



# INTEGRATED PEST MANAGEMENT PLAN



**City of University City  
Parks, Recreation and Forestry Department  
2019**

# CHAPTER 1

# INTEGRATED PEST MANAGEMENT (IPM)

## 1.1 INTRODUCTION

The City's parks and natural areas are a reflection of the values of the community. The Parks, Recreation and Forestry Department strives to ensure that public landscapes remain attractive and meet the expectations of thousands of users and preserve natural ecosystems for future generations. These green open spaces offer University City residents the opportunity to enjoy a natural environment within their community. Trees, shrubs, flower beds, ponds, rivers and lakes make up these open spaces, and require maintenance and protection from damage by both humans as well as biological pests.

Integrated pest management (IPM) is a sustainable approach to managing pests by combining biological, cultural, mechanical and chemical methods in a way that will minimize the effects on the environment, minimize domestic and health risks, while considering budgetary restrictions. The Parks, Recreation and Forestry Department has adopted this IPM, which outlines how both passive and active modes of maintenance are vital to the preservation of any environment. The objectives of the Parks, Recreation and Forestry Department's IPM program are as follows:

- To protect the health, safety, and welfare of the community.
- To provide efficient cost-effective maintenance of the City's park resources, which includes non-chemical controls whenever possible.
- To design new and renovate existing landscape areas that suit site conditions with sustainable maintenance practices, thus providing a comprehensive stewardship of parks and natural resources.
- To restore, create and protect environmentally valuable areas such as wetlands and riparian areas, aquatic and terrestrial wildlife habitat, forests, and meadow areas.

## 1.2 DEFINITIONS

**Integrated Pest Management (IPM)** – A decision-making process to determine if, where, when and how pest problems will be managed. An IPM program includes all potential pest control strategies, but focuses on non-chemical controls whenever possible, in order to perpetuate a sustainable environment. The following four pest control methods may be employed in an IPM program:

- **Cultural Control:** The use of sound horticultural practices to optimize plant health and to suppress insects, disease, and weed growth. Other cultural controls include site-appropriate design and the use of disease or drought-resistant plants.
- **Mechanical Control:** The use of a variety of tools and equipment for the purpose of eliminating pests.

- **Biological Control:** The use of biological control agents that act as predators or parasites of pest species. The use of other beneficial organisms that improve plant health by enhancing soil quality.
- **Chemical Control:** The application of various agricultural products such as herbicides, insecticides or fungicides or other chemical compounds to a target pest as a means of control.

**SDS** – Safety Data Sheets or SDS are prepared by manufacturers of chemical products to relay the necessary safety and protective information to users about the said chemical compounds.

**Pesticide** – Any material including agricultural chemicals, herbicides, insecticides and fungicides, or biological agents applied to a target pest as a control measure.

**Pest** – The word “pest” has been broadly defined in this document to include “injurious” insect species, plant pathogens, noxious or invasive vegetation, vertebrate animals such as rodents, structural pests or any other factor that creates an unhealthy environment for landscapes and structures.

**Threshold** – The term “threshold” refers to the point at which pest injury can no longer be tolerated without compromising the health or aesthetic value of a plant, ecosystem or other assets of value including human health. Once a threshold is being approached, some control measure may be necessary to suppress pest activity to acceptable levels.

### 1.3 BACKGROUND

#### Policies and Regulations

By legal definition, a pesticide is any substance for which a manufacturer or distributor claims pesticidal value. Today there are more than 32,000 pesticide products registered to destroy, prevent, attract, or in some manner, control pests.

The first act of pesticide control was passed in 1910 called the Insecticide Act of 1910. Since then there has been the Federal Insecticide, Fungicide, and Rodenticide Act of 1947 (FIRFA) and more recently, the Federal Environmental Pesticide Control Act of 1972. The major provisions of this act are:

- All pesticides must be registered with the U.S. Environmental Protection Agency (EPA). Qualified states may also register pesticides under special conditions.
- All pesticides will be classified for either general or restricted use.
- Only certified applicators, or those under their supervision, may apply restricted use pesticides. States have the authority to certify applicators.
- Use of pesticide inconsistent with labeling instructions is prohibited.

