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The Foundation for Safer Athletic Fields

Natural Grass Athletic Fields

It has become apparent that natural grass fields are being replaced with synthetic surfaces due to the belief that synthetic surfaces are less expensive and easier to maintain than natural surfaces. A properly maintained synthetic is not necessarily an effective replacement if lower maintenance costs are the goal. The primary reason natural grass fields are being replaced by synthetic is usually due to the lack of initial maintenance dollars. Proper construction and maintenance of a natural grass field will provide a safe playable surface that is natural and pleasing to players, parents, and coaches. Additionally, natural grass fields are often replaced by synthetic for aesthetic reasons, perhaps because the natural grass has a great deal of wear in the highly trafficked areas by the end of the season. However, one should not confuse aesthetics with playability because a worn field often still plays very well, plus, the natural grass can be restored if the right maintenance or strategies are employed. The following technical resource provides a detailed look into the benefits and cost effectiveness of maintaining natural grass fields.

Natural Grass Benefits

Environmental Benefits of Natural Grass Surfaces

I. Water Conservation

A major point of discussion with natural turfgrass systems is the amount of water required to irrigate. Quite simply, most sports field systems equipped with supplemental irrigation are overirrigated. Most water overuse is due to human error or miscalculation. Understanding and following proper irrigation practices will lead to water conservation. Water conservation can also be achieved by:

1. Using drought resistant turfgrass species and cultivars within species. Visit the Turfgrass Water Conservation Alliance website for species and varieties that are recommended for drought resistance in your area.
2. Allowing turfgrass to grow a little taller for deeper root development based on season and turfgrass species.
3. Allowing turfgrass to enter dormancy in drought situations.
4. Encouraging deeper rooting of turfgrass cultivars by watering deeply and infrequently. Apply only what your soil can infiltrate in one hour. Avoid puddles and runoff.
5. Using recycled water sources for irrigation.
6. Install rain sensors to shut down irrigation during a rain shower.
7. Installation of devices such as soil moisture probes or evapotranspiration pans will improve irrigation efficiency.

II. Groundwater preservation and recharge

1. Dense aboveground turfgrass biomass traps and holds water which reduces excess runoff and allows more water to infiltrate into the soil. Ten-thousand square feet can absorb up to 6000 gallons of water.
   a. A research study in Maryland compared surface water runoff losses between turfgrass and cultivated tobacco grown at the same site. During the tobacco-growing season (May-September), surface water runoff losses for the tobacco were 11 times greater than runoff losses from perennial turfgrass.
2. Extensive, fibrous turfgrass root system filters water percolating through the soil to enhance groundwater recharge.
3. Application of fertilizer has negligible potential for nutrient elements to pass through the rootzone into groundwater or be transported by runoff into surface water. Turfgrass roots are highly efficient at uptake of applied nutrients.
   a. A research study in Maryland followed total losses for nitrogen and phosphorus between turfgrass and cultivated tobacco grown at the same site. Runoff from the tobacco plantings had 195 times more N and 240 times more P than runoff from the turf.
4. Proper fertilizer and pesticide applications keep water safe. Product selection and characteristics, timing, and equipment used in the application can all greatly improve both the product performance and non-target effects on the environment. Turfgrass managers typically avoid applying these materials just before heavy rain, on to frozen soil, or on dormant turfgrasses because these situations can increase the potential for surface and groundwater contamination. Avoid getting fertilizer prills on any hardscape where runoff from rain or irrigation can carry fertilizer into drainage systems.
5. Current trends with turfgrass fertilization are toward low nutrient application rates on a more frequent basis (i.e. 'spoon feeding', with product often delivered through a spray system) and an expanded use of slow release nitrogen carriers. Both of these practices are environmentally friendly.
6. Properly managed turfgrass ecosystems support abundant earthworm populations, which contribute to increased macropore space in the soil, resulting in higher soil water infiltration rates, higher water-holding capacity, and improved soil structure.

III. Enhanced entrapment and biodegradation of synthetic organic compounds

1. Turfgrass systems catch and filter polluted runoff water.
2. Decaying turfgrass leaves, crowns, stems, roots, and thatch support large populations of microscopic decomposers that reside in the soil. Soil microbes also decompose pesticides, potentially noxious organic chemicals, and various bacteria producing bodily fluids such as blood, vomit, spit, and phlegm.

