

## Radiofrequency Radiation from Wireless Technology Damages and Kills Plants and Trees

**We rely on plants and trees for our very lives, even people living in the most plant-free areas of major cities rely on plants for their existence.**

**Plants produce the oxygen we breathe and are the basis of all the food we eat. Even the most carnivorous amongst us rely on plants because the animals we consume all consume plants. Our climate is dependent on trees, sufficient numbers of trees, which is why the destruction of the Amazon rain forest is so disastrous.**

Contrary to industry representations, **wireless technology is neither a sustainable nor environmentally-friendly technology** because wireless connectivity uses far more energy than wired connectivity. According to *Energy Consumption in Wired and Wireless Access Networks*, “**Wireless technologies will continue to consume at least 10 times more power than wired technologies** when providing comparable access rates and traffic volumes. PON [passive optical networks] will continue to be the most energy-efficient access technology.” (<http://people.eng.unimelb.edu.au/rtucker/publications/files/energy-wired-wireless.pdf>), even as technology becomes more energy efficient. A higher amount of energy is consumed in transmitting large amounts of information through the air (a medium that has high resistance and high level of signal absorption) compared to transmission via various corded communication connections (e.g., copper or fiber optic based). In fact, in a paper looking at the energy consumption of cloud computing, the authors state, “**Our energy calculations show that by 2015, wireless cloud will consume up to 43 TWh**, compared to only 9.2 TWh in 2012, an increase of 460%. This is an increase in carbon footprint from 6 megatonnes of CO<sub>2</sub> in 2012 to up to 30 megatonnes of CO<sub>2</sub> in 2015, **the equivalent of adding 4.9 million cars to the roads**. Up to **90% of this consumption is attributable to wireless access network technologies**, data centres account for only 9%.” (<http://www.ceet.unimelb.edu.au/publications/ceet-white-paper-wireless-cloud.pdf>) It is clear from the discussion, that cloud computing does not save energy unless it displaces local computing power, otherwise it just increases energy consumption, especially when accessed wirelessly.

Wireless devices use radiofrequency (RF) radiation sent indiscriminately through the air to communicate. The ambient levels of RF radiation have increased rapidly with the proliferation of wireless technology. Unfortunately, FCC regulators have had their heads in the sand, refusing to believe that RF radiation emitted by common wireless devices can have biological effects, unless they cook you. Regulations in the U.S., Canada and many other parts of the world are based on the avoidance of thermal harm, not protection from **non-thermal** detrimental biological effects, despite numerous studies documenting their existence. See <http://www.emfscientist.org>, <http://www.mainecoalitiontostopsmartmeters.org/?p=1469>, and <http://www.bioinitiative.org>.

**Radiation from wireless technology is now jeopardizing the health of our trees and other plants!**

*Adverse Influence of Radio Frequency Background on Trembling Aspen Seedlings: Preliminary Observations* by Katie Haggerty, a sham-controlled experiment using aspen seedlings, found that ambient RF levels at the experimental site in Colorado, U.S.A, were high enough to cause necrotic lesions on the leaves, decrease leader length and leaf area, and suppress fall anthocyanin production.

According to [Haggerty](#) (citing supporting references), suppression of fall anthocyanin production is quite detrimental to the trees.

*"During fall leaf senescence photosynthetic mechanisms become vulnerable to damage by visible light. Anthocyanins shield the photosynthetic apparatus from high light levels, preventing photoinhibition and damage to leaf tissue due to light stress. Transport of foliar nutrients requires energy provided by photosynthesis, and since the majority of nutrients in overwintering deciduous trees are derived from foliar nutrient transport during autumn leaf senescence, differences in anthocyanin production could have major effects on plant fitness."*

Absence of proper fall color has serious health implications for the trees, but it has serious economic implications for many parts of the country that rely on fall color tourists for a major portion of their income. At right is a picture of our basswood which would normally turn a beautiful yellow color, instead of this crinkly brownish. Other trees have turned colors more naturally, but then leaves in certain areas turn brown and crunchy.

Most of our cottonwoods lost their leaves when they were a necrotic off-green. Definitely not a look that anyone is going to travel to see (pictures below from September 18, 2016). There is a WiFi tower about a mile to the right of the trees in the picture below. The leaves are a closeup from the rightmost tree.



Trees for miles around our home are showing necrotic lesions, absence of normal fall color, and very premature leaf loss during what would normally be a period of active photosynthesis. Leaf loss and tree death were documented as early as July.

The progression from damage to death is not necessarily slow. Below are some pictures documenting a cottonwood tree experiencing damage over the course of months.



The pictures were taken on July 24, 2016; August 9, 2016; September 12, 2016; and October 10, 2016.



