

2017

City of Leduc

2017 CITY OF LEDUC INTEGRATED PEST MANAGEMENT REPORT

Executive Summary

Introduction

The City of Leduc 2012 *Municipal Development Plan* states that the City will conserve and protect natural areas by “adopting clear guidelines for pesticide application, reducing pesticide use, and implementing new and innovative integrated pest management methods.” In 2012, the City of Leduc completed Phase I of its *Environmental Plan*, which put forth a ten-year vision for a healthy and clean environment. The 2021 Land Vision, states “Leduc has protected its vital and ecologically important land resources” and “the land resources in Leduc also offer people that live within the community opportunities to recreate and experience nature.” The Environmental Plan identifies two key actions that support the land vision:

1. “The City of Leduc will review the potential for adopting more stringent local pesticide management policies”
2. “The City of Leduc will develop a pesticides report that is consistent with integrated pest management principles, and will consider if a full pesticide ban for municipal operations is warranted”

Integrated pest management (IPM) is an effective and environmentally sensitive decision-making model used to prevent and manage pest problems. As such, a variety of preventative and non-chemical pest management strategies are used or considered before using the least toxic, approved pesticide.

IPM is particularly important with an increasing land inventory, the increase in development and disturbed areas, as well as changing climate regimes, such as increased drought conditions, which may facilitate future pest management problems if not addressed.

Background

In 2003, the city of Leduc adopted an IPM plan from other municipalities in Alberta, which provided only a broad overview of how the prevention and management of pests is approached by the City. A lack of well-defined decision-making guidelines for management actions required under IPM programs has been cited as a major weakness of urban IPM implementation (North Carolina State University, 1997). The range of potential pests and pest management problems specific to Leduc is extensive and consequently input from City staff is necessary to develop action priorities that will enhance the operation, planning and technical results of a Leduc Specific IPM program.

Methodology

To implement a successful IPM program City staff, residents, developers/contractors, administration and Council need to have a clear understanding of the management goals and guidelines involved. To create a plan with updated policies and procedures specific to Leduc the following tasks were conducted, starting in 2015:

- Review the existing 2003 IPM Plan
- Identify pest problems specific to Leduc and areas for improvement through staff interviews with:
 - The City of Leduc Manager of Parks and Open Spaces
 - The City of Leduc 2015 Weed Inspector

- Research IPM practices used in other municipalities for comparison,
- Compile a report to set the general direction and recommendations for future IPM policies and procedures,
- Host meetings with Public Services staff and Enforcement Services to review report and recommendations; and
- Consult the Leduc Environmental Advisory Board (LEAB) and the Urban Development Institute (UDI) for feedback.

Areas for Improvement

Through the staff interviews it was evident that the City of Leduc utilizes a variety of management strategies within their operational units that are fundamentally IPM based, however, there is a need to formalize Leduc specific policies and procedures that ensure consistent pest prevention and control measures are implemented.

The following areas for improvement and recommended action items were identified and are summarized below in Tables 1 - 5.

Funding for the implementation of the recommendations will need to be assessed annually as part of the budget process. Recommendations identified for short term implementation build on existing City operations/programs and budget. Recommendations that will require additional resources and staff time to implement are identified for medium or long term implementation.

Table 1. Fundamental IPM Procedures

Developing formal IPM procedures will help staff identify pest problems, decide if treatments are necessary, determine the best timing of treatments, and evaluate their effectiveness.

ACTION	DESCRIPTION	DEPARTMENT	TIMEFRAME	COSTS
1. Create IPM procedures for monitoring, control and reporting	a) Develop formal and standardized monitoring forms, pesticide application records and non-pesticide control forms so that IPM activities can be tracked, documented and evaluated. <ul style="list-style-type: none"> • The City already has a formalized matrix for Elm Scale which can serve as a template for other monitoring. Maintenance activities like pruning and watering are currently being tracked by Public Services. 	Public Services	Short Term <2 years	\$0 – existing resources
2. Track IPM activities in an Ecological Management System	a) Use a database/mapping inventory system to track pests and IPM activities.	Public Services	On-going/Short Term <2 years	\$0 – existing resources

	<ul style="list-style-type: none"> Public Services awarded tender for a database/mapping inventory system to track pests and IPM activities in City Works, in 2017. <p>b) Have weed control contractors provide maps of the areas they are spraying, and where the need for control is identified provide contractors with a map of the location. Have asset management/GIS create maps with a unique weed control layer.</p>			
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Table 2. Pest Prevention

Proper design, development, construction, and approval of landscape features can effectively prevent or minimize pest problems.

ACTION	DESCRIPTION	DEPARTMENT	TIMEFRAME	COSTS
3. Provide internal IPM training programs	<p>a) Identify an IPM specialist to host training sessions.</p> <ul style="list-style-type: none"> In 2017 the City of Leduc hosted two workshops for professionals from several municipalities in the Capital Region; the group plans to meet biannually in the spring and fall. 	Planning, Engineering, Public Services, Community Development and Culture	Short Term <2 years	\$1,000 for two sessions annually
4. Enhance the process for landscape design and weed control inspections	<p>a) Inspections should be conducted frequently during the pre-construction, construction and post-construction phase to ensure landscape deficiencies are identified and weed propagation is controlled on disturbed areas.</p> <p>b) Landscaping inspections should be a multi-team approach to improve knowledge sharing and identification of deficiencies.</p>	Public Services, Enforcement Services	Short Term <2 years	<p>\$0 – existing resources, Landscape Technician and Enforcement Services, as well as other specialized Public Services staff</p> <p>Long-term – determine need for future resources</p>

<p>5. Educate developers/contractors on IPM and preventing weed propagation during construction</p>	<p>a) Provide education to developers and contractors on:</p> <ul style="list-style-type: none"> the cost of allowing invasive species to propagate on their sites, how to consider the type and magnitude of disturbance they will be conducting, and timing in regards to weed propagation; and cleaning equipment exposed to weed seeds and problem plants. <p>b) The Planning Department currently sends out courtesy letters to developers about controlling debris etc. on their properties – these letters should be updated to include information on weed management.</p> <p>c) The 2003 IPM plan is already provided as a schedule to the Precedent Development Agreement. The updated 2017 IPM plan should be presented to the Leduc UDI members before going to Council, and replace the 2003 Plan as a schedule to the Precedent Development Agreement.</p>	<p>Planning, Engineering, Communications</p>	<p>Short Term < 2 years</p>	<p>\$0 –summary document put together internally, updates to the courtesy letter to include weed management. Precedent Agreement to be updated with updated IPM Plan after consulting UDI.</p>
<p>6. Require developers/contractors to provide Weed Management Plans</p>	<p>a) Requiring Developers to provide a weed management plan should be considered, as part of Precedent Development Agreement review. Providing developers with a template plan is recommended for consistency.</p>	<p>Planning</p>	<p>Short Term <2 years</p>	<p>\$0 – existing resources</p>
<p>7. Implement Creative Sentencing for Weed and Pest Control Offences</p>	<p>a) Creative sentencing may include diverting penalty funds to projects that have a connection with the offence – i.e. funding community weed pulls, education programs or funding more IPM staff. i.e. similar to the Traffic Safety Fund</p>	<p>Enforcement Services,</p>	<p>Medium Term 2-5 years</p>	<p>\$0 – existing resources</p>
<p>8. Require Clean Plant Certified Stock</p>	<p>a) Require developers and contractors to use only clean certified stock to ensure all new plants are free of all regulated pests and substantially free from all other insects and disease.</p> <ul style="list-style-type: none"> The City currently requires this of all developers. <p>b) The City of Leduc 2010 <i>Minimum Landscape Design and Construction Standards</i>, are currently under</p>	<p>Public Services</p>	<p>Ongoing/Short Term <2 years</p>	<p>\$0 – existing resources</p>

	review and should be updated to formally include this requirement.			
9. Review and Update the City of Leduc 2010 Minimum Landscape Design and Construction Standards	a) The 2010 <i>Minimum Landscape Design and Construction Standards</i> are currently being reviewed and updated. Suggested updates include: <ul style="list-style-type: none"> require clean certified stock require natural plant species in new development and on city owned property require a diverse selection of plant material 	Public Services	Ongoing/Short Term <2 years	\$0 – existing resources
10. Enhance Mulching Best Practice	a) Prioritize pre-existing locations that need mulch to prevent weed propagation and ensure future sites are provided with mulch. b) Consider a pilot project on giving away mulch at the Eco-Station and provide the public with education material on how the use of mulch will reduce pest establishment in their yards.	Public Services	Short Term <2 years	\$10,000 – in 2018 budget under Compost Transfer Station. Will evaluate success of pilot project for potential long term integration

Table 3. Comprehensive Cultural Management

Cultural management plans include sound plant health care practices and focus on reducing pest establishment, reproduction, dispersal and survival. Cultural Management Plans can be utilized to ensure a consistent service level is maintained and standards for a particular site are met.