IV. Soil erosion control and dust stabilization

1. Turfgrass root systems and aboveground canopy are one of the most cost efficient ways to control water and wind erosion of soil and increase water infiltration into the soil.
2. Turfgrass functions as a vegetative filter that reduces the quantity of sediment entering surface streams and rivers.
3. High shoot density and root mass of turfgrass contributes to soil surface stabilization to reduce erosion. A high biomass matrix provides resistance to lateral surface water flow.
4. Turfgrasses act as a trap for dust and other particulate matter, improving air quality.

V. Improved atmospheric conditions

1. Turfgrass contributes to reductions in noise levels by absorbing, deflecting, reflecting, and refracting the various sounds. There are also reductions in discomforting glare and light reflection.

2. Turfgrass reduces atmospheric carbon dioxide and releases oxygen. Grass plants produce their own food through the process of photosynthesis. The plants take in carbon dioxide and convert it into simple sugars. As a result of photosynthesis and taking up of carbon dioxide, oxygen is released into the atmosphere.
   a. During an active growing season, 25 square feet of healthy turf will provide enough oxygen for one adult person for one day.

VI. Accelerated soil restoration

1. Improve soils through the addition of organic matter. As plant tissue dies, it is incorporated into the rootzone as organic matter.
2. Soil restoration of environmentally damaged areas (i.e. construction sites with topsoil stripped, burned-over land, garbage dumps, eroded rural landscapes, mining operations, and steep timber harvest areas) is accelerated when turfgrass is planted.

VII. Substantial heat dissipation-temperature moderation

1. Turfgrass dissipates high levels of radiant heat through the cooling process of transpiration.

Synthetic Surface Temperature Case Study

In spring 2002, Brigham Young University's athletic department installed a synthetic surface on half of its football practice field. The other half is sand-based natural turf. Complaints about the heat of the synthetic surface prompted researchers to take temperature measurements and compare them with natural turf, bare soil, asphalt and concrete. They recorded temperatures at the surface and 2 inches below the surface.

Temperatures of surfaces at BYU practice fields in June 2002. Average air temperature = 81.42°F

	Average surface temperature between 7:00 am and 7:00 pm		Average soil temperature between 7:00 am and 7:00 PM (two inch depth)		Average temperature between 9:00 am and 2:00 PM in the shade	
	Average	High	Average	High	Average	High
Soccer (synthetic)	117.38°F	157°F	95.33°F	116°F		
Football (synthetic)	117.04°F	156°F	96.48°F	116.75°F	75.89°F	99°F
Natural Turf	78.19°F	88.5°F	80.42°F	90.75°F	66.35°F	75°F
Concrete	94.08°F					
Asphalt	109.62°F					
Bare Soil	98.23°F		90.08°F			

Source: "Synthetic Surface Heath Studies," C. Frank Williams and Gilbert E. Pulley, Sports Turf Managers Association Annual Conference, January 2004.

The surface of the synthetic field averaged 117 degrees Fahrenheit while the natural grass surface averaged 78 degrees Fahrenheit and asphalt averaged 109 degrees Fahrenheit. Two inches below the synthetic turf surface, it was still 28 degrees hotter than the natural turf surface. Irrigation is installed on synthetic fields to help control surface temperatures. Researchers at Penn State University have found that temperature reductions last about 20 minutes. Researchers at BYU have found that irrigation cooled the synthetic surface from 174 degrees Fahrenheit to 85 degrees Fahrenheit, but during the summer in Utah, the surface could be back to 120 degrees Fahrenheit in five minutes.

These high temperatures make it dangerous for athletes as it increases the incidence of heat stroke, muscle cramping and overall fatigue.

Work conducted at the University of Missouri Turfgrass Research Center in 2010 regularly showed synthetic surface temperature increases of 50 to 70 degrees Fahrenheit over natural grass. Factors such as light, cloud cover, and breezes of 3 to 5 mph, reduced synthetic surface temperatures by 30 degrees. However, on clear, blue-sky days in mid-summer where air temperatures were at 98 degrees Fahrenheit with calm winds, temperatures would exceed 160 degrees Fahrenheit on synthetic surfaces. Natural grass under these conditions would range between 99 and 102 degrees.

