

April 28, 2025

## **RE: No Synthetic Turf**

CleanEarth4Kids.org strongly supports banning all uses of synthetic grass/artificial turf. Synthetic grass/artificial turf is harmful to human health and the environment.

Our youth, interns, and volunteers have worked hard to create videos and resources that can be found on our [CleanEarth4Kids.org Team 5: Stop Synthetic Turf page](#).<sup>1</sup>

Doctors, nurses, health professionals, children's health organizations, public health organizations, researchers, and the public are deeply concerned with the toxic and carcinogenic [chemicals](#), [heavy metals](#) like lead and cadmium, benzene, Polycyclic Aromatic Hydrocarbons (PAHs), phthalates, styrene, Volatile Organic Compounds (VOCs) and per- and polyfluoroalkyl substances (PFAS) are found in the plastic blades, backing, underlayment pads and in some plant based infills added to keep the blades upright.<sup>2,3</sup>

## **Synthetic Turf/Artificial Grass is PLASTIC**

Synthetic turf/artificial grass is made of mixed plastics, such as [polyethylene](#), [polypropylene](#), [nylon and more](#).<sup>4</sup>

[Over 16,000 chemicals](#) are used in plastics. At least 4,200 (26%) are chemicals that are highly hazardous to human health and the environment, yet only 980 have been regulated anywhere around the world.<sup>5</sup> All major plastic types tested leached hazardous chemicals, including food packaging, which alone can contain over [400 chemicals of concern](#).<sup>6</sup> Additionally, there is [little to no hazard information available](#) for over 10,000 of these chemicals.<sup>7</sup>

Chemicals commonly found in plastics, like PFAS and phthalates, can impair [reproduction, growth, and cognition](#).<sup>8</sup> Children are the most vulnerable due to developmental windows, more rapid metabolism, respiratory rates, cardiac output and greater caloric intake per pound. Chemicals in plastics have been linked to childhood [obesity, hyperactivity, ADHD, low IQ, and asthma](#).<sup>9</sup>

[Unborn children](#) are especially vulnerable to toxic exposures from plastics in utero

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<sup>1</sup> <https://cleaneearth4kids.org/team-5-synthetic-turf-toxic-chemicals>

<sup>2</sup> <https://theintercept.com/2019/10/08/pfas-chemicals-artificial-turf-soccer/>

<sup>3</sup> <https://www.hilarispublisher.com/polycyclic-aromatic-hydrocarbons-heavy-metals-crumb-synthetic-turf>

<sup>4</sup> <https://www.plymouth.ac.uk/discover/why-are-artificial-lawns-bad-for-the-environment>

<sup>5</sup> [https://www.cnn.com/2024/03/14/health/toxic-unregulated-chemicals-report-wellness?cid=ios\\_app](https://www.cnn.com/2024/03/14/health/toxic-unregulated-chemicals-report-wellness?cid=ios_app)

<sup>6</sup> [https://plastchem-project.org/wp-content/uploads/2024/03/PlastChem-Press-Release\\_English-v1.pdf](https://plastchem-project.org/wp-content/uploads/2024/03/PlastChem-Press-Release_English-v1.pdf)

<sup>7</sup> <https://plastchem-project.org/>

<sup>8</sup> <https://www.sciencedaily.com/releases/2020/12/201215131242.htm>

<sup>9</sup> <https://www.naturalsuperkids.com/health-effects-plastic-exposure-children>

which can “increase risks of prematurity, stillbirth, birth defects in the reproductive organs, neurodevelopmental impairment, impaired lung growth, and childhood cancer.”<sup>10</sup>

There are many highly toxic chemicals found in synthetic turf with phthalates and PFAS being some of the most studied.

## **Dangers of Phthalates**

[Phthalates](#) are typically added to most plastics to make them pliable and are commonly [found in plastic grass](#).<sup>11,12</sup> Phthalates are both [endocrine disrupting](#) and [neurotoxic](#). Men with higher phthalate levels have a higher risk of [cardiovascular disease and type 2 diabetes](#).<sup>13</sup> In midlife and postmenopause, women, phthalates can lead to [increased body fat](#), a higher BMI, and increased waist circumference.<sup>14</sup> Phthalates can also cause [increased rates of hot flashes](#).<sup>15</sup>

Phthalates are linked to [birth defects, infertility, miscarriages, as well as other neurological issues during child development](#) and can harm the endocrine system.<sup>16,17</sup>

Women exposed to phthalates during pregnancy are at greater risk of [preterm delivery](#).<sup>18</sup> Human studies have determined that [in-utero phthalate exposure](#) can cause later development of type II diabetes, and insulin resistance, obesity, asthma, and higher systolic blood pressure.<sup>19</sup> Female offspring are more likely to experience reproductive problems, including pregnancy loss, low birth weight infants, preterm birth and earlier menopause.<sup>20</sup> Other human studies have linked phthalates to [impaired motor skills in children](#) and delayed language development.<sup>21</sup> In male adults, a [reduction in sperm quality and quantity](#) has also been observed.<sup>22</sup>

## **PFAS in Synthetic Turf/Artificial Grass**

PFAS are used to aid the [extrusion of plastic](#) yarns for the “grass” blades.<sup>23</sup>

[Every plastic grass field tested](#)<sup>24</sup> has been [found to contain toxic PFAS](#),<sup>25</sup> with

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<sup>10</sup> <https://www.genevaenvironmentnetwork.org/resources/updates/plastics-and-health/>

<sup>11</sup> <https://www.nytimes.com/article/plastics-to-avoid.html>

<sup>12</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10262297/>

<sup>13</sup> <https://www.diabetes.co.uk/news/2017/jul/everyday-plastic-chemicals-linked-to-type-2-diabetes>

<sup>14</sup> <https://www.sciencedirect.com/science/article/abs/pii/S0013935123001482>

<sup>15</sup> <https://www.sciencedirect.com/science/article/abs/pii/S0013935121001857>

<sup>16</sup> <https://birthdefects.org/phthalates/>

<sup>17</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8157593/>

<sup>18</sup> [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(23\)00270-X/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(23)00270-X/fulltext)