The picture below from July 24, 2016, shows how quickly the damage shown above can progress to death. These cottonwoods trees began exhibiting damage similar to the trees above in 2015. Most of them greened up in the spring of 2016, then had the leaves die and drop. Two still retain leaves low down. Others are completely dead.



**As you can see the damage to trees can progress quickly to death.**

[Balimori](#) discusses the fact that "*White and black poplars (Populus sp.) and willows (Salix sp.) are more sensitive. There may be a special sensitivity of this family exists or it could be due to their ecological characteristics forcing them to live near water, and thus electric conductivity.*" Certainly the trees that are worst off in our area are willows and cottonwoods and they are growing in areas that are wet, but trees of all types exhibit damage.

**Please think of the future.**

We cannot live without a healthy tree population. We rely on trees for the very oxygen we breathe.

**No technology is worth endangering something as essential as our source of oxygen.**

[Haggerty](#) (citing supporting references) states "*More recently, it has been shown that mortality rates of all dominant tree species in the western United States have been doubling every 17-29 years in old growth forests, and that recruitment of new trees is now occurring at a lower rate than mortality.*" **The aspen experiment combined with other measurement and observational studies make a compelling case that our addiction to wireless technology is killing the trees we need so much for life far faster than they can replace themselves.**

["Tree damage in the vicinity of mobile phone base stations"](#) by Waldmann-Selsam and Egar in 2013, documented suspected RF radiation related tree damage and RF radiation readings over a period of six years. It found significantly higher RF radiation readings by damaged trees as compared to undamaged trees. Sometimes damaged areas and undamaged areas were on the same tree, in which case RF radiation levels were found to be higher near the damaged areas. **Because trees are unable to move, differences in RF radiation levels from fixed sources like cell towers can result in very different RF radiation exposure micro-environments in different parts of the same tree or bush.**

Most people don't really stop to consider how their cellphone or other wireless devices work. They're just "magic" and "neat" and "convenient". If they do think about it, common perception includes these erroneous assumptions: direct communication from device to base station similar to an invisible wire or a homogeneous RF field put out by devices and towers. Neither of these are true. The RF fields put out by both devices and towers are not exclusively direct from device to tower. Nor are the RF fields homogeneous. There are areas of high RF

concentration immediately adjacent to areas that are much lower. The exact nature of the fields depends on the transmitter configuration and use at the time. Hence, when you make a call on a cellphone or download a video on WiFi, the RF radiation (specifically, microwave radiation) used by the wireless devices goes through you and everyone around you. Which person, tree, or other creature is exposed to the most RF radiation will depend on the device, your surroundings, and the base station transmitter location. Trees cannot move when they start to "feel bad" and show signs of damage.



The influence of the main beam direction, building shadow and reflection, sheltering of trees by other trees and other factors are discussed in detail in [Waldmann-Selsam and Egar](#).

Trees demonstrate the very biologically significant nature of these different RF microclimates because they cannot move. This small lilac (7.5 ft) in my yard showing sided damage demonstrates the effect nicely. The signal appears to be coming from a WiFi tower on a hill about a mile away.

On the bare side of the lilac (the right side, a few lighter green leaves remain) the max reading on the Cornet ED85EX was 83.5 microwatts/m<sup>2</sup>. There were audible and visible spikes every 9 seconds. On the green side of lilac the max reading was 2.8 microwatts/m<sup>2</sup> with only periodic audible or visible spikes. There is a deep green lilac behind the affected lilac in the picture which nearly touches the green side of affected lilac. The bases are only 8 ft apart. The max reading by the green lilac was 0.6 microwatts/m<sup>2</sup> with no audible or visible

spikes in over 5 minutes. All readings were taken back to back sequentially over about 5 minutes each.

The study by [Waldmann-Selsam and Egar](#) and [Waldmann-Selsam et al](#) documented tree damage occurring at levels far below current RF limits. Just as all the levels documented at the lilac are below FCC RF limits. FCC RF limits do not even pretend to be protective against effects caused by frequency, modulation, pulse frequencies, or combinations of transmissions from different transmitters or technologies. FCC RF limits only address thermal harm under very limited conditions. The FCC RF limits are only meant to protect a large male from thermal harm during a 6 minute exposure from a single transmitter. As soon as the large male is exposed to more than one transmitter or for longer than 6 minutes, the exposure is outside of the scope of the situation in which FCC RF limits are meant to protect from thermal harm. People not fitting the description of a large male are not protected by the FCC RF limits. Watch this video clip to see how wireless radiation penetrates the human body, especially in children (<https://www.youtube.com/watch?v=yYDmlq-nTn4>).