VIII. Overall increase in human health

1. Closely mown areas of turfgrass reduce the number of nuisance pests that reside in taller grasses, such as ticks, which can carry Lyme disease and Rocky Mountain Spotted Fever.
2. Well maintained turfgrass areas are less likely to have weeds that are responsible for allergy-related pollens.
3. Fields with good quality turfgrass cover have higher traction, cushioning, and resiliency, and lower surface hardness, reducing the probability of injury in contact sports.
   a. Ball roll and bounce are influenced by the grass cover and its management, as are player movements, such as running, stopping, pivoting, dodging, jumping, landing, and walking.
4. Turfgrasses can offer a low cost, safe playing surface for athletes.
   a. Surface hardness is important when considering head injuries. Surface hardness is measured by dropping a weight (referred to as a missile) from a fixed height onto the playing surface. The missile contains an accelerometer that measures how fast the missile stops once it hits the surface. A numerical value, referred to as Gmax, is then generated. A high Gmax value means the missile stopped quickly and there is less absorption of force by the athletic surface and more absorption of force by the athlete, which indicates the surface is hard.

      Fields can be tested using a Clegg Impact Tester or F355 device. Gmax values taken from each of these devices are not interchangeable because the missiles are different weights and are not dropped from the same height. In other words, 100 Gmax measured with the Clegg is not the same as 100 Gmax measured with the F355.

      The NFL field testing program requires playing surface hardness of both natural and synthetic turf fields to be measured with the Clegg Impact Tester. Fields must be tested in multiple locations prior to every game and must be below 100 Gmax at all locations. If hardness levels begin to approach 100, steps must be taken to lower the Gmax value.

      The American Society for Testing and Materials (ASTM) standard (F1936) uses the F355 device to test surface hardness on natural and synthetic fields and sets an upper limit of 200 Gmax. According to ASTM Standards, a value greater than 200 Gmax qualifies for the expectation that life threatening head injuries may occur. At this point the surface should be repaired or replaced. The Synthetic Turf Council (STC) recommends Gmax does not exceed 164 when using the F355 device.

      Most synthetic fields upon completion measure Gmax in a range of 45 to 60 until the infill material settles in. In time, with use, relocation of crumb rubber, and separation of infill materials (those with sand and crumb rubber), increased Gmax readings can elevate to greater than 100 (using the Clegg Impact Tester). Gmax readings on synthetic fields are related to the thickness of the infill and proper grooming recommendations. Natural grass fields have several options to manage field hardness – increase soil moisture, mow taller, maintain good density, and add amendments. In a Penn State trial (2004), Gmax readings (using a Clegg Impact Tester) on a silt loam soil covered in Kentucky bluegrass ranged between 50 and 84 where traffic was applied and between 50 and 70 Gmax without traffic. Soil moisture ranged between 30 and 35 percent.

5. Aesthetics and recreational opportunities enhance physical and mental health of participants, relieve stress and contribute to enjoyment of life.
   a. Studies have been done to test the health benefits of nearby green spaces by testing blood pressure and heart rate of participants. Results show that views of open green spaces promote quicker recovery in hospital patients. Participants in another study had quicker and more complete recovery from induced stress when exposed to turfgrass and other landscape settings compared to those who were not.
6. Native soil fields hold less potential for injury.
   a. The most frequent injuries sustained on sports fields are those to the ankles and knees from rotating and changing directions on the field surface. A recent study at Michigan State University (Villwock et al., 2008) measured the effects that size and structure of infill materials would have on the rotational resistance of cleated shoes. Sixteen different surfaces were tested, including native soil and sand based fields, using testing methods conforming to the ASTM standard method for traction characteristics of an athletic shoe-surface interface. Cleated football shoes were mounted on a rigid foot-form and used on the surfaces. Results found that torque was significantly affected by field surface. Native soil fields reported the lowest torque overall.
7. Natural fields are the preferred playing surface among athletes. In 2010, a survey was conducted to evaluate what kind of playing surface NFL players preferred. 1619 players from all 32 teams participated in this survey.
   - 69% of the players preferred to play on natural grass fields
   - 14% preferred artificial infill
   - 9% had no preference

Players were also asked how they thought synthetic and natural grass surfaces affected their physical health:

	Artificial Infill Surface	Natural Grass Surface
Surface more likely to contribute to injury	82%	16%
Surface more likely to cause soreness and fatigue	89%	9%
Surface more likely to shorten career	89%	7%
Surface more likely to negatively affect quality of life after football	64%	4%

Natural Grass Limitations

I. Overuse

The overuse of many community sports facilities can push the limits of turfgrass to recover. Excessive traffic leads to compaction and bare areas, which can cause a surface to be unsafe and unplayable. Scheduling more events than a field can handle results in overuse.