ACTION	DESCRIPTION	DEPARTMENT	TIMEFRAME	COSTS
11. Prioritize natural areas for development and implementation of site specific weed management plans	a) At present, weed infestations within natural areas in the City of Leduc are a common occurrence, (including Noxious and Prohibited weeds). Site specific weed management plans should be developed.	Public Services, Enforcement Services	Short Term < 2 years	Increase budget line by ~\$30,000 by 2019 (incremental increase to budget to ensure we have the resources to continue to grow)
12. Develop a Turf Management Policy	a) Create a formal Turf Management Policy that outlines the series of minimum actions required for each classification (i.e. mowing, fertilization aeration and inspection frequencies) to ensure preventative and cultural controls are consistently used.	Public Services	Short Term <2 years	\$0 – existing resources

13. Develop a Reserve Fund for Forest Pest Outbreaks and Other Risks	<p>a) Develop a reserve fund for any potential pest/disease outbreaks (i.e. emerald ash borer or dutch elm disease). The reserve fund could also be used for potential climate and weather related risks to forests.</p> <ul style="list-style-type: none"> • There are currently plans in place to request funding from Council. 	Public Services	Medium Term >5 years	Up to \$500,000
14. Implement the 2010 Forest Management Plan	<p>a) Implement the recommendations in the 2010 Forest Management Plan, including prioritizing tree stands for regular monitoring/inspections. Sanitation measures and public education should also be considered.</p> <ul style="list-style-type: none"> • The forest inventory was last updated in 2012, and in 2017. <p>b) Continue working with the Canadian Food Inspection Agency and the City of Edmonton to monitor for DED and Emerald Ash Borer.</p> <p>c) Going forward contractors in new developments are to provide information on the tree inventory including GIS coordinates etc. prior to FAC.</p>	Public Services	Medium Term 2–5 years	Already in budget – plans to increase budget from \$185,000 to \$300,000 incrementally
15. Develop an Aquatic Site Management Plan	<p>a) Classify aquatic sites and prioritize for maintenance and monitoring (i.e. recreational areas, aesthetics, safety/pond function). The management plan should include watershed management controls (i.e. fertilizer restrictions, winter road maintenance/salt application).</p>	Public Services	Medium Term 2-5 years	\$30,000 – contractor services
16. Enhance Mosquito Management Plan	<p>a) Continue collaborating with the City of Edmonton to monitor populations, and continue garlic spray in high use areas.</p> <p>b) Classify sites for the required level of mosquito control; hire summer students to encourage people to reduce standing water on their property and to spray natural controls like garlic spray and pilot drops of olive/vegetable oil in stormponds.</p> <p>Re-evaluate management if control objective ever changes from nuisance control to disease control.</p>	Public Services	Long Term >5 years	\$48,000 (3 summer students at \$16,000 each)

17. Vertebrate Management	a) Continue to use a contractor contact through Public Services for vertebrate pest control.	Public Services, Enforcement Services	Short Term <2 years	\$0 - Contracted services are within an existing budget
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Table 4. Public Education and Involvement

Public education is required to ensure IPM practices on public land are supported and to encourage IPM practices on private land.

ACTION	DESCRIPTION	DEPARTMENT	TIMEFRAME	COSTS
18. Create an IPM education campaign for the public	a) Develop an education campaign with a focus on educating the public on the risk of invasive species, weed ID, public responsibility and alternative controls, and understanding the benefits of naturalized areas: <ul style="list-style-type: none"> • Update the City’s website with more information – Public Services is currently working with Communications to provide more information on tree pests. Public Services currently hands out door knockers to houses with tree pests and provide residents with notification that trees are being removed. • Enforcement Services is working with Communications to provide more information on noxious and prohibited noxious weeds to the public. • Enforcement Services intends to hand out pamphlets on weed control with weed notices and at community booths. 	Public Services, Enforcement Services, Engineering, Communications	Short Term <2 years	\$10,000 (for public and retailers) – for materials and products and internal communication staff time to assist (in Environmental budget)
19. Provide Information at Greenhouses and Stores where Herbicides and Pesticides are available	a) Engage stores to pledge to not sell invasive species or weeds; ask stores to provide “Grow Me Instead” booklets and information on natural pest controls. <ul style="list-style-type: none"> • Enforcement Services is going to talk to major retailers about not selling invasive species and will provide them with education material. 	Enforcement Services	Short Term <2 years	\$0 – costs included in public education cost estimate above

	b) In the future the City should also work with major retailers to sell only pesticide free plant products.			
20. Develop opportunities for Citizens to get involved	a) Create opportunities for citizen science (i.e. to record tree pest alerts, weeds and vertebrate pests). This could be incorporated into the “SeeClickFix” citizen engagement tool. b) Host more volunteer weed pull events.	Public Services, Enforcement Services, Engineering, Communications	Medium Term 2-5 years	\$0 – refer to public education cost estimate above
21. Continue to work in partnership with Communities in Bloom and the Leduc Environmental Advisory Board	a) Continue to work with community members on associated environmental initiatives	Engineering	Short Term <2 years	\$0 – existing resources

Table 5. Public Notification

Upon request, community residents should be able receive a 24-hour pre-notification on pesticide applications. Visible warning signs should be posted at the spraying sites after notification is given to concerned citizens.

ACTION	DESCRIPTION	DEPARTMENT	TIMEFRAME	COSTS
22. Advertise the Pesticide Spraying Notification Sign Up System	a) The City has already developed a notification system but it requires advertising and updating for public use. b) The City should consider annual newspaper postings. c) Send letters to schools and daycares.	Public Services, Communications, Engineering	Long Term >5 years	Weed Inspector or Seasonal IPM staff member?
23. Use consistent, informative and visible pre- and post-application signage	a) Implement readily visible pre and post application signage that can be consistently used, whether the site is being sprayed by contractors or the City, and which can be posted primarily by City staff to reduce costs. • Public Services will inquire with the weed control contractor about posting signage consistent with City signage and 24 hours in advance to spraying.	Public Services	Short Term <2 years	\$2,000 – for contractor posting of consistent City signage

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Appendix A – A Summary of the Updates to the City of Leduc Integrated Pest Management Plan and Impacts to Developers

Appendix B – Example of Post Notification Signage

1.0 INTRODUCTON

The City of Leduc 2012 *Municipal Development Plan* states that the City will conserve and protect natural areas by “adopting clear guidelines for pesticide application, reducing pesticide use, and implementing new and innovative integrated pest management methods.” In 2012, the City of Leduc completed Phase I of its *Environmental Plan*, which put forth a ten-year vision for a healthy and clean environment. The 2021 Land Vision, states “Leduc has protected its vital and ecologically important land resources” and “the land resources in Leduc also offer people that live within the community opportunities to recreate and experience nature.” The Environmental Plan identifies two key actions that support the land vision:

1. “The City of Leduc will review the potential for adopting more stringent local pesticide management policies”
2. “The City of Leduc will develop a pesticides report that is consistent with integrated pest management principles, and will consider if a full pesticide ban for municipal operations is warranted”

Integrated pest management (IPM) is an effective and environmentally sensitive decision-making model used to prevent and manage pest problems. As such, a variety of preventative and non-chemical pest management strategies are used or considered before using the least toxic, approved pesticide. It is not a single pest control method, but, rather a series of pest management evaluations, decisions and controls. A good IPM Plan uses proactive strategies for pest prevention and relies less on reactive measures for pest control.

IPM policies and procedures apply to all City departments, developers and contractors, who directly or indirectly manage pests, design, renovate or construct landscapes and facilities. Although generally costlier to set up initially, IPM strategies save money in the long run, avoiding the need for extensive maintenance, and/or re-landscaping and re-planting.

IPM is particularly important with an increasing land inventory, the increase in development and disturbed areas, as well as changing climate regimes, such as increased drought conditions, which may facilitate future pest management problems if not addressed.

1.1 BACKGROUND

In 2003, the city of Leduc adopted an IPM plan from other municipalities in Alberta, which provided only a broad overview of how the prevention and management of pests is approached by the City. A lack of well-defined decision-making guidelines for management actions required under IPM programs has been cited as a major weakness of urban IPM implementation (North Carolina State University, 1997). The range of potential pests and pest management problems specific to Leduc is extensive and consequently input from City staff is necessary to develop action priorities that will enhance the operation, planning and technical results of a Leduc Specific IPM program.

1.2 METHODOLOGY

To implement a successful IPM program City staff, residents, developers/contractors, administration and Council need to have a clear understanding of the management goals and guidelines involved. To create a plan with updated policies and procedures specific to Leduc the following tasks were conducted, starting in 2015:

- Review the existing 2003 IPM Plan
- Identify pest problems specific to Leduc and areas for improvement through staff interviews with:
 - The City of Leduc Manager of Parks and Open Spaces
 - The City of Leduc 2015 Weed Inspector
- Research IPM practices used in other municipalities for comparison,
- Compile a report to set the general direction and recommendations for future IPM policies and procedures,
- Host meetings with Public Services staff and Enforcement Services to review report and recommendations; and
- Consult the Leduc Environmental Advisory Board (LEAB) and the Urban Development Institute (UDI) for feedback.

2.0 AREAS FOR IMPROVEMENT

In 2015, information about the City of Leduc’s current pest management concerns on public and private land was gathered through staff interviews with the City of Leduc Manager of Parks and Open Spaces, and the City of Leduc Weed Inspector.

Through the staff interviews it was evident that the City of Leduc utilizes a variety of management strategies within their operational units that are fundamentally IPM based, however, there is a need to formalize Leduc specific policies and procedures that ensure consistent pest prevention and control measures are implemented.

The following areas for improvement were highlighted and will be subsequently reviewed in detail throughout the remainder of the report:

- **2.1 Fundamental IPM Procedures** – Developing formal IPM procedures will help staff identify pest problems, decide if treatments are necessary, determine the best timing of treatments, and evaluate their effectiveness.
- **2.2 Pest Prevention** – Preventing pests through the design and construction of facilities and landscapes, and early weed detection, is an essential component of IPM.
- **2.3 Comprehensive Cultural Management** - Cultural management plans include sound plant health care practices to maintain a healthy host and can be utilized to ensure a consistent service level is maintained and standards for a particular site are met.
- **2.4 Public Education** - Public education will assist in establishing consistent messages about pest control in the City and will inspire IPM practices on private land.
- **2.5 Public Notification** – Public notification is important so that concerned residents can stay informed about pesticide spraying going on in the City.

2.1 FUNDAMENTAL IPM PROCEDURES

Integrated Pest Management is information intensive and relies on informed and systematic decision making for pest control, much like an environmental management system.

Formal procedures will ensure that the appropriate checks and balances have been considered by pesticide applicator license holders prior to pesticide control activities. Formal procedures will help

foster dialogue and cooperation among impacted departments and establish the most effective IPM approach.

The following areas are suggested for the development of fundamental IPM procedures:

- Monitoring
- Control
- Reporting

2.1.1 MONITORING PROCEDURES

Successful IPM programs routinely monitor:

- Pest populations
- Areas vulnerable to pests; and
- The efficacy of prevention and control methods.

Monitoring is a systematic approach which includes identifying the pest population, estimating the damage and recording this information for each site. Monitoring allows for proper pest identification which is essential as most treatments must be tailored to a particular species or type of pest, and more often than not plant damage is actually caused by environmental conditions such as drought, overwatering, sunscald, frost or wind burn. It is also important to recognize and identify pests correctly to avoid eliminating beneficial species.

Monitoring can be used to make the most informed decision about whether control is required and the type of control that will be the most effective. Prior to the start of a pesticide application project or a non-pesticide control project, the inspector should record the date, time, weather information, pest identification, pest host and location, pest impact, percentage of infestation and level of damage to establish the type of control methods and equipment required.

After control is implemented post monitoring should take place and be recorded to evaluate the effectiveness of the control.

