

Texas State Golf Course
Integrated Pest Management Plan

Joe Villarreal
Fields Superintendent of Campus Recreation
Texas State University
601 University Dr.
San Marcos, TX 78666
Phone: 512-245-8421
Fax: 512-245-8486
Email: jv26@txstate.edu

I. Introduction

The Texas State Golf Course recognizes the potentially serious risks inherent in using chemical pesticides on the campus – especially in an environmentally sensitive setting like ours at Spring Lake.

Several examples of cultural methods to control pests include optimizing turf health through turf management practices to enhance natural plant resistance to pest infestation, optimizing habitats for beneficial species, and minimizing turf damage resulting from routine golf course operations. On occasion, when cultural practices are not fully effective at controlling pests, the use of pesticides to manage pest damage may be necessary. An essential component of the Integrated Pest Management Plan (IPM) is the coordination of the ongoing use of cultural methods with the selective use of these agents as a means of minimizing the need for pesticide application. Accordingly, the IPM provides Texas State Golf Course a sound working framework for the selection and implementation of the most environmentally sound solutions to manage golf course pest problems.

Because of the location of the golf course, adjacent to the environmentally sensitive Spring Lake, activities and materials used at the golf course are routinely monitored by the Spring Lake Manager and the Spring Lake Environmental Review Committee as part of the Spring Lake Management Plan. This monitoring, including routine tests of water quality in Spring Lake, assure that golf course activity has minimal impact on the unique ecosystems found in the lake.

II. IPM Definition

Integrated Pest Management is a sustainable approach to managing pests and minimizing the economic, health, and environmental risks. A primary goal of an IPM plan is to protect the environment and human health while running an economically viable golf course.

III. IPM Objectives

- Minimize potential hazards to human health and the environment
- Optimize playing conditions of the golf course
- Control operating costs
- Utilize effective monitoring to enable selective control of pest populations
- Minimize pesticide use through targeted application while optimizing pesticide efficacy
- Sustain high turf grass quality
- Maintain health of landscape elements such as trees, plants, and natural areas

IV. IPM Structure

(Not needed)

V. Area Definition

The Texas State Golf Course is a 9-hole golf course that borders Spring Lake in San Marcos, Texas. The property is owned by Texas State University and considered part of campus.

a. Turfgrass areas

Bermuda grass is the turfgrass used on all areas of the golf course (tees, fairways, greens). Common Bermuda grass makes up tee areas and fairways while putting surfaces consist primarily of a 419 Bermuda grass.

b. Non-turfgrass areas

Non-turfgrass areas consist of bunkers, ornamental plantings, trees, aquatic areas, and natural areas.

1. Bunkers

Six green-side bunkers are located throughout the golf course. Bunker management will be confined to routine maintenance including edging, raking and smoothing of sand contained within the bunkers.

2. Ornamental Plantings

A small number of ornamentals plants and shrubs are located in flower bed areas throughout the golf course

3. Natural Areas

Natural areas at Texas State University Golf Course are areas adjacent to golf course greens, tees and fairways/roughs that are comprised of native plant material. These areas will be left unmanaged to provide a wildlife corridor through the property as well as to serve as an environment and habitat for the native bird and animal population.

4. Buffer Zones

Buffer zones at the Texas State Golf Course are areas adjacent to Spring Lake that will receive no application of fertilizer, fungicides, insecticides, or broadleaf herbicides. Currently, a minimum 10-foot buffer zone is maintained. The buffer zones are defined by a series of wooden posts and chains. This area will left to grow naturally. Any maintenance of this area will be done in consultation with the Spring Lake Manager, the Spring Lake Environmental Review Committee and University Grounds Maintenance.

5. Cart Paths and Service Roads

The golf course has a continuous cart path that extends from tee to green and tee of the next hole. Cart paths are partially paved while the majority are gravel.

VI. Turfgrass Management Practices

The primary objective of the Integrated Pest Management program is to optimize turfgrass vigor utilizing sound cultural practices as a means of preventing and/or minimizing pest infestation. The primary cultural practices of turfgrass management at the Texas State Golf Course include mowing, fertilization, and irrigation. Secondary cultural practices include aeration, thatch management, topdressing, overseeding, and sod replacement.

