

2026

Vegetation Management Guide



As the leader in vegetation management Corteva Agriscience™ is committed to delivering effective solutions to professional vegetation managers for use in forestry and on utility, roadside, rail and bareground rights-of-way.

Our dedicated industrial vegetation management specialists are available to support your vegetation management programs and ensure that our product solutions are delivering industry leading results.

As a long-standing industry supporter, we take great pride in continuing to be your trusted partner every step of the way.

Whether it's weeds, brush or tree control you are looking for, Corteva Agriscience has a total portfolio solution to fit your needs.

TABLE OF CONTENTS

HERBICIDE PRODUCTS

WEED CONTROL

| | |
|----------------|-------|
| ClearView™ | P. 3 |
| Lontrel™ XC | P. 5 |
| Milestone™ NXT | P. 6 |
| Milestone™ | P. 8 |
| OcTTain™ XL | P. 10 |
| Sightline™ | P. 12 |
| Tordon™ 22K | P. 14 |

BRUSH CONTROL

| | |
|-------------|-------|
| Aspect™ | P. 15 |
| Garlon™ RTU | P. 17 |
| Garlon™ XRT | P. 20 |

ADJUVANT

| | |
|----------|-------|
| Gateway™ | P. 22 |
|----------|-------|

IVM HERBICIDE SPOT APPLICATION RATES

P. 23

PRODUCT SOLUTIONS TO FIT YOUR NEEDS

P. 24

IVM SPRAY CALIBRATION CALCULATOR

P. 28

STEWARDSHIP AND SUSTAINABLE VEGETATION MANAGEMENT

P. 30

RESISTANCE MANAGEMENT

P. 34

WATER QUALITY

P. 36

SURFACTANTS

P. 38

CONTACT YOUR IVM EXPERT

P. 39

ClearView™

HERBICIDE

ClearView™ herbicide is the industry standard selective herbicide for the professional vegetation manager, delivering consistent, high-performing, extended broadleaf weed and shrub control with flexible rates.

WHY USE CLEARVIEW™ HERBICIDE?

- **High performing and consistent.**
 - Extended, selective control of broadleaf weeds on Canadian rights-of-way.
 - Controls 65 weed and brush species including Canada thistle, wild parsnip, baby's breath, knapweed and hawkweed.
- **Flexible.**
 - Multiple labeled rates for flexibility in application.
 - Use alone or in combination with other products for bareground control.
 - Formulated as a convenient water-dispersible granule, with low use rates.
- **Peace of mind.**
 - No grazing restrictions for livestock.
 - Can be applied up to the dripline of desirable trees.
 - Controls broadleaf weeds and brush without harming grass.

WEEDS CONTROLLED

Absinthe wormwood
Baby's breath
Ball mustard
Black henbane
Bluebur
Brown knapweed
Bull thistle
Canada fleabane
Canada goldenrod¹
Canada thistle
Chickweed
Cleavers
Clover
Common groundsel
Common ragweed
Common tansy
Corn spurry
Cow cockle
Cudweed
Curly dock
Dandelion
Diffuse knapweed
Field scabious
Fireweed
Flixweed

Green smartweed
Hemp-nettle
Hoary alyssum
Horse-nettle
Hound's tongue
Japanese knotweed
Kochia²
Lady's-thumb
Lamb's-quarters¹
Mullein
Musk thistle or nodding thistle
Narrow-leaved hawk's-beard
Orange hawkweed
Ox-eye daisy (*pre-bud*)
Pasture sage (fringed sage)
Perennial pepperweed
Perennial sow-thistle
Plumeless thistle
Prairie sage
Prairie wild rose
Prickly lettuce
Prostrate pigweed
Purple loosestrife
Pussytoes
Rush skeletonweed

Russian thistle
Scentless chamomile
Scotch thistle
Shepherd's purse
Silverberry¹
Spotted knapweed
Stinkweed
Stork's-bill
Sweet clover
Tall buttercup
Tartary buckwheat
Volunteer alfalfa
Volunteer canola³
Western ragweed
Western snowberry (buckbrush)
Whitetop (hoary cress)
Wild buckwheat¹
Wild caraway
Wild carrot
Wild mustard
Wild parsnip
Wild strawberry
Yarrow¹
Yellow hawkweed
Yellow star-thistle

¹ Suppression.

² Non ALS resistant biotypes.

³ All varieties except ALS resistant canola.

For more information
on ClearView visit:



USE GUIDELINE

RATES AND PACKAGING:

Multiple rate structures on the label, allowing you the flexibility to choose the most suitable rate to fit your needs.

| | |
|--|--------------------------|
| PACKAGING | 2 x 1.84 kg jugs |
| HIGHEST LABELLED RATE Provides the most effective, longest lasting control | 230 g/ha |
| MID-RATE | 170 g/ha |
| ACRES TREATED per case | 16 ha at 230 g/ha rate |
| | 21.6 ha at 170 g/ha rate |

ClearView™ herbicide requires the addition of Gateway™ adjuvant at 0.2% v/v.

Individual plant applications: 2.3 g of ClearView, 20 mL of surfactant, in 10 L of water. Thoroughly and uniformly wet the foliage of all target plants, but not to the point of runoff.

| | |
|---------------------|---|
| WATER VOLUME | Broadcast: Apply in a minimum of 200 L/ha total solution. |
|---------------------|---|

WHEN TO APPLY:

Avoid applying to plants under stress

| | |
|---------------|--|
| WEEDS | Apply to actively growing weeds, after emergence, prior to flowering. |
| SHRUBS | Apply to actively growing shrubs, after full leaf expansion, but prior to the development of a waxy cuticle on the leaves of the shrubs. |

RAINFAST: 2 hours

TANK MIXES:

| | |
|---|---|
| LABELLED | 2,4-D Amine, Glyphosate, Torpedo EZ, Arsenal and Garlon™ XRT herbicides. |
| OTHER TANK MIXES (Supported Under PMRA Tank-Mix Policy) | Aspect™, OcTTain™ XL and EsplAnade herbicides. Contact your Corteva Agriscience™ IVM Expert. |

MIXING INSTRUCTIONS:

Pre-slurrying ClearView is recommended.

1. Fill the spray tank $\frac{3}{4}$ full of clean water.
2. Add the required amount of ClearView herbicide with the agitation running. Pre-slurrying with water may be necessary where there is little or no agitation, or an injection system is being used.
3. If tank mixing, add the required amount of tank-mix partner with continued moderate agitation.
4. Add Gateway at 0.2% v/v or 2 L/1,000 L of spray solution.
5. Add antifoaming agent such as Halt if required.

GRAZING: There is no grazing restriction on livestock grazing treated areas.

USE AROUND TREES: ClearView should NOT be used over the top of desirable trees. Application may be made up to the dripline (outermost edge of the branches) of desirable trees. Use additional caution around lateral root systems, shallow rooting species and those that propagate vegetatively through root shoots. Please refer to Use Around Trees section for additional information.

Lontrel™ XC**HERBICIDE**

Lontrel™ XC herbicide provides professional vegetation managers with excellent control of Canada thistle and other broadleaf weeds in close proximity to most tree species.

WHY USE LONTREL™ XC HERBICIDE?

- **Performance.** Control of tough broadleaf weeds such as Canada thistle.
- **Selective.** Targeted applications allow for control of undesirable species without harming grass and other desirable vegetation.

WEEDS CONTROLLED

Alsike clover
Canada thistle
Common groundsel
Common ragweed
Diffuse knapweed

Kudzu¹
Ox-eye daisy¹
Perennial sow-thistle¹
Scentless chamomile
Sheep sorrel¹

Spotted knapweed
Vetch
Volunteer alfalfa
Volunteer soybean
Wild buckwheat

¹ Suppression or top growth control

USE GUIDELINE

RATES AND PACKAGING:

| | |
|---------------------|--|
| PACKAGING | 4 x 2.67 L jugs |
| RATES | Broadcast application rate: 0.25–0.50 L/ha (Refer to the Weeds Controlled table on the product label for appropriate application rates) Spot spray application rate: 25–50 mL per 1000 m ² area. |
| WATER VOLUME | Broadcast applications: Apply in a minimum of 200 L/ha or 20 gal/ac total solution. Spot spray applications: Requires 200 L of water per 1000 m ² area. |

WHEN TO APPLY:

| | |
|---|---|
| WEEDS | Apply to actively growing weeds. Avoid applying to plants under stress. Only weeds present at time of application will be controlled. |
| CANADA THISTLE, PERENNIAL SOW-THISTLE AND SCENTLESS CHAMOMILE: | Applications should be made from the rosette to the pre-bud stage. Under dry soil conditions and poor growing conditions, Canada thistle control may be severely reduced. Best results are obtained when Canada thistle is actively growing and soil moisture is adequate for rapid growth. |

RAINFAST: 4 hours

GRAZING: There are no restrictions on the grazing of treated areas.

For more information
on Lontrel XC visit:



Milestone™ NXT

Rinskor™ active

HERBICIDE

Milestone™ NXT herbicide with Rinskor™ active for the industrial vegetation management professional delivers highly selective control of invasive broadleaf weed species along with lower use rates and tank-mix flexibility.

WHY USE MILESTONE™ NXT HERBICIDE WITH RINSKOR™ ACTIVE?

- **Favourable environmental profile.** Rinskor™ active rapidly degrades in the soil and has a low persistence in the environment.
- **New weed management tool.** Rinskor active is a new structural class of synthetic auxin herbicide.
- **Excellent extended control of invasive broadleaf weeds:**
 - Consistent weed control across variable conditions
 - Lower and flexible use rates
- **Selective.** When applied at recommended rates, provides effective control of labeled weeds and does not harm grass or other desirable plant species.
- **Tank mixability.** Excellent tank mix partner with Garlon™ XRT herbicide for brush control and Arsenal or glyphosate herbicides for total vegetation control.

