CITY OF VANCOUVER

CITY CLERK'S DEPARTMENT
Access to Information

File No.: 04-1000-20-2017-469

December 20, 2017

s.22(1)

Dear s.22(1)

Re: **Request for Access to Records under the Freedom of Information and Protection of Privacy Act (the "Act")**

I am responding to your request of November 21, 2017 for:

1. **A copy of the most current version of the City of Vancouver's Integrated Pest Management policy and any available information regarding the said policy, beyond what is provided on City of Vancouver's website (http://vancouver.ca/home-property-development/integrated-pest-management.aspx); and**
2. **Any available reports that present findings on the efficacy of the City of Vancouver's Integrated Pest Management policy (i.e. statistics on the decrease in pesticide use over time; statistics on pests that have been eradicated; statistics on public perception of pest management, etc.).**

All responsive records are attached. The department has advised that they do not have any current reports that provide the tracking or efficacy information requested.

Under section 52 of the Act you may ask the Information & Privacy Commissioner to review any matter related to the City's response to your request, within 30 business days from the date of this letter. You can request a review by writing to: Office of the Information & Privacy Commissioner, Email: info@oipc.bc.ca, Tel: 250-387-5629 and providing: 1) the request number (#04-1000-20-2017-469); 2) a copy of this letter; 3) a copy of your original request; and 4) the reason you're requesting a review.

Please do not hesitate to contact the Freedom of Information Office at foi@vancouver.ca if you have any questions.

Yours truly,

Cobi Falconer, FOI Case Manager, for

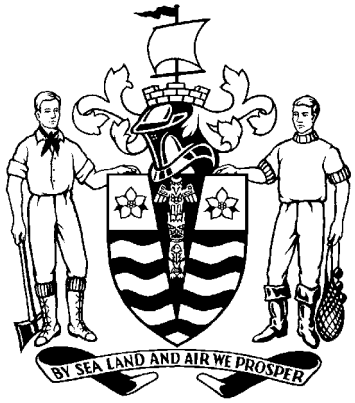
**Barbara J. Van Fraassen, BA**
**Director, Access to Information & Privacy**

*Barbara.vanfraassen@vancouver.ca*
*453 W. 12th Avenue Vancouver BC V5Y 1V4*
*Phone: 604 .873.7999*
*Fax: 604.873.7419*

Encl.

:cf

# CITY OF VANCOUVER
# BRITISH COLUMBIA




# HEALTH BY-LAW NO. 9535

**This By-law is printed under and by authority of the Council of the City of Vancouver**

**(Consolidated for convenience only to May 16, 2017)**

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**SCHEDULES**

# BY-LAW NO. 9535

## A By-law to provide for the care, promotion, and protection of the health of inhabitants

**[Consolidated for convenience only, amended to include By-law No. 11788 effective May 16, 2017]**

THE COUNCIL OF THE CITY OF VANCOUVER, in public meeting, enacts as follows:

## SECTION 1
## INTERPRETATION

### Name of By-law

1.1 The name of this By-law, for citation, is the "Health By-law".

### Definitions

1.2 In this By-law:

"building" includes a structure;

"burning" means to produce smoke, vapour or other substances that can be inhaled;

"business" means a business, trade, profession, or other occupation for which a person must obtain a license under the License By-law;

"common areas" include lobbies, foyers, stairwells, elevators, corridors, cloakrooms, washrooms, food fair seating areas, and other public areas of a building;

"customer service area" means a partially enclosed or unenclosed area, including a balcony, patio, yard or sidewalk, that is part of or connected to or associated with a business or use in a building or premises that includes the service of food or alcoholic drinks to customers or other persons for consumption on site;

"neonicotinoid" means a class of synthetic pesticides derived from nicotine that may be applied to seeds, soil and foliage including but not limited to imidacloprid, clothiandin, thiamethoxam, dinotefuran, thiacloprid and acteamiprid;

"premises" means a portion of a building in respect of which a person has exclusive possession;

"responsible person" means a person who owns, controls, manages, supervises, or operates:

(a) a business or other use which occupies all or substantially all of a building,

(b) a business or other use which occupies premises,

(c) common areas, or

(d) a customer service area,

and, in respect of common areas, includes a strata corporation or cooperative association, and also means a person who drives a vehicle for hire;

"smoke" or "smoking" includes burning a cigarette or cigar, or burning any substance using a pipe, hookah pipe, lighted smoking device or electronic smoking device; and

"vehicle for hire" means a vehicle for hire defined in the Vehicles for Hire By-law.

**Table of contents**

1.3 The table of contents for this By-law is for convenient reference only, and is not for use in interpreting or enforcing this By-law.

**Schedules**

1.4 The schedules attached to this By-law form part of this By-law.

**Severability**

1.5 A decision by a court that any part of this By-law is illegal, void, or unenforceable severs that part from this By-law, and is not to affect the balance of this By-law.

**Duty of administration and enforcement**

1.6 The intent of this By-law is to set standards in the general public interest, and not to impose a duty on the city or its employees to enforce its provisions, and:

(a) a failure to administer or enforce its provisions, or the incomplete or inadequate administration or enforcement of its provisions, is not give to rise to a cause of action in favour of any person; and

(b) the grant of any approval or permission or issuance of any permit is not a representation, warranty, or statement of compliance with the By-law, and the issuance thereof in error is not to give rise to a cause of action.

## SECTION 2
## HEALTH REGULATIONS

**Ban on certain behaviours**

2.1 A person must not expectorate, urinate, or defecate on or in any street or other public place, except in a location in a public building or facility provided specifically for such purpose.

**Ban on smoking**

2.2 A person must not smoke:

(a) in a building, except in:

(i) a dwelling unit or sleeping unit defined under the Zoning and Development By-law including a dwelling unit in which an owner or occupier also carries on a business,

(ii) a hotel or motel room or suite designated for smoking by a responsible person, or

(iii) enclosed premises:

(A) that are not open to the public,

(B) that are not private clubs or smoking clubs, a purpose of which is to allow patrons, customers, or other persons to smoke, and

(C) where the only occupants are the owner or owners of the business carried on in the premises;

(b) in a vehicle for hire;

(c) on public transit including a school bus, passenger bus, ferry, or rapid transit;

(d) in an enclosed or partially enclosed shelter where people wait to board a vehicle for hire or public transit;

(e) within six metres measured on the ground from a point directly below any point of any opening into any building including any door or window that opens or any air intake;

(f) in a customer service area;

(g) in a plaza identified in heavy black outline in Schedule "B"; and

(h) within six metres of the perimeter of a customer service area.

**Enforcement of ban on smoking**

2.3 Except as permitted by section 2.2, a responsible person must not suffer or allow a person to smoke in:

(a) a building or customer service area;

(b) premises or common areas;

(c) an area described in section 2.2(e) or (g) except to the extent that all or part of such area is not part of the parcel on which the building or customer service area is situate and is not an area over which such responsible person has possession or control; or

(d) in a vehicle for hire.

**Signs banning smoking**

2.4 A responsible person must display, or ensure the display of, a sign at all times:

(a) at each entrance to a building or customer service area or to premises, or in a vehicle for hire, where section 2.2 prohibits smoking, stating:

THIS IS A SMOKE FREE ENVIRONMENT – NO SMOKING; and

(b) on each exterior wall of a building, where section 2.2 prohibits smoking, stating:

SMOKING IS PROHIBITED WITHIN SIX METRES OF OPENINGS INTO THIS BUILDING INCLUDING DOORS AND WINDOWS THAT OPEN AND ANY AIR INTAKE.

**Sign requirements**

2.5 All signs referred to in section 2.4 must:

(a) include the text "City of Vancouver Health By-law" in letters not less than one quarter of the height of all other letters on the sign;

(b) display the international symbol to designate "No Smoking", or, in areas where smoking is permissible, the international symbol to designate "Smoking Permitted", which symbol must occupy at least 25% of the size of the sign;

(c) consist of at least two contrasting colours, except that if the lettering is on a clear panel then the lettering must contrast to the colour of the background;

(d) be at least 30 cm by 15 cm except that a sign in a vehicle for hire must be at least 9 cm by 11 cm;

(e) be clearly visible; and

(f) except for the text specified in subsection (a), consist of lettering, whether upper case or lower case, that is not less than the following heights based upon the following maximum viewing distances in direct line of sight:

| Viewing Distance | | Letter Height |
|---|---|---|
| Up to 3 m | - | 1 cm |
| Up to 6 m | - | 2 cms |
| Up to 12 m | - | 4 cms |

**Condition of signs**

2.6 A person must not remove, alter, conceal, deface, or destroy any sign required under this By-law.

**Regulation of smoking in parks**

2.7 The Board of Parks and Recreation is authorized to enact by-laws to regulate smoking in parks for the care, promotion and protection of the health of people in parks.

2.8 Sections 2.2, 2.3, 2.4, 2.5 and 2.6 of this By-law do not apply to parks regulated by the Park Board Smoking Regulation By-law.

**Ban on pesticides**

2.9 A person must not apply, or suffer or allow the application of, a pesticide:

(a) that is a neonicotinoid; or

(b) that is a registered control product under the Pest Control Products Act (Canada); and

that persons use directly or indirectly to control, destroy, attract, or repel a pest, being:

(i) an animal, plant, or other organism that is directly or indirectly injurious, noxious, or troublesome, or

(ii) an injurious, noxious, or troublesome condition or organic function of an animal, plant, or other organism, or to mitigate or prevent any injurious, noxious, or troublesome effects of a pest.

**Exception to ban on pesticides**

2.10 Despite section 2.9, a person may apply, or suffer or allow the application of, a pesticide other than a neonicotinoid:

(a) to disinfect swimming pools, whirlpools, spas, or wading pools;

(b) to purify water intended for the use of human beings or animals;

(c) within an enclosed building, being an area closed in by a roof or ceiling and walls with appropriate openings for ingress or egress equipped with doors which are kept closed except when actually in use for ingress or egress;

(d) to control termites;

(e) to control or destroy a health hazard;

(f) to control or destroy pests which have caused infestation to property, being the presence of pests in numbers or under conditions which involve an immediate or potential risk of substantial loss or damage;

(g) to exterminate or repel rodents;

(h) as a wood preservative;

(i) as an insecticide bait enclosed by the manufacturer in a plastic or metal container made in a way that prevents or minimizes access to the bait by human beings and pets;

(j) as an insect repellent for personal use; or

(k) that contains only one or more of the active ingredients set out in Schedule A to this By-law.

