

# Interim Evaluation of Toronto's Pesticide Bylaw



## Technical Report

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 **TORONTO**  
Public Health



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## Executive Summary

In May 2003, the City of Toronto enacted a Pesticide Bylaw (Municipal Code Chapter 612) that restricts the outdoor use of pesticides on all public and private properties in Toronto. City Council enacted the bylaw to protect the health and well-being of Toronto residents.

The Pesticide Bylaw came into force on April 1, 2004. To help residents and businesses adapt to the bylaw, its enforcement is being phased in and an education program is underway to promote natural lawn and garden care. Penalties began to apply for commercial pesticide users such as lawn care companies on September 1, 2005. Homeowners and renters will become subject to penalties for bylaw violations on September 1, 2007.

This report presents a preliminary evaluation of Toronto's bylaw, and offers some early indications of its influence on public awareness and pesticide use. Toronto Public Health (TPH) has drawn on the best available data, primarily collected between 2003 and 2005 before penalties for commercial pesticide users came into effect. To assess the full impacts of the different phases of the bylaw, TPH will continue to collect and review all available data on pesticide use.

Early evaluation shows promising signs of behaviour change regarding the use of pesticides in Toronto. Evidence shows that:

- **Fewer people are using pesticides in Toronto.** In 2005, 35 per cent fewer Toronto households reported any use of pesticides on their lawns, as compared to 2003;
- **Natural alternatives to pesticides are growing in popularity.** An increasing number of households report that they or their lawn care companies are using lower-risk pesticides and/or more natural alternatives;
- **The public continues to rely on lawn care companies.** Each year, a consistent proportion of Torontonians hire lawn care or landscaping companies to care for their properties. Furthermore, there is some evidence that Toronto's lawn care sector has grown each year since 2001;
- **People are aware of the bylaw.** A majority of Torontonians, particularly those with lawns or gardens, know about the Pesticide Bylaw; and
- **Bylaw compliance is high.** Since 2004, Public Health Inspectors have responded to over 3000 complaints of possible bylaw violations. Complaints have decreased substantially following the introduction of penalties in September 2005, and inspectors have laid only 3 charges and issued 28 warning letters for violations.

TPH credits these early signs of success in reducing the number of people and companies using pesticides to its dual implementation strategy of broad public education and graduated, firm enforcement. It is crucial to continue these efforts in the years ahead, particularly to prepare residents for the final stage of graduated enforcement in September 2007. TPH will work to ensure that businesses and residents fully understand

their obligations under the Pesticide Bylaw and have access to information about natural lawn and garden care. This report identifies several strategies that will be undertaken to achieve and evaluate success.

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## **1.0 Introduction**

The term “pesticide” describes an organism or a substance used to kill or control weeds, insects, fungus or other unwanted living things. Lawn and garden pesticides have been widely used in Canada since the 1950s. It was estimated in 2000 that seven of ten Canadian homeowners used pesticides on their home lawns and gardens<sup>1</sup>, and that sales across the country were worth \$100 million<sup>2</sup>.

In recent years, growing public concern and scientific evidence about the hazards of pesticides have prompted a number of Canadian municipalities to pass local bylaws to restrict these chemicals. Currently, an estimated 125 municipalities in six provinces have pesticide bylaws<sup>3</sup>.

Toronto’s Pesticide Bylaw (Municipal Code Chapter 612) came into force on April 1, 2004. (Appendix 1).

Since 2004, Toronto Public Health (TPH) has gradually shifted from purely education-based enforcement, where bylaw violators receive educational materials, to a combined education and penalty-based approach that introduces charges for violations. Following the education-based approach for all pesticide users, penalties began to apply for commercial users such as lawn care companies on September 1, 2005. On September 1, 2007, homeowners and renters will become subject to penalties for bylaw violations.

City Council requested that the Medical Officer of Health (MOH) evaluate the bylaw to gauge its success. This interim report presents preliminary results on the impact of the bylaw. TPH collected and reviewed the results of focus groups and surveys of Toronto residents, Public Health Inspectors’ statistics on bylaw compliance and pesticide use, and information about the experiences of residents, commercial stakeholders, and City staff. Key data are currently available from 2003 to 2005, thus permitting only an evaluation of the first phase of bylaw enforcement.

In the coming years, TPH will continue its education and enforcement activities, with a focus on ensuring that residents understand the bylaw and have information to pursue pesticide alternatives. TPH will also continue to collect and assess available data to gauge behaviour change.

## **2.0 Toronto’s Pesticide Bylaw**

Since the late 1990s, the City of Toronto has reduced pesticide use on public greenspace and promoted alternatives to residents through education campaigns. In 2001, following a Supreme Court of Canada ruling that supported a pesticide bylaw in Hudson, Quebec, the Toronto Board of Health began to consider pesticide restrictions on private property. After broad public consultation and scientific review, City Council passed a bylaw in

May 2003 that restricts the outdoor use of pesticides on all public and private properties in Toronto. The bylaw came into force on April 1, 2004.

The bylaw restricts the application of pesticides on all public and private properties in the City of Toronto. Toronto's bylaw applies to anyone who uses pesticides outdoors, including homeowners, renters, lawn care companies, golf courses and cemeteries. The bylaw is enforced by Public Health Inspectors, who identify possible violations through complaints and proactive surveillance.

Toronto's bylaw, like most municipal pesticide laws, is intended to reduce the use of non-essential (sometimes termed "cosmetic") pesticides to control weeds and unwanted pests in lawns and gardens. Pesticides composed of specific lower-risk active ingredients such as soap, biologicals or acetic acid, are exempted from the bylaw and have no restrictions on their use. Certain uses of restricted pesticides are permitted under the bylaw, such as to control or destroy pests which have infested property. Subsequent to the enactment of the bylaw, Council provided guidance on infestation thresholds for common lawn insects and amended the exempted products list to accommodate new lower-risk products as they become available.

City Council acknowledged that for many residents the bylaw presented a challenge to long-standing behaviours regarding lawn and garden care. Council was also aware that many in the professional lawn care sector were concerned that the law would damage their businesses. To support residents and businesses in adapting to these challenges, the enforcement of the bylaw was phased in and an expansive education program was launched to promote natural lawn and garden care.

The bylaw is being phased in as follows:

- **April 1, 2004:**  
**Education-based enforcement begins.** In response to complaints about suspected pesticide use, Public Health Inspectors visited the property and provided educational materials. A caution letter was issued for violations.
- **September 1, 2005:**  
**Penalty-based enforcement begins for commercial pesticide users.** Lawn care companies, commercial properties and other non-residential pesticide users are subject to tickets or summons for violations. Education materials are provided in all cases.
- **September 1, 2007:**  
**Penalty-based enforcement begins for residential users.** Residents (homeowners and tenants) become subject to tickets or summons for violations. Warning letters are issued for first offenders. Education materials are provided in all cases.

### **3.0 Implementation of the Pesticide Bylaw**

Toronto's Pesticide Bylaw is being implemented with a dual focus on public education and bylaw enforcement to motivate compliance, raise awareness and support professionals and homeowners in adopting pesticide alternatives.

Studies of best practices in other jurisdictions suggest that education and enforcement work together to achieve higher pesticide reductions together than either would separately. The Canadian Centre for Pollution Prevention (C2P2) reviewed pesticide policies in North America and Europe and found that, while education and legislation can motivate pesticide reductions, only those communities that passed a bylaw and supported it with public education achieved a high reduction in pesticide use<sup>4</sup>.

Public perceptions and behaviours regarding lawns suggest why bylaws and education complement each other. The current North American ideal of "the perfect lawn" and its associated lawn care habits originated in the 1950s. Intensive consumer marketing of this ideal and the pesticides needed to achieve it has fostered deeply-entrenched behaviours and neighbourhood norms<sup>5</sup>. Education programs can support those willing to change behaviours, but the law can provide additional motivation for those who are less likely to alter habits to which they are accustomed. Furthermore, within the lawn care and landscaping sector, many companies routinely apply pesticides and are likely to be influenced more by regulation than public education campaigns.

Surveys of attitudes and behaviours towards pesticides support the value of education programs. In recent years, several Canadian municipalities, including Toronto, Edmonton and Ottawa, have asked residents about pesticide use. At the time of the surveys, none of the cities had pesticide bylaws in effect. Generally, approximately one third to one half of homeowners maintaining lawns and gardens reported using pesticides<sup>6,7,8</sup>. Whether they used pesticides or not, however, over three quarters of respondents supported restrictions on pesticides and welcomed information that would help them use safer alternatives<sup>9,10,11,12</sup>.