A. Primary Cultural Practice**1. Mowing**

Mowing will be performed on an as-needed basis and mowing frequency is area dependent. During the growing season, mowing of greens will occur approximately five times a week, mowing of tees and fairways will occur one time per week.

Mowing heights will be adjusted for individual areas based on seasonal/cultural conditions. Mowing heights will be 1/8 – 3/16 inches for putting greens. The fairways will be mowed at 3/4 inches and the lengths of the roughs vary from 1-3 inches. Buffer zones will not be mowed, but left in a natural state.

2. Fertilization

Management of nutrients is essential for development of turf vigor. Management of turf fertility involves the understanding of soil composition, plant nutrient requirements, fertility management history, use of soil/tissue test information, and applications of the appropriate fertilizer formulations at the proper time. Additionally, the availability of beneficial soil microbes and biological amendments will be considered when managing the soil nutrient program. The objective of the fertilizer program is to provide optimal nutrient availability to turf while simultaneously avoiding the application of excess nutrients to avoid nutrient runoff/leaching, disease development and weed infestation. Accordingly, every effort will be made to minimize fertilizer application in an effort to strike a balance between optimizing turf vigor and preventing nutrient runoff and/or leaching.

The fertilizer treatment plan/schedule will be reviewed at the beginning of each year with the Spring Lake Manager. Any unique situation that may occur requiring deviation from the projected schedule will be reviewed with the Spring Lake Manager. An annual report of all application of fertilizers made during the year will be provided to the Spring Lake Manager.

a. Fertilizer Treatment Areas

Fertilizer applications are only applied on the putting surfaces and tee areas as needed.

b. Fertilizer Application

Fertilizer application equipment is calibrated prior to use to ensure proper rate of application. Fertilizer will not be applied if heavy rain is forecasted following the potential application event. Liquid applications will not be sprayed in high winds.

c. Fertilizer Storage

All fertilizers are maintained in our maintenance shop protected from the weather.

d. Fertilizer Documentation

All fertilizer applications will be documented. Information recorded will include date of application, location of application, total area treated, formulation of fertilizer(s), rate of application expressed as lbs. of N/1,000 ft², total quantity of product applied, and the applicator(s) name.

3. Irrigation

The distribution of adequate water onto turf via irrigation without over-watering is essential to turf health. In addition to providing optimal moisture levels for turf, irrigation practices are designed to conserve water whenever possible. During periods of hot weather, dry areas will be hand-watered in mid-afternoon as required, and the irrigation system runs overnight. Irrigation system on timer and has evapotranspiration sensor on it to make necessary adjustments. Finally, wetting agents may be used when necessary to improve water infiltration for localized dry spots and other hydrophobic areas of turf. Wetting agents will be applied in accordance with label rates and recommendations.

a. Water Source

The Texas State Golf Course pumps water directly out of Spring Lake to irrigate 7.5 of our 9 holes. City water is used to irrigate the other 1.5.

b. Irrigation System

The current irrigation control system is outdated. We plan to upgrade our control system when it can be afforded. Areas of localized dryness will be treated by hand watering or by the use of sprinklers.

d. Water Conservation

The irrigation system and program are designed to prevent over-application of water as a means of optimizing turf vigor and conserving water. The areas requiring the most frequent irrigation will be greens and tees. Because it represents a substantial percentage of the overall turfgrass area, the fairways and rough will be irrigated using the deep and infrequent methodology in order to conserve water. This methodology will be carefully monitored to ensure that low areas are not overwatered. "Out-of-play" areas will receive no irrigation due to the plant species abilities to extract required moisture through their deep roots.

B. Secondary Cultural Practice

1. Aerification

Aerification is the practice of removing soil cores from turf and is performed to reduce turf compaction. This practice enhances the movement of air, water and nutrients in the soil and is a useful technique to manage thatch layers. Additionally, solid tine aerification is another means of reducing compaction without removing soil.

