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1. Leaf Blowers and Air Quality: Health Impact

Gasoline-powered lawn and garden equipment is a significant source of toxic and carcinogenic exhaust and fine particulate matter. [\[BNE\]](#)

A study published in the November 2019 issue of British Medical Journal found that even small increases in PM2.5 (particulate matter) exposure were linked with substantial health care and economic costs. [\[HTHCSPH\]](#)

Gasoline-operated leaf blowers produce reactive hydrocarbons. On the basis of available human and animal evidence, it is concluded that reactive hydrocarbons, formed during incomplete combustion can cause acute irritation, neurophysiological symptoms and respiratory symptoms. There is also evidence for possible immunological effects and exacerbation of allergic responses to known allergens. Chronic

animal inhalation studies show a spectrum of dose-dependent chronic inflammation and histopathological changes in the lung in several studies. [\[WHO1\]](#)

A two-stroke leaf blower emits *299 times the hydrocarbons* compared to a 2011 Ford F-150 SVT Raptor Crew Cab pickup truck [\[EET\]](#).

Many hydrocarbons are volatile (VOCs) and participate in smog formation. [\[ARES\]](#)

Gas-powered blowers emit carbon monoxide, which is a toxic air pollutant. Carbon monoxide is a colorless, odorless gas produced by incomplete combustion. It is very difficult to separate the potential effects of carbon monoxide from those due to other respiratory irritants. Individuals working with gas-powered engines are also exposed to high concentrations of other combustion components of smoke and exhaust. [\[WHO2\]](#)

A two stroke leaf blower emits *23 times the carbon monoxide* compared to a 2011 Ford F-150 SVT Raptor Crew Cab pickup truck [\[EET\]](#).

Gas-powered blowers produce nitrogen oxides. Nitrogen oxides can create environmental health hazards when they react with sunlight and other chemicals to form smog. Nitrogen oxides and sulfur dioxide react with substances in the atmosphere to form acid rain. [\[National Library of Medicine\]](#)

A two-stroke leaf blower emits *two times the nitrogen oxide* compared to a 2011 Ford F-150 SVT Raptor Crew Cab pickup truck [\[EET\]](#)

Ozone is created when heat and sunlight react with nitrogen oxides and Volatile Organic Compounds [\[WUSL\]](#).

When inhaled, ozone can damage the lungs. Relatively low amounts of ozone can cause chest pain, coughing, shortness of breath and throat irritation. Other health hazards: premature death, cardiovascular effects, asthma, lower birth weight and decreased lung function in newborns [\[EPA1\]](#)

Gasoline exposure is associated with renal and liver cancer, acute myeloid leukemia (AML), myeloma, heart disease and irritant effects [\[EHP\]](#)

The particles in diesel exhaust are suspected of being carcinogens because of the elevated lung cancer rates found in occupational groups exposed to diesel exhaust. [\[USDOH\]](#)

As emissions controls on automobiles have become so effective, the relative contribution of small-engine emissions to overall air pollution has increased. While automobiles are typically operated between 100 and 1,000 times longer than small engines, such as leaf blowers, their emissions are 100 to 1,000 times lower [\[MSU\]](#)

By the year 2020, air emissions from lawn care equipment in California are expected to exceed the air emissions of all the cars in California [\[CAL-EPA\]](#)

Outdoor air pollution kills more than 800,000 people a year and sickens many more. Ambient air pollution is a major health risk, leading to respiratory and cardiovascular mortality. [\[ESC\]](#)

Leaf blower operators may be exposed to potentially hazardous concentrations of CO and PM intermittently throughout their work day. While exposures to CO and PM may not have immediate, acute effects, the potential health impacts are greater for long-term exposures leading to chronic effects. In addition, evidence of significantly elevated concentrations of benzene and 1,3-butadiene in the breathing zone of operators leads to concern about exposures to these toxic air contaminants. [\[CAL-EPA\]](#)

New York is the largest 'net importer' in the United States of early mortality caused by out-of-state air pollution. (We can't do much about that but we can address pollution caused locally.) [\[NYT\]](#)

Leaf blowers are an obvious source of particulate matter emissions. [\[FPP\]](#)

Particulate matter is the sum of all solid and liquid particles suspended in air many of which are hazardous. This complex mixture includes both organic and inorganic particles [\[EPA\]](#)

A study led by Harvard T.H. Chan School of Public Health and published in 2019 found that even small increases in PM_{2.5} (particulate matter) exposure were linked with substantial health care and economic costs [\[HTH CSPH\]](#)