- Violators may be fined or imprisoned or both.

Other important regulations pertain to working within a protected areas, such as wetlands and riparian corridors, steep slopes and native growth protection areas. Certain activities are restricted in these areas and may require special permits granted by the City of University City and other regulatory agencies.

### **Pesticide Use Decision**

The following individuals are involved in the determination of when to use pesticides within the University City Parks, Recreation and Forestry System.

- **Superintendent of Parks Maintenance** is responsible for upholding and applying City and Park's pesticide policies and procedures within their areas of control. He is also responsible for ensuring that any personal protective equipment (PPE) is available and properly fitted for use by applicable staff for any chemical application. He is also responsible for coordinating the mandatory annual recertification training for all licensed pesticide applicators.
- **Golf Superintendent, Forestry Supervisor and Crew Leaders** determine the most appropriate control measure for actual landscape pest situations, including selecting the most appropriate pesticide products, if necessary. They are also responsible for the safe storage and handling of pesticides, spill responses and related training.

### **Pest Management Guidelines**

The following pest management guidelines generally apply to all City of University City Parks, Recreation and Forestry Department landscapes:

- Park landscapes shall be designed to minimize pest management. Where resources are available and existing design themes will not be compromised, modifying landscapes will be considered to reduce pest management.
- All reasonable, cost effective non-chemical pest control options shall be considered first before resorting to the use of pesticides.
- The Parks, Recreation and Forestry Department shall practice IPM in all pest management situations, understanding that some situations will require the use of a pesticide.
- Certain levels of pest problems or populations shall be accepted within established thresholds. Those thresholds will vary with the pest and the landscape setting.
- Only pesticides approved for that particular use will be used for the prescribed applications. When pesticides are applied, the smallest effective area will be treated, and the application will be timed to minimized public contact and the effects on the environment.

- Whenever possible, pesticide applications will be carefully timed to control the pest and reduce the need for re-treatment.
- In accordance with the Missouri State Licensing Guidelines, all staff and contractors who are engaged in the use, application and storage of pesticides, shall have a current Missouri State Pesticide License. Contractors must notify appropriate Department representatives prior to the application of any pesticide for approval to use such pesticides.
- Parks, Recreation and Forestry Department pesticide applicators shall strictly observe all pesticide products label requirements. All chemicals used within the Parks, Recreation and Forestry System will have an SDS on file, and will be available to all staff, contractors and the public upon request.
- Pesticides shall not be used to control plants with edible fruit during the fruiting season unless the plant being controlled is not of sufficient size to produce fruit. Fruiting plants such as blackberries should be first cut to the ground, allowed to re-sprout and then chemically controlled before the plant can produce fruit. Plants controlled in this manner should never be allowed to produce fruit in the future.
- All sites where pesticides have been applied shall be posted, as required by the Missouri State Department of Agriculture. As required by the MSDA, all applications of pesticides will be recorded.
- When pesticides are used in confined environments such as greenhouses, the facility shall be clearly posted “Closed to Entry” until the re-entry time period has elapsed.
- The Parks, Recreation and Forestry Department will continue its aggressive training program for all staff that apply pesticides and will continue to emphasize learning new pest control techniques, as they are available.
- The Parks, Recreation and Forestry Department will continue to field test alternative controls to pesticide use and will implement successful control options as time and budget allows.
- The City shall comply with all Federal, State and Local regulations pertaining to the application, handling, storage, and disposal of pesticides.

### **Components of an IPM Program**

IPM involves a structured decision-making process that embodies the philosophy and components of the IPM system. Through the following applications, as well as the proceeding guidelines, a well managed IPM program can be implemented.