Spot checking is another method of monitoring which involves a less formal approach of inspecting known and new pest locations and populations. With the spot checking method, the pest damage observations should also be recorded.

The frequency of inspections may vary and should be specified for different site sensitivities or classifications.

Short Term Action: Public Services should develop formal and standardized monitoring forms for pest management; the City already has a monitoring matrix for Elm Scale that could serve as a template for monitoring other pests in the City.

2.1.2 CONTROL PROCEDURES

Setting an action threshold is critical to guiding pest control decisions. The action threshold for control will depend on the maintenance at a particular site and the consequences of leaving the pest untreated. Factors that should be evaluated in this determination include:

- Safety and security,

- Damage to structures,
- Aesthetics of the site; and
- Invasive species and habitat protection.

Choosing the type of control method used should be based on effectiveness, environmental impact, site characteristics, worker and public health and safety, economics and other applicable considerations.

Pests can be managed by a combination of control methods including:

- Cultural (anything that produces healthy hosts and prevents pest problems)
- Physical/mechanical
- Biological
- Microbial/Chemical pesticides

An initial consideration under IPM management should always look at the non-pesticide control methods available. If none of the non-pesticide control options provide effective treatment consideration should be given using them in conjunction with a limited use of pesticides. When pesticides use is determined to be the only remaining option a spot treatment should be utilized over broadcast spraying and a reduced application rate should be tested.

Short Term Action: Public Services should record all information pertaining to pest control treatments for future reference and evaluation, as well as set site specific action thresholds. The City currently tracks when and where watering and pruning etc. occur in the City.

2.1.3 REPORTING PROCEDURES

An important part of IPM is reporting accurate information in a systematic, orderly fashion. Pre-monitoring and post-monitoring forms, spot-checking monitoring forms, daily pesticide application records and non-pesticide control forms should be considered for recording decisive information related to the IPM process.

All of this recorded information will constitute the permanent record of pest problems and methods of control employed in the City of Leduc. Keeping records will provide baseline information to track the re-establishment of any pests and predict where new pests may emerge. Comparing data over time will provide information on pest management trends and help the city gauge the effectiveness of its program.

In addition, reporting this information will help meet the necessary regulatory requirements to report quantity and types of pesticides used, as well as evaluate increases or decreases in pesticide use over time.

Short Term Action: Documenting the use of alternative control methods will allow the City to show the public that the City is making efforts to find alternatives to pesticides where feasible and will also provide data that can be quantified for staffing and budgeting purposes. In 2017, Public Services awarded tender for a database/mapping inventory system in City Works to track pests and IPM activities in the City.

Short Term Action: The City of Leduc currently relies heavily on contractors for pest control. The City monitors what they do, what sites they visit and the amount of pesticides they have used, and relies on the contractor to make best practice recommendations. Public Services should also consider:

- **Have weed control contractors provide maps of the areas they are spraying.**
- **Where the need for control is identified provide contractors with a map of the location.**
- **Have asset management/GIS create maps with a unique weed control layer**

❖ **What are other municipalities doing?**

The City of Red Deer has developed formal and standardized pre-monitoring and post-monitoring forms, spot-checking monitoring forms, daily pesticide application records and non-pesticide control forms. IPM activities are tracked and recorded in an Ecological Management System (EMS) which is a database/mapping inventory system. To facilitate the flow of IPM asset information and data from the field to Parks GIS, small handheld electronic devices with GPS and GIS capabilities will be employed to field staff. Data is analyzed and operations are implemented to effectively reduce unwanted pest activity (The City of Red Deer, 2012).

The City of Edmonton has formed an Integrated Vegetation Management Team (IVMT). The IVMT is a part of the Neighbourhood, Parks and Community Recreation Branch which operates under an ISO 14001 certified Environmental Management System called “ENVISO.” The IVMT completes monitoring and inspections at known locations of smaller infestations of prohibited noxious and noxious weeds and selected ravines with current and/or historical weed infestation. The purpose is to detect new infestations as early as possible, before they get out of hand. The IVMT will spearhead the establishment of more IPM practices throughout all City of Edmonton operational teams, such as the Horticulture team, Sports Fields team and Turf team. The City of Edmonton has 45 council-directed herbicide free sites, where weed numbers are monitored (The City of Edmonton, 2013).

2.2 PEST PREVENTION

Preventing pests through the design and construction of facilities and landscapes is an essential component of IPM and developing cost-effective maintenance regimes. Pests can easily take up residence in areas that are not landscaped appropriately or areas with inappropriate plant materials.

The *City of Leduc 2010 Minimum Landscape Design and Construction Standards* (the *Standards*) were reviewed and found to contain many aspects of IPM, such as specifications for adequate topsoil depth, tree planting requirements, and species selection guidelines which all contribute to preventative pest management. The *Standards* serve as a principal tool for incorporating preventative pest control measures; however, without sufficient enforcement, deficiencies may be missed, leaving sites vulnerable to future pest problems. Evidence of poor landscape design may not be apparent until well after a project is completed and signed off. Once a site has become the City’s responsibility these underlying issues can result in expensive maintenance and restoration requirements of the City in order to maintain the site.

The City of Leduc is expanding quickly and with more land to take care of, the need to enforce the *Standards* and minimize long-term maintenance requirements is higher than ever. Increased development within the City has resulted in an increase of disturbed soil areas susceptible to weed infestation, as well an increase in introduced soils and potential weed seeds. When these areas are not controlled they become unsightly and contribute to the noxious and nuisance weed problem on surrounding private and public landscapes.

The large quantities of new trees and other plant materials used in new communities may also pose a risk, as appropriate site preparation and plant selection are the most important factors in preventing vulnerabilities to pests.

In order to improve the enforcement of preventative IPM control measures the following areas for improvement are suggested:

- Integrate IPM knowledge across departments
- Enhance the frequency of landscape design and weed control inspections
- Develop tools to discourage developer/contractor offences
- Require Clean Certified Stock

Each of the suggested action items is provided in more detail below.

2.2.1 INTEGRATE IPM KNOWLEDGE ACROSS DEPARTMENTS

For IPM to work, effective communication and operational planning among all impacted City departments is required.

Sufficient enforcement of the *Standards* requires a comprehensive understanding of IPM considerations across all City departments involved in the approval process. IPM goals and guidelines associated with the configuration and placement of landscape features, design details, construction specifications, and good construction practices should be readily available to promote understanding and a consistent approach to implementing IPM across departments. Landscape design and construction deficiencies may be missed if enforcing departments are not aware of IPM considerations.

It is particularly important that the departments inspecting new developments, and issuing Construction Completion Certificates (CCC) and the Final Acceptance Certificates (FAC) are knowledgeable in IPM landscape design and construction practices. The FAC certificate releases any further guarantee or maintenance responsibilities by the developer for the local improvements specified in the certificate, therefore, any issues that arise in the future become the City's responsibility.

Medium Term Action: Internal training programs to integrate IPM into decision making should be considered. Training sessions could be provided broadly at an introductory level, and followed by specific training to address the nature of work unique to each department. Interdepartmental information sharing will ensure that the implications of IPM practices in each department are acknowledged. The City may want to consider bringing in an IPM specialist who can host a workshop for each department on information, usefulness and standards of IPM.

In 2017 the City of Leduc hosted two workshops for professionals from several municipalities in the Capital Region; the group plans to meet biannually in the spring and fall.

❖ What are other municipalities doing?

The City of Calgary has acknowledged that training all departments involved with pest management will promote understanding and a consistent approach to implementing IPM. Calgary Parks and Recreation staff will train first, followed by staff from other departments during the second and third years of their IPM Plan implementation. Initial estimates of developing a training manual and training staff are approximately \$5,000 per year, over a five-year period (The City of Calgary, 2015).

Additional education is provided as needed to Okotoks Town staff, committees and council to help in decision-making about IPM strategies and implementation plans. Okotoks' IPM Plan recommends establishing regional cooperation and continued participation in external educational training programs for Town employees, developers, and private contractors involved with various aspects of pest management (Town of Okotoks, 2008).

In addition, to carrying out operational weed and pest duties, part of the roles of the City of Red Deer Weed Inspector and Pest Inspector is to interact with Parks staff and the public to provide education and awareness about IPM and community participation (The City of Red Deer, 2012).

2.2.2 UPDATE THE MINIMUM LANDSCAPE DESIGN AND CONSTRUCTION STANDARDS

Short Term/Ongoing Action: The City of Leduc 2010 *Minimum Landscape Design and Construction Standards* are currently under review by Public Services. The *Standards* will be updated to align with the latest Canadian Landscape Standard and should consider including requirements for the following:

- **require clean certified stock**
- **require natural plant species in new development and on city owned property**
- **require a diverse selection of plant material**

Native plants are ideal because they are uniquely suited to growing in their native climate and soil types. Native plants are typically armed with natural resistances to Albertan pests and disease. Native plants also likely co-evolved with beneficial species, like native pollinators.

Planting a diverse inventory of plants in one area, rather than planting a monoculture will help protect against vulnerabilities to pest.

2.2.3 ENHANCE THE PROCESS FOR LANDSCAPE DESIGN AND WEED CONTROL INSPECTION

Regular inspections will reduce the potential for weed propagation and inappropriate site preparation and plant selection. Regular weed control and landscape design inspections during construction will assist in ensuring adherence to the approved *Standards*.

The City of Leduc 2010 *Minimum Landscape Design and Construction Standards* require that "all areas be kept free from weeds from construction commencement until issuance of the Final Acceptance Certificate (FAC)." Currently the weed inspector is responding to neglected properties on a complaint basis. There is a need to complete regular inspections and follow ups, and actively seek out negligent properties.

Regular inspections will also aid in reducing the occurrence of landscape design and construction deficiencies that may otherwise result in costly maintenance or restoration activities after the site becomes City responsibility. The *Standards* for Tree and Shrub Planting, for example, require contractors to remove 1/3 of the wire basket and burlap from the top of the root-ball. If the wire basket and burlap are not properly removed this may adversely affect the trees ability to root. The FAC required monitoring period for developers is approximately 2 years, however, trees can typically live 3-5 years before symptoms of tree decline from improper planting occur. Trees that are improperly planted may not show adverse symptoms until after becoming the City's responsibility if the deficiency is not identified through regular inspections at the time of planting. This can become an extremely expensive issue if the same developer has planted a number of trees improperly throughout a new community or boulevard.

