

# What Everyone Should Know about Synthetic Turf



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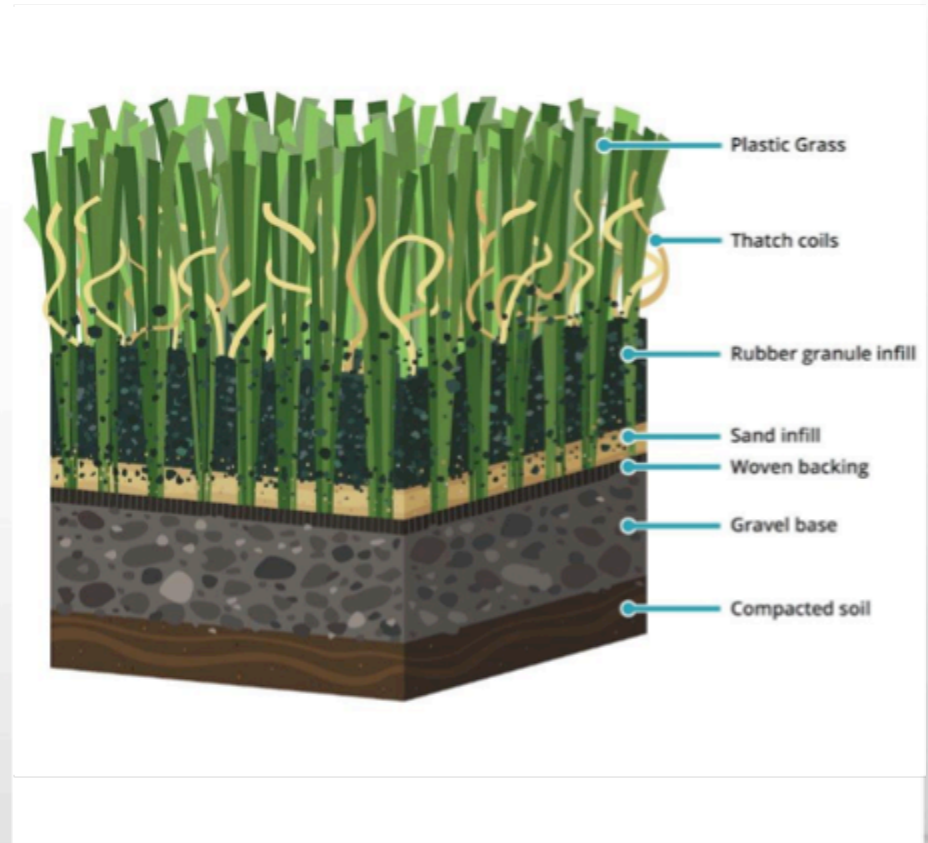


# What is Synthetic Turf?

**Average field-**  
80,000 square feet (>2 Acres)

= 40,000 pounds of  
plastic backing and blades

= 400,000 pounds of  
infill (tire waste, silica sand, or  
other infill material)



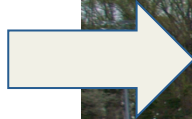
**DISPLACING Grass and soil which would otherwise filter pollutants and oxygenate air.  
The product is made of fossil fuels and contributes to climate change.**



Plastic fields promise 24/7 use.

They are frequently fenced in, limiting access and wear and start losing grass and tire crumb immediately.

**Promised**



WJHS 2016



**Reality**



# Synthetic turf is dangerous for athletes

## NFL Players Assoc. has called for real grass since 1976



**64.4%**  
of NFL players think that **artificial turf is more likely to negatively affect their quality of life** after football.

**82.4%**  
of NFL players think that **artificial turf is more likely to contribute to injury**

**89.1%**  
of NFL players think that **artificial turf causes more soreness and fatigue**

**89.7%**  
of NFL players think that **artificial turf is more likely to shorten their career**

### Increased Risk to Athletes of Suffering Noncontact Injuries on Synthetic Turf

	More than 1 Week of Time Loss	Any Time Loss
Lower Body	20%	27%
Knee	45%	46%
Knee/Ankle/Foot	67%	56%
Ankle/Foot	103%	68%

Jeff Miller VP of Public Affairs, NFL: NFL owners now replace their synthetic fields more frequently- two years – to reduce injury. That is not an option for schools and parks. 14 of 30 stadiums are synturf. Ravens play on grass, except one indoor field.



