
THE TURF BATTLES IN MAJOR LEAGUE BASEBALL



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WHO'S FERTILIZING AND WHO ISN'T

There are few standards that define what constitutes a surface on which sports are played. This is no different in baseball. The bases are required to be 90 feet apart, the pitching mound is 60 feet 6 inches from home plate, no more than 10 inches

above the level of home plate, with specific rules on location, diameter, and slope [1]. What constitutes the field is quite a bit broader, as are its dimensions. Other than being level, base paths, while traditionally dirt, have flexible specifications for their compositions. Outfields and foul territories vary in size and shape, and their consistency is a wide variety of grass and artificial turf. The fact that both the home and away teams play on the same field at the same time is thought to be an equalizing factor in Major League Baseball (MLB), but historical observations have shown that player familiarity with their home ballpark and its composition can provide selective advantages.

There are two types of natural surfaces common with MLB teams: Kentucky bluegrass and Bermuda grass. Midwestern cities and those in the northeast typically use Kentucky bluegrass fields, while southern and western cities have more Bermuda grass. Bermuda tends to be more drought resistant and grows more extensively in hotter climates, so it's not surprising to find it more common in baseball fields in warmer sites.

In addition to Kentucky bluegrass and Bermuda grass, Tampa and Toronto have synthetic turf surfaces and Miami and Houston have seashore paspalum grass surfaces. Tropicana Field in Tampa is generally hated by both the players and the management in Tampa. The team has contracted to install at least five different artificial turf surfaces since they arrived in 1997 [2], including changes in 2017 and 2018. The Rays have outlined their plans to vacate Tropicana for a better stadium with a natural turf surface by 2023 at the earliest, and they need to resolve the funding for a new, nearly \$1B stadium. In the meantime, the Rays are stuck at Tropicana with their ever-changing playing surface. Everybody else in this group looks to be stable in their current confines.

Again, Bermuda grass tends to be more common in southern and drought prone climates while Bluegrass is found on fields in northern climates. Bermuda grass is a wiry and spongy turf surface that's viable only from climate zones 7-10 in the United States. The resilience of the grass is attributed to the integrity of the wiry stems of the plants which grow the grass. The wire meshwork of the turf recovers quickly making

Bermuda grass a desirable surface for high traffic areas. Moderate to high amounts of watering and frequent mowings yield the most robust Bermuda surfaces.

Bluegrass tends to germinate in single blades below the soil. The individual blades are very soft making it pleasant to walk on. The texture can vary a little, but the blades are rather fine and easily bent under mechanical loading. Bluegrass tends to wilt under excessive wear conditions, but its saving grace is that it grows extensively in cold weather climates, hence the popularity in northern climate baseball fields.

The real tests between turf surfaces can be conducted when a team opts for a new type of blade. The Philadelphia Phillies opted to yank out their Bermuda grass infield for Bluegrass in 2016 thanks to Philadelphia's manager Larry Bowa (more on him later). The rationale was that the Bermuda grass was so spongy that balls hit the grass surface and bounced like it was AstroTurf. The move to create a more absorbent surface was based on a team goal to favor defense and use ground ball pitchers. As expected, after the bluegrass surface was installed, players on the Phillies found that balls going through the infield were slowed [21]. For the right pitchers, this switch could lower earned run averages. In fact, after the change, the Phillies team ERA dropped from 4.63 (2016) to 4.55 (2017) to 4.14 (2018) [20].

There are a couple of hybrid stadiums where the infield and outfield are different (Arizona), or a blend of grasses (Philadelphia), where the infield is Bluegrass and outfield is Bermuda grass. Cincinnati is another outlier by using rye grass. Regardless of the surface, groundskeepers are commissioned across the continent to make their fields flourish, but baseball played in one city on one surface can be quite different than the baseball played in another city.

WHY DON'T YOU SEE WEEDS AT YOUR LOCAL BALLPARK?

It's simple. While most of us homeowners are part time groundskeepers around the house, each team hires an army of turf specialists and groundskeepers to pick every weed that would germinate on the field.

In addition, the actual fields are designed for limited access and are rarely used for anything other than baseball, so there are fewer concerns that the field might be compromised.

Turf management is the realm of the agricultural schools and universities that are graduating crops of agronomists and plant growers that end up working for seed and fertilizer companies. They focus on methods such as enhanced soil aeration, top dressing, irrigation, drainage, and strategies to increase overall grass health. MLB does agronomy on a larger scale than any individual does at home.

