Many factsheets, publications and other resources are available from the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA). These can be ordered from Service Ontario:

- Online at ServiceOntario Publications: ontario.ca/publications
- By phone through the ServiceOntario Contact Centre Monday–Friday, 8:30 a.m. - 5:00 p.m. 416-326-5300 416-325-3408 (TTY) 1-800-668-9938 Toll-free across Canada 1-800-268-7095 TTY Toll-free across Ontario
- In person at ServiceOntario Centres located throughout the province or at any OMAFRA Resource Centre. Many can also be found online at ontario.ca/omafra
- For a complete list of publications from OMAFRA: ontario.ca/omafra

**OMAFRA Publications**
- Agronomy Guide for Field Crops – Publication 811
- Growing Strawberries in Ontario – Publication 513
- Growing Red Raspberries in Ontario – Publication 105
- Fruit Crop Protection Guide – Publication 360
- Guides to Weed Control – Publication 75A Field Crops & Publication 75B Hort Crops
- Integrated Pest Management for Ontario Apples – Publication 310
- Soil Fertility Handbook – Publication 611
- Vegetable Crop Protection Guide – Publication 838

**Websites**
Websites for technical information on pests and production in Ontario fruit crops:
- OMAFRA gateway to information on crops: ontario.ca/crops
- Spotted wing drosophila: ontario.ca/spottedwing
- Brown marmorated stink bug: ontario.ca/stinkbug
- Crop IPM (integrated pest management) modules: ontario.ca/cropipm
- Label Search Tool to find labels for pesticides and products registered for use in Canada: http://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php
- Information on pesticide application technology: www.sprayers101.com
- Specialty Cropopportunities to find information on specialty berries and fruit: ontario.ca/crops (search on "cropopportunities")

**OMAFRA Factsheets**
- Mating Disruption for Management of Insect Pests
- How Weather Conditions Affect Spray Applications
- Six Elements of Effective Spraying in Orchards and Vineyards
- Calibrating Airblast Sprayers
- Adjusting, Maintaining and Cleaning Airblast Sprayers
- Pesticide Drift from Ground Applications

**Best Management Practices**
The Best Management Practices series of publications presents a practical, affordable approach to conserving a farm’s soil and water resources without sacrificing productivity.

A sampling of titles appears below. For a complete list of books in the BMP series, see: ontario.ca/agbestpractices.
- BMP01E Farm Forestry and Habitat Management
- BMP06E Soil Management
- BMP07E Water Management
- BMP08E Irrigation Management
- BMP09E Integrated Pest Management
- BMP13E Pesticide Storage, Handling and Application
- BMP15E Buffer Strips
- BMP16E Manure Management
- BMP20E Managing Crop Nutrients

**Resources on Application Technology**
- Ontario Pesticide Education Program: www.opep.ca

Airblast 101 Course Materials: basic tools for applying pesticides and plant growth modifiers in an effective, economic and environmentally responsible manner. For more information, contact the ministry Application Technology Specialist.
APPENDIX B: Degree-Day Modeling

Temperature, light and humidity affect the growth and development of plants, disease-causing pathogens and insect pests. Of these, temperature is the most important factor for insect and mite development. These pests need a certain amount of heat to move to the next development stage. For pathogens, temperature and moisture play key roles in the development and infection of the plant.

The amount of heat required for insect, mite and pathogen development remains constant from year to year, but depending on weather conditions, the amount of actual time that it takes to complete development can vary. Insects, mites and pathogens have a minimum (lower) and maximum (upper) base temperature—below or above which development does not occur. These base temperatures are different for each organism.

Degree-Days Celsius (DDC) are used to estimate the growth and development of pests in the growing season (see Table 10–1. Examples of Degree-Day Models Used in Fruit Crops, page 429). Events such as peak egg-laying activity, egg hatch, movement of crawlers or the occurrence of disease infection can be predicted and used to schedule inspection and spray programs. For example, degree-day calculations can predict the first hatch of codling moth eggs or the percentage of apple scab ascospores that have matured in the orchard.

There are several methods used to calculate DDC, but the method commonly used with simple monitoring equipment is the averaging method or "max/min" method. DDC for a given organism are calculated as follows:

\[
\text{DDC} = \frac{\text{(Daily max °C) } + \text{(Daily min °C)}}{2} - \text{min base °C}
\]

Degree-Days Celsius are accumulated daily. The averaging method works well in most years. However, the actual DDC accumulations may be underestimated in extended periods of cool weather or overestimated in hot weather.

For a given pest:
- Lower base temperature = 10°C
- Upper base temperature = 35°C

On a given day:
- Minimum temperature = 5°C
- Maximum temperature = 15°C

Degree-Days Celsius (DDC) for that day is =
\[
\text{(maximum + minimum temperature)/2 – lower base temperature} = \frac{(15 + 5)}{2} – 10 = 0 \text{ DDC}
\]

Note that the maximum temperature was higher than the base temperature for the insect, so growth and development were possible for at least part of the day. However, no DDC were accumulated. This illustrates how cool temperatures, especially over several days, could lead to an underestimation of insect development.

Degree-Days Celsius are either accumulated from a set start date, such as April 1, or from a specific event known as a biofix. A biofix is a biological event or indicator of a developmental event that initiates the beginning of DDC calculations. A common biofix used for insects is the first sustained catch in pheromone traps. Using a biofix provides predictions that are more accurate and requires tracking temperatures over a shorter period.

There are several limitations to degree-days models:

- Factors such as humidity, light intensity and rainfall also affect pest development. As a result, DDC predictions are only estimates of pest development. Verify these predictions with field observations.
- Temperatures used to determine DDC must represent the environment where organisms develop. Use weather data collected from within 2 km or less of the actual orchard or field being monitored. Site-specific information can be obtained by using data loggers. Ventilated heat shields should be used with temperature-sensor data loggers to ensure accurate air temperatures. Place data loggers at locations in the crop where the pest is normally active.
- DDC models have been developed and validated for only a few fruit pests in Ontario.
- DDC model calculators can be found on-line, such as http://uspest.org/cgi-bin/ddmodel.us?spp=swd.
- Keep in mind that many of these models have not been validated under Ontario conditions. Use precise temperature data measured on or very close to your farm for the best estimate of the development of these pests.
Table 10–1. Examples of Degree-Day Models Used in Fruit Crops

