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Canada's Bulletin on Ecological Pest Management

Municipalities and pest control

In 1991, Hudson, Quebec, became the first municipality in Canada to pass a by-law restricting the use of pesticides on residential properties. Over the next decade, numerous other Quebec municipalities passed similar by-laws and cities and towns in other provinces followed Quebec's lead. Currently, more than 70 municipal pesticide by-laws have been passed in six provinces, with dozens more under active consideration.

Two landscape companies appealed the Hudson by-law to the Supreme Court, asking the Court to rule that municipal governments lack the authority to ban the cosmetic use of pesticides on private property. In December 2001 the Supreme Court upheld the Hudson by-law, ruling that the municipality did have the power under the Quebec Cities and Towns Act to enact by-laws which aim to "minimize the use of allegedly harmful pesticides in order to promote the health of its inhabitants."

In March 2003, the province of Quebec adopted a Pesticides Management Code which prohibits 20 specific active ingredients from use on lawns, bans "weed and feed" products from domestic sale or use and specifies that domestic products be stored in shelving inaccessible to the public. The Code will be completely phased in by 2008.

Three levels of pesticide regulation in Canada

As the Supreme Court affirmed in its Hudson decision, there are three different aspects or levels of pesticide regulation in Canada. Pest control products are registered by the Pest Management Regulatory Agency (federal), while provincial and territorial bodies regulate their sale, use, storage, transportation and disposal. A province or territory may prohibit or restrict the use of a federally registered pesticide. Municipalities are empowered to make local decisions concerning pesticides; municipal actions, like provincial actions, must be consistent with federal law.

Many factors play into municipal decisions to restrict pesticides. Most jurisdictions cite concerns about the health impacts of pesticides. Municipalities use pesticides mainly for maintenance of outdoor public properties and public buildings. Recently, however, many have reduced or completely eliminated pesticide use on parks and road boulevards. Some jurisdictions have explicitly embraced the principles of Plant Health Care and Integrated Pest Management (IPM).

Urban pest managers need effective alternatives

In this changing environment, a critical need for municipalities, for urban landscapers, for homeowners and for other urban pest managers is increased access to alternatives. A study conducted by the Canadian Centre for Pollution Prevention (C2P2) states: "the secret to changing lawnscape care practices is to educate the community about the appropriate product use, for those intending to continue using pesticides, and about alternatives, for those choosing not to use pesticides." The C2P2 report recommends that homeowners who choose to continue using pesticides learn IPM strategies, most especially the skill of using the right tool at the right time in the right way. C2P2 further recommends that the PMRA accelerate the evaluation process for lower-risk products to provide the public with safe alternatives.*

Meanwhile, municipalities are experimenting with new pest control measures:

- Toronto and Québec are using "Aquacide" units to replace glyphosate for weed control. The units "cook" weeds with super-heated water on sites such as baseball diamonds and roadsides.
- Winnipeg is using pheromone traps for the elm beetle.
- Calgary is experimenting with new grass varieties and different surface covers such as shredded rubber in play parks.
- Vancouver is using conservation biocontrol (see page 6) by planting nectar and pollen producers with staggered flowering times, and uses biocontrol agents at municipal conservatories, nursery operations and production facilities for perennials and annuals.
- Halifax is studying the use of compost to suppress diseases on turf in sports fields.

(Continued on page 8)

** The PMRA has recently struck a Low-Risk Working Group for this purpose. www.pmra-arla.gc.ca/english/advbod/lowrisk_wg-e.html*

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Submissions and letters to the editor are welcomed. Guidelines for submission are available on request from biocontrol-network@umontreal.ca.

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Guest author Wendy Gelernter

Biological control on golf courses: is it possible?

Golf course superintendents like to joke that if it weren't for the golfers, their jobs would be much easier. The same can be said for implementation of biological control on golf courses, where the almost impossible demand for cosmetically perfect turfgrass can scuttle even the best-intentioned plans. That there has nevertheless been significant progress in the adoption of biological control is to the credit of golf course superintendents and owners who must every day juggle the competing demands of golfers, environmental protection and sound agronomic principles.

