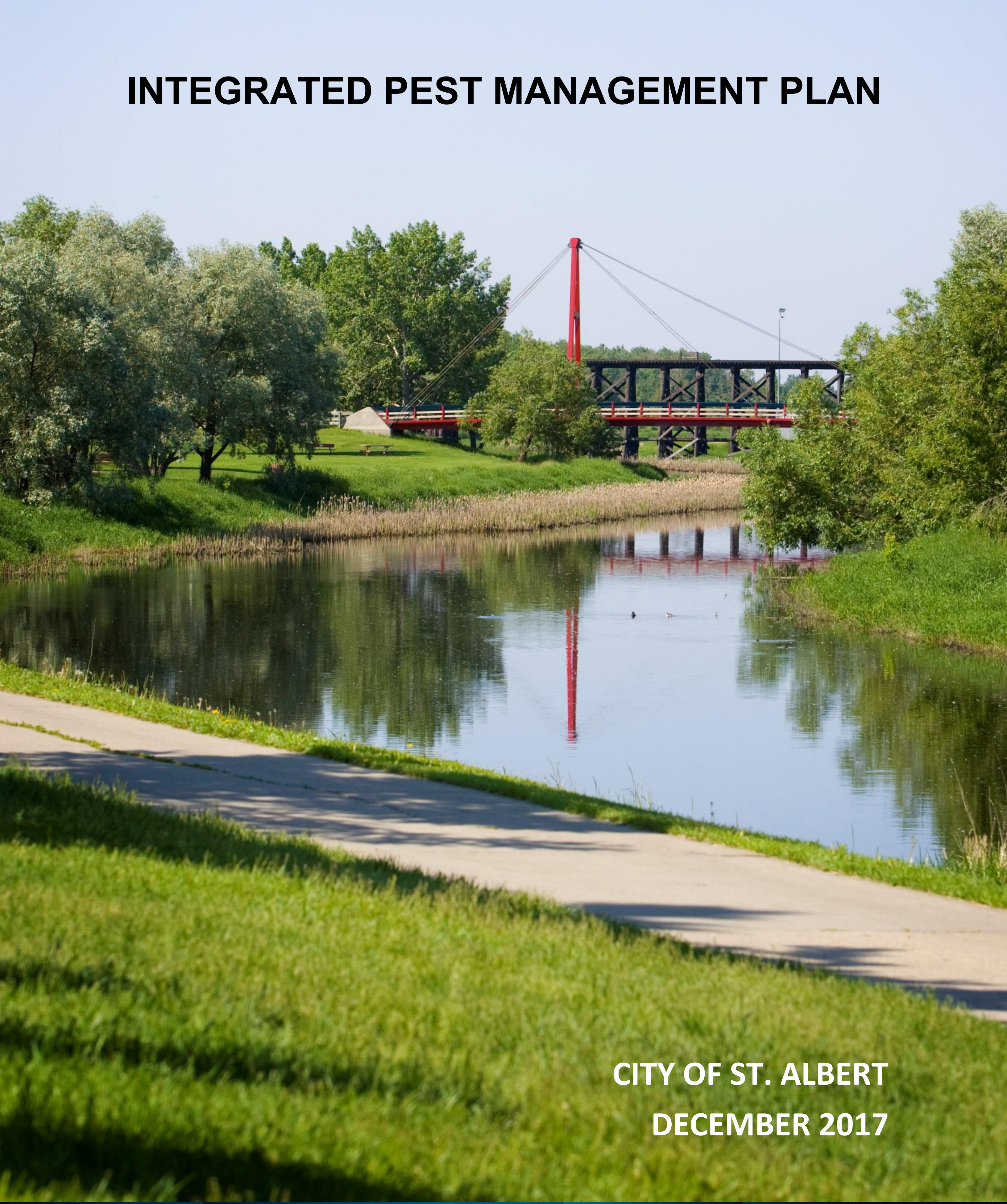
INTEGRATED PEST MANAGEMENT PLAN



CITY OF ST. ALBERT

DECEMBER 2017

PREFACE

In 2011, the City of St. Albert developed an integrated pest management (IPM) plan providing detailed information on how to prevent and manage pest problems in the City. The IPM promotes healthy vegetation, and guides pest control activities on all public land and within civic structures and facilities. One of the goals of the IPM is to keep pests at an acceptable level through effective, economical and environmentally sound methods.

The City recently updated the plan to act as a unified resource for current operational, planning, and technical pest control activities. Additionally, the plan is a source of information on current pest management programs, and an up-to-date list of pests and their corresponding management procedures.

Factors crucial to the success of an IPM program include: (1) adhering to and carrying out government mandates such as the *Weed Control Act* and the *Pest Act*; (2) integrating and using a diverse range of control products and methods while reducing the reliance on chemical pesticides; (3) monitoring pest activity before and after control procedures; and (4) providing guidance and assistance to city staff and engaging external organizations and the community. With a solid IPM framework in place, the community can participate in various pest control initiatives, including working with city staff to identify and monitor new pest problems and to help establish practical and effective pest control targets and workable solutions.

An IPM plan must inherently adapt to a dynamic pest environment. Thus, an IPM plan is complete only until the next major pest arrives on the scene, pesticide or pest control legislation changes, new control methods become available, or the public seeks a change in the way pests are dealt with because of shifting points of view.

Acknowledgements

The City of St. Albert would like to thank the City of Calgary and the City of Red Deer for allowing the use of portions of their IPM plans in the development of this document. We appreciate the sharing of knowledge and expertise in these matters.

The City of St. Albert would also like to thank the City of Leduc for allowing the use of portions of the Leduc IPM plan dealing with aquatic vegetation management. We appreciate their assistance.

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1 INTRODUCTION

The City of St. Albert (the City) manages 555 hectares of public park space and over 500 hectares of natural areas, including sports fields, roadway green space, decorative parks, and natural environment parks. Each year, the City also inspects and assumes responsibility for managing newly acquired property. In the past, the City used varied pest control techniques, and City Administration recognized the need for a formal policy and set of procedures for city-wide use to control pests. In 2011, the City developed an integrated pest management (IPM) plan with the objective of updating every 5 years. An IPM plan is a living document that acts as a foundation for current operational, planning, and technical pest control activities, but as a living document, it requires ongoing development and refinement. The 2017 IPM plan integrates new information on pests, legislation, the City policies, and controls.

This IPM plan has numerous functions:

- to ensure public accountability for pesticide use
- to comply with all pertinent laws, regulations, bylaws, and policies regarding the use of pesticides on lands for which the City is responsible
- to consider community values in the development and implementation of pest management plans
- to promote ecologically sound pest management principles, concepts, and techniques in the design and implementation of development projects on public lands
- to develop and promote opportunities for public education and information regarding environmentally sound methods of pest management
- to train staff who develop and implement the City's IPM plans
- to promote long-term, cost-effective management of pests

The IPM plan provides detailed information on how to prevent and manage pests on lands within the City. This document is split into numerous sections and supporting appendices for ease of use. The main body of the document includes: what an IPM plan is and why it is important (Section 2); the legislation and regulations that govern pest management (Section 3); the components of IPM, including implementation (Sections 4 and 5); and the common pests within the City (Section 6). Numerous supporting documents are presented as appendices to provide easy access to additional information.

2 INTEGRATED PEST MANAGEMENT

The goal of this IPM plan is to ensure operations involving pest management are implemented through a classical IPM plan that emphasizes an ecological approach, reduces the reliance on pesticides through preventive and alternative methods, and considers long-term costs for evaluating the effectiveness and economic feasibility of pest management prescriptions.

This section provides information on what is considered a pest, what is IPM, how the IPM integrates with other city policies, and items the City needs to consider with implementing an IPM plan.

2.1 What Is a Pest?

A pest is defined in the federal *Pest Control Products Act* as:

> *"an animal, a plant or other organism that is injurious, noxious or troublesome, whether directly or indirectly, and an injurious, noxious or troublesome condition or organic function of an animal, a plant or other organism"* (Government of Canada 2006).

The definition of a pest can also relate to the situation or size of the pest population that adversely interferes with the aesthetic, health, environmental, functional, or economic goals of humans.

There are provincial and federal legislation and regulations that provide a legal perspective to determine whether an organism is a pest and the requirements for control. The City has a legal responsibility to comply with these governing acts and regulations (refer to Section 3).

2.2 What Is Integrated Pest Management?

IPM is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques, such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment. The IPM plan uses extensive technical knowledge of individual pests and their relationships to the environment, and aims to maintain pests at acceptable levels through effective, economical, and environmentally sound methods. The IPM plan is also guided by federal and provincial legislation and municipal bylaws. The IPM plan for the City is an overarching document that provides guidance on objectives and implementation of IPM. Within an IPM plan, IPM programs are often developed for specific pests and may change from year to year as the pest is managed.

2.3 Why the Need for Integrated Pest Management?

Controlling pests while promoting healthy growth of desirable species reduces health dangers caused by insect or disease infestations, maintains native vegetation and wildlife habitat, supports biodiversity, supports public activities and interactions with land managed by the City, and is economically responsible. The IPM plan does the following:

- seeks to minimize the risk to human health and the environment
- considers cost effectiveness and operational feasibility

- considers community values
- protects vegetation communities by improving site conditions and fostering healthy conditions for optimal growth and plant health
- controls invasive pests while promoting healthy growth of desirable species

Implementation of the City's IPM must consider the three pillars of sustainability; environment, social and economics.

Environmental Concerns

- increased plant and animal susceptibility to pests if an infestation is over a tolerable level
- permanent pest damage considerations if infestations are annual
- damage to plants due to competition for space, water, nutrients, and sunlight
- maintenance of a native species balance and diversity
- use of the most environmentally sound methods of control available

Social Concerns

- public perception and complaints - aesthetics, health, and safety concerns
- need for increased education and awareness about pests
- increased maintenance cost - related to the provincial *Weed Control Act* and/or *Agricultural Pests Act*
- Use of control methods that are safe for human health

Economic Concerns

- control of spread to and from private property
- control of spread from private property using enforcement
- increased need for vegetation replacement; reduced vegetation value
- increased plant susceptibility to pests, which may lead to decreased landscape value
- maintenance standards - may lead to increased maintenance costs if not controlled
- prevention of equipment damage
- loss of recreational opportunities

2.4 Integrating Pest Management with Internal Policies and Management Plans

The City's IPM plan will apply to all the City departments, developers, and contractors who directly or indirectly manage pests or plan, design, renovate, or construct landscapes and facilities. For IPM to work, effective communication and operational planning are required between all relevant service sections of the City Public Works department, and often between other departments of the City as well. The policy planning and developmental framework of the IPM is founded in the context of the following City plans:

Environmental Sustainability Policy

The Environmental Sustainability Policy adopted by City Council states the City's commitment to environmental management of its operations, as well as providing a guiding framework for setting environmental goals and targets and implementing initiatives that will support community and City environmental sustainability.

https://stalbert.ca/uploads/files-excel/C-EUS-01_Environmental_Sustainability_Policy.pdf

Environmental Management Systems

The City's Environmental Management Systems (EMS) link the environmental policy to procedures to bring environmental considerations into decision-making and day-to-day operations, and provide a framework for evaluating and improving environmental performance. The EMS adhere to the International Organization for Standardization (ISO) 14001:2015 (ISO 2015) and are closely linked to the Environmental Master Plan (EMP).

https://stalbert.ca/city-services/environment/environmental-management-systems/

Environmental Master Plan

The EMP is a long-term community plan that identifies, prioritizes, and sets specific goals and targets for key environmental issues for the City and community, with effective and environmentally sound land stewardship as a key component. The EMP has broad goals that are directly in line with the objectives of the IPM:

- Goal 4 - preserve and manage trees, parks, and natural areas
- Goal 7 - improve water quality of the Sturgeon River with the following targets:
    - Reduce nutrients, pesticides and bacteria levels detected in the Sturgeon River by 2020 as measured by future River Water Quality Index
    - Reduce municipal pesticide use to 0.25 kg of active ingredient (ai) per hectare or lower by 2020
    - Reduce residential pesticide use to 0.5 kg of active ingredient (ai) per hectare or lower by 2020

https://stalbert.ca/uploads/legacy/documents/city/EnvironmentalMasterPlan.pdf

Parks and Open Spaces Management Plan

The City's Parks and Open Spaces Management Plan outlines the City's strategy to establish and maintain open, green public spaces that are recognized as important. The IPM is a key requirement of the Parks and Open Spaces Management Plan.

Natural Areas Conservation and Management Plan

The City's Natural Areas Conservation and Management Plan is part of the City's ongoing efforts to strengthen their commitment to conserving and managing St. Albert's natural areas. This plan has several goals that directly align with those of the IPM:

- maintain and enhance the native plant species composition or natural areas
- maintain capacity of natural area vegetation to develop and undergo natural succession, including experiencing natural disturbances (except fire)
- reduce wildlife-property conflict near/in natural areas
- promote good water quality of natural bodies of water

Urban Forest Management Policy and Plan

The City's Urban Forest Management Policy provides a framework for the consistent protection, management, and sustainability of the City's urban forest. In addition, the policy aims to preserve and enhance the City's tree canopy that consists of a beautiful, healthy and diverse tree population.

The Urban Forest Management Plan (2017) outlines the City's goals to sustainably manage and enhance the urban forest. The plan provides strategic direction for the entire urban forest area, including all trees within City limits. The vision of the plan is:

> "*Protect, ensure health, cherish and expand our urban forest for today and future generations".*

https://stalbert.ca/uploads/legislative/C-IS_-04_UrbanForestManagement.pdf

https://stalbert.ca/uploads/PDF-infosheets/StAlbert-Urban-Forest-Management-Plan_June-26-2017.pdf

City of St Albert Health and Safety Policy

The City employees are subject to the health and safety policies of the City. All employees will be familiar with and abide by the City of St Albert health and safety policies and safety procedures related to IPM.

2013 Municipal Engineering Standards

Preventing pest problems through thoughtful design and construction of facilities and landscapes is an essential component of IPM. Cost-effective maintenance, park and facility design are discussed during the review phase, with technical or operational staff involved with IPM. Implementing various IPM design and construction options will be taken into consideration when updating future landscape design standards. The IPM plan should be used to encourage developers, contractors, and citizens to use IPM principles when they develop and maintain facilities and landscapes on private land. Where appropriate, future park and facility design circulations should include the Manager of Operations for Parks and Open Spaces, and the Tree and Pest Team Lead to allow for comments or additional recommendations on park design or use of planting materials.

The City must apply IPM principles when planning, designing, constructing, and renovating projects. Inadequate information about site inventories, site and feature-specific data (such as fertilizer requirements), and features maintained by each operational group, impedes efforts to analyze current pest management operations and develop cost-effective IPM programs. In St. Albert, as with many urban communities, design and construction are major factors in creating or minimizing the occurrence or management of pest problems on public lands.

2.5 Integrated Pest Management Considerations for the City of St. Albert

While insect and disease problems create serious maintenance requirements for some of the City's landscape management operations, weeds are the major pest problem on the City's public lands. High levels of weeds in park areas and the subsequent deterioration of turf quality are important challenges facing the City. Pesticide use will be necessary to manage specific existing problems, and the extent of pesticide use depends on the available management resources, which determine how effectively IPM strategies are applied. The City may need to use herbicides to rehabilitate existing sites before moving to a maintenance mode using IPM strategies. In addition to site rehabilitation, facilities and parks have not been designed to minimize pesticide use and long-term maintenance requirements, which can also be a challenge when implementing IPM.

