

PSEG ISS GREEN TEAMS 2024

MONTCLAIR
STATE UNIVERSITY

PSEG Institute for
Sustainability Studies
Green Teams

SUSTAINABLE
VERONA 
Creating a Greener Community



MEET THE TEAM



Emma Grant-Bier
Psych and Environmental
Studies
Oberlin University



Mustafa Kayali
Finance
Montclair State
University



Mutanu Mbithi
Public Health & Biology
St. Lawrence
University



Roberto Riviere
Environmental
Engineering
PUPR



Eline Xia
Sustainability & Political
Science
Stockton University



MONTCLAIR
STATE UNIVERSITY

PSEG Institute for
Sustainability Studies
Green Teams

**SUSTAINABLE
VERONA**
Creating a Greener Community

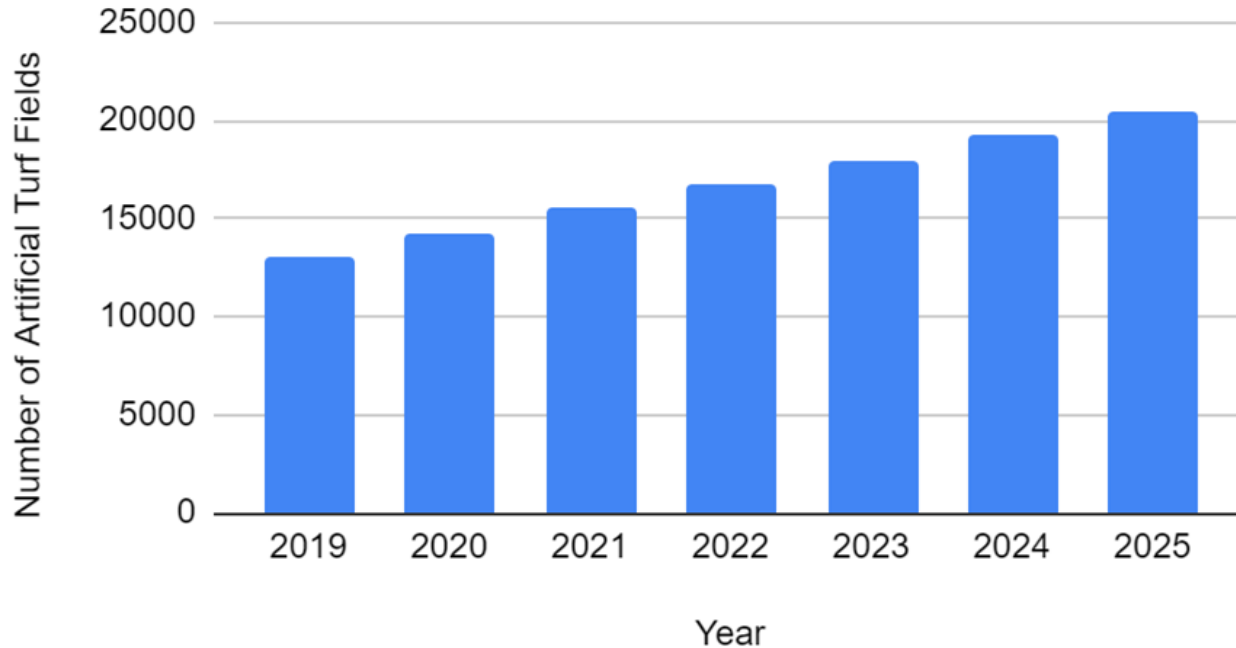


Centennial Field



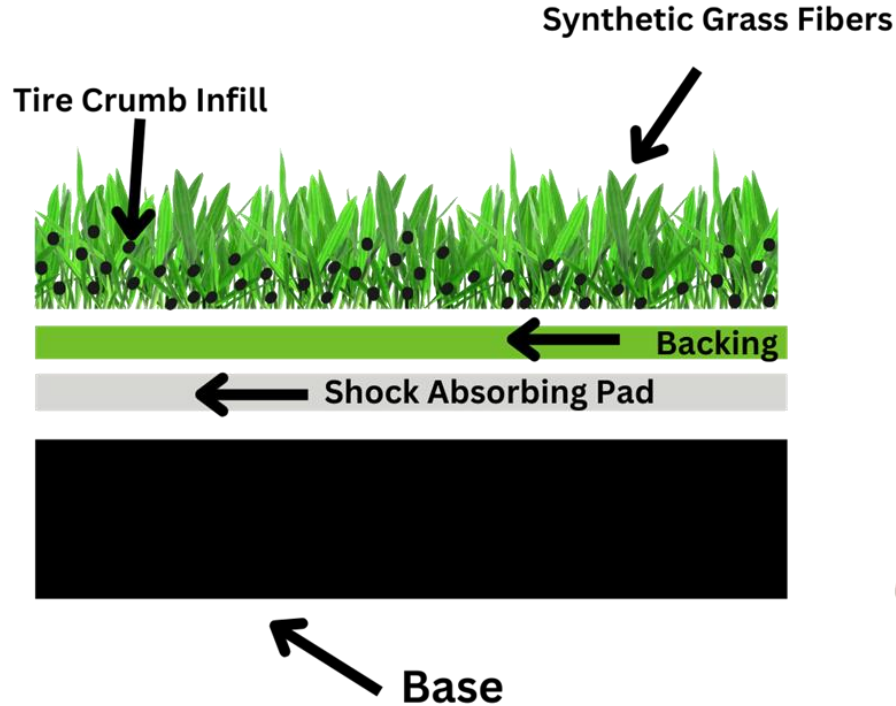
BACKGROUND

Number of Artificial Turf Fields in the US

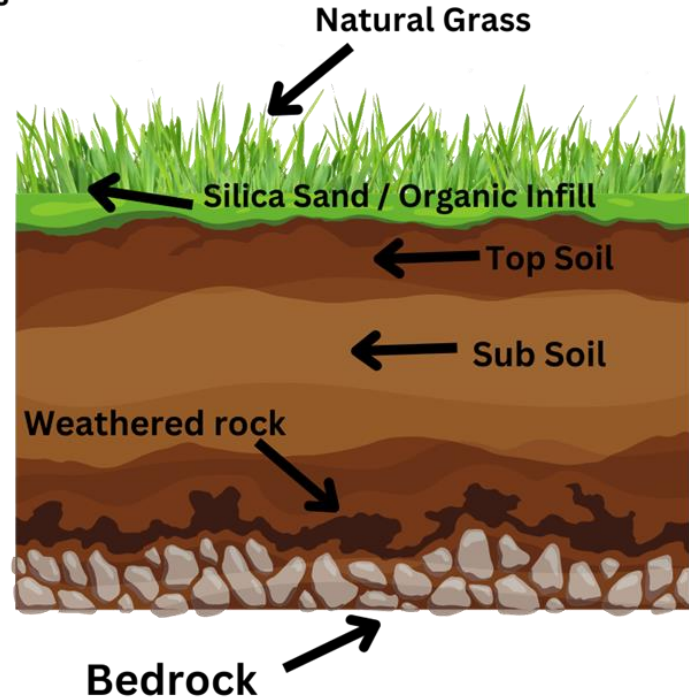


BACKGROUND

Artificial Turf



Natural Grass