To help prolong the life of natural fields:

- Rotate activities between fields.
- Limit use of fields to only necessary events, especially during rainy weather patterns.
- Change daily location of practices on the field.
- Shift fields of play to shift areas of concentrated wear.
- Buy portable goals and move them around the field for drills and practice, thus limiting wear in the area of the mounted goal posts.
- Have players do individual warm-ups off of the field.

- Execute team drills outside of painted numbers.
- Spread seed of climate and sport-appropriate, fast germinating grass species in wear areas before games and practices.
- Regularly educate field users regarding the importance of rotating traffic/use patterns around fields in order to maintain safety and optimum playability.

II. Standing Water

Inclement weather can lead to standing water and muddy conditions if the drainage system is not effective. This causes surfaces to be unsafe and unplayable.

To solve standing water problems, make sure there is a sufficient crown (i.e. slope) to move water off the field effectively. Regularly check to see that any installed collection basins and/or sub-surface drainage systems are operating effectively. If rain tarps are available, they can help keep water off of properly crowned fields and greatly improve field playability. Field managers should have the option to cancel events when inclement weather accelerates damage to the field.

Construction of Natural Grass Fields

The demise of many natural grass fields is in the initial construction or renovation work being done. Short-cuts due to budget constraints are temporary and will cost more in the long run. Well-constructed sports fields with proper maintenance will provide the type of playing surface so many parents, coaches and players desire.

Construction and renovation should begin with the selection of a knowledgeable contractor - someone with experience in sports field design and construction who carries a good portfolio with references and may be a certified field builder (CFB).

A good first step for field construction and renovation is ensuring the field has the correct crown and slope. This is where dollars should be spent in any project because if surface drainage is lacking, all else is lost. Crowns and slopes are equally important whether your field is constructed with native soils or modified soils or will have a sand-cap or sand-base. Drainage (surface and internal) is critical to a successful natural grass field.

Selection of the best growing medium for the turfgrass rootzone is also crucial for field health. The soil can be made up of native soil (modified or not) or a sand-based rootzone. The soil texture determines the degree of drainage (surface and internal), water holding capacity, and nutrient holding capacity.

Irrigation may or may not be a luxury and should be strongly considered for the durability and safety of natural grass fields. There are many different types of irrigation to consider, some being more efficient than others. Irrigation types and design should be based on the water source and pressure, number of fields or area, region of the country and type of turfgrass being grown. Regardless of the irrigation type, conduct regular irrigation audits to ensure distribution uniformity and be efficient with water usage. Mismanagement of irrigation will lead to other issues such as hot spots or diseases.

Turfgrass species selection is also an important component when constructing or renovating natural grass fields. Consider turfgrass varieties that offer good disease resistance and wear tolerance. The National Turfgrass Evaluation Program provides performance information on various turfgrass species and cultivars. If irrigation is not an option, select drought tolerant species of turfgrasses. The Turfgrass Water Conservation Alliance tests turfgrass species for drought tolerance and posts individual varieties that pass the test. Consideration of turfgrass species and varieties should always be made for good water conservation practices.

When constructing or renovating natural grass sports fields, it is important to follow the guidelines for field design and build. The end result will be a sports field that will perform as expected with proper maintenance. Parents, players and coaches can enjoy a playing surface that is natural and safe. Additional information on the

construction and renovation of sports fields can be found in Sports Fields: A Manual for Design, Construction and Maintenance by Jim Pulhalla, Jeff Krans, and Mike Goatley or through your local sports field contractor or state extension office.

Construction Costs for Various Types of Sports Field Surfaces

For a more complete understanding of what is involved with construction cost of a natural or synthetic field, please view the STMA Guide to Synthetic and Natural Turfgrass for Sports Fields.

