

FACTSHEET: RADIOFREQUENCY AND THE ENVIRONMENT

TREES AND CELL TOWER RADIATION



Norway Maple Tree
Image: Tree damage caused by mobile phone base stations by Breunig 2017

e base stations by Breunig 2017

Trees at Risk From Rapid Wireless Network Deployment

Hundreds of thousands of new cell towers, 4G/5G small cells and building mounted antenna facilities are being built across the country. Wireless antennas emit radio-frequency (RF) radiation, an environmental pollutant.

Trees Keep the Environment Healthy:

- Capture air pollution and improve air quality.
- Save energy by cooling and reducing energy consumption for air conditioning.
- Remove carbon dioxide from the air and release oxygen.
- Help prevent flooding and keep the soil nutrient-rich.
- Provide habitat for wildlife.

NOTE: All bold italic text is a clickable hyperlink.

Science on Impacts to Tree Canopy

The majority of studies have found RF impacts in plants. Some plants were found to be more sensitive than others to specific frequencies ([Halgamuge 2017](#)). Impacts observed include:

- Impacts to growth and development
- Thinner cell walls
- Altered gene expression
- Impacts on metabolic activities

A field study that monitored over 100 trees for 9 years published in *Science of the Total Environment* found a high level of damage to trees from nearby cell tower antennas ([Waldmann-Selsam 2016](#)). The damage started on the side of the tree exposed to higher RF.

Adverse Effects on Seedlings

A [study](#) on RF exposed Aspen tree seedlings found adverse effects on leaf and shoot growth as well as biochemical changes after RF exposure. Shielded seedlings were not impacted. ([Haggerty \(2010\)](#)).



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A "Monopine" Cell Tower
Fake Plastic Tree

A Lack of Environmental Oversight

The rapid construction of wireless infrastructure is impacting tree health in numerous ways:

- Companies have aggressively trimmed trees near towers and small cell sites with no or minimal oversight by arborists.
- Trees are being removed to clear land for towers and/or roads to the facility.
- Digging to install equipment can disrupt the root zone.
- Cell towers camouflaged as fake trees are contributing to microplastic pollution. Faux PVC pine needles can be found at the base of "monopines".

Trees Cut Down For Towers

Trees are heavily trimmed and sometimes felled to make way for new telecommunications networks. Public Employees for Environmental Responsibility documented 100 trees chainsawed in Yellowstone for telecommunications signals.

As another example, a cell tower application in [New Canaan, Connecticut](#) required over 100 trees to be cut down once approved.

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Meaningful Policies Are Needed

Local rules help protect trees from aggressive pruning and tree removal. Below are examples of measures that are a step forward. However much stronger policies that address RF radiation are needed to fully protect trees and plants.

ORDINANCES SEEKING TO PROTECT TREES

Washington DC

- Tree protected zone: 1 foot for each inch of the tree's diameter or a minimum of fifteen feet whichever is greater.
- No street tree shall be pruned, removed, or have its protected root zone impacted, to accommodate installation of Small Cell infrastructure

Denver Colorado

- "A minimum of 15-25 feet of separation to the tree trunk such that no proposed disturbance shall occur within 5 feet of the critical root zone (drip-line) of any tree..."

Albemarle County, VA

- The telecom applicant must submit a tree conservation plan prepared by a certified arborist.

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[City of Fort Collins, Colorado](#) [Excerpts from Section 5.3 Street Tree and Canopy Cover Protection](#)

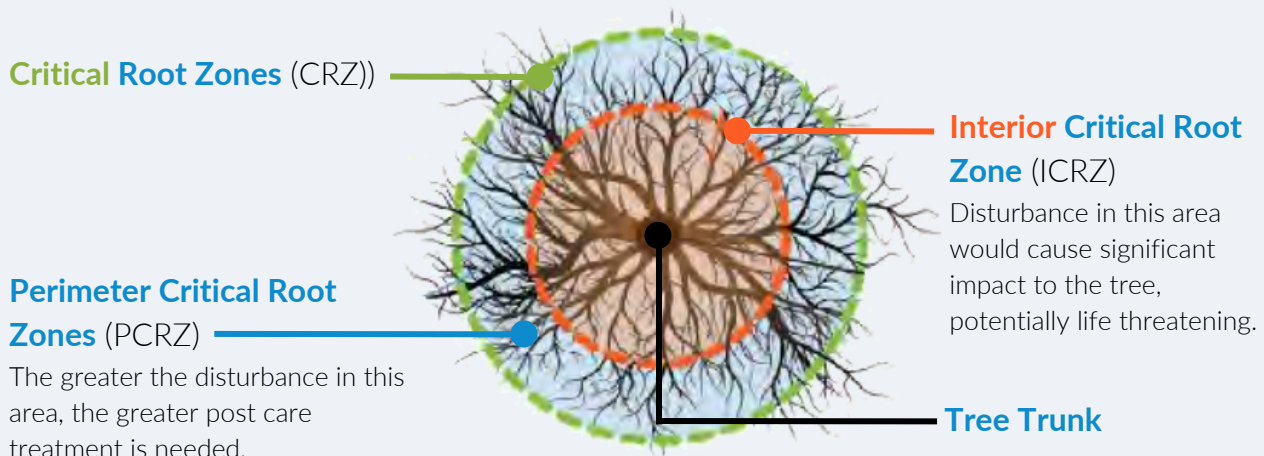
“It shall be unlawful for any person to plant, cut, trim, prune, remove, or destroy any tree within the public right-of-way of any street or sidewalk, or upon other City-owned property within the City of Fort Collins.”

