Global Warming's Fire Regime Change.

Accelerating **Global Warming** increases the frequency, distribution, abundance, intensity, duration, and severity of catastrophic wildfire.

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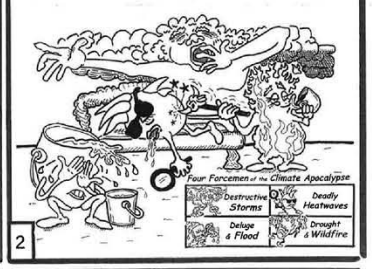
Global Warming intently influences wildfires because Earth's current weather patterns stochastically change with rising concentrations of atmospheric carbon dioxide (CO_2). Changed weather patterns impact wildfires' fuel quality and quantity.



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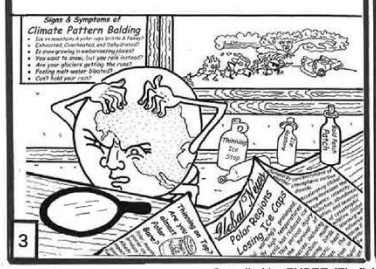
Atmospheric CO_2 levels determine the amount of heat held in the atmosphere and amount reradiated back to space. Also, Earth's Polar, mountain, and glacier ice and snow produce the **Albedo Effect**, reflecting heat back to space.



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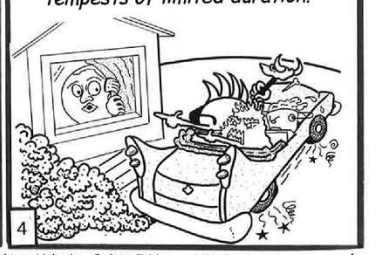
Incremental increases in atmospheric heat decrease arctic sea ice and alter Earth's usual patterns of storms. Normally, extensive arctic ice causes stratospheric jet streams to move swiftly and bring our familiar pattern of recurrent temperate tempests of limited duration.



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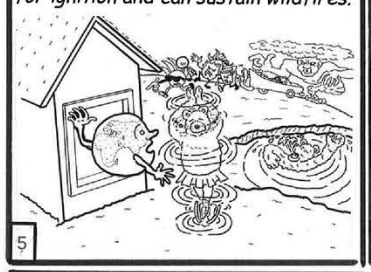
With decreased arctic ice and exposed water, the jet streams slow and can bring persistent droughts or extensive, prolonged downpours. Rain and humidity influence vegetation's internal moisture and determine whether this "fuel" remains available for ignition and can sustain wildfires.



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Wildland fire workers describe wildfires' "fuel" as living and dead plants, (including their leaves, branches, and trunks), and forest debris (called "litter" or "duff" which includes rotting needles, leaves, twigs, branches, and logs).

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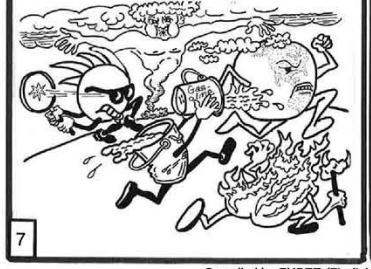
Prolonged wet weather, followed by a long dry season, can lead to an abundance of dried, small diameter fuel such as grass, leaves, needles and twigs (described as "fine" or "flashy" fuel).



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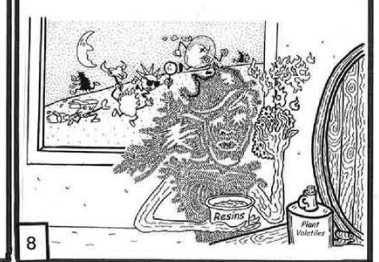
Weather can also influence the quality, quantity, and condition of fuels' resins and volatiles making plants more flammable. Also, Global Warming can transform some wildlands from rarely burned biomes into lands that burn yearly.



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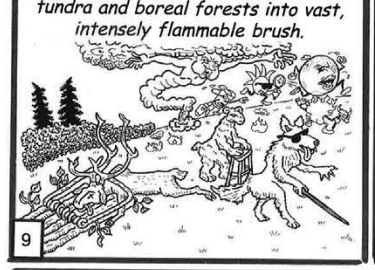
Climatic droughts can convert forests into fire-prone brush, chaparral, or dry steppe grasslands. Also, climate change can increase summer monsoons and develop desert areas into fire-prone brush and grasslands. Already Climate Change and wildfires have converted parts of Northern tundra and boreal forests into vast, intensely flammable brush.



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Climate change affects wildfire **frequency**. Hotter weather augments atmospheric moisture, causes more lightning, increases ignition potential, and enhances conditions for sustaining large wildfires. Global Warming extends lightning and fire seasons from earlier in Spring to later in Fall.

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Climate Change affects wildfire **intensity**. Intensity indicates amount of energy released. Flame-length remains a good proxy for intensity. Flame-length expands with dry, dense, but uncompressed, and highly oxygenated fuel. Also, extremely low fuel moisture and chronic or blustery winds influence intensity.

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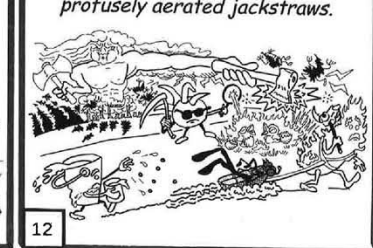
Wildfires will gain intensity with Global Warming's recurrent episodes of heavy rain followed by hot weather that produce flashy fuels such as fast-growing brush, foliage, and knee-high grass. Frequent and extreme windstorms scatter broken trees and branches, or pile them in profusely aerated jackstraws.