Medium Term Action: Landscape and weed control inspections by Public Services and Enforcement Services should be completed at all phases of landscape design and construction, and during any other ground disturbance activities to ensure IPM strategies and the *Standards* are adhered to. In addition, landscape inspections should be conducted through a multi-team approach to improve knowledge sharing and identification of deficiencies. Although it is evident that completing regular inspections will require more time allocation from staff, the benefits will likely outweigh the costly maintenance and restoration requirements that the City may otherwise incur.

❖ **What are other municipalities doing?**

The Township of Scugog, Ontario has an inspector that is accredited and appointed by the Council of the Corporation of Scugog as a Municipal Law Enforcement Officer for the purposes of their Integrated Pest Management and Plant Health Care Policy Bylaw (The Township of Scugog, 2005).

The City of Kamloops in B.C. employs a Planning Landscape Inspector, to conduct periodic inspections and be sure that contractor/developer work conducted on City owned property is being undertaken as per the landscape *Standards* (The City of Kamloops, 2007).

The City of Edmonton employs a Landscape Architect. The Landscape Architect's responsibilities include coordinating inspections, undertaking site monitoring during construction, and issuance of Landscape Construction Completion Certificates and Final Acceptance Certificates (The City of Edmonton, 2015a).

In addition, the City of Edmonton IVMT completes monitoring and inspections at known locations of smaller infestations of prohibited noxious and noxious weeds and selected ravines with current and/or historical weed infestation. The purpose is to detect new infestations as early as possible, before they get out of hand.

2.2.4 DEVELOP TOOLS TO ENCOURAGE DEVELOPERS/CONTRACTORS TO IMPLEMENT WEED CONTROL AND IPM PRACTICES

The *Weed Control Act* is a provincial Act intended to protect land from the invasion and establishment of weeds, and powers of enforcement have been delegated to the local municipality. When weeds are identified on a residential or commercial property by the Weed Inspector a *Weed Control Act* Inspector Notice is served and the offender has three days to comply. If the notice can not be served to the home owner or resident of the property over 18 years of age the notice will be posted on the property and a copy will be sent to the last known property owner by mail, with 10 days to comply. If the property is not compliant within the 3/10 day period, the Weed Inspector will post a Notice to Entry under the *Weed Control Act* on the property before calling in a contractor to clean up the property. A person who contravenes the *Weed Control Act* is guilty of an offence and liable to a total fine of not more than \$5,000 or, in the case of failure to comply with a Minister's notice, a fine of not more than \$1,000 for each day the offence continues.

In the City of Leduc Enforcement Services typically issues a ticket for charges under the *Community Standards Bylaw* S. 9(2) e Long Grass and Weeds rather than the *Weed Control Act*; charges under the *Weed Control Act* are typically reserved for severe or abnormal situations. The City of Leduc *Community Standards Bylaw*, states "(1) A person shall not cause or permit a nuisance to exist on land they Own or Occupy. (2) For the purpose of greater certainty a nuisance, in respect of land, means land that shows signs of a serious disregard for general maintenance and upkeep, whether or not it is detrimental to the

surrounding area, some examples which include: (e) grass or weeds higher than 10 centimeters.” A person guilty of an offence under the *Community Standards Bylaw* is liable to a fine up to \$10,000 and imprisonment for up to 6 months for non-payment of the fine.

The City of Leduc 2015 Weed Inspector reported that new developments routinely change hands in order to avoid the timeline from construction start to remove the weeds. Regular site inspections and follow up may help enforce notices under the *Weed Control Act* and offences under the *Community Standards Bylaw*, but there is also a need to educate developers and contractors on the cost of allowing invasive species and pests to propagate on their sites during the construction phase. Above and beyond the fines, invasive species are a threat to biodiversity and species native to the area.

Developers should be educated to consider the type and magnitude of the disturbance they will be conducting, as well as the timing of the disturbance in relation to the potential for weed infestation. It is also important that private contractors and developers be educated to ensure that all equipment, materials and vehicles are free of weed seeds and plant parts before arriving on-site. Equipment, materials and vehicles exposed to weeds and problem plants should be cleaned prior to leaving an infested site. See Appendix A for “A Summary of the Updates to the City of Leduc Integrated Pest Management Plan and Impacts to Developers.”

Short Term Action: The City of Leduc Planning department currently sends out courtesy letters to developers about controlling debris etc. on their properties; the City should consider updating this letter within the next two years to include information on weed management as well.

Short Term Action: The Planning Department should consider requiring developers and contractors to provide Weed Management Plans through updates to the Precedent Development Agreement; this will require consultation with UDI prior to going to Council. Weed Management Plans would be beneficial in that they would require short-term and long-term weed management and control objectives in the pre-construction, construction, and post-construction phases. This may include but is not limited to, weed surveys, and mitigation measures prior to construction, during construction, and post-construction. Providing developers with a template plan is recommended for consistency.

Medium Term Action: Implementing creative sentencing may be another useful tool in combating developer and contractor weed control offences. Creative sentencing options can encompass a wide variety of penalties, and among them is the possibility of diverting penalty funds to projects that have a connection with the offence. Enforcement Services should look at diverting *Community Standards* and *Weed Act* funds to funding community weed pulls, education programs on IPM, or potentially funding more staff for IPM enforcement and training. Enforcement Services already runs a similar program with the Traffic Safety Fund.

❖ What are other municipalities doing?

The City of Edmonton has Municipal Enforcement Officers patrolling the City for noxious weeds and responding to citizen complaints. All control costs incurred by the City are added to the owner’s property bill. Costs can vary on the amount of infestation and area to be cleared but range from \$250/mow to \$5,000/mow or more (The City of Edmonton, 2015b). The City of Edmonton currently requires developers/contractors to provide maintenance logs, and is also considering requiring spray logs and a weed management plan.

The Town of Okotoks has proposed to incorporate a regular weeding program into maintenance requirements and contracts (The Town of Okotoks, 2008).

Creative sentencing is used by Alberta Environment and Parks, among other enforcement options, to ensure compliance with their environmental regulations.

2.2.5 REQUIRE CLEAN CERTIFIED STOCK

The City of Leduc 2010 *Landscape Design and Constriction Standards* state that, “Plants shall be true to type and structurally sound, well branched, healthy and vigorous and free of disease, insect infestations, insect eggs, rodent damage, sunscald and frost cracks. They shall be densely foliated when in leaf and have a healthy, well-developed fibrous root system. Pruning wounds shall show vigorous bark on all edges and all parts shall be moist and show live, green cambium tissue when cut.”

If a developer or contractor does not follow this standard substantial and expensive pest control issues may arise for the City in the future. Currently, the City of Leduc has a number of trees infected by scale as a result of contractors not providing plants free of disease; replacement of these trees or control of the scale could potentially end up costing the City over ten thousand dollars.

Clean plant certified nurseries produce plants that meet high phytosanitary standards. These plants are completely free of all regulated pests and substantially free from all other insects and disease. The nurseries provide a Clean Plants stamp with a unique Clean Plants certification number. The implementation of a clean stock certification requirement for developers and contractors will result in a functioning trace-back and trace-forward system, to ensure that provided plants are completely free of all regulated pests, and substantially free from all other insects and disease. The trace-back and trace-forward system will allow for efficient inspections of plant health.

Short Term Action: Public Services currently requires all plant materials to be clean certified stock; the 2010 Minimum Landscape Design and Construction Standards should be formally updated to require it. In addition, consideration should be given to supporting and encourage nursery suppliers in the area to take part in the certification.

❖ What are other municipalities doing?

The Town of Okotoks intends to support and encourage nursery suppliers to join forces with the Domestic Phytosanitary Certification Program. This program was developed by the Canadian nursery industry and is supported by the Canadian Food Inspection Agency promoting clean nursery stock.

2.2.6 IMPLEMENT A MULCHING BEST PRACTICE

Mulch is a great weed suppressant. Mulch prevents weed seeds from coming into contact with soil and deprives weed seeds within the soil from the light they need to germinate. In addition, mulch helps retain soil moisture and adds nutrients to the soil, as it breaks down over time.

Short Term Action: Public Services should enhance their current Mulching Best Practice, which requires the use of mulch at all new bedding sites, and prioritize existing sites for mulch addition.

In addition, Public Services should consider offering free mulch and information on preventative pest control to residents at the Eco-Station where free compost is typically offered as well. Evaluation of the success of a pilot project will inform the potential for long term integration.

❖ What are other municipalities doing?

The City of Edmonton provides residents with free woodchips for their yards at the Ambleside Eco Station.

2.3 COMPREHENSIVE CULTURAL MANAGEMENT

The IPM approach is based on using proactive, preventative and cultural strategies and relies less on reactive measures for pest control. Cultural practices are referred to as sound plant health care practices; they focus on prevention of the pest by maintaining a healthy host through proper planting, pruning, mulching, use of fertilizers and sanitation practices, for example. Cultural practices also focus on reducing pest establishment, reproduction, dispersal and survival. A lack of cultural practices, whether on public or private lands, will invite species to take up residence, propagate and disperse quickly.

To ensure a consistent service level and to ensure that maintenance standards for a particular site are met a comprehensive cultural management plan should be developed. Cultural management plans will define the minimum plant/host health care practices and the frequency required to maintain a site. The following criteria should be considered in the development of site specific action thresholds and cultural management strategies:

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

By defining the minimum actions required to maintain each site the development of cultural management plans will help mitigate the reactive process where areas with frequent complaints are using or receiving more resources for pest management than other areas.

Cultural management plans also determine the frequency of inspections required at a site. Regular inspections and information recording will provide baseline data that can be used as a tool for predicting where new pests will emerge and for tracking the re-establishment of pests.

Cultural management plans will allow for evaluation and the identification of sites and features that involve high labour and/or maintenance requirements by determining their actual maintenance costs; this may assist in identifying opportunities to modify existing high maintenance sites to reduce long-term costs. Over time cultural management plans will allow for the development of department and operational group budgets for annual IPM program implementation.

The following areas are suggested for the development of cultural management plans:

- Natural area weed management
- Turf pest and disease management
- Urban forest pest and disease management

- Aquatic pest and disease management
- Mosquito control
- Vertebrate pest control

2.3.1 NATURAL AREA WEED MANAGEMENT

At present, weed infestations within natural areas in the City of Leduc are a common occurrence, including the presence of several Noxious and Prohibited Noxious weed species, as identified under the Provincial *Weed Control Act*. Without proper management, these infestations can spread to where they are currently absent or only present in low abundances, and can seriously jeopardize biodiversity in natural areas. For example, Common tansy, a Noxious weed that is pervasive throughout the City, aggressively spreads via rhizomes and a single plant can produce approximately 50,000 seeds that are disbursed by wind, water, livestock and pets (Fiera Biological Consulting, 2017).