The important role of cultural practices

If biological control can be defined to embrace not just the use of beneficial organisms and products such as those listed in Table 1 (see page 3), but also the cultural practices without which biocontrol cannot succeed, then all golf courses are already practicing a significant level of biological control. Cultural approaches strive to reduce the stress placed on turfgrass by the game of golf, and in so doing reduce the impact of pests on turf health and quality. These practices are so commonly used on golf courses today that many superintendents do not even recognize that they are conducting the most fundamental of biological control principles.

The biological control product dilemma

Cultural practices, however, do not address all possible pest problems. And so, when a pest escapes the somewhat porous safety net cast by cultural practices, what factors do golf course superintendents consider as they develop a control strategy?

Key factors that promote the use of biological control include:

- Humans come into very direct contact with golf course turf – whether as workers on the course, as residents in the surrounding communities, or as golfers.
- There is a need to protect the natural features — streams, rivers, wooded areas — that are part of many golf courses.
- Because turfgrass is a perennial crop, living biocontrol agents such as predators, parasites and microorganisms can become established without the usual disruption caused by harvest, crop rotation and tillage practices.
- Golf course turf is intensively scouted on a daily basis, a critically important practice for successful biocontrol.

These are countered by an equally compelling list of reasons why superintendents might select conventional pesticides instead:

- The demand for cosmetically perfect turf is the primary pressure faced by turf managers, and failure to meet this goal is the most frequent reason that superintendents are fired. With minimal job security (the average tenure on a golf course is less than five years), tried and true methods are going to be more attractive than experimentation.
- In many cases, conventional products are easier to use and produce more consistent results than biocontrol products.
- Conventional chemistries have grown increasingly safer (Table 1).
- Very few biocontrol products are registered in Canada for use on turf (Table 1), and even fewer are marketed aggressively.
- Very little research exists on the use of classical biocontrol in turf. Instead, the emphasis is on biopesticide products that must be applied repetitively.
- Some biocontrol products have been irresponsibly promoted, with dubious claims made regarding the benefits of use.

What the future holds

The incentive to use safer pest control approaches on golf courses is strong, and has resulted in the integration of many effective cultural practices that have helped to meet this goal. Low toxicity products – reduced risk pesticides or biopesticides – are also being adopted. But to make biocontrol on golf courses truly possible, a dreaded phrase must be invoked – "sacrifices will be necessary." Legislative mandates, such as those already enacted in some parts of Canada, can prompt the industry to move faster towards the goal of biocontrol, but mandates alone will not be successful. They need to be accompanied by concessions from golfers, who can help to reduce stress on turfgrass by accepting slightly slower greens that are mowed higher, a little less shade on the course, or wetter conditions than are optimal for play. As well, in order to provide additional low-risk options for pest control, universities and companies will require financial support for research, development and registration of new products and practices.

Table 1. Biopesticides and reduced risk pesticides available in Canada for use on golf course turf

Active ingredient	Product name(s)	Company	Target pest	Classification
corn gluten meal	Nutrite	Yara Canada	Crabgrass	Biopesticide
Heterorhabditis spp. beneficial nematodes	Nemasys, Heteromask	Becker Underwood, BioLogic	White grubs (scarab larvae)	Biopesticide
Steinernema spp. beneficial nematodes	Capsanem, Millennium, Scanmask	Koppert, Certis, Becker Underwood, Biologic	Caterpillars, crane fly larvae	Biopesticide
azoxystrobin	Heritage	Syngenta	Broad spectrum of turf diseases	Reduced risk
boscalid	Cadence	BASF	Dollar spot	Reduced risk
glyphosate	Round-Up	Monsanto	Broad spectrum of weeds	Reduced risk
mefenoxam	Subdue Maxx	Syngenta	Pythiuma	Reduced risk
spinosad	Conserve	Dow	Caterpillars	Reduced risk
trifloxystrobin	Compass	Bayer	Broad spectrum of turf diseases	Reduced risk

Table 2. Common cultural practices that significantly reduce pesticide inputs

Practice	Target pest(s)
Endophyte-enhanced ryegrass and fescue seed	Chinchbugs, billbugs, cutworms, webworms
Pest-tolerant turf varieties	Dollar spot, armyworms, chinch bugs, sod webworms
Increase soil manganese levels to 30 ppm	Diseases caused by *Gauemannomyces* (decline, take-all patch)
Maintain 3-20 ppm total plant available nitrogen in soils	Anthracnose, red thread, dollar spot
Monitor soil salinity and leach to maintain below 3 dS/m, 6 dS/m and 9 dS/m (respectively) for poa/bentgrass, ryegrass/fescue and warm-season turf varieties.	All