OBJECTIVES

COMPREHENSIVE REPORT



ENVIRONMENTAL IMPACT



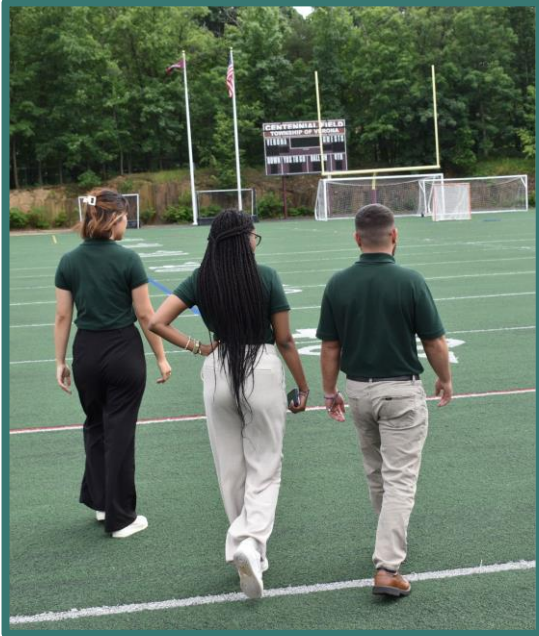
CHEMICAL EXPOSURE



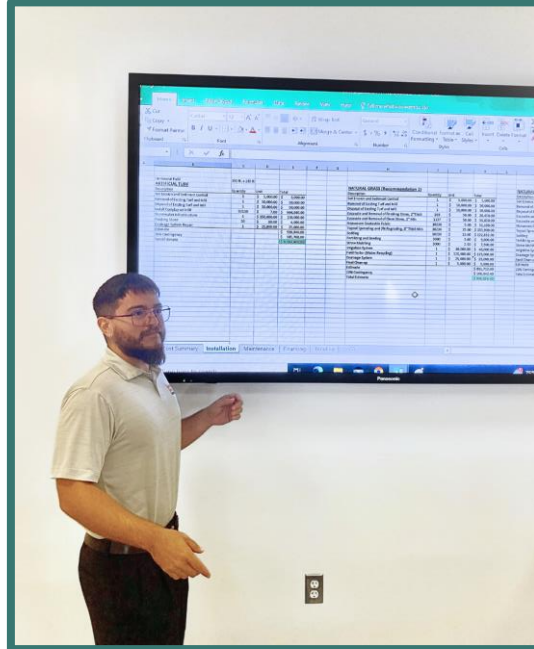
**SUSTAINABLE
VERONA** 
Creating a Greener Community

OBJECTIVES

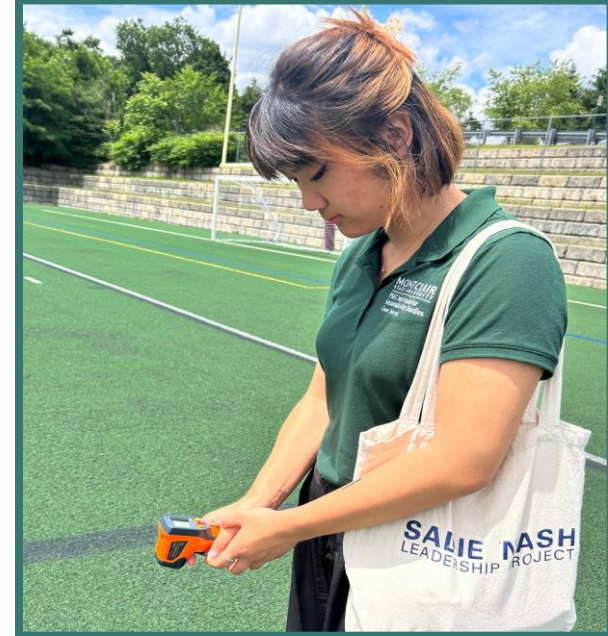
INJURY



COST BENEFIT ANALYSIS



HEAT DISPARITIES



MONTCLAIR
STATE UNIVERSITY

PSEG Institute for
Sustainability Studies
Green Teams

**SUSTAINABLE
VERONA**
Creating a Greener Community

OUR METHODS



**BACKGROUND
RESEARCH**



**LITERATURE
REVIEW**



**DATA
COLLECTION**



ENVIRONMENTAL IMPACT ASSESSMENT

	Artificial Turf	Natural Grass
Water Usage	390,000-450,000gal water/year	0.5-1 mil gal water/year
Runoff	Impervious surface	Effective water infiltration
Pollution - chemicals	Microplastics, chemical/metal leaching	Pesticides, fertilizers, & maintenance
Emissions	~55.6 tCO ₂	~18.5 tCO ₂

