The Importance of Scouting for Weeds After a Herbicide Application

Kristen Obeid

Weed Management Specialist - Horticulture

519-965-0107

@WeedProfesh

The Importance of Scouting

Many factors can contribute to the presence of weeds in the field after a herbicide application and later in the growing season. Scouting is the only way to know which weeds are present, and their patterns in the field can help to understand why they are present.

Scouting will be helpful in documenting changes in the weed population that occur over time in response to land management practices, including the evolution of herbicide-resistant weeds.

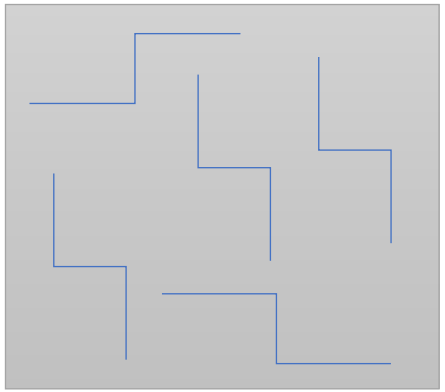
Changes in crop and weed management practices based on scouting help to:

- ✓Maximize crop yield and profitability by reducing weed competition
- ✓Reduce weed seed production
- ✓Maximize remedial management tactics within the same growing season

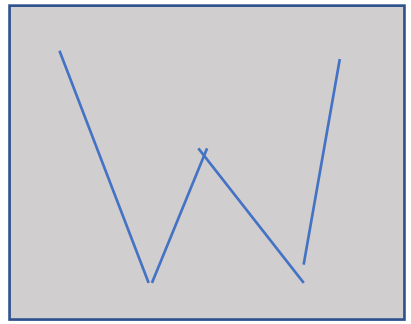
Scouting After a Herbicide Application

Begin scouting 7 to 14 days after each herbicide application, and continue at regular intervals until harvest.

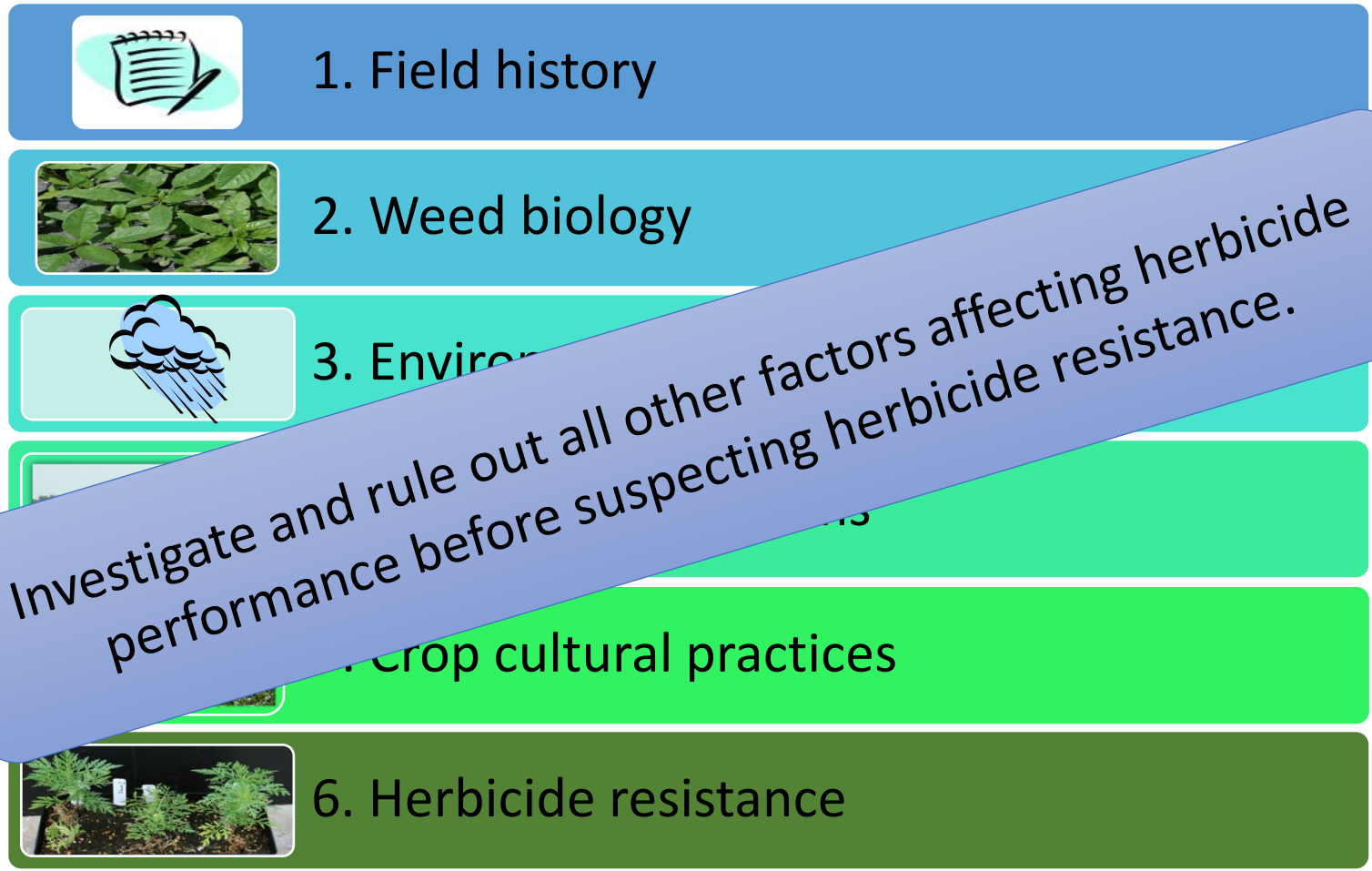
- Move across the field in a scouting pattern covering the area.
- Observe and record:
  - Weed species (proper identification is important)
  - Spatial patterns (if present) of weeds across the field
  - Weed densities
  - Presence of live and dead weeds
  - Herbicide symptomology on live weeds