Practice	Target pest(s)
Avoid organic fertilizers	Black turfgrass ataenius, Green June beetle, earthworms
Sand topdressing	Earthworms
Avoid soil compaction through management of foot and vehicular traffic, preventive aeration	All
Increase height of cut on greens	All
Reduce excessive shade through tree trimming or removal if necessary	All
Compost "teas", organic fertilizers, soil inoculants, molasses to promote the growth of beneficial microorganisms	All

Wendy Gelernter is the Research Director for the PACE Turfgrass Research Institute www.paceturf.org. She is also President-elect of the Society for Invertebrate Pathology.

EcoGuard: microbial control of costly turf disease

Dollar spot, so named because of the silver dollar-sized patches it causes on turfgrass, is the most prevalent and costly turf disease in the world. The disease is particularly rife on putting greens and closely mown fairways. In Canada, dollar spot stretches from east to west coasts, and is most severe in the Great Lakes region.

Dollar spot is caused by a fungus currently classified as *Sclerotinia homoeocarpa*, though taxonomists believe it may belong in another genus. When daytime highs climb above 15°C in the spring, fungal strands called mycelium reach outwards from thatch to infect wet leaf surfaces. The fungus spreads easily from diseased to healthy leaves; diseased tissue may also be transported via grass clippings on golf shoes, carts and maintenance equipment.

EcoGuard, manufactured by Novozymes Biologicals of Salem, Virginia, and based on the naturally occurring bacterial species *Bacillus licheniformis*, was registered in the U.S. for control of dollar spot in 2003. The product is also labelled for leafspot and blight diseases on all kinds of turf, ornamental plants, conifers and tree seedlings in outdoor, greenhouse and nursery sites. Currently, the company is discussing with the Pest Management Regulatory Agency what additional data might be required to register the product in Canada.

EcoGuard appears to work by producing antifungal compounds, though the precise nature of these agents has not yet been identified. For control of dollar spot, EcoGuard is best used as a preventive application, used as a foliar spray or soil drench just prior to or at the first sign of disease. The label includes directions for use alone or in rotation with conventional fungicides in low, moderate and high disease pressure.

Before being registered, EcoGuard was tested at universities and golf courses in the Midwest, the Northeast and the Southern U.S. Research suggests that, under low to moderate pressure, EcoGuard offers better than 90% control of dollar spot. It also indicates that the product can be used in an integrated pest management program as an effective preventive treatment in low to moderate infestations.

As an added bonus, possibly because of its high nitrogen content (10%), EcoGuard use may result in noticeable improvements in turf health and vigour. ■

Dollar spot lesion on blade of grass

Corn gluten meal: safe for dogs and kids

In view of the tendency of some dogs to lick herbicides off neighbourhood lawns, it may come as a relief to find an herbicide that not only saves Spot a visit to the vet, but manages weeds.

Corn gluten meal (CGM) is a by-product of the wet milling process used to make cornstarch. It controls weeds by preventing seeds from developing a normal root system, thus causing them to succumb to dehydration when exposed to drought stress. Because it works only on seedlings, CGM is registered as a pre-emergent herbicide.

In Canada, the product *TurfMaize* is registered by The Environmental Factor Inc. for the control of dandelion and crabgrass on Kentucky bluegrass lawns. The company is currently undertaking field tests in an effort to extend the registration to other types of turfgrass. Another CGM product - *Nutrite Pre-Emergent Crabgrass Weed Seed Germination Inhibitor with Corn Gluten* - is registered for use on perennial ryegrass lawns by Yara Canada LP. In the U.S., several CGM products are registered for a variety of grassy and broad-leaved weeds.

Timing is critical!

Apply CGM products 3-5 weeks before lawn weeds germinate in spring, with a second application in late summer. In the absence of rain, the product should be watered in; the lawn must then dry for 2 or 3 days to prevent newly germinated weeds from developing roots.