There are legions of groundskeepers who aim to maintain the high quality of turf standards at professional fields, some who grew up in the business while others have been schooled. One can't talk about groundskeepers without talking with reverence about the Bossard family (more on them later also) who've set the standard for turf maintenance in Major League Baseball and beyond.

OPTIMIZE YOUR TEAM BASED ON YOUR TURF

Just for fun, let us assume you're an MLB team Owner. After finding, building, or otherwise appropriating a stadium of satisfactory dimensions, the next issue to consider is your players. An analytics question (think "*Moneyball*") is whether a single player, assuming he (and maybe she) could play for several different teams, would be more successful playing in one location over the others considering weather and field composition alone.

Do the Colorado Rockies look for players who can hit home runs in rarified air? Do the Minnesota Twins look for players who are unafraid of defending solid ball contact (high "ball exit speed") during cold days in April? Do the Tampa Rays look for players with good knees [2, 3] who can play on AstroTurf indefinitely or can field high ground balls due to the coefficient of restitution of a rubberized AstroTurf? What happens when your team is aging on the field and you're locked into long-term contracts with the players? Can you manipulate the playing surface to help your team stay competitive? Is it even ethical to manipulate it [4]?



Northern climates have varieties of Bluegrass and southern parks tend to have Bermuda.

Broadly defined, that correlation between establishing the composition of the home team and winning in the scope of home field advantage and it has been assessed repeatedly by sports statisticians [5]. Perhaps that familiarity and comfort with playing at home and sleeping in one's own bed makes one more apt to play better. Perhaps the fact that one is playing at home means that there are more fans of the home team to watch and cheer. Perhaps the umpires are intimidated and less likely to make a controversial call against the home team. With instant replay, it's less likely that judgment calls are as influenced by the home team crowds, as in years past. For whatever reason, home field advantage is a real phenomenon.

From 2008-2010, Jon Bois at SB Nation tracked the performance stats for the 30 teams in MLB and found that all teams would play better if they had the chance to play the 81 seasonal away games at home instead [6]. The estimated gain in win percentage ranged from

3% (Los Angeles Angels and Miami Marlins) to ~10% (Pittsburgh Pirates and Detroit Tigers) with everyone else was in between. In other words, if Pittsburgh played 81 more games at home each year, they would average ~8 more wins per year and Miami would average ~2 more wins per year. Looking into different major American sports, Bois showed that the NBA had a larger home field advantage (10% more wins) than the NFL (6.4%) MLB (5.5%) and the NHL (5.3%) (Bois's team-specific data for the MLB is shown in Figure 2 [6]).

A deeper dive into whether there remains a home field advantage in the playoffs when the better teams are still competing suggests that, at least in baseball, the home field advantage is smaller (51% bias for the home team) than in the NBA (73%) [7].

HISTORICAL LOOKS AT HOW YOU CAN USE THE FIELD TO THE HOME TEAM'S ADVANTAGE

The Bossards in Cleveland, Chicago, and San Diego:

To date, three generations of the Bossard family have ruled over the fields linked with MLB teams in several cities including both the original and the newfangled Comiskey Park in Chicago, home to the White Sox. The family's influence on MLB has extended across the nation for over 100 years.

Great-Grandpa Emil Bossard was the head groundskeeper as early as 1911 with the minor league St. Paul Saints at Lexington Park in St. Paul, Minnesota, and after that with the Cleveland Indians starting in 1936. When he joined the Indians, Emil's sons Eugene, Harold, and Marshall all became Emil's de facto assistants. From there, the family proved spectacularly resourceful and loyal to the Indians and a grateful Lou Boudreau (player/manager for the Indians).

Eugene proved to be so good that the White Sox hired him away from Cleveland. The legacy continued in Eugene's son Roger, who took his father's place as the head groundskeeper at Comiskey—where he still works today. Roger Bossard has been innovative in turf management, drainage, and overall living turf quality. To give you some idea of the lure of the Bossard family, the White Sox drafted Roger's son, Bran-

don, in the 31st round 2016 MLB draft, probably in part to keep him from signing somewhere else and giving away all of Dad's secrets [22].



| Roger Bossard “bobblehead.”

The Bossard family is a legend not only for how to make grass grow, but they saw limitless potential in investing in every conceivable method to extract a perceived advantage. In his book *“The Cheater’s Guide to Baseball,”* Derek Zumsteg explains in great detail the depths to which Cleveland was using data analytics on the field 70 years ago [8]. Clancy Sigal mentions in his article that Bossard and his two sons, Harold and Marshall, made “adjustments to the playing surface for each home game based on what they knew of the other teams tendencies and the Indian’s likely

lineup” [9].

