by inhibiting rainfall and by blocking moisture-laden weather fronts from moving in from the Pacific Ocean with a coastal-wall of artificial high-pressure zones [44].
- In addition drought conditions caused by aerial spraying of particulate-pollutants, which damage trees and exacerbate wildfire risks, there is another adverse consequence. Coal fly ash, and perhaps potentially other aerosolized substances, is capable of absorbing moisture. Moisture-absorbing particles have been shown to damage the waxy coatings of tree leaves and needles which reduces their tolerance to drought [45]. Dead trees and desiccated vegetation provide readily combustible wildfire fuels.
- The aerial particulate spraying has significantly increased California temperatures through particulate-caused atmospheric heating and reduction of Earth's necessary and natural heat

loss. Warm air with unnaturally high temperatures increases and exacerbates the risk for forest fires [46,47].

- Increased lightning strikes from unnaturally dry and aerial particulate electrostatic charges increase the number of wildfires [48].
- Although speculative, the possibility should be considered that perhaps the aerosolized particulate matter upon settling on trees and vegetation may under some circumstances become pyrophoric, capable of ignition [49-52].

6. ADVERSE HUMAN HEALTH CONSEQUENCES OF WILDFIRES

Wildfire smoke is an important and growing risk to public health. Systemic review shows a positive association between exposure to wildfire smoke (including particulate matter $PM_{2.5}$) and all-cause mortality and especially respiratory disease, including pneumonia, asthma, and chronic obstructive pulmonary disease (COPD). Susceptible populations include people with respiratory and cardiovascular disease, older adults, children, and pregnant women [53]. Analysis of an extensive wildfire season in California (2015) showed elevated risks for both cardiovascular and cerebrovascular disease, especially in adults over 65 [54]. A multi-year study of exposure to wildland fire episodes in the U.S. (2008-2012) revealed major public health and economic burdens, with certain population subgroups disproportionately affected [55]. Besides adverse effects on respiratory and cardiovascular disease, general categories of health risks from forest fires include acute smoke inhalation, burns, heat-induced illness, ophthalmic (eye) disease, and psychiatric problems [56].

Wildfire smoke consists of particulate matter (PM) and gaseous products of combustion. PM_{10} particles (which are able to pass the upper respiratory tract and deposit in airways), and the smaller $PM_{2.5}$ particles (which can go deeper into the lungs) are produced by burning vegetation. Gaseous emissions, including carbon monoxide, nitrous oxide, and benzene, are produced, as are polycyclic aromatic hydrocarbons (often present on PM), aldehydes, and volatile organic compounds [56]. Several studies have documented the remobilization of metals from fire events, and significant levels of toxic (e.g. lead/mercury) and non-toxic metals are emitted into the environment during fires [57]. Ash from California fires was found to contain toxic levels of heavy metals including arsenic, cadmium, and lead [58]. Wildfires concentrate radionuclides, especially radiotoxic polonium-210, reaching levels of 7,255 ± 285 Bq/kg [59].

Due to the sporadic and unpredictable nature of wildfires and the tendency for air pollution monitors to be situated in urban centers, there have been few studies of the toxicity of wildfire smoke particulate matter (PM). However, a study of toxicity of coarse and fine PM from the California wildfires of 2008 showed wildfire PM was more toxic to the lungs than equal doses of PM collected from ambient air from the same region during a comparable season [60]. The wildfire coarse PM is about four times more toxic to alveolar macrophages than the same sized PM from normal ambient air (no wildfires). The majority of the toxic effects (cytotoxicity) of wildfire PM in the lungs are a result of oxidative stress. Active components of coarse PM from wildfire particulate matter include heat-labile organic compounds [61]. In California there is heavy use of pesticides in agriculture including at the urban interface. When wildfires burn, these chemicals and their combustion products are volatilized and can be inhaled by humans. Toxic components of forest fire/wildfire smoke and ash are typically transported long distances from the source of the fire [62].