There is a need to develop and employ site-specific natural area weed management plans in areas where weed management is an issue. These plans will ensure that areas of highest concern are targeted, and that the methods used to remove weedy species are appropriate and reflective of the ecological sensitivity of the site. For example, weeds within natural areas that contain wetlands or other aquatic habitats should not be controlled with spraying, but instead should use methods such as hand pulling, clipping of seed heads, mowing, or biological control. Weed management plans should cover aspects of prevention, early identification and eradication, containment and control, and monitoring and evaluation.

The City's Draft Environmentally Significant Areas Study (Fiera Biological Consulting, 2017), identified Noxious and/or Prohibited Noxious weeds at the following natural areas:

- Telford Lake – Weeds are moderately abundant throughout; this includes two detections of Purple loosestrife, a Prohibited Noxious weed, which was observed along the northern shore of the lake. In addition, Common tansy, a provincially designated Noxious weed, is also prevalent along the northeast shoreline, and at the west end of the lake. **Priority – HIGH**
- Melcor lands located in E 25-49-25-4 – Weeds are abundant throughout this area, including Purple Loosestrife, a Prohibited Noxious weed. In addition, the noxious invasive weed Canada thistle was abundant within many of the wetlands in the ESA. **Priority – HIGH**
- Deer Creek – Weed management is an issue in some locations of Deer Creek . Of particular concern is Common tansy, a provincially designated Noxious weed that dominates some areas of Deer Creek ESA. **Priority – MEDIUM**
- Tree stand located in NW 19-49-24-4 – This area has a very low disturbance of weeds relative to other natural areas in the City; however, Common tansy and Canada thistle was abundant along the outer edges of the tree stand. Active weed management will be required to prevent the spread of these weeds into the tree stand. **Priority – LOW**
- Wetland complex located in Section 30-49-24-4 – Weeds are moderately abundant throughout this area. Common tansy was observed in high concentrations along the edge. **Priority – MEDIUM**

- Whitemud Creek Tributary –During a field assessment in 2013 by Bruce Thompson and Associates the report notes “significant weeds”, however, a list of the weeds observed was not provided. **Priority – MEDIUM**
- Tree stand located less than 100 m from the north shore of Telford Lake – Common tansy, a Noxious invasive weed, was abundant throughout the tree stand. **Priority – MEDIUM**
- Tree stand located at the east end of Telford Lake, within 60 m of the north shore of the Lake – Common tansy, a Noxious weed, is abundant throughout this area. **Priority – MEDIUM**
- Tree stand located in SW 19-49-24-4 – Weed abundance is very low compared to other areas in the City; however, nearby residential development has resulted in localized patches of noxious weeds and controlling the spread of these weeds is critical to ensure the ecological condition of this area is maintained. **Priority – LOW**
- Tree Stand located in SW 23-49-25-4 – Land access was not granted for this ESA; therefore, no field assessment was conducted in 2016. However, given that weed management is generally an issue in the city, it should be noted that any noxious or prohibited weeds within or near the ESA should be controlled to ensure the overall condition of the tree stand is not degraded. **Priority – LOW**

Short Term Action: Public Services and Enforcement Services should develop and employ site-specific natural area weed management plans in the City’s natural areas to control prohibited noxious and noxious weeds as per the *Weed Control Act*; this may require using contractor services for implementation. Incremental increases to budget over time are required to ensure we have the resources as we continue to grow.

2.3.2 TURF PEST AND DISEASE MANAGEMENT

Turf includes all sports fields, fine ornamental lawns, general park areas, boulevards, meadows, picnic areas and rough grass areas. Developing a City of Leduc Turf Management Policy would facilitate the implementation of a comprehensive cultural management plan for turf. The goal of the policy would be to have green spaces throughout the community inspected on a regular basis and provided with timely maintenance that is appropriate to the use and function of the green space.

A turf policy would require that the City of Leduc classify turf sites into varying levels of required service/maintenance. The required level of service depends on the cost of controls and the value of the plant or the aesthetic values that would be lost if not treated. In parks other than public facilities, the need for controls 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 specified service levels.

It is recommended that at least three levels of classification be developed for turf to ensure the varying levels of required service/maintenance are adhered to and to focus the activities of the IPM program to minimize pesticide applications and reduce long-term maintenance costs. The following is an example of a Turf Management Policy site classification and series of minimum actions:

Classification	Facility Category	Turf Maintenance	Inspections	Example Sites
A	High Profile Display – Athletic Fields and City Buildings	Premium level of service – cut once per week, aeration once per year, top dressing and over seeding as required. Grass cut to standing height of 3”	Visual daily inspection and full written inspection is done monthly	Lede Park and Elks Park athletic fields and the Civic Center
B	Premium Parks and Playgrounds	High to moderate level of service – cut twice per month, aeration done once every 2 nd year, top dressing and over seeding as required. Grass cut to standing height of 3”	Visual weekly inspection and full written inspection is done monthly	Fred Johns and Alexandra Park
C	Open Spaces and Native Areas	Moderate to low level of service – cut twice per season	Visual inspections twice per growing season; during flowering and seeding. Full written inspection done annually	Kailey Park

Further classification may be used to include roadways and City owned empty lots etc.

Short Term Action: Public Services should create a Turf Management Policy that classifies turf sites into varying levels of required service/maintenance. The Turf Management Policy should be reviewed annually to confirm maintenance levels are appropriate for the use and the function of the site.

❖ **What are other municipalities doing?**

Other municipalities such as the City of Edmonton and Crowsnest Pass in Alberta, and Kenora in Ontario, have developed Turf Maintenance Service Levels, a Turf Management Policy, and a Turf Maintenance Policy, respectively. The municipality of Kenora identifies the turf maintenance regime including mowing, aeration, and top dressing frequency, whipping, litter control, and the frequency of inspections for each classification of site.

The Town of Okotoks in Alberta has developed an *Open Spaces Management Park Maintenance Classifications (2000)* document. Examples of acceptable weed levels are found in the *Outdoor Facilities Master Plan for Sports Fields (2006)* and the *Great Plains Turf Grass Manual for High and Medium Profile Areas (1997)*. The plan and manual identify their high profile parks, priority sports fields and high profile boulevards/medians which receive the highest standards of pest control. Their thresholds for weeds vary from 5% in high profile parks and boulevards to 15% on roadsides and natural areas (The Town of Okotoks, 2008).

2.3.3 URBAN FOREST PEST AND DISEASE ASSESSMENT AND CONTROL MEASURES

Urban forest includes all gardens, horticultural displays and borders, City boulevards and medians, general park and playground areas, nature parks, trails and other natural areas. Pests and disease in the urban forest may be less visible to the public eye, but protecting the urban forest asset from this damage is a key component in urban forestry risk management, and IPM. As trees have a long lifespan and add significant aesthetic and financial value to a community, protecting these assets is of utmost importance. The goal of an urban forest cultural management plan would be to have urban forests throughout the community prioritized, inspected on a regular basis, and provided with timely maintenance to reduce the potential for pest establishment.

An example of a serious threat to the urban forestry inventory is the Emerald Ash Borer (*Agilus planipennis*). Since the arrival of Emerald Ash Borer in North America from Asia, it has killed tens of millions of ash trees and continues to spread into new areas, with considerable economic and ecological impacts. As a result, all the Ash trees in 14 northeastern United States are already dead, and trees in southern Ontario are infested. Urban foresters in Alberta cities and municipalities believe that this beetle's arrival is inevitable; just one improperly checked nursery shipment or load of infested firewood is all it would take. Ash trees are commonly found in City streets, woodlots, windbreaks and forest crops across southern Canada. In many areas of western Canada, ash trees are one of the few suitable trees for planting in urban areas (Government of Canada, 2016). In Leduc, 80% of boulevard trees are Ash trees.

Another example of a serious threat to urban forestry inventory is Dutch Elm Disease (DED). DED is a deadly disease caused by a fungus (*Ophiostoma ulmi*) that can affect any elm tree. Since its introduction from Europe it has destroyed millions of American elm trees across North America. Although Alberta is still disease free the beetles which carry the disease have been found in Edmonton and St. Alberta (since 1995), Calgary (since 1994), and Vauxhall (since 1996). On average, DED arrives three to seven years after the first detection of elm bark beetles (The City of Edmonton, 2015d).

Although preventative treatment is not 100% effective and the up-front costs may be high, it is estimated that the economic benefits of slowing the introduction of wood boring insect pests will accumulate a net benefit; It is estimated that a net benefit of \$11.7 billion will be accumulated in the United States by taking preventative measures, taking into account benefits minus costs through 2050 (Ecological Society of America, 2014).

The threat and potential economic and environmental impacts of invasive species requires vigilance on behalf of a municipality and its citizens. In preparation the City of Leduc should continue to develop, prepare and enhance its response to any potential incursion. To prevent the establishment of an invasive pest or disease in the urban forest the City of Leduc needs to focus on implementing a cultural management plan for urban forestry which includes the following preventative measures:

- **Sanitation**

The prevention of invasive pests starts by keeping trees healthy. It is important to regularly prune all dead wood that may provide beetle or pest habitat. Pre-cautions should be taken when pruning healthy trees; it is particularly important that elm trees be pruned during the winter season when the beetles, which are attracted to fresh tree wounds, are not active.

Clean plant certified nurseries produce plants that meet high phytosanitary standards. Enforcing the use of clean plant certified stock in new developments will result in a functioning trace-back and trace-forward system, to ensure that plants in new developments are completely free of all regulated pests, and substantially free from all other insects and disease.

The International Phytosanitary Standard ISPM No. 15 (ISPM15) implementation requires that all wood packaging materials of greater than 6 millimeters thickness shipped between 70 signatory countries be debarked and then heated or fumigated with methyl bromide. It is likely that the current bilateral agreement to allow non-ISPM 15 stamped wood packaging to flow between US and Canada will be coming to an end in the near future (Ecological Society of America, 2014). A requirement for sanitation of wood products in Canada may be on the horizon.