- **Natural with On-site Native Soil (no added top soil or sod) - $0.60-$0.90 per sq. ft.**
- **Natural Turfgrass with Native Soils - $1.25-$2.50 per sq. ft.**
- **Natural with Sand Cap - $2.60-$3.85 per sq. ft.**
- **Natural with Sand and Drainage - $4.25-$5.00 per sq. ft.**
- **Synthetic Infill Systems (carpet, infill, and base) - $4.50-$10.25 per sq. ft.**

Maintenance Requirements for Natural Grass Fields

Maintenance of natural grass fields is critical to their success. Maintenance is often lacking due to budget constraints. However, when individuals feel that natural grass fields have failed, the money is always there for a conversion to a synthetic surface. Instead of giving up on a natural grass surface, raise the funds to provide good maintenance practices for a safe natural grass surface. Annual inputs of $20,000 to $30,000 per field can go a long way in the maintenance and performance of a natural grass field.

STMA provides many resources and opportunities to assist in the maintenance of natural grass fields. Educational bulletins, webinars, and educational conferences provide the support and tools necessary to address natural grass maintenance practices.

Maintenance Comparison Case Studies between Natural Grass Fields at North Scott Community School District and a Synthetic Field at Michigan State University

Disclaimer: Material and labor costs are highly variable depending on region of the country and type of facility. The following costs are based off of North Scott Community School District and Michigan State University, and are meant to provide a realistic representation for costs involved with building and maintaining athletic fields.

Natural – North Scott Community School District

North Scott Community School District is located in Eldridge, Iowa. School grounds and sports turf requiring maintenance totals 115 acres. The District maintains a native soil baseball field, softball field, and 214,000 square feet of native soil practice fields. The school also has a football stadium field with a 4 inch sand cap and a new, sand based soccer field built to USGA specifications. All of the grounds maintenance is done in house by three full time and three summer seasonal staff members. John Netwal, CGCS, is the Director of Operations for North Scott Community School District and has provided the following information.

Natural Turf Maintenance Equipment*

Tractor-mount sprayer	$700
Utility tractor	$15,000
Front end loader attachment for utility tractor	$4,000
Broadcast spreader	$400-$1,200
Rotary-motion aerator attachment for tractor	$6,300
Drag mat	$300
Topdresser	$7,000
Field painting equipment	$8,400
Work Cart	$4,500
Reel Mower	$3,500-$22,000
Rotary Mower	$22,000-$35,000
Trimmers	$250-$600
Seeder	$250
Total	**$72,600-$105,250**

* With new tier 4 compliance regulations, equipment prices will likely increase 10-15% going into 2016-2017.

Native Soil Practice Area Field Maintenance Cost Estimates

Total Area: 214,000 square feet

Description of Activity	Man Hours	Man Hour Cost	Product	Product Cost	Total Activity Cost
33 Mowings / Season	97	1,912.84			1,912.84
Aeration, 5 times per year	45	887.40			887.40
Fertilizer @ 4.9 #s N / year	14	276.08	Fertilizer	2,295.00	2,571.08
Soil Amendments	3	59.16	Gypsum	551.04	610.20

Herbicide Applications	3	59.16	Herbicide	45.32	104.48
Pre-emergent					
Spot Spray Round-Up, 1 Time / Month			Round-Up		
10 Game Field Prep's, Soccer	15	295.80	Paint	1,060.50	1,356.30
16 Practice Field Prep's, Football	45	887.40	Paint	610.10	1,497.50
Overseeding	8	157.76	Seed	1,710.00	1,867.76
Growth Regulator, Apr, May, Jun, Jul, Aug	16	315.52	Primo	2,324.10	2,639.62
Pre-emergent Applications					
Insecticide Applications			Dylox		
Water, 1 Acre Inch Per Week	10	197.20	Water	9,213.00	9,410.20
Miscellaneous $25 / Month	10	197.20	Supplies	200.00	397.20
Totals		**$5,245.52**		**$18,009.06**	**$23,254.58**

Labor Cost: $16.44 x 20% benefits = $19.72 per hour

Bottom Line: North Scott Community School District's native soil practice fields (214,000 square feet) cost $23,254.58 per year to maintain. One native soil football practice field (57,600 square feet) costs $6,045 per year to maintain.

