THE CITY OF LEDUC

*I*ntegrated *P*est *M*anagement *P*lan

1. SUMMARY

A. OVERVIEW

The Integrated Pest Management Plan provides detailed information on how to prevent and manage pests on lands and lakes within the City of Leduc.

Effective and environmentally sound land stewardship is a fundamental component of the City's park maintenance management.

Controlling invasive pests while promoting healthy growth of desirable species helps to fulfill this responsibility by:

- Reducing health dangers caused by insect or disease infestations
- Maintaining native vegetation
- Supporting citizens' activities i.e. sports, aesthetic enjoyment
- Maintaining wildlife habitat

The City of Leduc proposes an Integrated Pest Management (IPM) Plan to promote healthy vegetation and guide pest control activities on all public land and within civic structures and facilities.

Integrated Pest Management (IPM) is a decision-making model used to prevent and manage pest problems.

The City of Leduc's Plan promotes the use of "traditional" IPM tactics (cultural, mechanical, chemical, legal) to improve plant health, prevent and manage pest infestations.

The IPM Plan will apply to all City departments and contractors who directly or indirectly manage vegetation or pests; or plan, design, renovate or construct landscapes and facilities.

One of the goals of the IPM Plan is to keep pests at acceptable levels through effective, economical, and environmentally-sound methods.

Increasing cultural practices to improve long-term vegetation health can reduce pesticide use. Healthy vegetation successfully competes with weeds and disease.

B. NEED FOR A PLAN

With no formal pest control guidelines in place The City of Leduc has used varied pest control techniques. Administration recognizes the need for a formal plan

and a set of procedures for Citywide use.

Some important challenges facing the City include:

- High levels of weeds in certain park areas and the subsequent deterioration of turf quality
- Sporadic insect and fungus infestation in our urban forestry areas
- Elimination of restricted weeds as they appear
- Conforming to the ever growing legal requirements
- Balance of esthetics and maintenance vs. cost
- Being a good neighbor

Many citizens are concerned about the amount and location of pesticide application within Leduc and its associated health and environmental impacts.

2. INTEGRATED PEST MANAGEMENT ISSUES

A. PERCEPTION

Pesticide Use

***Issue**: There is a perception that all parkland is treated with pesticides each year and that the City indiscriminately uses pesticides.*

Response: The frequency of pesticide application on a given parcel of land is dependent on turf vigor and quality, location, and maintenance standards and type of park. The City only treats land with pesticides as required and does not normally blanket spray. The maintenance standards for different parcels of land direct the efforts needed to maintain that site. The City of Leduc does not condone indiscriminate use of pesticides. This type of inappropriate conduct contradicts the provincial Environmental Codes of Good Practice for pesticide applications and is subject to prosecution by the provincial government.

***Issue**: Should the City ban all pesticide use?*

Response: Integrated pest management promotes utilizing the best strategy to address a specific pest problem, which includes using pesticides when necessary. Banning pesticides would reduce the number of management tools. There are various toxicological differences between pesticides available for use in Canada. Since some of these products are less toxic than other, the IPM plan encourages the use of the least toxic products. It is hoped this would facilitate the elimination of toxic products to be replaced with products that we environmentally compatible and less toxic.

Cosmetic Use of Herbicides in Parks

***Issue**: There is a perception that broadleaf weeds such as dandelions are not invasive and do not pose a threat to civic land. There are others that contact the City to undertake spraying operations in the parks to control weeds.*

Response: Unhealthy turf is susceptible to diseases and weeds, including dandelions. Turf maintenance is required to protect the financial investment placed in parkland and inventory. Turf that is left unattended will suffer and result in a significant financial loss of the inventory-long term negligence may create a situation where it will be too costly to reclaim a site. The IPM Plan recommends

establishing injury and action levels for different pests, which will address pest tolerance issues such as the level of weed infestations in civic facilities and sites.

Human Health Concerns

***Issue**: There are concerns that the products presently used by the City represent long-term potentially dangerous hazards to individuals using public lands.*

Response: The Pest Management Regulatory Agency of Health Canada is the governing body that approves and grants registration for pesticides in Canada. Prior to receiving Federal registration, the manufacturers are required to demonstrate that the products do not pose a significant health risk, as long as they are used in the manner they are registered for. The City of Leduc only uses pest control products that have received Federal registration.

Public Notification of Pesticide Applications

***Issue**: The concerns that the present notification system does not adequately address all potentially susceptible park users.*

Response: There are several initiatives within the IPM Plan directed to improved public notice on pesticide applications. Upon request, community residents receive a 24 hour pre-notification of herbicide applications. Warning signs would be posted at the spraying sites after notification is given to concerned citizens.

B. RESOURCE MANAGEMENT

Formal Pest Management Plan

***Issue**: Present pest management practices differ throughout the corporation. There is no formal pest management plan in place.*

Response: Although there are no formal departmental IPM programs in place, Leduc has utilized different management strategies within their Departments that are fundamentally IPM based. However, there is a real need to have IPM standards and practices implemented throughout the Corporation to ensure that landscape maintenance standards and management practices, including pesticide use, are followed in an environmentally responsible manner.

Community Interest in Pest Management

***Issue**: There a number of individuals are interested in parks maintenance within their neighborhoods. Some residents have expressed interest in becoming "pesticide-free".*

Response: Presently, there is little coordination and continuity between the City and residents interested in reducing pesticide use within neighborhood parks. The IPM Plan would establish a framework to encourage and facilitate community involvement in park maintenance.

C. PLANNING

Development Industry

***Issue**: At present, there is little effective formalized structure outlining the methods to build in IPM principles in structure, landscape, and facility designs.*

Response: The IPM Plan recommends that IPM principles be included in development guidelines and standard specifications for landscape design and construction. These IPM guidelines will facilitate long-term reduction in resources required for maintenance. It will be necessary to educate staff and private consultants/contractors that are directly involved with the planning and design of corporate facilities and structures.

D. EDUCATION & LEADERSHIP

Public Education and Interpretation

***Issue**: Information regarding pest management is not consistent, or coordinated. The City needs to become a leader in environmentally sound pest management.*

Response: The IPM Plan would establish a frame-work to develop departmental IPM programs. This would occur through collaborative efforts between departmental representatives. The IPM Plan would encourage the City to initiate a public education campaign and educational materials to inform residents of current and alternative pest management practices.

3. BACKGROUND

City of Leduc's Public Services Department manages approximately 344 ha (850 acres) of land that includes roadway green spaces, decorative parks and natural environment parks. Each year the City of Leduc, through Public Services, inspects and formally assumes responsibility for managing newly acquired property and increasing the land inventory.

Herbicides have been successfully used to control weed populations. Generally, parks are sprayed on a rotational basis depending on need and weather conditions. The large land base physically prohibits annual application of each park. Spot treatments or site-specific herbicide applications generally have less impact on the environment and are cost-effective. In some cases, annual application for 2 or 3 consecutive years has been needed to reclaim or restore parks. Once park maintenance reaches a desirable level, alternative and cultural controls can replace herbicide applications.

WHAT IS A PEST?

These are governing provincial and federal legislation that provides a legal perspective to determine whether an organism is a pest. The City of Leduc has a legal responsibility to comply with these governing Acts and regulations.

A pest is defined in the Federal Pest Control Products Act as "any injurious, noxious or troublesome insect, fungus, bacterial organism, virus, weed, rodent or other plant or animal pest, and includes any injurious, noxious or troublesome organic function of a plant or animal." The definition is also related to the situation or size of the pest population that adversely interferes with the aesthetic, health, environmental, functional, or economic goals of humans. The federal definition essentially states that a pest is any organism that poses a threat to our resources, human health, and/or exists in an undesirable location.

The Provincial Weed Control Act and Agricultural Pest Act contain regulations that identify various plants as weeds and animals as pests, respectively. These lists are by no means comprehensive, particularly in relation to introduced species that have negatively impacted our natural environment parks (e.g. Caragana spp.).

A. COMMON PEST PROBLEMS FOR THE CITY OF LEDUC

Effective and efficient departmental IPM programs within the City of Leduc result from initial investigation of the following components: identification of key pest problems, factors that improve or promote health of desirable vegetation, factors that influence the presence of pests, and cost-effective IPM options for managing and preventing pests and undesirable vegetation.

