

Integrated Pest Management (IPM) Policy and Procedure Manual

Greenbelt Homes Inc.
Grounds Department

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INTRODUCTION

Greenbelt Homes Incorporated (GHI) encompasses 250 acres of land divided between member home and yard areas (approximately 83 acres) and common areas (approximately 167 acres). GHI common areas comprise a mix of green space uses including access lanes, playgrounds, parks and wooded natural areas.

GHI has, among others, responsibility for the maintenance of parks, common areas, forest parcels, and various other landscaped areas. Management of various pests are inherent in those responsibilities.

Suburban environments, such as might be found in Greenbelt, and the various pest organisms that these environments support provide challenges to individuals, businesses and agencies who attempt to provide for their control. Landscaping, as part of the suburban environment, can support additional pest organisms which, at some point, may require the implementation of pest control measures.

There is no simple, single approach to the management of any given pest that will provide for reliable long-term control of the pest. Just as the presence or absence of any organism and its periodic population fluctuations are a result of complex interactions, control measures too involve complex analysis involving all aspects of the pest and its surroundings.

A wealth of information exists regarding the control or management of pest species, most of it quite successful though it may be dependent on any number of factors. Complicating pest management matters considerably, and particularly in the area of landscape pest management, is the absence of any defining criteria regarding at what point a particular pest population becomes a problem. Analysis becomes subjective in nature and usually dependent on attitudes and the personal tolerances of the person(s) affected.

Pesticides are one tactic that do provide a measure of control against pests, the result can be short lived and can come with unwanted secondary effects. In order to minimize unnecessary pesticide use and its potential health and environmental effects, GHI has developed this Pest Management Program in order to approach its pest control activities in an integrated manner.

Integrated Pest Management (IPM) is a pest management strategy that focuses on long-term prevention or suppression of pest problems with minimum impact on human health, the environment, and non-target organisms. Preferred pest management techniques include encouraging naturally occurring biological control, using alternate plant species or varieties that resist pests, adoption of cultural techniques such as proper pruning, fertilization, and irrigation practices that reduce pest problems, changing the habitat to make it incompatible with pest development, and selecting pesticides with lowest toxicities to humans and non-target organisms.

In an integrated pest management program, broad spectrum pesticides may be used as a last resort when careful monitoring indicates they are needed according to pre-established guidelines. Implementing an IPM program requires a thorough understanding of pests, their life cycles, environmental requirements and natural enemies as well as the establishment of a regular, systematic program for surveying pests and their damage.

INTEGRATED PEST MANAGEMENT POLICY
GREENBELT HOMES INC. AND GROUNDS DEPARTMENT

1. Purpose

To provide procedural guidelines for the management of various pest species in areas maintained by Greenbelt Homes Inc. and its Grounds Maintenance Department.

2. Definitions

Integrated Pest Management (IPM) is a pest management strategy that focuses on long-term prevention or suppression of pest problems with minimum impact on human health, the environment and non-target organisms. These strategies require the selection, integration and implementation of various pest control techniques considering the various economic, ecological and sociological consequences.

By its design an IPM strategy utilizes a variety of practices that are tailored to the specific target pest, site conditions, and environmental factors to achieve the desired level of control of the pest. IPM philosophy focuses on first understanding the pest, its lifecycle and ecology before choosing a management strategy. Individual management strategies are typically developed for specific pests based on specific conditions.

3. Policy

- 3.1 Development of specific pest management practices shall be done utilizing contemporary and applicable IPM research, IPM literature and through consultation with recognized pest management professionals.

Recognizing that pest management is an on-going and evolving discipline, this policy shall be subject to change and other updating modifications as needed to reflect new laws, information, techniques, equipment and materials.

- 3.2 The goals of this policy shall be to:

3.2.1 Affect an overall reduction in pesticide usage based on unit area treated.

3.2.2 Provide for the utilization of alternative methods in the control of pests.

3.2.3 Provide for the utilization of least-toxic pesticides that will provide acceptable control of the pest(s).

3.2.4 Provide for appropriate pre and post-notification of pesticide application in parks and other areas where the public may be affected.

4. Procedures

- 4.1 The following recognized Integrated Pest Management techniques shall be employed in providing control of a pest. In the management of a pest, as many of these methods as necessary shall be used.

4.1.1 Education

- Provide pest management information, formally and informally, to maintenance personnel.
- Provide pest management information to affected and concerned residents and facility users.
- Where practical and in specific circumstances, provide pertinent pest management information to the community.

4.1.2 Monitoring

- Establish threshold action levels for pest damage, injury or nuisance.
- Identify pest species and track population levels.
- Identify beneficial species and track population levels.

4.1.3 Physical

- Barriers to exclude entry or introduction of pest.
- Continued use of mulching materials.
- Design considerations that minimize potential pest problems.
- Hand removal of pests.
- Removal of diseased and insect infested plant parts.

4.1.4 Mechanical

- Use of discs, weed mowers, string weed trimmers, hoes and hand pulling of weeds.

4.1.5 Cultural

- Providing conditions conducive to healthy plant growth.
- Sanitation through removal of plant debris that harbors insects and plant pathogens.
- Modification of the environment to disrupt the pest cycle such as in alteration of irrigation times, frequency, amount and adjustments to mowing heights of turf.
- Provide conditions that allow for increase in populations of beneficial organisms.

4.1.6 Biological

- Maintaining existing populations of beneficial organisms.
- Supplementation of beneficial populations through releases.
- Use of abiological or non-chemical pesticides.

4.1.7 Plant Selection

- Selection of plant materials suited to the site.
- Selection of resistant plant materials.
- Systematic removal of problem plants and replacement with appropriate plant species.

4.1.8 Chemical

- Use of bio-rational pesticides (typically those which are derived from plants which have pesticidal properties).
- Use of least-toxic pesticides.
- Selection and use of traditional pesticides that provide acceptable control with consideration given to human health and environmental effects.

PEST MANAGEMENT STRATEGIES

(Definitions)

The following information was used in the development of pest control strategies for the various pest that affect areas for which the Recreation and Parks Department has responsibility.