<table>
<thead>
<tr>
<th>Pest</th>
<th>Base Temperature</th>
<th>Biofix</th>
<th>Predicted Event</th>
<th>Model (when to expect the event)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Apples</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Codling moth</td>
<td>10°C</td>
<td>sustained moth catch (1st generation)</td>
<td>1st generation peak egg laying 83–111 DDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>early egg hatch 111–138 DDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>peak egg hatch 138 DDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2nd generation peak egg laying 611–639 DDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>early egg hatch 639–667 DDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>peak egg hatch 667–694 DDC</td>
<td></td>
</tr>
<tr>
<td>Obliquebanded leafroller (summers)</td>
<td>6.1°C</td>
<td>sustained moth catch (summer generation)</td>
<td>1st egg hatch 220–244 DDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>peak egg hatch 240–280 DDC</td>
<td></td>
</tr>
<tr>
<td>Oriental fruit moth</td>
<td>7.2°C</td>
<td>Sustained moth catch (1st generation)</td>
<td>1st generation peak egg laying 111–139 DDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>early egg hatch 139–153 DDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>peak egg hatch 194–208 DDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2nd generation early egg hatch 750–778 DDC</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>peak egg hatch 805–833 DCC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3rd generation early egg hatch 1305–1333 DDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>peak egg hatch 1361–1389 DDC</td>
<td></td>
</tr>
<tr>
<td>San Jose scale</td>
<td>10°C</td>
<td>March 1</td>
<td>1st generation start of crawler emergence 278 DDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2nd generation start of crawler emergence 806 DDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>sustained adult catch (each generation)</td>
<td>1st generation start of crawler emergence 172 DDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2nd generation start of crawler emergence 222 DDC</td>
<td></td>
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<tr>
<td>Apple scab</td>
<td>0°C</td>
<td>bud break on McIntosh</td>
<td>high risk of primary infection rapid maturation of ascospores</td>
<td>125 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>end of primary infection 95% of ascospores should be depleted if sufficient rainfall has occurred</td>
<td>418 DDC</td>
</tr>
</tbody>
</table>

Table 10–1. Examples of Degree-Day Models Used in Fruit Crops (cont’d)

<table>
<thead>
<tr>
<th>Pest</th>
<th>Base Temperature</th>
<th>Biofix</th>
<th>Predicted Event</th>
<th>Model (when to expect the event)</th>
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</thead>
<tbody>
<tr>
<td><strong>Berries</strong></td>
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</tr>
<tr>
<td>Tarnished plant bug (strawberries)</td>
<td>12.1°C</td>
<td>April 1</td>
<td>1st nymphs in strawberries</td>
<td>30–40 DDC</td>
</tr>
<tr>
<td>Spotted wing drosophila²</td>
<td>10°C</td>
<td>January 1</td>
<td>overwintering generation peak egg laying by overwintering females, 1st adult emergence</td>
<td>283 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1st generation peak adult emergence</td>
<td>419 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2nd generation peak adult emergence</td>
<td>694 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3rd generation peak adult emergence</td>
<td>968 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4th generation peak adult emergence</td>
<td>1243 DDC</td>
</tr>
<tr>
<td><strong>Grapes</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Grape berry moth³</td>
<td>8.3°C</td>
<td>50% bloom on wild grapes</td>
<td>1st generation 1st egg hatch</td>
<td>450 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2nd generation 1st egg hatch</td>
<td>900 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3rd generation 1st egg hatch</td>
<td>1,350 DDC</td>
</tr>
<tr>
<td><strong>Tender Fruit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obliquebanded leafroller (summer generation)</td>
<td>6.1°C</td>
<td>sustained moth catch (summer generation)</td>
<td>1st egg hatch</td>
<td>220–244 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>peak egg hatch</td>
<td>240–280 DDC</td>
</tr>
<tr>
<td>Oriental fruit moth</td>
<td>7.2°C</td>
<td>sustained moth catch (1st generation)</td>
<td>1st generation peak egg laying</td>
<td>111–139 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>early egg hatch</td>
<td>139–153 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>peak egg hatch</td>
<td>194–208 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2nd generation early egg hatch</td>
<td>750–778 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>peak egg hatch</td>
<td>805–833 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3rd generation early egg hatch</td>
<td>1305–1333 DDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>peak egg hatch</td>
<td>1361–1389 DDC</td>
</tr>
</tbody>
</table>


APPENDIX C: Suppliers of Pest Monitoring Equipment and Biological Control Agents

This list includes sources of weather monitoring equipment, pest monitoring supplies and biological control agents. For a more extensive list of beneficial insects and mite suppliers, see the OMAFRA website at ontario.ca/crops. This is a partial list and does not imply endorsement or recommendation by the Ontario Ministry of Agriculture, Food and Rural Affairs of the companies listed.

<table>
<thead>
<tr>
<th>Company</th>
<th>Address</th>
<th>Telephone/Fax/Email</th>
<th>Products</th>
</tr>
</thead>
</table>
| Anatis Bioprotection     | 278 rang Saint-André Saint-Jacques-le-Mineur, QC J0J 1Z0 | Toll-free: 1-800-305-7714  
Email: info@anatisbioprotection.com | • beneficial insects and mites                             |
| Biobest Canada Ltd.      | 2020 Foxrun Rd. R.R. #4 Leamington, ON N8H 3V7 | Tel: 519-322-2178  
Fax: 519-322-1271  
Email: info@biobest.ca | • beneficial insects, mites, nematodes  
• pheromone lures and traps  
• bumblebee hives for pollination |
| Cooper Mill Ltd.         | 31 Hastings Rd. R.R. #3 Madoc, ON K0K 2K0     | Tel: 613-473-4847  
Fax: 613-473-5080  
Email: ipm@coopermill.com | • pheromone lures and traps                              |
| Distributions Solida Inc.| 480 rang St-Antoine St. Ferreol-Ies-Neiges, QC G0A 3R0 | Tel: 418-826-0900  
Fax: 418-826-0901  
Email: info@solida.ca | • pheromone lures and traps  
• tangle traps, insect trap coating  
• hand lens magnifiers  
• tally counters |
| Gempler's                | P.O. Box 5175 Janesville, WI USA 53547        | Toll-free: 1-800-382-8473  
Fax: 1-800-551-1128  
Email: customerservice@gempler.com | • weather monitoring equipment  
• pheromone lures and traps  
• tangle traps  
• hand lens magnifiers  
• tally counters |
| Great Lakes IPM, Inc.    | 10220 Church Rd. NE Vestaburg, MI USA 48891   | Tel: 989-268-5693  
Toll-free: 1-800-235-0285  
Fax: 989-268-5311  
Email: glipm@greatlakesipm.com | • apple scab monitoring equipment  
• pheromone lures and traps  
• tangle traps  
• hand lens magnifiers  
• tally counters  
• insect sweep nets  
• field diagnostic equipment |
# APPENDICES