## SECTION 3
## MARINAS

**Definitions**

3.1 In this section:

"discharge" means any spilling, leaking, pumping, pouring, emitting, emptying, throwing or dumping;

"food waste" means coffee grounds, coffee filters, tea bags, tea leaves, eggs, eggshells, dairy products, bread, baked goods, pasta, batter, dough, meat, poultry, fish, shellfish, bones, fat, shells, fruit, vegetables, grains, nuts, seeds, peelings, shells, oils, butter, sauces combined with foods, whether raw, cooked or processed, but excludes grease, diapers, animal carcasses and liquid oils not combined with food;

"garbage" means solid waste that is not food waste or recyclable material;

"marina" means any installation operated under public or private ownership, which provides moorage space for watercraft;

"marine toilet" means any toilet on or within a watercraft;

"oil" means oil of any kind or in any form and, without limiting the generality of the foregoing, includes petroleum, fuel oil, sludge, oil refuse and oil mixed with wastes, but does not include dredged spoil;

"potable water" means water which meets the Guidelines for Canadian Drinking Water Quality;

"pump-out facility" means a device or method designed for the removal of sewage from a holding tank connected to a marine toilet or from a self-contained marine toilet, and includes a portable pumping system;

"recyclable material" means solid waste that has been designated as recyclable by the City Engineer; and

"watercraft" means any boat, hull barge or houseboat which is afloat, whether self-propelled or not, and includes pleasure and commercial craft.

**Marina supervision**

3.2 Every owner or operator of a marina shall supervise the operation of the marina and maintain the operation in conformance with this By-law.

**Potable water**

3.3 Potable water supplied to watercraft moored in a marina must be conveyed in such a manner as to maintain the quality and safety of the water.

**No watercraft to discharge oil**

3.4 No person, including a registered owner of a watercraft, shall cause, permit or allow the discharge of oil from any watercraft.

**No marina to discharge oil**

3.5 No owner or operator of a marina shall cause, permit or allow the discharge of oil from any watercraft moored at a marina.

**No watercraft to discharge sewage**

3.6 No person, including a registered owner of a watercraft, shall cause, permit or allow the discharge of sewage from watercraft other than into a sanitary sewer or pump-out facility.

**No marina to discharge sewage**

3.7 No owner or operator of a marina shall, cause permit or allow the discharge of sewage from watercraft in a marina other than into an approved sanitary sewer or pump out facility.

**Post notices**

3.8 Every owner or operator of a marina shall post and maintain at least four (4) notices in conspicuous locations prohibiting the discharge of sewage or oil from watercraft.

**No waste from watercraft**

3.9 No person shall cause, permit or allow the discharge or removal of any garbage, food waste or recyclable material from any watercraft other than into a garbage, food waste or recycling container.

**No waste from marina**

3.10 No owner or operator of a marina shall cause, permit or allow the discharge or removal of garbage, food waste or recyclable material from any watercraft moored at a marina other than into a garbage, food waste or recycling container.

**Marina regulations**

3.11 Every marina owner shall:

(a) post and maintain notices in conspicuous locations within the marina stating the location of garbage, food waste and recycling containers and that garbage, food waste and recyclable material shall be disposed of only at the garbage, food waste and recycling container area;

(b) provide an adequate number of covered containers for the collection of garbage, food waste and recycling, located conveniently where they can be readily seen and used;

(c) make provisions for the regular servicing and emptying of garbage, food waste and recycling containers so as to prevent overflowing garbage, overflowing food waste, overflowing recyclable material, foul odors, insects and other pests;

(d) provide containers designed for the collection and disposal of waste oil from the marina operation;

(e) maintain the marina property and buildings free of pests and of conditions which attract, provide shelter for or promote the propagation of pests; and

(f) ensure that buildings, docks, floats, gangways, piers and ramps are kept in good repair.

## SECTION 4
## OFFENCES AND PENALTIES AND ENFORCEMENT

**Notice of violation**

4.1 An inspector or official of the city, or a by-law enforcement officer, may give notice to any person ordering or directing that person to:

(a) discontinue or refrain from proceeding with any work or using or occupying any land or building or doing anything that contravenes this By-law; or

(c) carry out any work or do anything to bring any land or building into conformity with this By-law;

within the time specified in such notice.

**Service of notice**

4.2 An inspector or official of the city, or a by-law enforcement officer, may serve a notice under this By-law:

(a) by mailing it by registered post to an owner who is the addressee of the notice at the address of the owner shown on the real-property assessment roll prepared pursuant to the Assessment Act;

(b) by handing it to the person who is the addressee of the notice; or

(c) if the notice refers to real property, by posting it on the real property.

**Offences under By-law**

4.3 A person who:

(a) violates any provision of this By-law, or does any act or thing which violates any provision of this By-law, or suffers or allows any other person to do any act or thing which violates any provision of this By-law;

(b) neglects to do or refrains from doing anything required to be done by any provision of this By-law; or

(c) fails to comply, or suffers or allows any other person to fail to comply, with an order, direction, or notice given under any provision of this By-law;

is guilty of an offence against this By-law, and liable to the penalties imposed under this Section 3.

**Fine for offence**

4.4 Every person who commits an offence against this By-law is punishable on conviction by a fine of not less than $250.00 and not more than $10,000.00 for each offence, except that a person who commits an offence under section 2.3 or 4.3(c) of this Bylaw is liable to a fine of not less than $500.00 for each offence.

**Fine for continuing offence**

4.5 Every person who commits an offence of a continuing nature against this By-law is liable to a fine not less than $250.00 and not more than $10,000.00 for each day such offence continues.

**SECTION 5**
**REPEAL AND ENACTMENT**

**Repeal**

5.1 This By-law repeals By-law No. 6580.

**Force and effect**

5.2 This By-law is to come into force and take effect on the date of its enactment.

ENACTED by Council this 2nd day of October, 2007

Signed "Sam Sullivan"
Mayor

Signed "Syd Baxter"
City Clerk

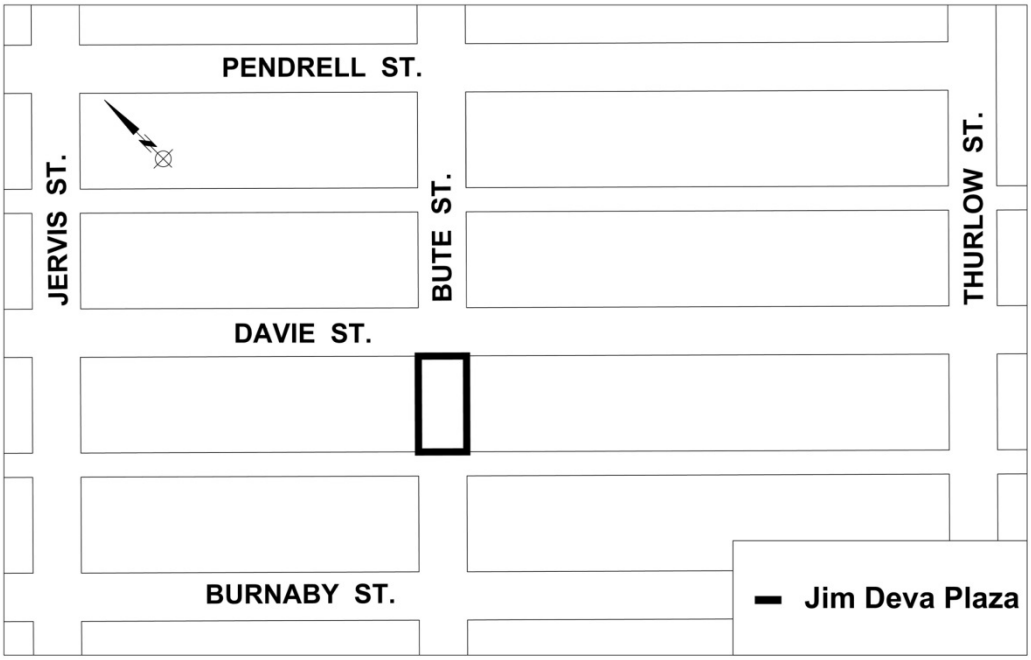
**SCHEDULE A**
**PERMITTED PESTICIDES**

| | |
|---|---|
| acetic acid | pesticides in aerosol containers |
| animal repellents except thiram | pesticides registered under the federal Act for application to pets |
| anti-fouling paints | piperonyl butoxide |
| antisapstain wood preservatives used on private, industrial land owned by the company or person responsible for applying the preservatives | plant growth regulators |
| asphalt solids used as pruning paints | polybutene bird repellents |
| bactericides used in petroleum products | pyrethrins |
| boron compounds | resmethrin |
| boron compounds with up to 5% copper for insect control and wood preservation | silica aerogel, also referred to as silica gel, amorphous silica and amorphous silica gel |
| capsaicin | silicon dioxide, also referred to as diatomaceous earth |
| cleansers | slimicides |
| corn cellulose | soaps |
| corn gluten | sulphur, including lime sulphur, sulphide sulphur and calcium polysulphide |
| deodorizers | surfactants |
| d-phenothrin | swimming pool algicides and bactericides |
| d-trans-allethrin, also referred to as d-cis, trans allethrin | tetramethrin |
| fatty acids | thymol |
| ferric phosphate | wood preservatives |
| ferrous sulphate | zinc strips |
| formic acid | *Bacillus sphaericus*, also referred to as Bs |
| hard surface disinfectants | *Bacillus subtilis* |
| insect repellents | *Bacillus thuringiensis* var. *israelensis*, also referred to as Bti |

| | |
|---|---|
| insect semiochemicals, including pheromones, kairomones, attractants and repellents | *Bacillus thuringiensis* var. *kurstaki*, also referred to as Btk |
| insecticides sold and used in tamper resistant bait stations | citric acid |
| kaolin | copper (oxychloride and tribasic only) |
| laundry additives | FeHEDTA |
| material preservatives | ferric sodium EDTA |
| methoprene | garlic |
| mineral oils for insect and mite control | lactic acid |
| naphthalene for fabric protection | *Phoma macrostoma* |
| n-octyl bicycloheptene dicarboximide | pyriproxyfen |
| octenol | *Sclerotinia minor* |
| oxalic acid | sodium chloride |
| paradichlorobenzene for fabric protection | spinosad |

**SCHEDULE B**

Davie Village - Jim Deva Plaza



# Integrated Pest Management Report for Arboriculture, 1995

Ian Wilson
Integrated Pest Management Assistant,
Vancouver Board of Parks and Recreation
September 21, 1995

Progress was made in all aspects of the IPM program this season, including: record-keeping, pest monitoring and infestation assessment techniques, public education and involvement, and new alternatives to chemical pesticides. The intent of this report is to summarize the major insect and disease problems on street trees in 1995, some of the new approaches which have been tried for control of these problems, as well as some recommendations for techniques which could be explored in the future.

Service requests coded as "pests" were handled primarily by myself, allowing the tree inspectors more time for other dutes. Elisabeth Deom assisted with many of the service requests involving disease problems. The Tree Manager database was utilized to improve record-keeping of all IPM service requests and activities. In addition to the existing tree and site information, a new system of IPM 'pest codes' was developed (Appendix I), allowing all service requests to be tracked according to any pest(s) involved, the infestation severity (low, medium or high), and any action taken. This system will allow 'hotspots' to be identified and monitored over time.

In order to improve the consistency of pest assessments between different observers, infestation rating techniques are being standardized for many of the major pests, including: aphids, scales, winter moth, bronze birch borer, pear trellis rust, fire blight, apple scab. These techniques will need to be refined and improved over time.

