

## **Mystic River Watershed Association Position on Artificial Turf**

MyRWA opposes the application of artificial turf in the Mystic River watershed because of its documented impact on natural resources, contributing to 'heat islands' and public health concerns. Artificial turf introduces microplastics and leached chemicals into the local environment and impacts public health through higher heat exposures.

### **About MyRWA**

The Mystic River Watershed Association (MyRWA) is a 501(c)(3) nonprofit organization founded in 1972. The organization's mission is to protect and restore clean water and related natural resources in the watershed's twenty-one communities and to promote responsible stewardship of our natural resources through educational initiatives. MyRWA accomplishes its mission by forging links with citizens' groups, universities, businesses, and government agencies. MyRWA has worked particularly hard in developing a partnership with municipalities to address the most pressing environmental issues.

MyRWA has focused tremendous efforts in the past decade on addressing stormwater pollution, understanding climate risks and mitigation opportunities, and advocating for a well-maintained and accessible park system. MyRWA advocates in a watershed that is already experiencing climate change. MyRWA has documented more intense rainfall and, relevant to artificial turf, excessively hot conditions in environmental justice neighborhoods.

### **About Artificial Turf**

Artificial turf fields are engineered systems built with synthetic materials to mimic natural grass fields for sports and recreation. They are built with a base layer of padding, plastic webbing, and synthetic grass blades, typically made of nylon or polyethylene. Recycled rubber tire crumb has been the most common infill material, but due to growing concerns about the health risks of chemicals in the crumb rubber, there's a shift towards alternatives such as EPDM (ethylene propylene diene monomer), TPE (thermoplastic elastomer), and organic infill materials like cork, coconut hulls, and sand.

### **Concerns about public health**

The Mystic River watershed includes some of the hottest areas in the greater Boston area—due to lack of tree canopies and greenspaces. Data collected during MyRWA's Wicked Hot Mystic project demonstrates that Boston, Chelsea, Everett, Malden, Revere, Somerville and Winthrop were up to 10 degrees F hotter than in the coolest parts of the watershed (see Figure 1).

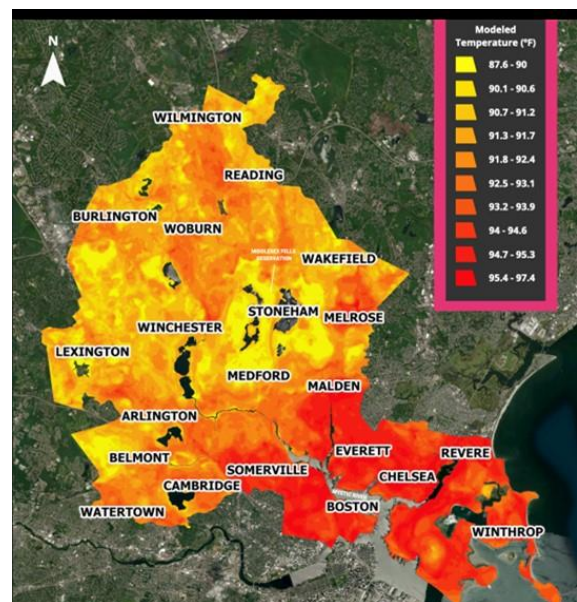


Fig. 1 Results of Wicked Cool Mystic surface temperature modeling showing disproportionate heat burden in environmental justice communities.

The heat—and corresponding disproportionate impact on environmental justice populations, is getting worse with climate change. Many studies<sup>1,2,3</sup> have documented that synthetic turf fields are much hotter than natural turf fields. Numerous studies have documented extremely high surface temperatures on artificial turf, and while there has been limited research on the temperature of the air above the field, data indicates that players on artificial turf fields have higher skin temperatures, indicating greater heat load, and perceive a greater degree of heat stress than when on natural grass fields. This negatively impacts those playing on the field—as well as the neighborhoods that depend on these spaces to be cool, safe places in the summer months. The health effects of extreme heat disproportionately impact young children, older adults, persons with disabilities, populations experiencing poverty, and people with chronic illnesses, particularly heart disease, diabetes, and asthma.

Through Wicked Cool Mystic, the Mystic River Watershed Association is working with residents and municipalities to implement interventions like increasing tree canopy, shaded bus stops, white-painted roofs, and green roofs, etc., to cool down our hottest areas. As such, we cannot support putting in new synthetic fields, which have been documented to be significantly hotter than asphalt and far hotter than grass fields.

Another health concern is the presence of harmful chemicals in artificial turf and its infill materials, particularly crumb rubber made from recycled tires. These materials may contain toxins like polycyclical aromatic hydrocarbons, phthalates, heavy metals, and forever chemicals (per- and polyfluoroalkyl substances (PFAS), which have been linked to cancer, developmental problems, and other health issues. Residents living near artificial turf fields are concerned about potential exposure to these chemicals through dust, air, and even water runoff.

The combination of excessive heat and potential chemical exposure creates a worrying situation for athletes and communities alike.

### **Impact on the Environment**

Artificial turf fields can harm the environment through the leaching of contaminants and the physical migration of artificial turf components<sup>4</sup>. One major concern is the leaching of harmful chemicals from the turf itself. Studies have shown that metals like zinc and polycyclic aromatic hydrocarbons (PAHs) can leak

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<sup>1</sup> Williams, C. F., & Pulley, G. E. (2002). Synthetic surface heat studies. Brigham Young University.

