

## Chapter 3 – Integrated Pest Management



The City's parks and natural areas are a reflection of the values of the community. The Parks 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 Bellevue 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 is a sustainable approach to managing pests by combining biological, cultural, physical 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 Department adopted an IPM program in 1997, which has been integrated into this document, which outlines how both passive and active modes of maintenance are vital to the preservation of any environment. The objectives of the Parks 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. This includes non-chemical controls whenever possible.
- To design new and renovate existing landscape areas that suit site conditions with sustainable maintenance practices, thus

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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.

### 3.2 Definitions

**Integrated Pest Management** – 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.

**MSDS** – Material Safety Data Sheets or MSDS 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.

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## 3.3 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 Insecticide Act of 1910 was the first legislative action taken in an effort to regulate the use of pesticides. 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.

In order to comply with this act as well as other regulations, the City of Bellevue has established its own Hazard Communication Program, which integrates into the Park's IPM program as well, to ensure that all employees remain informed and receive the proper training when dealing with hazardous chemicals and their application. The components of this will be discussed later in this chapter.

Other important regulations pertain to working within protected areas, such as wetlands and riparian corridors, steep slopes and native growth protection areas. Certain activities are restricted in these areas and may

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require special permits granted by the City of Bellevue and other regulatory agencies. Further description of these areas and their restrictions will be described in specific chapters of this manual.

### Pesticide Use Decision Process

The following agencies and individuals are involved in the determination of when to use pesticides in Bellevue Parks:

- The **Washington State Department of Agriculture (WSDA)** sets the overall policy for pesticide use in the state of Washington. The approved chemical list can be seen on their website at [www.agr.wa.gov](http://www.agr.wa.gov).
- The **Washington Department of Ecology (WDOE)** requires a special permit for all aquatic herbicide applications. This permit allows herbicide control for all listed noxious weeds within an aquatic environment and monitors impact levels on non-target plants.
- The **Park Resource Managers, Golf Course Superintendents, Contract Administrators and Crew Leaders** are responsible for upholding and applying City and Park's pesticide policies and procedures within their areas of control. They are also responsible for ensuring that any personal protective equipment (PPE) is available and properly fitted for use by applicable staff for any chemical application.
- The **Site Managers and Crew Leaders** determine the most appropriate control measure for actual landscape pest situations, including selecting the most appropriate pesticide products, if necessary. In golf maintenance, this responsibility rests with the **Golf Course Superintendent** or their immediate assistant. They are also responsible for the safe storage and handling of pesticides, spill responses, and related training.
- The **Risk Manager** is responsible for coordinating the mandatory annual recertification training for all licensed pesticide applicators, officially called "Pesticide Operators."

### Pest Management Guidelines

The following pest management guidelines generally apply to all City of Bellevue Parks and Community Services landscapes:

- Park landscapes will 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 will be considered first before resorting to the use of pesticides.
- Parks will practice IPM in all pest management situations, understanding that some situations will require the use of a pesticide product.
- Certain levels of pest problems or populations will be accepted within established thresholds. Those thresholds will vary with the pest and the landscape setting (see individual chapters).
- Parks will not perform prophylactic or calendar-based pesticide applications.
- 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 minimize 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 retreatment.
- In accordance with the Washington State Licensing Guidelines, all staff and contractors who are engaged in the use, application and storage of pesticides shall have a current Washington State Pesticide License. Contractors must notify appropriate Department representatives prior to the application of any pesticide for approval to use such pesticides.
- Parks pesticide applicators shall strictly observe all pesticide products label requirements. All chemicals used on Parks property will have an MSDS 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 may 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 will never be allowed to produce fruit in the future.
- All sites where pesticides have been applied shall be posted, as required by the Washington State Department of Agriculture (WSDA). As required by the WSDA, all applications of pesticides will be recorded. All application records Department wide will be filed in one central location at the Resource Management office and made readily available to the public upon request.

