

Natural Grass Playing Field Case Study: Springfield, MA

Organic Grass Fields Meet Athletes' Needs and Protect Connecticut River Watershed

THE CITY OF SPRINGFIELD, Massachusetts, manages 12 properties, or a total of 67 acres, organically. This includes sports fields, park areas, and other public properties. Springfield's organically managed fields fully meet the community's needs for sports and other recreational activities, with high quality grass and soil.

Since starting the organic program in 2014, the city has doubled the number of properties in the program and experienced an increase in overall recreational use due to the improvement in soil and grass conditions.

This case study provides detailed information on the number of hours played at three parks in Springfield: two large complexes and one single, full-sized soccer field. Communities wishing to estimate the number of playable hours on a soccer field can use Treetop Park, the full-sized soccer field, as the most relatable model of the three parks discussed here.

Treetop Park is used for approximately 1,050 hours of practice, play, and informal activity annually.



Children playing a pick-up soccer game on an organically-managed field in Springfield.

Aeration of the fields is a central element of successful organic maintenance. Other key elements include product application plans based on performance needs and soil testing for each field. Field management costs in 2018, including products, irrigation maintenance, and all labor costs, were just under \$1,500 per acre across all the properties.

Springfield's organic management of natural grass has eliminated the need for pesticides, while providing a practical playing surface that fully meets the needs of athletes and others who use the parks. The Parks Department also notes that their field management choices help to protect water quality in the Connecticut River.

Introduction

This case study has been developed by the Toxics Use Reduction Institute (TURI) as part of an effort to provide information to municipalities, schools, and other institutions as they make decisions about play surfaces. TURI has documented information on the materials often used in artificial turf playing fields.¹ TURI has also gathered information on natural grass fields and has developed a series of case studies to share experiences.

This case study focuses on the organic management of natural grass on city properties, including sports fields, by the Department of Parks, Buildings, and Recreation Management in

the city of Springfield, Massachusetts ("the Parks Department"). This large, city-wide program includes management of nearly three million square feet, or 67 acres. However, the organic practices described in this case study can be used on grass properties of any size.



Forest Park baseball outfield. This area is converted to a soccer field in the fall.

Communities often have questions about whether natural grass can meet their athletic and recreational needs, and whether organic management of natural grass is cost-effective. TURI has compiled this case study so that other communities can learn from the successes in Springfield.

Overview

In 2014, the Springfield Department of Parks, Buildings, and Recreation Management made a commitment to begin organic management of its natural grass fields and parks. Springfield received support through a TURI grant to design and implement organic land care and grass turf management practices on municipal and school properties.

The city began with six pilot sites. Over time, the city expanded organic care practices to additional school properties and public land. As of June 2019, these properties include 12 organically managed sites (Table 1). The Parks Department hopes to expand the program city-wide within the next few years.

This case study provides information on maintenance and costs for all the fields currently under organic management. It also provides detailed use information on three individual field areas. Each of these fields is used for scheduled sports team activities. In addition, each field is used for other activities, such as concerts, pick-up games, and informal picnics.

Communities may have a variety of reasons for choosing organic practices for grass maintenance. For Springfield, the motivation was to protect the surrounding watershed and provide healthy playing spaces for youth.

¹ Massachusetts Toxics Use Reduction Institute. "Artificial Turf: Seeking Safer Alternatives for Athletic Playing Fields." Available at www.turi.org/artificialturf.