7. ADVERSE HEALTH CONSEQUENCES OF AERIAL SPRAYING

7.1 Health Issues Related to Air Pollution

Air pollution is already the leading environmental cause of disease and death worldwide, and it is increasing at an alarming rate [63]. Exposure to ambient fine particulate matter ($PM_{2.5}$) air pollution is a significant risk factor for premature death, including ischemic heart disease, chronic obstructive pulmonary disease, and respiratory infections [64]. Long-term, cumulative exposure to fine particulate matter in the United States is associated with all-cause mortality, cardiovascular disease, and lung cancer [65]. In recent years, emerging evidence from clinical, observational, epidemiological and experimental studies strongly suggest that Alzheimer's Dementia, Parkinson's, and thrombotic stroke are associated with ambient air pollution [66]. Children residing in highly polluted urban environments were found to have cognitive deficits, and the majority of them showed brain abnormalities on MRI [67].

7.2 Health Issues Related to Aerosolized Coal Fly Ash

Climate manipulation utilizing aerosolized coal fly (CFA) constitutes a deliberate, undisclosed and global form of air pollution. Coal fly ash is also an extremely dangerous form of air pollution, with far-reaching implications for human and environmental health. Coal fly ash contains $PM_{2.5}$, ultrafine (UFP) (0.1-1 um) and nanometer-sized (<100 nm) particles [68]. UFP's are among the most toxic particles based on their greater number, larger content of redox active compounds, greater surface-to-mass ratio, and ability to penetrate cell walls [69]. Characterization of CFA particles by transmission electron microscopy reveals spherules often embedded in a silicon matrix containing metals including iron and aluminum [68]. Bioavailable iron, associated with reactive oxygen species and oxidative stress, is derived from the glassy alumino-silicate fraction of CFA particles [70]. Coal fly ash contains multiple toxic trace elements including arsenic, cadmium, chromium, lead, mercury, nickel, selenium, strontium, thallium, and titanium [71]. Coal fly ash also contains small amounts of radioactive nuclides and their daughter products [72] and polycyclic hydrocarbons like benzopyrene which is known to be carcinogenic [73].

We have shown that aerosolized coal fly ash utilized in atmospheric geoengineering operations is an important risk factor for chronic obstructive pulmonary disease (COPD) [74], lung cancer [75], and neurodegenerative disease [76]. Ultrafine and nanoparticles in CFA are inhaled into the lungs and produce numerous toxic effects, including decreased host defenses, tissue inflammation, altered cellular redox balance in the direction of oxidation, and genotoxicity. Oxidative stress and inflammation contribute to both acute and chronic lung disease [74]. Coal fly ash contains a variety of carcinogenic substances including silica, arsenic, cadmium, hexavalent chromium, and alpha-emitting radionuclides. Radical generation catalyzed by transition metals associated with PM in CFA result in cell signaling, transcription factor activation, mediator release, and chronic inflammation [75]. One such transition metal, iron, induces cancer stem cells and aggressive phenotypes in lung cancer [77]. The recent finding of spherical exogenous (pollution) magnetite (Fe_3O_4) nanoparticles in the brain tissue of persons with dementia [78] suggests an origin in air pollution produced by typically-spherical CFA particles. Primary components of CFA (Al, Fe, and Si) are all found in the abnormal proteins that characterize Alzheimer's Dementia, and the presence of these elements leads to oxidative stress and chronic inflammation. Energy absorbed by magnetite pollution particles from external electromagnetic fields may contribute to human neuropathology [76].

8. CONCLUSIONS

The California wildfires, as evidenced from our review, are exacerbated, if not directly caused, by undisclosed and largely unrecognized, large-scale jet-spraying of particulate matter in the region where clouds form which has become a near-daily, near-global activity. The California wildfires are thus a microcosm of similar global catastrophes.

The U. S. Air Force has misled the public by falsely asserting that the observed aerial particulate trails, called chemtrails by some, does not exist, and that the observed trails are harmless ice-crystal contrails from aircraft exhaust. That assertion is refuted by our review of the testimony of retired U. S. Air Force Brig. General Charles Jones and photographic evidence.

