

## The Problems with Artificial Turf

### References

<sup>1</sup> C. Frank Williams and Gilbert E. Pulley, Synthetic surface heat studies. Brigham Young University, 2002. Excerpted at Synturf.org 'Heat effects' #2 "The Utah Study."

<sup>2</sup> Penn State Center for Sports Surface Research , Sports Turf, (June 6, 2011) "Is there any way to cool synthetic turf?" Cited in Synturf.org 'Heat effects' #49 "A duh! moment for the artificial turf industry."

<sup>3</sup><https://www.reference.com/health/temperature-human-skin-burn-82a1af6b1322b289>

"At what temperature does human skin burn?"; see also Synturf.org 'Health & safety' #131 "Rockwood Files"

<sup>4</sup> Safe Healthy Playing Fields (May 2, 2016) "Comments on ASTDR 2016-0002-0003 Federal Research Action Plan on Recycled Tire Crumbs Used in Playing Fields and Playgrounds," p. 51.

<sup>5</sup> Williams and Pulley, op. cit.; ISA Sport USA "Turf and infill temperature evaluation" (June 30, 2012)

<sup>6</sup> Synturf.org 'Heat effects' #65 Burlington, Massachusetts, (Sept 1, 2017) "City issues heat policy guidelines for use of artificial turf fields by students"

<sup>7</sup> National Oceanic & Atmospheric Administration, Record of climatological observations, Newark Liberty International Airport, April-October 2018.

<sup>8</sup> Synturf.org, "Health & Safety" #31 Hospital for Special Surgery (New York City, Oct. 11, 2009) Study: "Artificial turf surface produced most strain on ACL;"

#60 "Injuries on artificial turf fields," a study of NFL players presented at the 2010 meeting of the American Orthopaedic Association. One finding: "Playing on FieldTurf was associated with an 88% greater risk of ACL injury"

#69 "Stanford study says football knee injuries more likely on artificial turf"

#78 "Not for the squeamish!" (video footage showing no-contact injuries occurring during football, soccer games)

#128 Montreal, Canada (Oct. 2016), "How turf soccer fields are causing devastating injuries to unsuspecting athletes"

#129 The Netherlands Times (Sept. 20, 2016) "More sports injuries occur on artificial turf than on grass. Period"

#151 Orthopedic surgeon Dr. John-Paul Rue (Feb. 2018), "Playing on synthetic turf is associated with 'an increased risk of injury, particularly to the ACL.' "

#7 (April 15, 2008) "Is artificial turf especially cruel to female athletes?"

<sup>9</sup> See, in general, articles filed under Synturf heading 'Players' Views' and 'Health & Safety'

#51 "Major survey: pro soccer players link artificial turf to higher risk of injury"

#60 "Former University of Alabama running back rejoices over conversion to natural grass at Ole Miss's Vaught-Hemingway stadium" (June 3, 2016)

#61 Foxboro, Mass. (Nov. 25, 2016) "New England Patriots Tom Brady wants natural grass"

#67 "Texas Rangers baseball players hate playing on artificial turf"

#100 "Faster aging curve among baseball players playing on artificial turf"

<sup>10</sup> Synturf #106 "FIFA 2015 Women's World Cup sheds light on the unforgiving nature of artificial turf"

Rachel Maddow (June 9, 2015) "U.S. Women's soccer objections force end to FIFA use of artificial turf fields" <http://www.msnbc.com/rachel-maddow-show/watch/us-womens-soccer-puts-end-to-fifa-turf-use-460951619836>

Andrew Das, "Claiming bias, female players sue U.S. soccer," The New York Times (March 9, 2019) p. 16.

<sup>11</sup> Synturf.org, 'Health & Safety' #144(Aug 1, 2017) "More about the relationship between playing on artificial turf and concussion"

"The Synthetic Turf Council, an industry trade group, recommends 165 as its GMAX limit. By comparison, a well-maintained natural grass field typically ranges from 80 to 140 on the GMAX scale."

#61 (May 6, 2011) “Laguna Beach, California: Football mom calls out town officials for negligence and indifference.”

#114 (Oct 29, 2015) “Columbus, Ohio: Lack of artificial turf maintenance endangers athletes’ health and safety.”