#### **3.1 Promoting Alternatives – The Public Education Campaign**

TPH's education campaign aims for variety and adaptability. The campaign delivers:

- a combination of simple tips and more comprehensive advice, to both residents and commercial users;
- information through various media, in stores and in several languages; and
- reminders throughout gardening season to influence key decision points, such as what to do or purchase in spring and fall for a healthy lawn or garden.

TPH collaborates with Parks, Forestry and Recreation, the Toronto Environment Office and Toronto Water to ensure consistent messaging and maximize the reach of the outreach campaign.

The education campaign uses the following means to reach particular audiences with appropriate information:

- **City of Toronto website ([www.toronto.ca/pesticides](http://www.toronto.ca/pesticides))**

This portal page is referenced in all promotions and educational materials, and provides background on the issue, the text of the bylaw, answers to frequently-asked questions, electronic versions of all brochures and fact sheets, guidance for professional users, complaint forms, and links to relevant information from other City divisions and community organizations. Regular updates capture seasonal tips and emerging issues. Some material appears in the City's most commonly-spoken non-English languages (French, Spanish, Italian, Portuguese, Russian, Tamil, Chinese and Farsi).

The website has proven to be a valuable resource for the public, stakeholders and other municipalities considering pesticide reduction programs. Website traffic and content have grown each year since it was launched in 2004. In its first year, 50 pages of content were visited an average of 4,754 times per month. In 2005, there was an average of 7,999 visits per month and 197 pages of information. In 2006 an average of 12,000 monthly visits were served by approximately 230 pages of content.

- **Toronto Health Connection**

Toronto Health Connection (416-338-7600) provides information and access to all TPH programs and services. Through this telephone line, TPH staff support the pesticide bylaw by responding to public inquiries, processing complaints, sending educational material and providing basic advice on natural lawn and garden care.

On average, 600 callers per year contact Toronto Health Connection for pesticide information. The majority of the calls are from residents reporting a suspected bylaw violation and/or to request educational information. Calls to the Health Connection also enable TPH to identify and address issues of concern, such as particular pest problems affecting a community.

- **Brochures, fact sheets and lawn signs**

TPH has produced a range of printed materials to appeal to residents at all stages of awareness and activity – from detailed horticultural information for “green thumbs” to postcards and tip sheets for those first learning about natural alternatives or seeking cues to speak with their lawn care company. Material is made available online, through the Health Connection, in civic centres, libraries and other community locations, and distributed through public events and during complaint investigations.

TPH evaluates the demand for these resources on an ongoing basis. The community also provides key feedback on which resources should be created, re-printed or

discontinued. Table 1 describes the types and quantities of information that has been distributed since 2004.

**Table 1: Types and quantities of pesticides educational resources distributed to date**

Resource	2004	2005	2006
General information postcard	5,000	9,745	15,330
General information brochure	35,000	10,611	n/a
General information pamphlet with a seasonal calendar, quick tips and bylaw information	n/a	n/a	77,619
2-page fact sheets on:			
- Common weeds	1500	5000	200
- Chinch bugs	1500	5000	200
- Lawn grubs	1500	5000	200
- Fall lawn care tips	n/a	5000	50
- Seasonal calendar of lawn, garden and tree care	n/a	5000	150
- Bylaw information	1500	5000	50
- Questions to ask a lawn care company	1500	5000	50
- Information about lower-risk pest control products	1500	5000	50
Series of 19 fact sheets on natural gardening topics	n/a	n/a	> 2,500
Plastic “pesticide free” lawn signs	3,000	1,646	300
40-page technical manual of lawn and garden care	435	892	482

n/a = material was not printed during that year or was discontinued

- **Information in stores**

The pesticide bylaw does not govern the selling or buying of pesticides, although it does exempt products containing specific ingredients from its restrictions. Both restricted and exempted pesticides remain available for purchase in Toronto, which can confuse the public as to whether or not the bylaw is in effect and how it works. Many residents mistakenly assume that products for sale are “approved” by the City. Retailers and some residents have also indicated that although lower-risk products are becoming more available in stores, consumer confidence in “natural” alternatives still appears to be relatively low.

To support residents and retailers, the City launched its “Go Natural” in-store education program in 2005. Developed in consultation with retailers, Go Natural brochures, tear-off sheets, staff aprons, posters and banners are voluntarily posted on store shelves or at cash registers, and direct consumers to certain ingredients (not brand names) in products for certain lawn or garden problems, and describes how these lower-risk products work.

To maximize the success of Go Natural, Toronto Public Health works with external consultants to manage delivery and promotion of these materials. To launch gardening season in May and June, TPH hosts promotional booths in certain retail locations to raise awareness and answer resident questions about the bylaw and materials. Training is also offered to store staff to improve customer outreach.

In the past two years, 122 retail locations, ranging from “big box” stores to small independent stores, have voluntarily participated in the program. In its first year, 83,343 materials were distributed to the public through stores. In 2006, almost 98,000 consumers were reached directly with these campaigns. Thirty-six weekend promotional events have been held to provide direct advice to consumers.

Overall, retailers report interest from their staff and customers and some changes in the popularity of conventional and lower-risk pesticides. No clear sales trends are evident because data on pesticide sales in Toronto are not available. Recent amendments to the federal *Pest Control Products Act* will provide aggregate sales data in the future, which may permit some limited analysis of Toronto sales trends.

TPH is considering ways to further enhance the success of “Go Natural” in 2007. For example, many consumers have asked TPH to identify specific pesticide brands as “approved” or “restricted” rather than noting ingredients on the label that consumers should seek. TPH is limited in its ability to direct the public to specific product brands, but is consulting with Legal Services to address this challenge. Furthermore, TPH will continue to seek the participation of retail chains that have not yet chosen to participate in this voluntary initiative. In 2006, three retail chains – operating 46 stores – did not participate. Some retail staff and consumers are therefore not reached by the campaign.

- **Advertising**

Advertising in spring and fall – when people are thinking most about their lawns and gardens – is a key outreach tool. Ads serve to remind residents of the bylaw, to balance marketing of traditional pesticides, and to support community acceptance of natural lawn care.

TPH has collaborated for several years with Toronto Water and Parks, Forestry and Recreation to create and place ads in a variety of media. Each year, TPH has run between 300 and 500 advertisements in major newspapers, community and ethnocultural newspapers, the Toronto Library newsletter, the TOFun Guide of Parks, Forestry and Recreation, family and lifestyle magazines, transit shelters and recycling bins. Other media include water bill inserts, ads in the waste and recycling calendar, and articles in WaterWatch and consumer and trade magazines.

In 2004, 353 ads reached an estimated audience of over 10 million. In 2005, 503 advertisements reached approximately 12 million people. The 2006 advertising

campaign was more modest, with 335 ads, but included a targeted magazine insert for an overall reach of at least 12 million people.

In preparation for the increased enforcement in September 2007, TPH conducted specific focus groups and surveys to gauge public response to these advertisements and educational messages. Findings are being incorporated into planning for the coming spring and summer.

- **Community Partnerships**

TPH has partnered with 16 environmental and cultural organizations since 2004 to deliver innovative workshops, garden tours and radio shows in eight languages. This work has expanded our audience and built the capacity of these groups to provide sustained environmental health education to their communities.

TPH has also collaborated with researchers from the University of Toronto, the University of Western Ontario and with community partners Future Watch, Toronto Chinese Environmental Ambassadors, Toronto Chinese for Ecological Living and the South Riverdale Community Health Centre to identify communication barriers and explore opportunities to improve multicultural outreach. A grant from the Social Sciences and Humanities Research Council (SSHRC) includes research to identify the best means of promoting the bylaw and natural lawn and garden care to multicultural audiences. This research will benefit all environmental health promotion work that TPH delivers.

- **Public events and presentations**

TPH seeks out opportunities to interact directly with the public on the bylaw and natural lawn care. The City is able to provide expert advice through health promotion consultants, Public Health Inspectors, Parks, Forestry and Recreation staff and the Toronto Environmental Volunteers.

In 2004, TPH made presentations at 53 events, and increased to 74 events in both 2005 and 2006. TPH promotes the Pesticide Bylaw at small community gatherings as well as large events such as the Community Environment Days, the Canadian National Exhibition, Canada Blooms, the Toronto Renovation Forum, Listening to Toronto, the Cottage Life Show and several Councillor-sponsored information sessions. Through these events, TPH has directly interacted with over 5,000 people.