The City must also consider a range of issues and responsibilities when implementing IPM in landscape and park environments, including the following:

- **Natural Areas** - St. Albert's natural areas provide valuable wildlife and native plant habitats. The value of natural areas to serve as habitats and corridors for wildlife and native plants will increase as areas of the city continue to be developed.

- **Prohibited Noxious, Noxious, and Nuisance Weeds** – Prohibited noxious, noxious, and nuisance weeds have serious negative impacts on both natural landscapes and developed lands. Weeds are classified as prohibited noxious, noxious, and nuisance by Alberta Agriculture and Forestry under the *Weed Control Act*. The provincial act requires property owners to control (prohibited noxious and noxious) weeds to prevent their propagation and spread.

- **Agricultural Pests** - Pests (animals, birds, insects, plants, or diseases) can have serious negative impacts on the ecology of natural and developed lands. Property owners must control those organisms classified as either pests or nuisances by Alberta Agriculture and Forestry under the *Agricultural Pests Act*.

- **Water Quality** - Activities to manage pests in the City's landscape, park facilities, and land could affect surface and groundwater quality, and adversely affect the functionality of the river's aquatic ecosystem Excess pesticide and fertilizer use can negatively impact aquatic invertebrates, fish populations and increase plant and algal growth. The water in the Sturgeon River is used for recreation and for downstream irrigators, so preservation of good water quality leaving the City is important.

- **Safety** - A primary management consideration is the safety of people using, maintaining, and developing the City's park facilities and other non-recreational corridors (i.e., roadway green spaces). Pest management operations must be developed and implemented in a manner that protects the health and safety of the public and the City personnel.

- **Education** - Education of the City staff and the public is an important component of implementing the IPM plan. The City shall keep current with pest management strategies and incorporate them where applicable into the IPM programs.

- **Aesthetics** - The natural and developed beauty of St. Albert is reflected in the diversity of its park system. For residents and visitors, the aesthetic values of the City's park environments warrant their acquisition, development, maintenance, and use. As growth pressures change the landscapes of St. Albert and the surrounding area, the aesthetic benefits provided by the City's park system will become increasingly important.

- **Recreational Opportunities** - St. Albert's park system provides citizens with a wide variety of recreational opportunities. Pest management plans and operations must facilitate and enhance the opportunity to pursue and enjoy recreational activities.

- **Heritage Features** - St. Albert's park environments include natural and introduced vegetation and features that are an important part of St. Albert's history.

- **Design Criteria** - Site design significantly influences landscape maintenance requirements, costs, and environmental impacts. The City shall promote development and implementation of landscape designs that not only are aesthetic and functional, but also provide opportunities for wholistic ecosystem approaches and cost-effective management of pests.

- **Contracted Work** - Private contractors hired by the City must carry out activities in accordance with the IPM plan, and follow IPM principles in design and construction.

3 FEDERAL AND PROVINCIAL LEGISLATION, AND MUNICIPAL BYLAWS

The IPM plan is guided by federal and provincial legislation and municipal bylaws. This section outlines the governing federal and provincial acts and regulations that determine whether an organism is a pest and the requirements for control, and the current City bylaws that directly or indirectly pertain to the management of pests in St. Albert.

3.1 Federal

Pest Control Products Act

The *Pest Control Products Act* aims to protect human health and safety and the environment by regulating pest control products.

http://laws-lois.justice.gc.ca/eng/acts/P-9.01/

Canadian Food Inspection Agency

The Canadian Food Inspection Agency coordinates programs to prevent the introduction and movement of invasive species between borders, and assists with education and monitoring within Canada.

http://www.inspection.gc.ca/plants/plant-protection/invasive-species/eng/1328325263410/1328325333845

Fisheries Act

The objective of the *Aquatic Invasive Species Regulations* is to provide a full suite of regulatory tools under the federal *Fisheries Act* to prevent the introduction of aquatic invasive species (AIS) into Canadian waters and to control and manage their establishment and spread, once introduced.

http://www.dfo-mpo.gc.ca/science/environmental-environnement/ais-eae/regulations-eng.html

Migratory Birds Convention Act, 1994, and *Species at Risk Act*

The *Migratory Birds Convention Act, 1994* and its supporting regulations aim to protect migratory birds, their eggs, and their nests. The *Species at Risk* Act and its supporting regulations aim to protect species of conservation concern in Canada. As part of the City's IPM plan, the federal government would be consulted before any pest control actions dealing with federally protected species.

http://laws-lois.justice.gc.ca/eng/acts/M-7.01/

http://laws-lois.justice.gc.ca/eng/acts/S-15.3/

3.2 Provincial

The *Environmental Protection and Enhancement Act*

The *Environmental Protection and Enhancement Act* (EPEA) and its supporting regulations govern the sale, use, application, handling, storage, transport, and disposal of pesticides in Alberta. EPEA contains the following regulations specific to pesticides:

- Pesticide (Ministerial) Regulation
- Pesticide Sales, handling, Use and Application Regulation
- Environmental Code of Practice for Pesticides

http://www.qp.alberta.ca/documents/Acts/E12.pdf

Weed Control Act

The *Weed Control Act* categorizes a weed as either noxious or prohibited noxious. 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 *Weed Control Act* protects citizens from economic and invasive losses caused by weeds.

The *Weed Control Act* defines municipal weed control actions, methods of serving notices, when notices must be served and the conditions necessary for appeal. The *Weed Control Act* also outlines municipal actions when managing weeds that are considered either noxious or prohibited noxious.

http://www.qp.alberta.ca/documents/Acts/W05P1.pdf

Agricultural Pests Act

The *Agricultural Pests Act* and its supporting Pest and Nuisance Control Regulation declares as a pest or nuisance any animal, bird, insect, plant, or disease that is destroying or harming, or is likely to destroy or harm, any land, livestock, or property in the province of Alberta. The regulation allows municipalities to deal with native and introduced pests and nuisances that affect agricultural production.

http://www.qp.alberta.ca/documents/Acts/A08.pdf

Local authorities are responsible for preventing the establishment of, and controlling or destroying, animals that have been designated as pests by Alberta Agriculture and Forestry. Unlike pests, local authorities are not mandated to prevent the establishment of, or destroy and control, species designated as nuisances under the *Agricultural Pests Act*. They are, however, permitted under the act to control these nuisances at their discretion using sound husbandry practices that comply with all applicable laws.

The City manages its obligations through a pest control unit in the Public Works department that is educated in the recognition of pests on public property. The unit will take appropriate action to fulfill obligations as they relate to pests on public property. The City also appoints the municipal enforcement officers as inspectors pursuant to the *Agricultural Pests Act* to answer to public complaints and enforce pest control on private property when required.

Wildlife Act

The *Wildlife Act* and its supporting regulations protect provincial species of conservation concern in the province. The City applies for annual Damage Control Licences and Permits from the provincial government to hunt or trap certain species of wildlife listed under the *Wildlife Act*. The province manages all wildlife species not covered under the Wildlife Regulation or Damage Control Licences. As part of the City's IPM plan, the City will consult the provincial government before any pest control actions dealing with provincially protected species. The City works closely with provincial fish and wildlife departments and uses their wildlife management expertise in preventing or managing any human-wildlife conflicts.

http://www.qp.alberta.ca/documents/Acts/W10.pdf

http://aep.alberta.ca/fish-wildlife/wildlife-damage-control-programs/damage-control-licences-permits.aspx

Alberta *Fisheries Act*

Aquatic Invasive Species Regulations under the provincial *Fisheries Act* aim to prevent the introduction of aquatic invasive species into Alberta waters.

http://laws-lois.justice.gc.ca/eng/regulations/SOR-2015-121/FullText.html

3.3 Municipal Bylaws

- The City's Bylaw 34/80 outlines the actions permitted by City municipal enforcement officers to inspect and control weeds on private lands within the City.

- The City's Bylaw 5/98 that controls and prevents the spread of Dutch elm disease is managed by the City staff and municipal enforcement officers.

- The City's Bylaw 38/78 that prohibits residents to harbour any wild animal is managed by the City municipal enforcement officers.

- The City's Bylaw 21/2014 that regulates the conduct and activities of people on privately owned property and immediately adjacent areas in order to promote the safe, enjoyable and reasonable use of such property for the benefit of all citizens of the City.

4 CITY OF ST. ALBERT INTEGRATED PEST MANAGEMENT PROCESS

The original IPM plan was developed through a process that included discussions with internal staff to gather impressions of public perceptions and views about pesticide use and pest management. The result of this initial process was the 2011 draft IPM plan. The initial step was to set program goals and management objectives. Feedback for the 2011 IPM plan was provided by the Environmental Advisory Committee, and City Council fully supported City Administration in the development and implementation of the IPM plan. The sections below discuss the roles and responsibilities within the City and the resources required to implement the IPM plan.

4.1 Roles and Responsibilities

The City Manager will have the overall authority for the IPM plan, strategies and prescriptions.

Environmental Advisory Committee

The Environmental Advisory Committee will review the IPM plan after updates and advise City Council, as required.

Environment Department and Public Works

Environmental Services and Public Works (through the Manager Operations Parks and Open Spaces and the Tree and Pest Team Lead) will do the following:

- stay apprised of new and modified legislation and regulations that make it necessary to amend the IPM plan
- coordinate the development and implementation of the IPM plan with the Environment Department and any other pest management operations within the City
- help develop design and construction criteria for use in landscape and facility development projects that are consistent with the IPM plan
- manage park lands throughout St. Albert with a standard consistent with the IPM plan
- evaluate, approve, and rank all pesticide products that the City departments wish to use, following these criteria:
    - **prescription evaluation** - application methods, scale of application, exposure elements, and buffer zones
    - **federal registration** - adverse human health effects; animal exposure data; mobility and persistence in the environment; potential impact on non-target organisms; inert ingredients; data gaps, and pesticide classification information obtained from Health Canada and Alberta Environmental Protection

    - federal designation of reduced risk pesticides

- coordinate the research needed to implement IPM programs
- ensure staff are trained appropriately to implement IPM
- develop and implement an education program that promotes awareness and understanding of the City's ecologically sound pest management practices, including all laws, regulations, bylaws, and policies that are directly or indirectly related to pest management operations
- evaluate the IPM plan and programs, as required

Integrated Pest Management Supervisory Duties

In St. Albert, the existing Tree and Pest Team Lead will have IPM implementation and day-to-day supervisory duties for their particular area.

4.2 Resources

A successful IPM plan requires an IPM supervisor; staff training; park design and development guidelines; park inventory and site evaluation; monitoring and recording systems; increased level of cultural practices; annual program evaluation, and a public education program.

4.2.1 Personnel

Current staff levels provide adequate pest management to maintain existing standards. The IPM programs developed do not require additional staff time to monitor, evaluate, and implement IPM prescriptions. However, as new programs are established, they will be evaluated to determine whether additional resources may be required in the future. A large portion of IPM duties, such as routine monitoring, mapping, and evaluating IPM maintenance practices should be assigned to one staff person.

4.2.2 Equipment

Equipment relevant to IPM operations should be regularly cleaned and maintained and updated on the capital replacement schedule to incorporate the latest innovations in safety and efficiency.

5 INTEGRATED PEST MANAGEMENT PROCEDURES AND IMPLEMENTATION

The IPM plan guides the management of civic land and sites within and around structures. IPM will be implemented on parks, playgrounds, sports fields, cemeteries, pathways, paved areas, storm water retention ponds, trees in park areas and on boulevards, natural areas and non-park areas including roadway green spaces, agricultural roadways, and undeveloped civic-owned properties. The City will also promote IPM strategies on major private land holdings, such as school board lands and industrial parks. This section provides information on the City's procedures and implementation. It outlines strategies and prescriptions for managing pest problems, monitoring, control and evaluation of the IPM plan and programs.

5.1 Strategies and 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, manually controlling weeds can be used 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 allowing for regular rest periods to recover from heavy use. IPM prescriptions may be a single strategy or a combination of different treatments within each strategy. It is important to review all possible treatment techniques to promote healthy vegetation and control pests then select the most appropriate technique(s).. Strategies for turf, urban forest, and vegetation management are shown on Figures 1, 2, and 3, respectively.

