



# TURFAX™

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## The Art and Invention Era in the Early Evolution of Turfs—1830 to 1952

James B Beard

A paper summarizing the key early inventions and art-related developments in the evolution of turfgrasses has not been addressed. Thus, over the past two decades this author has spent considerable time in the major libraries in the United States and the United Kingdom, including the Royal Horticultural Society, Kew Gardens, British Museum, Victoria and Albert Museum, and various Sports Association libraries. Through extensive study of the limited literature from a large number of unrelated writings over hundreds of years, this author has assimilated and presents the following chronology of key turfgrass developments in the early years, from 1830 to 1952. The criteria for their selection included the impact on all types of turf use, and not just one segment such as golf turf.

The evolution of turfs as we know them today occurred in association with animal agriculture in climates favorable

for grass growth, especially rainfall and temperature. The earliest significant uses of turfs for lawns were in the United Kingdom, where the rainfall distribution throughout the year was reasonably good and the moderate temperatures favored the growth of cool-season turfgrasses, such as *Agrostis*, *Festuca*, *Lolium*, and *Poa*. In addition, the grazing of sheep, with close-grazing mouthparts, was a significant agricultural activity throughout the countryside.

The key advances that furthered the use of turfgrasses involved inventions and developments achieved through trial-and-error activities, which is termed the art of turfgrass culture. Twelve developments that highlighted the turfgrass discovery and invention era are summarized in Table 1, and are discussed in the following sections.

### EVENT NO. 1—REEL MOWER

For years turfed areas were cut to a relatively uniform height either by the hand scythe or by a hand sickle in the case of closely maintained turf areas that were cut more frequently. The leaves of grasses were best cut by the scythe or sickle when the grass was wet, such as during early morning dews or after rains. This was a very laborious, time-consuming activity. Thus lawns of even a reasonable quality were limited primarily to wealthy estate owners. This started to change in 1830 with the invention of the reel mower by Edward Beard Budding, a textile engineer of Stroud, Gloucestershire, England. This first, manually pushed reel mower was more cost-effective, which allowed the opportunity for middle-class residents to maintain residential and village green turfs, which enhanced their quality of life. The original 1830 leaf cutting design of the Budding reel mowers continues to be used to this day—more than 170 years later. Also, it should be noted that one of the major developments in agriculture was the invention of the McCormick reaper. This occurred more than ten years after the development of the Budding reel mower, with a number of the design features of the McCormick reaper most probably having been derived from the earlier Budding patent.

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### EVENT NO. 2—CLAY DRAIN TILE

Cylindrical clay tile subsurface drains were developed in England, in circa 1840s. This was the standard worldwide technique for subsurface drainage of soils for over 100 years. During most of that period the clay tiles were installed by manual digging of the trenches. Thus, these subsurface drains did not come into widespread use until the development of the powered mechanical trenching machine in the early 1900s.

### EVENT NO. 3—WEED-FREE GRASS SEED

The next major advance occurred in the 1880s involving the marketing of weed-free grass seed based on proper seed cleaning—processing and testing techniques as pioneered by Orlando M. Scott of Marysville, Ohio. Initially “OM” utilized a manually-cranked, wooden seed cleaning machine that he had modified. Prior to that time, grass seed was harvested from pastures that were typically contaminated with weeds and the resultant seed sold directly to turf users. There were no effective, selective controls for the weeds in seed harvest fields or in the home lawns and turf areas planted with the weed seed-contaminated grass seed. Thus, the solution was the development of procedures to clean the weed seeds out of the grass seed. In addition, O.M. Scott pioneered seed testing procedures long before governmental agencies enacted laws requiring seed testing and labeling.

### EVENT NO. 4—EARTHWORM MANAGEMENT

The next major advance, in the late 1890s, was the development of an earthworm management control by Peter W. Lees, greenkeeper at the Mid Surrey Golf Club, near London, England. Prior to this event the two main practices discussed in gardening books of the 1700s and 1800s were rolling and mowing of the turf, with rolling usually listed

first. This can be attributed to the disruption of the surface by extensive earthworm activity, particularly in England where early turf culture evolved. Thus, with the development of an earthworm management material, rolling became substantially less important as a turfgrass cultural practice. In fact, rolling was eventually recognized in the 1920s as having negative effects in terms of soil compaction, especially on clayey soils. The procedure involved applying the irritant-control to the soil surface and watering it in with excess quantities of water. As a result the earthworms came to the surface, were raked into piles, shoveled onto wheelbarrows, and physically hauled off the turf area. It also should be noted that prior to this event the game of golf and golf courses had been limited principally to the coastal areas of Scotland and northern England, called linksland or seaside courses. Attempts to develop upland golf courses were relatively unsuccessful, principally because of the unplayable putting green surfaces caused by earthworms and their castings. The emergence and major expansion of golf courses on upland soils occurred at the same time, and could be attributed to the earthworm management procedure developed by Peter Lees.

### EVENT NO. 5—MULTIPLE GANG, SIDE-WHEEL DRIVE REEL MOWER

A set of lightweight, side-wheel drive mowers mounted on a multiple gang frame was developed and manufactured in 1919 by Charles C. Worthington of Shawnee, Pennsylvania. It was a major advancement and opened the way to economical, quality mowing of extensive turf areas in parks, golf course fairways, sports fields, recreational areas, and other large turfed areas. This basic multi-gang reel mower concept continues in use today, except for a change from a chain to a gear drive.

