Environment and Wildlife Effects.

Source: Physicians for Safe Technology https://mdsafetech.org/environmental-and-wildlife-effects/
Sections - see below summary.

Summary

Sections

Summary

A Animal Life and the Earth's Magnetic Field

A diverse array of animal life relies upon the earth's magnetic field for navigation, breeding, feeding, migration and survival. Biologists have discovered that **wireless electromagnetic radiation disturbs internal magneto-receptors used for navigation, as well as disrupting other complex cellular and biologic processes in mammals, birds, fish, insects, trees, plants, seeds and bacteria with profound impacts on the natural environment.** Different species have different interactions with radiofrequency radiation (RFR) and differ in their toxic effect. These effects may not be immediately apparent with a slow decline in the health of wildlife seen over time with cumulative exposure.

B Increased Radiofrequency Radiation and The Decline of Birds, Bees and Wildlife

Biologists have noted that wildlife are susceptible to harm from manmade ambient electromagnetic fields. Researchers are now attributing **RFR from cellular telecommunications** to be **a contributing cause of bee "colony collapse disorder", insect disappearance, the decline in house sparrows in London, as well as the steady deterioration of the worlds bird population with now than 40% of bird species under critical threat.** Scientists note a serious lack of radiation monitoring and protocols to study the impacts and call for precaution in the placement of cell towers and further expansion of wireless broadband. In the United States, Section 704 of the Telecommunications Act of 1996 does not allow consideration of environmental effects in the placement of cell towers. Telecommunications Act of 1996

C Wildlife Are More Vulnerable to Wireless Radiation

Adverse responses from radiofrequency radiation that have been identified include abnormal behavior, developmental abnormalities, diminished reproduction and increased mortality. Birds, bees, turtles, dolphins, salamanders, salmon, amphibians and other animals use the earth's weak magnetic field and their own internal magneto-

receptors to navigate. Birds have feathers that can act as antenna and amplify the negative effects of RF radiation Bigu-del-Blanco (1975). Insects, the base of the food chain, appear particularly susceptible to radiofrequency radiation, especially 5G millimeter wavelengths which are the size of the insect and create a damaging resonance effect.

Mammals, like humans, have similar reproductive organs, immune systems and nervous systems, thus are susceptible to molecular and cellular harm from artificial wireless radiofrequency wavelengths. Katie Singer, in her extensively referenced book Electronic Silent Spring, highlights that **the earths living systems evolved their own internal and external signaling systems in the presence of the earth's low electromagnetic environment and thus are vulnerable to the much higher levels of artificial pulsed electromagnetic radiation experienced today.**

D Cell Towers Emit Wireless Radiation Over Dozens of Miles of Terrain

Stationary cell and radio towers create a circle of high power wireless radiation (1500 feet) around them, with a much larger radius (dozens of miles) of lower power radiation, which scientists have found can contribute to environmental disturbances. In cities the density is much higher with more towers and co-location of multiple antennas on a single tower to accommodate multiple telecommunication carriers. Firstenberg (2017) in his fascinating and well-researched book, The Invisible Rainbow: A History of Electricity and Life, describes both observations and biological experiments performed, mostly in Europe, where **radio broadcast towers caused not only human symptoms but also affected widespread forest health with loss of birds, thinner growth rings on trees, poor seed germination and loss of duckweed, among other effects. When these towers were removed, not only did local residents symptoms disappear, the forest recovered. The Skrunda Radio Location Case.**

E Trees are Harmed by Radiofrequency Radiation

In Colorado, Aspen trees have been on the decline and experiments have pointed to **radiation from cell towers causing poor growth and smaller leaves**- **Haggerty 2010** A 4-year experiment by **Waldmann-Selsam** et al (2016) clearly demonstrated, with accurate RF emission testing, cell tower radiation causing the death of nearby trees over time. He notes, "These results are consistent with the fact that damage afflicted on trees by mobile phone towers usually start on one side, extending to the whole tree over time." These are truly alarming findings and serve as a dire warning on further wireless expansion, especially with regards to agricultural rural zones or wildlife areas with sensitive species. Research also raises the question of wildfires sparked by dead or dying trees near cell towers.

F Bird Migration Disrupted More by Weak Magnetic Fields

Biologists have noted that birds magnetic compass orientation appears more susceptible to weak broadband electromagnetic fields. **Schwarze** et al (2016), note in their paper that weak magnetic fields can have much more powerful influence on bird migration than strong fields. They state, "Our results indicated that **the magnetic compass orientation of European robins could not be disrupted by any of the relatively strong narrow-band electromagnetic fields employed here, but that the weak broadband field very efficiently disrupted their orientation**" **Pakhomov (2017)** and **Wiltschko (2015)** both confirmed this effect.