FIGURE 1 Turf Control Treatment Strategies

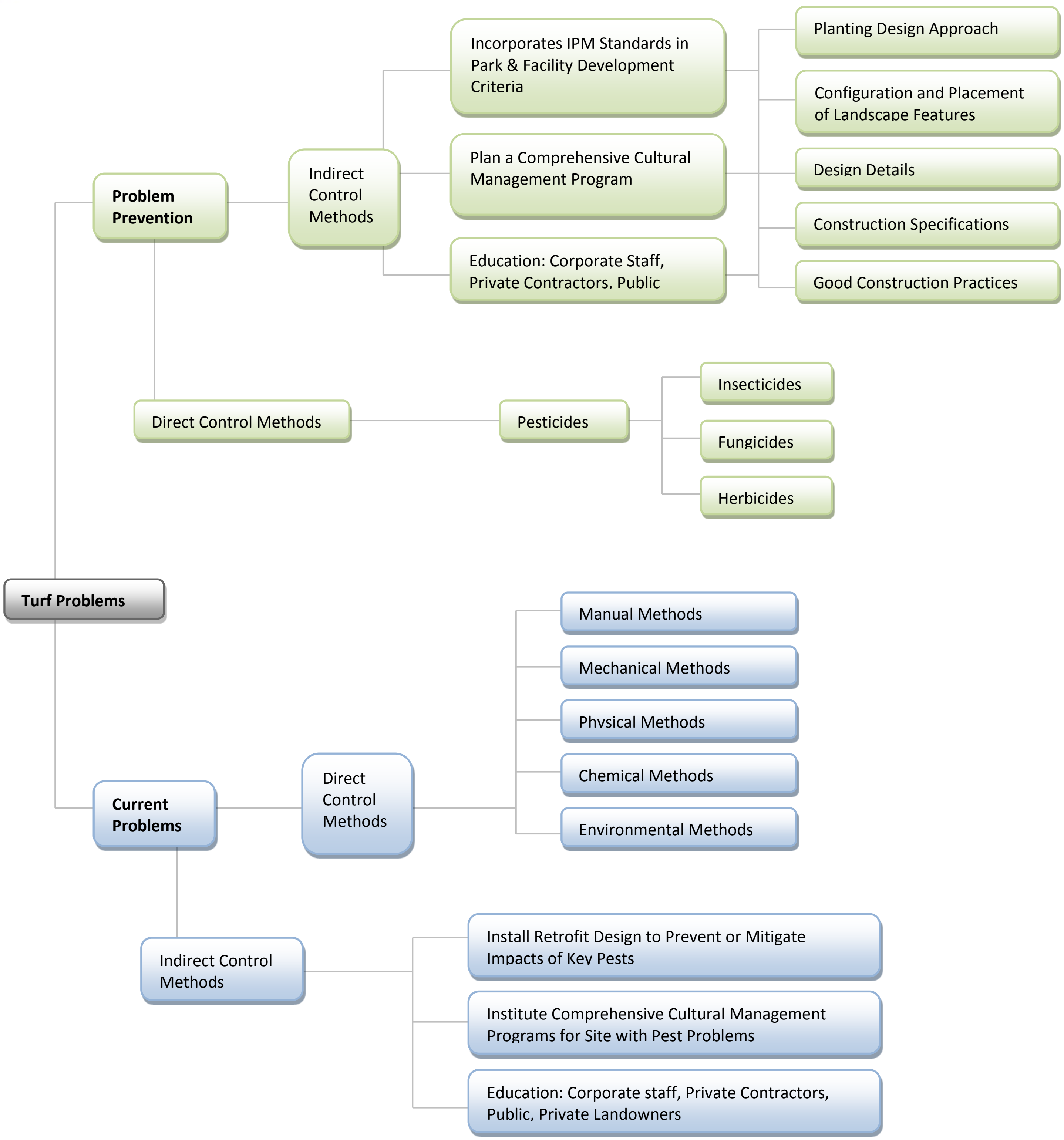


FIGURE 2 Urban Forest Control Treatment Strategies

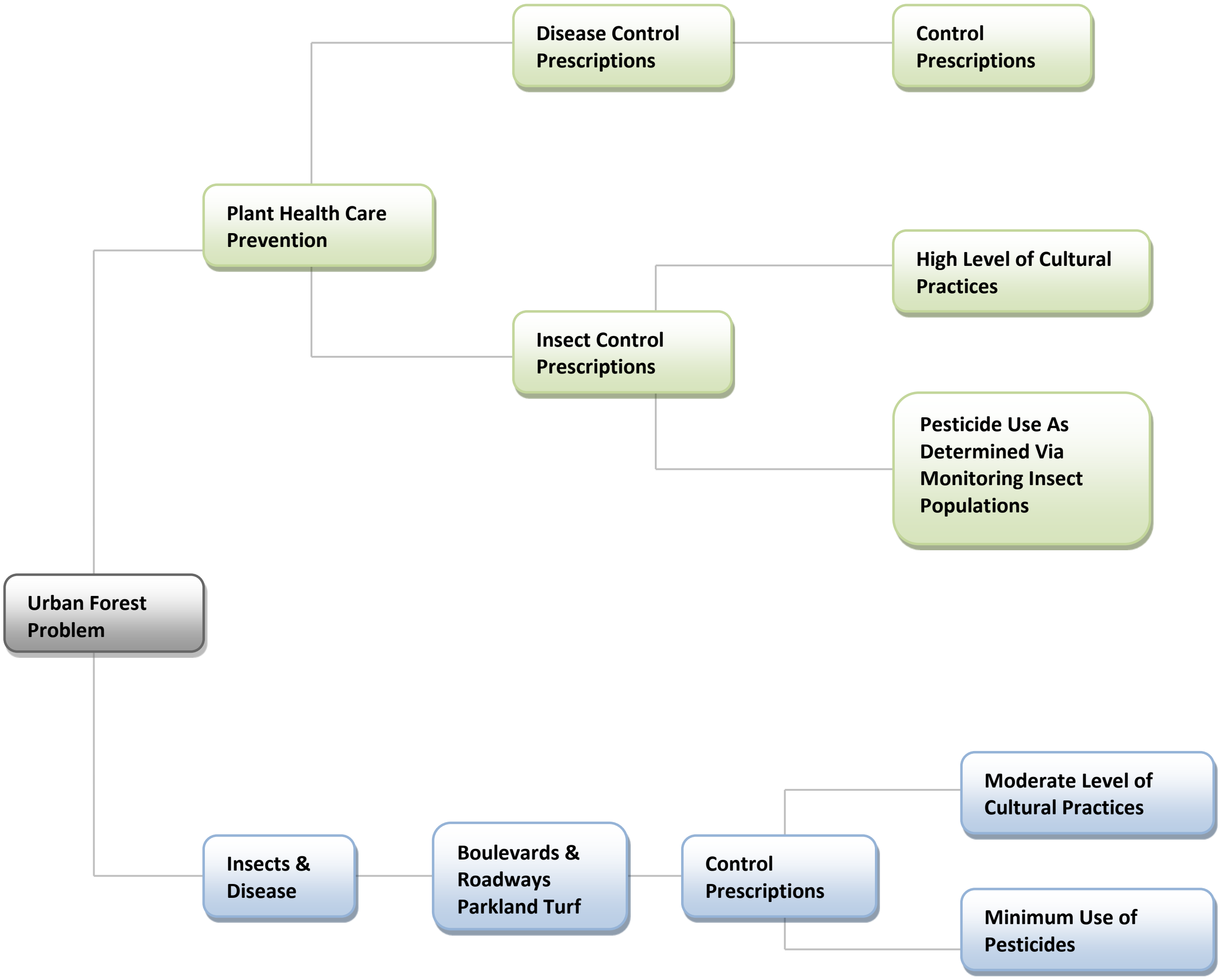
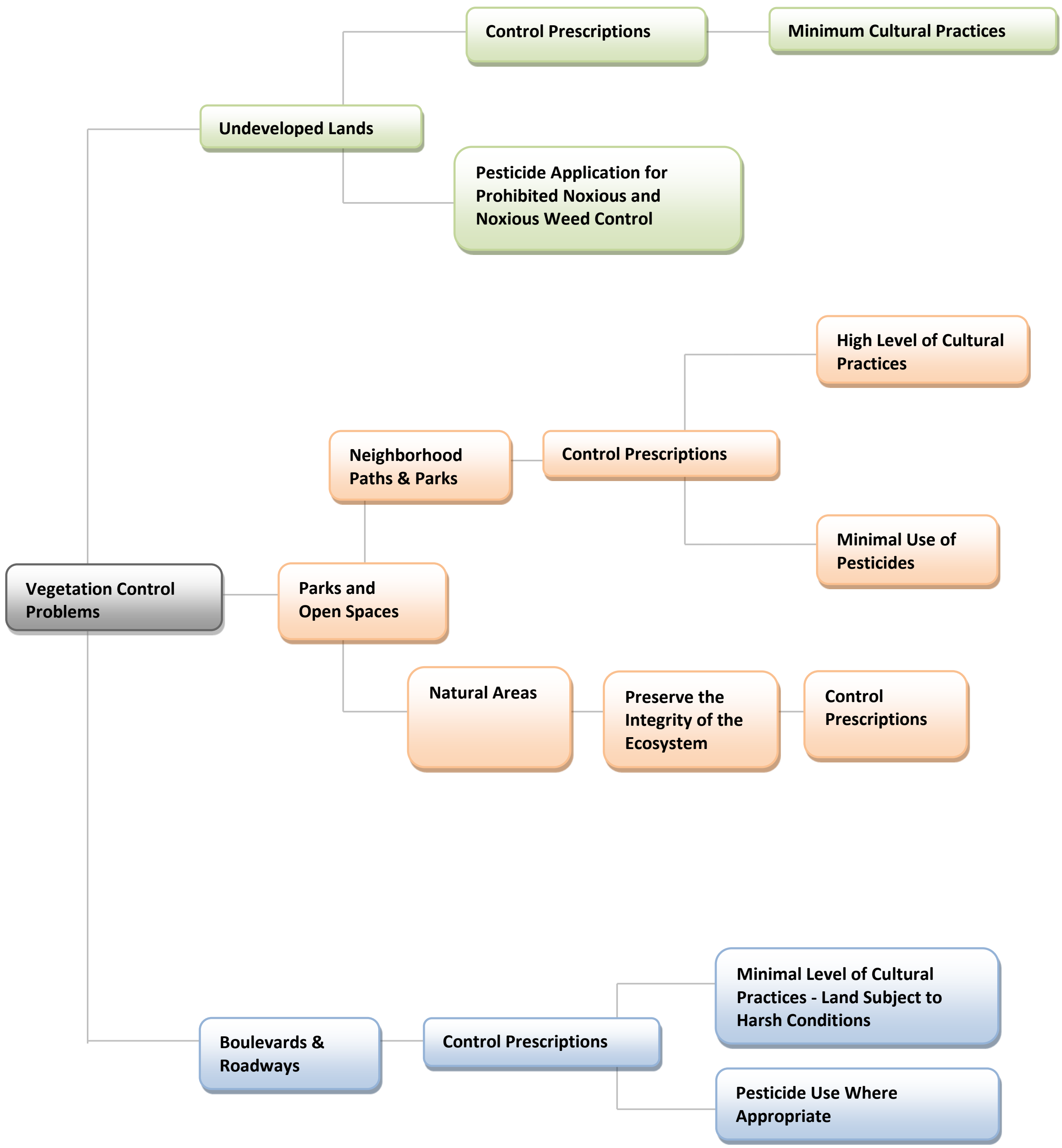


FIGURE 3 Vegetation Control Treatment Strategies



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 will consider the following criteria when selecting IPM prescriptions and developing pest management strategies:

- protecting/ensuring human health and safety
- being least disruptive of natural controls
- minimizing negative impacts to non-target organisms
- being least damaging to the environment
- preserving the natural or management ecosystem
- producing long-term reductions in pest control requirements
- being operationally feasible and effective
- being cost-effective in the short and long terms

Site-specific prescriptions require analysis and evaluation of the particular site conditions and circumstances. This information is used to prioritize and review potential options outlined in general prescriptions, and determine the most appropriate treatment methods, tools, materials, and timing that, together, provide cost-effective and environmentally sound results. Daycares and schools, waterbodies, environmentally sensitive areas and registered medical conditions are cases where site specific analysis and evaluation can have a major influence on the prescriptions chosen and notification requirements. For example, the Medical Alert Pesticide Registry allows residents to receive pre-notification if pesticides will be sprayed within 100 metres of their property.

https://stalbert.ca/uploads/legacy/documents/city/Integrated-Pest-Management-Medical-Alert.pdf

IPM prescriptions are continually subject to review and revision. Technology advancements, field research, registration and availability of control products, resources, and 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.

5.2 Monitoring

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

Quantitative samples (e.g., weed counts, insect traps) 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 can assess and record conditions and document general areas for control methods.

Site plans and evaluation forms for recording specific monitoring information should include the following:

- location
- type of pest (i.e., weed, insect, disease, vertebrate, etc.)
- stage of growth or development (e.g., pre-bolting, larval stage)
- population density
- reason for treatment, if required
- desirable non-target organisms/vegetation

Examples of a pesticide application and field inspection forms are provided in Appendix A.

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, or aquatic predacious insect in mosquito control).

5.3 Control

Various factors should be evaluated when deciding specific prescriptions for a site. Plant injury and pest populations are directly related to a site or facility's maintenance regime 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 threshold. The allowable level of damage (ALD) is similar to the AL, but represents a measure of damage rather than the size of the pest population. The ALD can be used in place of the AL 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 thresholds of damage. The AL can be determined by considering the following:

- acceptable damage tolerance levels
- current infestation level
- options for treatment(s)

- the most effective timing for treatment(s)

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 than chemical treatments. If pesticides must be used, applicants should first review monitoring records and site plans to determine factors that could affect treatment, and use careful timing and precise spot treatment equipment. Management techniques could include the following:

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

- **Physical and Mechanical Controls** - These control methods require operational equipment and staff, and their effectiveness is often limited by 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.

- **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 programs and must be applied with target-specific techniques whenever practical. This includes using backpack or hand-held sprayers, low-volume closed-system applicators, wick applicators, and covered-boom or shrouded applicators. Staff should remain up-to-date with the most recent formulations and availability of reduced risk pesticides.

Specific prescriptions and strategies for vegetation, mosquitoes, invasive aquatic species, and wildlife are provided in Appendix B.

5.4 Evaluation and Reporting

After treatments, it is necessary to determine the results through follow-up inspections. Frequency and timing of inspections vary according to the treatments and the site(s) category; timing may be within days, weeks, or months of treatment. Reviewing the efficacy of treatments is useful for future management decisions. A historical database of previous monitoring and evaluation inspections can be used to determine efficacy of treatment methods and the potential need for retreatment.

5.4.1 Data Management

The City is currently developing a data management system to track IPM activities and house information on maintenance requirements, resource use, protocols, and treatment results.

5.5 Education

The City will promote IPM principles through public education and will work to encourage private landowners, school boards, and others to incorporate IPM principles in their operations. The City will take a leadership role by educating citizens and private landowners about environmentally sound integrated approachs to pest management,

Training is essential for all personnel involved with field implementation of plant health and pest management operations. This training must be specific and updated at regular intervals. The City will provide or facilitate ongoing staff training to ensure effective implementation of these guidelines. Training is legally required under the provincial Environmental Code of Practice for Pesticides. Additional details on pesticide use, handling, and storage is presented in Appendix C.

5.6 Maintenance Standards

Maintenance standards determine the intensity and type of management applied to sites (e.g., priority is placed on the control of prohibited noxious and noxious weeds pests over nuisance or aesthetic weeds).

Pesticide use can usually be avoided by applying alternative management practices and tolerating less managed conditions in areas where lower maintenance standards are acceptable. However, where standards are high and tolerance for pest damage is low (e.g., areas with aesthetic importance, functional purpose, historical value, or extensive public investment), it may be difficult to avoid chemical use. Applying alternative management strategies and practices may not work, or limited fiscal resources may inhibit intensive use of effective non-chemical methods. In addition, maintenance personnel may be compelled to use pesticides to meet expected levels of quality, or to protect the integrity of the site.

When non-chemical approaches are ineffective or too expensive, but there are concerns about pesticide use , the City must decide how to manage sites with high maintenance standards by answering the following questions:

- Should pesticides be applied but in a limited capacity?
- Should the maintenance standard be amended to accept the presence of more pests (e.g., weeds in turf) or more pest damage?
- Can/should the site be modified to minimize or prevent pest problems and pesticide use?

6 PESTS IN THE CITY OF ST. ALBERT

Information about St. Albert's pest problems on public lands was compiled through discussions with operational and line personnel, technical staff from specific operational units within the corporation, and field inspection results of common plant health and pest management problems. Staff have identified, described, and ranked pest problems and these were reviewed and discussed during field visits.

Primary pests pose a significant environmental, economic, physical, legal, or health risk to parks land inventory, personnel or the public. Secondary pests, if left unattended, will over time create a significant environmental, economic, physical, legal, or health risk to parks land inventory or personnel. Virtually all pest problems found within the City's public lands are common to this region of Alberta. Pest problems are found throughout St. Albert, including decorative parks, Natural Areas, the Sturgeon River valley, annual and perennial display gardens, cemeteries, sport fields, roadway green spaces, and operational compounds.

6.1 Leading Causes of Pest Problems

Primary Causes of Pest Problems

Primary causes of pest problems are as follows:

- readily available sources for infestation, such as seeds, eggs, adults, spores, host sites (open soil, mulch), or plants
- environmental conditions, such as fluctuations in climate
- 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, and salt/mechanical damage from ice/snow removal

Secondary Causes of Pest Problems

Secondary causes of pest problems are as follows:

- People are a common cause of landscape problems. Pedestrians and cyclists travel across shrub beds and turf areas, causing wear and tear on plants to the point where they cannot recover. Residents that operate maintenance equipment can damage turf or injure trees.

- Design and construction practices are an important factor in creating or aggravating pest problems in urban areas. A variety of these situations were noted by Public Works staff as they relate to St. Albert's public lands.

- 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 area to care for with less budget. This conflict can seriously impede pest control and site quality, particularly on those sites that receive intensive use.

- Seasonal or localized site problems 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.

- The sale and use of contaminated soils has spread weeds to many areas of the City.

- Unattended properties adjacent to civic land, including annexed land and undeveloped land, provide an abundant source of wind-borne weed seeds. Seeds, spores, eggs, or other sources of pest infestation impact pest problems in sports fields and peripheral areas. Turf diseases are spread from site to site on the turf maintenance machinery. Pesticide applications can be kept to a minimum, provided the cultural practices effectively maintain turf and tree vigour.

6.2 Top Ten Pests

Table 1 presents the top pests found within the City's public lands that currently pose the greatest pest control challenge to the City. A comprehensive up-to-date list of pests and their corresponding management procedures is provided in the "City of Red Deer Integrated Pest Management Plan".