A. The Pest

The various insect, plant, disease and animal pests have been identified in general terms. The common names of pests are used though in some cases the scientific name could be used for purposes of clarification. As an example, identifying the aphid pest of tuliptrees as the tuliptree aphid is preferable than simply identifying it as aphid.

B. The Location

The various locations have been identified generically to accommodate the wide variety of situations for which the Department has responsibility.

C. The Host

The host is the site, plant (or animal) on which the pest lives. An example would be in the case of the tuliptree. The tree is the host, the tuliptree aphid is the pest.

D. Action Threshold

An action threshold is an observable condition or set of conditions that must be present before a pest control method can be initiated. Action thresholds are calculated to initiate a specific pest control method(s) when it will be effective in keeping the pest population below an injury level.

A pest is only a problem if it causes significant damage or nuisance effect. An insect that eats only one leaf from a tree is not a problem but if it ate 50% of the leaves it might be considered a problem. The amount of damage or nuisance affect that a pest must cause before it is considered a problem is the injury level. The injury level is then used to determine the action threshold. The action threshold should take into account the pest's natural population fluctuations, natural enemies, time needed for control measures to take effect, etc.. In the development of these action thresholds, IPM literature, staff experience, recognized pest management professional as well as other various resources have been consulted.

The action thresholds illustrated in the various Management Plans in this program differentiate between non-chemical and chemical control methods. Non-chemical control methods are preferred because they have few if any adverse effects and should be implemented before chemical control controls with potentially adverse effects are implemented.

Typical action thresholds found in this program include:

- Observing the pest in a specified abundance.
- Observing a specified amount of pest damage.
- Observing specific environmental conditions favorable pest environment.

E. Methods of Control

The following categories represent widely accepted components utilized for the control of pests using an IPM approach and have been utilized in the development of action plans found in the Pest Management Plans.

There are overlaps between these categories and they can be broken down further but as presented below they represent the major control method components. Below each are particular practices of tactics that illustrate the intent of the category. This list is by no means complete, they simply serve as illustration.

It is important to realize that in many cases no single approach will be effective in the control of a pest, rather it is the combination or integration of these methods for the purpose of successful ecosystem management that will provide long term control. Further, it should be understood that not all methods are effective against all pests nor should they be expected to be effective against all life stages of a particular pest.

Many control tactics should be developed and creativity is encouraged. This helps keep potentially adverse effects from accumulating and the pest from possibly developing resistance to a particular form of control. It also gives a number of options to best meet any particular situation. All potential methods should be considered.

The various management tactics outlined in the Pest Management Plans come from a variety of sources including pest management literature, pest management professionals and staff experience. As listed, they are the potential tactics that may be employed in the management of a pest. Though each tactic is a viable method to aid in the management of a pest, it should not be expected that every tactic will be successful at every site and in every situation.

1. Design Considerations

Prevention is the single most important component of landscape IPM. Recognizing the potential for future pest problems when designing or modifying a site can minimize and even eliminate many pest problems. Those design considerations include;

- Proper site preparation.
- Properly designed irrigation system.
- Selection of plant materials suited to the site and climate.
- Selection of plant materials with pest tolerance or resistance.
- Use of densely growing plants that will choke out weed growth.

2. Biological Control

This entails the use of beneficial organisms in the control of pests. It is important to realize that other pest management activities, most notably the use of pesticides, can have an adverse effect on beneficial organisms. Practical implementation would consider;

- Maintenance of existing populations of beneficial organisms.
- Supplementation of beneficial species.
- Encouraging plant diversity to provide food and habitat for beneficial species.
- Avoidance of pesticide use, particularly broad spectrum insecticides and fungicides.

3. Cultural Control

Cultural control tactics are horticultural practices that provide for optimum plant health. These include;

- Providing water in the proper manner, amount, frequency and time.
- Insuring proper soil fertility, avoiding nutrient deficiencies and excesses.
- Use of proper pruning techniques and pruning at the proper time.
- Proper mowing heights.
- Insuring proper sanitation practices.
- Use of mulch to suppress weeds or invasive plant regrowth.

4. Mechanical Controls

Mechanical methods generally utilize labor, materials not considered pesticides and machinery to control pest levels. Examples would include;

- Hand removal of weeds and other pests.
- Use of hand or power tools such as hoes, mowers, string weed trimmers.
- Removal of infested plants or plant parts.
- Use of traps.

5. Physical Controls

These controls are those activities that manipulate the environment and are quite successful in closed environments such as greenhouses. In the landscape these tactics could include;

- Thinning of a tree or shrub to improve air circulation in the canopy.
- Thinning of canopies to increase temperatures for insect control.
- Covering of cold sensitive plants in winter to increase temperatures.
- Utilizing sun and/or shade for temperature control.

6. Chemical Controls

Chemical controls employ pesticides in the management of pests. Tactics include;

- Use of least toxic pesticides.
- Use of lower-than-label rates of pesticides.
- Insuring proper timing of pesticide application.
- Spot treatments.
- Staggering of treatments.

F. Monitoring

Monitoring is an information gathering and record keeping activity that is the basis of any successful IPM program. Monitoring utilizes a variety of techniques ranging from casual observation to statistically valid quantitative sampling, to measure pest damage, track populations of both beneficial and pest organisms and provide assessment of the site and surroundings.

Careful, concise records are necessary to determine when specific control tactics are to be implemented to keep pest levels below the injury level. This information is further utilized to measure the effectiveness of specific tactics, to pinpoint hot spots and used in subsequent years for planning and timing of control activities.

A variety of monitoring methods will be utilized by GHI and will be dependent on the site and pest being monitored.

PEST MANAGEMENT PROCEDURES

A. Pest Management Request

All requests for pest control assistance shall be forwarded to the Manager of Sustainability and Quality Assurance in writing for the purposes of documentation.

1. Requests from GHI members or Grounds staff shall be in the form of a Work Order.
2. Complaints involving trees shall be in the form of a Work Order.
3. Requests from other departments may be in the form of a Work Order, a Request for Service or by E-mail.