ENVIRONMENTAL IMPACT ASSESSMENT



“Forever
Field”
Inquirer.com

ENVIRONMENTAL IMPACT ASSESSMENT

Artificial Turf

Natural Grass

Water
Usage



Runoff



Emission



Pollution -
chemicals



CHEMICAL EXPOSURE

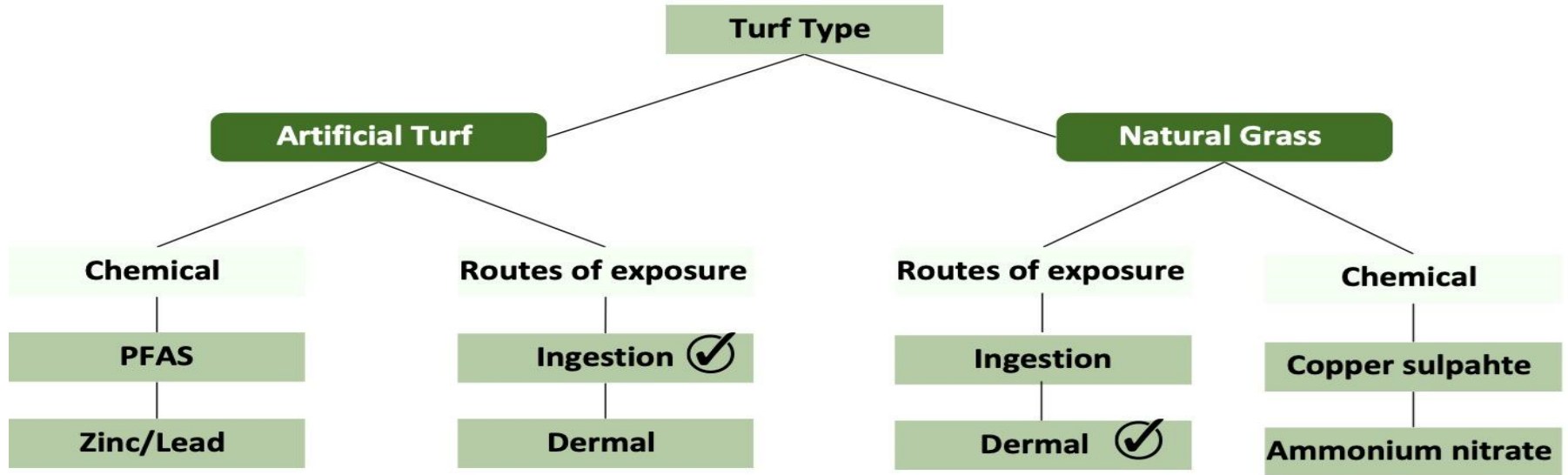
PFAS- FOREVER CHEMICALS

water repellent PFAS PFOA PFOS
chemical compounds forever chemicals
Water Pollution toxic and carcinogenic
biochemistry cancer polyfluoroalkyl waterproof PFAS Human health impermeable warning
environmental damage
Perfluoroalkyl and Polyfluoroalkyl
water-resistant properties

HOW ARE TURF
BLADES MADE?

WHAT IS THE RISK OF
WEATHERING?

CHEMICAL EXPOSURE



INJURY

	ARTIFICIAL TURF	NATURAL GRASS
Overall Lower Extremity Injuries	=	=
Knee	=	=
Hip	=	=
Foot and Ankle	↑	
Concussions	?	?
Abrasions	↑	

SURFACE HEAT



VERONA

91°

Sunny
H:92° L:68°

⚠ Severe Weather

Air Quality Alert. These conditions are expected to last until 11:00PM, Tuesday, June 18. Additional alert: Heat Advisory.
National Weather Service

Sunny conditions will continue for the rest of the day. Wind gusts are up to 13 mph.