Aerification will occur primarily on greens and tee surfaces on a regular basis, at least twice a year. Aeration will be typically performed during periods of active turf growth in the early spring, early summer and fall. Additional aeration may occur at the discretion of the Superintendent. In the case of greens, topdressing sand will be applied to fill the core spaces resulting from the aeration treatment. Finally, deep tine or aerification may be performed once every few years to aerify at depths of up to 10 inches to improve drainage whenever needed.

2. Thatch Management

Thatch is a layer of organic debris and the roots, crowns, and stems of grass that exists between the soil and the turf canopy. In the absence of cultural management, this layer becomes thicker over time, resulting in sub-optimal turf growth. Management of thatch is particularly important on greens and consists primarily of aerification and topdressing practices. Efforts will be made to maintain the thatch layer on greens at a depth of 0.5 inches. Thatch management practices will include hollow core aerification, solid core aerification and vertical mowing.

3. Topdressing

The practice of topdressing consists of the application of a layer of sand to greens and is used to assist in thatch layer management and to provide a smooth and firm playing surface. Topdressing applications typically follow the aerification or verticutting of greens, and will also be made in the absence of aerification ("light" topdressing). Following the application of sand, the sand will be lightly brushed into the turf surface.

4. Overseeding

Overseeding is the selective application of turfgrass seed to improve areas of turf depletion and to bolster turf density. Overseeding will be performed in the late fall.

5. Sod Replacement

Occasionally, problems with diseased, damaged, or weedy turf cannot be remedied by cultural practices. Under these circumstances, affected areas of turf will be removed, and fresh turf obtained from a turf farm will be used as replacement.

VII. Tree Management

1. Tree Maintenance

Trees will routinely be monitored for overall health, influence on playing characteristics, the presence of insects and diseases, influence on surrounding turf and ornamentals, and hazard potential. In general, insect and diseases pests are tolerated. Established trees do not require supplemental watering except in situations of extreme drought. Trees will be pruned to optimize

health, allow passage of light, minimize hazard, and manage pests. A commercial tree service will be consulted regarding trees that have disease and/or pest problems beyond the normal scope of golf course management practices. Any trimming of Oak trees on the golf course will be painted with a protective sealant immediately to protect from Oak wilt.

2. Tree Removal

Factors that will determine if a tree is a candidate for removal (e.g., disease, age, hazard) will be evaluated by the Texas State Golf Course Superintendent and then consulted with the Risk Management office on campus. Upon the determination that tree removal is necessary, the tree will be removed by the Texas State Golf Course staff, or when necessary, by a commercial tree service.

VIII. **Composting and Organic Materials Management**

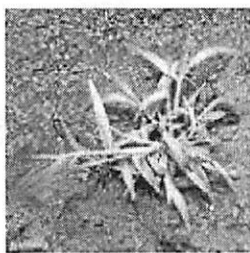
Debris of all kinds is regularly picked up off the golf course. Debris consists of grass clippings, leaves, branches and larger limbs or logs.

Grass clippings, leaves and other compostable materials are taken to the University compost area. Woody plants, branches and logs are taken to the base of the hill along our 5th hole. These branches are chipped into mulch once or twice per year when time permits.

IX. **Potential pests of golf course turf grass**

1. Weeds: Any plant other than the desired turf grass may be considered a weed in turf grass. Specific weeds that are commonly encountered on the golf course include Crab grass, Dallis grass, St. Augustine, Spurge, Goose grass and many others, including annual and perennial species.

2. Turfgrass diseases: Leaf spot (*Helminthosporium* spp.), brown patch (*Rhizoctonia* spp.), rust (*Puccinia* spp.), spring dead spot (*Leptosphaeria* korrae), pythium (*Pythium* spp.), dollar spot (*Sclerotinia homoeocarpa*) and take-all patch (*Gaeumannomyces graminis*).