B. Site Assessment/Monitoring

Upon receipt of a request, the Manager of Sustainability and Quality Assurance will inspect the site and surroundings and perform an assessment noting;

1. Presence/absence of pest and at what levels.
2. Presence/absence of beneficial insects and at what levels.
3. Site conditions, particularly those that may be contributory to the pest problem or that can be utilized in a solution.
4. Recent weather conditions of forecasts that could be contributory to the problem or utilized as part of a solution.

Once the site assessment has been completed, a discussion will take place with the affected party and an appropriate course of action will begin. Where a management plan for the pests exists, it will provide the guidelines to be followed. In the event a management does not exist, one is to be developed to provide proper direction for control of the pest. When a pest problem exists, the above steps will initiate the monitoring process.

C. Implementation of Control Measures

Regardless of the pest population or associated threshold level, a non-chemical control approach will always be considered first even when populations are at levels that chemical controls could be considered.

1. Non-chemical control

In most cases, the various management plans in this program outline multiple non-chemical pest control methods. These methods are to be enacted first. Instructions and any necessary training regarding implementation of these tactics will be provided to the responsible person/crew. Follow-up inspections will take place at specific intervals or pre-determined times to evaluate control.

2. Chemical Control

Any time that a chemical control measure is warranted and regardless of threshold levels, a least-toxic pesticide will always be considered first. Follow-up inspections will take place at specific intervals or pre-determined times to evaluate control.

All employees applying pesticides shall always remember the following;

- Follow product label instructions at all times
- Confine sprays to the site being treated, do not allow drift
- Treat only the targeted pest
- Treat only the smallest area necessary

3. Public Notification

To ensure that members and the public are aware that pesticides are to be used in parks, public building landscapes, surplus properties, any of the following methods or combinations of are to be utilized;

- signs
- isolation, in combination with signs
- media sources/neighborhood notification

4. Record Keeping

Records of pesticide use shall be kept by all persons applying pesticides.

These records are to include;

- date and time of application
- brand name of the pesticide
- target pest(s)
- amount of pesticide used
- name (or initials) of applicator
- where application was made (location, host, specific site within a park, etc.)

These records shall be forwarded to the Manager of Sustainability and Quality Assurance no later than the first working day of the week following application.

GENERAL PROCEDURES

A. Laws, rules and regulations

All Federal, State, and County laws, rules and regulations pertaining to the handling and use of pesticides will be followed.

B. Pesticide procurement

Pesticide acquisition shall be done only by the Director of Physical Plant Operations, Manager of Sustainability and Quality Assurance, or the Senior Grounds Maintenance employee assigned to pest control activities.

C. Pesticides and pesticide container disposal

1. Every effort shall be made to mix only that amount of pesticide necessary to complete an application(s).
2. Unused pesticides shall be lawfully disposed of at a site that is licensed to accept such wastes.

3. All empty pesticide containers shall be rendered clean according to regulations prior to disposal at a site approved by the State of Maryland Pesticide Regulation Division. The rinsate from rinsing procedures shall be added to the spray tank as part of the mixture. At such time as sufficient and appropriate storage space can be located, liquid pesticide containers shall be lawfully stored pending disposal at a regional container recycling event.

D. Applicator training

All personnel involved in pesticide handling and application activities will have the following training as required by law;

1. Annual training on the safe and proper handling of pesticides.
2. Each employee that handles pesticides shall be trained annually on the proper use of each pesticide prior to its use.
3. Continuing education is required by law for all Pest Control Advisors and Qualified Applicators in order to keep their licenses and certificates current. This education is in the areas of laws and regulations and pest control methods and is offered through seminars approved by the State Department of Pesticide Regulation.

E. Maintenance Staff training

The success of any IPM program is dependent on the skills and knowledge of those involved with its implementation. Information and training is to be provided for all maintenance staff and will include;

1. Principles and components of IPM.
2. Management strategies regarding pests common to all areas.
3. Management strategies regarding pests specific to specific areas.
4. Non-chemical pest control techniques.

F. Public Education

When requested from the general public, the following information will be given;

1. IPM concepts and components.
2. Integrated solutions to pest problems, if known.
3. Other contacts/agencies/resources that might be able to assist the individual.
4. Information regarding the departmental IPM program.

G. Reports

1. Monthly Report

The Manager of Sustainability and Quality Assurance will prepare a monthly summary report of all pesticides used. This is to be sent to the General Manager and Chair(s) of the Woodlands Committee.

2. Yearly Report

The Manager of Sustainability and Quality Assurance will use the monthly reports to prepare an annual report for the Board of Directors. This report will include:

- detailed pesticide usage data.
- how usage compared with target reduction of 50%.
- discussions of methods being used to reduce pesticide usage.
- any revisions or other updating of this program.

H. Research

GHI and its employees are not permitted to conduct research involving the use of pesticides for the purposes of field trials and data collection by pesticide manufacturers or those companies and individuals promoting pesticidal properties of products not registered by the EPA, nor would the Grounds Department wish to involve itself in these types of endeavors. Realizing however, that much needs to be learned in the area of pest management, particularly in the urban environment and especially with respect to our own problems, the department may assist the City, University, Extension and County Agricultural personnel in research involving;

1. Biology, habits and life cycles of pests.
2. Non-chemical methods of pest management.
3. Other projects that would further development of sound IPM practices.

Requests for assistance will be reviewed on a case-by-case basis considering liability, potential hazards to the public, potential damage to GHI property, time commitments and constraints that would be placed on GHI staff and facilities as well as any other considerations that might arise.

I. Contractors

All contractors performing work for the Greenbelt Homes Inc. will be required to follow notification guidelines with regards to sign posting and will be encouraged to follow sound IPM practices. This requirement applies to all new contracts GHI enters into.

PUBLIC NOTIFICATION

The following methods are to be used when notifying people of when and where pesticides have been or plan to be used.

A. Written Notice

When pesticides are scheduled to be used in a park, common area, woodland forest parcel, access lane or pathway, a public building landscape and other landscaped beds, that are adjacent to any member residence, staff shall provide written notice at least two weeks in advance. The written notice will include;

- Date and time of planned application.
- Location within the site to be treated and treatment method.
- The reason for the application and the pest(s) to be targeted.
- The pesticide(s) to be used.
- Warning to stay out of treated areas for a specific time.
- A departmental phone number to call for more information.