# **NFL + NCAA studies show: More injuries on plastic fields**


**Doctors agree: Ravens' orthopedic surgeon, Dr. Guyton, has testified about risk of injury!**



**LA Rams wide receiver Odell Beckham Jr. after sustaining a non-contact ACL tear in Super Bowl LVI on artificial turf**

# 10-yr NCAA study confirms NFL findings: Significantly more injury on synthetic turf

Based on **3,009,205** NCAA football athlete exposures over 10 years: 3X PCL and 1.63X ACL injury rates), American Journal of Sports Medicine.



Athletes in Division I competitions experienced **199% higher** PCL injury rates on artificial turf than on natural grass.

Athletes in Division II and III competitions experienced **213% higher** PCL injury rates on artificial turf than on natural grass.

Athletes in Division II and III competitions experienced **63% higher** ACL injury rates on artificial turf than on natural grass.



# Many Professional Leagues Choose Grass for Athlete Safety

- **FIFA** – The international governing body for professional soccer *now requires all tournaments to be on natural turf*, following a lawsuit by women's teams which had been relegated to artificial turf.
- In addition, profession and elite soccer players' contracts across Europe specifically exclude play on artificial turf.
- **MLB** – *Only 5 out of 30 professional baseball stadiums contain artificial turf.* Most teams that previously used synthetic have gone back to natural grass.

# Injury from Turf Burns

- Synthetic turf is uniquely abrasive and results in gashes, wounds & lacerations
- These *deep and painful abrasions* can become infected and frequently cause permanent disfiguring scarring.





# Turf burns create physical and toxic risk

Open wounds: Also direct pathway for synturf's many toxic substances into bloodstream



# Selected Toxins in Synturf Carpet & Infill

## Exposure through inhalation, ingestion, skin abrasions

### Toxins in Tire Infill: Known Effects

#### **Butadiene, styrene , Polycyclic aromatic hydrocarbons (PAHs)**

Carcinogenic: stomach, blood and lymphatic cancers; damage to central nervous system, headache, fatigue, weakness, depression; hearing and vision loss, peripheral neuropathy, loss of concentration

**Lead** NO SAFE LEVEL- accumulates--brain/ nervous system damage and behavioral problems; hypertension and kidney cancer; gastrointestinal issues and fertility problems

**Benzene** Inhaled. Harms bone marrow and decreases red blood cells leading to anemia; excessive bleeding, adverse impact to the immune system; known carcinogen, especially leukemia

“Researchers are only beginning to uncover the **toxic cocktail of chemicals, microplastics, and heavy metals** hidden in car and truck tires. [...] ...tire rubber contains **more than 400 chemicals and compounds**, many of them **carcinogenic**, and research is only beginning to show how widespread the problems from tire dust may be... [...] **Tires release 100 times the amount of volatile organic compounds as a modern tailpipe ...”** [Yale Environment 2023](#).

### Toxins in Plastic Grass:

**PFAS** NO SAFE LEVEL- accumulates. *1-38 pounds of PFAS in a single field carpet system.* Liver damage & reduced immunity; severe birth defects; thyroid, kidney, bladder, testicular, prostate & colon cancer.

**Phthalates** Hormone disruption leading to obesity, fertility problems and more.

**Harmful effects increase as exposures accumulate over time. Exposure to a mix of chemicals is more harmful than exposure to a single chemical.**



# All Synturf Contains Cancer-Causing PFAS

- All synturf grass samples from EVERY major manufacturer tested positive for PFAS (*University of Notre Dame*).
- Synthetic Turf Council testified in 2023 before CA legislature, manufacturers like Shaw say **synturf cannot be made without PFAS**.
- A 2020 Swedish study: Up to **38 lbs. of PFAS per field**.
- PFAS danger is so great EPA proposed 4 PPT in drinking water. 1 PPT is conceptualized as a drop in 20 Olympic pools.
- PFAS also contaminate the groundwater. Many communities rely on wells and reservoirs for all their needs.
- New evidence shows PFAS in the water that didn't exist prior to field installation.
- PFAS chemicals cause 75% of active duty firefighters to die of occupational cancer--not fire!