Two IPM training sessions were conducted this summer to help arboriculture crew identify pest problems. This will help crews to educate residents as well as assist the IPM department in their monitoring. The response to these sessions was very favourable. A binder describing many of the major pest problems is being prepared for each crew truck.

An indication of the success of the IPM program is the minimal requirement for pesticide spraying this season. Only 162 trees were sprayed in 1995 for pest management operations, all using insecticidal soap. An additional 51 trees were treated to test the effects of baking soda on oak leaf skeletonizer. Homeowners were notified by letter and with posted signs, and no negative feedback was received regarding any spray operations.

# INSECT PESTS

Following are some of the major insect problems encountered in 1995, as well as some potentially new pests to watch for on street trees.

## Aphids

Aphids continue to be the major pest problem on street trees, leading to numerous complaints and service requests. A number of new approaches were tried this year for aphid management, including new techniques for monitoring these insects, the testing of various biological control agents, and a revised pamphlet which educated the public about aphid management and biological control.

An extensive, statistically replicated trial was conducted on Lamey's Mill road and E. 45th street to develop improved techniques for aphid monitoring and determine if the predatory midge, *Aphidoletes aphidimyza*, was effective in controlling aphids on tuliptrees. By modifying a technique developed in California, we came up with a greatly improved monitoring method whereby small cards were hung from tree branches for a period of 4 hours. This allowed us to quantitatively measure the falling honeydew, and was much faster and more precise than the previous technique of counting aphids on the leaves. The quantitative nature of this technique will also allow the Parks Board to compare the severity and timing of aphid infestations over time, and develop "treatment thresholds" whereby pesticide use can be precisely timed for maximum efficacy.

The second part of this trial, the testing of predatory midges for biological control, was similar to an experiment conducted by E.S. Cropconsult in 1994. The 1994 trial was inconclusive, however, due in part to a lack of statistical analyses. The use of statistics was therefore a priority in our recent work. The results will be described in detail in another report, but I present some preliminary results here. We successfully established and monitored populations of *Aphidoletes* in our study areas with only three releases early in the year; this is the first time that this has been done on street trees, to our knowledge. However, the early results indicate that, even when established, *Aphidoletes* appeared to be unable to control aphid populations on tuliptrees. It may be that the aphid populations on these trees are just too high; other trees, such as lindens or beeches seem more promising for successful biological control.

Ultimately, it may be necessary to employ a combination of biological control agents for tuliptrees or other problem trees. The use of companion plants to attract natural populations of aphid predators

is an excellent strategy for long-term aphid management. This idea is also popular with homeowners, as it beautifies their neighborhood. In the interim, releases of biological control agents may be necessary. Following is a brief summary of these other agents and their promise:

Lacewings: The larval stage of this insect is a voracious predator, consuming large quantities of aphids, scale crawlers, small caterpillars, and other insects. Two small trials, testing the introduction of lacewing larvae and eggs for aphid control on beeches and tuliptrees, were unsuccessful. I suspect that high mortality and dispersal of released lacewings are to blame; a previous study on tuliptrees also found very low survival rates of released lacewings. A better strategy may be the planting of companion plants which will attract natural populations of lacewing adults.

Ladybird beetles: Larval and adult ladybird beetles are excellent aphid predators, and are the most common natural predator observed on street trees. Although ladybird beetle releases are very popular with the public, most studies with ladybird beetle releases have been unable to show any significant effects unless the beetles are caged to prevent their dispersal. Considering the city as a whole, this may still show promise on a larger scale.

Parasitic wasps: The larvae of certain parasitic wasps develops inside of adult aphids, eventually killing them. Most are specific and only attack one species of aphid. One such wasp, *Aphidius*, is available commercially, but is not recommended for release outdoors. Companion plants, however, will also help to attract adult wasps. Many of these wasps are naturally occurring in Vancouver. One notable exception is the linden aphid, which does not appear to have any parasitoids here. Projects are currently underway in California to assess the effectiveness of imported parasitoids for linden aphid control.

Pirate bugs: Naturally occuring Anthocorids, or pirate bugs, are also effective aphid predators, especially on beech trees where they can sometimes build up very high populations. We attempted to release a different species of pirate bug, *Orius*, onto tuliptrees, but most of the released bugs disappeared and had no noticeable effect. Pirate bugs can also be attracted with companion plants.

Hover (Syrphid) flies: The larvae of these flies are extremely voracious aphid predators, however, their huge appetite makes them difficult to grow commercially. A number of companion plants are known to attract adult hoverflies. We have also found that an effective way of "rearing" these insects in the lab is to bring back aphid-infested tree branches, especially cherry suckers. These suckers invariably have numerous fly larvae, and one need only introduce new aphids every few days for these larvae to feed on. It may be possible to rear large numbers of syrphids with this

technique in screened tents at Sunset.

A two-page public information sheet (Appendix II) was developed to inform the public about aphids and their predators. This proved to be very successful, especially since many homeowners were alarmed by the predators themselves, thinking that they were harmful insects.

Three areas were sprayed with Safer's Insecticidal Soap due to very high aphid populations and public concern. These included trees on 1415-1465 Lamey's Mill road, Fleming street, and Chambers street. All trees sprayed were tuliptrees (*Liriodendron tulipifera*). In the future, all aphid spraying should be done from the ground if possible, as it was found that this method gives the best coverage. The newly developed honeydew monitoring method should also be used next year to time spraying, as well as to evaluate the effectiveness of a spray.

**Scale Insects**

Scales are generally present at low levels throughout the city. Preferred hosts include maples (especially sycamore maple), lindens, and some horse chestnuts. Lecanium scale populations are especially high in three major "hotspots": Gastown (Water street), 3000-3100 and 3600 W. 33rd, and 2000 W. 45th. Cottony maple scale is heavy on Red Sunset red maples at 900 Howe.

Crawler emergence was monitored throughout May using double-sided sticky tape. The peak of emergence occurred in the Gastown area around mid-June. By spraying the susceptible crawler stage we were very successful in reducing scale populations with only one spray of Safer's soap. A total of 92 trees were sprayed for scale control at 3100 W. 33rd, Water St., and 3600-3700 W. 33rd.

A naturally occuring parasitic wasp has helped to keep populations in check. Very high levels of scale parasitism (>90%) was observed in some areas, allowing us to monitor these areas rather than spray.

**Winter Moth**

Thorough surveys were conducted in 1995 to determine the extent of spread of the winter moth. In general, winter moth can be found to some degree throughout the southern half of Vancouver, while the northern half is still relatively free of this insect. It is difficult to compare the levels of defoliation to last year, as the rating system used by different observers probably varies. However, the areas experiencing heavy defoliation do not appear to have expanded significantly, while there

has been an increase in the areas experiencing moderate and light defoliation. The heaviest defoliation was seen in the Shaughnessy and Kerrisdale areas, as well as around Fraserview Golf Course.

The tree banding program has been very successful in reducing damage levels and moth populations. Defoliation on properly banded trees was found to be minimal whereas nearby unbanded trees were often heavily defoliated. This program will continue with the help of volunteer community groups and has been expanded this year.

A new program was also started to introduce and distribute natural parasites for long-term winter moth control. This is described in detail in a separate report. Two parasites, a fly and a wasp, were introduced to Victoria in the 1970s and appear to have helped contain winter moth populations there. I travelled to Victoria on May 9, 1995 to collect parasitized larvae with the help of James Pickett, a temporary employee with the Parks Board, as well as Michelle Gorman, the IPM coordinator in Victoria. Approximately 2,900 larvae were collected. Some of these larvae (600) were allowed to pupate in the laboratory to determine the rate of parasitism. The remaining 2,300 larvae were immediately introduced onto trees at Kerrisdale Centennial Park (located at E 42nd and West Blvd.). The timing of this introduction appeared to be ideal, as the larvae were just on the verge of pupating, and therefore had the greatest chance of having been parasitized. Although many of the pupae kept in the laboratory did not survive, dissections of living pupae indicated that parasitism was approximately 52%; 51% contained parasitic flies, whereas only 1% were parasitized by a wasp. It seems likely that this parasitic fly will become successfully established, although larvae from this area should be checked next year to confirm this. If this project is successful, parasites can be collected from Kerrisdale Centennial Park and spread to other 'hotspots' in the city.

**Wasps**

Although the arboriculture tree inspectors are able to remove many problem wasp nests, wasps are often a nuisance in late summer around aphid-infested street trees with no apparent nesting site nearby. Wasps are attracted to honeydew secretions on the leaves, as well as honeydew secretions on cars, sidewalks, or other objects underneath these trees. Some of these trees can be sprayed with insecticidal soap to eliminate the aphids and honeydew, but the aphid populations are decreasing late in the summer and the wasps will soon be disappearing anyway, so a soap spray seems an overly excessive and expensive solution. Even if the aphids are eliminated, the wasps will still be present and may find other sources of food in residents' yards instead.

Wasp traps are a potential solution. These traps could help to eliminate some of these roaming wasps or at least help to attract them away from people or their property. Five traps were purchased from Phero Tech Inc. this summer to try them out. Synthetic lures were also purchased, eliminating the need to constantly change the bait. Traps were placed in a tuliptree at Blenz Coffee on Davie street, as well as in some tuliptrees and lindens in front of homes, in response to complaints of wasps around aphid-infested street trees. While the traps did not completely eliminate the wasps, they sometimes trapped hundreds of them within a few weeks. Customers of Blenz coffee seemed to be very happy with the idea, as did many homeowners. While traps are not an answer to every wasp problem, they show promise for use in certain situations.

**Oak Leaf Skeletonizer**

The second generation of Oak Leaf Skeletonizer (OLS) caterpillars was monitored closely this season to better understand the life cycle and timing of this pest. Very high populations were seen in mid-September, especially along Blenheim street and 2100 E. 43rd.

The difficulty in monitoring these insects in the tree canopy and comparing their populations from year to year prompted us to explore some new monitoring techniques. Because overwintering cocoons will be deposited almost anywhere in the vicinity of red oak trees, we have attached cards made of various materials to the trunks of these trees. Later in the Fall, these cards will be collected and the numbers of cocoons attached to them will be assessed. It is hoped that this technique will allow populations to be easily assessed and compared over time. Early results indicate that sticky cards will capture falling larvae and are effective for sampling OLS populations.

Baking soda was sprayed on a trial basis in May against OLS cocoons on 4300 and 4600 Blenheim, 4700 Wallace, and 2100 E. 43rd. A total of 51 trees were treated. Although baking soda killed some cocoons in the laboratory, it did not appear to be successful in the field, as cocoons on houses and other objects were not contacted.

Safer's soap was also sprayed in these same areas on a trial basis in mid-September. Sprayed trees had a significantly lower number of larvae per leaf than unsprayed trees, although there were still significant numbers of dropping caterpillars in sprayed areas. Field observations indicate that soap was effective as long as spray coverage was adequate, a difficult task in these large trees. Although the spray crew did a very thorough job, it is impossible to spray the undersides of all leaves. It may be necessary to use an electrostatic sprayer in the future. If this technique is successful, a single

spray of caterpillars in the Spring could significantly reduce populations for the rest of the year.