We review the evidence that atmosphere manipulation utilizing aerosolized coal fly ash is an undisclosed and largely unrecognized primary factor in the extent and severity of forest fires in California, Western North America, and elsewhere. Adverse effects of this type of climate manipulation include exacerbation of drought, tree and vegetation die-off and desiccation, and unnaturally heating the atmosphere and surface regions of the Earth.

Combustibility of trees and vegetation at canopy and ground level is increased by moisture-absorbing aerosolized particles that damage the waxy coatings of leaves and needles, reducing their tolerance to drought. While humans start most wildfires, the aerial atmosphere manipulation using coal fly ash and possibly other substances greatly increases the potential for natural ignition of forest fires by lightening.

Forest fires dramatically worsen baseline air pollution, emitting harmful gases and volatile organic compounds, and they both concentrate and re-emit toxic elements and radioactive nuclides over a

wide area. The type of air pollution created by forest fires is associated with increased all-cause mortality, with the greatest impact on respiratory and cardiovascular disease. Studies have shown that aerosolized coal fly ash is an important risk factor for chronic lung disease, lung cancer and neurodegenerative disease. Failure to recognize its multifold adverse consequences and halt jet-spraying particulates into the atmosphere, we submit, will continue the ever-accelerating progression of ecological and human health disasters.

REFERENCES

1. Seager R, Hooks A, Williams AP, Cook B, Nakamura J, Henderson N. Climatology, variability, and trends in the US vapor pressure deficit, an important fire-related meteorological quantity. Journal of Applied Meteorology and Climatology. 2015;54(6):1121-41.

2. Westerling A, Bryant B. Climate change and wildfire in California. Climatic Change. 2008;87(1):231-49.

3. Abatzoglou JT, Williams AP. Impact of anthropogenic climate change on wildfire across western US forests. Proceedings of the National Academy of Sciences. 2016;113(42):11770-5.

4. Harvey BJ. Human-caused climate change is now a key driver of forest fire activity in the western United States. Proceedings of the National Academy of Sciences. 2016;113(42):11649-50.

5. Harrison SP, Marlon JR, Bartlein PJ. Fire in the Earth system. Changing climates, earth systems and society: Springer; 2010. p. 21-48.

6. https://www.nasa.gov/image-feature/goddard/2018/californias-mendocino-complex-of-fires-now-largest-in-states-history Accessed August 26, 2018.

7. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd566303.pdf Accessed August 26, 2018.

8. Littell JS, Peterson DL, Riley KL, Liu Y, Luce CH. A review of the relationships between drought and forest fire in the United States. Global Change Biology. 2016;22(7):2353-69.

9. Allen CD, Breshears DD, McDowell NG. On underestimation of global vulnerability to tree mortality and forest die-off from hotter drought in the Anthropocene. Ecosphere. 2015;6(8):1-55.

10. Allen CD, Macalady AK, Chenchouni H, Bachelet D, McDowell N, Vennetier M, et al. A global overview of drought and heat-induced tree mortality reveals emerging climate change risks for forests. Forest Ecology and Management. 2010;259(4):660-84.

11. Bentz BJ, Régnière J, Fettig CJ, Hansen EM, Hayes JL, Hicke JA, et al. Climate change and bark beetles of the western United States and Canada: direct and indirect effects. BioScience. 2010;60(8):602-13.

12. Herndon JM. An open letter to members of AGU, EGU, and IPCC alleging promotion of fake science at the expense of human and environmental health and comments on AGU draft geoengineering position statement. New Concepts in Global Tectonics Journal. 2017;5(3):413-6.

13. Herndon JM. Obtaining evidence of coal fly ash content in weather modification (geoengineering) through analyses of post-aerosol spraying rainwater and solid substances. Ind J Sci Res and Tech. 2016;4(1):30-6.

14. http://www.nuclearplanet.com/1958evidence.pdf Accessed August 26, 2018.