Studies reviewed by the Pest Management Regulatory Agency found that a CGM product applied at label rates can provide up to 86% control of crabgrass during the first year and 98% in subsequent years. Dandelion infestations were eliminated with four years of spring and fall treatments. While Canadian products are registered only for these species, research has shown good control of a variety of weeds, including black nightshade, clover, buckthorn plantain, common lambsquarters, curly dock, purslane, redroot pigweed, and many grassy weeds.

CGM will not harm established lawns. But newly seeded grass is vulnerable to its effects until after the first mowing when the root systems are established. Corn gluten meal has another benefit. Because it is 10% nitrogen by weight in a slow release form, it makes a good weed and feed product. One limitation of CGM is that it is not soluble in water, and thus cannot be applied as easily as some herbicides. While CGM products may cost more than other weed and feed products, many consumers are willing to pay the higher price because of its non-toxic nature. ■

Bicarbonates for disease control

Baking soda has long been used by home gardeners to manage diseases on vegetables, roses, and other ornamentals. Gardening books from the 1930s recommended an ounce of baking soda in a gallon of water to control powdery mildew on roses.

More recently, there has been a fair amount of scientific research into the efficacy of baking soda (sodium bicarbonate) and other bicarbonates. Products which contain potassium bicarbonate are now registered for management of fungal diseases in both Canada and the U.S. In Canada, Milstop, manufactured by BioWorks, is registered for control or suppression of powdery mildew on selected commercial greenhouse vegetables and ornamentals. BioWorks is also interested in pursuing a domestic registration when a suitable distributor is identified. Milstop and some other products are acceptable in organic production. In the U.S., six products are registered for a wide variety of commercial as well as home and garden uses.

Bicarbonates control fungal diseases by disrupting the potassium balance in the fungal cell, causing the cell walls to collapse.

Powdery mildew on dogwood leaves

Research has shown that bicarbonates offer significant control of the following crop/pest combinations:

- powdery mildew and black spot of roses;
- powdery mildew on lettuce, grapes, cucurbits (cucumbers, melons), and tomatoes;
- blackroot rot of carrots;
- silver scurf on post-harvest potato tubers;
- grey mould and other post-harvest diseases in grapes.

Good results have also been reported for a wide variety of other vegetables, turf, shrubs, ornamental and nut trees. Studies have not shown good results on organic marigolds, while control of early blight in tomato has been variable.

Sprays of both potassium bicarbonate and baking soda can injure the plant, so these materials should be used with caution. ■

Fungus gnats beware: roundworms to the rescue

One of the ornamental grower's most common adversaries is the fungus gnat, *Bradysia coprophila*. These tiny creatures can rapidly destroy a large variety of plants by damaging roots and transmitting diseases. The adult is a tiny black fly, approximately 1/8" (3 millimetres) in length. But it's the larva that does the damage, feeding on plant roots, root hairs and lower stem tissues.

Nematodes, particularly the species *Steinernema feltiae*, are one biological answer to the problem of too many fungus gnats. Nematodes are microscopic roundworms which are shipped to growers in the infective juvenile stage. When applied to soil as a drench, juvenile *S. feltiae* seek out and penetrate the larval body of the pest. Inside the body, they release bacteria which result in infection and death of the larva within 24-48 hours.

A number of products containing *S. feltiae* are available from a variety of manufacturers, including: NemaShield (Bioworks, USA), Nemasys (Becker Underwood, UK), and Scanmask (BioLogic Co., USA). Imported biocontrol products containing species known to occur in North America (including *S. feltiae*) are granted import permits from the Canadian Food Inspection Agency, while there is currently no regulatory oversight for the use of *S. feltiae* products manufactured in Canada. Products are available at some nursery and specialty stores in Canada.

Greenhouse tests show that *S. feltiae* provides good control of fungus gnats on New Guinea impatiens, poinsettia and other ornamentals. Some trials found control levels indistinguishable from registered organophosphates, suggesting that *S. feltiae* may be both a safe and economical alternative to conventional chemical control.

It is recommended that growers treat as soon as possible after sowing seed or inserting cuttings and that, for slow growing crops, repeat applications be made at six-week intervals. After initial application, routine preventive treatments should be made to prevent crop damage. If fungus gnat populations are already established, reductions in adult populations may take two to three weeks.