<sup>19</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8157593/#B32-healthcare-09-00603>

<sup>20</sup> <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC8157593/#B32-healthcare-09-00603>

<sup>21</sup> <http://health.harvard.edu/blog/something-else-to-avoid-in-pregnancy-phthalates-2019031516224>

<sup>22</sup> <https://www.sciencedirect.com/science/article/abs/pii/S0304389417304570?via%3Dihub>

<sup>23</sup> <https://www.documentcloud.org/documents/6434596-Kulikov2005.html>

<sup>24</sup> <https://www.eenews.net/articles/our-community-has-been-deceived-turf-wars-mount-over-pfas/>

<sup>25</sup> <https://ceh.org/latest/press-releases/new-testing-reveals-high-levels-of-toxic-pfas-in-artificial-turf/>

industry stating plastic grass [can not be made without PFAS](#).<sup>26</sup> Turf companies [claiming](#) their product is PFAS free are intentionally misrepresenting their data, often setting extremely high reporting limits to get a non-detect result.<sup>27</sup>

[There is no safe level of PFAS!](#)<sup>28</sup>

[PFAS can be absorbed](#) into the body from skin contact with synthetic turf/artificial grass.<sup>29</sup>

PFAS (perfluoroalkyl and poly-fluoroalkyl substances) are a class of almost [15,000 synthetic \(man-made\) chemicals](#) found in [many products](#) like artificial grass/synthetic turf, food packaging, waterproofing sprays, household cleaners, stain-resistant carpet, nonstick cookware, fire fighting foam, clothing, makeup, toilet paper, personal care products, textiles, children's products and much more.<sup>30,31</sup>

PFAS as a [class](#) share many characteristics and toxicities.<sup>32</sup>

According to the [CDC](#),<sup>33</sup> [EPA](#),<sup>34</sup> and the [European Union Environment Agency](#),<sup>35</sup> PFAS are linked to low birth weight, thyroid disease, increased cholesterol, liver damage, kidney cancer, and testicular cancer. They are also linked to [liver cancer](#),<sup>36</sup> [diabetes](#),<sup>37</sup> [endocrine disruption](#), and other [serious health problems](#).<sup>38</sup>

PFAS [bioaccumulate](#) in our bodies, making the risk of cancers and other health problems more likely as we get older.<sup>39</sup>

### **Fluoropolymers Are Toxic PFAS**

[Fluoropolymers are a group of polymers within PFAS that are highly toxic](#) and are [used extensively in the manufacturing of synthetic turf](#) and other products.<sup>40,41</sup>

Fluoropolymers, like all PFAS, are known to [harm human health and the environment](#).<sup>42</sup>

The synthetic turf industry's claim of [PVDF \(polyvinylidene fluoride\)](#) as a “safe” PFAS

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<sup>26</sup> <https://www.theguardian.com/environment/2024/mar/15/athletes-higher-pfas-levels-artificial-turf>

<sup>27</sup> <https://youtu.be/G7Tw6Utl-Rw>

<sup>28</sup> <https://theconversation.com/pfas-why-epa-set-drinking-water-limits-for-these-health-harming-contaminants>

<sup>29</sup> <https://peer.org/pfas-in-artificial-turf-coats-players-skin>

<sup>30</sup> <https://comptox.epa.gov/dashboard/chemical-lists/pfasmaster>

<sup>31</sup> [https://www.cdc.gov/biomonitoring/PFAS\\_FactSheet.html](https://www.cdc.gov/biomonitoring/PFAS_FactSheet.html)

<sup>32</sup> <https://experts.unthsc.edu/en/publications/response-to-comment-on-scientific-basis-for-managing-pfas>

<sup>33</sup> <https://www.atsdr.cdc.gov/pfas/health-effects/index.html>

<sup>34</sup> <https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks-pfas>

<sup>35</sup> <https://www.eea.europa.eu/publications/emerging-chemical-risks-in-europe>

<sup>36</sup> <https://www.insider.com/study-confirms-link-between-forever-chemicals-and-liver-cancer-risk-2022-8>

<sup>37</sup> <https://pubmed.ncbi.nlm.nih.gov/35970987/>

<sup>38</sup> <https://pubmed.ncbi.nlm.nih.gov/32476019>

<sup>39</sup> <https://www.mdpi.com/2305-6304/10/2/44>

<sup>40</sup> <https://pmc.ncbi.nlm.nih.gov/articles/PMC7700770/>

<sup>41</sup> <https://dtsc.ca.gov/wp-content/uploads/Background-Document-on-Candidate-Chemicals-in-Artificial-Turf.pdf>

<sup>42</sup> <https://www.pfasfree.org.uk/f-gases-fluoropolymers>

is false; PVDF is a highly toxic PFAS just like all the rest.<sup>43</sup>

In addition, [ultraviolet radiation causes PVDF to be released](#) from synthetic turf, increasing the amount of toxic PFAS released into our air, water and soil.<sup>44</sup>

## **Plastic Pollution! Plastic Harms the Environment and Our Health**

Each stage of the plastic lifestyle [harms](#) human health and the environment.<sup>45</sup>

For example, “Cancer Alley” is an 85 mile piece of land in Louisiana where [nearly 150](#) oil refineries, plastics plants and chemical facilities, including the world’s largest manufacturer of [polystyrene \(Styrofoam\)](#) spew toxic chemicals into the air, land and water.<sup>46,47</sup>

Cancer Alley has the [highest risk of cancer in the nation, 50x the national average](#), along with [27% low birth and 25% preterm birth rates](#).<sup>48,49</sup>

The use of plastic continues environmental injustice because low-income communities suffer the [worst environmental consequences](#) of plastic production.<sup>50</sup> Studies clearly show plastic production is disproportionately situated in [“low- and mid-income countries or in poor and minority communities within high-income countries”](#).<sup>51</sup>

Plastics have a major carbon footprint, emitting about [3.4% of our total global greenhouse gas emissions](#).<sup>52</sup> After use, less than 9% of plastics are recycled, with the rest [littered, dumped in landfills, or burned](#).<sup>53</sup>