## Fruit Crop Protection Guide 2018–2019

<table>
<thead>
<tr>
<th>Company</th>
<th>Address</th>
<th>Telephone/Fax/Email</th>
<th>Products</th>
</tr>
</thead>
</table>
| Koppert Canada Ltd.            | 50 Ironside Cres. #2              | Tel: 1-800-567-4195 Fax: 416-291-0902 Email: info@koppert.ca | • beneficial insects, mites  
  • insect traps  
  • BioWorks products |
| Natural Insect Control         | 3737 Netherby Rd. Stevensville, ON L0S 1S0 | Tel: 905-382-2904 Fax: 905-382-4418 Email: nic@niagara.com | • beneficial insects, mites and nematodes (Canadian strains)  
  • pheromone lures and traps  
  • mating disruption devices  
  • bird houses |
| N.M. Bartlett Inc.             | 4509 Bartlett Rd. Beamsville, ON LOR 1B1 | Tel: 905-563-8261 Toll-free: 1-800-767-8658 Fax: 905-563-7882 Email: info@bartlett.ca | • pheromone lures and traps  
  • mating disruption devices |
| PheroTech                      | 7572 Progress Way Delta, BC V4G 1E9 | Tel: 604-940-9944 Fax: 604-940-9433 Email: sales@pherotech.com | • pheromone lures and traps |
| Plant Products Inc.            | 50 Hazleton St. Leamington, ON N8H 1B8 | Tel: 519-326-9037 Toll-free: 1-800-387-2449 Fax: 519-326-9290 Email: info@plantproducts.com | • pheromone lures and traps  
  • mating disruption devices  
  • rodent and tangle traps  
  • sticky tape and cards  
  • beneficial insects |
| Warwick Orchards and Nursery   | 7056 Egremont Rd. R.R. #8 Watford, ON N0M 2S0 | Tel: 519-849-6730 Fax: 519-849-6731 Email: warwickorchards@brktel.on.ca | • DeWitt leaf wetness sensor |
This is a list of safety supply companies in Ontario providing protective clothing and personal protective equipment. Ask safety supply companies for help to select protective clothing and personal protective equipment. This is a partial list and does not imply endorsement or recommendation by the Ontario Ministry of Agriculture, Food and Rural Affairs of the companies listed.

<table>
<thead>
<tr>
<th>Company</th>
<th>Address</th>
<th>Telephone/Fax/Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>3M Canada Company</td>
<td>300 Tartan Dr. London, ON N5V 4M9</td>
<td>Toll-free: 1-800-364-3577</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toll-free fax: 1-800-603-7758</td>
</tr>
<tr>
<td>Acklands Grainger</td>
<td>90 W. Beaver Creek Rd. Richmond Hill, ON L4B 1E7</td>
<td>Tel: 905-731-5516</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toll-free: 1-866-248-8801</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fax: 905-731-6053</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Email: <a href="mailto:contact@agi.ca">contact@agi.ca</a></td>
</tr>
<tr>
<td>Dupont Personal Protection Equipment</td>
<td>P.O. Box 2200 Streetsville Mississauga, ON L5M 2H3</td>
<td>Tel: 905-821-3300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toll-free: 1-800-931-3456</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fax: 905-816-3059</td>
</tr>
<tr>
<td>Dutch Industries “Protect-Air Cab Filter”</td>
<td>Huron Tractor 39995 Harvest Rd. Exeter, ON N0M 1S3</td>
<td>Tel: 519-235-1115</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fax: 519-235-1999</td>
</tr>
<tr>
<td>Hamisco Industrial Sales Inc.</td>
<td>3392 Wonderland Rd. S. London, ON N6L 1A8</td>
<td>Tel: 519-652-9800</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toll-free: 1-800-668-9800</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fax: 519-652-9661</td>
</tr>
<tr>
<td>Levitt-Safety (Eastern) Ltd.</td>
<td>2872 Bristol Circle Oakville, ON L6H 5T5</td>
<td>Tel: 905-829-3299</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toll-free: 1-888-453-8488</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fax: 905-829-2919</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Email: <a href="mailto:csr@levitt-safety.com">csr@levitt-safety.com</a></td>
</tr>
<tr>
<td>The Mitt &amp; Robe Company Ltd.</td>
<td>751 Norfolk St. N. Simcoe, ON N3Y 3R6</td>
<td>Tel: 519-428-4050</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toll-free: 1-877-893-6565</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fax: 519-428-5142</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Email: <a href="mailto:sales@mittrobe.ca">sales@mittrobe.ca</a></td>
</tr>
</tbody>
</table>
### APPENDICES

**Fruit Crop Protection Guide 2018–2019**

<table>
<thead>
<tr>
<th>Company</th>
<th>Address</th>
<th>Telephone/Fax/Email</th>
</tr>
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<tbody>
<tr>
<td>MSA Canada</td>
<td>100 Westmore Dr., Unit 23</td>
<td>Tel: 416-620-4225</td>
</tr>
<tr>
<td></td>
<td>Toronto, ON</td>
<td>Toll-free: 1-800-672-2222</td>
</tr>
<tr>
<td></td>
<td>M9V 5C3</td>
<td>Fax: 416-679-2875</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Email: <a href="mailto:info@msasafety.com">info@msasafety.com</a></td>
</tr>
<tr>
<td>Plant Products Inc.</td>
<td>50 Hazelton St.</td>
<td>Tel: 519-326-9037</td>
</tr>
<tr>
<td></td>
<td>Leamington, ON</td>
<td>Toll-free: 1-800-387-2449</td>
</tr>
<tr>
<td></td>
<td>N8H 1B8</td>
<td>Fax: 519-326-9290</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Email: <a href="mailto:info@plantproducts.com">info@plantproducts.com</a></td>
</tr>
<tr>
<td>Safety Express</td>
<td>4190 Sladeview Cres., Unit 1 &amp; 2</td>
<td>Tel: 905-608-0111</td>
</tr>
<tr>
<td></td>
<td>Mississauga, ON</td>
<td>Toll-free: 1-800-465-3898</td>
</tr>
<tr>
<td></td>
<td>L5L 0A1</td>
<td>Fax: 905-608-0091</td>
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<td></td>
<td>Email: <a href="mailto:info@safetyexpress.com">info@safetyexpress.com</a></td>
</tr>
<tr>
<td>The St. George Company Ltd.</td>
<td>20 Consolidated Dr.</td>
<td>Tel: 519-442-2046</td>
</tr>
<tr>
<td></td>
<td>P.O. Box 430</td>
<td>Toll-free: 1-800-461-4299</td>
</tr>
<tr>
<td></td>
<td>Paris, ON</td>
<td>Fax: 519-442-7191</td>
</tr>
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<td></td>
<td>N3L 3T5</td>
<td>Email: <a href="mailto:sales@thestgeorgeco.com">sales@thestgeorgeco.com</a></td>
</tr>
</tbody>
</table>
## APPENDIX E: Accredited Soil-Testing Laboratories in Ontario

The following labs are accredited to perform soil tests for pH, buffer pH, potassium, phosphorus, magnesium and nitrate-nitrogen on Ontario soils.

