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Green Section
FORE THE GOLFER
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This small sample of turf, thatch, soil and roots is teeming with a host of beneficial organisms that help filter air and water.

GOLF COURSES: LIVING BIO-FILTERS

BY USGA GREEN SECTION

Golf provides significant benefits to society. In 2011 golf was a $68-billion industry in the U.S. that had a total impact on the U.S. economy of more than $176 billion (Golf 20/20). Golf also has positive impacts on physical and mental health, not to mention real estate values. Perhaps most importantly, however, golf courses provide significant environmental benefits.

An entire book would need to be written to describe all the positive impacts that golf courses have on water quality, wildlife habitat, erosion control, sound abatement and local climates. In this short article, several facts are provided about how golf courses improve their surrounding environment. Golf course playing surfaces are living turfgrass ecosystems that provide the following sample of environmental benefits, among many others. Keep these figures in mind the next time you play a round of golf:

- An average 18-hole golf facility occupies a median of 150 acres comprised of 95 acres of maintained turf, 26 acres of naturalized areas and 6.4 acres of water features (GCSAA). Only 34.3 acres, or **36 percent** of the turf is intensively maintained greens, tees and fairways.

- Within the maintained turf area, there are billions of individual grass blades. Conservative estimates range from 30 million grass blades per acre on tees, fairways, and rough and 27 billion grass blades per acre on putting greens (Beard). This adds up to more than **80 billion** grass blades on an average 18-hole golf course. All of this grass improves air quality by producing oxygen, fixing carbon and trapping dust particles. Grasses also have extensive root systems that stabilize sediments, reduce erosion and filter harmful compounds from storm water runoff, thereby improving the quality of adjacent water bodies. Grass blades also reduce noise pollution when compared with paved surfaces like roads.

- Turfgrass supports earthworm populations averaging from 128 to 310 per square meter (Johnston, et al.). This equates to anywhere from **49 million to 119 million** earthworms on the average 18-hole golf course. Earthworms recycle nutrients, encourage the growth of soil microbe populations and aerate the soil, which reduces runoff. The turfgrass ecosystem also hosts more than 100 taxa of beneficial soil organisms.

- Golf courses are often host to more than **200 billion** soil microorganisms in just the first 6 inches of every square foot of soil (Zuberer). With more than 4 million square feet of maintained turf on an average 18-hole golf course, this equates to an astounding number of beneficial microbes that are busy recycling nutrients and degrading chemicals in the soil.

Golf courses, with their immense turfgrass and microbial populations, make excellent filters for storm water runoff and treated wastewater. In fact, a recent multi-year study of several golf courses in the southwestern United States found that turfgrass ecosystems can filter more than 80 percent of the pharmaceuticals and personal care products found in non-potable treated wastewater (McCullough). Water treatment facilities only remove about 80 percent of these chemicals from the non-potable wastewater used for irrigation. When the treated wastewater is applied to turf, the turf and its associated microbial populations remove an additional 80 percent of the remaining compounds for a combined removal of **96 percent** of the pharmaceuticals and personal care products found in non-potable treated wastewater.

Since 1921, the USGA has funded **$40 million** in turfgrass and environmental research. Currently, the USGA funds nearly $1 million in university research annually (USGA TERO). The research efforts help to improve our understanding of golf course ecosystem dynamics. Consider this the next time you take a divot at your local golf course and know that the USGA is on the forefront of protecting and enhancing the environmental value of golf courses.