Staff will be available to answer any questions or concerns that members have about the planned application prior to the commencement of work.

B. Signs

When pesticides are scheduled to be used in a park, common area, woodland forest parcel, access lane or pathway, a public building landscape and other landscaped beds, notification signs shall be posted.

The intent of posting is to provide sufficient warning to individuals that a pesticide application is planned or has recently occurred. This must be remembered when posting since each site has unique qualities that will affect sign locations, particularly where entries to a site or location within a site are not limited to specific gates, walkways, etc.

NOTE: It is permissible to use the small yellow Pesticide Application flags to further identify where pesticides have been applied. They are to be used in conjunction with, not as a replacement for, the signs.

1. Specifications

The signs shall be;

- 8 ½" x 11" in dimension
- Be printed in red and black lettering on a white background
- Be printed in English.
- Include the following information;
 - Date and time of planned application.
 - Location within the site to be treated and treatment method.
 - The pest(s) treated.
 - The pesticide(s) used.
 - Warning to stay out of treated areas for a specific time.
 - A departmental phone number to call for more information.

2. Posting duration

Signs shall be posted a minimum of 24 hours prior to the start of the pesticide application and will remain posted for a minimum of 24 hours after the application unless the pesticide label specifies a longer interval.

3. Posting locations

Posting locations will be dictated by the site or particular area within a site. It is recognized that not every sign placed will remain for the full posting duration. However, it is the responsibility of the applicator to insure that a site is fully posted before leaving the site after an application.

PARKS, COMMON AREAS, PUBLIC BUILDINGS - signs shall be posted at all sidewalks and paths that normally enter the site or treated area within the site, at any other location where people would normally enter the site or treated area and any other logical location that would provide adequate warning to people entering the site or treated area.

WOODLAND FOREST PARCELS - signs shall be located on each side of the property and any other logical location that would provide adequate warning to people entering the site or treated area.

TRAILS/PATHWAYS - signs shall be located at each end of the pathway and at any other entrances to the path.

LANDSCAPED BEDS - Signs will be placed around the site.

Residential trees will not be chemically treated without prior knowledge and consent of the resident. In the event that a pesticide is injected into the tree or soil, posting is not

required as long as the applicators remain on site throughout the duration of the operation.

Consult with the Manager of Sustainability and Quality Assurance when questions arise.

C. Isolation

When circumstances warrant, treated areas will be barricaded to restrict entry. This barricading may be in the form of physical barricades, warning tape or temporary fencing. This isolation shall always be done in combination with signs.

D. Media sources and/or Neighborhood notification

In some situations it may be necessary to notify the residents in a neighborhood of a planned pesticide application. In some cases the use of the local media through press releases may also be utilize

PEST MANAGEMENT PLANS

VEGETATION MANAGEMENT

The majority of pest management efforts performed by the GHI Grounds Department are in the control of weeds and other unwanted vegetation in various areas of responsibility for the purposes of aesthetics, invasive plant control, pedestrian and vehicular safety and to reduce plant competition.

AESTHETICS - Uncontrolled weed growth throughout GHI in general and in the parks, traffic medians and other landscapes in particular lead to an unkempt appearance.

INVASIVE PLANT CONTROL - Uncontrolled growth of invasive plant species that demonstrate harm to native plants and natural ecosystem balance. These plants threaten the health and diversity of natural areas and forest conservation management areas.

VISUAL SAFETY - Uncontrolled weed growth can interfere with visibility along our streets and create unsafe situations for pedestrians, cyclists and motorists.

COMPETITION - Those plants commonly referred to as weeds are well known for their ability to adapt to a variety of environments and out-compete landscape plants for water and nutrients. In order for landscape plant materials to become established, weed control efforts are necessary.

**VEGETATION MANAGEMENT
ACTION PLAN**

General Landscaped Areas

LOCATION	ACTION THRESHOLD	ACTION
All areas of departmental responsibility.	Weeds covering 10% or less of the ground where not desired.	Mechanically remove. Use weed burner. Where possible, add mulch to a minimum depth of 4 inches. Consider use of densely growing plant materials.
	Weeds cover more than 10% of the ground where not desired.	Any of the above non-chemical tactics. Spot treat with appropriate herbicide.
	Weeds cover 5% or less of the ground in planter beds.	Mechanically remove. Use weed burner. Where possible, add mulch to a minimum depth of 4 inches. Consider use of densely growing plant materials.
	Weeds cover more than 5% of the ground in planter beds.	Any of the above non-chemical tactics. Spot treat with appropriate herbicide.
	Any area historically requiring weed control measures.	Where possible, add mulch to a minimum depth of 4 inches. Consider use of densely growing plant materials.

**VEGETATION MANAGEMENT
ACTION PLAN**

Turf Areas

LOCATION	ACTION THRESHOLD	ACTION
All turf areas.	Broadleaf or grassy weeds cover less than 20% of the turf area.	Observe proper mowing schedule and mower sanitation. Remove mechanically. Re-evaluate cultural practices, test soil fertility.
	Broadleaf or grassy weeds cover 20% or more of the turf area.	Any of the above tactics. Aerate soil, amend and overseed soil. Consider turf conversion to landscaping or other use.
Turf edges that can be edged with power edger.	Any time edging is necessary.	Use power edger.
Turf edges that cannot be edged with power edger.	Turf growing over pavement edge.	Remove mechanically. Use weed burner.

Poison Ivy & Oak - Unwanted trees/shrubs

LOCATION	ACTION THRESHOLD	ACTION
All areas of departmental responsibility.	Poison ivy or oak growing in any area with potential for contact.	Remove mechanically. Treat regrowth with appropriate herbicide.
	Unwanted weed species; tree or shrub growing in close proximity to building or fence with potential to cause damage.	Remove mechanically. Remove and stump treat with appropriate herbicide.

Miscellaneous Areas

LOCATION	ACTION THRESHOLD	ACTION
Asphalt or concrete roads, pathways or other paving and hard surfaces.	Weeds growing in joints or cracks.	Mechanically remove. Use weed burner.
Roadsides, access lanes, pathways, other R-O-W sites such as fire hydrants traffic signal control boxes.	Weeds & other unwanted vegetation obstruct structure or access.	Mechanically remove. If possible, add mulch to a minimum depth of 4 inches.