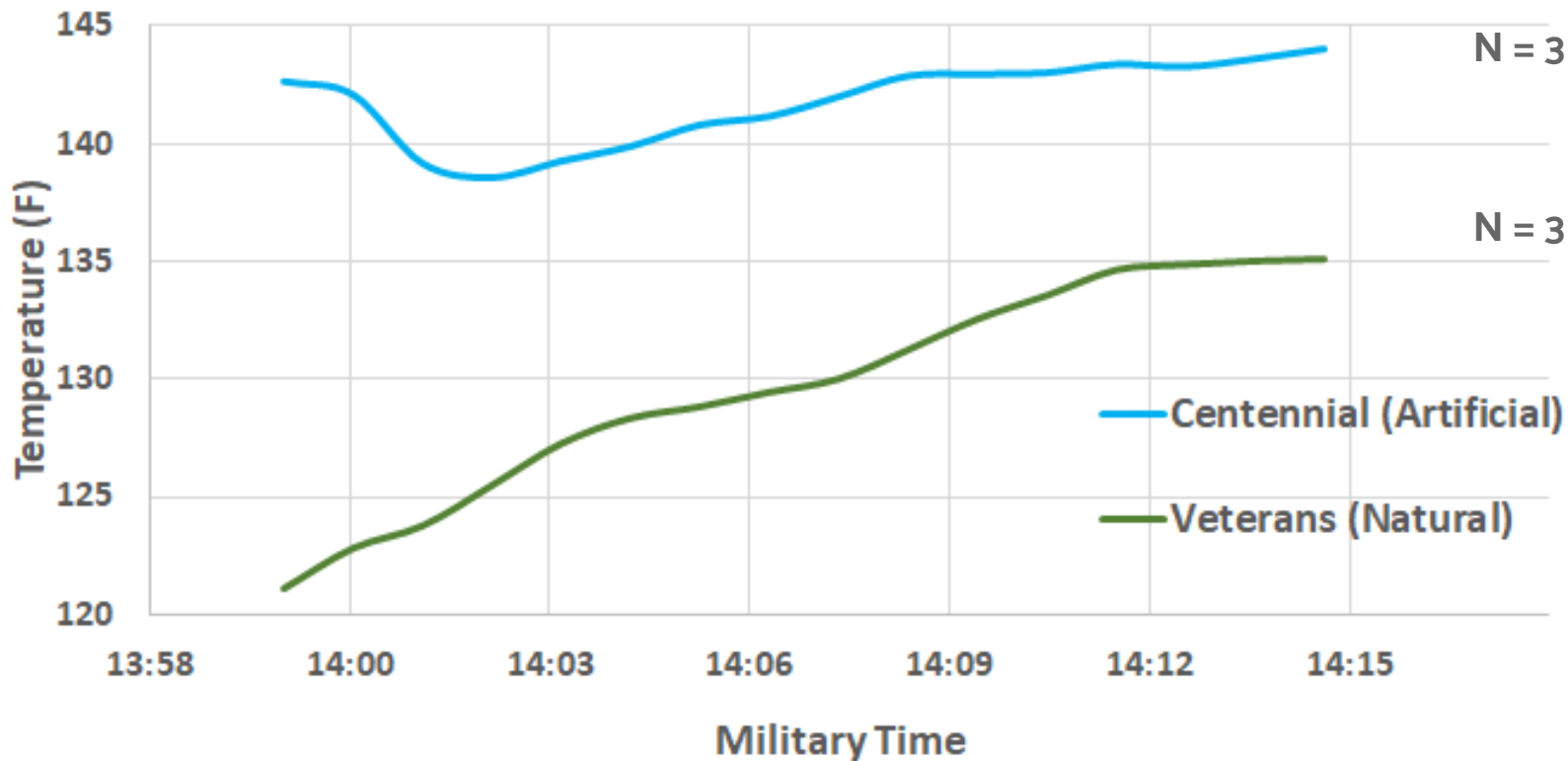
Now	3PM	4PM	5PM	6PM	7PM
91°	92°	91°	90°	88°	86°

10-DAY FORECAST



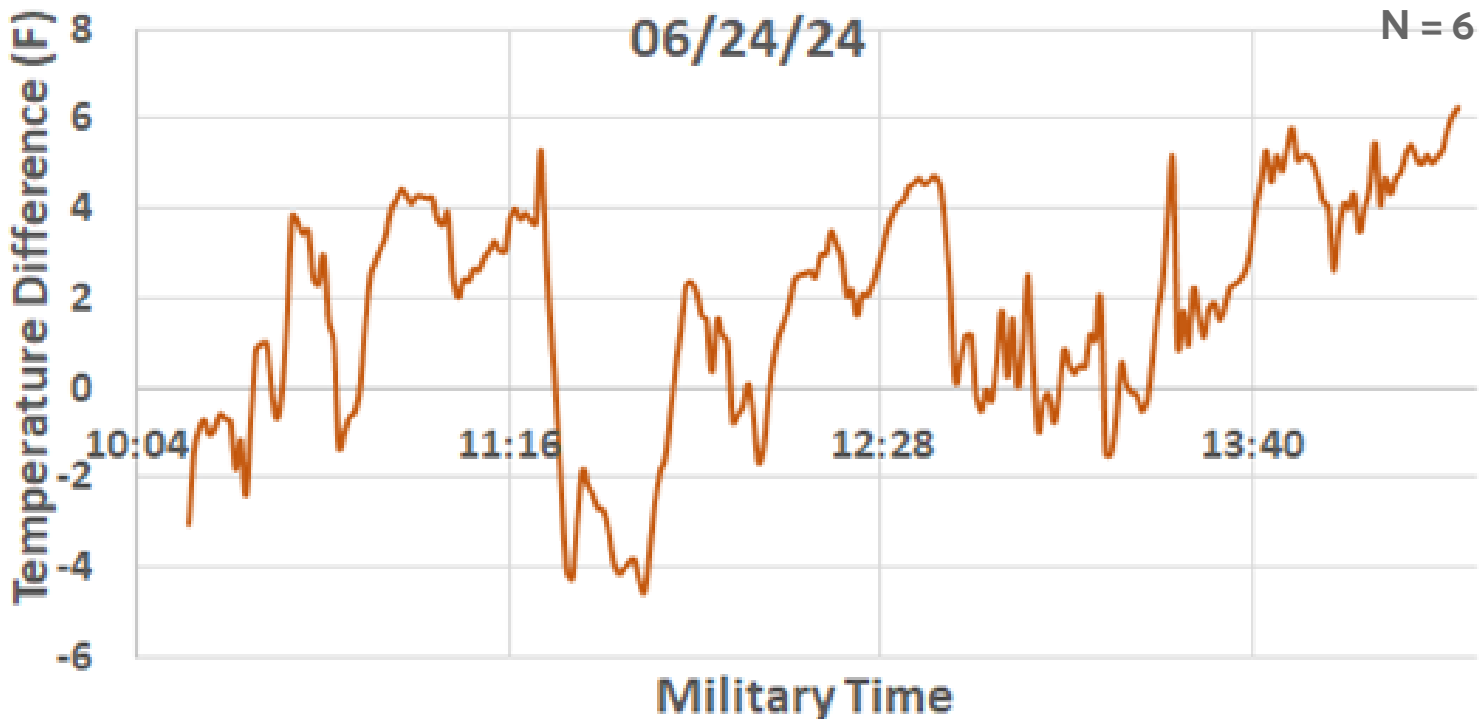
SURFACE HEAT

Temperature of Centennial vs Veterans Over Time 06/18/24



SURFACE HEAT

Difference Between Centennial (Artificial) & Veterans (Natural) Temperature Over Time