**Bronze Birch Borer**

Although the city's birches are gradually being removed through the Diseased Tree Program, many birches are still showing decline due to stress and attack by the Bronze Birch Borer (BBB). Published research on BBB suggests that only stressed trees are susceptible to BBB attack. Birch trees are adapted to wet, rich soils, therefore many of the city's birches experience drought during the summer and are subsequently attacked by the BBB.

In areas where birches are still healthy and homeowners are interested, the Parks Board can recommend that residents help to keep these trees healthy by watering them. It is important to emphasize that the watering should be deep and directed at the base of the tree as many homeowners only water enough to keep the surrounding grass green.

Adult BBB are attracted to various chemicals produced by stressed birch trees, such as ethanol. These chemicals could be used to monitor this insect, and possibly mass-trap the BBB in areas with high-value trees. Both ethanol lures and funnel traps are commercially available from Phero Tech, and I recommend that a small-scale trial be conducted in 1996 to determine the feasibility of BBB trapping. Traps should be hung at various heights in birch trees to determine the best trapping height. I recommend that declining birches are used for the test, as the ethanol may actually induce attack on the tree. If this is the case, ethanol could also be used to deliberately induce attack on a declining "trap tree", which would then be removed to destroy the developing BBB larvae.

**Fall Webworm**

Although fall webworm is mainly an aesthetic problem, many homeowners are alarmed by the large tents forming on trees in their neighborhood. As in previous years, tree inspectors remove tents if possible, and educate homeowners about the relatively innocuous nature of this pest. In a few areas of the city, tents continue to be very abundant, especially around 500-700 E. Georgia. Although this insect is reported to have numerous predators and parasites, webworm populations were found to have slightly increased in this area compared to 1994.

The parasitic wasp, *Trichogramma*, was released on a small trial basis in the E. Georgia area. This tiny wasp parasitizes moth eggs, and is available at a low cost commercially. There did not appear to be any impact of *Trichogramma* releases on the webworm population, but it is possible that the releases were not timed properly or were not distributed well enough throughout the area. If this is tried again in the future, *Trichogramma* should probably be released at very high rates, directly into the tree canopies, for at least 2-3 weeks before webworm eggs hatch. Monitoring the emergence of moths from overwintering pupae would be the best method of timing the release of *Trichogramma*. Pupae have been collected for this purpose. It is also important to use the proper species of *Trichogramma* for releases on trees.

Other tactics which may be successful against the fall webworm and could be tried next year on East Georgia include: Safer's Soap, Trounce, or BtK. sprays (early in the season when the tents are small), or injecting diatomaceous earth into webworm tents.

**Cherry Bark Tortrix**

Mac McNair at Simon Fraser University continues to conduct research on new attractants and repellents for the CBT. Preliminary findings show promise for CBT control.

**Douglas Fir Bark Beetle**

Douglas fir beetle, *Dendroctonus pseudotsugae*, was found to be infesting some downed timber in Stanley Park this Spring. Dr. John Borden from Simon Fraser University assisted in assessing the threat of this beetle to other trees in the park. Douglas fir beetle normally attacks dying or downed timber and it does not appear to be a threat to healthy trees in the park at this time. However, if large numbers of trees are felled or are blown over in the future, this would allow the beetle to build up a sizable population which could successfully attack standing trees. Large amounts of blowdown

or slash from thinning operations should be removed or at least debarked to prevent beetles from breeding.

Douglas fir beetle populations were monitored from April 24 to June 5 with pheromone traps along the Thompson Trail, Reservoir Trail, and Brockton Oval Trail, catching 85, 5, and 7 beetles, respectively. These catches would likely have been much higher if traps had been placed earlier in the Spring. The high numbers of beetles at the Thompson Trail reflects the increased availability of breeding sites for beetles in this area.

**Ants**

Although very few service requests were received regarding ant problems, feedback from the public at the PNE arboriculture exhibit indicated that ants are a very common concern. Ants are usually only associated with aphid-infested street trees due to their symbiotic relationship with aphids. Although the ants hinder natural aphid predators, control is not usually warranted and public education seems the best course of action. In some cases, sticky tree bands may help by keeping ants away from aphid predators.

**Oak Gall Wasp**

What appeared to be a new pest was found on English oaks, *Quercus robur*, this summer. In late July, many English oaks started turning yellow or brown as the leaves became scorched. When leaves were examined closely, small galls, formed by the developing larvae of tiny wasps, could be seen. Other species of oaks were not affected. Originally from Europe, this insect is also present in Victoria and was identified as *Neuroterus* sp. by Bob Duncan at Pacific Forestry Centre. Experts in Ottawa and Europe have been unable to give an exact identification. This is not the same species as the Jumping Gall Wasp (*Neuroterus saltatorius*) which has caused extensive damage on Garry oaks in Victoria. The damage symptoms are typical of drought scorching and there is some uncertainty as to whether this damage is due to the presence of galls or solely to drought conditions, as galling doesn't seem to be associated with damage on English oaks in Victoria. It is possible that the galling has induced excessive stress in the leaves, causing the drought symptoms. Surveys indicated that galled oaks were scattered throughout the city, although some were completely unaffected. Both newly planted and older trees showed galling and scorching.

Gall wasps are small, non-stinging wasps which form galls on their host plant in their larval stages. Many have two distinct life stages- an asexual stage and a sexual stage, each forming its own distinct

galls. The second (sexual) generation usually causes the most damage. In this particular species, the galls will continue to expand into the Fall, forming larger yellow and red galls. Continued scorching of the leaves may weaken trees over time, but is unlikely to cause tree mortality.

Monitoring of English oaks over the next year may give us more clues as to whether this insect is actually causing the damage. Unfortunately, there are few options available for gall wasp control. Pesticides cannot reach the protected larvae, and attempts to clean up the overwintering galls are futile. There are normally many parasites (mainly parasitic wasps) which help to keep populations in check; many of these parasites are present in BC, although they have failed to significantly control Jumping Gall Wasp in Victoria. In any case, the Parks Board may want to avoid new plantings of English oaks for now.

**Cherry Ermine Moth**

Although this insect did not appear to be a problem in Vancouver this year, the City of Victoria has experienced a recent outbreak of Cherry Ermine Moth. These insects and their host trees are present in Vancouver, so this could potentially become a problem here as well.

**Gypsy Moth**

Pheromone trapping for gypsy moth in 1994 indicated three "hotspots"; Asian gypsy moths were captured in Surrey and Nanaimo, while European moths were caught in Chilliwack. Chilliwack received aerial spraying. The continuous influx of gypsy moths into the lower mainland and decreasing funds for Agriculture Canada's control programs will probably lead to the eventual establishment of this insect here.

**Minor Pests**

The following were relatively minor insect pests on street trees in 1995: leafminers, leafhoppers, *Eriophid* mites, western tent caterpillar, forest tent caterpillar, apple ermine moth, pear slug, and pine shoot moth.

## DISEASES AND ABIOTIC DISORDERS

Unfortunately, very few options are available for disease control. In most cases, diseases on street trees must simply be tolerated. Very heavily affected trees are gradually being replaced with resistant cultivars through the Diseased Tree Program.

**Anthracnose**

Anthracnose continues to be a common problem, especially on particular cultivars of London plane and dogwood trees. This causes unsightly defoliation and premature leaf drop. Very few control exist, short of regular fungicide spraying.

**Black knot**

This appears to be a relatively rare problem on street trees. Monitoring should continue, however, as it could potentially spread to many of the city's plum or cherry trees. If found, black knot should be promptly pruned out and burned.

**Fire Blight/Pear Trellis Rust**

All of the city's pear trees were surveyed this summer with the help of light duties personnel.

Elisabeth Deom is currently working on this project. Two cultivars, 'Aristocrat' and 'Red Spire', were found to be heavily infected with fire blight, whereas 'Chanticleer' and 'Callery Pear' had low levels. Some of these trees were completely dead and require removal; others are being pruned to remove or reduce the levels of fire blight.

Surveys also indicated that almost all of the city pears are infected to some degree with pear trellis rust (PTR). This disease was likely already present at low levels throughout the city, however, the city trees may increase the innoculum levels, making the rust symptoms more noticeable to homeowners on their own pears or junipers. The B.C. Ministry of Agriculture is concerned about this problem, as it is a threat to the B.C. Nursery industry, and has apparently sent brochures about the disease to some homeowners. Unfortunately, these brochures have served to frighten rather than reassure a few residents. At this point, very little can be done, short of removing all of the pears or junipers in an area; as well, even if all of the city trees are removed the disease will still be present on private trees. This is a difficult problem which may require a co-operative project with the B.C. Ministry of Agriculture to find a solution.

**Phytophthora Root Rot**

A long-term project assessing biological control of *Phytophthora* on Lawson Cypress is continuing in cooperation with Dr. Raje Utkedhe from Agriculture Canada. The results of this trial will probably not be known for a few more years.

**Cherry dieback: Pseudomonas/Brown rot/Graft incompatibility**

The major cause of cherry dieback is unkown and could include *Pseudomonas* or brown rot infections, graft incompatibility, cherry bark tortrix damage, or urban abiotic stresses. It seems likely, however, that a combination of these factors is causing the decline. Again, few solutions exist. It may help to limit the spread of disease if pruning crews routinely disinfect their tools after pruning a cherry tree.

**Apple scab/Leaf Blights**

Apple scab severely defoliated most of the city's crabapple trees this year. Some of these trees are being replaced through the Diseased Tree Program. In the interim, residents were advised to rake up fallen leaves to remove the overwintering spores. Steve Wong has also suggested grafting various cultivars onto some existing trees to test for resistance. These resistant cultivars could be used in

new plantings.

Similarly, ash, hawthorn and many other trees suffer from fungal leaf blights. Raking the leaves to reduce the levels of fungal spores and tolerating the disease are the only solutions at this time.

**Powdery Mildew**

Powdery mildew can be seen occasionally, particularly on London planes and some magnolias. This is not usually a threat to the tree and can be tolerated. Experiments in the rose gardens have indicated that baking soda is an effective treatment for powdery mildew; this same treatment could also be used on any high-value/high-visibility trees on boulevards or in parks.

**Verticilium Wilt**

This disease was found on a magnolia tree, as well as some vine maples in Queen Elizabeth Park. The only solution appears to be replacing infected trees with less susceptible species.

**Root Rots on Douglas Fir (Stanley Park)**

Jeff Fournier, a pathologist with the B.C. Ministry of Forests, assisted in surveying a few areas of Stanley Park where young Douglas firs were dying and root rot fungi was suspected. Some trees near the Thompson Trail were found to be dying of unknown causes. One older tree which had died next to the Rawlings trail was found to be infected with *Armillaria* root disease. *Phellinus weirii*, a common root disease of Douglas firs, was not found in the limited survey we conducted. Jeff is certain, however, that it is present in the park, and recommended that current species diversity practices are continued. Western red cedar and western white pine are considered to be resistant, whereas Douglas fir and western hemlock are highly susceptible. The Ministry of Forests will be giving a number of white pine seedlings to the Parks Board this Fall. These seedlings are considered to be resistant to white pine blister rust, although they should be monitored to ensure that they are not infected. Blister rust infection can also be prevented by pruning off the lower branches as the trees grow.