TURF

Pest problems are found throughout Leduc in various locations including decorative parks, cemeteries, sport fields, roadway green spaces, operational compounds and City owned buildings and facilities. Generally each use site has different maintenance and pest management requirements.

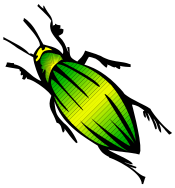
	WEEDS		**INSECTS/OTHER INVERTEBRATES**		**DISEASES**	
	Primary Problems	Secondary Problems	Primary Problems	Secondary Problems	Primary Problems	Secondary Problems
Pests	- Canada thistle - Turf broadleaves - Grasses/broadleaves	- Clover - Sow thistle - Quack grass - Black medic - Foxtail - Purple Loose Strife - Nodding thistle - Turf Broadleaves - Grasses - Tansy	- Wasps - Mosquitoes - Yellowheaded spruce sawfly - Whitefly - Scale - Thrips	- Aphids - Dew worms - White pine weevil - Birch leaf miner	- Various turf diseases - Powdery mildew - Cedar apple rust	- None
Hosts/Sites	- Turf - Shrub bed - Tree wells - Cracks/joints in Hard-surface areas - Sports fields	- Turf - Shrub bed - Tree wells - General turf areas - Fence lines - Limestone pathways - Lakes - Sports fields - Undeveloped land	- Garbage cans - People - Trees - Shrubs - Turf	- Trees	- Turf	- Turf

URBAN FORESTRY

The urban forestry program involves the promotion and care of trees on Leduc's public lands that include boulevards, facility sites, and park areas. There are also unique management challenges within natural environment parks, along bike paths and trail right-of-ways.

Environmental factors such as winds, snow cover, and soil conditions can predispose the urban forest to dieback, sun scald, chlorosis, and damage to root systems (lack of snow cover). These conditions threaten the integrity of the certain tree species within the City but can be minimized through proper site selection and nutrient supplements for new tree plantings.

	INSECTS/OTHER INVERTEBRATES		**DISEASES**		**ENVIRONMENTAL & PHYSICAL**	
	Primary Problems	Secondary Problems	Primary Problems	Secondary Problems	Primary Problems	Secondary Problems
Pests	- Yellowheaded sawfly (also larch sawfly) - Western ash bark beetle - Smaller European elm bark beetle and native elm bark beetle (monitoring)	- Voles - Leaf miner various spp. - Scale - Pine weevil - Forest tent caterpillars - Ugly nest caterpillars - Ants - Cooley spruce gall adelgids - Yellow jackets - Aphids	- Fire blight - Silver leaf - Black Knot	- Nectria - Slime flux - Cytospora canker	- Winds - Road salt	- Vandalism - Dogs - Automobiles - Site selection and design parameters - Nutrient deficiency
Hosts/Sites	- Various tree species	- Various tree species	- Various tree species	- Various tree species	- Various tree species	- Various tree species



B. CAUSES OF PEST PROBLEMS FOR THE CITY OF LED

In Leduc, the major causes of pests are:

- Readily available sources for infestation – seeds, eggs, adults, spores, host sites
  (open soil, mulch) or plants.
- Environmental conditions – insufficient irrigation, fluctuation in temperatures.
- Plants under stress – due to poor maintenance or cultural practices, poor soil conditions, too little/much shade and/or moisture; insufficient nutrients,

inappropriate site selection, vandalism; overuse of facilities/features; salt/mechanical
damage from ice/snow removal.

Other sources of pest problems:

- People are a common cause of landscape problems. Pedestrians and cyclists travel
  across shrub beds and turf areas, causing wear and tear on plants and soil compaction to the point where they cannot recover. Residents that operate maintenance equipment can damage turf or injure adjacent trees.
- Design and construction practices are also an important factor in creating or aggravate pest problems in urban areas. As they relate to Leduc's public lands, the Parks operational staff noted a variety of these situations.
- Increasingly, the growing constraints on municipal budgets coupled with the ever-growing level of public land development creates a situation where there is more to care for with fewer dollars. This conflict can seriously impede pest control and site quality, particularly on those sites or features which receive intensive use.
- Seasonal or localized site problems also influence the presence and severity of pest problems. For example, snow removal practices (which can include salt and/or mechanical damage) impede a plant's ability to resist insects and diseases.
- Turf health is affected by mowing factors such as height, frequency of cut, mowing equipment and efficiency of equipment.
- CPR Railline and ROW that run through the center of the City provides for an abundant source of weeds and spreading of seeds by trains.
- Poorly maintained private lands can provide a source of spreading weeds and pests.

TURF

PESTS			FACTORS THAT CAUSE PLANT STRESS		
Weeds	**Insects/ Other Invertebrates**	**Diseases**	**People**	**Design & Construction**	**Other**
-Available Seed sources -Peripheral areas -Open sites -Type of mulch -Irrigation turf stress -Tolerance levels	-General presence -Host plants -Favorable environmental conditions -Plant stress -Tolerance levels	-General presence -Host plants -Favorable environmental conditions -Plant stress -Tolerance levels	-Short cuts through plantings and turf -Mechanical damage from maint. equip. and rec. equip -Vandalism -Theft -Litter -Feeding pests -Off trail use in	-Plant selection -Planting location -Walkway materials -Walkway location -Pedestrian habits -"Invisible aesthetics" on streets (traffic speed) -Poor drainage -Inadequate soil depth -Poor soil quality -Soil compaction	-Growing number of facilities and features with same or lower budgets -Road salt and sand buildup from snow

			natural areas -No control over pets	-Plantings in narrow median widths -Privately developed land that is required to meet a final acceptance certificate (FAC) -General lack of maintenance considerations -Inadequate input from maint. staff in design process -Heavily booked fields -Foot traffic in small confined areas -Vandalism -Litter -Mechanical damage from maintenance operations -Use of fields during inclement weather (i.e. tournaments) -Poor placement of amenities	removal -Tree roots in pavement and shrub beds -Maintenance and cultural practices -Decentralization of pesticide applications -Pest resistance to continued pesticide applications

URBAN FORESTRY

Preventative strategies are one of the primary methods to reduce or eliminate the potential pest sources. Plant Health Care (PHC) is important to urban forestry because optimal conditions improve the viability of trees and minimize pest problems. Cultural practices include proper tree selection, planting, and maintenance in the establishment phase of tree development. Efforts placed on plant health care are an essential requirement in maintaining a healthy urban forest.

PESTS			FACTORS THAT CAUSE PLANT STRESS		
Weeds	**Insects/ Other Invertebrates**	**Diseases**	**People**	**Design & Construction**	**Other**

-N/A	-General presence -Host plants -Favorable environmental conditions -Plant stress -Tolerance levels	-General presence -Host plants -Favorable environmental conditions -Plant stress -Tolerance levels	-Mechanical damage and soil compaction from maint. equipment -Vandalism -Salt and sand from roadway snow and ice maintenance	-Inadequate coordination of tree planting and growth requirements in road/ park design --Mechanical injury during construction -Poor tree selection -Poor site selection	-Budgetary constraints may not allow for adequate pruning of trees e.g. elms -Insufficient monitoring of urban forest

GENERAL OBSERVATIONS

- Virtually all of the pest problems found on Leduc's public lands are common to this region of Alberta.
- While insect and disease problems are present and create serious maintenance requirements for some of Leduc's landscape management operations, weeds are the major pest problem on The City's public lands.
- Effective IPM prescriptions are available to minimize and prevent pest problems on Leduc's public lands.
- The City may need to use herbicides to rehabilitate existing sites before moving on to a maintenance mode using IPM strategies.
- In Leduc, as with many urban communities, design and construction are a major factor in creating or minimizing the occurrence or management of pest problems on public lands.

C. LEGISLATIVE CONTEXT

Vegetation and pest management operations are directed by the provincial *Weed Control Act* and *Agricultural Pest Act*, which are, legislated guidelines used by municipalities to manage and maintain their land inventories in accordance with legal guidelines.

Weed Control Act

The Weed Control Act places plants in three categories: restricted, noxious and nuisance. The list of weeds is not inclusive and should not be considered the final authority on problematic weeds but rather a guideline for municipal operations. The Act protects citizens from economic and invasive losses caused by weeds. For example, uncontrolled plant growth may interfere with lines of sight at intersections, rail or utility line control devices, as well as create fire hazards.