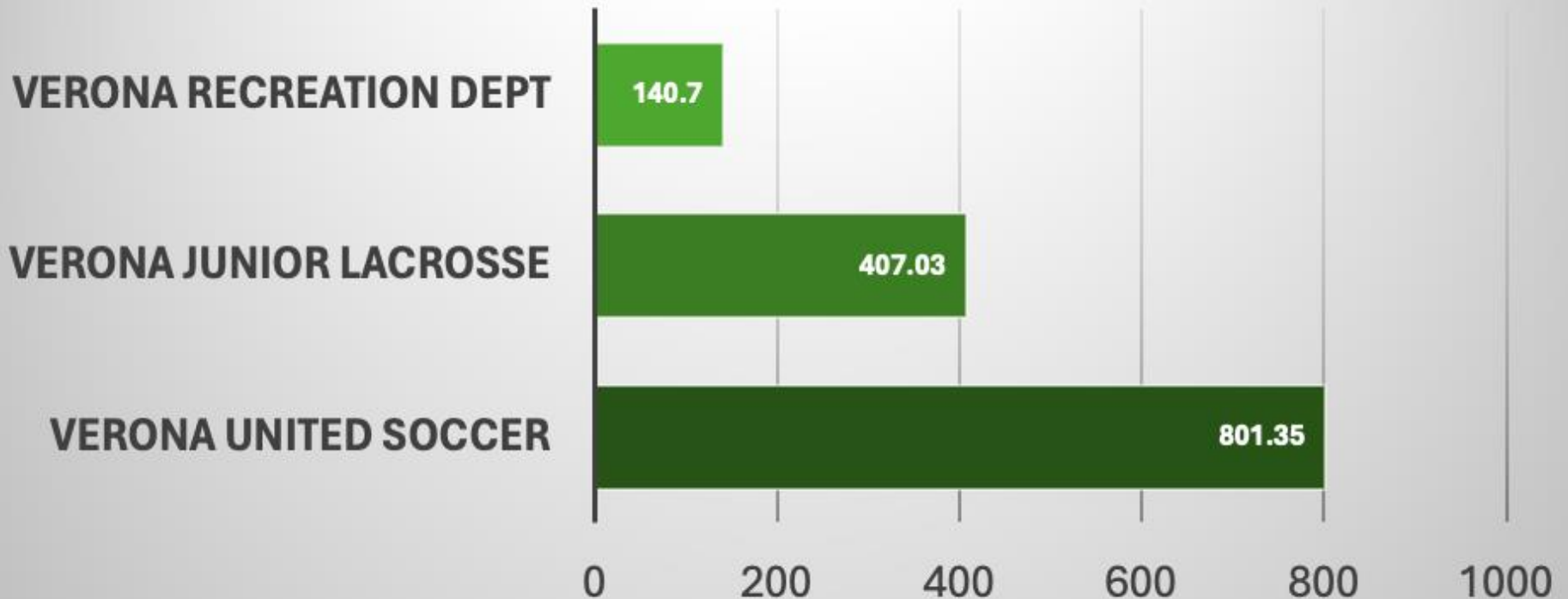
SURFACE HEAT

Difference between Centennial (Artificial) & Veterans (Natural) Temperature Over Time