**Scorch/Drought**

Many street trees showed symptoms of drought this summer, particularly horse chestnut, lindens, and some maples. Educating the public about the need to water street trees in the summer seems the

best solution.

**Red Sunset 'Disease'**

'Red Sunset' red maples looked extremely 'sick' this Spring, and many did not leaf out completely until late June. Aphids do attack the new leaves, but did not appear to be causing the damage. Foliage analyses indicated some possible nutrient problems; watering and fertilizing may be a good start to improving the health of these trees. It appears that the 'Red Sunset' cultivar is just a weak cultivar, and it may require extra attention to soil nutrients and mycorrizae.

**Dutch Elm Disease**

The European elm bark beetle, *Scolytus multistriatus*, is known to be present in Vancouver, although it does not appear to be vectoring Dutch elm disease here. In Montana, European elm bark beetles were discovered and the disease was then found several years later. European beetles were recently discovered in pheromone traps in Calgary and Saskatoon, although the disease hasn't been observed yet. This disease appears to be expanding its range every year and should be closely monitored as it could quickly devastate Vancouver's elms. Any diseased or dying elms in Vancouver should be promptly examined and removed.

INFORMATION REPORT

Date: July 16, 1992

SUBJECT: Integrated Pest Management Semi-Annual Report

**BOARD POLICY**

**It is the Park Board policy to manage pest problems through an Integrated Pest Management (I.P.M.) approach.**

PURPOSE

This report updates the Board on the current status of ongoing I.P.M. programs and outlines initiatives undertaken since the time of the previous report as was received February 17, 1992.

BACKGROUND

I.P.M. is defined as being the best combination of physical, cultural, genetic, and chemical methods for the most effective control of pests. The first four non-chemical methods receive priority consideration for solving problems; chemical control strategies are used only when a mix of other strategies has been found to be inadequate, and that unacceptable loss would otherwise occur. The goals of the policy are here presented in rank order of priority and importance:

.to maintain and improve facilities within the Park Board's jurisdiction
.to lessen the use of chemical pesticides
.to accomplish the first two objectives with an I.P.M. program

DISCUSSION

Since the adoption of the program in 1987, staff have become increasingly able to fulfil the criteria of the I.P.M. policy as outlined in the Morrow Engineering Report. The decision maker routinely follows a thought process that asks the questions:

.What exactly is the problem ?
.Is control necessary ?
.What are the non-chemical pesticide options ?
.If none, what pesticide would be least likely to adversely affect the stability of the ecosystem ?
.What can I do to make the need for further applications less likely?

DISCUSSION (cont'd)

It has been the role of the I.P.M. Coordinator to make sure that all staff are following this decision making process, and to facilitate this process by providing all available information on alternatives. Toward that end, the Coordinator writes and distributes a periodic newsletter entitled "The I.P.M. Monitor" that simultaneously updates all staff of pest related developments and makes recommendations for treatment. In addition, the Coordinator maintains a computer database that stores and processes information about pesticide use within the Board - the totals for the first six months of 1992 are listed in Enclosure 1.

Safety and responsibility continue to be emphasized to staff involved on applying pesticides. Full protective clothing is provided and checked on a regular basis, education seminars are given and arranged, equipment is updated , and warning signs are posted as required by Provincial Regulations, City By-law and Park Board policy. A blood testing program was recently initiated for employees at Sunset Nursery who regularly apply organophosphate or carbamate insecticides to determine if they are accumulating residues in their system, results thus far have been encouragingly negative.

Budget cutbacks have had a negative impact on the I.P.M. program as a reduced labour force is less able to cope with any further increases in manual work. The short term cost effectiveness of herbicides as compared to mechanical weeding is a powerful motivation to efficiency conscious foremen. Research is therefore being conducted into more biorational weed control as soaps, borax, ammonium sulphate, and various mulching techniques.

Bloedel Conservatory

Staff continue to manage problems through the release of beneficial insects and narrowly targeted applications of insect growth regulators. Pest populations are running high this summer but no permanent damage is occurring, it is hoped that they will return to normal levels with the introduction of more beneficial insects.

Display Gardens (Stanley Park, Queen Elizabeth, Sun Yat-Sen)

Due to recent budget cuts, the Queen Elizabeth Park formal rose gardens has not been receiving full I.P.M. attention. Fungal diseases have caused considerable damage to the vigour of the plants and the overall aesthetic appeal of the garden, efforts are under way to alleviate this problem with the use of low toxicity chemical fungicides. Beneficial insect releases this spring remain effective in minimizing damage due to insect pests.

DISCUSSION (cont'd)

Elsewhere in the park, a severe Tent Caterpillar infestation was avoided this year by pruning out over three hundred tents before the insects were advanced enough cause damage. All weeding is done manually.

Gardening staff at Stanley Park are keen on an organic gardening approach and are able to experiment with different techniques. Mineral oils, soaps, pyrethrin (a synthetic Chrysanthemum extract) baking soda, and an experimental Neem tree extract are combined with intensive sanitation measures and common sense to produce an excellent display this season.

All annual beds in the system were attacked by a heavy infestation of Cutworms. This insect is not normally a life threatening pest but the mild winter produced a bumper crop. Gardeners were caught by surprise this year but responded quickly by drenching beneficial Nematodes (an insect parasitic roundworm) into the beds; and by spraying the tops of the plants with either pyrethrin, soap, or the bacterial insecticide Bt. A monitoring program has now been devised that plots this years damage against cutworm populations in the soil, it will be employed in all beds next spring to determine whether or not treatment will be required before the bedding plants are in.

Several plants at Sun Yat-Sen were attacked by mites during the hot dry spring, it was found that regular water misting disrupted them enough to keep damage within acceptable limits. Other plants are doing well.

GENERAL PARKS

The aquatic weed Purple Loosestrife is still thriving at the Jericho pond, but in much reduced numbers from last year. Hand weeding of this and other ponds will be done if project scheduling constraints allow.

The Sportsfield Task Force will next meet in September to continue discussions on improving maintenance regimes. Thus far, an information package was prepared and distributed by Commissioner Thorne, and staff have completed a survey of the weed composition of all major playing fields. Hot dry weather in the spring and subsequent watering restrictions have impacted the turf more than the deeper rooted broadleafed weeds. Recent rains have helped but there is now a profusion of weed seeds being produced and colonizing areas of weakened turf. On the positive side, the recent acquisition of hydraulic mowers is improving the quality of cut and therefore reducing damage to the turf.

DISCUSSION (cont'd)

Street-end, median, and beautification beds continue to require pre-emergent herbicides as their proximity to traffic and ambient exhaust fumes makes them too dangerous and time consuming for hand weeding, leaf mulching is considered to be a fire hazard. Denser shrub plantings were used this year, new hardy species are being tried, and a wood mulching program is now being used around Manitoba Yard.

Testing has begun on a new biocontrol for Lawson's Cypress root rot. This control utilizes a naturally occurring bacteria (also found in human intestines) that is cultured and prepared by Agriculture Canada research scientists and drenched into the root zone. The first of four applications has been completed on the King Edward Street median, the second goes down in September. A complete report on this activity was submitted to the Environment and Operations committee in May.

Other pest control activities in General Parks include:

. Yellowjacket traps in picnic areas
. herbicidal soap on pathways
. borax and ammonium sulphate trials
. mechanical cultivation on all-weather sports fields
. canker and gall pruning of shrubs and park trees
. weed suppression with leaf mulch in shrub beds
. chalk lining of sportsfields

STREET TREES

Monitoring continues on a representative selection of street trees. Data is recorded on the computer and used to determine insect life cycles, acceptable levels of tolerance, and pest resistance. Information is being gathered to support a different planting system for the fall that accounts for the need to increase species diversity and ecosystem stability along individual streets as well as over the entire City. Flowering times will be staggered so that beneficial insects such as Syrphid flies and Lacewings have a more constant source of nectar. There will be a strong preference given to resistant varieties. There continues to be many isolated tree problems, only the most important will be discussed here.

Flowering Cherry dieback

Control methods for two of the stress factors associated with this syndrome are being investigated. Copper sprays were used at Vandusen Gardens to control the bacterial disease with some

DISCUSSION (cont'd)

success. High value cherry trees in parks will undergo this treatment beginning in the fall. A cooperative experiment with Arbourcare Tree Services in Kerrisdale is testing the effectiveness of pheromone traps and Tanglefoot glue against the wood boring Tortrix moth.

More thorough research than the I.P.M. program can provide is needed if a comprehensive solution is to be found, work has begun to try to find a backer(s) for such a project.

Winter Moth

This exotic insect is most prevalent in the southern half of the city, and was therefore unaffected by the aerial spraying program for Gypsy Moth. The banding of trees in Kerrisdale reduced the level of damage somewhat, but populations remain very high.

Numbers have increased dramatically to the north and west of this area with serious damage taking place in western Kerrisdale and at McCleery Golf Course. There is no longer enough funds available to provide banding material over the entire area of infestation (estimates taken from Tree Manager database are over $240,000), and complaints continued in the areas banded because their numbers were still significant enough to be a nuisance. It has therefore been decided that homeowners will be asked to band the trees in front of their house. Information on this technique will be advertised through the media, material will be sold by local merchants and the Vandusen Gift Shop. It must be emphasized that only a very few otherwise weakened trees died as a result of this insect when the infestations hit Victoria and Richmond, it is primarily an aesthetic and nuisance pest that will run its course over a period of about five years.

The alternative to relying on homeowner banding and tolerance is to spray the very worse neighbourhoods with the pesticides Bt (the same product used against the Gypsy Moth) or permethrin. Should there be a need for this action next spring, a detailed information report would be provided to the Board before the new year.

Aphids

These insects have historically caused life threatening damage to young Red Maples. When egg counts were again high last fall, mineral oil was sprayed onto the twigs of over five hundred trees in February to prevent their hatching - the results were encouraging. Homeowners on affected streets were given notices in advance that described the product used. With the exception of two people that objected to the parking inconvenience, there was a strong show of support for the program. Red Maples will again be checked for eggs this fall.

DISCUSSION (cont'd)

Aphids were heavy on European Birch trees this spring, but their populations diminished naturally and the trees returned to health. Dry weather tended to lessen some of the more traditional aphid problems.

Scales

These insects were not affected by Agriculture Canada's Bt spray program and continue to be a serious threat to the survival of many of the downtown sidewalk implants. Mineral oil is a safe and effective treatment for this problem and will be applied either this summer or in the winter, depending on the pesticides supply. There will be notices distributed in advance to all affected businesses (see Enclosure 2) and appropriate signs posted.

Gypsy Moth

Amidst controversy, Agriculture Canada completed its Gypsy Moth eradication spray program over the northern half of Vancouver. To date there have been no adults trapped in any of the over 10,000 traps set throughout the spray zone, but there have been several catches of suspected European Gypsy Moths in Richmond that are thought to be the offspring of a small colony discovered there last year. It is, however, too early to know the results of the spray. Dr. Greg Cooke of the UBC Medical Health Department is working on a report detailing what, if any, negative health effects were reported during the program and plans to release his report in the fall.

