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## TURFGRASS BENEFITS - A SCIENTIFIC ASSESSMENT

Humans have used turfgrasses to enhance their environment for over 10 centuries. Golf has been played on turfgrass for 5 centuries or one-half that time. Thus, humans have had an interest and willingness to invest time in maintaining turfgrasses for the enhancement of their environment for many centuries. Point in fact, turfgrasses may be one of the older techniques humans have used to enhance their external living environment. Thomas Jefferson, one of the foremost statesmen in the United States, once wrote that communities "should be planned with an eye to the effect upon the human spirit by being continually surrounded by a maximum of beauty."

Over 7,500 species of grasses, grouped in 600 genera, are widely distributed around the world. While turfgrasses can be identified as to their origin in specific regions of the world, most of the major turfgrasses used have been naturalized throughout most of the world for over 400 years. If humans should disappear from this continent, these turfgrasses would continue to persist and thrive.

Turfgrasses are one of the principle vegetations used on golf courses. While there are certain intensively maintained turf areas on the golf course in terms of closely mowed putting greens, tees, and fairways, more than 70% of the golf course is devoted to areas consisting of a naturalized ecosystem. These areas provide rich habitat for trees, shrubs, flowers, birds, fish, and other wildlife. Unfortunately, there is a tendency for golf courses to not be recognized for their valuable contribution in preserving a naturalized ecosystem in and near urban areas. If golf courses did not exist, these areas would probably be used either for urban residential and industrial development or for intensive agriculture.

Turfs have numerous important functions, as well as being both aesthetically attractive and important outdoor recreational surfaces. These

important beneficial dimensions that contribute to our quality-of-life are too often overlooked. The maintenance of our turfgrasses contributes US \$45 billion annually to the United States economy, which represents a substantial number of jobs.

### Soil Erosion and Dust Stabilization.

Turfgrasses are one of the more inexpensive, durable ground covers. They offer one of the most cost-effective methods to control wind and water erosion of soil, thereby protecting this valuable, nonrenewable soil resource. For example, studies have shown the comparative soil sediment loss from a very intense 3 inch (75 mm) per hour rainfall to be 199 lbs/acre (223 kg ha<sup>-1</sup>) from bare crop land, whereas the loss from a turfgrass cover was only 15% as much (Gross, et al., 1991). Note that rains of this intensity are rare. Most rains in the more normal range of 1 inch (25 mm) or less are characterized by negligible sediment loss from turfgrass areas.

### Water Entrapment, Ground Water Recharge and Flood Control.

A mowed turfgrass has from 30 million to 8 billion shoots per acre (Beard, 1973), with a shoot density of over 26 billion occurs on closely mowed greens. The closer the mowing height, the higher the shoot density. This dense plant canopy of mowed turfs is one of the most effective systems for the entrapment of water and water-borne particulate matter and chemicals. The large amount of water runoff from impervious surfaces, such as asphalt, concrete and roofs in urban areas, carries many pollutants in the runoff water that are trapped in the turf canopy thereby protecting the quality of surface waters.

The dense turfgrass canopy acts essentially as a sponge that greatly reduces the intensity of runoff water shortly after rains, thereby (a) holding water in place which increases the rate of ground water recharge and (b) reducing the rate and amount of runoff water which decreases the extensiveness and need to invest in expensive man-made flood control structures.

**Carbon Storage.** A grassland ecosystem is well known for its high soil organic matter levels. A high proportion of the world's most fertile soil was formed under a grass ecosystem. The very unique extensive, fibrous root system of turfgrasses contributes substantially to soil improvement through organic matter additions from decomposing roots and underground stems, that have an estimated turnover rate of 42%. For a turfgrass, 66% of the annual net productivity in plant biomass is below ground (Falk, 1967). Thus, turfs function in carbon storage via conversion of carbon dioxide emissions to soil organic matter. They also serve a vital function in the restoration of environmentally damaged lands.

