

Saint Louis University Integrated Pest Management Plan

Ornamental, Turf & Tree Program

Saint Louis University

#1 North Grand

St. Louis, MO 63103

314.977.2956

Grounds Services personnel, for identifying areas of pest infestation (weed, insect & disease), will inspect the exterior grounds of Saint Louis University (SLU), making recommendations for corrective implementation measures and developing a comprehensive integrated pest management (IPM) plan. This plan is intended to cover all developed turf, landscape and ornamental areas of the St. Louis physical campus. At the time of implementation, this encompasses approximately 55 acres. All vacant properties, teaching gardens/orchards and sports field turf areas are excluded from this plan. Acreage will be updated annually by Grounds Services.

The IPM plan will utilize all methods of pest control, which may include modifying cultural practices, monitoring for pest populations, mechanical and biological control, and the judicious use of pesticides. If possible, pesticides will not be applied on a routine basis; however, they may be used as a tool to maintain pest populations at or below an acceptable level while maintaining plant health and aesthetic quality. The selection of pesticides that may be used is based on a predetermined hierarchy that will utilize least toxic products as first choice. Whenever practicable, biological controls such as predatory insects, beneficial nematodes or microbial pesticides will be used. Proper implementation of this program will reduce the volume, toxicity and frequency of application of pesticides and other chemicals, thereby reducing negative environmental impact and the risk of potential exposure of campus users and visitors to the grounds who may be sensitive to their use.

Grounds Services management team will discuss various pest control options and determine the speed of control necessary as well as threshold/action levels based on pest population, species, plant health and aesthetic considerations.

Grounds Services supervisors will monitor/scout the grounds of the campus at least (2x) monthly March through October. Additional monitoring may be required during peak periods (May-August) to monitor for insects, weeds and diseases. Off-season (November-February) monitoring may also be scheduled on an as needed basis.

All pest problem areas and written recommendations for control applications will be recorded on "Saint Louis University - Application Record /Monitoring Report" form or substantially similar substitute. These forms will be kept in a file that will be maintained in the Grounds Services

office. Additional records that will be maintained in this file include a copy of this plan, copies of all soil sample analysis reports and copies of the pesticide product label information provided at the time of application.

The Grounds Services Director will review report logs prior to any pesticide applications on campus. The log will be maintained in the Grounds Services office and will serve as a tool to facilitate communication between all personnel. All pest sightings should be reported in the logs and should include specific information as to the location and type of pest, if known.

Turf Plan

Best management practices will be implemented at all times in an effort to maintain turf health and appearance. Turf will be mowed to a 2" - 3" height or as high as possible on a weekly/biweekly basis. Mowing should be done when the grass is dry to avoid spread of turf diseases. Mower blades should be maintained with sharp cutting edges to avoid excessive wounding and stress of the turf-grass. Grass blades carry on photosynthetic activity for the turf grass plant, so never remove more than 1/3 of the turf blade in a single cutting to avoid stressing the plant.

Upon implementation of the IPM program and prior to the application of any fertilizer or pesticides, soil samples will be collected by Grounds Services and analyzed. Soil samples will also be collected and analyzed annually to assess soil fertility and pH. Annual sampling will be performed in late fall or early spring after the frost has left the ground. Amendments will be made to the soil as recommended by the analysis reports. Proper soil pH and fertility will help to prevent many turf-grass diseases and promote plant vigor, thereby reducing the occurrence of insect and weed invasion. The ideal pH range is between 6.0 and 7.0.

When practicable, organic fertilizers will be used, otherwise, fertilizer with 50% slow release nitrogen shall be utilized. Fertilizer should be applied no later than November 15 as a general rule. Late fall applications of lime will be avoided if possible to reduce the risk of snow mold. Over fertilization may result in an increase of some plant diseases, more frequent mowing, increased thatch layer and risk of leachate into groundwater in some circumstances.

Proper management of grass clippings is an important part of maintaining the lawn. Grass clippings will remain on the turf wherever possible and allowed to degrade, returning 50% of available nitrogen back to the lawn. This will help to increase the soil organic matter and promote beneficial earthworm activity.