Other tree problems being dealt with either through the Disease Tree Program or simply by encouraging public tolerance are:

. fungal leaf blights
. Forest Tent Caterpillar (diminished in spray zone)
. Whitespotted Tigermoth
. Oak Leaf Skeletonizor

SUNSET NURSERY

The nature of this facility requires that plants are maintained relatively pest free. The plants are very young and vulnerable to pests, and any infestation left unattended could create serious problem when the plants are distributed throughout the system. Nematodes, soap, pyrethrin, and growth regulators are used with increased frequency. In addition, Neem tree extract is being tried against Thrips and Leafminers.

DISCUSSION (cont'd)

VANDUSEN GARDENS

The winter Moth banding program was expanded to the entire garden last fall and the spring showed quite positive results; only a few missed trees had to be spot sprayed. The reasons for the better results than in Kerrisdale are that the trees are younger and with smoother bark, and that staff took greater care in ensuring the job was done to completion.

Staff continue to apply I.P.M. practices throughout the garden as required, and are keen to use manual weeding whenever feasible, mulch heavily, choose biorational pesticides, and plant pest resistant species.

GOLF COURSES

The greens and tees of golf courses are maintained at unnaturally low heights and receive a great deal of wear and tear, yet it is critical to the course that they be healthy and free of disease. They are the only areas on a course that require fungicides. Staff monitor them areas carefully and are aware of the conditions that are conducive to the proliferation of disease, maintenance practices such as watering, dew removal, and fertilizing are adjusted to avoid aggravating potential outbreaks. The only way to reduce the requirement for fungicides is to improve the vigour of the turf. This has been done to a degree by using high quality fertilizer and timed irrigation; but the improvement of construction, air circulation and the introduction of resistant species of grasses such as recommended in the Golf Course Master Plan will make the most significant improvements in the long run.
Staff have made great efforts to avoid using herbicides around the bases of trees, the weedeaters of all three courses are in use almost full time. Weed pullers are used at McCleery in all areas within 15 metres of open water. The irrigation proposed for that course will reduce the need for selective herbicides on the rest of the fairways.

CONCLUSIONS

Staff continue to seek environmentally compatible methods of controlling pests through an approach that is integrated with as many phases of the operation as possible so that our park facilities enhance nature while still providing the public with the expected level of service. This task is made easier with every passing year as more biorational technologies become available on the market, and all staff become more adept at practising I.P.M..

Prepared by:
Environment & Operations Division
Board of Parks & Recreation
City of Vancouver

**VANCOUVER BOARD OF PARKS AND RECREATION**

**INTEGRATED PEST MANAGEMENT POLICY**

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- It is the policy of the Board of Parks and Recreation that park maintenance and pest control be conducted through an Integrated Pest Management approach. An Integrated Pest Management approach is the best combination of cultural, biological and chemical methods that are used in an environmentally-sound way to maintain pest populations below damaging levels.

- Pest control materials and activities should:
  - minimize hazard to human health and nontarget organisms
  - minimize hazard to the general environment
  - be most likely to bring about a long-term reduction in pest populations
  - be cost effective

- Physical, cultural and biological control methods shall receive priority consideration for managing pest problems. Chemical control strategies shall be used only where a mix of other strategies is inadequate and pest damage is above tolerable levels.

- Free public access facilities shall have no or minimal pesticide use. This includes general turf areas in playgrounds, picnic areas, passive areas and sportsfields; flower and shrub beds; medians; and street trees. Where pesticides need to be used, a high preference will be given to the use of Schedule 5 pesticides.

- Maintenance of areas having controlled public access shall have use of registered pesticides in accordance with applicable federal, provincial and municipal legislation.

- Posting sites where pesticides are used shall be in accordance with City bylaws.

- Park facilities shall be constantly monitored for pest populations so that the appropriate treatment may be applied in a timely manner and the effectiveness of such treatment assessed.

# VANCOUVER BOARD OF PARKS AND RECREATION

## INTEGRATED PEST MANAGEMENT POLICY

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- It is the policy of the Board of Parks and Recreation that park maintenance and pest control be conducted through an Integrated Pest Management approach. An Integrated Pest Management approach is the best combination of cultural, biological and chemical methods that are used in an environmentally-sound way to maintain pest populations below damaging levels.

- Pest control materials and activities should:

    - minimize hazard to human health and nontarget organisms
    - minimize hazard to the general environment
    - be most likely to bring about a long-term reduction in pest populations
    - be cost effective

- Physical, cultural and biological control methods shall receive priority consideration for managing pest problems. Chemical control strategies shall be used only where a mix of other strategies is inadequate and pest damage is above tolerable levels.

- Free public access facilities shall have no or minimal pesticide use. This includes general turf areas in playgrounds, picnic areas, passive areas and sportsfields; flower and shrub beds; medians; and street trees. Where pesticides need to be used, a high preference will be given to the use of Schedule 5 pesticides.

- Maintenance of areas having controlled public access shall have use of registered pesticides in accordance with applicable federal, provincial and municipal legislation.

- Posting sites where pesticides are used shall be in accordance with City bylaws.

- Park facilities shall be constantly monitored for pest populations so that the appropriate treatment may be applied in a timely manner and the effectiveness of such treatment assessed.

April, 1997
Stephen Wong, IPM Coordinator

# Vancouver Board of Parks and Recreation
# Integrated Pest Management (IPM)
# Program

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The management of pest problems (insects, diseases, weeds) within the Vancouver Board of Parks and Recreation is conducted using an Integrated Pest Management (IPM) approach, where cultural and biological control are given higher priority over the use of chemicals. If chemicals are used, preference is given to environmentally friendly ones which minimize the adverse effects to non-target species, the environment and human health.

Prior to the adoption of this IPM policy in 1987, there had been widespread use of relatively toxic pesticides without clear guidelines, and without regard for any deleterious effects. The use of chemicals has shown a steady decline through the years as we have been able to adopt an IPM approach in tackling more pest problems. For example, there is no longer any spraying of turfgrass in our free-access parks, relying instead on cultural practices such as coring, topdressing, fertilizing and liming. Insects on trees and shrubs are dealt with through applications of insecticidal soap as a "knock-back" spray and banding with glues for climbing insects.

Some key components for the successful implementation of IPM, and which we use within the Vancouver parks system are:

- Proper identification of pest
- Regular monitoring of the pests as well as beneficials, especially before and after treatments
- Establishing realistic action and tolerance levels
- Application of treatments that are effective, environmentally friendly and sustainable
- Follow up assessment

The IPM program consists of a full-time IPM Coordinator and 2 seasonal staff who act as resource people for any horticultural staff with pest problems. In the last few years, we have identified the importance of looking at the overall health of the plant, and the reduction of stress as a means of reducing the predisposition to insects, diseases and weeds. For example, the best method for controlling weeds in turfgrass is not by spraying, but by using proper and timely cultural practices that results in a healthy, thick stand of grass that can out compete the weeds. We are therefore aiming at a much more comprehensive and holistic approach to our pest and plant health problems, so we are now also making recommendations on soils, fertilizers, soil amendments, liming and irrigation in addition to the "conventional" recommendations on pest problems.

We spend a significant portion of our time on site visits throughout the horticulture system, including Arboriculture, Major Parks , General Parks, VanDusen Gardens and Golf Courses. We deal with the entire gamut of problems as they exist on street trees, turfgrasses, sportsfields, shrubs, flowers and in protected environments such as the nursery, greenhouses, and Bloedel Conservatory. In the Arboriculture section, the IPM staff responded to 230 pest service request calls from the public in 1996. In addition, we have an IPM laboratory where horticulture staff can drop in with specimens for identification and discussion of control methods. We also offer a number of IPM training courses for staff throughout the year.

In addition to the routine response to problems, we are active in trial and research work on a number of important projects where an effective IPM protocol has yet to be established. These are problems where a simple solution does not currently exist, and ones where we will continue to refine our methods over the years. Some examples of our IPM projects where we have received some degree of success are:

**Winter Moth Banding**

Winter moth in its caterpillar stage is a serious defoliator of a variety of deciduous trees. Every fall, we work with approximately 50 volunteers in the Kerrisdale area to enthusiastically band about 2000 street trees with a sticky glue that traps the emerging wingless females as they attempt to climb up the tree trunks. Trees that were once up to 80% defoliated now only show low levels of feeding damage.

We are continuing to work on the feeding preferences of the winter moth so that we can focus our resources on those trees that are particularly susceptible to feeding (e.g. Norway maple). In addition, we are looking at introducing naturally occurring parasitic flies and wasps from Victoria, hoping to get them established in Vancouver.

**Aphids**

Aphids are probably the most problematic pest problem on street trees, resulting in over 150 complaint calls in 1996. As the aphids feed, they secrete a sticky, sweet substance called honeydew that damages car finishes, results in sticky surfaces underneath, attracts wasps, and is a medium for the growth of an unsightly black mold. Our approach has been to carefully monitor for aphid levels by using an innovative method, "honeydew monitoring cards" that are suspended from trees to measure the amount of honeydew drops over a 4 hour period. If intervention is required, we will apply insecticidal soaps to reduce aphid populations, and then allow the naturally occurring beneficial insects (e.g. ladybugs, predatory midges, lacewings) to return to keep aphid populations in check. If the naturally occurring beneficial populations are lacking, we can purchase and release these beneficial insects.

This year we will continue at fine tuning the optimal time for spraying and introduction of beneficials. We will also expand on our program of encouraging homeowners to plant flowers at the base of street trees, as the pollen and nectar from these flowers are important attractants to the

naturally occurring beneficials in the area.

## Tree Base Flower Plantings

The health of our street trees is severely compromised due to the stressful conditions they are growing in. Typically in a residential area, they are not receiving sufficient moisture and to a lesser extent nutrients, that results in a stressed situation of declining growth and the predisposition to secondary disease or insect attack.

Given our limited resources, we have been working with residents on selected blocks to encourage them to grow flowers at the base of the street trees. In the process of watering and fertilizing the flowers, they provide these otherwise limiting factors to our trees. For this pilot program, we have supplied compost and flowering plants. Preliminary monitoring seems to indicate that our trees are benefiting from this treatment. We will expand the program for this year to include about 6-8 city blocks, and to establish a more rigorous monitoring program that would include measuring parameters such as shoot growth, increase in trunk diameter and tissue nutrient levels.

## Cherry Tree Auguring and Fertilizing

The Japanese flowering cherry trees are a treasured part of our urban landscape, yet for the past decade they have shown a steady decline due to a combination of factors, including attack by a tunnelling insect (cherry bark tortrix), diseases (bacterial canker, brown rot), possible viruses, graft incompatibility and urban stresses, including compacted soils and moisture and nutrient deficiency. There has been a lot of work done on this problem by many other agencies, including the Pest Management Program at SFU and the B.C. Ministry of Agriculture, with the focus on finding ways to control the pest problem. We have taken a different approach, looking instead at reducing the stressful conditions the cherry trees are growing in to improve tree health, and in so doing, reducing the predisposition of the trees to insect and disease attack.