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- 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.
- Parks will continue its aggressive training program for all staff who apply pesticides, and will continue to emphasize learning new pest control techniques as they are available.
- Parks will continue to field test alternative controls to pesticide use and will implement successful control options as budget allows.
- To promote public understanding and support of the benefits of the IPM program, educational assistance and information will be provided to the public regarding the use of pesticides.
- 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 the 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, location, 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 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.

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### IPM Control Alternatives Selection Hierarchy

The following selection rationales are used as a guide for 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 are preferred and will be employed first.
- If unsuccessful, mechanical means of vegetation and pest control will be employed next where feasible.
- 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 and other relevant considerations. At the same time, it is recognized that pesticide use is a legitimate element of an IPM program.

## 3.4 Best Management Practices

### 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



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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 Material Safety Data Sheet (MSDS) on hand for all chemicals or fertilizers at your site (required by law).
- Always check the MSDS 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 and avoid stockpiling of chemicals.
- Store fertilizer in a separate weatherproof area.
- All spray equipment shall be maintained in proper working order and stored in an OSHA-approved site.
- All protective gear (masks, filters, rain gear) will be stored separately from any possible contamination.
- Store and mix all chemicals in a WSDA-approved storage and mixing area. Label storage area with an NFPA-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. The Washington State Department of Agriculture (WSDA) provides free disposal of unwanted pesticides at various locations throughout the calendar year.
- All chemical containers will be clearly labeled.
- A pesticide inventory will be maintained by the Resource Management Division.

#### 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 tools used to destroy weed species after they have exceeded the acceptable threshold level. Broadcast applications shall be avoided unless absolutely necessary.

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

The table on the following page 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 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 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. All applications will be made under the guidelines of the NPDES Aquatic Noxious Weed Management General Permit as issued by the Washington State Department of Ecology (DOE). 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.

5. **Chemical Application in Watercourses**

Generally, the use of chemical products within aquatic environments shall be prohibited in favor of alternative control methods. In limited situations, the City may apply herbicides directly to watercourses to control wide spread noxious aquatic vegetation, such as Eurasian Water Milfoil, within public marinas, boat launches and swimming beaches. In such applications, only products registered for use in aquatic environments and approved by the DOE will be used. Chemical