The FCC has been very lax in enforcing even their outdated inadequate thermally-based RF limits for cell towers a.k.a. base stations. A detailed investigation by the EMR Policy Institute showed almost no enforcement of existing FCC RF limits and rampant violations (<http://www.marketwire.com/press-release/-1770139.htm>). A Wall Street Journal investigation (<http://online.wsj.com/articles/cellphone-boom-spurs-antenna-safety-worries-1412293055>) reports similar findings with one in ten towers out of compliance and experts concerned that out of compliance towers could be transmitting in the thermal range by around the end of 2015.



A pine in our yard shows damage from multiple signals. One signal hitting the pine at a bare spot on the left side of the picture (39 microwatts/m<sup>2</sup> max reading on the Cornet) is coming from a tower 6 miles away to the S/SW, readily visible at night due to lights and on clear days. I was only able to get a reading at the bottom of the bare spot on the right side of the picture (10 microwatts/m<sup>2</sup> max reading on the Cornet). Down below in the green whorl it was only 2.8 microwatts/m<sup>2</sup> max.

Waldmann-Selsam et al discuss the main features of tree damage that they hypothesize are being caused by RF radiation from wireless technology.

*"The selected 60 trees from the study polygon show damage patterns that are not usually attributable to harmful organisms, such as diseases (fungi, bacteria, viruses) and pests (insects, nematodes) or other environmental factors (water stress, heat, drought, frost, sun, compaction of the soil, air and soil pollutants). The main features of damage from this source are:*

- Trees are mainly affected on one side (showing side differences and unilateral damage) and can appear in any orientation. The damage only originates on one side.*
- Damage appears without external indications that the tree is infested with insects, nematodes, fungi, bacteria or viruses.*
- Damage appears on trees, which have previously grown well. Damage appears on once healthy trees within one or two years after Antennas were put into operation.*
- Damage increases from the outside to the inner part of the crown over time.*
- Trees of different species in the same location also show damage.*
- Damage appears in favourable (gardens, parks) as well as in unfavourable locations.*
- Trees in the same location, but that are shielded by buildings or other trees, are healthy."*

Additionally, the authors state *"broad bands of frequencies, modulation, pulse frequencies, interferences and other physical characteristics may play an important role, since in some cases, damage already appears at low intensities."*

Certainly this has been the case around our home. **Which obviously brings up the question of who defines "low". If intensities such as we are seeing around here can cause significant damage to trees and bushes and are billions of times greater than background RF radiation levels, are they really low?** Certainly they are biologically significant and harmful and no tree or person should be forced to be exposed to such harmful radiation.



According to Chapter 15 in the 2012 BioInitiative Report, **each different combination of frequency, modulation, amplitude should be considered a separate agent** with potentially very different effects: *"Our analysis suggests that different (bandwidth, frequency, modulation, polarization) NT MW [non-thermal microwave] signals should be considered as separate agents in setting the safety standards. The data also indicate that duration of exposure may be as important as power density (PD) and specific absorption rate (SAR), and, therefore, the 'dose' and duration of exposure should also be considered in safety standards along with PD/SAR."* ([http://www.bioinitiative.org/report/wp-content/uploads/pdfs/sec15\\_2012\\_Evidence\\_Disruption\\_Modulation.pdf](http://www.bioinitiative.org/report/wp-content/uploads/pdfs/sec15_2012_Evidence_Disruption_Modulation.pdf))

Obviously, the particular combination of these different "agents" could profoundly affect the level of exposure at which trees exhibit symptoms as well as the particular symptoms they experience.

Other factors can also affect the sensitivity of trees to RF exposures. Our cherry tree lost its leaves on the side facing the local WiFi tower during a very dry summer (right side in picture). The following two summers (which were neither particularly hot nor dry) the tree retained its leaves.



Here are some additional examples of tree damage that fits with the sort of damage reported in the literature to be caused by RF radiation from wireless technology. The first picture on the left shows maple leaders with few deformed, small leaves. Other trees of different species in the yard also exhibit leader damage. The second picture shows a linden tree exhibiting severe leaf damage and death from the top down. Leaves sheltered by the others are still green. This linden is in line with two dead trees. One was a small white pine and the other a large deciduous tree.



[Electromagnetic Fields Act Similarly in Plants as in Animals: Probably Activation of Calcium Channels via Their Voltage Sensor](#) by Dr. Martin Pall discusses that one important mechanism by which RF causes non-thermal biological effects in plants is through activation of the voltage sensor in Ca<sup>2+</sup> channels and two pore channels.

The location of the calcium and two pore channels in the lipid bilayer of the cell membrane is extremely important to their exquisite sensitivity to electromagnetic fields because it results in far greater forces on the voltage sensor:

*“the force on the voltage sensor is about 7.2 million times stronger than expected based on industry calculations and consequently we finally have a plausible explanation of how such weak EMFs can produce biological effects.”*

Dr. Pall notes "devices producing microwave EMFs are never tested biologically for safety, before they are put out and expose the unsuspecting public, a major flaw in the whole regulatory system".