The *Act* defines municipalities weed control actions, methods of serving notices, which notices should be served on, and the conditions necessary for appeal. The Act also defines municipal inspectors' actions when confronting plants that are considered restricted, noxious or nuisance weeds.

Agricultural Pest Act

The *Agricultural Pest Act* places vertebrate, invertebrate and disease organisms into two categories: pest (which pose a more serious threat to Alberta landscapes) and nuisance.

The Environmental Protection and Enhancement Act

The *Environmental Protection and Enhancement Act* and its supporting regulations, governs pesticide handling, storage and application. Alberta Environment Protection enforces the regulations that apply to pesticide use. The City of Leduc makes a conscious effort to ensure all its departments comply with the Alberta Environmental Protection's regulations. In order to comply with provincial regulations the City has routinely applied and has been granted approvals for pesticide applications within 30 horizontal meters of open bodies of water.

The Wildlife Act of Alberta and Migratory Birds Act of Canada

Some occasional pests fall under the guidelines of the *Alberta Wildlife Act* or the *Federal Migratory Birds Act*. As part of Leduc's IPM Plan, provincial and federal wildlife authorities are consulted prior to any pest control actions dealing with these species e.g. Canada Geese.

MUNICIPAL POLICIES & PRACTICES

The City's Bylaw Enforcement Services are authorized to enforce the provincial Weed Control Act.

Weed notices are issued at the discretion of the bylaw officer who follows established unit guidelines and considers the location and severity of infestation, the area/community, proximity to areas where the plant could spread (waterways), and potential impact on adjacent natural areas. Restricted weeds are always destroyed; whereas noxious weeds are controlled; and notices are always issued for Canada thistle, toadflax, scentless chamomile, leafy spurge and foxtail barley.

4. PESTICIDE USE, STORAGE, TRANSPORTATION AND HANDLING

A. LEGISLATIVE AUTHORITY FOR THE REGULATION OF PESTICIDES

Pest control products are regulated in Canada under the authority of the *Pest Control Products* (PCP) *Act and Regulations*. The intent of the legislation is to ensure the safety, merit and value of pest control products used in this country. This fundamental principle focuses specifically on the protection of human health and the environment, and product performance.

Control Product

In the PCP Act, a "control product" is defined as "any product, device, organism, substance or thing that is manufactured, represented, sold or used a means for directly or indirectly controlling, preventing, destroying, mitigating, attracting, or repelling any pest, and includes:

- Any compound or substance that enhances or modifies or is intended to enhance or modify the physical or chemical characteristics or a control product, to which it is added,

AND

- Any active ingredient used for the manufacture of a control product."

Pest

The term "pest" is defined as "any injurious, noxious or troublesome insect, fungus, bacterial organism, virus, weed, rodent or other plant or animal pest, and includes any injurious, noxious or troublesome organic function of a plant or animal." This directly relates when the situation or size of the pest population adversely interferes with the aesthetic, health, environmental, functional, or economic goals of humans.

As such, products regulated under the PCP *Act* cover a wide spectrum. As well as herbicides, fungicides, and insecticides, they include biological agents such as bacteria and viruses that are used to control pest: antimicrobial agents used in oil well, wood preservation, non-potable water purification systems and material

preservation; and growth regulators that control and "injurious, noxious or troublesome organic function of a plant or animal."

The PCP *Act and Regulations* require that all pest control products used or imported into Canada be registered. This includes all active ingredients and manufacturing concentrates, and all subsequent formulations (end-use products) containing active ingredients.

At the working level, product registration is a consultative process involving experts within Agriculture and Agri-Food Canada, Environment Canada, Health Canada, and Natural Resources Canada.

In addition to the PCP *Act*, a number of other federal acts may have implications in regulating or limiting the use of pesticides. *The Food and Drug Act* sets limits for permissible maximum residue levels of agricultural pesticides in food; the *Canadian Environmental Protection Act,* the *Fisheries Act* and the *Migratory Birds Convention Act* provide for protection of the environment from toxic chemicals, including pesticides. The provinces and territories also regulate pesticide through licensing and sale of products within their respective boundaries.

Herbicide

A chemical substance or cultured biological organism used to kill or suppress the growth of plants. Also defined as chemical compounds used to kill or inhibit undesirable plant growth.

Insecticide

A chemical substance used to control insects.

Fungicide

A chemical substance used to control or prevent the development of fungi.

B. FEDERAL AND PROVINCIAL LEGISLATION

The Environmental Protection and Enhancement Act (EPEA) addresses pesticide use within Alberta, including storage, handling, application, and use. Environmental Protection and Enhancement Act AR 24/97 Section 5 directs that "(1) No person shall (a) use, apply, supply, handle, transport, display, store or dispose of (i) a pesticide, (ii) seed that has been treated or mixed with a pesticide, or (iii) wood that has been treated with a pesticide or (b) operate any machine, equipment or vehicle, aircraft or vessel in connection with the use, application,

handling transportation, storage or disposal of a pesticide in a manner or a time or place that cause or is likely to cause an adverse effect. (2) For the purpose subsection (1), "adverse effect" does not include an effect that results from the application of a pesticide in a manner that conforms with the label and this Regulation".

Pesticides are not covered under the WHMIS (Workplace Hazardous Materials Information System). However, they are classified under the Transportation of Dangerous Goods (TDG) categories.

Pesticide use, storage, transportation, and handling must comply with the provisions of the Public Health Act, Nuisance and General Sanitation Regulation (AR 242/85). The regulation states that "No person shall create, commit or maintain any condition that is or might become injurious or dangerous to public health or that might hinder in any manner the prevention or suppression of disease". Similar provisions appear in the EPEA, AR 24/97 Section 5.

Service Registrations and Special Use Approvals

Alberta Environmental Protection's Chemicals Assessment & Management Division issues service registrations and special-use approvals to municipalities that apply pesticides. The City of Leduc holds a service registration special-use approval.

1. For pesticide applications within 30 horizontal meters of open bodies of water within the City of Leduc.

Approvals are valid for two years. Copies of service registrations and special-use approvals are kept on file at Public Services.

Prior to the start of a seasonal pesticide application campaign, employees ensure that their operations comply with the regulations and the conditions outlined in the special-use approvals.

Provincial Certification Requirements

Alberta Environmental Protection regulates pesticide sales, handling and applications throughout the province. The categories of pesticide applicator certificates which may apply to the City include: agricultural, aquatic, biting fly, forestry, greenhouse, industrial, landscape, structural, and special (including stump treatment).

All pesticide applicators must pass a certification exam to qualify for an Alberta Pesticide Applicator Certificate. Alberta Environmental Protection, in cooperation with Lakeland College, has authorized a training program to prepare prospective candidates for the certificate exam.
Training may be provided through completing the Home Study Course independently, or by attending a tutorial offered by several institutions. These classroom tutorials are intended to reinforce the candidate's understanding of course material by means of discussions, presentation, and lectures.

C. CITY ENVIRONMENTAL POLICIES AND PROCEDURES FOR PESTICIDE HANDLING AND STORAGE

Material Safety Data Sheets and WHMIS Training

A Material Safety Data (MSD) sheet must be submitted to the City for all pesticides used by the corporation. City employees, including private contractors hired by the corporation will not apply pesticides until the MSD sheets are reviewed by the appropriate supervisor.

Transportation of Dangerous Goods (TDG)

All pesticides transported within the Corporation-even those transported internally during daily operations – must be accompanied by TDG documentation.

Civic staff involved with transportation of pesticides must have received internal TDG training and certification.

Pesticide Purchase

Only staff that hold a current pesticide applicators certificate can purchase pesticides.

Pesticide Storage

All storage facilities must meet the minimum storage requirements as outlined in Alberta Regulation 24/97, which does not differentiate between temporary and permanent storage sites. Presently all provincially inspected City of Leduc storage facilities meet or exceed these requirements.

Pesticides are housed at the small Public Services Shop, which is a year round storage location.

Future storage compartments or buildings should always comply with Alberta's Safety Codes Act and pesticide storage requirements as outlined in Pesticide Sales, Handling, Sales and Application Regulation 24/97.

Environmental Release (Pesticide Spill)

In the event of a chemical release, please refer to your department emergency response protocols.