G Homing Pigeons Magneto-Receptors Disoriented by Wireless Communications

It is well established that magnetite, a form of iron ore, is found in a wide variety of organisms who use this magneto-receptor to sense the earth's low energy magnetic field as a directional reference. (Cadiou and McNaughton). Magnetite acts as an internal compass of sorts. **Migrating birds, fish, insects and animals connect these magneto-receptors with the earth's natural geomagnetic forces, to successfully guide them in long and short distance journeys, necessary for feeding and breeding. Modern communications systems with a proliferation of cell towers and smart meters in cities and rural areas, create a fluctuating blanket of continuous pulsating artificial radiofrequency wave mixtures that can alter local magnetic fields and thus impair migration and orientation of birds in addition to effects on pollinators. In 1998, soon after cell towers were installed in Pennsylvania, pigeon races ended in disaster as up to 90% of birds were disoriented and lost their navigational skills.** **When Homing Pigeons Don't Go Home Again** NY Times. Dec 6, 1998.

H Bird Navigation Disabled in Cities

Independently replicated studies have confirmed the radio frequency (RFR) effects on orientation of birds. **Engles et al (2014) exposed migratory European robins to background electromagnetic noise present in unscreened wooden huts at the University of Oldenburg city campus in Germany and found they could not orient using their magnetic compass. If grounded their orientation reappeared but disappeared again if broadband radiofrequencies were generated inside the huts.** He did not believe the effects at first and performed the same double-blinded study many times in 7 years and with different graduate students to confirm the effect before publishing his findings.

Dr. Engles concluded, "The disruptive effect of radiofrequency electromagnetic fields is not confined to a narrow frequency band and birds tested far from sources of electromagnetic noise required no screening to orient with their magnetic compass." **Research has also demonstrated abnormalities in reproduction and behavior of birds nesting near cell towers in addition to harm to amphibians.** This raises the question of the health and sustainability of cites with a dense assortment of telecommunications towers.

I Bee Colony Collapse Disorder

Bees are a critical pollinator species. Of the 100 crops that provide 90% of the world's food supply, 71 are pollinated by bees, according to the **UN Environmental Program**. Researchers agree that we are in the midst of a pollinator crisis. The White House in 2014 was so concerned it established a **Federal Strategy** with a Pollinator Task Force to promote bee health. As bee numbers have plummeted around the world, scientists have been investigating causes. They have found several contributing factors affecting the health and reproduction of bees, including pesticides, global climate change, loss of habitat and air pollution with new research pointing towards microwave radiation as an important and yet unrecognized cause for concern. Bees contain magnetite granules in their abdomen which offer them the ability to navigate with the earths natural low power non-pulsating magnetic field.

J Bee Behavior Disruption by Cell Phone Radiation

Bees operate in about a 5 kilometer radius and typically find their way without difficulty. Sharma **et al (2010) looked at bee behavior placing a cell phone near a hive. They found worker bees returned less and less frequently to the beehive after the installation of a mobile phone. There was a significant decline in colony strength and the rate of queen egg laying.**

Kumar et al (2011) looked at physiologic changes in bees exposed to **cell phone radiation** and found it **creates a stress response, increased agitation and increase in carbohydrate metabolism.**

Favre et al (2017) clearly demonstrated that bee behavior is disrupted by exposure to cell phone GSM radiofrequency radiation and **caused worker bees to emit a piping signal to swarm**. Bees have also demonstrated **aggression after 30 minutes of cell phone exposure.** Dr. Favre notes, "Mobile phone companies and policy makers point to studies with contradictory results." However, his study distinctly demonstrated adverse effects. He invites others to reproduce his research.

K Colony Collapse Disorder started After the Use of Pesticides

Cammaerts (2017), biologist and author of 54 peer reviewed publications on insects, observes that the sharp decline of bees did not start with the use of insecticides but much later and removal of pesticides has not been accompanied by the expected rise in bee populations. While she does not discount a role for insecticides causing bee decline, she advises beekeepers to consider that radiofrequency radiation could also have an impact and protect their hives by locating these in a low EMF environment or placing them in a Faraday cage or enclosure.