For optimum performance, soil temperature should be between 55-90 degrees, products should not be stored for extended periods, soil media should be irrigated before and after application (nematodes require moisture for movement), media should be kept moist for two weeks after application, and products should not be applied within seven days of a nematicide application. ■

For more useful information on entomopathogenic nematodes, consult the following websites:

http://www2.oardc.ohio-state.edu/nematodes/
http://www.biobest.be (click on *English*, then *Products*, then *Beneficial nematodes*, then *Steinernema-System*)
http://www.nysaes.cornell.edu/ent/biocontrol/pathogens/nematodes.html

Fungus gnat larva with nematodes inside

Rhapsody is music to ears of ornamental growers

In the summer of 2003, the U.S. EPA registered a new biocontrol agent called Rhapsody, manufactured by AgraQuest Inc. The active ingredient is a patented strain of the common bacterium, *Bacillus subtilis*, found in soils worldwide. This particular strain (QST 713) produces an array of chemicals called lipopeptides, which destroy both bacteria and fungi by punching holes in the cell membranes of the pathogens. Each of the many lipopeptides attacks a different part of the cell wall, working together to produce a zone of inhibition which restricts pathogen growth and prevents pathogens from attaching, penetrating and infecting the plant surface. The bacterium also activates a plant's systemic acquired resistance defence system. This versatility and multi-pronged onslaught make Rhapsody a particularly effective tool in resistance management.

Rhapsody controls a range of bacterial diseases such as *Pseudomonas*, *Xanthomonas* and *Erwinia* spp., as well as fungal diseases such as powdery mildew, *Botrytis*, *Anthracnose* and leaf spot diseases. In the U.S., an aqueous suspension is registered for use in the field and the greenhouse, as well as on indoor plantings and residential and commercial landscapes. It provides control of diseases which attack annual and perennial bedding plants, potted flowers, cut flowers, tropical foliage and container grown trees and ornamentals. AgraQuest has recently submitted an application to register Rhapsody in Canada.

Rhapsody has been approved for use in organic production in the U.S. It is non-toxic to beneficial insects and predatory mites, making it compatible with biologically based IPM programs.

Ideally, Rhapsody is applied when conditions favour disease development, but before the onset of symptoms. It may also be used at the first signs of disease symptoms. Because Rhapsody is a contact material, full coverage of plant surfaces is important. The use of a spreader/sticker or wetting agent is strongly recommended to improve penetration and coverage. ■

Bug Gardens: conservation biocontrol in practice

By Peter Isaacson (IPM and Minor Use Coordinator, Canadian Nursery Landscape Association)

Hover fly

Background

Encouraging natural enemies may be the most important and readily available biological control practice available to IPM practitioners. Conservation biocontrol manipulates the environment to favour naturally occurring populations of beneficial insects - predators and parasitoids. It attracts and maintains populations of beneficial insects by providing flowering plants which offer cover and overwintering protection for pupae and eggs (refugia) and alternate food sources (food, nectar and prey). Since natural enemies occur in all production systems, from the backyard garden to the commercial field, they are well suited to the local environment and to local target pests.

Recent and proposed municipal legislation limiting cosmetic use of pesticides is catalyzing expansion of conservation biocontrol. The significance of this aspect of biological control will grow within the green industry as homeowners and landscapers decrease pesticide use and implement integrated control in the landscape and garden. It will also have great impact on commercial horticulture operations, where available natural biological control may augment other control strategies.

Pilot project

The "Bug Gardens" pilot project will involve government, industry and municipal partners planting "Bug Gardens" as research and public demonstration displays. The project has three related goals: 1) to educate the gardening public and growers on the tenets of integrated pest management, including the use of conservation biological control; 2) to select landscape quality plants with the capacity to attract beneficials (i.e., provide refugia and/or food sources); and, 3) to conduct research into methods of enhancing beneficial insect populations.

Methodology

Urban public education/Demonstration gardens: With municipal partners, the project will plant demonstration bug gardens with display materials that invite home gardeners to apply the concepts of conservation biological control and to view the aesthetics of the suggested plant species.

Research gardens: With partners from colleges, Agriculture and Agri-Food Canada and industry, the project will plant research gardens to generate data on the levels of pest and natural enemy populations over time. One of the primary areas of study will be aphid predators and parasitoids. The bug gardens will allow researchers to follow natural populations of *Aphidoletes*, lacewings, syrphid flies and lady bird beetles on a variety of plant species that have been reported to benefit these biocontrol agents.