D. GENERAL PESTICIDE APPLICATION AND PRE-NOTIFICATION PROCEDURES

Pesticide Application by City Employees

Provisions within the Environmental Protection and Enhancement Act state that individuals receiving payment for application or applying a pesticide on a right-of-way, park, boulevard, campgrounds or picnic area located on public land, must hold a service registration (approval) and follow the provisions as described in Alberta Regulation 43/97 which require that no person shall:

Use or apply a pesticide in Schedule 1 or 2 unless that person:

- Holds an applicator certificate in one or more of the classes of application certificate listed in Schedule 5

OR

- Works under the supervision of an applicator and in accordance with the latest edition of the Environmental Code of Practice for Pesticides published by the Department.

AND

No person other than an applicator with the appropriate certificate or a person working under the supervision of an applicator in accordance with the latest edition of the Environmental Code of Practice for Pesticides published by the Department shall "use or apply a pesticide in Schedule 3 in or on the grounds of a school, hospital, nursing home or day care facility."

FURTHER

No person shall, unless that person holds a pesticide service registration, offer or provide a service involving the use or application or a pesticide for hire or reward.

OR

Use or apply a pesticide listed in Schedule 1,2 or 3 whether or not for hire or reward

(i) on a right-of-way:

(ii) on a park, boulevard, campground or picnic area located on public land:

Only City employees or private contractors who hold a valid and applicable pesticide applicators' certificate or work under the direct supervision of a provincially-certified applicator, may apply pesticides on City property. Furthermore, they must follow the Alberta "Environmental Code of Practice for Pesticides." The City will ensure that an experienced, conscientious applicator will be used in applications in environmentally sensitive or special use areas.

Posting and Notification – External Sites

Pesticide applicators must comply with the safe application methods as listed within The Environmental Code of Practice for Pesticide, Regulations 24/97 and 43/97, including wearing safety equipment as well as applying products under optimal environmental conditions and within the parameters as directed on the pesticide label.

Pre-notification signs will be posted adjacent to the areas 24 hours prior to herbicide applications.

Before pesticide application, applicators must post warning signs at all major entrances in parks that have a discreet perimeter, as well as additional signs in the middle of the park. On land that does not have discreet perimeters, signs are also posted in heavy traffic, non-paved pathways or sidewalks. The signs remain in place until 48 hours after application.

Posting and Notification – Internal Sites

Do not apply pesticides within the structural perimeters of public facilities unless notices have been posted at all public entrances to the site a minimum of 24 hours prior to the intended application. Such notices should remain posted for 48 hours or more after treatment. Where treatments occur in public use areas not accessible to the public, notices are required at staff entryway(s).

Prior notification is not required for applications of wettable powders to perimeter baseboards and/or cracks and crevices within the structural perimeters of public facility, unless such notification is a requirement of the pesticide label or such posting has been requested by the manager, owner or relevant authority.

Pesticide Application Near Open Bodies of Water

Pesticide applications within a specified distance from "open bodies of water", as defined under the Environmental Protection and Enhancement Act and the

Environmental Code of Practice for Pesticides, will only be undertaken by experienced, certified applicators.

An "open body of water" means the bed and shore of an irrigation canal, drainage canal, reservoir, river, stream, creek, lake marsh or other body of water, but does not include the following:

(i) waterworks systems;

(ii) reservoirs, lakes, marshes or other bodies of water that are completely surrounded by private land, that have an area of less than 4 hectares and have no outflow of water beyond the private land;

(iii) reservoirs, lakes, marshes or other bodies of water that are located on public land, that have an area of less than 0.4 hectares and have no outflow of water;

(iv) roadside ditches;

(v) wastewater systems;

(vi) storm drainage systems;

(vii) dry streams having a bed and shore averaging 0.5 meters or less in width within the boundaries of the treatment area.

A "*bed and shore*" means that is or has been covered by water to the extent that:

(i) no vegetation that grows on the land, or

(ii) the vegetation that grows on the land is aquatic vegetation that must be partially submerged in water for part of its life cycle to survive.

Record Keeping for Pesticide Applications

After each application, the applicator records all pertinent information in an approved form. At year-end, applicators send a copy of the approved form and a summary of all products used in that calendar year (volumes consumed, total area treated) to Public Services. Copies of all approved forms are kept on file for five years, as directed by the *Environmental Protection and Enhancement Act*.

Pesticide Application By Private Contractors

Guidelines for private applicators ensure that private contractors meet the specific requirements and qualifications required to carry out responsible pesticide applications on City land.

5. IPM PRESCRIPTIONS, STRATEGIES AND COMPONENTS

A. STRATEGIES & PRESCRIPTIONS

IPM strategies and prescriptions are necessary to manage pest problems:

> *Strategies are a combination of short and long-term approaches to managing a pest problem. For example, using direct, manual methods to control weeds in tree wells, while planning to install tree mulch by the end of the season to eliminate the need for further weed control.*
>
> *Prescriptions describe the implementation plans for one or more practices. For example, a prescription for turf grass management might include a strong cultural program consisting of increased mowing heights and frequency, fertilizing, irrigating, top dressing, aerating, over seeding, and allow for regular rest periods to recover from heavy use.*
>
> *IPM prescriptions may be comprised of a single strategy or a matrix of different treatments within each strategy.*

General prescriptions outline a full range of treatments that have shown merit and may be useful for preventing or managing a pest problem. They do not indicate the precise set of practices, techniques, or materials that will be cost-effective.

The City of Leduc will consider these criteria when selecting IPM prescriptions and developing pest management strategies;

1. Human health and safety.
2. Be least disruptive of natural controls.
3. Minimize negative impacts to non-target organisms.
4. Be least damaging to the general environment.
5. Best preserve the natural or management ecosystem.
6. Most likely produce long-term reductions in pest control requirements.
7. Be operationally feasible and effective.

8. Be cost-effective in the short and long term.

Site-specific prescriptions require analysis and evaluation of the particular site conditions and circumstances. This information is used in reviewing potential options outlined in general prescriptions to help determine the most appropriate treatment methods, tools, materials and timing, that together provide cost-effective and environmentally sound results.

IPM prescriptions are continually subject to review and revision. Technological advancements, field research, registration and availability of control products, resources, as well as changes in site conditions impact the long-term success and viability of an IPM prescription. The maintenance of an accurate site inventory, routine monitoring, and routine evaluation of historically successful prescriptions provides enough information to select prescriptions that address changes in the present and future pest populations.

B. PRESCRIPTION COMPONENTS

Categories of Facilities

The assignment to a category is based upon the level of management that will be applied to that site/facility, with High Profile sites receiving the most intensive management. There are examples for each type of category, however, the list is by no means exhaustive. Some park types such as natural areas are eligible for all management categories. Management levels are determined through a combination of different factors including site location, park type, and available resources.

Identification

It is important to identify the problem correctly, so that prescriptions are effective. Life-cycle information can help determine when management strategies and preventative measures have the greatest effect.

Reference guides complete with sketches and/or photographs are an invaluable aid for plant identification.

Monitoring

Monitoring helps staff decide if treatments are necessary, the best timing of treatments, and their effectiveness. Successful management programs include regular inspections of unwanted vegetation and pests, as well as their growth rate.

Quantitative samples (e.g. 2 weed counts) are normally collected when the level of a specific pest infestation is considered to be at treatment threshold. If precise monitoring methods have not been developed, visual inspections may be the only viable alternative.

Visual site inspections are needed to assess and record conditions. Use a map and highlighting pen to update general areas for control methods.

The frequency of site inspections per growing season depends on several factors including park type, established action and injury thresholds, and historical problems. Inspections may be required before treatments to ensure controls are applied at the optimum time. Variations in the target and non-target populations should be noted (e.g. recently germinated, seed head formations, population density of ladybird beetles in elm trees.

Establish Impact Assessment and Action Levels

A variety of factors should be evaluated when deciding how the site should be managed:

Plant injury and pest populations are directly related to a site or facility's maintenance regime of and the consequences of leaving target organisms untreated. The action level (AL) defines when a particular treatment should be applied to deter pest levels from rising above the predetermined impact or injury level (IL). The allowable level of damage (ALD) is similar to the action level but represents a measure of damage rather than the size of the pest population. It can be used in place of the action level when pest populations are difficult to monitor or with pests for which it is difficult to correlate the size of the pest population with the amount of damage that is occurring. The ALD can be difficult to establish due to its subjective nature. As with maintenance standards, participation from operational and administrative staff is essential in setting allowable levels of damage.