# Tires Are Waste Filled with Toxins

## Why Are They Allowed on the Field?



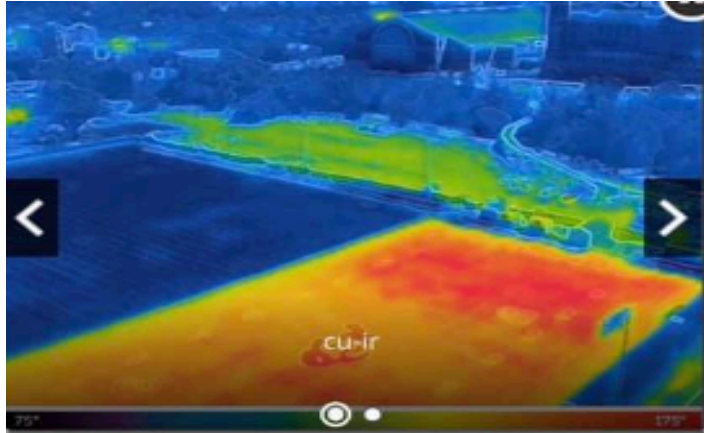
### What is cushioning that plastic green field?

According to the renowned Mount Sinai Children's Environmental Health Center:

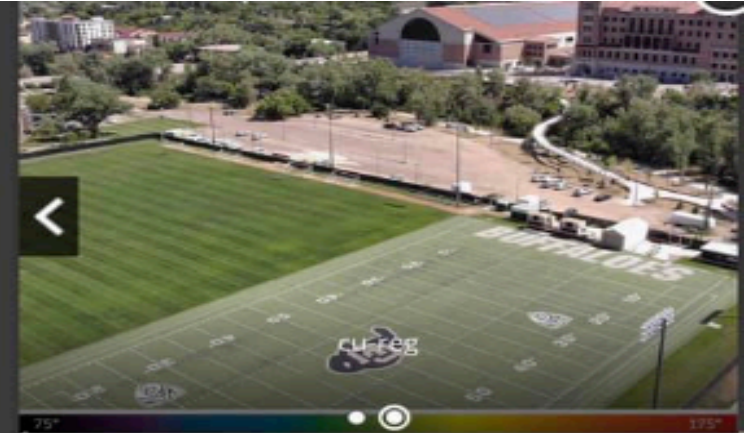
"...styrene and butadiene, ...principal ingredients of the synthetic rubber used for tires in the United States. **Styrene is neurotoxic** and reasonably anticipated to be a **human carcinogen**. **Butadiene is a proven human carcinogen** that has been shown to **cause leukemia and lymphoma**. Shredded and crumb rubber also contain lead, cadmium, and other metals known to damage the developing nervous system." (Feb. 2016)

- **Children's developing bodies and brains are especially sensitive to toxic substances and they are closer to the surface.**
- **Children absorb toxins by inhalation, ingestion, and contact.**
- **Toxic exposures are often cumulative and synergistic.**

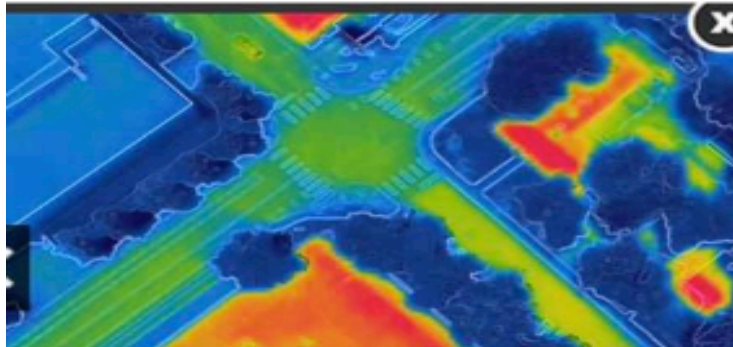
# Dangerous Heat Increases Heat Stroke Risk



Outdoor Temperature: 90F  
Grass Field: 88F  
Crumb Rubber Field: 155F



Outdoor Temperature: 90F  
Grass Field: 88F  
Crumb Rubber Field: 155F



On a 90F day: Grass is 88F, while synturf field is 155F.  
Which is better for children?