Selection of plant material

Bug Gardens will include: small trees and shrubs which offer varying canopy height and some shade; groundcovers and mulch for refuge; annuals for continuity of bloom (as sources of nectar and pollen); grasses for early pollen; herbaceous perennials with desirable flower structure, nectar and pollen; and pest-attracting species to provide alternative prey. A good example is sweet alyssum (*Lobularia maritima*) which has the following qualities: favorable flower structure (tiny flat flowers to attract parasitic wasps), abundant pollen and nectar, long flowering period, readily available, easy to grow, self-seeding without being invasive, inexpensive, and attractive.

Conservation biological control holds promise as a low-risk strategy in the control of insect pests. Bug Gardens will provide a living demonstration of ecologically-sound pest control that could be used in commercial horticulture or the home garden.

We greatly appreciate the partnership of the Institute for Sustainable Horticulture (Kwantlen University College), Olds College (Alberta), Agriculture and Agri-food Canada, Ontario Ministry of Agriculture and Food, the City of Vancouver and the Canadian Nursery Landscape Association as we move forward in developing this project and aim for our first Bug Garden plantings in 2006. ■

The Bug Gardens Project is an initiative of the newly formed Institute for Sustainable Horticulture (ISH) at Kwantlen University College in British Columbia. The ISH within the School of Horticulture was created in 2004 and integrates educational outcomes with industry-driven innovation and research.

Bug Gardens team:

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Biologicals target mosquito larvae

Winnipeg's new plan for mosquito control

It's been a wonderful year for mosquitoes in the City of Winnipeg – very warm weather, 140-200% above normal precipitation, night temperatures in the upper 20s ... party time if you're a mosquito. But it's been a tough year to be a mosquito's potential meal.

Over the next three years, the City of Winnipeg is phasing in a mosquito control strategy which may put a damper on mosquito celebrations. The plan will rely on biological products to control the (aquatic) larval mosquitoes, and use a multi-factor monitoring and assessment program to decide whether it is necessary to target the winged and biting adults. Program funding will jump from $3.55 million in 2005 to $6.165 million in 2007.

On July 15th of this year, the province of Manitoba issued a Public Health order, based on the risk of West Nile Virus, requiring the City of Winnipeg to implement a residential fogging program. Fogging operations continued from mid-July to mid-August. According to Ken Nawolsky, Surveillance Program Coordinator and Insect Control spokesperson for the City's Insect Control Branch, Winnipeg, like some other cities, currently uses malathion to target adult mosquitoes in its fogging operations.

The City and the province are working with other provinces in hope of getting new products registered for fogging operations, in particular synthetic pyrethroids. But market demand may not be sufficient to entice a registrant - Winnipeg is the only city in Canada with a history of routine residential fogging operations. There is hope, too, that an agent useful against the pupal stage can be registered, a valuable tool when larval development proceeds so quickly (hatch to adult in 5 days in 2005) that it is impossible to effectively manage larvae in all areas during the short larval window.

In addition, the City is embarking on an innovative project to enhance the actions of natural predators against both adult and larval mosquitoes. Dragonflies and damselflies – predators of both adult and larval mosquitoes – are being reared and released and their habitat enhanced. Populations of another predator, a minnow, will be bolstered in storm retention ponds and other permanent water bodies where the fish are part of the natural ecosystem.

Other than fogging, barrier treatments to control adults are the last line of defence if larval operations prove insufficient for controlling populations. Currently, synthetic pyrethroid products are registered for barrier treatments. The City has been using these products in parks, for example spraying along bush lines where mosquitoes harbour during the day.

Part of the new program is an assessment and decision-making protocol called Adulticiding Factor Analysis or AFA. Six factors are included:

- soil moisture;
- probability of rain in the following week;
- mosquito count in neighbourhood Light Traps;
- current stage of adult mosquito development;
- a day-degree model (a measure of the favourability of environmental conditions for adult mosquito development); and
- larval development.

When the AFA is low, the number of nuisance mosquitoes is low, and management of adults is unnecessary. With a medium AFA, some barrier spraying would be conducted. When the AFA is high, barrier spraying and/or fogging is prescribed.