L Insects: The Base of Our Food Chain Are In Decline

Bees are not the only insects necessary for sustainability and all are suffering decline. Purdue University among others points out that insects are critical in living ecosystems. They are wild and domestic pollinators, provide a source of food for amphibians, reptiles, birds and mammals, are primary decomposers for fungi, dead plants and animals and also eat other pest insects thus playing a beneficial role in the balance of nature. A Yale report in 2016 highlighted a **dramatic drop in insect populations in many parts of the world.** Insect traps set up in Germany are showing a startling 4 to 5 fold reduction. Biologists attribute this to monoculture farming, pesticides and habitat loss, however the scientific literature points to radiofrequency radiation as another significant contributing cause. **Yale report on insect decline.**

M Biodiversity and Abundance of Wild Pollinators

Lazaro (2016) emphasizes pollination as a key ecosystem service that needs protection. His group measured insect biodiversity on **wild pollinator communities including wild bees, hoverflies, bee flies, beetles, butterflies, and wasps** on 2 Greek islands at variable distances from telecommunication antennas. He found that **all pollinator groups, except butterflies, were affected with a decrease in abundance and composition of insects closer to antennas.** He did note an opposite effect on however, that underground-nesting wild bees and bee flies unexpectedly increased with EMR. He stated that this effect on wild insects could have

"additional ecological and economic impacts on the maintenance of wild plant diversity, crop production and human welfare."

N Ants Can Be Used as a Bio-indicator for Radiofrequency

Belgian entomologist Marie-Claire **Cammaerts** (2017) has done a number of studies on cell phone radiation and found that insects, particularly **ants, are extremely sensitive to radiofrequency radiation** (RFR). In fact, some methods of insect control use RFR. She performed dozens of experiments on countless numbers of ants with the following observations

- **Ants lost their olfactory and visual memory after GSM cell phone exposure and with a second exposure causing cumulative damage**. (Cammaerts **2012)**
- **3 Minutes of exposure of ants to cell phone radiation caused "locomotion ataxia", decreased linear speed, and increased angular speed**. The ants needed two to four hours for recovery. **When the phone was in standby mode under the ants nest, the ants relocated their nests far away from the cell phone with their eggs, larvae and nymphs. They returned after removal of the cell phone.** Cammaerts **(2013)**
- **Ants under the influence could not follow a pheromone trail or forage for food effectively, return to their nest and after 180 hours there was deterioration of the colony.** Cammaerts **(2013)** notes RFR "effects social insects' behavior and physiology."

O 5G Deployment More Harmful for Insects: The Resonance Effect

The increase the number and density of cell towers in cities and rural areas coincides with insect and bird decline. Older generation technology emits RF frequencies between 100 MHz and 6 GHz with wavelengths in inches to feet. A new 5th generation (5G) of wireless communications is being proposed, adding to the mix millimeter waves (fractions of an inch long) between 6 GHz to over 100 GHz. These high frequency wavelengths pulse at billions of cycles per second (1GHz=1 billion cycles per second).

Radiofrequency wavelengths, especially those that are modulated (or pulsed) are known to cause much more disruption to organisms, or structures within the organism, if the frequency wavelength is the same size as the organism, organ structure, cell or cell structure. This phenomenon is called resonance. It leads to heightened vibration and thus injury. Insects are smaller in size and close to the width of 5G frequencies.

Thielens (2018) studied this effect on 4 different insects exposed to electromagnetic fields from 2 to 120 GHz. He found "The insects show a maximum in absorbed radio frequency power at wavelengths that are comparable to their body size…..This could lead to changes in insect behaviour, physiology, and morphology over time due to an increase in body temperatures, from dielectric heating." Insects are thus especially susceptible to 5G microwave frequencies. There has been no premarket testing of this 5G technology however a body of research demonstrates harm to insects. Policies to expand deployment of this technology unfortunately do not consider these biological or environmental effects.

P Mammals: Reproductive Effects

Magras and Xenos **(1997)** performed an in-vivo study looking at prolonged exposure to low intensity radio frequency radiation and reproduction. They used 12 pairs of mice, placing them in various areas in an antenna park in a small mountaintop village in Greece near TV and FM broadcast transmitters. The animals lived in this area for 6 months with levels below well below CENELEC and IEEE standards. 6 pairs of animals were used as a control and placed in an environment free from RF radiation, about 10 KM from the town of Chortiatis, where the antennas were located. He notes, "Mice from the BALB/c/f breeding colony obtained from the ''Theageneion Anticancer Institute of Thessaloniki'' have been used for years in our laboratory for reproduction. Repeated pregnancies with a recovery period of 1 – 4 weeks for over a year, had never affected the fertility of the dams or any morphological parameters of the offspring, a fact that to our knowledge has not been questioned in the available literature." Their study showed a progressive reduction in litter size in the exposed female animals to the point of irreversible sterility by the 5th generation. The males exhibited rough hair and emaciation at the end of the study.

