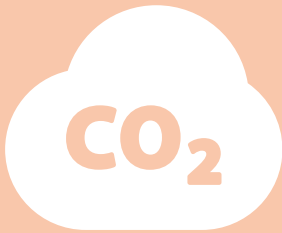


ENVIRONMENTAL BENEFITS OF NATURAL TURFGRASS



Trap and Store Carbon

During photosynthesis, turfgrasses remove carbon dioxide and add oxygen to the atmosphere.

With increasing levels of atmospheric carbon dioxide associated with the greenhouse effect, turfgrasses serve as a source of carbon storage, or sequestration. Grasses remove about 6 tons

of carbon dioxide per acre per year from the atmosphere. Although some benefit is reduced by maintenance practices requiring fossil fuels (i.e. mowing or production of fertilizer), practices such as mowing, returning clippings, fertilizing, and watering increase the ability for turfgrass to sequester carbon. In other words, healthier plants mean more carbon storage. Over the course of a year, a 2,500 square-foot lawn absorbs enough carbon dioxide to produce oxygen for a family of four, and a soccer field can offset the carbon produced by a car driving 3000 miles. (1, 2, 3)

Dust and Pollen

Healthy turfgrass areas have few weeds, which reduce pollen levels. Regular mowing prevents grass plants and weeds from producing pollen-bearing seedheads and flowers. The fibrous root systems of turfgrass plants form soil netting that reduces dust. Leaf tissue also traps dirt and dust particles to protect air quality. About 12 million tons of dust is released into the atmosphere each year in the U.S., and much of it is trapped by grass. (3)



Controls Soil Erosion and Water Run-Off

Run-off and erosion of soil is considered one of the primary causes of nutrient contamination in water systems. Research shows that sediment loss from grass is negligible under normal rainfall conditions. A fibrous root system, characteristic of healthy turfgrass, holds soil in place and provides stabilization on both flat and sloping areas. A dense shoot and root system slows surface water movement and improves the likelihood of water infiltrating into the soil. The average soccer field can absorb 50,000 gallons of water before run-off occurs. Turfgrass systems help protect water sources by stabilizing soil and slowing and filtering run-off before it enters storm water drains or natural water bodies. (3, 4)



ENVIRONMENTAL BENEFITS OF NATURAL TURFGRASS

Prevent Contaminants from Entering Water Sources



Turfgrass systems are efficient at holding onto nutrients and other pollutants. Nutrients like phosphorus are fixed onto soil particles or taken up by the plant and are not leached out readily. When fertilizer is applied to healthy turfgrass, nutrients are held in the soil and utilized by the plants. The root and thatch layer in turfgrass systems also effectively bind pollutants, such as oil, grease, and other household and industrial wastes. Grass buffer strips are frequently used around farm fields, streams, waterways, and in urban areas to filter soil and remove chemicals before they enter surface or groundwater. (2, 3)

Temperature Modification

Urban areas with fewer grasses and landscape plants are 10-15 percent warmer than rural areas. On a hot summer day, well maintained turfgrass is typically 30 percent cooler than asphalt and 14 percent cooler than bare soil. Research from Brigham Young University indicates that on an 81.4°F day, the average surface temperature on a natural grass surface is 78°F, while the average surface temperature on asphalt is 109°F. Turfgrass cools the atmosphere through the process of transpiration. Water evaporates through the stomata, tiny openings in the grass blades, which cools the grass plants and surrounding environment. Transpiration helps reduce temperatures in the urban environment by dissipating high levels of radiation. The overall environmental cooling effect of turfgrass can be understood by comparing it to air conditioning. The front lawns of eight average houses have the same cooling effect as 24 (3-4 ton capacity) home central air conditioning units. (2, 3, 5)



Sources:

1 - Texas A& M University - Economic Impact of Turfgrass - <https://scsc302.tamu.edu/scsc302-700+/rduble/ppt/intro2.pdf>

2 - Ohio State University - The Benefits of Turf - http://buckeyeturf.osu.edu/index.php?option=com_content&view=article&id=1277:the-benefits-of-turf&catid=1:latest-news&Itemid=170

3 - Kansas State University - Benefits of Healthy Turfgrass - <https://www.bookstore.ksre.ksu.edu/pubs/MF2940.pdf>

4 - Recommendation of the Expert Panel to Define Removal Rates for Urban Nutrient Management - http://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2015/03/CBP-APPROVED-FINAL-UNM-EXPERT-PANEL-REPORT-032514_SHORT.pdf

5 - Brigham Young University - Synthetic Surface Heat Studies

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INTEGRATED PEST MANAGEMENT FOR TURFGRASS AREAS

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SAFE
The Foundation for Safer Athletic Fields



Pesticides are a small part of a complete turf program that is the key to safe fields. Public health and safety are always the sports turf managers top priority when maintaining athletic fields. Responsible managers combine mowing, fertilization, irrigation, and other cultural practices to maintain healthy, dense, uniform surfaces. Responsible sports turf managers utilize IPM practices on sports and recreational surfaces to create safe playing surfaces and reduce human exposure to pests and pesticides.

Removing pesticides alone will not make athletic fields automatically safe for children. In research conducted at University of Tennessee, a Tifway Bermudagrass field subjected to 15 games was compared to 15 simulated games on a crabgrass plot. Weeds and other pests can reduce playing surface strength and uniformity and lead to safety concerns. (1)



Tifway Bermudagrass After 15 Simulated Games



Large Crabgrass After 15 Simulated Games

Photo credits: James Brosnan, Ph.D. and John Sorochan, Ph.D.