The City recently received funding for a drainage engineer to collaborate with the Insect Control team in efforts to reduce bodies of standing water. Because Winnipeg has heavy clay-based soil, water does not disperse rapidly. The engineer will work in conjunction with other City departments and developers to eliminate standing water sites which result from drainage problems. Initial efforts will identify areas where simple methods such as fixing the grade, unclogging culverts or removing brush from ditches can be employed.

The City is also conducting a public education campaign. Advertising methods include messages on bus shelters and in leisure guides. A program called Targeted Environmental Action Against Mosquitoes (TEAAM) involves students knocking on doors to offer a free yard audit. The audit helps homeowners identify potential standing water sites in their yard and take steps to rectify the situation.

Nawolsky points to signs that efforts to manage larvae are paying off. Winnipeg began the spring of 2005 with wet, saturated soil, a result of heavy fall rains, a quick freeze which hindered water infiltration, and above normal winter snowfall. This triple whammy meant a lot of standing water. But, despite frequent rains from mid-April to June, the nuisance mosquito population was well under control. Unfortunately, Mother Nature then served up another round of torrential downpours. Standing pools became, in essence, standing lakes, making it very difficult to effectively control mosquitoes.

Like the weather, mosquito populations are somewhat unpredictable. But with more tools in its toolkit, Winnipeg is hoping to put a lid on nuisance mosquitoes and West Nile Virus vectors. ■

Reliance on chemical pesticides for mosquito larval control has dropped from 90% in 2002 to 65-70% this year, and the City of Winnipeg hopes to completely phase out their use by 2007, and rely entirely on biopesticides and biological control. The three active ingredients currently used to control larvae are the microbials *Bacillus israelensis* and *Bacillus sphaericus,* and the insect growth regulator, methoprene. Use of these is expected to rise over the next two years of the phased-in program.

Resources:

Documents

Comprehensive Municipal Toolset for Plant Healthcare and Healthy Lawns. Power Point Presentation to the 7th Canadian Pollution Prevention Roundtable, June 11th, 2003 by Duck Kim, Environment Canada. http://pestinfo.ca/documents/DuckKim.pdf

Sustainable Turf Care. Appropriate Technology Transfer for Rural Areas (ATTRA), by Barbara Bellows, 2003. http://www.attra.org/attra-pub/PDF/turfcare.pdf

Canadian Nursery Crop Profile: Container Production. Prepared for Canadian National Landscape Association and Canadian Horticultural Council by McTavish Resource and Management Consultants, Ltd., March 2003. http://www.agr.gc.ca/env/pdf/nursery_container_e.pdf

Canadian Nursery Crop Profile: Field Production. Prepared for Canadian National Landscape Association and Canadian Horticultural Council by McTavish Resource and Management Consultants, Ltd., March 2003. http://www.agr.gc.ca/env/pdf/nursery_field_e.pdf

The Impact of By-Laws and Public Education Programs on Reducing the Cosmetic / Non-Essential, Residential Use of Pesticides: A Best Practices Review, by the Canadian Centre for Pollution Prevention and Cullbridge Marketing and Communications. http://pestinfo.ca/documents/PesticidesBestPracticeReview-FINAL040324.pdf

Website

Responsible Pest Management website (a project of the Federation of Canadian Municipalities) at http://www.pestinfo.ca/index.php3/lang/EN

Conferences

October 13-15, 2005: Association of Natural Bio-Control Producers Annual Meeting: "Beneficials without Borders," Guadalajara, Mexico. Contact: M. Burt, ANBP, 2230 Martin Dr., Tustin, CA 92782, USA. Eml: execdir@anbp.org. Fax/phone: 1-714-544-8295. Web: http://www.anbp.org

October 30-November 3, 2005: 6th Pacific Rim Conference on the Biotechnology of *Bacillus thuringiensis* and its Environmental Impact, Victoria, B.C. Contact: L. Levesque, Biocontrol Network, Dept. de Physiologie, Rm. 3156 P.G. Desmarais Bldg., Univ. de Montreal, 2960, Chemin de la Tour, Montreal, QUE H3T 1J4. Eml: biocontrol-network@umontreal.ca. Fax: 1-514-343-6631. Phone: 1-514-343-7950.