Around [70% of the pollution](#) in the ocean is from plastic, with an estimated 12.7 million tons of plastic dumped into our oceans every year.<sup>54</sup>

Burning plastic releases greenhouse gases and toxic air pollutants like [furans, mercury, polychlorinated biphenyls \(PCBs\) and polycyclic aromatic hydrocarbons \(PAHs\)](#).<sup>55</sup> Even after burning, [30% of plastic](#) remains as ash, which is typically buried, poisoning our soil, or blown in the air.<sup>56</sup>

The making and burning of plastic products in 2019 had about the [same emissions](#)

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<sup>43</sup> <https://www.nrdc.org/sites/default/files/pfas-polymer-fs.pdf>

<sup>44</sup> <https://www.mdpi.com/2073-4360/13/9/1354>

<sup>45</sup> <https://www.nature.com/articles/s41578-022-00419-y>

<sup>46</sup> <https://news.un.org/en/story/2021/03/1086172>

<sup>47</sup> <https://www.propublica.org/article/welcome-to-cancer-alley-where-toxic-air-is-about-to-get-worse>

<sup>48</sup> <https://www.theguardian.com/us-news/ng-interactive/cancertown-louisiana-reserve-special-report>

<sup>49</sup> <https://www.theguardian.com/us-news/2024/jan/25/louisiana-cancer-alley-low-birth-weight>

<sup>50</sup> <https://www.montereybayaquarium.org/stories/true-cost-plastic-pollution>

<sup>51</sup> <https://www.washingtonpost.com/health/2022/04/02/plastic-pollution-health-poverty/>

<sup>52</sup> <https://www.oecd.org/plastics/increased-plastic-leakage-and-greenhouse-gas-emissions.htm>

<sup>53</sup> <https://www.consumerreports.org/environment-sustainability/the-big-problem-with-plastic/>

<sup>54</sup> <https://kids.frontiersin.org/articles/10.3389/frym.2021.574637>

<sup>55</sup> <https://breathelife2030.org/news/burning-plastic-waste-adds-global-air-pollution-problem>

<sup>56</sup> <https://environmentaldefence.ca/2022/03/18/burning-plastic-is-a-terrible-idea>

as [189 coal power plants](#), releasing 850 million metric tons of greenhouse gases.<sup>57</sup>

## Plastics are Fossil Fuels

Over [99% of plastics](#) are made from fossil fuel based chemicals and plastics are predicted to drive [almost half](#) of the demand for oil and methane in the coming decades.<sup>58,59</sup>

As the world transitions from fossil fuels to renewable energy, the fossil fuel industry is [focused on plastics and petrochemicals](#),<sup>60</sup> as stated by both [ExxonMobile](#)<sup>61</sup> and [British Petroleum](#), who continue to place profits over climate, human and environmental health.<sup>62</sup>

This focus on plastics and petrochemicals is the reason for the [push for fracking](#) in the US as ethane is separated from methane (natural gas) and then “cracked” to make ethylene, the building block for most plastics.<sup>63</sup> This process produces a massive amount of [pollution and greenhouse gases](#).<sup>64</sup>

It is estimated that the plastic industry could be [19% of the total global carbon budget](#) by 2040 if we do not take action.<sup>65</sup> We must [remove plastic from our daily lives](#) and stop the fossil fuel industry from destroying our planet for money.<sup>66</sup>

## Plastic and Methane

[Methane is 80x more potent](#) at warming than carbon dioxide and is responsible for 25% of global warming.<sup>67</sup>

[Polyethylene](#) is the most common plastic used to make synthetic turf/artificial grass and is known to [release more methane](#) than other plastics as it breaks down.<sup>68</sup>

Dr. Sarah-Jeanne Royer of the Scripps Institution of Oceanography, who discovered this, wrote a [letter](#) in opposition to synthetic turf/artificial grass, citing methane as a major concern.<sup>69</sup>

During the [breakdown of polyethylene, the release of methane gas accelerates](#) as the surface area of the plastic increases, reacting more with the sunlight and releasing

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<sup>57</sup> <https://www.ciel.org/plasticandclimate/>

<sup>58</sup> <https://www.earthday.org/from-fossil-fuels-to-plastic-addiction-unveiling-the-hidden-link>

<sup>59</sup> <https://www.cnbc.com/2022/01/29/how-the-fossil-fuel-industry-is-pushing-plastics-on-the-world-.html>

<sup>60</sup> <https://www.sciencedirect.com/science/article/pii/S259033222300252X>

<sup>61</sup> <https://corporate.exxonmobil.com/Energy-and-environment/Outlook-for-Energy-A-perspective-to-2040>

<sup>62</sup> <https://www.scientificamerican.com/article/bp-pledges-to-go-carbon-neutral-how-remains-an-open-question/>

<sup>63</sup> <https://www.climaterealityproject.org/blog/ethane-cracker-plants-what-are-they>

<sup>64</sup> <https://insideclimatenews.org/plastics-hub-appalachian-fracking-ethane-cracker-climate-change-health/>

<sup>65</sup> <https://stories.undp.org/what-do-plastics-have-to-do-with-climate-change>

<sup>66</sup> <https://www.motherjones.com/environment/2020/03/your-plastic-addiction-is-bankrolling-big-oil/>

<sup>67</sup> <https://ecology.wa.gov/Blog/Posts/February-2023/The-trash-climate-connection-what-you-need-to-know>

<sup>68</sup> <https://www.bbc.com/news/science-environment-45043989>

<sup>69</sup> <https://drive.google.com/file/d/1O9NHwhVtY0vgHCcZDHHufkfcRdGFA35k/view>

more methane.<sup>70</sup> So, synthetic turf/artificial grass fields are constantly releasing methane, damaging our climate.