Watering may be done weekly to a between the hours of 12:00 am and 8:00 am depending on the schedule for each irrigation system. The second best time to water is late evening/early morning after the dew has fallen. Watering in the evening is not recommended on hot, humid nights because it may increase the occurrence of diseases. Necrotic ring spot and summer patch may be prevented by keeping the upper soil layers moist.

A thatch layer up to 1/2-3/4 inches thick is beneficial. An excessive layer is undesirable because it will block moisture, fertilizers and/or pesticides from reaching the root zone of the turf. Over-development of thatch can be prevented by reducing fertilizer applications and maintaining proper soil pH. If de-thatching is necessary, it will be done mechanically during the spring or late summer (September) when grasses are actively growing and can recover faster.

Fertilizer applications should be performed when grasses are actively growing to reduce nutrient runoff, usually late March/early April and late October/early November. Fertilizer applications will not exceed 4 - 4 1/2 pounds of nitrogen per 1000 square feet per year unless soil sample analysis reports indicate a necessity to further amend the soil. Multiple fertilizer applications at lower rates are preferable to single, high-rate applications which are also prone to runoff.

Turf Insects

Visual inspection of the turf areas will be done at least monthly, March through October, by the Grounds Supervisor to monitor for evidence of chinch bug, sod webworm, billbug and/or other destructive turf pests. Additional sampling may be performed to confirm the presence of these pests and/or White Grubs.

Applications of insecticide to turf areas will be limited in an effort to preserve populations of beneficial insects and nematodes. Pesticide application will be considered if monitoring indicates the following pest populations or up to 10% damage can be anticipated.

- 1) White Grubs 4 Larvae/square foot
- 2) Chinch Bug 30 - 50 Nymphs & adults/square foot or when damage is evident
- 3) Sod Webworms/Cutworms Areas 5 per square foot or when damage is evident.
- 4) Hyperodes weevil (annual bluegrass weevil) tolerance 20-40 larvae/square foot
- 5) Black turfgrass ataenius tolerance 30-50 larvae/square foot

Carbaryl or Lambda Cyhalothrin contact insecticides can be applied to control Japanese beetle, European chafer, Masked chafer, Oriental beetle and/or Asiatic garden beetle or other beetle species during late August/early September when larvae are present.

Cyfluthrin products will be applied to control chinch bug, billbug and sod webworm when damage is evident. (Damage periods normally occur during hot, dry weather - late June/July/early August).

Weed Control

A lawn area that is properly managed should produce dense, thick turf-grass, which ideally will help to prevent invasive weed species from getting established. Some weed growth should be

anticipated, and tolerated to some degree. Widespread applications of broadleaf herbicides will not be performed unless weed species have invaded greater than 10% of the entire turf area. Spot applications will be performed to small areas on an as needed basis.

2,4-D + MCPP + dicamba + carfentrazone products or Triclopyr + Clopyralid products may be applied as a spot application to control annual and perennial broadleaf weeds in the turf. The same product(s) may be applied when and if a widespread application of pesticides is deemed necessary.

Over seeding the area in late summer/early fall with improved turf-grass and raising the mower height during the growing season will help to prevent crabgrass encroachment. Quincloric may be applied as a post-emergent crabgrass control only when cultural practices have failed and providing that the area is not widespread. This will prevent problems with soil erosion in areas where the crabgrass has been killed off. Barricade pre-emergent herbicide, may be applied the following season to help prevent redevelopment of crabgrass.

Timing is the key to any application. Pre-emergent herbicides **MUST** be applied **BEFORE** crabgrass seed germinate. Crabgrass seeds germinate when spring soil temperatures tend upwards from 50 degrees F. Weed scientist's use 52 degrees F. at one-half inch deep as the trigger point for their application of pre-emergence herbicide.

Mesotrione may be applied as a spot application to control invasive annual grasses. The same product(s) may be applied when and if a widespread application of pesticides is deemed necessary.