Photos retrieved from Factors that Affect Dislodgeable Foliar Residues and Environmental Fate of Pesticides – Travis Gannon, Ph.D. – 2017 STMA Conference Presentation

Integrated Pest Management (IPM) is an approach to pest management that blends all available management techniques – nonchemical and chemical – into one strategy: Monitor pest problems, use nonchemical pest control, and resort to pesticides **ONLY** when pest damage exceeds an economic or aesthetic threshold. (2)

IPM is an environmentally friendly, common sense approach to controlling pests. Traditional pest control involves the routine application of pesticides. IPM, in contrast, focuses on pest prevention and only uses pesticides as needed. (2)

Every IPM program is designed based on the pest prevention goals and eradication needs of the situation. Successful IPM programs use a four-tiered implementation approach: Identify pests and monitor progress; set action thresholds; prevent; and control. (2)

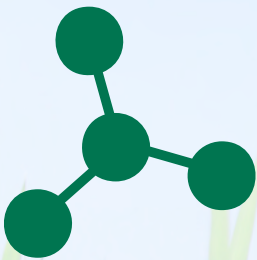


Integrated Pest Management for Turfgrass Areas



IPM creates a safer and healthier environment by managing pests and reducing human exposure to pests and pesticides. IPM is an effective and environmentally-sensitive approach that offers a wide variety of tools to reduce contact with pests and exposure to pesticides. (2)

A common way to document toxicity is by oral LD₅₀ values. LD₅₀ is the amount of chemical required to provide a “lethal dose” to 50% of the test population. LD₅₀ is measured in mg of chemical administered per kg of body weight. Therefore, an oral LD₅₀ of 500 means that 500 mg of chemical was needed to obtain lethality in a 1 kg subject (such as a rabbit). The lower the LD₅₀ value, the less chemical that is required to reach lethality. A chemical with an LD₅₀ of 10 mg/kg is more acutely toxic than one with an LD₅₀ of 100 mg/kg. (3)



Herbicides often have a higher LD₅₀ value than many commonly used or consumed products. Herbicides target highly specific biological or biochemical processes within plants, such as photosynthesis and production of branch-chain amino acids. Because humans do not photosynthesize or produce branch-chain amino acids, there is no place for the herbicide to bind in a human body and therefore have very little impact. Because the herbicides do not bind in a human, they are often excreted within 24 hours of the dose. That flushing does not allow concentrations to build up to toxic levels in the body. (3)

Even though some pesticide products are considered only slightly toxic or relatively nontoxic, all pesticides can be hazardous to humans, animals, other organisms, and the environment if the instructions on the product label are not followed. Following the directions on the label for personal protective equipment (PPE) and restricted entry interval (REI) keeps applicators and the public safe. It is a violation of Federal law to use pesticide products in a manner inconsistent with the labeling. Applicators are legally responsible for any misuse of a pesticide. (4)



Integrated Pest Management for Turfgrass Areas

The dose makes the poison. The lower the LD₅₀ of a pesticide product, the greater its toxicity to humans and animals. Pesticides with a high LD₅₀ are the least toxic to humans if used according to the directions on the product label. Compare the LD₅₀ of pesticides with some everyday chemicals.

LD₅₀ COMPARISON BETWEEN HOUSEHOLD ITEMS AND COMMON PESTICIDES	
CHEMICAL	LD₅₀
Nicotine	9
Paraquat (used to control broadleaf weeds and some grasses in agricultural crops)	~100
Caffeine	192
Bleach	192
Diazinon (used to control insects on fruit, vegetable, nut, and field crops)	300-400
Tylenol	338
Household ammonia (10%)	350
Carbaryl (used to control insects on trees and ornamentals, turfgrass, vegetable crops, rangeland, etc.)	500
2,4-D (used to control broadleaf weeds in agricultural crops, fruit and nut orchards, pastures, turfgrass, aquatic weeds, etc.)	666
Pyrethrum (used to control insects on ornamentals, flowering plants, and vegetables in gardens and greenhouses)	1500
Azoxystrobin (used to control fungal disease in a range of crops)	>2000
Table Salt	3000
Permethrin (used to control insects on fruits, vegetables, and trees. Also commonly used to prevent ticks)	>4000
Iprodione (used for the prevention and control of certain diseases of turfgrass and ornamentals)	>4400
Glyphosate - commonly known as Roundup (used for control of annual and perennial weeds and woody plants)	4900
Imazaquin (used to control weeds on established Bermudagrass, centipedegrass, St. Augustinegrass, seashore paspalum, and zoysiagrass in commercial and residential situations)	>5000
Chlorothalonil (used to control fungal diseases in trees, turfgrass, and ornamentals)	>10,000

Sources

- 1 - Factors that Affect Dislodgeable Foliar Residues and Environmental Fate of Pesticides - Travis Gannon, Ph.D. - 2017 STMA Conference Presentation
- 2 - Environmental Protection Agency (EPA) - Introduction to Integrated Pest Management - <https://www.epa.gov/managing-pests-schools/introduction-integrated-pest-management>
- 3 - University of Florida - Herbicides: How Toxic Are They? - <http://edis.ifas.ufl.edu/pi170>
- 4 - Penn State University - Toxicity of Pesticides - <http://extension.psu.edu/pests/pesticide-education/applicators/fact-sheets/pesticide-safety/toxicity-of-pesticides>