Above: Example of a scouting pattern in a field.



If Weeds are Present after an Application, Determine the Reason



Check List for Scouting

- ✓ Scout 7 to 14 days after each herbicide application and near harvest.
- ✓ Identify and record the weed species present.
- ✓ Determine the distribution pattern of plants in the field.
  - Correlate with application pattern or identify as random
- ✓ Determine if plants present survived a previously applied herbicide or emerged after the last herbicide application.
- ✓ Observe individual plant responses, especially if plants survived a herbicide application.
- ✓ Look at previous field history to understand what changes may be occurring.

Check List for Scouting

Conclusions

Scouting fields to determine the reasons for weed survival after a herbicide application is important.

Field history, weed biology, environment, application parameters, crop cultural practices and herbicide resistance are factors that can contribute to weeds surviving the application of a herbicide.

Symptomology may differ between the observations of low-level and high-level herbicide resistance.

Confirming herbicide resistance early, when just a few weeds are present, and removing them by hand can decrease the spread of herbicide-resistant weeds, thereby reducing the costs required to manage them.

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Current resistant weed situation in Ontario

Weed Species	WSSA Group	Weed Species	WSSA Group
barnyard grass	5	mustard, wild	5
Canada fleabane	2, 9, 22	nightshade, Eastern black	2, 22
carrot, wild	4	peppergrass, field	22
cocklebur	2	pigweed, green	2, 5, 7, 14
crabgrass, large	1	pigweed, redroot	2, 5, 6, 7
foxtail, green	2	pigweed, smooth	6
foxtail, giant	2	ragweed, common	2, 5, 9
foxtail, yellow	5	ragweed, giant	2, 9
goosefoot, late flowering	5	waterhemp	2, 5, 9, 14, 27
groundsel, common	5	witchgrass	5
lamb's-quarters	2, 5	Italian ryegrass	9

22 species, common trend is more species with multiple resistance

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Table 1. Current Genetic Tests