### 3 Integrated Pest Management (IPM)

Personal Protective Equipment (PPE) Guide for Using Pesticides			
Form of Pesticide	LABEL SIGNAL WORD		
	Caution	Warning	Danger
Dry	<ul style="list-style-type: none"> <li>• long-legged pants</li> <li>• long-sleeved shirt</li> <li>• shoes &amp; socks</li> </ul>	<ul style="list-style-type: none"> <li>• long-legged pants</li> <li>• long-sleeved shirt</li> <li>• shoes &amp; socks</li> <li>• wide-brimmed hat</li> <li>• gloves</li> </ul>	<ul style="list-style-type: none"> <li>• long-legged pants</li> <li>• long-sleeved shirt</li> <li>• shoes &amp; socks</li> <li>• hat</li> <li>• gloves</li> <li>• cartridge or canister respirator if dusts in air or if label precautionary statement says "Poisonous or fatal if inhaled"</li> </ul>
Liquid	<ul style="list-style-type: none"> <li>• long-legged pants</li> <li>• long-sleeved shirt</li> <li>• shoes &amp; socks</li> <li>• wide-brimmed hat</li> <li>• gloves</li> </ul>	<ul style="list-style-type: none"> <li>• long-legged pants</li> <li>• long-sleeved shirt</li> <li>• shoes &amp; socks</li> <li>• wide-brimmed hat</li> <li>• rubber gloves</li> <li>• goggles if required by label precautionary statement</li> <li>• cartridge or canister respirator if label precautionary statement says "Do not breathe vapors or spray mist" or "Poisonous if inhaled"</li> </ul>	<ul style="list-style-type: none"> <li>• long-legged pants</li> <li>• long-sleeved shirt</li> <li>• rubber boots</li> <li>• wide-brimmed hat</li> <li>• rubber gloves or face shield</li> <li>• canister respirator if label precautionary statement says "Do not breathe vapors or spray mists," or "Poisonous if inhaled"</li> </ul>
Liquid when mixing	<ul style="list-style-type: none"> <li>• long-legged pants</li> <li>• long-sleeved shirt</li> <li>• shoes and socks</li> <li>• wide-brimmed hat</li> <li>• gloves</li> <li>• rubber apron</li> </ul>	<ul style="list-style-type: none"> <li>• long-legged pants</li> <li>• long-sleeved shirt</li> <li>• shoes &amp; socks</li> <li>• wide-brimmed hat</li> <li>• rubber gloves</li> <li>• goggles or face shield</li> <li>• rubber apron</li> <li>• Respirator if label precautionary statement says: "Do not breathe vapors or spray mist" or "Poisonous (or fatal or harmful) if inhaled"</li> </ul>	<ul style="list-style-type: none"> <li>• long-legged pants</li> <li>• long-sleeved shirt</li> <li>• rubber boots</li> <li>• wide-brimmed hat</li> <li>• rubber gloves</li> <li>• goggles</li> <li>• rubber apron</li> <li>• canister respirator</li> </ul>
Liquid (prolonged exposure to spray, or application in enclosed area)	<ul style="list-style-type: none"> <li>• long-legged pants</li> <li>• long-sleeved shirt</li> <li>• boots</li> <li>• rubber gloves</li> <li>• waterproof wide-brimmed hat</li> </ul>	<ul style="list-style-type: none"> <li>• water-repellent long-legged pants &amp; long-sleeved shirt</li> <li>• rubber boots</li> <li>• rubber gloves</li> <li>• rubber apron</li> <li>• waterproof wide-brimmed hat</li> <li>• face shield</li> <li>• cartridge or canister respirator.</li> </ul>	<ul style="list-style-type: none"> <li>• waterproof suit</li> <li>• rubber boots</li> <li>• rubber gloves</li> <li>• waterproof hood or wide brimmed hat</li> <li>• face shield</li> <li>• canister respirator</li> </ul>



applications will be contained to the area of infestation and applied under guidelines set forth within the NPDES Aquatic Plant & Algae Management General Permit issued by the DOE. Aquatic pesticide applications will generally be contracted out to specialized aquatic weed management agencies and supervised by City Representatives.

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## 3.5 IPM Best Management Practices

Parks 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. Parks only uses City approved chemicals on park properties.

### Control of Special Pests

- **Blackberries** – An aggressive, invasive plant, blackberry will overtake a disturbed site at an alarming rate. Mechanical control is not very effective by itself, but combined with chemical control measures and replanting of the site, effective control can be maintained. Chemical applications shall be kept to the area of infestation. Treatment efforts should include re-vegetating the site with desirable plant species.
- **Scotch Broom** – An unruly plant, it thrives on disturbed sites. It is difficult to control and spreads rapidly. The seeds and flowers are toxic, making it a high priority for eradication. Manual control can have some effect, but it must be done at the proper time of year. Chemical control can also be effective, but requires follow up management techniques until full eradication occurs. Chemical applications shall be kept to the area of infestation.
- **English Ivy** – A very aggressive, invasive, introduced plant, Ivy is difficult to control or eradicate. Manual or mechanical control is somewhat effective, but highly time consuming. A combination of mechanical and chemical control is more effective and spread can be kept to a minimum with continuous control measures. Chemical applications shall be kept to the area of infestation.
- **Horsetail** – One of the most tenacious weeds in Northwest gardens is horsetail. It is almost impossible to control manually

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or mechanically. Horsetail can be controlled with herbicides. As with other chemical controls, chemical application shall be contained to the area of infestation. Horsetail is an indication of high water content in soil, so any use of herbicides should be well thought out and carefully timed.