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**Table 1. Key Events in the Turfgrass Discovery and Invention Era**

Year (circa)	Contribution/Invention	Contributor
1830	reel mower, mechanical hand pushed	Edwin Beard Budding, England
1843	cylindrical clay tile drains	England
1880	weed-free grass seed processing, testing, and marketing	O.M. Scott, Ohio
1896	earthworm management/control	P.W. Lees, England
1919	side-wheel driven reel mowers on a multiple-gang frame	C.C. Worthington, Pennsylvania
1928	slow-release (organic), complete-analysis turf fertilizer	O.M. Scott and Sons Co., Ohio
1930–1932	turfgrass fungicide development	J.L. Monteith and A.S. Dahl, Washington, DC
1930s	powered rotary mower	Power Specialities Ltd., England
1930–1935	pop-up sprinkler heads	Thompson Co., California
1945	2,4-D-selective broadleaf weed control	G.F.F. Davis, Washington, DC
1946	powered coring machine	T.C. Mascaro, Pennsylvania
1952	powered vertical cutting machine	T.C. Mascaro, Pennsylvania



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### EVENT NO. 6—SLOW-RELEASE, COMPLETE-ANALYSIS TURF FERTILIZER

The first commercially produced, slow-release, complete-analysis turf fertilizer was nationally marketed in 1928 by the O.M. Scott and Sons Company in Marysville, Ohio. It was a natural organic product developed at Ohio State University through research funded by the O.M. Scott and Sons Company. It was marketed in large cloth bags under the name of Scotts Turf Builder®. This branded slow-release fertilizer continues to be sold today—74 years later, in a synthetic organic formulation. An activated sewage sludge, Milorganite®, was first produced by the Milwaukee Metropolitan Sewerage District in Milwaukee, Wisconsin, in 1925, and subsequently was marketed nationally in bags as a speciality turf fertilizer in the mid-1930s.

### EVENT NO. 7—TURFGRASS FUNGICIDES

During the late 1920s and early 1930s two fungicides for the control of a number of turfgrass diseases were developed by Drs. John L. Montieth and Arnold S. Dahl of the USDA-USGA Arlington Turf Research Center in Washington, DC. The first truly effective fungicides for the control of *Microdochium* patch, *Rhizoctonia* brown patch, *Sclerotinia* dollar spot, and *Typhula* blights involved the use of inorganic mercury and cadmium compounds, which continued for 40 years.

### EVENT NO. 8—POWERED ROTARY MOWER

In the 1930s the first powered rotary mower was developed by Power Specialities Limited of England. The power source, a gasoline internal-combustion engine, generated the needed cutting-blade velocity to mow grasses. This resulted in the capability to mow minimal maintenance turfs at a higher height and a less frequent interval, which are conditions in which reel-type mowers are not very effective. Today a majority of residential lawns in the United States are mowed with powered rotary mowers.

### EVENT NO. 9—POP-UP SPRINKLER HEAD

In the early 1930s the first underground pop-up sprinkler head was developed by the Thompson Company in California. This was a major advance compared to the numerous types of individual, fixed, hose-end sprinklers of the oscillating or rotating type previously available, as they had to be manually moved frequently for effective irrigation.

### EVENT NO. 10—2,4-D-SELECTIVE BROADLEAF WEED CONTROL

In the mid-1940s the first truly effective herbicide for the selective removal of broadleaf weeds from perennial grasses was developed by Gretchen Fannie-Fern Davis in Washington, DC. Some of the earliest turfgrass tests were

conducted on the turfed mall area between the U.S. Capitol and Washington Monument. The development-use strategy for 2,4-D on turfgrasses was a major event. It remains a key herbicide in the management of quality turfgrass areas more than 50 years later.


### EVENT NO. 11—POWERED CORING MACHINE

In 1946 the first powered, mechanical coring machine was invented by Thomas C. Mascaro in West Point, Pennsylvania. A manual three- to four-tined coring unit was developed in England in the 1920s. However, it was not a widely used practice because of the very intense manual labor involved. It was not until the development of the mechanically powered, hollow-tined coring unit by Tom Mascaro that extensive coring of intensively trafficked turf areas came into widespread use, and continues to be used.

### EVENT NO. 12—VERTICAL CUTTING MACHINE

In 1952 the first powered, mechanical vertical cutting machine was developed by Thomas C. Mascaro of West Point, Pennsylvania. Thatch had been a continuing problem on turf areas for a long time, and there was no truly effective way of selectively removing an excessive accumulation of thatch, other than the total physical removal of the turf-thatch profile with a sod cutter and reestablishment. For the first time, in 1952, there was an efficient, effective method for vertical cutting into the turf canopy and removing the excess, dead organic material without totally destroying the living turf canopy. The basic design of the original vertical-cutting unit continues to be the standard in use to this day.

### SUMMARY

In our modern times of the 21st century some of these top 12 events seem of minimal significance. However, at the time they were developed or invented these contributions were very major advances in improving the quality and lowering the cost of turfgrass maintenance. Modern turfgrass science evolved gradually based on these early inventions and art-dominated trial and error developments between 1800 and 1952. These pioneering individuals and companies need our utmost respect for their very important contributions. 

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