1. **Identification of pest populations:** Identify the nature, locations, scale and the intensity of the problem.

2. **Determine plant injury levels:** Define the tolerance levels for aesthetic and economic injuries. Prescribe the point at which actions must be taken to avoid exceeding the tolerance level.
3. **Design and implement the pest management treatment:** Research all possible options and design strategies. Non-target organisms must be considered at this time. Use of pesticides is limited to situations where other cultural and biological options are not likely to be successful within the context of available resources. The pesticide chosen shall be the least toxic of those available and with the minimal of impact, as defined by that chemical's use.
4. **Evaluate results:** Conduct follow-up inspections to support evaluation:
  - Did the pest population decline to acceptable levels?
  - Was there a negative impact on non-target organisms?
  - Do the host plants appear to be able to thrive following a successful treatment?
5. **Adjust and extend program as indicated:** Decide whether further treatment will be necessary, either on a temporary or permanent basis. If it will be on a permanent basis, plan potential site modifications to eradicate the problem or prevent future recurrences.
6. **Create documentation of all research, monitoring, and application data:** A comprehensive system of forms for monitoring data and documenting treatment is a key component of a successful IPM program.
7. **Share pest management information with decision-makers and other maintenance staff:** Professional staff must know the degree to which landscape pest management programs impact existing staff, maintenance budgets, and park assets. Only through such understanding and ongoing communication can the best long-term strategies be developed for managing pest populations.

### **IPM Alternatives Selection Hierarchy**

The following section rationales are used as a guide in determining whether pesticides shall be used in place of other control methods:

- Proper planning and management decisions begin the IPM process.
- Cultural methods of vegetation and pest control will be employed next where feasible, and then.
- Biological means of vegetation and pest control will be employed next where they are practical and feasible.
- Pesticides will only be used when no other feasible method exists that will control the pest within the realities of the location, site conditions, budget, time and other relevant considerations. At the same time, it is recognized that pesticide use is a legitimate element of an IPM program.

## CHAPTER 2

## BEST MANAGEMENT PRACTICES (BMP's)

### 2.1 STORAGE AND USE GUIDELINES

Every employee has a personal responsibility to themselves, other staff, and the public to follow safe work practices when storing or using pesticides.

#### 1. Management Practices

- Always read the label of the chemical that you will be using.
- Store and handle all chemicals or fertilizers in a manner that minimizes worker exposure and potential for contamination of surface and ground water.
- Always have the correct Safety Data Sheet (SDS) on hand for all chemicals or fertilizers at you site (required by law).
- Always check the SDS for the type of protection needed and the recommended re-entry time before the chemical is applied.
- When possible, purchase the smallest amount of any pesticide needed and avoid stockpiling of chemicals.
- Store fertilizer in a separate weatherproof area and apply as soon as possible.
- All spray equipment shall be maintained in proper working order and stored in an approved site.
- All protective gear (masks, filters, rain gear) will be stored separately from any possible contamination.
- Store and mix all chemicals in an approved storage and mixing area. Label storage area with a coded sign to protect Fire Department or Hazmat personnel in case of emergency.
- Any pesticides in inventory that are no longer needed for use will be disposed of through hazardous materials disposal practices.
- A pesticide inventory shall be maintained by the Golf Superintendent, Forestry Supervisor and Parks Crew Leader(s).

#### 2. Pesticide Application Equipment

Pesticide application for all listed areas will be carried out by hand with directed, low-volume, single-wand sprayers, wiping, daubing and painting equipment, injection systems, or drop spreaders. Typically, applications are done with backpack sprayers, but may also include sprayers with larger fill tanks providing the same kind of hand application method is used. These

methods of delivery result in low-volume applications at low nozzle pressures. This practice minimizes the formation of fine mists that can result in pesticide drift. These practices also help ensure that the pesticide applied will reach only its intended target. In large open turf areas, boom type sprayers may also be employed. Boom sprayers are efficient and expedient, used to destroy weeds species after they have exceeded the acceptable threshold level.