**Organic Chemical and Pesticide Degradation.**

Turfgrasses have a unique, fibrous root system that is continually being replaced. The resultant dynamic root decomposition process supports a large, diverse population of soil micro-flora and micro-fauna. Compared to grassland, the average microbial biomass is 42% less for cropland and 29% less for forests. These measurements were made on unirrigated grasslands, thus many irrigated turfgrass areas would have microbial populations that are even larger. The turfgrass-soil ecosystem with its large microorganism population offers one of the most active biological systems for degradation of trapped organic chemicals and pesticides, thereby functioning in the protection of ground water quality.

**Enhanced Heat Dissipation.** The transpirational cooling capabilities of turfs have a significant impact on the urban microenvironment. Urban areas tend to be 10 to 12°F (4.6-6.7°C) warmer than adjacent rural areas. Thus, a higher percentage of turfgrass areas in urban communities relative to impermeable surfaces reduces this heat island effect. These transpirational cooling effects on the microenvironment strongly buffer the potential heat stress effects to humans

participating in sports and recreation on turfed surfaces when compared to the alternatives.

Type of Surface	Maximum Temperature °F (C)	Percent Temperature Increase Compared to Green Turf
Green growing turf	88 (31)	--
Dry, bare soil	102 (39)	16
Brown, dormant turf	126 (52)	43
Synthetic turf	148 (70)	80

**Reduction in Noise and Glare.** Significant noise abatement can be achieved through the use of turfgrasses. For example, a 4-inch (100 mm) high turfgrass canopy along a road abates vehicle noise levels by 40% in a distance of 70 feet (21.3 m) (Cook, et. al., 1971). This noise abatement is further accentuated by a combination of turfs, trees, and shrubs. By the same token, the multi-directional reflection of turfgrasses significantly reduces the discomfort of visual glare effects on the human eye.

**Decreased Noxious Pests and Allergy Related Pollens.**

Mowed turfgrasses surrounding residences and buildings reduce the natural habitat for certain undesirable animals, such as snakes, rats, and mice as well as insects, such as mosquitos, chiggers, and ticks (Clopton and Gold, 1992). The latter are particularly significant in the spread of Lyme disease. Finally, numerous allergy related pollens produced by dicotyledonous plants are reduced significantly in mowed turf areas.

**Reduced Fire Hazard and Enhanced Security.**

The living green space of irrigated turf on parks, golf courses, and residential lawns provides a

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significant green space of low fuel value that is vital as a fire break, particularly in areas that are subject to extended summer droughts (Youngner, 1970). Also, mowed turfs provide a high visibility zone that restricts the activities of unwanted intruders.

**Wildlife Habitat.** A diverse range and a large number of wildlife are supported by the integrated landscape of grasses, trees, shrubs, and water features commonly found on over 66% of a typical golf course area and in parks. Studies by scientists conducted on the municipal golf courses in the Cincinnati, Ohio area led to the conclusion that golf courses may be described as bird sanctuaries, especially when compared to the surrounding urban and intensive agricultural uses (Andrew, 1987).

**Recreational Benefits.** Turfgrasses enhance the physical health of sports and recreational participants. Over 24 million golfers play 500 million rounds of golf on more than 15,000 golf courses in the United States. This represents 2.4 billion hours of healthy outdoor recreation. As golf courses represent less than 4% of the turf facilities, the total recreational activities provided by turfs is many times greater. Turfs also provide a resilient cushion that minimizes injuries.

**Ornamental Benefits.** Turfgrasses provide beauty and aesthetic benefits that are difficult to quantitatively measure. In 1971 Harris-Life survey 95% of the respondents reported one of the things they wanted most around them was "green grass and trees." Golf courses help satisfy this human need. There also are the benefits derived from improved mental health, social harmony, and work productivity (Ulrich, 1984). How we use vegetation in our surroundings is basic to social stability and harmony, particularly in urban areas. Ugliness is costly! Cities can be dismal without green turfs in parks, along streets, surroundings homes, and on golf courses. If we fail to provide

representative amounts of turf in urban communities, there tends to be a loss of human productivity and greater susceptibility to anxieties that may lead to mental diseases. The clean, cool, green of turfs provides a pleasant environment in which to live, work, and play. Such aesthetic values are increasingly important to the dignity of the human spirit and to mental health, especially for urban residents.

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