### **Microplastics and Nanoplastics From Synthetic Turf/Artificial Grass**

Plastic fibers from synthetic turf/artificial grass are a widespread water pollutant, with over [15% of plastic debris in](#) rivers and seawater, coming from plastic grass with concentrations during the rainy seasons.<sup>71</sup>

In addition to seasonal effects, these plastic fibers undergo [significant weathering](#), which directly contributes to the increase in chemicals leached from them into rivers and seawater.<sup>72</sup>

Every synthetic turf/artificial grass field [loses between 2,000-3,000 pounds of microplastic fibers](#) every year.<sup>73</sup>

These [plastic fibers](#), like all plastics, do not decompose<sup>74</sup> like plants; they just break into smaller and smaller pieces, leading to micro and nano plastics that can be [eaten, drunk, or breathed in](#)<sup>75</sup> by animals or humans and are [even absorbed by plants](#).<sup>76</sup>

Plastic first [breaks down](#) into microplastics, smaller than 5mm, and then nanoplastics, which are less than 100 nm.<sup>77</sup> By [comparison](#), a sheet of paper is about 100,000 nm thick.

Microplastics have been found in [human blood, the placenta, and the feces of infants and adults](#).<sup>78</sup> Research has [linked ingested microplastics](#) to inflammatory bowel disease and metabolic diseases, including obesity, diabetes, and chronic liver disease.<sup>79</sup> The ability to be absorbed from the [digestive tract](#) allows microplastics to be transported to other organs, including the brain, and increases the risk of stroke.<sup>80</sup>

Nanoplastics [have been found deep in human lungs](#).<sup>81</sup> Research shows it is likely that [plastics can cross the blood-brain barrier](#), causing inflammation in the brain itself.<sup>82</sup> Microplastics in the human brain could [damage brain cells](#) and [dementia](#)-like symptoms have been seen in mice exposed to microplastics.<sup>83,84</sup>

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<sup>70</sup> <https://www.surfrider.org/new-study-shows-plastic-as-source-of-greenhouse-gases-potentially-contribut>

<sup>71</sup> <https://www.sciencedirect.com/science/article/pii/S0269749123010965>

<sup>72</sup> <https://www.sciencedirect.com/science/article/pii/S0269749123010965#bib38>

<sup>73</sup> [https://dtsc.ca.gov/wp-content/31/2024/09/Artificial-Turf-Workshop-Slides\\_DTSC\\_Accessible.pdf](https://dtsc.ca.gov/wp-content/31/2024/09/Artificial-Turf-Workshop-Slides_DTSC_Accessible.pdf)

<sup>74</sup> <https://www.scienceabc.com/nature/how-do-we-know-plastic-will-take-so-long-to-decompose.html>

<sup>75</sup> <https://www.theguardian.com/environment/microplastics-found-in-human-blood-for-first-time>

<sup>76</sup> <https://www.sciencedirect.com/science/article/abs/pii/S0165993622003727>

<sup>77</sup> <https://www.iaea.org/research-on-the-possible-effects-of-micro-and-nano-plastics-on-marine-animals>

<sup>78</sup> <https://www.theguardian.com/environment/microplastics-found-in-human-blood-for-first-time>

<sup>79</sup> <https://www.theguardian.com/microplastics-may-be-linked-to-inflammatory-bowel-disease-study-finds>

<sup>80</sup> <https://www.euronews.com/green/how-much-plastic-do-you-eat-it-could-be-as-much-as-a-credit-card-a-week>

<sup>81</sup> <https://www.theguardian.com/environment/microplastics-found-deep-in-lungs-of-living-people-for-first-time>

<sup>82</sup> <https://www.sciencedirect.com/microplastics-could-trigger-inflammation-in-human-brain-cells>

<sup>83</sup> <https://www.sciencedirect.com/science/article/pii/S0013935117310770?via%3Dihub>

<sup>84</sup> <https://futurism.com/neoscope/scientists-microplastics-cause-dementia-mice>

These microscopic [bits of plastic can increase our chances of stroke and heart attacks](#), as nearly 60% of clogged arteries in a recent study were found to contain plastic.<sup>85</sup>

### **Plastics In Drinking Water And Food**

Each person consumes an estimated [5 grams of plastic](#), the equivalent of a credit card, every week.<sup>86</sup>

Plastics have been found in [83%](#) of tap water and [93%](#) of bottled water sampled.<sup>87,88</sup>

The [food chain has also been affected by microplastics](#), with [microplastic contamination](#) found in fish, shellfish and crustaceans, canned fish, sugar, salt, honey, beer, fruits and vegetables, milk, rice, meat, and other common food products.<sup>89,90</sup>

### **Harms Wildlife and Marine Ecosystems**

Many [wildlife accidentally eat plastic](#) after mistaking it for food, which not only can cause them to choke or starve, but can also [poison](#) them as plastics contain toxic chemicals.<sup>91,92</sup>

Plastic pollution harms [“all sea turtle species, half of marine mammal species, and one-fifth of seabird species.”](#)<sup>93</sup>

In the past decade, the amount of plastic dumped in our oceans has increased and reached up to [350 million tons of plastic](#).<sup>94</sup>

Microplastics and nanoplastics can harm entire marine ecosystems, with [15–51 trillion microplastic particles](#) floating in the ocean.<sup>95</sup> Microplastics can enter marine animals as they “breathe,” allowing them to accumulate in organisms. These plastics also hurt corals, which are essential for fisheries and are crucial for the health of marine ecosystems, providing [“habitat, feeding, spawning, and nursery grounds for over one million aquatic species, including commercially harvested fish species.”](#)<sup>96</sup>

Additionally, over [800 marine species](#) are directly harmed by plastic, leading to “starvation, malnutrition, intestinal blockage, and intake of toxins.”<sup>97</sup>

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<sup>85</sup> <https://www.sciencealert.com/plastic-found-inside-more-than-50-of-plaques-from-clogged-arteries>

<sup>86</sup> <https://www.panda.org/Revealed-plastic-ingestion-by-people-could-be-equating-to-a-credit-card-a-week>

<sup>87</sup> <https://beachapedia.org/Plastic-Pollution-Facts-and-Figures>

<sup>88</sup> <https://www.bonappetit.com/story/microplastics-food>

<sup>89</sup> <https://www.sciencedirect.com/science/article/pii/S0048969722069340>

<sup>90</sup> <https://www.sciencedirect.com/science/article/abs/pii/S0025326X22008827>