### **3. Personal Protective Equipment (PPE)**

The table shows the personal protective equipment required by City, state and federal regulations for pesticide use.

### **4. Chemical Application near Watercourses & Aquatic Habitats**

Generally, the use of chemical products within 50 - 100 feet of a watercourse shall be prohibited in favor of an alternative control method. If a pesticide or herbicide must be applied within the 50 - 100 foot buffer, only products registered for use near water bodies shall be used, and great care will be taken to ensure that the product does not migrate into the watercourse either through drift or by overland flow. Weather conditions must be monitored carefully to avoid applying a chemical near a watercourse immediately before heavy rains. Soil conditions and site topography must also be carefully studied to determine the appropriate timing of a chemical application and/or whether a chemical should even be applied at the site.

## **2.2 IPM BEST MANAGEMENT PRACTICES (BMP's)**

The Parks, Recreation and Forestry Department maintains a wide-variety of landscape types, each with unique pest control issues and control measures. For these reasons, the pest control measures specific to each landscape are dealt with separately in this section. If chemical applications are required, only chemicals approved for a specific location will be used in that location. The Parks, Recreation and Forestry Department only uses approved chemicals within the Parks, Recreation and Forestry System.

### **IPM BMP's For Trees**

Trees are an integral part of most landscapes, whether formal or natural, and are considered an asset. They provide shade, clean the air of pollutants, modify both micro and macro climates, and provide visual relief to the urban environment. Because trees are often very large and tall, accessing and managing insects and disease can be quite difficult and costly.

#### **1. Pest Tolerance Thresholds**

- In general, insect and disease pests in trees are tolerated.
- Insect or disease pests in selected, high-value specimen trees may be subject to control measures.



## Pest Management Strategies

- Physical Damage to Trees – Physical damage to trees can be a major factor in overall loss of trees. This damage most often occurs in one of two ways. One is when trees are repeatedly struck by mowing equipment. A second form of injury is by string trimmers, which can damage bark leading ultimately to tree loss. Many trees are also lost to lack of appropriate care during construction projects within existing parks.
  - Removing turf from around the tree base to create tree mulch rings 3 to 4 feet in diameter can substantially reduce damage caused by mowers and trimmers. With tree mulch rings, a mower or trimmer never has to come close enough to the tree to cause damage. The tree mulch ring will need to be kept free of grass and weeds.
  - Construction Site Management substantially reduces or eliminates damage from construction activities.
  - All pruning for tree health reasons and for hazard reduction will be done in conformance with the International Society of Arboriculture standards.
- Plant a diverse urban forest with a goal of planting no more than 5% of a particular *Genus* of tree.
- Insect Control – The Parks, Recreation and Forestry Department does not actively control insect pests in trees. This is particularly true of large trees where the control of the pest might require the use of large aerial spray equipment, which carries with it a high probability of the insecticide, applied leaving the area due to wind drift. When insect pests are controlled in trees, the following measures are used:
  - Trees that are highly susceptible to specific insect pests may be removed from the landscape and replaced with resistant species.
  - When possible, the portion of the tree affected by the insect can be physically removed, eliminating the pest.
  - An insecticide may be applied to control a specific insect pest in very selected situations. These situations include pests on specimen quality trees at special gardens or in high visibility locations where the presence of the pest threatens the life of the tree. In these situations, general foliar applications will not be made unless the potential for product drift can be controlled.
  - New injection technology may allow for systemic control of certain insect pests with minimal or no impact to human or environmental health. The Parks, Recreation and Forestry Department will continue to explore this technology as a potential control in the future for insect pests that may threaten the health of valuable park trees.
- Disease Control – Most diseases are tolerated in trees, unless they lead to a tree becoming a hazard to the surrounding environment. As with insecticides, it is unlikely that the Parks, Recreation and Forestry Department will subscribe to general foliar applications of fungicides

or similar pesticide products to control disease pests in trees. The following are control measures that can be performed:

- Trees that are susceptible to particular disease pathogens may be removed from the landscape and replaced with resistant varieties.
- When possible, parts of trees affected by disease should be pruned out and properly disposed to stop the spread of disease within the tree and to adjacent trees.
- An appropriate fungicide may be applied to control a specific disease pathogen in very selected situations. These cases include specimen quality trees in special gardens or in high-visibility park locations where the presence of the disease threaten the life of the tree. In these situations, general foliar applications will not be made unless the potential for product drift can be controlled.
- New “injection” technology may allow for systemic control of certain disease in trees pests with minimal or no impact of human or environmental health. The Parks, Recreation and Forestry Department will continue to explore this technology as a potential control for disease pests that may threaten valuable trees in City parks.

## **IPM BMP's For Turf**

The City of University City's Parks, Recreation and Forestry System maintains a variety of turf types. These include park lawn areas (both formal and informal), athletic fields, meadow areas and other turf types. Each of these turf types has different pest management challenges, and practices may vary accordingly:

### **1. Pest Tolerance Thresholds**

- Some level of weed, insect, and disease pests are tolerated in general park lawn areas.
- Pests in highly maintained turf such as athletic fields and other high-visibility/high-use areas are generally controlled through good turf cultural practices.
- Because of the unique conditions present on athletic fields, a variety of pest control measures are used, including mechanical, cultural and chemical.

### **2. Pest Management Strategies**

- Broadleaf Weeds – Weeds in turf are tolerated, to some level, with the exception of athletic field turf and a few high-visibility park turf areas. When control is necessary, the primary method is through the following cultural practices:
  - Careful monitoring of watering practices
  - Fertilization
  - Aeration
  - Top-dressing
  - Over-seeding

By performing these cultural practices, park turf is made healthier and better able to compete with various broadleaf weeds. Chemical weed control will be used only as a last resort for controlling particularly difficult weeds in high-visibility turf areas.

- In these limited situations the least toxic, least residual pesticide will be used for spot treatments.
- General broadcast treatments will generally be avoided.
- Timing of such applications will be made to avoid contact with the public to the extent possible.
- Posting of the site that has been treated will meet or exceed legal requirements.

Maintenance for the City's athletic fields generally does have to control for broadleaf weeds. This control is done through cultural practices and spot application of carefully selected herbicides.

- Insect Control - The only real insect pest currently of significance for turf in the University City area is the grub worm.
  - Chemical control is used only in the very limited circumstances to turf of very high visibility and value such as athletic fields and selected high-visibility/high-use park turf.
  - Any chemical applications will be spot treatments directed specifically at the turf areas containing the pest.
  - The preferred initial choice for application in high-use areas is the "safest" or least toxic product available.
- Disease Control General Park Turf – Disease in general park turf is typically tolerated and not actively controlled.
  - In high-use/high visibility park turf areas, disease will be controlled to a considerable degree by performing sound cultural practices.
  - Pesticides may be used as a last resort to control disease in park turf areas.
- Athletic Field Turf – Because turf disease can be a significant problem on athletic fields, it must be controlled to preserve the function of this asset. Athletic Field turf, must perform under extreme conditions of maintenance and use. These conditions make athletic turf more susceptible to disease than general park turf.
  - Athletic Field turf disease is controlled through good cultural practice to the extent possible.
  - Certain diseases are controlled through the application of an appropriate fungicide.
  - When used, fungicides are applied to the diseased turf only.
  - The least toxic and still effective products are used.
  - The fungicide used will be rotated yearly to reduce the chance of the turf disease developing a resistance to the chemical control.