TABLE 1 Top Pests within the City of St. Albert's Public Lands

	PEST	REASON
WEEDS	Purple loosestrife Himalayan balsam Garlic mustard	Prohibited noxious weeds
	Canada thistle and sow thistle Common burdock	Noxious weed
	Turf broad-leaves	Turf degradation
INVERTEBRATES	Wasps	Public health and safety
	Yellow-headed Spruce sawfly	Tree damage and mortality
	Western ash bark beetle	Tree damage and mortality
	Scales and aphids	Tree damage and mortality Property damage from drippings
DISEASES	Black knot	Tree damage
	Fire blight	Tree mortality
VERTEBRATES	Northern pocket gopher	Turf degradation Public health and safety concerns

6.3 Pests and Urban Forestry

The urban forestry program involves the promotion and care of trees on St. Albert's public lands, including boulevards, facility sites, and park areas. Urban forestry contributes to aesthetics of the City, wellbeing of residents and represents a large financial resource and potential cost to the City should trees need to be replaced. There are also unique management challenges within natural areas, along bike paths and trail right-of-ways.

Environmental factors, such as winds, snow cover, drought, and soil conditions, can predispose the urban forest to dieback, sun scald, chlorosis, and damage to root systems. These conditions threaten the integrity of certain tree species within the City, but can be minimized through proper site selection and nutrient supplements for new tree plantings. Early detection of emerging threats is crucial to facilitating a quick response through control measures, allowing threats to be eliminated before they can cause significant loss to the forest canopy. Primary and secondary insect pests that can vector tree diseases are monitored by placing insect traps. Monitoring is coordinated with outside agencies dedicated to the prevention of the spread of invasive pests and diseases. The Society to prevent Dutch Elm Disease (STOPDED) and the Canadian Food Inspection Agency are two such agencies.

Preventative strategies are one of the primary methods to reduce or eliminate the potential pest sources to urban forestry. Plant health care (PHC) is important to urban forestry both as a preventative measure and treatment because optimal conditions improve the viability of trees and minimize pest problems. PHC practices include proper tree selection, planting, and maintenance in the establishment phase of tree development. Efforts placed on PHC are an essential requirement in maintaining a healthy urban forest. Additional information on IPM for urban forestry is provided in Appendix B.

7 SUMMARY

The IPM must be treated as a living document; one that is intended to function as a basis for current planning, operational and technical pest control activities, but requires regular review and revision.

With this in mind, the City recognizes that there are gaps in the IPM program that need to be addressed. One such gap is a formalized data management and documentation system to effectively track and record work and asset information related to IPM. Such a system involves maintenance of written records of specific pest management factors observed during monitoring, information on labour and materials used in implementation of an IPM program, results of applied pest management strategies, and comprehensive data on pesticide applications.

8 GLOSSARY

Action Threshold Level

Action level is the level of development of a vegetation and pest population at a specific site at which treatment should take place in order to prevent the pest population from reaching the injury threshold level. The action threshold depends on the type of treatment and on the life cycle and reproductive rate of the pest.

Biodiversity

Consists of genetic (sum of genetic information contained in individuals and populations), species (number of biological organisms and their relative abundance) and ecosystem (habitat variety, biotic communities, landscape and ecological processes) diversity

Biological Control

The use of living organisms (parasites, predators, pathogens) to reduce or maintain pest populations to acceptable levels.

Chemical Control

The use of a control product such as a pesticide to suppress or control a pest.

Community

A group of populations of plants and animals in a given area. Also relates to a group of individuals living within a legal or political boundary.

Control Product

Any product, device, organism, substance or thing that is manufactured, represented, sold or used as a means for directly or indirectly controlling, preventing, destroying, mitigating, attracting, or repelling any pest.

Cultural Practices

Management practices that focus on the prevention of pest by maintaining healthy hosts through proper planting, pruning, mulching, sanitation practices (also referred to as Plant Health Care (PHC))

Diversity

The variety of species, vegetation communities, habitats or landform in a given area

Ecology
The study of interactions among organisms and their environment.

Ecological Approach
A systems approach to prevention and management where control strategies are determined based on the relationship between the target's organisms life cycle and its environment.

Ecosystem
All living (biotic) organisms in a given area interacting with each other, and with the abiotic components, of their environment.

Environmental Advisory Committee (EAC)
An advisory committee of City Council that provides a vehicle for the flow of strategic advice and expert information between and among the public, City administration and Council, with an ongoing focus on best practices and the development and implementation of the City's environmental policies, strategies and initiatives.

Environmentally Sound Methods
IPM strategies and prescriptions that provide a desired result at reducing the impact of pest populations. These strategies are chosen based on the selection criteria to ensure minimal impact on the general environment and non-target organisms.

Evaluation
Involves analysis of treatment strategies and prescriptions to help determine the effectiveness of the control program. These records are useful in developing future pest management plans.

Fungicide
A chemical substance or cultured biological organism used to kill or suppress or prevent the development of fungi.

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.

Host Species
A species that acts as a host for a pest (e.g., a spruce tree is a host for the spruce budworm, an insect pest).

IPM Data Management and Documentation System

Involves maintenance of written records of specific pest management factors observed during monitoring, information on labour and materials used in implementation of the urban IPM program, results of applied pest management strategies, and comprehensive data on pesticide applications.

IPM Prescriptions

Integrated pest control or eradication plans that are specific to a variety of pest management situations and/or pests and vegetation; these plans are based on the principles of IPM.

IPM Programs

Department, Division, and/or Operational Section level programs which are designed and developed to implement the Integrated Pest Management Plan; individual programs are geared to the specific administrative and operational requirements and responsibilities of that specific working group.

Injury Threshold Level

When a pest population reaches numbers such that it causes unacceptable injury or damage to public safety, recreation, or health; natural and/or managed ecosystems; aesthetic values; economic injury to desirable plants; or the integrity, function, or service life of facilities.

Insecticide

A chemical substance or cultured biological organism used to kill or suppress the growth of insects.

Integrated Pest Management (IPM)

Integrated Pest Management is an ecological approach to suppressing pest populations (i.e. weeds, insects, diseases, etc) in which all necessary techniques are consolidated in a unified program, so that pests are kept at acceptable levels in effective, economical, and environmentally sound methods. Since pest problems are often symptomatic of ecological imbalances, the goal is to attempt to plan and manage ecosystems to prevent organisms from becoming pests.

Invasive Species

An organism (plant, animal, fungus or bacterium) that is not native to the ecosystem, and poses potentially negative effects on a region's economy, environment, or public health. Not all introduced species an considered invasive.

Inventory

A survey of selected natural resources not necessarily including an assessment.

Management
To direct to a degree, the outcome of a particular project or land area.

Management Plan
A planning study and resulting document where the concern is to identify issues and create a management and implementation strategy.

Miticide
A chemical substance or cultured biological organism used to kill or suppress the growth of mites.

Monitoring
Involves the regular surveying of sites and/or features to understand and identify the location and extent of potential pest management problems.

Native
Species of animals or plants that have not been introduced by people or their direct activities.

Natural Area
Any land and/or water area that has existing characteristics of a: natural/native plant or animal community; portions of a natural ecological and or geomorphic system. It retains or has re-established a natural character although it need not be completely natural.

Noxious (weed)
Plants which have potential for rapid spreading and major environmental and economic impact. Weeds in this category are to be controlled to prevent their spread. They are well established in some areas of the province. Efforts must be undertaken to prevent spread to other locations within the province.

Non-Park Areas
Parcels of civic land that are managed by St. Albert but are not considered parklands. This includes roadway green spaces and undeveloped land. These properties will be managed within the framework of the IPM Plan.

Non-Target Organism
Any plant or animal other than the intended target of a pest management strategy

Nuisance (organism)
Common animals which are widespread across the province. They are found on nearly all land and while they do cause economic losses their further spread is virtually impossible since they already occupy every area to which they are biologically suited. Further legislation is of no value.

Nuisance (weed)
The most common weeds which are widespread across the province. They are found on nearly all land and while they do cause economic losses, their further spread is virtually impossible since they already occupy every area to which they are biologically suited..

Organism
An individual animal, plant, or single-celled life form.

Parasite
An organism (parasite) that lives in or on another (host), from which it obtains food, shelter, or other requirements.

Park
This definition was developed for the Parks and Open Spaces Management Plan. A specific use open space area which is managed to provide opportunities for recreation, education, cultural or aesthetic use. The main types of parks are:

- Destination parks - a park, also referred to a special interest park that offers historical, cultural and educational opportunities for the residents of and visitors to the city.
- Regional Recreational Parks - a park, large and basic to the park system. It offers diverse or special activities to the entire city. These currently include athletic parks and natural environment parks.
- Community Parks - a large park having facilities intended for local use. It includes school grounds, community athletic fields and natural environment parks.
- Neighbourhood Parks - a small passive park offering spontaneous recreation to the local resident. It can include tot lots and playground.

Park (or Parkland) Zone
A resource management technique involving distinguishing units for varied management objectives, within a specific park (e.g.) recreational experiences, preservation etc.

Pathogen
A disease-causing organism.

Pathways
A route that provides designated access by a variety of compatible multiple or single travel modes (excluding automobiles). It is designed for the pursuit of outdoor recreational experience and activities. Pathways may be for bicycles, cross country skiing, pedestrian or equestrian use unless otherwise identified.

Pest
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 situation or size of its population adversely interferes with the aesthetic, health, environmental, social, or economic goals of humans.

Pesticide
A substance that is intended, sold or represented for use in preventing, destroying, repelling or mitigating any insect, nematode, rodent, predatory animal, parasite, bacteria, fungus, weed or other form of plant or animal life or virus. A substance that is a pest control product within the meaning of the *Pest Control Products Act* (Canada) and is granted federal registration by Pest Management Regulatory Agency, Health Canada. e.g. herbicides, insecticides, fungicides, rodenticides, and miticides.

Plant Health Care (PHC)
A holistic approach to plant (turf and tree) care that focuses on the health, growth, and beauty of plants. Utilizes a comprehensive matrix of information to facilitate decision making.

Preventative Measures
Management practices that are directed towards preventing the establishment of pests (e.g. site design, genetic materials, and optimal site selection for plant materials)

Primary Pest
A pest that poses a significant environmental, economic, physical, legal or health risk to the land inventory or personnel.

Reduced Risk Pesticide
Pesticide products which have a reduced risk to human health and the environment when compared to the existing pesticide alternatives.

Prohibited Noxious (weed)

These weeds must be eradicated according to provincial legislation. Weeds in this category possess highly competitive characteristics inherent for rapid spread, and may pose difficulties for control. These weeds are known to be very serious problems in other countries or provinces.

Rodenticide

A chemical substance or cultured biological organism used to kill or used to control or prevent the development of rodents.

Secondary Pest

A pest, if left unattended, will over time create a significant environmental, economic, physical, legal or health risk to the land inventory or personnel.

Selection of Optimal Strategies

The criteria for selecting treatment tactics and developing pest management strategies include:

- Least disruptive of natural controls;
- Least hazardous to human health;
- Minimizes negative impacts to non-target organisms;
- Least damaging to the general environment
- Best preserves natural or managed ecosystems;
- Most likely to produce long-term reductions in pest control requirements;
- Effective implementation is operationally feasible;
- Cost-effectiveness in the short and long term.

Service Levels – Parks/Green spaces

Service levels and maintenance standards provided for various parks and green spaces within St. Albert.

- **Sports fields**
    - Level 1 fields (full size football and soccer fields and Fowler Track): weekly cutting up to 18 times per year and weekly trimming.
    - Level 2 fields (minor baseball, mini fields and recreational open spaces): cutting on a 10-day maximum cycle and trimming every two weeks.

- **Parks**
  - Level 1 parks (civic buildings, cemetery, river valley and Red Willow Trail): weekly cutting up to 18 times per year, with weekly trimming for cemetery and civic buildings only.
  - Level 2 parks (all open green space excluding buffers, boulevards or natural areas): cutting on a 10-day maximum cycle with monthly trimming.

- **Buffers and boulevards**
  - Level 2 (all open green space in buffers and boulevards): cutting on a 10-day maximum cycle with monthly trimming.

- **Natural areas**
  - Selected weed spraying or harvesting (annually).
  - One pass of grass cutting along fence lines and trails in selected areas (on a 10-day cycle).

Special-Use Approval
An approval issued by Alberta Environment and Parks for projects in specific locations. This includes pesticides that are excluded from the Environmental Code of Practices for Pesticides but used within 30 horizontal metres of open bodies of water.

Species
The largest group of organisms in which two individuals can produce fertile offspring.

Timing
Involves a treatment action during the most vulnerable time in the life cycle of the vegetation or pest with the least impact on natural predators and/or other non-target organisms.

Undeveloped Land
Corporately owned land that does not contain any permanent buildings, structures or facilities.

Viroids
The smallest known infectious pathogen.

Weed
A plant considered undesireable in a particular situation.

9 REFERENCES

Government of Canada. 2006. *Pest Control Products Act*. S.C. 2002, c. 28. Published by the Minister of Justice. Current to September 18, 2016. Last amended on June 28, 2006. http://laws-lois.justice.gc.ca/eng/acts/P-9.01/

International Organization for Standardization (ISO). 2015. *Environmental Management Systems - Requirements with Guidance for Use*. ISO 14001:2015.

APPENDIX A

Weed, Pest and Invasive Species List

Appendix B

Current Integrated Pest Management Programs

CURRENT INTEGRATED PEST MANAGEMENT PROGRAMS

TABLE OF CONTENTS

1 PLANT HEALTH CARE

1.1 General Vegetation Control Prescriptions and Strategies

This category includes all herbaceous monocot and dicot, annual, biennial, and perennial species, as well as woody plants and moss, in areas such as fence lines, parking lots, signs, lamp posts, hard surface areas, and utility areas.

1.1.1 Level of Vegetation Management

There are three levels of vegetation management:

- **Level 1** - areas where no growth is desirable, such as paved surfaces and sidewalks
- **Level 2** - areas where low-growing or minimal vegetation is acceptable, such as along fence lines and lamp posts
- **Level 3** - planted areas where weeds occur among desirable plants, such as shrub beds and natural areas, parks and sports fields.

1.1.2 Categories of Facilities

There are three categories of facilities in the City of St. Albert:

- High profile/premium level of service (e.g., formal displays, high profile/intensively managed facilities, high traffic areas such as City Hall, Servus Credit Union Place, premier parks, and downtown streets)
- Medium profile/high to moderate level of service (e.g., civic buildings, boulevards and medians, general park and playground areas/fence lines, parking lot perimeters, shrub beds)
- Low profile/moderate to low level of service (e.g., utility areas, works yards, naturalized areas, trails and ditches)

1.1.3 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. To aid in identification, numerous characteristics may be examined:

- **Herbaceous weeds**
  - growing site location
  - leaf shape, size, and colour

- growth habit
- flower shape, size, and colour
- seed head form

- **Woody plants**

  - growing site location
  - leaf shape, size, and colour
  - bark colour and texture
  - growth habit
  - flowers, fruit, and seed head

Summary of Minimum Actions Necessary

Ensure weeds are correctly identified using reference materials or extension services.

1.1.4 Monitoring

Monitoring provides the information needed to decide whether treatments are necessary, the best timing of treatments, and if the treatments are working. Successful management programs are based on regular inspection for the presence of unwanted plants and their growth rates.