Exposure to ambient fine particulate matter is a major global health concern. [\[PNAS1\]](#)

The majority of studies reported reduced birth weight and increased odds of low birth weight in relation to exposure to carbon monoxide (CO), nitrogen dioxide (NO₂) and particulate matter less than 10 and 2.5 microns. [\[SD AAP\]](#)

Airborne magnetite particles in the brain may increase the risk of Alzheimer's disease [\[SR A\]](#)

Research has shown that ultra fine particles transported in the blood are primarily deposited in the liver, where they may cause oxidative stress which can damage cells and eventually lead to liver cirrhosis or even cancer. [\[NCBI AL\]](#)

Ultra fine particles can enter deeper into the alveoli; they are more prone to deposit in the lungs, and can cause inflammation in the alveoli and exacerbation of existing respiratory diseases in more vulnerable individuals such as asthmatics, children, and those suffering from circulatory or respiratory diseases. [\[TFO\]](#) [\[NCBI A\]](#)

Epidemiological studies have consistently shown an association between particulate air pollution and not only exacerbations of illness in people with respiratory disease but also rises in the numbers of deaths from cardiovascular and respiratory disease among older people. [\[TL AP\]](#)

Early life exposure to Particulate Matter was associated with a reduction in fundamental cognitive abilities, including working memory and conflict attentional network. [\[EHP1\]](#)

Numerous scientific studies have linked particle pollution exposure to a variety of problems, including: premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat aggravated asthma, decreased lung function, increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing. [\[EPA\]](#)

Legacy heavy metals from past industrial activity combine with traffic paint; asphalt; and bits of tires, brakes, and car parts to create toxic dust on our roadways. [\[MS\]](#)

A group of Italian researchers does posit the idea that SARS-CoV-2, the virus behind the covid-19 pandemic, might be getting a helping hand from atmospheric pollution. [\[LSUB\]](#)

People with Covid19 who live(d) in U.S. regions with high levels of air pollution are more likely to die from the disease than people who live in less polluted areas, according to a new nationwide study from Harvard T.H. Chan School of Public Health. [\[HCSPH\]](#)

Workers can not protect themselves from toxins emitted by leaf blowers:
He (landscaping) worker has little control over the equipment he must use. [\[PF\]](#)

The American Lung Association gives the State of New York poor air quality ratings with an F grade for the greater metropolitan areas [\[State Of The Air\]](#)

According to the Lung Association, a leaf blower causes as much smog as 17 cars. [\[Lung Association\]](#)

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2. Leaf Blowers and Climate Change

Hydrocarbons and other VOCs contribute to the formation of ozone by increasing the amount of nitric dioxide in the air, which then combines with oxygen molecules to produce nitrogen and ozone, both greenhouse gasses. Nitrogen oxide has 300 times more heating power than carbon dioxide. Carbon monoxide is only a very weak direct greenhouse gas, but has important indirect effects on global warming. Carbon monoxide reacts with hydroxyl radicals in the atmosphere, reducing their abundance. As hydroxyl radicals help to reduce the lifetimes of strong greenhouse gases, like methane, carbon monoxide indirectly enlarges the global warming potential of these gases. [\[Respiratory Health\]](#)

1.6 million landscaping and groundskeeping workers were counted by the National Association of Landscape Professionals, and the number is still growing. [\[Nat. Ass. of Landscape Professionals\]](#)

Thousands of landscaping companies drive around our county to offer homeowners landscaping services. Their service generally consists of mowing, blowing and the application of fertilizers and pesticides. All these 'conventional' services have, in their own ways, a negative impact on our environment, our biodiversity, our health and our climate [\[HY\]](#)

Sustaining and restoring this natural habitat is essential for the preservation of biodiversity and climate resilience. Conventional landscaping services are doing the opposite: they promote the use of exotic turf grasses and exotic plant species, they annihilate wildlife habitat, intoxicate the soil and our waterways with pesticides and fertilizers and they create a landscape with little capacity for drainage, and enhanced sensitivity to drought and climate events. [\[HY\]](#)

3. Leaf Blowers and Noise

A full summary of article about noise pollution can be found in the Noise pollution Clearing House Online Library [\[NPC_OL\]](#)

Noise exposures from leaf blowers may be high enough that operators are at increased risk of developing hearing loss. [\[CAL-EPA\]](#)

Leaf blowers can cause irreversible hearing damage to the million-plus lawn workers who use them [\[ACSH\]](#)