It was breathtaking to see how in 1948, prior life experiences helped the Indians steal signs from the opposing catcher in an elaborate scheme, executed by Boudreau, and including both the groundskeepers and several Hall of fame pitchers with the Indians. Bob Feller had been a gunnery officer on board a Navy ship in WW II and used a telescope for spotting targets [10]. The telescope was about three feet long, but with good optics, and the spotter could see 100+ yards. After Feller’s discharge, he came home with the telescope. The telescope made its way to Cleveland’s scoreboard where Feller, or Bob Lemon, would sit and relay signs to Marshall or Harold Bossard, who were poking their heads through holes in the scoreboard where out-of-town scores were normally displayed [10]. They relayed signs day-by-day, changing from a face in the hole, to an arm hanging out, to a light flashing. The signs were signaled by the opposing catcher, interpreted by Bob Lemon or

Bob Feller, relayed to one of the Bossards, who would then relay the sign to the batter—all in a matter of seconds. Pretty sneaky.

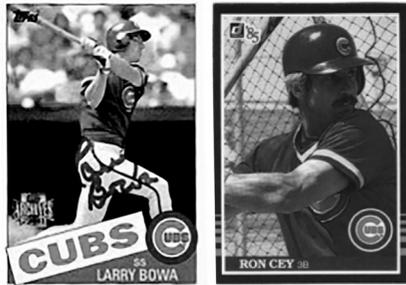
Harold Bossard took over for his Dad, Emil, as head groundskeeper for the Indians in 1956. He continued the legend of the Bossards for another 21 years before retiring in 1977 [11]. Harold seemed to have the Bossard knack for storytelling and having fun. For the journalists covering the game, that was often an important feature. After Harold retired in 1977 from tending to the turf for both the Indians and the Cleveland Browns, Harold's son Brian, who studied agronomy at Purdue, took over as head groundskeeper for the football Browns until the San Diego Padres came calling in 1985 [11]. The Padres presented Brian with over 130 newspaper articles identifying all sorts of problems with the turf at Jack Murphy stadium in San Diego, a big challenge and probably one linked with a better salary and better weather for sure. Brian Bossard tore out the rocks underneath the infield turf at Jack Murphy stadium and replaced them with clay. Within three years Brian turned San Diego's infield at Jack Murphy into arguably the best field in the National League. Sadly, Brian passed away rather prematurely only eight years after heading to San Diego [12].

Eugene "Geno" Bossard, Harold's brother, who was born in 1918, was the one who left the flock and joined the White Sox in 1940 as head groundskeeper after his apprenticeship with dad and his brothers in Cleveland. Eugene took over at the ripe old age of 22. He was known for soaking the infield at Comiskey in Chicago so much that ground balls were significantly slowed as a result. Geno was a legend, having found a way to create a swamp-like condition to deaden the first bounce from a hard ground ball by digging up the ground around home plate, affectionately called Bossard's Swamp [13]. Eugene and his son Roger would be up very early in the morning or gameday, armed with hoses and pick-axes to soften things up. It was obvious to the players on both teams taking batting practice that hard ground balls hitting the muck would ricochet off globs of wet mud, but they played on.

Geno Bossard was probably singlehandedly the reason that a rag-tag group of White Sox with an average batting average of .225 and no batter higher than .241 could be competitive enough to be tied for the

division lead as late in the season as September 6 in 1967 [14]. Eugene stayed for 40 years with the White Sox, ultimately retiring once Geno's son, Roger was ready to take over. Geno continued to help Roger with the field work at Comiskey until he died in 1998 at 80.

Like Brian Bossard, Roger also went to Purdue to study agronomy coupled with all of his practical training from his apprenticeship with Geno. He was destined for great things [14]. Roger officially joined the White Sox as a groundskeeper in 1967 and took over for Geno as head groundskeeper in 1983. What Roger learned at Purdue he put into practice in Chicago, developing a more functional drainage system which was ultimately patented for wider use. Other teams and the league took notice and worked with Roger directly to develop more functional drainage systems to reduce the number of rainouts. Roger's patented sand-based drainage systems are now found in 19 MLB and minor league parks [15]. The venues include both Chicago locations, Detroit, Milwaukee, St Louis, Boston, New York, San Diego, Seattle Arizona, and Washington D.C. [16]. This notoriety birthed the nickname "the Sodfather" and Roger has his own wiki site [16]. Heck, even the White Sox had a bobblehead night for the head groundskeeper—where does that happen other than in Chicago [16]?