- **Communication with professional stakeholders**

The Pesticide Bylaw directly impacts the businesses of landscapers, lawn care companies, arborists and other horticultural professionals working in Toronto. Since the bylaw's enactment, TPH has communicated regularly with this sector to support compliance and their transition to sustainable pesticide reductions.

TPH has interacted most regularly with lawn care companies, many of whom were understandably concerned about the impacts of the bylaw on their ability to serve clients and maintain their businesses. TPH's most direct dialogue is through enforcement staff, who regularly discuss issues of compliance on specific issues or during complaint investigations. In addition, TPH has:

- produced fact sheets and web-based information aimed at helping those that hire lawn care companies to understand how the bylaw will affect their service and how they can contribute to making the transition to a more natural lawn;
- met with companies to discuss and clarify specific issues, such as noxious weed control and when certain pest control products may be permitted;
- presented information at professional conferences such as the Ontario Turfgrass Symposium; and
- written articles for publication in printed and electronic industry newsletters.

TPH also liaises with Health Canada's Pest Management Regulatory Agency and the Ontario Ministry of the Environment to ensure a consistent approach with respect to other levels of pesticide regulation, such as new product testing and warning signage.

### **Evaluating education approaches**

TPH consults with staff in other City divisions, commercial stakeholders and the public on an ongoing basis to assess and adapt its educational tools and enforcement protocols.

Informal feedback from the community helped identify, for example, the need for expert resources on plants and gardens. TPH responded by partnering with the Toronto Master Gardeners to produce a series of fact sheets on natural care of flowers and vegetable gardens and promote the information via the internet, during lectures, community events and a telephone information line. Community feedback also resulted in our retail materials, information for the lawn care sector and our ethnocultural partnerships.

TPH uses public surveys and focus groups to more formally assess the reach of our educational programs. Focus groups have been used, for example, to develop the initial public education materials in 2004, the retailer materials, and most recently in the consideration of new resources for 2007. Surveys offer an indication of the reach of advertising campaigns or educational materials. Surveys indicate that almost 70 per cent (68%  $\pm$ 3%) of Torontonians with lawns are aware of the pesticide by-law, and over 40 per cent (44%  $\pm$ 3%) are aware that the City has an education campaign about the bylaw and natural lawn care alternatives<sup>13</sup>. For a competitive advertising venue like Toronto, this is a high recall for promotions.

## **3.2 Bylaw Enforcement**

City Council supported a phased-in enforcement strategy for the bylaw to motivate compliance while granting time for those accustomed to using pesticides to learn about

the restrictions and to adopt alternative methods for lawn and garden care. Table 2 outlines the enforcement phases of the bylaw.

**Table 2: Toronto Pesticide Bylaw Enforcement Phases**

Date	Bylaw Enforcement Phase
April 1, 2004	<b>Education-based enforcement begins.</b> In response to complaints about suspected pesticide use, Public Health Inspectors visited the property and provided educational materials. A caution letter was issued for violations.
September 1, 2005	<b>Penalty-based enforcement begins for commercial pesticide users.</b> Lawn care companies, commercial properties and other non-residential pesticide users are subject to tickets or summons for violations. Education materials are provided in all cases.
September 1, 2007	<b>Penalty-based enforcement begins for residents.</b> Residents (homeowners and tenants) become subject to tickets or summons for violations. Warning letters are issued for first offenders. Education materials are provided in all cases.

The bylaw is currently enforced by Public Health Inspectors, who investigate suspected violations in response to complaints or during proactive surveillance activities. Complaints are received through Toronto Health Connection, by email and by direct phone calls to staff.

The City investigates all complaints of suspected pesticide use, whether by an individual or a company. Public Health Inspectors respond to all complaints with a site visit. In the current enforcement phase, a detailed investigation is undertaken for complaints involving companies and commercial properties to collect evidence and determine if a violation has occurred. An investigation may include the following:

- Complainants are asked to provide a written account of the incident by signing a witness statement (called a “Statement of Bylaw Infraction”);
- All necessary parties (eg. the resident, commercial property owner, lawn care company) are interviewed to confirm the facts;
- If a lawn care company is involved, the company may be asked to conduct a site visit with the inspector;
- A soil or plant sample may be collected to test for pesticide residues;
- Photos are taken as necessary to document signage, pest conditions, and other relevant details.

Providing educational materials continues to be the City’s preferred response to complaints. In most cases, inspectors issue warnings and educational materials for first offenders. For repeat offenders a ticket or summons will be issued for non-compliance.

In addition to providing educational outreach during complaint investigations, inspectors respond to inquiries from residents and businesses and have:

- conducted 291 proactive information visits to sensitive sites, such as daycares and hospitals, and all public and private golf courses and bowling greens;
- made over 20 public presentations at stores, gardening clubs and events like the Canadian National Exhibition and Canada Blooms; and
- led 20 meetings with external stakeholders and City staff on compliance.

Enforcement staff continue to participate in training programs to enhance their expertise in natural lawn and garden care. Health Inspectors have been trained in various topics by Landscape Ontario, the Ministry of the Environment, the Ministry of Agriculture, Food and Rural Affairs, the Organic Landscape Alliance and Toronto Parks, Forestry and Recreation. Inspectors have also been accredited in Integrated Pest Management by the Ontario IPM/PHC Council, a professional standard typically awarded to companies, golf clubs and other interested industry representatives.

Collaboration between City divisions and with the professional sector has served to anticipate and address emerging issues. For example, Public Health is assisting Parks, Forestry and Recreation staff to address infestations of gypsy moths in Toronto with minimal and lower-risk pesticides. Health Inspectors also meet with businesses such as Hydro One to ensure bylaw compliance.

From 2004 through 2006, four Public Health Inspectors (2 full-time equivalents (FTEs)) specialized in bylaw enforcement. In 2007, in anticipation of the next phase of enforcement, the Health Hazard Investigation team of 40 Public Health Inspectors will assume some additional responsibilities for bylaw enforcement. This will ensure that residents can be made aware of their obligations under the bylaw, and that all complaints and investigations continue to be conducted in a timely manner. See Appendix 2 for a description of TPH's enforcement plan for 2007.

#### **4.0 Evaluation of the Pesticide Bylaw**

The goal of the Pesticide Bylaw is to promote the health of Toronto residents by reducing their exposure to pesticides. As people become more aware of the bylaw and of the information about how to manage their lawns and gardens without pesticides, it is anticipated that fewer pesticides will be used and consequently public exposure will be reduced.

TPH monitors a number of factors to gauge the success of the bylaw, including:

- Awareness of the bylaw
- Changes in pesticide use behaviour
- Enforcement and compliance
- Economic impacts
- Comparable experience in other jurisdictions

To gauge bylaw awareness and changes in behaviour, TPH relies primarily on surveys as a surrogate for measuring actual product usage. This is done because virtually no data on

actual quantities of pesticides used or purchased for lawns or gardens are collected or made publicly available in Canada

TPH has conducted telephone surveys each year since 2002 to gauge bylaw awareness, public attitudes and use of pesticides. In addition, focus groups have been conducted at several times to better understand survey results, and to inform both survey content and specific elements of the education and enforcement programs. Data collected by other organizations in other jurisdictions have been used where possible to supplement the TPH data.

#### **4.1 Survey data sources**

Most of the survey information, including the results presented in the charts that follow, was collected through the Rapid Risk Factor Surveillance System (RRFSS). RRFSS is an anonymous monthly telephone survey used by Toronto Public Health to monitor community knowledge, attitudes and risk behaviours related to a variety of public health issues. In 2006, there were 21 health units in Ontario that participated in RRFSS. An independent survey research organization, the Institute for Social Research (ISR) at York University, administers the survey for each participating health unit. Each month, in Toronto, ISR surveys approximately 100 Toronto residents. The survey is conducted in English by telephone with Toronto residents aged 18 years and over.

The response rate for the 2003, 2004 and 2005 Toronto RRFSS surveys ranged from 56% to 58%. The survey under-represents the Toronto population with low income and/or low education. For questions about bylaw and education campaign awareness, general household weights were applied to the data to adjust for the effect of household size on probability of selection. Response estimates are accompanied by 95% confidence intervals, which means that the estimate is within this range 19 times out of 20. On the graphs in this report, the confidence intervals are depicted by the small lines at the top of each bar. The difference between estimates is statistically significant if the confidence intervals do not overlap.