“Small cell foundations and poles shall not be located within 40 feet or within the Critical Root Zone (CRZ) of an existing tree or planting site. The greater of the two shall apply.”

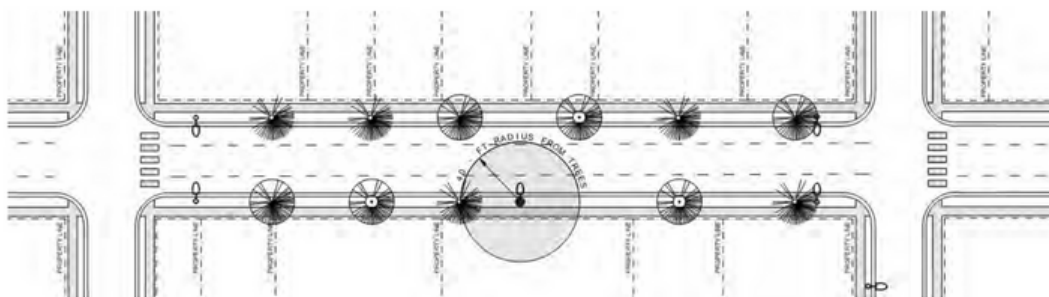
“Within the drip line of any protected existing tree, there shall be no cut or fill over a four-inch depth unless a qualified arborist or forester has evaluated and approved the disturbance.”

Critical Root Zones (top view)

Critical Root Zone (CRZ) is the distance from the trunk that equals one foot for every inch of the tree's diameter. For example, if the tree has a trunk 12 inches in diameter, the CRZ is a 12 foot radius around the tree.



40-foot radius from the Critical Root Zone



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Graphics from Fort Collins Small Cell Design Guidelines

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RESEARCH ON TREES, PLANTS AND EMFS

RREVIEWS

[A review of the ecological effects of radiofrequency electromagnetic fields \(RF-EMF\) by Cucurachi S. et al., Environment International \(2013\)](#)

[Low-level EMF effects on wildlife and plants: What research tells us about an ecosystem approach. Levitt BB et al., Frontiers in Public Health \(2022\)](#)

[Effects of non-ionizing electromagnetic fields on flora and fauna, part 1. Rising ambient EMF levels in the environment. Part 2 impacts: How species interact with natural and man-made EMF. Part 3. Exposure standards, public policy, laws, and future directions Levitt BB. et al., Reviews on Environmental Health \(2022\)](#)

[Lessons learned from the application of machine learning to studies on plant response to radio-frequency. Halgamuge, M. N., & Davis, D. Environmental Research \(2019\).](#)

[Review: Weak radiofrequency radiation exposure from mobile phone radiation on plants. Halgamuge, M. N. Electromagnetic Biology and Medicine \(2017\)](#)

[Sensitivity of plants to high frequency electromagnetic radiation: Cellular mechanisms and morphological changes. Kaur, S., et. al., Reviews in Environmental Science \(2021\)](#)

[Electromagnetic Fields Act Similarly in Plants as in Animals: Probable Activation of Calcium Channels via Their Voltage Sensor. Pall, M., Current Chemical Biology \(2016\)](#)

SELECTED STUDIES

[The aftermath of long-term exposure to non-ionizing radiation on laboratory cultivated pine plants \(Pinus halepensis M.\) Stefi et al., Fora \(2017\)](#)

[Reduced growth of soybean seedlings after exposure to weak microwave radiation from GSM 900 mobile phone and base station. Halgamuge, M. et. al., Bioelectromagnetics \(2015\)](#)

[Adverse Influence of Radio Frequency Background on Trembling Aspen Seedlings: Preliminary Observations. Haggerty, K. International Journal of Forestry Research \(2010\)](#)

[Do electromagnetic fields used in telecommunications affect wild plant species? A control impact study conducted in the field. Czerwiński M., et al., Ecological Indicators \(2023\)](#)

[Influence of microwave frequency electromagnetic radiation on terpene emission and content in aromatic plants. Soran, M. et al., Journal of Plant Physiology \(2014\)](#)

[The effect of the non ionizing radiation on cultivated plants of Arabidopsis thaliana \(Col.\). Stefi A. L., et. al., Flora \(2016\)](#)

[Impacts of Radio-Frequency Electromagnetic Field \(RF-EMF\) on Lettuce \(Lactuca sativa\)- Evidence for RF-EMF Interference with Plant Stress Responses. Tran, N. T., et. al., Plants \(2023\)](#)

[Radiofrequency radiation injures trees around mobile phone base stations. Waldmann-Selsam C., et.al., Science of The Total Environment \(2016\).](#)

[The influence of bioactive mobile telephony radiation at the level of a plant community – Possible mechanisms and indicators of the effects. Czerwiński, M., et.al., Ecological Indicators, \(2020\)](#)

[Plant Responses to High Frequency Electromagnetic Fields. Vian A et al., Biomed Res Int. \(2016\)](#)

[Morphophysiological and Proteomic Responses on Plants of Irradiation with Electromagnetic Waves Zhong, Z., et. Al., International Journal of Molecular Sciences \(2021\)](#)

[Oxidative stress and an animal neurotransmitter synthesizing enzyme in the leaves of wild growing myrtle after exposure to GSM radiation. Aikaterina et. al., Flora \(2018\)](#)



“Tree damage caused by mobile phone base stations 2021”



**Waldmann-Selsam, C., et al.
“Radiofrequency radiation injures trees around mobile phone base stations.”
Science of the Total Environment**



**International Conference on Trees and
Electromagnetic Radiation**