Select Treatment Techniques

A management program may include one or more treatments. Wherever possible, non-chemical treatments should be used as they have less impact on the environment. If pesticides must be used, applicants should first review

monitoring records and site plans to determine factors that could affect treatment, and then use careful timing and precise equipment. Management techniques include the following items:

1. *Preventative/Cultural Measures*: Design, development and construction of landscape facilities prevent or minimize pest problems. Cultural practices – such as routine irrigation, fertilizing, and top-dressing – also provide similar benefits.

2. *Physical and Mechanical Controls*: These control methods require operational equipment and staff, and their effectiveness can often be limited by insufficient funding. Examples include manual weeding, string trimming and mowing around fence-lines and site perimeters, chainsaws or heavy-duty mowers to control woody perennials, repetitive mowing, or cutting of top-growth of bushy weed species.

3. *Chemical Controls:* Control products are selected according to specific criteria, with preference given to low toxicity and highly selective products. Selected herbicides must be compatible with an IPM program and must be applied with target-specific techniques whenever practical. There must be justification for using broadcast applications.

For plant species that vigorously re-sprout after cutting (e.g. quack grass), applying herbicides to the fresh re-growth, often reduces the amount of herbicide needed.

The most target-specific application techniques available should be used. This includes using backpack or hand-held sprayers, low-volume closed-system applicators (e.g., the Expedite system), wick applicators (e.g., the Rod Weeder), and covered boom or shrouded applicators.

Evaluation

After treatments, it is necessary to determine the results through follow-up inspections. Frequency and timing of inspections varies according to the treatments and the site(s) category: optimal timing may be within days, weeks, or months of treatment. Review monitoring records and site plans to determine factors that effected the treatment(s). A historical database of previous monitoring and evaluation inspections can be used to determine effectiveness of treatment methods and the need for re-treatment. Examples of factors include the rate of regrowth after mowing and percentage of stems killed by herbicides.

Summarize Minimum Action Necessary

To maintain a service level for a particular site, a series of minimum actions are outlined within each section. This should serve as a "starting" point when developing an IPM program. An enhanced service level includes the minimum actions along with any additional treatments necessary to retrofit, improve, or maintain a parcel of land at the desired maintenance level.

C. PLANT HEALTH CARE (PHC)

GENERAL VEGETATION

This category consists primarily of both monocot and dicot, annual, biennial and perennial herbaceous weeds.

CATEGORIES OF FACILITIES

High Profile/Premium level of service, e.g. formal displays, botanical gardens, high profile sites

Medium Profile/High to Moderate level of service, e.g. Identification

Low Profile/Moderate to Low level of service, e.g. natural parks, low use recreation areas, natural display beds

Identification

Identification is essential because most treatments must be tailored to a particular species. Once a species causing a problem is identified, information about its life cycle can be used to identify when suppressive measures will have the greatest effect and what preventative measures would be most effective. To aid in identification, a number of variables may be examined, including:

<u>Herbaceous Weeds</u>

1. Growing site location

2. Leaf shape, size and colour
3. Growth habit
4. Flower shape, size and colour
5. Seed head form

Woody Plants

1. Growing site location
2. Leaf shape, size and colour
3. Bark colour, texture
4. Growth habit
5. Flowers, fruit, seed head

Monitoring

Monitoring provides the information needed to decide whether treatments are necessary, the best timing of treatments, and how the treatments are working. Successful management programs are based on regular inspection for the presence of unwanted plants and their growth rate. Generally, bi-monthly inspections per growing season is sufficient, with additional inspections conducted before treatment to ensure controls are applied at the optimum time.

Establishing Impact Assessment and Action Levels

How much damage is tolerable depends on how intensively the facility is managed and the consequences of leaving weeds untreated. The action level is when a particular treatment should be applied to deter weed levels from rising above the predetermined impact level.

The various areas that have been recorded during monitoring must be assessed with regard to the mandate of the organization in charge of the site. When making decisions on how the facilities should be managed, a variety of factors should be evaluated. They include:

1. Safety and Security
    a. Degree of trip/slip hazards presented by weeds.
    b. Impairment of sight lines on roadways and parking lot exits.
    c. Coverage of signs, curbs and light standards/luminaries by weeds.

2. Aesthetics/Site Location:

    a. Traffic levels.

b. Nature of area (rural or urban).
c. Adjacent facilities that might be affected.
d. Proximity to sensitive natural areas.

3. Damage to Structures:

a. Hard surfaces such as sidewalks, tennis courts.
b. Overgrown fence-lines, signposts.
c. Building foundations.

Individual areas must be assessed according to these and possibly other factors, to determine thresholds that are acceptable to the organization. A percentage of weed/vegetative cover suitable to each site could be established as thresholds for determining when treatments may be needed.

Selection of Treatment Techniques

One or several treatments may be coordinated into a management program for a target pest or for the entire complex of weeds in a site or facility. Substituting physical or cultural controls for chemicals is promoted wherever feasible to reduce impacts on the environment, if these non-chemical alternatives have lower potential environmental impacts. When pesticides are used, they should be applied as efficiently as possible, through careful timing and improved equipment.

1. Preventative/Cultural Measures:

1. Plant aggressive ground covers and mass plantings to reduce the space, nutrients and light available to weeds.

2. Use landscape fabrics in perennial ornamental display beds to prevent germination by blocking light from reaching the soil.

3. Use organic materials (e.g., leaves, wood chips and bark as mulches to prevent weed establishment and emergence.

4. Provide ideal growing conditions, including light, fertilizer, water and other conditions for desired plants so that they out compete the weeds.

5. Use weed-free nursery stock to prevent the importation of weed seeds to new planting areas.

6. Anticipate renovation of areas and plan to provide a better environment for more desirable plant material (including better plant material selection).

7. Eliminate potential problem areas during the design and landscape construction stages.

2. Physical & Mechanical Controls:

1. Manual weeding, which is most appropriate on smaller, more intensively managed sites.

2. Mechanical cultivation used to prevent weeds from becoming established; this is especially useful in preparing new planting beds.

Physical and mechanical controls maybe used throughout the entire growing seasons. Weeds should be removed or controlled before seed heads form.

3. Chemical Controls:

If chemical controls are necessary, the least toxic, effective herbicide should be used. Weeds should be treated while in an actively growing stage prior to seed head formation.

Preferred Herbicides

a. Fatty acid herbicides are low toxicity and can be effectively applied to annual weeds, especially shortly after germination.

Pre-emergent herbicides should be applied before weed seeds germinate, as they will not kill established plants. Post-emergent, selective herbicides can be effective in controlling annual, biennial and perennial material while in an actively growing stage, before seed heads form. Post-emergent, non-selective, herbicides may be appropriate for use as spot treatments on deep-rooted or rhizomatous perennial weeds in open ground, where there is no desirable vegetation present. Apply to actively growing weeds before seed heads form.

TURF: WEED CONTROL PRESCRIPTIONS AND STRATEGIES

This category includes all sports fields, fine ornamental lawns, general park areas, residential and commercial lawns, boulevards, meadows, picnic areas and rough grass areas.

CATEGORIES OF FACILITIES

High Profile Display – Premium level of service, e.g., irrigated fields and fine ornamental lawns.

Open green space – Moderate to low level of service, e.g., opened park areas, sport fields, picnic areas and rough grass, boulevards

Identification

Follow protocols as directed in first section.

Monitoring

Monitoring provides the information needed to decide whether treatments are necessary, the best timing of treatments, and how the treatments are working. Successful turf management programs are based on regular inspections.

Confirm extent of weed infestation and population density by visual inspection. Record numbers as percentage of area by species to arrive at total weed cover of site. Examples of a sampling methods for weeds in turf is:

Centerline system – walk the center of sports fields from goal post to goal post and estimate percent weed cover every second step.

Schedule monitoring periods to coincide with periods of active vegetative growth or flowering cycle. Weed counts should occur in early spring and again in August.

Impact Assessment and Action Levels

How much damage is tolerable depends on the cost of treatments and the value of the plant or the aesthetic values that would be lost if not

treated. The action level is when a particular treatment should be applied to deter pest populations from rising above the pre-determined injury level. In parks other than public facilities, the need for treatment often depends on how much weed cover the public will tolerate, rather than on the harm to a plant or to a site. On sports turf, safety considerations will influence the action levels.