VEGETATION MANAGEMENT ACTION PLAN

Non-Native Invasive Species

What is a Non-Native, Invasive Plant?

Non-native plants are those introduced by people either accidentally or on purpose into a region far from the plant's native habitat. Most non-native species cause no problems and many contribute positively to farming, gardening, landscaping, and soil stabilization. However, a small number of non-native plant species exhibit undesirable traits allowing them to readily invade natural areas including:

- Rapid growth and maturity
- Prolific seed production
- Highly successful seed dispersal, germination, and colonization
- Rampant vegetative spread
- Ability to out compete native species
- High cost of removal and control

Why are they a problem?

Non-native, invasive plants are widely recognized as the second greatest threat to biodiversity, just behind habitat loss to development.¹ Because of their growth traits and lack of natural competitors, invasive plants overwhelm native vegetation and destroy food sources that birds and other wildlife depend on for survival. Dense stands of nonnative plants can choke out native species, destroying and altering habitat. Whereas native vegetation encourages a diversity of species, invasive plants typically create a monoculture of a single plant type. Invasive species tend to thrive in natural areas that are disturbed by human activity.

Management Approach

By design, an Integrated Pest Management strategy to control invasive plants utilizes a customized approach to control the targeted plant based on the characteristics of the plant, plant lifecycle, site location, size of affected area, proximity of desirable plants, and other environmental conditions. The chart below details typical control strategies and considerations when applying an IPM strategy for some of the most common invasive plants GHI manages. This chart is intended to provide a general overview rather than a comprehensive analysis of all possible management considerations implicit in an IPM strategy.

¹ President Clinton Expands Federal Effort to Combat Invasive Species,
<http://www.publicaffairs.noaa.gov/releases99/feb99/invasive.html>

Prioritization and Action Threshold Criteria

GHI is responsible for managing a large property -- encompassing varied geographical and environmental conditions and considerable invasive plant impacts -- with limited staff, financial, and volunteer resources. Accordingly, it is necessary to prioritize management activities to balance resources and conservation goals.

GHI Staff, in coordination with the Woodlands Committee and Board of Directors, have developed general criteria to help guide the decision-making process for action thresholds and prioritizing vegetation management activities. On a continuum, preference for management activities action will be given to plant species and sites exhibiting relatively higher degree of the following characteristics:

- Plant species characteristics
 - Rapid ascent of trees or shrubs (i.e. climbing vines)
 - Aggressive spread by seed and/or high seed germination rates.
 - Rapid vegetative spread to new areas.
- Site characteristics
 - Ecologically sensitive sites (i.e. rare plant communities, stream corridors, vernal pools, etc) – high value ecosystem
 - Minimal present impact by invasive plant(s) to site (i.e. new plant introduction, limited density within area.) – high eradication/control potential
 - High profile sites (i.e. adjacent to parks, playgrounds, popular trails, or other high use area) – high visibility/educational potential
 - Coordination with control efforts of other parties (i.e. members, City, etc.) - high collaboration potential

GHI staff will use these criteria to develop and implement vegetation management activities on an annual basis. Staff and Woodlands Committee volunteers will conduct regular assessments of common areas, parks, and forest parcels to evaluate the success of control efforts and inform future management activities. Staff and the Committee will prepare periodic reports for the Board of Directors on invasive plant control efforts.

**VEGETATION MANAGEMENT
ACTION PLAN**

Non-Native Invasive Species

PLANTS	LOCATION	ACTION	LIKELY SUCCESS OF CONTROL	OTHER CONSIDERATIONS
English Ivy (<i>Hedera helix</i>) & Winter creeper (<i>Euonymus sp.</i>)	Climbing trees	Cut vines on tree and pull vines around base of tree.	High success to remove mature vines from tree canopy. Low success in controlling the spread of the plant.	Vines will regrow on tree if adjacent vines remain. Any portion of remaining root system will resprout.
		Cut-Stump method and hand-paint herbicide to large mature vines.	High success to kill mature plants and slow spread of regrowth.	Extreme care necessary to avoid damage to mature trees.
	Ground area (small)	Mechanically remove, mulch or reseed bare soil.	High success to completely remove plant.	Any portion of remaining root system will resprout. Special care needed to avoid excessive soil disturbance.
	Ground area (large)	Mechanically remove, mulch or reseed bare soil.	Moderate success to control spread of plant.	Any portion of remaining root system will resprout. Special care needed to avoid excessive soil disturbance. Large sites should be handled in small phases. Hand pulling not recommended on slopes or highly erodible soils.
Bamboo (<i>Bambuseae sp.</i>)	All sites	Cut stalks, apply 4" depth of mulch Apply targeted herbicide to regrowth.	Targeted herbicide is most effective method of control and assures high success completely control mature plants. Moderate success of control when adjacent bamboo areas remain.	Multiple hand cutting treatments and mulch will weaken plant root system and minimize required herbicide. Cutting alone will not achieve complete control of the plant and will tend to reinvigorate new growth.

