

WHITEPAPER

SYNTHETIC TURF VS NATURAL GRASS FOR ATHLETIC FIELDS

SportsGrass
by ForeverLawn®



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INTRODUCTION

Since the invention of synthetic turf in the 1960s, there has been an ongoing discourse on natural grass vs. artificial surfacing in athletics. While the discussion has evolved over time, the purpose of this paper is to highlight and explain how synthetic turf alleviates many of the issues plaguing natural fields and in many cases improves upon the performance, safety, and usability aspects of grass sports surfaces.

BACKGROUND

Each year in the United States, there are between 2,000 and 2,500 synthetic sports fields installed. These are a combination of newly constructed fields as well as resurfaced existing synthetic turf fields, which have a normal lifespan of 8-12 years.

Football is exceptionally hard on fields. This is due to several factors, including the number of athletes on the field, aggressive planting and cutting during play, and the concentrated wear as each play begins between the hashes. This expedited wear has led to an explosion of synthetic turf surfacing for football fields at all levels.



A large majority of D1 college competition football fields are now synthetic turf. At the high school level, synthetic football fields outnumber natural fields in many leagues across the country.

While soccer has historically employed natural grass surfaces, many professional and collegiate organizations are turning toward synthetic fields, especially in situations where spaces are shared by multiple sports or used for more than just games. Previously stark opponents to synthetic turf, such as Lionel Messi, have even shown willingness to compete on synthetic turf in recent years. Six MLS teams currently play their home games on synthetic turf and many more utilize it for their practice fields and indoor facilities.

Most natural collegiate soccer fields exist at the D1 level, where teams have their own fields not shared by multiple sports and maintenance budgets allow for meticulous upkeep. At the D2, D3, and high school levels, most soccer teams compete on shared fields. Additionally, indoor soccer organizations draw large numbers of athletes of all ages and often rely heavily on synthetic turf.

Baseball and softball are the fastest growing segments of the synthetic sports turf market. In much of the United States, it is common for baseball and softball games to be canceled, postponed, or relocated due to wet field conditions.

As synthetic turf fields remain functional regardless of weather, many high schools, colleges, and even professional organizations are opting for synthetic turf to help maximize the playable portion of their seasons. This currently includes five MLB teams. In many cases, the improvement turf provides is significant enough that even partial synthetic fields are employed to solve these issues.



USABILITY

It's clear that one of the biggest advantages of synthetic turf fields is their usability. Synthetic fields can support over 3,000 use hours per year while natural fields can usually only support around 800 use hours per year. This equates to eight hours per day for synthetic fields compared to just two for natural fields.

The ForeverLawn Sports Complex in Canton, Ohio utilizes a SportsGrass Edge synthetic turf system and hosts a high volume of sporting events, including high school practices, league use, and tournaments for all sports, accruing over 4,000 use hours per year. This type of use is only possible with synthetic turf fields.

In addition to handling extreme volumes of traffic, synthetic turf fields are also usable in all weather conditions, including during intense rain. While it is possible to play on some natural fields during rainfall, the surface will often significantly affect athletic performance and safety and the wear on the wet surface can necessitate extensive repair work to restore the field to playable condition. These challenges are not concerns with synthetic turf fields.

Snow removal on synthetic turf fields is a very simple process that requires minimal specialized equipment. Snow can be removed from natural fields, but it is a much more challenging process. Natural fields are prone to freezing in extreme cold, resulting in an exceptionally hard surface and reduced traction. For this reason, many premier natural grass venues, such as Lambeau Field, utilize subsurface heating systems.



Synthetic turf fields employ drainage systems which are designed to pull water away from the surface through the base material and into collector pipes. This ensures that synthetic turf fields will not freeze and will maintain proper firmness and traction levels.

In environments where the growth of natural grass is challenging or impossible, synthetic fields are a great solution. Some examples of environments that are inconducive to natural grass fields include:

- Arid climates
- Extremely cold climates
- Indoor applications
- Hard surfaces, such as asphalt or concrete

For customers with space constraints, such as urban and suburban high schools, parks districts, and colleges, synthetic turf fields are the best way to handle the highly concentrated use fields will receive. As a prime example, the New York City Department of Parks and Recreation is the single largest owner of synthetic sports fields in the United States, with over 130 turf fields under its authority.