“Investigators asked 68 central Ohio school districts whether they had turf and what their latest GMAX field test results are. Some area schools, including almost all the area’s private schools, would not disclose what their ratings are. Athletes and their parents have no way of knowing.”

#118 (Dec. 31, 2015) “Synthetic turf and concussion – a year’s end review”

“One in 7 high school sports concussions is caused by surface impacts, and one in 4 concussions in youth soccer and football.”

Gale Associates, Inc. (2015) “Alternative infills for synthetic turf” Available at:

<https://www.galeassociates.org/wp-content/uploads/2015/03/Alternative-Infills-for-Synthetic-Turf.pdf>

An information sheet, provided by a turf consultant, shows which types of infill require a shock pad: silica sand fields (polymer-coated or not); cork or coconut husk or similar, and thermoplastic elastomer (TPE). Cost of shock pad listed as \$130,000. (2015 price)

<sup>12</sup>See articles and discussion under Synturf.org heading ‘Silica’

#4 “How dangerous is silica in artificial turf fields?”

“Breathing only a tiny amount of silica dust per day – enough, roughly, to cover Franklin Delano Roosevelt’s nose on a dime – can put a worker at risk for myriad health problems, according to Michael Breitenstein of the National Institute for Occupational Safety and Health.”

<sup>13</sup>Federal Register, Occupational Safety and health Administration (March 26, 2016)

“Occupational exposure to respirable crystalline silica”

<sup>14</sup>Smithsonian (Sept. 8, 2017) “The world is running out of sand,”

<https://www.smithsonianmag.com/science/world-facing-global-sand-crisis-1809648>

This article shows how mining sand from rivers and beaches devastates ecosystems.

Business Insider (June 11, 2018) “The world is running out of sand – and there’s a black market for it now”

<https://www.scmp.com/week-asia/society/.../world-running-out> “Most analysts expect a spike in sand prices.”

<sup>15</sup> See Synturf.org articles and discussion under heading ‘Crumb rubber’

Synturf.org, ‘Fact Sheets’ #15 “Two basic documents to begin the conversation”

Environment & Human Health, Inc. (2015) “Artificial turf: chemical analysis”

<sup>16</sup> Synturf.org ‘Wrap-up articles’ #2 “The Westport brief: citizens question safety of rubber crumb in artificial turf (Sept 28, 2007). See section entitled “The EHHI report on the CAES study” (Connecticut Agricultural Experiment Station)

<sup>17</sup> David Brown, Director of Public Health Toxicology for Environment & Human Health Institute, Synthetic turf: industry’s claims versus the science: a careful analysis of studies that industries use to justify safety claims (Nov. 2017)

<sup>18</sup> Stuart Shalat, Sc.D., New Jersey Department of Environmental Protection, “An evaluation of potential exposures to lead and other metals as the result of aerosolized particulate matter from artificial turf playing fields: Final Report” (July 14, 2011)

<http://www.nj.gov/dep/dsr/publications/artificial-turf-report.pdf>

“Research has shown that even limited activity on carpeted surfaces can result in multiple orders of magnitude of increases in respirable/inhalable particulate matter. It is therefore desirable to sample in a non-static fashion for any potential particulate matter that is released from the surface.” (p.2)

<sup>19</sup> San Francisco Chronicle (Feb. 21, 2015), Melody Gutierrez, “Critics say EPA played dual role in recycled tire controversy.” Excerpted in Synturf.org ‘EPA’ #19.

<sup>20</sup>Consumer Product Safety Commission, Analysis and assessment of synthetic turf grass blades. (July 2008); Environmental Protection Agency, Scoping-level field monitoring study of synthetic turf fields and playgrounds. (2009)

<sup>21</sup>Synturf.org 'Maintenance/replacement' #64 "Financial impact on sellers and insurers of premature deterioration of artificial turf fields under warranty"

<sup>22</sup>See the critique of CPSC methodology and assumptions by David Brown of EHHI in Synturf.org 'CPSC' #3 "CPSC says 'Turf industry should get out the lead, but turf fields are okay to play on' (August 3, 2008)

<sup>23</sup>Synturf.org 'EPA':