# Heat Danger is Well Understood

- Highest synturf temperature published in research paper: **200° F** on 98° F day. Artificial turf can get **dangerously hot regardless of infill.**
- Synturf **air temp at child chest/head height** is regularly **130-140° F**. Children are more vulnerable to deadly heat stroke and less likely to speak up.
- **Natural grass stays cool; rarely exceeds 100° F, due to transpiration.**
  - Commonly 75° to 85° F (25° to 35° C) even on warmest days
  - Usually below air temperature and cools ambient air on and around field
- Bands and many athletes wear **heavy gear on fields.** [WV high school band](#) and staff collapsed in the heat sending 37 to 3 hospitals; dozens more treated onsite.
- Exertion heat stroke can be lethal: UMD's Jordan McNair's core body temp of **106° F** (in May) lead to state legislation, \$3.5M+ lawsuit, and new federal legislation.
- Sports Illustrated Oct 2022 cover story: [With Hotter Temperatures Come More Football Deaths - And Black HS Players Are Disproportionately Affected](#), specifically mentions heat due to artificial turf.

# Synturf Disposal: Turf Dumps

TIP OF THE TURF-  
BERG?!



Waste with harmful chemicals dumped anywhere and everywhere.  
Billions of pounds of waste across the country.

# Synthetic Turf Pollution

- Blades and infill begin to disperse & migrate off-site immediately upon installation: A field may lose roughly 20 tons of toxic infill in 8 yrs.
- Plastic debris goes everywhere:
  - Homes: Exposes young children and pets
  - Schools: Exposes students who don't use the field
  - Environment: Contaminates soil and disrupts soil ecology (soil microbes, worms, ants, beetles, ground bees, etc.)
- PFAS in the 2 acres of plastic grass immediately starts contaminating the soil and groundwater nearby. Municipal water authorities and communities that rely on wells are not equipped to remove PFAS from drinking water supplies.

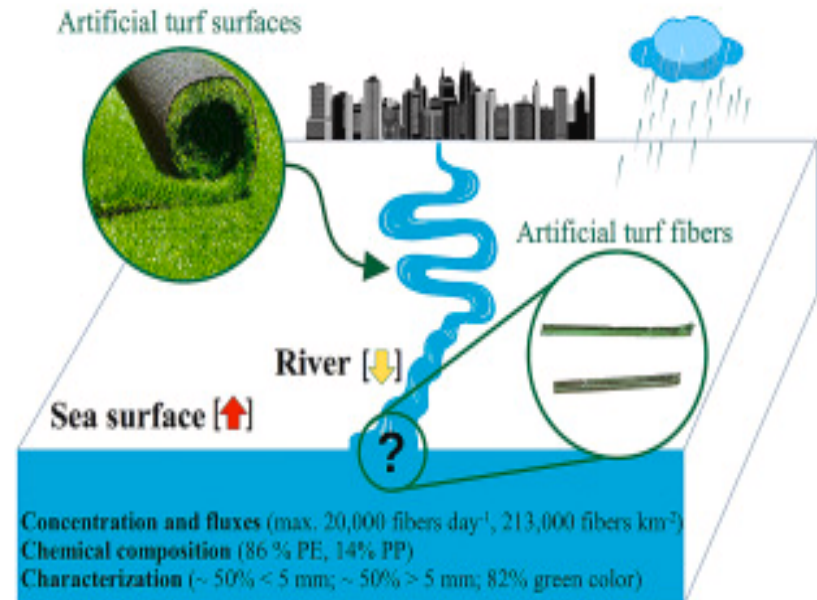


# Synthetic Turf Pollution

And into streams, rivers, and oceans...

Wanna know how much?

- Recent Spanish peer-reviewed study in *Environmental Pollution*, 15% of plastics in river and ocean are from plastic turf. (7 yrs.)
- Chinese study showed 12%.
- On land and in water, these microplastics are deadly when consumed by birds, fish, whales and all wildlife.