Table 1: Springfield organically managed properties in order from largest to smallest, June 2019

Park	Area (sq. ft.)	Sports/Other Information
Blunt Park	757,508	Baseball, softball, football, soccer, lacrosse, and concerts
Forest Park Playing Field	733,165	Baseball, softball, football, soccer and concerts
Van Horne	459,994	Baseball, soccer, rugby concerts
Nathan Bill Park	306,662	Baseball, softball, soccer
Central High School	231,739	Baseball, soccer; two separate fields included in organic program
Treetop Park	117,771	Soccer
Sweeny Athletic Field at High School of Commerce	104,108	Athletic play and physical education classes
Court Square	74,862	Park in downtown Springfield across the street from City Hall; heavy foot traffic
Camp Wilder	64,577	Park with playground, pond, and small playing field; leisure sports; organically managed since construction
Terrace at Mason Square	25,350	Irrigated small park in downtown Springfield
Merrick Park	24,956	Small park in downtown Springfield
Mary Troy Park	22,700	Small park in the city; includes playground
Total organically managed area	2,923,392	

Project Design and Startup

The first steps in the organic management program were to conduct soil testing, identify priority actions to improve soil health, and allocate staff time for maintenance activities. Chip Osborne of Osborne Organics designed the testing protocol, analyzed results, and developed a detailed maintenance plan for the city.

Soil Testing

The soil testing provided information on physiochemical characteristics of the soil such as texture and acidity (pH), and levels of key nutrients

such as phosphorus, potassium, nitrogen and calcium (Table 2). Soil testing also provided information on microorganisms in the soil, including bacteria, fungi, and nematodes. The correct balance of physiochemical and biological variables is essential to healthy soil and a healthy grass root system.

Since the project startup, Springfield has repeated selected soil tests every two to three years in order to estimate an accurate amount of fertilizer and other soil amendments to add to fields throughout the year.

Table 2: Variables measured during soil testing (examples)

Physiochemical	Nutrients	Biological
Texture	Phosphorus	Total organic biomass
Moisture	Potassium	Active bacterial biomass
pH	Nitrate	Active fungal biomass
Organic content	Calcium	Nematodes

Source: Osborne, Chip. 2015. *Organic Land Care Project: Springfield, MA: Technical Review*. Report provided to Patrick Sullivan, Director, Springfield Parks Department.

Hours of Activity: Examples from Three Sports Fields

One of the questions frequently asked by decision-makers is how many hours of activity they will be able to schedule on a natural grass playing field. According to the Parks Department, organic management has improved the overall condition of these fields. Many hours of both formal and informal sports play occur on these fields, and there are few cancellations due to weather-related field conditions.

The Parks Department provided TURI with scheduled sports team use hours for two sports

field complexes, Forest Park and Blunt Park, and one full-sized soccer field, Treetop Park.

Youth and adult (high school and adult league) sports teams generally use city fields from late March through late November. Hours of sports team use were estimated by multiplying the number of scheduled practices and games per week by the number of hours booked for each activity. Table 3 shows the number of weeks each sport is played per season, and the amount of time allotted for practices and games for each sport and age group.

Table 3: Weeks per season, hours of use per practice, and hours of use per game for each sport played on case study fields

Sport	Age Group	Weeks per Season	Hours per Practice	Hours per Game
Baseball/softball (Mid-March to June)	Adult	14	2	3
	Youth	14	1.5	2.5
Football (Mid-Aug to Nov)	Adult	14	3	3
	Youth	14	2	2
Soccer (Mid-Aug to Nov)*	Adult	14	2	2
	Youth	14	1.5	1
Lacrosse (Mid-April to June)	Adult	10	2	none **

*Soccer is played in both the spring and fall at Treetop Park. Treetop is the only park with a longer soccer season.

**Lacrosse games are not played on case study fields; only practice is held on these fields.

These fields are also used by Springfield residents for informal activities, such as pick-up games, or passive recreation, such as picnics. These activities take place during open park hours that have not been scheduled for team use, or on areas of the complex that are not in use during formally scheduled activities. Though this type of use is not

formally tracked, the Parks Department noted steady use for unscheduled activities throughout the year. In the absence of data on informal activities, TURI estimated that Forest Park and Blunt Park were used for an additional 14 hours per week, and Treetop Park an additional seven hours per week, of informal/ unscheduled activity.