ACROSS TOWN: THE CHICAGO CUBS

Across town from Comiskey Park during the 1984 season, the Cubs were stocked with great pitchers like Rick Sutcliffe, Dennis Eckersley, Steve Trout and Scott Sanderson, and won their division but lost in the

divisional playoffs. Most of the starters were quite good at coaxing ground balls out of the opposing team and there was a lot of activity in the infield during the 1984 season. Embarking on another year in 1985, the team had a second baseman in Ryne Sandberg who was just coming into his own as a terrific infielder, but on the left side of the diamond saw Ron Cey at third base and Larry Bowa at shortstop—both great infielders in their prime—but each had slowed considerably as both past their 35th birthdays.

Remember Bowa, the manager of the Phillies in 2016, when they were coerced into a new turf because the infielders couldn't respond to ground balls in time? In 1985, the Cubs, who were seeing grounders make it past their shortstop and third basemen in practice, came up with a practical solution—they would leave the grass long on the left side of infield to slow ground balls. UPI ran a story in mid-May during the 1985 season stating that the grass in Chicago was at least an inch taller than any other ballpark in MLB [17]. Al Bumbry, a reserve with the Padres at the time remarked that he didn't think the mowers actually had any blades as they traversed the field [17].

If you have pitchers who are producing ground balls, and the infielders are too slow to get them, the next best approach, if you're playing at home, is to slow the ball down by having ground balls bounce and roll through much thicker grass. While the Cubs had to also bat with the thick left side of the diamond, the management believed the team was more competitive when their defense was retiring ball players on ground balls. The ploy was obvious enough to rankle other Cubs players, who complained that they were grounding out more often as well with hits that would, in any other ballpark, find their way to left field.

Of course, the Cubs were doomed with this strategy, as the one thing they hadn't planned on was having their ground ball pitchers on the DL for much of the 1985 season, and when other pitchers that got the call were not getting ground balls, the height of the grass doesn't help. When the Cubs ultimately got a new shortstop with wider range, suddenly the grass was shorn much shorter [18]. The Cubs had enough

other problems that addressing the grass height was not the panacea the brass had envisioned.

Brian is partial to the Cubs, who have had to maintain both the grass and the ivy [19] on the outfield wall, but he has a much better appreciation for what has happened on the other side of town. Of course, fast-forward 30+ years later and the Cubs finally put most of the curses to rest, winning the World Series in 2016.

FINALLY!

ALSO ACROSS TOWN

Soldier Field, home to the Chicago Bears, was built in preparation for the World's Fair in Chicago and is a legacy park just off Lake Michigan. The field is natural grass although the distinction between different bluegrasses important. Members of the Bears complained about the field being easily chewed up and slippery. Prior to the 2014 season in which Soldier Field switched from an Illinois-based sod producer to one from New Jersey [23], one would not expect one bluegrass versus another would have many differences, but the sod from New Jersey had more sand than clay as compared to the Illinois product. In this case, supporting sod farmers in Illinois ran counter to providing a better playing surface. Higher sand concentration maintains the cohesive strength of the turf so that it doesn't get easily chewed up by cleats and appears less slippery when wet. If the Bears were winning in the bog of Soldier Field leading up to the turf change, perhaps management would have made a different decision, but the switch they made was ultimately safer for the players and the referees alike.

Creative engineered solutions about turf surfaces are forthcoming. Supple grass fields have been produced, even within dome structures like the one at the University of Phoenix's "State Farm Stadium" where the Arizona Cardinals play. This structure is designed to shield the grass from the oppressive desert heat by having the turf on a rolling track that they can roll into the dome [24]. This required a separate space at the field level adjacent to the dome to which the field is

wheeled when not in use. In this manner, turf managers are able to produce a schedule of sun exposure that is less stressful and allows the turf to thrive while shielding the most damaging effects of the Phoenix climate.

Despite their efforts, this playing surface has had some issues for the players. In December 2018, the Detroit Lions beat the Cardinals in Arizona and complained bitterly that the field was being torn up in clumps and players were sliding all over the place. Eight different Lions went down with injuries during the game. Ricky Jean Francois, a Lions defensive lineman, told *Detroit Free Press* reporters that “You pay too much money for a stadium like this to have grass that bad. I’m just saying, if you’re going to spend billions (on the stadium) you might as well cover everything.” [25]

Overall, give due to the groundskeepers who work diligently to maintain natural turf field surfaces. While their efforts largely go unnoticed, surfaces clearly play a critical role in professional sports and can affect the competitiveness of your favorite team.