Crab grass



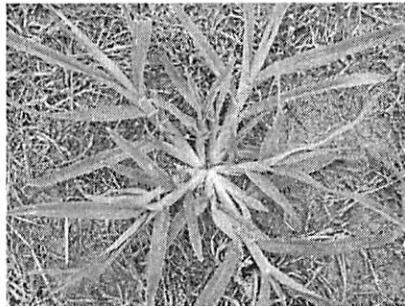
Dallis grass



Bluegrass



Spurge



Goose grass

X. **Pest Threshold Levels**

A. Weeds: The goal for the Texas State Golf Course is not to eliminate all weeds; it is to keep weed numbers low enough to prevent significant visual damage. Turf is a very dynamic ecosystem, and even under optimum grass-growing conditions some weeds will become established. Even height smooth turf is required on the golf course. Treatment for weeds will be considered necessary if weed growth causes the turf surface to be too uneven for golf.

B. Diseases: Turf diseases, if encountered, will be managed quickly after discovery to minimize the spread of disease.

C. Insects: Even height smooth turf is required on golf course playing surfaces. The presence of an infestation will be verified prior to treatment. Treatment for insect infestation will be considered necessary when damage is noticeable, unsightly and/or impacting play on the golf course. Several treatment thresholds are noted in the following information.

1. Armyworms: identified by either a professional landscape maintenance company or trained University staff and treated at 5 per square foot.

2. Chinch bugs: identified by either a professional landscape maintenance company or trained University staff by flushing with water and treated when characteristic damage is evident.

3. Fire ants: identified by either a professional landscape maintenance company or trained University staff by characteristic mound, aggressive behavior or biting; treated when at least one colony exists in a sensitive area, or several colonies exist in a non-sensitive area.

4. Grubs: identified by either a professional landscape maintenance company or trained University staff and verified by digging, and treated at a minimum of 5 \ per square foot.

5. Mole crickets: identified by either a professional landscape maintenance company or trained University staff and treated at 3 per square foot.

6. Sod webworms: identified by either a professional landscape maintenance company or trained University staff and treated at 5 per square foot.

XI. Pesticides

All pesticides used on the golf course are reviewed annually with the Spring Lake Environmental Review Committee to guard against negative impact to Spring Lake and its unique ecosystems. Any modifications to this schedule are made in consultation with the Spring Lake Environmental Review Committee. All pesticides are applied by individuals trained and certified in their use, and are applied strictly following the product's recommended application method.

The following pesticides are currently used on the golf course: Pre-emergent (Crab grass/goose grass), fungicide (Rubigan), Ant bait (Advion), broad leaf herbicide (Speed Zone or Q4), insecticide (Talstar), grassy weed herbicide (Revolver).

Product description and labels for all of these products can be found online.

XII. Facilities Description

All storage and disposal of materials strictly adhere to University policies and procedures (cite University UPPS dealing with storage and disposal of hazardous materials) The methodology is reviewed with the University Office of Risk Management.

1. Maintenance Building

Maintenance functions are performed in a dedicated maintenance building. The building is physically segregated into two main areas (outdoor and indoor). The indoor area consists of office space, tool and small equipment storage, and the staff restroom. The outdoor area is used for large equipment storage, fertilizer storage, fuel and pesticide storage.

a. Maintenance Shop

This area is where all equipment maintenance and repair work will be performed. All fluids and solvents required for maintenance and repair will be maintained within this area and used fluids and solvents will be disposed of according to federal, state, and local guidelines.

b. Equipment Storage

This area will contain all equipment used in golf course maintenance operations including mowers, tractors, and fertilizer and pesticide application equipment.

c. Fertilizer Storage

. All fertilizer is stored in a dry, well-ventilated environment that has restricted access.

d. Pesticide Storage

All pesticides are stored in a well-ventilated storage area that has restricted access.

2. Petroleum Fluid Storage and Disposal

a. Fluid Storage

All oils, solvents, lubricants, and antifreeze will be stored in dedicated areas on secondary containment systems.

c. Fluid Disposal

Used fluids will be disposed of according to state and local regulations.

3. Fuel

Fuel is stored in a locked cabinet in a covered and locked outdoor area.