Cancellations

Baseball games and practices are rescheduled during active rain. In general, baseball field use is cancelled during rain because puddles form on the

clay areas in the infield. This is unrelated to the organically managed grass, and is standard for baseball fields. An estimated total of 30 baseball

games/practices were cancelled in 2018 in both Forest Park and Blunt Park, primarily due to rain at the time of the scheduled activity.

In contrast, soccer, football, and lacrosse generally do not need to be cancelled due to rain. Cancellations occur only if there has been heavy

rain for an extended period of time (a full day or more). For soccer, football and lacrosse in 2018, there were 10 individual game or practice cancellations at Forest Park, zero cancellations at Blunt Park, and 12 individual game or practice cancellations at Treetop Park.

Forest Park: Baseball and Soccer Complex

The playing field area at Forest Park is around 730,000 square feet and includes four 60-foot diamonds and two 90-foot diamonds with converging outfields.² The fields are open seven days a week from dawn until dusk. Scheduled play occurs each weekday from 2 p.m. to 8 p.m., and weekend days from 9 a.m. to 7 p.m. During these time periods, the area is in continuous use by sports teams.

In the spring and summer, the sports complex is used primarily for baseball and softball team games and a few weeks of pre-season practices. An average of 20 adult and 25 youth baseball and softball team games were played weekly in the spring/summer season of 2018.

In the fall, the baseball outfields are merged together to form three soccer fields used for both team practices and games. In 2018, adult teams used the fields for 10 games and 10-15 practices per week. Youth teams used the fields for 15 games and 10-15 practices per week.

Over the course of 2018, sports teams used the Forest Park sporting complex just over 200 hours per week, or nearly 2,900 hours for the entire year, for sports practice and games. Adding estimated informal use time leads to an estimated total of nearly 3,300 hours per year. Table 4 shows the total number of hours used by adult and youth teams for each sport per season.

Table 4: Forest Park baseball and soccer complex (733,165 sq. ft.): Hours of use for sports practice and games, 2018

Sport	Age Group	Season	Total Use: Hours per Week*	Total Use: Hours per Season
Baseball/softball	Adult	Spring	67	940
	Youth	Spring	68	950
Soccer	Adult	Fall	40	560
	Youth	Fall	30	420
Total documented sports team use – all seasons			205	2,870
Estimated informal recreation hours			14	392
Estimated total hours – all seasons			219	3,262

*Baseball/ softball and soccer seasons were 14 weeks each. Informal use hours were calculated for 28 weeks.

Hours do not account for cancellations. There were approximately 60 hours of baseball cancellations and 20 hours of soccer cancellations in 2018.

² “60 foot” and “90 foot” refers to number of feet between bases. The sizes of these fields are standard for baseball and softball diamonds.

Blunt Park: Baseball, Soccer, Football, and Lacrosse Complex

Blunt Park's field area measures around 760,000 square feet and is open from dawn until dusk. The sports complex contains four 60-foot fields and two 90-foot diamonds, along with space for other recreation. The complex is mainly used for baseball/softball, football, soccer, and lacrosse practices and games. The park is also used for pickup games and many other non-sports events, such as concerts, throughout the year. Table 5 shows the total number of hours used by adult and youth teams for each sport per season.

In spring and summer 2018, the fields were used for 35-40 adult baseball/softball practices per week before the start of the season. During the game season, they were used for an average of 20 adult games per week. Youth teams used the fields for 15-20 youth practices and an average of 10 games per week. Blunt Park outfields were also used for

five youth lacrosse practices per week during the spring.

In the fall, these baseball/softball outfields are combined and converted into two football fields and one combination field area for soccer, football, and lacrosse. During the 2018 football season, the outfield complex was used for 15 adult and five youth football practices per week. The field was also used for eight adult and five youth football games per week. During the fall soccer season, the field was used for five adult and five youth practices per week throughout the season. In addition, the field was used for five adult lacrosse practices per week during the fall. The estimated hours of use by sports teams on the complex totaled just over 230 hours per week and just over 3,200 hours for the year. Including estimated informal recreation, the field complex was used for about 3,600 hours in 2018.