Weed Species	Herbicide Group (s)	Common Herbicide Trade Name (s) (provided ONLY as example herbicides commonly used in horticulture)	Target Site Mutation / Metabolic / Species Identification
Amaranthus species	-	-	Species Identification
Brassica species	-	-	Species Identification
Brassica species	9	Glyphosate	Presence of transgene
Canada fleabane	9	Glyphosate	Target-site (P106S)
Common chickweed	2	Pinnacle, Prism, Pursuit, Sandea	Target-site (P197Q & unpublished)
Common ragweed	2	Pinnacle, Prism, Pursuit, Sandea	Target-site (W574L)
	5	Atrazine, Sencor, Simazine, Sinbar	Target-site (V219I)
	7	Lorox	Target-site (V219I)
	9	Glyphosate	Target-site (P106S)
Eastern black nightshade	2	Pinnacle, Prism, Pursuit, Sandea	Target-site (A205V)
Giant foxtail	2	Pinnacle, Prism, Pursuit, Sandea	Target-site (unpublished)
Giant ragweed	2	Pinnacle, Prism, Pursuit, Sandea	Target-site (W574L)
	5	Atrazine, Sencor, Simazine, Sinbar	Target-site (V219I)
	7	Lorox	Target-site (V219I)
Green foxtail	2	Pinnacle, Prism, Pursuit, Sandea	Target-site (unpublished)
Green pigweed	2	Pinnacle, Prism, Pursuit, Sandea	Target-site (S653N & W574L)
	5	Atrazine, Sencor, Simazine, Sinbar	Target-site (A251V, S264G, V219I & F274L)
	7	Lorox	Target-site (A251V, V219I & F274L)
	14	Aim, Authority*, Chateau*, Goal, Reflex*	Target-site (ΔG210 in PPX2L)
Italian ryegrass	9	Glyphosate	Target-site (P106S)
Lamb's-quarters	5	Atrazine, Sencor, Simazine, Sinbar	Target-site (S264G)
Large crabgrass	1	Assure, Poast Ultra, Select, Venture	Metabolic: ACCase gene amplification
Redroot pigweed	2	Pinnacle, Prism, Pursuit, Sandea	Target-site (S653N & W574L)
	5	Atrazine, Sencor, Simazine, Sinbar	Target-site (A251V, S264G, V219I & F274L)
	7	Lorox	Target-site (A251V, V219I & F274L)
Waterhemp	2	Pinnacle, Prism, Pursuit, Sandea	Target-site (S653N & W574L)
	5	Atrazine, Sencor, Simazine, Sinbar	Target-site (A251V, S264G, V219I & F274L)
	9	Glyphosate	Metabolic: EPSPS gene amplification
	14	Aim, Authority*, Chateau*, Goal, Reflex*	Target-site (ΔG210 in PPX2L)

*Several of these tests were developed by other researchers and reproduced from the scientific literature. *S264G mutation only induces resistance to Group 5 herbicides, not Group 7.*

Combating Herbicide Resistant Weeds

First Step – Sample Collection

- Collect a quarter size sample of leaf tissue and insert in tube or in an envelope inserted into a Ziploc bag with silica gel.
- Samples required from 10 plants in each field.

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Combating Herbicide Resistant Weeds

First Step – Sample Collection

- Sample collection kits with instructions can be obtained from Kristen Obeid
- Samples sent directly to Harvest Genomics in Guelph, Ontario
  www.harvestgenomics.ca
- All samples will be tested free of charge

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Resistance Management

This Resource:

Groups herbicides used in horticulture by mode of action

Lists all the resistant weed species to each mode of action by county

Will Help You:

Be aware of resistant weeds in your area

Rotate herbicide groups more effectively

Copies Available

HERBICIDES IN EASTERN CANADA FOR HORTICULTURE BY MODE OF ACTION

Herbicides should be used as part of an Integrated Weed Management (IWM) program. IWM uses all available weed control strategies, in the best possible way to manage weed populations, thereby optimizing economic returns to the grower. Such strategies include cultural, mechanical and chemical methods of weed control. Tank mixing herbicides with multiple modes of action as part of your IWM plan is one of the most effective ways to delay or prevent the development and spread of herbicide resistant weeds.