A complete re-evaluation of any area requiring a broad application of pesticide will be performed by name of certified supervisor to assess and re-implement proper cultural practices to maintain turf density and vigor.

Disease Management

Pesticide applications for control of turf diseases will be performed only if evidence of disease has been found and significant areas (10-15% of the total turf area) of permanent damage can be anticipated and all proper cultural practices have been employed. Grounds Services Director will discuss pest control options with Grounds supervisors to determine the appropriate course of action. Proper fertility management will also help to prevent disease pressure.

Flower Beds & Formal Landscaping

Best management practices will also be followed for the care and management of all flowerbeds and ornamental plantings. Insect and disease resistant plant varieties will be selected for planting in any flowerbeds and/or formal landscaping areas whenever possible. The grounds supervisor will visually inspect plants for insect and/or disease infestation prior to planting. Plants found to have any infestation will be rejected in an effort to eliminate damage on a large scale. Plants will

be planted at the proper depth to avoid plant stress. Mulch will be placed in all garden areas and around individual trees and shrubs. Mulch materials will be placed at sufficient depth to reduce weed growth and help to retain moisture. Mulch placement will also be placed to provide a buffer area to eliminate mechanical damage that may result from use of string trimmers or mechanical edger's.

Foundation plantings and vines will be trimmed at least 12" away from the building to eliminate rodent harborage and access to the building and allow for monitoring of rodent activity.

As instructed, the grounds staff will remove and dispose of dead and dying vegetation from plants and plant beds (monthly) to prevent spread of disease. Leaves will also be raked away to prevent accumulation and development of rodent harborage. Branches and plant material will be properly composted at the end of each day that work has been performed.

Ornamental Insect Control

Visual inspections will be conducted during routine maintenance activities and pest monitoring traps will be utilized, where appropriate, to indicate the presence of harmful pests. Wherever pest activity is found and if practicable, infested plant(s) or branches will be washed off using a strong stream of water or removed and properly disposed of.

In an effort to preserve beneficial and predatory insects, pesticides will be applied only on an as needed basis. Application of pesticide may be considered if it is anticipated that pest activity will result in unacceptable levels of damage to ornamental plants. For this facility, up to 10% damage or defoliation to ornamental plants will be considered acceptable.

Pesticide application will be limited to only the infested area(s). General applications of pesticides will not be done. Bio-insecticides, insecticidal soaps, dormant oil or summer oil will be utilized if possible.

The timing of each application will be based first on whether the pest is present and causing damage, the pest life cycle and at what stage the pest is most vulnerable to pesticides.

Preventive pesticide applications may be performed only to areas where the previous year's monitoring has shown evidence of insect pests that may over-winter on ornamental plants.

Weed Control

Trifluralin + Isoxaben product may be applied as a pre-emergent weed control in annual flower beds and ornamental shrub gardens. Pre-emergent weed control may also be used in perennial flower gardens where pesticide labeling allows. Glyphosate or other Non-Selective Herbicides may be used for post-emergent spot applications. Where practicable, hand weeding will be

performed in flower gardens and areas of ornamental plantings on a limited basis due to labor expenses. Borders and walkways will be edged using a string trimmer or mechanical edger.

Disease Management

Pesticide applications for control of ornamental diseases will be performed if evidence of disease has been found and significant areas (10% or greater) of permanent damage can be anticipated and all proper cultural practices have been employed.

Preventive pesticide applications may only be performed when the previous year's monitoring has indicated a likelihood of disease or if certain plant species, prone to disease problems, are present. Preventive applications should be made only to specific problem areas

Grounds Services Director will discuss pest control options with Grounds Supervisor(s) to determine the appropriate course of action.

Pesticide Plan

Pesticide products change on a regular basis, and those listed in this plan are provided for reference only. Listing a specific product trade name does not constitute an endorsement of its use. Many pesticide products other than those listed in this plan are available and may be suitable for use.