- **Grass Trimming Abatement** – The control of grass growing along fence lines and around trees, bollards, posts and other landscape features is a regular maintenance activity that helps preserve the asset by allowing large riding lawn mowers to steer clear of objects. This is especially important around trees where impact from mower damage can easily lead to tree loss. At the same time, keeping this grass controlled allows Parks to present parks that appear clean and well kept. This grooming affects how the public uses our facilities. Well-maintained parks are subject to less vandalism and related misuse. The following are BMP's for grass trimming:
  - *String trimmers or push mowers.* The grass is trimmed using gas-powered string trimmers or push-type lawn mowers. This labor-intensive practice is costly and produces noise and air pollution.
  - *Herbicide.* Applications are performed annually or semi-annually, to provide pre-emergent control of weed and grass seed not yet germinated in tree mulch rings, plant beds and similar areas.
  - *Concrete mow strips.* As resources are available, it is sometimes possible to provide a "mow strip" of concrete or a similar low maintenance product around some landscape features to eliminate the need for grass trimming. This control option is costly and doesn't work in all situations.

### **IPM BMP's For Natural and Sensitive Areas**

Natural areas are City-owned property with critical environmental resources. These sensitive habitats shelter native ecosystems and wildlife habitat. For the purposes of this BMP manual, these resource assets are divided into three (3) major groups:

- Wetlands, riparian corridors, shorelines and aquatic habitats
- Forests
- Meadows

#### **1. Pest Tolerance Thresholds**

- Invasive plants are generally not tolerated. Invasive plants will be controlled in conjunction with natural resource enhancement efforts in these environments as resources permit and where control can be practically achieved.
- Noxious weeds will not be tolerated and will be controlled when found in conformance with State of Missouri mandate.
- Only insect pests that pose a risk to the public (such as hornets) or to the resource (emerald ash borer) will be controlled.
- Plant diseases will generally be tolerated unless: a specific control can be employed that will be effective in ensuring the health of particularly valuable assets; or if they pose a threat to other plant populations outside of the natural area; or if they pose an unacceptable risk to the public.

- Herbicide Use: The use of herbicides in any natural environment must be carefully considered. Herbicides will be used for weed control in natural areas only when other control measures have been tried and failed, and only if control can be achieved through the use of an herbicide, and is imperative to the health of the site. For wetland or water environments, only approved wetland herbicides (Rodeo or equivalent) will be used.

When needed, herbicide use practices are as follows:

- Cut and stem treatment (daubing or painting) is the preferred choice for natural area management.
- Certain invasive plants are difficult to treat and control in their mature form. If possible, remove existing growth manually or mechanically. Wait for new growth to become established. Then treat with the appropriate and approved herbicide.

## 2. Pest Management Strategies

- Weed Control - An overriding principle of the IPM is the maintenance of healthy plant communities. That means weed control of the following types:
  - *Timed Mowing*. Carefully timed mowing before seed set can effectively reduce weed seed sources. Frequent mowing can eliminate woody species.
  - *Mulching*. Mulching around the base of plantings is widely accepted as a horticultural practice for soil fertility and weed control. In most instances, composted wood chips or recycled leaf litter are adequate materials. Avoid wood chips from diseased trees. Mulch should be between 2 to 3 inches deep for best results.
  - *Weed watch during mulching*. Care must be given to not incorporate new weed problems when importing mulch materials.
- Woody Brush Control – The control of woody brush is very important in certain park locations. Often these plants are found in transition areas between developed park areas and natural areas. If not controlled, woody brush can easily over take forest-edge environments, elimination vital habitat opportunities. Control measures for woody brush include the following:
  - Manual or mechanical removal using hand tools or gas-powered equipment. Special tools are now available for removing woody brush. In many areas, this can provide effective control.
  - Chemical control can be employed when other measures are not mechanically or economically feasible. Spot applications are preferred, whenever possible, to large area applications.
- Insect Control – Insects like the emerald ash borer can potentially devastate University City’s urban forest. The Parks, Recreation and Forestry Department will cooperate with state and federal agencies in their monitoring and control programs to prevent the introduction of these pests.