Visual site inspections are necessary to assess and record conditions. Site plans and evaluations forms for recording specific information should include the following:

- Date
- location
- type of vegetation
- stage of vegetative growth
- distribution and density of weeds present
- reason for treatment, if required
- desirable vegetation, if present
- presence of noxious/invasive weeds
- Inspector name

Summary of Minimum Actions Necessary

- Regular inspection and sampling programs should be established for each category of facility. Determine frequency before the start of each season.
- Records of the extent of weed infestation and population density of weeds should be kept for each major site. + measure of change from year to year – efficacy of treatment

1.1.5 Establishing Impact Assessment and Treatment Threshold Levels

How much infestation is tolerable depends on how intensively the facility is managed and the consequences of leaving weeds untreated. Treatment action should be taken when a weed levels exceed the predetermined threshold level.

When making decisions on how facilities should be managed, various factors should be evaluated:

- **Safety and security**
  - degree of trip/slip hazards presented by plants
  - impairment of sight lines on roadways and parking lot exits
  - concealment of signs, curbs, and light standards/luminaries by plants
- **Aesthetics/site location**
  - visibility and use patterns
  - nature of area (rural, urban, or natural)
  - adjacent facilities that might be affected
  - proximity to sensitive natural areas and open bodies of water
  - schools, daycares, playgrounds, proximity to residents on Pesticide Registry
- **Damage to structures**
  - hard surfaces, such as sidewalks, tennis courts, or parking lots
  - overgrown fence lines, sign posts, or culverts
  - building foundations
  - fire hazards

Individual areas must be assessed according to the above factors and possibly other factors to determine acceptable thresholds.

Summary of Minimum Actions

- Determine thresholds using monitoring data for each class of site. These thresholds should be quantitative where possible.
- Record the criteria used to establish thresholds for each class of site, such as weed species and classification, cover percentage, location, risk of spread to adjacent areas, etc.

1.1.6 Selection of Treatment Techniques

One or several treatments may be co-ordinated into a management program for a target pest or for the entire complex of weeds at a site or facility. Substituting physical or cultural controls for chemicals is promoted wherever feasible to reduce impacts on the environment, if the non-chemical alternatives have lower potential environmental impacts. When pesticides are used, they should be applied as efficiently as possible, through careful timing and use of precise, accurate equipment. Pesticides should not be applied in riparian areas along the Sturgeon River.

Preventative measures include the following:

- regular mowing and string trimming of fence lines and site perimeters to help prevent perennial and brush weed species from becoming established
- renovations of areas to provide a better environment for more desirable plant material (including better selection of plant material)
- regular sweeping, flushing with water, and cleaning of hard surface areas to prevent the buildup of organic material in cracks, which provides a growing medium for unwanted vegetation
- filling cleaned cracks and crevices with a sealant to remove potential germination sites on asphalt and concrete surfaces
- applying organic mulches, leaves, wood chips, etc. in areas likely to be infested by persistent weed species (e.g., Canada thistle)
- planting aggressive ground covers and mass plantings to reduce the space, nutrients, and light available to weeds
- using landscape fabrics in perennial ornamental display beds to prevent germination by blocking light from reaching the soil
- using root barriers to prevent encroachment from neighbouring areas
- providing ideal growing conditions, including light, fertilizer, water, and other conditions for desired plants, so that the desired plants out-compete the weeds
- using weed-free nursery stock and soil to prevent the importation of weed seeds to new planting areas
- anticipating renovation of areas and planning a better environment for more desirable plant material (including better plant material selection)
- eliminating potential problem areas during the design and landscape construction stages

There should be strict guidelines established within the City to eliminate any potential problem areas during the design, development, and construction of landscape facilities.

Physical and mechanical controls include the following:

- manual weeding
- string trimming and mowing around fence lines and site perimeters (these operations should be timed to prevent seed head formation and maintain acceptable aesthetic levels)
- flame weeding on narrow, weed-infested strips where safe to do so
- pressure/steam washing and sweeping to remove organic material where weed seed and/or moss may germinate and root
- cultivation and scraping to reduce the ability of weeds to become established
- using chainsaws, brush saws, or heavy-duty mowers to control woody perennials (repetitive mowing or cutting of top growth of bushy weed species will deplete the energy reserves of the root)
- complete removal, where feasible, of the roots or stump grinding for long-term control of plant species that sprout after cutting
- Grazing by herd animals

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

Chemical control measures include the following:

- If chemical controls are necessary, the least toxic effective herbicide should be used. Weeds should be spot treated in the active growing stage, before seed head formation.
- Pre-emergent herbicides should be applied before weed seeds germinate, as these herbicides will not be effective on established plants.
- Post-emergent, selective herbicides can control annual, biennial, and perennial material while in an active 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 on open ground, where there is no desirable vegetation present. Apply to actively growing weeds before seed heads form.
- The most target-specific application techniques available should be used where practical. This includes using backpack or hand-held sprayers, low-volume closed-system applicators, and wipe-on applicators. An alternative to spraying is to paint the stump of the plant with a systemic herbicide after cutting back stems. This treatment is often most effective in fall when plants actively transport herbicides to their roots.

Summary of Minimum Actions

- Develop a plan for the integrated control of weeds for each major class of site.
- Provide rationale for each chemical to be used based on specific monitoring data for each major site.
- Herbicides must be applied with target-specific application techniques whenever practical.

1.1.7 Evaluation of Control Strategies

After treatments have been applied to vegetation, it is necessary to determine the efficacy of the treatment. Records and site plans should be used in addition to notes on the effectiveness of the treatment(s) employed. Examples of factors to evaluate include the rate of regrowth after mowing, and percentage of stems killed by herbicides. Change in aerial extent, change in species composition, etc.

Frequency and timing of evaluation inspections will vary according to the different treatments employed and the category of site(s) being managed. Maintain ongoing records of monitoring and evaluation inspections to determine the effectiveness of treatment methods and the need for retreatment.

1.2 Disease Control Prescriptions and Strategies

This category includes all horticultural displays and borders, flowering ornamentals, trees, shrubs, and lawns, boulevards and medians, general park and playground areas, natural environment parks, and pathways.

1.2.1 Level of Threat to Inventory

There are three levels of threat:

- **Serious**: zero tolerance to presence of pathogen (biotic) or environmental factors (abiotic; e.g., Dutch elm disease, sudden oak death, fire blight)
- **Moderate**: will tolerate a small percentage of the inventory with the pathogen (biotic) or environmental factors (abiotic; e.g., black knot fungus, cytospora, sun scald)
- **Low**: will tolerate most of the inventory with the pathogen (biotic) or environmental factors (abiotic); (e.g., *Nectria*, fairy ring, reduced plant tolerance due to salt injury)

Each level is further subdivided into three additional service levels for the following locations:

- **High profile**: highest level of service (e.g., horticultural display gardens, flowering ornamentals, and hanging baskets)
- **Medium profile**: high to moderate level of service (e.g., boulevards, medians, general park and playground areas; specimen, shade, and boulevard trees; annual and perennial borders)

- **Low profile**: moderate to low level of service (e.g., natural environment parks, hiking trails, , native trees and other vegetation)

1.2.2 Identification

Identification of a disease causing organism is essential because most treatments must be tailored to a particular species. In addition, alternate abiotic causes such as chemical or sun damage must be ruled out. Once a causative species 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 organisms or pathogens include:

- fungi
- bacteria
- viruses and viroids
- mycoplasmas

Identification can be carried out by:

- looking for signs of the disease, including spores, conks, fruiting bodies, and other parts of the disease-causing organism(s)
- symptoms expressed by the plant including wilting, leaf spots and blights, root rots, and cankers
- sending a sample to a diagnostic laboratory or by direct isolation and culturing for identification

Given the turnaround time for diagnoses from professional laboratories, the recommended approach is to compare any diagnosis that has been done based on symptoms to the laboratory identification of the causal organism. Outside agencies (such as Plant Surveillance Section of Alberta Agriculture and Forestry) and consultants may assist with identification when required.

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

Summary of Minimum Actions

- Diseases must be identified through plant symptoms and physical evidence of the disease on affected plants.
- Determine how diseases will be identified, how disease symptoms will be distinguished from abiotic factors, and when samples will be sent to a disease identification laboratory.

1.2.3 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 other signs of their presence, and may include monitoring for beneficial species.

Visual inspections can be done weekly in conjunction with monitoring for insects; diseased plants are usually first noticed through symptom presentation.

The following characteristics should be noted on monitoring forms:

- severity and extent of the problem
- position on plant
- number of plants affected
- whether plants appear to be in the early or advanced stages of the disease
- proximity of alternate hosts (e.g., rusts-pear trellis on pear and juniper)

Scoring systems may be used to help establish disease severity (e.g., hawthorn leaf blight: 0=healthy, no spots on leaves; 1 = slight, the occasional spot observed but less than 10% of crown involved; scores may range up to 10 = severe, total necrosis or premature leaf drop).

Factors to check for when assessing plant damage include the following:

- history of plant
- recent weather influences
- signs and locations of disease
- evidence of nearby fertilizer or herbicide use
- construction in the area
- use or evidence of de-icing salt in the root zone
- other disturbances

Inspections of indicator plants (i.e., varieties susceptible to diseases that occur in the area) should be monitored at the times of the year that symptoms would be expressed.

Summary of Minimum Actions

- Regular inspection and sampling programs should be established for each class of facility; frequency will depend on the pathogens, weather conditions, and affected plants.
- Determine the frequency of inspections, sampling procedures, and monitoring methods

- Implement sanitation protocols when transporting samples and cleaning equipment

1.2.4 Establishing Impact Assessment and Action Levels

How much damage is tolerable depends on what part of the plant is affected, the cost of treatment, the value of the plant or the aesthetic value 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. Treatment action should be taken when weed levels exceed the predetermined threshold level.

Action levels will have to be developed for each site, as action levels for disease control on ornamentals are generally not yet available. The site class and category can be used to help set tolerance levels.

For all sites, complete the following:

- Define when no action needs to be taken (what population density is acceptable).
- Define when preventative intervention is required (when population densities are currently low but are increasing, as verified through monitoring).
- Define when suppressive action is required (when population densities are high and increasing, and/or there is the risk of major economic damage or nuisance).

Thresholds may be defined and recorded as follows:

- percentage or proportion of leaves damaged on a particular plant
- percentage of plants affected on a site
- scores or indices over a predetermined level

An example of an adjustable threshold is as follows:

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

Summary of Minimum Actions

- Develop treatment thresholds for each major class of site. These thresholds should be quantitative where possible.
- Determine the criteria used to establish thresholds for each major site, such as plant damage, duration of weather favourable to disease development, risk of spread to adjacent sites, etc.

1.2.5 Selection of Treatment Techniques

One or several treatments should be co-ordinated 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.

Preventative/cultural measures include the following:

- Integrated pest management (IPM) programs emphasize making changes in the management of plants and habitats to prevent pest problems from developing. Ensure proper horticultural and arboriculture practices are adhered to; these practices include proper soil management, nutrient and watering programs, and optimal pruning/planting techniques. When a disease occurs that must be treated, the manager should re-evaluate the management program for the disease/site/plant to determine how to improve plant health and prevent the problem in the future.
    - 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 the local climate.
    - Ensure new planting sites are properly prepared; plant into friable, un-compacted soil. Avoid planting in heavy soils during fall; plant during spring. Drainage of site?
    - Inspect planting stock, and purchase only healthy plants. Check tree root collars for circling, kinked roots, and basal cankers. Check the condition of main roots and for girdling ropes or wires. Ensure plants conform to Landscape Alberta Nursery Trade Association (LANTA) standards.
    - Plant at the proper recommended depth.
    - 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.
    - Ensure regular and adequate water during establishment of new plantings.
    - Provide good drainage. Dig a drainage trench on the downhill side of the hole, and backfill the hole with coarse material when planting on a hillside where water is likely to collect in the hole.
    - 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.

- 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.

- Conduct routine inspections of incoming plant material; grow or start your own plant material.

- Evade pathogens by using vigorous seed and maintaining proper planting dates and sites. Keep proper distances between disease-susceptible plants by inter-planting with non-susceptible stock. Control insect and weeds that are agents of disease or harbour disease pathogens.

- Use pathogen-free propagating material; it is often possible to grow plants free of pathogens for their entire lives if you start clean, especially woody plants affected by non-vectored viruses.

- Eradicate or reduce disease inoculum levels by removing alternate hosts (e.g., pines or *Ribes* spp. where white pine blister rust is a problem), and 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., planting Schubert chokecherry into a black knot zone)remove/destroy infected leaves or woody debris, and prune infected branches that may harbour the pathogens.

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

- Use resistant or tolerant varieties; select native species that possess resistance factors to local disease and climate conditions.

- When selecting a plant site, 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)

  - abiotic 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.

- Investigate tree watering regime. Fertilizers that promote root growth (e.g., 10-52-10) 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.

- 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 bind phosphorus .

- Conduct species testing and variety selection. Internal inspection of our urban forest may yield unique healthy tree specimens that survive within our climatic and growing region. Wherever feasible, remove fruit, and try to propagate new sapling trees. Propagation trials may be accommodated at the heritage tree nursery or in co-operation with a private tree nursery.

Physical and mechanical controls include the following:

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

Chemical controls include the following:

- Use preferred fungicides
  - Chose fungicides that are both reasonably effective and the least disruptive to the beneficial organisms protecting the plant from insects and diseases.
  - Powders are generally more disruptive than other means of application as they are more residual and can impede respiration in beneficial insects.
  - Spreaders/stickers can cause mortality to beneficial insects; even oils and anti-transpirants are a concern.
  - Flowable sulphur is generally a safe alternative compared to other sulphur fungicides.
  - Chemical families should be alternated, preferably between systemic and contact products, to help avoid inducing resistance.
- Use spot treatments instead of general broadcast sprays whenever practical. Other related options/techniques involve applications of compounds such as fixed copper during fall and spring as a protectant (e.g., on ornamental pears to prevent infections of *Pseudomonas syringae*). This is appropriate before signs or symptoms of disease if the following apply:
  - The plant material is known to be susceptible.
  - The disease occurs in the area.

- The value of the plant material warrants maintaining this program.

Summary of Minimum Actions

- Develop a plan for the integrated control of diseases for each major class of site, and summarize this plan on a form. The primary disease management program should be based on preventative and cultural controls.
- Provide a rationale for use of each fungicide or other pesticide for each facility/site category (i.e., high, medium, and if relevant, low based on specific monitoring and impact assessment data).
- Pesticides selected for use must be compatible with St. Albert's IPM plan and must be applied with target-specific application techniques whenever practical.

1.2.6 Evaluation of 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.

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

Summary of Minimum Actions

- Develop a plan for annual inspections, describing the monitoring methods and plant health criteria that will be used to determine treatment effectiveness on annual and perennial plants.
- Conduct routine inspections when diseases are known to be present, and maintain written records of results, including assessments of treatment effectiveness.

1.3 Trees and Ornamental Insect Control Prescriptions and Strategies

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

It is important to note that provincial and federal cooperation is critical, as tree insect pests are a nation-wide concern. The City collaborates with numerous agencies on this issue, such as the provincial Society to Prevent Dutch Elm Disease (STOPDED).