Since the fall of 2003, for approximately six months between September and April, the Toronto RRFSS surveys have included questions about pesticide use during the previous summer. Thus, TPH has estimates of self-reported residential pesticide use in 2003 (prior to the enactment of the by-law), 2004 (by-law enacted; education-only phase) and 2005 (last months of education-only phase and first month of enforcement for non-residential users). In the fall and winter of 2005-2006, the Toronto RRFSS survey also included questions about pesticide by-law and education campaign awareness. The Toronto RRFSS survey is currently collecting pesticide use data for the summer of 2006, which is the first full season of penalty-based enforcement for commercial users. These results are expected in early summer of this year.

To draw comparisons with other Ontario municipalities, and to understand whether Toronto's results are typical of Ontario municipalities, self-reported pesticide use data would need to be available from other municipalities. As the pesticide-use questions in

RRFSS are optional, it is up to the individual health units to select if and when they will ask these questions. Unfortunately, no other health unit has asked these questions for the three years that Toronto has asked them; Middlesex-London is the only health unit with data pertaining to the summers of both 2003 and 2005. The data from Middlesex-London is presented alongside the Toronto data in section 4.4 below. TPH is not aware of any other source of comparable data for Ontario municipalities.

While there are limitations to the use of self-reported survey data, TPH is confident in the strength of the data presented in this report. For example, although TPH's information about use of pesticides on residential lawns is limited to self-reported data rather than actual volumes or quantities of pesticides used, a decline in the number of households reporting pesticide use is unlikely to indicate an increase in the quantities of pesticides applied. Another limitation is that it is more likely that illegal activities, including pesticide use restricted under a bylaw, will be under-reported on surveys. Yet the data presented in this interim evaluation are all collected prior to the time when residential users are subject to penalties under the bylaw, therefore the threat of penalty is unlikely to have had an important impact on residents' responses. Furthermore, there are a number of factors which may act to reduce under-reporting, including that the bylaw has some permitted uses of pesticides, that the questions are asked as part of a longer survey with questions about many health-related topics, and that the surveys are anonymous and conducted over the telephone with an independent survey organization.

The findings presented in the following sections are mostly drawn from the results of the Toronto RRFSS surveys<sup>14</sup>. In 2002, a TPH survey of attitude towards pesticide use and bylaws included several questions about pesticide use over the previous 2 summers. A follow-up survey was done in 2006, in which the same questions about pesticide use were included. The additional data collected through these other surveys and in focus groups support the RRFSS results and increase our confidence in the conclusions presented in this report.

## 4.2 Awareness of the bylaw

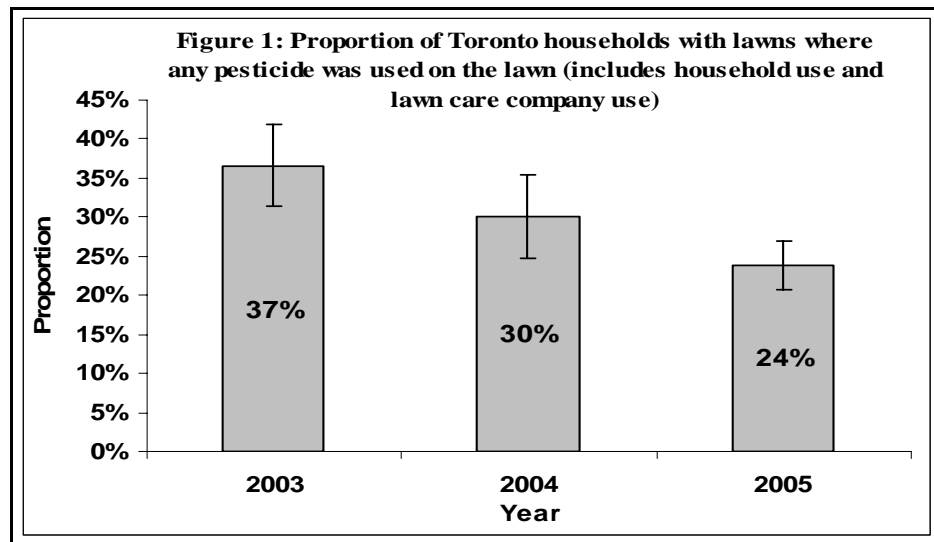
Awareness of the bylaw is high, particularly among those who have a lawn. Nearly 70 per cent (68%  $\pm$ 3%) of Toronto residents with a lawn indicate that they are aware that Toronto has a Pesticide Bylaw. This is encouraging, since people with lawns are the target audience for TPH's education programs. Awareness is slightly lower among those without lawns, but still more than half of these residents (57%  $\pm$ 6%) also report knowing of the law.

## 4.3 Changes in pesticide use behaviour

Overall, surveys indicate:

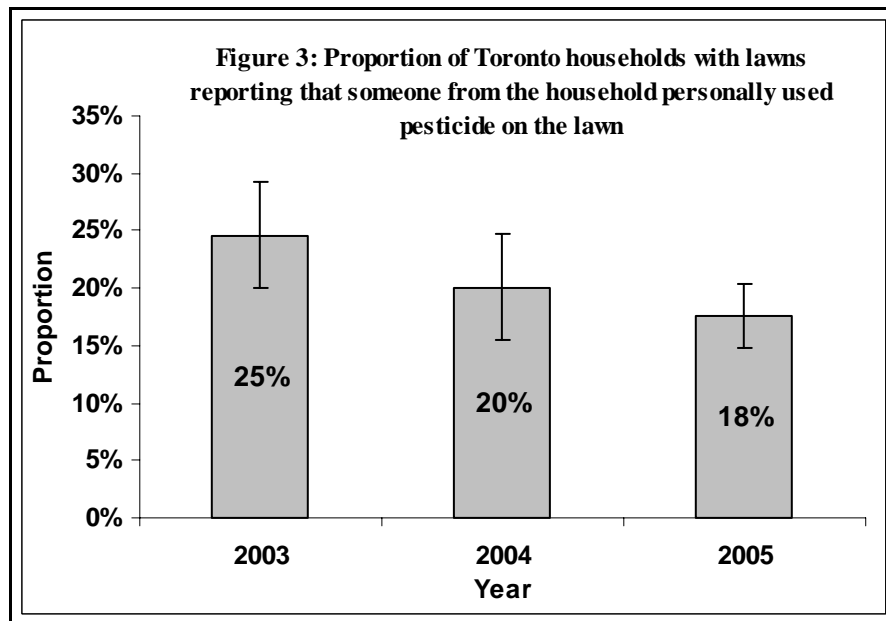
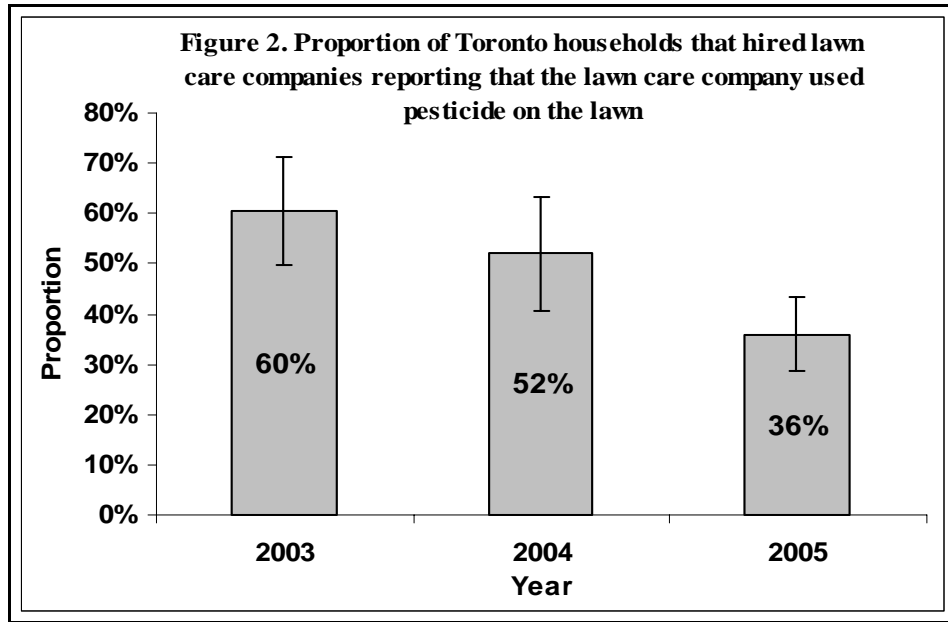
- **Fewer people are using pesticides in Toronto.** From 2003 to 2005, the proportion of Toronto residents who report any pesticide use on their lawns decreased by 35 per cent. (Figure 1). More than one-third of Toronto

households with lawns reported that pesticides had been used on their lawns in the summer of 2003. Two years later, less than one-quarter of such households report pesticide use. (Note: reported pesticide use does not necessarily imply bylaw violations, since the bylaw permits pesticide use in certain situations.)

