# CHOOSING APPROPRIATE AERIFICATION METHODS FOR GREENS

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Aerification is a term used synonymously with aerifying and aeration. All are terms that describe the more technically accurate process of turfgrass cultivation. Turfgrass cultivation is the loosening or "working" of soil with minimal disturbance of the turfgrass surface.

Turfgrass cultivation is an essential cultural practice for golf greens, fairways, and sports fields--for all turfgrass areas that support play or traffic.

Cultivation of golf greens, when performed at the right time with the proper tools, will accomplish a number of things.

Among them:

**1)** Alleviate soil compaction, thereby improving water infiltration and percolation, gaseous exchange between atmosphere and soil air and diffusion of oxygen within the soil and root zone.

**2)** Provide for deep placement of fertilizer, especially the mineral constituents and thereby promote deeper, more extensive root growth;

**3)** Mix topdressing and other surface-applied materials into existing soil thereby developing a more uniform soil profile and precluding buildup of layers that are disruptive to movement of water and that adversely affect root growth;

**4)** Affect or facilitate textural (particle size) changes in surface layers when used in conjunction with topdressing;

**5)** Eliminate, disrupt, mix or at the least, partially alter textural composition of layers especially those of variable constituents and textural classes;

**6)** Remove and reduce thatch mechanically as well as promote biological decomposition of thatch;

**7)** Prepare seedbeds in established and damaged turfgrass areas for reseeding and for overseeding;

**8)** Prepare seedbeds in established and damaged turfgrass sites for introduction of new, improved species and cultivars of turfgrass, and;

**9)** Aid in leveling and truing of turfgrass surfaces.

Most of these functions improve the soil-air-water relationships and, as a result, promote deeper more efficient root systems and consequently, more easily managed, healthy, vigorous dense and wear-resistant turfgrass.

Compaction resulting from the surface pressure of traffic occurs for the most part, in the upper 2-3 inches of the soil. The zone of maximum compaction usually is found between 3/4 and 1 1/2 inches below the surface. And, layers of non-uniform textural materials caused by poor construction techniques sometimes occur on greens. In these latter cases, "deep tine' cultivation may be required. However, tines that penetrate 3, 3-1/2 inches effectively alleviate compaction caused by surface traffic.

## How Turfgrass Soils Are Cultivated

Cultivation of turfgrass is accomplished by one or more of three basic methods. Namely, spiking or coring. For best performance throughout the growing season a combination of devices and techniques will produce more satisfactory results than will the use of a single unit on a continuing a basis.

**Spiking** —This was, more than likely, the earliest turf cultivation technique. Nails driven though a board to which a handle was attached; or a pitchfork-like device used to punch holes in severely compacted, heavily-thatched, diseased or otherwise damaged areas is conjectured to have been the earliest tool used for this process.

**Slicing** — is accomplished by a number of disc-type devices. These simply slice through the sward into the soil. Depending upon the nature of the unit and the size, shape and configuration of the tine or blade, slicers may be used as a "quick fix" for crusted soil, to break up relatively thin layers of clay and silt that have been deposited by windstorms, and to simply cultivate turf areas. Also, the process may be used to prepare a seedbed for in-season repair and to facilitate overseeding.

**Coring** — is a turf cultivation technique that employs a hollow tine to punch a hole through the turf into the soil and extract a "core" of soil as the tine exits. The core or plug of soil is then deposited on the surface.

Three tine configurations are generally recognized:

**1)** A straight hollow tine that punches a vertical hole and that extracts a more or less cylindrical plug of soil;

**2)** A closed tine; or, sometimes a partially open "spoon" that penetrates the soil at a 50 to 60

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degree angle; then, as the unit moves forward, the point of the tine or spoon sweeps backward and exits at a similar angle. This action creates a cultivated "cavity" and extracts a plug of soil. The underground cavity thus created is substantially greater than the hole that results from vertical penetration only;

**2)** A closed tine; or, sometimes a partially open "spoon" that penetrates the soil at a 50 to 60 degree angle; then, as the unit moves forward, the point of the tine or spoon sweeps backward and exits at a similar angle. This action creates a cultivated "cavity" and extracts a plug of soil. The underground cavity thus created is substantially greater than the hole that results from vertical penetration only;

**3)** "Drill" type times will cultivate under a wide range of soil conditions and remove a spiral of soil. It'd major disadvantage is the slowness of operation.

Timely cultivation, especially coring, is a practical way of reducing excess thatch and of maintaining a desirable level of thatch. Cultivation combined with topdressing helps to mix soil and organic matter at or near the soil surface. This speed microbial activity and reduces thatch. Thus, core cultivation increases air, water and nutrient penetration of the thatch layer and further, aids in thatch decomposition.

Agnew (Grounds Maintenance, Sept, '85), shows the effect of tine diameter and spacing on the amount and percentage of soil removal by coring to a 3 inch depth. Table 1 and 2 prepared by Agnew are shown below.

Cultivation disrupts a smooth, true putting green surface. And, when topdressed following cultivation, the green putts more slowly for the next 6-8 days. When putting surfaces are disturbed during the playing season, golfers are unhappy! As a result, greens are usually cultivated only in the spring and the fall. And, often an insufficient number of tines to adequately alleviate compaction. Thus, when environmental stress due to temperature or moisture extremes occur, the grass is unable to cope.

A machine which incorporates a new concept of cultivation that avoids surface disturbance but breaks up layers and alleviates compaction to a depth of 5-7 inches will be available near term. It shows great promise of providing a means of cultivating greens throughout the growing season without causing damage to the turfgrass or the putting surface.

Cultivation is an essential cultural practice. It improves water infiltration and percolation, enhances soil compaction and aids in the decomposition of thatch by creating an environment conducive to microbial activity. Currently, the golf course superintendent has a wide array of equipment and techniques from which to select the most appropriate method to cultivate their greens. Factors that affect that decision are climate, weather, amount of play, type of soil, green design (as it affects traffic flow), thatch and type of grass.

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Table 1

Cubic inches of soil removed by coring to a 3-inch soil depth

| Tine diameter (inches) | Tine spacing (inches) 6" | 4" | 2" |
|---|---|---|---|
| 1/4" | 0.60 cu. in. | 1.40 cu. in. | 5.40 cu. in. |
| 1/2" | 2.40 cu. in. | 5.30 cu. in. | 21.20 cu. in. |
| 3/4" | 5.30 cu. in | 12.00 cu. in. | 47.90 cu. in. |
| 1" | 9.40 cu. in. | 21.20 cu. in. | 85.00 cu. in. |

Table 2

Percentage of soil removed from a 6-in. soil profile by coring to a 3-in. soil depth

| Tine diameter (inches) | Tine spacing (inches) 6" | 4" | 2" |
|---|---|---|---|
| 1/4" | .07% | .16% | .63% |
| 1/2" | .28% | .61% | 2.45% |
| 3/4" | .61% | 1.39% | 5.54% |
| 1" | 1.09% | 2.45% | 9.83% |