1.3.1 Level of Threat to Inventory

There are three levels of threat:

- **Serious**: zero tolerance to presence of insect (e.g., native or European elm bark beetle, Asian Longhorn Beetle, Emerald Ash Borer)
- **Moderate**: will tolerate a small percentage of the inventory with the insect (e.g., western ash bark beetle, Fruit lecanium scale)
- **Low:** will tolerate most of the inventory with the insect (e.g., aphid)

Each level is further subdivided into three additional service levels:

- **Trees**
  - **High profile trees** - boulevard trees, medians, sign clearance, traffic clearance, and any dangerous trees
  - **Medium profile trees** - parks and playground trees
  - **Low profile trees** – trails and natural areas
- **Shrub beds**
  - **High profile** - City Hall, downtown, display gardens, hanging baskets, etc.
  - **Medium profile** - all entrance beds
  - **Low profile** - all interior beds

1.3.2 Identification

Identification is essential because most treatments must be tailored to a particular species. Once a causative species 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 three general classes:

- sucking arthropods - aphids, scale, mites, mealy bugs, etc.
- root/crown feeding insects – weevils, etc.
- leaf-chewing and mining insects - leaf miners, caterpillars, etc.

Summary of Minimum Actions

- Insects and other arthropods targeted for treatment must be accurately identified before treatments are planned.

- Identify the life stages when specific treatment or suppressive measures will be most effective.
- Determine the identification procedures that will be used.

1.3.3 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.

Examples of specific monitoring methods include the following:

- visual inspections for many small insects, mites and characteristic damage (indicator plants are useful to observe for pest presence or damage)
- yellow sticky traps to attract aphids, whiteflies, and leaf miners
- pheromone traps for gypsy moths and smaller European elm bark beetles

Summary of Minimum Actions

- Inspections for pests and/or damage must be conducted regularly; frequency will depend on the class of site and nature of the pests.
- Describe frequency of inspections, sampling procedures, and the use of traps and other monitoring methods on a monitoring form.

1.3.4 Establishing Impact Assessment and Action Levels

How much damage is tolerable depends on what part of the plant is affected, the cost of treatments, the value of the plant, or the aesthetic value that would be lost if not treated. Tolerable damage would also depend on the environmental impacts of chemical spray. In parks, the need for treatment is equally dependant on how much damage the public will tolerate, and the harm a pest might be causing to a plant. 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, complete the following:

- Define when no action needs to be taken (what population density is acceptable).
- Define when preventative intervention required (when population densities are currently low but are increasing, as verified through monitoring).
- 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 follows:

- percentage or proportion of leaves damaged on a particular plant
- percentage of plants affected on a site
- number of pests or pest colonies counted

An example of thresholds is as follows:

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

Summary of Minimum Actions

- Develop treatment thresholds using monitoring data for each major class of site. These thresholds should be quantitative where possible.
- Determine the criteria used to establish thresholds for each major site, such as number of pests, populations of beneficial species, amount of plant damage, etc.

1.3.5 Selection of Treatment Techniques

Single or multiple treatments may be co-ordinated into a management program for a target pest or for the entire complex of pests in a site. 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 accurate, precise equipment. Criteria for selection of treatment technique will also include choosing the least toxic yet effective product for the application.

Preventative/cultural measures include the following:

- IPM plans 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 arboriculture practices, such as proper soil management, nutrient and watering programs, and pruning and planting techniques.
- The Manager of Parks and Open Spaces 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.
    - Plant diverse cultivars, species, and families of plants and trees to prevent single-species plantings, which are vulnerable to serious insect problems. Continue to investigate and test new species that are adaptive to our climate.

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

- Inspect planting stock, and purchase only healthy plants. Ensure plants conform to Canadian Nursery Trades Association (CNTA) or LANTA standards.

- Plant at the proper depth.

- 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.

- Ensure regular and adequate water during establishment of new plantings.

- 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 from October to March. Pruning during other times of the year increases the attractiveness of the elm to the smaller European elm bark beetle.

- 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.

- Avoid using fast-acting, high-nitrogen fertilizers that promote succulent, insect-susceptible plants.

- When selecting a plant site, 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.

- Investigate tree watering regime. Fertilizers that promote root growth (e.g., 10-52-10) 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, but not in riparian areas.

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

Physical and mechanical controls include the following:

- sticky barriers on tree trunks to control the following:
  - ants (which remove natural enemies of aphids)
  - caterpillars moving into the foliage of trees
  - weevils
- water sprays for aphids, thrips, and mites
- pruning out the following:
  - tent caterpillar infested branches
  - bronze birch borer infested wood

Chemical controls include the following:

- Spray programs may be required when populations are too high to successfully start a biological control program. Least toxic or low residual chemicals should be used as a cleanup before beginning a biological control program.
- Preferred Insecticides include the following:
  - insect growth regulators (e.g., kinoprene) for aphids and whiteflies
  - insecticidal soaps for chewing and sucking insects and mites, especially for spot sprays
  - pyrethrins (low in toxicity to mammals, but post-treatment delays in introducing some beneficial arthropods may be required because of the compound's potential impact on them)
  - mineral oils (dormant and supreme horticultural oils) for scales, mites, aphid eggs, moth eggs, etc. on dormant stock
- Other pesticides should be considered if there is a strong rationale for their use. Preferred application methods include the following:
  - spot sprays targeted to the specific location for the appropriate pests
  - placing systemic pesticides in bands or using Mauget tree injection technology (e.g., for sucking insects such as aphids)

- Tree Trunk Implants

- Future products may include the following:

  - *Bacillus thuringiensis* var. San Diego for beetles such as elm leaf beetle
  - products containing neem (azadiractin), which are being tested as a repellent or anti-feedant for some insects
  - avermectins derived from soil micro-organisms, which are effective on leaf miners and spider mites (they have some systemic effects)

Summary of Minimum Actions

- Evaluate available options for control of each targeted pest.
- Develop a plan for the integrated control of these pests or pest complexes, including preventative/cultural measures.
- Provide rationale for each chemical to be used based on specific monitoring and impact assessment data for each major category.
- Pesticides selected for use must be compatible with St. Albert's IPM plan and, except in certain circumstances, non-persistent. These products must be applied with target-specific application techniques whenever practical.

1.3.6 Evaluation of Control Strategies

Follow-up monitoring and 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 future.

Use visual inspections and sticky-trap monitoring to continue pest population assessment. Keep records of inspections and insect counts, both desirable and undesirable. Look for dead or parasitized insects and signs of fresh or continuing damage.

Summary of Minimum Actions

- Develop a plan for follow up inspections, describing the monitoring methods and criteria that will used for determining treatment effectiveness.
- Specify when and how frequently these inspections will be conducted, and maintain records of results, including assessments of treatment effectiveness.

1.4 Turf Weed Control Prescriptions and Strategies

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

1.4.1 Categories of Facilities

The categories of facilities are as follows:

- Civic buildings
  - Level 1
- Cemetery
  - Level 3
- Sports fields
  - Level 1 fields (full size football and soccer fields and Fowler Track)
  - Level 2 fields (minor baseball, mini fields, and recreational open spaces)
- Parks
  - Level 1 parks (civic buildings, Servus Place, cemetery, Sturgeon river valley)
  - Level 2 parks (all open green space, excluding buffers, boulevards, or natural areas)
- Buffers and boulevards
  - Level 3 (all open green space in buffers and boulevards)
- Natural Areas
  - Level 3

1.4.2 Identification

Identification is essential because most treatments must be tailored to a particular species. Once a causative species 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, several variables may be examined:

- herbaceous weeds
- growing site location
- leaf shape, size, and colour
- growth habit

- flower shape, size, and colour
- seed head form

Reference guides complete with sketches and/or photographs aid in plant identification. Should further assistance be required, a leaf, stem, or complete plant may be submitted to the Weed/Pest Team Lead for identification.

Summary of Minimum Actions

- Ensure weeds are correctly identified using reference materials or extension services.

1.4.3 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 and counts to determine the proportion of weed cover in the turf.

Confirm the aerial 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 the site. The grid system will be used to determine counts. The grid system involves counting all the weeds in a 1 m square area of turf; count 3-5 squares per site. Average the scores to arrive at a percentage of weed cover.

Schedule monitoring periods to coincide with periods of active vegetative growth or flowering cycle. Weed counts should occur in early spring. Records should note park usage patterns, dog parks, daycare and playgrounds and proximity to open water bodies.

Presence of prohibited noxious or invasive weeds present should be noted for compliance. Safety concerns over clumps of weeds shall be noted for sports fields. A check for health concerns in the neighbourhood in the Pesticide Registry must be made before use of pesticides.

Summary of Minimum Actions

- Establish regular inspections for each class of facility.
- Record of the extent of weed infestation and population density of weeds for each major site.

1.4.4 Establishing 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 weed populations from rising above the predetermined infestation level. In parks and other 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.

- **Level 1 parks** (civic buildings, cemetery, Fowler Track, Riel Football field)
  - Highest level of service; maintain weed free; ensure playability, safety, wear resistance, and changes in weed infestation level trends should be considered in determining action levels; turf with 5% to 10% weed cover may be accepted by the public as weed free; acceptable thresholds may be 10% to 15% weed cover
- **Level 2 fields** (full size football and soccer fields, minor baseball, mini fields, and recreational open spaces)
  - High to moderate level of service; some weeds are acceptable, providing public safety and/or functional use of facility is not compromised; acceptable thresholds may be 20% to 30% weed cover
- **Level 3 parks** (all open green space, buffers, boulevards or natural areas)
  - Moderate to low level of service; controls should be implemented only in the interest of public safety or if noxious/invasive weeds threaten to contaminate adjoining higher classification facilities; acceptable thresholds may be over 40% weed cover

Summary of Minimum Actions

- Develop treatment thresholds for each major class of site. These thresholds should be quantitative where possible.

1.4.5 Selection of Treatment Techniques

One or several treatments may be co-ordinated into a management program for a target weed or for the entire complex of weeds in a site or facility. Substituting physical or cultural controls for chemicals are promoted wherever feasible to reduce impacts on the environment. When pesticides are used, they should be applied as efficiently as possible, through careful timing and improved equipment.

For annual weeds, control should focus on preventing seed spread and germination of dormant seeds already in the soil or migrating in from adjacent areas.

For perennial weeds, top growth of established stands of perennials should be controlled before blossoming, when root nutrient reserves are at their 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.

Preventative/cultural measures are as follows:

- 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 cornerstone of a successful IPM plan and include ensuring proper turf management practices are adhered to, such as proper soil management, nutrient, over seeding, 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 prevent the problem in the future.

    - 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.

    - Keep thatch to a minimum through periodic removal by verti-cutting or raking. Where annual bluegrass (*Poa annua)* is a problem, avoid de-thatching operations in early fall or spring when weed seeds are germinating. De-thatch when weed seeds are dormant, and leave as much soil covered as possible to reduce areas for germination. Microbial amendments are also available, which may reduce thatch level.

    - Provide for regular aeration to reduce soil compaction; frequency depends on the type of turf and usage. Use deep tine aerating to a depth of 6.5 inches.

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

    - Promptly repair worn or damaged areas by over seeding, reseeding, or resodding.

    - Select and apply fertilizers appropriate to turf grass nutritional requirements. For sports fields and bent grass greens, 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.

    - 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.

    - Sports field grass cultivars should have the following desirable characteristics: disease resistant, ability to withstand cutting heights of 0.75 to 2.5 inches, high wear tolerance, rapid healing abilities from aggressive rhizomes, drought resistance, and good colour.

- Avoid planting a single grass cultivar since a monoculture lacks the genetic variation required for successful disease resistance.
- Clean equipment that has been contaminated by weeds and pests before moving to the next site.

Physical and mechanical controls include the following:

- 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 5 to 6 cm (2 to 2.5 inches) without sacrificing vigour or usability. Mowing height and frequency should be adjusted to seasonal variations and grass growth or use patterns (e.g., baseball infields often require more frequent cutting and shorter turf than outfields). Time mowing to remove seed heads of weeds to prevent spreading.
- Hand-pull small populations of weeds before seed production. Well-designed hand tools make weed pulling fast and easy.

Chemical controls include the following:

- Select chemicals that are registered for turf and rated for the weed to be controlled.
- Apply herbicides at the appropriate rate for weeds to be controlled.
- Be cautious of ornamental trees that are within the turf areas so as not to adversely affect them.
- Keep herbicides away from fences bordering residences.
- Use appropriate signage before applying herbicides, and notify the turf maintenance Team Lead for the area. Sports fields may require booking timeslots for maintenance.
- Ensure that products selected are effective for specific weed types, and use spot treatments instead of general boom spraying wherever feasible. Ensure that products selected are not phytotoxic to desirable turf species and that low volatility formulations of herbicides are used. Select proper time of application to maximize effects to target species and minimize effects of spray on other species.

Summary of Minimum Actions

- Determine the most effective control measures for each major class of site. The primary weed control measures should be based on preventative and cultural controls.
- Provide rationale for use of herbicides for each facility/site category based on specific monitoring and impact assessment data.
- Herbicides selected for use must be compatible with St. Albert's IPM plan and must be applied with target-specific application techniques whenever practical; justification for using broadcast applications must be indicated.

1.4.6 Evaluation of Control Strategies

Follow-up monitoring and 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. Recording application rate, visual inspection results, and weed problems should be incorporated into the duties of maintenance staff onsite most frequently. A visual inspection and evaluation of turf areas that have been treated with herbicide should be scheduled 7 to 14 days after treatment.

Summary of Minimum Actions

- Conduct annual review of evaluation and control strategies using historical data and currently available products.
- Visually survey facilities at appropriate intervals after specific treatments.
- Specify when these inspections will be conducted, and maintain records of results, including assessments of treatment effectiveness.

2 AQUATIC INVASIVE SPECIES (AIS)

2.1 Invasive Aquatic Vegetation

Category includes the Sturgeon River, and artificial water bodies, such as storm retention ponds.

2.1.1 Categories

Invasive aquatic vegetation in St. Albert is mainly confined to flowering rush growing within the channel of the Sturgeon River. This species has been present for a few years in the river but is quickly filling in the channel, and is at risk for moving to other parts of the river downstream.

2.1.2 Identification and Monitoring

Identification or monitoring will be carried out for invasive aquatic plants along the entire course of the Sturgeon River within the City boundaries. Algae, natural aquatic vegetation and aesthetic factors will not be considered as part of the IPM plan.

2.1.3 Establishing Impact Assessment and Action Levels

Flowering rush is required to be removed according to provincial legislation.

2.1.4 Selection of Treatment Techniques

With invasive aquatic vegetation, the environmental impacts of all treatment methods must be evaluated. Special use approvals must be in place with the provincial and federal governments before application of Diquat to flowering rush.

Mechanical controls include hand removal of aquatic vegetation. NOTE: This is only permissible after appropriate licences/approvals have been obtained from Alberta Environment and Parks.

2.1.5 Evaluation of 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. Continual communications with Aquatic Invasive Species Specialists with the Government of Alberta is crucial to the success of any aquatic invasive control strategies.

2.2 Quagga and Zebra Mussels and Invasive Fish

Category includes the Sturgeon River, and man-made water bodies, such as storm retention ponds.

2.2.1 Categories

Invasive goldfish species are present in St. Albert stormwater management facilities and are the subject of ongoing chemical control measures. – refer to procedural document

Although not yet detected in Alberta waterbodies to date, two AIS of greatest concern currently are:

- Quagga mussel
- Zebra mussel

2.2.2 Identification and Monitoring

https://www.albertaparks.ca/media/5790304/aquatic-invasive-species-quick-facts.pdf

2.2.3 Establishing Impact Assessment and Action Levels

Any aquatic invasive species found in City bodies of water and watercourses will be immediately reported to provincial authorities (1-855-336-BOAT).

2.2.4 Selection of Treatment Techniques

Prevention is the cornerstone of a successful IPM plan and will prevent aquatic invasive species from establishing in water bodies and watercourses. This will include public education efforts tied to the Alberta Environment and Parks "Clean, Drain and Dry" and "Don't Let it Loose" campaigns.