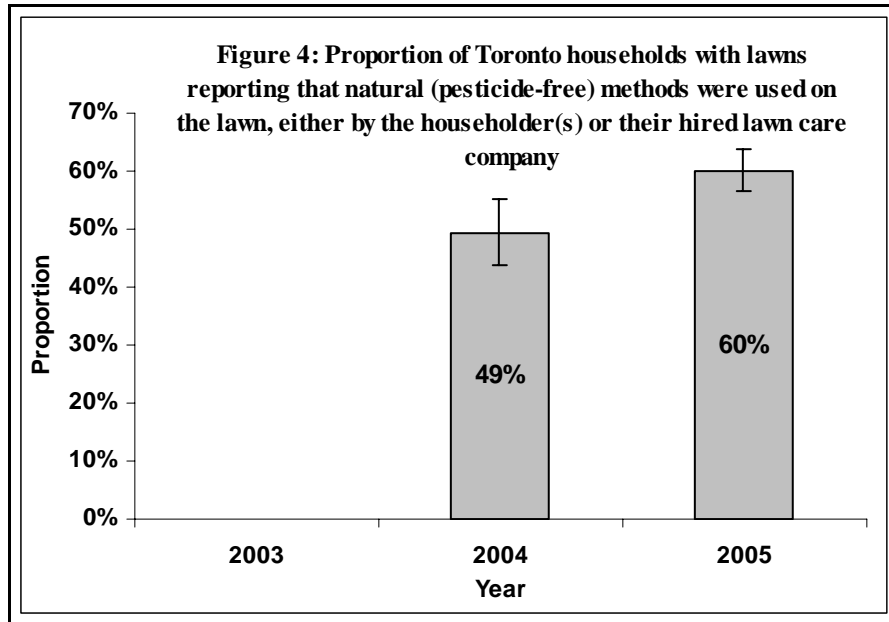


Toronto households reported that their lawn care companies have substantially reduced their use of pesticides. In 2003, more than half of the households that reported they hired a lawn care company indicated that the companies had applied pesticides to the lawn (Figure 2). In 2005 – the last summer prior to penalties being introduced for companies – the proportion of such households reporting that their lawn care company applied pesticides was 36 per cent ( $\pm 7\%$ ), just over half of the previously reported level.

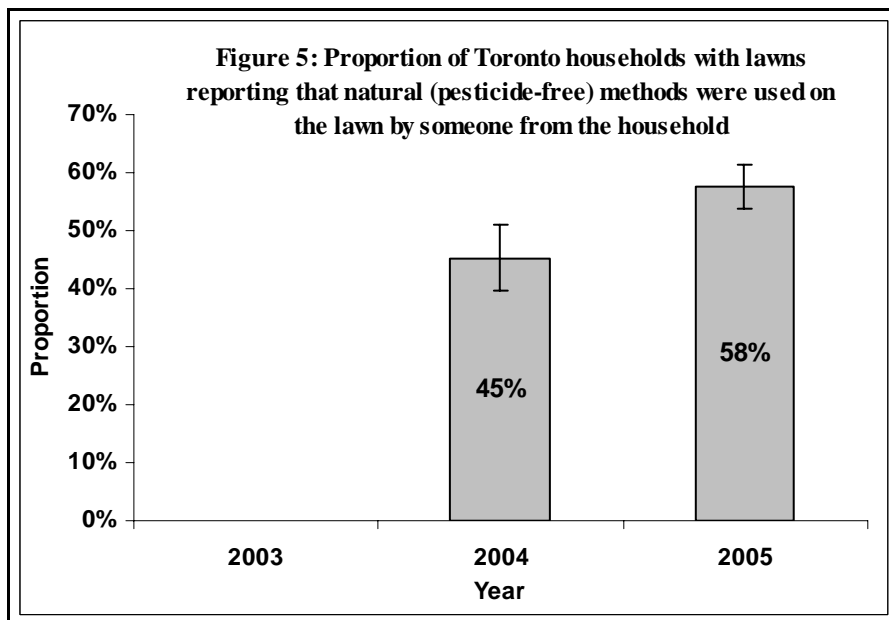
Residents also reported a decrease in the use of pesticides by someone in their household, although the rate of decline between 2003 and 2005 was less than that attributed to lawn care companies over the same period. In 2003, 25 per cent ( $\pm 5\%$ ) of residents with lawns reported household application of pesticides, a proportion that decreased to 18 per cent ( $\pm 3\%$ ) in 2005 (Figure 3).

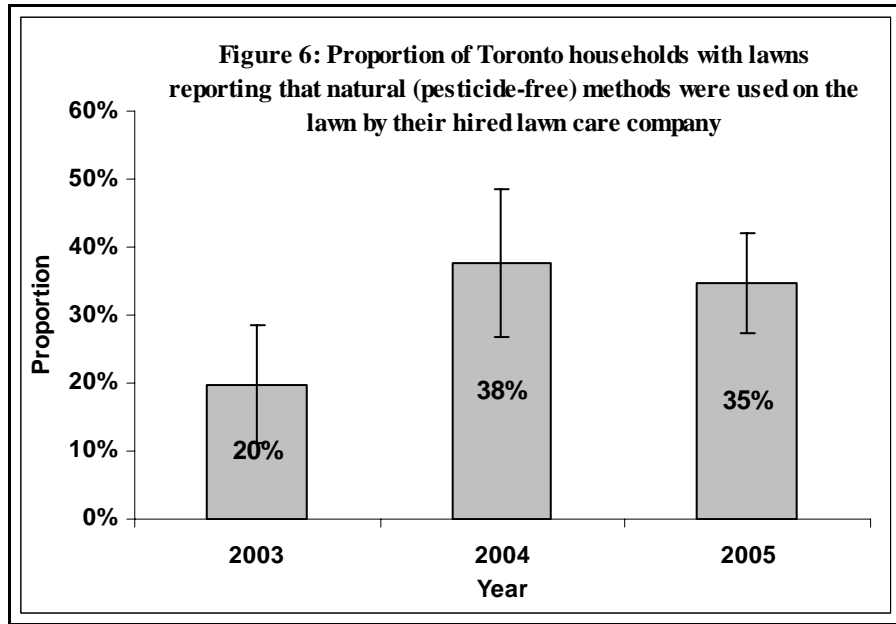


- Natural alternatives to pesticides are growing in popularity.** As the number of people reporting pesticide use decreases, households report that use of pesticide-free or natural alternatives to care for lawns has increased (Figure 4). In 2004, 49 per cent ( $\pm 6\%$ ) of all households with lawns reported some use of natural lawn care methods, either by a lawn care company or a householder. In 2005, the proportion had risen to 60 per cent ( $\pm 4\%$ ) of all households. (Households were not asked about their own use of pesticide-free methods in 2003.)



Residents report their own use of natural methods more often than they report their lawn care companies using them, and their own reported use has increased from 45 per cent ( $\pm 6\%$ ) to almost 60 per cent ( $58\% \pm 4\%$ ) (Figure 5). At the same time, there has been a significant upward trend in lawn care companies' reported use of natural approaches. The number of households that reported their companies using pesticide alternatives nearly doubled from 2003 to 2005 (Figure 6).