Measurements indicate that the gas leaf blowers have a significantly greater low-frequency component. This low-frequency sound creates a different acoustic quality of the sound of gas leaf blowers versus battery leaf blowers. Because the low-frequency sound travels further, it is audible over greater distances, transmits most easily through the windows and glass doors of homes, and is more audible inside the home. The measured gas leaf blowers have a greater noise impact on the community than the measured battery-powered blowers. [\[CP\]](#)

Even gas blowers that are rated by the industry as emitting the same 65 decibels as battery blowers are significantly noisier. [\[ARUP\]](#)

The low frequency noise from gas blowers travels much longer distances and penetrates windows more easily and therefore affects a significantly larger numbers of neighbors in urban settings. [\[ARUP\]](#)

Noise exposures from leaf blowers may be high enough that operators are at increased risk of developing hearing loss. [\[CAL-EPA\]](#)

Many gas leaf blowers impact the operator's ears at 100 decibels or more. [\[BNE\]](#)

91 decibels for 2 hours or 100 decibels for only 15 minutes a day can result in permanent hearing loss [\[CDC\]](#)

The noise that causes sensorineural hearing loss is usually not one deafening bang, but decades worth of exposure to the high-decibel accessories of daily life that includes leaf blowers and other sources. [\[JB\]](#)

Even exposure to an average of 75 decibels over a lifetime can result in permanent hearing loss. [\[PF\]](#)

Adverse effects from noise include cardiovascular impacts, and effects on the immune system and on development. [\[PF\]](#)

Low frequency noise such as emitted by gas blowers is such a special health concern that additional protection is warranted, especially for children, the elderly, and other sensitive populations. [\[BNE\]](#)

Workers frequently walk into the path of approaching traffic since they cannot hear the traffic because of the noise. [\[BNE\]](#)

Loud noise interferes with habitats and life cycles of birds and animals. [\[BNE\]](#)

Where the legislation is under Noise Ordinance, enforcement is impractical since it requires the presence of an inspector with a noise meter at the time of the violation. [\[HY\]](#)

Some communities require citizens calling in to make reports about noise disturbance, which they are reluctant to do. [\[HY\]](#).

Landscape companies have trouble following varying ordinances. [\[HY\]](#)

Leaf blowing is an entry-level job where the worker has little job security or control over the equipment (hearing protection) he must use. [\[PF\]](#)

OSHA policy requires that employers use safe equipment to protect workers (e.g. battery-powered blowers) but hearing protectors are often not effective in preventing hearing loss because of their poor quality and the need for even the high quality protectors to fit correctly. [\[CP\]](#)

Studies conducted in the past fifteen years document that noise exposures negatively affect health by contributing to many diseases, including: cardiovascular diseases; obesity; developmental delays; mental illness; and reduced job and academic performance. [\[NBP\]](#)

4. Leaf Blowers and Ecology

Leaf blowers are not only loud and pollute the air through their internal combustion engines, they also seriously harm the soil biology. [\[BUND\]](#)

Over time, leaf blowers erode topsoil so the crowns of your plants are exposed and will damage the roots close beneath surface. [\[SA\]](#)

Leaf blowers blow away leaves and grass clippings that should remain on your lawn and mulched back into the soil, adding nutrients and improving texture. [\[SA\]](#)

One of the most common soil problems is compaction and leaf blowers are an important culprit. Compacted soil makes it difficult for oxygen to circulate or water to permeate the surface, causing a host of problems for your lawn. [\[SA\]](#)

One of the next most valuable things you can do to support pollinators and other invertebrates is to provide them with the winter cover they need in the form of fall leaves and standing dead plant material. [\[JW\]](#)

The vast majority of butterflies and moths overwinter in the landscape as an egg, caterpillar, chrysalis, or adult. In all but the warmest climates, these butterflies use leaf litter for winter cover. [\[JW\]](#)

Beyond butterflies, bumble bees also rely on leaf litter for protection. At the end of summer, mated queen bumble bees burrow only an inch or two into the earth to hibernate for winter. An extra thick layer of leaves is welcome protection from the elements. There are so many animals that live in leaves. [\[JW\]](#)

Wood thrush, like many other species of wildlife, are really adversely affected by loud noises. They will avoid areas where there are roads. They will avoid areas where there are loud noises like leaf blowers. [\[DC\]](#)

Other species of wildlife will move to avoid loud noises...We think that if we're driving out birds, we're driving out other species of wildlife. [\[DC\]](#)