2.2.5 Evaluation of Control Strategies

Annual monitoring and recording of presence or absence of invasive fish must be performed on an annual basis. Follow up monitoring in treated stormwater facilities should be completed to ensure success of the eradication program.

3 MOSQUITO CONTROL

3.1 Mosquito Control Prescriptions and Strategies

The City of St. Albert does not operate a mosquito control program. There is, however, an awareness of the effects of the West Nile virus and other mosquito borne health hazards on human and animal populations. If the West Nile virus becomes a greater threat in the region, the City will re-evaluate the need to conduct an aggressive mosquito control program. In the meantime, the City staff will monitor the presence of adult mosquitoes and artificial water impoundments that may offer mosquito breeding grounds. Where such impoundments are found on City owned lands, they will be drained. If water impoundments are located on private property, the owner of the property will be requested to drain the impoundment, as outlined in the Provincial West Nile Virus Response Plan - 2009.

4 HUMAN-WILDLIFE CONFLICT MANAGEMENT

Urban wildlife is part of life in St. Albert, with over 900 hectares of parks and natural areas within our city boundaries, and with Lois Hole Centennial Provincial Park on the west and Riverlot 56 Natural Area on the east. The City recognizes that wildlife provides many ecological and social benefits, but we also need to understand and be prepared for potential human-wildlife conflicts that may occur in our urban environment. For this report, urban wildlife does not include domesticated animals.

The wildlife management guidelines are meant to outline measures to prevent and manage human-wildlife conflicts while insuring the conservation of biodiversity in the natural environment. While the guidelines do not encompass all the wildlife species that may be encountered within St. Albert, it focuses on the more common human-wildlife conflicts that commonly occur. The guiding principles of the wildlife management include the following:

- recognize that wildlife has intrinsic ecological, economic, social, and cultural value

- response to human-wildlife conflicts must be ecologically sound and based on scientific and technical knowledge
- outreach and education are important tools for minimizing human-wildlife conflicts

It is anticipated that these management guidelines will be reviewed regularly and updated as new issues or management techniques become available.

4.1 MANAGEMENT GUIDELINES

4.1.1 Birds

Crows, starlings, pigeons, magpies, and Canada geese may create problems in various situations, both on city lands and private property.

4.1.1.1 Crows

Crow management can be challenging. Crows are attracted to urban environments because of the retained tree stands in our parks and the abundance of garbage and litter available. They eat insects and clean up carrion along our roadways, so in that respect, they are helpful. Crows like to perch and nest in tall trees and live in groups called 'roosts'. Roosts can contain anywhere from two to three breeding pairs, to hundreds of pairs. Once a roost is established, the pairs and their offspring will return to it every year to nest.

Removing potential food sources such as pet food, food waste, and material put out for composting is critical in reducing the number of crows in an area. Crows are not easily trapped, leaving the option of culling/shooting as the most effective way of reducing or dispersing them. Given their mobility, distinguishing between private and City owned lands is difficult, leading to challenges with control efforts. Harassment techniques can cause them to move off and not return; this can easily be accomplished with a laser pointer.

If a crow problem exists on public property, trained Public Works staff will assess the degree of the problem and take appropriate steps to manage the situation. These actions may include the following:

- tearing down nests before the nesting season
- Placing of live traps to capture crows for euthanization
- issuing notices to private homeowners to clean up food sources
- using visual deterrents/noise makers, where practical, to scare birds away from roosting sites
- contracting the services of professional wildlife specialists to safely employ management techniques, with appropriate provincial permits

When crows are a problem on private property, it is the homeowner's responsibility to address the problem through personal actions or through the services of a professional pest control specialist.

For a full explanation of the options for crow control, please see the following website:

http://aep.alberta.ca/fish-wildlife/human-wildlife-conflict/crows-magpies.aspx

Crows are known to be carriers of the West Nile virus; therefore, in those cases where the provincial government has deemed action be taken to control the West Nile virus, local authorities will be responsible for managing crows accordingly.

4.1.1.2 Starlings

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex729

4.1.1.3 Magpies

Magpies can create problems and can be trapped if they become a nuisance, making them slightly easier to manage than crows. Magpies exhibit many of the same tendencies as crows. They feed on food scraps, carrion, pet food, and the young of songbirds.

If a magpie problem exists on public property, trained Public Works staff will assess the degree of the problem and take appropriate steps to manage the situation. These actions may include the following:

- tearing down nests before the nesting season
- issuing notices to private homeowners to clean up food sources
- using visual deterrents/noise makers, where practical, to scare birds away from roosting sites
- trapping the birds using a government approved trap, and relocating or euthanizing them
- contracting the services of professional wildlife specialists to safely employ management techniques, with appropriate provincial permits

When magpies are a problem on private property, it is the homeowner's responsibility to address the problem through personal actions or through the services of a professional pest control specialist. Trapping the birds using a government approved trap and relocating or euthanizing them is one option available to residents.

For additional information, please see the following websites:

http://icwdm.org/handbook/birds/Magpies.asp http://aep.alberta.ca/fish-wildlife/human-wildlife-conflict/crows-magpies.aspx

4.1.1.4 Canada Geese

Canada geese can become a significant problem in public green spaces, as geese are attracted to open, grassy areas close to water bodies where they can graze on grass shoots while being close to an escape route from predators. Although numbers of nesting geese remain low aside SWMFs, it is worth considering control options at this time, should nesting geese become a problem. Geese can deposit up to 1.5 pounds (.68 kg.) of excrement per bird per day, leaving parks, trails, and playing fields potentially unusable while the geese are present. The resulting nutrient enrichment (known as guanotrophication) of water bodies could result in poor water quality, low oxygen conditions and excessive vegetation growth.

Spring and fall migrations make control difficult, as the birds remain in the area for only a short period of time. No management options are recommended for these migrating birds, other than educating the public about the short-term nature of the problem and trying to schedule events away from affected areas.

Nesting birds create a larger problem. Aggressive adult birds have been known to attack humans in defence of nesting sites. In these situations, any actions taken to control Canada geese must have federal and provincial approval. If geese become a problem, the City will retain the services of a professional wildlife management specialist.

Regardless of which above-noted actions are undertaken, the following should occur:

- The public should be actively discouraged from feeding any waterfowl in parks and open spaces, as this practice habituates these animals to a reliance on humans for food.
- A public education campaign should be undertaken in conjunction with any goose deterrent, population reduction, or relocation campaign.
- A continuous monitoring program is essential to provide reliable data on species and population numbers of various waterfowl present in the Sturgeon River watershed so that well-informed decisions regarding population management can be made.

For additional information, please see the following websites:

https://www.ec.gc.ca/mbc-com/6D2B893B-C671-41AF-8439-713305DB384C/Handbook_Canada_Cackling_Geese_e[1].pdf

http://aep.alberta.ca/fish-wildlife/human-wildlife-conflict/geese.aspx

4.1.2 Small Mammals

4.1.2.1 Skunks

Skunks can be an urban problem, particularly those seeking den sites under cement stairs and garden sheds in residential areas. The City will provide advice on discouraging skunk dens around resident property.

The City will not trap, hunt, or interfere with skunks unless they are sick (i.e., rabid) or exhibit aggressive behaviour toward humans.

Upon receiving a report of a sick or aggressive skunk, trained Public Works staff will attempt to observe the affected animal. If it is confirmed that the animal poses a health threat to the public, the City will retain the services of a professional wildlife management specialist. It will be up to the specialist to determine the most effective method of removing the affected animal from the situation.

For additional information, please see the following website:

http://aep.alberta.ca/fish-wildlife/human-wildlife-conflict/skunks.aspx

4.1.2.2 Richardson's Ground Squirrels and Northern Pocket Gophers

Richardson's ground squirrels and northern pocket gophers can create serious problems in portions of the City along roads, in parks, and adjacent to natural areas or farmland. While ground squirrel and gopher holes can be a concern on public sports fields, creating an unsafe playing surface for sports participants, they are generally regarded as a minor nuisance to private homeowners.

Ground squirrels and gophers will be controlled on public lands by trained Public Works staff using various methods appropriate to the circumstances. Control methods may vary from simply filling in surface holes to create a level and safe playing surface, to trapping or eradicating the animals if there is no risk to the public.

When ground squirrels or gophers are found on private property, it is the homeowner's responsibility to address the problem through personal actions or through the services of a professional wildlife management specialist.

For additional information please see the following websites:

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex3471

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex897

4.1.2.3 Rabbits and Hares

Rabbits and hares may occasionally be a problem in the City's parks, natural areas and private property. They may nibble at flowers and vegetables in the summer and damage woody landscape vegetation during the winter months.

Rabbits may be live-trapped and relocated away from populated areas by trained Public Works staff when they are found in public parks or green spaces.

When rabbits and hares are found on private property, it is the homeowner's responsibility to address the problem through personal actions or through the services of a professional wildlife management specialist.

For additional resources please see the following website:

http://aep.alberta.ca/fish-wildlife/human-wildlife-conflict/rabbits-hares.aspx

4.1.2.4 Porcupines

Porcupines may occasionally be a problem in the City's parks, natural areas, and private properties. Damage to trees and shrubs may occur, as porcupines feed on young branches and shoots, or remove the bark from older vegetation.

Porcupines may be live-trapped and relocated away from populated areas by trained Public Works staff when they are found in public parks or green spaces.

When porcupines are found on private property, it is the homeowner's responsibility to address the problem through personal actions or through the services of a professional wildlife management specialist.

For additional information please see the following website:

http://aep.alberta.ca/fish-wildlife/human-wildlife-conflict/porcupines.aspx

4.1.3 Coyote and Fox

Coyotes and foxes have lived along the river and in the fields and farmlands of the St. Albert area since before European settlement. Both play a natural and beneficial role in the food chain by feeding on mice and other small rodents.

The City will not trap, hunt, or interfere with these fur-bearing animals unless they are sick (i.e., rabid) or exhibit aggressive behaviour toward humans.The City of St Albert tracks the sightings and calls about coyotes and foxes as part of our Integrated Pest Management Response.

Upon receiving a report of a sick, injured, or aggressive coyote or fox, trained municipal enforcement officers will attempt to observe the affected animal. If it is confirmed that the animal poses a safety hazard to the public, the City will retain the services of a professional wildlife management specialist and/or provincial wildlife officers. It will be up to the specialist to determine the most effective method of removing the affected animal from the threatening situation.

The City will maintain records of the encounters and evaluate management options as needed.

If a fox or coyote is not found to be sick, injured, or aggressive toward the public, the City will not take any action that would interfere with the animal or its habitat (including den sites).

Sightings of coyotes and foxes in St. Albert is a regular occurrence. For more information please contact **Urban Coyote Information line (780-644-5744) and listen to the recorded information.**

The City will undertake educational programs to encourage residents to keep food waste, ripe fruits from trees, pet food, and bird-feeder seed unavailable for foxes and coyotes, as well as other wild animals (skunks and mice) that might be attracted to an easy meal. Such action on the part of City residents may avoid conflicts between foxes, coyotes, and the public.

For additional information, please see the following websites:

http://aep.alberta.ca/fish-wildlife/human-wildlife-conflict/coyotes.aspx

http://aep.alberta.ca/fish-wildlife/human-wildlife-conflict/foxes.aspx

4.1.4 Deer and Moose

Periodic visitations by deer and moose to properties within the City limits will be monitored by trained municipal enforcement officers/Public Works staff. Actions to manage the behaviour of these animals will be undertaken only if the animals are sick, injured, represent a danger to public safety (i.e. males in rut, females with young), or pose a hazard to traffic.

The City will advise Alberta Environment and Parks, Fish and Wildlife Division, and the RCMP when a large wildlife animal complaint is received. Depending on the circumstances and the risk to the safety of the public, appropriate co-ordination and action will take place. The City will assist law enforcement officials as necessary in dealing with this type of concern. This includes attempting to guide the problem animal out of the City and back into a rural area. Decisions made to tranquilize and transport problem wildlife or euthanize injured wildlife will remain with the RCMP and Fish and Wildlife officers.

For additional information, please see the following websites:

http://aep.alberta.ca/fish-wildlife/human-wildlife-conflict/deer.aspx

http://aep.alberta.ca/fish-wildlife/human-wildlife-conflict/moose.aspx

4.1.5 Beavers

The City developed Beaver Management Guidelines in 2006 with the input of residents and the City's Environmental Advisory Committee (refer to Appendix or website). The guidelines outline the City's approach to dealing with beavers, using both preventative and active management techniques. The beaver management guidelines are in line with the City's environmental policy that reflects a balanced approach to coexist with beavers while addressing flooding control, infrastructure integrity, native tree and shrub assets, and public safety on City owned lands.

4.1.5.1 Timeline

Representatives from Public Works, Office of Environment, and Environmental Advisory Committee will review these guidelines annually.

4.1.5.2 Management

Trained Public Works staff will record any beaver activity during the unfrozen period of the year as part of their regular inspection procedures (minimally in June and late August/early September). The following information will be collected:

- population estimate based on number of lodges and/or visual sightings
- dam locations and sizes
- Effect of impounded water (if any)
- Bank stability (in the case of bank beavers)
- immediate areas of feeding
- types and numbers of trees being removed

Trained Public Works staff will assess any potential impact to public property using the collection of data as outlined above. Unacceptable beaver activity will be reported to the Office of Environment, and determination of action will be decided upon by Office of Environment and Public Works staff.

Unacceptable beaver activity may include the following:

- cutting trees managed by the City that are 6 cm or greater in diameter at breast height (DBH), have special value or may cause a safety concern
- tunnelling under walking trails
- destabilizing slope or any activity that undermines the river bank
- tunnelling under areas in which mower operators drive in groomed park areas
- interfering with culverts or other infrastructure
- flooding issues
- activity in high use public areas that may put the beaver or public health at risk

If active management is deemed necessary, the management of beavers will initially be carried out through a non-invasive approach, following all applicable provincial and federal guidelines, such as the following:

- protecting trees with ecological or aesthetic value in areas of feeding through wire skirts, enclosures, or river-edge beaver fencing (additionally, other trees and shrubs, where there are large quantities with advanced regenerative capability, should be left unprotected for the use of beaver)
- dismantling of beaver structures through methods least destructive to the environment
- removing debris
- other non-invasive deterrents that do not harm the beaver, such as pond levelers and Beaver Deceivers

If non-invasive management techniques are not possible or are ineffective, the City will consider retaining a licensed professional to live-trap and relocate the beaver following all provincial and federal guidelines. Some considerations when relocating beaver are:

- Signage will be posted at strategic locations to notify the public that trapping activities are occurring in the area.
- Relocation should occur when beavers will have adequate time to recolonize (typically between May and August).
- Attempt to move beavers within the watershed and/or a maximum distance of 10 to 15 km.
- The relocation destination should be predetermined, and proper permission obtained.
- Move beavers only to areas where there is a high probability of beaver survival once relocated.
- Once beavers have been relocated, prevention and exclusion techniques should be implemented at the site to prevent the area from being recolonized by another beaver.

Destroying beavers will be considered after all other management tools have been exhausted or when an emergency situation has arisen. Once the beavers are euthanized, prevention and exclusion techniques will be implemented to help prevent the area from being recolonized by another beaver. Beaver remains will be disposed of appropriately.

Unacceptable beaver activity will lead directly to live-trapping and/or destroying in the following artificial water bodies: Lacombe Park Lake, Grandin Pond, upper and lower Heritage Lakes, and any other storm water retention ponds.