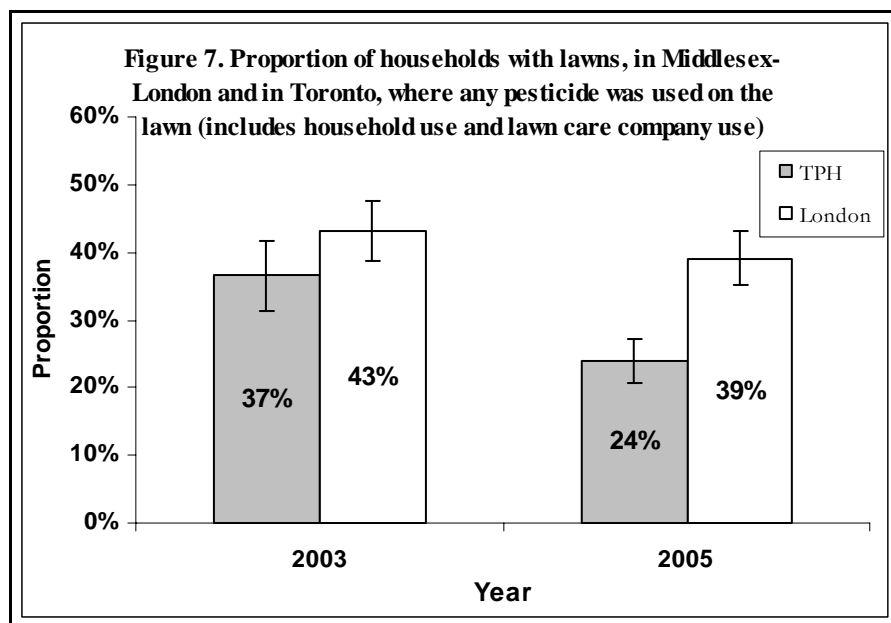




#### 4.4 Comparison to other jurisdictions

To determine whether or not these reported behaviour changes are unique to Toronto, TPH sought to compare its 2003-2005 data to those observed in other Ontario municipalities with and without pesticide bylaws. The only known comparable data spanning this same time period is RRFSS data gathered by the Middlesex-London Health Unit for the summers of 2003 and 2005<sup>15</sup>. No pesticide bylaws were in effect in this area during the survey period. The City of London passed a pesticide bylaw in 2006.

In 2003, the proportion of households reporting that pesticides were used on their lawns was slightly lower in Toronto than in Middlesex-London, although the observed difference was not statistically significant (Figure 7). In 2005, the proportion of households in both of these health units reporting that pesticides were used on their lawns was lower than in 2003. However, in Toronto there was a significant decrease in the proportion of households reporting that pesticides were used on their lawn, whereas in Middlesex-London the observed decline was smaller and not statistically significant. Furthermore, in 2005 the proportion of households reporting the use of pesticides on their lawns was significantly lower in Toronto than in Middlesex-London.



Over the observed time period, the proportion of households reporting that a lawn care company used pesticides on their lawn decreased in both health units, as did the number of households reporting that someone in the household used pesticides on the lawn. In both of these cases, the decrease in Toronto was somewhat greater than that in Middlesex-London, and was less likely to be due to chance. Also, in both health units the decrease in the number of households reporting that their lawn care company used pesticides on the lawn was greater than the decrease in the reports of householder application.

#### 4.5 Bylaw Enforcement and Compliance

Monitoring bylaw enforcement provides additional indications of the success of the bylaw. TPH tracks bylaw complaints and the details of investigations through its Toronto Healthy Environment Information System (THEIS) database. Information gathered during investigations and proactive visits by inspectors provides additional insight into levels of awareness and compliance.

Compliance data exists to the end of 2006. This data may more accurately reflect the impact of regulation on landscaping and lawn care companies and their commercial clients than on residents, for two reasons:

- Since September 1, 2005, the bylaw has been in full effect for commercial pesticide users, but residents do not face charges for non-compliance until September 1, 2007.
- Over 95 per cent of complaints received by the City are for suspected violations by licensed applicators rather than residents. This does not suggest that only companies may be committing violations: rather, it is likely that

since provincial regulations require licensed applicators – but not homeowners – to post warning signs, these notices are attracting the majority of attention.

The number of complaints has been decreasing annually since the bylaw was enacted, and declined sharply in 2006 (Table 3). The education and enforcement presence is likely contributing to this reduction, but it appears that the introduction of penalties on September 1, 2005 provided the strongest incentive for bylaw compliance.

**Table 3: Pesticide bylaw complaint investigations and outcomes**

<b>Year</b>	<b>Number of investigations</b>	<b>Warnings issued / Charges Laid*</b>
2004	1672	n/a
2005	1118	6 warning letters, 3 charges
2006	294	28 warning letters, 0 charges

\* warnings and charges were not issued prior to September 1, 2005.

In 2005, warnings were issued for 6 bylaw violations. Three charges were laid and successfully prosecuted in court. A single company pled guilty to the charges and was fined \$250 for each charge.

In 2006, the first full season of enforcement on lawn care companies and commercial properties, complaints of suspected violations decreased almost 75 per cent from the previous year. Of the complaints received in 2006, the majority of investigations confirmed compliance and only 28 violations were found. It is TPH’s policy to warn first offenders rather than issue tickets or summons, and all of the violations were for first offences. The decrease in complaints and the low number of violations observed suggest that our enforcement and education messages have reached much of the professional sector and most have come into compliance. Survey data on reported pesticide reductions by this sector support this suggestion.

TPH will continue outreach to pesticide users, particularly to residents with the approaching penalty phase beginning in September 2007. TPH will continue to liaise closely with lawn care and landscaping companies to maintain compliance.

#### **4.6 Compliance by the City of Toronto and specific users**

City Council requested that TPH specifically monitor bylaw compliance and pesticide usage by City agencies, boards, commissions and divisions (ABCDs) and by lawn care companies, golf courses, bowling greens, cemeteries and companies managing transportation and utility rights-of-way. Compliance is evaluated by monitoring investigations, and TPH has developed pesticide usage inventories to gather data on the application of exempt and non-exempt pesticides and the use of alternatives.

City ABCDs that manage properties are operating in compliance with the Pesticide Bylaw. Given the demands and values placed on the City’s greenspace resources, the complete elimination of pesticides cannot be anticipated, however, efforts continue to facilitate and maintain pesticide reductions. Progress in this regard is tracked through a

pesticide usage inventory that was developed collaboratively by ABCDs to record both pesticide use and use of alternative techniques. It was pilot-tested in 2005 and collected the first full season of information in 2006. In 2005 and 2006, non-exempt herbicides were periodically used to control invasive weeds, particularly dog-strangling vine, and to maintain the safety and integrity of hydro substations and subway tracks. By their nature and function, the municipally-owned golf courses and bowling greens required periodic pesticide applications, particularly fungicides under infestation conditions.

The inventory further demonstrates that City ABCDs and their contracted landscapers are using plant health care techniques such as compost topdressing and testing exempted products like horticultural vinegar and alternatives such as pressurized hot water for weed control. In order to maintain pesticide reductions, the two operative strategies used by Parks, Forestry and Recreation are Integrated Plant Health Care (IPHC) and Integrated Pest Management (IPM). Further, the IPHC Section of the Park's Branch has developed a Request for Quotations template that includes specifications for plant health care and IPM for City ABCDs that require contracted landscape management to maintain city properties. The IPHC Section has become the designated agent for the City of Toronto for the Municipal IPM Accreditation program developed by the IPM / PHC Council of Ontario and works in liaison with the IPM-accredited Public Health Inspectors.

In 2005 and 2006, a sample pesticide use inventory was distributed via mail and posted online for lawn care companies, golf courses, bowling greens, cemeteries and transportation and companies managing transportation and utility rights-of-way. Toronto Parks, Forestry and Recreation Public provided data for public golf courses and lawn bowling greens. In 2005 only three private golf courses provided data. In 2006 seven golf courses and several cemeteries submitted information. Lawn care companies and companies managing transportation and utility rights-of-way have chosen not to provide TPH with pesticide usage data. While RRFSS surveys and compliance data indicate that lawn care companies are reducing their pesticide use, data from these companies would permit further analysis of progress in this sector.

TPH will require data for the coming years to identify pesticide use trends. TPH will closely monitor this situation and continue to liaise with lawn care companies, golf courses, bowling greens, cemeteries and transportation and companies managing transportation and utility rights-of-way to collect data.