Leaf blowers also are fatal to insects and other small creatures. This is especially important in light of recent warnings that our insect population is rapidly declining, threatening global biodiversity and our food supply. In fact, one report has referred to it as a coming insect armageddon. As a result, in 2019, the German government has told its citizens that leaf blowers should only be used if absolutely necessary. [\[WP\]](#)

Leaf mulching is 100% beneficial to the lawn [\[MSU2\]](#)

There is no change in soil pH after six seasons of mulching oak leaves into a lawn.[\[MSU2\]](#)
c If mulching is done correctly and lawn performance is still poor, soil microbial life may be lacking.
[\[MSU2\]](#)

The grass blades should be vertical and visible through the layer of mulched leaves. In certain areas, it may help to spread the mulch around from thick spots to areas with thinner mulch distribution.[\[MSU2\]](#)

Successful lawn care companies testified or submitted statements in favor of leaf mulching practices.[\[LLA_LT\]](#)

Successful lawn care companies testified or submitted statements to attest the financial profitability of leaf mulching.[\[LLA_LT\]](#)

Waste composition studies indicate that yard waste represents from 10% to 30% of municipal solid waste. A study conducted for the US Environmental Protection Agency found the total amount of yard waste produced in the United States to be 18% by weight of the total amount of municipal solid waste generated. Yard waste represents a greater percentage of the waste stream (from 35% to 40%) during certain times of the year.[\[NHDES\]](#)

Leaf and yard waste is also easily composted, which allows us to treat the material as a resource rather than a waste.[\[NHDES\]](#)

Mulch mowing can save municipalities (and taxpayers) tens of thousands of dollars, by avoiding the necessity of municipal collection. [\[Leave Leaves Alone\]](#)

ENVIRONMENTAL Fact Sheet



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WMD-SW-3

2018

Municipal Composting of Yard Waste

Background Information

Composting is an aerobic (oxygen-dependent) degradation process by which plants (leaves, vegetable trimmings, lawn clippings, and similar garden debris) and other organic wastes (kitchen refuse, sludge) decompose under controlled conditions. It is not a new process but has been an accepted agricultural practice for years. As a natural process, it can be carried out with as little, or as much, intervention and attention as desired. The basic parameters that influence the composting process are oxygen, temperature, moisture and the carbon-to-nitrogen ratio (C:N).



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Yard waste composting has many benefits. These include:

- Reducing waste disposal costs.
- Conserving natural resources.
- Producing a valuable soil amendment.
- Reducing environmental impact.

New Hampshire Leaf & Yard Waste Disposal Rules

In 1992, the New Hampshire Legislature passed House Bill 646, Chapter 266, which prohibits the disposal of leaf and yard waste in both landfills and incinerators, effective July 1, 1993. The rationale for this restriction is that leaf and yard waste can use precious capacity in our solid waste management facilities. Leaf and yard waste is also easily composted, which allows us to treat the material as a **resource** rather than a **waste**.

Composting facilities at which only leaf and yard waste and/or animal manure are processed are not subject to the New Hampshire *Solid Waste Rules* and in most cases will not require a permit. However, facilities that incorporate select food waste and/or other solid wastes in a compost pile are subject to the rules and may require a permit. Contact NHDES at (603) 271-2925 to obtain permitting information.

5. Battery Powered Leaf Blowers

Many lawn care companies use blowers other than gas-powered blowers, and they are profitable [\[Testimonials\]](#)

Companies are now operating with battery-powered equipment and manual tools at competitive prices. The National Association of Landscape Professionals named battery-powered equipment among its top trends for 2018, stating that “Many lawn mowers, leaf blowers, and similar equipment feature low or no emissions, are battery-powered, and are quieter. [\[JB\]](#)

Our testing revealed wide performance variations across models. Our recommended leaf blowers offer top performance [\[Consumers Reports Leaf Blowers Online\]](#)

The new breed of commercial-grade battery electric leaf blowers gives operators near-gas-like performance (power, speed, torque, weight, and run-times) while operating at about half the noise level. [\[AGZA\]](#)

Nationwide, many businesses, schools, and more than 135 municipalities, have moved away from gas-powered blowers, with no noticeable complaints. [\[AGZA\]](#)

Mulch mowing greatly reduces the need for leaf blower use and is better for the soil, the air, and profitability. [\[Testimonials\]](#)

An allowed phase-out over three years gives companies time to replace old gas-powered blowers with battery-powered blowers since gas-powered blowers wear out quickly. [\[AGZA\]](#)