4.1.5.3 Other Management Considerations

Beavers will not be prohibited from moving up and down the Sturgeon River.

Relocation sites and permits for control should be kept up to date for quick response.

A document developed in 2015 for Beaver County by Dr. Glynnis Hood and the University of Alberta, *Mitigating Human-Beaver Conflicts through Adaptive Management*, may be considered when exploring beaver management options.

4.1.5.4 Addendum - Carrot Creek

The Beaver Management Guidelines were initially developed specifically for the reach of the Sturgeon River that runs through St. Albert. This reach is predominantly surrounded by the Red Willow Park trail system and residential and industrial developments. Beaver issues are typically centered around effects on infrastructure and safety around trails and parks; however, the area of Carrot Creek acquired by the City is surrounded predominantly by agricultural development, rural residents, and some oil and gas activities. Access along Carrot Creek is also very restricted, except where there are road crossings, and the issues with beavers are more related to flooding of buildings, roads, and agricultural lands.

Background Information

The City acquired Carrot Creek in February 2007.

The City now owns to the far top bank of the creek on the west side in the annexed area. The exception to this is along the constructed ditch from Highway 2 at the north portion of the annexed area, where the City owns to the south side of the ditch.

The Office of Environment and representatives from Public Works reviewed existing beaver management strategies with Sturgeon County representatives; the strategy has been to respond to landowner complaints only, and to have a professional on retainer to deal with these complaints. This typically included kill-trapping the beavers and removing the dams with dynamite. Landowner complaints were typically related to land flooding or tree removal. Local oil and gas companies are contacted if dam removal is close to their facilities.

Four potential beaver locations along Carrot Creek were identified with the staff of Sturgeon County. Most issues were related to flooding of private lands rather than damage to culverts or bridges. There are approximately 20 landowners along Carrot Creek that could be affected by beaver activity.

Beaver Management - Carrot Creek

The City will follow the beaver management practices set up by Sturgeon County in the short term so that the residents will receive the same level of service. The City will re-evaluate these practices in one (1) year to determine what changes to these practices may be necessary.

The City will respond to resident complaints related to beavers rather than conducting regular inspections. The City will continue to document any beaver activity related to culverts or bridges that is observed during regular working tours. Trained Public Works staff will investigate each public complaint to assess the type of unacceptable beaver activity that is of concern to residents. Unacceptable beaver activity will be reported to Office of Environment and Public Works staff. The Office of Environment will decide upon a determination of action.

Unacceptable beaver activity may include the following:

- cutting trees managed by the City that are 6 cm or greater DBH, have special value, or may cause a safety concern
- destabilizing slope or any activity that undermines the riverbank and causes a safety concern
- interfering with culverts or infrastructure that could cause flooding of private or public buildings or agricultural lands
- flooding issues that may occur in the event of a large runoff
- activity in high use public areas that may put the beaver or public health at risk

If it has been determined that there is unacceptable beaver activity, the City will consider retaining a licensed professional to remove the dam and/or kill-trap the beavers following all provincial and federal guidelines. Beaver remains will be disposed of appropriately.

Once the beavers are euthanized, prevention and exclusion techniques will be recommended to the resident, if applicable, to help prevent the area from being recolonized by another beaver (e.g., wire skirts, exclosures, or creek-edge beaver fencing to protect trees with special value).

For additional information please see the following website:

http://aep.alberta.ca/fish-wildlife/human-wildlife-conflict/beavers.aspx

Appendix C

Pesticide Use, Storage, Transportation and Handling

PESTICIDE USE, STORAGE, TRANSPORTATION, AND HANDLING

TABLE OF CONTENTS

1 LEGISLATIVE AUTHORITY FOR THE REGULATION OF PESTICIDES

Pest control products are regulated in Canada under 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 Canada. This fundamental principle focuses specifically on the protection of human health and the environment, and product performance.

1.1 Pests

A pest is defined in the federal *Pest Control Products Act* as “an animal, a plant or other organism that is injurious, noxious or troublesome, whether directly or indirectly: and an injurious, noxious or troublesome condition or organic function of an animal, a plant or other organism” (Government of Canada 2006). 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.

1.2 Control Products

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

- 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
- any active ingredient used for the manufacture of a control product

Products regulated under the *PCP Act* cover a wide spectrum. These products include the following:

- herbicides, fungicides, and insecticides
- biological agents, such as bacteria and viruses that are used to control pests
- antimicrobial agents used in oil wells, wood preservation, non-potable water purification systems, and material preservation
- growth regulators that control injurious, noxious, or troublesome organic functions 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*, numerous other federal acts may have implications in regulating or limiting the use of pesticides. The *Food and Drugs Act* sets limits for permissible maximum residue levels of agricultural pesticides in food. The *Canadian Environmental Protection Act, 1999*; the *Fisheries Act*; and the *Migratory Birds Convention Act, 1994* 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. Provincial and territorial regulations may apply more stringent controls than federal regulations, although they may not permit the use of products not registered by the federal authority. Furthermore, municipalities may enact bylaws that limit the use of pesticides on a local level.

In Alberta, the provincial *Environmental Protection and Enhancement Act* (EPEA) defines a pesticide as follows:

- any substance intended, sold, or represented for use in preventing, destroying, repelling, or mitigating any insect, nematode, rodent, predatory animal, parasite, bacteria, fungus, weed, or other form of plant or animal life or virus, except a virus, parasite, bacteria, or fungus in living people or animals
- any substance that is a pest control product within the meaning of the *PCP Act* or is intended for use as such a pest control product
- any substance that is a plant growth regulator, a defoliant, or a plant desiccant
- a fertilizer within the meaning of the *Fertilizers Act* that contains a substance referred to in subclause (i), (ii) or (iii)
- any other substance designated as a pesticide in the regulations but does not include a substance that is intended, sold, or represented for use in potable water to prevent or destroy bacteria, parasites, or viruses if the substance is not a pest control product within the meaning of the *PCP Act*

Pesticides can be subdivided into different classes:

- 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
- rodenticide - a chemical substance used to control or prevent the development of rodents
- piscicide- a chemical substance used to control aquatic vertebrates

2 FEDERAL AND PROVINCIAL LEGISLATION

2.1 Pesticide Sales, Handling, Use and Application Regulation

The EPEA *Pesticide Sales, Handling, Use and Application Regulation* (Alberta Regulation 24/1997) addresses pesticide use within Alberta, including storage, handling, application, and use. Division 2 of the act directs that no person shall do the following (except in accordance with regulations and label information applying to the pesticide in question):

- sell, distribute, use, apply, handle, store, or transport a pesticide
- operate or clean any machinery, equipment, vehicle, aircraft, or vessel used in connection with the sale, distribution, use, application, handling, storage, or transportation of a pesticide
- use or clean a pesticide container

Pesticides are not covered under the Workplace Hazardous Materials Information System (WHMIS). However, they are classified under the *Transportation of Dangerous Goods Act, 1992* categories.

Pesticide use, storage, transportation, and handling must comply with the provisions of the *Public Health Act, Nuisance and General Sanitation Regulation* (Alberta Regulation 243/2003).

2.2 Service Registrations and Special-use Approvals

Alberta Environment and Parks issues service registrations and special-use approvals to municipalities that apply pesticides. The City of St. Albert holds a Pesticide service registration and applies for special-use approvals as required.

Approvals are valid for 2 years. Copies of service registrations and special-use approvals are kept on file.

Before 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.

2.3 Provincial Certification Requirements

Alberta Environment and Parks (AEP) regulates pesticide sales, handling, and applications throughout the province. The categories of pesticide applicator certificates that may apply to the corporation include: agricultural, aquatic, biting fly, forestry, industrial, landscape, and structural.

All pesticide applicators must have an Alberta pesticide applicator certificate.

AEP, in co-operation with Lakeland College, has authorized a training program to prepare prospective candidates for the certificate exam. Training may be provided by 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 the course material by means of discussions, presentations, and lectures. To obtain the maximum benefit from the tutorials, course materials should be reviewed thoroughly before attending. It is strongly recommended that any civic employee wishing to obtain an Alberta pesticide applicator certificate complete the Lakeland College pesticide applicator home-study course before writing a certification examination. Anyone failing a certification examination will be required to complete an approved training program before an examination rewrite can be attempted.

Civic employees that require a pesticide certificate for their operation and are interested in obtaining the Lakeland College pesticide applicator home-study course or attending a tutorial should notify their immediate supervisor to request training support from the City.

3 CITY ENVIRONMENTAL POLICIES AND PROCEDURES FOR PESTICIDE HANDLING AND STORAGE

3.1 Environmental Regulatory Compliance Policy

The City environmental policy states that the City shall comply with all relevant environmental legislation and regulations and strive to set an example or the rest of the community. It also states that the City shall prevent the release of pollutants into air, land, or water and shall minimize the use of natural resources throughout its operations.

3.2 Material Safety Data Sheets and WHMIS Training

All pesticides must have a Safety Data Sheet before the City employees, including private contractors hired by the City, use them.

Once a Safety Data Sheet is obtained, staff must receive product-specific WHMIS training before using the product to ensure they can safely handle the product. All pesticides transported within the City - even those transported internally during daily operations - must be accompanied by WHMIS documentation.

3.3 Transportation of Dangerous Goods

Civic staff involved with transportation of pesticides that are classified as hazardous under TDG legislation and are in significant quantities to require route notification, placarding, and emergency planning will have been certified in the Transportation of Dangerous Goods.

3.4 Pesticide Purchase

Employees purchase only products that are properly selected and have a current Pest Control Product Number and WHMIS Safety Data Sheet.

Only staff with a current pesticide applicator certificate can purchase pesticides. In addition, purchases must correspond to their certificate (e.g., an employee with a landscape certificate can purchase turf- or landscape-related products).

3.5 Pesticide Storage

All storage facilities must meet the minimum storage requirements as outlined in Alberta Regulation 24/1997, which does not differentiate between temporary and permanent storage sites. Presently, all provincially inspected City of St. Albert storage facilities meet or exceed these requirements.

The Public Works yard is the primary year-round storage location. Unheated, summer storage sites may also be used during the operational season.

Future storage compartments or buildings should comply with Alberta's *Safety Codes Act* and pesticide storage requirements as outlined in Alberta Regulation 24/1997.

3.6 Pesticide Container Disposal

Pesticide containers are disposed of in accordance with Alberta Regulation 24/1997. Store them according to regulation, and dispose of them at an approved site annually.

3.7 Environmental Release (Pesticide Spill)

In the event of any type of chemical spill or release, employees must follow

EM-PW-001

Environmental Emergency Manual

and complete an environmental incident/spill/release field report found in

SOP-PW-002

Spill Procedure

4 PRE-NOTIFICATION PROCEDURES

4.1 Pesticide Application by Civic Employees

Provisions within the EPEA state that individuals receiving payment for application or applying a pesticide on a right-of-way (RoW), park, boulevard, campground, or picnic area located on public land must hold a service registration (approval) and follow the provisions as described in the EPEA *Pesticide (Ministerial) Regulation* (Alberta Regulation 43/1997), which requires that no person use or apply a pesticide in Schedules 1 or 2 unless that person meets the following requirements:

- holds an applicator certificate in one or more of the classes of application certificate listed in Schedules 4 and 5
- works under the supervision of an applicator and in accordance with the latest edition of the *Environmental Code of Practice for Pesticides*

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* shall use or apply a pesticide in Schedules 1, 2 or 3 in or on the grounds of a school, hospital, nursing home, or daycare facility.

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

4.2 Posting and Notification - Open Spaces

Pesticide applicators must comply with all safe application methods as listed within the *Environmental Code of Practice for Pesticide* and Alberta Regulations 24/1997 and 43/1997, including wearing safety equipment and applying products under optimal environmental conditions and within the parameters as directed on the pesticide label.

Annually, advertisements will be placed in the local newspaper and on the City website advising of the type of pest, activity, and tentative schedule for pesticide spraying.

Before turf pesticide application within active parks and open spaces, applicators must post pre-notification signs at all major entrances in parks that have a discreet perimeter, as well as a minimum of two additional signs in the middle of the park 48 hours in advance. Spot applications within parks will have pre-notification signs placed at each end when public interaction with treatment area is possible. Where appropriate, signs are also posted in heavy-traffic, non-paved pathways, such as accesses to bus stops or sidewalks. The signs remain in place at least 48 hours after application.

A pesticide registry (database) will be established by the City, identifying residents with allergies to pesticides who, due to health reasons, wish to be advised when spaying is to take place. These residents will be required to fill out a medical alert pesticide form and submit this form to the City. The City will pre-notify these residents via phone/voice mail that spraying will take place within 100 m of their property. Notification will occur a minimum of 24 hours before spraying the open space adjacent to their residence.

Site warning signs will not be required in areas that prohibit access by the public.

4.3 Posting and Notification - Adjacent to Structures/Facilities

The City staff and contractors shall 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 before the intended application if facility is open to public Treatments are to be scheduled when facilities are closed, wherever possible. Such notices should remain posted for 48 hours or more after treatment. Where treatments occur in areas of public use, areas not accessible to the public (e.g., working area of a restaurant), notices are only required at staff entryways. Pesticides contained within a bait box will have the warning and label posted on each box in lieu of facility posting.

Prior notification is not required for applications of wettable powders to perimeter baseboards and/or cracks and crevices within the structural perimeters of a 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.

4.4 Pesticide Application near Open Bodies of Water

Pesticide applications within a specified distance from open bodies of water as defined under the EPEA and the *Environmental Code of Practice for Pesticides* will be undertaken only 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:

- waterworks systems
- 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

- 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
- irrigation and drainage canals that are completely surrounded by private land and have no outflow beyond private land
- roadside ditches
- wastewater systems
- storm drainage systems
- dry streams having a bed and shore averaging 0.5 m or less in width within the boundaries of the treatment area
- a man-made water hazard that is located on a golf course and has no outflow of water beyond the golf course boundary

A bed and shore means land that is or has been covered by water up to the high water mark (bankfull width). 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.

Within St Albert, the Sturgeon River, Carrot Creek, Riverside and Riel SWMF are classified as Open Bodies of Water.

4.5 Record Keeping for Pesticide Applications

After each application, the applicator records all pertinent information (product, volumes used, general area, weather, etc.) in a pesticide report approved form. At year end, applicators send a summary of all products used in that calendar year (volumes consumed, total area treated, etc.) to the City Environmental Services. Copies of all pesticide records are kept on file by Public Works for 5 years.

4.6 Pesticide Application by Private Contractors

The Parks and Open Spaces Manager will ensure that private applicators, including those hired by developers to maintain public lands during their maintenance period, meet the specific requirements and qualifications required to carry out responsible pesticide applications on public land.

4.7 Application Protocols for other City Departments or Organizations

Notification guidelines ensure that the general public are fully aware of the City's IPM operations. There can be variations on these guidelines, as long as the City departments maintain the original intent of keeping the public aware of pesticide applications.

5 REFERENCES

City of St. Albert (the City). 2012. *The City of St. Albert Contractors Environmental Responsibilities Package, Transit*. St. Albert, Alberta. 5 pp.

Government of Canada. 2006. *Pest Control Products Act*. S.C. 2002, c. 28. Published by the Minister of Justice. Current to September 18, 2016. Last amended on June 28, 2006. http://laws-lois.justice.gc.ca/eng/acts/P-9.01/

Province of Alberta. 2016. *Environmental Protection and Enhancement Act, Pesticide Sales, Handling, Use and Application Regulation*. Alberta Regulation 24/1997, with amendments up to and including Alberta Regulation 105/2016. Queen's Printer. Edmonton, Alberta.