Selection of Treatment Techniques

One or several treatments may be coordinated into a management program for a target pest or for the entire complex of pests in a site or facility. Substituting physical or cultural controls for chemicals is promoted wherever feasible to conserve native beneficial species and reduce impacts on the environment. When pesticides are used, they should be applied as efficiently as possible, through careful timing and improved equipment.

a. Annual weeds – Control should focus on preventing seed spread and germination of dormant seeds already in the soil or migrating in from adjacent areas.

b. Perennial weeds – Top growth of established stands of perennials should be controlled before blossoming, when root nutrient reserves are at they're lowest and the plant is least capable of regenerating new top growth. Roots must also be destroyed to achieve effective control if eradication is desired.

1. Preventative/Cultural Measures:

When weed populations exceed tolerance levels it is usually because competing turf grasses have been thinned out by stress, leaving openings to be colonized by weeds.

Prevention is the corner stone of a successful IPM program and will prevent pest problems from developing. Ensure proper turf management practices are adhered to; these include proper soil management, nutrient and watering programs. When weed populations become consistently too high and require routine control, re-evaluate the management program for the site to determine how to improve turf health and how to prevent the problem in the future.

a. Ensure that seed type selected is suitable for local climatic conditions. Select the best seed available that is

appropriate to functional use. Examples include:

- Shade tolerant fescue species for general park use in shady areas.

b. Optimize irrigation:
- Water deeply, infrequently; avoid shallow watering, which promotes shallow rooting, accumulation of thatch and germination of weed seeds on exposed soil areas.

c. Provide for regular aeration to reduce soil compaction; frequency depends on the type of turf and usage. Use deep tyne aerating to a depth of 6 ½".

d. Avoid compaction from overuse. If possible, rotate goalmouth areas and entrance points to turf areas for pedestrians and equipment; rotate players' benches and bleachers or install them on permanent hard surfaces. Alternate directions of mowing.

e. Repair worn or damaged areas by over seeding, re-seeding or re-sodding.

f. Select and apply fertilizers appropriate to turf grass nutritional requirements. For sports fields, regular soil testing and tissue analysis is recommended to ensure that lime and fertilizer requirements are sufficient to promote optimal plant vigour. Adjust application rates to ensure that nutrient imbalances do not occur and to prevent leaching beyond the root zone.

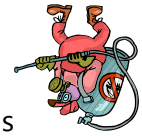
g. Avoid overuse of sports field surfaces through implementation of a field closure policy during inclement weather. Limit play on sensitive or stressed sports field surfaces whenever possible.

2. Physical & Mechanical Controls:

a. Keep mowing height as high as possible for turf species and usage. Most turf grass species in recreational and athletic areas can be mowed at a height of 7.5-9 cm (3-3.5 inches) without sacrificing vigour or usability. Mowing height and frequency should be adjusted to seasonal variations and grass growth or use patterns (e.g., ball infields often require more frequent cutting and shorter

turf than outfields.)

b. Hand pull small population of weeds prior to seed production. Well-designed hand tools now available make weed pulling faster and easier. Remove weeds growing on gravel/sand all-weather fields by mechanical method. This is often sufficient to kill many weeds.

3. Chemical Controls 

Ensure that product selected is effective for specific weed type and use spot treatments instead of general boom spraying wherever possible or feasible. Ensure that product selected is not phytotoxic to desirable turf species and that low volatility formulations of herbicides are used. Select proper time of application to maximize effect to target species and minimize effect of spray on other species.

Evaluation of Weed Control Strategies

Follow-up monitoring or inspections are necessary to find out how successful an IPM strategy has been. It is essential to review records to determine what worked, where improvements should be made and what preventative steps may be possible in future. Frequency of evaluations should be determined by facility classification type.

Evaluation of weed control effectiveness should be continuous. Accurate record keeping of visual inspections and sample counts is essential. Incorporate visual inspection and recording of weed problems into the duties of maintenance staff that are on site most frequently. Schedule visual inspection and evaluation of turf areas, which have been treated with herbicide 7-14 days after treatment.

ORNAMENTALS & TREES: INSECT CONTROL PRESCRIPTIONS AND STRATEGIES

This category includes all gardens, horticultural displays and borders, flowering ornamentals, city boulevards and medians, general park and playground areas and nature parks, trails and other natural areas.

Level of threat to inventory:

> **Serious**: Zero tolerance to presence of insect. E.g. Native or European elm bark beetle.
>
> **Moderate**: Will tolerate a small percentage of the inventory with the insect, e.g. Western Ash bark beetle.
>
> **Low**: Will tolerate a majority of the inventory with the insect, e.g. Aphid

Each Level will be further sub-divided into additional service levels:

> **High Profile Display**: Premium level of service, e.g. horticultural display gardens, flowering, hanging baskets, ornamentals.
>
> **Medium Profile Display**: High to Moderate level of service, e.g. city boulevards, medians, general park and playground areas; specimen, shade, and boulevard trees; annual and perennial borders.
>
> **Low Profile Locations**: Moderate to low level of service, e.g. natural environment parks, hiking trails, native trees and other vegetation.

Identification

Identification is essential because most treatments must be tailored to a particular species. Once a species causing a problem or potential problem is identified, information about its life cycle can be used to identify when suppressive measures will have the greatest effect and what preventative measures would be most effective. Insects and other arthropods can be grouped into 3 general classes.

1. Sucking arthropods: aphids, scale, mites, mealy bugs, etc.
2. Root/crown feeding insects; weevils, etc.
3. Leaf chewing and mining insects; leaf miners, caterpillars, etc.

A chart can be made of pest and relevant beneficial insects that show their development in relation to date, degree-days, non-related flowering plants, or other seasonal indicators.

Monitoring

Monitoring provides the information needed to decide whether treatments are necessary, the best timing of treatments, and how the treatments are working. Most monitoring programs are based on regular inspection for pests, pest damage or signs of their presence and may include monitoring for beneficial species. Staff carrying out the monitoring may find the identification chart useful to optimize these activities. Monitoring should be done through visual inspections.

1. Visual inspections – for many small insects, mites and for characteristic damage. Indicator plants are useful to observe for pest presence or damage and can be those that are along a regularly traveled route and are easily visible from a passing vehicle.

Establishing Impact Assessment & Action Levels

How much is tolerable depends on what part of the plant is affected, the cost of treatments and the value of the plant, or the aesthetic values that would be lost if not treated. In parks and other public facilities, the need for treatment often depends on how much damage the public will tolerate, rather than on the harm a pest might be causing to a plant. The action levels are when a particular treatment should be applied to deter pest populations from rising above the predetermined injury level.

Serious injury – Aesthetic injury threshold is low because plants are viewed at close range.

Moderate injury – Proportionately higher population range is acceptable for treatment thresholds.

Low injury – A higher level of plant injury is allowed before actions are initiated. As a
general rule, suppressive action will be implemented when unacceptable plant loss or spread of pest into adjoining higher profile facility is probable.

For all sites:

1. Define when no action needs to be taken; what population density is acceptable.

2. Define when preventative intervention is required; when population densities are low but are increasing as verified through monitoring.
3. Define when suppressive action is required; when population densities are high and increasing and there is the risk of major economic damage or nuisance.

Thresholds may be defined and recorded as:

1. Percentage or proportion of leaves damaged on a particular plant.
2. Percentage of plants affected on a site.
3. Number of pests or pest colonies counted.

For chemical controls – action levels depend on the facility and target. Action levels for aphid control may be relatively high due to the number of native aphid predators that are usually present.

Selection of Treatment Techniques

One or several treatments may be coordinated into a management program for a target pest or for the entire complex of pests in a site or facility. Substituting physical or cultural controls for chemicals is promoted wherever feasible to conserve native beneficial species and reduce impacts on the environment. When pesticides are used, they should be applied as efficiently as possible, through careful timing and more accurate, precise equipment. Criteria for selection of treatment technique will also include choosing the least toxic yet effective product for the application.

1. Preventative/Cultural Measures:

IPM programs emphasize making changes in the management of plants and habitats to prevent the development of pest problems. Tree health can be improved and maintained by following recommended horticultural and arboricultural practices such as proper soil management, nutrient and watering programs, pruning and planting techniques.