15. Kirby PA. Chemtrails Exposed 2012.

16. Thomas W. Chemtrails Confirmed. Carson City, Nevada (USA): Bridger House Publishers; 2004.

17. http://www.nuclearplanet.com/websites.pdf Accessed August 26, 2018.

18. Herndon JM, Whiteside M, Baldwin I. Fifty Years after “How to Wreck the Environment”: Anthropogenic Extinction of Life on Earth. J Geog Environ Earth Sci Intn. 2018;16(3):1-15.

19. Jiusto JE. Prediction of Aircraft Condensation Trails, PROJECT CONTRAILS. Cornell Aeronautical Laboratory Report No. VC-1055-P-5, 1961.

20. Schumann U. On conditions for contrail formation from aircraft exhausts. Meteorologisch Zeitschrift. 1996;N.F.5:4-23.

21. http://wwwnuclearplanetcom/USAFpdf Accessed August 26, 2018.

22. Wigington D. Geoengineering a Chronicle of Indictment 2017.

23. Herndon JM. Aluminum poisoning of humanity and Earth's biota by clandestine geoengineering activity: implications for India. Curr Sci. 2015;108(12):2173-7.

24. Herndon JM, Whiteside M. Contamination of the biosphere with mercury: Another potential consequence of on-going climate manipulation using aerosolized coal fly ash J Geog Environ Earth Sci Intn. 2017;13(1):1-11.

25. Herndon JM. Adverse agricultural consequences of weather modification. AGRIVITA Journal of agricultural science. 2016;38(3):213-21.

26. Herndon JM, Whiteside M. Further evidence of coal fly ash utilization in tropospheric geoengineering: Implications on human and environmental health. J Geog Environ Earth Sci Intn. 2017;9(1):1-8.

27. Gluskoter HJ. Trace elements in coal: occurrence and distribution. Illinois State Geological Survey Circular no 499. 1977.

28. Berkowitz N. An introduction to coal technology: Elsevier; 2012.

29. Chen Y, Shah N, Huggins F, Huffman G, Dozier A. Characterization of ultrafine coal fly ash particles by energy filtered TEM. Journal of Microscopy. 2005;217(3):225-34.

30. Moreno N, Querol X, Andrés JM, Stanton K, Towler M, Nugteren H, et al. Physico-chemical characteristics of European pulverized coal combustion fly ashes. Fuel. 2005;84:1351-63.

31. Montes-Hernandez G, Perez-Lopez R, Renard F, Nieto J, Charlet L. Mineral sequestration of CO 2 by aqueous carbonation of coal combustion fly-ash. Journal of Hazardous Materials. 2009;161(2):1347-54.

32. Zhuang Y, Kim YJ, Lee TG, Biswas P. Experimental and theoretical studies of ultra-fine particle behavior in electrostatic precipitators. Journal of Electrostatics. 2000;48(3):245-60.

33. http://svs.gsfc.nasa.gov/cgi-bin/details.cgi?aid=20010 August 26, 2018.

34. Moteki N, Adachi K, Ohata S, Yoshida A, Harigaya T, Koike M, et al. Anthropogenic iron oxide aerosols enhance atmospheric heating. Nature communications. 2017;8:15329.

35. Teller E. The Planet Needs a Sunscreen. Wall Street Journal. October 19, 1997.

36. Burkhardt U, Kärcher B. Global radiative forcing from contrail cirrus. Nature Climate Change. 2011;1(1):54.

37. Herndon JM. Evidence of variable Earth-heat production, global non-anthropogenic climate change, and geoengineered global warming and polar melting. J Geog Environ Earth Sci Intn. 2017;10(1):16.

38. Sparling DW, Lowe TP. Environmental hazards of aluminum to plants, invertibrates, fish, and wildlife. Rev Environ Contam Toxicol. 1996;145:1-127.

39. Herndon JM, Williams DD, Whiteside M. Previously unrecognized primary factors in the demise of endangered torrey pines: A microcosm of global forest die-offs. J Geog Environ Earth Sci Intn 2018;16(4):1-14.