<sup>2</sup> Penn State's Center for Sports Surface Research (2012). Synthetic Turf Heat Evaluation- Progress Report. January 2012. Available at: <http://plantscience.psu.edu/research/centers/ssrc/documents/heat-progress-report.pdf>

<sup>3</sup> Thoms, A. W. et al. (2014). Models for Predicting Surface Temperatures on Synthetic Turf Playing Surfaces. *Procedia Engineering*, 72, 895-900. Available at: <http://www.sciencedirect.com/science/article/pii/S1877705814006699>

<sup>4</sup>de Haan, W. P. et al. The dark side of artificial greening: Plastic turfs as widespread pollutants of aquatic environments *Environ. Pollut.* 334, 122094 (2023)

out of the turf and contaminate nearby soil and water<sup>5</sup>. In 2010, the Connecticut Department of Environmental Protection (CT-DEP) demonstrated artificial turf leachate contained concerning levels of heavy metals, particularly zinc, that pose a significant risk to aquatic life in nearby surface waters after rain events<sup>6</sup>. The CT-DEP wrote in a summary: "Based on these results, DEP concludes that there is a potential risk to surface waters and aquatic organisms associated with whole effluent and zinc toxicity of stormwater runoff from artificial turf fields. Zinc concentrations in the stormwater may cause exceedances of the acute aquatic toxicity criteria for receiving surface waters, especially smaller watercourses<sup>7</sup>."

Recycled rubber tires used in crumb rubber fill contain another chemical of serious concern. Following repeated incidents of mass coho salmon mortality in urban environments around Puget Sound, researchers at Washington State University were able to identify that a particular tire additive 6-PPD, once oxidized, created a byproduct (6-PPD quinone) with significant toxicity<sup>8</sup>. Even short exposures to 6PPD-Q in stormwater runoff were found to be lethal for some fish species, like coho salmon. Researchers are still unraveling the exact mechanisms, but evidence suggests 6PPD-Q disrupts blood flow and damages vital organs like the brain and gills in affected fish. This discovery highlights the need for stricter regulations on chemicals used in artificial turf and a focus on safer alternatives to protect our waterways.

Another environmental impact is the contribution of microplastics to the ecosystem. As artificial turf ages, the plastic blades and infill materials can break down into tiny microplastics that can contaminate the soil, local waterways, and potentially harm wildlife. As any visitor to a local artificial turf field will witness, crumb rubber migrates from the designated areas, and is distributed in soils and frequently in the storm drain system. Less visible, the degradation of the artificial 'grass' blades results in very small floatable microplastics that are being washed into local waterways and out into the ocean. Research by Haan et. al. (2023)<sup>4</sup> demonstrated that artificial turf fibers are present in local waterways and marine environments in staggering amounts. This research is consistent with prior studies in China<sup>9</sup>

These microplastics can also enter the food chain, posing a risk to human health as well.

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<sup>5</sup> T. Kallqvist, Norwegian Institute for Water Research(NIVA), Environmental Risk Assessment of Artificial Turf Systems, December 2005, p. 5; T. Edeskar, Lulea University of Technology, Technical and Environmental Properties of Tyre Shreds Focusing on Ground Engineer Application, 2004 as cited in KEM, Swedish Chemicals Agency, Facts: Synthetic Turf, April 2007.

<sup>6</sup> Connecticut Department of Environmental Protection (2010). Artificial Turf Study: Leachate and Stormwater Characteristics, Final Report. Available at:  
[http://www.ct.gov/deep/lib/deep/artificialturf/dep\\_artificial\\_turf\\_report.pdf](http://www.ct.gov/deep/lib/deep/artificialturf/dep_artificial_turf_report.pdf)

<sup>7</sup> <https://portal.ct.gov/-/media/deep/artificialturf/depsummarypdf.pdf>

<sup>8</sup> Tian, Zhenyu et al., *A ubiquitous tire rubber-derived chemical induces acute mortality in coho salmon*, 371 *Science* 6525, 185-89 (2020)

<sup>9</sup> T. Wang, B. Li, X. Zou, Y. Wang, Y. Li, Y. Xu, L. Mao, C. Zhang, W. Yu  
Emission of primary microplastics in mainland China: invisible but not negligible *Water Res.*, 162 (2019), pp. 214-224, 10.1016/j.watres.2019.06.042

### **Environmental justice populations**

The heat—and corresponding disproportionate impact on environmental justice populations, is only going to get worse with climate change. During the past few years members of environmental justice communities from throughout the watershed have approached MyRWA and highlighted concerns on artificial turf regarding toxic chemicals (PFAS), the exposures to heat, and the loss of natural greenspaces in their community. They've highlighted concerns about being marginalized in conversations - either because they were not invited to participate in engagement activities and in other cases, their voices were ignored.

Municipalities need to apply additional caution in siting artificial turf. Municipalities are serving large constituencies of residents from throughout the community asking for facilities to accommodate youth sports. Without specific care, these facilities are being placed in a local area that may disproportionately impact a local population that is historically disenfranchised in decision-making.

### **Guidance on natural grass and artificial turf in Massachusetts**

Massachusetts does have resources available to guide communities on artificial turf. The state website (<https://www.mass.gov/info-details/artificial-turf-fields>) provides information on the components of artificial turf fields, potential health risks, and safer alternatives for infill materials. The University of Massachusetts - Lowell [Toxic Use Reduction Institute](#) (TURI) has published [extensive resources](#) on artificial turf and guidance for maintenance of natural surfaces.

### **Conclusion**

As a science-based organization that is dedicated to protecting both the environment and people, we believe that the evidence is sufficient to say that these turf fields are detrimental to our watershed and to public health, both now and in the future.