<sup>91</sup> <https://www.plasticsoupfoundation.org/en/plastic-problem/plastic-affect-animals/animals-eat-plastic/>

<sup>92</sup> <https://www.nationalgeographic.com/environment/article/plastic-pollution>

<sup>93</sup> <https://www.nrdc.org/sites/default/files/choked-plastic-pollution-marine-life-fs.pdf>

<sup>94</sup> <https://plasticseurope.org/wp-content/uploads/2021/10/2018-Plastics-the-facts.pdf>

<sup>95</sup> <https://kids.frontiersin.org/articles/10.3389/frym.2021.574637>

<sup>96</sup> <https://www.epa.gov/coral-reefs/basic-information-about-coral-reefs>

<sup>97</sup> <https://www.nrdc.org/sites/default/files/choked-plastic-pollution-marine-life-fs.pdf>

## **Synthetic Turf/Artificial Grass is NOT Recycled**

Replaced every 7-10 years, the average synthetic turf/artificial grass soccer field produces [40,000 lbs of plastic carpeting and 400,000 lbs of infill](#) waste.<sup>98</sup>

Despite what the synthetic turf industry claims, there is no proof that actual recycling is occurring. The plastic carpet and infill are often [dumped or sent to landfills](#) as there are no [recycling facilities for synthetic turf in the US](#).<sup>99,100</sup>

[Reuse is not recycling](#)<sup>101</sup> and so called “[chemical recycling](#)” is just greenwashing for incineration.<sup>102</sup> Burning is not recycling!

## **Synthetic Turf/Artificial Grass is HOT**

Synthetic turf/artificial grass is 40°-70° [hotter](#) than surrounding air temperatures and has burned hands and feet.<sup>103</sup> [Natural grass releases water vapor](#) and this evaporation means natural grass fields rarely get above 100°F.<sup>104</sup> But the [surface temperature of synthetic turf/artificial grass](#) has been found to be 37° higher than asphalt and 86.5° hotter than natural grass.<sup>105</sup> A study found that in 90° weather, the surface temperature of a natural grass field was 98° while an artificial grass/synthetic turf field was [over 160°](#).<sup>106</sup> [Shoes have melted](#) from the heat on synthetic turf/artificial grass, with players and coaches getting blisters on the bottom of their feet through their shoes.<sup>107</sup> [First-degree burns](#) occur at 118° with blistering and second-degree burns at 131°.<sup>108</sup> Several artificial grass/synthetic turf fields in the Los Angeles Unified School District are currently [closed](#) due to high heat and melting surfaces.<sup>109</sup>

Playing on synthetic turf/artificial grass can [increase](#) the chance of [heat stroke, dehydration, and other heat-related illnesses](#).<sup>110,111</sup> Synthetic turf/artificial grass fields also [create heat islands](#), which cause [higher daytime and nighttime temperatures along with higher levels of air pollution](#).<sup>112,113</sup>

## **Synthetic Turf/Artificial Grass is Dangerous to Athletes**

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<sup>98</sup> <https://www.beyondplastics.org/fact-sheets/synthetic-turf>

<sup>99</sup> <https://www.theatlantic.com/science/artificial-turf-fields-are-piling-no-recycling-fix/603874/>

<sup>100</sup> <https://www.msn.com/how-pennsylvania-became-a-dumping-ground-for-discarded-artificial-turf>

<sup>101</sup> <https://peer.org/artificial-turfs-big-lie-old-fields-not-recycled/>

<sup>102</sup> <https://www.nrdc.org/stories/chemical-recycling-isnt-actually-recycling>

<sup>103</sup> <https://www.safehealthyplayingfields.org/heat-levels-synthetic-turf/>

<sup>104</sup> <https://www.nrpa.org/parks-recreation-magazine/synthetic-sports-fields-and-the-heat-island-effect/>

<sup>105</sup> <https://aces.nmsu.edu/programs/turf/documents/brigham-young-study.pdf>

<sup>106</sup> <https://www.center4research.org/injuries-related-to-artificial-turf/>

<sup>107</sup> <https://ftw.usatoday.com/2015/08/its-so-hot-in-texas-turf-is-melting-cleats>

<sup>108</sup> <https://www.nist.gov/el/fire-research-division-73300/firegov-fire-service/fire-dynamics>

<sup>109</sup> <https://www.latimes.com/sports/highschool/story/2022-08-17/synthetic-l-a-unified-out-of-commission>

<sup>110</sup> <https://www.npr.org/2008/08/07/93364750/high-temps-on-turf-fields-spark-safety-concerns>

<sup>111</sup> <https://www.tandfonline.com/doi/full/10.1080/02656736.2019.1605096>

<sup>112</sup> <https://aces.nmsu.edu/programs/turf/documents/brigham-young-study.pdf>

<sup>113</sup> <https://www.epa.gov/heatislands/heat-island-impacts>

Synthetic turf/artificial grass fields contain [bacteria](#) and must be regularly cleaned with chemicals.<sup>114</sup> [Turf burns](#) from artificial grass/synthetic turf can become infected with bacteria like staph and MRSA, which can be life-threatening.<sup>115</sup> An EPA study found [MRSA in 70%](#) of the fields tested.<sup>116</sup>

Playing on synthetic turf/artificial grass can cause more injuries. According to an NFL Players Association (NFLPA) [study](#), playing and practicing on synthetic turf/artificial grass increases the chance of a lower extremity injury, with a 69% higher rate of non-contact foot/ankle injuries than on natural grass.<sup>117</sup> The NFLPA has called for [all NFL fields to be natural grass](#).<sup>118</sup>

A [study](#) of National Collegiate Athletic Association (NCAA) athletes found playing on synthetic turf/artificial grass greatly increased the chance of knee ligament injuries, while a [study](#) of high school athletes found they were 58% more likely to sustain an injury playing on synthetic turf/artificial grass than natural grass.<sup>119,120</sup>

Playing on [synthetic turf](#)<sup>121</sup> instead of natural grass not only [increases the chances of having a concussion](#),<sup>122</sup> but also increases the chances of a [serious concussion](#).<sup>123</sup>