Football Stadium Field Maintenance Cost Estimates

Football field has 4 inch sand cap

Total Area: 70,000 square feet

Description of Activity	Man Hours	Man Hour Cost	Product	Product Cost	Total Activity Cost
33 Mowings / Season	50	986.00			$986.00
Aeration, 3 Times Per Year	15	295.80	Verti-Drain		$295.80
Sod Replacement Sidelines	12	720.00	Sod	1,000.00	$1,720.00
Fertilizer @ 4.9 #s M / year	8	157.76	Fertilizer	810.00	$967.76
Soil Amendments	1	19.72	Gypsum	183.68	$203.40
Herbicide Applications	1	19.72	Herbicide	14.28	$34.00
Pre-emergent Applications					
Growth Regulator (Apr, May, Jun, Jul, Aug)	5	98.60	Primo	762.60	$861.20
Game Field Prep's	60	1,183.20	Paint	378.75	$1,561.95
Over-Seeding	15	295.80	Seed	570.00	$865.80
Insecticide Applications			Dylox		
Water, 1 Acre Inch Per Week	10	197.20	Water	4,784.34	$4,981.54
Miscellaneous, $25.00 / Month	30	591.60	Supplies	200.00	$791.60
Stadium Preps	18	354.96			$354.96

Sports Lighting, 15 events @ 4 hours in length / season			Electricity	373.76	$373.76
Totals		**$4,920.36**		**$9,077.41**	**$13,997.77**

Labor Cost: $16.44 x 20% benefits = $19.72 per hour

Bottom Line: North Scott Community School District's sand capped football stadium field costs $13,997.77 per year to maintain.

Sand Based Soccer Field Maintenance Cost Estimates

Total Area: 114,000 square feet

Description of Activity	Man Hours	Man Hour Cost	Product	Product Cost	Total Activity Cost
50 Mowings / Season	113	2,228.36			$2,228.36
Growth Regulator, Once Per Month	12	236.64	Primo	1,227.60	$1,464.24
Topdressing, 5 Applications Per Year	31.5	621.18	Sand	1,987.50	$2,608.68
Water, 1 Acre Inch Per Week / 26 Weeks	6	118.32	City Water	5,440.50	$5,558.82
Fertilizer @ 6.1 #s N / Year	12	236.64	Fertilizers	1,548.00	$1,784.64
Paint, 6 Applications Per Season / 20-5 Gallon Pails	45	887.40	Paint	378.75	$1,266.15
Aeration, 3 Times Per Year	13.5	266.22	Verti-Drain		$266.22
Fungicide, Four Applications / Season	8	157.76	Disarm 480 SC	1,575.00	$1,732.76
Over-Seeding, Once Per Season	5	98.60	Seed	997.50	$1,096.10
Herbicide, One Application Per Season	2	39.44	Herbicide	22.66	$62.10
Fence-line Maintenance, 2 Apps. Per Year	8	157.76	Control Products	125.00	$282.76
Miscellaneous	50	986.00	Misc. Products	200.00	$1,186.00
Pre-emergent Applications	4	78.88	Drive 75 DF	360.18	$439.06
Insecticide Applications			Dylox		
Sports Lighting, 10 events @ 3 hrs in length per season			Electricity	402.60	$402.60
Totals		**$6,113.20**		**$14,265.29**	**$20,378.49**

Labor Cost: $16.44 x 20% benefits = $19.72 per hour

Bottom Line: North Scott Community School District's sand based soccer field costs $20,378.49 per year to maintain.

Synthetic – Michigan State University

Outside Contractor Maintenance Charges

Consultation and/or training	$1,200-$3,000 per day plus expenses
Repairs	$30-$70 per linear foot
Crumb Rubber	$.50-$1.00 per pound applied

Synthetic Turf Maintenance Equipment*

Boom Sprayer	$1,000-$35,000
Sweeper	$1,500-$20,000
Broom	$500-$3,000
Painter	$500-$3,000
Groomer	$1,500-$2,000
Cart (to tow equipment)	$2,500-$16,000
Field Magnet	$500-$1,000
Rollers	$250-$2,000
Total	**$8,250-82,000**

* With new tier 4 compliance regulations, equipment prices will likely increase 10-15% going into 2016-2017.

Maintenance Budget for Synthetic Infill Field with a three year old surface

Seam Repairs (outside contractor; $30 per linear foot)	$8,000
Apply Crumb Rubber (1 time per year; 20 hours per application; 10 tons of topdressing at $500 per ton)	$5,000
Spray Field (4 times per year; 3.5 oz rate per 1000 square feet; 3 hours each; 12 hours per year)	$216
Fabric softener at $7 per 64 oz container	$120
Disinfectant at $5 per gallon	$100
Sweep Field (Parker Sweeper; 4 times per year; 8 hours each; 32 hours per year)	$1,500
Broom	$500
Groomer	$2,800
Hand Pick (3 times per week; 1 hour each; 156 hours per year at $18 per hour)	$2,800
Paint Field (2 times per year; 30 hours each; 60 hours per year; 30-40 gallons per year at $25 per gallon)	$1,000

Total Straight Hourly Cost (Field only; 280 hours at $18 per hour; benefits not included)	$5,040
Total Supply Cost	$6,220
Total Equipment Cost	$3,500
Total Outside Contractor Repairs	$8,000
Total Maintenance Cost	**$22,760**

Bottom Line: Michigan State University synthetic field costs $22,760 per year to maintain.