40. Córdoba C, Munoz J, Cachorro V, de Carcer IA, Cussó F, Jaque F. The detection of solar ultraviolet-C radiation using KCl:Eu2+ thermoluminescence dosemeters. Journal of Physics D: Applied Physics. 1997;30(21):3024.

41. D'Antoni H, Rothschild L, Schultz C, Burgess S, Skiles J. Extreme environments in the forests of Ushuaia, Argentina. Geophysical Research Letters. 2007;34(22).

42. Herndon JM, Hoisington RD, Whiteside M. Deadly ultraviolet UV-C and UV-B penetration to Earth's surface: Human and environmental health implications. J Geog Environ Earth Sci Intn. 2018;14(2):1-11.

43. Whiteside M, Herndon JM. Unacknowledged potential factors in catastrophic bee and insect die-off arising from coal fly ash geoengineering Asian J Biol. 2018: provisionally published.

44. Kulakowski D, Jarvis D. The influence of mountain pine beetle outbreaks and drought on severe wildfires in northwestern Colorado and southern Wyoming: a look at the past century. Forest Ecology and Management. 2011;262(9):1686-96.

45. Burkhardt J, Zinsmeister D, Grantz D, Vidic S, Sutton MA, Hunsche M, et al. Camouflaged as 'degraded wax': hygroscopic aerosols contribute to leaf desiccation, tree mortality, and forest decline. Environmental Research Letters. 2018.

46. Spracklen DV, Mickley LJ, Logan JA, Hudman RC, Yevich R, Flannigan MD, et al. Impacts of climate change from 2000 to 2050 on wildfire activity and carbonaceous aerosol concentrations in the western United States. Journal of Geophysical Research: Atmospheres. 2009;114(D20).

47. Westerling AL, Hidalgo HG, Cayan DR, Swetnam TW. Warming and earlier spring increase western US forest wildfire activity. Science. 2006;313(5789):940-3.

48. Altaratz O, Kucienska B, Kostinski A, Raga GB, Koren I. Global association of aerosol with flash density of intense lightning. Environmental Research Letters. 2017;12(11):114037.

49. Mohan S, Ermoline A, Dreizin EL. Pyrophoricity of nano-sized aluminum particles. Journal of Nanoparticle Research. 2012;14(2):723.

50. Roling PV, Parker WL, Goliaszewski AE, Williams TS, Groce BC, Sintim QK. Inhibition of pyrophoric iron sulfide activity. U. S. Patent 6,328,943 B1.

51. Shende R, Doorenbos Z, Vats A, Puszynski J, Kapoor D, Martin D, et al. Pyrophoric nanoparticles and nanoporous foils for defense applications. SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY RAPID CITY, 2008.

52. Shi Z, Krom MD, Bonneville S, Baker AR, Jickells TD, Benning LG. Formation of iron nanoparticles and increase in iron reactivity in mineral dust during simulated cloud processing. Environmental Science & Technology. 2009;43(17):6592-6.

53. Cascio WE. Wildland fire smoke and human health. Science of the Total Environment. 2018;624:586-95.

54. Wettstein ZS, Hoshiko S, Fahimi J, Harrison RJ, Cascio WE, Rappold AG. Cardiovascular and cerebrovascular emergency department visits associated with wildfire smoke exposure in California in 2015. Journal of the American Heart Association. 2018;7(8):e007492.

55. Fann N, Alman B, Broome RA, Morgan GG, Johnston FH, Pouliot G, et al. The health impacts and economic value of wildland fire episodes in the US: 2008–2012. Science of the Total Environment. 2018;610:802-9.

56. Finlay SE, Moffat A, Gazzard R, Baker D, Murray V. Health impacts of wildfires. PLoS currents. 2012;4.

57. Kristensen LJ, Taylor MP. Fields and forests in flames: Lead and mercury emissions from wildfire pyrogenic activity. 2012.