Site of Action	Level of Risk for Resistance Development	Chemical Family	Active Ingredient	Single-Mode Products	Resistant Weed Species by County
1 ACCase inhibitors	High	Aryloxyphenoxypropionates (Fop) Cyclohexanediones (Dim)	fluazifop-p-butyl quizalofop-p-ethyl clethodim sethoxydim	Venture® L Assure® II, Elegant 10 EC, Yuma® GL Arrow 240 EC, Clethodim 240, Select® Poast® Ultra	**1 resistant weed species in Ontario** **Large crabgrass** - Chatham-Kent, Essex, Huron **49 resistant weed species globally**
2 ALS/AHAS inhibitors	High	Imidazolinones Sulfonylureas	imazapyr imazethapyr chlorsulfuron halosulfuron ethametsulfuron-ethyl metsulfuron-ethyl nicosulfuron rimsulfuron thifensulfuron-methyl triflusulfuron-methyl	Arsenal® Nu-Image, Pursuit®, Phantom® Telar® Permit® WG, Sandea® WG Muster® Ally® Accent® 75 DF, Nicosh Herbicide, Ultim® 75 DF Elim™ 25 SG, Prism™ SG, Sharda Rimsulfuron Pinnacle® SG UpBeet®	**11 resistant weed species in Ontario** **Canada fleabane** - widespread throughout Ontario **Cocklebur** - Lambton **Common ragweed** - Bruce, Chatham-Kent, Carleton, Elgin, Essex, Haldimand, Huron, Lambton, Middlesex, Niagara, Norfolk, Ottawa, Oxford, Perth, Prescott-Russell, Simcoe, Stormont, Dundas and Glengarry, Wellington **Eastern black nightshade** - Bruce, Carleton, Elgin, Huron, Middlesex, Ottawa, Oxford, Perth, Simcoe, Stormont, Dundas and Glengarry, Wellington **Giant foxtail** - Elgin, Essex, Lambton, Oxford **Giant ragweed** - Chatham-Kent, Essex, Lambton **Green foxtail** - Huron, Kawartha Lakes, Lambton, Oxford, Perth, Wellington **Green pigweed** - Bruce, Chatham-Kent, Elgin, Essex, Haldimand, Hamilton-Wentworth, Huron, Lambton, Lennox and Addington, Middlesex, Oxford, Perth, Simcoe, Stormont, Dundas and Glengarry, Wellington **Lamb's-quarters** - Chatham-Kent, Elgin, Essex, Lambton, Middlesex, Simcoe, Stormont, Dundas & Glengarry **Redroot pigweed** - Bruce, Chatham-Kent, Elgin, Essex, Haldimand, Hamilton-Wentworth, Huron, Lambton, Lennox and Addington, Middlesex, Oxford, Perth, Simcoe, Stormont, Dundas and Glengarry, Wellington **Waterhemp** - Brant, Bruce, Chatham-Kent, Elgin, Essex, Haldimand, Huron, Lambton, Middlesex, Norfolk, Northumberland, Wellington, Wentworth **166 resistant weed species globally**
3 Mitosis inhibitors	Moderate	Dinitroanilines	trifluralin pendimethalin	Bonanza 480, Rival®, Treflan™ EC Prowl® H2O	**0 resistant weed species in Ontario** **1 resistant weed species globally**
4 Synthetic auxins	Low	Benzoic Acid Pyridine carboxylic acid Phenoxy carboxylic acids	dicamba clopyralid 2,4-D MCPA Mecoprop-p	Banvel® II, Hawkeye®Power, Oracle®, Vanquish®, VMD 480 Lontrel™ 72, Lontrel™ 360, Lontrel™ XC, Pyralid 2,4-D amine, 2,4-D ester MCPA Compitox®, Mecoprop	**1 resistant weed species in Ontario** **Wild carrot** - Halton, Wellington **41 resistant weed species globally**
5 Photosystem II inhibitors	Moderate-High	Triazines Pyridazinone Uracil	simazine prometryne hexazinone metribuzin pyrazon terbacil	Princep®Nine-T®, Simadex®, Simazine 480 Gesagard® 480SC Pronone® 10G, Velpar® Lexone® 75DF, Metrix SC, Sencor 480F, Sencor® 75DF, Sencor® Solupak®, Squadron Pyramin® FL Sinbar® WDG	**11 resistant weed species in Ontario** **Barnyard grass** - Waterloo **Common groundsel** - York **Common ragweed** - Brant, Bruce, Essex, Haldimand-Norfolk, Hamilton-Wentworth, Lambton, Lennox and Addington, Niagara, Norfolk, Wellington **Green pigweed** - Documented in every county except Hastings and Prince Edward. Populations have not been documented in any of the districts. **Lamb's-quarters** - widespread throughout Ontario **Late-flowering goosefoot** - Brant **Redroot pigweed** - Chatham-Kent, Simcoe, Stormont, Dundas and Glengarry, Waterloo **Waterhemp** - Bruce, Chatham-Kent, Essex, Haldimand, Huron, Lambton, Middlesex **Witchgrass** - Grey, Haldimand, Leeds and Grenville, Norfolk, Prescott-Russell, Wellington **Wild mustard** - Stormont, Dundas and Glengarry **Yellow foxtail** - York **74 resistant weed species globally**