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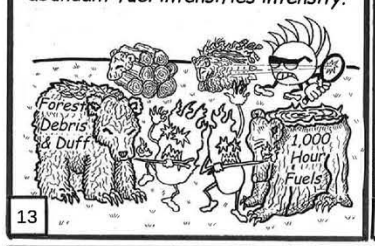
Abundantly aerated flashy fuel carries and kindles fire. Wind, low fuel moisture, and fuel quality remain the primary drivers of wildfire. Fire suppression, in places, has increased fuel quantity by piling up slow-drying, large diameter, or densely packed debris. Once ignited, abundant fuel intensifies intensity.



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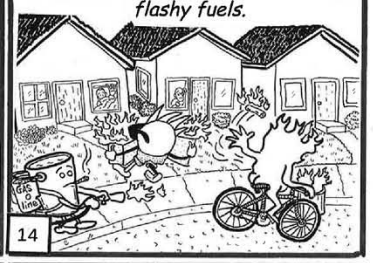
Climate change disrupts usual patterns of wildfire **distribution**. Drought will cause some previously lush areas to dry out and become fire-prone. Heavy rain brings luxurious plant fuel growth in previously barren zones that quickly parch in hot weather and become flashy fuels.



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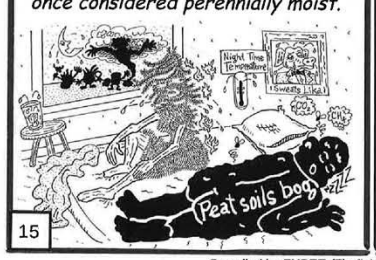
Floods, winds, and deluge-induced landslides will routinely pile killed trees and debris that await ignition from more prevalent lightning. Global Warming's unusual higher nighttime temperatures will rapidly melt snow packs and cause excessive drying of fuel and soils in places once considered perennially moist.



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Climate change affects wildfire **abundance**. It will likely intensify fire-prone fuel conditions in quality and quantity. Also, the weather that favors wildfire ignition and spread will likely proliferate. Amplified atmospheric heat and moisture add additional lightning and wildfires.

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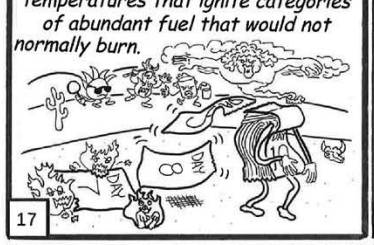
Climate change affects wildfire **duration** in three ways. One, relentless heat waves and endless wind push fires days longer than typical. Two, more fuel becomes more available and more fuel burns more than the expected 15%. Three, wildfires' intensity reaches critical temperatures that ignite categories of abundant fuel that would not normally burn.



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Climate change affects wildfire **severity**. Some call small wildfires that vaporize limited areas and landscape fires that burn a lot of acreage "severe." But this ignores the immense benefits of low-intensity flames over vast areas.

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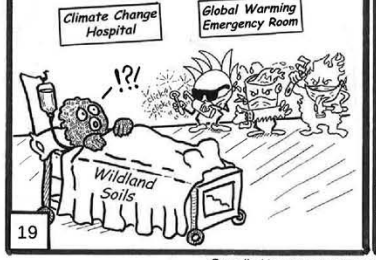
Nonetheless, the evolving understanding of severity focuses on the percentage of burned areas that have seriously injured soils. Recent data indicates a rising percentage of wildfire-caused seriously injured soils.



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Severely injured soils can have these traits: (a) water-repelling hydrophobic conditions; (b) vaporized nutrients and impaired mineral cycling; (c) lost, impaired, or dysfunctional microbes; and (d) conversion from **carbon sinks** to **carbon sources**, (that is, soils transform from being carbon sequesters to carbon emitters).

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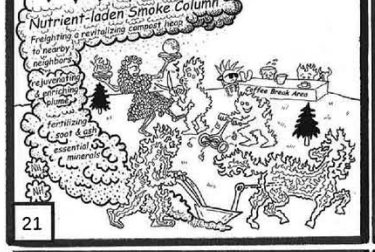
Prescribed and **Natural Fires** can improve soils and hold carbon on site. They breakdown decay-resistant plant nutrients and disperse them to new areas through smokes' soot and ash. Enhanced nutrient cycling allows plants and soils to sequester more carbon and become better carbon sinks.



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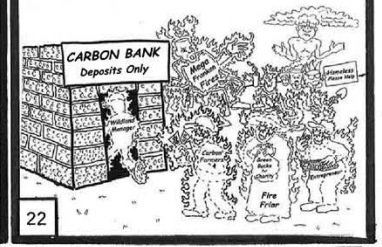
Low-intensity flames consume flashy fuel and char heavy fuel, extinguishing its contribution to future extremely severe wildfires. They also provide ecosystems with opportunities for change and resilience. Rot-resistant char provides surfaces for microbes that improve soil chemistry and reduce long-term microbial CO_2 emissions.



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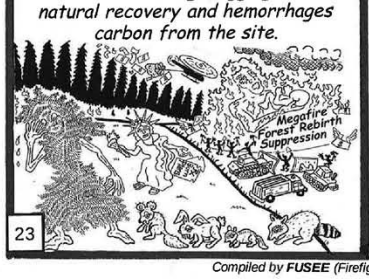
Misguided responses to **Landscape Fires** include deploying armies of firefighters when aggressive tactics exacerbate soil damage and extend severely injured areas. Also, fuelbreak "thinning" for timber profits can be ineffective and often creates ecologically -confused projects. Studies show salvage logging detours natural recovery and hemorrhages carbon from the site.



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Responses to Global Warming should involve strategies to hold carbon on site. The safest, most economically ethical, and ecologically congruent methods remain prescribed fire and natural fire use.

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