**U.S. Department of Interior States: Current Radiation Standards Inapplicable** On February 7, 2014, the U.S. Department of Interior (DOI) stated, "*the electromagnetic radiation standards used by the Federal Communications Commission (FCC) continue to be based on thermal heating, a criterion now nearly 30 years out of date and inapplicable today,*" in reference to the current limits governing radiation utilized by WiFi. The DOI letter discusses a number of studies in which birds appear harmed by low-level RF radiation associated with cell towers and other wireless technologies ([http://www.ntia.doc.gov/files/ntia/us\\_doi\\_comments.pdf](http://www.ntia.doc.gov/files/ntia/us_doi_comments.pdf)).

## **Stop the buildout of 5G and other additional wireless infrastructure**

Trees are being killed and damaged across the U.S. and world-wide even without full-scale implementation of 5G. RF radiation is being implicated as the cause. Several studies show the very serious effects that RF radiation has on the health of trees. Trees are essential to the welfare of the global environment and the continuation of the human race. The FCC should not be moving forward with implementing a technology, 5G wireless technology, that will hasten the RF caused death of our urban and rural forests. We cannot afford additional forest die-off. Large mature trees are being seriously damaged and killed, this damage will take 50 years or more to repair.

**Please read the following papers to see the toll RF radiation from wireless technology is already taking on trees:**

- Radiofrequency radiation injures trees around mobile phone base stations [https://www.researchgate.net/publication/306435017\\_Radiofrequency\\_radiation\\_injures\\_trees\\_around\\_mobile\\_phone\\_base\\_stations](https://www.researchgate.net/publication/306435017_Radiofrequency_radiation_injures_trees_around_mobile_phone_base_stations)
- Adverse Influence of Radio Frequency Background on Trembling Aspen Seedlings: Preliminary Observations <https://www.hindawi.com/journals/ijfr/2010/836278/>
- Tree damage in the vicinity of mobile phone base stations <http://kompetenzinitiative.net/KIT/wp-content/uploads/2016/06/Tree-damages-in-the-vicinity-of-mobile-phone-base-stations.pdf>
- The trees make it easy to recognize the effects of RF-EMF. Examples of tree damage: <http://kompetenzinitiative.net/KIT/wp-content/uploads/2016/09/Trees-in-Bamberg-and-Hallstadt-Dokumentation-2006-2016.pdf>
- Electromagnetic Fields Act Similarly in Plants as in Animals: Probably Activation of Calcium Channels via Their Voltage Sensor: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3780531/>

**Please read the following reports which demonstrate that wireless technology is causing serious harm to wildlife:**

- "The Report on Possible Impacts of Communication Towers on Wildlife Including Birds and Bees" commissioned on 30th August 2010 by the Ministry of Environment and Forest, Government of India [http://www.moef.nic.in/downloads/public-information/fnal\\_mobile\\_towers\\_report.pdf](http://www.moef.nic.in/downloads/public-information/fnal_mobile_towers_report.pdf)
- "Impacts of radio-frequency electromagnetic field (RF-EMF) from cell phone towers and wireless devices on biosystem and ecosystem - a review" [http://www.biolmedonline.com/Articles/Vol4\\_4\\_2012/Vol4\\_4\\_202-216\\_BM-8.pdf](http://www.biolmedonline.com/Articles/Vol4_4_2012/Vol4_4_202-216_BM-8.pdf)
- Balmori, A. "Electromagnetic pollution from phone masts. Effects on wildlife," Pathophysiology (2009), doi:10.1016/j.pathophys.2009.01.007 <http://www.ncbi.nlm.nih.gov/pubmed/19264463>

The Supreme Court of India ordered cell towers removed from schools, colleges, hospitals and playgrounds in Rajasthan because of radiation being "hazardous to life." The court's amazing 200+ page decision thoroughly reviews the worldwide evidence that cell towers are harming human beings and wildlife (<http://timesofindia.indiatimes.com/city/jaipur/No-mobile-towers-near-schools-hospitals-directs-Rajasthan-HC/articleshow/17399705.cms>).

On July 5, 2013 the Supreme Court of India upheld this decision.

Many other nations are taking precautionary action (<http://ehtrust.org/policy/international-policy-actions-on-wireless/>), the U.S. ought to be as well.

**Healthy trees and plants are more important than wireless.**

**Eating and breathing are essential to life.**

**We will not do either for long if we kill off our trees and plants by using wireless.**

**Use only planet-friendly wired broadband connectivity.**

Please visit [www.electricalpollution.com/WirelessKillsTrees.html](http://www.electricalpollution.com/WirelessKillsTrees.html) for more information.