Panagopoulos (2007) exposed flies to 2 different digital cell phone frequencies for a few minutes a day for the first 6 days of life and found widespread cell death. He states, "Induced cell death is recorded for the first time, in all types of cells constituting an egg chamber (follicle cells, nurse cells and the oocyte) and in all stages of the early and mid-oogenesis….The exposure conditions were similar to those to which a mobile phone user is exposed…"

The NIEHS National Toxicology Program on Cell Phones and Cancer released their results in 2018 looking at non-thermal effects of cell phone non-ionizing radiation. They showed consistent perinatal effects, including lower pup body weights and lower pup survival. The **NTP study**, at https://ntp.niehs.nih.gov/ntp/about_ntp/trpanel/2018/march/tr595peerdraft.pdf , also noted **clear evidence of he art tumors, a statistically significant increase in brain tumors and adrenal gland tumors, as well as DNA damage and cardiomyopathy similar to aging. An abundance of in vitro studies in animals shows that non-ionizing radiation can damage reproduction by creating a stress response in cells producing damaging reactive oxygen species.** See also Physicians for Safe Technology Reproductive Health Effects Scientific Literature.

Q Mammals: Swiss Calves Born with Cataracts

Several studies indicate that low power non-ionizing microwave radiation contributes to and can cause cataracts. Heat is a well-established mechanism for induction of cataracts as the lens does not have vessels that can dissipate heat. Non-thermal effects however have also been demonstrated in some research, which show adverse effects on lens transparency, alteration of epithelial cell proliferation and apoptosis, and a stress response in lens epithelial cells. Damage to lens epithelial cells is associated with cataracts. Hassig et al (2009) investigated in Swiss calves the prevalence of nuclear cataract near mobile phone base stations. They found (32 %) of the calves had various degrees of nuclear cataract. The number of antennas within 100 to 199 meters was associated with oxidative stress and there was an association between oxidative stress and the distance to the nearest mobile phone base station. In a later study, **Hassig et al (2012) looked at the incidence of cataracts in newborn calves before and after a mobile phone cell tower was placed and found a 3.5 times higher rate of significant cataract after the mobile phone station was installed.**

R Tagging Wildlife Reduces Reproduction and Survival

Tagging animals for tracking is an important tool to help researchers understand their behavior, habitat selection and migration patterns. Some studies have indicated no harm from these tracking devices, however, other **studies show lowered survival rates and reproductive rates. There may be a direct interference in the behavior of the animal due to discomfort as well as direct harm from the continuous pulsing radiofrequency which is located on the body**, as a growing body of science demonstrates. Balmori (2016) warns, "It is paradoxical that, at the same time, field scientists investigating the movements and other aspects of animal biology are providing animals with radio transmitters that emit the same type of radiation, since this may affect the results concerning their orientation and movement." There is also **concern with regards to successful reproduction and animal behavior with close proximity to RF radiation.**

S Government Agencies Highlight Cell Tower Risks to Wildlife

The US Fish and Wildlife Service and the Department of Interior (DOI) has had concerns for many years about the adverse impacts of cell towers and electromagnetic radiation on migratory birds and other wildlife. It is **conservatively estimated that 4 to 5 million birds die each year in cell tower and guy-wire collisions**. (Government- Manville 2005, 2009). The DOI noted that there were 241 species of birds whose populations merit special protection. Balmori has documented **wildlife effects after cell towers were constructed including nest and site abandonment, plumage deterioration, locomotion problems, and death in House Sparrows, White Storks, Rock Doves, Magpies, Collared Doves, and other species.**

T Robotic Bees: "Smart" or Dumb Pollination?

Are we creating dead zones in cities where urban or rural farmers will not be able to grow food or have a vegetable garden? The tech industry may advise us to use the very technology that is harming ecosystems by using bee drones to pollinate our crops. Walmart has already filed a patent for a pollinating robotic bee. What about ownership of drones, privacy, security and adverse effects on sensitive native bees and flowers with the use of these drones? Many questions, no answers but predictable untoward results.

U Prevention Smarter Than Cure

Will the situation worsen? **Solving the real problems causing the decline of species seems smarter than always trying to develop a new and potentially more toxic industry to fix it.** Patients are often given prescriptions to treat the numerous chronic diseases of our modern culture. These medications can cause side effects that may be far worse than the disease. Physicians now understand it is often more sensible and effective to help patients change their diet, add exercise and avoid toxic exposures to promote health and prevent disease. Wireless radiation is another toxic exposure with measurable biological effects. **Should we not approach wireless technology with the same preventative precautions as we do pesticides, industrial chemicals and ionizing radiation?**

V What are Safe Levels of RF Radiation?