We initiated a comprehensive experiment last year where we augured holes under the dripline of selected trees to increase the infiltration of water and air into the root system, as well as dropping slow release fertilizer tabs into each of these augured holes. In all, we had 50 treated trees and 50 control trees over 10 city blocks. All trees were photographed from fixed positions to provide a reference point for rating the tree health over the years. We will continue with intensive monitoring of the cherry trees this year, as well as to include trees that have been stressed to due to recent road or sidewalk construction.

## Organic Amendments in Sportsfields

Sportsfields have been routinely built with straight sand for the last few decades, with the advantages being improved drainage, reduced compaction, and an easier to specify product. However, these fields, at an average cost of about $250, 000, are extremely difficult to maintain,

requiring high inputs of water and fertilizer, and are extremely difficult to repair if damaged. Invariably, the sandfields that have been established have looked extremely anaemic, resulting in low stress tolerance to wear and tear. Tissue tests have confirmed overall low levels of most nutrients, in particular nitrogen, phosphorus and calcium. The weakened turfgrass has been extremely susceptible to invasion by weeds and diseases.

An important part of the IPM program is to look at how to change the way we build our sportsfields, with the objective of producing a field that is healthy, free from weeds and diseases, requires lower inputs of water and fertilizer, and results in less chemicals being leached into the environment. To meet these objectives, it was mandatory that these relatively sterile sand fields be "re-engineered", to include incorporation of organic matter to produce a growing medium that was vibrant with biological activity for the retention and slow release of nutrients, retention of moisture and proliferation of beneficial microbes that suppress the development of diseases.

The positive results that were obtained with our trial plots at Beaconsfield led us to work with Parks Planning in setting up a large scale experiment at the 2 new fields at Memorial South, constructed and seeded in the late summer/fall of 1996. The first field was built the conventional way, with an 18 inch layer of river pump sand. The second field at Memorial South was constructed with a 1 inch layer of organic matter (peat) broadcasted over the entire sand surface, and rototilled to a depth of 6-8 inches.

Observations to date are extremely positive. Although seeded 1 month later, the peat incorporated field now looks healthier and fuller, and with less disease. Funds have been dedicated for continuing to assess the benefits of the organic matter incorporation, as well as assessing the benefits of different topdressing materials such as compost and mycorrhizae (beneficial fungi). We have submitted applications to a turf industry group (Western Canada Turfgrass Association) and the B.C. Ministry of Agriculture (IPM Program) in attempt to obtain "matching" funds. A masters student has been hired to work on an auxiliary basis to undertake the experimentation.

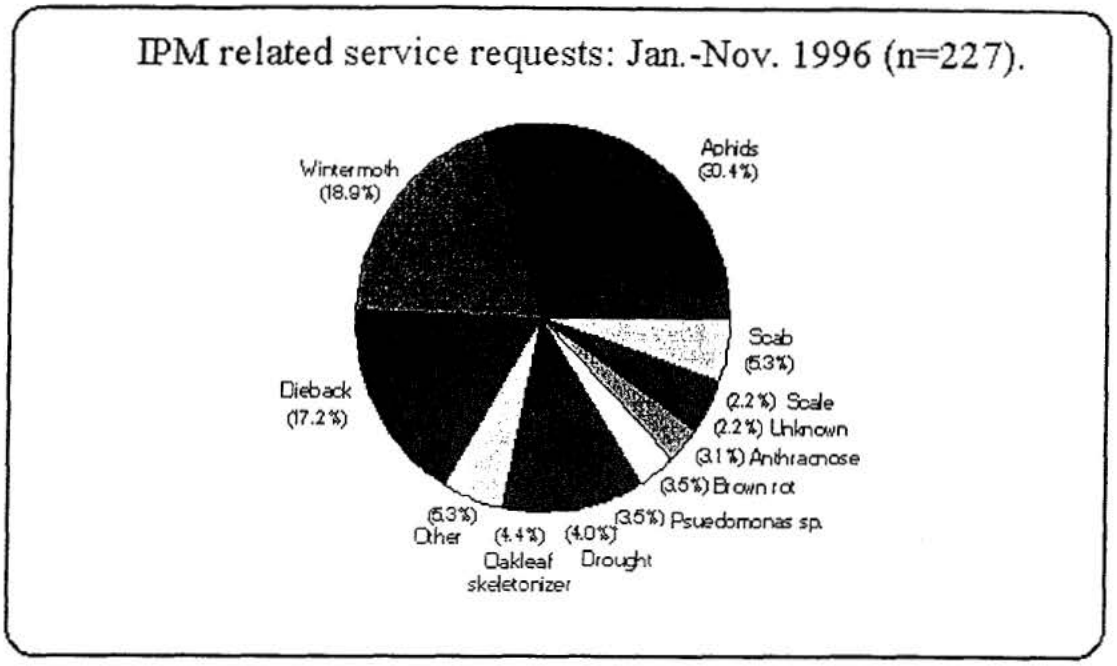
**Purple Loosestrife**

This invasive weed has established in a number of areas in the Vancouver Parks system, where they out compete the native wetland plants. Over the last 2 years at Jericho Park, repeated cuttings at water level has weakened this plant to the point where native vegetation has grown back in.

**Greenhouse Pests**

These have been kept to manageable levels with the introductions of predatory mites and pirate bugs, parasitic wasps and the timely applications of insecticidal soaps and an insect growth regulator.

# IPM Service Requests, Arboriculture Department: Jan.- Nov. 1996




The distribution of IPM related service requests paints an interesting picture of the public's reaction to the insect and disease conditions that affect our city trees. Judging from the attached piechart, aphids are the biggest single problem, followed by wintermoth and die-back. Although aphids cause little harm to the trees, their sticky honeydew which rains down onto underlying cars, sidewalks and gardens is a major nuisance. When infestations become severe, as is common on Linden, Tulip, and Weeping birch trees, it is often necessary to use applications of Safer's soap to bring their population down to tolerable levels. For the longer term, we continue to investigate the use of natural biological controls to keep populations from becoming a problem.

Wintermoth larvae cause considerable defoliation damage to susceptible trees during the spring. Most of the calls from residents concern flowering cherry trees, yet the principle hosts are large sized Norway Maple and Elm trees. Tree banding remains our most successful strategy to control this insect, and community participation in this program remains outstanding. As the wingless females emerge from their inground cocoons in the fall and begin to ascend the tree trunks to lay their eggs, they become ensnared in sticky glue and soon die. For the longer term, we are planning to introduce natural wintermoth parasites from the Victoria area. If this strategy is successful, these parasites will become established locally and reduce the wintermoth population down to a level where tree banding will be unnecessary.

Die-back is the third most common cause for public concern, and is caused by a number of

problems including soil compaction, low fertility, root disturbance and drought. As the trees become increasingly stressed, they become more susceptible to insect and disease infestations which can cause death in both minor or major limbs. This increases the demands on pruning crews to remove hazardous limbs, and over time, even the entire tree may die and have to be replaced. The solution to this problem is complex and requires an increased focus on overall tree health. In particular, continued efforts to prevent drought stress to, and improve the growing conditions of newly planted trees will play a pivotal role in reducing this problem.

The remainder of the IPM related service requests are comprised of numerous problems including: apple scab, oakleaf skeletonizer, drought, brown rot, Pseudomonas sp., anthracnose and scale. Apple scab was a major problem on flowering crab apple trees this year, perhaps due to the prolonged spring weather. Likewise, many cherry trees throughout the city were affected by Pseudomonas spp. and Brown rot. The oakleaf skeletonizer was again very active on red oaks and appears to be spreading throughout the city. This insect causes minimal harm to affected trees, but the caterpillars descending on silken threads, and coccoons overwintering on houses and cars, presents a considerable nuisance to local homeowners. Other problems include stress, cherry bark tortrix, leaf blight, bronze birch borer, mites, Phytophthora, Phylloxera, Sowbugs, and western tent caterpillars. While the IPM related service calls do not necessarily represent an accurate picture of the most severe insect and disease problems facing our city's trees, this analysis nevertheless serves as an interesting barometer to gauge the public's concern.

**Vancouver Parks IPM Program Update**
**Stephen Wong**
**April 19, 1996**

Vancouver Parks adopted an IPM policy 9 years ago, in 1987. Its first IPM Coordinator was hired in 1990, and the present Coordinator in 1994. The IPM department consists of a full-time IPM Coordinator and 2 temporary positions. Additional costs are for biologicals, operation of the lab and incidental IPM supplies. By going to an IPM approach, we have reduced the costs associated with spraying on a regular basis, the associated negative environmental impacts, and the costs of dealing with an irate public.

Despite initial apprehensions about managing pests in a parks system using an IPM approach, this method at least in principle, is quite firmly in place, and one that is widely accepted by Parks staff. We no longer spray on a routine basis, as was done in the past. When we do spray, we need to provide justification for doing so, and basically when other approaches, such as cultural and biological have not worked. Staff consult with the IPM Coordinator before the applications of any spray. We have increasingly gone away from the more toxic chemicals to the more low- toxic pesticides such as insecticidal soap, pyrethrins and glue. We have done some trials supporting the use of alternatives like baking soda for powdery mildew control. Monitoring is a key component of our program, and one which we do before and after treatments to test their efficacy.

Increasingly, we see spraying as only a means for knocking back the pest populations prior to the introduction of biological control agents. Although there is the initial expense, this is a much more sustainable approach, as these reproduce themselves year after year. Examples of biological control agents that we have used are ladybugs, lacebugs, predatory midges, mites and pirate bugs, and parasitic wasps for a variety of different pests, including aphids, scales, whiteflies, mealybugs and thrips.

Some notable IPM successes to date have been:

Winter Moth Banding: Winter moth is a serious defoliator of a variety of deciduous trees. Every fall, approximately 50 volunteers enthusiastically band about 2000 street trees with a sticky glue that traps the emerging wingless females. Trees that were once up to 80% defoliated now only show low levels of feeding damage.

Aphids: Our approach has been to carefully monitor for aphid levels and beneficial insects. If intervention is required, we will apply insecticidal soaps to reduce aphid populations, followed by the release of biologicals, such as predatory midges and ladybugs.

Greenhouse Pests: These have been kept to manageable levels with introductions of predatory mites and pirate bugs, parasitic wasps and the timely applications of insecticidal soaps and an insect growth regulator.

Weeds in turf: We have tried to approach this problem by addressing the health of the

turfgrass. Currently, the turfgrass in our sand based fields are unhealthy, resulting in bare areas susceptible to invasion by weed species. We have recently established replicated test plots incorporating compost with the sand. Results to date are promising, with grass that is seemingly healthy, and competitive.

Purple Loosestrife: This invasive weed has established in several areas, where they outcompete native wetlands plants. In a trial over 2 years, repeated cutting at water level has weakened this plant to the point where native vegetation has grown back in.