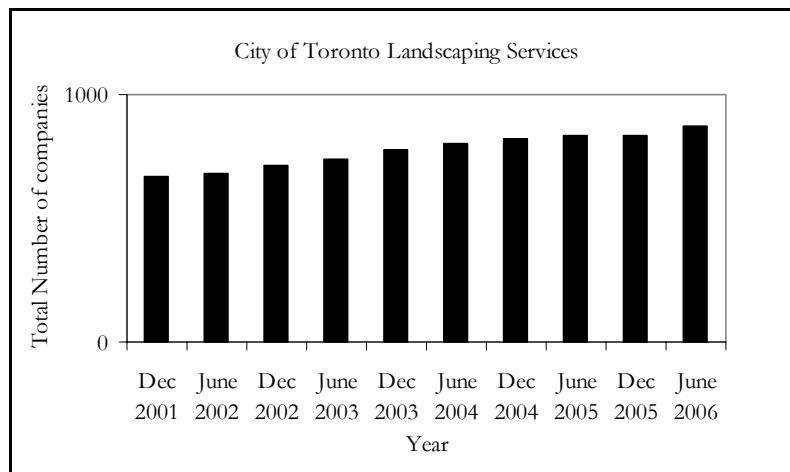
#### **4.7 Economic Impact**

Limited information provides some indication of the state of Toronto's lawn care and landscaping sector since the bylaw was enacted. Canadian Business Patterns is compiled by Statistics Canada and released twice a year (in June and December). The data provides counts of Canadian business establishments by industry sector and geographic location, categorized by the number of employees. Data for the landscaping and lawn care sector from December 2001 through June 2006 were examined for Toronto, the Greater Toronto Area, and all of Ontario. In addition, from 2003 through 2006, the Toronto RRFSS

respondents who were asked about pesticide use were also asked whether they hired a lawn care company.

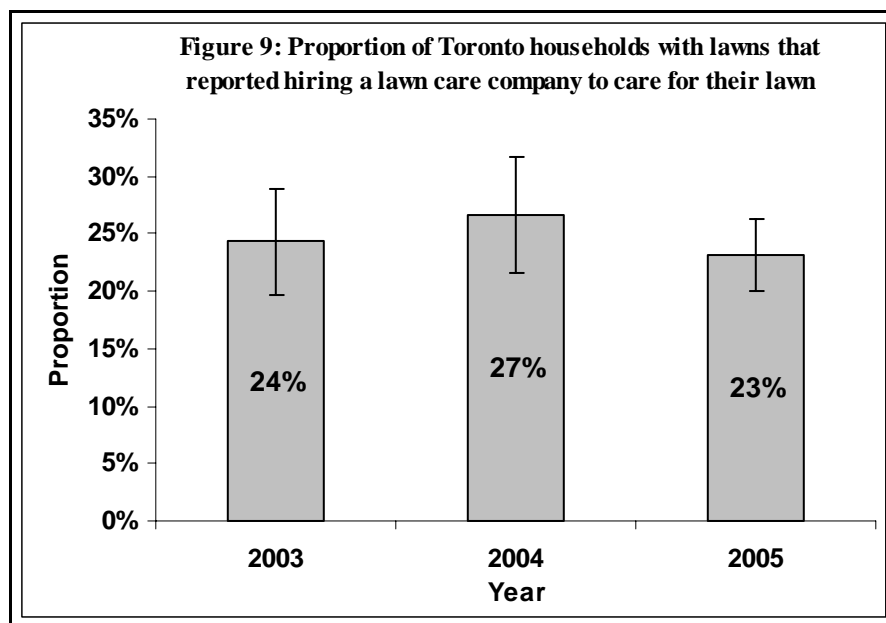
Since 2001, the Canadian Business Patterns data shows that the number of landscaping and lawn care sector businesses located in Toronto has grown each year. Toronto has seen a 30 per cent increase in the number of companies in this sector (Figure 8), while the increase in companies located anywhere in the Greater Toronto Area was 36%. This growth rate is consistent with that observed across Ontario (32%) in the same sector over the same time period<sup>16</sup>.

**Figure 8: Number of landscaping / lawn care businesses operating in the City of Toronto 2001-2006**



A similar trend has been observed in Halifax, Nova Scotia. Halifax enacted a pesticide bylaw in 2000 which came into full force in 2003. Canadian Business Patterns data show that between 2000 and 2005, the number of landscaping and lawn care businesses in Halifax grew by 53 per cent<sup>17</sup>.

When Toronto passed its pesticide bylaw, many lawn care companies expressed concerns that the regulation would restrict their products and services to the extent that their clients would cancel contracts and take care of properties themselves. RRFSS data indicates that this has not occurred. In 2003, 2004 and 2005, approximately 25 per cent of those with lawns reported hiring a lawn care service, a proportion that has remained relatively consistent since 2002 (Figure 9). As the number of households with lawns remained fairly stable over this time period, this also means the proportion of all Toronto RRFSS respondents who reported hiring a lawn care company remained stable at approximately 13% over the same period.



## 5.0 Further Implementation

It is essential to maintain the education, enforcement and evaluation programs that are in place if Toronto is to continue the pesticide reductions that are evident in these first years of the bylaw. This is particularly important until TPH has sufficient data to evaluate the impacts of each phase of the bylaw's enforcement.

In 2007, TPH will continue to implement the programs outlined in this report, and place priority in the following areas:

- **Preparing residents for the September 1, 2007 enforcement phase.** TPH's educational campaign has until now focused largely on enhancing residents' skills in pesticide-free lawn and garden care. These important messages will continue to be promoted, but TPH will more directly communicate homeowners' obligations under the bylaw and the pending enforcement deadlines.
- **Enhancing enforcement capacity.** TPH will train its entire team of 40 Health Hazard Investigation Public Health Inspectors to assume some additional responsibilities for bylaw enforcement. This will improve our capacity to conduct proactive surveillance, complaint investigations, and interact directly with homeowners and businesses on a timely basis.
- **Evaluating the impacts of the bylaw.** TPH will continue to collect RRFSS and compliance data to monitor behaviour change and bylaw awareness through each phase of the bylaw. It will also consider ways to encourage more commercial pesticide users to submit information on use of pesticides and alternatives, and work with other Ontario health units to facilitate RRFSS data collection in those municipalities.

## 6.0 Conclusion

Toronto's Pesticide Bylaw (Municipal Code 612) was enacted in 2003 and came into force in April 2004. It was passed to protect the health and well-being of Toronto residents by reducing exposure to non-essential pesticides used on lawns and gardens.

Toronto City Council understood the challenge that the bylaw represented to many residents and businesses. To help everyone adapt to these challenges, the enforcement of the bylaw was phased in and an expansive education program was launched to promote the bylaw and the switch to natural lawn and garden care.

The preliminary signs of behaviour change are encouraging. Between 2003 and 2005, the number of households reporting pesticide use on their lawns decreased by 35 per cent. The proportion of Torontonians who report using lower-risk pesticides or alternative techniques also increased. Since the bylaw came into effect in 2004, complaints of pesticide use have decreased annually, particularly following the introduction of penalties for commercial applicators in 2005. Furthermore, a consistent proportion of households continue to trust the expertise of professionals to care for their properties. The lawn care and landscaping sector is growing in Toronto, the Greater Toronto Area and across the province.

The full impact of the Pesticide Bylaw will only become apparent in the coming years. It is crucial that TPH continue its effort to raise awareness of the bylaw and pesticide alternatives, as well as monitor each phase of enforcement. Based on the evidence to date, it is reasonable for Toronto to expect even greater reductions in pesticide use and increasing use of natural alternatives in the coming years.

## Appendix 1: Toronto's Pesticide Bylaw (Municipal Code Chapter 612)

### Chapter 612

#### PESTICIDES, USE OF

§ 612-1. Definitions.

§ 612-3. Offences.

§ 612-2. Restrictions.

[HISTORY: Adopted by the Council of the City of Toronto 2003-05-23 by By-law No. 456-2003.<sup>1</sup> Amendments noted where applicable.]

#### GENERAL REFERENCES

Property standards — See Ch. 629.

§ 612-1. Definitions.

As used in this chapter, the following terms shall have the meanings indicated:

ENCLOSED — Closed in by a roof or ceiling and walls with an appropriate opening or openings for ingress or egress, which openings are equipped with doors which are kept closed except when actually in use for egress or ingress.

HEALTH HAZARD — A pest which has or is likely to have an adverse effect on the health of any person.

INFESTATION — The presence of pests in numbers or under conditions which involve an immediate or potential risk of substantial loss or damage.

PEST — An animal, a plant or other organism that is injurious, noxious or troublesome, whether directly or indirectly, and an injurious, noxious or troublesome condition or organic function of an animal, a plant or other organism.

PESTICIDE — Includes:

A. A product, an organism or a substance that is a registered control product under the federal Pest Control Products Act which is used as a means for directly or indirectly controlling, destroying, attracting or repelling a pest or for mitigating or preventing its injurious, noxious or troublesome effects.