#10 (June 7, 2009) "PEER: EPA endorsed use of crumb rubber in playing fields without analyzing its potential toxicity;"

#13 (Sept 14, 2009) "PEER says EPA punts on risks to children from playground tire crumb;

#14 (Oct 13, 2009) "EPA is dragging its feet on testing artificial turf fields;"

PEER (March 21, 2013) "Demand for Correction under the Information Quality Act: 2009 Study Regarding Synthetic Fields and Playgrounds"

<sup>24</sup>Synturf.org 'CPSC' #10, "Public Employees for Environmental Responsibility (PEER): (Synthetic) Turf Lobbyists Cultivate Consumer Product Safety Commission" (April 28, 2015)

According to PEER executive director Jeff Ruch, documents obtained via the Freedom of Information Act "depict a consumer watchdog which has learned to play dead too well. While industry gets unfettered access, consumer complaints about excess lead get the run-around before they are forgotten altogether."

Thomas Frank, USA Today (March 16, 2015) "Feds promote artificial turf as safe despite health concerns."

<sup>25</sup>Synturf.org 'Health & Safety' #146, "Amy's list summary, Sept. 2017"

As of Sept. 2017, Amy Griffith's list had grown to 248 athletes (average age 20-21) with cancer (lymphoma, leukemia, sarcoma, testicular, thyroid, brain, ovarian and lung). Of these 248, 62% (155) have blood cancers (lymphoma and leukemia, which are believed

to be influenced by environmental exposure). Of the 196 soccer players with cancer, 115 (59%) are goalkeepers.

<sup>26</sup> Lynne Peeples, Huffington Post (June 9, 2015) “Artificial grass may save water, but does it endanger people?”

Synturf.org ‘CPSC’ #9 “Chairman of the Consumer Product Safety Commission has deep concerns with the (2008) press release that said synthetic turf fields OK to install, OK to play on.”

<sup>27</sup> Suzanne Wuerthele, toxicologist for 23 years at EPA, quoted in Synturf.org ‘EPA’#19 “US EPA no longer promotes the use of recycled tires on artificial turf fields and playgrounds.”

<sup>28</sup> Center for Disease Control and Prevention (CDC), U.S. Environmental Protection Agency (USEPA), Agency for Toxic Substances and Disease Registry (ATSDR). Federal research action plan on recycled tire crumb used on playing fields and playgrounds. Status report. December 2016, p. 136-8.

<sup>29</sup> Safe Healthy Playing Fields, in “Comments on ASTDR 2016-0002-0003 Federal Research Action Plan on Recycled Tire Crumbs Used in Playing Fields and Playgrounds,” (May 2, 2016) p.78.

<sup>30</sup> Synturf.org ‘Process’#82, “NJ Advance Media’s report lays bare FieldTurf’s marketing and sale of a defective product” A report by Christopher Baxter and Matthew Stanmyre, “100-Yard Deception” (Dec 4, 2016) <http://fieldturf.nj.com>

<sup>31</sup> Delaware Riverkeeper Network, “Alternative infills for artificial turf fact sheet” [www.delawareriverkeeper.org](http://www.delawareriverkeeper.org)

<sup>32</sup> Synturf.org, ‘Alternative infills’#12 “On Nike Grind and other alternative infills.”

<sup>33</sup> Diana M. Zuckerman, PhD, President, National Center for Health Research (August 28, 2017), “Letter from NCHR about dangerous playgrounds and athletic fields to the mayor and city council of Washington, D.C.”

<sup>34</sup> Gale Associates Inc. (2015) “Alternative infills for synthetic turf.” Available at <https://www.galeassociates.org/wp-content/uploads/2015/03/Alternate-Infills-for-Synthetic-Turf.pdf>

<sup>35</sup> Synturf.org, ‘Alternative infills’ #16 “Buyer beware! Rubber and other unsuspected ingredients in some plant-derived infills

<sup>36</sup> Gale Associates Inc. (2015)

<sup>37</sup> Gale Associates Inc. (2015); Synturf.org, ‘Alternative infills’ #15, Long Beach, Cal. (June 16, 2015) “Health concerns prompt Parks and Recreation to recommend organic infill.” Geofill, a corkonut infill, is described as having a 2-3 year lifespan.