- **Public Education**

Central to education and outreach activities is the need to provide data and information on invasive pests to the public (particularly travellers who may intentionally or unintentionally introduce invasive species), in accessible formats and through readily available portals or networks. Important educational messages associated with urban forest pest prevention may include:

- Buy and burn local firewood only,
- Learn where your firewood comes from,
- Find out if you are living in or travelling to an area regulated for an invasive species,
- Leave natural items in their natural habitats.

- **Monitoring**

It is essential to detect and identify invasive species before or immediately after they become established. Site-specific and general monitoring around critical points of entry and susceptible areas is critical. Detection and monitoring activities should include surveillance activities in areas at high risk, and the establishment of coordinated public monitoring networks to detect and report invasive pest sightings. Host trees should also be monitored for the adverse effects of extreme weather conditions which may increase their vulnerability to pests and disease. Established monitoring networks can enhance coordination and ensure rapid and effective response to new invasions and pathways of invasion.

The City of Leduc should classify urban forestry sites into varying levels of cultural management based on their risk to pests and disease. Action levels for each site classification should also be determined to identify when a particular treatment should be applied to deter pest populations from rising above the pre-determined level. A zero tolerance for high risk invasive species such as DED and Emerald Ash Borer is already established.

Medium Term Action: Public Services should implement the recommendations in the 2010 Urban Forest Management Plan to address the need for pest prevention measures including sanitation, public education and monitoring. The City's existing Urban Forest Management Plan indicates that a tree inspection cycle should be implemented and trees should be inspected at least every 5 years. The forest inventory was last updated in 2012 and 2017.

The plan should also include information on sanitation measures and public education.

The City is already working with the Canadian Food Inspection Agency and the City of Edmonton to monitor for DED and Emerald Ash Borer.

Going forward contractors in new developments are to provide information on the tree inventory including GIS coordinates etc. prior to FAC.

Medium Term Action: Public Services should develop a reserve fund that is readily available to treat trees if the establishment of an invasive pest occurs. The reserve fund could also be allocated to future weather and climate related risks including flooding, wind and drought.

❖ **What are other municipalities doing?**

The City of Edmonton developed an *Urban Forest Management Plan* in 2012, which is a ten-year strategy for sustainably managing and enhancing their urban forest. One of their short term goals includes developing strategies to reduce the impacts of natural disasters on the urban forest. Actions under this strategy include identifying risks and developing response plans to monitor for threats such as local and invasive pests and to anticipate adverse weather phenomena. Currently the City of Edmonton monitors for invasive species such as Emerald Ash Borer and Dutch Elm Disease and its vectors; the city performs an annual tree health assessment to detect early forest health issues. The City also intends to increase communication about tree pest issues such as native and exotic pests on private and public lands through accurate and up to date information on their City website, in the media, and through their *Master Naturalist Program* (The City of Edmonton, 2012).

The City of Red Deer has an educational document reminding residents “Don’t move firewood.” One of the easiest ways to control the spread of invasive species is to simply not move wood from one area to another, even if it’s just a few kilometers; You never know what might be hiding in or under the bark (The City of Red Deer, 2015).

The City of Red Deer has also developed “Tree Pest Alerts” to post on their website if an invasive species is identified (City of Red Deer, 2012).

2.3.4 AQUATIC PEST AND DISEASE CONTROL

Aquatic features include all natural lakes, watercourse and man-made structures including stormwater retention ponds. The exponential growth habits of aquatic weeds and algae during warm weather requires an early response to minimize the amount of maintenance required, costs, and the visual impact of the decaying organic matter. In addition, some aquatic invasive species are threatening to invade Alberta waters, with the potential to cause significant damage to the environment and the economy. There are 16 plants, 11 bugs or shellfish and 25 fish which are classified as banned under the province’s *Fisheries Act*.

The goal of an aquatic cultural management plan will be to have aquatic features throughout the community prioritized, inspected on a regular basis and provided with timely maintenance to reduce the potential for pest and invasive species establishment.

Aquatic features should be designed and maintained to include cattails and other native vegetation at the water’s edge to filter organic compounds, and reduce weed propagation. Keeping surrounding lawns to a minimum fertilization level will also reduce nutrient inputs. Physical modifications of in-lake elements to remove accumulated nutrients or disrupt conditions favorable for algal or cyanobacterial

growth, may include increased circulation, dilution and flushing, dredging, light limiting dyes, surface covers and mechanical removal of blooms.

How much vegetation and algae is tolerable may depend on the use of the site and the cost of treatments. A natural lake may be considered for treatment if there is a manicured beach or recreational area. In a stormwater pond vegetation must be kept from restricting water flow at the inflow and outflow structures. Where residential properties are adjacent to stormwater ponds aesthetics is a factor. The extremely high toxicity of blue-green algae is a concern in any urban water at any level.

Where the cumulative nutrient input is high, and/or where the risk to human health is high aquatic features should be prioritized for management. These sites may include water bodies within the golf course where fertilizer is used extensively, and Telford Lake, where the public actively uses the lake for recreational activities such as boating and paddling. Monitoring will ensure that these risks are identified quickly and that lake users are informed.

Alberta Health Services (AHS) issues blue-green algae advisories identified through the AHS' Routine Recreational Water Monitoring Program, or through members of the public (verified by AHS) (Alberta Health Services, 2015). The City of Leduc should consider registering Telford Lake with AHS' Routine Recreational Water Monitoring Program to protect recreational users from the risk of blue-green algae.

The discovery of goldfish in stormwater ponds and the on-going threat of a zebra mussel infestation has the Alberta government ramping up awareness of invasive aquatic species in provincial water bodies. Goldfish are becoming a problem throughout stormponds in Alberta and have been identified in St. Albert, Lacombe, Lethbridge and Fort McMurray stormwater ponds.

Crayfish may also be an emerging problem in Leduc as they have been identified in a number of stormwater ponds; however, they are more than likely a crayfish species natural to the area.

Medium Term Action: Public Services should classify aquatic sites into varying levels of required service/maintenance through an Aquatic Sites Management Plan. Detection and monitoring activities should include surveillance activities in areas at high risk, and the establishment of coordinated public monitoring networks to detect and report invasive pest sightings.

Public Services should also develop a zero tolerance policy for invasive aquatic species where there is a threat of significant damage to the environment and the economy.

❖ **What are other municipalities doing?**

Pigeon Lake is working with Alberta Environment and Parks to control blue-green algae. Watershed controls including fertilizer restrictions, enhanced stormwater treatment, riparian restoration, and agricultural best management practices are being employed. It was noted that along with these initiatives there is a need for a strong education and awareness campaign to help lower the input of nutrients to the lake. Alberta Environment and Parks and Alberta Lake Management Society Lake Watch program are working together to collect data necessary to produce a nutrient budget for the lake. Monitoring has been expanded to include weekly to bi-weekly sampling of streams within the Pigeon Lake watershed (from April to October) and weekly lake sampling (June to September) as well as additional groundwater and air monitoring samples. (Pigeon Lake, 2015).

Strathcona County implemented a stormwater pond monitoring program, which was carried out to understand trends in water quality over time and understand the impacts on receiving waters. The monitoring program consisted of sampling seven locations every month from May to October. Parameters sampled for included BOD, chloride, COD, DO, Nitrogen, TSS, TDS, turbidity, phosphorous, coliforms, TKN, and once a year herbicides and hydrocarbons. The results were recorded in a database, and the County has indicated that they will be continuing with the monitoring program in the future, to monitor for potential water quality issues (Strathcona County, 2005).

Parkland County is developing an online training tool to educate property owners near the lake edge on watershed controls.

The Sylvan Lake Watershed Stewardship Society has worked with the Alberta Real Estate Foundation to develop an information package on information specifically for lakefront and streamside properties in Alberta. The publication is called "*On the Living Edge: Your Guide for Waterfront Living*" and provides information on erosion, septic systems, building by water and purchasing tips.

2.3.5 MOSQUITO MANAGEMENT

Mosquito control through IPM addresses each of the core elements of mosquito management namely: surveillance and environmental monitoring, source reduction and other forms of water management, and public relations and education. Larvicides and adulticides should only be used as a last resort and depending on the mosquito control objectives.

Developing an IPM based program should be the gold standard for any jurisdiction considering implementing a mosquito control program; however, it takes a considerable amount of planning, lead time and financial support to achieve a truly integrated mosquito control program. Leduc must first consider whether their mosquito control objectives will be focused on disease control or discomfort control.

As of January 2004, 43 species of mosquitos have been identified as possible vectors of West Nile Virus (WNV) in North America by the US Center for Disease Control. Of these 43 species, 30 occur in Canada. Municipalities that are carrying mosquito control programs are well advised to map and deal with any breeding sites that are producing these potential vector species. *Culex* species appear to act as the main amplifying vector of WNV and have been targeted as a priority species for control in many jurisdictions across North America. Currently, the Public Health Agency of Canada holds the opinion that "the chance of being infected is low - and the percentage of those infected that develop severe health effects is even lower" (Health Canada, 2001).

The City of Leduc is conscious of the potential effects of the WNV, and is currently working with the City of Edmonton to monitor mosquito populations. Part of the purpose of monitoring mosquito populations is to determine if the types of mosquitoes present are the variety which can be carriers of this virus. Leduc currently only controls mosquitos in the larvae stage with a natural garlic spray. The garlic spray is non-toxic and is mainly used in high-use public areas. While the City understands that mosquitos can be a severe annoyance during the summer months, the potential environmental, health and economic costs of a mass spraying program are not in the best interest of Leduc at this time. The City may need to re-evaluate the need to conduct a more aggressive mosquito control program if the risk of WNV becomes a greater threat in this region.

A mosquito cultural management plan may include:

- Incorporate preventative design guidelines to eliminate potential problem areas in the design, development and construction of landscape facilities
- Renovations of poorly drained wet areas to minimize larval breeding sites
- Mowing of long grass to reducing resting sites for adult mosquitos
- Provide public education to eliminate standing water and potential breeding habitats
 - Ensure rain barrels have covers,
 - Make sure eaves troughs are unclogged and allow water to flow properly,
 - Mow long grass.

Long Term Action: Public Services should continue collaborating with the City of Edmonton to monitor mosquito populations, and continue to use garlic spray to control mosquitos in high use public areas. The City should consider classifying sites for the required level of mosquito control and re-evaluate mosquito management if the control objective changes from nuisance control to disease control.