<table>
<thead>
<tr>
<th>Laboratory Name</th>
<th>Address</th>
<th>Telephone/Fax/Email</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>A &amp; L Canada Laboratories Inc.</td>
<td>2136 Jetstream Rd. London, ON N5V 3P5</td>
<td>Tel: 519-457-2575 Fax: 519-457-2664 Email: <a href="mailto:aginfo@alcanada.com">aginfo@alcanada.com</a></td>
<td>Greg Patterson Ian McLachlin</td>
</tr>
<tr>
<td>Activation Laboratories Ltd.</td>
<td>141 Bittern St. Ancaster, ON L9G 4V5</td>
<td>Tel: 905-648-9611 Fax: 905-648-9613 Email: <a href="mailto:victoriapechorina@actlabs.com">victoriapechorina@actlabs.com</a></td>
<td>Rob Deakin Victoria Pechorina</td>
</tr>
<tr>
<td>SGS Agri-Food Laboratories</td>
<td>503 Imperial Rd., Unit #1 Guelph, ON N1H 6T9</td>
<td>Tel: 519-837-1600 Toll-free: 1-800-265-7175 Fax: 519-837-1242 Email: <a href="mailto:lab@agtest.com">lab@agtest.com</a></td>
<td>Jack Legg Papken Bedirian</td>
</tr>
<tr>
<td>Brookside Laboratories, Inc.</td>
<td>200 White Mountain Dr. New Bremen, OH USA 45869</td>
<td>Tel: 419-977-2766 Fax: 419-977-2767 Email: <a href="mailto:jbrackman@blinc.com">jbrackman@blinc.com</a></td>
<td>Jackie Brackman Mark Flock</td>
</tr>
<tr>
<td>Eurofins Environment Testing Canada Inc.</td>
<td>8-146 Colonnade Rd. Ottawa, ON K2E 7Y1</td>
<td>Tel: 613-727-5692 Fax: 613-727-5222</td>
<td>—</td>
</tr>
<tr>
<td>Honeyland Ag Service</td>
<td>3918 West Corner Dr. Ailsa Craig, ON N0M 1A0</td>
<td>Tel: 226-377-8485 Email: <a href="mailto:croelands@honeylandag.com">croelands@honeylandag.com</a></td>
<td>Chris Roelands</td>
</tr>
<tr>
<td>University of Guelph Laboratory Services</td>
<td>University of Guelph P.O. Box 3650, 95 Stone Rd. W. Guelph, ON N1H 8J7</td>
<td>Tel: 519-767-6299 Fax: 519-767-6240 Email: <a href="mailto:aflinfo@uoguelph.ca">aflinfo@uoguelph.ca</a></td>
<td>Nick Schrier</td>
</tr>
<tr>
<td>Stratford Agri Analysis</td>
<td>1131 Erie St. Box 760 Stratford, ON N5A 6W1</td>
<td>Tel: 519-273-4411 Toll-free: 1-800-323-9089 Fax: 519-273-2163 Email: <a href="mailto:info@stratfordagri.ca">info@stratfordagri.ca</a></td>
<td>Keith Lemp Mark Aikman</td>
</tr>
</tbody>
</table>

There is no official accreditation in Ontario for tissue analysis but all the accredited soil-testing labs are monitored for proficiency on tissue analyses.
APPENDIX F: Diagnostic Services

Samples for disease diagnosis, insect or weed identification, nematode counts and Verticillium testing can be sent to:

Pest Diagnostic Clinic
Laboratory Services Division
University of Guelph
95 Stone Rd. W.,
Guelph, ON N1H 8J7
Tel: 519-767-6299
Fax: 519-767-6240
Website: www.afl.uoguelph.ca
Email: aflinfo@uoguelph.ca

Payment must accompany samples at the time of submission. Submission forms are available at http://afl.uoguelph.ca/submitting-samples#forms.

To obtain information on the fee schedule, visit www.afl.uoguelph.ca or phone the Pest Diagnostic Clinic.

How to Sample for Nematodes

Soil

When to sample
Soil and root samples can be taken at any time of the year that the soil is not frozen. In Ontario, nematode soil population levels are generally at their highest in May and June, and again in September and October.

How to sample soil
Use a soil sampling tube, trowel or narrow-bladed shovel to take samples. Sample soil to a depth of 20–25 cm (8–10 in.). If the soil is bare, remove the top 2 cm (1 in.) prior to sampling. A sample should consist of 10 or more subsamples combined. Mix well, then take a sample of ½–1 L (1 pint–1 qt) from this. No single sample should represent more than 2.5 ha (6.25 acre). Mix subsamples in a clean pail or plastic bag.

Sampling pattern
If living crop plants are present in the sample area, take samples within the row and from the area of the feeder root zone (with trees, this is the drip line).

Number of subsamples
Based on the total area sampled:

- 500 m² (5,400 ft²): 10 subsamples
- 500 m²–0.5 ha (5,400 ft²–1.25 acre): 25 subsamples
- 0.5 ha–2.5 ha (1.25–6.25 acre): 50 subsamples

Roots
From small plants, sample the entire root system plus adhering soil. For large plants, 10–20 g (½–1 oz.), dig fresh weight from the feeder root zone and submit.

Problem areas
Take soil and root samples from the margins of the problem area where the plants are still living. If possible, also take samples from healthy areas in the same field. If possible, take both soil and root samples from problem and healthy areas in the same field.

Sample Handling

Soil samples
Place in plastic bags as soon as possible after collecting.

Root samples
Place in plastic bags and cover with moist soil from the sample area.

Storage
Store samples at 5°–10°C (40°–50°F) and do not expose them to direct sunlight or extreme heat or cold (freezing). Only living nematodes can be counted. Accurate counts depend on proper handling of samples.

Submitting Plant for Disease Diagnosis or Identification

Sample submission forms
Forms can be obtained from your local Ontario Ministry of Agriculture, Food and Rural Affairs office. Carefully fill in all of the categories on the form. In the space provided, draw the most obvious symptom and the pattern of the disease in the field. It is important to include the cropping history of the area for the past three years and this year’s pesticide use records.

Choose a complete, representative sample showing early symptoms. Submit as much of the plant as is practical, including the root system, or several plants showing a range of symptoms. If symptoms are general, collect the sample from an area where they are of intermediate severity. Completely dead material is usually inadequate for diagnosis.

With plant specimens submitted for identification, include at least a 20–25 cm sample of the top portion of the stem with lateral buds, leaves, flowers or fruits in identifiable condition. Wrap plants in newspaper and put in a plastic bag. Tie the root system off in a separate plastic bag to avoid drying out and contamination of the leaves by soil. Do not add moisture, as this encourages decay in transit. Cushion specimens and pack in a sturdy box to avoid damage during shipping. Avoid leaving specimens to bake or freeze in a vehicle or in a location where they could deteriorate.

Delivery
Deliver to the Pest Diagnostic Clinic as soon as possible by first-class mail or by courier at the beginning of the week.
Submitting Insect Specimens for Identification

Collecting samples
Place dead, hard-bodied insects in vials or boxes and cushion with tissues or cotton. Place soft-bodied insects and caterpillars in vials containing alcohol. Do not use water, as this results in rot. Do not tape insects to paper or send them loose in an envelope.

