Synthetic and Natural Turf Sports Fields for Municipalities
11th Annual Public Works Continuing Education Conference

Brad Park, Rutgers University
March 2015
Benefits of turf

Uniform stands of cool-season perennial turf cover prevents soil erosion ... even during winter

Sports fields are not lawns!
Public sports fields & grounds
- Intense use (need for greater management)
- Acreage (Often overlooked – unless you’re the one managing!)
- Managing contracted services
Professional-Level Sports Turf Conditions:
Are these conditions attainable at the Municipal or School level?

Better quality Municipal and School fields are possible.
Natural turf success stories

Philly.com sports blog:
The best field in South Jersey
October 2009
Varsity Football Field
Overbrook HS, Pine Hill, NJ

June 2009
Salem HS, Salem, NJ

December 2007
Salem HS, Salem, NJ

Fred Kendall

June 2009
Salem HS, Salem, NJ
Improved turf cover/playing surface – June 2013
Timely weed control with appropriate active ingredient
Seeding
Fertilization

South Jersey Municipality
August 2012

Improved turf cover/playing surface – June 2013
Timely weed control with appropriate active ingredient
Seeding
Fertilization

Observations of successful facilities …

Traffic management plan
Municipality with a sports field/grounds staff whose primary responsibility is maintenance of sports fields and grounds

- Focus on the basics: Mowing, Irrigation, Fertilization, Seeding, Cultivation
- Continuing education - One or more staff has acquired a pesticide license and fertilizer certification
  - Rutgers-NJAES OCPE courses
  - Sports Field Managers Association of New Jersey Field Days
  - New Jersey Green Expo
Turfgrass cultural practices

Primary
- Mowing
- Irrigation
- Fertilization

Supplementary
- Cultivation
- Topdressing
- Matting (core incorporation)
- Rolling
- Plant growth regulation

High Traffic Sports Fields
- Mowing
- Irrigation
- Fertilization
- Cultivation
- Seeding

Invest in mowing

Industry Q&A: Sports Field Management Magazine
February 27, 2015

What field care product/piece of equipment could you not live without? [Multi-deck rotary] mower. We have a large fleet of vehicles/ equipment that are vital to our operation. We swap/share equipment with our golf course frequently. However, the [mower] is the only unit that is exclusive to this site and we have no backup. The [mower] is responsible for mowing the 13 soccer fields three-plus times per week. – Noel Brusius, Waukegan SportsPark Waukegan (Illinois) Park District
Invest in sharp mower blades

**Mowing frequency**

Rule-of-thumb: Mow frequently enough so that no more than \( \frac{1}{3} \) of the leaf tissue is removed during a single mowing.
**Mowing Frequency**

Number of days between mowings varies according to function, desired turf qualities, and growth rate.

Mow more frequently when turf is actively growing to maintain desirable height of cut and avoid scalping.

Greater mowing frequency required during spring months when turf is growing quickly.
No need to mow non-irrigated turf that is not rapidly growing.

Seeding strategies for high traffic fields

Repetitive overseeding during sports season. Allow athletes to cleat-in

GOAL: Maximize turf cover going into winter

'Field within the field'
Seed now!

14 September 2010: 6 days after seeding

**Perennial Ryegrass**

- Germination will occur in 3-5 days after seeding (warm moist soil)
- Best traffic tolerance as seedling turfgrass
- Overseeding tool for heavily trafficked sports fields

Seeded 8 September 2010
14 September 2010: 6 days after seeding
Perennial Ryegrass Selection – Gray Leaf Spot

Grand Prix Perennial Ryegrass (Revenge GLX, Paragon GLR, Palmer V GLR)
New Jersey Distributor: Jersey Seed, New Brunswick, NJ; 732.247.3100

New Jersey distributor: Grass Roots, Randolph, NJ; 973.252.5455

Professional Select Ryegrass Blend (Applaud II, Soprano, 1G Squared)
See: http://www.penningtonseed.com/psc-_97-pd-_208
New Jersey distributor: Pennington Seed, Laurel, MD 800.732.3332

Perennial Ryegrass Blend GLSR (Overdrive, Buena Vista, Fusion)
See: http://www.burlinghamseeds.com/userfiles/products/docs/Par-5-flyer.pdf
New Jersey distributor: The Turf Trade, Mullica Hill, NJ; 856.478.6704

Diamond Quality Tri-Rye Blend (Grand Slam 2, Stellar GL, Apple GL)
See: http://www.reedandperrine.com/grassseed.html
New Jersey distributor: Reed and Perrine, Tennent, NJ; 732.446.6363

List compiled by Brad Park, NJAES

Traffic management
### Table 1. Sample Field Rotation Program

<table>
<thead>
<tr>
<th>Sports Field</th>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field 1</td>
<td></td>
<td>Game</td>
<td>Practice</td>
<td>Renovate/Rest</td>
</tr>
<tr>
<td>Field 2</td>
<td>Renovate/Rest</td>
<td>Game</td>
<td>Practice</td>
<td></td>
</tr>
<tr>
<td>Field 3</td>
<td>Practice</td>
<td>Renovate/Rest</td>
<td>Game</td>
<td></td>
</tr>
</tbody>
</table>