Sage, Carpenter, Blank and other scientists note in the Bioinitiative Report that **non-thermal bioeffects are clearly established.** There is an **urgent need for government agencies to**

adopt a realistic biologically based exposure standard to replace the thermal (SAR) standard, which is far too permissive and not protective of human or environmental health.

The Bioinitiative Report reviewed studies looking at the lowest levels of non-thermal, non-ionizing radiofrequency that did not cause harmful biological effects. Their conclusions, based on peer reviewed research, indicated that there should be a " scientific benchmark of 0.003 uW/cm2 or three nanowatts per centimeter squared for 'lowest observed effect level' for RFR is based on mobile phone base station-level studies." They also suggest "Applying a ten-fold reduction to compensate for the lack of long-term exposure (to provide a safety buffer for chronic exposure, if needed) or for children as a sensitive subpopulation…". This translates into a **recommended precautionary action exposure level of 0.0003 uW/cm2.** Our current U.S. guidelines follow that of the WHO International Commission on Non-Ionizing Radiation Protection (ICNIRP), whose guideline is 200 uW/cm2 to 1000 uW/cm2 (2 W/m2 to 10 W/m2) for RF radiation depending on frequency.

W Human Survival Linked to Biodiversity and Healthy Ecosystems

Human survival depends on biodiversity and complex ecosystems for a healthy functioning environment, maintaining clean air, clean water and sustainable soils. The environment is our natural capital. It appears now under threat from the proliferation of radiofrequency towers along with habitat loss and exposure to other environmental toxins such as pesticides and industrial chemicals. **It is critical to consider the adverse effects of the proposed expansion of wireless telecommunications towers and lower atmospheric balloons in cities and rural areas before they are deployed. Like sonic threats** sonic threats **for marine mammals the hazards are not seen, heard or felt by humans and harm to animals is slow to be realized.**

X Safer Alternatives

Consideration should be given to relocating antennas in residential, school and hospital zones where people live and work and **converting broadband to fiberoptic cabled systems which are safer and more sustainable in both cities and rural areas.**
See also **PST Broadband Expansion**

Y Reviews on Wildlife

Balmori (2015) notes in his latest review "**Current evidence indicates that exposure at levels that are found in the environment (in urban areas and near base stations) may particularly alter the receptor organs to orient in the magnetic field of the earth. These results could have important implications for migratory birds and insects, especially in urban areas, but could also apply to birds and insects in natural and protected areas where there are powerful base station emitters of radiofrequencies**.
https://www.researchgate.net/publication/273121908_Anthropogenic_Radiofrequency_Electromagnetic_Fields_as_an_Emerging_Threat_to_Wildlife_Orientation

The Cucurachi Review (2012) of **113 peer-reviewed publications revealed, "In about two thirds of the reviewed studies ecological effects of RF-EMF was reported at high as well as at low dosages. The very low dosages are compatible with real field situations, and could be found under environmental**

conditions." https://www.researchgate.net/publication/233974663_A_review_of_the_ecological_effects_of_radiofrequency_electromagnetic_fields_RF-EMF

Panagopoulos (2013) explains in his review of experimental data, how **living organisms are in harmony with terrestrial and magnetic fields, which effect their cellular processes and even circadian rhythms. Interference of this delicate interaction with human wireless technology can adversely affect the health and well-being of ecosystems**. https://www.novapublishers.com/catalog/product_info.php?products_id=41753f

The Saravanamuttu Review (2013) found that harm to the environment is demonstrated but there are no long term studies to support safety of this technology. Sivani and Sudarsanam state, "**Based on current available literature, it is justified to conclude that RF-EMF radiation exposure can change neurotransmitter functions, blood-brain barrier, morphology, electrophysiology, cellular metabolism, calcium efflux, and gene and protein expression in certain types of cells even at lower intensities.**" They note that these studies are important to identify the frequencies, intensities and durations that are safer, enabling the use of wireless technology while ensuring the health and sustainability of the environment. https://www.researchgate.net/publication/258521207_Impacts_of_radio-frequency_electromagnetic_field_RF-EMF_from_cell_phone_towers_and_wireless_devices_on_biosystem_and_ecosystem-A_review

A 2010 review paper from the Ministry of Environment and Forests in India reviewed all available peer reviewed research on the impacts of wireless radiofrequency (RF) on living organisms, including birds and bees, plants, animals and humans. **Of 919 articles collected 593 showed adverse impacts. In each category of organism, over 60% of the research indicated harm to that biological species.** http://www.moef.nic.in/downloads/public-information/final_mobile_towers_report.pdf

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