# Recycling Myth: How Many Synturf Fields Have Been Recycled? **“The Answer is None.”**

**After well over a decade of assurances from industry that thousands of fields would be recycled and facilities were opening throughout the U.S.:**

**Testimony from Martha’s Vineyard, MA Hearing, March 2021.**

**MV Commissioner:**

***“Can you tell me any fields that have been recycled that are in the United States and where they went and how many have been taken out?”***

**TenCate Northeast Sales Manager Mark Curran:**

***“The answer is none.”***

# So Where Does Old Synthetic Turf Go?

Synthetic turf has a life of **just 8-10 years**. Each field generates 440,000+ pounds of waste.

A used tire is classified as waste and is regulated for public and environmental protection. But 20k-40k tires ground up, spread on a field as infill, can later be dumped nearly anywhere (farm fields, woods, near streams, etc.).

Trucks have no debris containment as they transport the material.

Turf that was later dumped in Baltimore county

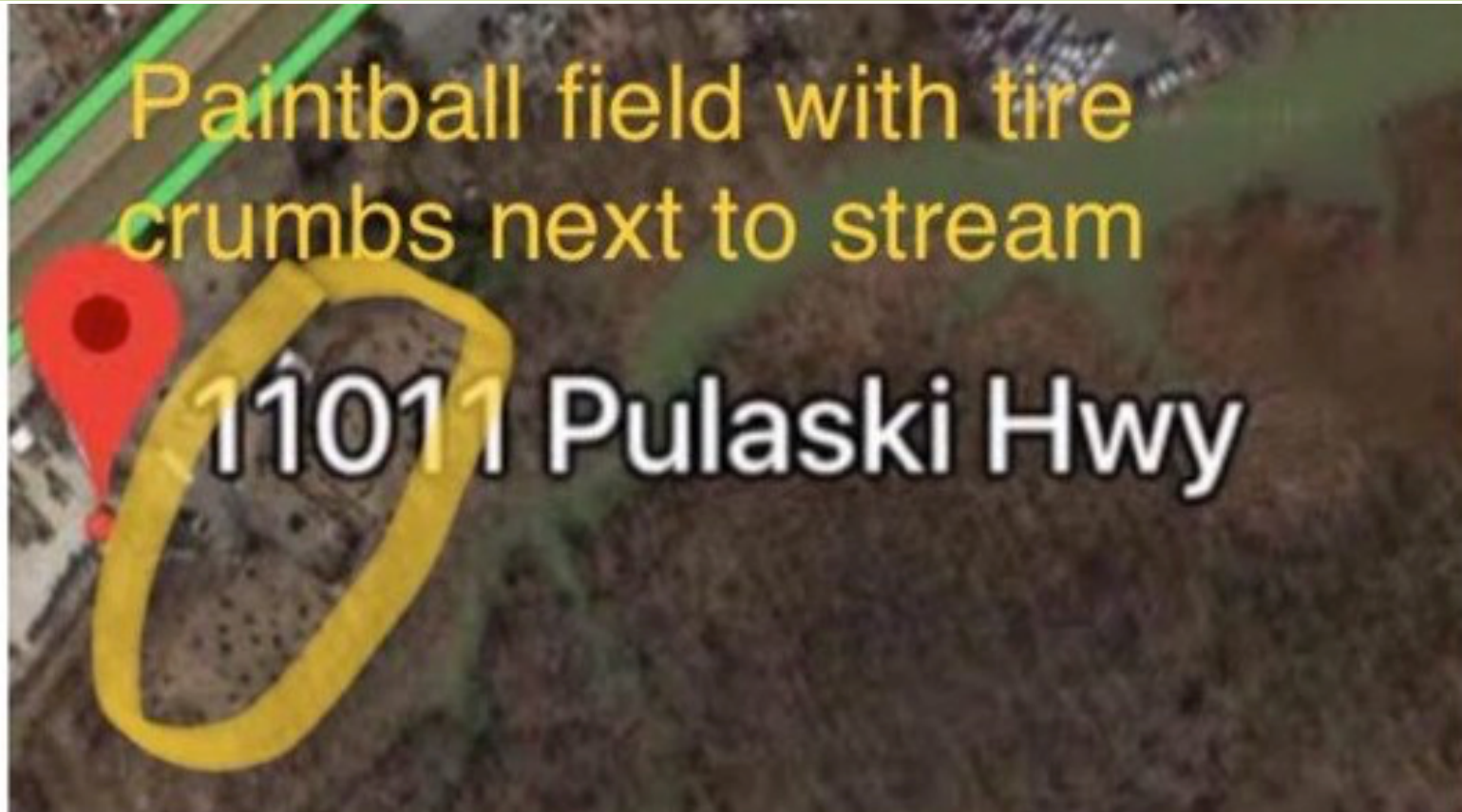


Example of turf dumping in Albemarle Co. VA





# That truck dumped the field in Baltimore County: White Marsh near Bird River



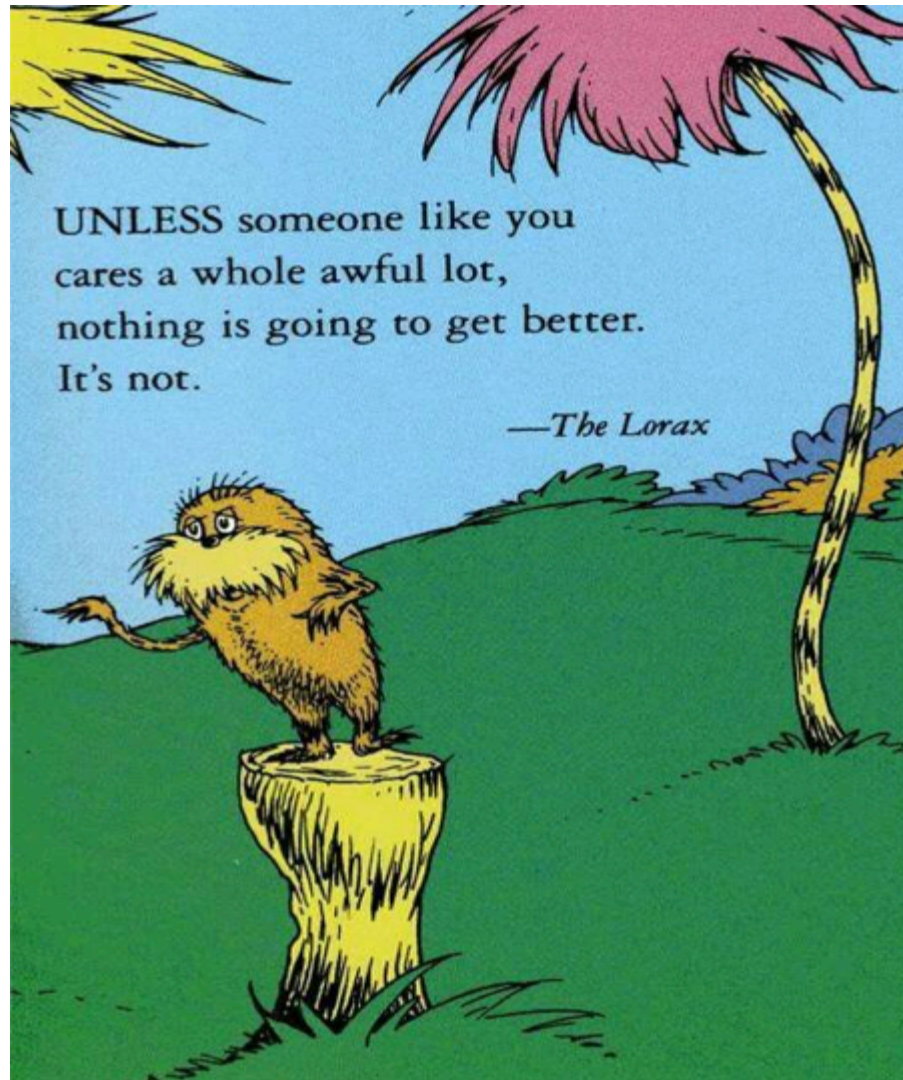
- Synturf is frequently dumped quietly on private property where it contaminates the soil, groundwater, and watershed resources.

# There is a solution-GRASS!



Pro's say it's the best!

# You Make the Choice for Our Children and Our Planet





# Resources:

## **This presentation was prepared by:**

Marie LaPorte, Maryland Sierra Club, Diana Conway, Safe Healthy Playing Fields, Inc., Dr. Kathy Michels, Laura Stewart, Free State PTA.