Place live insects in a container with enough plant “food” to support them during transit. Be sure to write “live” on the outside of the container.
### APPENDICES

**Fruit Crop Protection Guide 2018–2019**

**APPENDIX G: Ontario Ministry of Agriculture, Food and Rural Affairs – Fruit Crop Advisory Staff**

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Tel.</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agroforestry Specialist</td>
<td>Todd Leuty</td>
<td>Tel: 519-826-3215</td>
<td><a href="mailto:todd.leuty@ontario.ca">todd.leuty@ontario.ca</a></td>
</tr>
<tr>
<td>Application Technology Specialist</td>
<td>Jason Deveau</td>
<td>Tel: 519-426-8934</td>
<td><a href="mailto:jason.deveau@ontario.ca">jason.deveau@ontario.ca</a></td>
</tr>
<tr>
<td>Crop Protection Specialist</td>
<td>Denise Beaton</td>
<td>Tel: 519-826-6594</td>
<td><a href="mailto:denise.beaton@ontario.ca">denise.beaton@ontario.ca</a></td>
</tr>
<tr>
<td>Entomology, Horticulture</td>
<td>Hannah Fraser</td>
<td>Tel: 905-562-1674</td>
<td><a href="mailto:hannah.fraser@ontario.ca">hannah.fraser@ontario.ca</a></td>
</tr>
<tr>
<td>Fresh Market Quality Specialist</td>
<td>Jennifer R. DeEll</td>
<td>Tel: 519-426-1408</td>
<td><a href="mailto:jennifer.deell@ontario.ca">jennifer.deell@ontario.ca</a></td>
</tr>
<tr>
<td>Fruit Crop Specialist (berry)</td>
<td>Erica Pate</td>
<td>Tel: 519-426-2238</td>
<td><a href="mailto:erica.pate@ontario.ca">erica.pate@ontario.ca</a></td>
</tr>
<tr>
<td>Fruit Crop Specialist (tender fruit, grape)</td>
<td>Kathryn Carter</td>
<td>Tel: 905-562-1639</td>
<td><a href="mailto:kathryn.carter@ontario.ca">kathryn.carter@ontario.ca</a></td>
</tr>
<tr>
<td>Horticulture IPM Specialist (pome fruit)</td>
<td>Kristy Grigg-McGuffin</td>
<td>Tel: 519-426-4322</td>
<td><a href="mailto:kristy.grigg-mcguffin@ontario.ca">kristy.grigg-mcguffin@ontario.ca</a></td>
</tr>
<tr>
<td>Horticulture IPM Specialist (specialty crops)</td>
<td>Melanie Filotas</td>
<td>Tel: 519-426-4434</td>
<td><a href="mailto:melanie.filotas@ontario.ca">melanie.filotas@ontario.ca</a></td>
</tr>
<tr>
<td>Horticulture IPM Specialist (tender fruit, grape)</td>
<td>Wendy McFadden-Smith</td>
<td>Tel: 905-562-3833</td>
<td><a href="mailto:wendy.mcfadden-smith@ontario.ca">wendy.mcfadden-smith@ontario.ca</a></td>
</tr>
<tr>
<td>Industrial Crop Specialist</td>
<td>Jim Todd</td>
<td>Tel: 519-426-3823</td>
<td><a href="mailto:jim.todd@ontario.ca">jim.todd@ontario.ca</a></td>
</tr>
<tr>
<td>Minor Use Coordinator</td>
<td>Jim Chaput</td>
<td>Tel: 519-826-3539</td>
<td><a href="mailto:jim.chaput@ontario.ca">jim.chaput@ontario.ca</a></td>
</tr>
<tr>
<td>New Crop Development Specialist</td>
<td>Evan Elford</td>
<td>Tel: 519-426-4509</td>
<td><a href="mailto:evan.elford@ontario.ca">evan.elford@ontario.ca</a></td>
</tr>
<tr>
<td>Soil Fertility Specialist, Horticulture</td>
<td>Christoph Kessel</td>
<td>Tel: 519-824-4120 ext. 52480</td>
<td><a href="mailto:christoph.kessel@ontario.ca">christoph.kessel@ontario.ca</a></td>
</tr>
<tr>
<td>Pathologist, Horticulture</td>
<td>Michael Celetti</td>
<td>Tel: 519-824-4120 ext. 58910</td>
<td><a href="mailto:michael.celetti@ontario.ca">michael.celetti@ontario.ca</a></td>
</tr>
<tr>
<td>Soil Management Specialist</td>
<td>Anne Verhallen</td>
<td>Tel: 519-674-1614</td>
<td><a href="mailto:anne.verhallen@ontario.ca">anne.verhallen@ontario.ca</a></td>
</tr>
<tr>
<td>Surveillance Coordinator</td>
<td>Cora Loucks</td>
<td>Tel: 519-826-3139</td>
<td><a href="mailto:cora.loucks@ontario.ca">cora.loucks@ontario.ca</a></td>
</tr>
<tr>
<td>Soil Sustainability Specialist</td>
<td>Deanna Nemeth</td>
<td>Tel: 905-562-1170</td>
<td><a href="mailto:deanna.nemeth@ontario.ca">deanna.nemeth@ontario.ca</a></td>
</tr>
<tr>
<td>Tree Fruit Specialist</td>
<td>Amanda Green</td>
<td>Tel: 519-426-1102</td>
<td><a href="mailto:amanda.green@ontario.ca">amanda.green@ontario.ca</a></td>
</tr>
<tr>
<td>Weed Management, Horticulture</td>
<td>Kristen Obeid</td>
<td>Tel: 519-738-1232</td>
<td><a href="mailto:kristen.obeid@ontario.ca">kristen.obeid@ontario.ca</a></td>
</tr>
</tbody>
</table>

A complete list of Ontario Ministry of Agriculture, Food and Rural Affairs crop advisory staff is available on the OMAFRA website at [ontario.ca/crops](http://ontario.ca/crops).

### Agricultural Information Contact Centre

Provides province-wide, toll-free technical and business information to commercial farms, agri-businesses and rural businesses.

1 Stone Rd. W., Guelph, ON N1G 4Y2
Tel: 1-877-424-1300
Fax: 519-826-3442
Email: ag.info.omafra@ontario.ca
# APPENDIX H: Ontario Ministry of the Environment and Climate Change – Regional Contact Information