<sup>38</sup> Zuckerman, op. cit.

<sup>39</sup> Synturf.org ‘Heat effects’ #17 “Why grass is cooler than turf” (April 2008)

“Synthetic turf fields run 60 degrees hotter than grass fields on sunny afternoons, easily reaching temperatures of 140 degrees F or more. How do plants manage to avoid reaching such high temperatures? The answer is evaporation of soil moisture through their leaves. Plants are nature’s ‘geniuses’ when it comes to evaporating water to stay cool in the sunlight.”

<sup>40</sup> Paul Sachs, Managing Healthy Sports Fields: a guide to using organic materials for low-maintenance and chemical-free playing fields. Hoboken, John Wiley & Sons, 2004, p.129-30.

<sup>41</sup> Y. Qian and R.F. Follett, “Assessing soil carbon sequestration in turfgrass systems using long-term soil testing data” *Agron J* 94: 930-935. (2002)

Ranajit Sahu, Technical assessment of the carbon sequestration potential of managed turfgrass in the United States (2008), excerpted in Synturf.org ‘Carbon footprint’ #2 “Natural grass to the rescue!”

G. Zirkle, R. Lal and B. Augustin, “Modeling carbon sequestration in home lawns” *Hort Science* 46 (5) 808-814. (2011)

<sup>42</sup>P. Hepperly, D. Lotter, C. Ziegler Ulsh, R. Seidel and C. Reider, "Compost, manure and synthetic fertilizer influence crop yields, soil properties, nitrate leaching and crop nutrient content" *Compost Science & Utilization*, Vol 17 no 2, 117-126. (2009)

The Rodale Institute found:

"Compost treatments supported both high yields and increased soil C and N (nitrogen) content, while synthetic chemical fertilizer and raw manure produced only high yields but did little or nothing to improve soil nutrient content.

The compost treatments also required no liming over the trial, while chemical fertilization acidified the soil, making lime applications necessary...Liming increases the atmospheric C impact of chemical fertilizer systems because the breakdown of acids in the soil liberates carbon dioxide from the calcium carbonate being applied."

<sup>43</sup> Synturf.org 'Heat effect' #4 "The New York City Study" (2006).

<sup>44</sup> Synturf.org. 'Carbon footprint' #4, Duncan, British Columbia, Canada: "One more act of cruelty against nature – making way for synthetic turf fields;"

<sup>45</sup> Synthetic Turf Council, "Guidelines for maintenance of infilled synthetic turf sports fields" (January 2013)

<sup>46</sup> Icahn School of Medicine at Mount Sinai, Children's Environmental Health Center, "Artificial turf: a health-based consumer guide" (May 2017)

This consumer guide advises that there is potential exposure concern from off-gassing of inhalable volatile organic compounds (VOC's and PAH's) including benzothiazole, hexane, toluene, formaldehyde and others. These include respiratory irritants, asthma triggers, neurotoxicants and some known human carcinogens.

<sup>47</sup> Synturf.org#5, Newton, Mass., (Feb. 16, 2008)"What do vomit, spit, sweat and other human and animal discharge, and mold and bacterial growth look like in the fibers of artificial turf? Wonder no more!"

<sup>48</sup> See Synturf.org articles under 'Vandalism'

<sup>49</sup>See Synturf.org articles under 'Migration' for the problem of infill spreading off the field and into the environment; in particular

#34 Andrew McNitt, director of the Center for Sports Science at Penn State says  
"between 6000 and 7000 lbs of crumb rubber can come out of a field each year."

#4, 'Crumb rubber microplastics,' "The myth of rubberized landscapes." Rubber leachate from car tires can kill entire aquatic communities of algae, zooplankton, snails and fish. Plant species have been known to accumulate abnormally high levels of zinc, sometimes to the point of death.