Public Services should also consider hiring summer staff to inspect residential properties for standing water, provide resident education, and pilot natural mosquito controls like garlic spray and olive oil in standing water.

❖ What are other municipalities doing?

The City of Brandon, Manitoba has established mosquito thresholds for areas within the City. Established thresholds are primarily based on a mosquito larvae dip sample taken at the breeding sites. A larviciding program is initiated if more than 25 mosquito larvae are caught in 10 dups. Staff will document the control and monitor for results. In Brandon, adulticiding is only applied when Manitoba Health identifies a health concern. (The City of Brandon, 2015).

The Township of Langley, B.C. participates in the Metro Vancouver Regional Nuisance Mosquito Control Program. The environmentally-sensitive program is designed to reduce nuisance mosquito populations to tolerable levels by aiming to control mosquitoes at the larval stage of the mosquito life cycle. When sites meet threshold levels, specific identified surface water is treated with the environment-friendly larvicide *Bacillus thuringiensis israelensis* coated pellets. *Bacillus thuringiensis israelensis* is a bacterium found naturally in soils (The Township of Langley, 2005).

2.3.6 VERTEBRATE MANAGEMENT

Under the *Agricultural Pests Act, Pest and Nuisance Control Regulation* AR 184/2001 local authorities are delegated the responsibility and required to prevent the establishment of, or destroy animals that have been designated as “pests”. The only declared vertebrate pests are rat species and rabies diseased wildlife. Unlike “pests”, local authorities are not mandated to prevent the establishment of, or destroy and control species designated as nuisances; however, they are permitted to control nuisances at their discretion using sound husbandry practices that comply with all applicable laws.

The City of Leduc has several vertebrate nuisances including voles, badgers, coyotes, beavers, gophers and gulls. Gopher holes can be a concern on public sports fields, creating an unsafe playing surface for sports participants. Coyote management may be required by regulation if the animals are sick with rabies or exhibit an aggressive behavior towards humans. Beavers may require control if they are interfering with culverts and stormwater infrastructure and/or causing prospective flooding issues in the

event of a large runoff. Gull management may be required when they are interfering with the Edmonton International Airport flight path.

For the most part vertebrate pests are not a prevalent issue for Leduc. The City of Leduc currently uses a contractor for pest control, which is outsourced through Public Services.

Short Term Action: Public Services should continue to use a contractor for vertebrate pest control.

Medium Term Action: Public Services should also encourage the use of citizen science to track and record the number of vertebrate pests in the City. Gathering information in this manner will be relatively inexpensive and can then be used to evaluate the need for further vertebrate control resources. This may be possible through the SeeClickFix citizen engagement tool.

❖ **What are other municipalities doing?**

St. Albert manages its discretion on the prevention and control of vertebrate nuisances through the establishment of a Pest Control unit in Public Services that is educated in the recognition of nuisances on public property. The unit will take appropriate action to ensure there is a balance of natural wildlife establishment and quality of life and safety for residents (The City of St. Albert, 2011).

The City of Edmonton has a Pest Control Operator, who is specialized in the control of mosquitoes, rodents and various other insect and vertebrate pests/nuisances. The Pest Control Operator also controls aquatic weeds and other plants found in the lakes of ornamental parks (The City of Edmonton, 1990).

2.4 PUBLIC EDUCATION

There are few formal educational opportunities in Leduc that enable residents to understand the methods and principles needed to participate in IPM on civic or private landscapes. Different levels of cooperation and participation from residents will result from apparent contradictory messages received from various sources internal and external to the community. There is a need to establish consistent messaging regarding pest management in the City and educational programs that help homeowners utilize IPM principles and strategies on their own property.

Weeds and pests on private property contribute to unsightly premises, weed and pest dispersment, and public complaints. Weed infestation in ecological reserve areas is a prominent problem for the City and the source of weeds has commonly been residential or poorly maintained new developments. As residential properties contribute to a large portion of the weed populations in Leduc the lack of education and sense of responsibility surrounding pest management needs to be addressed.

Short Term Action: Public Services, Enforcement Services, Engineering and Communications should work together to create an IPM Education Campaign.

Public education in the following areas is suggested:

- **The Risk of Invasive Species** – Invasive weeds can be attractive and many people may not view them as a concern. It is important for the public to understand that invasive species have the potential to cause damage to the environment, the economy, human health and safety. Invasive species have no natural predators or pathogens to limit their population and they spread rapidly.

They have been identified as the second most significant threat to biodiversity in the world, and are threatening the survival of our native plants and thus our fish and wildlife.

- **Weed Identification** – Plants that are perfectly safe to plant in one part of the country can be an environmental or agricultural problem in another. It is important to provide educational information to the public to help them identify weeds local to their area. Identification of Noxious and Prohibited Noxious weeds, as per the *Weed Control Act*, is particularly important. Information on identifying common weed and pest problems within the City and how to control them can be advertised in the City newspaper, website and social media.

Short Term Action: Enforcement Services is currently working with Communications to add Noxious and Prohibited Noxious weeds to the website, and intends to hand out pamphlets on weed control with weed notices and at community booths.

Public Services currently hands out door knockers to houses with elm scale and black knot and notifies residents when trees are being removed from City lands in neighborhoods due to disease or pest management. In addition, Public Services is working with Communications to provide more information on tree pests on the City's website within the next two years.

- **Remove Weeds from Retailer Shelves** - It is also not uncommon that attractive Noxious and Prohibited Noxious weeds are cultivated and propagated in private gardens. Educational campaigns can be used to help residents identify weeds and select non-invasive species at garden centres for their yard. The City may also want to consider talking to local garden centers directly to help them weed out threatening invasive species from store shelves. The City of Leduc should consider certifying invasive-free retailers that can be promoted for public use.

Short Term Action: Enforcement Services should work with major retailers to remove invasive, noxious and prohibited noxious weed species from store shelves. In addition, the City should also recommend that retailers sell herbicide free plants.

- **Public Responsibility** – Weed infestations on residential properties can spread quickly into surrounding lands, including sensitive ecological reserves. It is important to instill a sense of responsibility in residents with regards to maintaining their yards. Educational campaigns may be useful to remind residents that maintaining their yard, boulevard, side yard and back alleys are all their responsibility; these areas are often neglected and therefore a prime place for weed propagation.

Short Term Action: Weed education efforts should be particularly aimed at the owners of newly built homes, as unfinished landscaping and disturbed areas are particularly vulnerable to weed growth when not adequately maintained.

- **Preventative and Cultural Weed Control Methods** – There is a need to provide information to the public on proactive cultural and preventive measures for controlling weed species. Currently when weeds are identified on private property the only thing the weed inspector is able to prescribe is

mowing down the weed or hand pulling. Weed and pest complaints need to be followed up with the appropriate communication tools to educate property owners and tenants. Information on preventative (landscape design) and cultural practices (maintenance regimes) to prevent weeds in the future, as well information on why it's important to control weeds and invasive species in general should be provided when an order to comply is issued.

Short Term Action: An education campaign advocating for “do it yourself natural controls” would also help empower residents to control weeds on their property without the use of pesticides.

- **Understanding the Benefits of Naturalized Areas** – Where minimum maintenance standards are acceptable to the public and maintenance staff, pesticide use can usually be avoided by applying alternative management practices and tolerating less managed conditions. There is a need to educate the public on what is classified as a weed, versus a nuisance, and the benefits of naturalized landscaping, to reduce the number of public complaints. Dandelions for example, are not listed by the Alberta *Weed Control Act* and so are considered a non-regulated nuisance weed; As such the City does not blanket spray for dandelions in an effort to protect the environment and reduce pesticide use and maintenance costs. Naturalized landscapes usually requires less maintenance and are less vulnerable to pest infestations.

Short Term Action: Public Services should work with Communications to provide information on the ecological advantage of naturalized areas, despite appearing less manicured, on the City website within the next two years.

- **Opportunities to get involved** – There are a number of residents who have expressed an interest in parks maintenance within their neighborhoods. Presently, there is little coordination and continuity between the City and residents in pest management. The IPM plan can be used to establish a framework to encourage and facilitate community involvement with City staff to identify and monitor new pest problems and to help establish practical and effective pest control targets and workable solutions.

Short Term Actions:

- **Enforcement Services should continue to work with residents and volunteer groups in the hand pulling of noxious weeds in environmentally sensitive areas.**
- **Public Services and Engineering should continue to collaborate with Communities in Bloom and the Leduc Environmental Advisory Board on related environmental issues.**

Medium Term Actions:

- **Public Services should consider promoting citizen science as a cost effective method of monitoring for pests. This could be incorporated into the SeeClickFix citizen engagement tool.**

❖ What are other municipalities doing?

The Edmonton Zoning Bylaw requires that residential property owners landscape any front or side yards that are visible from a public street. Having common landscaping standards that all property owners must meet helps ensure Edmonton is an appealing, safe and livable city for everyone.

Edmonton completes weed pulls with the Edmonton Naturalization Group in ecological areas such as the Garlic Mustard Pull in Mill Creek Ravine. The City of Edmonton also has a webpage dedicated to Naturalization FAQ to inform residents of the benefits of naturalized areas (The City of Edmonton, 2013).

The City of Okotoks has public education through communications and the horticulture hotline, which aim to inform residents of strategies to control pests and disease while conserving water and minimizing chemical use (The City of Okotoks, 2008).

The City of Calgary has partnered with local garden centers, and Landscape Alberta Nursery Trades Association on an innovative program aimed at eliminating threatening invasive species from store shelves (The City of Calgary, 2015a).

The County of Strathcona provides weed identification information on bus benches and the City of St. Alberta highlights “the weed of the day” in their newspaper.

The City of Red Deer provides information to their local radio and television stations for broadcast, submits various articles about mosquito control, weeds, assorted insect pests, Dutch Elm Disease etc. to the Community Services Activity and Program Guide, and carries out public involvement with local schools for Dutch Elm Disease Awareness Week (The City of Red Deer, 2012).

In addition, part of the roles of the City of Red Deer Weed Inspector and Pest Inspectors is to interact with parks staff and the public to provide education and awareness about IPM and community participation (The City of Red Deer, 2012).

2.5 PUBLIC NOTIFICATION

2.5.1 PRE-APPLICATION NOTIFICATION SIGN UP SYSTEM

The health and safety of citizens and the environment are very important to the City and so herbicide and pesticide application is done in the most responsible way possible. Residents concerned about the spraying taking place in Leduc have the option to join the Pesticide Spraying Notification Program and receive pre-notification emails of spraying taking place within the City.