- **Eurasian Water Milfoil** – Because it is widely distributed and difficult to control, milfoil is considered to be one of the most problematic invasive aquatic plants in Washington State. Milfoil can drastically alter a water body’s ecology and significantly interfere with recreational activities such as swimming and boating. Because of its wide distribution, eradication is not practical. Therefore, a “management” approach has been adopted to control the spread of milfoil within public marinas, boat launches and swimming beaches. A combination of manual and chemical control shall be used to achieve the most effective results.
- **New Zealand Mud Snails** – This invasive species has recently been discovered in Kelsey Creek (Kelsey Creek Park) and Valley Creek (Highland Park). The City is currently developing protocol to prevent the further spread of this invasive species. Decontamination of equipment, personal gear and increasing public awareness will all be a part of the city-wide response to the New Zealand mud snail.
- **Garden Slugs** – As in all Northwest gardens, garden slugs can have a significant impact on park floral beds. Approved control strategies include manual control and careful use of chemical control products. One non-toxic chemical that is found to work is iron phosphate, which is biodegradable and is even healthy for garden soil.
- **Rats** – Rats are only somewhat of a pest problem in Bellevue parks. Bellevue does have some natural predators of rats which helps alleviate many of the problems that could occur. They do pose a human health risk and will be controlled in given situations. The common method of control is baiting with an approved rat bait/trap. Extreme caution must be taken to place rat bait in locations where people or domestic animals cannot access it.
- **Mice** – Mice are becoming an increasing human health problem from Hanta virus. Mice control is not currently a major pest

control issue in park facilities, but increased control measures may be required in the future based on the history of the virus.

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- **Moles** – Moles can cause significant damage and disfigurement to turf areas in developed parks, athletic fields and golf courses. Moles can also destroy flower beds and damage underground utilities. Since mole trapping is outlawed in Washington State, approved mole baits have become the most common control method utilized by Bellevue Parks. Extreme caution must be taken to place mole baits in locations where people or domestic animals cannot access them.
- **Yellow Jackets, Hornets, and Wasps** – These insects often require control in parks. Control is typically through use of an approved insecticide. Only individual nests are treated and only if the nest poses an imminent risk to humans using park facilities.
- **Vector-borne Disease** – Here in the Pacific Northwest, vector-borne diseases are only starting to become an issue. The most significant is mosquito-borne diseases, such as the West Nile Virus (WNV). Complete control of mosquito infestations is near impossible, but cultural control can have some effect, such as removing any standing-stagnant water from any sites. Larvicides may also be used to control mosquito infestations if it's determined that public health concerns warrant their use. As part of the city-wide WNV response plan, surveillance (dipping) for pond facilities will be included during the mosquito season when human cases are reported in the Puget Sound region.

### IPM for Greenhouse Operations

Greenhouses are a production operation dealing with large numbers of plants, of similar species, in a closed, non-public environment. Because of these factors, the tolerance threshold for many pest problems is much less in the greenhouse environment than it is in general park landscapes, requiring the use of a broader palette of pesticide products.

#### Pest Tolerance Thresholds

- Weeds are not tolerated in the City greenhouse.
- Insects or disease pests that threaten the health of plant collections or production crops are not tolerated in the greenhouse.
- Display spaces shall be kept free of weeds.



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#### **Pest Management Strategies**