**VEGETATION MANAGEMENT
ACTION PLAN**

**Non-Native Invasive Species
(continued)**

Multiflora Rose (<i>Rosa multiflora</i>) & Japanese Honeysuckle (<i>Lonicera japonica</i>)	Small areas	Mechanically remove complete root system Frequent repeat cutting or mowing	High success of complete control with repeat treatments.	Repeat mowing treatments will be necessary for 2-4 years to exhaust root system and resident seed bed. Special care needed to avoid excessive soil disturbance. Mowing not recommended in areas where native plants could be impacted.
	Large areas	All above techniques. Cut stump or targeted herbicide spraying to plant regrowth.	Moderate success of complete control with complete treatment. High success of complete control with repeat treatment.	Repeat mowing treatments will be necessary for 2-4 years to exhaust root system and resident seed bed. Mowing not recommended in areas where native plants could be impacted. Hand pulling not recommended across large sites, on slopes or highly erodible soils.
Bush Honeysuckle (<i>Lonicera sp.</i>), Japanese Barberry (<i>Berberis thunbergii</i>), & Burning Bush (<i>Euonymus altus</i>)	Small areas and young seedlings.	Mechanically remove complete root system Repeat cuttings in highly shaded areas.	High success for complete control with repeat follow up. Plants will continue to spread by seed from adjacent areas and will require regular monitoring.	Cutting alone will not achieve complete control of the plant in most cases and will tend to reinvigorate new growth Plant will vigorously resprout when cut and will regenerate from root fragments. Monitoring and repeat treatments necessary.
	Large areas and mature plants	All above techniques. Cut-Stump method and hand-paint herbicide to large mature plants.	Moderate success for complete control with repeat follow up. Plants will continue to spread by seed from adjacent areas and will require regular monitoring.	Cutting alone will not achieve complete control of the plant in most cases and will tend to reinvigorate new growth Plant will vigorously resprout when cut and will regenerate from root fragments. Monitoring and repeat treatments necessary. Hand pulling or digging not recommended on large sites, slopes or highly erodible soils.

**VEGETATION MANAGEMENT
ACTION PLAN**

Non-Native Invasive Species
(continued)

Tree of Heaven <i>(Ailanthus altissima)</i>	All sites	Cut-Stump method and hand-paint herbicide to mature plants. Hand pull and dig out roots of small plants.	Moderate success for complete control with repeat follow up. Targeted herbicide is most effective method of control.	Cutting alone is counterproductive and will reinvigorate new growth. Hand pulling or digging not recommended on large sites, slopes or highly erodible soils.
Asian Wisteria <i>(Wisteria floribunda)</i>	Climbing trees	Hand cut vines off tree.	High success to remove mature vines from tree canopy. Low success in controlling the spread of the plant.	Hand cutting tends to invigorate new plant growth. Plant has an extensive root system. Vines will regrow on tree if adjacent vines remain.
	All other sites	Cut-Stump method and hand-paint herbicide to large mature vines.	High success to kill mature plants and slow spread of regrowth.	Extreme care necessary to avoid damage to mature trees.

INSECT PEST MANAGEMENT

Insect pest management involves controlling damaging insects as well as those causing nuisance problems. These pests can cause significant flower and foliar damage, physically weaken plants, spread disease and provide opportunities for disease and other insects to invade plants. Control is achieved through a variety of methods.

While the vast majority of the landscape plants in this area suffer from insect infestation at some time or other, the typical insect pest problems that are found in the landscapes maintained by the GHI Grounds Department generally involve only a few insect pests and a handful of plant species. This is true for the trees and landscaping that are maintained by the Department. Whether this is fully attributable to beneficial insect diversity or because the plants that remain are those that suffer fewer insect pest problems and/or can tolerate higher insect populations is not known.

Mechanically, pests and/or infested plant parts should be removed by hand when possible. Removal of brood wood is effective in controlling certain insect species. Periodic, high pressure water washes can be used when insect populations are low.

Culturally, maintenance of plant health is of great importance in insect pest control. Properly cared for plants are less stressed and therefore less susceptible to insect (and disease) attack. Along the same lines, plant materials should be selected with care, matching species to conditions present at the site. In most cases, GHI will choose to select alternative plant species that are less susceptible to insect damage to replace higher maintenance plants.

Biologically, beneficial insects provide the single greatest effort in controlling plant pests. This is why we have few insect pest outbreaks many of which require no attention on our part. Maintenance of beneficial insects is the key to controlling pest problems. This is accomplished by judicious use of pesticides and encouraging additional habitat.

Chemicals are not used by GHI in the control of plant damaging pests.

Indoor Insect Pest Management

GHI retains the contractual services of a certified pest management company to administer integrated pest management activities for insect pest management of structures and indoor areas including member homes. This contract is managed by the Technical Services Department and contractor is required to adhere to the guiding principals of the GHI IPM policy.

PLANT DISEASE MANAGEMENT

With few exceptions plant diseases do not constitute a severe enough problem to require extensive control efforts on our part. Leaf blights caused by anthracnose, powdery mildew and entomosporium leaf spot can occur on several of our tree and shrub species and can at times cause severe and repeated defoliation.

As with many plant diseases, these three problems are weather dependent. That is, they spread during specific weather conditions. When weather conditions change, the disease subsides and the problem resolves itself. While control can be achieved chemically, it would typically require many repeat applications during these specific weather conditions. Because of these factors GHI has adopted a non-chemical approach in dealing with these diseases.

**INSECT PEST MANAGEMENT
ACTION PLAN**

LOCATION	ACTION THRESHOLD	ACTION
All GHI maintained trees and landscape plants.	APHIDS: 10 aphid of any growth stage found on any 10 leaves OR 10 or more aphid found on the terminal 6 inches of growth on any 10 terminals OR foliar distortion visible on 20% or more of foliage OR any honeydew present on pavement, vehicles, street furniture, OR yellowjackets observed feeding on honeydew.	Address cultural needs, avoid high nitrogen levels. Control ants where present. Prune out infested areas. Use high pressure water wash. Use reduced-risk insecticides (neem, soaps, oils).
	SCALE: Scale visible on plants branches.	Address cultural needs. Control ants where present. Prune out infested areas.
	MITES: Mite damage visible on foliage.	Address cultural needs, avoid high nitrogen levels. Address site conditions that promote population build-ups. Use high pressure water wash.
	CATERPILLARS: Lepidopteran larvae causing damage to less than 10% of foliage.	Remove pests/prune out infested areas. Treat with B.t. if 1 st or 2 nd instar.
	BORERS: Signs of boring insects apparent.	Address cultural needs. Prune to remove infested wood. Routine pruning only when adult borers are not present. Remove brood wood or those plants with sufficient infestation that threaten other plants. Select proper replacement plant species.