The resilience of synthetic turf allows for fields to not only handle scheduled sport programming but, in many cases, to also support non-sporting events, such as classes, graduations, concerts, and fundraisers. Synthetic fields across the country are often made available for public use, as overuse is not a concern. It is also not uncommon for local high schools to allow residents to access their field for recreational use when programming is not scheduled.

In temporary applications, synthetic fields have many advantages, including speed of installation and ease of removal. While it is possible to build natural fields quickly, the surface will not be immediately playable, as the sod requires days or weeks to root. Super Bowl LVII gave the world a prime example of what happens when athletes compete on an improperly rooted sod field.

Conversely, synthetic fields are playable immediately upon installation completion and provide athletes with consistent performance across the entire surface.



PERFORMANCE

It is well-established that a pristine natural grass field will provide an outstanding playing experience. With synthetic turf fields, this performance can be replicated without the constraints of natural grass fields for owners who lack the time, resources, and funding to maintain a natural field year-round.

Synthetic turf provides consistent performance with each step and in all weather conditions. In fact, many athletes report improved athletic performance on synthetic turf fields, as well as reduced fatigue.

While performance testing standards for natural fields are inconsistent and surfaces are tested infrequently, the opposite is true of synthetic fields. In addition to safety standards, performance standards for synthetic turf are clear and quantifiable. Lab testing is widely available from reputable synthetic turf providers and field testing is incredibly common.

The Synthetic Turf Council provides recommended scoring for a full suite of tests and sports leagues are afforded the opportunity to define their own performance standards to meet the needs of their sports.

Some common tests relating to the performance of synthetic turf fields include:

- Rotational resistance to ensure proper traction levels
- Vertical deformation to ensure proper underfoot stability
- Shock absorption and energy restitution to ensure surface reactivity
- Ball roll and bounce for sport-specific ball reactivity (soccer and baseball)

Synthetic turf surfaces provide the unique opportunity to build fields that will provide the exact performance characteristics required by the teams who will train and compete on them.



SAFETY STANDARDS AND TESTING

Natural grass fields in the US are rarely scrutinized for safety and while high-end fields may receive multiple types of safety tests, it is more common for safety to be reduced to simply the Clegg GMax test. This test only gauges impact attenuation and is performed very infrequently on most natural fields.

Synthetic turf fields are frequently scrutinized for safety, leading to the development of a broad range of safety tests with recommended standards (set by the Synthetic Turf Council) that meet or exceed ASTM levels. These tests cover every aspect of safety, including impact attenuation, stability, traction, consistency, and more. These tests include:

- GMax – fixed-height impact attenuation
- HIC (Head Injury Criterion) – varying-height impact attenuation
- Vertical deformation – stability and impact attenuation
- Shock absorption – stability and impact attenuation
- Energy restitution – stability and impact attenuation
- Rotational resistance – traction
- Infill depth – consistency

Lab testing will be available from any reputable synthetic turf supplier, and many fields receive testing upon completion of the installation. It is also common practice for synthetic fields to be tested annually for impact attenuation and infill depth.

Many sports associations and leagues choose to create their own testing standards based on the requirements of their sports. For example, FIFA has a defined suite of tests with established acceptable scores for synthetic turf systems to be used on fields. These tests are mainly existing industry-standard tests for safety and performance with a focus on surface reactivity, such as ball bounce and roll.

Other leagues, such as the World Rugby Association and the NFL, employ differing tests such as the HIC and GMax (respectively) to measure and fine-tune their playing surfaces. This ability to design and engineer surfaces to meet the exact requirements needed for a sport while also supporting broad standardized testing is a huge advantage of synthetic turf systems.





SAFETY STATISTICS

From NFL injury data, synthetic and natural fields are shown to have nearly identical non-contact injury rates. In Major League Soccer, a four-year study showed that the injury rate of players on synthetic turf surfaces was equivalent with those on natural grass fields.

At lower (non-professional) levels, where annual maintenance budgets are significantly smaller, natural field conditions are typically much worse than those of synthetic turf fields. It is obvious that use and weather can significantly impact playing conditions on natural fields over the course of a season and even within a single game. Athletes depend on consistency in their playing surfaces, as inconsistencies often pose increased injury risks.