- **Weed Control:**
  - Greenhouse operating areas and containers and conservatory through hand/manual weeding.
  - Weeds shall be controlled in exterior spaces, building perimeters, shade houses, cold frames and related areas either by hand or mechanically with push type mowers and string trimmers or suppressed with landscape fabrics.
  - Exterior areas shall receive pesticide treatments for weed control, if they impact interior production.
- **Insect Control:**
  - Insect pests shall be routinely monitored by visual inspection or the use of "sticky traps."
  - Cultural practices including regular irrigating and fertilizing shall be used.
  - Insects should be removed by hand or washing them off the affected parts of the plants.
  - Biological controls, such as beneficial insects and other organisms that attack pest insects, should be used to keep pest populations under control. Periodic release of beneficial insects helps to suppress and reduce the need for chemical control.
  - Spot treatments of the least toxic, yet effective, insecticide shall be directed at specific plant parts for specific pest control.
- **Disease Control:**
  - Good sanitation techniques shall be provided, including regular removal of plant debris and keeping tools and work areas clean.
  - Plants shall be properly spaced to provide for good air circulation.
  - Disease resistant plants shall be selected.
  - Diseased plants shall be kept away from healthy crops.
  - The least toxic, but effective, pesticide product shall be applied to control specific disease pathogens on specific plants or crops.

## IPM for Nursery Operations

The nursery, located on SE 16th Street, is a facility for the growing of plants for use on developed and undeveloped park property. It occupies roughly five acres of property and has been in continuous operation for more than 35 years. The plants provided by the nursery operation include natives as well as ornamentals, groundcovers, vines, perennials, shrubs and trees. The plants are grown to support various needs throughout the park system from small in-house planting projects to large Capital Improvement Projects. In recent years, the production of native plants has been increased substantially to meet increasing demand, primarily for forest restoration projects. Control of pests in the nursery environment is very important since many plants may be affected at one time.

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### Pest Tolerance Thresholds

- Pests that threaten the health of the nursery crops will not be tolerated and will be controlled.

### Pest Management Strategies

- **Surface and Groundwater Protection:**
  - General site runoff is controlled through biofiltration.
  - Select the least toxic and most non-leaching chemical products only when necessary.
  - Precisely follow all label instructions.
- **Weed Control:**
  - Most weed control at the nursery is accomplished through hand weeding, mulching and use of landscape fabrics.
  - When other controls have failed, herbicide is used for spot control of weeds.
- **Insect Control:**
  - Habitat for natural insect pest predators will be encouraged as an environmentally sound means to reduce populations of insect pests.
- **Disease Control:**
  - Select disease-resistant plant varieties.
  - Monitor plant crops for disease outbreaks.
  - Practice good cultural practices including watering, fertilizing, pruning and maintaining good air circulation.

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- Reduce the potential for transfer of disease through good sanitation techniques. These practices include keeping growing areas, tools and containers clean and removing plant litter and debris in a timely manner.

### IPM for Planting Beds

Planting beds are defined as non-turf planted areas that include woody plant material such as shrubs, trees and ground covers. The category also includes floral color displays containing herbaceous plants such as perennials, annuals and bulbs. The most serious pest management issue in planting beds is weed control. If not controlled, weeds not only make a plant look unkempt, but more importantly, can out-compete desirable landscape plants resulting in a loss of assets. The table on the following page shows pest tolerance thresholds and IPM principles that shall be employed in selecting maintenance methods for planting beds.

#### Pest Tolerance Thresholds

- In general, weeds are not tolerated in park planting beds.
- Insect pests are tolerated, unless they pose a threat to humans.
- Diseased plants are not tolerated and are usually removed.

#### Pest Management Strategies

- **Weed Control:**
  - Weeds are controlled by hand pulling, or by mechanical methods in larger planting beds.
  - Planting beds will be mulched after planting to suppress new weed growth.
  - Spot treatment with herbicides shall be used as necessary.
- **Disease Control:**
  - Diseased plants shall be hand pulled from planting beds and discarded appropriately.
  - Disease resistant plants shall be planted in all planting beds, whenever possible.