Maintenance Comparison between a Professional Level Natural Grass Field and Synthetic Field at Paul Brown Stadium, Cincinnati, Ohio

Disclaimer: Material and labor costs are highly variable depending on region of the country and type of facility.

Paul Brown Stadium is located in Cincinnati, Ohio and is home to the Cincinnati Bengals Football Club. Darian Daily is the Sports Field Manager at Paul Brown Stadium and is responsible for managing both natural and synthetic fields for the team. The practice facility is natural grass with a sand-based rootzone and totals 100,000 square feet. The game field is synthetic turf with crumb rubber infill and totals 102,000 square feet. All of the grounds maintenance is done in house by three full time and four seasonal staff members. Daily has provided a realistic comparison of maintenance costs between the natural grass and synthetic fields he manages.

Natural Grass Field – Practice Facility

Natural Grass Field Maintenance Estimates

Product	Cost
Fertilizer	$6,000
Fungicides	$1,500
Herbicides	$2,000
Topdressing	$3,500
Paint	$4,000
Total Product Cost	**$17,000**

Labor	Man Hours
Mowing	600
Cultural Practices	70
Painting	200
Total Man Hours	**870**

Synthetic Field – Paul Brown Stadium Game Field

Synthetic Field Maintenance Estimates

Product	Cost
Crumb Rubber	$3,000 ($750 per ton)
Cleaning Products	$1,000
Deep Cleaning	$6,500
Paint/Paint Remover	$5,000
Total Product Cost	**$15,500**

Labor	Man Hours
Cleaning	180
Grooming	135
Repairs	40
Total Man Hours	**355**

The natural grass field used in the comparison was not overseeded or sprigged. However, sprigging of a different field cost $21,000.

Involving your STMA Sports Turf Manager

It is important to have a qualified professional to help with decision making and the gathering of information and costs. Hiring or involving a sports turf manager who can oversee construction and/or daily maintenance of a natural grass field is important for its success. If constructing a field, the sports turf manager can serve as a grow-in consultant to work with the architect and contractors (hiring a Certified Field Builder can assure quality construction and renovations when needed) to supervise the entire construction process. Mistakes during the construction phase often result in problems that sometimes can never be corrected or that will take years of management to overcome. A trained sports turf manager on staff will ensure that specifications are adhered to during construction. On a daily basis, your sports turf manager can oversee the care of the athletic fields, maintain the budget, manage staff, and communicate with users.

It is also important to invest in the continuing education of your sports turf manager to keep them current on industry trends and research. Make sure your sports field manager is involved with STMA for networking and continuing education opportunities. STMA also provides the opportunity to become certified through a rigorous training and testing program. Certified Sports Field Managers (CSFMs) are recognized in the industry for their professional development and knowledge of sport field construction and renovation.

Natural Grass Fields

The environmental and human health benefits alone make natural grass fields a desirable option when considering keeping or building an athletic field. The cost effectiveness of construction and annual maintenance only add to their appeal. It is important to have a complete understanding of the costs and benefits associated with both natural and synthetic surfaces when considering conversion from natural grass to a synthetic surface. Often times many of the benefits of natural grass systems are overlooked because of strong arguments and marketing efforts of synthetic turf companies.

Next Steps

To advocate the construction of a natural turfgrass surface or improve the quality of the current natural grass field:

- Involve your STMA Sports Turf Manager in decisions and gathering of information and costs.
- Organize a meeting to educate community, coaches, administration, athletes, and parents about the benefits of a natural turfgrass athletic field.
- Define resources needed to maintain a quality surface for your facility.
- Develop a budget.
- If constructing a field, meet with architects and contractors to find the best option for your situation.
- Schedule meetings to keep those involved updated on progress.
- Form committees to assist in logistics and fundraising.

References:

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