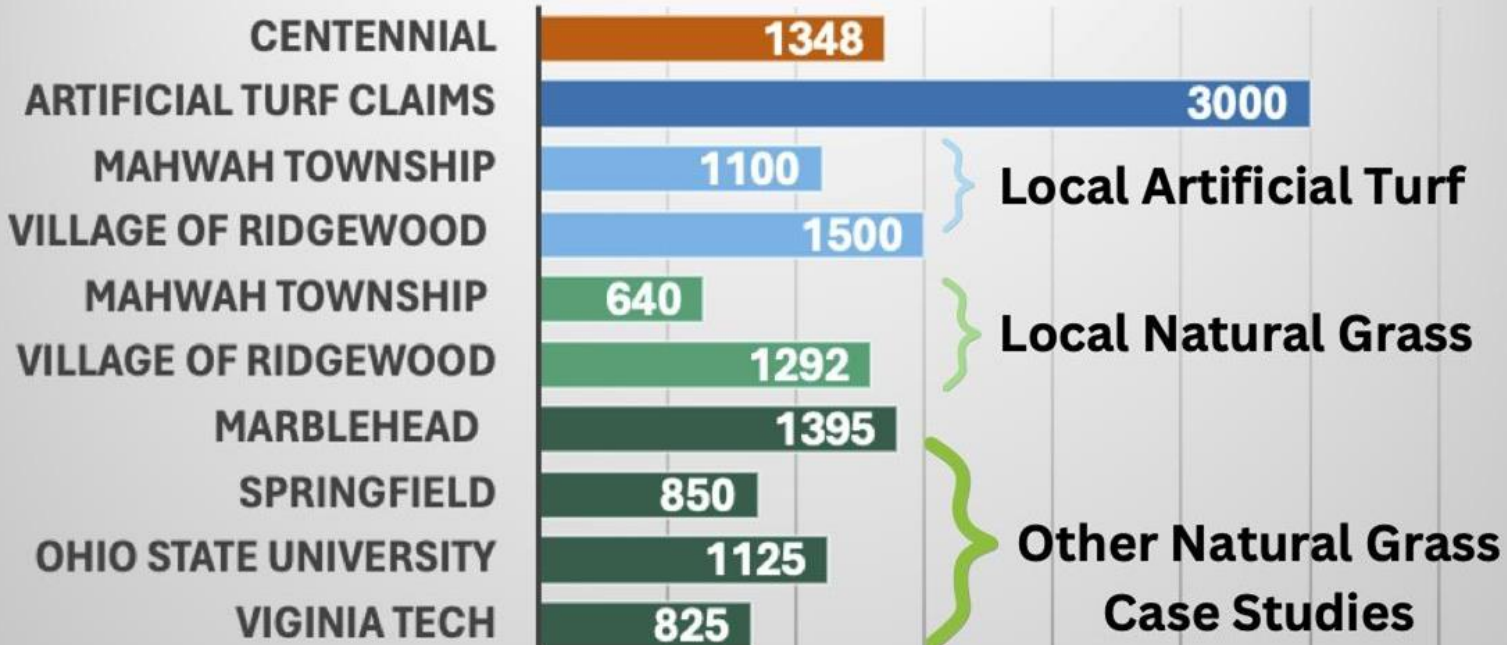
CENTENNIAL FIELD USAGE

Scheduled Hours on Centennial Field



Scheduled Annual Usage (Hours)

0 500 1000 1500 2000 2500 3000 3500



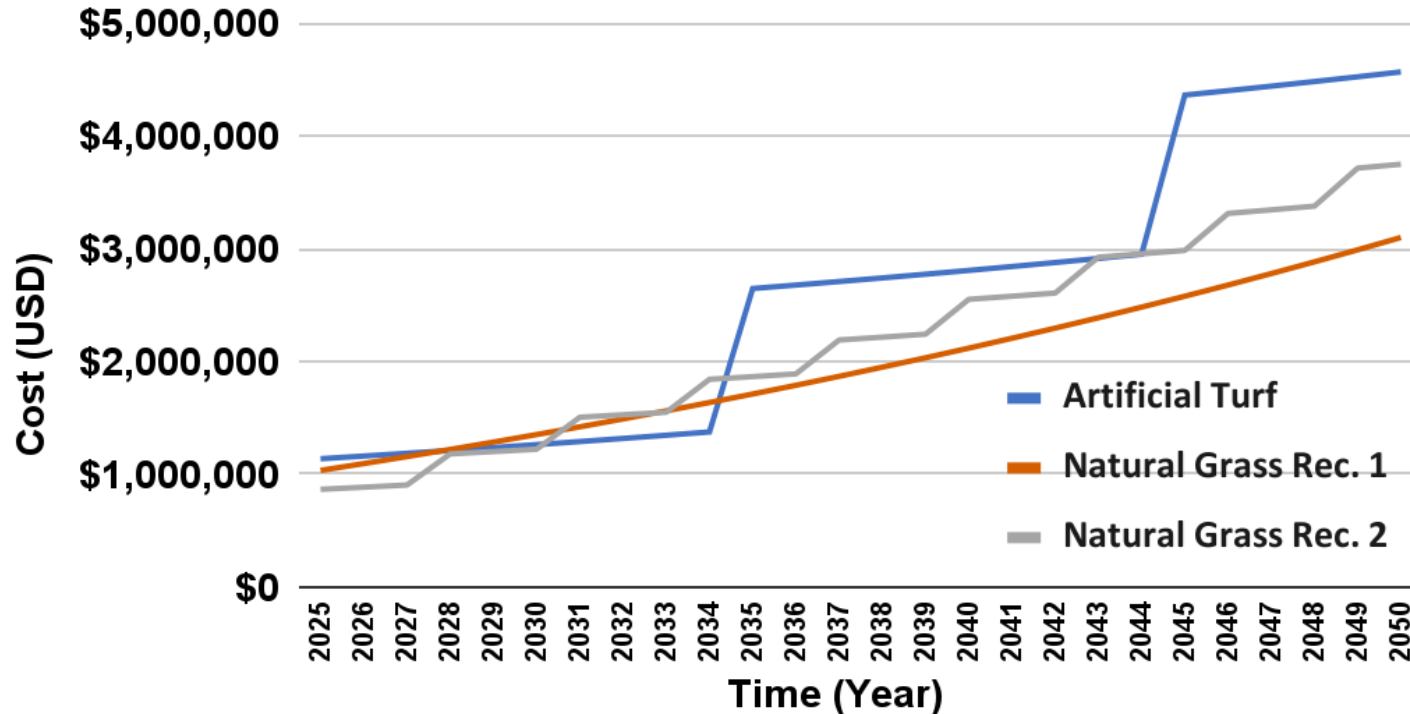
Data from:
Township of Verona,
Synthetic Turf Council,
Township of Mahwah,
Village of Ridgewood,
Toxic Use Reduction
Institute,
DC Community Meeting
(May 30, 2024)

COST BENEFIT ANALYSIS

Centennial Field	Artificial Turf	Natural Grass (Rec. 1)	Natural Grass (Rec. 2)
Installation Total	\$ 1,114,608	\$ 1,073,054	\$ 848,054
Annual Maintenance Total	\$ 23,270	\$ 59,000	\$ 18,483
2025 Total Cost	\$ 1,137,878	\$ 1,132,054	\$ 866,537
2050 Cumulative Cost	\$ 4,568,608	\$ 3,197,745	\$ 3,749,828

COST ANALYSIS

Cumulative Cost Over Time



RECOMMENDATIONS

	ARTIFICIAL TURF		NATURAL GRASS	
	Rec. 1	Hybrid turf	Rec. 1	Rec. 2
CONSTRUCTION	Stormwater infrastructure	Sand-based construction	Recycle water	Drainage & irrigation
TYPE / MATERIAL	Natural / TPE infill	Stitched system	Kentucky bluegrass / Perennial ryegrass	Tall fescue
MAINTENANCE	Hardness testing Frequent infill replacement	Tining Dethatching Brushing	Frequent aeration FT organic land management	PT management Organic pesticides

ACKNOWLEDGEMENTS



**SUSTAINABLE
VERONA** 
Creating a Greener Community

Kevin O'Sullivan
Kerry Bass

MONTCLAIR
STATE UNIVERSITY

PSEG Institute for
Sustainability Studies
Green Teams

Iman Cumberbatch
Leonard Richardson
Dr. Josh Galster
Dr. Amy Tuininga



College of Science and Mathematics

Thank you!