See also <http://www.kimointernational.org/feature/microplastic-pollution-from-artificial-grass-a-field-guide/>

<sup>50</sup>See Synturf.org 'Water damage' for articles and photos of flooded fields

Synturf.org 'Migration' # Montclair Local (Aug. 15, 2018) "Heavy rains wash away crumb rubber off three town fields"

<sup>51</sup>Leigh Davis, "Care and feeding of your new artificial grass" Highland Park Mirror (June 18, 2009) <http://www.highlandparkmirror.com/hpmfts2.html>

<sup>52</sup>Synturf.org 'Heat effect' #4 "The New York City Study"

Larry Wroblewski, "Athletic field blamed for flooding woes," on MetroWNY.com, (Oct. 6, 2011) [http://www.metrony.com/news/974-Athletic\\_field\\_blamed\\_for\\_flooding\\_woes.html](http://www.metrony.com/news/974-Athletic_field_blamed_for_flooding_woes.html)

<sup>53</sup>Synthetic Turf Council, "Guidelines for synthetic turf base systems" (February 2017)

<sup>54</sup> Synturf.org 'Carbon footprint' #1 "Estimating the required global warming offsets to achieve a carbon neutral synthetic turf field installation." A study by the Athena Institute, Merrickville, Ontario.

<sup>55</sup> Synturf.org 'Disposal' #8 Montgomery County, Maryland: "Disposal issues follow removal of Richard Montgomery high school field material," (Aug 7, 2018)

This article includes a graphic illustration of "Lifecycle Options of Synthetic Turf" presented by Turf Reclamation Solutions.

<sup>56</sup>Synthetic Turf Council, "Guidelines for maintenance of infilled synthetic turf sports fields" (January 2013), p. 5-8.

<sup>57</sup>Synturf.org 'Maintenance/replacement' #6 "Boston College interview" (May-June 2006)

<sup>58</sup>Synthetic Turf Council, "Guidelines for maintenance," p. 8.

<sup>59</sup>Synturf.org, 'Maintenance/replacement' #5 "Fouty's perspective" (Annual maintenance figures from Michigan State University athletic turf manager)

<sup>60</sup>Fouty, *ibid.*

<sup>61</sup>ISA Sport USA for Limonta, *op cit.*

<sup>62</sup>Boston College interview, *op cit.*

<sup>63</sup>Kyle Hanson, "Special report: is artificial turf cheaper to maintain?" ABC 7 KVIA News, (August 8, 2018) Quote is from New Mexico State University professor Bernd Leinauer, turf-grass extension specialist for the State of New Mexico.

<https://www.kvia.com/special-reports/more-water-needed-to-keep-artificial-turf-cool-study-says/779081355>

<sup>64</sup>Fouty, *op cit.*

<sup>65</sup>New Jersey Advance Media, *op cit.*

<sup>66</sup> See, under Synturf.org, 'Maintenance/replacement' :

#23 Brookfield, Connecticut, "Brookfield High School turf unplayable after a couple of years"

#31 Midland, Texas "Turf bursts at the seams, needs replacement after five years"

#54 New York, NY "Soccer referees boycott two turf fields due to dangerous conditions"

#112 Clifton, NJ "Another case of premature deterioration of artificial turf fields," NorthJersey.com, (April 22, 2017)

<sup>67</sup>Zoe Roos "One year old Guilford High School synthetic turf field has to be replaced," The Courier, (Dec. 31, 2018)

<https://www.zip06.com/news/20181231/entire-high-school-turf-field-to-be-replaced>

"The synthetic turf carpet was coming apart at the seams and sections of padding had come apart."

Synturf.org, 'Maintenance/replacement' #113 Burnett, Texas "Defective artificial turf field needs replacing just two years after installation" (May 24, 2017)

<sup>68</sup>Synturf.org, 'Maintenance/replacement':

#57 Carlisle, Pennsylvania "Sink hole in 1-year-old artificial turf field deep-sixes soccer match" (May 4, 2010)

#35 Liverpool, New York "The bubbling turf field is still closed" (December 3, 2010)

#22 Liverpool, New York "Team has no home field" (July 25, 2008)

"Acting director of athletics Mark Potter said erosion in a crushed stone layer under the turf has created soft spots – or potholes – along with bumps. He likened the experience (of playing on this surface) to walking down stairs, only to miss the last step."