6 Photosystem II inhibitors	Low	Benzothiadiazinone Benzonitrile Phenyl-pyridazine	bentazon bromoxynil pyridate	Basagran®, Basagran® Forte, Bentazon Super Bromotril® 240 EC, Bromoxynil 240 EC, Brotex®240, Koril® 235, Pardner® Tough	**2 resistant weed species in Ontario** **Redroot pigweed** - Chatham-Kent **Smooth pigweed** - Essex **4 resistant weed species globally**
7 Photosystem II inhibitors	Low-Moderate	Substituted ureas	diuron linuron	Diuron® 80WDG, Karmex® DF Lorox® L	**2 resistant weed species in Ontario** **Green pigweed** - Lambton, Middlesex, Simcoe **Redroot pigweed** - Chatham-Kent, Lambton, Middlesex, Simcoe **29 resistant weed species globally**
8 Fatty acid and lipid inhibitors	Moderate	Thiocarbamate Phosphorodithioate	EPTC bensulide	Eptam® Liquid EC Betasan® 4.8-E, Prefar® 4.8-E	**0 in Ontario** **10 resistant weed species globally**
9 EPSP synthase inhibitors	Low	Glycine	glyphosate	Credit® 54, Crush'R540, Factor® 540, Fortran 540, Forza™ Bio 540, Glyfos® Bio 540, Mad Dog K Plus, Matrix, Maverick™ II, Mpower®, Polaris™ Max, Renegace HC, Roundup Transorb® HC, Roundup Ultra2®, Roundup WeatherPRO®, TouchdownTotal® , Traxion®, Vantage™ Max, Vantage™ Plus Max, Vantage™ XRT, Vision®, VisionMax™, etc.	**4 resistant weed species in Ontario** **Canada fleabane** – widespread throughout Ontario **Common ragweed** - Essex **Giant ragweed** - Chatham-Kent, Essex, Lambton, Lennox and Addington **Waterhemp** - Brant, Bruce, Chatham-Kent, Elgin, Essex, Haldimand, Huron, Lambton, Middlesex, Norfolk, Northumberland, Wellington, Wentworth **53 resistant weed species globally**
10 Glutamine synthetase inhibitors	Low	Phosphinic acid	glufosinate ammonium	Liberty® 150 SN, Ignite® 15 SN	**0 resistant weed species in Ontario** **4 resistant weed species globally**
11 Carotenoid inhibitors	Low-Moderate	Triazole	amitrole	Amitrol 240 Liquid	**0 resistant weed species in Ontario** **6 resistant weed species globally**
13 Carotenoid inhibitors	Low-Moderate	Isoxazolidinone	clomazone	Command 360 ME	**0 resistant weed species in Ontario** **2 resistant weed species globally**
14 PPO inhibitors	Low-Moderate	Aryl triazone Dicarboximide Diphenylethers N-Phenyl-imide	carfentrazone-ethyl flumioxazin fomesafen oxyfluorfen tiafenacil	Aim® EC Broadstar®, Chateau®, SureGuard® Reflex® Goal™ 2XL Tergeo	**1 resistant weed species in Ontario** **Waterhemp** - Bruce, Chatham-Kent, Elgin, Essex, Haldimand, Huron, Lambton, Middlesex, Norfolk, Wellington **13 resistant weed species globally**
15 Mitosis inhibitors	Low-Moderate	Amide Acetamide Acetanilide Chloroacetamide Isoxazoline	propyzamide napropamide s-metolachlor dimethenamid-P pyroxasulfone	Kerb™SC Devrinol®2 XT Dual II Magnum®, Komodo Herbicide Frontier® Max, Frontier Max Plus® Pyroxasulfone 85 WG	**0 resistant weed species in Ontario** **7 resistant weed species globally**
16 Fatty acid and Lipid inhibitors	Low-Moderate	Benzofurane	ethofumesate	Nortron® Flowable, Nortron® EC	**0 resistant weed species in Ontario** **1 resistant weed species globally**
20 Cellulose inhibitors	Low-Moderate	Benzonitrile	dichlobenil	Casoron® G-4	**0 resistant weed species in Ontario** **3 resistant weed species globally**
22 Photosystem I inhibitors	Low-Moderate	Bipyridyliums	diquat paraquat	Reglone® Desiccant Gramoxone® 200 SL	**3 resistant weed species in Ontario** **Canada fleabane** - Essex **Eastern black nightshade** - Chatham-Kent **Field peppergrass** - Essex **32 resistant weed species globally**
26 Unknown	Low	Unknown	pelargonic acid	Beloukha	**0 resistant weed species in Ontario** **1 resistant weed species globally**
27 HPPD inhibitors	Low-Moderate	Pyrazolone Triketones	topramezone mesotrione tembotrione	Armezon®, Impact® Callisto® 480SC, Mester 480SC Laudis™	**0 resistant weed species in Ontario** **2 resistant weed species globally**
29 Cellulose inhibitors	Low-Moderate	Alkylazine	indaziflam	Alion	**0 resistant weed species in Ontario** **3 resistant weed species globally**