### IPM 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

Area	Weeds	Insects	Disease
<b>General Planting Beds</b>	Some weeds acceptable. Goal is for bed areas to be generally free of weeds for both asset protection and appearance. Weeds will not be allowed to out-compete desirable landscape plants.	Generally tolerated unless particularly valuable plants are actually threatened.	Generally tolerated. Manual and cultural controls preferred. Chemical controls used only to preserve particularly valuable specimens.
<b>Highly-visible/ Public facility landscapes</b>	Generally not acceptable.	Generally tolerated unless they threaten particularly valuable plants. Manual removal of obvious pests is encouraged.	Generally tolerated. Manual and cultural controls preferred. Chemical controls used only to preserve particularly valuable specimens.
<b>Special gardens/ exhibits</b>	Generally not acceptable.	Generally tolerated but will not be allowed to damage or destroy valuable plants.	Generally tolerated. Manual and cultural controls preferred. Chemical controls used only to preserve particularly valuable specimens.
<b>Floral beds</b>	Generally not acceptable.	Generally tolerated.	Disease problems tolerated. If disease persists, landscape will be replaced.
<b>Newly-established landscapes</b>	Weed control is very important to ensure complete establishment of desired plants.	Generally tolerated. Presence of pests may result in host plant being removed and replaced.	Disease problems, if minor, will be tolerated. Presence of disease problems may result in host plant removal and replacement.



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tall, accessing and managing insects and disease can be quite difficult and costly.

#### **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 mulching, 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.
- Following the BMPs in Section 1, 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.

- **Insect Control:**

Parks 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. For example, Parks does not spray aphids despite the "honeydew" problem associated with them. When insect pests are controlled in trees, the following measures are used:

- Trees that are highly susceptible to specific insect pests (such as blue spruce and spruce aphids) may be

removed from the landscape and replaced with resistant species.

- When possible, the portion of the tree affected by the insect (such as tent caterpillars) 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. Parks 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.

Notes:

- **Disease Control:**

Dutch Elm Disease and Anthracnose on London Plane Trees are the only tree diseases Parks actively controls with pesticides. Most other 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 Parks 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 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.

Notes:

- New “injection” technology may allow for systemic control of certain disease in tree pests with minimal or no impact to human or environmental health.

### IPM for Turf

The City of Bellevue Park system maintains a wide variety of turf types. These include park lawn areas (both formal and informal), athletic fields, golf courses, meadow areas and other turf types. Each of these turf types has different pest management challenges, and practices may vary accordingly.

#### 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, bathing beaches and other high-visibility/high-use areas are generally controlled through good turf cultural practices.
- Because of the unique conditions present on golf courses, a variety of pest control measures are used, including mechanical, cultural and chemical.

#### Pest Management Strategies

- **Broadleaf Weed Control:**  
Weeds in turf are tolerated, to some level, with the exception of golf course 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 rare situations the least toxic, least residual pesticide 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 meet or exceed legal requirements. Maintenance for the City's golf courses generally does require 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 of significance for turf in the Bellevue area is the European Crane Fly. While it can be quite damaging to turf areas, the crane fly is not controlled by prophylactic means in City of Bellevue parks.
  - Chemical control is used in limited circumstances for highly visible and valuable turf areas such as golf courses, athletic fields and formal park areas (i.e. Robinswood House).
  - 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.
  - ***Golf Course Turf:***  
 Because turf disease can be a significant problem on golf courses, it must be controlled to preserve the function of this asset. Golf course turf, particularly greens and tees, must perform under extreme conditions of maintenance and use. These conditions make golf course turf more susceptible to disease than general park turf.

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- Golf 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, such as a green.
  - 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 BMPs 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 for Natural and Sensitive Areas

Natural areas are City-owned property with critical environmental resources. These sensitive habitats shelter native ecosystems and wildlife habitat and include nearly all classifications in the City's *Sensitive Areas Manual*, including steep slopes and slide prone areas.

For the purposes of this BMP manual, these resource assets are divided into three major groups:

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

### Pest Tolerance Thresholds

For all natural and sensitive areas:

- 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 Washington mandate. For more information on noxious weeds, visit the following web-site: <http://www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds.aspx>
- Only insect pests that pose a risk to the public (such as hornets) or to the resource (such as gypsy moth) 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 a herbicide, and is imperative to the health of the site. For wetland or water environments, only approved wetland herbicides 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.