Priority is given to those pesticides having the lowest toxicity, taking into consideration the method and frequency of application and the risk of exposure to campus occupants. Whenever practicable, biological pest control such as predatory insects, beneficial nematodes or microbial pesticides will be utilized. Pesticides selected for possible use are as follows;

First Choice: (Products having the lowest toxicity and/or least risk of exposure based on the formulation, method and frequency of application.)

Turfgrass/Ornamental Herbicides

Pre-Emergent

- a) Trifluralin + Isoxaben: Ornamental pre-emergent, selective
- b) Proflam: Turfgrass pre-emergent, selective

Post Emergent

- a) 2,4-D, MCPP, dicamba, carfentrazone: Turfgrass Broadleaf post emergent, selective
- b) Quinclorac: Turfgrass Crabgrass post emergent, selective
- c) Halosulfuron: Turfgrass Yellow Nutsedge post emergent, selective
- d) Mesotrione: Turfgrass Annual Bluegrass suppression, selective
- e) Glyphosphate: Turfgrass/Ornamental post emergent, non-selective

Turfgrass/Ornamental Fungicides

- a) Azoxystrobin + Propiconazole: Acroptean penetrant
- b) Azoxystrobin: Acroptean penetrant
- c) Propiconazole: Acroptean penetrant
- d) Mefenoxam: Acroptean penetrant
- e) Iprodione: Contact

Turfgrass/Ornamental Insecticides

- a) Chlorantraniliprole: Nervous system
- b) Carbaryl: Nervous system
- c) Cyfluthrin: Nervous system

Second Choice: (Products having moderate toxicity and/or risk of exposure based on the formulation, method and frequency of application.)

Turfgrass/Ornamental Herbicides

Pre-Emergent

- a) Oryzalin: Ornamental pre-emergent
- b) Dithiopyr: Turfgrass pre-emergent

Post Emergent

- c) Triclopyr + Clopyralid: Turfgrass Broadleaf post emergent
- d) Fenoxaprop: Turfgrass Crabgrass post emergent

Turfgrass/Ornamental Fungicides

- a) Chlorothalonil: Contact
- b) Thiophanate Methyl: Acropetal penetrant
- c) Phosphonate: Systemic penetrant

Turfgrass/Ornamental Insecticides

- a) Imidaproclid: Nervous system
- b) Lambda-Cyhalothrin: Nervous system

Third Choice: (Products having moderate to high toxicity and/or risk of exposure based on the formulation, method and frequency of application.)

Turfgrass/Ornamental Herbicides

- a) 2,4-D, MCP, dicamba: Trimec Classic™- Broadleaf post emergent

Turfgrass/Ornamental Fungicides

- a) None

Turfgrass/Ornamental Insecticides

- a) Dursban 50W™

Rev. 5/14

IPM Annual Checklist

Update IPM Plan	Due By	Person Responsible	Notes
Acreage Covered	1/1/2014	Grounds Supervisor	Update to include all developed areas covered by plan.
Pesticide Selection	2/1/2014	Grounds Supervisor	Review pesticide selections for effectiveness and revise as necessary.
Pesticide Threshold	2/1/2014	Grounds Supervisor	Review pesticide action thresholds and revise as necessary.
Soil Sample	3/1/2014	Grounds Supervisor	Annual soil sample taken to assess soil fertility, pH and need for amendments.
IPM File (labels)	2/1/2014	Director, Grounds	Update binder containing all pesticide labels as specified in the IPM plan.
Monitoring Calendar	2/1/2014	Grounds Supervisor	Update calendar to reflect approximate dates for monitoring to occur.
Other	TBD	TBD	TBD
Final Review	2/15/2014	Director, Grounds	Review the plan for accuracy and approval of all recommended changes.
Issue Revised Plan	3/1/2014	Director, Grounds	