Updated March 2021 by Kristen Obeid kristen.obeid@ontario.ca OMAFRA Weed Management Specialist - Horticulture

Note: WSSA has removed Group 7 and added linuron and diuron to Group 5 and removed Group 8 and 16 moving EPTC and ethofumesate to Group 15. bensulide has been moved to an unknown mode of action, however, labels have not been updated on the PMRA label search website.

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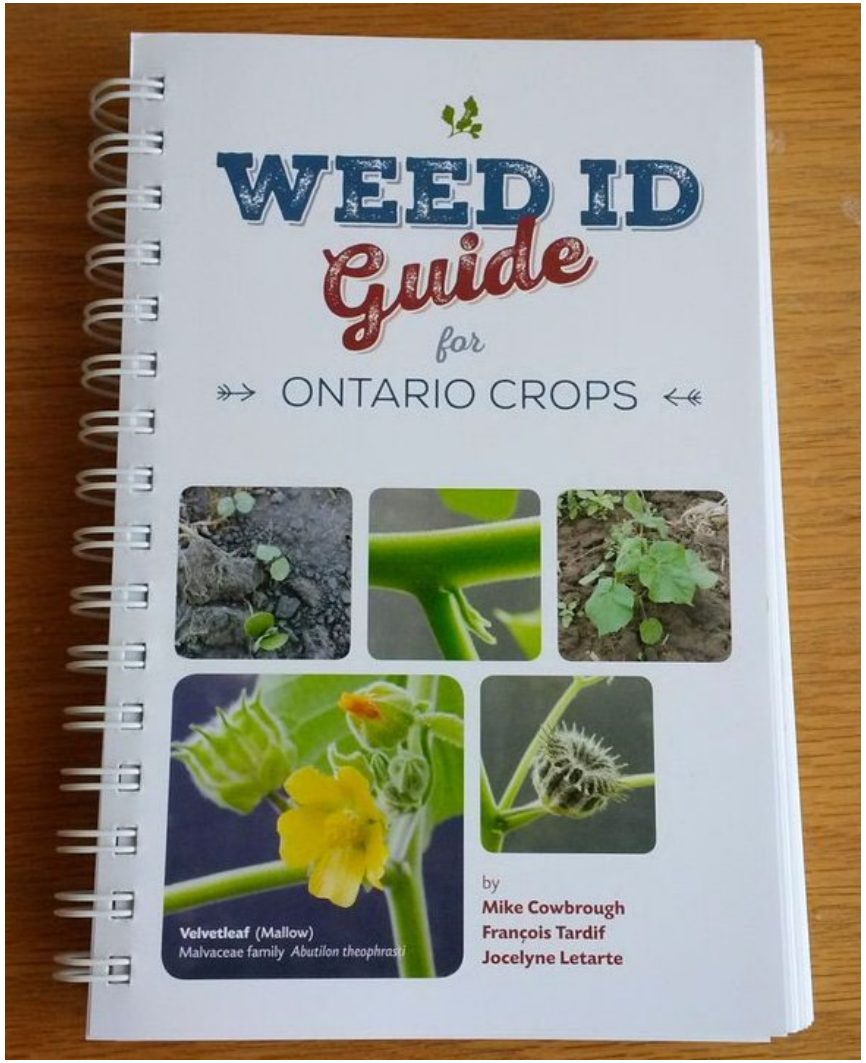
Resources