Table 5: Blunt Park baseball, soccer, football, and lacrosse complex (757,508 sq. ft.): Hours of use for sports practice and games, 2018

Sport	Age Group	Season	Total Use: Hours per Week*	Total Use: Hours per Season
Baseball/softball	Adult	Spring	70	980
	Youth	Spring	48	665
Lacrosse	Adult	Spring	10	100
Football	Adult	Fall	69	966
	Youth	Fall	20	280
Soccer	Adult	Fall	10	140
	Youth	Fall	8	105
Total documented sports team use – all seasons			234	3,236
Estimated informal recreation hours			14	392
Estimated total hours – all seasons			248	3,628

*Baseball/ softball, football, and soccer seasons were 14 weeks each. Lacrosse season was 10 weeks. Informal use hours were calculated for 28 weeks.

Hours do not account for cancellations. There were approximately 60 hours of baseball cancellations in 2018.

Treetop Park: Full-Sized Soccer Field

Treetop Park is around 118,000 square feet and is primarily reserved for scheduled soccer practices and games in the spring, summer, and fall. The field is used less frequently for informal recreation than Forest Park and Blunt Park, as the entrance to the parking lot is locked. Table 6 summarizes the number of hours used for each sport and age group in 2018.

Forest Park and Blunt Park both include multiple overlapping fields. In contrast, Treetop Park is a single, full-sized soccer field. Communities wishing to estimate number of playable hours on a soccer field can use Treetop Park as the most comparable model.

In spring 2018, the field was used for five adult and 10 youth practices per week, two weeks prior to the start of the official spring playing season. During the official season, the field was used for five adult and 10 youth games per week. In the fall, Treetop was used for five practices and five games by adult teams, and five practices and 10 games by youth teams per week. The soccer field was estimated to have been used by sports teams for about 60 hours per week and just over 850 hours for the year. If estimated informal use is included, usage in 2018 totals about 1,050 hours.

Table 6: Treetop Park soccer field (117,771 sq. ft.): Hours of use for sports practice and games, 2018				
Sport	Age Group	Season	Total Use: Hours per Week*	Total Use: Hours per Season
Soccer	Adult	Spring	11	160
	Youth	Spring	12	170
Soccer	Adult	Fall	20	280
	Youth	Fall	18	245
Total documented sports team use – all seasons			61	855
Estimated informal recreation hours			7	196
Estimated total hours – all seasons			68	1,051

*Soccer is played year-round at Treetop Park. Spring and fall seasons were 14 weeks each. Informal use hours were calculated for 28 weeks.

Hours do not account for cancellations. There were approximately 24 hours of soccer cancellations in 2018.

Maintenance

Maintenance occurs throughout the playing season, and includes aeration and the application of organic products including fertilizer and soil amendments. Soil amendments are materials added to soil to improve physical and/or chemical properties. Table 7 shows the 2018 schedule for aeration and application of organic products for the three parks highlighted in this case study.

Aeration

Aeration is accomplished by pulling up plugs of soil and grass using a riding or push machine. This process relieves compaction of soil and thatching of grass and allows air, water, and added nutrients to penetrate the soil. Aeration can be a time-consuming process, but is arguably the most important step for maintaining healthy, organic grass.

All of the organically managed fields in Springfield are aerated four times per year (Table 7). The Park Environmental Specialist aerates all the fields, at times with the assistance of one additional staff member. Choosing the type of aerator to use depends on the size of the grass area. A riding aerator is used for large, open areas with space for wide, gradual turns. A smaller push aerator is used for smaller areas or tight spaces near sports equipment or trees.



Springfield's tractor-led aerator used for large areas

Recommendations include how many pounds of product are needed per field, per acre, and per application. These site-specific recommendations help avoid over-application of products.

Springfield uses an organic granular fertilizer made from soybean meal, feather meal, and potassium sulfate. Fertilizer is added to each field twice per year: once early in the summer, and again in late summer (Table 7). Springfield uses a Lely Broadcast Spreader to apply all products to fields.

Fertilizers and Soil Amendments

Springfield uses organic fertilizers and soil amendments and utilizes services provided by PJC Organics, a small consulting company and fertilizer producer/distributor in Massachusetts. PJC organizes soil testing and recommends products and their application schedules for each park based on these results along with performance needs.

Springfield also uses soil amendments including a soil conditioner and lime. The soil conditioner is made with biochar (charcoal), kelp, molasses, and soybean and is used to improve the chemistry, structure, and biological activity in the soil. Conditioner is added to the fields in the spring or early summer to jump-start microbial activity. Lime is added to the fields in October to adjust soil pH.

- Key elements of Springfield's organic grass management:
- Soil testing for physical, chemical, and biological characteristics
 - Aerating grass and soil
 - Using organic fertilizer & soil amendments
 - Mowing regularly

Table 7: Aeration and organic product applications schedule, 2018

Location	Field Aeration				Fertilizer		Conditioner	Lime
	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2		
Blunt Park	May	Jun	Sep	Nov	Jun	Sep	Jun	Oct
Forest Park	Apr	Jun	Sep	Oct	May	Sep	Jun	Oct
Treetop Park	May	Jun	Aug	Oct	Jun	Oct	spring	Oct

This table shows only the fields highlighted in this case study. The other organically managed properties follow a similar schedule.

Costs

The majority of costs fall into three main categories: products, irrigation maintenance, and staffing. In general, costs associated with organic grass management often decrease after the first few establishing years, as the health of the soil and vegetation improves. The following are cost figures for 2018, the fourth year of Springfield’s organics program.

Products

Products include organic fertilizer, soil conditioner and lime. The amount of product needed for a field depends on soil properties and intended use of individual fields. Grass seed was used to fill in small areas of heavy use, such as the areas in front of soccer goals. The amount of grass seed needed to accomplish this was small, and the cost was negligible for the year.

In 2018, Springfield used 440 pounds of fertilizer (total for two applications), 420 pounds of soil conditioner, and 230 pounds of lime per acre of land (Table 8). Springfield spent a total of \$670 per acre, or \$45,280 total, on soil products in 2018. A further breakdown of product cost estimates per organic property is shown in Table 9.

Irrigation Maintenance

Maintenance costs associated with irrigation include repairs on sprinkler heads and water lines, as well as the winterization of the system during months when the ground freezes. Springfield spent a total of \$7,200 on irrigation maintenance in 2018 (Table 9).

The total cost for the Parks Department’s organic management of 12 grass properties was \$98,080 in 2018 (Table 9). Broken down by acre of land, the city paid around \$1,460 per acre.

Table 8: Annual amount of soil products used and associated costs per acre in Springfield’s organic management program, 2018		
Product	Pounds Used per Acre	Cost per Acre
Fertilizer (two applications)	440	\$410
Conditioner	420	\$200
Lime	230	\$60
Totals	1,090	\$670

Totals are rounded to the nearest 10.

Table 9: Estimated annual costs for 12 organically managed grass properties in Springfield