The United States Men's Professional Soccer Team and other national teams [only play on natural grass](#) in the World Cup, and the [United States Women's Soccer Team sued FIFA](#) to not play on synthetic turf/artificial grass due to the increased risk of injury.<sup>124,125</sup> Soccer legend [Lionel Messi](#) will only play on natural grass.<sup>126</sup>

Upon hearing of the death of David West, the sixth player from the Philadelphia Phillies to die of the same rare form of brain cancer ([glioblastoma](#)), [Philadelphia Inquirer investigative journalists David Gambacorta and Barbara Laker](#) investigated pieces of AstroTurf from Veterans Stadium, which was the Philly home stadium until 2004.<sup>127,128</sup>

The pieces of turf analyzed from 1977 and 1981 were found to contain at least 16 different PFAS. They determined that in the summer, the synthetic turf/artificial grass would heat up to 165°F, increasing the release of toxins into the air, creating additional modes of transmission to the players.

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<sup>114</sup> <https://sportsturfsw.com/wp-content/uploads/2015/11/Bass-paper-in-big-sky-journal.pdf>

<sup>115</sup> <https://www.healthline.com/health/turf-burn#pictures>

<sup>116</sup> [https://www.epa.gov/sites/default/files/2019-08/documents/tc\\_public\\_webinar\\_-\\_august\\_6\\_2019.pdf](https://www.epa.gov/sites/default/files/2019-08/documents/tc_public_webinar_-_august_6_2019.pdf)

<sup>117</sup> <https://nflpa.com/posts/only-natural-grass-can-level-the-nfls-playing-field>

<sup>118</sup> <https://apnews.com/article/9b34d4402f2f82ae60708605f65aa560>

<sup>119</sup> <https://pubmed.ncbi.nlm.nih.gov/30995074/>

<sup>120</sup> <https://www.uhhospitals.org/articles-and-news/articles/2019/08/artificial-turf-vs-natural-grass>

<sup>121</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10782390/>

<sup>122</sup> <https://doi.org/10.1177/03635465000280050401>

<sup>123</sup> <https://journals.sagepub.com/doi/10.1177/03635465000280050401>

<sup>124</sup> <https://www.sportsbusinessjournal.com/Articles/2023/11/06/america-stadiums-side>

<sup>125</sup> <https://www.npr.org/353312770/soccer-players-sue-over-proposed-turf-field-for-womens-world-cup>

<sup>126</sup> <https://www.sbnation.com/soccer/lionel-messi-inter-miami-mls-turf>

<sup>127</sup> <https://deadspin.com/philadelphia-phillies-brain-cancer-tug-mcgraw-1850202995>

<sup>128</sup> <https://www.mediaite.com/sports/6-phillies-players-died-of-same-brain-cancer/>

## Crumb Rubber Infill is Toxic

Made from ground-up tires, crumb rubber is a very common infill for synthetic turf/artificial grass fields and is full of [heavy metals and toxic chemicals](#).<sup>129</sup> [Over 300 chemicals](#) have been found in crumb rubber infill, with 58 classified as known carcinogens and 197 predicted to be carcinogenic.<sup>130</sup>

Crumb rubber infill used on plastic grass fields are known to contain [latex allergens](#) among other chemicals which can cause allergic reactions on the skin.<sup>131</sup> People playing on synthetic turf are [more susceptible](#) to allergic reactions than on natural grass.<sup>132</sup>

6PPD and its derivative 6PPD-quinone are [very highly toxic pollutants](#) to all aquatic organisms and [are responsible for wiping out](#) over 90% of endangered Coho Salmon in CA, OR, and WA every year.<sup>133</sup> While there is limited information on the impacts of 6PPD and 6PPDq to human health, 6PPD is currently listed as a [presumed human reproductive toxicant](#) by the European Chemicals Agency (ECHA).<sup>134</sup>

Humans can be exposed to these toxic chemicals in crumb rubber through inhalation, ingestion, and skin contact, leaving [humans vulnerable to carcinogenic exposure in many different ways](#).<sup>135</sup> [Alternative infills](#) like TPE or cork have inhalation and chemical risks as well.<sup>136</sup>

The Norwegian Institute for Water Research conducted a [risk assessment](#) on runoff from synthetic turf/artificial grass fields, finding a significant risk of environmental effects on surface water.<sup>137</sup> The [Connecticut Department of Environmental Protection \(DEP\)](#) also concluded that runoff from synthetic grass/artificial turf fields was a potential risk to surface waters and aquatic organisms.<sup>138</sup>

## Alternative Infills Are Not Safe

One alternative infill is crystallized silica from quartz rock, which contains up to [95% silicon dioxide](#) which is extremely toxic, long associated with diseases like [silicosis](#), a progressive lung disease which can develop into lung cancer.<sup>139,140</sup>

The International Agency for Research on Cancer (IARC), classifies crystallized silica

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<sup>129</sup> <https://www.sciencedirect.com/science/article/pii/S0048969721076208>

<sup>130</sup> <https://www.sciencedirect.com/science/article/pii/S0013935118305528>

<sup>131</sup> [https://www.health.ny.gov/environmental/outdoors/synthetic\\_turf/crumb-rubber\\_infilled/fact\\_sheet.htm](https://www.health.ny.gov/environmental/outdoors/synthetic_turf/crumb-rubber_infilled/fact_sheet.htm)

<sup>132</sup> <https://sproutsanfrancisco.com/get-educated/harmful-chemicals-artificial-turf/>

<sup>133</sup> <https://www.ezview.wa.gov/Stormwater/Tianetal.2022.Revisedtoxicityassessment06PPD-quinone.pdf>

<sup>134</sup> <https://echa.europa.eu/registration-dossier/-/registered-dossier/15367/5/1>

<sup>135</sup> <https://nccch.ca/documents/guide/human-health-risk-assessments-addressing-artificial-turf>

<sup>136</sup> <https://www.safehealthyplayingfields.org/the-problem-with-alternative-infills>