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Fencing with a ‘softer’ appearance

**Great Lawn, Central Park**

*Courtesy Central Park Conservancy*
**Field permitting**

High profile fields, game fields

Permitted

Lower profile fields, practice fields

Non-permitted

*Having one or more non-permitted fields will allow accessibility*

*Photos courtesy of Central Park Conservancy*

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**Use positive results to gain user groups’ confidence in traffic management**

Great Lawn

1975

2013

Sheep Meadow

1975

2013

*Photos courtesy of Central Park Conservancy*
Middlesex County Parks, Middlesex County, NJ

Effective field permitting plan

Middlesex County Parks – 2013 Field of the Year Winner
Sports Field Managers Association of NJ

Traffic management - Synthetics
Natural turf fields: Multiple sports and field use

Synthetic turf: Multiple sports
Synthetic turf considerations

Observations have been made that overall conditions of natural turf fields improve with on-site synthetic installation

- Scheduling flexibility
- Intense traffic can be designated to one field
- Lights (Early spring late fall field use)
- Not bare soil/mud
Synthetic infill fields

Seams and line markings

Permanent inlaid lines
Seam repair?

From A-Turf warranty:

“Further, this Warranty is void and of no effect if the Owner has repaired or altered the surface without A-Turf, Inc.’s prior written consent. In no event will A-Turf, Inc. be liable to the Owner for any alleged repair or alteration to the Surface made by the Owner.”

Painting and paint removal
Painted field markings

- *Use APPROVED* paints
- *Use APPROVED* removal techniques (Abrasiveness)

![Easily Applied & Removed](image)

From A-Turf Warranty: “This warranty does apply to any defect, failure, damage, or excessive wear caused by ... (d) use of improper cleaning and maintenance methods; (e) owner negligence in failing to maintain the Surface in accordance with all appropriate documentation.”

- Grooming – Equipment & frequency
- Painting – Approved paints and removal techniques
- Static control – Approved materials
- Wetting agents – Hydrophobic crumb rubber: stops draining
- Debris removal – Equipment & frequency
- Snow removal – Equipment / techniques
- Irrigation?
- Sanitize?

**KEEP DETAILED RECORDS**
Debris removal: Does your warranty allow the use of this equipment?

Debris removal
Infill system maintenance

GroomAll – Sports Field Specialties, Inc.

From December 2007 Sportsturf magazine:

“FieldTurf recommends the GroomAll for all maintenance needs. The GroomAll is equipped with a sweeper component, grooming component, and brush component.”

Debris removal

Invest in a tow-behind magnet

Photo: Shawn Mahonski, Townson University
Testing synthetic surfaces

ASTM Standards related to synthetic surfaces


F1015: Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces


Assessing surface hardness

When a body is moving rapidly in one direction and suddenly hits the ground, the impact is absorbed...and if the field is too hard, it's absorbed largely by the body, including critical areas such as the head and neck.

Sportexe® (www.sportexe.com)
Assessing surface hardness

G-max testing

ASTM F355 – Shock absorbing properties of playing surface systems and materials

A weight is dropped onto the surface and the shock of impact is measured as negative acceleration

Units are gravities (G)

Gmax is the maximum deceleration – the higher the harder

Testing

Six points on a football field are tested
Surface hardness

How hard is too hard?

Per ASTM F1936 – If one or more points is in excess of 200, the surface of the field should be repaired or replaced.

U.S. Consumer Product Safety Commission has accepted the 200 value.

How often should fields be tested?

New installation: establish a baseline preferably within 30 days after install (Mancino et al., 2006).

Use the bid contract to demand that the surface company pay for independent Gmax testing yearly for the length of warranty (McNitt et al. 2007)

Irrigate to cool synthetic surfaces?

Heat

• Study from Williams and Pulley in June 2002:
  • Synthetic infill system: +86.5° F than turfgrass & +37° F than asphalt
  • Affect of irrigation: 174° to 85° F; 5 minutes later surface rebounded to 120° F
  • Hottest temp: 200° F surface temp with 98° F air temp
  • Temps greater than 125° F – Don’t play?
    – Powell and Andresen, 2004
Sanitization of synthetic infill fields

Penn State study findings:

- Laboratory techniques used to isolate staph including selective media, gram stain, or latex agglutination found no microbial colonies that tested positive for staph from any crumb rubber or fiber samples.
- The study did not differentiate between MRSA [a bacterial infection resistant to most antibiotics] and the nonresistant strain because "they are the same bacterium. It’s just that some of the bacteria have developed resistance to antibiotics. … We didn’t differentiate, as we didn’t find any staph — resistant or otherwise — in the synthetic turf.” †

† Athletic Turf News August 29, 2006
- Staph was not found on the natural turfgrass fields assessed.
- Areas testing positive for staph included:
  - Human hands and faces
  - Blocking pads
  - Weight equipment
  - Stretching table
  - Used towels

Authors’ conclusions:

- Surface temperatures of outdoor synthetic infill fields and low moisture content of indoor infill field do not provide hospitable environment for staph.