Products								
Location	Acres	Fertilizer (per acre)		Soil conditioner (per acre)		Lime (per acre)		Total Cost
		Pounds	Cost	Pounds	Cost	Pounds	Cost	
Blunt Park	17.4	7,650	\$7,190	7,220	\$3,500	3,830	\$1,030	\$11,720
Forest Park Playing Field	16.8	7,410	\$6,960	6,990	\$3,390	3,700	\$1,000	\$11,350
Van Horne	10.6	4,650	\$4,370	4,380	\$2,130	2,320	\$630	\$7,130
Nathan Bill Park	7.0	3,100	\$2,910	2,920	\$1,420	1,550	\$420	\$4,750
Central High School playing field	5.3	2,340	\$2,200	2,210	\$1,070	1,170	\$320	\$3,590
Treetop Park	2.7	1,190	\$1,120	1,120	\$540	600	\$160	\$1,820
Sweeny Athletic Field at High School of Commerce	2.4	1,050	\$990	990	\$480	530	\$140	\$1,610
Court Square	1.7	760	\$710	710	\$350	780	\$100	\$1,160
Camp Wilder	1.5	650	\$610	620	\$300	330	\$90	\$1,000
Terrace at Mason Square	0.6	250	\$240	240	\$120	130	\$40	\$400
Merrick Park	0.6	250	\$240	240	\$120	130	\$30	\$390
Mary Troy Park	0.5	230	\$220	220	\$110	120	\$30	\$360
Annual total for products on 12 fields								\$45,280
Maintenance								
Irrigation maintenance	Includes all repairs: broken sprinkler heads, lines, startup, shutdown and winterization							\$7,200
Labor								
Labor costs for all fields	Includes full-time staff and assistant for 120 days of work							\$45,600
Annual total for products, maintenance, and labor on 12 fields								\$98,080
Annual total for products, maintenance, and labor per acre								\$1,460

Totals have been rounded to the nearest 10. Case study fields are highlighted in green text.

Summary and Lessons Learned

Between the beginning of the program in 2014 and the end of 2018, the city has doubled the number of properties in its organic program and experienced an increase in overall recreational use due to the improvement in soil and grass conditions. These results were accomplished through frequent aeration of the fields, and the creation of field-specific product application plans based on performance needs and soil testing for

each field. Field management costs in 2018, including products, irrigation maintenance, and all labor costs, were just under \$1,500 per acre across all the properties.

Springfield's experience is that the organically managed fields fully meet the community's needs for sports and other recreational activities. They have also found that all of the organically managed

properties have higher quality grass and soil than those outside of the program.

The Parks Director notes that field needs have changed over time. In the past, there were few or no formally scheduled sports after the baseball season ended in early July. Today, sporting requirements continue throughout the year. The fields never shut down during open hours, and game cancellations are rare.

For 2018 use information, this case study focused on three fields: Forest Park, Blunt Park, and Treetop Park. Formal use of the Forest Park sports complex totaled about 2,900 hours by baseball and soccer teams, and about 3,300 hours per year with estimated informal use included. Blunt Park sports complex totaled about 3,200 hours of use by baseball, football, and lacrosse teams, and about 3,600 hours with estimated informal use included. Treetop Park was used about 850 hours by soccer teams, and a total of about 1,050 hours with an estimated informal use included. Treetop Park is the best field to use for comparison of playable hours on an individual field, as it is composed of a single, full-sized soccer field.

“The organically managed fields are definitely in better condition than they were before organic management. When you look at a natural meadow, it’s self-sustaining. That’s what we’re replicating with our organic fields. And our parks are part of the Connecticut River watershed, all of our choices affect that broader ecosystem.”

– Patrick Sullivan, Director,
Springfield Parks Department

The Parks Department Director recommends using organic management as soon as a field is

constructed, when possible.

Camp Wilder, a field measuring 64,577 square feet and used for general recreation by a summer camp, has been managed organically since it was constructed. Planning for organic management at the beginning of the field’s life saved Springfield time and money on restructuring soil and grass in the future.

Staff working on the organic program note that the process is time-consuming but that they derive satisfaction from the

process and its results. They consider field aeration to be the most essential element of the program.

The Parks Department notes that their choices affect water quality in the Connecticut River, illustrating that there are broad advantages to choosing the organic approach. The Parks Department has set a goal of reaching out to homeowners to educate them about the advantages of organic grass management, further expanding the benefits of this project.

To view our video documenting the Springfield Parks Department’s experience, visit:

www.turi.org/Our_Work/Community/Organic_Lawn_Care

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The Toxics Use Reduction Institute is a multi-disciplinary research, education, and policy center established by the Massachusetts Toxics Use Reduction Act of 1989. The Institute sponsors and conducts research, organizes education and training programs, and provides technical support to help Massachusetts companies and communities reduce the use of toxic chemicals.