- Disease Control: Root Rots – Even native forests can have serious disease problems. Root rots are the most serious problem, leading often to the death of significant trees. Several strategies help control root rot in forests:
  - Remove infected wood
  - Plant resistant varieties
  - Treat resulting stumps
  - Do not change site conditions on mature trees
  
- Stump Re-Sprouting Control – Often there is a need to remove small trees and prevent re-sprouting of a stump. Methods for controlling the re-sprouting of stumps include the following:
  - If the location of the stump(s) will allow access by equipment, then they can be mechanically removed providing the location is not within an environmentally critical area.
  - Small stumps may be removed manually providing they are not on steep slopes or in other environmentally critical areas.
  - The re-sprouting of stumps can also be controlled by painting newly cut stump surfaces with an herbicide. Care will be taken to limit the application of the selected herbicide to the stump surface only.
  
- Invasive Plant Control – Invasive plants have taken over many of the City's forested areas and have radically and negatively impacted pre-existing ecosystems. Attaining long-term control of invasive plants is essential to the recovery and preservation of University City's natural ecosystems. The goal is suppression of weed populations to below threshold (damage causing) levels. Eradication of certain ecological weeds (ivy) in all of the City's natural areas is neither feasible nor cost-effective. However, controlling spread of the problem and eradicating it in certain priority locations are Parks goals. Control methods include:
  - Use *extent of removal* and *type of habitat* to determine the pest control method.
  - Large areas that are totally infested can be mowed. Areas that are interspersed with invasive pests require more selective procedures such as manual removal.
  - Heavy equipment or manual removal can be used on firm soils. On either steep or saturated soil, use techniques that will minimize site or slope disturbance.
  - Where mechanical or manual removal is neither possible nor practical but control is essential, careful and selective use of an approved herbicide is permitted. Use of these chemicals shall conform to the guidelines listed below in "Herbicide Use".
  - Re-establishing a new native planting regime as quickly as possible following the removal of invasive plants is critical to successful forest restoration. These new plantings will require care for several years to guarantee establishment.
  - Preserve established native plants when possible rather than reestablishing new plants after the clearing of invasives.
  - Public education and outreach concerning plant identification and management techniques will also aid the City in controlling noxious weeds.

- Nuisance Wildlife Control – Beavers, moles, coyotes, opossums, raccoons, waterfowl and other species can be destructive to natural areas when their activities are excessive. Overall, Parks does not encourage the interference with wildlife, and prefers to leave them to their natural behaviors. If control of wildlife is deemed necessary, the Parks, Recreation and Forestry Department will work with the most appropriate city, county or state agency to formulate a control solution.

## **IPM BMP's Trails**

### **1. Pest Tolerance Thresholds**

- Invasive plants that invade the trail area are generally not tolerated. Invasive plants will be controlled in conjunction with ecosystem restoration efforts on any park trail as resources permit.
- Noxious weeds will not be tolerated and will be controlled when found in conformance with State of Missouri mandate.
- Weeds are generally found on trails and many will be tolerated within nature trail areas. Weeds that begin to from a hindrance of trail function will be eradicated.
- Only insect pests that pose a risk to the public (e.g. hornets) will be controlled.

### **2. Pest Management Strategies**

- Weed Control – Weeds on trails are generally tolerated, until they begin to interfere with trail function. When control is necessary, the primary method is increasing mulch on, or resurfacing trail surface.

Chemical weed control is often not necessary on most trail surfaces but will be used only as a last resort for controlling particularly difficult weeds.

- In these rare situations the least toxic, least residual herbicide will be used for spot treatments.
  - General broadcast treatments will be avoided.
  - Timing of such applications will be made to avoid contact with the public to the extent possible.
  - Posting of the site that has been treated will be done as legally required.
- Insect Control – Overall, insects on trails are tolerated. Only insects that can cause a health risk are controlled. Wasps and hornets are some of the few insects that will be eradicated immediately when encountered. When this is necessary, chemical control, with an approved insecticide, is the preferred method.