Electric leaf blowers are more economical to operate than gas leaf blowers. [\[AGZA\]](#) [\[JCGrounds\]](#)

Many manufacturers offer battery-powered blowers; power is constantly improving. [\[AGZA\]](#)

Environmentally, the lithium-ion battery is worrying. On the other hand, the impact of the lithium supply itself is likely to improve. Ultimately, recycling lithium should play a part in mitigating political, environmental and economic risks in the future, but high rates of lithium battery recycling are yet to be seen. [\[BML\]](#)

The total global warming emissions from operating depend on the sources of the electricity that charge batteries and on the efficiency of the engine [\[Union Concerned Scientists\]](#)

From cradle to grave, battery-electric vehicles are cleaner. On average, battery electric vehicles (BEVs) representative of those sold today produce less than half the global warming emissions of comparable gasoline-powered vehicles. [\[Union Concerned Scientists\]](#)

Batteries are easier to use because they clip right into the unit unlike gas, which has to be poured. No need to transport gas, no filling and spilling. [\[MG_T\]](#)

There are companies that use all battery-powered blowers; profitability numbers are similar to those who don't. These companies work on small and large properties (up to 4 acres of lawn); and the time required is comparable to companies that use gas leaf blowers. [\[MG_T\]](#)

Most customers allow landscapers to plug in and charge at outdoor outlets. When it comes to the cost to charge a small blower or trimmer battery, I have heard numbers like \$5 per season. I haven't done the math on it to be precise however. We also have inverters in our vehicles plugged into larger batteries that allow us to charge small ones (for leaf blowers and trimmers) at the vehicle. Vehicles can be equipped to charge batteries while in motion also, to charge batteries while in transit. [\[MG_T\]](#)

Battery leaf blowers are cheaper to operate than gas blowers. [\[MG_T\]](#) [\[AGZA\]](#)

The energy source of charging for battery powered equipment can be 100% renewable energy. [\[MG_T\]](#)

Battery leaf blowers are easier to operate than gas blowers, lighter and have less vibration. [\[JC Grounds\]](#)

note: if emissions from two stroke engine are an estimated 17 fold of a regular car engine, the switch to battery operated leaf blowers, with consideration of the mining process, will therefore be extremely impactful

6. Leaf Blowers and Legislation

The financial interests of the commercial lawn care companies incentivise the most aggressive use of blowers. [\[JF\]](#)

Marketplace forces do not reflect the interests of those affected by the use of this noisy equipment (workers, neighbors.) [\[CE\]](#)

The lobbyist-witnesses for the lawn-care industry centered their case on “considerate” lawn care practices, such as using only one machine at a time, and not running the machines at top volume. The

industry can submit no evidence whatsoever that their “guidance” affects real-world practices, because none exists. This rationale resembles tobacco industry arguments that rules about secondhand smoke were not necessary, because smokers could learn to be more considerate of others [\[JF\]](#)

The manufacturers of the equipment (OPEI) and the Lawn Care trade association (NALP) or Turf Association have no control over lawn care companies, all of which are independently operated. [\[CE\]](#)

Home owners generally think their landscaper knows best and are reluctant to tell their landscaper what to do. [\[HY\]](#)

Home owners who ask for mow mulching are often misunderstood, ignored and the service denied. [\[HY\]](#)

It is difficult for workers in the landscaping industry, with their tight schedule, to answer to specific wishes. Working with the same tools while repeating the same practice from home to home, is most efficient. [\[HY\]](#)

Enforcement techniques such as the use of citizen affidavits, eliminate the need for an inspector to observe a violation while it is occurring. When complaints are called in hours or days later, Malhi said he cannot issue a citation because he didn’t witness the violation. That’s why only 39 complaints in 2019 – 9.7% of the total number – resulted in citations, McCrossin noted. “The overall problem, the way we see it, is that it’s not just enforcement – it also has to be education,” he added. “There’s an ebb and flow of who’s working in town and doing yard work, and they may or may not be aware of the ordinance.” [\[CE\]](#)

Pre-existing rules on violations, especially when ‘ticketing’ violaters is unlawful, can make it difficult to enforce legislation [\[HY\]](#)

The EPA has adopted emission standards to control both exhaust and evaporative emissions from small spark-ignition engines. [\[EPA_ES\]](#)

The results of the stricter emission standards will need to be compared with the growing sales of leaf blowers [\[MI_LB\]](#)

**Summary by Leave Leaves Alone and Healthy Yards Sustainable Landscaping www.healthyyards.org.
For additional information, suggestions please contact :info@healthyyards.org**