Published by the Grain Farmers of Ontario, the resource features over 120 species commonly found in and around agricultural fields. The publication was funded through *Growing Forward 2, a federal-provincial-territorial initiative.* The Weed ID Guide for Ontario Crops is now available in the following formats:

- ePub format (124 MB file for Kindle, iBooks and other e-reader apps)
- .pdf format (8 mb file)
- print ready .pdf (141 mb file)

These can be downloaded from the following website:

http://fieldcropnews.com/2016/09/weed-id-guide-for-ontario-crops/

Print Copy (printing and shipping costs apply, volume discounts available) can be ordered from the following website:
http://www.blurb.ca/b/7797011-weed-id-guide-for-ontario-crops

- The price is $37.51 for one copy.
- 10% discount if you order 10 or more.

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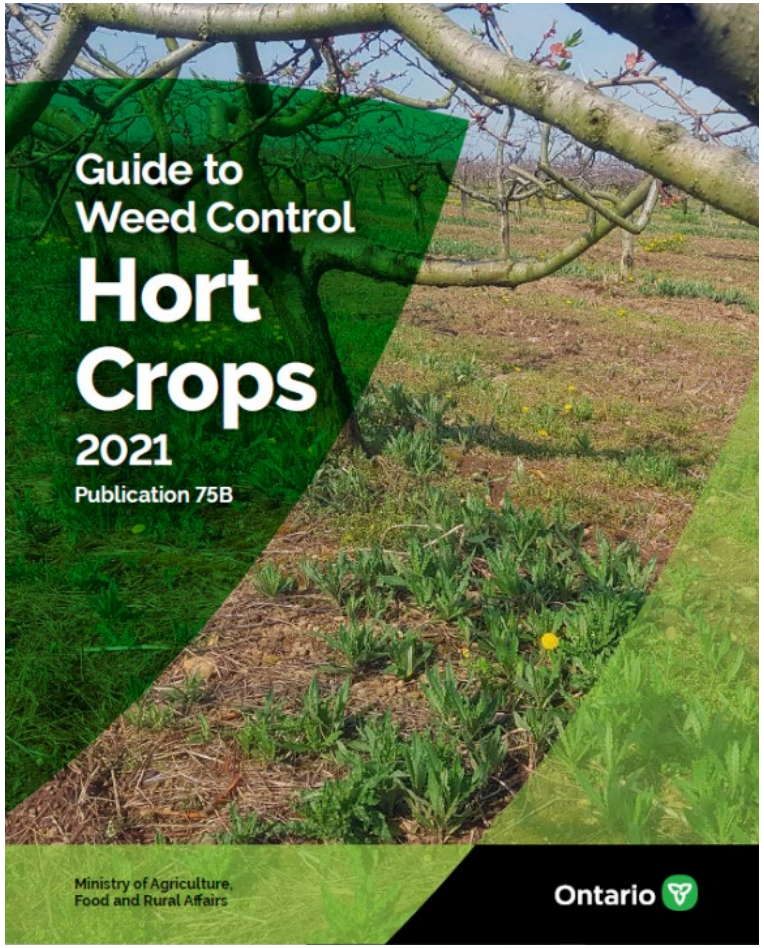
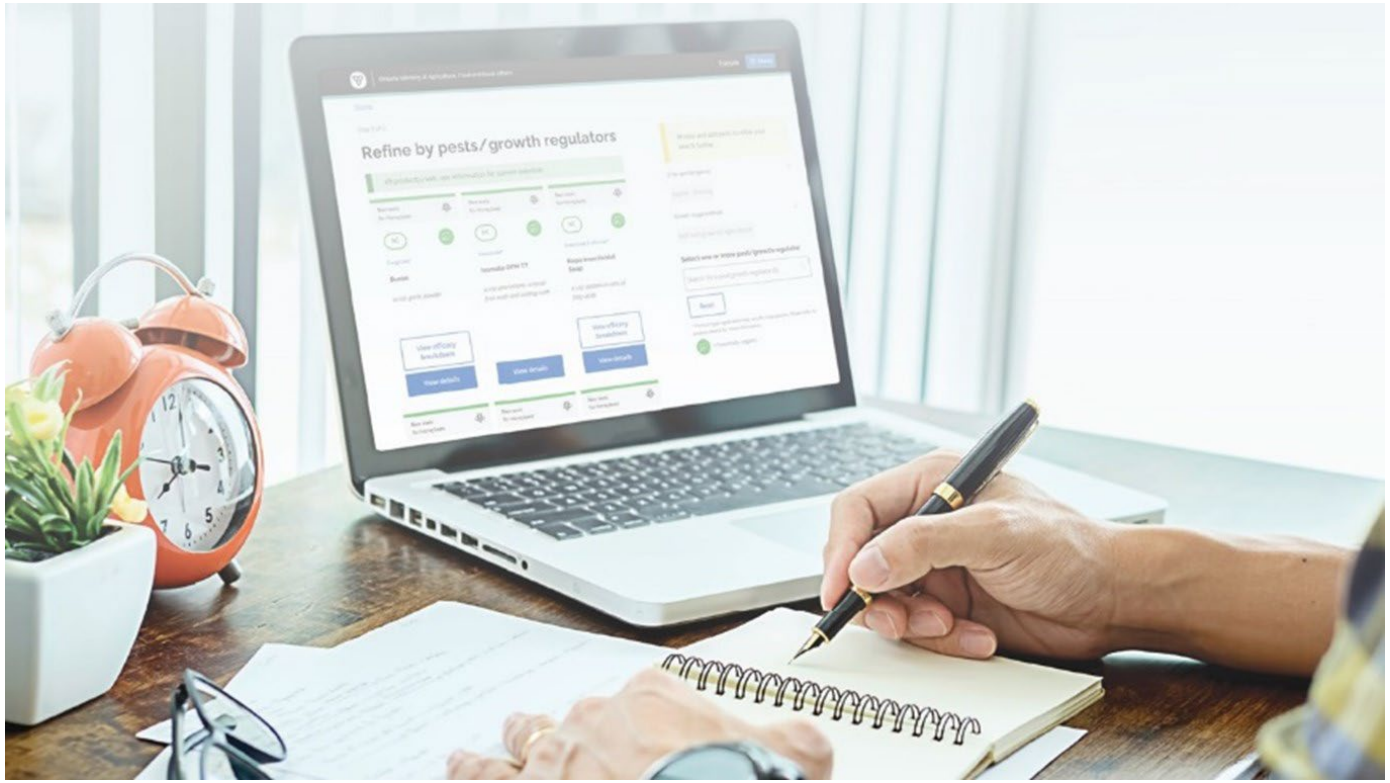


Guide to Weed Control for Hort Crops 2021 Publication 75B Now Available

Free PDF download available:
www.omafra.gov.on.ca/english/crops/pub75/pub75B/pub75Btoc.htm



Ontario Crop Protection Hub
Ontario.ca/CropProtection

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Questions???

Kristen Obeid, M.Sc.
Weed Specialist–Horticulture
OMAFRA, Harrow

519-965-0107 text
kristen.obeid@ontario.ca
@WeedProfesh

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