**INSECT PEST MANAGEMENT
ACTION PLAN**

LOCATION	ACTION THRESHOLD	ACTION
All GHI maintained trees and landscape plants.	<p>EMERALD ASH BORER: Ash tree shows sign of this insect.</p>	<p>Provide proper cultural needs, specifically water needs.</p> <p>Remove infested wood. Pruning to be done during dormant season only.</p> <p>Remove brood trees, unhealthy trees showing 25% or more dieback regardless of cause.</p> <p>Destroy all wood suspected of being infested with this pest by chipping, grinding, burial or complete tarping for a one year period.</p> <p>NOTE: GHI no longer plants ash trees and recommends against planting of any ash species in Prince Georges County.</p>
	<p>GYPSY MOTH: Oak tree shows sign of this insect.</p>	<p>Provide proper cultural needs, specifically water needs.</p> <p>Mechanically remove pests/prune out infested areas.</p> <p>Use high pressure water wash.</p>

VERTEBRATE PESTS

GHI retains the contractual services of a certified pest management company to administer integrated pest management activities for vertebrate pest management of structures and indoor areas including member homes. This contract is managed by the Technical Services Department and contractor is required to adhere to the guiding principals of the GHI IPM policy.

Rats & Mice

Though typically viewed as being quite similar there are considerable physiological and behavioral differences between rats and mice. Generally speaking, mice are found indoors while rats are found out of doors. While a mouse will make its presence known through noise or droppings, the presence of rats is sometimes harder to determine. If a rat is seen indoors or outside in the daytime it can be safely assumed there is a large rat population.

LOCATION	ACTION THRESHOLD	ACTION
All areas of departmental responsibility.	Evidence of mice are observed or one has been seen.	Eliminate entry sites. Eliminate food sources, provide proper sanitation. Safely set traps in areas of activity. Safely set bait stations in areas of activity.
	Evidence of rats are observed or one has been seen.	Eliminate entry sites. Eliminate food sources, provide proper sanitation. Evaluate habitat for modification or removal. Safely set traps in areas of activity. Safely set bait stations in areas of activity

Gophers, Moles, & Groundhogs

Though quite difference in appearance, diet and behavior, most people cannot differentiate the mounds caused by a gopher from those of a mole. Though beneficial in the sense that they aerate and turn the soil, both animals can be damaging to the landscape and, in the case of gophers, create holes that are tripping hazards. Oftentimes these holes are enlarged by dogs.

Groundhogs are considerably larger than both gophers and moles but also form burrows that present hazard to pedestrians. Groundhog burrows can be quite large and potentially cause structural problems for decks, sheds, and homes.

LOCATION	ACTION THRESHOLD	ACTION
All areas of departmental responsibility.	Evidence of mole is observed.	Physically remove mole. Trap; to be set only where it can be done safely.
	Any gopher population.	Flood burrow system where possible. Trap.
	Any groundhog population	Use exclusionary control where possible. Trap and fill burrow entrance.

Tree Squirrels

Tree squirrels are usually no more than entertaining animals but they can injure people and can cause considerable damage and even death to plants with some of its feeding habits. Squirrels can also be destructive to fences, sheds and homes because of their chewing and nesting habits. GHI provides inspection and management of squirrels that have entered or damaged member homes or other structures.

LOCATION	ACTION THRESHOLD	ACTION
All areas of departmental responsibility.	Any damage by tree squirrel to any structure or plant of value.	Use repellants where possible. Use exclusionary control where possible. Trap.
	Any squirrel activity inside of a structure or member home.	Use exclusionary control where possible. Trap.

Raccoons and Opossums

Raccoons are highly intelligent and very curious and somewhat sociable especially during mating season. They are nocturnal in nature and typically cause problems with homeowners May through September. Raccoons average 12" high and weigh anywhere from 15-48 pounds. They are extremely adaptable and thrive in the suburban and urban areas.

Opossums are another intelligent wild animal commonly found in suburban and urban areas. They are nocturnal and also well known for "playing possum", or feigning death, a defense tactic. Adult possums are typically about two feet long and about ten pounds in weight.

Both are omnivorous, and will eat almost anything, including carrion and garbage, making them disruptive to trash containers and bird feeders. Opossums are slow, but excellent climbers, and will live in attics. Raccoons have excellent dexterity and are able to manipulate doors and vents to gain access to crawl spaces or sheds. Both can be very destructive to sheds, homes, and other structures if they gain entry for nesting. Both will also live under sheds or decks.

LOCATION	ACTION THRESHOLD	ACTION
All areas of departmental responsibility.	Any activity <u>outside</u> of a structure or member home.	Sanitation to prevent attracting animals with feed such as bird seed, pet food, household garbage. Use exclusionary control where possible to prevent access to trash containers. Trap.
	Any activity <u>inside</u> of a structure or member home.	Use exclusionary control where possible. Trap.

MISCELLANEOUS AND NUISANCE PESTS

Bees

Bees are a beneficial insect of immeasurable value because of their pollination efforts. Bees in general are not viewed by the department as threatening though bee stings are painful and cause extreme allergic reaction in some people. Management activities are designed to eliminate plant materials that are attractive to bees.

Where possible, every effort should be made to preserve bee populations both in physical activities as well as in the selection and use of pesticides. Occasionally situations arise when the removal or destruction of a hive is necessary.

Wasps, hornets, yellowjackets

This group of stinging insects are collectively known as wasps. Most of these species are beneficial in they are predatory on soft-bodied insects and are best known for their aggressive, unwanted behavior. Their stings are painful and can cause extreme allergic reaction.

Digger bees (digger wasps, sand wasps)

This is an interesting insect closely related to the wasp group. They are found in large colonies in most of the sand play areas in our parks. This beneficial insect looks and behaves somewhat like a yellowjacket and can be a cause for alarm. Though fully capable of stinging, this insect is not aggressive and is no cause for concern.

Spiders

Spiders are perhaps the most maligned and least understood of the animals found in the environment. Most people have some degree of aversion to spiders though they are extremely beneficial in their control of flies and other small insects. This area is home to large number of spider species found in a variety of habitats. Because of most people's dislike of spiders, some degree of control is generally desired.

Ants

While it might be hard to get many people to agree, ants should be viewed as a beneficial species in the sense of the role they play in the environment. It is when ants get into homes and other structures that people experience the nuisance side of their behavior.