Synthetic turf in the news
NBC News story: How safe is the artificial turf your child plays on?
Amy Griffin, Associate Head Coach, Women’s Soccer Team, University of Washington
• Compiled a list of 38 American soccer players - 34 of them goalies - who have been diagnosed with cancer.
• “Goalkeepers’... bodies are in constant contact with the turf... In practices and games, they make hundreds of dives, and each plunge sends a black cloud of tire pellets [crumb rubber from recycled tires] into the air. The granules get into their cuts and scrapes, and into their mouths. Griffin wondered if those crumbs – which have been known to contain carcinogens and chemicals – were making players sick.”
• No research has linked cancer to artificial turf.

Spurred interest in alternative infill materials
• Crumb rubber from non-recycled tire sources
• Organic Infill consisting of granules of natural components mixed with plant fibers

Synthetic turf deterioration
Synthetic turf deterioration
Do not overlook future costs: Tear-out, disposal (recycle?), & surface replacement

Montgomery County, MD Public Schools

Draft For Public Comment  April 2011

20 Year Costs - Parks

<table>
<thead>
<tr>
<th></th>
<th>Artificial</th>
<th>Bermuda (seed base)</th>
<th>Kentucky BQ (seed base)</th>
<th>Bermuda (mother soil)</th>
<th>Cool Season (mother soil)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Capital Cost</strong></td>
<td>1,125,000</td>
<td>530,000</td>
<td>580,000</td>
<td>150,000</td>
<td>75,000</td>
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<tr>
<td><strong>20 Year Replacement/Rehab Cost</strong>*</td>
<td>1,130,000</td>
<td>150,000</td>
<td>175,000</td>
<td>100,000</td>
<td>60,000</td>
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<tr>
<td><strong>20 Year Maintenance/Other Costs</strong></td>
<td>206,000</td>
<td>1,000,000</td>
<td>1,000,000</td>
<td>900,000</td>
<td>506,000</td>
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<tr>
<td><strong>20 Year Total Costs</strong></td>
<td>2,461,000</td>
<td>1,680,000</td>
<td>1,755,000</td>
<td>1,150,000</td>
<td>636,000</td>
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<tr>
<td><strong>20 Year Revenue - Parks</strong></td>
<td>2,000,000</td>
<td>2,000,000</td>
<td>2,000,000</td>
<td>200,000</td>
<td>200,000</td>
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<tr>
<td><strong>20 Year Net Cost - Parks</strong></td>
<td>461,000</td>
<td>480,000</td>
<td>755,000</td>
<td>970,000</td>
<td>416,000</td>
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<tr>
<td><strong>20 Year Net Cost - Not Present Value</strong></td>
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<tr>
<td>3 Percent Discount Rate</td>
<td>532,711</td>
<td>488,109</td>
<td>688,848</td>
<td>676,971</td>
<td>323,183</td>
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<tr>
<td>5 Percent Discount Rate</td>
<td>564,483</td>
<td>475,547</td>
<td>649,828</td>
<td>584,860</td>
<td>279,310</td>
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<td>7 Percent Discount Rate</td>
<td>587,512</td>
<td>464,297</td>
<td>619,758</td>
<td>513,000</td>
<td>245,050</td>
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Cost Per Hour of Use

<table>
<thead>
<tr>
<th></th>
<th>1,000</th>
<th>500</th>
<th>500</th>
<th>500</th>
<th>500</th>
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<tbody>
<tr>
<td><strong>Annual Hours of Use</strong></td>
<td>23.65</td>
<td>40.00</td>
<td>75.50</td>
<td>67.00</td>
<td>41.50</td>
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<tr>
<td><strong>20 Year Net Cost Per Hour of Use - Parks</strong></td>
<td>26.64</td>
<td>40.68</td>
<td>68.58</td>
<td>67.70</td>
<td>32.32</td>
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<tr>
<td>3 Percent Discount Rate</td>
<td>26.82</td>
<td>39.63</td>
<td>64.96</td>
<td>58.48</td>
<td>27.90</td>
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<tr>
<td>5 Percent Discount Rate</td>
<td>29.38</td>
<td>38.69</td>
<td>61.98</td>
<td>51.30</td>
<td>24.51</td>
</tr>
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</table>

*Assumes two artificial turf carpet replacements (after years 8 and 16) and one major natural grass rehab after year 12.
**Natural Grass Revenue = same $ rate as AT for sand-based fields; current rates (82) hr assumed for native soil fields

www.montgomerycountymd.gov/content/council/publicreportwithappendicesapril132011.pdf
Good luck in 2015!

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