Crewleaders should re-evaluate the management program for the site when faced with a reoccurring pest problem. Determine how to improve plant health and prevent the pest problem in the future.

a. Plant diverse cultivars, species and families of plants and trees to prevent single species planting which are vulnerable to serious insect problems. Continue to investigate and test new species that are adaptive to our

climate.

b. Establish alternate hosts to attract and maintain natural predator/parasite populations. Try to alternate species with different flowering times to provide a more consistent nectar supply for beneficial insects.

c. Inspect planting stock and purchase only healthy plants – ensure plants are in good health and conform to ISA or LANTA standards.

d. Plant at the proper depth.

e. Maintain a mulched tree circle or bed around new plantings to retain moisture, nurture beneficial soil organisms and prevent injury from mowers and other equipment.

f. Design irrigation systems taking into account the difference in water requirements between turf, shrubs, and trees at varying sites. Ensure regular and adequate water during establishment of new plantings.

g. Prune and train young trees properly so that large pruning cuts will not be needed later to correct poor tree structures; make cuts properly to promote rapid wound closure. Elm trees shall only be pruned during the months of October to March. Pruning during other times of the year increases the attractiveness of the elm to the smaller European elm bark beetle.

h. Sanitation – remove infested, dead and fallen twigs, leaves and fruit from base of trees and shrubs, especially where soil-borne or root/crown feeding insects have been a problem.

i. Avoid use of fast acting, high nitrogen fertilizers that promote succulent, insect susceptible plants.

j. Plant site selection. Find the proper tree species to be utilized in the specific situation. When tree mortality occurs, determine the cause of tree failure. Consider the following diagnostic options:

Abiotic factors – e.g. mechanical damage, physical damage. If death is a result of these types of abiotic intervention,

then replant the site with the same species.

Biotic factors – e.g. environmental conditions including too wet, insufficient nutrients. If death is a result of these types of conditions, then replant the site with a more appropriate tree species.

Select the best management option and tree species for each site – do not overlook eliminating the site, if necessary.

k. Investigate tree-watering regime. Fertilizers that promote root growth (e.g. 10-52-10) may be applicable to new planting for the first few years. Monitoring tree well composition may be appropriate by the third year to determine nutrient needs. Fertilizers may not be required in certain soil types.

l. Investigate whether salinity damage maybe a result of over-fertilization instead of road salt.

m. Consider a spring application of a high nutrient fertilizer (e.g. 20-20-20) to spruce trees that are under moderate to severe environmental stress. This may be particularly useful in soils that are more prone to binding up phosphorous nutrients.

2. Physical & Mechanical Controls:

a. Water sprays for aphids, thrips, mites

b. Pruning out:

- tent caterpillar infested branches
- bronze birch borer infested wood

c. Wiping plant scales from stems

3. Chemical Controls

Spray programs may be required when populations are too high. Least toxic or low residual chemicals should be used.

Preferred Insecticides:

a. Insect growth regulators (e.g. kinoprene) for aphids and whitefly.

b. Bacillus thuringiensis var. kurstaki (Bkt) for caterpillars.

c. Insecticidal soaps for chewing and sucking insects and mites, especially for spot sprays.

d. Pyrethrins, low in toxicity but to mammals post-treatment delays in introducing some beneficial arthropods may be required because of the compound's potential impact on them.

e. Mineral oils (dormant and supreme horticultural oils) for scales, mites, aphid eggs, moth eggs, etc. on dormant stock).

f. Primor and Vendex for mites.

Other pesticides should be considered if there is a strong rationale for their use.

Preferred application methods:

a. Spot sprays targeted to the specific location for the appropriate pests.

b. Placing systemic pesticides in bands or Maugetreg injectors on tree trunks (e.g. for sucking insects such as aphids).

Future products:

a. Bacillus thuringiensis var. San Diego for beetles such as elm leaf beetle.

b. Biocontrol fungus for powdery mildew control.

c. Products containing neem (azadiractin) are being tested as a repellent or anti-feedant for some insects.

d. Avermectins derived from soil micro-organisms, effective on leaf miners and spider mites; they have some systemic effects.

Evaluation of Insect Control Strategies

Follow-up monitoring or inspections are necessary to find out how successful a strategy has been. It is essential to review records to determine what worked, where improvements should be made and what preventative steps may be possible in the future.

Use visual inspections to continue pest population assessment. Keep records of inspections and look for dead or parasitized insects and signs of fresh or continuing damage.

ORNAMENTALS & TREES: DISEASE CONTROL PRESCRIPTIONS & STRATEGIES

This category includes all botanical gardens, horticultural displays and borders, flowering ornamentals, nursery stock, city boulevards and medians, general park and playground areas, natural environment parks and pathways.

Level of Threat to Inventory

Serious: Zero tolerance to presence of pathogen (biotic) or environmental factors (abiotic). e.g. Dutch elm disease.

Moderate: Will tolerate a small percentage of the inventory with the pathogen (biotic) or environmental factors (abiotic). e.g. Fire blight, cytospora, sunscald.

Low: Will tolerate a majority of the inventory with the pathogen (biotic) or environmental factors (abiotic). e.g. Nectira, reduced plant tolerance as a result of salt injury

Identification

Identification is essential because most treatments must be tailored to a particular species. Once a species causing a problem or potential problem is identified, information about its life cycle can be used to identify when

suppressive measures will have the greatest effect and what preventative measures would be most effective. Categories of disease organisms include:

1. Fungi
2. Bacteria
3. Viruses and Viroids
4. Mycoplasmas

Identification can be carried out by:

1. Signs of the disease including spores, conks, mushrooms and other actual parts of the disease causing organisms.

2. Symptoms expressed by the plant – wilting, leaf spots and blights, root rots and cankers.

3. Identification of the causal organism by sending a sample to a diagnostics laboratory or by direct isolation and culturing for identification, where lab facilities are available.

Given the turn-around time for diagnoses from professional laboratories, the recommended approach is to periodically follow up any diagnosis that has been done on the basis of symptoms with a laboratory identification of the causal organism.

Keep photographs and descriptions of disease symptoms that occur on various sites to assist in future identification.

Monitoring

Monitoring provides the information needed to decide whether treatments are necessary, the best timing of treatments, and how the treatments are working. Most monitoring programs are based on regular inspection for pest, pest damage or signs of their presence and may include monitoring for beneficial species.

Visual inspections can be done in conjunction with monitoring for insects: diseased plants are usually first noticed via symptoms.

Factors to check for when assessing plant damage include:

1. Prior history of plant
2. Recent weather influences
3. Signs and locations of disease

4. Evidence of nearby fertilizer or herbicide use
5. Whether there has been construction in the area
6. Use of de-icing salt in the root zone
7. Other types of disturbances

Establishing Impact Assessment and Action Levels

How much damage is tolerable depends on what part of the plant is affected, the cost of treatments and the value of the plant or the aesthetic values that would be lost if not treated. In parks, conservatories and other public facilities, the need for treatment often depends on how much damage the public will tolerate, rather than on the harm a pest might be causing to a plant or to a site. The action level is when a particular treatment should be applied to deter pest populations from rising above the predetermined injury level.

For all sites:

1. Define when no action needs to taken; what population density is acceptable.

2. Define when preventative intervention required; when population densities are low but are increasing as verified through monitoring.

3. Define when suppressive action is required; when population densities are high and increasing and there is the risk of major economic damage or nuisance.

Thresholds may be defined and recorded as:

1. Percentage or proportion of leaves damaged on a particular plant.
2. Percentage of plants affected on a site.
3. Scores or indices over a predetermined level.

Examples of an adjustable threshold:

1. A decision not to control black spot on wild roses in a natural setting may be appropriate for instance, while a preventative program consisting of weekly application of sulphur, fungicidal soap, or other product may be applicable to rose beds in display gardens that have expressed a past history of the problem.

Selection of Treatment Techniques

One or several treatments should be coordinated into a management program for a target pest or for the entire complex of pests in a site or facility. Substituting physical or cultural controls for chemicals is promoted wherever feasible to conserve native beneficial species and reduce impacts on the environment. When pesticides are used, they should be applied as efficiently as possible, through careful timing and improved equipment.