Synthetic turf fields are predictable surfaces that perform the same throughout the course of a single game and season alike, enabling athletes to exert maximum effort with confidence and consistency.

INITIAL INVESTMENT

When considering new construction costs, both natural and synthetic fields require significant investment. For a standard full-size synthetic football or soccer field, construction costs will typically be between \$700,000 and \$1,000,000 for excavation, base work, and turf (typically around \$9 to \$11 per square foot).

Natural field costs can vary widely, but a safe estimate is \$400,000 to \$725,000 (roughly \$5 to \$8 per square foot) for a properly constructed natural field with adequate drainage.

Initial equipment investments for synthetic turf fields usually fall between \$15,000 and \$20,000 for a UTV and brush. This equipment is low-maintenance and requires minimal storage space.

Natural grass fields require more sophisticated and expensive maintenance equipment, such as mowers, spreaders, and aerators, and may have an initial investment upwards of \$50,000 to \$100,000. This equipment is more difficult to maintain and requires significant storage space.

MAINTENANCE

Synthetic turf's most evident benefit is that it is extremely low-maintenance, requiring little more than grooming and debris removal every 40-80 use hours. This will be weekly to monthly for most fields and requires just 2-3 hours per session.

Professional-level natural grass fields often incur hundreds of thousands of dollars annually in maintenance costs. While it is unlikely that high schools, colleges, and communities have the budget to maintain fields to these standards, costs accrue easily, totaling tens of thousands of dollars annually for even very basic maintenance routines.