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- 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.

#### **Pest Management Strategies**

- **Weed Control:**

An overriding principle of 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 blackberry and other 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 onsite recycle leaf litter are adequate materials. Avoid wood chips from diseased trees. Mulch should be between 2 to 3 inches deep for best results.
- ***Weed monitoring during mulching.*** Care must be given to not incorporate new weed problems when importing mulch materials.

- **Woody Brush Control:**

The control of woody brush, like blackberry, 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, eliminating 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 European and Asian Gypsy moth and the Asian Long Horned Beetle can potentially devastate Bellevue's urban forest. Parks 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:

- Inoculate with mycorrhizae
- Remove infected wood
- Plant resistant varieties
- Treat resulting stumps with borax on Western Hemlock
- 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 Bellevue's natural ecosystems. Invasive plant control shall follow the guidelines established by *King County Noxious Weed Boards*. Except in the case of Class A weeds, the goal is suppression of weed

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populations to below threshold (damage causing) levels. Eradication of certain ecological weeds (blackberry or ivy) in all of the City's natural areas is neither feasible nor cost-effective. However, controlling the spread of the problem and eradicating it in certain priority locations is the goal. 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.
  - 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 re-establishing 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:**  
Mountain beavers, moles, coyotes, beavers, 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, Parks will work with the most appropriate city (Animal Control) or state (Department of Wildlife) agency to formulate a control solution.

## IPM for Trails

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### 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 Washington mandate.
- Weeds are generally found on trails and many will be tolerated. Weeds that begin to form a hindrance of trail function will be eradicated.
- Only insect pests that pose a risk to the public (i.e. hornets) will be controlled.

### 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 re-surfacing, the trail surface. Chemical weed control is often not necessary on 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, and only the individual nests will be treated.

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### IPM within Agricultural Areas

#### Pest Tolerance Thresholds

- Invasive plants that invade agricultural areas are generally not tolerated. Invasive plants will be controlled as resources permit.
- Noxious weeds will not be tolerated and will be controlled when found in conformance with State of Washington mandate.
- Weeds are generally found in agricultural areas and many will be tolerated. Weeds that begin to interfere with crop production will be eradicated.
- Only insect pests that pose a risk to the public (i.e. hornets) will be controlled.

#### Pest Management Strategies

- **Weed Control:**

Generally, weeds are tolerated in agricultural areas. When control is necessary, mechanical practices are the primary methods.

- Mowing
- Hand pulling
- Herbicides are used only in extreme cases

- **Insect Control:**

Insects are not a high concern on agricultural farms. In the past, there has been little need to utilize insecticides, except in the case of hornet nests. The selective use of surfactants has proven to be effective for controlling minor insect breakouts.

- **Disease Control:**

Most agricultural areas owned by Parks are on wetlands. Disease issues related to that kind of environment make control more difficult. At the present time, only fungicides approved for a wetland environment have been used to counter diseases such as "mummy berry", which is a serious disease on blueberry farms. The following control measures may be performed in order to prevent spread of diseases:

- Drainage of crop rows to reduce root rot.
- Spot application of an approved fungicide. In these situations, general foliar application will not be made unless the potential for product drift can be controlled.
- Clean cultivation or tilling of the soil around crop plants to bury mummified berries to 1 inch will help prevent

the disease from spreading in the following year.

- **Fertilizer Use:**

Parks does not use fertilizers on any agricultural lands.

- **Nuisance Wildlife**

There is some need for control of nuisance wildlife on Parks owned agricultural lands. Most of the farms grow fruits, which are highly appealing to many wildlife populations. Most grazing by wildlife is tolerated, with the exception of Starlings. They pose a major detriment to the farm as they can consume large amounts of foods and are very abundant. The Starling population has risen to such a level that extreme measures of control have been considered. Presently, Parks uses bird calling machines placed throughout the farm areas as a deterrent to Starlings and other birds.

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## 3.6 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.