<sup>137</sup> [https://www.iss-sportsurfacescience.org/downloads/documents/5VEU2CZB25\\_NIVAEngelsk.pdf](https://www.iss-sportsurfacescience.org/downloads/documents/5VEU2CZB25_NIVAEngelsk.pdf)

<sup>138</sup> <https://portal.ct.gov/-/media/DEEP/artificialturf/DEPArtificialTurfReportpdf.pdf>

<sup>139</sup> <https://www.osha.gov/enforcement/directives/cpl-02-02-007>

<sup>140</sup> [https://www3.epa.gov/pesticides/chem\\_search/reg\\_actions/reregistration/fs\\_G-74\\_1-Sep-91.pdf](https://www3.epa.gov/pesticides/chem_search/reg_actions/reregistration/fs_G-74_1-Sep-91.pdf)

as a [known carcinogen](#) in humans.<sup>141</sup> Long term exposure to crystallized silica can cause permanent lung scarring, known as [pulmonary fibrosis](#).<sup>142</sup> Silicosis is the most [prevalent chronic lung disease in the world](#) and because of the size of the crystallized silica used in synthetic turf fields, dust can easily reach the terminal bronchioles and alveoli of the respiratory system.<sup>143</sup>

The infill zeolite, a crystallized aluminosilicate compound, increases the risk of developing [mesothelioma](#).<sup>144</sup>

Other [alternative infills](#) like cork or coconut husk have inhalation and chemical risks as well.<sup>145</sup>

### **Synthetic Turf Does Not Save Water**

On average, [980 gallons of water](#) are needed to make 1 square meter of plastic grass, which would water 1 square meter of natural, organic grass for up to 18 years.<sup>146</sup>

Because of heat, [water is used to cool synthetic turf fields](#), where [natural grass does not need it](#) because of evaporative cooling.<sup>147,148</sup> In addition, synthetic turf/hot, toxic plastic grass [must be cleaned several times a week](#), using even more water.<sup>149</sup>

Synthetic turf/artificial grass uses [just as much or even more water](#) than natural grass.<sup>150</sup> Unlike natural grass, synthetic turf/hot, toxic plastic grass prevents rain water from filtering through the soil, regenerating [groundwater](#).<sup>151</sup>

Synthetic turf/artificial grass is [classified by the EPA](#) as an impervious/impermeable surface.<sup>152</sup> This means rains will flood these fields, washing away the toxic infill along with microplastics into our streams and other waterways.

### **No Safe Levels of PFAS: EPA Guidelines Failing Us**

There are no safe levels of PFAS and the EPA guidelines are failing us. PFAS “forever chemicals” poison our water, soil, food, and harm humans, animals, ecosystems, our environment and climate.

[Section 7\(a\)\(2\) of the Endangered Species Act \(ESA\)](#) requires federal agencies like the EPA to ensure that their actions do not likely jeopardize the continued existence of

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<sup>141</sup> <https://www.atsdr.cdc.gov/toxfaqs/tfacts211.pdf>

<sup>142</sup> <https://www.lung.org/lung-health-diseases/lung-disease-lookup/silicosis>

<sup>143</sup> <https://www.ncbi.nlm.nih.gov/books/NBK594245/#:~:text=Silicosis>

<sup>144</sup> <https://www.healthyplayingsurfaces.org/chemicals>

<sup>145</sup> <https://www.safehealthyplayingfields.org/the-problem-with-alternative-infills>

<sup>146</sup> <https://www.waterwise.org.uk/2022/09/21/new-uk-water-efficiency-strategy-to-2030-published/>

<sup>147</sup> <https://scisoc.confex.com/crops/2017am/webprogram/Paper106290.html>

<sup>148</sup> <https://documents.coastal.ca.gov/reports/2023/12/W13.1a/W13.1a-12-2023-report.pdf>

<sup>149</sup> <https://ideal-turf.com/turf-sports-field-maintenance/>

<sup>150</sup> <https://www.stma.org/wp-content/uploads/2017/11/Artificial-Turf-Booklet-2.pdf>

<sup>151</sup> [https://westernresourceadvocates.org/wp-content/uploads/2023/01/2022\\_WRA\\_Artificial\\_Turf\\_Report.pdf](https://westernresourceadvocates.org/wp-content/uploads/2023/01/2022_WRA_Artificial_Turf_Report.pdf)

<sup>152</sup> <https://www3.epa.gov/region1/npdes/stormwater/ma/2016fpd/appendix-a-2016-ma-sms4-gp.pdf>

any endangered or threatened species or their habitats.<sup>153</sup>

The EPA currently [has only set Maximum Contaminant Levels \(MCLs\) for six PFAS](#) in public drinking waters with enforceable levels of the 2 most researched (PFOA and PFOS) set to 4.0 parts per trillion.<sup>154</sup> Yet [according to the EPA](#), “the lower the levels...the lower the risk.”<sup>155</sup>

The EPA must [lower their limit](#) and set it for all PFAS with proper regulations and enforcement.<sup>156</sup>

[Many states](#) have already implemented their own MCLs to regulate PFAS levels in drinking water.<sup>157</sup> The [State of New York](#) has set MCLs at 2.7 ppt for all PFAS in their drinking water.<sup>158</sup>

Banning synthetic turf/hot, toxic plastic grass is a huge step towards cleaner water and healthier futures by stopping a major source of PFAS in our waterways.