## **2.3 TRAINING**

Because IPM is an ecologically sophisticated process that requires professional expertise in vegetation and pest management, it demands trained field personnel that are knowledgeable about:

1. Ecological interactions and relationships among vegetation and pests;
2. Potential tools and materials that can be used to effectively manage vegetation and pests by manipulating environmental conditions; and
3. Correct timing for implementing specific management practices relative to vegetation and pest biology.

Educational and career opportunities in IPM will enhance crew professionalism, their knowledge of current vegetation and pest management practices, and their stewardship of managed landscapes. Each landscape type will have an individualized training program developed and accessible to all applicable staff.



# APPENDIX

## COMMON WEEDS AND INVASIVES

### Crown Vetch

1. Crown vetch is a low growing plant that quickly takes up large patches of landscape. It has pink flowers starting in late spring.
2. Should be sprayed with Roundup/Rodeo or equivalent (If near water), several times a year while it is actively growing, starting in early spring

### Honeysuckle

1. Honeysuckle is a soft wooded shrub that can grow to be quite large. It has fragrant white flowers in late spring, turning to red berries in summer and fall.
2. Honeysuckle can be sprayed with Roundup/Rodeo or equivalent (If near water), then cut to the ground, or can be cut first and then treated with herbicide on the freshly cut stump to prevent re-sprouting. Young sprouts can be pulled from the roots.

### Cottonwood

1. Cottonwood is a tree that seeds itself prolifically. It has a distinctive D-shaped leaf.
2. Pull young sprouts by the roots, or cut at ground level and herbicide fresh stumps if it has grown too large to pull.

### Dogwood

1. Dogwood is a nice native tree that unfortunately can become invasive. Look for a twig with leaves opposite of each other, and a pinkish hue at the very tip.
2. Pull young sprouts by the roots, or cut at ground level and herbicide fresh stumps if it has grown too large to pull.

### Willow

1. Willow is a tree with thin, spear shaped leaves. It sprouts from the root systems of other willow trees.
2. Pull young sprouts by the roots, or cut at ground level and herbicide fresh stumps if it has grown too large to pull.
3. Any willow seedlings should be pulled or cut and treated with herbicide at the stump.

### Elm

1. Elm is a tree that sprouts up in small numbers. Look for a seedling with compact growth and serrated leaf edges.
2. Pull young sprouts by the roots, or cut at ground level and herbicide fresh stumps if it has grown too large to pull.

## Johnson Grass

1. Johnson Grass is a tall grass that grows in large clumps. It is usually 6 feet tall or more, with large seed heads in summer.
2. Johnson Grass should be sprayed with a grass specific herbicide (Outrider or equivalent) and should never be allowed to go to seed. If it is not treated with herbicide in time, it should be cut back before seeds drop.

## Nutsedge

1. Nutsedge is a small, grass like plant that produces spiny round yellowish seed pods in the summer.
2. It is easiest to hand pull nutsedge with less than six leaves, but it can be sprayed with halosulfuron-methyl (Sedgehammer or equivalent) if necessary.

Plant Species	Treatment	Time of Year
Crown Vetch	Spray	Early spring and throughout summer
Honeysuckle	Spray, pull or cut and treat	Pull year round; cut and treat in spr/sum
Cottonwood	Pull or cut and treat	Pull year round; cut and treat in spr/sum
Dogwood	Pull or cut and treat	Pull year round; cut and treat in spr/sum
Willow	Pull or cut and treat	Pull year round; cut and treat in spr/sum
Elm	Pull or cut and treat	Pull year round; cut and treat in spr/sum
Johnson Grass	Spray	Mid-late spring and throughout summer
Nut Sedge	Spray or pull	Throughout growing season