<table>
<thead>
<tr>
<th>Region/County</th>
<th>Address</th>
<th>Telephone/Fax</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Central Region</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toronto, Halton, Peel, York, Durham, Muskoka, Simcoe</td>
<td>5775 Yonge St., 8th Floor</td>
<td>Tel: 416-326-6700</td>
</tr>
<tr>
<td></td>
<td>Toronto, ON M2M 4J1</td>
<td>Toll-free: 1-800-810-8048</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fax: 416-325-6345</td>
</tr>
<tr>
<td><strong>West-Central Region</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haldimand, Norfolk, Niagara, Hamilton-Wentworth, Dufferin, Wellington, Waterloo, Brant</td>
<td>Ontario Government Building</td>
<td>Tel: 905-521-7640</td>
</tr>
<tr>
<td></td>
<td>119 King St. W., 9th Floor Hamilton, ON L8P 4Y7</td>
<td>Toll-free: 1-800-668-4557</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fax: 905-521-7820</td>
</tr>
<tr>
<td><strong>Eastern Region</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frontenac, Hastings, Lennox &amp; Addington, Prince Edward, Leeds &amp; Grenville, Prescott &amp; Russell, Stormont/Dundas &amp; Glengarry, Haliburton, Peterborough, Kawartha Lakes, Northumberland, Renfrew, Ottawa, Lanark, District of Nipissing (Twp. of South Algonquin)</td>
<td>1259 Gardiners Rd., Unit 3 PO Box 22032</td>
<td>Tel: 613-549-4000</td>
</tr>
<tr>
<td></td>
<td>Kingston, ON K7M 8S5</td>
<td>Toll-free: 1-800-267-0974</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fax: 613-548-6908</td>
</tr>
<tr>
<td><strong>Southwestern Region</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elgin, Middlesex, Oxford, Essex, Kent, Lambton, Bruce, Grey, Huron, Perth</td>
<td>733 Exeter Rd. London, ON N6E 1L3</td>
<td>Tel: 519-873-5000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toll-free: 1-800-265-7672</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fax: 519-873-5020</td>
</tr>
<tr>
<td><strong>Northern Region (East)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manitoulin, Nipissing, Parry Sound, Sudbury, Algoma (East), Timiskaming, Sault Ste. Marie</td>
<td>199 Larch St., Ste. 1201</td>
<td>Tel: 705-564-3237</td>
</tr>
<tr>
<td></td>
<td>Sudbury, ON P3E 5P9</td>
<td>Toll-free: 1-800-890-8516</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fax: 705-564-4180</td>
</tr>
<tr>
<td><strong>Northern Region (West)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algoma (West), Cochrane, Kenora, Rainy River, Timmins, Thunder Bay</td>
<td>435 James St. S., Ste. 331</td>
<td>Tel: 807-475-1205</td>
</tr>
<tr>
<td></td>
<td>Thunder Bay, ON PTE 6S7</td>
<td>Toll-free: 1-800-875-7772</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fax: 807-475-1745</td>
</tr>
<tr>
<td><strong>Standards Development Branch</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pesticides Section</td>
<td>Tel: 416-327-5519</td>
</tr>
<tr>
<td></td>
<td>40 St. Clair Ave. W., 7th Floor</td>
<td>Fax: 416-327-2936</td>
</tr>
<tr>
<td></td>
<td>Toronto, ON M4V 1L5</td>
<td></td>
</tr>
<tr>
<td><strong>Environmental Approvals Branch</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pesticides Licensing</td>
<td>Tel: 416-314-8001</td>
</tr>
<tr>
<td></td>
<td>2 St. Clair Ave. W., 12A Floor</td>
<td>Toll-free: 1-800-461-6290</td>
</tr>
<tr>
<td></td>
<td>Toronto, ON M4V 1L5</td>
<td>Fax: 416-314-8452</td>
</tr>
</tbody>
</table>
# APPENDIX I: Other Contacts

## Agriculture and Agri-Food Canada Research Centres

- **Eastern Cereals and Oilseeds Research Centre**
  - 960 Carling Ave.
  - Ottawa, ON K1A 0C6
  - Tel: 613-759-1858

- **Greenhouse and Processing Crops Centre**
  - 2585 County Rd. 20
  - Harrow, ON N0R 1G0
  - Tel: 519-738-2251

- **Southern Crop Protection and Food Research Centre**
  - 1391 Sandford St.
  - London, ON N5V 4T3
  - Tel: 519-457-1470

- **Vineland Research Farm**
  - 4902 Victoria Ave. N.
  - Vineland, ON L0R 2E0
  - Tel: 905-562-4113

- **Guelph Food Research Centre**
  - 93 Stone Rd. W.
  - Guelph, ON N1G 5C9
  - Tel: 519-829-2400

## Canadian Food Inspection Agency Regional Offices (Plant Protection)

- **Belleville**
  - 345 College St. E.
  - Belleville, ON K8N 5S7
  - Tel: 613-969-3333

- **Brantford**
  - 625 Park Rd. N., Ste. 6
  - Brantford, ON N3T 5P9
  - Tel: 519-753-3478

- **Hamilton**
  - 709 Main St. W., Ste. 101
  - Hamilton, ON L8S 1A2
  - Tel: 905-572-2201

- **London**
  - 19-100 Commissioners Rd. E.
  - London, ON N5Z 4R3
  - Tel: 519-691-1300

- **St. Catharines**
  - 395 Ontario St., P.O. Box 19
  - St. Catharines, ON L2N 7N6
  - Tel: 905-937-8232

- **Ottawa District**
  - 38 Auriga Dr., Unit 8
  - Ottawa, ON K2E 8A5
  - Tel: 613-274-7374, ext. 221

- **Toronto**
  - 1124 Finch Ave. W., Unit 2
  - Downsview, ON M3J 2E2
  - Tel: 416-665-5055

- **Guelph**
  - 174 Stone Rd. W.
  - Guelph, ON N1G 4T1
  - Tel: 519-837-9400

## University of Guelph

- **Main Campus**
  - Guelph, ON N1G 2W1
  - Tel: 519-824-4120
  - [www.uoguelph.ca](http://www.uoguelph.ca)

- **Ridgetown Campus**
  - Ridgetown, ON N0P 2C0
  - Tel: 519-674-1500
  - [www.ridgetown.uoguelph.ca](http://www.ridgetown.uoguelph.ca)

## Vineland Research and Innovation Centre

- 4890 Victoria Ave. N.
  - Vineland Station, ON L0R 2E0
  - Tel: 905-562-0320
  - [www.vinelandresearch.com](http://www.vinelandresearch.com)

- **Lab Services Division**
  - 95 Stone Rd. W., PO Box 3650
  - Guelph, ON N1H 8J7
  - Tel: 519-767-6299
  - [www.uoguelph.ca/labserv](http://www.uoguelph.ca/labserv)

- **Trace Organics and Pesticides**
  - 4890 Victoria Ave. N., PO Box 7000
  - Vineland Station, ON L0R 2E0
  - Tel: 905-562-4141
  - Fax: 905-562-3413

- **Pest Diagnostic Clinic**
  - Tel: 519-767-6256
Appendices

APPENDICES

APPENDIX J: Production Insurance

Production Insurance (PI) covers production losses and yield reductions caused by insured perils. This includes adverse weather, disease, wildlife and insect infestations. Depending on the plan, coverage is available on a total-yield, dollar-value or acreage-loss basis. Producers can choose the type and level of coverage that best meets their needs. When enrolled in PI, producers are guaranteed a level of production, based on their yield history and their chosen coverage level. Claims are paid when an insured peril causes a yield to fall below the guaranteed production.

In Ontario, Agricorp administers PI on behalf of the Government of Ontario and Agriculture and Agri-Food Canada. More than 15,000 producers and 2 million hectares (5 million acres) of Ontario farmland are insured each year.

PI is available to all Ontario farmers, landlords and sharecroppers who grow or manage eligible agricultural products. Coverage is available on many commercially produced agricultural products in Ontario in the following sectors:

- forage
- fresh vegetables
- fruit
- grains and oilseeds
- processing vegetables
- specialty crops

For more information, contact Agricorp.