WEEDS CONTROLLED

Absinthe wormwood

Annual sow-thistle

Bitter sneezeweed

Bull thistle

Canada fleabane

Canada thistle

Cleavers

Clover

Common broomweed

Common ragweed

Common waterhemp

Cudweed

Curly dock

Fireweed

Fuller's teasel

Hairy buttercup

Hairy fleabane

Horsenettle

Lamb's quarters

Mullein

Musk or nodding thistle

Orange hawkweed

Ox-eye daisy

Perennial sow-thistle

Plumeless thistle

Poison hemlock

Prickly lettuce

Purple loosestrife

Rush skeletonweed

Scentless chamomile

Scotch thistle

Spotted Knapweed

Tall buttercup

Tall ironweed

Tansy ragwort

Tropic croton

Tropical soda apple

Velvetleaf

Western ragweed

Wild caraway

Wild chervil

Wild parsnip

Yellow star-thistle

WEEDS SUPPRESSED

Canada goldenrod

Common yarrow

Common tansy

Dandelion

Diffuse knapweed

Japanese knotweed

Sulphur cinquefoil

Russian knapweed



USE GUIDELINE

RATES AND PACKAGING:

| | |
|-------------------------------|--|
| PACKAGING | 2 x 2.8 kg case |
| ACRES TREATED | 28 ha/case at highest labelled rate. For best results, apply at 200 g/ha. Milestone™ NXT herbicide with Rinskor™ active requires the addition of Gateway™ adjuvant at 0.25 – 0.5% v/v. |
| INDIVIDUAL PLANT APPLICATIONS | 2 g of Milestone NXT plus 50 mL of surfactant in 10 L of water. Thoroughly wet, but not to point of runoff. |
| WATER VOLUME | Broadcast applications: Apply in a minimum of 200 L/ha total solution. |

WHEN TO APPLY:

| | |
|-------|---|
| WEEDS | Apply to target weeds after emergence, prior to flowering when actively growing. Only weeds present at time of application will be controlled. Avoid applying to plants under stress. |
|-------|---|

RAINFAST: 4 hours

TANK MIXES:

| | | | | | | | | | | | | | | | | | | | |
|--|---|--------------------|----------|---------|--------------|--------------|---------|-------------------|----------|------------------|-------------|-----------|-------------|-----------------|-----------------|--------------|--------------|-----------|--|
| LABELLED (when total vegetation control is desired): | Garlon™ XRT, glyphosate or Arsenal herbicides. Refer to product label for rates. | | | | | | | | | | | | | | | | | | |
| OTHER TANK MIXES (Supported Under PMRA Tank-Mix Policy): | Contact your Corteva Agriscience™ IVM Expert. | | | | | | | | | | | | | | | | | | |
| 2,4-D | <p>Tank mix Milestone NXT from 117-200 g/ha with 2,4-D for enhanced spectrum of control on the following weeds:</p> <table> <tr> <td>Annual sow-thistle</td><td>Flixweed</td></tr> <tr> <td>Bluebur</td><td>Goat's beard</td></tr> <tr> <td>Blue lettuce</td><td>Gumweed</td></tr> <tr> <td>Burdock (<4 leaf)</td><td>Hawkweed</td></tr> <tr> <td>Canada goldenrod</td><td>Hoary cress</td></tr> <tr> <td>Cocklebur</td><td>Peppergrass</td></tr> <tr> <td>Common plantain</td><td>Stinging nettle</td></tr> <tr> <td>Common tansy</td><td>Sweet clover</td></tr> <tr> <td>Dandelion</td><td></td></tr> </table> <p><i>Refer to product label for complete use directions.</i></p> | Annual sow-thistle | Flixweed | Bluebur | Goat's beard | Blue lettuce | Gumweed | Burdock (<4 leaf) | Hawkweed | Canada goldenrod | Hoary cress | Cocklebur | Peppergrass | Common plantain | Stinging nettle | Common tansy | Sweet clover | Dandelion | |
| Annual sow-thistle | Flixweed | | | | | | | | | | | | | | | | | | |
| Bluebur | Goat's beard | | | | | | | | | | | | | | | | | | |
| Blue lettuce | Gumweed | | | | | | | | | | | | | | | | | | |
| Burdock (<4 leaf) | Hawkweed | | | | | | | | | | | | | | | | | | |
| Canada goldenrod | Hoary cress | | | | | | | | | | | | | | | | | | |
| Cocklebur | Peppergrass | | | | | | | | | | | | | | | | | | |
| Common plantain | Stinging nettle | | | | | | | | | | | | | | | | | | |
| Common tansy | Sweet clover | | | | | | | | | | | | | | | | | | |
| Dandelion | | | | | | | | | | | | | | | | | | | |
| GARLON™ XRT | Tank mix Milestone NXT at 100-200 g/ha with 2.5 – 5 L/ha of Garlon™ XRT herbicide for broad spectrum control of broadleaf weeds, woody plants and tree species. <i>Refer to product label for complete use directions.</i> | | | | | | | | | | | | | | | | | | |

GRAZING: Grazing/feeding is permitted on the day of application (0 days). There is no restriction on livestock grazing treated areas.

USE AROUND TREES: Milestone NXT should NOT be used over the top of desirable trees. Application may be made up to the dripline (outermost edge of the branches) of desirable trees. Use additional caution around lateral root systems, shallow rooting species and those that propagate vegetatively through layering.



Milestone™ herbicide for the professional vegetation manager delivers highly selective control of invasive broadleaf weed species with low use rates, tank-mix flexibility and a liquid formulation.

WHY USE MILESTONE™ HERBICIDE?

- **Invasive weed control.** Controls a wide range of invasive plants and broadleaf weeds.
- **Selective.** When applied at recommended rates, provides effective control of labeled weeds and does not harm grass or desirable plant species.
- **Tank mixability.** Excellent tank mix partner with Torpedo EZ, EsplAnade, Arsenal or glyphosate herbicides for total vegetation control.

WEEDS CONTROLLED

Absinthe wormwood
Bitter sneezeweed
Canada fleabane
Canada thistle
Canadian goldenrod*
Common broomweed
Common ragweed
Clover
Common tansy*
Common yarrow*
Cudweed
Curly dock
Bull thistle
Dandelion*

Diffuse knapweed*¹
Fireweed
Fuller's teasel
Hairy buttercup
Hairy fleabane
Horsenettle
Japanese knotweed*
Mullein
Musk or nodding thistle
Orange hawkweed
Ox-eye daisy²
Perennial sow-thistle
Plumeless thistle
Prickly lettuce

Purple loosestrife
Rush skeletonweed
Russian knapweed*
Scentless chamomile
Scotch thistle
Spotted knapweed
Sulphur cinquefoil*
Tall buttercup
Tall ironweed
Tansy ragwort
Tropical soda apple³
Tropic croton
Western ragweed
Yellow star-thistle³

*Suppression.

¹Apply to plants in the bolting stage of development.

²Apply to plants in the pre-bud stages of development.

³Apply to plants at the rosette through to bolting growth stage.

For more information
on Milestone visit:



USE GUIDELINE

RATES AND PACKAGING:

| | |
|--------------------------------------|---|
| PACKAGING | 2 x 10 L jugs |
| ACRES TREATED | 40 ha or 100 ac per case at highest labelled rate. For best results, apply at 0.5 L/ha (40 ha/case rate). |
| INDIVIDUAL PLANT APPLICATIONS | 5 mL of Milestone™ herbicide in 10 L of water. Thoroughly and uniformly wet foliage of all target plants, but not to the point of runoff. |
| WATER VOLUME | Broadcast applications: Apply in a minimum of 200 L/ha total solution. |

WHEN TO APPLY:

| | |
|--------------|--|
| WEEDS | Apply to target weeds when actively growing, after emergence, prior to flowering. Avoid applying to plants under stress. Only weeds present at time of application will be controlled. |
|--------------|--|

RAINFAST: 2 hours

TANK MIXES:

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|-------------------------|--|----------------------|-------------------|---------------|-----------|----------------|---------------|----------------|-------------------------------------|-------------------------|---------------------------------|-------------|-----------|----------------|------------|-------------------|-------------|----------------|----------------|--------------------|-----------|---------------------|-------------|------------|--|
| LABELLED (when total vegetation control is desired): | Glyphosate, Arsenal and Torpedo EZ herbicides. Refer to product label for rates. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OTHER TANK MIXES (Supported Under PMRA Tank-Mix Policy): | OcTTain™ XL and EsplAnade herbicides. Contact your Corteva Agriscience™ IVM Expert. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2,4-D | <p>Milestone at 0.5 L/ha tank mixed with 2,4-D Amine will provide activity on the following weeds:</p> <table><tr><td>– Annual sow-thistle</td><td>– Common plantain</td><td>– Hoary cress</td></tr><tr><td>– Bluebur</td><td>– Common tansy</td><td>– Peppergrass</td></tr><tr><td>– Blue lettuce</td><td>– Curled dock (<i><4 leaf</i>)</td><td>– Perennial sow-thistle</td></tr><tr><td>– Burdock (<i><4 leaf</i>)</td><td>– Dandelion</td><td>– Ragweed</td></tr><tr><td>– Bull thistle</td><td>– Flixweed</td><td>– Stinging nettle</td></tr><tr><td>– Buttercup</td><td>– Goat's-beard</td><td>– Sweet clover</td></tr><tr><td>– Canada goldenrod</td><td>– Gumweed</td><td>– Western snowberry</td></tr><tr><td>– Cocklebur</td><td>– Hawkweed</td><td></td></tr></table> <p><i>Refer to product label for complete use directions.</i></p> | | | – Annual sow-thistle | – Common plantain | – Hoary cress | – Bluebur | – Common tansy | – Peppergrass | – Blue lettuce | – Curled dock (<i><4 leaf</i>) | – Perennial sow-thistle | – Burdock (<i><4 leaf</i>) | – Dandelion | – Ragweed | – Bull thistle | – Flixweed | – Stinging nettle | – Buttercup | – Goat's-beard | – Sweet clover | – Canada goldenrod | – Gumweed | – Western snowberry | – Cocklebur | – Hawkweed | |
| – Annual sow-thistle | – Common plantain | – Hoary cress | | | | | | | | | | | | | | | | | | | | | | | | | |
| – Bluebur | – Common tansy | – Peppergrass | | | | | | | | | | | | | | | | | | | | | | | | | |
| – Blue lettuce | – Curled dock (<i><4 leaf</i>) | – Perennial sow-thistle | | | | | | | | | | | | | | | | | | | | | | | | | |
| – Burdock (<i><4 leaf</i>) | – Dandelion | – Ragweed | | | | | | | | | | | | | | | | | | | | | | | | | |
| – Bull thistle | – Flixweed | – Stinging nettle | | | | | | | | | | | | | | | | | | | | | | | | | |
| – Buttercup | – Goat's-beard | – Sweet clover | | | | | | | | | | | | | | | | | | | | | | | | | |
| – Canada goldenrod | – Gumweed | – Western snowberry | | | | | | | | | | | | | | | | | | | | | | | | | |
| – Cocklebur | – Hawkweed | | | | | | | | | | | | | | | | | | | | | | | | | | |

GRAZING: There is no grazing restriction on livestock grazing treated areas.

USE AROUND TREES: Milestone should NOT be used over the top of desirable trees. Application may be made up to the dripline (outermost edge of the branches) of desirable trees. Use additional caution around lateral root systems, shallow rooting species and those that propagate vegetatively through layering. Please refer to Use Around Trees section for additional information.

OcTTain™ XL

HERBICIDE

OcTTain™ XL herbicide for the professional vegetation manager provides seasonal broadleaf control of tough weeds, including Group 2 and 9 resistant kochia up to 50 cm in height, with tank-mix flexibility for roadside or bareground applications.

WHY USE OCTTAIN™ XL HERBICIDE?

- **Performance.** Controls a wide range of broadleaf weeds, including Group 2 and 9 resistant kochia up to 50 cm in height.
- **Flexible.** Can be used as a stand-alone treatment, or tank mixed with products such as ClearView™, Milestone™, Torpedo EZ and glyphosate herbicides.
- **Economical.** Cost-effective weed control for vegetation managers.

WEEDS CONTROLLED

Bluebur
Blue lettuce¹
Burdock
Canola (*all varieties*)
Cleavers^{3,5}
Cocklebur
Dandelion²
Docks
Dog mustard
Field bindweed¹
Field horsetail¹
Field peppergrass
Flixweed
Goat's-beard
Gumweed

Hairy galinsoga¹
Hedge bindweed
Hemp-nettle
Hoary cress¹
Kochia³
Lady's-thumb
Lamb's-quarters
Mustards (except green & grey tansy)
Oak-leaved goosefoot
Plantain
Prickly lettuce
Ragweed
Redroot pigweed
Round-leaved mallow⁴

Russian thistle
Shepherd's purse
Smartweed
Stinkweed
Stork's-bill⁶
Sunflower (Annual)
Sweet clover
Tansy mustard
Tartary buckwheat
Vetch
Volunteer flax
Wild buckwheat⁶
Wild radish

WEEDS SUPPRESSED

Annual sow-thistle
Canada thistle¹
Chickweed^{3,7}
Perennial sow-thistle¹

¹ Top growth control only.

² Spring rosettes.

³ Including Group 2 and 9 resistant biotypes.

⁴ 1- to 6-leaf.

⁵ 1- to 8-whorls.

⁶ 1- to 8-leaf.

⁷ Up to 8 cm.

For more information
on OcTTain XL visit:



USE GUIDELINE

RATES AND PACKAGING:

| | |
|--|---|
| PACKAGING | 2 x 9 L jugs/case, 108 L drum and 576 L tote |
| ACRES TREATED | 5.8 – 11.25 ha/case |
| BROADCAST RATES | Smaller kochia and broadleaf weeds in non-crop areas: 1.6 L/ha Larger kochia (between 20 cm and up to 50 cm) and broadleaf weeds in non-crop areas: 3.1 L/ha |
| SPOT RATES (hose and handgun or backpack sprayer): | 16–31 mL in 10 L of spray solution; 1,600 – 3,100 mL in 1,000 L of spray solution. |

WHEN TO APPLY:

| | |
|--------------|---|
| WEEDS | When weeds are actively growing, optimally between temperatures of 12° C and 24° C. Control will be reduced if frost occurs three days before or after application. |
|--------------|---|

RAINFAST: 1 hour

TANK MIXES:

| | |
|---|---|
| LABELLED | Milestone™ herbicide |
| Supported in non-cropland areas under PMRA Tank-Mix Policy: | For bareground control: Glyphosate, Torpedo EZ, Arsenal and EsplAnade herbicides. Contact your Corteva Agriscience™ IVM Expert. |

MIXING INSTRUCTIONS:

1. Fill the spray tank with 1/2 to 3/4 of the required amount of water.
2. Continue agitation throughout the mixing and spraying procedure.
3. Add any required water conditioners.
4. Add any tank-mix partners that are a dry formulation.
5. Add any tank-mix partners that are liquid formulation.
6. Add the required amount of OcTTain™ XL herbicide.
7. Add any required adjuvant or surfactants.
8. Complete filling the sprayer tank with water.

Note: When tank mixing with Torpedo EZ, the addition of Gateway™ adjuvant at 0.25% to 1% or equivalent non-ionic surfactant is required.

GRAZING: There is no grazing restriction on beef livestock grazing treated areas.

Sightline™

HERBICIDE

Sightline™ herbicide for the professional vegetation manager delivers broad-spectrum control of broadleaf weeds, including ALS and glyphosate resistant kochia, in a convenient, all-in-one package.

WHY USE SIGHTLINE™ HERBICIDE?

- **Broad spectrum.** The widest spectrum for extended control of broadleaf weeds, invasive plants and shrubs.
- **Kochia control.** Exceptional post-emergent control of kochia, including ALS and glyphosate resistant biotypes.
- **Bareground.** Can be tank mixed with Torpedo EZ herbicide or other non-selective products to achieve total vegetation control.
- **Multiple modes of action.** Three different active ingredients and two modes of action in one box.

WEEDS CONTROLLED

Absinthe wormwood
Baby's breath
Ball mustard
Black henbane
Bluebur
Brown knapweed
Bull thistle
Canada fleabane
Canada goldenrod¹
Canada thistle
Chickweed
Cleavers
Clover
Common groundsel
Common ragweed
Common tansy
Corn spurry
Cow cockle
Cudweed
Curly dock
Dandelion
Diffuse knapweed
Field scabious
Fireweed
Flixweed
Green smartweed

Hemp-nettle
Hoary alyssum
Horsenettle
Hound's tongue
Japanese knotweed
Kochia
Lady's-thumb
Lamb's-quarters¹
Mullein
Musk or nodding thistle
Narrow-leaved hawk's-beard
Orange hawkweed
Ox-eye daisy (*pre-bud*)
Pasture sage (*fringed sage*)
Perennial pepperweed
Perennial sow-thistle
Plumeless thistle
Prairie wild rose
Prairie sage¹
Prickly lettuce
Prostrate pigweed
Purple loosestrife
Pussytoes
Rush skeletonweed
Russian thistle
Silverberry¹

Scentless chamomile
Scotch thistle
Shepherd's purse
Spotted knapweed
Stinkweed
Stork's-bill
Sweet clover
Tall buttercup
Tartary buckwheat
Volunteer alfalfa
Volunteer canola²
Western ragweed
Western snowberry (*buckbrush*)
Whitetop (*hoary cress*)
Wild buckwheat¹
Wild caraway
Wild carrot
Wild mustard
Wild parsnip
Wild strawberry
Yarrow¹
Yellow hawkweed
Yellow star-thistle



USE GUIDELINE

RATES AND PACKAGING:

| | |
|---------------------|---|
| PACKAGING | Sightline™ A herbicide: 1.84 kg jug; Sightline™ B herbicide: 6.72 L jug |
| RATES | Highest Rate: 8 ha (20 ac) per case Sightline requires the addition of Gateway™ adjuvant at 0.2% v/v. Individual plant applications: 2.3 g of Sightline A, 8.4 mL of Sightline B and 20 mL of surfactant in 10 L of water. Thoroughly and uniformly wet foliage of all target plants, but not to the point of runoff. |
| WATER VOLUME | Broadcast applications: Apply in a minimum of 200 L/ha total solution. |

WHEN TO APPLY:

| | |
|----------------|--|
| WEEDS | Apply to actively growing weeds, after emergence, prior to flowering. |
| SHRUBS: | Apply to actively growing shrubs, after full leaf expansion, but prior to the development of a waxy cuticle on the leaves of the shrubs. |
| KOCHIA: | For best results, apply to young plants once majority of the population has emerged, prior to seed set. |

Only weeds and shrubs present at time of application will be controlled. Avoid applying to plants under stress.

RAINFAST: 2 hours

TANK MIXES:

| | |
|--|--|
| LABELLED (for total vegetation control): | Glyphosate |
| OTHER TANK MIXES (Supported Under PMRA Tank-Mix Policy): | Torpedo EZ, Arsenal and EsplAnade herbicides. Contact your Corteva Agriscience™ IVM Expert. |

MIXING INSTRUCTIONS:

Use 135–230 g/ha Sightline A herbicide tank mixed with 0.42–0.84 L/ha Sightline B herbicide. Note that the highest rate of Sightline B (0.84 L/ha) is required for control of kochia (2 to 8 leaf stage).

1. Fill the spray tank $\frac{3}{4}$ full of clean water.
2. Add the required amount of Sightline A herbicide with the agitation running. Pre-slurrying with water may be necessary where there is little or no agitation, or an injection system is being used.
3. Add the required amount of Sightline B herbicide with moderate agitation running.
4. Add Gateway at 0.2% v/v or 2 L/1,000 L of spray solution.
5. Add antifoaming agent, such as Halt, if required.

Note: When tank mixing with Torpedo EZ, the addition of Gateway™ adjuvant at 0.25% to 1% or equivalent non ionic surfactant is required.

USE AROUND TREES: Sightline should NOT be used over the top of desirable trees. Application may be made up to the dripline (outermost edge of the branches) of desirable trees. Use additional caution around lateral root systems, shallow rooting species and those that propagate vegetatively through root shoots. Please refer to Use Around Trees section for additional information.

Tordon™ 22K**HERBICIDE**

Tordon™ 22K herbicide for the professional vegetation manager provides the longest lasting control of deep-rooted, hard-to-control leafy spurge and toadflax.

WHY USE TORDON™ 22K HERBICIDE?

- **Extended control.** Provides the longest lasting control of leafy spurge and toadflax.
- **Easy to use.** Liquid formulation packaged in convenient 10 L jugs.

WEEDS CONTROLLED

Canada thistle
Diffuse knapweed
Field bindweed

Leafy spurge
Pasture sage
Perennial sow-thistle

Poverty weed
Russian knapweed
Scentless chamomile

Spotted knapweed
Toadflax

USE GUIDELINE**RATES AND PACKAGING:**

| | |
|---------------------|---|
| PACKAGING | 2 x 10 L jugs |
| RATES | 1.1 – 4.5 L/ha Leafy spurge, field bindweed and toadflax control only: a spot treatment rate of 90 mL/100 m ² may be used, provided no more than 50% of a hectare is treated. |
| WATER VOLUME | 400–800 L/ha of spray solution per treated hectare is usually required. Wet the weeds without run-off. |

WHEN TO APPLY:

| | |
|--------------|---|
| WEEDS | Apply to target weeds when they are actively growing. |
|--------------|---|

Only weeds present at time of application will be controlled.

RAINFAST: 4 hours**PRECAUTIONS:**

- Do not apply to soils that are very permeable (textures of sandy loam to sand) throughout the entire profile and that also have an underlying shallow aquifer.
- Do not treat areas intended to be used for cultivated sensitive crops or other desirable plants in sequential years. Clippings from grass or crops that have been treated with Tordon 22K should not be used for composting or mulching, nor should the manure from animals grazing treated areas or fed treated forage be used around susceptible plants.
- Avoid application when heavy rain is forecast.

GRAZING:

- There is no restriction for livestock grazing treated areas.
- Do not permit lactating dairy animals to graze fields within 7 days after application

USE AROUND TREES:

Tordon 22K should NOT be used over the top of desirable trees. Application should remain 1.5x the height of off target trees away. Use additional caution around lateral root systems, shallow rooting species and those that propagate vegetatively through layering. Please refer to Use Around Trees section for additional information.

For more information
on Tordon 22K visit:





Aspect™ herbicide provides vegetation managers with extended control of woody species and broadleaf weeds.

HERBICIDE

WHY USE ASPECT™ HERBICIDE?

- **Trusted results.** Consistent, reliable extended control of woody species and broadleaf weeds such as birch, poplar, dandelion and leafy spurge on rail, roadside and utility corridors.
- **Selective.** Controls woody species and broadleaf weeds without harming grass.

BRUSH AND BROADLEAF WEED SPECIES CONTROLLED

Brush species

Alder
Birch
Cedar
Maple
Pine
Poplar
Spruce and other species

Broadleaf weeds

Burdock
Canada thistle
Common ragweed
Common yarrow
Dandelion
Dock
Fleabane

Goldenrod
Leafy spurge
Plantain
Prickly lettuce
Sweet and red clover
Toadflax
Vetch
Wild carrot

USE GUIDELINE

RATES AND PACKAGING:

| | |
|-----------------------------|--|
| PACKAGING | 2 x 10 L jugs |
| RATES | <p>Broadleaf weeds: 2.47 – 4.67 L/ha in a min 200 L total spray solution.</p> <p>Woody plants: Apply up to 11.5 L/ha in a min 200 L total spray solution.</p> <p>For faster burndown of coniferous species, use Gateway™ adjuvant at 0.25% by volume (250 mL/100 L of water). For maximum rainfastness, increase the rate to 0.375% (375 mL/100 L of water). Gateway should be added after the herbicide is thoroughly mixed.</p> <p>For control of leafy spurge and toadflax under less-than-optimum growing conditions, add Gateway adjuvant at the rate of 0.25% by volume.</p> |
| DIRECTED STEM APPLICATIONS: | For control of woody plants, use 6.67 L/ha in 1,000 L water and apply after the foliage is fully developed. Thoroughly and uniformly wet to the point of runoff. |

For more information
on Aspect visit:



WHEN TO APPLY:

| | |
|--------------|--|
| WEEDS | Apply to actively growing weeds, after emergence, prior to flowering. |
| TREES | Apply to actively growing trees, after full leaf expansion, but prior to the development of a waxy cuticle on the leaf of the trees. |

Only weeds and trees present at time of application will be controlled. Avoid applying to plants under stress.

RAINFAST: 2 hours**TANK MIXES:**

| | |
|---|---|
| OTHER TANK MIXES (Supported Under PMRA Tank-Mix Policy): | ClearView™ herbicide. Contact your Corteva Agriscience™ IVM Expert. |
|---|---|

PRECAUTIONS:

- Do not treat areas intended to be used for cultivated sensitive crops or other desirable plants in sequential years. Clippings from grass or crops that have been treated with Aspect™ herbicide should not be used for composting or mulching, nor should the manure from animals grazing treated areas or fed treated forage be used around susceptible plants.

USE AROUND TREES:

Aspect should NOT be used over the top of desirable trees. Applications should remain 1.5x the height of off target trees away. Use additional caution around lateral root systems, shallow rooting species and those that propagate vegetatively through layering. Please refer to Use Around Trees section for additional information.

Garlon™ RTU

HERBICIDE

Garlon™ RTU herbicide offers convenience and performance as the industry's only ready-to-use herbicide.

WHY USE GARLON™ RTU HERBICIDE?

- **Convenient, simple and precise.**
 - Year-round control of more than 30 deciduous tree species, including aspen, birch and poplar.
 - Designed for selective, direct stem application to woody species.
- **Application flexibility.**
 - Use anytime throughout the year when plants are dry.
 - Three application methods: streamline, one-sided and cut stump.
- **Ready to use.**
 - Formulated to be used right out of the container, no mixing required.

TREES CONTROLLED

Alder
Ash
Aspen
Basswood
Beech
Birch
Blackberry
Buckthorn
Cherry[†]
Chokecherry[†]
Cottonwood

Dogwood
Elderberry
Elm[†]
Hawthorn
Hickory
Honey locust[†]
Hop-hornbeam
Locust
Maples
Mulberry
Oaks[†]

Pines[†]
Poplar
Red maple[†]
Sassafras
Sumac
Sycamore
Tamarack
Wild rose
Willow
Witch hazel

[†]These species may need to be re-treated the following year.

For more information
on Garlon RTU visit:

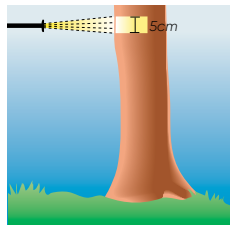
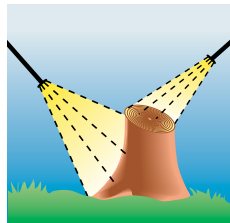


USE GUIDELINE

RATES AND PACKAGING:

| | |
|-----------|---|
| PACKAGING | 13 L jerriboxes, 2 x 10 L jugs, 110 L drum and 1,000 L tote |
|-----------|---|

APPLICATION METHODS:

| | | |
|---------------------|---|---|
| STREAMLINE | <p>This has proven to be the fastest and most effective method of selective basal bark application. Best results are on young, actively growing stems less than 8 cm in diameter.</p> <ul style="list-style-type: none"> Achieving complete “wrap” of the solution around the entire stem circumference is essential for effectiveness. Spray 30–50 cm above ground level: <ul style="list-style-type: none"> For stems less than 8 cm basal diameter, spray a band 5 cm wide on one side of each stem. For stems 8–15 cm basal diameter, spray a band 5 cm wide on two sides of each stem (two-sided streamline). With sufficient volume, the treated zone should widen to encircle the entire stem circumference within 30 minutes. |  |
| CUT STUMP TREATMENT | <p>This method is excellent for prevention of re-sprouting. It also reduces the need for repeated cutting of large diameter stumps of species that sprout from the base or suck from roots. Applications may be made to both old and freshly cut stumps.</p> <p>Thoroughly wet the stump, including:</p> <ul style="list-style-type: none"> Cut surfaces, especially the cambium layer just inside the bark. The remaining bark to the ground line, including the root collar. |  |

WHEN TO APPLY:

| | |
|-------|---|
| TREES | <p>Optimal results are achieved when applications are made to young, vigorously growing stems that have not developed the thicker bark characteristic of slower growing older trees.</p> <p>For best results, apply when stem and bark are dry.</p> <p>Garlon™ RTU herbicide can be applied at any time, including the winter months, except when snow or water prevents spraying at the ground line.</p> |
|-------|---|

OPTIMIZING PERFORMANCE

| | |
|---|--|
| <p>"Free water" on stems resulting from melting frost, wet snow or rain causes emulsification and failure to penetrate bark during streamline and stump treatments. Emulsified herbicide can run down the treated stem like water, showing no evidence of "wrap". If the wetting front formed by the oil in the bark does not wrap, then control is likely to be incomplete. Tips for best results include:</p> | |
| FROST | If no emulsification occurs (dry frost), then the solution is working. If the oil solution does not penetrate the frost (ice), shut down the application. Watch for frost as temperature rises above 0°C and moisture appears on stems. |
| POTENTIAL SPRAY DRIFT | Keep application pressure low to prevent vapour drift. Small quantities of vapour drift, which may not be visible, can seriously injure susceptible plants and sensitive non-target vegetation. |
| RAIN | Basal bark and cut stump applications cannot be made to wet stumps or emulsification may occur and the target trees will not be controlled. However, rain immediately after an application will not affect the efficacy of the product as it will have already entered the bark. |
| SNOW | When snow prevents access to ground line at the base of target trees, one-sided application should be stopped. Two-sided streamline application should be used on larger stems to ensure wrap. |
| TEMPERATURE | Garlon™ RTU herbicide can be applied at temperatures below -10°C anytime throughout the year. However, if temperature drops too low and coagulation begins to occur, applicators should stop operations. |

PACKAGE DISPOSAL:

Garlon RTU containers should not be reused for any purpose. For disposal please contact and return to the distributors as per their instructions.

If the cardboard shows no sign of pesticide contamination, remove the plastic bag inserts and recycle the cardboard box locally. Collect empty plastic bags together and do not triple rinse.

Return the plastic bag inserts or the whole package to the distributors as per their instructions.

GRAZING:

There is no restriction on livestock grazing treated areas.

Garlon™ XRT

HERBICIDE

Gateway™

ADJUVANT

Garlon™ XRT herbicide plus Gateway™ adjuvant is an industry leading advanced formulation for the professional vegetation manager.

NEW - Garlon XRT herbicide is now registered for application by Remotely Piloted Aircraft Systems (drone)! Refer to product label for details.

WHY USE GARLON™ XRT HERBICIDE?

- **Selective.** Desirable species such as forbs and wild flowers return post treatment much sooner than competitive alternatives.
- **Peace of mind.** Professional vegetation managers can confidently apply to the outer edge of desirable trees without risking potential root uptake or damage.
- **Industry leading.** The addition of Gateway adjuvant to Garlon XRT provides superior control of deciduous trees.

TREES AND BRUSH SPECIES CONTROLLED

Alder
Ash
Aspen
Basswood
Beech
Birch
Blackberry
Buckthorn
Cherry*
Chokecherry*
Cottonwood
Dogwood

Elderberry
Elm*
Hawthorn
Hickory
Honey locust*
Hop-hornbeam
Locust
Maples
Mulberry
Oaks*
Poison oak
Pines*

Poplar
Red maple*
Raspberry*
Sassafras
Sumac
Sycamore
Tamarack
Wild rose
Willow
Witch hazel

BROADLEAF WEEDS CONTROLLED

Burdock
Chicory
Curled dock
Dandelion

Dog strangling vine¹
Field bindweed
Lamb's-quarters
Ragweed

Smartweed
Smooth bedstraw
Vetch
Wild lettuce

¹Suppression at 2.5 L/ha and Control at 5 L/ha when applied with Gateway™ adjuvant at 0.375% v/v.

*These species may require treatment at the higher rate and may need to be re-treated the following year, particularly if the original treatment was made at the lower rate.

For more information
on Garlon XRT visit:



USE GUIDELINE

RATES AND PACKAGING:

| | |
|------------------|--|
| PACKAGING | 2 x 10 L jugs/case, 110 L drum |
| RATES | Broadleaf weed and deciduous tree control: 2.5 – 5 L of Garlon™ XRT herbicide plus 0.25 – 0.375% v/v Gateway™ adjuvant in a minimum of 200 L of water per hectare. |

APPLICATION METHODS:

| | |
|------------------------------------|--|
| SINGLE STEM FOLIAR | For control of woody plants up to 2.5 m in height, use Garlon XRT at rates of 2.5 – 5 L plus 0.25 – 0.375 % v/v of Gateway in enough water to make 1,000 L of spray solution. Use the higher rate for late summer application when growth rates are reduced or when hard-to-control species are present. Spray brush to the point of runoff. Coverage should be thorough to wet all foliage. |
| LOW VOLUME FOLIAR | For control of woody plants up to 2.5 m in height use this technique with knapsack or backpack sprayers equipped with flat fan or solid cone nozzles. For control of woody plants, mix 0.6 – 3 L of Garlon XRT plus 0.25 – 0.375% v/v of Gateway in enough water to make 100 L of spray solution. Direct the spray solution to thoroughly wet the foliage of the target plants, but not to the point of runoff. Apply after full leafout, but before autumn colouration. |
| BASAL BARK/ STUMP TREATMENT | For selective control of woody plants, Garlon XRT can be used in oil mixtures and applied using the streamline or stump treatment technique. Use a diluent such as mineral oil or vegetable oil. Add Garlon XRT to the required amount of oil in the mixing tank and mix thoroughly. If basal bark and stump treatment applications are required, please see Garlon™ RTU for additional information. |

- Use higher rates when hard-to-control species such as ash, chokecherry, elm, maple (other than vine or big leaf), oaks or pine are present. If lower rates are used on hard-to-control species, resprouting may occur and re-treatment may be necessary the following year.
- Avoid applications in hot temperatures. If temperatures reach 28°C or higher, cease applications for the day.

WHEN TO APPLY:

| | |
|--------------|--|
| WEEDS | Apply to actively growing weeds, after emergence, prior to flowering. |
| TREES | Apply after full leafout to actively growing trees, prior to autumn colouration. |

Avoid applying to plants under stress.

RAINFAST: 2 hours

GRAZING:

Beef livestock:

- There is no restriction on livestock grazing treated areas for areas applied with up to 3 L/ha.
- 3–5 L/ha: Do not graze or harvest green forage from treated area for 14 days following treatment. Note: No grazing restriction for beef livestock if less than 25% of the grazed area has been treated.

Gateway™

ADJUVANT

Gateway™ adjuvant is an innovative non-ionic, paraffinic oil blend surfactant developed for use with the IVM portfolio of products from Corteva Agriscience™.

WHY USE GATEWAY™ ADJUVANT?

- **Industry leading technology.** An innovative adjuvant formulation unique to Corteva Agriscience and non-ionic surfactants.
- **Performance.** Gateway improves plant uptake in challenging environmental conditions.
- **Tank mixability.** Labelled for use with the IVM portfolio of products from Corteva Agriscience requiring surfactants.

USE GUIDELINE

RATES AND PACKAGING:

| | |
|-----------|--|
| PACKAGING | 4 x 4 L jugs |
| RATES | <ul style="list-style-type: none"> • 0.25 – 1% v/v (2.5 L – 10 L Gateway adjuvant/1,000 L spray mixture) • Use the higher rate in adverse conditions, such as dense weed populations, late weed growth stages, poor environmental conditions or with certain multiple-product tank mixes. • Refer to individual herbicide product labels for additional details on rate of use and mixing instructions. |

TANK MIXES

Gateway is recommended for use with the following herbicides: Aspect™, ClearView™, Garlon™ XRT, Milestone™ NXT with Rinskor™ active and Sightline™. For additional products refer to the Gateway label.

For more information
on Gateway visit:



Corteva Agriscience™ IVM Herbicide Spot Application Rates

The following spot application rate recommendations for Industrial Vegetation Management (IVM) products are for individual plant spot treatments only. If you are using a calibrated hose and handgun and attempting to mimic a broadcast sprayer, please use the broadcast rate. For additional weed, brush and tree application information including staging or broadcast rates please refer to the product label or contact your Corteva Agriscience Regional Account Manager.

| Aspect™ herbicide | |
|-------------------|----------------|
| Aspect Required | Spray Solution |
| 67 mL | 10 L |
| 670 mL | 100 L |

Thoroughly wet foliage up to the point of run off.

Recommend use of Gateway™ adjuvant @ 37.5 mL/ 10 L spray solution for tree and brush control.

| ClearView™ herbicide | | |
|----------------------|----------------------|----------------|
| ClearView Required | Surfactant (Gateway) | Spray Solution |
| 2.3 grams | 20 mL | 10 L |
| 23 grams | 200 mL | 100 L |

Thoroughly and uniformly wet the foliage of all target plants but not to the point of runoff.

2.3 grams is apx. equivalent to 1 tsp.

| Garlon™ XRT herbicide | |
|---|--|
| Rates will be based on tree height and application method. Contact your Corteva Agriscience Regional Account Manager for recommendations. | |

| Lontrel™ XC herbicide | |
|-----------------------|----------------|
| Lontrel XC Required | Spray Solution |
| 5 mL | 10 L |
| 50 mL | 100 L |

Thoroughly and uniformly wet the foliage of all target plants but not to the point of runoff.

| Milestone™ NXT herbicide with Rinskor™ active | | |
|---|----------------------|----------------|
| Milestone NXT Required | Surfactant (Gateway) | Spray Solution |
| 2 grams | 50 mL | 10 L |
| 20 grams | 500 mL | 100 L |

Thoroughly and uniformly wet the foliage of all target plants but not to the point of runoff.

| Milestone™ herbicide | |
|----------------------|----------------|
| Milestone Required | Spray Solution |
| 5 mL | 10 L |
| 50 mL | 100 L |

Thoroughly and uniformly wet the foliage of all target plants but not to the point of runoff.

| Sightline™ herbicide | | | |
|----------------------|----------------------|----------------------|----------------|
| Sightline A Required | Sightline B Required | Surfactant (Gateway) | Spray Solution |
| 2.3 grams | 8.4 mL | 20 mL | 10 L |
| 23 grams | 84 mL | 200 mL | 100 L |

Thoroughly and uniformly wet the foliage of all target plants but not to the point of runoff.

2.3 grams is apx. equivalent to 1 tsp.

| Tordon™ 22K herbicide (Spot treatment rate may be used provided no more than 50% of a hectare is treated) | |
|---|----------------|
| Tordon 22K Required | Spray Solution |
| 50 mL | 10 L |
| 500 mL | 100 L |

Thoroughly wet foliage but not to the point of run off.

PRODUCT SOLUTIONS TO FIT YOUR NEEDS

| BROADLEAF WEEDS AND SHRUBS | MILESTONE™ NXT HERBICIDE | MILESTONE™ NXT + 2,4-D HERBICIDES | MILESTONE™ HERBICIDE | MILESTONE™ + 2,4-D HERBICIDES | CLEARVIEW™ HERBICIDE | CLEARVIEW™ + 2,4-D HERBICIDES | SIGHTLINE™ HERBICIDE | ASPECT™ HERBICIDE | GARLON™ XRT HERBICIDE + GATEWAY™ ADJUVANT | LONTREL™ XC HERBICIDE | OCTAIN™ XL HERBICIDE | TORDON™ 22K HERBICIDE |
|---------------------------------|-----------------------------|---|-------------------------|-------------------------------------|-------------------------|-------------------------------------|-------------------------|----------------------|--|--------------------------|-------------------------|--------------------------|
| ABSINTHE WORMWOOD | x | x | x | x | x | x | x | | | | | |
| ALSIKE CLOVER | | | | | | | | | | x | | |
| ANNUAL SOW-THISTLE | x (up to 3 cm) | x | | x | | x | | | | | ^^^ | |
| BABY'S BREATH | | | | | x | x | x | | | | | |
| BALL MUSTARD | | | | | x | x | x | | | | | |
| BITTER SNEEZEWEED | x | x | x | x | | | | | | | | |
| BLACK HENBANE | | | | | x | x | x | | | | | |
| BLUE LETTUCE (TOP GROWTH) | | x | | x | | x | | | | | x | |
| BLUEBUR | | x | | x | x | x | x | | | | x | |
| BROWN KNAPWEED | | | | | x | x | x | | | | | |
| BULL THISTLE | x | x | x | x | x | x | x | | | | | |
| BURDOCK <4 LEAF | | x | | x | | x | | x | x | | x | |
| CANADA FLEABANE | 9 | 9 | x | x | x | x | x | x | | | | |
| CANADA GOLDENROD | ^^^ | x | ^^^ | x | ^^^ | x | ^^^ | x | | | | |
| CANADA THISTLE | x | x | x | x | x | x | x | x | | x | ^^ | x |
| CHICKWEED | | | | | x | x | x | | | | ^^^ (up to 8 cm) | |
| CHICORY | | | | | | | | | x | | | |
| CLEAVERS | 10 | 10 | | | x | x | x | | | | x (1-8 whorl) | |
| CLOVER | x | x | x | x | x | x | x | x | | | | |
| COCKLEBUR | | x | | x | | x | | | | | x | |
| COMMON BROOMWEED | x | x | x | x | | | | | | | | |
| COMMON GROUNDSEL | | | | | x | x | x | | | x | | |
| COMMON PLANTAIN | | x | | x | | x | | x | | | x | |
| COMMON RAGWEED | x | x | x | x | x | x | x | x | x | x | x | |
| COMMON TANSY | ^^^ | x | ^^^ | x | x | x | x | | | | | |
| COMMON WATERHEMP | 11 | 11 | | | | | | | | | | |
| COMMON YARROW | ^^^ | ^^^ | ^^^ | ^^^ | ^^^ | | ^^^ | x | | | | |
| CORN SPURRY | | | | | x | x | x | | | | | |
| COW COCKLE | | | | | x | x | x | | | | | |
| CUDWEED | x | x | x | x | x | x | x | | | | | |
| CURLY DOCK | x | x | x | x | x | x | x | x | x | | x | |
| DANDELION | ^^^ | x | ^^^ | x | x | x | x | x | x | | spring rosettes | |
| DIFFUSE KNAPWEED | 5 | 5 | 5 | 5 | ΔΔΔ | ΔΔΔ | ΔΔΔ | | | | | x |
| DOG MUSTARD | | | | | | | | | | | x | |
| DOG STRANGLING VINE | | | | | | | | | x | | | |
| FIELD BINDWEED | | | | | | | | | x | | ^^ | x |
| FIELD HORSETAIL (TOP GROWTH) | | | | | | | | | | | x | |
| FIELD PEPPERGRASS | | | | | | | | | | | x | |
| FIELD SCABIOUS | | | | | x | x | x | | | | | |
| FIREWEED | x | x | x | x | x | x | x | | | | | |
| FLIXWEED | | x | | x | x | x | x | | | | x | |
| FULLER'S TEASEL | x | x | x | x | | | | | | | | |
| GOAT'S-BEARD | | x | | x | | x | | | | | x | |

Product Solutions to Fit Your Needs

| BROADLEAF WEEDS, SHRUBS AND GRASS | MILESTONE™ NXT HERBICIDE | MILESTONE™ NXT + 2,4-D HERBICIDES | MILESTONE™ HERBICIDE | MILESTONE™ + 2,4-D HERBICIDES | CLEARVIEW™ HERBICIDE | CLEARVIEW™ + 2,4-D HERBICIDES | SIGHTLINE™ HERBICIDE | ASPECT™ HERBICIDE | GARLON™ XRT HERBICIDE + GATEWAY™ ADJUVANT | LONTREL™ XC HERBICIDE | OCTTAIN™ XL HERBICIDE | TORDON™ 22K HERBICIDE |
|---|-----------------------------|---|-------------------------|-------------------------------------|-------------------------|-------------------------------------|-------------------------|----------------------|--|--------------------------|--------------------------|--------------------------|
| GUMWEED (TOP GROWTH) | | x | | x | | x | | | | | x | |
| HAIRY BUTTERCUP | x | x | x | x | | | | | | | | |
| HAIRY FLEABANE | x | x | x | x | | | | | | | | |
| HAIRY GALINSOGA | | | | | | | | | | | x | |
| HAWKWEED | | x | | x | | x | | | | | | |
| HEDGE BINDWEED | | | | | | | | | | | x | |
| HEMP-NETTLE | | | | | x | x | x | | | | x | |
| HOARY ALYSSUM | | | | | x | x | x | | | | | |
| HOARY CRESS (TOP GROWTH) | | x | | x | x | x | x | | | | x | |
| HORSENETTLE | x | x | x | x | x | x | x | | | | | |
| HOADS TONGUE | | | | | x | x | x | | | | | |
| JAPANESE KNOTWEED | 7 | 7 | 7 | 7 | x | x | x | | | | | |
| KOCHIA | | | | | Δ | Δ | x | | | | x | |
| KUDZU | | | | | | | | | | ^ | | |
| LADY'S-THUMB | | | | | x | x | x | | | | x | |
| LAMB'S-QUARTERS | 12 | 12 | | | ^^^ | x | ^^^ | | x | | x | |
| LEAFY SPURGE | | | | | | | | * | | | | x |
| MULLEIN | x | x | x | x | x | x | x | | | | | |
| MUSK OR NODDING THISTLE | x | x | x | x | x | x | x | | | | | |
| MUSTARDS (EXCEPT GREEN TANSY & GREY TANSY) | | | | | | | | | | | x | |
| NARROW-LEAVED HAWK'S-BEARD | | | | | x | x | x | | | | | |
| OAK-LEAVED GOOSEFOOT | | | | | | | | | | | x | |
| ORANGE HAWKWEED | 8 | 8 | 8 | 8 | ΔΔΔΔ | ΔΔΔΔ | ΔΔΔΔ | | | | | |
| OX-EYE DAISY | 2 | 2 | 2 | 2 | 2 | 2 | 2 | | | ^^^ | | |
| PASTURE SAGE (FRINGED SAGE) | | | | | x | x | x | | | | | x |
| PEPPERGRASS | | x | | x | | | | | | | | |
| PERENNIAL PEPPERWEED | | | | | x | x | x | | | | | |
| PERENNIAL SOW-THISTLE | x | x | x | x | x | x | x | | | ^^ | ^^^ | x |
| PLUMELESS THISTLE | x | x | x | x | x | x | x | | | | | |
| POISON HEMLOCK | x | x | | | | | | | | | | |
| POVERTY WEED | | | | | | | | | | | | x |
| PRAIRIE SAGE | | | | | ^^^ | x | ^^^ | | | | | |
| PRAIRIE WILD ROSE | | | | | x | x | x | | x | | | |
| PRICKLY LETTUCE | x | x | x | x | x | x | x | x | | | x | |
| PROSTRATE PIGWEED | | | | | x | x | x | | | | | |
| PURPLE LOOSESTRIFE | x | x | x | x | x | x | x | | | | | |
| PUSSYTOES | | | | | x | x | x | | | | | |
| REDROOT PIGWEED | | | | | | | | | | | x | |
| ROUND-LEAVED MALLOW (1-6 LEAF) | | | | | | | | | | | x | |
| RUSH SKELETONWEED | x | x | x | x | x | x | x | | | | | |
| RUSSIAN Knapweed | 6 | 6 | 6 | 6 | | | | | | | | x |
| RUSSIAN THISTLE | | | | | x | x | x | | | | x | |
| SCENTLESS CHAMOMILE | x | x | x | x | x | x | x | | | x | | x |
| SCOTCH THISTLE | x | x | x | x | x | x | x | | | | | |
| SHEEP SORREL | | | | | | | | | | ^^^ | | |
| SHEPHERD'S PURSE | | | | | x | x | x | | | | x | |

Product Solutions to Fit Your Needs

| BROADLEAF WEEDS, SHRUBS AND GRASS | MILESTONE™ NXT HERBICIDE | MILESTONE™ NXT + 2,4-D HERBICIDES | MILESTONE™ HERBICIDE | MILESTONE™ + 2,4-D HERBICIDES | CLEARVIEW™ HERBICIDE | CLEARVIEW™ + 2,4-D HERBICIDES | SIGHTLINE™ HERBICIDE | ASPECT™ HERBICIDE | GARLON™ XRT HERBICIDE + GATEWAY™ ADJUVANT | LONTREL™ XC HERBICIDE | OCTTAIR™ XL HERBICIDE | TORDON™ 22K HERBICIDE |
|--------------------------------------|-----------------------------|---|-------------------------|-------------------------------------|-------------------------|-------------------------------------|-------------------------|----------------------|--|--------------------------|--------------------------|--------------------------|
| SHRUBBY CINQUEFOIL | | | | | | x | | | | | | |
| SILVERBERRY (WOLF WILLOW) | | | | | ^^^ | x | ^^^ | | | | | |
| SMARTWEED (GREEN) | | | | | x | x | x | | x | | x | |
| SMOOTH BEDSTRAW | | | | | | | | | x | | | |
| SPOTTED KNAPWEED | x | x | x | x | x | x | x | | | | | x |
| STINGING NETTLE | | x | | x | | x | | | | | | |
| STINKWEED | | | | | x | x | x | | | | x | |
| STORK'S-BILL | | | | | x | x | x | | | | 1-8 leaf | |
| SULPHUR CINQUEFOIL | 4 | 4 | 4 | 4 | | | | | | | | |
| SUNFLOWER (ANNUAL) | | | | | | | | | | | x | |
| SWEET CLOVER | | x | | x | x | x | x | x | | | x | |
| TALL BUTTERCUP | x | x | x | x | x | x | x | | | | | |
| TALL IRONWEED | x | x | x | x | | | | | | | | |
| TANSY MUSTARD | | | | | | | | | | | x | |
| TANSY RAGWORT | x | x | x | x | | | | | | | | |
| TARTARY BUCKWHEAT | | | | | x | x | x | | | | x | |
| TROPICAL SODA APPLE | 3 | 3 | 3 | 3 | | | | | | | | |
| TROPIC CROTON | x | x | x | x | | | | | | | | |
| VELVETLEAF | 13 | 13 | | | | | | | | | | |
| VETCH | | | | | | | | x | x | x | x | |
| VOLUNTEER ALFALFA | | | | | x | x | x | | | x | | |
| VOLUNTEER CANOLA | | | | | ΔΔ | ΔΔ | ΔΔ | | | | x | |
| VOLUNTEER FLAX | | | | | | | | | | | 1-12 cm | |
| VOLUNTEER SOYBEAN | | | | | | | | | | x | | |
| WESTERN RAGWEED | x | x | x | x | x | x | x | | x | | x | |
| WESTERN SNOWBERRY (BUCKBRUSH) | | | | x | ^^^ | x | x | | | | | |
| WILD BUCKWHEAT | | | | | ^^^ | x | ^^^ | | | x | 1-8 leaf | |
| WILD CARAWAY | x | x | | | x | x | x | | | | | |
| WILD CARROT | | | | | x | x | x | x | | | | |
| WILD CHERVIL | 14 | 14 | | | | | | | | | | |
| WILD LETTUCE | | | | | | | | | x | | | |
| WILD MUSTARD | | | | | x | x | x | | | | | |
| WILD PARSNIP | x | x | | | x | x | x | | | | | |
| WILD RADISH | | | | | | | | | | | x | |
| WILD STRAWBERRY | | | | | x | x | x | | | | | |
| YELLOW HAWKWEED | | | | | ΔΔΔΔ | ΔΔΔΔ | ΔΔΔΔ | | | | | |
| YELLOW STAR-THISTLE | 1 | 1 | 1 | 1 | x | x | x | | | | | |
| YELLOW TOADFLAX | | | | | | | | * | | | | x |

This is meant as a reference guide; always read and follow label directions. If there is a species not listed here you are seeking to control, please contact your Corteva Agriscience™ representative for recommendations.

Δ Non ALS resistant biotypes.

ΔΔ All varieties except ALS resistant canola.

ΔΔΔ Apply ClearView at 230 g/ha when plants are actively growing with the optimum time of application occurring from rosette to the bolting stages of development or in the fall. Plants will be controlled by mid-summer and fall application even though plants may not show any changes in form or stature the year of application.

ΔΔΔΔ Apply ClearView at 230 g/ha to plants in the bolting stage of development.

* For control of leafy spurge and toadflax under less-than-optimum growing conditions, use a recommended surfactant such as Gateway adjuvant at the rate of 0.25–0.375% by volume (250–375 ml per 100 L of water).

^ Up to season long suppression of top growth.

^^ Top growth control.

^^^ Suppression.

¹ Yellow star-thistle: Apply to plants at the rosette through bolting growth stage.

² Ox-eye daisy: Apply to plants in the pre-bud stages of development.

³ Tropical soda apple: Apply to any growth stage, but application by flowering will reduce seed production.

⁴ Sulphur cinquefoil (suppression): Apply to plants in the pre-bud stage of development.

⁵ Diffuse knapweed (suppression): Apply to plants in the bolting stage of development.

⁶ Russian knapweed (suppression): Apply to plants in the spring and summer that are in the bud to flowering.

⁷ Japanese knotweed (suppression): Apply to plants 0.9–1.2 m tall.

⁸ Orange hawkweed: For seasonal and 12 month control, apply to plants in the bolting stage of development.

⁹ Canada fleabane: Bolting up to 20 cm

¹⁰ Cleavers: Up to 10 cm

¹¹ Common waterhemp: Up to 3 leaf and 8 cm

¹² Lamb's quarters: Prior to budding stage

¹³ Velvetleaf: Up to 3 leaf and 8 cm

¹⁴ Wild chervil: Up to budding stage and 40 cm

| TREE SPECIES | CLEARVIEW™ + GARLON™ XRT HERBICIDES + GATEWAY™ ADJUVANT | GARLON™ XRT HERBICIDE + GATEWAY™ ADJUVANT | GARLON™ RTU HERBICIDE | ASPECT™ HERBICIDE |
|--------------|---|--|--------------------------|----------------------|
| ALDER | x | x | x | x |
| ASH | x | x | x | |
| ASPEN | x | x | x | |
| BASSWOOD | x | x | x | |
| BEECH | x | x | x | |
| BIRCH | x | x | x | x |
| BLACKBERRY | x | x | x | |
| BUCKTHORN | x | x | x | |
| CEDAR | | | | x |
| CHERRY | x | * | * | |
| CHOKECHERRY | x | * | * | |
| COTTONWOOD | x | x | x | |
| DOGWOOD | x | x | x | |
| ELDERBERRY | x | x | x | |
| ELM | x | * | * | |
| HAWTHORN | x | x | x | |
| HICKORY | x | x | x | |
| HONEY LOCUST | x | * | * | |
| HOP-HORNBEAM | x | x | x | |
| LOCUST | x | x | x | |
| MAPLE | x | x | x | x |
| MULBERRY | x | x | x | |
| OAKS | x | * | * | |
| PINE | x | * | * | x |
| POISON OAK | x | x | | |
| POPLAR | x | x | x | x |
| RASPBERRY | x | * | | |
| RED MAPLE | x | * | * | |
| SASSAFRAS | x | x | x | |
| SPRUCE | x | | | x |
| SUMAC | x | x | x | |
| SYCAMORE | x | x | x | |
| TAMARACK | x | x | x | |
| WILLOW | x | x | x | |
| WITCH HAZEL | x | x | x | |

*These species may need to be re-treated the following year, particularly if the original treatment was made at the lower rate.

IVM SPRAYER CALIBRATION CALCULATOR

Properly calibrated equipment is essential to the effective use of Corteva Agriscience vegetation management herbicides, and ensuring proper stewardship of these products.

Our sprayer calibration calculator will assist Industrial Vegetation Management applicators in properly calibrating ground application equipment. It will also provide you with guidance on how much product to put in each tank and what order to put the products in the tank. Input tank size, products and rates for a quick calculation of how much of each product to use and proper application speed.

The IVM Sprayer Calibration Calculator is easy to use and is available in both desktop and mobile-friendly versions.

Try it now at IVMCalibrationCalculator.corteva.ca

Sprayer Speed Calculator

SPRAYER TYPE

Are you using a boomed or boomless sprayer?

Boomed

NOZZLES

How many nozzles are on your sprayer?

SPACING

What is the spacing between each nozzle?

cm in

NOZZLE OUTPUT

What is the average output per nozzle in 30 seconds

ml oz

SPRAY OUTPUT

What is your total desired spray volume per hectare or acre?

L/ha USG/ac

RECOMENDED SPRAYING SPEED

Based on the values provided, your ideal spray speed is:

0.0

km/h mph

CALCULATE

NOTE: The IVM Sprayer Calculator should be used as a guide only. Always read and follow label directions.



NOTES: _____

STEWARDSHIP

SUSTAINABLE VEGETATION MANAGEMENT

The effective use of vegetation management herbicides is essential to controlling target weeds and brush. Corteva Agriscience™ is committed to providing vegetation management professionals with the products and tools to get the job done right and ensuring that the practices used are sustainable in the long term.

STEWARDSHIP TRAINING AVAILABLE

All Corteva Agriscience IVM Experts can provide detailed information to answer your questions about products, application procedures and safety. Our representatives are available to train your applicators on a variety of subjects, including: Corteva Agriscience products, product application procedures, human and environmental safety and professionalism. Contact your Corteva Agriscience IVM Expert for details or to book a training session.

MANAGING INVASIVE PLANTS CROSSES FENCE LINES

Invasive plant control is not only critical in industrial right of ways, roadside and other non-crop area vegetation management. It is also crucial on private permanent grass pastures and rangeland. Controlling invasive plants with a herbicide is an effective way to reduce the spread and infestation of a species that may have the potential to be detrimental to biodiversity and the ecosystem.

Corteva Agriscience offers effective herbicide solutions for invasive plant control on rangeland and permanent pastures. We also provide an educational brochure used by counties and municipalities to promote the control of invasive plants with area residents. To learn more about Corteva Agriscience herbicides designed for range and pasture use, please visit IVM.corteva.ca.

PROTECTING POLLINATORS

Bees are one of several types of pollinators that feed from flowers, transferring pollen in the process. Other examples include butterflies and hummingbirds.

Herbicides target a specific pathway in plants. These target sites do not exist in pollinators, including bees. For this reason, herbicides from Corteva Agriscience do not have an adverse effect on pollinators when used according to the label.

Controlling invasive species with herbicides is beneficial for ensuring food stability for pollinators. When invasive plants, such as spotted or diffused knapweed, overtake an area they can choke out a variety of native species. Invasive weeds can flower once annually, while native plants flower throughout the whole growing season, providing a continual food source for pollinators. By eliminating the invasive plant types, the native species will re-establish themselves from seed, providing more sustainable foraging ground and habitat for bees and other pollinators.

SCIENCE BASED SOLUTIONS

Corteva Agriscience is committed to investing globally in products specifically designed to meet the needs of the industrial vegetation management market. This investment funds active ingredient discovery for non crop uses, advancements in formulations that are easier to use, and a continued focus to make sure that our chemistry couples performance together with the highest standards in safety to applicators, the general public, wildlife, pollinators and the environment.

USE AROUND TREES

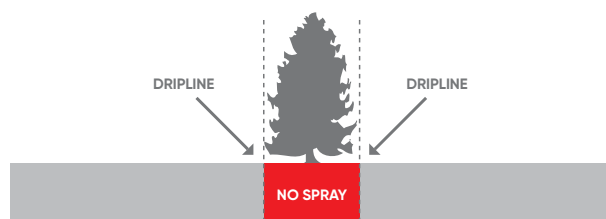
Aspect™, ClearView™, Milestone™, Milestone™ NXT with Rinskor™ active, Tordon™ 22K and Sightline™ herbicides may have activity on woody species, including trees, when applied to the soil within the root zone. These products should not be used as a spray application under the tree canopy.

ClearView, Garlon™ XRT, Garlon™ RTU, Milestone and Milestone NXT herbicides should NOT be used over the top of desirable trees. Application may be made up to the dripline (outermost edge of the branches) of desirable trees. Milestone, Milestone NXT, ClearView and Sightline can be applied up to the dripline of the following species:

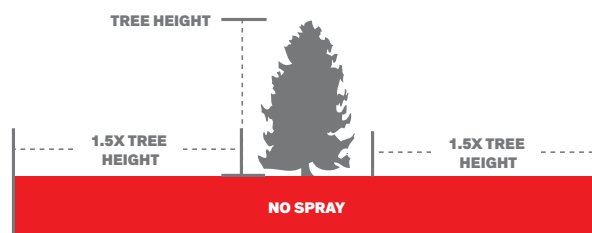
- | | |
|----------------------|---|
| • Ash | • Maple |
| • Aspen | • Oaks |
| • Birch | • Ponderosa and lodgepole pines (<i>may cause transient leaf curling that will disappear</i>) |
| • Black cherry | • Poplar |
| • Cottonwood | • Spruce species |
| • Dogwood | • Sweetgum |
| • Eastern white pine | • Willow |
| • Elm | |
| • Fir | |
| • Junipers | |

Use caution when using Milestone, Milestone NXT, ClearView and Sightline around the following species. Greatest caution should be taken around those species with extensive lateral root systems, shallow rooting species and those that propagate vegetatively through layering.

- | | | |
|----------------|------------------------|----------|
| • Black locust | • Honey locust | • Redbud |
| • Caragana | • Mimosa | • Rose |
| • Cedar | • Other locust species | |



- Sightline, ClearView, Milestone and Milestone NXT should NOT be used over the top of desirable trees. Application may be made up to the dripline (outermost edge of the branches) of desirable trees. Use additional caution around lateral root systems, shallow rooting species and those that propagate vegetatively through layering.

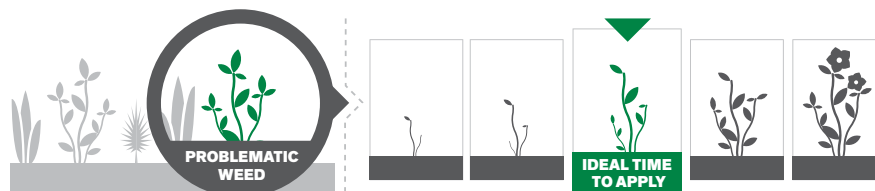


- Aspect and Tordon 22K should NOT be used over the top of desirable trees. Applications should remain a distance of 1.5x the height of desirable trees at all times.
- Do not apply Aspect and Tordon 22K to coarse texture soils (> 40% sand) with a high water table (within 1.8 metres or 6 feet of the soil surface).
- Do not apply Aspect and Tordon 22K within 30 metres (approximately 100 feet) of an open water body (does not include dugouts) or as per provincial regulations.

CAUTION: DO NOT use Aspect, ClearView, Milestone, Milestone NXT, Tordon 22K or Sightline over the top of, or directly under, any desirable tree species; injury or death can also result from foliar applications to trees.

APPLICATION TIMING

Herbicide application should be made after the majority of the target weed populations have emerged and are actively growing.



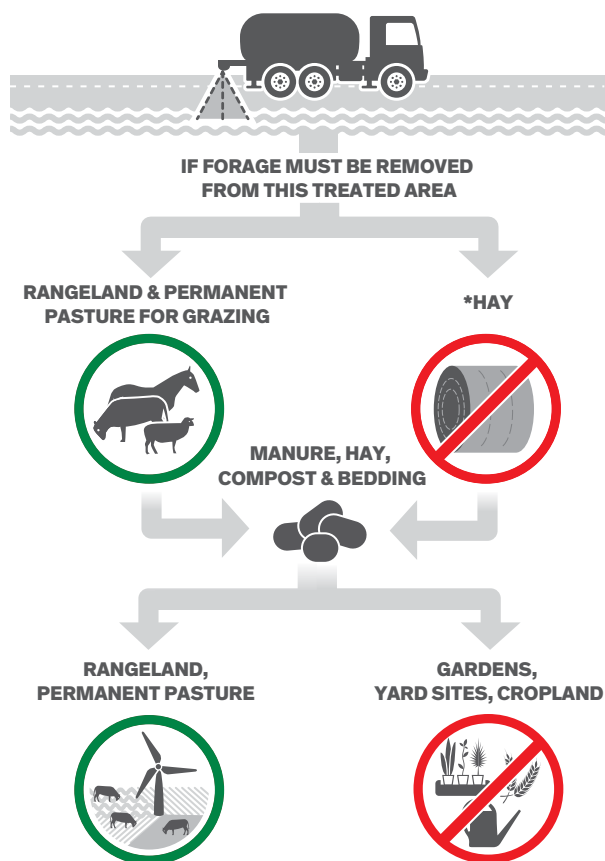
- The ideal timing for application will generally be in June through to mid-July with the exception of Canada thistle, which enters its ideal timing in mid- to late July when the majority of plants have emerged.
- Timing varies from season to season due to environmental conditions that influence growth and plant staging.
- When targeting shrubs such as buckbrush or wolf willow, they must be fully leafed out prior to an application.

HAY, SOIL AND MANURE MANAGEMENT

Treated area:

Vegetation management products.

- Soil from treated areas should never be moved to areas where sensitive plants may be planted within five years.
- Manure from livestock consuming treated grass should never be used for compost or around susceptible plants.
- Clippings from grass that has been treated with Corteva Agriscience™ vegetation management products should never be used for composting or mulching.
- Please contact your Corteva Agriscience IVM Expert with additional questions regarding hay, soil and manure management.



* If forage must be removed from treated area.

RE-SEEDING AND GRASS TOLERANCE



- Newly seeded grass should not be sprayed until secondary root development and a minimum of four leaf surfaces have established – well past the seedling stage.



- Safe to established grasses.
- Grasses may be seeded 10 months following an application.
- Legume re-establishment may be affected for up to five years.
- Soil organic matter, rainfall and temperature all affect the rate of degradation.

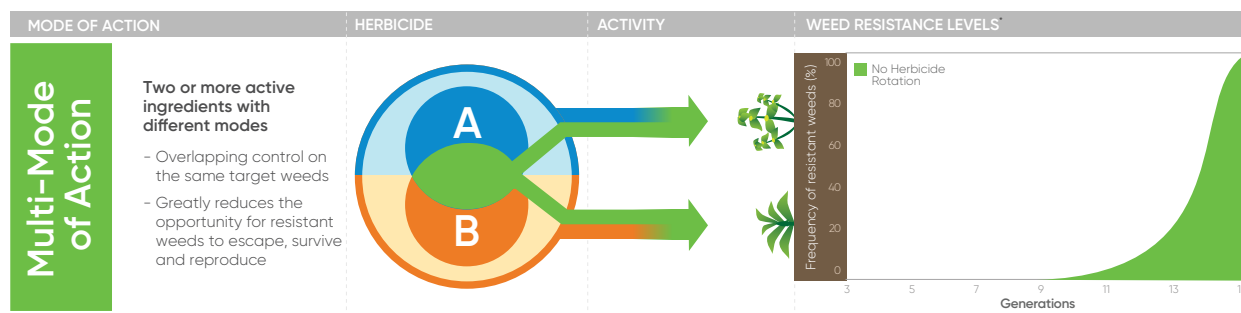


- Avoid application under stress conditions when grass is not actively growing (hot or cold weather, excessive moisture, or drought) as grass injury, including leaf discolouration and stunting of growth in the season of application may result.

MULTIPLE MODES OF ACTION

Products with multiple modes of action contain two or more active ingredients with different modes of action that deliver overlapping control on the same target weeds.

The use of multiple modes of action on key weeds will provide more effective control and will delay the onset of resistance.



* Adapted from: Powles, S.B., Preston, C., Bryan, I.B., and Jutsum, A.R., (1997) Herbicide Resistance: Impact and Management. *Advances in Agronomy*: Vol. 58, pp. 57-93. Herbicide rotation alone will delay the onset of resistance; however, incorporating Multi-Mode of Action products in conjunction with rotation is a more effective resistance management strategy. The graphs depicting frequency of resistant weeds over generations is a hypothetical example valid only for the modeled parameters. Actual rates of weed resistance development and increase are dependent on a variety of conditions, including the weed species, propensity for outcrossing, seed dormancy, mode of inheritance of the resistance trait, herbicide mode of action and herbicide efficacy.

RESISTANCE MANAGEMENT IN CANADA

BEST PRACTICES FOR INDUSTRIAL VEGETATION MANAGEMENT

As a professional vegetation manager, it is important to understand how weeds develop resistance and what strategies can be implemented to delay resistance.

Proper application and stewardship of vegetation management herbicides are essential to controlling target weeds and brush, and ensuring environmental, wildlife and human safety. Corteva Agriscience™ is committed to providing vegetation management professionals with the products, tools and education to get the job done right, ensuring the practices used are sustainable in the long term.

WHAT IS HERBICIDE RESISTANCE?

Resistance is the naturally occurring inheritable ability of some weed biotypes within a given weed population to survive a herbicide treatment that would, under normal use conditions, effectively control that weed population.

Research shows herbicide resistance is increasing globally due to the frequent use of herbicides with a similar site of action in a growing season in the same field; crop rotations that rely on similar site of action herbicides; and limited use of non-herbicide weed control options.

HERBICIDE RESISTANCE IN CANADA

Today, Canadian industrial vegetation managers have approximately eight groups of herbicides available to control target weeds on industrial sites. To date, the development of resistant weeds in industrial settings in Canada has been limited thanks to best management practices already being implemented by professional vegetation managers, such as:

- using full rates
- calibrating equipment to ensure proper rates are being applied
- using high water volumes to achieve good coverage
- spot spraying versus full broadcast application year after year
- only using one herbicide application on most roadsides and utility rights-of-way every three to five years
- excellent monitoring (returning to sites to ensure weed populations are controlled and managing any that have not been controlled)
- incorporating mowing and cultural control options

DECREASING THE RISK OF RESISTANCE

Other best management practices we recommend implementing to decrease the risk of resistance development are:

- rotating herbicides groups (not product brand names)
- selecting herbicides with multiple modes of action (each with activity on the target weed)
- using herbicide mixtures containing different herbicide groups with activity on the target species (proven to be more effective than just rotating herbicides); and, if possible
- adjusting the timing of application

Professional vegetation managers should try to avoid applying herbicides at the same time year after year, as this can potentially lead to selection of certain weed species. For example, if you are managing bare ground sites or roadsides, rotate what area you start your program in from year to year.

INNOVATIONS FOR PROFESSIONAL VEGETATION MANAGERS

As leaders in industrial vegetation management, Corteva Agriscience provides you with the products, tools and education to help delay resistance. Our trusted herbicide solutions deliver elite control of a broad spectrum of broadleaf weeds, brush and invasive plants. It's important to remember that the long-term sustainability of herbicides as an effective tool to manage vegetation is in your hands.

For more information about herbicide resistance and the tools available to manage vegetation on industrial sites, please contact your Corteva Agriscience IVM Expert or visit IVM.corteva.ca

WATER QUALITY

Water quality for herbicide applications is defined by its hardness, pH, alkalinity and turbidity.

HARD WATER AND PH

Hard water is classified by high concentrations of cations such as Ca^{2+} , Mg^{2+} , Mn^{2+} , Zn^{2+} , Na^+ , K^+ , Al^{3+} or Fe^{3+} (Table 1)¹. Hard water can be problematic because these cations can bind to the herbicide causing a decrease in efficacy of the product². Most research looking at herbicide antagonism with hard water has found Ca^{2+} , Mg^{2+} , Mn^{2+} , Na^+ and Fe^{3+} to be the most problematic. The pH of the water solution can also exaggerate the impact of hard water on the herbicide's activity. Most post-applied herbicides are weak acids, meaning they have a pKa value less than 7¹.

If the pH of the water is greater than the pKa of the herbicide, the product has a greater chance to dissociate¹. This results in the separation of the herbicide into negative ions, which can combine with the cations of the hard water, thereby reducing the efficacy of the product^{1,3}. Addition of ammonium sulfate (21-0-0-24) (AMS) can reduce the interaction between hard water and herbicides because the sulfate binds with the positive ions in the hard water and the ammonium binds to the herbicide, which actually helps the product to penetrate the plant cell membrane¹.

Table 1: The World Health Organization's classification of soft to extremely hard water

| Mineral parts per million (ppm) in water | World Health Organization water classification |
|--|--|
| 0 – 114 | Soft |
| 114 – 342 | Moderately Hard |
| 342 – 800 | Hard |
| >800 | Extremely Hard |

Note: Some hard water test results will be in "grains," which is the ppm divided by 17.



ALKALINITY

Soft water can be high in bicarbonates (HCO_3^-) or carbonate (CO_3^{2-}), which can also interfere with some herbicides, similar to the hard water ions. When testing water for alkalinity, levels should be below 300 ppm¹.

TURBID WATER

Turbid water is a name used to describe a water source that has suspended particles which could include soil, organic matter, algae, salt or contamination from runoff. Pesticides have the potential to bind to these particles in the water source, tying up the active ingredient and decreasing the efficacy of the product. How well a chemistry binds to the sediment depends on their Koc* ratio, which is the soil organic carbon sorption coefficient¹. A high Koc number means the product binds strongly to the particles – for example glyphosate at 24,000 mL/g,

where lower numbers like dicamba (2 mL/g) do not bind as strongly⁴. Aminopyralid and Picloram have relatively low Koc numbers, 10.8 and 16 mL/g, respectively^{4,5,6}. However, Triclopyr has been known to adsorb tightly to soil, with a Koc value of 780 mL/g. Therefore, it is extra important to have clean water when applying Triclopyr.

Table 2: The pKa values of Aminopyralid, Triclopyr and Picloram

| Herbicide | pKa value |
|--------------|-----------|
| Aminopyralid | 2.6 |
| Picloram | 2.3 |
| Triclopyr | 2.7 |

Note: pKa (logKa) is an index to express acidity of soils – the smaller the value, the stronger the acid.

WHAT CAN BE DONE?

- Ensure water source is free from sediment – any amount of sediment can be problematic; if you visually see particles, consider a different water source.
- Perform a water analysis to determine suitability for herbicide applications (i.e., hardness, pH, total dissolved solids, etc.).
- Some hard water/pH testers can be bought from local pool stores. These testers sometimes read hard water at 300 ppm whereas spraying hard water is considered 1,000 ppm or higher.
- Ideal water pH for these weak acid herbicides is around 5–7.
- If the pH is too high (over 8), consider a different water source.
- Hard water: Studies by Thomes et al. (1996) and Zollinger et al. (2010) found AMS could be added to Picloram and Aminopyralid to mitigate hard water impacts, although there has not been a rate identified specifically for these products.
 - The recommended rates of AMS with glyphosate are 13: 1–2% w/w (i.e., 1–2 kg/100 L of water), or 2.5–5% v/v of a 400 g/L AMS solution
- If water is over 1,000 ppm and you are applying Aminopyralid or Picloram, consider adding AMS at 20.4 g/L.
- A jar test can be performed before putting any products in the spray tank to ensure they will not create any problems.
- Follow all label directions for tank mixes and adjuvants.
- For best results, Corteva Agriscience™ recommends using clean fresh water sources for spray solution. Using open bodies of water or poor quality water (sediment, hardness or high pH) as a source increases risk of having water issues.

SUMMARY

- Picloram and Aminopyralid activity could be affected by hard water ions.
- Picloram and Aminopyralid can both be impacted by pH of water since it can cause them to break down into ions, allowing them to combine with hard water ions decreasing efficacy.
- Triclopyr formulated as an ester has the potential to bind to organic matter or sediment in the water and reduce efficacy.

*Koc (Soil Organic Carbon–Water Partitioning) is a measurement of how well a chemistry binds to the sediment of the soil. The higher the number, the greater potential to bind.

¹ Hall, Linda, Beckie, Hugh and Wolf, Thomas. 1999. *How Herbicides Work: The biology of application*. Alberta Agriculture and Rural Development. Information Management. 7000–113 Street, Edmonton, Alberta.

² Patton, Aaron J., Weisenberger, Daniel V. and Johnson, William G. 2016. Divalent Cations in Spray water Influence 2,4-D efficacy on Dandelion (*Taraxacum officinale*) and Broadleaf Plantain (*Plantago major*). *Weed Technology* 30:431–440.

³ Zollinger, R.K., Nalewaja, J.D., Peterson, D.E. and Young, B.G. 2010. Effect of hard water and ammonium sulfate on weak acid herbicide activity. *J Am Soc Test Mater Int* 7(6):1–10.

⁴ Gillespie, William E., Czapar, George F. and Hager, Aaron G. 2011. *Pesticide Fate in the Environment: A Guide for Field Inspectors*. Illinois State Water Survey. Institute of Natural Resource Sustainability. University of Illinois at Urbana-Champaign. Champaign, Illinois.

⁵ Corteva Agriscience. 2006. Aminopyralid AI Module. Technology transfer Corteva Agriscience internal documents.

⁶ Corteva Agriscience. 1999. Triclopyr AI Module. Technology transfer – Corteva Agriscience internal documents.

SURFACTANTS

NOT ALL SURFACTANTS ARE CREATED EQUAL.

It is well established that many herbicides require the addition of a surfactant to improve efficacy.

HOW DO SURFACTANTS IMPROVE HERBICIDE EFFICACY?

Increased efficacy comes from improved spray retention on the target weed, greater droplet spreading across the leaf surface and improved herbicide uptake into the target species.

Target grass and broadleaf weed species differ in leaf structure, size and growth habit. Their leaf surfaces can vary widely from hairy (black henbane), to smooth and waxy (leafy spurge). Surfactants help reduce the impact of these physical barriers to herbicide entry into the plant.

If a surfactant is not used with certain herbicides then the water in the spray solution, which has a high surface tension, forms discrete droplets on the leaf surface causing uneven herbicide coverage.

For best herbicide performance, a spray droplet must wet foliage, spread out and cover the leaf. Surfactants reduce surface tension of the spray droplet and the interfacial tension between that droplet and the leaf, improving herbicide uptake and translocation for better weed control.

WHY USE GATEWAY™ ADJUVANT?

Gateway™ adjuvant is an innovative non-ionic, paraffinic oil blend surfactant developed for use with the portfolio of IVM solutions from Corteva Agriscience™.

Gateway improves plant uptake in challenging environmental conditions and is recommended for use with the following Corteva Agriscience herbicide products:

- Aspect™ herbicide
- ClearView™ herbicide
- Garlon™ XRT herbicide
- Milestone™ NXT herbicide with Rinskor™ active
- Sightline™ herbicide

CONTACT US

If you have a technical question, your Corteva Agriscience™ IVM Expert can help.

Corteva Agriscience

#240, 115 Quarry Park Road SE

Calgary, AB T2C 5G9

Website: IVM.corteva.ca



British Columbia

Vegetation Management Expert

Lisa Jarrett

Cell: 250-870-3734

Email: lisa.jarrett@corteva.com



Alberta, Saskatchewan & Manitoba

Vegetation Management Expert

Thane Beagle

Cell: 403-394-6824

Email: thane.beagle@corteva.com



Atlantic Canada, Quebec & Ontario

Vegetation Management Expert

Justin Toner

Cell: 506-479-0444

Email: justin.toner@corteva.com

Questions?
Contact your Corteva Agriscience
IVM Expert or visit us at
IVM.corteva.ca