**Slide 2:** Maryland Sierra Club-<https://www.sierraclub.org/maryland/synthetic-turf#:~:text=An%20average%20single%2080%2C000%20sq,waste%20sometimes%20mixed%20with%20sand>)

**Slide 4:** Casey Reynolds, PhD, Sports Field Management Online (president CEO of Turfgrass Producers International) 1976 CPSC ruling denying NFLPA petition to reexamine the risk of injury presented by synthetic turf and "to develop appropriate product safety rules;" 1977 Final Report of US House of Representatives Select Committee on Professional Sports.

Jeff Miller, NFL VP on NFL synturf replacement.

<https://www.nbcsports.com/nfl/profootballtalk/rumor-mill/news/report-nfl-data-shows-number-of-non-contact-injuries-were-almost-the-same-on-grass-turf-in-2021>

**Slide 5:** Dr. Greg Guyton is the NFL Ravens lead orthopedic surgeon for foot & ankle injuries, as well as for many college teams. Dr. Greg Guyton, **Ravens orthopedic surgeon** testimony March 5, 2020 opposing Open Space funding of for synturf due to injuries.

[http://mgaleg.maryland.gov/mgaweb/Committees/Media/false?cmte=app&clip=APP\\_3\\_5\\_2020\\_meeting\\_1&ys=2020rs](http://mgaleg.maryland.gov/mgaweb/Committees/Media/false?cmte=app&clip=APP_3_5_2020_meeting_1&ys=2020rs)

**Slide 6:** Graphic Source:, Casey, PhD. Natural Grass and Synthetic Turf Injury and Research, Sport Field Management Online

<https://sportsfieldmanagementonline.com/2020/01/03/natural-grass-and-synthetic-turf-injury-research/11008/>

Incidence of Knee Injuries on Artificial Turf Versus Natural Grass in National Collegiate Athletic Association American Football: 2004-2005 Through 2013-2014 Seasons, *Am J Sports Med.* 2019 May;47(6):1294-1301. doi: 10.1177/0363546519833925. Epub 2019 Apr 17.

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

**Slides 8 & 9:** Photos provided by SHPFI.

**Slide 10:** Dr. Kathleen Michels

Robbins, Jim, Road Hazard: Evidence Mounts on Toxic Pollution from Tire, Yale Environment 360, September 19, 2023

<https://e360.yale.edu/features/tire-pollution-toxic-chemicals>

4.16.23: PFAS in artificial turf, Swedish research, February 2020; presented by Dr. Jeffrey Gearhart, 4-16-23, Arlington, MA. Dr. Jeff Gearhart, The Ecology Center, MI. <https://www.youtube.com/watch?v=Z3OYx2axnlw>

# Resources:

## Slide 11:

Toxic 'Forever Chemicals' Infest Artificial Turf, *The Ecology Center*. <https://www.ecocenter.org/toxic-forever-chemicals-infest-artificial-turf>

Toxic PFAS Chemicals Found in Artificial Turf, *The Intercept*, confirming the presence of PFAS in old synturf dumped in MA wetlands. <https://theintercept.com/2019/10/08/pfas-chemicals-artificial-turf-soccer/>.

## Slide 12:

Abel, David, **Toxic chemicals are found in blades of artificial turf** <https://www.bostonglobe.com/metro/2019/10/09/toxic-chemicals-found-blades-artificial-turf/1mlVxXjzCAqRahwgXtfy6K/story.html>

Qian'en Huang, et al, Emerging Health Risks of Crumb Rubber Inhalation of Environmentally Persistent Free Radicals via Saliva During Artificial Turf Activities, *Environ. Sci. Technol.* 2023, <https://pubs.acs.org/doi/10.1021/acs.est.3c03278>

Mt. Sinai Children's Environmental Health Center; testimony to Connecticut legislature, Feb. 16 2016 <https://www.cga.ct.gov/2016/KIDdata/Tmy/2016HB-05139-R000216-Sarah%20Evans,%20Icahn%20School%20of%20Medicine%20at%20Mount%20Sinai-TMY.PDF>

## Slide 14:

Surface Temperatures of Synthetic Turf, Penn State's Center for Sports Surface Research