Agricorp
1 Stone Rd. W.
Box 3660, Stn. Central
Guelph, ON N1H 8M4
Open weekdays, 7 a.m. - 5 p.m.
Tel: 1-888-247-4999
TTY: 1-877-275-1380
Fax: 519-826-4118
Email: contact@agricorp.com
Web: www.agricorp.com

Ontario Agricultural Products Covered by Production Insurance (as of 2017)

General Crops
- barley
- canola
- coloured beans (adzuki, black, cranberry, kidney, Japanese/other)
- corn (conventional, organic options)
- established forage (excess and insufficient options)
- flax
- mustard
- premium new forage seeding (newly seeded hay and pasture)
- oats
- peanuts
- popping corn
- rye
- seed corn
- soybeans (conventional, tofu, natto and organic options available)
- spring grain
- sorghum
- spring wheat
- standard new forage seeding
- sunflower
- white beans
- winter spelt, organic
- winter wheat (soft white, hard white, soft red, hard red, organic options)

Specialty Crops
- bees
- ginseng
- honey
- industrial hemp
- tobacco (black, burley, flue-cured)

Fruit Crops
- apples and apple trees
- cherries (sweet, sour)
- grapes and grape vines
- peaches/nectarines
- pears
- plums
- strawberries

Vegetable Crops – Average Farm Yield or Total Production
- asparagus
- butternut squash (processing)
- carrots (fresh)
- carrots (processing)
- cucumbers (processing)
- green beans and wax beans (processing)
- lima beans (processing)
- onions (seed, set, Spanish, yellow)
- peas (processing)
- peppers (banana, bell)
- potatoes (fresh)
- potatoes (processing)
- red beets (processing)
- rutabagas
- sweet corn (processing)
- tomatoes (processing)

Fresh Market Vegetables – Acreage Loss Root Vegetables
- carrots
- celeriac
- French shallots
- garlic
- green onions
- leeks
- parsnips
- radishes
- red beets
- rutabagas
- Spanish onions
- sweet potatoes
- turnips
- yellow onions

Leafy Vegetables
- bok choy
- broccoli
- Brussels sprouts
- cauliflower
- celery
- Chinese cabbage
- gai lan
- kale
- lettuce
- mesclun
- spinach
- summer cabbage
- winter cabbage
- yu choy

Fruit Vegetables
- bell and specialty peppers
- cucumbers
- eggplant
- melons
- pumpkins
- squash
- tomatoes
- watermelon
- zucchini

Other Vegetables
- broad beans
- green and wax beans
- green peas
- sweet corn

Ontario Agricultural Products Covered by Production Insurance (as of 2017)
APPENDIX K: The Metric System

Metric Units

Linear Measures (length)
- 10 millimetres (mm) = 1 centimetre (cm)
- 100 centimetres (cm) = 1 metre (m)
- 1,000 metres = 1 kilometre (km)

Square Measures (area)
- 100 m × 100 m = 10,000 m² = 1 hectare (ha)
- 100 ha = 1 square kilometre (km²)

Cubic Measures (volume)
- 1,000 cubic millimetres (mm³) = 1 cubic centimetre (cm³)
- 1,000,000 cm³ = 1 cubic metre (m³)

Dry Measure
- 1,000 cubic millimetres (mm³) = 1 cubic centimetre (cm³)
- 1,000,000 cm³ = 1 cubic metre (m³)

Liquid Measure
- 1,000 millilitres (mL) = 1 litre (L)
- 100 L = 1 hectolitre (hL)

Weight-Volume Equivalents (for water)
- (1,000 kg) 1,000 grams = 1 litre (1.00 L)
- (0.5 kg) 500 g = 500 mL (0.5 L)
- (0.1 kg) 100 g = 100 mL (0.1 L)
- (0.01 kg) 10 g = 10 mL (0.01 L)
- (0.001 kg) 1 g = 1 mL (0.001 L)

Weight Measures
- 1,000 milligrams (mg) = 1 gram (g)
- 1,000 g = 1 kilogram (kg)
- 1,000 kg = 1 tonne (t)
- 1 mg/kg = 1 part per million (ppm)

Dry–Liquid Equivalents
- 1 cm³ = 1 mL
- 1 m³ = 1,000 L

Liquid Equivalents

<table>
<thead>
<tr>
<th>Litres/Hectare</th>
<th>Imperial Gallons/Acre</th>
<th>U.S. Gallons/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>4.45</td>
<td>5.35</td>
</tr>
<tr>
<td>100</td>
<td>8.9</td>
<td>10.7</td>
</tr>
<tr>
<td>150</td>
<td>13.53</td>
<td>16.05</td>
</tr>
<tr>
<td>200</td>
<td>17.8</td>
<td>21.4</td>
</tr>
<tr>
<td>250</td>
<td>22.25</td>
<td>26.75</td>
</tr>
<tr>
<td>300</td>
<td>26.7</td>
<td>32.1</td>
</tr>
</tbody>
</table>

Approximate Dry Weight Equivalents

<table>
<thead>
<tr>
<th>Grams/Hectare</th>
<th>Ounces/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1 ½</td>
</tr>
<tr>
<td>200</td>
<td>3</td>
</tr>
<tr>
<td>300</td>
<td>4 ½</td>
</tr>
<tr>
<td>500</td>
<td>7</td>
</tr>
<tr>
<td>700</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Kilograms/Hectare</th>
<th>Pounds/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.10</td>
<td>1</td>
</tr>
<tr>
<td>1.50</td>
<td>1 ¼</td>
</tr>
<tr>
<td>2.00</td>
<td>1 ½</td>
</tr>
<tr>
<td>2.50</td>
<td>2 ¼</td>
</tr>
<tr>
<td>3.25</td>
<td>3</td>
</tr>
<tr>
<td>4.00</td>
<td>3 ½</td>
</tr>
<tr>
<td>5.00</td>
<td>4 ½</td>
</tr>
<tr>
<td>6.00</td>
<td>5 ¼</td>
</tr>
<tr>
<td>7.50</td>
<td>6 ¼</td>
</tr>
<tr>
<td>9.00</td>
<td>8</td>
</tr>
<tr>
<td>11.00</td>
<td>10</td>
</tr>
<tr>
<td>13.00</td>
<td>11 ½</td>
</tr>
<tr>
<td>15.0</td>
<td>13 ½</td>
</tr>
</tbody>
</table>

Weight-Volume Equivalents (for water)
- (1.00 kg) 1,000 grams = 1 litre (1.00 L)
- (0.5 kg) 500 g = 500 mL (0.5 L)
- (0.1 kg) 100 g = 100 mL (0.1 L)
- (0.01 kg) 10 g = 10 mL (0.01 L)
- (0.001 kg) 1 g = 1 mL (0.001 L)

Weight Measures
- 1,000 milligrams (mg) = 1 gram (g)
- 1,000 g = 1 kilogram (kg)
- 1,000 kg = 1 tonne (t)
- 1 mg/kg = 1 part per million (ppm)

Dry–Liquid Equivalents
- 1 cm³ = 1 mL
- 1 m³ = 1,000 L

Approximate Metric Conversions
- 5 mL = 1 tsp
- 15 mL = 1 tbsp
- 28.5 mL = 1 imp. fl. oz.
### Conversion Table – Metric to Imperial (approximate)