The City will have to do its best to keep the notification system up to date, as spraying is heavily dependent on weather conditions. The highest level of precipitation and daily average winds are in June, July and August; these climatic factors seriously restrict pesticide application timing. This makes notification prior to pesticide applications very difficult which in turn increases manpower costs and costs to reschedule applications.

The notification emails may appear as follows:

“Herbicide applications are scheduled to take place in the following communities during the week of xxxxx.”

“Please note: When you sign up you to the registry you will receive notification of all spraying taking place in the City of Leduc. The City will do its best to keep the notification system up to date, but spraying is heavily dependent on weather conditions. The City will not be held responsible for any errors in or missed notifications. Please note it is the responsibility of the resident to update the City on any changes in the email address that notifications are being sent to.”

Medium Term Action: The Pesticide Spraying Notification Program has already been developed by the City of Leduc, but the program requires advertising to promote the sign up option. Notifications and website updates need to be coordinated with Public Services staff and sent out in the early spring prior to spraying taking place.

In addition, Public Services should consider annual newspaper postings regarding proposed spraying and provide more detail on the spray buffer around schools and playgrounds.

❖ **What are other municipalities doing?**

The City of Edmonton has a “Spray-Line” which citizens can call and get daily updates and detailed information on any current spraying activities on City lands (April – October). Spraying information is also advertised in local community newsletters and newspapers and notification letters are sent to all schools, daycares and community leagues prior to the spraying season (The City of Edmonton, 2015c).

The City of Red Deer places a yearly pesticide-use notification ad in the local newspaper to provide the public with information regarding the application of pesticides in public open spaces areas (City of Red Deer, 2012).

2.5.2 PRE AND POST-APPLICATION SIGNAGE

Before pesticide application, applicators must post warning signs. The applicator shall provide all necessary information on the sign and signs shall remain in place and be retrieved 48 hours after application.

Short Term Action: Both pre and post notification signage needs to be readily visible, understandable and not susceptible to vandalism. Public Services should consider implementing readily visible pre and post application signage that can be consistently used, whether the site is being sprayed by contractors or the City. Public Services should coordinate with the weed control contractor to see if they can post consistent City signage 24 hours in advance to spraying.

❖ **What are other municipalities doing?**

The District of North Vancouver Notification of Pesticide Use Bylaw requires all signage to be 30 cm by 45 cm in size. The sign is required to include the following information:

- the word WARNING at least 2.5 cm in height, and followed by “This area will be/has been chemically treated on or after (date).”
- the common trade name, active ingredient and concentration of the pesticide
- the date and time of the pesticide application
- the name and telephone number of the person applying the pesticide
- the words “AVOID CONTACT WITH TREATED AREAS,” and

- the words “if you require emergency medical information, the Poison Control Centre telephone numbers are xxx” (The District of North Vancouver, 1991).

The City of Calgary has several types of pesticide signage including the following:

- Community signs – large signs are posted at major roadways entering the specific community four days prior to possible herbicide application. The signs indicate when possible herbicide spraying will commence, the time frame of possible application, and the identification of yellow signs which provide additional information.
- White pesticide area identification signs – smaller signs are posted at the entryways or along the perimeters of the specific park that is being treated just prior to application commences.
- Yellow pesticide applied indicator signs – signs are 16 inches x 24 inches and are posted around the specific areas inside the park indicating exactly where the pesticide has been applied. These signs have all the information pertaining to the product used at the specific location, what pest was being treated, the date and time of application, the active ingredient of the product applied and the Pest Control Product (PCP) number associated with the product (The City of Calgary, 2015b).

An example of the City of Calgary post-notification signage is available in Appendix B.

The City of Red Deer also uses on-site signage to inform the public that non-pesticide applications of strictly water are being used to help control pests; the intent of these signs is to alleviate any perceived concerns by the public about pesticide use (City of Red Deer, 2012).

3.0 SUMMARY AND CONCLUSIONS

The range of pests can be extensive and consequently input from city staff and members of the public is vital and necessary to enhance the operational, planning and technical results of the IPM program. In gathering information from concurrent weed and pest operations it was concluded that with the increase in development and disturbed areas in Leduc, as well as changing climate regimes, such as increased drought conditions, the City should consider focusing on establishing preventative pest control strategies, and implementing site specific cultural management plans to reduce pest establishment, reproduction, dispersal and survival.

The main action items suggested to improve the City’s current pest-control operations are summarized as follows:

- A greater emphasis on fundamental IPM procedures including monitoring, control and reporting,
- A greater emphasis on preventing pest problems through site design and enforcement,
- Increased levels of cultural practices,
- Enhanced public education,
- Enhanced public notification.

Through fostering IPM awareness among City staff, developers and contractors, and the public, the City will be able to develop well-defined decision-making guidelines for management actions under IPM.

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APPENDIX A

A Summary of the Updates to the City of Leduc Integrated Pest Management Plan and Impacts to Developers

October 27, 2017

The City has developed an updated Integrated Pest Management Plan since the release of their original plan in 2003. As the original plan was quite general, the new plan includes updated regulatory language and Leduc specific recommended actions. Although the plan largely focuses on action priorities specific to the City, the plan also references developer weed control responsibilities and opportunities for developers to implement integrated pest management on private land. The updated IPM plan will replace the existing plan, as a schedule to the Precedent Development Agreement; the following document summarizes key aspects of the plan that will have an impact on developers.

Integrated Pest Management for New Developments and Construction

Preventing pests through the design and construction of facilities and landscapes is an essential component of IPM and developing cost-effective maintenance regimes. Pests can easily take up residence in areas that are not landscaped appropriately or areas with inappropriate plant materials.

Increased development within the City has resulted in an increase of disturbed soil areas susceptible to weed infestation, as well an increase in introduced soils and potential weed seeds. When these areas are not controlled they become unsightly and contribute to the weed problem on surrounding private and public landscapes. The large quantities of new trees and other plant materials used in new communities may also pose a risk, as appropriate site preparation and plant selection are the most important factors in preventing vulnerabilities to pests.

It is important that new developments and ground disturbance activities consider the type and magnitude of the disturbance that will be conducted as well as the timing of the disturbance in relation to the potential for weed infestation. Equipment, materials and vehicles should be cleaned of weed seeds and plant parts before arriving on-site and cleaned prior to leaving an infested site to avoiding spreading.

The City of Leduc 2010 *Minimum Landscape Design and Construction Standards* (the *Standards*) contain many aspects of IPM, such as specifications for adequate top soil depth, tree planting requirements, and species selection guidelines which all contribute to preventative pest management. The *Standards* serve as a principal tool for incorporating preventative pest control measures during site development and should be reviewed.

Plant Selection

The City of Leduc *Standards* state that, “Plants shall be true to type and structurally sound, well branched, healthy and vigorous and free of disease, insect infestations, insect eggs, rodent damage, sunscald and frost cracks. They shall be densely foliated when in leaf and have a healthy, well-developed fibrous root system. Pruning wounds shall show vigorous bark on all edges and all parts shall be moist and show live, green cambium tissue when cut.” In support of this statement the City of Leduc currently requires that all new plant material be Clean Certified Stock.

Native plantings are recommended because they are uniquely suited to growing in their native area. Native plants have typically co-evolved with beneficial species, like native pollinators, and are typically armed with natural resistances to Albertan pests and disease.

Planting a diverse inventory of plants per site is recommended over planting a monoculture to help protect against susceptibility to pests.

Weed Control

The *Standards* require that “all areas be kept free from weeds from construction commencement until issuance of the Final Acceptance Certificate (FAC).”

Under the *Alberta Weed Control Act (WCA)*, prohibited noxious weeds need to be destroyed and noxious weeds need to be controlled. The *WCA* is a provincial Act intended to protect land from the invasion and establishment of weeds. Weeds listed in the *WCA* are a threat to Alberta’s environment, economy and society. They have the potential to degrade habitats, reduce biodiversity, increase erosion, cause wildfires, reduce property value, create obstacles to international trade and cause reduction in productivity of agricultural land.

Under the *WCA*, powers of enforcement have been delegated to the local municipality. When weeds are identified on a residential or commercial property by the Weed Inspector a *WCA* Inspector Notice is served and the offender has three days to comply. If the notice can not be served to the home owner or resident of the property over 18 years of age the notice will be posted on the property and a copy will be sent to the last known property owner by mail, with 10 days to comply. If the property is not compliant within the 3/10 day period the Weed Inspector will post a Notice to Entry under the *WCA* on the property before calling in a contractor to clean up the property. A person who contravenes the *WCA* is guilty of an offence and liable to a total fine of not more than \$5,000 or, in the case of failure to comply with a Minister’s notice, a fine of not more than \$1,000 for each day the offence continues.

In the City of Leduc Enforcement officers typically issue a ticket for charges under the *Community Standards Bylaw* Section 9(2)e Long Grass and Weeds rather than the *WCA*; charges under the *WCA* are typically reserved for severe or abnormal situations. The City of Leduc *Community Standards Bylaw*, states that “(1) A person shall not cause or permit a nuisance to exist on land they Own or Occupy. (2) For the purpose of greater certainty a nuisance, in respect of land, means land that shows signs of a serious disregard for general maintenance and upkeep, whether or not it is detrimental to the surrounding area, some examples which include: (e) grass or weeds higher than 10 centimeters.” A person guilty of an offence under the *Community Standards Bylaw* is liable to a fine up to \$10,000 and imprisonment for up to 6 months for non-payment of the fine.

The updated IPM Plan includes a recommendation to update the Precedent Development Agreement with the requirement for Developers to provide a weed management plan. As part of the updates to the Precedent Development this year, this recommendation will be reviewed.

Prohibited Noxious and Noxious Weed fact sheet: <https://www.abinvasives.ca/fact-sheets>

More information on the *Alberta Weed Control Act*:

[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/acts6156](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/acts6156)

APPENDIX B

WARNING

AVOID PROLONGED CONTACT WITH TREATED AREA UNTIL DRY

 **THIS AREA HAS BEEN SPOT TREATED FOR PESTS** 

with _____ for _____
on _____, 20____ at _____
Active Ingredient _____ PCP Number _____

For further information call:
call: 3-1-1

 THE CITY OF CALGARY
PARKS

Do not remove this sign for 48 hours after application date