### **Natural Grass is Best**

[Natural grass is the healthiest choice](#) for playing fields and parks.<sup>159</sup> [Natural grass fields are more cost-effective](#) than [synthetic turf/artificial grass fields, which have higher maintenance and long-term costs](#).<sup>160,161</sup> [Natural grass fields are also cheaper to install](#) than synthetic turf/artificial grass.<sup>162</sup>

Natural grass fields can be effectively maintained using [organic land management practices](#), especially for playing fields.<sup>163</sup> Please watch this video, [Pesticide Free Parks](#), on organic management.<sup>164</sup>

High-use, organically managed, natural grass fields have been in use [in many areas](#), including [Irvine, CA](#).<sup>165,166</sup>

With proper care and maintenance, a natural grass field can accommodate any amount of play, as demonstrated by Marblehead, MA, with [20 acres of organically managed fields](#) for over 15 years.<sup>167</sup>

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<sup>153</sup> <https://crsreports.congress.gov/product/pdf/R/R46867>

<sup>154</sup> <https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas>

<sup>155</sup> <https://www.epa.gov/questions-and-answers-health-advisories-pfoa-pfos-genx-chemicals-and-pfbs#q12>

<sup>156</sup> <https://earthjustice.org/community-advocates-seek-to-defend-epas-pfas-drinking-water-standards-in-court>

<sup>157</sup> <https://www.saferstates.com/toxic-chemicals/pfas/>

<sup>158</sup> <https://www.dec.ny.gov/chemical/122803.html>

<sup>159</sup> <https://www.safehealthyplayingfields.org/health-benefits-of-natural-turf>

<sup>160</sup> [https://www.safehealthyplayingfields.org/s/Natural Grass Athletic Fields Ppoint Final.ppt](https://www.safehealthyplayingfields.org/s/Natural%20Grass%20Athletic%20Fields%20Ppoint%20Final.ppt)

<sup>161</sup> <https://www.safehealthyplayingfields.org/maintenance-grass-vs-synthetic-turf>

<sup>162</sup> <https://www.safehealthyplayingfields.org/cost-grass-vs-synthetic-turf>

<sup>163</sup> <https://www.turi.org/var/application/982fb1bc7bb561b4ce07072c5d26ab11.pdf>

<sup>164</sup> <https://youtu.be/oJZgy8MOMYU>

<sup>165</sup> <https://www.nontoxiccommunities.com/organic-athletic-fields.html>

<sup>166</sup> <https://online.flippingbook.com/view/535223568/32/>

<sup>167</sup> <https://www.turi.org/content/NaturalGrassPlayingFieldCaseStudyMarbleheadMAJune202019.pdf>

**Score Card: Synthetic Turf vs. Natural Grass Playing Fields**

Impact	Synthetic Turf	Natural Grass	Comments
Oil extraction/fracking	Yes	No	Emissions of GHG, particulate matter, VOC's and hazardous air pollutants in sacrifice zones
Petrochemical refining	Yes	No	
Manufacturing synthetic turf & underlayment pads	Yes	No	Source: Sierra Magazine 9/15/22
Field Temperature - heatstroke, dehydration and thermal burns	Temperature is 40-70 F above ambient air	Temperature is equal to ambient air	Measured on warm sunny days
Release of PFAS, UV stabilizers, heavy metals, plasticizers ...	Yes	No	Natural grass fields need to avoid synthetic pesticides and fertilizers
Release of microplastics	Yes	No	Inhaled/ingested/released to env.
Infection risk - MSRA (Methicillin-resistant Staphylococcus aureus)	Pathogens survive on plastic surface	No	Synthetic turf fields require bactericidal chemical treatment
Sports injuries	Higher incidence	Absorbs impacts better	
Robustness to intense use	Yes	Yes	Both require maintenance
Water use	Manufacturing process Cooling and cleaning	Drought tolerant turf grass	
Installation and maintenance cost	\$1.2M/field; 8-10 yr life	Lower installation cost	Maintenance costs ~equal
Climate change	Methane from mfg. End of life off gassing for 450 years	Carbon sequestration	
Soil biome health	Baked/compacted soil	Maintains healthy soil	
Hazardous waste disposal of at end of life (8-10 years)	Yes, 50 tons/acre	No, composted	

Ron Askeland, Chair, Sierra Club Conservation Committee. San Diego Hi Sierran Volume 84 No. 3

These Are the New Titans of Plastic: Pennsylvania is just the latest sacrifice zone for the plastics industry  
<https://www.sierraclub.org/sierra/2022-3-fall/feature/these-are-new-titans-plastic-shell-pennsylvania-fracking>

Costs: Grass vs. Synthetic Turf

<https://www.safehealthyplayingfields.org/cost-grass-vs-synthetic-turf>

## Cancer and Toxic Chemicals

90–95% of cancers are caused by environmental and lifestyle factors while our children are surrounded by an estimated 350,000 synthetic/man-made chemicals and chemical mixtures every day, nearly all of them invented since 1950.<sup>168,169</sup>

There is clear evidence that exposure to these chemicals is an important contributor to childhood cancer.<sup>170</sup>

A 50 year review of pediatric cancer found cancer is now the leading cause of death by disease in US children under 15 with rates of leukemia, the most common cancer in children and adolescents, having increased by 21% in children since 1976, with

<sup>168</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2515569/>

<sup>169</sup> <https://pubmed.ncbi.nlm.nih.gov/31968937/>

<sup>170</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6546253/>

brain cancer rates increasing by 45%.<sup>171,172</sup>

With about 43 [children diagnosed](#) with cancer every day, we must reduce their exposure to toxic chemicals.<sup>173</sup> We must protect the places where they run and play, the water they drink, the food they eat and the air they breathe.

**Additional Video Resources:**

[Tire Particulate Matter in Synthetic Turf and Children](#)

[Failing Synthetic Turf Fields](#)

[Artificial Turf is Not Recycled](#)

[Environmental Health Impacts of Synthetic Turf and Safer Alternatives](#)

[Insult to Injury: Plastic Fields Hurt Players](#)

[The High Costs of Fake Plastic Fields](#)

[The Hazards of Artificial Turf: Learn the Latest from Leading Experts](#)

[Conversation on Synthetic Playing Surfaces](#)

[Health and Environmental Hazards of Artificial Turf and Safer Alternatives](#)

**Stop Synthetic Turf/Artificial Grass**

CleanEarth4Kids.org asks you to take strong action to stop all uses of synthetic turf/artificial grass in California to protect human health and the environment.

The decisions we make today affect our children's health and future.

Sincerely,



S  
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(760) 518-2776  
CleanEarth4Kids.org

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<sup>171</sup> <https://www.annals-research-oncology.com/pediatric-cancer-and-the-environment-a-fifty-year-perspective/>

<sup>172</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5550103/>

<sup>173</sup> <https://www.stjude.org/get-involved/other-ways/childhood-cancer-awareness-month.html>