#19 Cedar Hill, Texas "Repairs to stadium's turf drainage system may cost district \$850,000"

<sup>69</sup>Synturf.org, 'Maintenance/replacement'

#25 Brookfield, Connecticut "High school turf field is in dire need of repairs after just two years"

<sup>70</sup> See Synturf.org, 'Water damage':

#6 Philipsburg, NJ "Standing water on 30% of 2-year turf mars soccer game" (Sept 2008)

#11 East Greenwich, RI "Artificial turf field floods after one-half inch of rain" (July 2009)

#15 Ridgewood, NJ "Flood closes down artificial turf field" (April 2011)

#17 Bernards Township, NJ "Water polo, anyone" (June 2013)

#18 East Huntingdon, PA "Rains pleat the artificial turf field" (Sept 2013)

After two inches of rain fell, the water "burrowed under the playing surface. The surface then buckled up, ripped apart and washed away."

#20 "Float that carpet, wash away the infill" (Oct 2016)

In Spring Lake Park, Minnesota, after a heavy rain “The football/soccer field was under at least half a foot of water, with a large air bubble pushing the turf up in a long bump that ran down the middle of the playing surface....(T)he AD figures that the field drainage system couldn’t keep up with the heavy rain....and with the pumps pushing back against the deluge, air was forced underneath the turf, causing the huge bubbles to form.”

<sup>71</sup>Nick Harris, Technical Surfaces Ltd., “Artificial pitch maintenance – who, how, when and why” Pitchcare Magazine, Issue 40, (Dec 2011-Jan 2012)

<sup>72</sup>Synturf.org, ‘Maintenance/replacement’

#117 Southern California – “Premature aging and failing artificial turf fields are costing taxpayers millions in addition to the expensive upfront installation cost” (June 19, 2018)

“Each customer with a high school football field, soccer field or other synthetic turf surface has been forced to decide whether to accept a standard replacement (of the same, failing turf) from FieldTurf for free, pay extra for an upgraded surface, or sue the company.” FieldTurf said it would replace failing fields free of charge “only if it used the same fibers from the same company it had used three years earlier; an upgrade would cost \$175,000 per field.”

#95 Charlestown, West Virginia “Another case of premature aging” (February 20, 2014)

“FieldTurf has only offered to provide a discount on installing a new field, rather than replace the failing turf...We’ll end up suing them. They’re not going to honor (the warranty).”

#85 Beaverton, Oregon “Failing artificial turf fields, faulty record-keeping as to use and maintenance, useless warranty = taxpayers’ nightmare!”

“According to a news report in The Oregonian (April 6, 2012) “Beaverton School District plans to spend as much as \$850,000 to replace the artificial turf at Westview and Southridge high schools after the 6-year-old fields failed prematurely. Although the district signed a limited warranty with the installer, faulty record-keeping on the district’s part complicated negotiations for a new field.” When the school district negotiated with FieldTurf to replace the field, “they discovered the district had not followed the requirements of the warranty.

The warranty signed by the district required the staff to keep track of the hours of field use as well as the frequency and type of maintenance. The warranty also limited the field use to football and soccer, but the schools use them for lacrosse, baseball, band, cheerleading and PE (physical education) classes. It also restricted repetitive or high-intensity training on the same part of the field, such as around goals.”

<sup>73</sup>Mike Ozanian, “Failure rates of artificial turf fields unknown by public,” Forbes (Nov 2, 2014).

Mike Ozanian, “Buyer’s remorse surfacing over artificial turf fields” Forbes (Oct 27, 2014).

<sup>74</sup>Montgomery County, Maryland, “Disposal issues” op. cit.

<sup>75</sup>Synthetic Turf Council, “Removal, recovery, reuse and recycling of synthetic turf and its system components” (Revised July 2015)

<sup>76</sup>Montgomery County, Maryland, “Disposal issues, op. cit.

<sup>77</sup>Synthetic Turf Council, “Removal, recovery” op. cit. p. 2.

<sup>78</sup>Synturf.org ‘Disposal’ #5, “Current theory and practice of dealing with used artificial turf fields.”

<sup>79</sup>Synturf.org ‘Disposal’ #2 Middletown, New Jersey (Oct. 2, 2008) “Town plans to dispose of old turf in garbage.” According to Board of Education attorney Paxton, “Our original plan was to roll it up and do whatever.”