#### Pressure
- 1 kilopascal (kPa) = 0.15 pounds/in²

#### Speed
- 1 metre per second = 3.28 feet per second
- 1 metre per second = 2.24 miles per hour
- 1 kilometre per hour = 0.62 mile per hour

#### Temperature
- °F = \((°C \times 9/5) + 32\)

#### Conversion Tables – Imperial to Metric (approximate)

### Weight
- 1 ounce = 28.35 g
- 1 pound = 453.6 g
- 1 ton = 0.91 tonne

### Pressure
- 1 pound per square inch = 6.90 kPa

### Temperature
- °C = \((°F - 32) \times 5/9\)

### Abbreviations
- % = percent (by weight)
- ai = active ingredient
- cm = centimetre
- cm² = square centimetre
- e.g. = for example
- g = gram
- ha = hectare
- kg = kilogram
- km/h = kilometres per hour
- kPa = kilopascal
- L = litre
- m = metre
- m/s = metres per second
- m² = square metre
- mL = millilitre
- mm = millimetre
- t = tonne

---

### Conversion Table – Metric to Imperial

<table>
<thead>
<tr>
<th>Length</th>
<th>Metric (mm)</th>
<th>Imperial (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 millimetre (mm)</td>
<td>0.04 inch</td>
<td>0.04 inch</td>
</tr>
<tr>
<td>1 centimetre (cm)</td>
<td>0.4 inch</td>
<td>0.4 inch</td>
</tr>
<tr>
<td>1 metre (m)</td>
<td>39.4 inches</td>
<td>39.4 inches</td>
</tr>
<tr>
<td>1 metre (m)</td>
<td>3.28 feet</td>
<td>3.28 feet</td>
</tr>
<tr>
<td>1 metre (m)</td>
<td>1.09 yards</td>
<td>1.09 yards</td>
</tr>
<tr>
<td>1 kilometre (km)</td>
<td>0.62 mile</td>
<td>0.62 mile</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area</th>
<th>Metric(m²)</th>
<th>Imperial (sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 square centimetre (cm²)</td>
<td>0.16 square inch</td>
<td>0.16 square inch</td>
</tr>
<tr>
<td>1 square metre (m²)</td>
<td>10.77 square feet</td>
<td>10.77 square feet</td>
</tr>
<tr>
<td>1 square kilometre (km²)</td>
<td>0.39 square mile</td>
<td>0.39 square mile</td>
</tr>
<tr>
<td>1 hectare (ha)</td>
<td>107,636 square feet</td>
<td>107,636 square feet</td>
</tr>
<tr>
<td>1 hectare (ha)</td>
<td>2.5 acres</td>
<td>2.5 acres</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Volume (dry)</th>
<th>Metric (m³)</th>
<th>Imperial (cubic ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cubic centimetre (cm³)</td>
<td>0.061 cubic inch</td>
<td>0.061 cubic inch</td>
</tr>
<tr>
<td>1 cubic metre (m³)</td>
<td>35.31 cubic feet</td>
<td>35.31 cubic feet</td>
</tr>
<tr>
<td>1,000 cubic metres (m³)</td>
<td>35.31 cubic feet</td>
<td>35.31 cubic feet</td>
</tr>
<tr>
<td>1 hectolitre (hl)</td>
<td>2.8 bushels</td>
<td>2.8 bushels</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Volume (liquid)</th>
<th>Metric (L)</th>
<th>Imperial (gallon)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 millilitre (mL)</td>
<td>0.035 fluid ounce (Imp.)</td>
<td>0.035 fluid ounce (Imp.)</td>
</tr>
<tr>
<td>1 litre (L)</td>
<td>1.76 pints (Imp.)</td>
<td>1.76 pints (Imp.)</td>
</tr>
<tr>
<td>1 litre (L)</td>
<td>0.88 quart (Imp.)</td>
<td>0.88 quart (Imp.)</td>
</tr>
<tr>
<td>1 litre (L)</td>
<td>0.22 gallon (Imp.)</td>
<td>0.22 gallon (Imp.)</td>
</tr>
<tr>
<td>1 litre (L)</td>
<td>0.26 gallon (U.S.)</td>
<td>0.26 gallon (U.S.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight</th>
<th>Metric (g)</th>
<th>Imperial (oz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 gram (g)</td>
<td>0.035 ounce</td>
<td>0.035 ounce</td>
</tr>
<tr>
<td>1 kilogram (kg)</td>
<td>2.21 pounds</td>
<td>2.21 pounds</td>
</tr>
<tr>
<td>1 tonne (t)</td>
<td>1.1 short tons</td>
<td>1.1 short tons</td>
</tr>
<tr>
<td>1 tonne (t)</td>
<td>2,205 pounds</td>
<td>2,205 pounds</td>
</tr>
</tbody>
</table>
Emergency and First-Aid Procedures for Pesticide Poisoning

For pesticide poisonings and pesticide injuries, call the Poison Information Centre: Toronto 1-800-268-9017

PREVENT ACCIDENTS

- **Read the label.** Follow all the precautions the label recommends. Read the First Aid section of the label BEFORE you begin to handle any pesticide.
- **Make sure that someone knows** what pesticides you are working with and where you are.
- **Keep a file of labels and product Material Safety Data Sheets (MSDS) for the pesticides you use.** Make sure everyone knows where to find this in case of an emergency.
- **Post emergency numbers near all telephones.**
- **Keep clean water, paper towels, extra gloves and clean coveralls close by** in case you spill pesticide on yourself.

If someone has been working with pesticides and you see any possible symptoms of pesticide poisoning or injury, take emergency action immediately.

FIRST AID

**If a pesticide comes in contact with skin:**

- remove all contaminated clothing; wash skin thoroughly with lots of soap and warm water.
- dry skin well and cover with clean clothing or other clean material.

**If pesticide comes in contact with eyes:**

- hold eyelids open; wash the eyes with clean running water for 15 minutes or more.

**If pesticide was inhaled:**

- move the victim to fresh air and loosen tight clothing.
- give artificial respiration if the victim is not breathing.

Do not breathe in the exhaled air from the victim—you could also be poisoned.

**If a pesticide was swallowed:**

- call the Poison Information Centre IMMEDIATELY.

For a major spill, a theft or a fire involving a pesticide:

Call the Ministry of the Environment and Climate Change Spills Action Centre at 1-800-268-6060 (24 hr a day, 7 days a week). Notify your municipality.

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- by phone through the ServiceOntario Contact Centre, Monday to Friday, 8:30 a.m. to 5:00 p.m. ET
- 416-326-5300
- 1-800-668-9938, toll-free across Canada
- 1-800-268-7095 (TTY), toll-free across Ontario

Published by the Ministry of Agriculture, Food and Rural Affairs
© Queen’s Printer for Ontario, 2018
Toronto, Ontario
ISSN 2561-6854 (Print)
ISSN 2561-6862 (Online)
06-18-1M

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ontario.ca/omafra