58. Wittig V, Williams S, DuTeaux S. Public Health Impacts of Residential Wildfires: Analysis of Ash and Debris from the 2007 Southern California Fires. Epidemiology. 2008;19(6):S207.

59. Carvalho FP, Oliveira JM, Malta M. Exposure to radionuclides in smoke from vegetation fires. Science of the Total Environment. 2014;472:421-4.

60. Wegesser TC, Pinkerton KE, Last JA. California wildfires of 2008: coarse and fine particulate matter toxicity. Environmental Health Perspectives. 2009;117(6):893.

61. Franzi LM, Bratt JM, Williams KM, Last JA. Why is particulate matter produced by wildfires toxic to lung macrophages? Toxicology and applied pharmacology. 2011;257(2):182-8.

62. Carratt SA, Flayer CH, Kossack ME, Last JA. Pesticides, wildfire suppression chemicals, and California wildfires: A human health perspective. 2017.

63. Ambient air pollution – a global assessment of exposure and burden of disease. Geneva: World Health Organization (WHO) 2016.

64. Apte JS, Brauer M, Cohen AJ, Ezzati M, Pope CA. Ambient PM2.5 Reduces Global and Regional Life Expectancy. Environmental Science & Technology Letters. 2018.

65. Pope A, Burnett R, Thun M, Thurston G. Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. JAMA. 2002;287(9):1132-41.

66. Genc S, Zadeoglulari Z, Fuss SH, Genc K. The Adverse Effects of Air Pollution on the Nervous System. Journal of Toxicology. 2012;2012.

67. Calderón-Garcidueñas L, Mora-Tiscareño A, Ontiveros E, Gómez-Garza G, Barragán-Mejía G, Broadway J, et al. Air pollution, cognitive deficits and brain abnormalities: a pilot study with children and dogs. Brain and cognition. 2008;68(2):117-27.

68. Chen Y, Shah N, Huggins FE, Huffman GP. Transmission electron microscopy investigation of ultrafine coal fly ash particles. Environ Science and Technogy. 2005;39(4):1144-51.

69. Araujo JA, Nel AE. Particulate matter and atherosclerosis: role of particle size, composition and oxidative stress. Particle and Fibre Toxicology. 2009;6(1):24.

70. Veranth JM, Smith KR, Huggins F, Hu AA, Lighty JS, Aust AE. Mössbauer spectroscopy indicates that iron in an aluminosilicate glass phase is the source of the bioavailable iron from coal fly ash. Chemical Research in Toxicology. 2000;13(3):161-4.

71. Fisher GL. Biomedically relevant chemical and physical properties of coal combustion products. Environ Health Persp. 1983;47:189-99.

72. Pandit GG, Sahu SK, Puranik VD. Natural radionuclides from coal fired thermal power plants –estimation of atmospheric release and inhalation risk. Radioprotection. 2011;46(6):S173–S9.

73. Roy WR, Thiery R, Suloway JJ. Coal fly ash: a review of the literature and proposed classification system with emphasis on environmental impacts. Environ Geology Notes #96. 1981.

74. Whiteside M, Herndon JM. Aerosolized coal fly ash: Risk factor for COPD and respiratory disease. Journal of Advances in Medicine and Medical Research. 2018;26(7):1-13.

75. Whiteside M, Herndon JM. Coal fly ash aerosol: Risk factor for lung cancer. Journal of Advances in Medicine and Medical Research. 2018;25(4):1-10.

76. Whiteside M, Herndon JM. Aerosolized coal fly ash: Risk factor for neurodegenerative disease. Journal of Advances in Medicine and Medical Research. 2018;25(10):1-11.

77. Chanvorachote P, Luanpitpong S. Iron induces cancer stem cells and aggressive phenotypes in human lung cancer cells. American Journal of Physiology-Cell Physiology. 2016;310(9):C728-C39.

78. Maher BA, Ahmed IAM, Karloukovski V, MacLauren DA, Foulds PG, et al. Magnetite pollution nanoparticles in the human brain. Proc Nat Acad Sci. 2016;113(39):10797-801.