1. Preventative/Cultural Measures:

IPM programs emphasize making changes in the management of plants and habitats to prevent pest problems from developing. Ensure proper horticultural and arboricultural practices are adhered to; these include proper soil management, nutrient and watering programs, and optimal pruning/planting techniques. When a disease occurs that must be treated, the crew leader should re-evaluate the management program for the disease/site/plant to determine how to improve plant health and how to prevent the problem in the future.

a. Plant diverse cultivars, species and families of plants and trees to prevent single species plantings which are vulnerable to serious disease problems. Continue to investigate and test new species that are adaptive to our climate.

b. Ensure new planting sites are properly prepared; plant into friable, uncompacted soil. Avoid planting in heavy soils in the fall. Plant in the spring in these situations.

c. Inspect planting stock and purchase only healthy plants – check tree root collars for circling, kinked roots, basal cankers, check condition of main roots and for girdling ropes or wires; ensure plants are in good health and conform to Landscape Alberta Nursery Trades Association (LANTA) standards.

d. Plant at the proper depth.

e. Maintain a mulched tree circle or bed around new plantings to retain moisture, nurture beneficial soil organisms and prevent injury from mowers and other equipment.

f. Design irrigation systems taking into account the difference in water requirements between turf, shrubs and trees at varying sites. Ensure irrigation water is not directed to root crowns of mature trees or that new beds become water logged. Ensure regular and adequate water during establishment of new plantings.

g. Provide good drainage. Dig a drainage trench on the downhill side of the hole and backfill with coarse material when planting on a hillside where water is likely to collect in the hole.

h. Prune and train young trees properly so that large pruning cuts will not be needed later to correct poor tree structures; make cuts properly to promote rapid wound closure.

i. Sanitation – remove infested, dead and fallen twigs, leaves and fruit from the base of trees and shrubs, especially where soil-borne or root/crown feeding insects have been a problem.

j. Quarantines and inspections – conduct routine inspections of incoming plant material; grow or start your own plant material.

k. Evasion of the pathogen – use vigorous seed, maintain proper planting dates and sites. Keep proper distance between disease susceptible plants by interplanting with non-susceptible stock. Control insect and weeds that are agents of disease or harbour disease pathogens.

l. Eradicate or reduce disease inoculum levels through removal of alternate hosts (e.g. pines or Ribes where white pine blister rust is a problem), rotating plants in beds – avoid planting a susceptible plant in the same site where a plant has been taken out due to the same disease (e.g. alternate plantings of tulips with other spring flowers to avoid buildup of tulip fire-Botrytis tulipae) and remove/destroy infected leaves, prune infected branches and other plant debris that my harbor the pathogen.

m. Create conditions unfavourable to pathogen (e.g., use of non-soil mixes for containerized nursery stock).

n. Use resistant or tolerant varieties; select native species that possess resistance factors to local disease.

o. Investigate tree watering regime. Fertilizers that promote root growth (e.g. 10-51-10) may be applicable to new plantings for the first few years. Monitoring tree well composition may be appropriate by the third year to determine nutrient needs. Fertilizers may not be required in certain soil types.

p. Investigate whether salinity damage maybe a result of over-fertilization instead of road salt.

q. Consider a spring application of a high nutrient fertilizer (e.g. 20-20-20) to spruce trees that are under moderate to severe environmental stress. This may be particularly useful in soils that are more prone to binding up phosphorous nutrients.

2. Physical & Mechanical Controls:

a. Remove and destroy diseased tissue and over wintering stages of the disease organisms; isolate or remove diseased stock to avoid spreading diseases such as Pseudomonas, Verticillium, Armillaria, etc.

b. Regular syringing leaves with water in the morning to wash off dew and dislodge spores before they germinate (e.g., black spot and powdery mildew on roses).

3. Chemical Controls:

Preferred fungicides:

a. Choose fungicides that are both reasonably effective and the least disruptive to the beneficial organisms protecting the plant from insect and disease.

b. Powders are generally more disruptive as they are more residual and can impede respiration in beneficial insects.

c. Spreader/stickers can cause mortality to beneficials; even oils and anti-transpirants are a concern.

d. Flowable sulphur is generally pretty safe.

e. Chemical families should be alternated, preferably between systemic and contact products to help avoid inducing resistance.

Use spot treatments whenever practical instead of general broadcast sprays. Other related options/techniques involve applications of compounds such as fixed copper in the fall and spring (e.g., on ornamental pears to prevent infections of Pseudomonas syringae) as a protectant. This is appropriate prior to signs or symptoms of disease if:

- the plant material is known to be susceptible and;
- the disease occurs in the area, and;
- the value of the plant material warrants maintaining such a yearly programs.

Evaluation of Disease Control Strategies

Follow-up monitoring or inspections are necessary to find out how successful an IPM strategy has been. It is essential to review records to determine what worked, where improvements should be made and what preventative steps may be possible in the future.

For annuals, evaluation often means quickly determining whether the plant recovered or not. For perennials and long-lived plants it may involve using pre and post treatment monitoring involving a scoring system and/or photographs to track the disease progression.

AQUATIC: WEED CONTROL PRESCRIPTIONS & STRATEGIES

This category includes all natural lakes, watercourses and man made structures including storm retention ponds.

Categories

The categories can be grouped into three major types:

1. Aquatic vegetation
2. Shoreline vegetation
3. Algae

Identification

Identification is essential because most treatments must be tailored to a particular species. Once a species causing a problem is identified, information about its life cycle can be used to identify when suppressive measures will have the greatest effect and what preventative measures would be most effective.

Monitoring

Monitoring provides the information needed to decide whether treatments are necessary, the best timing of treatments and how the treatments are working. Successful aquatic weed management programs are based on regular inspections.

Confirm extent of aquatic weed infestation and population density by visual inspection.

Schedule monitoring periods to coincide with periods of active vegetative growth or flowering cycle. Monitoring should begin in early spring and continue through to the end of the hot part of the summer, typically the end of August.

Impact Assessment and Action Levels

How much vegetation and algae is tolerable depends use of the site and the cost of treatments. A natural lake would only be considered for treatment if there were a manicured beach area. In a storm water pond, vegetation must be kept from restricting water flow at the inflow and outflow structures. Where residential properties are adjacent to ponds aesthetics is a factor. The extremely high toxicity of blue-green algae is a concern in any urban water at any level. The action level is when a particular treatment should be applied to deter pest populations from rising above the pre-determined level.

The exponential growth habits of aquatic weeds and algae during warm weather require an early response to minimize the amount of product required, costs and the visual impact of the decaying organic matter.

Selection of Treatment Techniques

One or several treatments may be coordinated into a management program for a target pest or for the entire complex of pests in a site or facility. Especially in aquatic plans, the environmental impacts of all methods must be evaluated. Even small oil and gas spills or leaks can be a serious detriment to an aquatic environment. When pesticides are used, they should be applied as efficiently as possible, through careful timing and approved equipment.

1. Preventative/Cultural Measure:

   Prevention is the cornerstone of a successful IPM program and will prevent pest problems from developing. A number of methods can minimize nutrient inputs and reduce pesticide requirements.

   a. Minimize nutrient inputs:

      i. Surrounding lawns can be kept to a minimum fertilization level and allow vegetation to grow higher closer to the shoreline
      ii. Education programs to inform homeowners on ways of reducing and filtering nutrients headed into storm retention ponds.

   b. Filtration: Design and maintenance of ponds and waterways to include cattails and other vegetation at the waters edge to filter organic contaminants.

2. Physical & Mechanical Controls:

   a. Manual cutting and removal of aquatic and shoreline vegetation
   b. Mechanical removal of aquatic and shoreline vegetation

3. Environmental Controls

   Heavy rainfall can have a positive effect on controlling pests. Flushing of storm retention ponds is a very effective way of controlling algae growth. Therefore, monitoring of weather conditions vs. timing of other controls should always be considered.

4. Chemical Controls

   Ensure that product selected is effective and registered for the specific pest type. Ensure that the *Letter of Authorization* from Alberta

Environment includes the use of that product for this treatment. Select proper time of application to maximize effect to target species and minimize effect of spray on other species.

Evaluation of Weed Control Strategies

Follow-up monitoring or inspections are necessary to find out how successful an IPM strategy has been. It is essential to review records to determine what worked, where improvements should be made and what preventative steps may be possible in future. Frequency of evaluations should be determined by facility classification type.

Accurate record keeping of visual inspections and sample counts is essential. Incorporate visual inspection and recording of weed problems into the duties of maintenance staff that are on site most frequently. Schedule visual inspection and evaluation of areas that have been treated 7-14 day after treatment.