[https://www.google.com/search?q=penns+state+heat+on+synthetic+turf&rlz=1C5CHFA\\_enUS925US925&oq=penns+state+heat+on+synt&ags=chrome.1.69i57j33i10i160i4j33i299i2.9286j1j15&sourceid=chrome&ie=UTF-8](https://www.google.com/search?q=penns+state+heat+on+synthetic+turf&rlz=1C5CHFA_enUS925US925&oq=penns+state+heat+on+synt&ags=chrome.1.69i57j33i10i160i4j33i299i2.9286j1j15&sourceid=chrome&ie=UTF-8)

Synthetic surface heat studies. Provo (UT): Brigham Young University; Williams CF, Pulley GE 2002. Available from: <https://aces.nmsu.edu/programs/turf/documents/brigham-young-study.pdf>. Accessed March 2019.

ESPN, Sources: Maryland OL Jordan McNair showed signs of extreme exhaustion. Available from:

[http://www.espn.com/college-football/story/\\_/id/24343021/jordan-mcnair-maryland-terrapins-died-heatstroke-team-workout](http://www.espn.com/college-football/story/_/id/24343021/jordan-mcnair-maryland-terrapins-died-heatstroke-team-workout)

**WV Marching Band:** <https://www.wtrf.com/news/parents-and-students-react-to-band-members-overheating/1423706673>

With Hotter Temperatures Come More Football Deaths And Black high school players are disproportionately affected., Jon Wertheim, Oct 7, 2022, <https://www.si.com/high-school/2022/10/07/football-climate-change-daily-cover>

# Resources:

## Slide 16:

Safe Healthy Playing Fields, Inc., <https://www.safehealthyplayingfields.org/maintenance-synthetic-turf>

## Slide 17:

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

De Haan, William P. et al, Environmental Pollution Volume 334, 2023 ; The dark side of artificial greening: Plastic turfs as widespread pollutants of aquatic environments☆

**Slide 18:** Turf recycler hit with environmental violations as it works to open PA plant, *Bucks County Courier Times* April 2, 2023; Rodgers, Bethany.

<https://www.phillyburbs.com/story/news/environment/2023/03/20/pa-officials-say-turf-recycler-is-violating-environmental-laws/69995371007/>

**Artificial Turf ‘Recycling’ A Decade-Long Deception.** Testimony Martha’s Vineyard, MA Hearing, March 2021.

<https://www.youtube.com/watch?v=9Wndy6dLJGk>

**Toxic Use Reduction Institute at U-Mass Lowell** includes information on natural v artificial turf, plus resources on managing heavily-used natural turf fields. [www.turi.org](http://www.turi.org) .

**Slide 19:** Source Maryland Sierra Club Zero Waste

[https://www.sierraclub.org/maryland/synthetic-turf#:~:text=An%20average%20single%2080%2C000%20sq,waste%20sometimes%20mixed%20with%20sand\).](https://www.sierraclub.org/maryland/synthetic-turf#:~:text=An%20average%20single%2080%2C000%20sq,waste%20sometimes%20mixed%20with%20sand).)

# Appendix:

## Different infills, same problems

**Each infill presents its own mix of defects but all are hot. All migrate constantly off-field. Newer infills have unproven performance, uncertain supply & cost profile.**

- **Tires:** Used tire crumb is the **hottest** and **most toxic** –and the most common.
- **Other plastics:** Shoe manufacturing waste, plastic-coated sand are nearly as hot as tire.
- **Plant-based infills:** **Cork, nut-shell, pine, rice etc.**, are “Goldilocks” products: Too dry and the field is dusty & slippery; footing shifts and piles up. Too wet and fields get sticky & clumpy. In freezing temps they can form hard clumps.
- **Zeolite:** Volcanic rock related to cat litter; high dust & skin injury rates; turns pasty in rain.

**Regardless of infill type or color:**

**Silica sand:** Artificial turf carpets are held down with hundreds of tons of silica sand, resulting in constant generation of silica dust known to be carcinogenic when inhaled.

**Unusably hot:** Artificial turf will be increasingly unusable due to climate change, at 140 or 160+ degrees. Water-cannon irrigation interrupts play, changes field conditions, delays other games —and fields just return to original temp within 20 min.