April 4-6, 2006: 5th U.S. National IPM Symposium: "Delivering on a Promise," St. Louis, Mo, USA. Contact: E. Wolff, OCE, Univ. of Illinois, 302 E. John St., Suite 202, Champaign, IL 61820, USA. Fax: 1-217-333-9561. Phone: 1-217-333-2880. Web: http://www.ipmcenters.org/ipmsymposiumv/

Municipalities and pest control (page 1 continued)

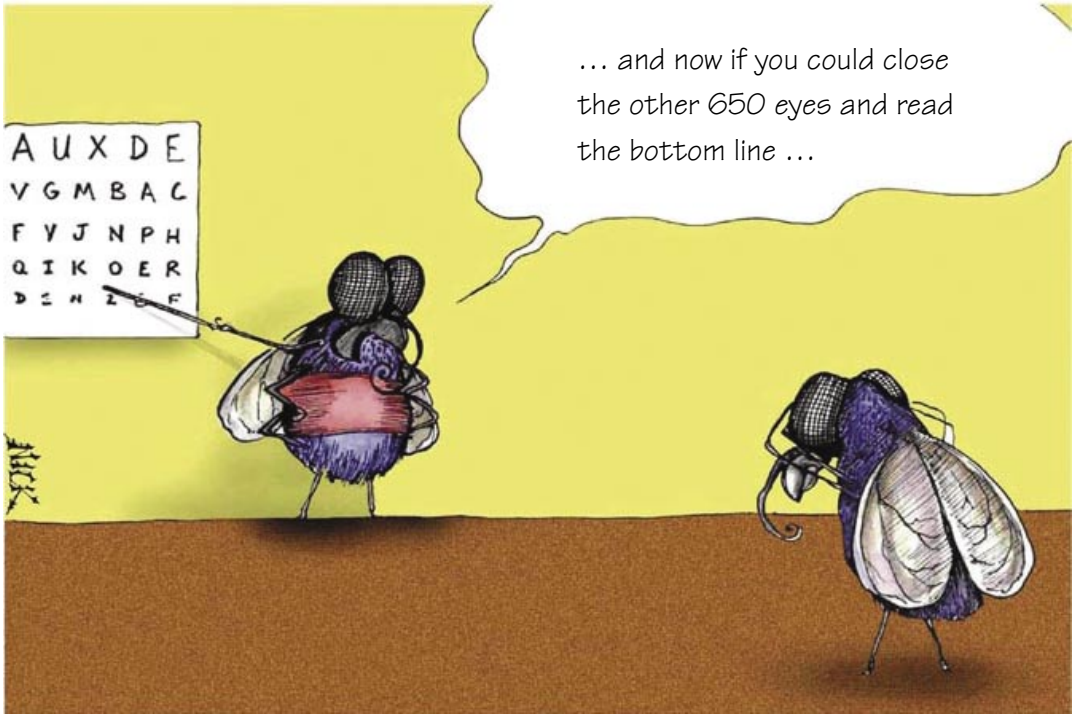
Challenges

Probably the thorniest challenge to achieving safer and effective pest control, thereby reducing risk at the municipal level, is a lack of information. Elected representatives, staff and citizens are poorly informed about potential effects of pesticides and effective alternate approaches. There may be a perception that reduction or elimination of pesticide use may lead to parks overrun by weeds, unusable sports fields and prohibitive costs. (On the other hand, there may also be a perception that all pesticide use is dangerous, which could lead to enactment of by-laws without adequate contingency plans.) Educational programs - brochures, free yard and lawncare advice, hotlines, etc. - have been operated by many Canadian jurisdictions.

Also, the financial implications of alternative pest management programs compared to traditional chemical use programs are not clear. Costs are sometimes perceived as high. In other cases, adopters cite long term cost reductions, transferability of current costs to new programs and avoidance of externalising costs arising from pesticide use.

Conclusion

As more and more municipalities restrict urban pesticide use and adopt IPM strategies, the market for biological pest control products and other safer or "low risk" products is sure to grow. For example, it is estimated that sales of "low-impact" pest control products grew by about 45% in Halifax in the year following full phase-in of the new pesticide by-law. It will be incumbent on regulators to ensure increased access to low-risk products and on companies to bring forward products to meet a growing need. ■



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