B. Despite Subsection A, a pesticide does not include:

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<sup>1</sup> Editor's Note: This by-law was passed under the authority of section 130 of the *Municipal Act, 2001*, S.O. 2001, ch. 25. Section 2 of this by-law states that it comes into force 2004-04-01.

TORONTO MUNICIPAL CODE  
PESTICIDES, USE OF

## § 612-2

- (1) A product that uses pheromones to lure pests, sticky media to trap pests or “quick-kill” traps for vertebrate species considered pests, such as mice and rats.
- (2) A product that is or contains only the following active ingredients:  
**[Amended 2004-05-20 by By-law No. 385-2004]**
  - (a) A soap;
  - (b) A mineral oil, also called “dormant or horticultural oil”;
  - (c) Silicon dioxide, also called “diatomaceous earth”;
  - (d) Biological pesticides, including Bt (*bacillus thuringiensis*) and nematodes; **[Amended 2005-02-16 by By-law No. 121-2005]**
  - (e) Borax, also called “boric acid” or “boracic acid”;
  - (f) Ferric phosphate;
  - (g) Acetic acid;
  - (h) Pyrethrum or pyrethrins;
  - (i) Fatty acids;
  - (j) Sulphur; or
  - (k) Corn gluten meal.

**§ 612-2. Restrictions.**

- A. No person shall apply or cause or permit the application of pesticides within the boundaries of the City.
- B. The provision set out in Subsection A does not apply when pesticides are used:
  - (1) To disinfect swimming pools, whirlpools, spas or wading pools;
  - (2) To purify water intended for the use of humans or animals;
  - (3) Within an enclosed building;
  - (4) To control termites;
  - (5) To control or destroy a health hazard;
  - (6) To control or destroy pests which have caused infestation to property;
  - (7) To exterminate or repel rodents;
  - (8) As a wood preservative;
  - (9) As an insecticide bait which is enclosed by the manufacturer in a plastic or metal container that has been made in a way that prevents or minimizes access to the bait by humans and pets;
  - (10) For injection into trees, stumps or wooden poles;
  - (11) To comply with the *Weed Control Act*<sup>2</sup> and the regulations made thereunder; or
  - (12) As an insect repellent for personal use.

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<sup>2</sup> Editor’s Note: See R.S.O. 1990, c. W.5.

**§ 612-3. Offences.**

Any person who contravenes any provision of this chapter is guilty of an offence and, upon conviction, is liable to a fine or penalty provided for in the *Provincial Offences Act*.<sup>3</sup>

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<sup>3</sup> Editor's Note: This section was passed under the authority of section 425 of the *Municipal Act, 2001*, S.O. 2001, ch. 25, and, under section 61 of the *Provincial Offences Act*, R.S.O. 1990, c. P.33, a person convicted of an offence under this section is liable to a fine of not more than \$5,000.

**Please note:** This version of the Toronto's Pesticide Bylaw (Municipal Code Chapter 612) is current as of the date of this report. The most up to date version is available on the website at: [http://www.toronto.ca/legdocs/municode/1184\\_612.pdf](http://www.toronto.ca/legdocs/municode/1184_612.pdf)



## Appendix 2: Pesticide Bylaw Enforcement

The enforcement protocols currently followed by Toronto Public Health's Health Hazard Investigation team, as outlined below, will continue. As of September 1, 2007, residents will be subject to fines or summons for non-compliance.

Beginning in 2007, enforcement of the Pesticide Bylaw will be incorporated into TPH's general Health Hazard Investigation (HHI) program. Enforcement will be coordinated by two Public Health Inspectors accredited in Integrated Pest Management and Plant Health Care, and supported by 40 HHI Public Health Inspectors. HHI Public Health Inspectors will receive training and incorporate integrated pest management and plant health care strategies into proactive surveillance and preliminary complaint investigation. This will improve TPH's capacity to conduct proactive surveillance, complaint investigations and interact directly with homeowners and businesses on a timely basis.

### **Complaint response:**

Toronto Public Health will initiate an investigation of any complaint of alleged pesticide use within 24 hours (or by the next business day). Infractions suspected against the *Ontario Pesticide Act*, such as signage or application procedures, will be referred to the Ontario Ministry of the Environment.

The Public Health Inspectors will refer to horticultural resources, such as the Ontario Ministry of Agriculture and Food Publication 162 "Diseases and Insects of Turfgrass in Ontario" for detailed descriptions and photos of common diseases, weeds, and insect problems. Inspectors accredited in Integrated Pest Management and Plant Health Care will provide additional support.

During the inspection of the area(s) to which a (non-permitted) pesticide is alleged to have been applied, the Public Health Inspector will consider a number of factors when determining whether or not the application of pesticide was in compliance with the bylaw. Based on experience to date, most investigations require Inspectors to consider whether or not the application was in compliance with the definition of infestation. These considerations include:

- a) The type of property and surface to which the pesticide was applied;
- b) The method of pesticide application (equipment used to apply the pesticide and whether it was a blanket or localized application);
- c) Verifying that there are conditions on the property that make it susceptible to pest infestations;
- d) Confirming pest occurrence coincides with seasonal conditions;
- e) Determining the process that site personnel / resident followed to determine that there was an infestation. This should include consideration of insect (grub and chinch bug) and weed infestation thresholds passed by Toronto City Council and any guidance previously provided by TPH regarding the use of specific pest control products or the application of the *Ontario Weed Control Act*; and

- f) Validating identification of pest in numbers to substantiate an infestation prior to pesticide application.

**Violations of the Pesticide By-Law:**

Commercial property owners and lawn care companies who have received an initial warning will be liable to fines and applicable court orders for contraventions of the pesticide by law. The Public Health Inspector will utilize historical data in both proactive surveillance and complaint investigations to assist in investigations.

As of September 1, 2007 residents will be liable to fines and any applicable Court orders if it is determined by the Public Health Inspector that residents have been previously provided with the appropriate educational materials and been issued a warning for a pesticide application in contravention of the by law.

## Endnotes

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- <sup>1</sup> Evenson, B. 2001. The Accidental Crusader. *Saturday Night Magazine*. May 2001.
- <sup>2</sup> Standing Committee on Environment and Sustainable Development. 2000. Pesticides: Making the Right Choice for the Protection of Health and the Environment. Government of Canada.
- <sup>3</sup> <http://www.flora.org/healthyottawa/BylawList.pdf> December 24, 2006.
- <sup>4</sup> Canadian Centre for Pollution Prevention and Cullbridge Marketing and Communications. 2004. The Impact of Bylaw and Public Education Programs on Reducing the Cosmetic/Non-Essential, Residential Use of Pesticides: A Best Practices Review.
- <sup>5</sup> Jermyn, Leslie. 2005. Lawn and Order: A Review of the Literature on Effective Strategies for Reducing Outdoor Residential Pesticide Use. University of Toronto. <http://www.cuhi.utoronto.ca/research/>
- <sup>6</sup> Toronto Public Health. 2002. Public Opinion Survey for the Phase-Out of Non-Essential Pesticide Use: Final Report. December 2002. Prepared by Smaller World Communications.
- <sup>7</sup> Oracle Poll Research. 2004. Cosmetic Pesticides in Edmonton and Peterborough: Report. Prepared for the Canadian Association of Physicians for the Environment.
- <sup>8</sup> City of Ottawa. 2002. Pesticide Use and Attitude Survey. [http://ottawa.ca/residents/healthy\\_lawns/lawns/initiative/news\\_release\\_en.shtml#7](http://ottawa.ca/residents/healthy_lawns/lawns/initiative/news_release_en.shtml#7)
- <sup>9</sup> Toronto Public Health. 2002. Ibid.
- <sup>10</sup> Oracle Poll Research. 2004. Ibid.
- <sup>11</sup> City of Ottawa. 2002. Ibid.
- <sup>12</sup> Oracle Research. 2000. Cosmetic Pesticide Use in Caledon. Report prepared for Environmental Economics International. November 2000.
- <sup>13</sup> RRFSS – Rapid Risk Factor Surveillance System, 2003-2005, Toronto Public Health and Institute for Social Research, York University.
- <sup>14</sup> RRFSS. Ibid.
- <sup>15</sup> RRFSS. Ibid.
- <sup>16</sup> Statistics Canada. 2006. Business Register. Canadian Business Patterns (2001-2006).
- <sup>17</sup> Statistics Canada. 2005. Business Register. Canadian Business Patterns (1998-2005).