PSEG



Office of the Provost and Academic Affairs



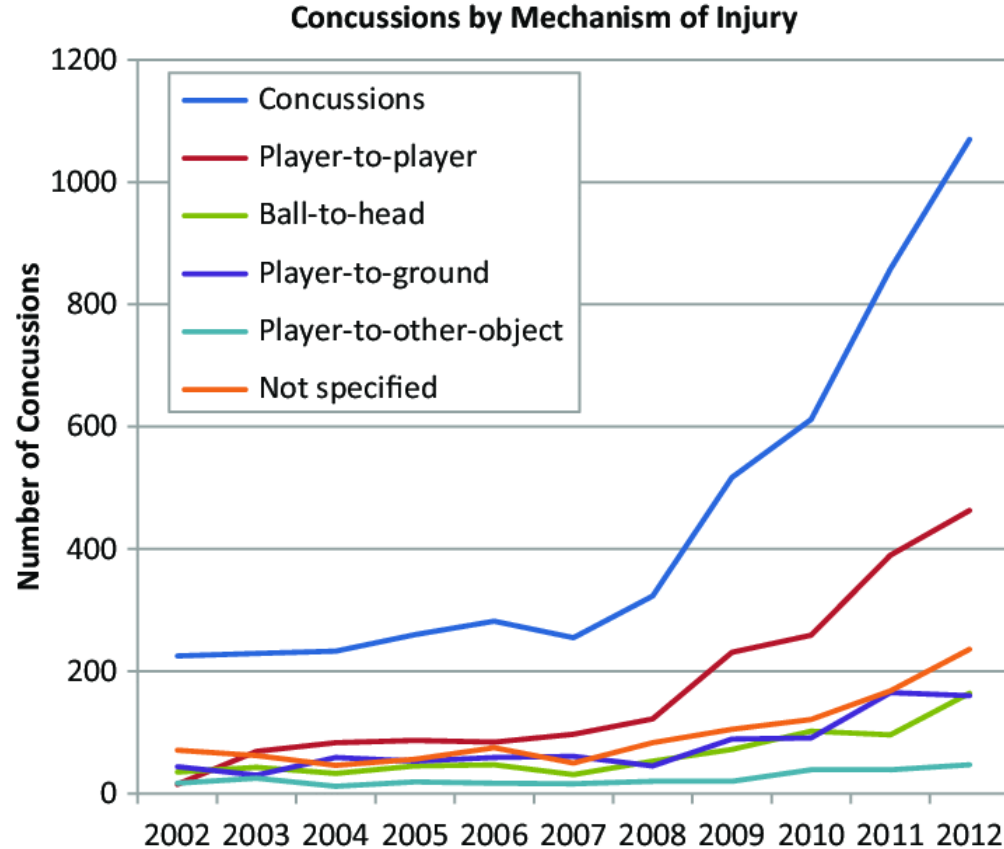
National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE

PSEG ISS is generously supported by the National Science Foundation under NSF HSI (Hispanic-Serving Institutions) HRD Grant No. 1953631, NSF IUSE (Improving Undergraduate STEM Education) DUE Grant No. 2013495, and NSF INCLUDES DBI Grant No. 1744460. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

This research was supported by the intramural research program of the U.S. Department of Agriculture, National Institute of Food and Agriculture, Research and Extension Experience for Undergraduates, GRANT13698714, Accession Number: 1030103. The findings and conclusions in this preliminary presentation have not been formally disseminated by the U. S. Department of Agriculture and should not be construed to represent any agency determination or policy.

Q&A

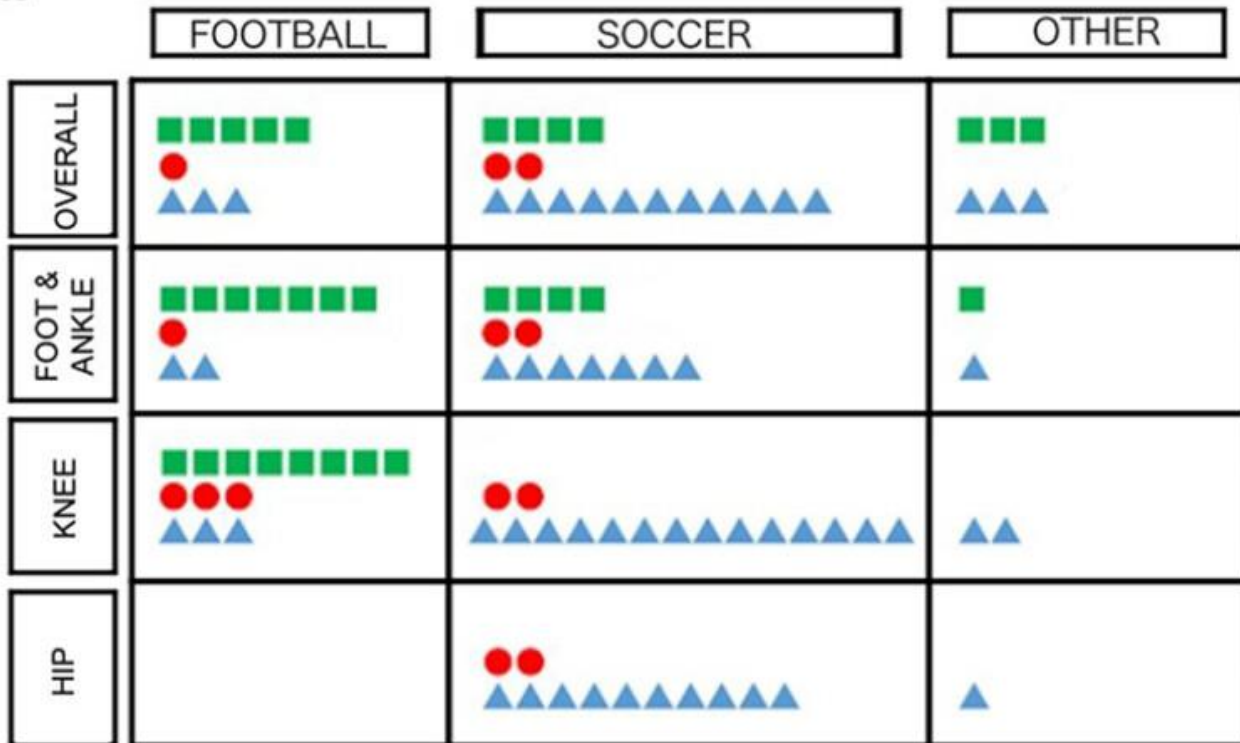
INJURY: CONCUSSION DIAGNOSIS OVER TIME



*Research Gate:
Number of
concussions trended
over the 11-year time
frame by mechanism of
injury.*

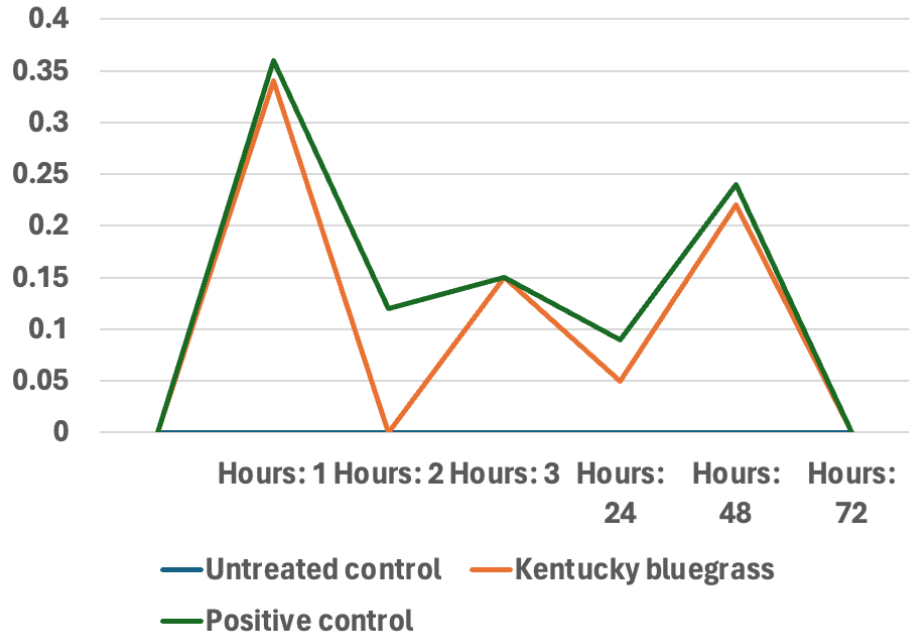
Study Outcomes Categorized By Sport

- Turf causes more injuries
- Grass causes more injuries
- ▲ Injury rates equal

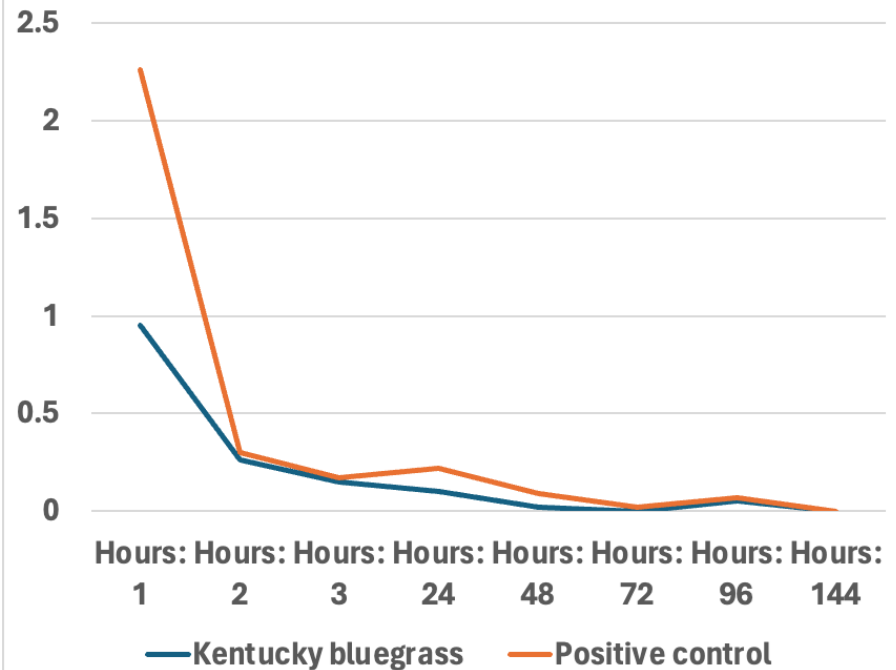


INFECTION RISK

Bacteria per cm² on Fields in August



Bacteria per cm² on Fields in May



BACKGROUND



**SUSTAINABLE
VERONA**
Creating a Greener Community

MONTCLAIR
STATE UNIVERSITY

PSEG Institute for
Sustainability Studies
Green Teams

Number of Artificial Turf Fields in the US