Since the start of the IPM policy, we have increasingly reduced our reliance on pesticides. This has been achieved without a noticeable reduction in quality of our plants. IPM is a relatively slow process, not providing the quick, but temporary fix that pesticides provide. Therefore, it is essential to look at the longterm effects of your pest management approach, and its sustainability. Once the biologicals are released, "nature" will look after itself, to a large degree. In addition, if one wants to involve the community in a positive way, IPM may be an answer, whether banding trees, monitoring for pests or providing feedback on the health of trees.

# Integrated Pest Management Program
# Board of Parks and Recreation
# City of Vancouver, British Columbia

**Prepared by Sophie Dessureault**
**Integrated Pest Management Coordinator**
**April 2005**

The Vancouver Board of Parks and Recreation uses an Integrated Pest Management (IPM) approach in managing pest infestations. Cultural and biological controls are used in preference to chemical applications. If pesticide treatments are required, environmentally friendly products which minimize the adverse effects to non-target species, the environment and human health are preferred. Prior to the adoption of this IPM policy in 1987, there had been widespread use of relatively toxic pesticides without clear guidelines and without regard for any deleterious effects. Since then we have identified the importance of a more holistic approach to the maintenance of our urban plantings. Therefore, with our focus on pest prevention, we have reduced and in some cases even eliminated our dependence on pesticides.

## Background

For many years, the Park Board has relied on numerous pesticide applications for the management of pest problems, without any considerations for alternative control methods or secondary effects of pesticides. Following a public outcry against broadcast applications of herbicides on park grounds, the Vancouver Park Board adopted an integrated pest management policy in 1987 (Appendix 1). The program was implemented in 1990 with the creation of the integrated pest management coordinator position. The IPM staff act as consultants to the various arboriculture and horticulture departments.

## Scope of the Problem

The Vancouver Board of Parks and Recreation includes two hundred neighbourhood parks (over 1100 hectares), six golf courses (over 200 hectares), Bloedel conservatory (tropical garden under glass), VanDusen botanical gardens, three major parks including Stanley Park, Queen Elizabeth Park and Hastings Park, Sunset nursery, a tree farm in Langley (11 hectares), and over 128,000 street trees. Specific problems exist for each area (Table 1).

Table 1: Examples of pest problems seen throughout Vancouver park facilities

| Host | Insects and Mites | Diseases | Other Problems |
|---|---|---|---|
| Turf | Leatherjackets, European chafers | Various diseases | Weeds, Stress |
| Flower beds | Root weevils, Cutworms, Sawflies, Lace bugs | Various fungal and bacterial diseases | Weeds |
| Street and park trees | Aphids, Woolly aphids, Winter moths, Oak leaf skeletonizers, Scales, Mites, Tent caterpillars | Fire blight, Anthracnose, Wilts, Cankers, Root rots, Scabs, Other fungal or bacterial diseases | Stress, Mechanical damage (construction) |
| Glasshouses | Aphids, Thrips, Whiteflies, Mites | Various fungal, bacterial and viral diseases | Weeds |
| Tree Farm | Various insects | Various diseases | Weeds |

The IPM staff spend a significant portion of time on site visits throughout the horticulture system. We deal with the entire gamut of problems as they exist on street trees, golf courses, sports fields, shrubs, flowers and in protected

environments such as glasshouses. In the Arboriculture section, the IPM staff responded to over 550 pest service request calls from the public in 2004. In addition, we have created a diagnostic laboratory where horticulture staff can drop in with specimens for identification and discussion of control methods. We also offer a number of IPM training courses for staff throughout the year.

As well the routine response call to problems, we are active in trial and research work on a number of important projects where effective IPM protocols have yet to be established. These are problems where a simple solution does not currently exist and ones where we will continue to refine our methods over the years.

Objectives

The goals of this program (and of the Board) are presented in rank order of priority and importance. The first goal is the maintenance and improvement of facilities within the Board's jurisdiction. The second goal is to decrease the use of chemical pesticides. The third goal is to achieve these first two goals by the implementation of an Integrated Pest Management Program (IPM). An IPM program is defined as the best combination of cultural, biological, genetic, and chemical methods for the most effective and economical control of pests. Inherent in the approach is an emphasis on "Integrated"--an approach whereby all aspects of the pest problem are included in determining treatment strategies that are focussed and have little or no side-effects on non-pest species or predators of pests. The use of a variety of "tools" lessens the dependence on any one tool and also lessens its use. Increased control through non-chemical methods will conversely decrease chemical use.

Steps Responsible for the Success of Our Program

The education of staff and public is a critical and ongoing step crucial to the development, acceptance and success of our integrated pest management program. It is a relatively new concept in which the approach and implementation are not always evident; continuous training is essential to gain the necessary knowledge and support.

The most difficult step in the implementation of this program was to abolish the customs set down by a long tradition of pesticide dependence. Staff had to be taught to look beyond the pest to successfully determine the causes of infestation or infection and that there are no silver bullets when dealing with such pests. Focus was directed towards improving cultural practices: peat or compost was added to sand based fields, more competitive plants were selected, and monocultures were avoided. The IPM concepts were presented to staff through small demonstrations. For example, to illustrate the efficacy of biological control of aphids on roses, we split a rose garden in two. While one half received a standard chemical control regime, the other was treated to several introductions of commercially reared lady bird beetles and lacewings as well as the installation of plants to attract beneficial insects. The results demonstrated that biological control could be as effective as chemical treatments.

Another problem we had to face was the lack of information on urban IPM. Since the implementation of our program we have run trials to fill these knowledge gaps: development of monitoring protocols for street tree aphids, life cycle and control studies on the oak leaf skeletonizer, determination of distribution and host preferences for the winter moth, efficacy testing of various nematodes against leatherjackets, weed suppression trials against purple loosestrife, and soil amendment trials for turf health and disease suppression. With extensive monitoring and trials we have been able to establish tolerance and action thresholds for several urban pests. We are continuing research projects and are now capable of diagnosing most of our pest problems.

Control Methods

According to our IPM policy, pest problems are generally controlled using cultural, physical or biological means. However, should these techniques prove ineffective in managing pest infestations, the use of pesticides may be necessary.

Cultural Control:

The best way to avoid a pest problem is not to create it. We have therefore adopted a more holistic approach in the selection, installation and care of our plants. Now, in the planning or redevelopment of any park installation, the site conditions and the requirements of the selected plants are paramount. Insect and disease resistance is highly favoured. Unfortunately, many of our current problems are inherited from the past. For example, most of the crab apples planted ten years ago are highly susceptible to apple scab. Rather than treat the disease with a costly fungicide regime, we have developed a diseased tree removal

program. Every year, hundreds of trees are selected according to disease severity, and with the blessings from the residents, these trees are removed and replaced by disease resistant trees in the span of a couple of days. In some cases, plants have been relocated to locations more suitable to their growing needs.

Physical & Mechanical Control:

Physical or mechanical control is often very effective because it consists of the exclusion or removal of the pest or host species. Some physical control methods are also considered cultural controls. For instance, the selection of competitive plants may control weeds by excluding them. Unfortunately, these methods are often labour intensive. However, when adopting its IPM policy, the Board of Parks recognized that for certain problems physical control was the better option. This is the case for the winter moth. This lepidopteran is capable of causing serious damage to many of our large street and park trees such as maples and elms. While other control options existed, the application of sticky tree bands in the fall to trap migrating female winter moths had the least environmental impact.

Biological Control:

In areas where natural beneficials are inadequate, commercially reared biological control agents will be used. These include: *Amblyseius cucumeris, A. fallacis, Aphidius colemani, A. ervi, Aphidoletes aphidimyza, Cryptolaemus montrouzieri, Chrysoperla carnea, Delphastus* spp*., Dicyphus hesperus, Encarsia formosa, Heterorhabditis* spp*., Hippodamia convergens, Hypoaspis miles, Orius insidiosus, Phytoseiulus persimilis, Steinernema carpocapsae* and *S. feltiae*. At Sunset nursery, the strategy of the bio-control program has been to create a zoo: introduce lots of diversity in larger numbers. These are older greenhouses in which a large variety of crops are grown throughout the year, making the establishment of certain biologicals difficult. Some of the problems include the lack of screening on the vents and pesticide residue in the structures.
Biologicals are also used outdoors, although their effectiveness can be somewhat limited. The biggest problem with using biologicals outdoors is dispersal. In our climate, some biologicals will establish themselves readily but their effect will be too diluted due to the lack of containment. *Aphidoletes* & *Aphidius* may work very well against aphids in a sheltered rose garden but will have relatively no effect on larger trees. Some biologicals do work well outdoors: *Amblyseius fallacis* was used successfully to control spider mites and other mites on landscape trees and shrubs. *A. fallacis* overwintered and was recovered the following year. Nematodes are also used regularly to control root weevils and leatherjackets.

Chemical Control

Important changes occurred to the pesticide use policy when the IPM policy was adopted. Scheduled spray programs have been eliminated and any pesticide application must be approved by the IPM staff. Pesticide treatments are only approved once other control options have proven ineffective and only the least toxic, effective chemicals will then be selected. Pesticides, such as insecticidal soap, horticultural oils and other low toxicity pesticides, are now favoured. Our Health By-Law requires that all pesticide treatments be posted at least three days prior to application and that the notices stay up for at least seven days after treatment.

Since the implementation of the IPM program, pesticide use has steadily diminished. All neighbourhood parks, sports fields and playgrounds are now pesticide-free. Bloedel conservatory, VanDusen garden and Sunset nursery have minimal pesticide use. Most control is achieved culturally or biologically. At Sunset nursery, a bio-control program was adopted in 2000. That year, the nursery reduced its number of applications of moderate to highly toxic pesticides (LD50 <500mg/kg) by half. In 2001, overall pesticide use at the nursery was further reduced by 75% and only low toxicity, bio-friendly insecticides were used. Since then, pesticide use has been minimal to protect the populations of biological control agents that are now established in the greenhouses.

Conclusion

Integrated pest management has a promising future in urban settings. There is a strong desire from the public and politicians to see the maintenance of urban plantings done without pesticide use. Therefore, IPM will become increasingly valuable as public awareness recognizes its importance.

**Appendix 1**

## VANCOUVER BOARD OF PARKS AND RECREATION

## INTEGRATED PEST MANAGEMENT POLICY

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- It is the policy of the Board of Parks and Recreation that park maintenance and pest control be conducted through an Integrated Pest Management approach. An Integrated Pest Management approach is the best combination of cultural, biological and chemical methods that are used in an environmentally-sound way to maintain pest populations below damaging levels.

- Pest control materials and activities should:
  - minimize hazard to human health and nontarget organisms
  - minimize hazard to the general environment
  - be most likely to bring about a long-term reduction in pest populations
  - be cost effective

- Physical, cultural and biological control methods shall receive priority consideration for managing pest problems. Chemical control strategies shall be used only where a mix of other strategies is inadequate and pest damage is above tolerable levels.

- Free public access facilities shall have no or minimal pesticide use. This includes general turf areas in playgrounds, picnic areas, passive areas and sportsfields; flower and shrub beds; medians; and street trees. Where pesticides need to be used, a high preference will be given to the use of Schedule 5 pesticides.

- Maintenance of areas having controlled public access shall have use of registered pesticides in accordance with applicable federal, provincial and municipal legislation.

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