Cockroaches

Cockroaches may become pests in homes, schools, restaurants, hospitals, warehouses, offices, and virtually in any structure that has food preparation or storage areas. They contaminate food and eating utensils, destroy fabric and paper products, and impart stains and unpleasant odors to surfaces they contact. People are repulsed when they find cockroaches in their homes and kitchens. Indoor infestations of cockroaches are an important source of allergens and risk for asthma among some populations. The levels of cockroaches and allergens are directly related to cockroach density, housing disrepair, and sanitary conditions.

Birds

Though birds generally are not much of a problem, some species have on occasion become severe enough of a problem to warrant some type of action. There are only a few control methods available that can be utilized for birds and even fewer in urban settings. While some methods work well with some species, they cannot be counted on to work for all species.

**MISCELLANEOUS AND NUISANCE PESTS
ACTION PLAN**

LOCATION	ACTION THRESHOLD	ACTION
All areas of departmental responsibility.	BEES: A swarm of bees is observed on a plant, structure, etc.	Have beekeeper remove.
	WASPS: wasp, hornet or yellowjacket nest is found anywhere that is potentially threatening to patrons.	Physically remove or destroy nest. Treat nest with insecticide
	SPIDERS: found in/on buildings.	Use broom, vacuum or water to remove spider and webbing.
	DIGGER BEES: Observed in play areas or other high traffic areas.	Rake to discourage nesting.
	ANTS: observed inside structures	Seal routes of entry where possible. Provide proper sanitation, properly store foodstuffs. Use sticky barriers. Use properly placed bait stations. Use insecticide.
	COCKROACHES: observed inside structures.	Provide proper sanitation, properly store foodstuffs. Seal routes of entry where possible. Use sticky barriers. Use properly placed bait stations. Use insecticide.
	BIRDS: evidence of troublesome or nuisance birds.	Eliminate food sources. Use exclusionary tactics at roosting/nesting sites; <ul style="list-style-type: none"> • Thin tree foliage. • Install wires, screen, netting, etc. • Use frightening devices.

APPENDIX A

The following describes pesticide usage measurement and pesticides products used by GHI.

Pesticide Usage Measurement

Pesticide usage is to be measured in *pounds active ingredient* (a.i.). This is a commonly accepted unit of measurement in the industry and is easily found on or calculated from information found on the pesticide label or Material Safety Data Sheet. In the event that this information cannot be found nor calculated for a liquid pesticide formulation, it will be assumed that the product contains 1 pounds a.i. per gallon.

Herbicides Products Used by GHI Since 2004

Common Name	Active Ingredient	Category	Signal word
Roundup Pro	Glyphosate	IV	Caution
NuFarm Credit Extra	Glyphosate	IV	Caution

Table 2. Herbicide Products Used by GHI Since 2004

Glyphosate is a non-selective herbicide that kills plants by preventing the synthesis of certain amino acids produced by plants but not by animals. It inhibits the biosynthesis of certain aromatic amino acids required for protein synthesis, which, in turn, are necessary for plant growth and maintenance. Plants exposed to glyphosate display stunted growth, green color loss, and wrinkled leaves. Plant death may take several days to weeks to occur.

Source: <http://www.npic.orst.edu/factsheets/glyphogen.pdf>

APPENDIX B

Herbicide Primer

For the purpose of this policy and procedure, pesticides are defined “substances or mixtures of substances that prevent, destroy, repel, or mitigate pests, or defoliate, desiccate, or regulate plants” (Source: Maryland Department of Agriculture Pesticide Regulation Division).

Herbicides are considered a class of pesticides specifically developed for the control of plant pests in the landscape.

Laboratory Testing

Before the United States Environmental Protection Agency (U.S. EPA) registers pesticides, they must undergo laboratory testing for short-term (acute) and long-term (chronic) health effects. Laboratory animals are purposely fed high enough doses to cause toxic effects. These tests help scientists judge how these chemicals might affect humans, domestic animals, and wildlife in cases of overexposure. When pesticide products are used according to the label directions, toxic effects are not likely to occur because the amount of pesticide that people and pets may be exposed to is extremely low compared to the doses fed to laboratory animals. *Source: U.S. EPA, <http://www.epa.gov/pesticides/about/index.htm>*

The U.S. EPA uses the following criteria to determine the toxicity category of pesticides. These criteria are based on the results of animal tests done in support of registration of the pesticide. Category I is the most toxic.

	I	II	III	IV
Oral LD50	Up to and including 50 mg/kg	From 50 thru 500 mg/kg	From 500 thru 5000 mg/kg	Greater than 5000 mg/kg
Inhalation LC 50	Up to and including 0.2 mg/liter	From 0.2 thru 2 mg/liter	From 2.0 thru 20 mg/liter	Greater than 20 mg/liter
Dermal LD 50	Up to and including 200 mg/kg.	From 200 thru 2000 mg/kg	From 2,000 thru 20,000 mg/kg	Greater than 20,000 mg/kg
Eye effects	Corrosive; corneal opacity not reversible within 7 days	Corneal opacity reversible within 7 days; irritation persisting for 7 days.	No corneal opacity; irritation reversible within 7 days	No irritation
Skin effects	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation at 72 hours.

Table 1. Toxicity Categories

Source: <http://www.epa.gov/EPA-PEST/1999/October/Day-21/p27397.htm>

Further information on these criteria and labeling requirements is published in the Code of Federal Regulations (40 CFR 156.10). *Source: <http://www.epa.gov/agriculture/tpes.html>*

Human Hazard Signal Words for Toxicity Categories

- **Toxicity Category I** - All pesticide products meeting the criteria of Toxicity Category I shall bear on the front panel the signal word "Danger." In addition if the product was assigned to Toxicity Category I on the basis of its oral, inhalation or dermal toxicity (as distinct from skin and eye local effects) the word "Poison" shall appear in red on a background of distinctly contrasting color and the skull and crossbones shall appear in immediate proximity to the word "poison."
- **Toxicity Category II** - All pesticide products meeting the criteria of Toxicity Category II shall bear on the front panel the signal word "Warning."
- **Toxicity Category III** - All pesticide products meeting the criteria of Toxicity Category III shall bear on the front panel the signal word "Caution."
- **Toxicity Category IV** - All pesticide products meeting the criteria of Toxicity Category IV shall bear on the front panel the signal word "Caution."