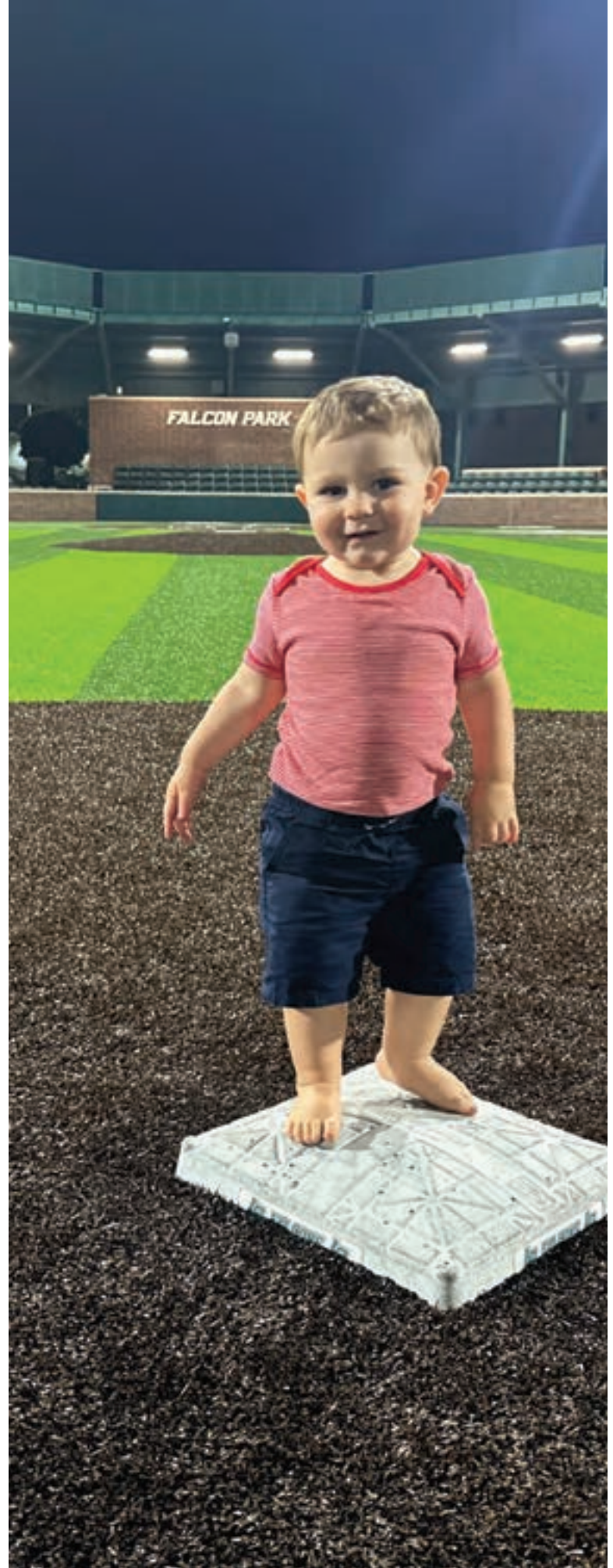
RETURN ON INVESTMENT

In most cases, synthetic turf fields will have a comparable total cost of ownership to natural grass fields over time. However, when compared with natural surfaces that are maintained to a high level, synthetic surfaces have a much lower cost of ownership.

At 3,000 use hours per year over an eight-year lifespan, a synthetic turf field will provide 24,000 hours of use. A natural field supporting 800 use hours per year over eight years will only provide 6,400 hours of use. When considering this disparity in usability, synthetic turf is much less expensive on a per-hour basis than natural grass.

(For a more detailed breakdown of the cost comparison, see the chart provided at the end of this whitepaper).

Additionally, for customers looking to generate revenue, synthetic turf fields can be rented out much more frequently and command a premium of up to 2-3 times the hourly rate of comparable natural fields.



SUMMARY

There will always be a place for high-end natural grass fields. However, most owners simply don't have the resources necessary to support these surfaces.

Modern synthetic turf options aim to replicate the playing experience of the world's best natural grass fields without the associated challenges. A quality synthetic field will provide consistent safety and enhanced performance while decreasing maintenance and providing unmatched usability for athletes of all levels.



COST COMPARISON

Natural Systems

Natural Systems refer to any sort of natural grass or sod field. The quality of these systems can vary greatly, as can initial construction cost. While it is not uncommon for high-end natural grass fields to cost hundreds of thousands of dollars in maintenance every year and to be resodded annually or more, we used much more conservative numbers here that would be more representative of the average high school, college, or community field.

Infill-Based Synthetic Turf Systems

Infill-Based Synthetic Turf Systems are the industry standard offering. They typically consist of tall, thin face construction, lightweight backing, and high amounts of infill.

Product-Based Synthetic Turf Systems

Product-Based Synthetic Turf Systems use improved technology, including denser face construction, a thatch zone for durability and infill containment, premium backing, and decreased infill for more realistic play. While they are slightly more expensive than infill-based systems initially, their longer lifespans and lower maintenance costs make them less expensive than infill-based systems long term.

For both types of synthetic turf systems, a full gravel base build with drainage is assumed in the construction costs. Simple turf replacement will be less expensive by about 50%.

ForeverLawn offers both infill-based and product-based systems.

	Natural	Infill-Based Synthetic	Product-Based Synthetic
Construction	\$400,000–\$900,000	\$700,000–\$1,000,000	\$740,000–\$1,075,000
Maintenance Equipment	\$50,000–\$100,000	\$15,000–\$20,000	\$15,000–\$20,000
Total Up Front Cost	\$450,000–\$1,000,000	\$715,000–\$1,020,000	\$755,000–\$1,095,000
Labor (annual)	\$5,000–\$10,000	\$3,000–\$6,000	\$1,500–\$3,000
Watering (annual)	\$2,000–\$4,000	\$0	\$0
Fertilizing (annual)	\$3,000–\$8,000	\$0	\$0
Field Painting (annual)	\$2,000–\$3,000	\$0	\$0
Infill Topdressing	\$0	\$8,000–\$10,000	\$0
Annual Maintenance	\$12,000–\$25,000	\$11,000–\$16,000	\$1,500–\$3,000
Lifespan	8 years	8 years	10 years
Total Cost	\$546,000–\$1,200,000	\$803,000–\$1,148,000	\$770,000–\$1,125,000
Cost Per Year	\$71,250–\$156,250	\$100,375–\$143,500	\$77,000–\$112,500
Use Hours Per Year	800	3,000	3,000
Total Use Hours	6,400	24,000	30,000
Cost Per Hour	\$85.31–\$187.50	\$33.45–\$47.83	\$25.67–\$37.50