IPM Scouting/Monitoring	Month	Person Responsible	Notes
Ann./Per. Grassy Weeds	Mar - Nov	Grounds Supervisor	Scouting/Monitoring interval dates and frequencies to coincide with high pressure dates.
Ann./Per. Broadleaf Weeds	Mar - Nov	Grounds Supervisor	Scouting/Monitoring interval dates and frequencies to coincide with high pressure dates.
Turf Disease	Mar - Nov	Grounds Supervisor	Scouting/Monitoring interval dates and frequencies to coincide with high disease potential.
Turf Insect	Mar - Nov	Grounds Supervisor	Scouting/Monitoring interval dates and frequencies to coincide with high pressure dates.
Ornamental Disease	Mar - Nov	Grounds Supervisor	Scouting/Monitoring interval dates and frequencies to coincide with high disease potential.
Ornamental Insect	Mar - Nov	Grounds Supervisor	Scouting/Monitoring interval dates and frequencies to coincide with high pressure dates.
Due Date:	2/1/2014	Grounds Supervisor	Date to complete scouting/monitoring schedule for upcoming year.
Final Review	2/15/2014	Director, Grounds	Submission Director for review, approval and inclusion into IPM plan.
Update Google Calendar	2/1/2014	Grounds Supervisor	Updates scouting and monitoring dates for the calendar year.

*The scouting/monitoring dates listed above are for planning purposes only and may vary due to climatic conditions.

**Saint Louis University
Ornamental, Turf &
Tree
Pesticide Application Record**

Service Location	Servicing Company	

Date:	Supervisor:	Certification No.
Time In: Out:	Operator:	Certification No.

Specific Recommendations/Actions Needed *(See also - inspection report)*

Pesticide Application Record				
Pesticide Formulation	Rate/Acre	Amount Applied/Dilute	Target Pest	Area Treated (Sq. Feet)

Landscape Diagram (Use Additional Sheet if Necessary)																															

Saint Louis University
Ornamental, Turf and Tree
IPM Monitoring Form

Name: _____

Date: _____

Site/ Area	Host Plant	Size	Stage	Pest	Stage	Damage Site	Damage Level	Natural Enemies	Control Action

Key to Codes:

Host Plant Size:	Host Plant Stage:	Pest Stage:	Damage Site:	Damage Level:	Natural Enemies:	Action:
<1ft. Seedling=1	seedling=2	egg=1	bark=1	none(0%)=0	rare=1	no action=1
1-3 ft. tall=2	budding=3	early instar=2	bud =2	trace (<5%)=1	few=2	mechanical=2
3-6 ft. Tall=3	flowering=4	late instar=3	flower=3	light (5-10%)=2	common=3	cultural=3
6-8 ft. Tall=4	fruiting=8	pupa=4	fruit=4	moderate (10-30%)=3	abundant=4	biological=4
>8 ft. Tall=5	leafing out=9	adult=5	foliage=5	heavy (30-90%)=4		chemical=5
	mature=10	damage only,	miner = 6	total damage (100%)=5		
	dormant =11	past damage=6	borer = 7			
			roots=8			
			general dieback=9			
			gall=10			

Turf Checklist

Damage Level/Action

Turfgrass Species Present	Kentucky Bluegrass____ Tall Fescue____ Perennial Ryegrass Fine Leaf Fescue____ Other:	
Lawn Establishment	Age:____ Seed:____ Sod:____ Sun:____ Shade:	
Thatch Accumulation	____<1/2" ____1/2 to 1" ____>1"	
Turf Density	Thick (TK) Thin (TN) Moderately Thick (MTK) Sparce (SP)	
Turf Color	Dark Green (DG) Light Green (LG) Yellow Green (YG) Turf Dormant (TD)	
Soil	Texture: Depth: Condition:	
Weeds	Dandelion____ Crabgrass____ Plantain____ Oxalis____ Spurge Knotweed____ Ground Ivy____ Yellow Nutsedge____ Other:	
Insects	_____Avg.No./Sq. Ft. _____Avg.No./Sq. Ft. _____Avg.No./Sq. Ft. _____Avg.No./Sq. Ft.	
Disease	Affected Species:_____ % Area of Turf Infected____ Disease: Affected Species:_____ % Area of Turf Infected____ Disease:	
Cultural Practices	Mowing:_____ Watering:	

Comments: