



INTEGRATED VEGETATION MANAGEMENT

2020 HERBICIDE PERMIT APPLICATION

SUBMITTED BY:

Sara L. Packer, CF
Transmission & Distribution
Vegetation Management Program Manager
Vermont Electric Cooperative, Inc.
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800-832-2667
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Licensed in VT #148.0122516 & New Hampshire #350
Society of American Foresters, Certified #1175



Vermont Electric Cooperative, Inc.

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March 27, 2020

Mr. Cary Giguere
Agrichemical Management Section Chief
Vermont Agency of Agriculture
Agricultural Resource Management & Environmental Stewardship
116 State Street
Montpelier, VT 05620

Cary:

Please accept Vermont Electric Cooperative's 2020 Herbicide Permit Application. Included you will find product information for all products identified for use in the permit application and VEC's historical herbicide use data through 2018 (2019 data will be forthcoming).

The proposed herbicide treatment area map, along with a pdf copy of the permit application, product information and historical use data are being submitted electronically to be uploaded to the Vermont Pesticide Advisory Council (VPAC) share-point page.

The 5-year revision of VEC's Vegetation Management Plan was completed in December of 2019 and forwarded to the Vermont Agency of Agriculture earlier this year.

Also included, is an email from the Vermont Water Supply Division confirming that the well location data used in preparing the proposed herbicide treatment area maps to be provided to the certified applicators is current and up to date. As always, well locations will also be located and verified on the ground during herbicide application field preparation.

Unlike in the past, due to the COVID-19 pandemic, we have not provided any hard copies of the permit application and product information at this time, but would be happy to do so at a later date, upon your request.

Please feel free to contact me if you have any questions.

My regards,

Sara L. Packer, CF
Transmission & Distribution Vegetation Management Program Manager

Packer, Sara

To: Pingree, Rodney
Subject: RE: Private Well Data - NEED RESPONSE PRIOR TO APRIL 1ST DEADLINE

From: Pingree, Rodney [mailto:Rodney.Pingree@vermont.gov]
Sent: Friday, March 27, 2020 10:01 AM
To: Packer, Sara <spacker@vermontelectric.coop>
Subject: RE: Private Well Data - NEED RESPONSE PRIOR TO APRIL 1ST DEADLINE

This email is from a source outside VEC. PLEASE use caution when opening attachments and clicking links!

Hello Sara,

Yes, please consider this email as an official response to your well data request. To the best of our knowledge the well information in the Agency Atlas is current and accurate, based on the submittals to the Agency from the VT licensed well drillers working in Vermont.

Please contact me if you have additional questions.

With my best,
Rodney

Rodney I. Pingree, Chief
Water Resources Section
Drinking Water and Groundwater Protection Division
1 National Life Drive, Davis 4
Montpelier, VT 05620-3521

Telephone: 802-585-4912

Due to the coronavirus (COVID-19) we are taking additional safety measures to protect our employees and customers and are now working remotely while focusing on keeping our normal business processes fully functional. Please communicate with our staff electronically or via phone to the greatest extent possible since our processing of postal mail may be slowed during this period. **You may now submit permit applications, compliance reports and fee payments through our new online form to expedite its receipt and review:** https://anonline.vermont.gov/?formtag=DWGWPD_Intake

"Note: Written communications to and from state officials regarding state business are considered public records and will be available to the public for review."

From: Packer, Sara <spacker@vermontelectric.coop>
Sent: Friday, March 27, 2020 9:46 AM
To: Pingree, Rodney <Rodney.Pingree@vermont.gov>
Subject: Private Well Data - NEED RESPONSE PRIOR TO APRIL 1ST DEADLINE

Importance: High

EXTERNAL SENDER: Do not open attachments or click on links unless you recognize and trust the sender.

Hello Mr. Pingree:

I recognize that you are likely working remotely, due to the COVID-19 pandemic, but am hoping that you will still receive this email and may be able to respond in time for me to include your response in my permit application, which has an April 1st deadline.

Thank you,

Sara

Sara L. Packer, CF

Transmission & Distribution
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Vermont Electric Cooperative, Inc.
42 Wescom Road
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Direct Line: 802-730-1104 Fax: 802-635-7645
Toll Free: 800-832-2667 (ext. 1104)
Cell: 802-254-1458
E-mail: spacker@vermontelectric.coop



From: Packer, Sara
Sent: Monday, March 23, 2020 3:42 PM
To: rodney.pingree@vermont.gov
Subject: Private Well Data

Mr. Pingree:

As you may recall from last year, each year when preparing Vermont Electric Cooperative's application for a permit to apply herbicides within its' rights-of-way, I am required to obtain a letter from the Drinking Water and Groundwater Protection Division to include with the permit application, indicating that the private well data we are utilizing is the most accurate and up-to-date data available.

We have once again used well location data provided by VT ANR (found on their [OpenData](#) Portal) and need to confirm that our maps depict all private water supplies and public source protection areas known to the Water Supply Division of the DEC. We are aware of the potential inaccuracies of this data and locations are verified on the ground during herbicide application field preparation.

I look forward to your response.

My Regards,

Sara

Sara L. Packer, CF

Transmission & Distribution
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REQUEST FOR PERMIT TO CONDUCT RIGHTS-OF-WAY SPRAYING

Request is hereby made, pursuant to Title 6 V.S.A., Chapter 87, and the regulations issued pursuant thereto, for an approved permit to conduct spraying on rights-of-way within the State of Vermont.

A. General Information

1. Title of Organization: *Vermont Electric Cooperative, Inc.*

2. Address: *42 Wescom Road
Johnson, VT 05656*

3. Telephone Number: *802-635-2331*

4. Contact Person: *Sara Packer*

5. Type of Right-of-Way:

- a. Electric Power Transmission Line
- b. Electric Power Distribution Line
- c. Telephone Line
- d. Highway
- e. Pipeline (Specify: Gas, Soil, Water)
- f. Railroad
- g. Airport Approaches and Safety Zones
- h. Other - Describe

6. Type of Treatment

- a. Selective Basal
- b. Stump Treatment
- c. Dormant Cane (Broadcast Basal)
- d. Soil Applications (Soil Sterilant)
- e. Ground Broadcast Stem-Foliage
- f. Stem Injection (Frill Treatment)
- g. Other - Describe: *Selective Low-Volume Foliar*

7. Railroad Right-of-Way Treatment *N/A*

- a. Ballast
- b. Shoulder

B. Site Specific Information

1. List Towns where Treatment will be Made: *Albany, Alburgh, Barton, Belvidere, Berkshire, Bloomfield, Brighton, Brunswick, Cambridge, Canaan, Charleston, Craftsbury, Derby, Eden, Enosburg, Fairfield, Ferdinand, Franklin, Guildhall, Highgate, Irasburg, Jay, Lowell, Maidstone, Montgomery, Newport City, North Hero, Norton, Richford, Sheldon, St. Albans Town, Swanton, and Westfield.*
 2. Total Acreage to be Treated Total Acres: *Up to +/- 1610*

Ground Application Acres: *Up to +/- 1610*
 3. Width of Right-of-Way - Transmission Feet : *50-100*
Width of Right-of-Way - Distribution Feet : *30-50*
 4. Width of Area In Right-of-Way to be Treated - Transmission Feet : *50-100 (Full Width)*
Width of Area In Right-of-Way to be Treated - Distribution Feet : *30-50 (Full Width)*
 5. Anticipated Starting Date: *June 29, 2020*
- C. Special Needs - Treatment Within Buffer Strips
1. Specific Areas where Application is to be Made: *Cut surface - 10 foot set back on surface water
Foliar - 15 foot set back on transient standing water*
 2. Type of Vegetation to be Controlled:
Undesirable plant species (predominately fast growing tree species) which at maturity will attain a height that will endanger the safe and reliable operation of the electric facilities.
 3. Pesticide(s) to be Applied (List Here and in Section E):
*Cut Surface - Rodeo (53.8% Glyphosate) EPA Registration # 62719-324
Foliar – Tank Mix with Rodeo (53.8%Glyphosate) or Krenite S (41.5% Fosamine Ammonium)/Escort XP or Patriot (60%Metsulfuron Methyl)/Arsenal Powerline or Polaris (26.7% Imazapyr)
See Section E. for EPA Reg. Numbers.*
 4. Rate of Application (List Here and in Section E):
*Cut Surface - 50% Rodeo diluted in water applied per target stem density at an anticipated rate of 0.1 to 1.87 gallons per acre.
Foliar – Glyphosate (0.1-1.87gal./ac.) or Fosamine Ammonium (0.8-3.0 gal./ac)/Metsulfuron Methyl (0.2-1.0oz/ac.)/Imazapyr (2.0oz.-1pint/ac.)*
 5. Application Technique to be Implemented: *Cut Surface or Foliar*
 6. Application Equipment to be Used:
*Cut Surface - Hand-held squirt bottle or low pressure hand pump with spray wand.
Foliar - Motorized and/or hand operated back-pack sprayer.*
 7. Explain how this Request will Protect Sensitive Areas, Sensitive Crops, Site Conditions, Wells, etc.:
Treatments are applied as a directed spray with hand-held equipment in close proximity to targets. Cut surface applications are limited to freshly cut stump surfaces and foliar applications are made parallel to transient standing water.

D. Contractor Information

1. Contractor's Name: ***Tracy Clark***

***John Schauer
Kristopher R. DiGiulio
Eric Franks
Jerrad Bishop***

2. Company Name: ***TTS Tree Service, LLC***

New England Tree Experts, Inc.

3. Company Address: ***3985 County Route 27
Russell, NY 13684***

***1868 VT Route 16 PO Box 504
East Hardwick, VT Hardwick, VT
05836 05843***

4. Current Vermont Applicator Certificate Number:

1679-5606

***000MW1-4843
000W4M-5133
5400
5527***

VT ID: 00043Q Certificate # 651

5. Company Telephone Number:

315-386-8733

802-472-6646

**Request for Permit to Conduct Rights-of-Way Spraying
Page 4**

E. Control Details

Pesticides to be used and rates to be applied. If more than one chemical is listed, a summary of the uses intended for each chemical must be provided. The summary should state whether the chemical will be mixed or applied separately, specifying which chemicals will control what types of vegetation. (Please Note: A copy of a label, SDS sheet and EPA Fact Sheet [if available] must be supplied for each chemical to be used.)

Trade Name	Common Name of Active Ingredient(s)	EPA Reg. Number	Application Rate Product/Acre	Vegetation to Be Controlled	Type of Application and Equipment to be Used
<i>Rodeo</i>	<i>Glyphosate (53.8%)</i>	<i>62719-324</i>	<i>0.1 – 1.87 gal./ac.</i>	<i>Undesirable Tall Shrub and Tree Species</i>	<i>Cut Surface Treatment Hand-held squirt bottle or low pressure hand pump with spray wand.</i>
<u>Tank Mix #1:</u> <i>Rodeo * Escort XP or Patriot Arsenal Powerline or Polaris</i>	<i>Glyphosate (53.8%) Metsulfuron Methyl (60%) Imazapyr (26.7%)</i>	<i>62719-324 432-1549/228-391 241-431/228-534</i>	<i>0.1-1.87 gal./ac. 0.2-1.0 oz./ac. 2.0 oz.-1.0 pint/ac.</i>	<i>Undesirable Tall Shrub and Tree Species</i>	<i>Selective Low-Volume Foliar Application Motorized and/or hand operated back-pack sprayer.</i>
<u>Tank Mix #2:</u> <i>Krenite S * Escort XP or Patriot Arsenal Powerline or Polaris</i>	<i>Fosamine Ammonium (41.5%) Metsulfuron Methyl (60%) Imazapyr (26.7%)</i>	<i>42750-247 432-1549/228-391 241-431/228-534</i>	<i>0.8-3.0 gal./ac. 0.2-1.0 oz./ac 2.0 oz.-1.0 pint/ac.</i>	<i>Undesirable Tall Shrub and Tree Species</i>	<i>Selective Low-Volume Foliar Application Motorized and/or hand operated back-pack sprayer.</i>
<u>Tank Mix #3:</u> <i>Garlon 4 Ultra Escort XP or Patriot</i>	<i>Triclopyr (60.45%) Metsulfuron Methyl (60%)</i>	<i>62719-527 432-1549/228-391</i>	<i>0.25-1.5 gal./ac. 0.2-1.0 oz./ac.</i>	<i>Undesirable Tall Shrub and Tree Species</i>	<i>Selective Low-Volume Foliar Application Motorized and/or hand operated back-pack sprayer.</i>
<i>Garlon 4 Ultra mixed w/ Basal Oil</i>	<i>Triclopyr (60.45%)</i>	<i>62719-527</i>	<i>0.25-1.5 gal./ac.</i>	<i>Undesirable Tall Shrub and Tree Species</i>	<i>Selective Low-Volume Basal Application Hand operated back-pack sprayer with spray wand. Cut Stump Application Hand-held squirt bottle or low pressure hand pump with spray wand.</i>
<u>Adjuvants:</u> <i>MSO Surfactant Reign Drift Control Agent Thinvert Deposition Aid Quest Water Conditioning Agent (Or Comparable Products)</i>	<i>Methylated Vegetable Oil Polyacrylamide Paraffinic Oil/Emulsifier Blend Ammonium salts</i>	<i>N/A N/A N/A N/A</i>			

** Individual chemical may be applied separately from tank mix as a stand- alone product in some locations with same application rate, type of application and equipment.*

F. Methods of Notification

1. List the Newspapers in which you will Advertise this Application to Comply with Section IV, 4.b., of the Vermont Regulations for Control of Pesticides.

- a) *Caledonia County – The Caledonian Record & Hardwick Gazette*
- b) *Chittenden County – The Times Argus & Burlington Free Press*
- c) *Essex County – The Caledonian Record & Burlington Free Press*
- d) *Franklin County – The Messenger & Burlington Free Press*
- e) *Grand Isle County – The Islander & Burlington Free Press*
- f) *Lamoille County – The Times Argus & Burlington Free Press*
- g) *Orleans County – Newport Daily Express & Burlington Free Press*

2. Please Indicate Other Notification Option Chosen to Comply with Section IV, 4.d., of the Vermont Regulations for Control of Pesticides.

In addition to newspaper advertisements, further notification shall be provided by three (3) spot messages per day on each of two (2) radio stations in the area of spraying on two (2) consecutive days during the two-week period prior to the commencement of spraying.

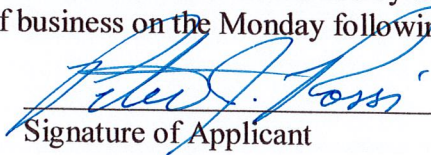
G. Other Information To Be Submitted With Application

- 1. Two (2) Sets of Geodetic (in 7.5 minute scale) or Orthophoto Maps indicating the Right-of-Way to be Treated. (Only one set of maps is needed if maps have been previously submitted and revisions have not been made.) **Please see note below*
- 2. Current Labeling for each Pesticide to be Used.
- 3. Current Safety Data Sheet (SDS) for each Pesticide to be Used.
- 4. Current Environmental Protection Agency Pesticide Fact Sheet (if available).

The undersigned accepts full responsibility for all statutes and regulations of the State of Vermont and understands that any authorization is limited to the described materials, locations and time periods stated herein.

The undersigned further understands that weekly spray and dusting operations must be reported to the Vermont Agency of Agriculture. Such written report shall be on forms furnished by the Secretary of Agriculture and placed in the mail not later than the close of business on the Monday following the week's operation.

3/27/2020
Date



Signature of Applicant

(NOTE: Additional sheets may be attached to include further information.)

** Please Note: Private wells are identified on maps according to VT Agency of Natural Resources well locator data. Locations will be verified on the ground during herbicide application field preparation.*

PRODUCT INFORMATION

Rodeo

Active Ingredient

Glyphosate

Specimen Label

GLYPHOSATE	GROUP	9	HERBICIDE
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HERBICIDE

® TM Trademarks of Dow AgroSciences, DuPont or Pioneer and their affiliated companies or respective owners

For control of annual and perennial weeds and woody plants in natural and production (plantations), forests for site preparation, mid-rotation release treatments, timber stand improvement activities, noncrop sites including industrial sites, rights-of-way (including roadsides, electric utility and communication transmission lines, pipelines, railroads, airports), irrigation and drainage ditches, canals, reservoirs, natural areas (including wildlife management areas, wildlife openings, wildlife habitats and refuges, parks and recreational areas, campgrounds, trailheads and trails), rangeland, and in and around aquatic sites and wetlands; also for perennial grass release, and grass growth suppression and grazed areas on these sites.

Avoid contact of herbicide with foliage, green stems, exposed non-woody roots or fruit of crops, desirable plants and trees, because severe injury or destruction may result.

Active Ingredient:

glyphosate N-(phosphonomethyl)glycine, isopropylamine salt	53.8%
Other Ingredients.....	46.2%
Total	100.0%

Contains 5.4 lb per gallon glyphosate, isopropylamine salt (4 lb per gallon glyphosate acid).

Precautionary Statements

Hazards to Humans and Domestic Animals

EPA Reg. No. 62719-324

Keep Out of Reach of Children

CAUTION

Harmful If Inhaled • Avoid breathing spray mist. Remove contaminated clothing and wash before reuse. Wash thoroughly with soap and water after handling.

Personal Protective Equipment (PPE)

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in Worker Protection

Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d)(4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

First Aid

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-992-5994 for emergency medical treatment information.

Environmental Hazards

Do not contaminate water when cleaning equipment or disposing of equipment washwaters. Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.

In case of leak or spill, soak up and remove to a landfill.

Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied using only stainless steel, aluminum, fiberglass, plastic or plastic-lined steel containers.

Do not mix, store or apply this product or spray solutions of this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks. This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas, which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Read all Directions for Use carefully before applying.

This is an end-use product. Dow AgroSciences does not intend and has not registered it for reformulation.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical-resistant gloves made of any waterproof material
- Shoes plus socks

Non-Agricultural Use Requirements

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries or greenhouses.

Keep people and pets off treated areas until spray solution has dried.

Storage and Disposal

Do not contaminate water, food, feed or seed by storage or disposal.

Pesticide Storage: Store above 10°F (-12°C) to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68°F (20°C) for several days to redissolve and roll or shake container or recirculate in mini-bulk containers to mix well before using.

Pesticide Disposal: Wastes resulting from use of this product that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticide disposal or in accordance with applicable Federal, state or local procedures.

Nonrefillable containers 5 gallons or less:

Container Handling: Nonrefillable container. Do not reuse or refill this container.

Triple rinse or pressure rinse container (or equivalent) promptly after emptying. **Triple rinse** as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. **Pressure rinse** as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 psi for at least 30 seconds. Drain for 10 seconds after the flow begins to drip. Then offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities.

Refillable containers larger than 5 gallons:

Container Handling: Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or a mix tank. Fill the container about 10% full with water and, if possible, spray all sides while adding water. If practical, agitate vigorously or recirculate water with the pump for two minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times. Then offer for recycling if available, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities.

Nonrefillable containers 5 gallons or larger:

Container Handling: Nonrefillable container. Do not reuse or refill this container.

Triple rinse or pressure rinse container (or equivalent) promptly after emptying. **Triple rinse** as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. **Pressure rinse** as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 psi for at least 30 seconds. Drain for 10 seconds after the flow begins to drip. Then offer for recycling if available, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities.

Product Information

This product is a broad spectrum, systemic, postemergent herbicide with no soil residual activity. It is intended for control of annual and perennial weeds and woody plants and brush. It is formulated as a water soluble liquid.

Time to Symptoms: The active ingredient in this product moves through the plant from the point of foliage contact to and into the root system. Visible effects are a gradual wilting and yellowing of the plant that advances to complete browning of above ground growth and deterioration of underground plant parts. Visible effects on most annual weeds occur within two to four days, but on most perennial weeds visible effects may not occur for seven days or more. Extremely cool or cloudy weather

following treatment may slow the activity of this product and delay development of visual symptoms.

Stage of Weeds: Annual weeds are easiest to control when they are small. Best control of most perennial weeds is obtained when treatment is made at late growth stages approaching maturity. Refer to the annual, perennial and woody brush and trees rate tables for specific weeds. Always use the higher rate within the rate range for heavy or dense weed growth or when weeds are growing in an undisturbed (noncultivated) area. When treating weeds with disease or insect damage, weeds heavily covered with dust, or weeds under poor growing conditions, reduced weed control may result.

Cultural Considerations: Reduced control may result when applications are made to annual or perennial weeds that have been mowed, grazed, or cut, and have not been allowed to regrow to the specified stage for treatment.

Rainfastness: Heavy rainfall soon after application may wash off this product from the foliage and a repeat application up to the labeled rate may be required for adequate control.

Spray Coverage: For best results, spray coverage should be uniform and complete.

Mode of Action: The active ingredient in this product inhibits an enzyme. This enzyme is found only in plants and microorganisms that are essential to forming specific amino acids.

No Soil Activity: Weeds must be emerged at the time of application to be controlled by this product. Weeds germinating from seed after application will not be controlled. Unemerged plants arising from unattached underground rhizomes or rootstocks of perennials will not be affected by the herbicide and will continue to grow.

Biological Degradation: Degradation of this product is primarily a biological process carried out by soil microbes.

Maximum Application Rates: The maximum application rates specified in this label are given in units of volume, either fluid ounces, pints or quarts, of this product per acre. The maximum allowed application rates apply to this product combined with the use of any and all other glyphosate- or sulfosate-containing herbicides, either applied separately or in a tank mix, on the basis of total pounds of glyphosate (acid equivalents) per acre. If more than one glyphosate- or sulfosate-containing product is applied to the same site within the same year, ensure that the total of pounds acid equivalent glyphosate does not exceed the maximum allowed.

Do not apply more than 8 quarts of this product (8 lb glyphosate acid) per acre per year for all use sites listed on this label.

IMPORTANT: When using this product, unless otherwise specified, mix with a surfactant, such as a nonionic surfactant containing 80% or greater active ingredient. For conifer release (pine release) use only surfactants that are approved for conifer release and specified on the surfactant label as safe for use in conifer release (pine release). Use of this product without surfactant will result in reduced herbicide performance. Ammonium sulfate, drift control additives, or dyes and colorants may be used. See Mixing Directions and the surfactant manufacturer's label for more information.

Grazing Restrictions: This product may be used to treat undesirable vegetation in utility rights-of-way that pass through pastures, rangeland, and forestry sites that are being grazed. For tank mix applications, comply with all restrictions appearing on the tank mix product label.

Except for lactating dairy animals there are no grazing restrictions following the labeled applications of this product.

For lactating dairy animals there are no grazing restrictions for the following labeled applications of this product:

- Where the spray can be directed onto undesirable woody brush and trees, including in handgun spray to wet or low volume directed spray treatments.
- For tree injection of frill applications and for cut stump treatments.

For broadcast applications, observe the following restrictions for lactating dairy animals:

- For application rates between 4.5 and 7.5 quarts per acre, no more than 15 percent of the available grazing area may be treated.
- For application rates less than 4.5 quarts per acre, no more than 25 percent of the available grazing area may be treated.

These restrictions do not apply to pastures, rangeland or forestry sites outside of utility rights-of-way.

Herbicide Resistance Management

Glyphosate, the active ingredient in this product, is a group 9 herbicide (inhibitor of EPSP synthase). Some naturally occurring weed biotypes that are tolerant (resistant) to glyphosate may exist due to genetic variability in a weed population. Where resistant biotypes exist, the repeated use

of herbicides with the same mode of action can lead to the selection for resistant weeds. Certain agronomic practices reduce the likelihood that resistant weed populations will develop, and can be utilized to manage weed resistance once it occurs.

To delay the selection for glyphosate resistant weeds, use the following practices:

- Scout fields before and after application to detect weed escapes or shifts in weed species.
- Start with a clean field by applying a burndown herbicide or by tillage.
- Control weeds early when they are small.
- Add other herbicides, including a selective and/or a residual herbicide, and cultural practices, including tillage or crop rotation, where appropriate.
- Use the application rate for the most difficult to control weed in the field. Do not tank mix with other herbicides that reduce this product's efficacy through antagonism or with ones that encourage application rates of this product below those specified on this label.
- Control weed escapes and prevent weeds from setting seeds.
- In situations where resistant weeds are a problem, before moving from one site to another, clean equipment to minimize the spread of weed seeds or plant parts.
- Use new commercial seed that is as free of weed seed as possible.
- Report any incidence of repeated non-performance of this product against a particular weed species to the local retailer, county extension agent, or Dow AgroSciences representative.

The following good agronomic practices are recommended to reduce the spread of confirmed glyphosate-resistant biotypes:

- Tank mix this product or apply it sequentially with an appropriately labeled herbicide with a different mode of action to achieve control if a naturally occurring resistant biotype is present in the site.
- Cultural and mechanical control practices, including crop rotation or tillage, may also be used.
- To control weed escapes, including resistant biotypes, before they set seed, scout treated sites after applying this product.
- Thoroughly clean equipment before leaving any site known to contain resistant biotypes.

Because the presence of glyphosate resistance in weed populations is difficult to detect prior to use, Dow AgroSciences accepts no liability for any losses that may result from the failure of this product to control glyphosate-resistant weeds.

Attention

Avoid contact of herbicide with foliage, green stems, exposed non-woody roots or fruit of crops, desirable plants and trees, because severe injury or destruction may result.

AVOID DRIFT. Use extreme care when applying this product to prevent injury to desirable plants and crops.

Do not allow the herbicide solution to mist, drip, drift or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to the crop, plants or other areas on which treatment was not intended. The likelihood of injury occurring from the use of this product increases when winds are gusty, as wind velocity increases, when wind direction is constantly changing, or when there are other meteorological conditions that favor spray drift. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. **Avoid applying at excessive speed or pressure.**

NOTE: Use of this product in any manner not consistent with this label may result in injury to persons, animals or crops, or other unintended consequences. Keep container closed to prevent spills and contamination.

Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment- and weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions. The following drift management requirements must be followed to avoid off-target drift movement from aerial applications to agricultural field crops. These requirements do not apply to forestry applications, public health uses or to applications using dry formulations.

- The distance of the outermost nozzles on the boom must not exceed 3/4 the length of the wingspan or rotor.
- Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees.

Where states have more stringent regulations, they must be observed.

The applicator must be familiar with and take into account the information covered in the Aerial Drift Reduction Advisory.

Aerial Drift Reduction Advisory

This section is advisory in nature and does not supersede the mandatory label requirements.

Importance of Droplet Size: The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent adverse effects from drift if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversions).

Controlling Droplet Size:

- **Volume** - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- **Pressure** - Do not exceed the nozzle manufacturer's recommended pressures. Use the lower spray pressures for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of Nozzles** - Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle Orientation** - Orienting nozzles so that the spray is parallel to the airstream produces larger droplets than other orientations and is the recommended practice. Significant deflection from horizontal will reduce droplet size and increase drift potential.
- **Nozzle Type** - Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift.

Boom Length: For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.

Application Height: Applications must not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

Swath Adjustment: When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance must increase with increasing drift potential (higher wind, smaller drops, etc.).

Wind: Drift potential is lowest between wind speeds of 2 to 10 mph. However, many factors, including droplet size and equipment type, determine drift potential at any given speed. Do not apply this product when wind speed is below 2 mph due to variable wind direction and high inversion potential. **Note:** Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

Temperature and Humidity: When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

Temperature Inversions: Do not apply this product during a temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a connected cloud (under low wind conditions) indicates an inversion, while smoke that moves upwards and rapidly dissipates indicates good vertical air mixing.

Sensitive Areas: Apply this pesticide only when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

Mixing Directions

Use only clean, stainless steel, fiberglass, plastic or plastic-lined steel containers to mix, store and apply spray solutions of this product. Do not mix, store or apply this product or spray solutions of this product in galvanized steel or unlined steel, except stainless steel, containers or spray tanks.

Eliminate any risk of siphoning the contents of the tank mix back into the carrier source while mixing. Use approved anti-back-siphoning devices where required by state or local regulations.

Note: Reduced results may occur if water containing soil is used, including visibly muddy water or water from ponds and ditches that is not clear.

Rodeo – Alone

This product mixes readily with water. Mix spray solutions of this product as follows:

1. Fill the mixing or spray tank with the required amount of clean water.
2. Add the specified amount of this product and nonionic surfactant near the end of the filling process and mix well.
3. During mixing and application, foaming of the spray solution may occur. To prevent or minimize foaming, avoid the use of mechanical agitators, terminate by-pass and return lines at the bottom of the tank and, if needed, use an approved anti-foam or defoaming agent.

Rodeo – Tank Mix

This product does not provide residual weed control. For residual weed control or an alternate mode of action, tank mix this product with other herbicides. It is the pesticide user’s responsibility to ensure that all products in the listed mixtures are registered for the intended use. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture..

Under certain conditions, at certain growth stages, and/or under other circumstances, some tank mix products have the potential to cause injury. Read all labels for products used in the tank mix prior to using them to determine the potential for crop injury.

Tank mixing with other herbicides, insecticides, fungicides, micronutrients or foliar fertilizers may result in reduced weed control or injury. Do not use these products in applications with this product unless otherwise noted in this label. To the extent consistent with applicable law, buyer and all users are responsible for all loss or damage in connection with the use or handling of mixtures of this product with herbicides or other materials that are not expressly specified in this labeling. Mixing this product with herbicides or other materials not specified on this label may result in reduced performance.

The user is responsible for ensuring that the specific application being made is included on the label of the product used in the tank mix when a tank mixture with a generic active ingredient, including 2,4-D, atrazine, dicamba, diuron, or pendimethalin, is used.

Read all individual product labels for all products in the tank mix and observe all precautions and restrictions on the label. Use according to the most restrictive directions for each product in the tank mix. Always predetermine the compatibility of all tank mix products, together in the carrier, by mixing small proportional quantities in advance of mixing and applying them to the use site. Add the tank mix product to the tank as directed by the label. Maintain agitation and add the required amount of this product.

Maintain good agitation at all times until the contents in the tank are sprayed. If the mixture is allowed to settle, thorough agitation is required to resuspend the mixture before spraying resumes. Keep the bypass line on or near the bottom of the tank to minimize foaming. The screen size in the nozzle or line strainers must be no finer than 50 mesh.

Note: If tank mixing with Garlon® 3A herbicide, ensure that Garlon 3A is well mixed with at least 75 percent of the total spray volume before adding this product to the spray tank to avoid incompatibility.

Hand-Held Sprayers

Prepare the desired volume of spray solution by mixing the amount of this product in water as shown in the following table:

Spray Concentration (percent)	Amount of this Product for Desired Volume:		
	1 gal	25 gal	100 gal
0.5	2/3 fl oz	1 pt	2 qt
0.75	1 fl oz	1 1/2 pt	3 qt
1	1 1/3 fl oz	1 qt	1 gal
1.5	2 fl oz	1 1/2 qt	1 1/2 gal
2	2 2/3 fl oz	2 qt	2 gal
3.75	5 fl oz	3 3/4 qt	3 3/4 gal
5	6 1/2 fl oz	1 1/4 gal	5 gal
10	13 fl oz	2 1/2 gal	10 gal

Nonionic Surfactant

When using this product, unless otherwise specified, mix with a surfactant, including a nonionic surfactant containing 80% or more active ingredient. For conifer release (pine release), use only surfactants that are approved for conifer release and specified on the surfactant label as safe for use in conifer release. Using this product without surfactant will result in reduced herbicide performance.

Colorants or Dyes

Agriculturally-approved colorants or marking dyes may be added to this product. Colorants or dyes used in spray solutions of this product may reduce performance, especially at lower rates or dilutions. Use colorants or dyes according to the manufacturer's directions.

Drift Control Additives

Drift control additives may be used with all equipment types except wiper applicators, sponge bars and CDA equipment. When a drift control additive is used, it is the pesticide user’s responsibility to ensure that all products in the listed mixtures are registered for the intended use. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture..

Application Equipment and Application Methods

Chemigation: Do not apply this product through any type of irrigation system.

Apply spray solutions in properly maintained and calibrated equipment capable of delivering desired volumes.

This product may be applied with the following application equipment and application methods.

Aerial Application

Equipment: Fixed wing and helicopter

Do not apply this product using aerial spray equipment except under conditions as specified within this label.

Avoid drift. Do not apply when winds are gusty or under any other condition which favors drift. Drift may cause damage to any vegetation contacted to which treatment is not intended. To prevent injury to adjacent desirable vegetation, maintain appropriate buffer zones.

Do not directly apply to any body of water.

Use the specified rates of this herbicide in 3 to 25 gallons of water per acre unless otherwise specified on this label. Refer to the specific use directions of this label for volumes and application rates.

Coarse sprays are less likely to drift; therefore, do not use nozzles or nozzle configurations that dispense spray as fine spray droplets. Do not angle nozzles forward into the airstream and do not increase spray volume by increasing nozzle pressure. A drift control additive may be used. When a drift control additive is used, carefully read and observe the precautionary statements and all other information specified on the additive label.

Ensure uniform application. To avoid streaked, uneven or overlapped application, use appropriate marking devices.

Aerial Application Restrictions in California Only

AVOID DRIFT: Do not apply when winds are gusty or under any other condition which favors drift. Drift may cause damage to any vegetation contacted to which treatment is not intended. To prevent injury to adjacent desirable vegetation, appropriate buffer zones must be maintained.

Do not aerially apply this product in a tank mix with dicamba in California.

Make aerial applications with helicopter only. To ensure uniform application, avoid streaking, uneven, or overlapped application, and use appropriate marking devices.

Use the following guidelines when aerial applications are made near crops or desirable perennial vegetation after budbreak and before total leaf drop, and/or near other desirable vegetation or annual crops:

- Do not apply this product using aerial equipment in residential areas.
- Do not apply within 100 feet of all desirable vegetation or crop(s).
- If wind up to 5 miles per hour is blowing toward desirable vegetation or crop(s), do not apply within 500 feet of the desirable vegetation or crop(s).
- Winds blowing from 5 to 10 miles per hour toward desirable vegetation or crop(s) may require buffer zones in excess of the 500-foot minimum buffer.
- Do not apply when winds are in excess of 10 miles per hour or when inversion conditions exist.

Use only coarse sprays to minimize drift. Do not use nozzles or nozzle configurations that dispense spray as fine spray droplets. Do not angle nozzles forward into the airstream and do not increase spray volume by increasing nozzle pressure above the manufacturer's directions.

Thoroughly wash aircraft, especially landing gear, after each day of spraying to remove residues of this product accumulated during spraying or from spills. Prolonged exposure of this product to uncoated steel surfaces may result in corrosion and possible failure of the part. Landing gear is most susceptible. The maintenance of an organic coating (paint) which meets aerospace specification MIL-C-38413 may prevent corrosion.

**ADDITIONAL LIMITATIONS FOR AERIAL APPLICATION
IN FRESNO COUNTY, CALIFORNIA ONLY**

Always read and follow the label directions and precautionary statements for all products used in the aerial application.

The following information applies only from February 15 through March 31 within the following boundaries of Fresno County, California:

North: Fresno County line
South: Fresno County line
East: State Highway 99 West

Observe the following directions to minimize off-site movement during aerial application of this product. Minimization of off-site movement is the responsibility of the grower, Pest Control Advisor and aerial applicator.

Written Directions

Written directions MUST be submitted by or on behalf of the applicator to the Fresno County Agricultural Commissioner 24 hours prior to the application. These written directions MUST state the proximity of surrounding crops and that conditions of each manufacturer's product label and this label have been satisfied.

Aerial Applicator Training and Equipment

Aerial application of this product is limited to pilots who have successfully completed a Fresno County Agricultural Commissioner and California Department of Pesticide Regulation approved training program for aerial application of herbicides. All aircraft must be inspected, critiqued in flight and certified at a Fresno County Agricultural Commissioner approved fly-in. Test and calibrate spray equipment at intervals sufficient to insure that proper rates of herbicides and adjuvants are being applied during commercial use. Applicator must document such calibrations and testing. Demonstration of performance at Fresno County Agricultural Commissioner approved fly-ins constitutes such documentation, or other written records showing calculations and measurements of flight and spray parameters acceptable to the Fresno County Agricultural Commissioner.

Applications at Night – Do not apply this product by air earlier than 30 minutes prior to sunrise and/or later than 30 minutes after sunset without prior permission from the Fresno County Agricultural Commissioner.

To report known or suspected misuse of this product, call 1-800-332-3111.

For additional information on the proper aerial application of this product in Fresno County, call 916-784-1718.

Aquatic and Noncrop Sites

When this product is applied under the conditions described, it controls or partially controls the labeled weeds growing in the following industrial, recreational, and public areas or other similar sites.

Aquatic sites includes all bodies of fresh and brackish water that may be flowing, nonflowing, or transient-including lakes, rivers, streams, ponds, seeps, irrigation and drainage ditches, canals, reservoirs, estuaries and similar sites.

If aquatic sites are present in the noncrop area and are part of the intended treatment, read and observe the following directions:

- This product does not control plants that are completely submerged or have a majority of their foliage under water.
- There is no restriction on the use of treated water for irrigation, recreation, or domestic purposes.

Spray Solution:

Desired Volume	Amount of This Product								
	0.5	0.75	1	1.25	1.5	2	5	8	10
1 gal	2/3 fl oz	1 fl oz	1 1/3 fl oz	1 2/3 fl oz	2 fl oz	2 2/3 fl oz	6 1/2 fl oz	10 1/4 fl oz	13 fl oz
25 gal	1 pt	1 1/2 pt	1 qt	1 1/4 qt	1 1/2 qt	2 qt	1 1/4 gal	2 gal	2 1/2 gal
100 gal	2 qt	3 qt	1 gal	1 1/4 gal	1 1/2 gal	2 gal	5 gal	8 gal	10 gal

2 Tablespoons = 1 fl oz

For best results when using knapsack sprayers, mix the specified amount of product with water in a larger container. Fill the knapsack sprayer with the solution and add the correct amount of surfactant.

Selective Equipment

Equipment: Recirculating sprayers, shielded and hooded sprayers, wiper applicators and sponge bars.

Do not contact desirable vegetation with herbicide. Droplets, mist, foam, or splatter of the herbicide settling on desirable vegetation is likely to result in discoloration, stunting or destruction.

Better results are obtained when more of the weed is exposed to the herbicide solution. Weeds not contacted by the herbicide solution will not be affected. This may occur in dense clumps, severe infestations, or

- Consult local and state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.
- To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after the application. The water intake may be turned on prior to 48 hours if the glyphosate level in the intake water is below 0.7 parts per million as determined by laboratory analysis. These aquatic applications may be made only in those cases where there are alternative water sources or holding ponds that would permit the turning off of an active potable water intake for a minimum period of 48 hours after the application.

Restrictions:

- Do not apply this product within 1/2 mile upstream of an active potable water intake in flowing water (i.e., river stream, etc.), or within 1/2 mile of an active potable water intake in a standing body of water, such as a lake, pond, or reservoir.

Ground Application

Equipment: Boom or boomless systems, pull-type sprayer, floaters, pick-up sprayers, spray coupes and other ground broadcast equipment.

Use the specified rates of this product in 3 to 40 gallons of water per acre as a broadcast spray unless otherwise specified on this label. As density of weeds increases, increase the spray volume within the rate range to ensure complete coverage. Carefully select proper nozzles to avoid spraying a fine mist. For best results with ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

Hand-Held and High-Volume Including Backpack Application

Equipment: Knapsack and backpack sprayers, pump up pressure sprayers, handguns, hand wands, mistblowers, lances, and other hand-held and motorized spray equipment used to direct the spray onto weed foliage. **Note:** This product is not registered in Arizona or California for use in mistblowers.

Apply to foliage of vegetation to be controlled. Do not spray to the point of runoff for applications made on a spray to wet basis. Use coarse sprays only. For best results, cover the top half of the plant and at least half of the total foliage. To ensure adequate spray coverage, spray both sides of large or tall woody brush and trees, when foliage is thick and dense, or where there are multiple sprouts.

High Volume Sprays: Prepare a 3/4 to 2 percent solution of this product in water, add a nonionic surfactant and apply to foliage of vegetation to be controlled. For specific rates of application and instructions for control of various annual and perennial weeds, see the Weeds Controlled section.

Make applications on a spray to wet basis with uniform and complete spray coverage. Do not spray to point of runoff.

Low Volume Directed Sprays: This product may be used as a 5 to 10 percent solution in low volume directed sprays for spot treatment of trees and brush. This treatment method is most effective in areas where there is a low density of undesirable trees or brush. If a straight stream nozzle is used, start the application at the top of the targeted vegetation and spray from top to bottom in a lateral zigzag motion. Ensure that at least 50 percent of the leaves are contacted by the spray solution. For flat fan and cone nozzles and with hand-directed mist blowers, mist the application over the foliage of the targeted vegetation. Treat small, open-branched trees only from one side. If the foliage is thick or there are multiple root sprouts, apply from several sides to ensure adequate spray coverage. Prepare the desired volume of spray solution by mixing the amount of this product in water as shown in the following table.

when the height of weeds varies so that not all weeds are contacted. If this occurs, repeat treatment up to the labeled rate may be necessary.

Shielded and Hooded Applicators: A shielded or hooded applicator directs the herbicide solution onto weeds while shielding desirable vegetation from the herbicide. Use nozzles that provide uniform coverage within the treated area. Keep shields on these sprayers adjusted to protect desirable vegetation. **Exercise extreme care to avoid contact of the herbicide with desirable vegetation.**

Wiper Applicators: Wiper applicators are devices that physically wipe appropriate amounts of this product directly onto the weed. Equipment must be designed, maintained and operated to prevent the herbicide solution from contacting desirable vegetation.

Adjust wiper applicators used over the top of desirable vegetation so that the wiper contact point is at least 2 inches above the desirable vegetation. Better results are obtained when more of the weed is exposed to the herbicide solution. Weeds should be a minimum of 6 inches above the desirable vegetation. Adjust the applicator height to ensure adequate contact with weeds as weeds not contacted by the herbicide solution will not be affected. Poor contact may occur when weeds are growing in dense clumps, in severe weed infestations, or when weed height varies dramatically. If this occurs, repeat treatment up to the labeled rate may be necessary.

Operate this equipment at ground speeds no more than 5 mph. Performance may be improved by reducing speed in areas of heavy weed infestations to ensure adequate wiper saturation. Better results may be obtained if two applications are made in opposite directions.

Droplets, mist, foam, or splatter of the herbicide settling onto desirable vegetation may result in discoloration, stunting or destruction. Avoid leakage or dripping onto desirable vegetation. Adjust height of applicator to ensure adequate contact with weeds. Keep wiping surfaces clean. Be aware that on sloping ground the herbicide solution may migrate, causing dripping on the lower end and drying of the wicks on the upper end of a wiper applicator.

Do not use wiper equipment when weeds are wet.

Mix only the amount of solution to be used during a one-day period as reduced activity may result from use of leftover solutions. Clean wiper parts by thoroughly flushing with water immediately after using this product.

For best results, use a nonionic surfactant at a rate of 10 percent by volume of total herbicide solution for all wiper applications.

Rope or Sponge Wick Applicators: Use solutions of 33 to 75 percent of this product in water.

Panel Applicator: Use solutions of 33 to 100 percent of this product in water.

Injection Systems

Equipment: Aerial or ground injection sprayers.

This product may be used in aerial or ground injection spray systems. It may be used as a liquid concentrate or diluted prior to injecting into the spray stream. Do not mix this product with the concentrate of other products when using injection systems.

Controlled Droplet Applicator (CDA)

Equipment: Hand-held or boom-mounted applicators that produce a spray consisting of a narrow range of droplet sizes.

The rate of this product applied per acre by vehicle-mounted CDA equipment must not be less than the amount specified on this label when applied by conventional broadcast equipment. For vehicle-mounted CDA equipment, apply 3 to 15 gallons of water per acre.

For the control of annual weeds with hand-held CDA units, apply a 20 percent solution of this product at a flow rate of 2 fl oz per minute and a walking speed of 1.5 mph (1 1/2 pints of product per acre). For control of perennial weeds, apply a 20 to 40 percent solution of this product at a flow rate of 2 fl oz per minute and a walking speed of 0.75 mph (3 to 6 pints of product per acre).

CDA equipment produces a spray pattern that is not easily visible. Exercise extreme care to avoid spray or drift contacting the foliage or any other green tissue of desirable vegetation as damage or destruction may result.

Use Sites

Use this product in noncrop areas, including airports, apartment complexes, aquatic sites, Christmas tree farms, commercial sites, Conservation Reserve Program (CRP) areas, ditch banks, driveways, dry ditches, dry canals, fencerows, golf courses, greenhouses, habitat management, industrial areas, lumber yards, manufacturing sites, municipal sites, natural areas, office complexes, ornamentals, parking areas, parks, pastures, petroleum tank farms and pumping installations, plant nurseries, public areas, railroads, rangeland, recreation areas, utility rights-of-way, roadsides, shadehouses, sod or turf seed farms, sports complexes, storage areas, substations, turfgrass areas, utility sites, warehouse areas, wildlife habitat management areas, and in grazed areas on these sites.

Aquatic Sites

This product may be applied to emerged weeds in all bodies of fresh and brackish water that may be flowing, nonflowing or transient including lakes, rivers, streams, ponds, estuaries, rice levees, seeps, irrigation and drainage ditches, canals, reservoirs, wastewater treatment facilities, wildlife habitat restoration and management areas and similar sites.

If aquatic sites are present in the noncrop area and are part of the intended treatment, read and observe the following directions:

- This product does not control plants that are completely submerged or have a majority of their foliage under water.
- There is no restriction on the use of treated water for irrigation, recreation or domestic purposes.
- Consult local and state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.
- To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after the application. The water intake may be turned on prior to 48 hours if the glyphosate level in the intake water is below 0.7 parts per million as determined by laboratory analysis. These aquatic applications may be made **only** in those cases where there are alternative water sources or holding ponds which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the application.
- For treatments after draw down of water or in dry ditches, allow 7 days or more after treatment before reintroduction of water to achieve maximum weed control. Apply this product within 1 day after draw down to ensure application to actively growing weeds.
- Floating mats of vegetation may require retreatment up to the labeled rate. Avoid wash off of sprayed foliage by spray boat or recreational boat backwash or by rainfall within 6 hours of application. Do not retreat within 24 hours following the initial treatment.
- Applications made to moving bodies of water must be made while traveling upstream to prevent concentration of this herbicide in water. When making any bankside applications, do not overlap more than 1 foot into open water. Do not spray in bodies of water where weeds do not exist. The maximum application rate of 7 1/2 pints per acre must not be exceeded in any single broadcast application that is being made over water.
- When emerged infestations require treatment of the total surface area of impounded water, treating the area in strips may avoid oxygen depletion due to decaying vegetation. Oxygen depletion may result in fish kill.

Restrictions:

- Do not apply this product directly to water within 1/2 mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.), or within 1/2 mile of an active potable water intake in a standing body of water, such as a lake, pond or reservoir. This restriction does not apply to intermittent inadvertent overspray of water in terrestrial use sites.

Wetland Sites

This product may be applied to undesirable vegetation in and around water (aquatic areas) and wetlands found in forestry, utility rights-of-way sites or other site listed on the label, including where these sites are adjacent to or surrounding domestic water supply reservoirs, supply streams, lakes and ponds.

If wetland sites are present, read and observe the following directions:

- There is no restriction on the use of treated water for irrigation, recreation or domestic purposes.
- Consult local public water control authorities before applying this product in and around public water. Permits may be required to treat in such areas.

Restrictions:

- Do not apply this product directly to water within 1/2 mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.), or within 1/2 mile of an active potable water intake in a standing body of water, such as a lake, pond or reservoir. This restriction does not apply to intermittent inadvertent overspray of water in terrestrial use sites.
- Do not spray open bodies of water where woody brush, trees and herbaceous weeds do not exist. Do not apply more than 3 3/4 quarts per acre in a single over water broadcast application except in stream crossings in utility right-of-way or where applications will result in less than 20 percent of the total water area being treated. In either of these locations, any specified rate may be applied:

Christmas Tree Plantations

Broadcast Application (Oregon and Washington Only)

Broadcast apply this product over the established Christmas tree species Douglas fir (*Pseudotsuga menziesii*), fir species (*Abies* spp.), and pine species (*Pinus* spp.) (except eastern white, loblolly, longleaf, shortleaf, slash), and spruce species (*Picea* spp.). Use 1 quart of this product per acre in 5 to 30 gallons of water per acre. For best results, add up to 10 fl oz of Entry II surfactant per acre. If using a different surfactant, follow the manufacturer's directions for use and ensure conifer safety has been adequately tested for that surfactant. Apply after trees have completed at least a full growing season since planting or transplanting.

Apply only in the fall after the formation of the final conifer resting buds or in the spring prior to initial bud swell. Final resting buds must be fully hardened and in the dormant stage. Applying this product at any other time may result in unacceptable injury to the Christmas trees. Avoid spray pattern overlap as injury may occur.

In some areas, 1 to 2 quarts of this product per acre may be used. Consult your local representative for specific use instructions if rates greater than 1 quart per acre are required.

For best results, do not use drift control additives as they may increase injury to Christmas trees.

Precautions:

- Ensure that adequate buffers are maintained to prevent drift onto nearby desirable crops or vegetation.

Restrictions:

- **Preharvest Interval:** Do not apply within 1 full year prior to tree harvest.

Cut Stump

Treat cut stumps in any noncrop site listed on this label. This product will control regrowth of freshly cut stumps and resprouts of many types of woody brush and tree species, some of which are listed below. Apply this product using suitable equipment to ensure coverage of the entire cambium. Cut trees or resprouts close to the soil surface. Apply a 50 to 100 percent solution of this product to freshly cut surface immediately after cutting. Delays in application may result in reduced performance. For best results, make applications during periods of active growth and full leaf expansion.

When used according to directions for cut stump application, this product will control, partially control or suppress most woody brush and tree species, some of which are listed below:

Common Name	Scientific Name
alder	<i>Alnus</i> spp.
coyotebrush ¹	<i>Baccharis pilularis</i>
dogwood ¹	<i>Cornus</i> spp.
eucalyptus	<i>Eucalyptus</i> spp.
hickory ¹	<i>Carya</i> spp.
madrone, Pacific	<i>Arbutus menziesii</i>
maple ¹	<i>Acer</i> spp.
oak	<i>Quercus</i> spp.
peppertree, Brazilian	<i>Schinus terebinthifolius</i>
Australian-pine,	<i>Casuarina equisetifolia</i>
poplar ¹	<i>Populus</i> spp.
reed, giant	<i>Arundo donax</i>
saltcedar	<i>Tamarix ramosissima</i>
sweetgum ¹	<i>Liquidambar styraciflua</i>
sycamore ¹	<i>Platanus occidentalis</i>
tan oak	<i>Lithocarpus densiflorus</i>
willow	<i>Salix</i> spp.

¹Do not use this product on these species in the state of California.

Precautions:

- Adjacent trees that are of a similar age, height and spacing may indicate shared roots.
- Injury is likely to occur to non-treated stems or trees when one tree or more that shares a common root is treated.

Restrictions:

- Do not make cut stump applications when the roots of desirable woody brush or trees may be grafted to the roots of the cut stump. Some sprouts, stems, or trees may share the same root system.

Injection and Frill (Woody Brush and Trees)

Woody vegetation may be controlled by injection or frill application of this product. Apply this product using suitable equipment that penetrates into the living tissue. Apply the equivalent of 1 mL of this product per each two to three inches of trunk diameter at breast height (DBH). This is best achieved by applying 50 to 100 percent concentration of this product either to a continuous frill around the tree or as cuts evenly spaced around the tree below all branches. As tree diameter increases in size, better results are achieved by applying diluted material to a continuous frill or more closely spaced cuttings. Do not make any applications that allow runoff to occur from frilled or cut areas in species that exude sap freely. In species such as this, make frill or cuts at an oblique angle to produce a cupping effect and use a 100 percent undiluted concentration of this product. For best results, apply during periods of active growth and full leaf expansion.

This product controls the following woody species:

Common Name	Scientific Name
oak	<i>Quercus</i> spp.
poplar	<i>Populus</i> spp.
sweetgum	<i>Liquidambar styraciflua</i>
sycamore	<i>Platanus occidentalis</i>

This product suppresses the following woody species:

Common Name	Scientific Name
blackgum ¹	<i>Nyssa sylvatica</i>
dogwood	<i>Cornus</i> spp.
hickory	<i>Carya</i> spp.
maple, red	<i>Acer rubrum</i>

¹Do not use this product on these species in the state of California.

Forestry Site Preparation

This product is for the control or partial control of woody brush, trees, and herbaceous weeds in forestry. This product is also for use in preparing or establishing wildlife openings within these sites and maintaining logging roads.

In forestry sites, use this product in site preparation prior to planting any tree species including Christmas trees, eucalyptus, hybrid tree cultivars and silvicultural nursery sites. Unless otherwise specified, make applications of this product for control or partial control of herbaceous weeds, woody brush and trees listed in the Weeds Controlled section.

Application Rates

Method of Application	Rate	Spray Volume (gal/acre)
Broadcast		
aerial	1.5 - 7.5 qt/acre	5 - 30
ground		10 - 60
Spray to Wet		
handgun, backpack	0.75 - 2%	spray to wet
mistblower	by volume	
Low Volume Directed Spray¹		
handgun, backpack	5 - 10%	partial coverage
mistblower	by volume	

¹ For low volume directed spray applications, coverage should be uniform with at least 50% of the foliage contacted. For best results, coverage of the top one-half of the plant, including the growing tip, is important (over the top and down coverage). To ensure adequate spray coverage, spray all sides of large or tall woody brush and trees, when foliage is thick and dense, or where there are multiple stems or tall sprouts.

Use a higher rate in the rate range for control or partial control of woody brush, trees and hard to control perennial herbaceous weeds. For best results, apply to actively growing woody brush and trees after full leaf expansion and before leaf drop. Use increased rates within the rate range to control perennial herbaceous weeds from emergence up to the appearance of seedheads, flowers or berries. Use a lower rate in the rate range to control annual herbaceous weeds and actively growing perennial herbaceous weeds after seedheads, flowers or berries appear. Apply to foliage of actively growing annual herbaceous weeds anytime after emergence.

This product has no herbicidal or residual activity in the soil. Where repeat applications up to the labeled rate are necessary, do not apply more than 8 quarts of product per acre per year.

Tank Mixes

This product may be used in tank mix combination with other herbicide products to broaden the spectrum of vegetation controlled. When tank mixing, read and observe applicable use directions, precautions and limitations on the respective product labels. Use according to the most restrictive precautionary statements for each product in the mixture. Any specified rate of this product may be used in a tank mix.

Note: For forestry site preparation, make sure the tank mix product is approved for use prior to planting the desired species. Observe planting interval restrictions.

Any specified rate of this product may be used in a tank mix with the following products for forestry site preparation:

Product
Milestone VM
Garlon 3A
Garlon 4
Arsenal Applicators Concentrate
Escort
Chopper
Oust XP
Arsenal Applicators Concentrate
Arsenal Applicators Concentrate

For control of herbaceous weeds, use the lower specified tank mixture rates. For control of dense stands or difficult to control woody brush and trees, use the higher specified rates.

Aerial Application

Aerially apply this product by helicopter only in forestry sites. See Aerial Application in Application Equipment and Application Methods for more details.

Ground Application

Apply this product using suitable ground equipment for broadcast applications in forestry sites. See Ground Application in Application Equipment and Application Methods for more details. Unless otherwise specified, apply the specified rates of this product as a broadcast spray in sufficient spray volume to provide complete and uniform coverage of plant foliage. Check for even distribution throughout the spray pattern.

Hand-Held and Backpack Application

Apply this product using handgun and backpack equipment in forestry sites. See Hand-Held and Backpack Application in Application Equipment and Application Methods for more details. For spray to wet applications, coverage should be uniform and complete, but not to the point of runoff.

This product may be used for low volume directed sprays for spot treatment of trees and brush. It is most effective in areas where there is a low density of undesirable trees or brush. For flat fan and cone nozzles, spray the foliage of the targeted vegetation. Small, open branched trees need only be treated from one side. If the foliage is thick or there are multiple root sprouts, apply from several sides to ensure adequate spray coverage.

Forestry Conifer and Hardwood Release

Directed Sprays and Selective Equipment

Apply this product as a directed spray or with selective equipment in forestry conifer and hardwood sites, including Christmas tree plantations and silvicultural nurseries. A surfactant must be used with this product. Use only surfactants approved for conifer release and specified on the surfactant label as safe for use in conifer release (pine release). Using this product without a surfactant will result in reduced herbicide performance. See Mixing Directions and Application Equipment and Application Methods sections.

Avoid contact of spray drift, mist or drips with foliage, green bark or non-woody surface roots of desirable plant species.

Tank Mixes: When tank mixing, read and observe applicable use directions, precautions and limitations on the respective product labels. Use according to the most restrictive precautionary statements for each product in the mixture.

Broadcast Application Outside Area of Southeastern United States

Apply this product as a broadcast application for release of Douglas fir (*Pseudotsuga menziesii*), fir (*Abies* species), hemlock (*Tsuga* species), pines (*Pinus* species) (includes all species except loblolly, longleaf, shortleaf, or slash), and California redwood (*Sequoia* species) outside the area of the southeastern United States. Apply this product as a broadcast application only after formation of final conifer resting buds in the fall or prior to initial bud swelling in the spring. Note: Except where specified, make broadcast applications of this product only where conifers have been established for more than one year.

Injury may occur to conifers treated for release, especially where spray patterns overlap or the higher labeled rate is applied. Damage can be accentuated if applications are made when conifers are actively growing, are under stress from drought, flood water, improper planting, insects, animal damage or diseases.

Apply 3/4 to 1 1/2 quarts per acre as a broadcast spray. Apply 3/4 to 1 1/8 quarts of this product per acre to release Douglas fir, pine and spruce species at the end of the first growing season (except California). Ensure all conifers are well hardened off.

A surfactant must be used with this product for optimum weed control. Use only surfactants approved for use in over the top release applications. Using this product without a surfactant will result in reduced herbicide performance. For best results, do not use a surfactant for release of hemlock species or California redwood. In mixed conifer stands, injury to these species may result if a surfactant is used. See Mixing Directions and Application Equipment and Application Methods sections.

For release of Douglas fir, a nonionic surfactant for over the top foliar spray may be used. To avoid possible conifer injury, use nonionic surfactants at 2 fl oz per acre at elevations above 1500 feet, or 1 fl oz per acre in the coastal range or at elevations below 1500 feet. Using a higher rate of surfactant may result in unacceptable conifer injury. Ensure the nonionic surfactant has been adequately tested for safety to Douglas fir before using.

Tank Mixes with Oust XP: Apply 3/4 to 1 1/2 quarts of this product with the labeled rate of Oust XP per acre to release jack pine and white. Use the labeled rate of Oust XP per acre with this product to release white pine. Make applications to actively growing weeds as a broadcast spray over the top of established conifers. Make applications after formation of conifer resting buds in the late summer or fall.

Tank Mixes with Arsenal Applicators Concentrate: Apply 3/4 to 1 1/8 quarts of this product with the labeled rate of Arsenal Applicators Concentrate per acre to release Douglas fir. Apply 1 1/2 quarts of this product with the labeled rate of Arsenal Applicators Concentrate per acre to release balsam fir and red spruce.

In **Maine** and **New Hampshire**, apply up to 2 1/4 quarts of this product per acre to control or suppress difficult to control hardwood species. For the release of red pine, balsam fir, red spruce, white spruce, Norway spruce, and black spruce with dense tough to control brush, and where maples make up a large component of the undesirable trees, this product may be tank mixed with the labeled rate of Arsenal Applicators Concentrate and the labeled rate of Oust XP per acre. Apply this mix as a broadcast spray.

Broadcast Application in Southeastern United States

Apply this product as a broadcast application for release of loblolly pine (*Pinus taeda*), eastern white pine (*Pinus strobus*), shortleaf pine (*Pinus echinata*), slash pine (*Pinus elliotii*), Virginia pine (*Pinus virginiana*), and longleaf pine (*Pinus palustris*) in the southeastern United States.

Apply 1 1/8 to 1 7/8 quarts of this product per acre as a broadcast spray during late summer or early fall after the conifers have hardened off. For applications at the end of the first growing season, use 3/4 quart of this product alone or in a tank mix.

Tank Mixes with Arsenal Applicators Concentrate: For conifer release, apply 3/4 to 1 1/2 quarts of this product with the labeled rate of Arsenal Applicators Concentrate per acre as a broadcast spray. Use only on conifer species that are labeled for over the top spray for both products. Use the higher specified rates for dense tough to control wood brush and trees.

Herbaceous Release

When applied as directed, this product plus listed residual herbicides provide postemergence control of the annual weeds and control or suppression of the perennial weeds listed in this label, and residual control of the weeds listed in the residual herbicide label. Make applications to actively growing weeds as a broadcast spray over the top of labeled conifers.

Use a surfactant labeled for use in over the top herbaceous release applications. Using this product without a surfactant will result in reduced herbicide performance. See Mixing Directions and Application Equipment and Application Methods sections on this label.

Weed control may be reduced if spray solution water volumes exceed 25 gallons per acre for these treatments.

Tank Mixes with Oust XP: Apply 12 to 18 fl oz of this product with the labeled rate of Oust XP per acre to release loblolly pines. Apply 9 to 12 fl oz of this product with the labeled rate of Oust XP per acre to release slash pines.

Tank Mix with Atrazine: Apply 3/4 quarts of this product with 4 lb ai of atrazine per acre to release Douglas fir. Apply only over Douglas fir that has been established for at least one full growing season. Apply in the early spring, usually mid-March through early April. Injury will occur if applications are made after bud swell in the spring. For this use, do not add surfactant to the tank mix.

In **Maine** and **New Hampshire**, for release of red pine, balsam fir, red spruce, white spruce, Norway spruce, and black spruce with heavy grass and herbaceous weeds infesting the site, up to 2 1/4 quarts of this product per acre may be tank mixed with the labeled rate of Oust XP to control grass, herbaceous weeds and woody brush. Apply this mix as a broadcast spray.

Mid-Rotation Conifer Release and Spot Treatments for Crop Tree Release and Timber Stand Improvement

This product is applied as a ground broadcast or directed spray application for mid-rotation release applications under the canopy of pines (and other conifers) and hardwoods. Make applications using application techniques that prevent or minimize direct contact to the foliage of crop trees (including in stands of pine, other conifers, or hardwood). This may be accomplished using directed sprays and ground equipment with nozzles oriented to target only undesirable understory vegetation below the crop tree canopy. This product is applied as a spot, individual plant treatment for woody and herbaceous weeds (see Hand-Held and Backpack Application in Application Equipment and Application Methods section). When making spot applications, do not allow spray to contact the foliage of desirable crop trees.

Broadcast Application for Control of Undesirable Competitive Vegetation in Larch (*Larix* spp.) Plantations in Maine

Apply this product to control or reduce competition from undesirable vegetation in Larch (*Larix* spp.) plantations in the state of Maine.

Application Timing

Apply only after lignification has occurred in 50% or more of the current year's terminal growth.

Application Directions

Broadcast Spray: Use 1 to 3 quarts of this product per acre. Apply in a total spray volume of 10 to 60 gallons per acre using ground equipment or 5 to 15 gallons per acre if applied aerially. Up to 30 fl oz of Entry II surfactant may be added.

Directed Sprays: This product may be applied as a directed spray for competitive release of larch. Avoid contact of spray drift, mist or drips with foliage, green bark or non-woody surface roots of desirable plants. See Application Equipment and Application Methods of the product label.

Injury to larch may occur, especially where spray patterns overlap or higher labeled rates of this product or surfactant were applied. Damage can be accentuated if application is made when larch is actively growing or is under stress. Make applications only if some level of injury to larch is acceptable.

Noncrop Areas and Industrial Sites

See the rate tables in the Annual Weeds, Perennial Weeds, and Woody Brush and Trees sections for specific application rates. This product has no herbicidal or residual activity in the soil. Where repeat applications up to the labeled rate are necessary, do not apply more than 8 quarts of this product per acre per year.

Use a higher rate in the rate range for control or partial control of woody brush, trees, and hard to control perennial herbaceous weeds. For best results, apply to actively growing woody brush and trees after full leaf expansion and before fall color and leaf drop. Use increased rates within the rate range for difficult to control species, where dense stands occur, or where conditions for control are not ideal and to control perennial herbaceous weeds from emergence up to the appearance of seedheads, flowers or berries. Use a lower rate in the rate range to control annual herbaceous weeds and actively growing perennial herbaceous weeds after seedheads, flowers or berries appear. Apply to foliage of actively growing annual herbaceous weeds anytime after emergence.

Tank Mixing for Noncrop Areas

This product may be used in tank mix combination with other herbicide products to broaden the spectrum of vegetation controlled. When tank mixing, read and observe applicable use directions, precautions and limitations on the respective product labels. Use according to the most restrictive precautionary statements for each product in the mixture. Any specified rate of this product may be used in a tank mix.

Maintain good agitation at all times during the mixing process and application. Ensure that the tank mix product(s) is well mixed with the spray solution before adding this product. Mix only the amount of spray solution that will be used during the same day. Reduced weed control may result if a tank mixture is allowed to stand overnight. If the spray mix is allowed to settle, thorough agitation is required to resuspend the mixture before spraying is resumed.

Weed Control, Trim and Edge, and Bare Ground

This product may be used in general noncrop and non-food areas. It may be applied with any application equipment described in this label. This product may be used to trim and edge around objects in noncrop sites, for spot treatment of unwanted vegetation, and to eliminate unwanted weeds growing in established shrub beds or ornamental plantings. This product may be used prior to planting an area to ornamentals, flowers, turfgrass (sod or seed), or prior to laying asphalt or beginning construction projects.

To maintain bare ground, repeated applications up to the labeled rate of this product may be used.

This product provides control of emerged annual weeds and control or partial control of emerged perennial weeds, woody brush and trees when applied in a tank mix to bare ground.

Turfgrass Renovation, Seed or Sod Production

This product controls most existing vegetation prior to renovating turfgrass areas or establishing turfgrass grown for seed or sod. For maximum control of existing vegetation, delay planting or sodding to determine if any regrowth from escaped underground plant parts occurs. When repeat treatments are necessary, sufficient regrowth must be attained prior to application. For warm season turfgrass, including bermudagrass, summer or fall applications provide the best control. Where existing vegetation is growing under mowed turfgrass

management, apply this product after omitting at last one regular mowing to allow sufficient grown for good interception of the spray.

Do not disturb soil or underground plant parts before treatment. Delay tillage or renovation techniques, including vertical mowing, coring, or slicing, for seven days after application to allow translocation into underground plant parts.

Desirable turfgrass may be planed following the above procedures.

Hand-held equipment may be used for spot treatment of unwanted vegetation growing in existing turfgrass. Broadcast or hand-held equipment may be used to control sod remnants or other unwanted vegetation after sod is harvested.

Do not feed or graze turfgrass grown for seed or sod production for eight weeks following application.

Ornamentals and Plant Nurseries

Post-Direct and Trim and Edge

This product may be used as a post-directed spray around established woody ornamental species, including arborvitae, azalea, boxwood, crabapple, euonymus, fir, Douglas fir, jojoba, hollies, lilac, magnolia, maple, oak, provet, pine, spruce and yew. This product may also be used to trim and edge around trees, buildings, sidewalks and roads, potted plants and other objects in a nursery setting.

Desirable plants may be protected from the spray solution by using shields or coverings made of cardboard or other impermeable material. Do not use this product for any over the top broadcast spray in ornamentals. Exercise care to avoid contact of spray, drift or mist with foliage or green bark of established ornamental species.

Site Preparation

This product may be used prior to planting any ornamental, nursery or Christmas tree species.

Greenhouse/Shadehouse

This product may be used to control weeds growing in and around greenhouses and shadehouses. Desirable vegetation must not be present during application and air circulation fans must be turned off.

Wildlife Habitat Management

This product may be used to control exotic and other undesirable vegetation in habitat management and natural areas, including rangeland and wildlife refuges. Apply to allow recovery of native plant species, prior to planting desirable native species, and for broad spectrum vegetation control. Apply spot treatments to selectively remove unwanted plants for habitat enhancement.

Wildlife Food Plots

This product may be used as a site preparation treatment to control annual and perennial weeds prior to planting wildlife food plots. Any wildlife food species may be planted after applying this product, or native species may be allowed to repopulate the area. If tillage is needed to prepare a seedbed, wait 7 days after application before tilling to allow translocation into underground plant parts.

Hollow Stem Injection

Apply this product to control giant knotweed (*Polygonum sachalinense*), Japanese knotweed (*Polygonum cuspidatum*), or other invasive knotweeds using individual stem treatment. Use a hand-held injection device that delivers the specified amount of this product into these hollow stem plants.

Make a hole through both sides of the stem about 6 inches above the ground, just below a node, using an awl or other pointed tool. Inject 5 mL of undiluted product directly into this hole in the hollow stem. Treat each stem of the knotweed plant.

Restrictions:

- Do not apply more than a total of 8 quarts of this product per acre for all treatments combined. At 5 mL per stem, 7.5 quarts will treat approximately 1420 stems per acre.

Parks, Recreational and Residential Areas

Use this product in parks, recreational and residential areas. Apply it with any application equipment described in this label. Use this product to trim and edge around trees, fences, paths, around buildings, sidewalks, and other objects in these areas. This product may be used for spot treatment of unwanted vegetation, eliminate unwanted weeds growing in established shrub beds or ornamental plantings, and prior to planting an area to ornamentals, flowers, turfgrass (sod or seed), or prior to laying asphalt or beginning construction projects.

All of the label instructions apply to park and recreational areas.

Railroads

All of the instructions in the Noncrop Areas and Industrial Sites and Roadside sections apply to railroads.

Bare Ground, Ballast and Shoulders, Crossings, and Spot Treatment

Use this product to maintain bare ground on railroad ballast and shoulders. Repeat applications up to the labeled rate of this product may be used as weeds emerge to maintain bare ground. Use this product to control tall growing weeds to improve line of sight at railroad crossings and reduce the need for mowing along rights-of-way.

Brush Control

Apply 3 to 8 quarts of this product per acre as a broadcast spray, using boom-type or boomless nozzles. Applications up to 80 gallons of spray solution per acre may be used. Apply a 3/4 to 1.5 percent solution of this product when using high volume spray to wet applications. Apply a 5 to 10 percent solution of this product when using low volume directed sprays for spot treatment.

Roadsides

All of the instructions in the Noncrop Areas and Industrial Sites and Railroads sections apply to roadsides.

Shoulder Treatments

Use this product on road shoulders. Apply it with boom sprayers, shielded boom sprayers, high volume off-center nozzles, OC nozzle clusters, manifold nozzle systems, hand-held equipment, and similar equipment, and under-deck mowing plus herbicide systems.

Guardrails and Other Obstacles to Mowing

Use this product to control weeds growing under guardrails and around signposts and other objects along the roadside.

Spot Treatment

Use this product as a spot treatment to control unwanted vegetation growing along roadsides.

Tank Mixes: This product may be used in tank mix combination with other herbicide products to broaden the spectrum of vegetation controlled and for residual weed control. Follow applicable use directions, precautions and limitations on the respective product labels. Use according to the most restrictive precautionary statements for each product in the mixture. Any specified rate of this product may be used in a tank mix.

Chemical Mowing

Perennials: This product suppresses perennial grasses listed in this section to serve as a substitute for mowing. Use 4.5 fl oz of this product per acre when treating Kentucky bluegrass, tall fescue, fine fescue, orchardgrass, or quackgrass. Apply 12 fl oz of this product per acre when treating bermudagrass. Apply 4.5 to 8 fl oz of this product per acre when treating bahiagrass. Use the higher labeled rates when grass is under heat stress. Apply 3 pints of this product per acre when treating torpedograss or paragrass. Apply treatments in 10 to 20 gallons of spray solution per acre.

Annuals: For growth suppression of some annual grasses, including annual ryegrass, wild barley and wild oats growing in coarse turfgrass on roadsides or other industrial areas, apply 3 to 3.75 fl oz of this product in 10 to 40 gallons of spray solution per acre. Apply when annual grasses are actively growing and before the seedheads are in the boot stage of development. Treatments may cause injury to the desired grasses.

Release of Dormant Bermudagrass or Bahiagrass

Apply 6 to 48 fl oz of this product per acre in 10 to 40 gallons of water per acre. Use only in areas where bermudagrass or bahiagrass are desirable groundcovers and where some temporary injury or discoloration can be tolerated. Treatments of more than 12 fl oz per acre may result in injury or delayed greenup in highly maintained areas, including golf courses and lawns.

For best results on winter annuals, treat when weeds are in an early growth stage (less than 6 inches in height) after most have germinated. For best results on tall fescue, treat when fescue is in or beyond the 4- to 6-leaf stage.

Tank Mixes: This product may be used in tank mix combination with other herbicide products to broaden the spectrum of vegetation controlled and for residual weed control. When tank mixing, read and follow all applicable use directions, precautions, and limitation on the respective product labels. Use according to the most restrictive precautionary statements for each product in the mixture. Any specified rate of this product may be used in a tank mix.

Actively Growing Bermudagrass

Use this product to control or partially control many annual and perennial weeds for effective release of actively growing bermudagrass. Use only in areas where some temporary injury or discoloration can be tolerated. Use only on well-established bermudagrass. Bermudagrass injury may result from the treatment, but regrowth will occur under moist conditions. Repeat applications of the tank mix in the same season are not recommended because severe injury may occur.

Apply up to 2.25 pints of this product in 10 to 40 gallons of spray solution per acre. Use the lower rate when treating annual weeds less than

6 inches in height (or runner length). Use the higher labeled rate as weeds increase in size or as they approach flower or seedhead formation.

Actively Growing Bahiagrass

For suppression of vegetable growth and seedhead inhibition of bahiagrass for approximately 45 days, apply 4.5 fl oz of this product in 10 to 40 gallons of water per acre. Apply one to two weeks after full greenup or after mowing to a uniform height of 3 to 4 inches. Make this application prior to seedhead emergence. For suppression up to 120 days, apply 3 fl oz of this product per acre, followed by an application of 1.5 to 3 fl oz per acre about 45 days later. Make no more than two applications per year.

Tank Mixes: This product may be used in tank mix combination with other herbicide products to broaden the spectrum of vegetation controlled and for residual weed control. When tank mixing, read and follow all applicable use directions, precautions, and limitation on the respective product labels. Use according to the most restrictive precautionary statements for each product in the mixture. Any specified rate of this product may be used in a tank mix.

Utility Sites

Use this product for control of brush, tree, and weed control and side trimming in areas including electrical power, pipeline and telephone rights-of-ways, and other sites associated with these rights-of-ways including substations, roadsides, and railroads. This product may be applied with any application equipment or method described on this label unless specifically prohibited.

Tank Mixes: This product may be used in tank mix combination with other herbicide products to broaden the spectrum of vegetation controlled and for residual weed control. When tank mixing, read and follow all applicable use directions, precautions, and limitation on the respective product labels. Use according to the most restrictive precautionary statements for each product in the mixture. Any specified rate of this product may be used in a tank mix.

Rangelands

Use this product to control or suppress many annual weeds growing in perennial cool and warm season grass rangelands. Preventing weed seed production is critical to the successful control of annual grassy weeds invading these perennial grass sites. Eliminate most of the viable seeds with follow up applications in sequential years. Delay grazing of treated areas to encourage growth of desirable perennials. Allowing desirable perennials to flower and reseed in the treated area will encourage successful transition.

Bromus: Use this product to control or suppress downy brome/cheatgrass (*Bromus tectorum*), Japanese brome (*Bromus japonicus*), soft chess (*Bromus mollis*), cheat (*Bromus secalinus*), cereal rye, and jointed goatgrass. Apply 6 to 12 fl oz of this product per acre as a broadcast treatment.

For best results, coincide treatments with early seedhead emergence of the most mature plants. Delaying the application until this growth stage maximizes the emergence of other weedy grass flushes. Make applications to the same site each year until seed banks are depleted and the desirable perennial grasses become established on the site.

Medusahead: Apply 12 fl oz of this product per acre to control or suppress medusahead at the 3-leaf stage when plants are actively growing. Delaying applications beyond this stage results in reduced or unacceptable control. Repeat applications in subsequent years to eliminate the seed bank before reestablishing desirable perennial grasses. Apply in the fall or spring.

Apply by ground or air. Make aerial applications for these uses with fixed wing or helicopter equipment. For aerial applications, apply in 2 to 10 gallons of water per acre. For ground applications, apply in at least 10 to 20 gallons of water per acre.

Spot Treatment and Wiper Application

Apply this product in rangeland, pastures, or industrial sites as a spot treatment or over the top of desirable grasses using wiper applicators to control tall weeds. See Wiper Application section for specific instructions. Make repeat applications up to the labeled rate in the same area at 30-day intervals.

The entire site or any portion of it may be treated when using 2.25 quarts or less of this product per acre for spot treatments or wiper applications. No more than 10 percent of the total site may be treated at any one time when using more than 2.25 quarts of this product per acre for spot treatments or wiper applications. To achieve maximum performance, remove domestic livestock before application and wait 7 days after application before grazing livestock or harvesting for feed.

Pastures

Type of Pastures: Bahiagrass, bermudagrass, bluegrass, brome, fescue, orchardgrass, ryegrass, timothy, wheatgrass, alfalfa, clover

Spot Treatment and Wiper Application

This product may be applied as a spot treatment or as a wiper application. Make applications in the same area at 30-day intervals. See Wiper Application section for specific instructions.

Precautions:

- For spot treatment and wiper applications, the entire field or any portion of it may be treated when using a rate of 2.25 quarts or less per acre.
- To achieve maximum performance, remove domestic livestock before application and wait 14 days after application before grazing livestock or harvesting.

Restrictions:

- Do not treat more than 10 percent of any acre at one time if applying more than 2.25 quarts per acre as a spot treatment or wiper application.

Preplant, Preemergence, and Pasture Renovation

Apply this product prior to planting or emergence of forage grasses and legumes. In addition, this product may be used to control perennial pasture species listed on this label prior to re-planting.

Precautions:

- If the application rates total 2.25 quarts or less per acre, there is no waiting period between treatment and feeding or livestock grazing is required.
- If the application rates total more than 2.25 quarts per acre, remove domestic livestock before application and wait eight weeks after application before grazing or harvesting.

Restrictions:

- Crops listed for treatment in this label may be planted into the treated area at any time. Wait 30 days between application and planting for all other crops.

Bamboo

Use this product on roadside rights-of way to control or suppress bamboo. Use the higher rate in the rate range for dense stands and larger plants. Mow or cut bamboo and allow it to resprout to have sufficient foliage in order for the spray solution to completely cover the foliage. Optimum control or suppression of bamboo is achieved when this product is applied between August and October (prior to frost). One application of this product plus a surfactant will not eradicate bamboo. Several mowings and applications are required to completely control bamboo.

Apply the specified rate plus a surfactant (1/4 to 1/2% v/v), such as a nonionic surfactant containing 80% active ingredient or more. Using this product without a surfactant results in reduced performance.

Application Method	Rate	Spray Volume (gal/acre)
ground broadcast	1.5 – 7.5 qt/acre	10 - 60
handgun spray to wet	0.75 – 2%	spray to wet
handgun or backpack low volume directed spray	4 – 10%	spray to cover

Restrictions:

- Do not apply more than a total of 8 quarts of this product per acre per year.

Annual Weeds, Perennial Weeds, and Woody Brush and Trees

Annual Weeds

Apply 24 fl oz of this product per acre if weeds are less than 6 inches in height or runner length. Use 1.25 to 3 quarts of this product per acre if weeds are more than 6 inches in height or runner length or when weeds are growing under stressed conditions. Use a higher rate in the rate range for tough to control species regardless of the size of the weed at the time of application. Treat tough to control weeds when they are relatively small. Tank mix this product with only those products that are labeled for application at the target site. Refer to the label of the tank mix partner for use sites and application rates.

Apply a 0.4 percent solution of this product as a spray to wet application to weeds less than 6 inches in height or runner length. Use a 0.7 to 1.5 percent solution for annual weeds more than 6 inches tall or for smaller weeds growing under stressed conditions. Use the higher concentration for tough to control species or for weeds more than 24 inches tall. Apply prior to seedhead formation in grass or bud formation in broadleaf weeds.

Use a 4 to 7 percent solution of this product for low volume directed spray applications. Spray coverage should be uniform with at least

50 percent of the foliage contacted. For best results, cover the top one-half of the plant. To ensure adequate spray coverage, spray both sides of large or tall weeds when foliage is thick and dense or where there are multiple sprouts.

Common Name

anoda, spurred balsamapple¹
barley
barnyardgrass
bassia, fivehook
bittercress
bluegrass, annual
bluegrass, bulbous
brome, downy/cheatgrass
brome, Japanese
buttercup
Carolina foxtail
Carolina geranium
castorbean
chamomile, mayweed
cheat
chervil
chickweed
cocklebur, common
coreopsis, plains
corn, volunteer
crabgrass
dwarf/dandelion, Virginia
eastern mangrass
eclipta
falsedandelion
falseflax, smallseed
fiddleneck
field pennycress
fleabane, annual
fleabane, hairy
fleabane, rough
Florida pusley
foxtail
goatgrass, jointed
goosegrass
groundsel, common
henbit
horseweed/marestail
itchgrass
johnsongrass
junglerice
knotweed
kochia²
lambquarters, common
mallow, little
medusahead
morningglory
mustard, blue
mustard, tumble
mustard, wild
oats, wild
panicum, fall
pigweed, redroot
pigweed, smooth
prickly lettuce
puncturevine
purslane, common
ragweed, common
ragweed, giant
rocket, London
Russian-thistle
rye, cereal
ryegrass, Italian³
sandbur, field
sesbania, hemp
shattercane
shepherd's-purse
sicklepod
signalgrass, broadleaf
smartweed, Pennsylvania
sowthistle, annual
Spanishneedles³
speedwell, corn
speedwell, purslane
sprangletop
spurge, annual
spurge, prostrate
spurge, spotted
spurry, umbrella
stinkgrass
sunflower, common
tansymustard, pinnate
teaweed/sida, prickly
Texas panicum

Scientific Name

Anoda cristata
Momordica charantia
Hordeum vulgare
Echinochloa crus-galli
Bassia hyssopifolia
Cardamine spp.
Poa annua
Poa bulbosa
Bromus tectorum
Bromus japonicus
Ranunculus spp.
Alopecurus carolinianus
Geranium carolinianum
Ricinus communis
Anthemis cotula
Bromus secalinus
Anthriscus cerefolium
Cerastium vulgatum
Xanthium strumarium
Coreopsis tinctoria
Zea mays
Digitaria spp.
Krigia virginica
Glyceria spp.
Eclipta prostrata
Pyrrhopappus carolinianus
Camelina microcarpa
Amsinckia spp.
Thlaspi arvense
Erigeron annuus
Conyza bonariensis
Erigeron strigosus
Richardia scabra
Setaria spp.
Aegilops cylindrica
Eleusine indica
Senecio vulgaris
Lamium amplexicaule
Conyza canadensis
Rottboellia cochinchinensis
Sorghum halepense
Echinochloa colona
Polygonum spp.
Kochia scoparia
Chenopodium album
Malva parviflora
Taeniatherum caput-medusae
Ipomoea spp.
Chorispora tenella
Sisymbrium altissimum
Sinapis arvensis
Avena fatua
Panicum dichotomiflorum
Amaranthus retroflexus
Amaranthus hybridus
Lactuca serriola
Tribulus terrestris
Portulaca oleracea
Ambrosia artemisiifolia
Ambrosia trifida
Sisymbrium irio
Salsola tragus
Secale cereale
Lolium perenne
Cenchrus spinifex
Sesbania herbacea
Sorghum bicolor
Capsella bursa-pastoris
Senna obtusifolia
Urochloa platyphylla
Polygonum pennsylvanicum
Sonchus oleraceus
Bidens bipinnata
Veronica arvensis
Veronica peregrina
Leptochloa spp.
Chamaesyce spp.
Chamaesyce humistrata
Chamaesyce maculata
Holosteum umbellatum
Eragrostis cilianensis
Helianthus annuus
Descurainia pinnata
Sida spinosa
Panicum spp.

Common Name (Cont.)

velvetleaf
Virginia pepperweed
wheat
witchgrass
woolly cupgrass
yellow rocket

¹Apply with hand-held equipment only.

²Do not treat kochia in the button stage.

³Apply 3 pints of product per acre.

Perennial Weeds

Best results are obtained when perennial weeds are treated after they reach the reproductive stage of growth (seedhead initiation in grasses and bud formation in broadleaves). Best results are obtained when non-flowering plants are treated when they reach a mature stage of growth. In many situations, applications are required prior to these growth stages. Under these conditions, use a higher rate in the rate range.

When using spray to wet treatments with hand-held equipment, ensure thorough coverage of the plant. For best results, use a 1.5 percent solution on harder to control perennials including bermudagrass, dock, field bindweed, hemp dogbane, milkweed and Canada thistle.

Use a 4 to 7 percent solution of this product in low volume directed spray applications. Spray coverage should be uniform with at least 50 percent of the foliage contacted. For best results, cover the top one-half of the plant. To ensure adequate spray coverage, spray both sides of large or tall weeds when foliage is thick and dense or where there are multiple sprouts.

Allow 7 days or more after application before tillage.

Common Name

alfalfa
alligatorweed¹
anise/fennel
artichoke, Jerusalem
bahiagrass
beachgrass, European
bentgrass
bermudagrass
bindweed, field
bluegrass, Kentucky
blueweed, Texas
brackenfern
brome, smooth
bursage, woollyleaf
canarygrass, reed
cattail
clover, red
clover, white
cogongrass
cordgrass
cutgrass, giant¹
dallisgrass
dandelion
dock, curly
dogbane, hemp
fescue
fescue, tall
German ivy
guineagrass
horsenettle
horseradish
iceplant, crystalline
johnsongrass-
kikuyugrass
knapweed, Russian
lantana, largeleaf
lespedeza, common
lespedeza, sericea-
loosestrife, purple
lotus, American
maidenhair
milkweed
muhly, wirestem
mullein, common
napiergrass
nightshade, silverleaf
nutsedge, purple
nutsedge, yellow
orchardgrass
pampasgrass
paragrass
phragmites²
poison-hemlock
quackgrass
redvine
reed, giant
ryegrass, perennial

Scientific Name

Abutilon theophrasti
Lepidium virginicum
Triticum aestivum
Panicum capillare
Eriochloa villosa
Barbarea vulgaris

Scientific Name

Medicago sativa
Alternanthera philoxeroides
Foeniculum vulgare
Helianthus tuberosus
Paspalum notatum
Ammophila arenaria
Agrostis spp.
Cynodon dactylon
Convolvulus arvensis
Poa pratensis
Helianthus ciliaris
Pteridium aquilinum
Bromus inermis
Ambrosia grayi
Phalaris arundinacea
Typha spp.
Trifolium pratense
Trifolium repens
Imperata cylindrica
Spartina spp.
Zizaniopsis miliacea
Paspalum dilatatum
Taraxacum officinale
Rumex crispus
Apocynum cannabinum
Festuca spp.
Lolium arundinaceum
Senecio mikanioides
Urochloa maxima
Solanum carolinense
Armoracia rusticana
Mesembryanthemum crystallinum
Sorghum halepense
Pennisetum clandestinum
Acroptilon repens
Lantana camara
Kummerowia striata
Lespedeza cuneata
Lythrum salicaria
Nelumbo lutea
Panicum hemitomon
Asclepias spp.
Muhlenbergia frondosa
Verbascum thapsus
Pennisetum purpureum
Solanum elaeagnifolium
Cyperus rotundus
Cyperus esculentus
Dactylis glomerata
Cortaderia selloana
Urochloa mutica
Phragmites spp.
Conium maculatum
Elymus repens
Brunnichia ovata
Arundo donax
Lolium perenne

Common Name (Cont.)

smartweed, swamp
sowthistle, perennial
spatterdock
starthistle, yellow-
sweet potato, wild¹
thistle, artichoke
thistle, Canada
timothy
torpedograss¹
trumpetcreeper
tules, common
vaseygrass
velvetgrass
water fern³
waterhyacinth
waterlettuce
waterprimrose
wheatgrass, western

¹ Partial control.

² Partial control in southeastern states.

³ Not for use in California

Scientific Name

Polygonum amphibium
Sonchus arvensis
Nuphar lutea
Centaurea solstitialis
Ipomoea pandurata
Cynara cardunculus
Cirsium arvense
Phleum pratense
Panicum repens
Campsis radicans
Scirpus acutus
Paspalum urvillei
Holcus spp.
Salvinia spp.
Eichornia crassipes
Pistia stratiotes
Ludwigia spp.
Pascopyrum smithii

Woody Brush and Trees

Apply this product after full leaf expansion unless otherwise directed. Use the higher labeled rate for larger plants and/or dense areas of growth. On vines, use the higher labeled rate for plants that have reached the woody stage of growth. Best results are obtained when application is made in late summer or fall after fruit formation.

In arid areas, best results are obtained when applications are made in the spring or early summer when brush species are at high moisture content and are flowering.

Ensure thorough coverage when using hand-held equipment.

See Low Volume Directed Spray Application section of label. Spray coverage should be uniform with at least 50 percent of the foliage contacted. For best results, cover the top half to 2/3 of the plant foliage. Spray both sides of large or tall woody brush and trees to ensure adequate spray coverage when foliage is thick and dense or where there are multiple sprouts. Symptoms may not appear prior to frost or senescence with fall treatments.

Allow seven days or more after application before tillage, mowing or removal. Repeat treatments up to the labeled rate may be necessary to control plants regenerating from underground parts or seed. Some autumn colors on undesirable deciduous species are acceptable provided no major leaf drop has occurred. Reduced performance may result if fall treatments are made following a frost.

Note: If brush has been mowed or tilled, or trees have been cut, do not treat until regrowth has reached the specified stage of growth.

This product will control, partially control, or suppress the following woody brush and trees.

Common Name

alder
ash¹
aspen, quaking
bearclover, beararm
beach
birch
bittercherry
blackberry
blackgum
blue gum, Tasmanian
brackenfern
broom, French
broom, Scotch
buckwheat, California¹
cascara¹
catclaw-vine¹
ceanothus
chamise
cherry
cherry, black
cherry, pin
copperleaf, hophornbeam
coyotebrush
deer vetch
dewberry, southern
dogwood
elderberry
elm¹
gorse
hasardia¹
hawthorn
hazel
hickory
holly, Florida

Scientific Name

Alnus spp.
Fraxinus spp.
Populus tremuloides
Ceanothus prostratus
Fagus spp.
Betula spp.
Prunus emarginata
Rubus spp.
Nyssa sylvatica
Eucalyptus globulus
Pteridium aquilinum
Genista monspessulana
Cytisus scoparius
Eriogonum fasciculatum
Frangula purshiana
Macfadyena unguis-cati
Ceanothus spp.
Adenostoma fasciculatum
Prunus spp.
Prunus serotina
Prunus pensylvanica
Acalypha ostryifolia
Baccharis pilularis
Lotus unifoliolatus
Rubus trivialis
Cornus spp.
Sambucus nigra
Ulmus spp.
Ulex europaeus
Haplopappus squamosus
Crataegus spp.
Corylus spp.
Carya spp.
Schinus terebinthifolius

Common Name (Cont.)

honeysuckle
hornbeam, American
kudzu
locust, black¹
madrone, Pacific
manzanita
maple
maple, red¹
maple, sugar
maple, vine¹
monkeyflower¹
oak
oak, black¹
oak, pin
oak, post
oak, red
oak, southern red
oak, white¹
peppertree, Brazilian
persimmon¹
pine
poison-ivy, eastern
poison-oak
poison-sumac¹
prunus
raspberry
redbud, eastern-
rose, multiflora-
Russian-olive
sage, black, white
sagebrush, California
salmonberry
saltcedar¹
saltbush, sea myrtle
sassafras-
sourwood¹
sumac, smooth¹
sumac, dwarf¹
sweetgum-
swordfern¹
tallowtree, Chinese-
oak, tanbark resprouts
thimbleberry, western
tobacco, tree¹
trumpetcreeper-
Virginia-creeper¹
waxmyrtle, southern¹
willow-
yellow-poplar¹
yerba santa
¹Partial control

Scientific Name

Lonicera spp.
Carpinus caroliniana
Pueraria montana
Robinia pseudoacacia
Arbutus menziesii
Arctostaphylos spp.
Acer spp.
Acer rubrum
Acer saccharum
Acer circinatum
Mimulus guttatus
Quercus spp.
Quercus kelloggia
Quercus palustris
Quercus stellata
Quercus rubra
Quercus falcata
Quercus alba
Schinus terebinthifolius
Diospyros spp.
Pknus spp.
Toxicodendron radicans
Toxicodendron spp.
Toxicodendron vernix
Prunus spp.
Rubus spp.
Cercis canadensis
Rosa multiflora
Elaeagnus angustifolia
Salvia spp.
Artemisia californica
Rubus spectabilis
Tamarix ramosissima
Baccharis halimifolia
Sassafras albidum
Oxydendrum arboreum
Rhus glabra
Rhus copallinum
Liquidambar styraciflua
Polystichum munitum
Triadica sebifera
Lithocarpus densiflorus
Rubus parviflorus
Nicotiana glauca
Campsis radicans
Parthenocissus quinquefolia
Myrica cerifera
Salix spp.
Liriodendron tulipifera
Eriodictyon californicum

unfavorable temperatures, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Dow AgroSciences or the seller. To the extent permitted by law, all such risks shall be assumed by buyer.

Limitation of Remedies

The exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at Dow AgroSciences' election, one of the following:

- (1) Refund of purchase price paid by buyer or user for product bought, or
- (2) Replacement of amount of product used.

To the extent permitted by law, Dow AgroSciences shall not be liable for losses or damages resulting from handling or use of this product unless Dow AgroSciences is promptly notified of such loss or damage in writing. To the extent permitted by law, in no case shall Dow AgroSciences be liable for consequential or incidental damages or losses.

The terms of the Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies cannot be varied by any written or verbal statements or agreements. No employee or sales agent of Dow AgroSciences or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or Limitation of Remedies in any manner.

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**Produced for
Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis, IN 46268**

Label code: CD02-148-020
Replaced label: D02-148-007
LOES number: 010-01471
EPA accepted 11/27/18

Revisions

1. Updated the trademark line to read, "®™ Trademarks of Dow AgroSciences, DuPont or Pioneer and their affiliated companies or respective owners"
2. Add "Caution" to the Precautionary Statements and combine the statements into one paragraph.
3. Under Rainfastness – revised sentence to read, "Heavy rainfall soon... repeat application up to the labeled rate may be required."
4. Revised 2nd paragraph of Directed Sprays to read, "Injury to larch may occur especially where spray patterns overlap or higher labeled rates of this..."
5. Removed rates and application method from table of Tank Mix Partners for Forestry Sites.
6. Broadcast Applications Outside Areas of Southeastern United States revised to read, "...overlap or the higher labeled rate is applied."
7. Chemical Mowing revised sentence to read, "Repeat applications of the tank mix in the same season are not recommended because severe injury may occur."
8. Add missing table for Hand Held Sprayers to sub-label B
9. Add following statements to Wiper Applications: "Rope or Sponge Wick applications: Use solutions of 33 to 75 percent of this product in water." "Panel Applications: Use solutions of 33 to 100 percent of this product in water."
10. Correct typo under "Hollow Stem Injection" "Do not apply more than a total of 7.5 quarts of this product..."
11. Update Mode of Action banner to reflect provisions in PR Notice 2017-01.

Terms and Conditions of Use

If terms of the following Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies are not acceptable, return unopened package at once to the seller for a full refund of purchase price paid. Otherwise, to the extent permitted by law, use by the buyer or any other user constitutes acceptance of the terms under Warranty Disclaimer, Inherent Risks of Use and Limitations of Remedies.

Warranty Disclaimer

Dow AgroSciences warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. TO THE EXTENT PERMITTED BY LAW, Dow AgroSciences MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

Inherent Risks of Use

It is impossible to eliminate all risks associated with use of this product. Crop injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as

SAFETY DATA SHEET

DOW AGROSCIENCES LLC

Product name: RODEO Herbicide

Issue Date: 11/10/2015

Print Date: 11/10/2015

DOW AGROSCIENCES LLC encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. IDENTIFICATION

Product name: RODEO Herbicide

Recommended use of the chemical and restrictions on use

Identified uses: End use herbicide product

COMPANY IDENTIFICATION

DOW AGROSCIENCES LLC
9330 ZIONSVILLE RD
INDIANAPOLIS IN 46268-1053
UNITED STATES

Customer Information Number:

800-992-5994

info@dow.com

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 800-992-5994

Local Emergency Contact: 352-323-3500

2. HAZARDS IDENTIFICATION

Hazard classification

This material is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

Other hazards

No data available

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature: Mixture

This product is a mixture.

Component

CASRN

Concentration

Glyphosate IPA salt

38641-94-0

53.75%

Isopropylamine	75-31-0	5.8%
Balance	Not available	40.45%

4. FIRST AID MEASURES

Description of first aid measures

General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice.

Skin contact: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

Eye contact: Hold eyes open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. Call a poison control center or doctor for treatment advice.

Ingestion: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Never give anything by mouth to an unconscious person.

Most important symptoms and effects, both acute and delayed: Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

Indication of any immediate medical attention and special treatment needed

Notes to physician: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label with you when calling a poison control center or doctor, or going for treatment.

5. FIREFIGHTING MEASURES

Suitable extinguishing media: To extinguish combustible residues of this product use water fog, carbon dioxide, dry chemical or foam. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Straight or direct water streams may not be effective to extinguish fire. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. Alcohol resistant foams (ATC type) may function.

Unsuitable extinguishing media: No data available

Special hazards arising from the substance or mixture

Hazardous combustion products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating.

Unusual Fire and Explosion Hazards: This material will not burn until the water has evaporated. Residue can burn. Container may vent and/or rupture due to fire. Electrically ground and bond all equipment. Flammable mixtures of this product are readily ignited even by static discharge. May produce flash fire. Vapors are heavier than air and may travel a long distance and accumulate in low lying areas. Ignition and/or flash back may occur. Flammable mixtures may exist within the vapor space of containers at room temperature.

Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Stay upwind. Keep out of low areas where gases (fumes) can accumulate. Water may not be effective in extinguishing fire. Eliminate ignition sources. Move container from fire area if this is possible without hazard. To extinguish combustible residues of this product use water fog, carbon dioxide, dry chemical or foam. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.

Special protective equipment for firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Isolate area. Refer to section 7, Handling, for additional precautionary measures. Keep unnecessary and unprotected personnel from entering the area. Keep personnel out of low areas. No smoking in area. Eliminate all sources of ignition in vicinity of spill or released vapor to avoid fire or explosion. Vapor explosion hazard. Keep out of sewers. For large spills, warn public of downwind explosion hazard. Check area with combustible gas detector before reentering area. Ground and bond all containers and handling equipment. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Contain spilled material if possible. Pump with explosion-proof equipment. If available, use foam to smother or suppress. Absorb with materials such as: Clay. Dirt. Sand. Sweep up. Collect in suitable and properly labeled containers. Large spills: Contact Dow AgroSciences for clean-up assistance. See Section 13, Disposal Considerations, for additional information.

7. HANDLING AND STORAGE

Precautions for safe handling: Keep away from heat, sparks and flame. No smoking, open flames or sources of ignition in handling and storage area. Electrically bond and ground all containers and equipment before transfer or use of material. Use of non-sparking or explosion-proof equipment may be necessary, depending upon the type of operation. Containers, even those that have been emptied,

can contain vapors. Do not cut, drill, grind, weld, or perform similar operations on or near empty containers. Vapors are heavier than air and may travel a long distance and accumulate in low lying areas. Ignition and/or flash back may occur. Never use air pressure for transferring product. Keep out of reach of children. Do not swallow. Avoid breathing vapor or mist. Avoid contact with eyes, skin, and clothing. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation.

Conditions for safe storage: Minimize sources of ignition, such as static build-up, heat, spark or flame. Keep container closed. Do not store in: Carbon steel. Galvanized containers. Steel. Flammable mixtures may exist within the vapor space of containers at room temperature. Store in a dry place. Store in original container. Do not store near food, foodstuffs, drugs or potable water supplies.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure limits are listed below, if they exist.

Component	Regulation	Type of listing	Value/Notation
Isopropylamine	ACGIH	TWA	5 ppm
	ACGIH	STEL	10 ppm
	OSHA Z-1	TWA	12 mg/m3 5 ppm

RECOMMENDATIONS IN THIS SECTION ARE FOR MANUFACTURING, COMMERCIAL BLENDING AND PACKAGING WORKERS. APPLICATORS AND HANDLERS SHOULD SEE THE PRODUCT LABEL FOR PROPER PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING.

Exposure controls

Engineering controls: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

Individual protection measures

Eye/face protection: Use safety glasses (with side shields).

Skin protection

Hand protection: Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. Examples of preferred glove barrier materials include: Butyl rubber. Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Polyvinyl chloride ("PVC" or "vinyl"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Other protection: Wear clean, body-covering clothing.

Respiratory protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. For most conditions no respiratory protection should be needed; however, if discomfort is experienced, use an approved air-purifying respirator.

The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Physical state	Liquid.
Color	Yellow
Odor	Odorless
Odor Threshold	No data available
pH	4.8 <i>pH Electrode</i>
Melting point/range	Not applicable
Freezing point	No data available
Boiling point (760 mmHg)	No data available
Flash point	closed cup > 93 °C (> 199 °F) <i>Setaflash Closed Cup ASTM D3828</i> none below boiling point
Evaporation Rate (Butyl Acetate = 1)	No data available
Flammability (solid, gas)	No data available
Lower explosion limit	No data available
Upper explosion limit	No data available
Vapor Pressure	No data available
Relative Vapor Density (air = 1)	No data available
Relative Density (water = 1)	1.21 at 22 °C (72 °F) / 4 °C <i>Pyknometer</i>
Water solubility	Soluble
Partition coefficient: n-octanol/water	No data available
Auto-ignition temperature	none below 400 degC
Decomposition temperature	No test data available
Dynamic Viscosity	64.6 mPa.s at 20 °C (68 °F)
Kinematic Viscosity	53.4 mm ² /s at 20 °C (68 °F)
Explosive properties	No
Oxidizing properties	No significant increase (>5C) in temperature.
Liquid Density	1.20 g/cm ³ at 20 °C (68 °F) <i>Digital density meter</i>
Molecular weight	No data available

NOTE: The physical data presented above are typical values and should not be construed as a specification.

10. STABILITY AND REACTIVITY

Reactivity: No dangerous reaction known under conditions of normal use.

Chemical stability: Thermally stable at recommended temperatures and pressures.

Possibility of hazardous reactions: Polymerization will not occur.

Conditions to avoid: Active ingredient decomposes at elevated temperatures. Avoid static discharge.

Incompatible materials: Heat produced by the reaction with water will cause vaporization. Flammable hydrogen may be generated from contact with metals such as:

Hazardous decomposition products: Decomposition products depend upon temperature, air supply and the presence of other materials.

11. TOXICOLOGICAL INFORMATION

Toxicological information appears in this section when such data is available.

Acute toxicity

Acute oral toxicity

Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

As product:

LD50, Rat, male and female, > 5,000 mg/kg

Acute dermal toxicity

Prolonged skin contact is unlikely to result in absorption of harmful amounts.

As product:

LD50, Rabbit, male and female, > 5,000 mg/kg

Acute inhalation toxicity

No adverse effects are anticipated from single exposure to mist. Excessive exposure may cause irritation to upper respiratory tract (nose and throat).

As product:

LC50, Rat, male and female, 4 Hour, dust/mist, > 6.37 mg/l No deaths occurred at this concentration.

Skin corrosion/irritation

Brief contact is essentially nonirritating to skin.

Serious eye damage/eye irritation

May cause slight temporary eye irritation.
Corneal injury is unlikely.

Sensitization

Did not cause allergic skin reactions when tested in guinea pigs.

For respiratory sensitization:
No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)

Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Specific Target Organ Systemic Toxicity (Repeated Exposure)

For similar active ingredient(s).

Glyphosate.

Based on available data, repeated exposures are not anticipated to cause significant adverse effects.

For the minor component(s):

In animals, effects have been reported on the following organs after inhalation:

Eye.

Respiratory tract.

Carcinogenicity

For similar material(s): Glyphosate. Did not cause cancer in laboratory animals. Weight of evidence evaluation of epidemiology studies supports no association between glyphosate exposure and cancer.

Teratogenicity

For similar active ingredient(s). Glyphosate. Has been toxic to the fetus in laboratory animals at doses toxic to the mother. Did not cause birth defects in laboratory animals.

Reproductive toxicity

For similar active ingredient(s). Glyphosate. In laboratory animal studies, effects on reproduction have been seen only at doses that produced significant toxicity to the parent animals.

Mutagenicity

For the active ingredient(s): In vitro genetic toxicity studies were negative in some cases and positive in other cases. Animal genetic toxicity studies were negative in some cases and positive in other cases.

Aspiration Hazard

Based on physical properties, not likely to be an aspiration hazard.

Carcinogenicity**Component**

Glyphosate IPA salt

List

IARC

Classification

Group 2A: Probably carcinogenic to humans

12. ECOLOGICAL INFORMATION

Ecotoxicological information appears in this section when such data is available.

Toxicity**Acute toxicity to fish**

Material is slightly toxic to aquatic organisms on an acute basis (LC50/EC50 between 10 and 100 mg/L in the most sensitive species tested).

LC50, *Oncorhynchus mykiss* (rainbow trout), 96 Hour, > 2,500 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates

EC50, *Daphnia magna* (Water flea), 48 Hour, 918 mg/l, OECD Test Guideline 202 or Equivalent

Acute toxicity to algae/aquatic plants

ErC50, Pseudokirchneriella subcapitata (green algae), 72 Hour, 127 mg/l, OECD Test Guideline 201 or Equivalent

Toxicity to Above Ground Organisms

Material is practically non-toxic to birds on an acute basis (LD50 > 2000 mg/kg).

oral LD50, Colinus virginianus (Bobwhite quail), > 2000mg/kg bodyweight.

contact LD50, Apis mellifera (bees), > 100µg/bee

oral LD50, Apis mellifera (bees), > 100µg/bee

Persistence and degradability

Glyphosate IPA salt

Biodegradability: For similar active ingredient(s). Glyphosate. Biodegradation may occur under aerobic conditions (in the presence of oxygen).

Photodegradation

Test Type: Half-life (indirect photolysis)

Sensitizer: OH radicals

Atmospheric half-life: 0.115 d

Method: Estimated.

Isopropylamine

Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Material is ultimately biodegradable (reaches > 70% mineralization in OECD test(s) for inherent biodegradability).

10-day Window: Pass

Biodegradation: 70 - 80 %

Exposure time: 28 d

Method: OECD Test Guideline 301F or Equivalent

Theoretical Oxygen Demand: 3.53 mg/mg

Chemical Oxygen Demand: 1,300 - 1,975 mg/g

Biological oxygen demand (BOD)

Incubation Time	BOD
5 d	18.3 %
10 d	54 %
20 d	59 %

Photodegradation

Test Type: Half-life (indirect photolysis)

Sensitizer: OH radicals

Atmospheric half-life: 3.26 Hour

Method: Estimated.

Balance

Biodegradability: No relevant data found.

Bioaccumulative potential

Bioaccumulation: For similar active ingredient(s). Bioconcentration potential is low (BCF < 100 or Log Pow < 3).

Mobility in soil

For similar active ingredient(s).
Expected to be relatively immobile in soil (Koc > 5000).

13. DISPOSAL CONSIDERATIONS

Disposal methods: If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

14. TRANSPORT INFORMATION

DOT

Not regulated for transport

Classification for SEA transport (IMO-IMDG):

**Transport in bulk
according to Annex I or II
of MARPOL 73/78 and the
IBC or IGC Code**

Not regulated for transport
Consult IMO regulations before transporting ocean bulk

Classification for AIR transport (IATA/ICAO):

Not regulated for transport

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard

This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Chronic Health Hazard

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

Pennsylvania (Worker and Community Right-To-KnowAct): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:

The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

Components	CASRN
Isopropylamine	75-31-0

Pennsylvania (Worker and Community Right-To-KnowAct): Pennsylvania Special Hazardous Substances List:

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

United States TSCA Inventory (TSCA)

This product contains chemical substance(s) exempt from U.S. EPA TSCA Inventory requirements. It is regulated as a pesticide subject to Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requirements.

Federal Insecticide, Fungicide and Rodenticide Act

EPA Registration Number: 62719-324

This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and for workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label:

CAUTION

Harmful if inhaled

16. OTHER INFORMATION

Hazard Rating System

NFPA

Health	Fire	Reactivity
1	2	0

Revision

Identification Number: 101188488 / A211 / Issue Date: 11/10/2015 / Version: 4.0

DAS Code: NAF-552

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

ACGIH	USA. ACGIH Threshold Limit Values (TLV)
OSHA Z-1	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
STEL	Short-term exposure limit
TWA	8-hour, time-weighted average

Information Source and References

This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

DOW AGROSCIENCES LLC urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.



R.E.D. FACTS

Pesticide Reregistration

Glyphosate

All pesticides sold or distributed in the United States must be registered by EPA, based on scientific studies showing that they can be used without posing unreasonable risks to people or the environment. Because of advances in scientific knowledge, the law requires that pesticides which were first registered years ago be reregistered to ensure that they meet today's more stringent standards.

In evaluating pesticides for reregistration, EPA obtains and reviews a complete set of studies from pesticide producers, describing the human health and environmental effects of each pesticide. The Agency imposes any regulatory controls that are needed to effectively manage each pesticide's risks. EPA then reregisters pesticides that can be used without posing unreasonable risks to human health or the environment.

When a pesticide is eligible for reregistration, EPA announces this and explains why in a Reregistration Eligibility Decision (RED) document. This fact sheet summarizes the information in the RED document for glyphosate.

Use Profile

Glyphosate is a non-selective herbicide registered for use on many food and non-food field crops as well as non-crop areas where total vegetation control is desired. When applied at lower rates, glyphosate also is a plant growth regulator.

Glyphosate is among the most widely used pesticides by volume. It ranked eleventh among conventional pesticides used in the U.S. during 1990-91. In recent years, approximately 13 to 20 million acres were treated with 18.7 million pounds of glyphosate annually. The largest use sites include hay/pasture, soybeans and field corn.

Three salts of glyphosate are used as active ingredients in registered pesticide products. Two of these active ingredients, plus technical grade glyphosate, are contained in the 56 products that are subject to this RED.

The isopropylamine salt, an active ingredient in 53 registered products, is used as a herbicide to control broadleaf weeds and grasses in many food and non-food crops and a variety of other sites including ornamentals, lawns and turf, residential areas, greenhouses, forest plantings and industrial rights-of-way. It is formulated as a liquid, solid or pellet/tablet, and is applied using ground or aerial equipment.

The sodium salt of glyphosate, an active ingredient in two registered pesticide products, is used as a plant growth regulator for peanuts and sugarcane, to modify plant growth and hasten the ripening of fruit. It is applied as a ground spray to peanut fields and as an aerial spray to sugarcane. Preharvest intervals are established for both crops.

The monoammonium salt of glyphosate is an active ingredient in an additional seven herbicide/growth regulator products. This form of glyphosate was initially registered after November 1984, so it is not subject to reregistration or included in this RED. However, in reassessing the existing glyphosate tolerances (maximum residue limits in or on food and feed), EPA included those for the monoammonium salt.

Regulatory History

EPA issued a Registration Standard for glyphosate in June 1986 (NTIS PB87-103214). The Registration Standard required additional phytotoxicity, environmental fate, toxicology, product chemistry and residue chemistry studies. All of the data required have been submitted and reviewed, or were waived.

Human Health Assessment

Toxicity

Glyphosate is of relatively low oral and dermal acute toxicity. It has been placed in Toxicity Category III for these effects (Toxicity Category I indicates the highest degree of acute toxicity, and Category IV the lowest). The acute inhalation toxicity study was waived because glyphosate is non-volatile and because adequate inhalation studies with end-use products exist showing low toxicity.

A subchronic feeding study using rats showed blood and pancreatic effects. A similar study with mice showed reduced body weight gains in both sexes at the highest dose levels. A dermal study with rabbits showed slight reddening and swelling of the skin, decreased food consumption in males and decreased enzyme production, at the highest dose levels.

Several chronic toxicity/carcinogenicity studies using rats, mice and beagle dogs resulted in no effects based on the parameters examined, or resulted in findings that glyphosate was not carcinogenic in the study. In June 1991, EPA classified glyphosate as a Group E oncogen--one that shows evidence of non-carcinogenicity for humans--based on the lack of convincing evidence of carcinogenicity in adequate studies.

In developmental toxicity studies using pregnant rats and rabbits, glyphosate caused treatment-related effects in the high dose groups including diarrhea, decreased body weight gain, nasal discharge and death.

One reproductive toxicity study using rats showed kidney effects in the high dose male pups; another study showed digestive effects and decreased body weight gain. Glyphosate does not cause mutations.

In one metabolism study with rats, most of the glyphosate administered (97.5 percent) was excreted in urine and feces as the parent compound; less than one percent of the absorbed dose remained in tissues and organs, primarily in bone tissue. Aminomethyl phosphonic acid (AMPA) was the only metabolite excreted. A second study using rats showed that very little glyphosate reaches bone marrow, that it is rapidly eliminated from bone marrow, and that it is even more rapidly eliminated from plasma.

Dietary Exposure

The nature of glyphosate residue in plants and animals is adequately understood. Studies with a variety of plants indicate that uptake of glyphosate or AMPA from soil is limited. The material which is taken up is readily translocated throughout the plant and into its fruit. In animals, most glyphosate is eliminated in urine and feces. Enforcement methods are available to detect residues of glyphosate and AMPA in or on plant commodities, in water and in animal commodities.

85 tolerances have been established for residues of glyphosate and its metabolite, AMPA, in or on a wide variety of crops and crop groups, as well as in many processed foods, animal feed and animal tissues (please see 40 CFR 180.364, 40 CFR 185.3500 and 40 CFR 186.3500). EPA has reassessed the existing and proposed tolerances for glyphosate. Though some adjustments will be needed, no major changes in existing tolerances are required. EPA also has compared the U.S. tolerances with international Codex maximum residue limits (MRLs), and is recommending certain adjustments to achieve greater compatibility.

EPA conducted a dietary risk assessment for glyphosate based on a worst-case risk scenario, that is, assuming that 100 percent of all possible commodities/acreage were treated, and assuming that tolerance-level residues remained in/on all treated commodities. The Agency concluded that the chronic dietary risk posed by glyphosate food uses is minimal.

A reference dose (RfD), or estimate of daily exposure that would not cause adverse effects throughout a lifetime, of 2 mg/kg/day has been proposed for glyphosate, based on the developmental toxicity studies described above.

Occupational and Residential Exposure

Occupational and residential exposure to glyphosate can be expected based on its currently registered uses. However, due to glyphosate's low acute toxicity and the absence of other toxicological concerns (especially carcinogenicity), occupational and residential exposure data are not required for reregistration.

Some glyphosate end-use products are in Toxicity Categories I or II for primary eye irritation or skin irritation. In California, glyphosate ranks high among pesticides causing illness or injury to workers, who report numerous incidents of eye and skin irritation from splashes during mixing and loading.

EPA is not adding any personal protective equipment (PPE) requirements at this time, but any existing PPE label requirements must be retained.

The Worker Protection Standard (WPS) for Agricultural Pesticides (please see 40 CFR 156 and 170) established an interim restricted entry interval (REI) of 12 hours for glyphosate. The Agency has decided to retain this REI as a prudent measure to mitigate risks to workers. During the REI, workers may reenter areas treated with glyphosate only in the few, narrow exceptions allowed in the WPS. The REI applies only to glyphosate uses within the scope of the WPS, so homeowner and commercial uses are not included.

Human Risk Assessment

EPA's worst case risk assessment of glyphosate's many registered food uses concludes that human dietary exposure and risk are minimal. Existing and proposed tolerances have been reassessed, and no significant changes are needed to protect the public.

Exposure to workers and other applicators generally is not expected to pose undue risks, due to glyphosate's low acute toxicity. However, splashes during mixing and loading of some products can cause injury, primarily eye and skin irritation. EPA is continuing to recommend PPE, including protective eye wear, for workers using end-use products that are in Toxicity Categories I or II for eye and skin irritation. To mitigate potential risks associated with reentering treated agricultural areas, EPA is retaining the 12 hour REI set by the WPS.

Environmental Assessment

Environmental Fate

Glyphosate adsorbs strongly to soil and is not expected to move vertically below the six inch soil layer; residues are expected to be immobile in soil. Glyphosate is readily degraded by soil microbes to AMPA, which is degraded to carbon dioxide. Glyphosate and AMPA are not likely to move to ground water due to their strong adsorptive characteristics. However, glyphosate does have the potential to contaminate surface waters due to its aquatic use patterns and through erosion, as it adsorbs to soil particles suspended in runoff. If glyphosate reached surface water, it would not be broken down readily by water or sunlight.

Ecological Effects

Glyphosate is no more than slightly toxic to birds and is practically non-toxic to fish, aquatic invertebrates and honeybees. Due to the presence of a toxic inert ingredient, some glyphosate end-use products must be labeled, "Toxic to fish," if they may be applied directly to aquatic environments. Product labeling does not preclude off-target movement of glyphosate by drift. EPA therefore is requiring three additional terrestrial plant studies to assess potential risks to nontarget plants.

EPA does not expect that most endangered terrestrial or aquatic organisms will be affected by the registered uses of glyphosate. However,

many endangered plants as well as the Houston toad (due to its habitat) may be at risk. EPA is deferring any use modifications or labeling amendments until it has published the Endangered Species Protection Plan and has given registrants guidance regarding endangered species precautionary labeling.

Ecological Effects Risk Assessment

Based on current data, EPA has determined that the effects of glyphosate on birds, mammals, fish and invertebrates are minimal. Under certain use conditions, glyphosate may cause adverse effects to nontarget aquatic plants. Additional data are needed to fully evaluate the effects of glyphosate on nontarget terrestrial plants. Risk reduction measures will be developed if needed, once the data from these studies are submitted and evaluated.

Additional Data Required

EPA is requiring three generic studies (Tier II Vegetative Vigor, Droplet Size Spectrum, and Drift Field Evaluation) which are not part of the target data base and do not affect the reregistration eligibility of glyphosate. The Agency also is requiring product-specific data including product chemistry and acute toxicity studies, as well as revised Confidential Statements of Formula and revised labeling.

Product Labeling Changes Required

All end-use glyphosate products must comply with EPA's current pesticide product labeling requirements. In addition:

- **Protection of Aquatic Organisms**

Non-Aquatic Uses - End-use products that are not registered for aquatic uses must bear the following label statement:

Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters and rinsate.

Aquatic Uses - End-use products registered for aquatic uses must bear the following label statement:

Do not contaminate water when disposing of equipment washwaters and rinsate. Treatment of aquatic weeds can result in oxygen loss from decomposition for dead plants. This loss can cause fish kills.

- **Worker Protection Standard (WPS) Requirements**

Any product whose labeling permits use in the production of an agricultural plant on any farm, forest, nursery or greenhouse must comply with the labeling requirements of:

- PR Notice 93-7, "Labeling Revisions Required by the Worker Protection Standard (WPS)," and

-
- PR Notice 93-11, "Supplemental Guidance for PR Notice 93-7."

Unless specifically directed in the RED, all statements required by these two PR Notices must appear on product labeling exactly as instructed in the Notices. Labels must be revised by April 21, 1994, for products distributed or sold by the primary registrant or supplementally registered distributors, and by October 23, 1995, for products distributed or sold by anyone.

- **Personal Protective Equipment (PPE)**

No new PPE requirements must be added to glyphosate labels. However, any existing PPE requirements on labels must be retained.

- **Entry Restrictions**

Products Not Primarily Intended for Home Use:

- Uses Within the Scope of the WPS - A 12-hour restricted entry interval (REI) is required for all products with uses within the scope of the WPS, except products intended primarily for home use. The PPE for early entry should be that required for applicators of glyphosate, except any applicator requirement for an apron or respirator is waived. This REI and PPE should be inserted into the standardized statements required by PR Notice 93-7.

- Sole Active Ingredient End-Use Products - Labels must be revised to adopt the entry restrictions set forth in this section. Any conflicting entry restrictions on current labeling must be removed.

- Multiple Active Ingredient Products - Registrants must compare the entry restrictions set forth in this section to those on their current labeling and retain the more protective. A specific time period in hours or days is considered more protective than "until sprays have dried" or "dusts have settled."

- Uses Not Within the Scope of the WPS - No new entry restrictions must be added. However, any entry restrictions on current product labeling with these uses must be retained.

Products Primarily Intended for Home Use:

- No new entry restrictions must be added. However, any entry restrictions on current product labeling must be retained.

Regulatory Conclusion

The use of currently registered pesticide products containing the isopropylamine and sodium salts of glyphosate in accordance with the labeling specified in this RED will not pose unreasonable risks or adverse effects to humans or the environment. Therefore, all uses of these products are eligible for reregistration.

These glyphosate products will be reregistered once the required product-specific data, revised Confidential Statements of Formula and revised labeling are received and accepted by EPA.

Products which contain active ingredients in addition to glyphosate will not be reregistered until all their other active ingredients also are eligible for reregistration.

**For More
Information**

EPA is requesting public comments on the Reregistration Eligibility Decision (RED) document for glyphosate during a 60-day time period, as announced in a Notice of Availability published in the Federal Register. To obtain a copy of the RED document or to submit written comments, please contact the Pesticide Docket, Public Response and Program Resources Branch, Field Operations Division (7506C), Office of Pesticide Programs (OPP), US EPA, Washington, DC 20460, telephone 703-305-5805.

Following the comment period, the glyphosate RED document will be available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161, telephone 703-487-4650.

For more information about EPA's pesticide reregistration program, the glyphosate RED, or reregistration of individual products containing glyphosate, please contact the Special Review and Reregistration Division (7508W), OPP, US EPA, Washington, DC 20460, telephone 703-308-8000.

For information about the health effects of pesticides, or for assistance in recognizing and managing pesticide poisoning symptoms, please contact the National Pesticides Telecommunications Network (NPTN). Call toll-free 1-800-858-7378, between 8:00 am and 6:00 pm Central Time, Monday through Friday.

THE COMMONWEALTH OF MASSACHUSETTS

EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS



Department of Agricultural Resources

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GLYPHOSATE

In addition to the review that is presented below, a comprehensive review available from USDA Forest Service provides information that incorporates more recent studies and data. The US Forest Service risk assessment report is available at: <http://www.fs.fed.us/foresthealth/pesticide/risk.shtml>

Review conducted by MDAR and MassDEP for use in Sensitive Areas of Rights-of-Way in Massachusetts

Common Trade Name(s): Roundup, Glyphosate VMF Round Up Pro, Rodeo, Accord, Accord Concentrate,

Chemical Name: N—(phosphonomethyl)glycine— isopropylamine salt
CAS No.: 1071-83-6

GENERAL INFORMATION

Glyphosate, n-phosphonomethyl glycine, is a systemic, broad spectrum herbicide effective against most plant species, including deep rooted perennial species, annual and biennial species of grasses, sedges, and broadleafed weeds. The major pathway for uptake in plants is through the foliage, however, some root uptake may occur. The presence of surfactants and humidity increases the rate of absorption of glyphosate by plants (15).

Foliarly applied glyphosate is readily absorbed and translocated from treated areas to untreated shoot regions. The mechanism of herbicidal action for glyphosate is believed to be inhibition of amino acid biosynthesis resulting in a reduction of protein synthesis and inhibition of growth (10, 15, 101).

Glyphosate is generally formulated as the isopropylamine salt in aqueous solution (122). Of the three products containing glyphosate considered here, Roundup is sold with a surfactant and Rodeo and Accord are mixed with surfactants prior to use (15). Glyphosate has been reviewed by US Forest Service (15), FAO (122), and EPA 00W (51).

ENVIRONMENTAL FATE

Mobility

Glyphosate is relatively immobile in most soil environments as a result of its strong adsorption to soil particles. Adsorption to soil particles and organic matter begins almost immediately after application. Binding occurs with particular rapidity to clays and organic matter (15). Clays and organic matter saturated with iron and aluminum (such as in the Northeast) tend to absorb more glyphosate than those saturated with sodium or calcium. The soil phosphate level is the main determinant of the amount of glyphosate adsorbed to soil particles. Soils which are low in phosphates will adsorb higher levels of glyphosate (14, 15).

Glyphosate is classified as immobile by the Helling and Turner classification system. In soil column leaching studies using aged (1 month) Glyphosate, leaching of glyphosate was said to be insignificant after 0.5 inches of water per day for 45 days (14).

Persistence

It has been reported that glyphosate dissipates relatively rapidly when applied to most soils (14). However, studies indicate that the soil half-life is variable and dependent upon soil factors. The half-life of glyphosate in greenhouse studies when applied to silty clay loam, silt loam, and sandy loam at rates of 4 and 8 ppm was 3, 27 and 130 days respectively, independent of application rate (14). An average half-life of 2 months has been reported in field studies for 11 soils (15).

Glyphosate is mainly degraded biologically by soil micro-organisms and has a minimal effect on soil microflora (15). In the soil environment, glyphosate is resistant to chemical degradation such as hydrolysis and is stable to sunlight (15). The primary metabolite of glyphosate is aminomethyl phosphonic acid (AMPA) which has a slower degradation rate than glyphosate (15). The persistence of AMPA is reported to be longer than glyphosate, possibly due to tighter binding to soil (14). No data are available on the toxicity of this compound.

Glyphosate degradation by microorganisms has been widely tested in a variety of field and laboratory studies. Soil characteristics used in these studies have included organic contents, soil types and pHs similar to those that occur in Massachusetts (117).

Glyphosate degradation rates vary considerably across a wide variety of soil types. The rate of degradation is correlated with microbial activity of the soils and does not appear to be largely dependent on soil pH or organic content (117). While degradation rates are likely temperature dependent, most reviews of studies do not report or discuss the dependence of degradation rate on temperature. Mueller et al. (1981 cited in 117) noted that glyphosate degraded in Finnish agricultural soils (loam and fine silt soils) over the winter months; a fact which indicates that degradation would likely take place in similar soils in the cool Massachusetts climate. Glyphosate half-lives for laboratory experiments on sandy loam and loamy sand, which are common in Massachusetts, range up to 175 days (117). The generalizations noted for the body of available results are sufficiently robust to incorporate conditions and results applicable to glyphosate use in Massachusetts.

TOXICITY REVIEW

Acute (Mammalian)

Glyphosate has reported oral LD50s of 4,320 and 5,600 mg/kg in male and female rats (15,4). The oral LD50s of the two major glyphosate products Rodeo and Roundup are 5,000 and 5,400 mg/kg in the rat (15).

A dermal LD50 of 7,940 mg/kg has been determined in rabbits (15,4). There are reports of mild dermal irritation in rabbits (6), moderate eye irritation in rabbits (7), and possible phototoxicity in humans (9). The product involved in the phototoxicity study was Tumbleweed marketed by Murphys Limited UK (9). Maibach (1986) investigated the irritant and the photo irritant responses in individuals exposed to Roundup (41% glyphosate, water, and surfactant); Pinesol liquid, Johnson Baby Shampoo, and Ivory Liquid dishwashing detergent. The conclusion drawn was that glyphosate has less irritant potential than the Pinesol or the Ivory dishwashing liquid (120).

Metabolism

Elimination of glyphosate is rapid and very little of the material is metabolized (6,106).

Subchronic/Chronic Studies (Mammalian)

In subchronic tests, glyphosate was administered in the diet to dogs and rats at 200, 600, and 2,000 ppm for 90 days. A variety of toxicological endpoints were evaluated with no significant abnormalities reported (15,10).

In other subchronic tests, rats received 0, 1,000, 5,000, or 20,000 ppm (57, 286, 1143 mg/kg) in the diet for 3 months. The no observable adverse effect level (NOAEL) was 20,000 ppm (1,143 mg/kg) (115). In the one year oral dog study, dogs received 20, 100, and 500 mg/kg/day. The no observable effect level (NOEL) was 500 mg/kg (116).

Oncogenicity Studies

Several chronic carcinogenicity studies have been reported for glyphosate including an 18 month, mouse study; and a two year rat study. In the rat study, the animals received 0, 30, 100 or 300 ppm in their diet for 2 years. EPA has determined that the doses in the rat study do not reach the maximum tolerated dose (112) and replacement studies are underway with a high dose of 20,000 ppm (123). The mice received 1000, 5000 or 30,000 ppm for 18 months in their diets. These studies were non-positive (112,109). There was a non-statistically significant increase in a rare renal tumor (renal tubular adenoma (benign) in male mice (109). The rat chronic study needs to be redone with a high dose to fill a partial data gap (112). The EPA weight of evidence classification would be D: not classified (51).

Mutagenicity Testing

Glyphosate has been tested in many short term mutagenicity tests. These include 7 bacterial (including *Salmonella typhimurim* and *B. subtilis*) and 1 yeast strain *Sacchomyces cerevisiae* as well as a mouse dominant lethal test and sister chromatid exchange. The microbial tests were negative up to 2,000 mg/plate (15), as were the mouse dominant lethal and the Chinese hamster ovary cell tests. EPA considers the mutagenicity requirements for glyphosate to be complete in the Guidance for the Registration of Pesticide Products containing glyphosate (112).

The developmental studies that have been done using glyphosate include teratogenicity studies in the rat and rabbit, three generation reproduction studies in the rat, and a reproduction study in the deer mouse. (15)

Rats were exposed to levels of up to 3,500 mg/kg/d in one rat teratology study. There were no teratogenic effects at 3,500 mg/kg/d and the fetotoxicity NOEL was 1,000 mg/kg/d. In the rabbit study a fetotoxicity NOEL was determined at 175 mg/kg/d and no teratogenic effects were observed at 10 or 30 mg/kg/d in one study and 350 mg/kg/d in the other study (15). No effects were observed in the deer mouse collected from conifer forest sprayed at 2 lbs active ingredient per acre (15).

Tolerances & Guidelines

EPA has established tolerances for glyphosate residues in at least 75 agricultural products ranging from 0.1 ppm (most vegetables) to 200 ppm for animal feed commodities such as alfalfa (8).

U.S. EPA Office of Drinking Water has released draft Health Advisories for Glyphosate of 17.50 mg/L (ten day) and 0.70 mg/L (Lifetime)(51).

Avian

Two types of avian toxicity studies have been done with glyphosate: ingestion in adults and exposure of the eggs. The species used in the ingestion studies were the mallard duck, bobwhite quail, and the adult hen (chickens). The 8 day feeding LC50s in the mallard and bobwhite are both greater than 4,640 ppm. In the hen study, 1,250 mg/kg was administered twice daily for 3 days resulting in a total dose of 15,000 mg/kg. No behavioral or microscopic changes were observed (15).

Invertebrates

A variety of invertebrates (mostly arthropods) and microorganisms from freshwater, marine, and terrestrial ecosystems have been studied for acute toxic effects of technical glyphosate as well as formulated Roundup. The increased toxicity of Roundup compared with technical glyphosate in some studies indicates that it is the surfactant (MONO 818) in Roundup that is the primary toxic agent (117). Acute toxicity information may be summarized as follows:

Glyphosate (technical): Acute toxicity ranges from a 48 hr EC50 for midge larvae of 55 mg/L to a 96 hr TL50 for the fiddler crab of 934 mg/L (15).

Roundup: Acute toxicity ranges from a 48 hr EC50 for *Daphnia* of 3 mg/L to a 95 hr LC50 for catfish of 1000 mg/L (15).

Among the insects tested, the LD50 for honeybees was 100 mg/bee 48 hours after either ingestion, or topical application of technical glyphosate and Roundup. This level of experimental exposure is considerably in excess of exposure levels that would occur during normal field applications (15).

Aquatic Species (Fish) Technical glyphosate and the formulation Roundup have been tested on various fish species. Roundup is more toxic than glyphosate, and it is the surfactant that is considered to be the primary toxic agent in Roundup:

Glyphosate (technical):

Acute 96 hr LC50s range from 24 mg/L for bluegill (Dynamic test) to 168 mg/L for the harlequin fish (15).

Roundup: Acute lethal toxicity values range from a 96 hr LC50 for the fathead minnow of 2.3 mg/L to a 96 hr TL50 for rainbow trout of 48 mg/L (15).

Tests with Roundup show that the egg stage is the least sensitive fish life stage. The toxicity increases as the fish enter the sac fry and early swim up stages.

Higher test temperatures increased the toxicity of Roundup to fish, as did higher pH (up to pH 7.5). Above pH 7.5, no change in toxicity is observed.

Glyphosate alone is considered to be only slightly acutely toxic to fish species (LC50s greater than 10 mg/L), whereas Roundup is considered to be toxic to some species of fish, having LC50s generally lower than 10 mg/L (15,118).

SUMMARY

Glyphosate when used as recommended by the manufacturer, is unlikely to enter watercourses through run-off or leaching following terrestrial application (117). Toxic levels are therefore unlikely to occur in water bodies with normal application rates and practices (118).

Glyphosate has oral LD50s of 4,320 and 5,600 in male and female rats respectively. The elimination is rapid and very little of it is metabolized. The NOAEL in rats was 20,000 ppm and 500 mg/kg/d in dogs. No teratogenic effect was observed at doses up to 3,500 mg/kg/d and the fetotoxicity NOELs were 1,000 mg/kg/d in the rat and 175 mg/kg/d in the rabbit.

The evidence of oncogenicity in animals is judged as insufficient at this time to permit classification of the carcinogenic potential of glyphosate. The compound is not mutagenic.

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What is glyphosate?

Glyphosate is an herbicide. It is applied to the leaves of plants to kill both broadleaf plants and grasses. The sodium salt form of glyphosate is used to regulate plant growth and ripen fruit.

Glyphosate was first registered for use in the U.S. in 1974. Glyphosate is one of the most widely used herbicides in the United States. People apply it in agriculture and forestry, on lawns and gardens, and for weeds in industrial areas. Some products containing glyphosate control aquatic plants.



What are some products that contain glyphosate?

Glyphosate comes in many forms, including an acid and several salts. These can be either solids or an amber-colored liquid. There are over 750 products containing glyphosate for sale in the U.S.

Always follow label instructions and take steps to avoid exposure. If any exposures occur, be sure to follow the First Aid instructions on the product label carefully. For additional treatment advice, contact the Poison Control Center at 1-800-222-1222. If you wish to discuss a pesticide problem, please call 1-800-858-7378.

How does glyphosate work?

Glyphosate is a non-selective herbicide, meaning it will kill most plants. It prevents the plants from making certain proteins that are needed for plant growth. Glyphosate stops a specific enzyme pathway, the shikimic acid pathway. The shikimic acid pathway is necessary for plants and some microorganisms.



How might I be exposed to glyphosate?

You can be exposed to glyphosate if you get it on your skin, in your eyes or breathe it in when you are using it. You might swallow some glyphosate if you eat or smoke after applying it without washing your hands first. You may also be exposed if you touch plants that are still wet with spray. Glyphosate isn't likely to vaporize after it is sprayed.

NPIC General Fact Sheets are designed to provide scientific information to the general public. This document is intended to promote informed decision-making. Please refer to the Technical Fact Sheet for more information.

What are some signs and symptoms from a brief exposure to glyphosate?

Pure glyphosate is low in toxicity, but products usually contain other ingredients that help the glyphosate get into the plants. The other ingredients in the product can make the product more toxic. Products containing glyphosate may cause eye or skin irritation. People who breathed in spray mist from products containing glyphosate felt irritation in their nose and throat. Swallowing products with glyphosate can cause increased saliva, burns in the mouth and throat, nausea, vomiting, and diarrhea. Fatalities have been reported in cases of intentional ingestion.

Pets may be at risk if they touch or eat plants that are still wet with spray from products containing glyphosate. Animals exposed to products with glyphosate may drool, vomit, have diarrhea, lose their appetite, or seem sleepy.

What happens to glyphosate when it enters the body?

In humans, glyphosate does not easily pass through the skin. Glyphosate that is absorbed or ingested will pass through the body relatively quickly. The vast majority of glyphosate leaves the body in urine and feces without being changed into another chemical.

Is glyphosate likely to contribute to the development of cancer?

When high doses were administered to laboratory animals, some studies suggest that glyphosate has carcinogenic potential. Studies on cancer rates in people have provided conflicting results on whether the use of glyphosate containing products is associated with cancer. Some studies have associated glyphosate use with non-Hodgkin lymphoma.



Has anyone studied non-cancer effects from long-term exposure to glyphosate?

Glyphosate exposure has been linked to developmental and reproductive effects at high doses that were administered to rats repeatedly during pregnancy. These doses made the mother rats sick. The rat fetuses gained weight more slowly, and some fetuses had skeletal defects. These effects were not observed at lower doses.

No information was found linking exposure to glyphosate with asthma or other diseases.

Are children more sensitive to glyphosate than adults?

There were no studies found showing that children are more sensitive to glyphosate than adults. While [children may be especially sensitive to pesticides](#) compared to adults, there are currently no data showing that children have increased sensitivity specifically to glyphosate.

What happens to glyphosate in the environment?

Glyphosate binds tightly to soil. It can persist in soil for up to 6 months depending on the climate and the type of soil it is in. Glyphosate is broken down by bacteria in the soil.

Glyphosate is not likely to get into groundwater because it binds tightly to soil. In one study, half the glyphosate in dead leaves broke down in 8 or 9 days. Another study found that some glyphosate was taken up by carrots and lettuce after the soil was treated with it.

Can glyphosate affect birds, fish, or other wildlife?

Pure glyphosate is low in toxicity to fish and wildlife, but some products containing glyphosate may be toxic because of the other ingredients in them. Glyphosate may affect fish and wildlife indirectly because killing the plants alters the animals' habitat.



Where can I get more information?

For more detailed information call the National Pesticide Information Center, Monday - Friday, between 8:00 AM and 12:00 PM Pacific Time (11:00 AM to 3:00 PM Eastern Time) at 1-800-858-7378 or visit us on the web at <http://npic.orst.edu>. NPIC provides objective, science-based answers to questions about pesticides.

Date Reviewed: 2015

NPIC is a cooperative agreement between Oregon State University and the U.S. Environmental Protection Agency (U.S. EPA, cooperative agreement # X8-83458501). The information in this publication does not in any way replace or supersede the restrictions, precautions, directions, or other information on the pesticide label or any other regulatory requirements, nor does it necessarily reflect the position of the U.S. E. A.

Arsenal Powerline

Active Ingredient

Imazapyr

ARSENAL[®]

POWERLine[™]

herbicide

SPECIMEN

For the control of undesirable vegetation in grass pasture, rangeland and industrial noncropland areas including railroad, utility plant sites, petroleum tank farms, pumping installations, storage areas; utility, pipeline, and highway rights-of-way; fence rows; nonirrigation ditchbanks; and for the establishment and maintenance of wildlife openings

Active Ingredient:

isopropylamine salt of imazapyr (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-3-pyridinecarboxylic acid)* 26.7%

Other Ingredients: 73.3%

Total: 100.0%

* Equivalent to 21.8% 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-3-pyridinecarboxylic acid or 2 pounds acid per gallon

EPA Reg. No. 241-431

EPA Est. No.

KEEP OUT OF REACH OF CHILDREN CAUTION/PRECAUCIÓN

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand this label, find someone to explain it to you in detail.)

See inside for complete **First Aid, Precautionary Statements, Directions For Use, Conditions of Sale and Warranty**, and state-specific crop and/or use site restrictions.

In case of an emergency endangering life or property involving this product, call day or night 1-800-832-HELP (4357).

Net Contents:

FIRST AID

If swallowed	<ul style="list-style-type: none">• Call a poison control center or doctor immediately for treatment advice.• Have person sip a glass of water if able to swallow.• DO NOT induce vomiting unless told to by a poison control center or doctor.• DO NOT give anything to an unconscious person.
If in eyes	<ul style="list-style-type: none">• Hold eyes open and rinse slowly and gently with water for 15 to 20 minutes.• Remove contact lenses, if present, after first 5 minutes; then continue rinsing eyes.• Call a poison control center or doctor for treatment advice.
If on skin	<ul style="list-style-type: none">• Take off contaminated clothing.• Rinse skin immediately with plenty of water for 15 to 20 minutes.• Call a poison control center or doctor for treatment advice.
If inhaled	<ul style="list-style-type: none">• Move person to fresh air.• If person is not breathing, call 911 or an ambulance; then give artificial respiration, preferably by mouth to mouth, if possible.• Call a poison control center or doctor for further treatment advice.

HOTLINE NUMBER

Have the product container or label with you when calling a poison control center or doctor or going for treatment. You may also contact BASF Corporation for emergency medical treatment information: 1-800-832-HELP (4357).

Precautionary Statements

Hazards to Humans and Domestic Animals

CAUTION. Harmful if swallowed, causes moderate eye irritation. Avoid contact with eyes or clothing. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

Personal Protective Equipment (PPE)

Some materials that are chemical resistant to this product are barrier laminate, butyl rubber, or polyethylene. If you want more options, follow the instructions for **Category A** on an EPA chemical-resistance category selection chart.

Mixers, loaders, applicators, and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks
- Chemical-resistant gloves for all mixers and loaders, plus applicators using handheld equipment

Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. **DO NOT** reuse them.

Engineering Controls

Pilots must use an enclosed cockpit that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(6)].

USER SAFETY RECOMMENDATIONS

Users should:

- Wash hands with plenty of soap and water before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

Physical and Chemical Hazards

Spray solutions of **Arsenal® PowerLine™ herbicide** should be mixed, stored and applied only in stainless steel, fiberglass, plastic and plastic-lined steel containers.

DO NOT mix, store or apply **Arsenal PowerLine** or spray solutions of **Arsenal PowerLine** in unlined steel (except stainless steel) containers or spray tanks.

Environmental Hazards

This product is toxic to plants. Drift and runoff may be hazardous to plants in water adjacent to treated areas.

DO NOT apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. **DO NOT** contaminate water when disposing of equipment washwater or rinsate. See **Directions For Use** for additional precautions and requirements.

Directions For Use

It is a violation of federal law to use this product in a manner inconsistent with its labeling.

DO NOT apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application.

Arsenal® PowerLine™ herbicide must be used only in accordance with instructions on the leaflet label attached to the container. Keep containers closed to avoid spills and contamination.

<p>AGRICULTURAL USE REQUIREMENTS</p>
<p>Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.</p> <p>DO NOT enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 48 hours.</p> <p>PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:</p> <ul style="list-style-type: none"> • Protective eyewear • Coveralls • Shoes plus socks • Chemical-resistant gloves made of any waterproof material.

<p>NONAGRICULTURAL USE REQUIREMENTS</p>
<p>The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.</p> <p>DO NOT enter or allow others to enter treated areas until sprays have dried.</p>

<p>STORAGE AND DISPOSAL</p>
<p>DO NOT contaminate water, food or feed by storage or disposal.</p> <p>Pesticide Storage DO NOT store below 10° F.</p> <p>Pesticide Disposal Wastes resulting from the use of this product must be disposed of on-site or at an approved waste disposal facility.</p>

(continued)

<p>STORAGE AND DISPOSAL <i>(continued)</i></p>
<p>Container Handling Nonrefillable Container. DO NOT reuse or refill this container. Triple rinse or pressure rinse container (or equivalent) promptly after emptying; then offer for recycling, if available, or reconditioning, if appropriate, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures approved by state and local authorities.</p> <p>Triple rinse containers small enough to shake (capacity ≤ 5 gallons) as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank, or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times.</p> <p>Triple rinse containers too large to shake (capacity > 5 gallons) as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank, or store rinsate for later use or disposal. Repeat this procedure two more times.</p> <p>Pressure rinse as follows: Empty the remaining contents into application equipment or mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank, or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container and rinse at about 40 PSI for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.</p> <p>Refillable Container. Refill this container with pesticide only. DO NOT reuse this container for any other purpose. Triple rinsing the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller.</p> <p>Triple rinse as follows: To clean the container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill the container about 10% full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times.</p>

(continued)

STORAGE AND DISPOSAL *(continued)*

Container Handling *(continued)*

When this container is empty, replace the cap and seal all openings that have been opened during use; return the container to the point of purchase or to a designated location. This container must only be refilled with a pesticide product. Prior to refilling, inspect carefully for damage such as cracks, punctures, abrasions, worn-out threads and closure devices. Check for leaks after refilling and before transport. **DO NOT** transport if this container is damaged or leaking. If the container is damaged, or leaking, or obsolete and not returned to the point of purchase or to a designated location, triple rinse emptied container and offer for recycling, if available, or dispose of container in compliance with state and local regulations.

In Case of Spill

In case of large-scale spillage regarding this product, call:

- CHEMTREC 1-800-424-9300
- BASF Corporation 1-800-832-HELP (4357)

Steps to be taken in case material is released or spilled:

- Dike and contain the spill with inert material (sand, earth, etc.) and transfer liquid and solid diking material to separate containers for disposal.
- Remove contaminated clothing, and wash affected skin areas with soap and water.
- Wash clothing before reuse.
- Keep the spill out of all sewers and open bodies of water.

RESTRICTIONS

DO NOT use on food crops. Keep from contact with fertilizers, insecticides, fungicides and seeds. **DO NOT** drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots. **DO NOT** use on lawns, walks, driveways, tennis courts, or similar areas where roots of desirable vegetation may extend and be exposed to potential injury and/or mortality from root uptake of **Arsenal**[®]

PowerLine[™] herbicide unless this risk is acceptable.

DO NOT side trim desirable vegetation with this product unless severe injury or plant death can be tolerated.

DO NOT allow sprays to drift onto desirable plants.

Clean application equipment after using this product by thoroughly flushing with water.

PRODUCT INFORMATION

Use Sites. **Arsenal PowerLine** is an aqueous solution to be mixed with water and a surfactant and applied as a spray solution to grass pasture and rangeland and industrial noncropland including utility plant sites, petroleum tank farms, pumping installations, storage areas; railroad, utility, and highway rights-of-way; fence rows; and nonirrigation ditchbanks including grazed or hayed areas within these sites. **Arsenal PowerLine** is recommended for the

establishment and maintenance of wildlife openings.

Arsenal PowerLine may also be used for the release of unimproved Bermudagrass (see specific directions) and for use under certain paved surfaces (see specific directions).

Application Methods. **Arsenal PowerLine** will control most annual and perennial grasses and broadleaf weeds in addition to many brush and vine species. **Arsenal PowerLine** will provide residual control of labeled weeds that germinate in the treated areas. This product may be applied either preemergence or postemergence to the weeds; however, postemergence application is the method of choice in most situations, particularly for perennial species. For maximum activity, weeds should be growing vigorously at the time of postemergence application, and the spray solution should include a surfactant (see **ADJUVANTS** section for specific recommendations).

These solutions may be applied selectively using low-volume techniques or may be applied broadcast by using ground equipment or aerial equipment. In addition, **Arsenal PowerLine** may also be used for stump and cut stem treatments (see specific directions).

Herbicidal Activity. **Arsenal PowerLine** is readily absorbed through leaves, stems, and roots and is translocated rapidly throughout the plant, with accumulation in the meristematic regions. Treated plants stop growing soon after spray application. Chlorosis appears first in the newest leaves, and necrosis spreads from this point. In perennials, the herbicide is translocated into, and kills, underground storage organs which prevents regrowth. Chlorosis and tissue necrosis may not be apparent in some plant species until 2 weeks after application. Complete kill of plants may not occur for several weeks. Applications of **Arsenal PowerLine** are rainfast 1 hour after treatment.

PRECAUTIONS FOR AVOIDING INJURY TO NONTARGET PLANTS

Untreated trees can occasionally be affected by root uptake of **Arsenal PowerLine** through movement into the top soil. Injury or loss of desirable trees or other plants may result if **Arsenal PowerLine** is applied on or near desirable trees or other plants, on areas where their roots extend, or in locations where the treated soil may be washed or moved into contact with their roots.

SPRAY DRIFT REQUIREMENTS

Aerial Applications

- Applicators are required to use a coarse or coarser droplet size (ASABE S572) or, if specifically using a spinning atomizer nozzle, applicators are required to use a volume mean diameter (VMD) of 385 microns or greater for release heights below 10 feet. Applicators are required to use a very coarse or coarser droplet size or, if specifically using a spinning atomizer nozzle, applicators are required to use a VMD of 475 microns or greater for release heights above 10 feet. Applicators must consider the effects of nozzle orientation and flight speed when determining droplet size.

- Applicators are required to use upwind swath displacement.
- The boom length must not exceed 60% of the wingspan or 90% of the rotor blade diameter to reduce spray drift.
- Applications with wind speeds less than 3 mph and with wind speeds greater than 10 mph are prohibited.
- Applications into temperature inversions are prohibited.

Ground Boom Applications

- Applicators are required to use a nozzle height below 4 feet above the ground or plant canopy and coarse or coarser droplet size (ASABE S572) or, if specifically using a spinning atomizer nozzle, applicators are required to use a volume mean diameter (VMD) of 385 microns or greater.
- Applications with wind speeds greater than 10 mph are prohibited.
- Applications into temperature inversions are prohibited.

Wind Erosion

Avoid treating powdery, dry or light sandy soils when conditions are favorable for wind erosion. Under these conditions, the soil surface should first be settled by rainfall or irrigation.

ADJUVANTS

Postemergence applications of Arsenal® PowerLine™ herbicide require the addition of a spray adjuvant for optimum herbicide performance.

Nonionic Surfactants. Use a nonionic surfactant (NIS) at the rate 0.25% volume/volume (v/v) or higher (see manufacturer's label) of the spray solution (0.25% v/v is equivalent to 1 quart in 100 gallons). For best results, select a nonionic surfactant with an HLB (hydrophilic to lipophilic balance) ratio between 12 and 17 with at least 70% surfactant in the formulated product (alcohols, fatty acids, oils, ethylene glycol or diethylene glycol should not be considered as surfactants to meet the above requirements).

Methylated Seed Oils (MSO) or Vegetable Oil Concentrates. Instead of a surfactant, a methylated seed oil or vegetable-based seed oil concentrate may be used at the rate of 1.5 to 2 pints per acre. When using spray volumes greater than 30 gallons per acre, methylated seed oil or vegetable-based seed oil concentrates should be mixed at a rate of 1% of the total spray volume, or alternatively use a nonionic surfactant as described above. Research indicates that these oils may aid in **Arsenal PowerLine** deposition and uptake by plants under moisture or temperature stress.

Silicone-based Surfactants. See manufacturer's label for specific rate recommendations. Silicone-based surfactants may reduce the surface tension of the spray droplet allowing greater spreading on the leaf surface as compared to conventional nonionic surfactants. However, some silicone-based surfactants may dry too quickly, limiting herbicide uptake.

Fertilizer/Surfactant Blends. Nitrogen-based liquid fertilizers, such as 28%N, 32%N, 10-34-0 or ammonium sulfate, may be added at the rate of 2 to 3 pints per acre in combination with the recommended rate of nonionic surfactant, methylated seed oil or vegetable/seed oil concentrate. The use of fertilizers in a tank mix without a nonionic surfactant, methylated seed oil or vegetable/seed oil concentrate is not recommended.

APPLICATION METHODS

AERIAL APPLICATIONS

All precautions must be taken to minimize or eliminate spray drift. Fixed-wing aircraft and helicopters can be used to apply **Arsenal PowerLine**. However, **DO NOT** make applications by fixed-wing aircraft unless appropriate buffer zones can be maintained to prevent spray drift out of the target area or, when treating open tracts of land, spray drift as a result of fixed-wing aircraft application can be tolerated. Aerial equipment designed to minimize spray drift, such as a helicopter equipped with a **Microfoil™ boom**, **Thru-Valve™ boom** or raindrop nozzles, must be used and calibrated. Except when applying with a **Microfoil boom**, a drift control agent may be added at the recommended label rate. Side trimming is not recommended with **Arsenal PowerLine** unless death of treated tree can be tolerated.

Uniformly apply the specified amount of **Arsenal PowerLine** in 2 or more gallons of water per acre. The actual minimum spray volume per acre is determined by the spray equipment used. Use adequate spray volume to provide accurate and uniform distribution of spray particles over the treated area and to avoid spray drift. Include in the spray solution a nonionic surfactant or methylated seed oil or manufacturer's label rate of a silicone-based surfactant (see the **ADJUVANTS** section of this label for specific recommendations). A foam-reducing agent may be added at the recommended label rate, if needed.

IMPORTANT. Thoroughly clean application equipment, including landing gear, immediately after use of this product. Prolonged exposure of this product to uncoated steel (except stainless steel) surfaces may result in corrosion and failure of the exposed part. The maintenance of an organic coating (paint) may prevent corrosion.

GROUND APPLICATIONS

Broadcast. Use 5 or more gallons of water per acre. The actual minimum spray volume per acre is determined by the spray equipment used. Use adequate spray volume to provide accurate and uniform distribution of spray particles over the treated area and to avoid spray drift. To minimize spray drift, select proper nozzles to avoid spraying a fine mist. Use pressures less than 50 psi, and **DO NOT** spray under gusty or windy conditions. Add a foam-reducing agent, if needed, and a spray pattern indicator, if desired, at the recommended label rates. Clean application equipment after using this product by thoroughly flushing with water.

When making applications to rights-of-way corridors where desirable tree roots may extend, use 1 to 3 pints of **Arsenal® PowerLine™ herbicide** per acre in combination with recommended tank mixes. Use rates higher than 3 pints per acre in these situations may cause injury or death of desirable trees when their roots extend into treated zones.

FOLIAR

Side Trimming

DO NOT side trim with **Arsenal PowerLine** unless severe injury or death of the treated tree can be tolerated.

Arsenal PowerLine is readily translocated and can result in death of the entire tree.

Low-volume Foliar

Use equipment calibrated to deliver 5 to 20 gallons of spray solution per acre. To prepare the spray solution, thoroughly mix in water 0.5% to 5% **Arsenal PowerLine** plus surfactant (see the **ADJUVANTS** section of this label for specific recommendations). A foam-reducing agent may be applied at the recommended label rate, if needed. For control of difficult brush species (see **WEEDS CONTROLLED** section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes, but **DO NOT** apply more than 6 pints of **Arsenal PowerLine** per acre. Excessive wetting of foliage is not recommended. See the following mixing guide for some suggested volumes of **Arsenal PowerLine** and water.

BRUSH CONTROL

Use the specified rate of **Arsenal PowerLine** with the preferred application technique for the control of undesirable brush.

TANK MIXES AND APPLICATION RATES*

Target Vegetation	Rate of Arsenal® PowerLine™ herbicide	Tank Mix
Mixed hardwoods without elm, locust, or pine	1.0 to 1.5% by volume	Surfactant
Mixed hardwoods containing elm, locust, and pine	0.5 to 1.0% by volume	Accord ® at 2 to 3% by volume plus surfactant
Mixed hardwoods with locust and pine, but no elm	0.5 to 1.0% by volume	Krenite ® at 2 to 5% by volume plus surfactant
Mixed hardwoods with locust and elm, but no pine	0.5 to 1.0% by volume	Escort ® at 2 ozs/acre or 2.3 grams/gallon plus surfactant

* Tank mixes with 2,4-D or products containing 2,4-D have resulted in reduced efficacy of **Arsenal PowerLine**.

MIXING CHART

% Solution	Arsenal PowerLine per Gallon of Mix (fl ozs)	Arsenal PowerLine per 4-gallon Backpack (fl ozs)
0.5%	0.6	2.6
1.0%	1.3	5.1
2.0%	2.6	10.2
3.0%	3.8	15.4
5.0%	6.4	25.6

MEASURING CHART

128 fluid ounces	=	1 gallon
16 fluid ounces	=	1 pint
8 pints	=	1 gallon
4 quarts	=	1 gallon
2 pints	=	1 quart

Application Instructions. For low volume, select proper nozzles so that herbicide is not overapplied. Best results are achieved when the spray covers the crown and approximately 70% of the plant. The use of an even flat-fan tip with a spray angle of 40 degrees or less will aid in proper deposition.

Recommended tip sizes include 4004E or 1504E. For a straight stream and cone pattern, adjustable cone nozzles, such as 5500 X3 or 5500 X4, may be used. Attaching a roll-over valve onto a Spraying Systems Model 30 gunjet or other similar spray guns allows for the use of both a flat-fan and cone tips on the same gun.

Proper Spray Pattern. Moisten but **DO NOT** drench target vegetation causing spray solution to run off.

Low Volume with Backpacks. For brush up to 4-feet tall, spray down on the crown covering crown and penetrating approximately 70% of the plant.

For brush 4-feet to 8-feet tall, swipe the sides of target vegetation by directing spray to at least 2 sides of the plant in smooth vertical motions from the crown to the bottom. Make sure to cover the crown whenever possible.

For brush over 8-feet tall, lace sides of the brush by directing spray to at least 2 sides of the target in smooth zigzag motions from crown to bottom.

Low Volume with Hydraulic Handgun Application Equipment. Use same technique as described for **Low Volume with Backpacks**.

For broadcast applications, simulate a gentle rain near the top of target vegetation allowing spray to contact the crown and penetrate the target foliage without falling to the understory. Herbicide spray solution that contacts the understory may result in severe injury or death of plants in the understory.

SPRAY SOLUTION MIXING GUIDE FOR LOW-VOLUME APPLICATIONS					
Amount of Spray Solution Prepared (gallons)	Desired Concentration (fluid volume)				
	0.5%	0.75%	1%	1.5%	5%
	(amount of Arsenal® PowerLine™ herbicide to use)				
1	0.6 fl oz	0.9 fl oz	1.3 fl ozs	1.9 fl ozs	6.5 fl ozs
3	1.9 fl ozs	2.8 fl ozs	3.8 fl ozs	5.8 fl ozs	1.2 pints
4	2.5 fl ozs	3.8 fl ozs	5.1 fl ozs	7.7 fl ozs	1.6 pints
5	3.2 fl ozs	4.8 fl ozs	6.5 fl ozs	9.6 fl ozs	2 pints
50	2 pints	3 pints	4 pints	6 pints	10 quarts
100	4 pints	6 pints	8 pints	6 quarts	5 gallons

2 tablespoons = 1 fluid ounce

High-volume Foliar

For optimum performance when spraying medium-density to high-density brush, use equipment calibrated to deliver up to 100 gallons of spray solution per acre (GPA). Spray solutions exceeding 100 GPA may result in excessive spray runoff causing increased ground cover injury and injury to desirable species.

To prepare the spray solution, thoroughly mix **Arsenal PowerLine** at a rate of 2 to 6 pints per acre (see **GROUND APPLICATIONS** section) in water and add a surfactant (see **ADJUVANTS** section for specific recommendations and rates of surfactants). A foam-reducing agent may be added at the recommended label rate, if needed. For control of difficult species (see **WEEDS CONTROLLED** section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes, but **DO NOT** apply more than 6 pints of **Arsenal PowerLine** per acre. Uniformly cover the foliage of the vegetation to be controlled, but **DO NOT** apply to runoff. Excessive wetting of foliage is not recommended.

Tank Mixes for Brush Control

Arsenal PowerLine may be tank mixed with **Accord®**, **Banvel®**, **Escort®**, **Garlon® 3A**, **Krenite®**, **Roundup®**, **Telar®**, **Tordon® K**, and **Vanquish®** to provide control of **Arsenal PowerLine**-tolerant species.

Consult manufacturer’s labels for specific rates and weeds controlled. Always follow the more restrictive label when making an application involving tank mixes. Tank mixing with 2,4-D, or products which contain 2,4-D, has resulted in reduced performance of **Arsenal PowerLine**.

Invert Emulsions. **Arsenal PowerLine** can be applied as an invert emulsion. The spray solution results in an invert (water-in-oil) spray emulsion designed to minimize spray drift and spray runoff resulting in more herbicide on the target foliage. The spray emulsion may be formed in a single tank (batch mixing) or injected (in-line mixing). Consult the invert chemical label for proper mixing directions.

CUT SURFACE

Cut Stubble

Arsenal® PowerLine™ herbicide can be applied within 2 weeks after mechanical mowing or cutting of brush. To suppress or control resprouting, uniformly apply a spray solution of **Arsenal PowerLine** at the rate of 1 to 2 pints per acre to the cut area. **Arsenal PowerLine** may be tank mixed with **Tordon® K** or picloram to aid in control or suppression of brush. The addition of 5% (v/v) or more of a penetrating agent can aid in uptake through the bark or exposed roots.

Cut stubble applications are made to the soil and cut brush stumps. This type of application may increase ground cover injury. However, vegetation will recover. Making applications of **Arsenal PowerLine** directly to the soil can increase potential root uptake causing injury or death of desirable trees.

Efficacy can be increased, and root uptake by desirable vegetation can be decreased, if the brush is allowed to regrow and the foliage is treated. See the **APPLICATION METHODS** section of this label.

Stump and Cut-stem Treatments

Arsenal PowerLine may be used to control undesirable woody vegetation on noncropland by applying the **Arsenal PowerLine** solution to the cambium area of freshly cut stump surfaces or to fresh cuts on the stem of the target woody vegetation. Applications can be made at any time of the year except during periods of heavy sap flow in the spring. **DO NOT** overapply solution causing runoff or puddling.

Mixing. Arsenal PowerLine may be mixed as either a concentrated or dilute solution for stump and cut stem treatments. The dilute solution may be used for applications to the surface of the stump or to cuts on the stem of the target woody vegetation. Concentrated solutions may be used for applications to cuts on the stem. Use of the concentrated solution permits application to fewer cuts on the stem, especially for large-diameter trees. Follow the application instructions to determine proper application techniques for each type of solution.

To prepare a dilute solution, mix 8 to 12 fluid ounces of **Arsenal PowerLine** with 1 gallon of water. If temperatures are such that freezing of the spray mixture may occur, antifreeze (ethylene glycol) may be used according to manufacturer's label to prevent freezing. The use of a surfactant or penetrating agent may improve uptake through partially callused cambiums. To prepare a concentrated solution, mix 2 quarts of **Arsenal PowerLine** with no more than 1 quart of water.

Application with Dilute Solutions

For cut stump treatments. Spray or brush the solution onto the cambium area of the freshly cut stump surface. Ensure that the solution thoroughly wets the entire cambium area (the wood next to the bark of the stump).

For tree-injection treatments. Using standard injection equipment, apply 1 milliliter of solution at each injection site

around the tree with no more than 1-inch intervals between cut edges. Ensure that the injector completely penetrates the bark at each injection site.

For frill or girdle treatments. Using a hatchet, machete, or similar device, make cuts through the bark at intervals around the tree with no more than 2-inch intervals between cut edges. Spray or brush the solution into each cut until thoroughly wet.

Application with Concentrated Solutions

For tree injection treatments. Using standard injection equipment, apply 1 milliliter of solution at each injection site. Make at least 1 injection cut for every 3 inches of Diameter at Breast Height (DBH) on the target tree. For example, a 3-inch DBH tree will receive 1 injection cut, and a 6-inch DBH tree will receive 2 injection cuts. On trees requiring more than 1 injection site, place the injection cuts at approximately equal intervals around the tree.

For frill or girdle treatments. Using a hatchet, machete, or similar device, make cuts through the bark at approximately equal intervals around the tree. Make at least 1 cut for every 3 inches of DBH on the target tree. For example, a 3-inch DBH tree will receive 1 cut, and a 6-inch DBH tree will receive 2 cuts. Spray or brush the solution into each cut until thoroughly wet.

NOTE: Injury may occur to desirable woody plants if the shoots extend from the same root system or their root systems are grafted to those of the treated tree.

FOR CONTROL OF UNDESIRABLE WEEDS UNDER PAVED SURFACES

Arsenal PowerLine can be used under asphalt, pond liners and other paved areas ONLY in industrial sites or where the pavement has a suitable barrier along the perimeter that prevents encroachment of roots of desirable plants.

Arsenal PowerLine should be used only where the area to be treated has been prepared according to good construction practices. If rhizomes, stolons, tubers or other vegetative plant parts are present in the site, they should be removed by scalping with a grader blade to a depth sufficient to insure their complete removal.

IMPORTANT. Paving should follow **Arsenal PowerLine** applications as soon as possible. **DO NOT** apply where the chemical may contact the roots of desirable trees or other plants.

The product may not be used under pavement on residential properties such as driveways or parking lots, nor in recreational areas such as under bike or jogging paths, golf-cart paths, or tennis courts, or where landscape plantings could be anticipated. Injury or death of desirable plants may result if this product is applied where roots are present or where they may extend into the treated area. Roots of trees and shrubs may extend a considerable distance beyond the branch extremities or drip line.

APPLICATION DIRECTIONS FOR USE UNDER PAVED SURFACES

Applications should be made to the soil surface only when final grade is established. **DO NOT** move soil following **Arsenal® PowerLine™ herbicide** application.

Apply **Arsenal PowerLine** in sufficient water (at least 100 gallons per acre) to ensure thorough and uniform wetting of the soil surface, including the shoulder areas. Add **Arsenal PowerLine** at a rate of 6 pints per acre (2.2 fl ozs per 1000 square feet) to clean water in the spray tank during the filling operation. Agitate before spraying.

If the soil is not moist prior to treatment, incorporation of **Arsenal PowerLine** is needed for herbicide activation. **Arsenal PowerLine** can be incorporated into the soil to a depth of 4 to 6 inches using a rototiller or disc. Rainfall or irrigation of 1 inch will also provide uniform incorporation. **DO NOT** allow treated soil to wash or move into untreated areas.

FOR CONTROL OF UNDESIRABLE WEEDS IN UNIMPROVED BERMUDAGRASS AND BAHIAGRASS

Arsenal PowerLine may be used on unimproved Bermudagrass and Bahiagrass turf on roadsides, utility rights-of-way and other noncropland industrial sites. The application of **Arsenal PowerLine** on established common and coastal Bermudagrass and Bahiagrass provides control of labeled broadleaf and grass weeds. Competition from these weeds is eliminated, releasing the Bermudagrass and Bahiagrass. Treatment of Bermudagrass with **Arsenal PowerLine** results in a compacted growth habit and seedhead inhibition.

Uniformly apply with properly calibrated ground equipment using at least 10 gallons of water per acre with a spray pressure 20 to 50 psi.

IMPORTANT. Temporary yellowing of grass may occur when treatment is made after growth commences.

DO NOT add surfactant in excess of the recommended rate (1 fl oz per 25 gallons of spray solution).

DO NOT APPLY to grass during its first growing season.

DO NOT APPLY to grass that is under stress from drought, disease, insects, or other causes.

DOSAGE RATES AND TIMING

BERMUDAGRASS

Apply **Arsenal PowerLine** at 6 fl ozs to 12 fl ozs per acre when the Bermudagrass is dormant. Apply **Arsenal PowerLine** at 6 fl ozs to 8 fl ozs per acre after the Bermudagrass has reached full greenup. Applications made during greenup will delay greenup. Include a surfactant in the spray solution (see preceding **IMPORTANT** statements).

For additional preemergence control of annual grasses and small-seeded broadleaf weeds, add **Pendulum® AquaCap™ herbicide** at the rate of 2.1 to 4.2 quarts per acre. Consult the **Pendulum** label for weeds controlled and for other use directions and precautions.

For control of Johnsongrass in Bermudagrass turf, apply **Arsenal PowerLine** at 8 fl ozs per acre plus **Roundup® herbicide** at 12 fl ozs per acre plus surfactant. For additional control of broadleaves and vines, **Garlon® 3A** may be added to the above mix at the rate of 1 to 2 pints per acre. Observe all precautions and restrictions on the **Garlon 3A** and **Roundup** labels.

BAHIAGRASS

Apply **Arsenal PowerLine** at 4 fl ozs to 8 fl ozs per acre when the Bahiagrass is dormant or after the grass has initiated greenup but has not exceeded 25% greenup. Include in the spray solution a surfactant (see **ADJUVANTS** section for specific recommendations on surfactants).

Weeds Controlled in Unimproved Bermudagrass and Bahiagrass

Bedstraw*	<i>Gallium</i> spp.
Bishopweed*	<i>Ptilimnium capillaceum</i>
Buttercup*	<i>Ranunculus parviflorus</i>
Carolina geranium	<i>Geranium carolinianum</i>
Fescue	<i>Festuca</i> spp.
Foxtail	<i>Setaria</i> spp.
Little barley	<i>Hordeum pusillum</i>
Seedling Johnsongrass	<i>Sorghum halepense</i>
White clover	<i>Trifolium repens</i>
Wild carrot	<i>Daucus carota</i>
Yellow woodsorrel	<i>Oxalis stricta</i>

* Use not permitted in California unless otherwise directed by supplemental labeling.

GRASS GROWTH AND SEEDHEAD SUPPRESSION

Arsenal PowerLine may be used to suppress growth and seedhead development of certain turfgrass in unimproved areas. When applied to desirable turf, **Arsenal PowerLine** may result in temporary turf damage and/or discoloration. Effects to the desirable turf may vary with environmental conditions. For optimum performance, application should be made prior to culm elongation. Applications may be made before or after mowing. If applied prior to mowing, allow at least 3 days of active growth before mowing. If following a mowing, allow sufficient time for the grasses to recover before applying this product or injury may be amplified.

DO NOT APPLY to turf under stress (drought, cold, insect damaged, etc.) or severe injury or death may occur.

BERMUDAGRASS

Apply **Arsenal PowerLine** at 6 fl ozs to 8 fl ozs per acre from early greenup to prior to seedhead initiation. **DO NOT** add a surfactant for this application.

COOL SEASON UNIMPROVED TURF

Apply **Arsenal PowerLine** at 2 fl ozs per acre plus 0.25% nonionic surfactant. For increased suppression, **Arsenal PowerLine** may be tank mixed with such products as **Campaign®** (24 ozs per acre) or **Embark®** (8 ozs per acre).

Tank mixes may increase injury to desired turf. Consult each product label for recommended turf species and other use directions and precautions. Tank mixes with 2,4-D or products containing 2,4-D may decrease the effectiveness of **Arsenal® PowerLine™ herbicide**.

TOTAL VEGETATION CONTROL WHERE BARE GROUND IS DESIRED

Arsenal PowerLine is an effective herbicide for preemergence or postemergence control of many annual and perennial broadleaf and grass weeds where bare ground is desired. **Arsenal PowerLine** is particularly effective on hard-to-control perennial grasses. **Arsenal PowerLine** at 1.5 pints to 6 pints per acre can be used alone or in tank mix with herbicides such as **Banvel®**, **Finale®**, **Karmex®**, **Oust®**, **Pendulum®**, **Roundup®**, simazine, or **Vanquish®**. The degree and duration of control are dependent on the rate of **Arsenal PowerLine** used, tank mix partner, the volume of carrier, soil texture, rainfall and other conditions.

Consult manufacturers labels for specific rates and weeds controlled. Always follow the more restrictive label when making an application involving tank mixes.

TANK MIX INSTRUCTIONS FOR BARE GROUND

Herbicide Rates per Acre*

Arsenal PowerLine	Pendulum® AquaCap™ herbicide	Pendulum® 3.3 EC herbicide	Diuron
(pints)	(quarts)	(quarts)	(lbs ai)
1.5 to 3	4.2	4.8	4 to 6
2 to 4	4.2	4.8	6 to 10
3 to 6	4.2	4.8	8 to 12

* Use higher rates for fall applications and in areas that have not been previously treated or that feature heavy infestations.

Applications of **Arsenal PowerLine** may be made at any time of the year. Use equipment calibrated to deliver desired gallons per acre spray volume and uniformly distribute the spray pattern over the treated area.

Postemergence Applications. Always use a spray adjuvant (see **ADJUVANTS** section of this label) when making a postemergence application. For optimum performance on tough-to-control annual grasses, applications should be made at a total volume of 100 gallons per acre or less. For quicker burndown or brown-out of target weeds, **Arsenal PowerLine** may be tank mixed with products such as **Finale** or **Roundup**. Tank mixes with 2,4-D or products containing 2,4-D have reduced performance of **Arsenal PowerLine**. Always follow the more restrictive label when tank mixing.

SPOT TREATMENTS

Arsenal PowerLine may be used as a follow-up treatment to control escapes or weed encroachment in a bareground situation. To prepare the spray solution, thoroughly mix in each gallon of water 0.5% to

5% **Arsenal PowerLine** plus an adjuvant. For increased burndown, include **Finale** or **Roundup**, or similar products. For added residual weed control or to increase the weed spectrum, add **Pendulum** or diuron. Always follow the more restrictive label when tank mixing.

FOR SPOT TREATMENT WEED CONTROL IN GRASS PASTURE AND RANGELAND

For the control of undesirable vegetation in grass pasture and rangeland, **Arsenal PowerLine** may be applied as a spot treatment at a rate of 2 fl ozs to 48 fl ozs of product per treated acre using any of the described ground application methods. Spot applications to grass pasture and rangeland may not exceed more than 1/10 of the area to be grazed or cut for hay. See appropriate sections of this label for specific use directions for the application method and vegetation control desired. **DO NOT** apply more than 48 fl ozs per acre per year.

GRAZING AND HAYING RESTRICTIONS

There are no grazing restrictions following **Arsenal PowerLine** application. **DO NOT** cut forage grass for hay for 7 days after **Arsenal PowerLine** application.

INSTRUCTIONS FOR RANGELAND USE

Arsenal PowerLine may be applied to rangeland for the control of undesirable vegetation to achieve 1 or more of the following vegetation management objectives:

1. To control undesirable (nonnative, invasive and noxious) plant species
2. To control undesirable vegetation to aid in the establishment of desirable rangeland plant species
3. To control undesirable vegetation to aid in the establishment of desirable rangeland vegetation following a fire
4. To control undesirable vegetation to reduce wildfire fuel
5. To release existing desirable rangeland plant communities from the competitive pressure of undesirable plant species
6. To control undesirable vegetation to improve wildlife habitat

To ensure the protection of threatened and endangered plants when applying **Arsenal PowerLine** to rangeland:

1. Federal agencies must follow NEPA regulations to ensure protection of threatened and endangered plants.
2. State agencies must work with the Fish and Wildlife Service or the Service's designated state conservation agency to ensure protection of threatened and endangered plants.
3. Other organizations or individuals must operate under a Habitat Conservation Plan if threatened or endangered plants are known to be present on the land to be treated.

See the appropriate section(s) of this label for specific use directions for the desired rangeland vegetation management objective.

Arsenal PowerLine should only be applied to a given rangeland acre as specific weed problems arise. Long-term control of undesirable weed species ultimately depends on

the successful use of land management practices that promote the growth and sustainability of desirable rangeland plant species.

ROTATIONAL CROP INSTRUCTIONS

Rotational crops may be planted 12 months after applying **Arsenal® PowerLine™ herbicide** at the specified pasture and rangeland rate. Following 12 months after an **Arsenal PowerLine** application and before planting any crop, a successful field bioassay must be completed. The field bioassay consists of a test strip of the intended rotational crop planted in the previously treated area in the grass pasture/rangeland and grown to maturity. The test strip should include low areas and knolls, and include variations in soil type and pH within the treated area. If no crop injury is evident in the test strip, the intended rotational crop may be planted the following year.

Use of **Arsenal PowerLine** in accordance with label directions is expected to result in normal growth of rotational crops in most situations; however, various environmental and agronomic factors make it impossible to eliminate all risks associated with the use of this product and, therefore, rotational crop injury is always possible.

WEEDS CONTROLLED

Arsenal PowerLine will provide preemergence or post-emergence control with residual control of the following target vegetation species at the rates listed. Residual control refers to control of newly germinating seedlings in both annuals and perennials. In general, annual weeds may be controlled by preemergence or postemergence applications of **Arsenal PowerLine**.

For established biennials and perennials, postemergence applications of Arsenal PowerLine are recommended. The rates shown below pertain to broadcast applications and indicate the relative sensitivity of these weeds. The relative sensitivity should be referenced when preparing low-volume spray solutions (see **Low-volume Foliar** section of **GROUND APPLICATIONS**); low-volume applications may provide control of the target species with less **Arsenal PowerLine** per acre than is shown for the broadcast treatments. **Arsenal PowerLine** may be used only in accordance with the instructions on this label.

RESISTANT BIOTYPES

Naturally occurring biotypes (a plant within a given species that has a slightly different but distinct genetic makeup from other plants of the same species) of some weeds listed on this label may not be effectively controlled by this and/or other herbicides (**Oust®**) with the ALS/AHAS enzyme-inhibiting mode of action. If naturally occurring ALS/AHAS-resistant biotypes are present in an area, **Arsenal PowerLine** should be tank mixed or applied sequentially with an appropriate registered herbicide having a different mode of action to ensure control.

Weeds Controlled

GRASSES

Common Name	Species	Growth Habit ²
Apply 2 to 3 pints per acre¹		
Annual bluegrass	(<i>Poa annua</i>)	A
Broadleaf signalgrass	(<i>Brachiaria platyphylla</i>)	A
Canada bluegrass	(<i>Poa compressa</i>)	P
Downy brome	(<i>Bromus tectorum</i>)	A
Fescue	(<i>Festuca</i> spp.)	A/P
Foxtail	(<i>Setaria</i> spp.)	A
Italian ryegrass	(<i>Lolium multiflorum</i>)	A
Johnsongrass	(<i>Sorghum halepense</i>)	P
Kentucky bluegrass	(<i>Poa pratensis</i>)	P
Lovegrass	(<i>Eragrostis</i> spp.)	A/P
Orchardgrass	(<i>Dactylis glomerata</i>)	P
Paragrass	(<i>Brachiaria mutica</i>)	P
Quackgrass	(<i>Agropyron repens</i>)	P
Sandbur	(<i>Cenchrus</i> spp.)	A
Sand dropseed	(<i>Sporobolus cryptandrus</i>)	A
Smooth brome	(<i>Bromus inermis</i>)	P
Vaseygrass	(<i>Paspalum urvillei</i>)	P
Wild oats	(<i>Avena fatua</i>)	A
Witchgrass	(<i>Panicum capillare</i>)	A
Apply 3 to 4 pints per acre¹		
Barnyardgrass ³	(<i>Echinochloa crus-galli</i>)	A
Beardgrass	(<i>Andropogon</i> spp.)	P
Bluegrass, annual ³	(<i>Poa annua</i>)	A
Cheat	(<i>Bromus secalinus</i>)	A
Crabgrass	(<i>Digitaria</i> spp.)	A
Crowfootgrass ³	(<i>Dactyloctenium aegyptium</i>)	A
Fall panicum	(<i>Panicum dichotomiflorum</i>)	A
Giant reed	(<i>Arundo donax</i>)	P
Goosegrass	(<i>Eleusine indica</i>)	A
Itchgrass ³	(<i>Rottboellia exaltata</i>)	A
Junglerice ³	(<i>Echinochloa colonum</i>)	A
Lovegrass ³	(<i>Eragrostis</i> spp.)	A
Maidencane	(<i>Panicum hemitomon</i>)	A
Panicum, browntop ³	(<i>Panicum fasciculatum</i>)	A
Panicum, Texas ³	(<i>Panicum texanum</i>)	A
Prairie threeawn	(<i>Aristida oligantha</i>)	P
Reed canarygrass	(<i>Phalaris arundinacea</i>)	P
Sandbur, field ³	(<i>Cenchrus incertus</i>)	A
Signalgrass ³	(<i>Brachiaria</i> spp.)	A
Torpedograss	(<i>Panicum repens</i>)	P
Wild barley	(<i>Hordeum</i> spp.)	A
Wooly cupgrass ³	(<i>Eriochloa villosa</i>)	A

Weeds Controlled *(continued)*

GRASSES *(continued)*

Common Name	Species	Growth Habit ²
Apply 4 to 6 pints per acre¹		
Bahiagrass	<i>(Paspalum notatum)</i>	P
Bermudagrass ⁴	<i>(Cynodon dactylon)</i>	P
Big bluestem	<i>(Andropogon gerardii)</i>	P
Cattail	<i>(Typha spp.)</i>	P
Cogongrass	<i>(Imperata cylindrica)</i>	P
Dallisgrass	<i>(Paspalum dilatatum)</i>	P
Feathertop	<i>(Pennisetum villosum)</i>	P
Guineagrass	<i>(Panicum maximum)</i>	P
Phragmites	<i>(Phragmites australis)</i>	P
Prairie cordgrass	<i>(Spartina pectinata)</i>	P
Saltgrass ⁴	<i>(Distichlis stricta)</i>	P
Sand dropseed	<i>(Sporobolus cryptandrus)</i>	P
Sprangletop ³	<i>(Leptochloa spp.)</i>	A
Timothy	<i>(Phleum pratense)</i>	P
Wirestem muhly	<i>(Muhlenbergia frondosa)</i>	P

BROADLEAF WEEDS

Apply 2 to 3 pints per acre¹

African rue ¹⁰	<i>(Peganum harmala)</i>	P
Alligatorweed	<i>(Alternanthera philoxeroides)</i>	A/P
Burdock	<i>(Arctium spp.)</i>	B
Carolina geranium	<i>(Geranium carolinianum)</i>	A
Carpetweed	<i>(Mollugo verticillata)</i>	A
Clover	<i>(Trifolium spp.)</i>	A/P
Common chickweed	<i>(Stellaria media)</i>	A
Common ragweed	<i>(Ambrosia artemisiifolia)</i>	A
Dandelion	<i>(Taraxacum officinale)</i>	P
Dogfennel	<i>(Eupatorium capillifolium)</i>	A
Filaree	<i>(Erodium spp.)</i>	A
Fleabane	<i>(Erigeron spp.)</i>	A
Hoary vervain	<i>(Verbena stricta)</i>	P
Indian mustard	<i>(Brassica juncea)</i>	A
Kochia ⁵	<i>(Kochia scoparia)</i>	A
Lambsquarters	<i>(Chenopodium album)</i>	A
Lespedeza	<i>(Lespedeza spp.)</i>	P
Miners lettuce	<i>(Montia perfoliata)</i>	A
Mullein	<i>(Verbascum spp.)</i>	B
Nettleleaf goosefoot	<i>(Chenopodium murale)</i>	A
Oxeye daisy	<i>(Chrysanthemum leucanthemum)</i>	P
Pepperweed	<i>(Lepidium spp.)</i>	A
Pigweed	<i>(Amaranthus spp.)</i>	A
Puncturevine	<i>(Tribulus terrestris)</i>	A
Russian thistle	<i>(Salsola kali)</i>	A

Weeds Controlled *(continued)*
BROADLEAF WEEDS *(continued)*

Common Name	Species	Growth Habit ²
Apply 2 to 3 pints per acre¹ <i>(continued)</i>		
Smartweed	<i>(Polygonum spp.)</i>	A
Sorrell	<i>(Rumex spp.)</i>	P
Sunflower	<i>(Helianthus spp.)</i>	A
Sweet clover	<i>(Melilotus spp.)</i>	A
Tansymustard	<i>(Ambrosia psilostachya)</i>	P
Wild carrot	<i>(Daucus carota)</i>	B
Wild lettuce	<i>(Lactuca spp.)</i>	A/B
Wild parsnip	<i>(Pastinaca sativa)</i>	B
Wild turnip	<i>(Brassica campestris)</i>	B
Woollyleaf bursage	<i>(Franseria tomentosa)</i>	P
Yellow woodsorrel	<i>(Oxalis stricta)</i>	P
Apply 3 to 4 pints per acre¹		
Broom snakeweed ⁶	<i>(Gutierrezia sarothrae)</i>	P
Bull thistle	<i>(Cirsium vulgare)</i>	B
Burclover ³	<i>(Medicago spp.)</i>	A
Chickweed, mouseear ⁵	<i>(Cerastium vulgatum)</i>	A
Clover, hop ³	<i>(Trifolium procumbens)</i>	A
Cocklebur	<i>(Xanthium strumarium)</i>	A
Cudweed ³	<i>(Gnaphalium spp.)</i>	A
Desert camelthorn	<i>(Alhagi pseudalhagi)</i>	P
Diffuse knapweed	<i>(Centaurea diffusa)</i>	A
Dock	<i>(Rumex spp.)</i>	P
Fiddleneck ³	<i>(Amsinckia intermedia)</i>	A
Goldenrod	<i>(Solidago spp.)</i>	P
Henbit ³	<i>(Lamium amplexicaule)</i>	A
Knotweed, prostrate ³	<i>(Polygonum aviculare)</i>	A/P
Pokeweed	<i>(Phytolacca americana)</i>	P
Purple loosestrife ⁶	<i>(Lythrum salicaria)</i>	P
Purslane	<i>(Portulaca spp.)</i>	A
Pusley, Florida ³	<i>(Richardia scabra)</i>	A
Rocket, London ³	<i>(Sisymbrium irio)</i>	A
Rush skeletonweed ⁶	<i>(Chondrilla juncea)</i>	B
Saltbush	<i>(Atriplex spp.)</i>	A
Shepherdspurse ³	<i>(Capsella bursa-pastoris)</i>	A
Spurge, annual ³	<i>(Euphorbia spp.)</i>	A
Stinging nettle ⁶	<i>(Urtica dioica)</i>	P
Velvetleaf ³	<i>(Abutilon theophrasti)</i>	A
Yellow starthistle	<i>(Centaurea solstitialis)</i>	A

Weeds Controlled *(continued)*

BROADLEAF WEEDS *(continued)*

Common Name	Species	Growth Habit ²
Apply 4 to 6 pints per acre¹		
Arrowwood	<i>(Pluchea sericea)</i>	A
Canada thistle	<i>(Cirsium arvense)</i>	P
Giant ragweed	<i>(Ambrosia trifida)</i>	A
Grey rabbitbrush	<i>(Chrysothamnus nauseosus)</i>	P
Japanese bamboo/knotweed	<i>(Polygonum cuspidatum)</i>	P
Little mallow	<i>(Malva parviflora)</i>	B
Milkweed	<i>(Asclepias spp.)</i>	P
Primrose	<i>(Oenothera kunthiana)</i>	P
Russian knapweed	<i>(Centaurea repens)</i>	P
Sago pondweed ¹⁰	<i>(Potamogeton pectinatus)</i>	P
Silverleaf nightshade	<i>(Solanum elaeagnifolium)</i>	P
Sowthistle	<i>(Sonchus spp.)</i>	A
Texas thistle	<i>(Cirsium texanum)</i>	P

VINES AND BRAMBLES

Apply 1 pint per acre

Field bindweed	<i>(Convolvulus arvensis)</i>	P
Hedge bindweed	<i>(Calystegia sepium)</i>	A

Apply 2 to 3 pints per acre¹

Wild buckwheat	<i>(Polygonum convolvulus)</i>	P
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Apply 3 to 4 pints per acre¹

Greenbriar	<i>(Smilax spp.)</i>	P
Honeysuckle	<i>(Lonicera spp.)</i>	P
Morningglory	<i>(Ipomoea spp.)</i>	A/P
Poison ivy	<i>(Rhus radicans)</i>	P
Redvine	<i>(Brunnichia cirrhosa)</i>	P
Wild rose	<i>(Rosa spp.)</i>	P
including: Multiflora rose	<i>(Rosa multiflora)</i>	P
Macartney rose	<i>(Rosa bracteata)</i>	P

Apply 4 to 6 pints per acre¹

Kudzu ⁴	<i>(Pueraria lobata)</i>	P
Trumpet creeper	<i>(Campsis radicans)</i>	P
Virginia creeper	<i>(Parthenocissus quinquefolia)</i>	P
Wild grape	<i>(Vitis spp.)</i>	P

Weeds Controlled (continued)

BRUSH SPECIES

Apply 4 to 6 pints per acre¹

Common Name	Species	Growth Habit ²
American beech	(<i>Fagus grandifolia</i>)	P
Ash	(<i>Fraxinus</i> spp.)	P
Bald cypress	(<i>Taxodium distichum</i>)	P
Bigleaf maple	(<i>Acer macrophyllum</i>)	P
Blackgum	(<i>Nyssa sylvatica</i>)	P
Black locust ⁷	(<i>Robinia pseudoacacia</i>)	P
Boxelder	(<i>Acer negundo</i>)	P
Brazilian peppertree	(<i>Schinus terebinthifolius</i>)	P
Cherry	(<i>Prunus</i> spp.)	P
Chinaberry	(<i>Melia azedarach</i>)	P
Chinese tallow-tree	(<i>Sapium sebiferum</i>)	P
Dogwood	(<i>Cornus</i> spp.)	P
Elm ⁸	(<i>Ulmus</i> spp.)	P
Hawthorn	(<i>Crataegus</i> spp.)	P
Hickory	(<i>Carya</i> spp.)	P
Honeylocust ⁹	(<i>Gleditsia triacanthos</i>)	P
Maple	(<i>Acer</i> spp.)	P
Melaleuca	(<i>Melaleuca quinquenervia</i>)	P
Mulberry	(<i>Morus</i> spp.)	P
Oak	(<i>Quercus</i> spp.)	P
Persimmon	(<i>Diospyros virginiana</i>)	P
Poplar	(<i>Populus</i> spp.)	P
Privet	(<i>Ligustrum vulgare</i>)	P
Red alder	(<i>Alnus rubra</i>)	P
Red maple	(<i>Acer rubrum</i>)	P
Russian olive	(<i>Elaeagnus angustifolia</i>)	P
Saltcedar	(<i>Tamarix ramosissima</i>)	P
Sassafras	(<i>Sassafras albidum</i>)	P
Sourwood	(<i>Oxydendrum arboreum</i>)	P
Sumac	(<i>Rhus</i> spp.)	P
Sweetgum	(<i>Liquidambar styraciflua</i>)	P
Willow	(<i>Salix</i> spp.)	P
Yellow poplar	(<i>Liriodendron tulipifera</i>)	P

¹ The higher rates should be used where heavy or well-established infestations occur.

² Growth Habit: A = Annual, B = Biennial, P = Perennial

³ For preemergence control, tank mix with **Pendulum**® herbicide.

⁴ Use a minimum of 75 GPA; control of established stands may require repeat applications.

⁵ For preemergence control, tank mix with **Karmex**®, **Pendulum**, or diuron.

⁶ For best results, early postemergence applications are required.

⁷ Tank mix with **Accord**®, **Escort**®, **Garlon 3A**, **Krenite**®, **Roundup**®, or **Tordon**® K.

⁸ Tank mix with **Accord**, **Escort**, or **Roundup**.

⁹ Tank mix with **Accord**, **Garlon 3A**, **Roundup**, or **Tordon K**.

¹⁰ Use not permitted in California unless otherwise directed by supplemental labeling.

Conditions of Sale and Warranty

The **Directions For Use** of this product reflect the opinion of experts based on field use and tests. The directions are believed to be reliable and must be followed carefully. However, it is impossible to eliminate all risks inherently associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or use of the product in a manner inconsistent with its labeling, all of which are beyond the control of BASF CORPORATION ("BASF") or the Seller. To the extent consistent with applicable law, all such risks shall be assumed by the Buyer.

BASF warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes referred to in the **Directions For Use**, subject to the inherent risks, referred to above.

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1108

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BASF Corporation
26 Davis Drive
Research Triangle Park, NC 27709



The Chemical Company

Safety Data Sheet

ARSENAL POWERLINE HERBICIDE

Revision date : 2016/06/16
Version: 5.0

Page: 1/11
(30322009/SDS_CPA_US/EN)

1. Identification

Product identifier used on the label

ARSENAL POWERLINE HERBICIDE

Recommended use of the chemical and restriction on use

Recommended use*: herbicide

* The "Recommended use" identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:

BASF CORPORATION
100 Park Avenue
Florham Park, NJ 07932, USA

Telephone: +1 973 245-6000

Emergency telephone number

CHEMTREC: 1-800-424-9300
BASF HOTLINE: 1-800-832-HELP (4357)

Other means of identification

Substance number: 234359
EPA Registration number: 241-431
Molecular formula: C(13) H(15) N(3) O(3). C(3) H(9) N
Chemical family: imidazole derivative
Synonyms: Isopropylamine salt of imazapyr

2. Hazards Identification

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Classification of the product

Skin Sens. 1 Skin sensitization

Label elements

Pictogram:

Safety Data Sheet

ARSENAL POWERLINE HERBICIDE

Revision date : 2016/06/16
Version: 5.0

Page: 2/11
(30322009/SDS_CPA_US/EN)



Signal Word:
Warning

Hazard Statement:
H317 May cause an allergic skin reaction.

Precautionary Statements (Prevention):
P280 Wear protective gloves.
P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
P272 Contaminated work clothing should not be allowed out of the workplace.

Precautionary Statements (Response):
P303 + P352 IF ON SKIN (or hair): Wash with plenty of soap and water.
P333 + P311 If skin irritation or rash occurs: Call a POISON CENTER or doctor/physician.
P362 + P364 Take off contaminated clothing and wash it before reuse.

Precautionary Statements (Disposal):
P501 Dispose of contents/container to hazardous or special waste collection point.

According to Regulation 1994 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Emergency overview

CAUTION:
May cause moderate but temporary irritation to the eyes.
Prolonged or repeated skin contact may cause sensitization or allergic reactions.
HARMFUL IF SWALLOWED.
KEEP OUT OF REACH OF CHILDREN.
KEEP OUT OF REACH OF DOMESTIC ANIMALS.
Avoid contact with the skin, eyes and clothing.
Avoid inhalation of mists/vapours.

3. Composition / Information on Ingredients

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

<u>CAS Number</u>	<u>Weight %</u>	<u>Chemical name</u>
81510-83-0	26.7 %	imazapyr isopropylamine salt

According to Regulation 1994 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

<u>CAS Number</u>	<u>Weight %</u>	<u>Chemical name</u>
81510-83-0	26.7 %	imazapyr isopropylamine salt
	73.3 %	Proprietary ingredients

4. First-Aid Measures

Description of first aid measures

Safety Data Sheet

ARSENAL POWERLINE HERBICIDE

Revision date : 2016/06/16
Version: 5.0

Page: 3/11
(30322009/SDS_CPA_US/EN)

General advice:

Remove contaminated clothing.

If inhaled:

Keep patient calm, remove to fresh air, seek medical attention.

If on skin:

Wash thoroughly with soap and water.

If in eyes:

Wash affected eyes for at least 15 minutes under running water with eyelids held open.

If swallowed:

Immediately rinse mouth and then drink 200-300 ml of water, seek medical attention.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.

Indication of any immediate medical attention and special treatment needed

Note to physician

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
foam, dry powder, carbon dioxide, water spray

Special hazards arising from the substance or mixture

Hazards during fire-fighting:
carbon monoxide, carbon dioxide, nitrogen oxide, nitrogen dioxide, Hydrocarbons,
If product is heated above decomposition temperature, toxic vapours will be released. The substances/groups of substances mentioned can be released if the product is involved in a fire.

Advice for fire-fighters

Protective equipment for fire-fighting:
Firefighters should be equipped with self-contained breathing apparatus and turn-out gear.

Further information:

In case of fire and/or explosion do not breathe fumes. Keep containers cool by spraying with water if exposed to fire. Collect contaminated extinguishing water separately, do not allow to reach sewage or effluent systems. Dispose of fire debris and contaminated extinguishing water in accordance with official regulations.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Safety Data Sheet

ARSENAL POWERLINE HERBICIDE

Revision date : 2016/06/16
Version: 5.0

Page: 4/11
(30322009/SDS_CPA_US/EN)

Take appropriate protective measures. Clear area. Shut off source of leak only under safe conditions. Extinguish sources of ignition nearby and downwind. Ensure adequate ventilation. Wear suitable personal protective clothing and equipment.

Environmental precautions

Do not discharge into the subsoil/soil. Do not discharge into drains/surface waters/groundwater. Contain contaminated water/firefighting water.

Methods and material for containment and cleaning up

Dike spillage. Pick up with suitable absorbent material. Place into suitable containers for reuse or disposal in a licensed facility. Spilled substance/product should be recovered and applied according to label rates whenever possible. If application of spilled substance/product is not possible, then spills should be contained, solidified, and placed in suitable containers for disposal. After decontamination, spill area can be washed with water. Collect wash water for approved disposal.

7. Handling and Storage

Precautions for safe handling

RECOMMENDATIONS ARE FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS. PESTICIDE APPLICATORS & WORKERS must refer to the Product Label and Directions for Use attached to the product for Agricultural Use Requirements in accordance with the EPA Worker Protection Standard 40 CFR part 170. Ensure adequate ventilation. Provide good ventilation of working area (local exhaust ventilation if necessary). Keep away from sources of ignition - No smoking. Keep container tightly sealed. Protect contents from the effects of light. Protect against heat. Protect from air. Handle and open container with care. Do not open until ready to use. Once container is opened, content should be used as soon as possible. Avoid aerosol formation. Avoid dust formation. Provide means for controlling leaks and spills. Do not return residues to the storage containers. Follow label warnings even after container is emptied. The substance/ product may be handled only by appropriately trained personnel. Avoid all direct contact with the substance/product. Avoid contact with the skin, eyes and clothing. Avoid inhalation of dusts/mists/vapours. Wear suitable personal protective clothing and equipment.

Protection against fire and explosion:

The relevant fire protection measures should be noted. Fire extinguishers should be kept handy. Avoid all sources of ignition: heat, sparks, open flame. Sources of ignition should be kept well clear. Avoid extreme heat. Keep away from oxidizable substances. Electrical equipment should conform to national electric code. Ground all transfer equipment properly to prevent electrostatic discharge. Electrostatic discharge may cause ignition.

Conditions for safe storage, including any incompatibilities

Segregate from incompatible substances. Segregate from foods and animal feeds. Segregate from textiles and similar materials.

Further information on storage conditions: Keep only in the original container in a cool, dry, well-ventilated place away from ignition sources, heat or flame. Protect containers from physical damage. Protect against contamination. The authority permits and storage regulations must be observed.

8. Exposure Controls/Personal Protection

Users of a pesticidal product should refer to the product label for personal protective equipment requirements.

Safety Data Sheet

ARSENAL POWERLINE HERBICIDE

Revision date : 2016/06/16
Version: 5.0

Page: 5/11
(30322009/SDS_CPA_US/EN)

Advice on system design:

Whenever possible, engineering controls should be used to minimize the need for personal protective equipment.

Personal protective equipment

RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:

Respiratory protection:

Wear respiratory protection if ventilation is inadequate. Wear a NIOSH-certified (or equivalent) TC23C Chemical/Mechanical type filter system to remove a combination of particles, gas and vapours. For situations where the airborne concentrations may exceed the level for which an air purifying respirator is effective, or where the levels are unknown or Immediately Dangerous to Life or Health (IDLH), use NIOSH-certified full facepiece pressure demand self-contained breathing apparatus (SCBA) or a full facepiece pressure demand supplied-air respirator (SAR) with escape provisions.

Hand protection:

Chemical resistant protective gloves, Protective glove selection must be based on the user's assessment of the workplace hazards.

Eye protection:

Safety glasses with side-shields. Tightly fitting safety goggles (chemical goggles). Wear face shield if splashing hazard exists.

Body protection:

Body protection must be chosen depending on activity and possible exposure, e.g. head protection, apron, protective boots, chemical-protection suit.

General safety and hygiene measures:

Wear long sleeved work shirt and long work pants in addition to other stated personal protective equipment. Work place should be equipped with a shower and an eye wash. Handle in accordance with good industrial hygiene and safety practice. Personal protective equipment should be decontaminated prior to reuse. Gloves must be inspected regularly and prior to each use. Replace if necessary (e.g. pinhole leaks). Take off immediately all contaminated clothing. Store work clothing separately. Hands and/or face should be washed before breaks and at the end of the shift. No eating, drinking, smoking or tobacco use at the place of work. Keep away from food, drink and animal feeding stuffs.

9. Physical and Chemical Properties

Form:	liquid
Odour:	odourless
Odour threshold:	not applicable, odour not perceivable
Colour:	transparent light yellow
pH value:	approx. 6 - 8 (25 °C)
Freezing point:	approx. 0 °C (1,013.3 hPa)
Boiling point:	Information applies to the solvent. approx. 100 °C (1,013.3 hPa) Information applies to the solvent.

Safety Data Sheet

ARSENAL POWERLINE HERBICIDE

Revision date : 2016/06/16
Version: 5.0

Page: 6/11
(30322009/SDS_CPA_US/EN)

Flash point:	> 100 °C The product has not been tested. The statement has been derived from the properties of the individual components.
Flammability:	not applicable
Lower explosion limit:	As a result of our experience with this product and our knowledge of its composition we do not expect any hazard as long as the product is used appropriately and in accordance with the intended use.
Upper explosion limit:	As a result of our experience with this product and our knowledge of its composition we do not expect any hazard as long as the product is used appropriately and in accordance with the intended use.
Autoignition:	Based on the water content the product does not ignite.
Vapour pressure:	approx. 23.3 hPa (20 °C) Information applies to the solvent.
Density:	approx. 1.10 g/cm ³ (20 °C)
Relative density:	1.10 (20 °C)
Vapour density:	not applicable
Partitioning coefficient n-octanol/water (log Pow):	not applicable
Thermal decomposition:	carbon monoxide, carbon dioxide, nitrogen oxide, nitrogen dioxide, Hydrocarbons Stable at ambient temperature. If product is heated above decomposition temperature toxic vapours may be released.
Viscosity, dynamic:	163.2 mPa.s (20 °C)
Solubility in water:	miscible
Molar mass:	320.4 g/mol
Evaporation rate:	not applicable
Other Information:	If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals:
Corrosive effect on: mild steel brass

Oxidizing properties:
Not an oxidizer.

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

Possibility of hazardous reactions

Safety Data Sheet

ARSENAL POWERLINE HERBICIDE

Revision date : 2016/06/16
Version: 5.0

Page: 7/11
(30322009/SDS_CPA_US/EN)

The product is chemically stable.

Conditions to avoid

Avoid all sources of ignition: heat, sparks, open flame. Avoid prolonged storage. Avoid electro-static discharge. Avoid contamination. Avoid prolonged exposure to extreme heat. Avoid extreme temperatures.

Incompatible materials

oxidizing agents, reducing agents

Hazardous decomposition products

Decomposition products:

No hazardous decomposition products if stored and handled as prescribed/indicated., Prolonged thermal loading can result in products of degradation being given off.

Thermal decomposition:

Possible thermal decomposition products:

carbon monoxide, carbon dioxide, nitrogen oxide, nitrogen dioxide, Hydrocarbons

Stable at ambient temperature. If product is heated above decomposition temperature toxic vapours may be released.

11. Toxicological information

Primary routes of exposure

Routes of entry for solids and liquids are ingestion and inhalation, but may include eye or skin contact. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

Acute Toxicity/Effects

Acute toxicity

Assessment of acute toxicity: Slightly toxic after single ingestion. Relatively nontoxic after short-term skin contact. Relatively nontoxic after short-term inhalation.

Oral

Type of value: LD50

Species: rat

Value: > 2,000 mg/kg (OECD Guideline 423)

No mortality was observed.

Inhalation

Type of value: LC50

Species: rat

Value: > 5.5 mg/l

Exposure time: 4 h

The product has not been tested. The statement has been derived from substances/products of a similar structure or composition.

Dermal

Type of value: LD50

Species: rabbit

Value: > 5,000 mg/kg (OECD Guideline 402)

No mortality was observed.

Assessment other acute effects

Safety Data Sheet

ARSENAL POWERLINE HERBICIDE

Revision date : 2016/06/16
Version: 5.0

Page: 8/11
(30322009/SDS_CPA_US/EN)

Assessment of STOT single:
The available information is not sufficient for evaluation.

The product has not been tested. The statement has been derived from the properties of the individual components.

Irritation / corrosion

Assessment of irritating effects: May cause slight but temporary irritation to the eyes. May cause slight irritation to the skin.

Skin

Species: rabbit
Result: non-irritant
Method: Primary skin irritation test

Eye

Species: rabbit
Result: non-irritant

Sensitization

Assessment of sensitization: Caused skin sensitization in animal studies.

Skin sensitization test

Species: guinea pig
Result: Caused skin sensitization in animal studies.

Chronic Toxicity/Effects

Genetic toxicity

Assessment of mutagenicity: The product has not been tested. The statement has been derived from the properties of the individual components. Mutagenicity tests revealed no genotoxic potential.

Carcinogenicity

Assessment of carcinogenicity: The product has not been tested. The statement has been derived from the properties of the individual components. The results of various animal studies gave no indication of a carcinogenic effect.

Reproductive toxicity

Assessment of reproduction toxicity: The product has not been tested. The statement has been derived from the properties of the individual components. The results of animal studies gave no indication of a fertility impairing effect.

Teratogenicity

Assessment of teratogenicity: The product has not been tested. The statement has been derived from the properties of the individual components. Animal studies gave no indication of a developmental toxic effect at doses that were not toxic to the parental animals.

Symptoms of Exposure

The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.

Medical conditions aggravated by overexposure

Individuals with pre-existing diseases of the respiratory system, skin or eyes may have increased susceptibility to excessive exposures.

Safety Data Sheet

ARSENAL POWERLINE HERBICIDE

Revision date : 2016/06/16
Version: 5.0

Page: 9/11
(30322009/SDS_CPA_US/EN)

12. Ecological Information

Toxicity

Aquatic toxicity

Assessment of aquatic toxicity:

There is a high probability that the product is not acutely harmful to fish. There is a high probability that the product is not acutely harmful to aquatic invertebrates. Acutely harmful for aquatic plants.

There is a high probability that the product is not acutely harmful to aquatic organisms.

Toxicity to fish

LC50 (96 h) > 120 mg/l, Cyprinus carpio

Aquatic invertebrates

EC50 (48 h) > 100 mg/l, Daphnia magna

Aquatic plants

EC50 (72 h) > 98.0 mg/l, Pseudokirchneriella subcapitata

No observed effect concentration (72 h) 25.8 mg/l, Pseudokirchneriella subcapitata

Assessment of terrestrial toxicity

With high probability not acutely harmful to terrestrial organisms.

Other terrestrial non-mammals

Information on: imazapyr

LC50, Anas platyrhynchos

With high probability not acutely harmful to terrestrial organisms.

LD50 > 100 ug/bee, Apis mellifera

With high probability not acutely harmful to terrestrial organisms.

Mobility in soil

Assessment transport between environmental compartments

The product has not been tested. The statement has been derived from the properties of the individual components.

Information on: Imazapyr

The substance will not evaporate into the atmosphere from the water surface.

Following exposure to soil, the product trickles away and can - dependant on degradation - be transported to deeper soil areas with larger water loads.

Additional information

Other ecotoxicological advice:

The ecological data given are those of the active ingredient. Do not release untreated into natural waters.

Safety Data Sheet

ARSENAL POWERLINE HERBICIDE

Revision date : 2016/06/16
Version: 5.0

Page: 10/11
(30322009/SDS_CPA_US/EN)

13. Disposal considerations

Waste disposal of substance:

Pesticide wastes are regulated. Improper disposal of excess pesticide, spray mix or rinsate is a violation of federal law. If pesticide wastes cannot be disposed of according to label instructions, contact the State Pesticide or Environmental Control Agency or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

Container disposal:

Rinse thoroughly at least three times (triple rinse) in accordance with EPA recommendations. Consult state or local disposal authorities for approved alternative procedures such as container recycling. Recommend crushing, puncturing or other means to prevent unauthorized use of used containers.

RCRA:

This product is not regulated by RCRA.

14. Transport Information

Land transport

USDOT

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

Federal Regulations

Registration status:

Crop Protection TSCA, US released / exempt

Chemical TSCA, US blocked / not listed

EPCRA 311/312 (Hazard categories): Not hazardous;

CA Prop. 65:

Risk assessment indicates No Significant Risk Levels for Carcinogens and No Maximum Allowable Dose Levels for Chemicals Causing Reproductive Toxicity are expected when using this product as labeled for agricultural or residential use.

Safety Data Sheet

ARSENAL POWERLINE HERBICIDE

Revision date : 2016/06/16
Version: 5.0

Page: 11/11
(30322009/SDS_CPA_US/EN)

NFPA Hazard codes:

Health : 2 Fire: 1 Reactivity: 0 Special:

Labeling requirements under FIFRA

This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label.

CAUTION:

May cause moderate but temporary irritation to the eyes.

Prolonged or repeated skin contact may cause sensitization or allergic reactions.

HARMFUL IF SWALLOWED.

KEEP OUT OF REACH OF CHILDREN.

KEEP OUT OF REACH OF DOMESTIC ANIMALS.

Avoid contact with the skin, eyes and clothing.

Avoid inhalation of mists/vapours.

16. Other Information

SDS Prepared by:

BASF NA Product Regulations

SDS Prepared on: 2016/06/16

We support worldwide Responsible Care® initiatives. We value the health and safety of our employees, customers, suppliers and neighbors, and the protection of the environment. Our commitment to Responsible Care is integral to conducting our business and operating our facilities in a safe and environmentally responsible fashion, supporting our customers and suppliers in ensuring the safe and environmentally sound handling of our products, and minimizing the impact of our operations on society and the environment during production, storage, transport, use and disposal of our products.

IMPORTANT: WHILE THE DESCRIPTIONS, DESIGNS, DATA AND INFORMATION CONTAINED HEREIN ARE PRESENTED IN GOOD FAITH AND BELIEVED TO BE ACCURATE, IT IS PROVIDED FOR YOUR GUIDANCE ONLY. BECAUSE MANY FACTORS MAY AFFECT PROCESSING OR APPLICATION/USE, WE RECOMMEND THAT YOU MAKE TESTS TO DETERMINE THE SUITABILITY OF A PRODUCT FOR YOUR PARTICULAR PURPOSE PRIOR TO USE. NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE REGARDING PRODUCTS DESCRIBED OR DESIGNS, DATA OR INFORMATION SET FORTH, OR THAT THE PRODUCTS, DESIGNS, DATA OR INFORMATION MAY BE USED WITHOUT INFRINGING THE INTELLECTUAL PROPERTY RIGHTS OF OTHERS. IN NO CASE SHALL THE DESCRIPTIONS, INFORMATION, DATA OR DESIGNS PROVIDED BE CONSIDERED A PART OF OUR TERMS AND CONDITIONS OF SALE. FURTHER, YOU EXPRESSLY UNDERSTAND AND AGREE THAT THE DESCRIPTIONS, DESIGNS, DATA, AND INFORMATION FURNISHED BY OUR COMPANY HEREUNDER ARE GIVEN GRATIS AND WE ASSUME NO OBLIGATION OR LIABILITY FOR THE DESCRIPTION, DESIGNS, DATA AND INFORMATION GIVEN OR RESULTS OBTAINED, ALL SUCH BEING GIVEN AND ACCEPTED AT YOUR RISK.
END OF DATA SHEET

Polaris

Active Ingredient

Imazapyr

Nufarm

GROUP 2 HERBICIDE

Polaris® Herbicide

For control of undesirable vegetation growing within certain aquatic sites, forestry sites, pasture/rangeland, nonagricultural lands, establishment and maintenance of wildlife openings, release of unimproved Bermudagrass and Bahiagrass, bareground weed control, for use under certain paved areas, industrial noncropland areas including railroad, utility, pipeline and highway rights-of-way, utility plant sites, petroleum tank farms, pumping installations, fence rows, storage areas, non-irrigation ditchbanks including grazed or hayed areas within these sites, roads and transmission lines.

ACTIVE INGREDIENT:

Isopropylamine salt of Imazapyr: (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid)* 27.7%

OTHER INGREDIENTS: 72.3%

TOTAL: 100.0%

* Equivalent to 22.62% 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid or 2 pounds acid per gallon.

Have the product container label with you when calling a poison control center or doctor or going for treatment.
In the State of New York, Aquatic Uses are Not Allowed.

KEEP OUT OF REACH OF CHILDREN CAUTION / PRECAUCIÓN

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you **DO NOT** understand the label, find someone to explain it to you in detail.)

SEE NEXT PAGE BOOKLET FOR ADDITIONAL FIRST AID AND PRECAUTIONARY STATEMENTS

For Chemical Spill, Leak, Fire, or Exposure, Call CHEMTREC (800) 424-9300
For Medical Emergencies Only, Call (877) 325-1840

EPA Reg. No. 228-534

Manufactured for
Nufarm Americas Inc.
11901 S. Austin Avenue
Alsip, IL 60803

 **Nufarm**
Grow a better tomorrow



1 91662 01337 5

Net Contents
2.5 Gal.
(9.46 L)

Nonrefillable Container

14785000

**PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS
CAUTION / PRECAUCIÓN**

No human or domestic animal hazard statements are required. Follow the instructions for Personal Protective Equipment and User Safety Recommendations.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

Mixers, loaders, applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks
- Chemical-resistant gloves made of any waterproof material

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. DO NOT reuse them.

Engineering Controls

Pilots must use an enclosed cockpit that meet the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d) (6)].

USER SAFETY RECOMMENDATIONS

Users should

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. If pesticide gets on skin, wash immediately with soap and water.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

PHYSICAL AND CHEMICAL HAZARDS

Spray solutions of this product should be mixed, stored and applied only in stainless steel, fiberglass, plastic and plastic-lined steel containers.

DO NOT mix, store or apply this product or spray solutions of this product in unlined steel (except stainless steel) containers or spray tanks.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to plants. Drift and run off may be hazardous to plants in water adjacent to treated areas. DO NOT apply directly to water except as specified on the label. Treatment of aquatic weeds may result in oxygen depletion or loss due to decomposition of dead plants. DO NOT treat more than one half the surface area of the water in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow aquatic organisms to move into untreated areas. DO NOT contaminate water when disposing of equipment washwater or rinsate. This pesticide is toxic to vascular plants and must be used strictly in accordance with the drift precautions of the label.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. DO NOT apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

DO NOT enter or allow worker entry into treated areas during the restricted entry interval (REI) of 48 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Shoes plus socks
- Chemical-resistant gloves made of any waterproof material
- Protective eyewear

NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

DO NOT enter or allow others to enter treated areas until sprays have dried.

PRODUCT INFORMATION

This product is an aqueous solution to be mixed with water and a surfactant and applied as a spray solution to control undesirable vegetation growing within certain aquatic sites, forestry sites, pasture/rangeland, and nonagricultural lands. Aquatic sites consist of standing and flowing water, estuarine/marine, wetland, and riparian areas. Nonagricultural lands include private, public and military land as follows: uncultivated nonagricultural areas (including airports, highway, railroad and utility rights of way and sewage disposal areas), uncultivated agricultural areas – noncrop producing (including farmyards, fuel storage areas, fence rows, nonirrigation ditch banks and barrier strips), industrial sites – outdoor (including lumber yards, pipeline and tank farms) and natural areas (including wildlife management areas, wildlife openings, wildlife habitats, recreation areas, campgrounds, trailheads, and trails). This product may also be used for the release of unimproved Bermudagrass and Bahiagrass, for bareground weed control, and for use under certain paved surfaces.

Herbicidal Activity: This product will control most annual and perennial grasses and broadleaf weeds in addition to many brush and vine species with some residual control of undesirable species that germinate above the waterline. This product is readily absorbed through emergent leaves and stems and is translocated rapidly throughout the plant, with accumulation in the meristematic regions. For maximum activity, weeds should be growing robustly at the time of application, and the spray solution should include a surfactant (see **ADJUVANTS** section for specific use directions). Treated plants stop growing soon after spray application. Chlorosis appears first in the newest leaves, and necrosis spreads from this point. In perennials, the herbicide is translocated into, and kills, underground or submerged storage organs, which prevents regrowth. Chlorosis and tissue necrosis may not be apparent in some plant species until two or more weeks after application. Complete kill of plants may not occur for several weeks. Applications of this product are rainfast one hour after treatment.

RESTRICTIONS and LIMITATIONS

DO NOT use on food or feed crops.

DO NOT apply this product to water within 0.5 miles upstream of an active potable water intake in flowing water (i.e. river, stream, etc.) or within 0.5 miles of an active potable water intake in a standing body of water, such as a lake, pond or reservoir.

DO NOT apply to water used for irrigation except as described in USE PRECAUTIONS AND RESTRICTIONS section of this label.

Keep from contact with fertilizers, insecticides, fungicides and seeds.

DO NOT drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the treated soil may be washed or moved into contact with their roots.

DO NOT use on lawns, walks, driveways, tennis courts or similar areas.

DO NOT side trim desirable vegetation with this product unless severe injury and plant death can be tolerated. Prevent drift of spray to desirable plants.

Clean application equipment after using this product by thoroughly flushing with water.

Nonagricultural Lands and Forestry Sites

- DO NOT apply more than 1.5 pounds acid equivalent Imazapyr (equivalent to 6 pints) per acre per year.

Pasture/Rangeland Sites

- DO NOT apply more than 0.75 pound acid equivalent Imazapyr (equivalent to 3 pints) per acre per year.
- DO NOT treat more than 1 /10 of the available area to be grazed or cut for hay.
- For spot treatment only.

Aquatic Sites

- DO NOT apply more than 1.5 pounds acid equivalent Imazapyr (equivalent to 6 pints) per acre per year.
- **No Application to Aquatic Sites in New York State.**

Aerial application - Aerial application to aquatic sites is restricted to helicopter only.

Irrigation water - Application to water used for irrigation that results in residues greater than 1.0 part per billion (ppb) MUST NOT be used for irrigation purposes for 120 days after application or until residue levels of this product are determined by laboratory analysis or other appropriate means of analysis to be 1.0 ppb or less. When applications are made within 500 feet of an active irrigation intake, DO NOT irrigate for at least 24 hours following application to allow for dissipation.

Quiescent or Slow-moving Waters - In lakes and reservoirs, DO NOT apply this product within 1 mile of an active irrigation water intake during the irrigation season. Applications less than 1 mile from an active irrigation water intake may be made during the off-season, provided that the irrigation intake will remain inactive for a minimum of 120 days after application or until residue levels of this product are determined by laboratory analysis or other appropriate means of analysis to be 1.0 ppb or less.

Restrictions for potable water intakes - DO NOT apply this product directly to water within 0.5 miles upstream of an active potable water intake in flowing water (i.e. river, stream, etc.) or within 0.5 miles of an active potable water intake in a standing body of water such as a lake, pond or reservoir. To make aquatic applications around and within 0.5 miles of active potable water intakes, the water intake must be turned off during application and for a minimum of 48 hours after the application. These aquatic applications may be made only in the cases where there are alternative water sources or holding ponds that would permit the turning off of an active potable water intake for a minimum period of 48 hours after the applications.

NOTE: Existing potable water intakes that are no longer in use, such as those replaced by connections to wells or a municipal water system, are not considered to be active potable water intakes. This restriction does not apply to intermittent, inadvertent overspray of water in terrestrial use sites.

Permitting - Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.

Public waters - Application of this product to water can only be made by federal or state agencies, such as Water Management District personnel, municipal officials, and the U.S. Army Corps of Engineers, or those applicators who are licensed or certified as aquatic pest control applicators and are authorized by the state or local government. Treatment to other than non-native invasive species is limited to only those plants that have been determined to be a nuisance by a federal or state government entity.

Private waters - Applications may be made to private waters that are still, such as ponds, lakes and drainage ditches where there is minimal or no outflow to public waters.

Recreational use of water in treatment area - There are no restrictions on the use of water in the treatment area for recreational purposes, including swimming and fishing.

Livestock use of water in/from treatment area - There are no restrictions on livestock consumption of water from the treatment area.

Precautions for Avoiding Injury to Nontarget Plants

Untreated desirable plants can be affected by root uptake of this product from treated soil. Injury or loss of desirable plants may result if this product is applied on or near desirable plants, on areas where their roots extend, or in locations where the treated soil may be washed or moved into contact with their roots. When making applications along shorelines where desirable plants may be present, caution should be exercised to avoid spray contact with their foliage or spray application to the soil in which they are rooted. Shoreline plants that have roots that extend into the water in an area where this product has been applied generally will not be adversely affected by uptake of the herbicide from the water.

If treated vegetation is to be removed from the application site, DO NOT use the vegetative matter as mulch or compost on or around desirable species.

MANAGING OFF-TARGET MOVEMENT

Aerial Application

- Applicators are required to use coarse or coarser droplet size (ASABE S572) or if specifically using a spinning atomizer, nozzle applicators are required to use a volume mean diameter (VMD) of 385 microns or greater for release heights below 10 feet. Applicators are required to use a very coarse or coarser droplet size or if specifically using a spinning atomizer nozzle, applicators are required to use a VMD of 475 microns or greater for release heights above 10 feet. Applicators must consider the effects of nozzle orientation and flight speed when determining droplet size.
- Applicators are required to use upwind swath displacement.
- The boom length must not exceed 60% of the wingspan or 90% of the rotor blade diameter to reduce spray drift.
- Applications with wind speeds less than 3 mph and with wind speeds greater than 10 mph are prohibited. These requirements do not apply to forestry applications, public health uses or to applications using dry formulations.
- Applications into temperature inversions are prohibited.

Ground Boom Application

- Applicators are required to use a nozzle height below 4 feet above the plant canopy or the ground and coarse or Coarser droplet size (ASABE S572) or, if specifically using a spinning atomizer nozzle, applicators are required to use a volume mean diameter (VMD) of 385 microns or greater.
- Applications with wind speeds greater than 10 mph are prohibited.
- Applications into temperature inversions are prohibited.

WIND EROSION

Avoid treating powdery dry or light sandy soils when conditions are favorable for wind erosion. Under these conditions, the soil surface should first be settled by rainfall or irrigation.

ADJUVANTS

Post-emergence applications of this product require the addition of a spray adjuvant for optimum herbicide performance. Only spray adjuvants that are approved or appropriate for aquatic use can be utilized. The addition of a Chemical Producers and Distributors Associations (CPDA) certified adjuvant can increase control. A CPDA certified drift control agent may also be used.

Nonionic Surfactants: Use a nonionic surfactant at the rate 0.25% v/v or higher (see manufacturer's label) of the spray solution (0.25% v/v is equivalent to 1 quart in 100 gallons). For best results, select a nonionic surfactant with a HLB (hydrophilic to lipophilic balance) ratio between 12 and 17 with at least 70% surfactant in the formulated product. Alcohols, fatty acids, oils, ethylene glycol or diethylene glycol should not be considered as surfactants to meet the above requirements.

Methylated Seed Oils or Vegetable Oil Concentrates: Instead of a surfactant, a methylated seed oil or vegetable-based seed oil concentrate may be used at the rate of 1.5 to 2 pints per acre. When using spray volumes greater than 30 gallons per acre, methylated seed oil or vegetable based seed oil concentrates should be mixed at a rate of 1 % of the total spray volume, or alternatively use a nonionic surfactant as described above. Research indicates that these oils may aid in product deposition and uptake by plants under moisture or temperature stress.

Silicone Based Surfactants: See manufacturer's label for specific rate recommendations. Silicone-based surfactants may reduce the surface tension of the spray droplet, allowing greater spreading on the leaf surface as compared to conventional nonionic surfactants. However, some silicone-based surfactants may dry too quickly, limiting herbicide uptake.

Invert emulsions: This product can be applied as an invert emulsion. The spray solution results in an invert (water-in-oil) spray emulsion designed to minimize spray drift and spray run-off, resulting in more herbicide on the target foliage. The spray emulsion may be formed in a single tank (batch mixing) or injected (in-line mixing). Consult the invert chemical label for proper mixing directions. Do not apply more than 3 pints of this product per acre in an invert emulsion.

Fertilizer/Surfactant Blends: Nitrogen based liquid fertilizers such as 28%N, 32%N, 10-34-0 or ammonium sulfate, may be added at the rate of 2 to 3 pints per acre in combination with the recommended rate of nonionic surfactant, methylated seed oil or vegetable/seed oil concentrate. The use of fertilizers in a tank mix without a nonionic surfactant, methylated seed oil or vegetable/seed oil concentrate is not recommended.

Other: An antifoaming agent, spray pattern indicator or drift reducing agent may be applied at the product labeled rate if necessary or desired.

TANK MIXES

It is the pesticide user's responsibility to ensure that all products are registered for the intended use. Read and follow the applicable restrictions and limitations and directions for use on all product label involved in tank mixing. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

APPLICATION METHODS

This product may be selectively applied by using low volume directed application techniques or may be broadcast applied using ground equipment, watercraft, or aircraft. Aerial applications to aquatic sites must be made by helicopter. In addition, this product may also be applied using cut stump, cut stem, and frill or girdle treatment techniques within nonagricultural lands, pasture/rangeland and aquatic sites. See AERIAL APPLICATION and GROUND APPLICATION sections for additional details.

COMPATIBILITY

Before full-scale mixing of this product with other pesticides, emulsifiers, fertilizers, surfactants or oils, determine the compatibility of the proposed mixture. Use proportionate quantities of each ingredient and mix in a small container. Always mix one product thoroughly with the diluent before adding another product. If no incompatibility is evident after 30 minutes, the mixture is generally compatible for spraying. To evaluate potential short term effects of applying the mixture, test the tank mix combination on a few plants or a small area before larger-scale treatments. Wait at least 2 to 3 days for problems to become apparent.

IMPORTANT: MIXING WITH OTHER SUBSTANCES MAY INCREASE THE RISK OF MIXING INCOMPATIBILITIES, REDUCED EFFECTIVENESS AND/OR CAUSE CROP INJURY OR LOSS. ANY LIABILITY FOR LOSS, INJURY OR DAMAGE RESULTING FROM A MIXTURE NOT SPECIFIED ON THIS LABEL OR IN MANUFACTURER'S SUPPLEMENTAL LABELING DISTRIBUTED FOR THIS PRODUCT IS SPECIFICALLY DISCLAIMED BY MANUFACTURER.

AERIAL APPLICATION

All precautions must be taken to minimize or eliminate spray drift. Both helicopter and fixed wing aircraft can be used to apply this product, but applications to aquatic sites are restricted to helicopter only. DO NOT make applications by helicopter or fixed wing aircraft unless appropriate buffer zones can be maintained to prevent spray drift out of the target area, or when spray drift as a result of helicopter application can be tolerated. Aerial equipment designed to minimize spray drift such as a helicopter equipped with a Microfoil™ boom Thru-Valve™ boom or raindrop nozzles must be used and calibrated. Except when applying with a Microfoil boom, a drift control agent may be added at the specified label rate. DO NOT side trim with this product unless death of treated tree can be tolerated.

Uniformly apply the specified amount of this product in 2 to 30 gallons of water per acre. A foam reducing agent may be added at the specified label rate.

Immediately after each use of this product thoroughly clean application equipment, including landing gear. Uncoated steel surfaces (except stainless steel surfaces) may result in corrosion and failure after prolonged exposure to the product. The maintenance of a paint (organic coating) may prevent corrosion.

GROUND APPLICATION

Low Volume Foliar:

Use equipment calibrated to deliver 5 to 20 gallons of spray solution per acre. To prepare the spray solution, thoroughly mix in water 0.5 to 5% of this product plus surfactant (see the ADJUVANTS section of this label for specific recommendations). A foam reducing agent may be applied at the label rate, if needed. For control of difficult species (see AQUATIC WEEDS CONTROLLED section and the TERRESTRIAL WEEDS CONTROLLED section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes but DO NOT apply more than 3 quarts of this product per acre in aquatic sites and nonagricultural lands and 1-5 quarts per acre in pasture/rangeland. Excessive wetting of foliage is not necessary.

For low volume foliar application, select proper nozzles to avoid over-application. Proper application is critical to ensure desirable results. Best results are achieved when the spray covers the crown and approximately 70% of the plant. The use of an even flat fan tip with a spray angle of 40 degrees or less will aid in proper deposition.

Appropriate tip sizes include 4004E, or 1504E. For a straight stream and cone pattern, adjustable cone nozzles such as 5500 X3 or 5500 X4 may be used. Attaching a rollover valve onto a Spraying Systems Model 30 gunjet or other similar spray guns allows for the use of both a flat fan and cone tips on the same gun.

Moisten, but DO NOT drench target vegetation causing spray solution to run off.

Low Volume Foliar with Backpacks:

For low-growing species, spray down on the crown, covering crown and penetrating approximately 70% of the plant.

For target species 4 to 8 feet tall, swipe the sides of target vegetation by directing spray to at least two sides of the plant in smooth vertical motions from the crown to the bottom. Make sure to cover the crown whenever possible.

For target species over 8 feet tall, lace sides of the target vegetation by directing spray to at least two sides of the target in smooth zigzag motions from crown to bottom.

Low Volume Foliar with Hydraulic Handgun Application Equipment:

Use same technique as described above for Low Volume Foliar with Backpacks.

For broadcast applications, simulate a gentle rain near the top of target vegetation, allowing spray to contact the crown and penetrate the target foliage without falling to the understory. Herbicide spray solution which contacts the understory may result in severe injury or death of plants in the understory.

High Volume Foliar:

For optimum performance when spraying medium to high-density vegetation, use equipment calibrated to deliver up to 100 gallons of spray solution per acre (GPA). Spray solutions exceeding 100 GPA may result in excessive spray run-off, causing increased ground cover injury, and injury to desirable species.

To prepare the spray solution, thoroughly mix this product in water and add a surfactant (see ADJUVANT section for specific recommendations and rates of surfactants). A foam-reducing agent may be added at the label rate, if needed. For control of difficult species (see AQUATIC WEEDS CONTROLLED section and the ADDITIONAL WEEDS CONTROLLED section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes, but DO NOT apply more than 3 quarts of this product per acre in aquatic sites and nonagricultural lands, and 1-5 quarts per acre in pasture/rangeland. Uniformly cover the foliage of the vegetation to be controlled but DO NOT apply to run-off. Excessive wetting of foliage is not necessary.

SIDE TRIMMING

DO NOT side trim with this product unless severe injury or death of the treated tree can be tolerated. This product is readily translocated and can result in death of the entire tree.

CUT SURFACE TREATMENTS

This product may be used to control undesirable woody vegetation by applying the product solution to the cambium area of freshly cut stump surfaces or to fresh cuts on the stem of the target woody vegetation. Applications can be made at any time of the year except during periods of heavy sap flow in the spring. DO NOT over apply solution causing run-off from the cut surface.

Injury may occur to desirable woody plants if the shoots extend from the same root system or their root systems are grafted to those of the treated tree.

This product may be mixed as either a concentrate or dilute solution. The dilute solution may be used for application to the cut surface of the stump or to cuts on the stem of target woody vegetation. Concentrated solutions may be used for applications to cuts on the stem. Use of the concentrated solution permits application to fewer cuts on the stem, especially for large diameter trees. Follow the application instructions to determine proper application techniques for each type of solution.

- To prepare a dilute solution, mix 8 to 12 fluid ounces of this product with one gallon of water. If temperatures are such that freezing of the spray mixture may occur, antifreeze (ethylene glycol) may be used according to manufacturer's label to prevent freezing. The use of a surfactant or penetrating agent may improve uptake through partially callused cambiums.
- To prepare a concentrated solution, mix 2 quarts of this product with no more than 1 quart of water.

CUT STUMP TREATMENT

Dilute Solution - Spray or brush the solution onto the cambium area of the freshly cut stump surface. Ensure that the solution thoroughly wets the entire cambium area (the wood next to the bark of the stump).

CUT STEM TREATMENT

(injection, hack-and-squirt)

Dilute Solution - Using standard injection equipment, apply 1 milliliter of solution at each injection site around the tree with no more than one-inch intervals between cut edges. Ensure that the injector completely penetrates the bark at each injection site.

Concentrate Solution - Using standard injection equipment, apply 1 milliliter of solution at each injection site. Make at least one injection cut for every 3 inches of Diameter at Breast Height (DBH) on the target tree. For example, a 3-inch DBH tree will receive 1 injection cut and a 6-inch DBH tree will receive 2 injection cuts. On trees requiring more than one injection site place the injection cuts at approximately equal intervals around the tree.

CUT STUBBLE

This product can be applied within 2 weeks after mechanical mowing or cutting of brush. To suppress or control resprouting, uniformly apply a spray solution of this product at the rate of 1.0 to 2.0 pints per acre to the cut area. This product may be tank-mixed with picloram (such as Trooper 22K), or equivalent labeled product for this use, to aid in control or suppression of brush. The addition of 5% (v/v) or more of a penetrating agent can aid in uptake through the bark or exposed roots.

Cut stubble applications are made to the soil and cut brush stumps. This type of application may increase ground cover injury. However, vegetation will recover. Making applications of this product directly to the soil can increase potential root uptake causing injury or death of desirable trees.

Efficacy can be increased and root uptake by desirable vegetation can be decreased if the brush is allowed to regrow and the foliage is treated. See the Brush Control section of this label.

FRILL OR GIRDLE TREATMENT

Using a hatchet, machete, or chain saw, make cuts through the bark and completely around the tree to expose the cambium. The cut should angle downward extending into the cambium enough to expose at least two growth rings. Using a spray applicator or brush, apply a 25% to 100% solution of this product into each cut until thoroughly wet. Avoid applying so much herbicide that runoff to the ground or water occurs.

BASAL APPLICATION

This product is an aqueous formulation that requires mixing with **basal oil containing at least 15% emulsifier or will require the addition of an emulsifier, for application to the basal area** of brush and trees to control undesirable vegetation in the following noncropland areas: access roads, airfields, airports, along forest roads, around commercial or industrial structures or outbuildings, around farm and ranch structures and outbuildings, bare ground, construction sites, ditch banks, dry ditches & canals, fences & fencerows, firebreaks, gravel yards, habitat restoration & management areas, highways & roadsides (including aprons, medians, guardrails & right of ways), industrial plant sites, industrial areas, lumber yards, natural areas, paved areas, petroleum & other tank farms, pumping installations, pipeline, power, telephone & utility rights-of-way, power stations, railroad rights-of-way, refineries, resorts, storage areas, substations, uncropped farmstead areas, uncultivated non-agricultural areas, vacant lots, walkways, wastelands & wildlife habitat areas.

Thinline Basal and Stem Application

- This product may be applied as a thinline basal or arcing application to the stems of susceptible species such as big leaf maple (*Acer macrophyllum*), willow (*Salix* spp.) and Eucalyptus (*Eucalyptus* spp.) with a stem ground line diameter of 3 inches or less. Mix 24 to

48 fluid ounces of this product in one gallon of **basal oil containing at least 15% emulsifier**. Maintain uniform mixtures with frequent agitation. Direct a thin line of the spray solution to the stems beginning a few feet from the ground and descending toward the base of the tree making a zig-zag motion. Do not over apply causing puddling.

Low Volume Basal Bark Treatments

- This product, at the rate of 8 to 12 fluid ounces per gallon may be applied for low volume basal bark treatments. This product at 3.0 to 5.0% is recommended to be tank mixed with Relegate™ or Garlon® 4 or other basal products to broaden the spectrum of control. Consult the herbicide labels for rates and susceptible brush species. Mixing with basal requires compatibility tests prior to mixing large quantities. Mixing aids (such as emulsifiers, etc.) and ongoing agitation are required to attain a homogenous tank mix.
- Basal application should be made to the lower 12” to 18” of the target brush and go to the soil. Care should be taken not to puddle or over treat the stem. Basal application is best suited for low density brush sites, where stems do not exceed 700 stems per acre. For Basal Application – It is advisory to mix only the intended amount of mixture that is to be sprayed that day. Adequate agitation must be maintained with all emulsion mixtures to prevent phase separation. Prior to tank mixing with other products, herbicides and oils, you must determine the compatibility of the proposed mixture. (See **COMPATIBILITY** section).

SPRAY SOLUTION MIXING GUIDE						
			TANK MIXING			
AMOUNT OF SPRAY SOLUTION BEING PREPARED	NUFARM POLARIS ALONE		NUFARM POLARIS WHEN TANK MIXING		RELEGATE or GARLON 4	
	6%	9%	3.0%	5.0%	15%	20%
1 Gallon	8.0 fl. oz.	12.0 fl. oz.	3.8 fl. oz.	6.4 fl. oz.	1.2 pts.	1.6 pts.
3 Gallons	1.5 pts.	2.25 pts.	11.5 fl. oz.	1.2 pts.	1.8 qts.	2.4 qts.
4 Gallons	1.0 qt.	1.5 qts.	15.4 fl. oz.	1.6 pts.	2.4 qts.	3.2 qts.
5 Gallons	1.25 qts.	1.0 qt. + 28.0 fl. oz.	1.2 pts.	1.0 qt.	3.0 qts.	1.0 gal.
50 Gallons	3.0 gals. + 1.0 pt.	4.0 gals. + 2.75 qts.	1.5 gals.	2.5 gals.	7.5 gals.	10.0 gals.
100 Gallons	6.0 gals. + 1.0 qt.	9.0 gals. + 1.5 qts.	3.0 gals.	5.0 gals.	15.0 gals.	20.0 gals.
16 fluid ounces = 1 pint : 2 pints = 1 quart : 4 quarts = 1 gallon						

FORESTRY USE

Site Preparation Treatment

This product may be used to control labeled grasses, broadleaf weeds, vines and brambles, and woody brush and trees on forest sites in advance of regeneration for the following conifer crop species:

Common Name	Scientific Name	Rate (fl oz/A)
Loblolly pine	<i>Pinus taeda</i>	48 to 80
Loblolly X pitch hybrid		
Longleaf pine	<i>Pinus palustris</i>	
Shortleaf pine	<i>Pinus echinata</i>	
Virginia pine	<i>Pinus virginiana</i>	
Slash pine	<i>Pinus elliottii</i>	40 to 64
Coastal redwood	<i>Sequoia sempervirens</i>	24 to 48
Douglas fir	<i>Pseudotsuga menziesii</i>	
Incense cedar	<i>Libocedrus decurrens</i>	
Western hemlock	<i>Tsuga heterophylla</i>	
California red fir	<i>Abies magnifica</i>	24 to 40
California white fir	<i>Abies concolor</i>	
Jack pine	<i>Pinus banksiana</i>	24 to 32
Lodgepole pine	<i>Pinus contorta</i>	
Pitch pine	<i>Pinus rigida</i>	
Ponderosa pine	<i>Pinus ponderosa</i>	
Sugar pine	<i>Pinus lambertiana</i>	
White pine	<i>Pinus strobes</i>	
Black spruce	<i>Picea mariana</i>	
Red spruce	<i>Picea rubens</i>	
White spruce	<i>Picea glauca</i>	

Use the specified rate of this product per acre applied as a broadcast foliar spray for long-term control of labeled woody plants and residual control of herbaceous weeds. Within 4 to 6 weeks of treatment, grass and other herbaceous weeds will be controlled and may provide fuel to facilitate a site preparation burn if desired to control conifers or other species tolerant to the herbicide.

Apply the specified rate of this product per acre in 5 to 30 gallons total spray solution for helicopter applications or 5 to 100 gallons total spray solution for mechanical ground spray and backpack applications. Use a minimum of 0.5% by volume nonionic surfactant (NIS). Use the higher label rate of this product and higher spray volumes when controlling particularly dense or multilayered canopies of hardwood stands or difficult to control species.

In certain cases, tank mixes may be necessary for chemical control of conifers and other species tolerant to this product. Observe all precautions and restrictions on the product labels. Always follow the most restrictive label. Combinations with other products labeled for forest site preparation may kill certain plants such as legumes and blackberry which are desirable for wildlife habitat.

Where quick initial brownout (deadening of foliage) is desired for burning, apply a tank mixture of 32 to 64 fl. oz. of this product with 16 to 64 fl. oz. glyphosate or 16 to 48 fl. oz. triclopyr ester per acre. For control of seedling pines, apply 32 to 64 fl. oz. of this product with 3 to 4 quarts glyphosate. For site preparation, rates less than 48 fl. oz. of this product will provide suppression of hard wood brush and trees, some resprouting may occur.

DO NOT plant seedlings of black spruce (*Picea mariana*) or white spruce (*Picea glauca*) on sites broadcast treated with this product or into the treated zone of spot or banded applications for 3 months following application or injury may occur.

HERBACEOUS WEED CONTROL

Use this product for selective weeding in the following conifer crop species:

Common Name	Scientific Name	Rate (fl oz/A)
Loblolly pine	<i>Pinus taeda</i>	12 to 20
Loblolly X pitch hybrid		
Virginia pine	<i>Pinus virginiana</i>	
Longleaf pine ¹	<i>Pinus palustris</i>	8 to 12
Slash pine ¹	<i>Pinus elliotii</i>	
Douglas fir ¹	<i>Pseudotsuga menziesii</i>	

¹Use of surfactant is not recommended

This product may be applied as a broadcast treatment, banded over tree rows, or as a directed spray for release of young conifers from herbaceous weeds. To prevent possibility of conifer injury, DO NOT apply this product when conifers are under stress from drought disease, animal or winter injury, planting shock, or other stresses reducing conifer vigor. Broadcast applications may be made by helicopter, ground, or backpack sprayer. For difficult to control weeds, use the higher labeled rates. Where herbaceous weeds have overtopped conifer seedlings, a nonionic surfactant may be added to improve weed control (except for slash pine, long leaf pine, and Douglas fir) at a rate not to exceed 0.5% of spray solution volume. Some minor conifer growth inhibition may be observed when herbaceous weed control treatments are made during periods of active conifer growth.

This product may also be applied using backpack or handheld sprayers to control herbaceous weeds around individual conifer seedlings. Mix 0.8 to 1.2 fl. oz. of this product + 0.2 oz. nonionic surfactant per gallon of water. Direct the spray to the weeds and minimize the amount applied to conifer foliage for best conifer tolerance. Ensure that maximum labeled rates per acre for previously listed crop species are not exceeded.

This product may be tank mixed with Spyder[®] and/or Spyder Extra to broaden the spectrum of weeds controlled. For loblolly pine, apply 8 to 12 fl. oz. of this product + 1 to 2 fl. oz. Spyder and/or Spyder Extra per acre. The application of this product plus Spyder and/or Spyder Extra on other conifer species may cause growth suppression.

CONIFER RELEASE TREATMENT

This product may be applied as a broadcast or directed spray application for suppression of labeled brush, tree, and herbaceous weed species. Directed spray applications may be made with low volume applications in conifer stands of all ages by targeting unwanted vegetation and avoiding direct application to the conifer. Ensure that maximum labeled rates per acre listed for the following crop species are not exceeded.

Broadcast Applications for Release of the Following Conifers from Hardwood Competition

Common Name	Scientific Name	Rate (fl oz/A)
Loblolly pine ³	<i>Pinus taeda</i>	24 to 40
Loblolly X pitch hybrid ³		
Virginia pine ³	<i>Pinus virginiana</i>	
Longleaf pine	<i>Pinus palustris</i>	24 to 32
Pitch pine	<i>Pinus rigida</i>	
Shortleaf pine	<i>Pinus echinata</i>	
Slash pine	<i>Pinus elliotii</i>	
White pine ¹	<i>Pinus strobes</i>	16 to 32
California red fir	<i>Abies magnifica</i>	16 to 24
California white fir	<i>Abies concolor</i>	
Lodgepole pine ²	<i>Pinus contorta</i>	
Douglas fir ²	<i>Pseudotsuga menziesii</i>	
Jack pine ²	<i>Pinus banksiana</i>	12 to 24
Black spruce ²	<i>Picea mariana</i>	
Red spruce ²	<i>Picea rubens</i>	
White spruce ²	<i>Picea glauca</i>	

¹DO NOT make applications to white pine stands younger than three years old. To minimize potential white pine injury, release treatments should not be made prior to July 15.

²Applications should be made after formation of final conifer resting buds in the fall or height growth inhibitor may occur

³**Mid rotation release:** For broadcast applications below the pine canopy in established stands of loblolly pine, loblolly X pitch hybrid, and Virginia pine, use 32 to 64 fl. oz. of this product per acre. For mid rotation release of other species, use rates listed in the chart above.

For slash pine and longleaf pine, broadcast release treatments over the top of pines for the purpose of woody plant control must be made after August 15 and only in stands 2 through 5 years old. For applications over the top of slash pine and longleaf pine, DO NOT add surfactant and use lower labeled rates on sandy soils.

FOR THE AERIAL RELEASE TO SLASH PINE (*PINUS ELLIORTII*) STANDS OVER THE AGE OF 5 YEARS

This product may be applied as an aerial application for release of slash pine stands over the age of 5 years. In addition to reading and following all directions in this product, the following precautions and restrictions are required:

- Make applications in the fall after slash pine height growth has stopped and buds have set.
- Do not apply before September 15 even if height growth has stopped and buds have set.
- A maximum of 12 to 14 fl. oz./A of this product may be applied. Use the 12 fl. oz./A rate on sandier sites.

Apply the label rate of this product per acre when making broadcast applications with helicopter or ground spray equipment. Refer to mixing and application instructions for proper spray volumes. A nonionic surfactant may be added at no more than 0.25% by volume. Use the higher label rates of this product when controlling particularly dense stands or difficult to control species.

Some minor conifer growth inhibition may be observed when release treatments are made during periods of active conifer growth. To minimize potential conifer height growth inhibition, DO NOT make broadcast applications to conifer stands except loblolly pine before the end of the second growing season. To minimize potential conifer height growth inhibition, broadcast release treatments may be made late in the growing season. To prevent possibility of conifer injury, DO NOT apply this product when conifers are under stress from drought, disease, animal or winter injury, or other stresses reducing conifer vigor.

This product may be used to release loblolly pine seedlings during the first growing season following planting or for one year old natural loblolly pine regeneration. For one year old loblolly pine release, apply 24 to 40 fl. oz. per acre of this product after July 15. Rates below 32 fl. oz. per acre are intended for hardwood growth suppression expect hardwood resprouting.

SPOT TREATMENT OF UNDESIRABLE HARDWOOD VEGETATION

This product may be used as a directed foliar or cut stem application to control undesirable brush and hardwoods in the management of stands of all ages for the conifer species listed in the broadcast application section above. Refer to the mixing and application instructions in the foliar or cut stem sections for proper use rates, equipment, and application techniques. DO NOT exceed maximum labeled rates per acre listed for crop species. Cut stem applications may be used for spot treatment of undesirable hardwoods in Ponderosa pine stands using 24 fl. oz. or less of this product per acre.

Avoid direct application to desired plant species or injury may occur. Injury may occur to nontarget or desirable hardwoods or conifers if they extend from the same root system or their root systems are grafted to those of the treated tree or their roots extend into the treated zone.

LATE ROTATION VEGETATION CONTROL IN WESTERN CONIFER

In California, the Pacific Northwest, and Inland Northwest, broadcast aerial applications of this product up to 48 fl. oz. per acre are permissible in conifer stands that are targeted for harvesting the year following treatment. Use minimum spray volume of 15 gallons per acre. Significant conifer injury or mortality must be expected. DO NOT use this treatment if conifer injury or mortality cannot be tolerated.

BAG AND SPRAY APPLICATION FOR CONIFER RELEASE

In Douglas fir and Ponderosa pine stands, broadcast applications of this product up to 32 fl. oz. per acre are permissible when the trees are covered by bags prior to the application. The bags must prevent the spray mix from contacting the conifer foliage. On sites with coarse textured soils (e.g., decomposed granite, pumice, sandy or rocky sites) or low levels of soil organic matter (generally 5% or less) significant conifer growth inhibition and mortality is possible. DO NOT use this treatment on these types of sites if conifer growth inhibition and mortality cannot be tolerated.

NONAGRICULTURAL LAND USE

This product may be used for woody and herbaceous weed control in nonagricultural lands including private, public, and military lands. Applications are not applicable to treatment of commercial timber or other plants grown for sale or other commercial use or for commercial seed production or for research purposes.

BRUSH CONTROL

Use the specified rate of this product with the preferred application technique for control of undesirable brush.

Tank Mixes and Application Rates for Low-Volume Foliar Brush Control*

Target Vegetation	Arsenal Rate (% by volume)	Tank Mix
Mixed hardwoods without elm, locust, or pine	1.0 to 1.5	Surfactant
Mixed hardwoods containing elm, locust, and pine	0.5 to 1.0	AquaNeat® at 2% to 3% or Razor® at 2 2/3 to 4% by volume plus surfactant
Mixed hardwoods with locust and pine but no elm		Krenite® at 2% to 5% by volume plus surfactant
Mixed hardwoods with locust and elm but no pine		Patriot® at 2 oz/A or 2-3 grams/gal plus surfactant
*Tank mixes with 2,4-D or products containing 2,4-D could result in reduced product efficacy.		

Backpack and Handheld Spray Mixing Guide

% Solution	Product Per Gallon of Mix (oz)	Product Per 4 Gallon Backpack (oz)
0.25	0.3	1.3
0.5	0.6	2.6
1.0	1.3	5.1
2.0	2.6	10.2
3.0	3.8	15.4
5.0	6.4	25.6

Measuring Chart

128 fluid ounces	=	1 gallon
16 fluid ounces	=	1 pint
8 pints	=	1 gallon
4 quarts	=	1 gallon
2 pints	=	1 quart

FOR SELECTIVE CONTROL OF UNDESIRABLE WEEDS IN UNIMPROVED BERMUDAGRASS AND BAHIAGRASS

This product may be used on unimproved industrial noncropland Bermudagrass and bahiagrass turf, such as roadsides, utility rights-of-way and other nonagricultural lands. The application of this product on established common and coastal Bermudagrass and bahiagrass provides control of labeled broadleaf and grass weeds. Competition from these weeds is eliminated, releasing the Bermudagrass and bahiagrass. Treatment of Bermudagrass with this product results in a compacted growth habit and seedhead inhibition.

Uniformly apply with properly calibrated ground equipment using at least 10 gallons of water per acre. Temporary yellowing of grass may occur when treatment is made after growth begins. DO NOT add surfactant in excess of the specified rate (1 fl. oz. per 25 gallons of spray solution). DO NOT apply to grass during its first growing season. DO NOT apply to grass that is under stress from drought, disease, insects, or other causes.

DOSAGE RATES AND TIMING:

Bermudagrass - Apply this product at 6 to 12 fl. oz. per acre when the Bermudagrass is dormant. Apply this product at 6 to 8 fl. oz. per acre after the bermudagrass has reached full green-up. Applications made during green-up will delay green-up. Include a surfactant in the spray solution.

For additional pre-emergence control of annual grasses and small seeded broadleaf weeds, add Pendulum® Aquacap™ herbicide at the rate of 3.1 to 6.3 pints per acre. Consult the Pendulum® label for weeds controlled and for other use directions and precautions.

For control of Johnsongrass in bermudagrass turf, apply this product at 8 fl. oz. per acre plus Roundup® or Razor® at 12 fl. oz. per acre plus surfactant. For additional control of broadleaves and vines, Tahoe®3A or Garlon®3A may be added to the above mix at the rate of 1-2 pints per acre. Observe all precautions and restrictions on the Tahoe®3A, Garlon®3A and Roundup® labels.

Bahiagrass - Apply this product at 4 to 8 fl. oz. per acre when the bahiagrass is dormant or after the grass has initiated green-up but has not exceeded 25% green-up. Include in the spray solution a surfactant (See Adjuvant section for specific use directions for surfactants).

WEEDS CONTROLLED IN UNIMPROVED BERMUDAGRASS AND BAHIAGRASS

Bedstraw (*Galium* spp.)

Bishopweed (*Ptilimnium capillaceum*)

Buttercup (*Ranunculus parviflorus*)

Carolina geranium (*Geranium carolinianum*)

Fescue (*Festuca* spp.)

Foxtail (*Setaria* spp.)

Little barley (*Hordeum pusillum*)

Seedling Johnsongrass (*Sorghum halepense*)

Wild carrot (*Daucus carota*)

White clover (*Trifolium repens*)

Yellow woodsorrel (*Oxalis stricta*)

GRASS GROWTH AND SEEDHEAD SUPPRESSION

This product may be used to suppress growth and seedhead development of certain turfgrass in unimproved areas. When applied to desirable turf, this product may result in temporary turf damage and/or discoloration. Effects to the desirable turf may vary with environmental conditions. For optimum performance, application should be made prior to culm elongation. Applications may be made before or after mowing. If applied prior to mowing, allow at least three days of active growth before mowing. If following a mowing, allow sufficient time for the grasses to recover before applying this product or injury may be amplified.

DO NOT apply to turf under stress (drought, cold, insect damaged, etc.) or severe injury or death may occur.

Bermudagrass - Apply this product at 6 to 8 fl. oz. per acre from early green-up to prior to seed head initiation. DO NOT add a surfactant for this application.

Cool Season Unimproved Turf - Apply this product at 2 fl. oz. per acre plus 0.25% nonionic surfactant. For increased suppression, this product may be tank-mixed with such products as Campaign® (24 fl. oz. per acre) or Embark® (8 fl. oz. per acre).

Tank-mixes may increase injury to desired turf. Consult each product label for recommended turf species and other use directions and precautions. Tank mixes with 2,4-D or products containing 2,4-D may decrease the effectiveness of this product.

TOTAL VEGETATION CONTROL WHERE BAREGROUND IS DESIRED

This product is an effective herbicide for preemergence or post-emergence control of many annual and perennial broadleaf and grass weeds where bareground is desired. This product is particularly effective on hard-to-control perennial grasses. This product at 1.5 to 6 pints per acre can be used alone or in tank-mix with herbicides approved for use in bare ground. The degree and duration of control are dependent on the rate of this product used, tank-mix partner, the volume of carrier, soil texture, rainfall and other conditions.

Consult manufacturer's labels for specific rates and weeds controlled. Always follow the most restrictive directions for use and precautionary statements of each product when making an application involving tank-mixes.

Applications of this product may be made anytime of the year. Use equipment calibrated to deliver desired gallons per acre spray volume and uniformly distribute the spray pattern over the treated area.

Post-emergence Applications: Always use a spray adjuvant (See Adjuvant section of this label) when making a post-emergence application. For optimum performance on tough to control annual grasses, applications should be made at a total volume of 100 gallons per acre or less. For quicker burndown or brown-out of target weeds, this product may be tank-mixed with products such as Razor®, or Roundup®. Tank mixes with 2,4-D or products containing 2,4-D may reduce the performance of this product. Always follow the most restrictive directions for use and precautionary statements of each product when tank-mixing.

Spot Treatments: This product may be used as a follow-up treatment to control escapes or weed encroachment in a bareground situation. To prepare the spray solution, thoroughly mix in each gallon of water 0.5 to 5% of this product plus an adjuvant. For increased burndown, include Razor®, Roundup®, or similar products. For added residual weed control or to increase the weed spectrum, add ProClipse® herbicide, Vanquish® herbicide, or Diablo® herbicide. Always follow the most restrictive directions for use and precautionary statements of each product when tank-mixing.

FOR CONTROL OF UNDESIRABLE WEEDS UNDER PAVED SURFACES

This product can be used under asphalt, pond liners and other paved areas, ONLY in industrial sites or where the pavement has a suitable barrier along the perimeter that prevents encroachment of roots of desirable plants.

This product should be used only where the area to be treated has been prepared according to good construction practices. If rhizomes, stolons, tubers or other vegetative plant parts are present in the site, they should be removed by scalping with a grader blade to a depth sufficient to insure their complete removal.

Paving should follow applications of this product as soon as possible. DO NOT apply where the product may contact the roots of desirable trees or other plants.

This product is not to be used under pavement on residential properties such as driveways or parking lots or for use in recreational areas such as under bike or jogging paths, golf cart paths, or tennis courts, or where landscape plantings could be anticipated.

Injury or death of desirable plants may result if this product is applied where roots are present or where they may extend into the treated area. Roots of trees and shrubs may extend a considerable distance beyond the branch extremities (drip line).

Applications should be made to the soil surface only when final grade is established. DO NOT move soil following application of this product. Apply this product in sufficient water (at least 100 gal. per acre) to ensure thorough and uniform wetting of the soil surface, including the shoulder areas. Add this product at a rate of 3 quarts per acre (2.2 fl. oz. per 1000 square feet) to clean water in the spray tank during the filling operation. Agitate before spraying.

If the soil is not moist prior to treatment, incorporation of this product is needed for herbicide activation. This product can be incorporated into the soil to a depth of 4 to 6 inches using a rototiller or disc. Rainfall or irrigation of 1 inch will also provide uniform incorporation. DO NOT allow treated soil to wash or move into untreated areas.

SPOT TREATMENTS AND CRACK-AND-CREVICE TREATMENTS

Use this product as an initial or follow up treatment to control weed escapes or weed encroachment in bareground situations, including cracks and crevices in paved surfaces such as parking lots, runways and roadways.

FOR SPOT TREATMENT WEED CONTROL IN GRASS PASTURE AND RANGELAND

For the control of undesirable vegetation in grass pasture and rangeland, this product may be applied as a spot treatment at a rate of 2 to 48 fl. oz. of product per acre using any of the ground application methods as described in this label. Spot applications may not exceed more than one tenth of the area to be grazed or cut for hay in grass pasture and rangeland. See appropriate sections of this label for specific use directions for the application method and vegetation control desired.

DO NOT apply more than 48 fl. oz. per acre per year.

Grazing and Haying Restrictions:

DO NOT cut forage grass for hay for 7 days after application of this product.

There are no grazing restrictions following application of this product.

Rangeland Use Instructions:

This product may be applied to rangeland for the control of undesirable vegetation to achieve one or more of the following vegetation management objectives:

- Control of undesirable (noxious, invasive and non-native) plant species.
- Control of undesirable vegetation for wildlife habitat improvement.
- Control of undesirable vegetation to aid in the establishment of desirable rangeland plant species.
- Release of existing desirable rangeland plant communities from the competitive pressure of undesirable plant species.
- Control of undesirable vegetation to aid in the establishment of desirable vegetation following a fire.
- Control of vegetation to reduce wildfire fuel.

To ensure the protection of threatened and endangered plants, when applying this product to rangeland:

- Federal agencies must follow NEPA regulations to ensure protection of threatened and endangered plants.
- Other organizations or individuals must operate under a habitat conservation plan if threatened or endangered plants are known to be present on the land to be treated.
- State agencies must work with the Fish and Wildlife Service or the Service's designated state conservation agency to ensure protection of threatened and endangered plants.

See appropriate sections of this label for specific use directions for the desired rangeland vegetation management control desired.

This product must only be applied to a given rangeland acre as specific weed problems arise. Long-term control of undesirable weeds ultimately depends on the successful use of the land management practices that promote the sustainability and growth of desirable rangeland plant species.

ROTATIONAL CROP GUIDELINE

Rotational crops may be planted 12 months after applying this product at the specified pasture and rangeland rate. Twelve months after an application of this product, and before planting any crop, a successful field bioassay must be completed. The field bioassay consists of a test strip of the intended rotational crop planted in the previously treated area in the grass pasture and rangeland and grown to maturity. The test strip should include low areas and knolls, and include variations in soil type and pH within the treated area. If no crop injury is evident in the test strip, the intended rotational crop may be planted the following year.

Use of this product in accordance with label directions is expected to result in normal growth of rotational crops in most situations; however, various agronomic factors and environmental factors make it impossible to eliminate all risks associated with the use of this product and, therefore, rotational crop injury is always possible.

TERRESTRIAL WEEDS CONTROLLED

In terrestrial sites, this product will provide preemergence or post-emergence control with residual control of the following target vegetation species at the rates listed. Residual control refers to control of newly germinating seedlings in both annuals and perennials. In general, annual weeds may be controlled by preemergence or postemergence applications of this product. For established biennials and perennials postemergence applications of this product are recommended.

The rates shown below pertain to broadcast applications and indicate the relative sensitivity of these weeds. The relative sensitivity should be referenced when preparing low volume spray solutions (see “Low Volume” section of “Ground Applications”); low volume applications may provide control of the target species with less product per acre than is shown for the broadcast treatments. This product must be used only in accordance with the Directions for Use on this label.

The relative sensitivity of the species listed below can also be used to determine the relative risk of causing non-target plant injury if any of the below listed species are considered to be desirable within the area to be treated.

Resistant Biotypes: Naturally occurring biotypes (a plant within a given species that has a slightly different, but distinct genetic makeup from other plants of the same species) of some weeds listed on this label may not be effectively controlled. If naturally occurring resistant biotypes are present in an area, this product should be tank-mixed or applied sequentially with an appropriate registered herbicide having a different mode of action to ensure control.

TERRESTRIAL WEEDS CONTROLLED		
COMMON NAME	SCIENTIFIC NAME	GROWTH HABIT ²
GRASS WEEDS		
Apply 2 to 3 pints per acre¹		
Annual bluegrass	<i>Poa annua</i>	A
Broadleaf signalgrass	<i>Brachiaria platyphylla</i>	A
Canada bluegrass	<i>Poa compressa</i>	P
Downy brome	<i>Bromus tectorum</i>	A
Fescue	<i>Festuca</i> spp.	A/P
Foxtail	<i>Setaria</i> spp.	A
Italian ryegrass	<i>Lotium multiflorum</i>	A
Johnsongrass ⁴	<i>Sorghum halepense</i>	P
Kentucky bluegrass	<i>Poa pratensis</i>	P
Napier grass ⁵	<i>Pennisetum purpureum</i>	P
Orchardgrass	<i>Dactylis glomerata</i>	P
Paragrass	<i>Brachiaria mutica</i>	P
Quackgrass	<i>Agropyron repens</i>	P
Sandbur	<i>Cenchrus</i> spp.	A
Smooth brome	<i>Bromus inermis</i>	P
Vaseygrass	<i>Paspalum urvillei</i>	P
Wild oats	<i>Avena fatua</i>	A
Witchgrass	<i>Panicum capillare</i>	A

(continued)

TERRESTRIAL WEEDS CONTROLLED (continued)		
COMMON NAME	SCIENTIFIC NAME	GROWTH HABIT ²
GRASS WEEDS (continued)		
Apply 3 to 4 pints per acre¹		
Barnyardgrass	<i>Echinochloa crus-galli</i>	A
Beardgrass	<i>Andropogon</i> spp.	P
Bluegrass, annual	<i>Poa annua</i>	A
Bulrush ⁵	<i>Scirpus validus</i>	P
Cheat	<i>Bromus secalinus</i>	A
Cogongrass	<i>Imperata cylindrica</i>	P
Crabgrass	<i>Digitaria</i> spp.	A
Crowfootgrass	<i>Dactyloctenium aegyptium</i>	A
Fall panicum	<i>Panicum dichotomiflorum</i>	A
Goosegrass	<i>Eleusine indica</i>	A
Itchgrass	<i>Rottboellia exaltata</i>	A
Lovegrass ⁴	<i>Eragrostis</i> spp.	P
Maidencane ⁵	<i>Panicum hemitomom</i>	A
Panicum, browntop	<i>Panicum fasciculatum</i>	A
Panicum, Texas	<i>Panicum texanum</i>	A
Prairie threeawn	<i>Aristida oligantha</i>	P
Sandbur, field	<i>Cenchrus incertus</i>	A
Signalgrass	<i>Brachiaria platyphylla</i>	A
Wild barley	<i>Hordeum</i> spp.	A
Woolly cupgrass	<i>Eriochloa villosa</i>	A

(continued)

TERRESTRIAL WEEDS CONTROLLED (continued)		
COMMON NAME	SCIENTIFIC NAME	GROWTH HABIT ²
GRASS WEEDS (continued)		
Apply 4 to 6 pints per acre¹		
Bahiagrass	<i>Paspalum notatum</i>	P
Bermudagrass ^{3,4}	<i>Cynodon dactylon</i>	P
Big bluestem	<i>Andropogon gerardii</i>	P
Dallisgrass	<i>Paspalum dilatatum</i>	P
Feathertop	<i>Pennisetum villosum</i>	P
Guineagrass	<i>Panicum maximum</i>	P
Saltgrass ³	<i>Distichlis stricta</i>	P
Sand dropseed	<i>Sporobolus cryptandrus</i>	P
Sprangletop	<i>Leptochloa</i> spp.	A
Timothy	<i>Phleum pratense</i>	P
Wirestem muhly	<i>Muhlenbergia frondosa</i>	P
¹ Use higher rate where heavy or well-established infestations occur. ² Growth Habit: A = Annual, B = Biennial, P = Perennial ³ Use a minimum of 75 GPA. ⁴ Use higher labeled rates. ⁵ Use not permitted in California unless otherwise directed by supplemental labeling.		

TERRESTRIAL WEEDS CONTROLLED (continued)		
COMMON NAME	SCIENTIFIC NAME	GROWTH HABIT ²
BROADLEAF WEEDS		
Apply 2 to 3 pints per acre¹		
Burdock	<i>Arctium</i> spp.	B
Carolina geranium	<i>Geranium carolinianum</i>	A
Carpetweed	<i>Mollugo verticillata</i>	A
Clover	<i>Trifolium</i> spp.	A/P
Common chickweed	<i>Stellaria media</i>	A
Common ragweed	<i>Ambrosia artemisiifolia</i>	A
Dandelion	<i>Taraxacum officinale</i>	P
Dogfennel	<i>Eupatorium capillifolium</i>	A
Filaree	<i>Erodium</i> spp.	A
Fleabane	<i>Erigeron</i> spp.	A
Hoary vervain	<i>Verbena stricta</i>	P
Indian mustard	<i>Brassica juncea</i>	A
Kochia	<i>Kochia scoparia</i>	A
Lambsquarters	<i>Chenopodium album</i>	A
Lespedeza ³	<i>Lespedeza</i> spp.	P
Miners lettuce	<i>Montia perfoliata</i>	A

(continued)

TERRESTRIAL WEEDS CONTROLLED (continued)		
COMMON NAME	SCIENTIFIC NAME	GROWTH HABIT ²
BROADLEAF WEEDS (continued)		
Apply 2 to 3 pints per acre¹ (continued)		
Mullein	<i>Verbascum</i> spp.	B
Nettleleaf goosefoot	<i>Chenopodium murale</i>	A
Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	P
Pepperweed	<i>Lepidium</i> spp.	A
Pigweed	<i>Amaranthus</i> spp.	A
Puncturevine	<i>Tribulus terrestris</i>	A
Russian thistle	<i>Salsola kali</i>	A
Smartweed	<i>Polygonum</i> spp.	A/P
Sorrell	<i>Rumex</i> spp.	P
Sunflower	<i>Helianthus</i> spp.	A
Sweet clover	<i>Melilotus</i> spp.	A/B
Tansymustard	<i>Descurainia pinnata</i>	A
Western ragweed	<i>Ambrosia psilostachya</i>	P
Wild carrot	<i>Daucus carota</i>	B
Wild lettuce	<i>Lactuca</i> spp.	A/B
Wild parsnip	<i>Pastinaca saliva</i>	B
Wild turnip	<i>Brassica campestris</i>	B
Woollyleaf bursage	<i>Franseria tomentosa</i>	P
Yellow woodsorrel	<i>Oxalis stricta</i>	P
Apply 3 to 4 pints per acre¹		
Broom snakeweed	<i>Gutierrezia sarothrae</i>	P
Bull thistle	<i>Cirsium vulgare</i>	B
Burclover	<i>Medicago</i> spp.	A
Chickweed mouseear	<i>Cerastium vulgatum</i>	A
Clover hop	<i>Trifolium procumbens</i>	A
Cocklebur	<i>Xanthium strumarium</i>	A
Cudweed	<i>Gnaphalium</i> spp.	A
Desert camelthorn	<i>Alhagi pseudalhagi</i>	P
Dock	<i>Rumex</i> spp.	P
Fiddleneck	<i>Amsinckia intermedia</i>	A
Goldenrod	<i>Solidago</i> spp.	P
Henbit	<i>Lamium amplexicaule</i>	A
Knotweed, prostrate	<i>Polygonum aviculare</i>	A/P
Pokeweed	<i>Phytolacca americana</i>	P
Purslane	<i>Portulaca</i> spp.	A
Pusley, Florida	<i>Richardia scabra</i>	A
Rocket London	<i>Sisymbrium irio</i>	A

(continued)

TERRESTRIAL WEEDS CONTROLLED (continued)		
COMMON NAME	SCIENTIFIC NAME	GROWTH HABIT²
BROADLEAF WEEDS (continued)		
Apply 3 to 4 pints per acre¹ (continued)		
Rush skeletonweed ⁴	<i>Chondrilla juncea</i>	B
Saltbush	<i>Atriplex</i> spp.	A
Shepherdspurse	<i>Capsella bursa-pastoris</i>	A
Spurge, annual	<i>Euphorbia</i> spp.	A
Stinging nettle ⁴	<i>Urtica dioica</i>	P
Velvetleaf	<i>Abutilon theophrasti</i>	A
Yellow starthistle	<i>Centaurea solstitialis</i>	A
Apply 4 to 6 pints per acre¹		
Arrowwood	<i>Pluchea sericea</i>	A
Canada thistle	<i>Cirsium arvense</i>	P
Giant ragweed	<i>Ambrosia trifida</i>	A
Gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	P
Little mallow	<i>Malva parviflora</i>	B
Milkweed	<i>Asclepias</i> spp.	P
Primrose	<i>Oenothera kunthiana</i>	P
Silverleaf nightshade	<i>Solanum elaeagnifolium</i>	P
Sowthistle	<i>Sonchus</i> spp.	A
Texas thistle	<i>Cirsium texanum</i>	P
¹ Use higher rate where heavy or well-established infestations occur. ² Growth Habit: A = Annual, B = Biennial, P = Perennial ³ Use not permitted in California unless otherwise directed by supplemental labeling. ⁴ For best results, early postemergence applications are required.		

TERRESTRIAL WEEDS CONTROLLED (continued)		
COMMON NAME	SCIENTIFIC NAME	GROWTH HABIT²
VINES AND BRAMBLES		
Apply 1 pint per acre		
Field bindweed	<i>Convolvulus arvensis</i>	P
Hedge bindweed	<i>Calystegia sepium</i>	A
Apply 2 to 3 pints per acre¹		
Wild buckwheat	<i>Polygonum convolvulus</i>	P
Apply 3 to 4 pints per acre¹		
Greenbriar	<i>Smilax</i> spp.	P
Honeysuckle ³	<i>Lonicera</i> spp.	P
Morningglory	<i>Ipomoea</i> spp.	A/P
Poison ivy	<i>Rhus radicans</i>	P
Redvine	<i>Brunnichia cirrhosa</i>	P

(continued)

TERRESTRIAL WEEDS CONTROLLED (continued)		
COMMON NAME	SCIENTIFIC NAME	GROWTH HABIT²
VINES AND BRAMBLES (continued)		
Apply 3 to 4 pints per acre¹ (continued)		
Wild rose ³ Including: Multiflora rose Macartney rose	<i>Rosa</i> spp. <i>Rosa multiflora</i> <i>Rosa bracteata</i>	P P P
Apply 4 to 6 pints per acre¹		
Trumpet creeper	<i>Campsis radicans</i>	P
Virginia creeper	<i>Parthenocissus quinquefolia</i>	P
Wild grape	<i>Vitis</i> spp.	P
¹ Use higher labeled rate where heavy or well-established infestations occur. ² Growth Habit: A = Annual, B = Biennial, P = Perennial ³ Use higher labeled rate.		

TERRESTRIAL WEEDS CONTROLLED (continued)		
COMMON NAME	SCIENTIFIC NAME	GROWTH HABIT²
BRUSH SPECIES		
Apply 2 to 4 pints per acre¹		
Brazilian peppertree	<i>Schinus terebinthifolius</i>	P
Chinese tallow tree Popcorn tree	<i>Sapium sebiferum</i>	P
Russian olive	<i>Elaeagnus angustifolia</i>	P
Sumac	<i>Rhus</i> spp.	P
Willow	<i>Salix</i> spp.	P
Apply 4 to 6 pints per acre¹		
Alder	<i>Alnus</i> spp.	P
American beech	<i>Fagus grandifolia</i>	P
Ash ³	<i>Fraxinus</i> spp.	P
Aspen	<i>Populus</i> spp.	P
Autumn olive	<i>Elaeagnus umbellata</i>	P
Bald cypress	<i>Taxodium distichum</i>	P
Bigleaf maple	<i>Acer macrophyllum</i>	P
Birch ³	<i>Betula</i> spp.	P
Black gum ⁴	<i>Nyssa sylvatica</i>	P
Black oak	<i>Quercus kelloggii</i>	P
Boxelder	<i>Acer negundo</i>	P
Ceanothis	<i>Ceanothis</i> spp.	P
Cherry ^{3, 4}	<i>Prunus</i> spp.	P
Chinaberry	<i>Melia azedarach</i>	P
Chinquapin	<i>Castanopsis chrysophylla</i>	P

(continued)

TERRESTRIAL WEEDS CONTROLLED (continued)		
COMMON NAME	SCIENTIFIC NAME	GROWTH HABIT ²
BRUSH SPECIES (continued)		
Apply 4 to 6 pints per acre ¹		
Cottonwood	<i>Populus trichocarpa</i> <i>P. deltoides</i>	P
Cypress	<i>Taxodium</i> spp.	P
Dogwood ³	<i>Cornus</i> spp.	P
Elm	<i>Ulmus</i> spp.	P
Eucalyptus	<i>Eucalyptus</i> spp.	P
Hawthorn	<i>Crataegus</i> spp.	P
Hickory ³	<i>Carya</i> spp.	P
Huckleberry	<i>Gaylussacia</i> spp.	P
Lyonia spp. Including: Fetterbush Staggerbush	<i>Lyonia lucida</i> <i>Lyonia mariana</i>	P P
Madrone	<i>Arbutus menziesii</i>	P
Maple	<i>Acer</i> spp.	P
Melaleuca	<i>Melaleuca quinquenervia</i>	P
Mulberry ^{3, 6}	<i>Morus</i> spp.	P
Oak ⁷	<i>Quercus</i> spp.	P
Persimmon ⁴	<i>Diospyros virginiana</i>	P
Poison oak	<i>Rhus diversiloba</i>	P
Poplar	<i>Populus</i> spp.	P
Privet	<i>Ligustrum vulgare</i>	P
Red alder	<i>Alnus rubra</i>	P
Red maple	<i>Acer rubrum</i>	P

(continued)

TERRESTRIAL WEEDS CONTROLLED (continued)		
COMMON NAME	SCIENTIFIC NAME	GROWTH HABIT ²
BRUSH SPECIES (continued)		
Apply 4 to 6 pints per acre ¹ (continued)		
Saltcedar	<i>Tamarix pentandra</i>	P
Sassafras	<i>Sassafras albidum</i>	P
Sourwood ⁴	<i>Oxydendrum arboreum</i>	P
Sweetgum	<i>Liquidambar styraciflua</i>	P
Sycamore	<i>Platanus occidentals</i>	P
Tanoak ³	<i>Lithocarpus densiflorus</i>	P
Tit ⁸	<i>Cyrilla racemiflora</i>	P
Tree of heaven	<i>Ailanthus altissima</i>	P
Vaccinium spp. Including: Blueberry Sparkleberry	<i>Vaccinium</i> spp. <i>Vaccinium arboreum</i>	P P
Water willow ⁹	<i>Justicia americana</i>	P
Yellow poplar ³	<i>Liriodendron tulipifera</i>	P
¹ Use higher labeled rate where heavy or well-established infestations occur. ² Growth Habit: A = Annual, B = Biennial, P = Perennial ³ Use higher labeled rate. ⁴ Best control with applications before formation of fall leaf color. ⁵ Tank mix with glyphosate. ⁶ Degree of control may be species dependent. ⁷ For water oak (<i>Quercus nigra</i>) laurel oak (<i>Quercus lauriflora</i>) willow oak (<i>Quercus phellos</i>) and live oak (<i>Quercus virginiana</i>) use higher labeled rates. ⁸ Suppression only. ⁹ Use not permitted in California unless otherwise directed by supplemental labeling.		

AQUATIC WEEDS CONTROLLED

This product may be applied for control of floating and emergent weeds (see Aquatic Weeds Controlled and Terrestrial Weeds Controlled) in or near bodies of water that may be nonflowing, flowing, or transient. This product may be applied to aquatic sites that include rivers, lakes, streams, seeps, drainage ditches, ponds, reservoirs, canals, bogs, marshes, swamps, estuaries, bays, brackish water, transitional areas between terrestrial and aquatic sites, riparian sites and seasonal wet areas. See Use Precautions and Restrictions section of this label for instructions, directions, precautions and restrictions on aquatic uses.

Read and observe the following directions if aquatic sites are present in nonagricultural lands and are part of the intended treatment area.

This product must be applied to the emergent foliage of the target vegetation and little to no activity on submerged aquatic weeds. Concentrations of this product, resulting from direct application to water, are not expected to be of sufficient concentration nor duration to control target vegetation. Application should be made in such a way as to maximize spray interception by the target vegetation while minimizing the amount of overspray that enters the water.

This product does not control plants that have a majority of their foliage underwater or plants that are completely submerged.

Product Application: This product should be applied with helicopter or surface application equipment in a minimum of 2 gallons of water per acre. When applying by helicopter, follow directions under Aerial Application section of this label; when using surface equipment refer to the Ground Application section.

When applying this product to moving bodies of water applications should be made while traveling upstream to prevent concentration of this herbicide in water. DO NOT apply to bodies of water or portions of bodies of water where emergent and/or floating weeds do not exist.

Large Application Areas / Oxygen Depletion: When application is to be made to target vegetation that covers a large percentage of surface area of impounded water, treating area in strips may avoid oxygen depletion from vegetation decay. Oxygen depletion may result in the suffocation of some sensitive aquatic organisms. If oxygen depletion is a concern, treat no more than 1/2 of the surface area of the water at a time. Wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow aquatic organisms ability to move into untreated areas.

Avoid washoff of sprayed foliage by recreational boat backwash or spray boat for 1 hour after application.

Apply this product at 1 to 3 quarts per acre depending on weed density and species present. DO NOT exceed the maximum label rate of 1.5 pounds acid equivalent Imazapyr (equivalent to 3 quarts) per acre per year. Use the higher labeled rate for heavy weed pressure. See Aquatic Weeds Controlled and Terrestrial Weeds Controlled sections for specific rates.

This product may be applied as a draw-down treatment in areas described in this label. Apply this product to weeds after water has been drained and allow 14 days before reintroduction of water.

This product will control the following target species as specified in the Use Rates and Application Directions section of the table. Rate instructions are expressed in terms of product volume for broadcast applications and as a percent solution for directed applications including spot treatments. For percent solution applications, DO NOT apply more than 1.5 pounds acid equivalent Imazapyr (equivalent to 3 quarts) per acre per year.

Mixing Guide

% Solution	Product Per Gallon of Mix (oz)
0.25	0.3
0.5	0.6
1.0	1.3
2.0	2.6
3.0	3.8
5.0	6.4

Measuring Chart

128 fluid ounces	=	1 gallon
16 fluid ounces	=	1 pint
8 pints	=	1 gallon
4 quarts	=	1 gallon
2 pints	=	1 quart

Common Name	Scientific Name	Use Rates and Application Directions
Floating Weeds		
*Floating heart	<i>Nymphodes spp</i>	2 to 4 pints/A applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Frogbit	<i>Limnobium spongia</i>	1 to 2 pints/A applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Spatterdock	<i>Nuphar luteum</i>	Apply a tank mix of 2 to 4 pints/A of this product + 4 to 6 pints/A glyphosate in 100 GPA water for best control. Ensure 100% coverage of actively growing emergent foliage.
*Water hyacinth	<i>Eichhornia crassipes</i>	1 to 2 pints/A applied in 100 GPA water to actively growing foliage.
*Water lettuce	<i>Pistia stratiotes</i>	1 to 2 pints/A applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
Emerged Weeds		
*Alligatorweed	<i>Alternanthera philoxeroides</i>	1 to 4 pints/A applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Arrowhead duck potato	<i>Sagittaria spp</i>	1 to 2 pints/A applied to 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Bacopa lemon	<i>Bacopa spp</i>	1 to 2 pints/A applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.

*Use not permitted in California unless otherwise directed by supplemental labeling.

(continued)

Common Name	Scientific Name	Use Rates and Application Directions
Emerged Weeds (continued)		
*Parrot feather	<i>Myriophyllum aquaticum</i>	Foliage must be above water for sufficient product uptake. Apply 2 to 4 pints/A (0.5% to 1.0% solution) of this product to actively growing emergent foliage.
*Pennywort	<i>Hydrocotyle spp</i>	1 to 2 pints/A applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Pickerelweed	<i>Pontedena cordata</i>	2 to 3 pints/A applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Taro wild Coco yam Dasheen Elephant's ear	<i>Colocasia esculentum</i>	4 to 6 pints/A applied in 100 GPA with a high quality sticker adjuvant. Ensure good coverage of actively growing emergent foliage.
*Water chestnut	<i>Trappa natans</i>	4 to 6 pints/A applied in 100 GPA with a high quality sticker adjuvant. Ensure good coverage of actively growing emergent foliage.
*Water lily	<i>Nymphaea odorata</i>	2 to 3 pints/A applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Water primrose	<i>Ludwigia uruguayensis</i>	4 to 6 pints/A (1.0% to 1.5% solution). Ensure 100% coverage of actively growing emergent foliage.
Terrestrial/Marginal Weeds		
*Aquatic nightshade Soda apple	<i>Solanum tampicense</i>	2 pints/A (0.5% solution) applied to foliage
*Bamboo Japanese	<i>Phyllostachys spp</i>	3 to 4 pints/A (0.75% to 1.0% solution) applied to foliage
*Beach vitex	<i>Vitex rotundifolia</i>	5% solution + 1% MSO foliar spray. 17% solution stem injection (hack and squirt)
Brazilian pepper Christmasberry	<i>Schinus terebinthifolius</i>	2 to 4 pints/A (0.5% to 1.0% solution) applied to foliage
Cattail	<i>Typha spp</i>	2 to 4 pints/A (0.5% to 1.0% solution) applied to actively growing green foliage after full leaf elongation. Lower rates will control cattail in the North. Higher rates are needed in the South.
Chinese tallow tree	<i>Sapium sebiferum</i>	16 to 24 fl. oz./A applied to foliage
Cogongrass	<i>Imperata cylindrical</i>	Burn foliage, till area, then fall spray 2 quarts/A (1.0% solution) of this product+MSO applied to new growth.
Cordgrass prairie	<i>Spartina spp</i>	4 to 6 pints/A (1.0% to 1.5% solution) applied to actively growing foliage
*Cutgrass	<i>Zizaniopsis miliacea</i>	4 to 6 pints/A (1.0% to 1.5% solution) applied to actively growing foliage
*Elephant grass Napier grass	<i>Pennisetum purpureum</i>	3 pints/A (0.75% solution) applied to actively growing foliage
*Flowering rush	<i>Butomus umbellatus L</i>	2 to 3 pints/ (0.5% to 0.75% solution) A applied to actively growing foliage
Giant reed Wild cane	<i>Arundo donax</i>	4 to 6 pints/A (1.0% to 1.5% solution) applied in spring to actively growing foliage
*Golden bamboo	<i>Phyllostachys aurea</i>	3 to 4 pints/A (0.75% to 1.0% solution) applied to foliage when plant is actively growing, before setting seedhead. More foliage will result in greater herbicide uptake, resulting in greater root kill.
Junglerice	<i>Echinochloa colonum</i>	3 to 4 pints/A (0.75% to 1.0% solution) applied to actively growing foliage.
Knapweed	<i>Centaurea spp</i>	Russian knapweed: 2 to 3 pints/A (0.5% to 0.75% solution) +1 quart/A (0.5% solution) MSO fall applied after senescence begins.
Knotweed, Japanese	<i>Polygonum cuspidatum</i> <i>Fallopia japonica</i>	3 to 4 pints/A (0.75% to 1.0% solution) applied postemergence to actively growing foliage.

*Use not permitted in California unless otherwise directed by supplemental labeling.

(continued)

Common Name	Scientific Name	Use Rates and Application Directions
Terrestrial/Marginal Weeds (continued)		
Melaleuca Paperbark tree	<i>Melaleuca quinquenervia</i>	<ul style="list-style-type: none"> Established stands: apply 6 pints/A (1.5% solution) of this product + 6 pints/A (1.5% solution) glyphosate+spray adjuvant. For best results use 4 quarts/A (2.0% solution) MSO as an adjuvant. Broadcast foliar control: apply aerially in a minimum of 2 passes at 10 gallons/A applied cross treatment. Spot treatment: use 25% of this product+25% solution of glyphosate +1.25% MSO in water applied as a frill or stump treatment.
*Nutgrass Kili'p'opu	<i>Cyperus rotundus</i>	2 pints/A (0.5% solution) this product+1 quart/A (0.5% solution) MSO applied early postemergence.
*Nutsedge	<i>Cyperus spp</i>	2 to 3 pints/A (0.5% to 0.75% solution) postemergence to foliage or preemergence incorporated, nonincorporated preemergence applications will not control.
Phragmites Common reed	<i>Phragmites australis</i>	4 to 6 pints/A (1.0% to 1.5% solution) applied to actively growing green foliage after full leaf elongation. Ensure 100% coverage. If stand has a substantial amount of old stem tissue, mow or burn, allow to regrow to approximately 5 feet tall before retreatment. Lower rates will control phragmites in the North, higher rates are needed in the South.
*Poison hemlock	<i>Conium maculatum</i>	2 pints/A (0.5% solution) this product+1 quart/A (0.5% solution) MSO applied preemergence to early postemergence to rosette before flowering
Purple loosestrife	<i>Lynthrum salicana</i>	1 pint/A (0.25% solution) applied to actively growing foliage.
Reed canarygrass	<i>Phalaris arundinacea</i>	3 to 4 pints/A (0.75% to 1.0% solution) applied to actively growing foliage.
Rose swamp	<i>Rosa palustris</i>	2 to 3 pints/A (0.5% to 0.75% solution) applied to actively growing foliage.
Russian olive	<i>Elaeagnus angustifolia</i>	2 to 4 pints/A (1% solution) applied to foliage.
Saltcedar Tamarisk	<i>Tamarix spp</i>	Aerial application: 2 quarts this product+0.25% v/v NIS applied to actively growing foliage during flowering. Spot treatment: Use 1% solution of this product+0.25% v/v NIS and spray to wet foliage. After application, wait at least 2 years before disturbing treated saltcedar. Earlier disturbance can reduce overall control.
Smartweed	<i>Polygonum spp</i>	2 pints/A (0.5% solution) applied early postemergence
Sumac	<i>Rhus spp</i>	2 to 3 pints/A (0.5% to 0.75% solution) applied to foliage
Swamp morningglory Kangkong Water spinach	<i>Ipomoea aquatic</i>	1 to 2 pints/A (0.25% to 0.5% solution) of this product + 1 quart/A (0.5% solution) MSO applied early postemergence
Torpedo grass	<i>Panicum repens</i>	4 pints/A (1.0 to 1.5% solution). Ensure good coverage to actively growing foliage.
*White top Hoary cress	<i>Cardaria draba</i>	1 to 2 pints/A (0.25% to 0.5% solution) applied in spring to foliage during flowering.
Willow	<i>Salix spp</i>	2 to 3 pints/A (0.5% to 0.75% solution) of this product applied to actively growing foliage. Ensure good coverage.

*Use not permitted in California unless otherwise directed by supplemental labeling.

STORAGE AND DISPOSAL

DO NOT contaminate water, food or feed by storage or disposal.

PESTICIDE STORAGE: DO NOT store below 10° F.

PESTICIDE DISPOSAL: Wastes resulting from the use of this product must be disposed of on site or at an approved waste disposal facility.

CONTAINER HANDLING:

NOTE: This product is available in multiple containers. Refer to the Net Contents section of this products labeling for the applicable "Nonrefillable" or "Refillable" designation. Follow the container disposal [handling] instructions below that apply to your container type / size.

Nonrefillable Containers 5 Gallons or Less: Nonrefillable container. DO NOT reuse or refill this container. Offer for recycling if available. Triple rinse container (or equivalent) promptly after emptying. **Triple rinse as follows:** Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by State and local authorities. Plastic containers are also disposable by incineration, or, if allowed by State and local authorities, by burning. If burned stay out of smoke.

Nonrefillable containers larger than 5 gallons: Nonrefillable container. DO NOT reuse or refill this container. Offer for recycling if available. If recycling or reconditioning not available, puncture and dispose of in a sanitary landfill, or by other procedures approved by State and local authorities. Plastic containers are also disposable by incineration, or, if allowed by State and local authorities, by burning. If burned stay out of smoke. Triple rinse or pressure rinse container (or equivalent) promptly after emptying. **Triple rinse as follows:** Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. **Pressure rinse as follows:** Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 psi for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

Refillable containers larger than 5 gallons: Refillable container. Refill this container with pesticide only. DO NOT reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or a mix tank. Fill the container about 10% full with water. Agitate vigorously or recirculate water with the pump for two minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times. Then offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities. If burned stay out of smoke.

WARRANTY DISCLAIMER

The directions for use of this product must be followed carefully. TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, (1) THE GOODS DELIVERED TO YOU ARE FURNISHED "AS IS" BY MANUFACTURER OR SELLER AND (2) MANUFACTURER AND SELLER MAKE NO WARRANTIES, GUARANTEES, OR REPRESENTATIONS OF ANY KIND TO BUYER OR USER, EITHER EXPRESS OR IMPLIED, OR BY USAGE OF TRADE, STATUTORY OR OTHERWISE, WITH REGARD TO THE PRODUCT SOLD, INCLUDING, BUT NOT LIMITED TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, USE, OR ELIGIBILITY OF THE PRODUCT FOR ANY PARTICULAR TRADE USAGE. UNINTENDED CONSEQUENCES, INCLUDING BUT NOT LIMITED TO INEFFECTIVENESS, MAY RESULT BECAUSE OF SUCH FACTORS AS THE PRESENCE OR ABSENCE OF OTHER MATERIALS USED IN COMBINATION WITH THE GOODS, OR THE MANNER OF USE OR APPLICATION, INCLUDING WEATHER, ALL OF WHICH ARE BEYOND THE CONTROL OF MANUFACTURER OR SELLER AND ASSUMED BY BUYER OR USER. THIS WRITING CONTAINS ALL OF THE REPRESENTATIONS AND AGREEMENTS BETWEEN BUYER, MANUFACTURER AND SELLER, AND NO PERSON OR AGENT OF MANUFACTURER OR SELLER HAS ANY AUTHORITY TO MAKE ANY REPRESENTATION OR WARRANTY OR AGREEMENT RELATING IN ANY WAY TO THESE GOODS.

LIMITATION OF LIABILITY

TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, IN NO EVENT SHALL MANUFACTURER OR SELLER BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, OR FOR DAMAGES IN THEIR NATURE OF PENALTIES RELATING TO THE GOODS SOLD, INCLUDING USE, APPLICATION, HANDLING, AND DISPOSAL. TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, MANUFACTURER OR SELLER SHALL NOT BE LIABLE TO BUYER OR USER BY WAY OF INDEMNIFICATION TO BUYER OR TO CUSTOMERS OF BUYER, IF ANY, OR FOR ANY DAMAGES OR SUMS OF MONEY, CLAIMS OR DEMANDS WHATSOEVER, RESULTING FROM OR BY REASON OF, OR ARISING OUT OF THE MISUSE, OR FAILURE TO FOLLOW LABEL WARNINGS OR INSTRUCTIONS FOR USE, OF THE GOODS SOLD BY MANUFACTURER OR SELLER TO BUYER. ALL SUCH RISKS SHALL BE ASSUMED BY THE BUYER, USER, OR ITS CUSTOMERS. TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BUYER'S OR USER'S EXCLUSIVE REMEDY, AND MANUFACTURER'S OR SELLER'S TOTAL LIABILITY SHALL BE FOR DAMAGES NOT EXCEEDING THE COST OF THE PRODUCT.

If you do not agree with or do not accept any of directions for use, the warranty disclaimers, or limitations on liability, do not use the product, and return it unopened to the Seller, and the purchase price will be refunded.

RV100918 [5]

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All other trademarks are the property of their respective owners.



1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Polaris® Herbicide

EPA Reg. No.: 228-534

Product Type: Herbicide

Company Name: Nufarm Americas Inc.
11901 S. Austin Avenue
Alsip, IL 60803
1-800-345-3330

Telephone Numbers: For Chemical Emergency, Spill, Leak, Fire, Exposure, or Accident,
Call CHEMTREC Day or Night: 1-800-424-9300
For Medical Emergencies Only, Call 1-877-325-1840

This product is an EPA FIFRA registered pesticide. Some classifications on this SDS are not exactly the same as on the FIFRA label. Certain sections are superseded by federal law governed by EPA for a registered pesticide. Please see Section 15. REGULATORY INFORMATION for explanation.

2. HAZARDS IDENTIFICATION

PHYSICAL HAZARDS:

Not hazardous

HEALTH HAZARDS:

Not hazardous

ENVIRONMENTAL HAZARDS:

Not hazardous

SIGNAL WORD:

None Required

HAZARD STATEMENTS:

Not hazardous in accordance with 29CFR 1910.1200 (Hazcom 2012)

PRECAUTIONARY STATEMENTS

Use with appropriate protective equipment.

3. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENTS	CAS NO.	% BY WEIGHT
Isopropylamine Salt of Imazapyr	81510-83-0	22 – 23.3
Other Ingredients	Trade Secret	Trade Secret

Synonyms: 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid
Ingredients not precisely identified are proprietary or non-hazardous. Values are not product specifications.

4. FIRST AID MEASURES

If Inhaled: Move person to fresh air. Seek medical attention if symptoms develop.

If in Eyes: Hold eye open and rinse slowly and gently with water for sever minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Seek medical attention if irritation persists.

If on Skin or Clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water Seek medical attention if irritation persists.

If Swallowed: Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person. Seek medical attention if symptoms develop

Most Important symptoms/effects, acute and delayed: None expected.

Indication of Immediate medical attention and special treatment if needed: Immediate medical attention is not generally required. For ingestion there is no specific antidote available. Treat symptomatically.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Use media that is suitable for the surrounding fire.

Special Fire Fighting Procedures: Firefighters should wear NIOSH approved self-contained breathing apparatus and full fire-fighting turn out gear. Dike area to prevent runoff and contamination of water sources. Dispose of fire control water later.

Unusual Fire and Explosion Hazards: This product is not flammable or combustible. If water is used to fight fire, contain runoff, using dikes to prevent contamination of water supplies. Dispose of fire control water later.

Hazardous Decomposition Materials (Under Fire Conditions): May produce gases such as oxides of carbon, hydrogen and nitrogen.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Wear appropriate protective gear for the situation. See Personal Protection information in Section 8.

Environmental Precautions: Prevent material from entering public sewer systems or any waterways. Do not flush to drain. Large spills to soil or similar surfaces may necessitate removal of topsoil. The affected area should be removed and placed in an appropriate container for disposal.

Methods for Containment: Dike spill using absorbent or impervious materials such as earth, sand or clay. Collect and contain contaminated absorbent and dike material for disposal.

Methods for Cleanup and Disposal: Pump any free liquid into an appropriate closed container. Absorb residues with an inert material and place in a suitable container for disposal. Decontaminate tools and equipment following cleanup. See Section 13: DISPOSAL CONSIDERATIONS for more information.

Other Information: Large spills may be reportable to the National Response Center (800-424-8802) and to state and/or local agencies.

7. HANDLING AND STORAGE

HANDLING:

Avoid contact with skin, eyes, or clothing. Avoid breathing spray mist. Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

Spray solutions of this product should be mixed, stored, and applied only in stainless steel, fiberglass, plastic, and plastic-lined steel containers. DO NOT mix, store, or apply this product or spray solutions of this product in unlined steel (except stainless steel) containers or spray tanks.

STORAGE:

Do not store below 10° F. Do not contaminate water, food, or feed by storage or disposal.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls:

Where engineering controls are indicated by specific use conditions or a potential for excessive exposure, use local exhaust ventilation at the point of generation.

Personal Protective Equipment:

Eye/Face Protection: To avoid contact with eyes, wear chemical goggles or shielded safety glasses. **Skin Protection:** To avoid contact with skin wear long-sleeved shirt and long pants, shoes plus socks, chemical-resistant gloves made of any waterproof material. Washing facilities should be readily accessible to the work area.

Respiratory Protection: Not normally required. If vapors or mists exceed acceptable levels, wear NIOSH approved air-purifying respirator with cartridges/canisters approved for use against pesticides.

General Hygiene Considerations: Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this material: 1) do not store, use and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored; 2) wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics or using the toilet.

Exposure Guidelines:

Component	OSHA		ACGIH		Unit
	TWA	STEL	TWA	STEL	
Imazapyr	NE	NE	NE	NE	
Other Ingredients	NE	NE	NE	NE	

NE = Not Established

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Blue liquid
Odor:	Faint ammonia like
Odor threshold:	No data available
pH:	6.26 (1% w/w dilution in DIW)
Melting point:	No data available
Initial boiling point and boiling range	No data available
Flash point:	>212° F (>100° C)
Evaporation rate:	No data available
Flammability (solid, gas):	No data available
Upper/lower flammability or explosive limits:	No data available
Vapor pressure:	No data available
Vapor density:	No data available
Relative density:	1.057 g/mL @ 20° C
Solubility(ies):	No data available
Partition coefficient: n-octanol/water:	No data available
Autoignition temperature:	No data available
Decomposition temperature:	No data available
Viscosity:	3.766 cSt @20° C; 1.988 cSt @ 40° C
VOC Emission Potential (%):	-0.13 (TGA)

Note: Physical data are typical values, but may vary from sample to sample. A typical value should not be construed as a guaranteed analysis or as a specification.

10. STABILITY AND REACTIVITY

Reactivity: Not reactive.

Chemical Stability: This material is stable under normal handling and storage conditions.

Possibility of Hazardous Reactions: Will not occur

Conditions to Avoid: Excessive heat. Do not store near heat or flame. Do not mix or store this product or solutions of this product in unlined steel containers

Incompatible Materials: Strong oxidizing agents: bases and acids.

Hazardous Decomposition Products: Under fire conditions may produce gases such as oxides of carbon, hydrogen and nitrogen.

11. TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Eye contact, Skin contact

Eye Contact: Minimally irritating. May cause irritation, redness and tearing.

Skin Contact: Slightly toxic and no more than mildly irritating based on toxicity studies.

Ingestion: Low toxicity based on toxicity studies.

Inhalation: Low toxicity based on toxicity studies.

Delayed, immediate and chronic effects of exposure: None expected.

Toxicological Data:

Data from laboratory studies conducted on Imazapyr Technical:

Oral: Rat LD₅₀: >5,000 mg/kg

Dermal: Rabbit LD₅₀: >5,000 mg/kg

Inhalation: Rat 4-hr LC₅₀: >2.07 mg/l (no mortalities highest dose attainable)

Eye Irritation: Rabbit: Minimally irritating (MMTS= 6.0)

Skin Irritation: Rabbit: Slightly irritating (PDII=0.8)

Skin Sensitization: Not a contact sensitizer in guinea pigs following repeated skin exposure.

Subchronic (Target Organ) Effects: For imazapyr, no adverse effects at approximately 1,700 mg/kg/day (highest dose tested).

Carcinogenicity / Chronic Health Effects: Imazapyr did not cause cancer in laboratory animals. EPA has classified imazapyr as a Group E (evidence of non-carcinogenicity for humans) carcinogen.

Reproductive Toxicity: The results of animal studies with imazapyr gave no indication of a fertility impairing effect.

Developmental Toxicity: No indications of a developmental toxic / teratogenic effect were seen in animal studies with imazapyr.

Genotoxicity: For imazapyr, no mutagenic effect was found in various tests with microorganisms and mammals.

Assessment Carcinogenicity: None listed with ACGIH, IARC, NTP or OSHA.

12. ECOLOGICAL INFORMATION

Ecotoxicity:

Data on Imazapyr:

96-hour LC ₅₀ Bluegill:	>100 mg/l	Bobwhite Quail 8-day Dietary LC ₅₀ :	>5,000 ppm
96-hour LC ₅₀ Rainbow Trout:	>100 mg/l	Bobwhite Quail Oral LD ₅₀ :	>2,150 mg/kg
48-hour EC ₅₀ Daphnia:	>100 mg/l	Mallard Duck 8-day Dietary LC ₅₀ :	>5,000 ppm
14-day EC ₅₀ Duckweed:	0.024 mg/l	Mallard Duck Oral LD ₅₀ :	>2,150 mg/kg
7-day EC ₅₀ Green Algae:	71 mg/l	Honey Bee LD ₅₀ :	>100 mg/bee

Environmental Fate:

Imazapyr is degraded by microbial metabolism and can be relatively persistent in soils. It has an average half-life in soils that ranges from 2 weeks to 5 months. Half-lives tend to be shorter in forest litter and soils. Imazapyr is water-soluble and variably binds to organic materials in the soils. Although the potential to leach is high, leaching is limited under typical field conditions. In water, imazapyr can be rapidly degraded by photolysis with a half-life averaging 2 days. Due to its rapid photodegradation by sunlight, water contamination by imazapyr is generally not of concern.

13. DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

Container Handling and Disposal:

Nonrefillable Containers 5 Gallons or Less: Nonrefillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying.

Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by State and local authorities. Plastic containers are also disposable by incineration, or, if allowed by State and local authorities, by burning. If burned stay out of smoke.

Nonrefillable containers larger than 5 gallons: Nonrefillable container. Do not reuse or refill this container. Offer for recycling if available. Triple rinse or pressure rinse container (or equivalent) promptly after emptying.

Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times.

Pressure rinse as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of

the container, and rinse at about 40 psi for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

Refillable containers larger than 5 gallons: Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or a mix tank. Fill the container about 10% full with water and, if possible, spray all sides while adding water. Agitate vigorously or recirculate water with the pump for two minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times.

14. TRANSPORTATION INFORMATION

Follow the precautions indicated in Section 7: HANDLING AND STORAGE of this SDS.

DOT

Not Regulated

IMDG

Not Regulated

IATA

Not Regulated

15. REGULATORY INFORMATION

EPA FIFRA INFORMATION

This chemical is a pesticide product registered by the United States Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets (SDS), and for workplace labels of non-pesticide chemicals. The hazard information required on the pesticide label is reproduced below. The pesticide label also includes other important information, including directions for use.

CAUTION. No human or domestic animal hazard statements are required. Follow instructions for Personal Protective Equipment and User Safety Recommendations.

U.S. FEDERAL REGULATIONS

TSCA Inventory: This product is exempted from TSCA because it is solely for FIFRA regulated use.

SARA Hazard Notification/Reporting:

Hazard Categories Under Criteria of SARA Title III Rules (40 CFR Part 370):

Not hazardous

Section 313 Toxic Chemical(s):

None

Reportable Quantity (RQ) under U.S. CERCLA:

None

RCRA Waste Code:

Under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste.

State Information:

Other state regulations may apply. Check individual state requirements.

California Proposition 65: Not Listed.

16. OTHER INFORMATION**National Fire Protection Association (NFPA) Hazard Rating:****Rating for this product: Health: 1 Flammability: 0 Reactivity: 0**

Hazards Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

This Safety Data Sheet (SDS) serves different purposes than and DOES NOT REPLACE OR MODIFY THE EPA-ACCEPTED PRODUCT LABELING (attached to and accompanying the product container). This SDS provides important health, safety and environmental information for employers, employees, emergency responders and others handling large quantities of the product in activities generally other than product use, while the labeling provides that information specifically for product use in the ordinary course.

Use, storage and disposal of pesticide products are regulated by the EPA under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) through the product labeling, and all necessary and appropriate precautionary, use, storage, and disposal information is set forth on that labeling. It is a violation of Federal law to use a pesticide product in any manner not prescribed on the EPA-accepted label.

Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, Nufarm Americas Inc. makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Nufarm Americas Inc. be responsible for damages of any nature whatsoever resulting from the use of or reliance upon Information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS AND ALL SUCH WARRANTIES ARE HEREBY SPECIFICALLY DISCLAIMED.

Date of Issue: April 12, 2015**Supersedes:** October 16, 2013

Polaris is a registered trademark of Nufarm Americas Inc.

THE COMMONWEALTH OF MASSACHUSETTS

EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS



Department of Agricultural Resources

251 Causeway Street, Suite 500, Boston, MA 02114
617-626-1700 fax: 617-626-1850 www.mass.gov/agr



IMAZAPYR

In addition to the review that is presented below, a comprehensive review available from USDA Forest Service provides information that incorporates more recent studies and data. The US Forest Service risk assessment report is available at: <http://www.fs.fed.us/foresthealth/pesticide/risk.shtml>

Review conducted by MDAR and MassDEP for use in Sensitive Areas of Rights-of-Way in Massachusetts

Common Trade Name(s): Arsenal

Chemical Name: Imazapyr!

2-(4-isopropyl-4-methyl--5-oxy-2-imidazolin-2-yl)
nicotinic acid with isopropyl amine (2)

CAS No.: 81510-83-0

GENERAL INFORMATION

Imazapyr is effective against and provides residual control of a wide variety of annual and perennial weeds, deciduous trees, vines and brambles in non—cropland situations. It also provides residual control and may be applied either pre or postemergence. Postemergence is the preferred method especially for the control of perennial species. Imazapyr is readily absorbed by the foliage and from soil by the root systems. Imazapyr kills plants by inhibiting the production of an enzyme, required in the biosynthesis of certain amino acids, which is unique to plants (10, 100).

ENVIRONMENTAL FATE

Mobility

There are few studies which have investigated the mobility of Imazapyr in soil, but available reports indicate that Imazapyr does not leach and is strongly absorbed to soil (100). Imazapyr has a high water solubility (1 — 1.5%) which could generally indicate a high leaching potential, but as with other organic acids Imazapyr is much less mobile than would normally be expected (100). No soil partition coefficients have been reported, but they may be expected to be quite high (100).

One field study investigated Imazapyr mobility in a sandy loam soil (0.9% organic matter, 8.0% clay; 38.8% silt). Imazapyr did not leach below the 18—21 inch layer after 634 days and 49.6 inches of rain. The levels found below the 12 inch layer were just above the 5 ppb detection limit. In addition, this study investigated the off—target mobility of Imazapyr and found no residues further than 3 inches from the sprayed area after 1 year (102).

Although low levels of Imazapyr did move to the 18 to 21 inch layer this was only after nearly 2 years and fifty inches of rain. This indicates that imazapyr is relatively non-mobile and does not leach through the soil profile. Imazapyr remains near the soil surface and heavy precipitation may cause some off target movement from surface erosion of treated soils.

Persistence

The main route of Imazapyr degradation is photolysis. In a study of photodegradation in water, the half—life of Imazapyr was calculated as 3.7, 5.3 and 2.5 days in distilled water, pH 5 and pH 9 buffers respectively (101). A soil photolysis study for Arsenal on sandy loam calculated a half—life of 149 days (101).

Studies have investigated the persistence of Imazapyr in soil under aerobic and anaerobic conditions. The half-life of Imazapyr in soil has been reported as varying from 3 months to 2 years (100). A laboratory study found the half-life to be 17 months (101). Detectable residues were found in a field study in all soil layers to 21 inches at 634 days (102). Vegetation was sprayed with radio-labelled Imazapyr at a rate of 1 lb. a.i./acre. The soil was a sandy loam (0.9% organic matter) which received 49.6 inches of rain during 634 days. The highest level of radioactivity (0.234 ppm Imazapyr) was found in the top 3 inches of soil at 231 days after application and there were detectable levels in the 9-12 inch layer. The concentrations in the top layer increased steadily from day 4 to 231 when they reached their maximum (0.234 ppm) and then declined. At day 634 the level in the top layer (0-3 inch) was 0.104 ppm (102). These data indicate that Imazapyr is persistent in soil and, most importantly, that Imazapyr is translocated within plants from the plant shoots back to the roots and released back into soil. Very little of the Imazapyr actually reached the soil during application. The soil residues may be due to the decay of plant material containing Imazapyr in the soil (102).

TOXICITY REVIEW

Acute (Mammalian)

The acute oral LD50 in both male and female rats was greater than 5000 mg/kg using technical Imazapyr. The acute dermal LD50 in male and female rabbits was greater than 2000 mg/kg. The compound was irritating to the rabbit eye but recovery was noted 7 days after application of 100 mg of the test substance. It was classified as mildly irritating to the rabbit skin following application of 0.5 grams of the material on abraded or intact skin (103).

Arsenal product formulation was tested in a similar battery of tests. The rat oral LD50 value was greater than 5000 mg/kg and the rabbit dermal LD50 was greater than 2148 mg/kg. The irritation was observed following installation of 0.5 ml of the test substance in the skin study and 0.1 ml in the eye study (104).

Technical Imazapyr was administered to rats as an aerosol for four hours at a concentration of 5.1 mg/L. There were ten rats per sex and the animals were observed for 14 days after treatment before they were sacrificed. Slight nasal discharge was seen in all rats on day one but disappeared on day two (105).

The inhalation LC50 is greater than 5.0 mg/L for both the formulation and the technical product (105,106). Technical Imazapyr was applied dermally at the following dosages: 0, 100, 200 and 400 mg/kg/day (109). Arsenal was used at 0, 25, 50 and 100% of the formulated solution in sterile saline. Each dose group consisted of 10 male and 10 female rabbits and the test substance was applied to either intact or abraded skin and occluded for 6 hours each day.

The result of the dermal studies with Imazapyr as well as Arsenal were non remarkable with regard to body weights, food consumption, hematology, serum chemistry, clinical observations, necropsy observations and histopathology. It was noted that Arsenal, undiluted, was locally irritating (109).

Subchronic and Chronic Studies (Mammalian)

In the subchronic tests a NOEL for systemic toxicity with dermal administration in rabbits was 400 mg/kg/d (2,109). After dietary administration for 13 weeks in the rat, there was no effect at 10,000 ppm (571. mg/kg/d) which was the highest dose tested (141).

A bioassay is currently underway to evaluate the potential oncogenicity of technical Imazapyr. Groups of 65 rats per sex per dose group have received 0, 1000, 5000 or 10,000 ppm in the diet. Hematology, clinical chemistry and urinalysis tests were conducted at 3, 6 and 12 months and will also be done at 18 months and at study termination. At the 12 month sacrifice the only effect noted was a slight increase in mean food consumption in all treated female groups. Most of the increases were statistically significant, but they did not always exhibit a dose response. The oncogenicity test is due to be submitted to the EPA in the spring of 1989 (115).

Oncogenicity Studies

Chronic bioassays as discussed in the subchronic/chronic section are underway.

Mutagenicity Testing

Five different bacterial strains of Salmonella typhimurium (TA1535, TA98, TA100, TA1537, and TA1538) and one of Escherichia coli (WP-2 uvrA-) were used to evaluate the mutagenicity of Imazapyr. It is unclear whether the compound used was technical or formulated Imazapyr. Dose levels up to 5000 micrograms/plate were used and each strain was evaluated both in the presence or absence of PCB—induced rat liver 5—9 microsomes. Negative results were noted in all assays. The six tester strains were designed to detect either base-pair substitutions or frameshift mutations (113).

Developmental Studies (Mammalian)

Two teratology studies have been done and both of these studies evaluated technical Imazapyr. One study used rats as the test species and the other utilized rabbits (111,112).

Pregnant rats received dosages of 0, 100, 300 or 1000 mg/kg/d of Imazapyr during days 6—15 of gestation. There were 22 rats in the control group and 24, 23 and 22 in the low, mid and high dose groups. All doses were administered orally by gavage. Salivation was noted only during the dosing period in 6 of the 22 females in the highest dose group (1000 mg/kg). No other adverse observations were noted in the treated dams (111). Fetal body weight and crown-rump length data for the treated groups were comparable to controls. Fetal development (external, skeletal and visceral) “revealed no aberrant structural changes which appeared to be the result of the exposure to Imazapyr” (111). The NOEL for maternal toxicity was 300 mg/kg and the NOEL for teratogenicity and fetotoxicity was 1000 mg/kg (116).

Four groups of 18 pregnant rabbits were exposed on days 6-18 of gestation to doses of 0, 25, 100, 400 mg/kg/d Imazapyr. There was no statistically significant difference between control and treated groups at any dose (112).

Avian

Acute oral LD50s of Imazapyr in bobwhite quail and mallard duck were 2150 mg/kg. The 8 day dietary LC50 in the bobwhite quail and mallard duck were greater than 5000 ppm (101).

Invertebrates

The dermal honey bee LD50 for Imazapyr is greater than 100 mg/bee (101). The LD50 (48 hr) was greater than 100 mg/L for the water flea (100).

Aquatic

The LC50s of Imazapyr in the rainbow trout, bluegill sunfish and channel catfish were greater than 100 mg/L (101).

SUMMARY

Imazapyr is a relatively immobile herbicide in the soil profile even when used in sandy and low organic content soils. It is also persistent in soils. The low mobility and persistence may result in off-target movement of Imazapyr from surface erosion of treated soils.

The atypical soil—plant flux characteristics of Imazapyr and delayed maximum soil concentrations indicate that repeated annual applications may result in build—up of Imazapyr in soil. Consequently, an interval is required to allow for the degradation of soil residues before a repeated application is made.

The oral LD50 of Imazapyr in rats is greater than 5000 mg/kg and the dermal LD50 is greater than 2000 mg/kg in rabbits. The oncogenicity bioassay is currently underway and the only effect reported in the interim study was an increase in food consumption in the treated females. No mutagenic effects were observed.

The acute oral LD50s of Imazapyr and the Arsenal formulation are greater than 5000 mg/kg. In the subchronic 13 week rat study there was no effect observed at the highest dose tested 10,000 ppm. The oncogenicity study is currently underway.

REFERENCES

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103. Acute Toxicology of AC 243,997 to Rats and Rabbits. American Cyanamid Company, A83-24.

104. Acute Toxicology of AC 252,925 22.6% to Rats and Rabbits. American Cyanamid Company, A83-67.

105. Acute Inhalation Toxicity of AC 243,997 in Sprague-Dawley Rats. Food and Drug Research Laboratories, Inc. Study No. 7624.

106. Acute Inhalation Toxicity of AC 252,925 in Sprague-Dawley Rats. Food and Drug Research Laboratories, Inc. Study No. 7607.

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108. Evaluation of the Sensitization Potential of AC 252,925 in Guinea Pigs. Toxicology Pathology Services, Inc. Study No. 186A—201-231-83.

109. Twenty-one Day Dermal Toxicity Study with AC 243,997 in Rabbits. Toxicology Pathology Services, Inc. Study No. 186B—301-230-83.

110. Twenty—one Day Dermal Toxicity Study with AC 252,925 in Rabbits. Toxicology Pathology Services, Inc. Study No. 187B-230-83.

111. Teratology Study in Albino Rats with AC 243,997. ToxiGenics Study No. 450-1222.

112. Teratology Study in Albino Rabbits with Ac 243,997. ToxiGenics Study No. 450-1224.

113. Bacterial/Microsome Reverse Mutation (Ames) Test on CL 243,997. American Cyanamid Company GTOX Volume 3, Number 13.

114. Herbicide AC 243,997: The Absorption, Excretion, Tissue Residues and Metabolism of Carboxyl Carbon—14 Labeled AC 243,997 Nicotinic acid, 2-(4—*isopropyl*—4-methyl—5—oxo—2-imidzolin—2-yl) in the Rat. American C~anamid Company Report No. PD-M Volume 20—3.



Imazapyr

Pesticide Fact Sheet: Forestry Use

Product Information

Imazapyr is the common name for the active ingredient in the herbicide products **Arsenal** and **Chopper**.

Imazapyr is a systemic plant growth inhibitor. This chemical is biologically active in plants at low concentrations. Imazapyr is rapidly taken up by the plant, where it inhibits an enzyme essential to plant growth. This enzyme is not present in other organisms.

Arsenal is a formulated salt of imazapyr (53.1% active ingredient and 46.9% inert ingredients). It is used primarily to control woody plants in forestry. Chopper, also formulated as a salt (27.6% active ingredient, 72.4% inert ingredients), is another formulation of imazapyr.

Arsenal and Chopper are typically applied at rates of 0.06 to 1.25 pounds of active ingredient per acre. The products can be applied to foliage, freshly cut stumps, injected into trees, or applied to cuts made around the base of a tree.

Imazapyr may be applied all year, depending on the use. It is

often applied aerially in the fall for site preparation and conifer release.

For comparative purposes, the Environmental Protection Agency (EPA) categorizes pesticides by their short-term toxicity on a scale of I (most toxic) to IV (least toxic). Most undiluted imazapyr formulations are Toxicity Category IV.

Public Health

Researchers use animal studies to define the potential for a pesticide to cause harmful effects to human health. It is important to know that these tests are carried out using doses high enough to cause toxicity (poisoning). Effects seen at toxic doses in animals are unlikely to occur after short-term, low-level exposure in humans. The level of exposure must be considered to estimate the risk of harmful effects.

Based on laboratory studies, imazapyr is classified as practically non-toxic to mammals on a short term (acute) basis.

Rats treated with an oral administration of imazapyr eliminated 87% of the material within 24 hours.

There is no evidence that imazapyr causes cancer, DNA

damage, nerve damage, or birth defects.

The EPA has classified imazapyr as a Class E carcinogen (no evidence of carcinogenicity for humans).

Wildlife Effects

Laboratory and field studies indicate that imazapyr is practically non-toxic to fish, birds, and bees on a short-term (acute) basis.

Imazapyr is toxic to plants at very low concentrations. Applicators should take precautions to minimize drift to non-target areas.

Imazapyr does not appear to bioaccumulate in animals.

Environmental Fate

Imazapyr may be persistent in soils. Half-lives range from 14 days to 17 months.

In forestry dissipation studies, reported values for the half-life of imazapyr range from 14 to 44 days in forest litter, 19 to 34 days in forest soils, and 12 to 40 days on plants.

Imazapyr is water soluble and does not readily bind to organic

material in soils. Therefore, it is classified as highly mobile and can travel through soil with water and enter groundwater. It can also move with runoff and enter surface water. Its low application rates minimize potential impacts on surface or groundwater. Forestry uses should be evaluated for potential surface and groundwater contamination.

Risk Assessment

- The EPA has evaluated use practices, environmental fate, potential exposure routes, and toxicity of imazapyr and has set a Reference Dose (RfD) for imazapyr of 2.50 mg/kg/day. A 70 kg (154 lb) person would have an RfD of 175 mg/day. The RfD is the amount of daily pesticide exposure judged to pose no appreciable risk over a 70-year lifetime. Imazapyr's RfD is based on the results of the most sensitive animal studies (dog) and includes built-in safety measures.
- EPA has determined that the expected exposure associated with imazapyr in forestry use will not result in adverse health effects. However, you should take reasonable precautions to avoid exposure. Do not walk through freshly-sprayed vegetation. Do not eat berries, mushrooms, or other edibles, or drink the water from newly-treated areas. If you are concerned about exposure, consult the resources listed in Additional Information.

References

- American Cyanamid Company. 1988. Imazapyr Environmental Fate and Physical Properties Data Summary. American Cyanamid Company. Princeton, NJ.
- Bureau of Land Management. 1991. Vegetation Treatment on BLM Lands in Thirteen Western States, Final Environmental Impact Statement With Appendices. U.S. Department of the Interior. Washington, D.C.
- Meister, R.T., editor. 1996. Farm Chemicals Handbook '96. Meister Publishing Company. Willoughby, OH.
- U.S. Environmental Protection Agency. 1995. Pesticide Environmental Fate One-Line Summary: Imazapyr. Environmental Fate and Effects Division. Washington, D.C.
- Vogue, P.A., E.A. Kerle, and J.J. Jenkins. 1994. OSU Extension Pesticide Properties Database. Department of Agricultural Chemistry. Oregon State University. Corvallis, OR.

Additional Information: Oregon

- Oregon State University Extension Environmental Chemistry and Toxicology Program
1-541-737-5993 Extension Specialist
- Oregon Poison Control
1-800-222-1222 (National)
1-503-494-8968 (Portland)
1-800-452-7165 (Outside Portland)
- Oregon Department of Agriculture
1-503-986-4550
1-503-986-4635 (Pesticide Division)
- Oregon Health Division Pesticide Analytical Response Center
1-503-731-4025 (8 a.m.-5 p.m., M-F)

Washington

- Poison Control Center
1-800-222-1222 (National)
1-206-526-2121 (Seattle)
1-800-732-6985 (Outside Seattle)
- Washington Dept. of Agriculture, Pesticide Management Division
1-877-301-4555 (toll free)
1-360-902-2040 (Olympia)
1-509-576-3064 (Yakima)
- Washington State University Food and Environmental Quality Laboratory
100 Sprout Road
Richland, WA 99352-1643
1-509-372-7462 (phone)
1-509-372-7460 (fax)
- Washington Department of Health
1-800-525-0127
1-360-236-3360 (Pesticide Division)
1-888-586-9427 (toll free)

Nationwide

- National Pesticide Information Center
1-800-858-PEST (7378)
<http://npic.orst.edu/>
- Extension Toxicology Network (EXTOXNET)
<http://ace.orst.edu/info/extoxnet/>
- DuPont Agricultural Products
P.O. Box 80038 Wilmington, DE
19880-0038
1-800-441-7515
1-800-441-3637 (emergency phone)
1-302-992-2276 (fax)



Imazapyr

Roadside Vegetation Management Herbicide Fact Sheet

This fact sheet was developed by Oregon State University and Intertox, Inc. to assist interested parties in understanding the risks associated with pesticide use in Washington State Department of Transportation's (WSDOT) Integrated Vegetation Management program.

Introduction

Imazapyr is an imidazolinone herbicide used to control grasses, broadleaves, vines, brambles, brush, and trees. Imazapyr disrupts an enzyme (found only in plants) necessary for protein synthesis, and interferes with cell growth and DNA synthesis in plants. The isopropylamine salt of imazapyr is the only active ingredient (28.7%) in the herbicides **Arsenal** and **Habitat**. According to the product labels, Arsenal and Habitat also contain 71.3% other ingredients (unspecified). Arsenal is typically tank mixed with 0.25% of a nonionic surfactant. Habitat is labeled for use in aquatic environments. The Washington State Department of Transportation (WSDOT) is considering the future use of Arsenal for non-selective weed and brush control and Habitat for non-selective control of weeds growing near surface water.

WSDOT assessed the potential risks to human, wildlife, and aquatic animals exposed to imazapyr in their Integrated Vegetation Management (IVM) program. Evaluating potential risks takes into account both the toxicity of a pesticide and the characteristics of possible exposure.

WSDOT Application Rates and Use Patterns on Highway Rights-of-Way

WSDOT is currently evaluating the use of Arsenal and Habitat for maintenance of a bare ground strip at the edge of pavement. Arsenal and Habitat are typically applied at 3.5 to 5.2 pounds of product—or a maximum of about 1.5 pounds of imazapyr—per acre. Applicators use truck mounted booms placed 18" above the ground to make a single application of imazapyr in the spring. In 2005 WSDOT applied 35 pounds of imazapyr statewide.

Laboratory Testing: Before pesticides are registered by the U.S. Environmental Protection Agency (EPA), they must undergo laboratory testing for short-term (acute) and long-term (chronic) health effects. Laboratory animals are purposely fed doses high enough to cause toxic effects. These tests help scientists determine how chemicals might affect humans, domestic animals, or wildlife in cases of overexposure. Pesticide products used according to label directions are unlikely to cause toxic effects. The amount of pesticide that people and pets may be exposed to is low compared to the doses fed to laboratory animals.

Human Health Effects

The U.S. Environmental Protection Agency (EPA) classifies Arsenal and Habitat as category III (Low Toxicity)

Toxicity Category and Signal Word

	High Toxicity (<i>Danger</i>)	Moderate Toxicity (<i>Warning</i>)	Low Toxicity (<i>Caution</i>)	Very Low Toxicity (<i>Caution</i>)
Oral LD50	Less than 50 mg/kg	50-500 mg/kg	500-5000 mg/kg	Greater than 5000 mg/kg
Dermal LD50	Less than 200 mg/kg	200-2000 mg/kg	2000-5000 mg/kg	Greater than 5000 mg/kg
Inhalation LC50	Less than 0.05 mg/l	0.05-0.5 mg/l	0.5-2.0 mg/l	Greater than 2.0 mg/l
Eye Effects	Corrosive	Irritation persisting for 7 days	Irritation reversible in 7 days	Minimal effects, gone in 24 hrs
Skin Effects	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation

Note: Highlighted categories specify the range for imazapyr cited in this fact sheet.

with a signal word of CAUTION (see “Toxicity Category and Signal Word” table).

Acute toxicity: Imazapyr has low toxicity if individuals get residues on their skin, and very low toxicity if it is eaten or inhaled. Imazapyr was not irritating to rabbit eyes, but was mildly irritating when applied to the skin. Imazapyr did not produce sensitization in guinea pigs.

Chronic toxicity: Mice fed imazapyr for two years developed fluid accumulation in the lungs and increased incidence of kidney cysts. Rats fed imazapyr for two years developed abnormal blood formation in the spleen, increased blood pooling in the liver, an increase in thyroid cysts, and a decrease in food efficiency. Most of these data were not considered significant by U.S. EPA. There was no information on either study describing exposure dose.

Reproductive effects: In a 2-generation reproductive study conducted in rats, no treatment-related effects were seen in parents or offspring at any of the doses tested. In other studies, there were no maternal, reproductive, or developmental effects in rats and rabbits exposed to imazapyr during pregnancy.

Carcinogenic effects: Imazapyr is considered not likely to be a human carcinogen by U.S. EPA.

Fate in humans and animals: Rats rapidly excrete imazapyr unchanged in urine and feces. Imazapyr does not bioaccumulate (build up) in mammals.

Wildlife and Aquatic Effects

Effects on mammals: Imazapyr is practically non-toxic to mammals based on an acute oral LD50 of >5,000 mg/kg in rats. Acute dermal toxicity of >2,000 mg/kg was reported in rabbits.

Effects on birds: Imazapyr is practically non-toxic to birds. Oral LD50 values of >2,150 were reported for both quail and duck.

Effects on fish: The reported acute toxicity LC50 concentration for rainbow trout, bluegill sunfish, and channel catfish is >100 mg/L based on product registrant studies with technical grade imazapyr using standard 96-hr exposure studies. Tests were also conducted with the Atlantic silverside to address the potential toxicity of imazapyr to marine fish. In those tests the highest concentration tested was 184 mg/L, which yielded no significant toxicity (mortality). A summary report by USDA reported an LC50 of <100 mg/L for fish. On these bases, imazapyr would be characterized as practically non-toxic to slightly toxic to fish.

Effects on aquatic insects: Imazapyr would be considered slightly toxic to practically non-toxic to invertebrates based on the results from a range of invertebrate species. The reported acute toxicity LC50 concentration for the water flea *Daphnia magna* is >100 mg/L. One study where Arsenal was applied with a surfactant (not defined) with *Daphnia magna* yielded a 48-hr LC50 of 350 mg-Arsenal/L.

LD50/LC50: Acute toxicity is commonly measured by the lethal dose (LD) or lethal concentration (LC) that causes death in 50 percent of treated laboratory animals. LD50 indicates the dose of a chemical per unit body weight of an animal and is expressed as milligrams per kilogram (mg/kg). LC50 is the concentration of a chemical per volume of air or water and is expressed as milligrams per liter (mg/L). Chemicals are highly toxic when the LD50 or LC50 value is small and practically nontoxic when the value is large. However, the LD50 and LC50 do not reflect potential health effects such as cancer, birth defects, or reproductive toxicity that may occur at levels of exposure below those that cause death.

Wildlife Toxicity Category			
Risk Category	Mammals	Birds	Fish or Aquatic Insects
	Acute Oral or Dermal LD₅₀ (mg/kg)	Acute Oral LD₅₀ (mg/kg)	Acute LC₅₀ (mg/L)
Practically nontoxic	>2,000	>2,000	>100
Slightly toxic	501-2,000	501-2,000	>10-100
Moderately toxic	51-500	51-500	>1-10
Highly toxic	10-50	10-50	0.1-1
Very highly toxic	<10	<10	<0.1

*Highlighted categories specify the range for imazapyr cited in this fact sheet. The toxicity of imazapyr to wildlife receptors varies by species.

Environmental Fate

A typical half-life for imazapyr in soils is 10 days (see “Half-life” text box). Microbes and sunlight break down imazapyr in the environment. Imazapyr’s potential to leach to groundwater is high; surface runoff potential is high, and potential for loss on eroded soil is intermediate. Imazapyr has low volatility and the potential for loss to the atmosphere is low. Imazapyr does not bioconcentrate (build up) through the food chain. Plants take up imazapyr through the leaves and roots. Imazapyr is translocated (moved throughout) to other plant parts.

Half-life is the time required for half of the compound to degrade.

1 half-life = 50% degraded
2 half-lives = 75% degraded
3 half-lives = 88% degraded
4 half-lives = 94% degraded
5 half-lives = 97% degraded

Remember: the amount of a chemical remaining after a half-life will always depend on the amount of the chemical originally applied.

Human Health Risk Assessment

WSDOT evaluated several human exposure scenarios, including workers applying herbicides and the public (adults and children) picking and eating drift-contaminated berries, eating drift-contaminated garden vegetables, and walking through sprayed vegetation. For each exposure scenario, WSDOT evaluated conditions of average exposure and extremely conservative conditions of maximum exposure (see “Human Cancer/Non-cancer Risk Classification” text box and “Human Risk Classification for Average Exposure Scenarios” table).

Imazapyr is expected to pose negligible potential risks of adverse non-cancer effects to WSDOT workers and the public under conditions of average and maximum exposure. All hazard quotients are below 1. Imazapyr is not regulated as a carcinogen.

Human Cancer/Non-cancer Risk Classification: Scientists estimate non-cancer health risks by generating a hazard quotient (HQ). This number is the exposure divided by the toxicity. When the HQ is less than 1, exposures are unlikely to cause any adverse health effects. When the HQ is greater than 1, the potential for non-cancer health effects should be considered. Risk assessments for chemicals that cause cancer (carcinogens) estimate the probability of an individual developing cancer over a lifetime. Cancer risks estimated in this way are very conservative, and actual cancer risks are likely to be much lower. Cancer risk estimates of less than 1 in 100,000 are within the range considered negligible by most regulatory

Wildlife Risk Assessment

Wildlife risk assessment considers herbicide behavior in the environment and routes of exposure. Indirect exposure to mammals and birds can occur when they eat contaminated prey or vegetation. Direct exposure can occur when mammals and birds contact herbicide residues with their skin or eyes or when they inhale vapors or particulates. WSDOT’s proposed application rates and use patterns for imazapyr would be expected to pose an insignificant risk to mammals. The estimated dietary exposures to rats, mice, and meadow vole from maximum label application rates would be 3,600, 420 and 550-fold lower, respectively, than the acute dietary LD50 for imazapyr. The estimated dietary exposures of imazapyr to quail, marsh wren, and American robin from WSDOT’s proposed application practices would be 970, 110, and 85-fold lower, respectively, than the acute dietary LD50 for bobwhite quail. These estimated dietary exposures are considered insignificant for quail and low for wren and robin.

Human Risk Classifications for Average Exposure Scenarios

Hazard Quotient (Non-cancer Risk)	Cancer Risk	Potential Risks and Management Priority
Less than 1	Less than 1 in 100,000	Negligible
Between 1 and 10	Between 1 in 10,000 and 1 in 100,000	Low
Between 10 and 100	Between 4 in 1,000 and 1 in 10,000	Moderate
Greater than 100	Greater than 4 in 1,000	High

Note: Highlighted categories specify the range of potential risk for specific exposure scenarios involving imazapyr.

Aquatic Risk Assessment

WSDOT takes extra precautions applying herbicides near open water, wetlands, and wellhead protection zones. However, contamination may result from application drift, rainfall runoff, or residue leaching through the soil into groundwater. Fish and aquatic insect exposure to imazapyr occurs primarily through direct contact with contaminated surface waters and sediment. Imazapyr is highly persistent in soil but breaks down relatively quickly in water. The estimated risks to fish and aquatic invertebrates from imazapyr applied at levels established by WSDOT is low in the Columbia Plateau and Blue Mountain regions and slight in the other six regions of the state.

Additional Resources

- National Pesticide Information Center 1-800-858-PEST (7378) and <http://npic.orst.edu>
- Washington State Department of Transportation, Roadside Maintenance Branch 1-360-705-7865
- Washington Department of Agriculture, Pesticide Management Division 1-877-301-4555 (toll free)

Escort XP

Active Ingredient
Metsulfuron Methyl

GROUP 2 HERBICIDE



Escort[®] XP

HERBICIDE

Dry Flowable	
Active Ingredient	By Weight
Metsulfuron methyl	
Methyl 2-[[[4-methoxy-6-methyl-1,3,5-triazin-2-yl]amino]-carbonyl]amino]sulfonyl]benzoate	60%
Other Ingredients	40%
TOTAL	100%

EPA Reg. No. 432-1549 EPA Est. No. 352-IL-001

Nonrefillable Container

**KEEP OUT OF REACH OF
CHILDREN
CAUTION**

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand this label, find someone to explain it to you in detail.)

Net Weight
1 Pound
84122394
A01780754 150622AV3

See inside leaflet for complete First Aid Instructions, Precautionary Statements, Directions for Use and Storage and Disposal Instructions.

AGRICULTURAL USES

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 4 hours. PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water is:

- Coveralls
- Shoes plus socks

FIRST AID

IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for further treatment advice.

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for further treatment advice. Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-334-7577 for emergency medical treatment information.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION! Causes eye irritation. Avoid contact with skin, eyes, or clothing. Avoid breathing dust or spray mist.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants.
- Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

USERS SHOULD: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

ENVIRONMENTAL HAZARDS

Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters or rinsate. This herbicide is injurious to plants at extremely low concentrations. Nontarget plants may be adversely effected from drift and run-off.

Produced for:
Bayer Environmental Science
A Division of Bayer CropScience LP
2 T. W. Alexander Drive
Research Triangle Park, NC 27709

Bayer



Escort XP

HERBICIDE

Dry Flowable

Active Ingredient

Metsulfuron methyl

Methyl 2-[[[4-methoxy-6-methyl-1,3,5-triazin-

2-yl)amino]-carbonyl]amino]sulfonyl]benzoate..... 60%

Other Ingredients..... 40%

TOTAL 100%

By Weight

EPA Reg. No. 432-1549

EPA Est. No. 352-IL-001

Nonrefillable Container

KEEP OUT OF REACH OF CHILDREN CAUTION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand this label, find someone to explain it to you in detail.)

See inside leaflet for complete First Aid Instructions, Precautionary Statements, Directions for Use and Storage and Disposal Instructions.

Net Weight

1 Pound
84122394

A01780754 150622AV3

AGRICULTURAL USES

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 4 hours. PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water is:

- Coveralls
- Shoes plus socks

FIRST AID

IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for further treatment advice.

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for further treatment advice. Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-334-7577 for emergency medical treatment information.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION! Causes eye irritation. Avoid contact with skin, eyes, or clothing. Avoid breathing dust or spray mist.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Applicators and other handlers must wear:

Long-sleeved shirt and long pants.

Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

USERS SHOULD: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

ENVIRONMENTAL HAZARDS

Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters or rinsate. This herbicide is injurious to plants at extremely low concentrations. Nontarget plants may be adversely affected from drift and run-off.

Produced for:

Bayer Environmental Science
A Division of Bayer CropScience LP
2 T. W. Alexander Drive
Research Triangle Park, NC 27709

Bayer

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Escort® XP Herbicide must be used only in accordance with instructions on this label or in separately published Bayer CropScience LP instructions.

Bayer CropScience LP will not be responsible for losses or damages resulting from the use of this product in any manner not specified on this label. User assumes all risks associated with such non-specified use.

Do not apply more than 4 ounces of Escort® XP Herbicide per acre per year.

Do not use on food or feed crops except as specified by this label or supplemental labeling.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application.

For any requirements specific to your State or Tribe, consult the agency in your State responsible for pesticide regulation.

PRODUCT INFORMATION

Escort® XP Herbicide is a dispersible granule that is mixed in water and applied as a spray by ground or aerial application.

Escort® XP Herbicide is registered for the control of annual and perennial weeds and unwanted woody plants on private, public and military lands, on rights-of-way, industrial sites, non-crop areas, ditchbanks of dry drainage ditches, certain types of unimproved turf grass, and conifer and hardwood plantations, including grazed areas on these sites. Do not use on irrigation ditches.

Escort® XP Herbicide controls weeds and woody plants primarily by post-emergent activity. Although Escort® XP Herbicide has preemergence activity, best results are generally obtained when Escort® XP Herbicide is applied to foliage after emergence or dormancy break. Generally, for the control of annual weeds, Escort® XP Herbicide provides the best results when applied to young, actively growing weeds. For the control of perennial weeds, applications made at the bud/bloom stage or while the target weeds are in the fall rosette stage may provide the best results. The use rate depends upon the weed species and size at the time of application.

The degree and duration of control may depend on the following:

- weed spectrum and infestation intensity
- weed size at application
- environmental conditions at and following treatment
- soil pH, soil moisture, and soil organic matter

Escort® XP Herbicide may be applied on conifer and hardwood plantations, and non-crop sites that contain areas of temporary surface water caused by the collection of water between planting beds, in equipment ruts, or in other depressions created by management activities. It is permissible to treat intermittently flooded low lying sites, seasonally dry flood plains and transitional areas between upland and lowland sites when no water is present. It is also permissible to treat marshes, swamps and bogs after water has receded as well as seasonally dry flood deltas. DO NOT make applications to natural or man-made bodies of water such as lakes, reservoirs, ponds, streams, and canals.

BIOLOGICAL ACTIVITY

Escort® XP Herbicide is absorbed primarily through the foliage of plants, and by the roots to a lesser degree. Plant cell division is generally inhibited in sensitive plants within a few hours following uptake. Two to 4 weeks after application, leaf growth slows followed by discoloration and tissue death. The final effects on annual weeds are evident about 4 to 6 weeks after application. The ultimate effect on perennial weeds and woody plants occurs in the growing season following application.

Warm, moist conditions following treatment promote the activity of Escort® XP Herbicide, while cold, dry conditions may reduce or delay activity. Weeds and brush hardened off by cold weather or drought stress may not be controlled. Weed and brush control may be reduced if rainfall occurs soon after application.

ADJUVANTS

The use of a surfactant is recommended to enhance the control of susceptible plants, except where noted. Apply at a minimum rate (concentration) of 1/4% volume/volume (1 quart per 100 gallons of spray solution), or at the manufacturer's recommended rate. Use only EPA approved surfactants containing at least 80% active ingredient. Certain types of surfactants, such as those incorporating acetic acid (i.e. LI-700), may not be compatible with Escort® XP Herbicide and may result in decreased performance. Certain surfactants may not be suitable for use on desirable plants, such as turf and conifers, listed on this label. Consult the surfactant manufacturer's label for appropriate uses.

INVASIVE SPECIES MANAGEMENT

This product may be considered for use on public, private, and tribal lands to treat certain weed species infestations that have been determined to be invasive, consistent with the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW) National Early Detection and Rapid Response (EDRR) System for invasive plants.

Effective EDRR systems address invasions by eradicating the invader where possible, and controlling them when the invasive species is too established to be feasibly eradicated. Once an EDRR assessment has been completed and action is recommended, a Rapid Response needs to be taken to quickly contain, deny reproduction, and if possible eliminate the invader. Consult your appropriate state extension service, forest service, or regional multidisciplinary invasive species management coordination team to determine the appropriate Rapid Response.

RESISTANCE

Escort® XP Herbicide, which contains the active ingredient metsulfuron methyl, is a Group 2 herbicide based on the mode of action classification system of the Weed Science Society of America.

When herbicides that affect the same biological site of action are used repeatedly over several years to control the same weed species in the same field, naturally-occurring resistant biotypes may survive a correctly applied herbicide treatment, propagate, and become dominant in that field. Adequate control of these resistant weed biotypes cannot be expected. If weed control is unsatisfactory, it may be necessary to retreat the problem area using a product affecting a different site of action.

To better manage herbicide resistance through delaying the proliferation and possible dominance of herbicide resistant weed biotypes, it may be necessary to change cultural practices within and between crop seasons such as using a combination of tillage, retreatment, tank-mix partners and/or sequential herbicide applications that have a different site of action. Weed escapes that are allowed to go to seed will promote the spread of resistant biotypes.

It is advisable to keep accurate records of pesticides applied to individual fields to help obtain information on the spread and dispersal of resistant bio-types. Consult your agricultural dealer, consultant, applicator, and/or appropriate state agricultural extension service representative for specific alternative cultural practices or herbicide recommendations available in your area.

INTEGRATED PEST MANAGEMENT

This product may be used as part of an Integrated Pest Management (IPM) program that can include biological, cultural, and genetic practices aimed at preventing economic pest damage. IPM principles and practices include field scouting or other detection methods, correct target pest identification, population monitoring, and treating when target pest populations reach locally determined action thresholds. Consult your state cooperative extension service, professional consultants, or other qualified authorities to determine appropriate action treatment threshold levels for treating specific pest/crop systems in your area.

PREPARING FOR USE - Site Specific Considerations

Understanding the risks associated with the application of Escort® XP Herbicide is essential to aid in preventing off-site injury to desirable vegetation and agricultural crops. The risk of off-site movement, both during and after application, may be affected by a number of site specific factors such as the nature, texture and stability of the soil, the intensity and direction of prevailing winds, vegetative cover, site slope, rainfall, drainage patterns, and other local physical and environmental conditions. A careful evaluation of the potential for off-site movement from the intended application site, including movement of treated soil by wind or water erosion, must be made prior to using Escort® XP Herbicide. This evaluation is particularly critical where desirable vegetation or crops are grown on neighboring land for which the use of Escort® XP Herbicide is not labeled. If prevailing local conditions may be expected to result in off-site movement and cause damage to neighboring desirable vegetation or agricultural crops, do not apply Escort® XP Herbicide.

Before applying Escort® XP Herbicide the user must read and understand all label directions, precautions and restrictions completely, including these requirements for a site specific evaluation. If you do not understand any of the instructions or precautions on the label, or are unable to make a site specific evaluation yourself, consult your local agricultural dealer, cooperative extension service, land managers, professional consultants, or other qualified authorities familiar with the area to be treated. If you still have questions regarding the need for site specific considerations, please call 1-800-331-2867.

TANK MIXES

Escort® XP Herbicide may be tank mixed with other herbicides registered for the use sites described in this label. Use only those tank mix partners which are labeled for the appropriate use site. When tank mixing, use the most restrictive label limitations for each of the products being used in the tank mix.

AGRICULTURAL USES

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 4 hours. PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water is:

- Coveralls
- Shoes plus socks

CONIFER PLANTATIONS

Application Information

Escort® XP Herbicide is registered for the control of many species of weeds and deciduous trees on sites where conifers are growing or are to be planted. Apply by ground equipment or by air (helicopter only). Refer to the "Weeds Controlled" and "Brush Species Controlled" for a listing of susceptible species.

Application Timing

Apply Escort® XP Herbicide after weeds have emerged or after undesirable hardwoods have broken winter dormancy and have reached the point of full leaf expansion.

Conifer Site Preparation

--Application Before Transplanting

After consulting the "Weeds Controlled" and "Brush Species Controlled" tables, apply the rates of Escort® XP Herbicide specified for the most difficult to control species on the site.

Southeast—Apply up to 4 ounces per acre for loblolly and slash pines. Transplant the following planting season.

Northeast and Lake States—Apply up to 2 ounces per acre for red pine. Transplant the following planting season. Apply up to 2 ounces per acre for black, white and Norway spruce. Transplant the following spring.

West—Apply up to 2 ounces per acre prior to planting Douglas Fir, Sitka Spruce, Western Red Cedar, Western Hemlock, Ponderosa Pine, and Grand Fir in the Coast Rangeland and western slope of the Cascades in Oregon and Washington. These conifer species listed can be planted anytime after application. Other conifer species can be planted providing the user has prior experience indicating acceptable tolerance to Escort® XP Herbicide soil residues.

Without prior experience, it is recommended that other species be planted on a small scale to determine selectivity before large-scale plantings are made as unacceptable injury may occur. Bayer CropScience LP will not assume responsibility for injury to any conifer species not listed on this label.

Tank Mix Combinations—

For broader spectrum control, the following products may be used in combination with Escort® XP Herbicide.

Glyphosate (4 pound active per gallon)

Tank mix 1 to 2 ounces of Escort® XP Herbicide with 2 to 10 quarts of glyphosate per acre. Refer to the product container for a list of species controlled.

Imazapyr (4 pound active per gallon)

Tank mix 1 to 2 ounces of Escort® XP Herbicide with 10 to 24 fluid ounces of imazapyr per acre. Loblolly and slash pines may be transplanted the planting season following application. This combination controls ash, black gum, cherry, hawthorn, honeysuckle, hophornbeam, persimmon, oaks (red, white and water), sassafras, sweetgum, Vaccinium species, and suppresses blackberry, dogwood, elms, myrtle dahoon, hickories, and red maple.

Glyphosate (4 pound active per gallon) + Imazapyr (4 pound active per gallon)

Tank mix 1/2 to 1 ounce of Escort® XP Herbicide with 16 to 64 fluid ounces of glyphosate and 10 to 12 fluid ounces of imazapyr per acre. Slash and loblolly pines may be transplanted the planting season following application. This combination controls cherry, dogwood, elms, oaks (red and water), persimmon, sassafras, sweetgum and suppresses hickory.

Velpar® L [VU] Herbicide or Velpar® DF [VU] Herbicide

Tank mix 1 to 2 ounces of Escort® XP Herbicide per acre with Velpar® L [VU] Herbicide or Velpar® DF [VU] Herbicide at the rates specified on the container for various soil textures. Loblolly and slash pines may be transplanted the planting season following application. Refer to the product container for a list of species controlled.

Oust® Extra Herbicide

Tank mix 1/2 to 1 1/2 ounces of Escort® XP Herbicide with 2 to 3 ounces of Oust® Extra Herbicide per acre for herbaceous weed control. Refer to the product container and the "Weeds Controlled" section of this label for a listing of the weeds controlled. Loblolly and slash pines may be transplanted the planting season following application. Tank mix 2 ounces of Escort® XP Herbicide with 3 ounces of Oust® Extra Herbicide per acre for herbaceous weed control and early spring suppression of bull thistle and Canada thistle in the Coast Rangeland and western slope of the Cascade Mountains. Douglas fir may be transplanted at least 90 days following application.

Release--Hardwood Control and Suppression

Escort® XP Herbicide may be used for application over the top of established slash and loblolly pine to control the species listed in "Weeds Controlled" and "Brush Species Controlled" section of this label. Apply 1 to 4 ounces per acre to control the species indicated, including kudzu.

Tank Mix Combinations—

For broader spectrum control the following products may be used in combination with Escort® XP Herbicide.

Imazapyr (4 pound active per gallon)

Tank mix 1 to 2 ounces of Escort® XP Herbicide with 8 to 16 fluid ounces of imazapyr per acre for application to loblolly pine. Refer to the imazapyr label regarding the use of surfactants and the appropriate application timing with respect to the age and development stage of the pines. This combination controls ash, black gum, cherry, hawthorn, honeysuckle, hophorn-

beam, oaks (red, white and water), sassafras, sweetgum, Vaccinium species, and suppresses blackberry, dogwood, elms, myrtle dahoon, hickories, persimmon, and red maple.

Velpar® L [VU] Herbicide or Velpar® DF [VU] Herbicide

Tank mix 1 to 2 ounces of Escort® XP Herbicide with Velpar® L [VU] Herbicide or Velpar® DF [VU] Herbicide at the rates specified on the container for various soil textures. This combination may be applied to loblolly and slash pines.

Release--Herbaceous Weed Control

Escort® XP Herbicide may be applied to transplanted loblolly and slash pine for the control of herbaceous competition. Consult the "Weeds Controlled" for a listing of the susceptible species and application rates. Best results are obtained when Escort® XP Herbicide is applied just before weed emergence until shortly after weed emergence.

Tank Mix Combinations—

For broader spectrum control the following products may be used in combination with Escort® XP Herbicide.

Imazapyr (4 pound active per gallon)

Tank mix 1/2 to 1 ounce of Escort® XP Herbicide with 4 fluid ounces of imazapyr per acre. The tank mix may be used on loblolly pine.

Velpar® L [VU] Herbicide or Velpar® DF [VU] Herbicide

Tank mix 1/2 to 1 ounce of Escort® XP Herbicide with Velpar® L [VU] Herbicide or Velpar® DF [VU] Herbicide at the rates specified on the container for various soil textures. This combination may be applied to loblolly and slash pines.

Release - Directed Spray in Conifers

Western US

To release conifers from competing brush species, such as, blackberry, salmonberry, snowberry, thimbleberry and wild roses, mix 2 to 4 ounces of Escort® XP Herbicide per 100 gallons of spray solution. Direct spray onto the foliage of competing brush species using a knapsack or backpack sprayer. For best results, apply any time after the brush species have reached full leaf stage but before autumn coloration. For best results at application, the majority of the brush must be less than six feet in height to help ensure adequate spray coverage. Thorough coverage of the target foliage is necessary to optimize results. Care must be taken to direct the Escort® XP Herbicide spray solution away from the conifer foliage.

NOTE:

Escort® XP Herbicide may cause temporary yellowing and or growth suppression when the spray solution contacts conifer foliage. The use of a surfactant with Escort® XP Herbicide may improve brush control results. When using a surfactant with Escort® XP Herbicide, extra precaution must be taken to avoid contact with conifer foliage. Excessive drift onto conifers may result in severe injury.

IMPORTANT PRECAUTIONS—CONIFER PLANTATIONS ONLY

- Applications of Escort® XP Herbicide made to conifers that are suffering from loss of vigor caused by insects, diseases, drought, winter damage, animal damage, excessive soil moisture, planting shock, or other stresses may injure or kill the trees.
- Applications of Escort® XP Herbicide made for herbaceous release must only be made after adequate rainfall has closed the planting slit and settled the soil around the roots following transplanting.
- Do not apply Escort® XP Herbicide to conifers grown as ornamentals.
- Escort® XP Herbicide applications may result in damage and mortality to other species of conifers when they are present on sites with those listed in the preceding specifications for conifer plantations.

HARDWOOD PLANTATIONS

Application Information

Escort® XP Herbicide may be used at rates of up to 2 ounces per acre for the control of many weed species on sites where yellow poplar is growing or is to be planted, and on sites where red alder is to be planted. Apply by ground equipment or by air (helicopter only). Refer to the “Weeds Controlled” sections of this label for a listing of susceptible species.

Application Timing

Escort® XP Herbicide may be applied as a site preparation treatment prior to planting red alder or yellow poplar. As a prior to planting site preparation treatment for red alder, Escort® XP Herbicide may be tank mixed with other herbicides labeled for this use.

Escort® XP Herbicide may also be applied over-the-top of planted yellow poplar seedlings after the soil has settled around the root system, but before the seedlings have broken dormancy (prior to bud break).

Release--Herbaceous Weed Control

Escort® XP Herbicide may be applied to yellow poplar for the control of herbaceous competition. Consult the “Weeds Controlled” for a listing of the susceptible species and specified application rates. Best results are obtained when Escort® XP Herbicide is applied just before weed emergence until shortly after weed emergence.

Tank Mix Combinations—

Tank mix 1/2 ounce of Escort® XP Herbicide with 4 to 6 pints of Velpar® L [VU] Herbicide as directed on the package label for “RELEASE--HERBACEOUS WEED CONTROL” in pine plantations in the eastern U.S. Follow the Velpar® L [VU] Herbicide label directions regarding altering the application rate by soil texture.

IMPORTANT PRECAUTIONS—HARDWOOD PLANTATIONS ONLY

- Application of Velpar® L [VU] Herbicide and Escort® XP Herbicide made to yellow poplar that are suffering from loss of vigor caused by insects, disease, drought, winter damage, animal damage, excessive soil moisture, planting shock, or other stresses may injure or kill the seedlings.
- Applications of Escort® XP Herbicide made for release must only be made after adequate rainfall has closed the planting slit and settled the soil around the roots following transplanting.
- The use of surfactant is not recommended for applications made over the tops of trees.
- Careful consideration must be given by an experienced and knowledgeable forester to match the requirements of yellow poplar and/or red alder to the conditions of the site. Treatment of yellow poplar and/or red alder planted on a site inadequate to meet its requirements may injure or kill the seedlings.

PASTURE, RANGELAND, AND CONSERVATION RESERVE PROGRAM (CRP)

Escort® XP Herbicide is registered for the control of broadleaf weeds, brush and several woody vine species in the establishment, maintenance, and restoration of pasture, rangeland, and Conservation Reserve Program (CRP).

Escort® XP Herbicide may be tank mixed with other pesticides labeled for use in pasture, rangeland, and CRP. Read and follow the labels on all products used in the tank mix. Observe the most restrictive precautions on each of the product's labels. Application of Escort® XP Herbicide to pasture, rangeland and CRP may be made by ground or air. Use a sufficient volume of water to ensure thorough coverage of the targeted weeds with the equipment being used. In Idaho, Oregon and Washington use a minimum application volume of 3 gallons of spray solution per acre.

APPLICATION INFORMATION FOR GRASS ESTABLISHMENT IN PASTURE, RANGELAND, AND CONSERVATION RESERVE PROGRAM (CRP)

Escort® XP Herbicide is registered for the control or suppression of broadleaf weeds to aid in the establishment of the following perennial native or improved grasses planted in pasture, rangeland, and acres enrolled in the Conservation Reserve Program (CRP):

Blue Gramma	Sideoats gramma
Bluestems-	Switchgrass-
Big	Blackwell
Little	Wheatgrasses-
Plains	bluebunch
Sand	crested
WW Spar	intermediate
Buffalograss	pubescent
Green sprangletop	Siberian
Kleingrass	slender
Lovegrasses-	steambank
Atherstone	tall
Sand	thickspike
Weeping	western
Wilman	Wildrye grass-
Orchardgrass	Russian

Maximize potential for grass establishment by consulting with the Natural Resource and Conservation Service of other government agencies or local experts concerning planting techniques and other cultural practices.

Performance from Escort® XP Herbicide may not always be satisfactory due to the inability of newly planted grass stands to sufficiently compete with weeds and the severity of weed pressure in new grass stands.

An additional herbicide application or mowing may be needed.

Use Rates and Application Timing for Grass Establishment in Pasture, Rangeland and CRP Preplant (prior to planting) or Preemergence (after planting but before grass emergence)

Do not use more than 1/10 ounce/acre of Escort® XP Herbicide for grass establishment in pasture, rangeland, and CRP. Apply Escort® XP Herbicide at 1/10 ounce/acre on all labeled grasses except orchardgrass and Russian wildrye grass. Do not apply Escort® XP Herbicide preplant or preemergence to orchardgrass and Russian wildrye grass as severe crop injury may result.

Early postemergence to new plantings

Apply Escort® XP Herbicide at 1/10 ounce/acre, plus a non-ionic surfactant at the rate of 2 to 4 pints/100 gallons of spray solution on all labeled grasses anytime after grass emergence.

Do not use a spray adjuvant other than non-ionic surfactant. Because grass species differ in time of emergence, apply only after the majority of grasses are in the 3 to 4 leaf stage.

Postemergence to stands with 1 – 5 leaf grasses planted the previous season.

Apply Escort® XP Herbicide at 1/10 ounce/acre plus a non-ionic surfactant at the rate of 2 to 4 pints/100 gallons of spray solution on all labeled grasses when the majority of the grasses have one or more leaves.

Do not use a spray adjuvant other than non-ionic surfactant.

APPLICATION INFORMATION FOR ESTABLISHED GRASSES IN PASTURE, RANGELAND, AND CONSERVATION RESERVE PROGRAM (CRP)

Use Rates for Established Grasses in Pasture, Rangeland, and CRP

Apply up to 1 2/3 ounces Escort® XP Herbicide per acre as a broadcast application to established grasses in pasture, rangeland and CRP. For spot applications, use 1 ounce per 100 gallons of water. Do not apply more than 1 2/3 ounces of Escort® XP Herbicide per acre per year in pasture, rangeland, and CRP.

Refer to the Weeds Controlled section of the section 3 label for a listing of the weeds controlled by Escort® XP Herbicide and the appropriate use rate to obtain control.

Application Timing – Established Grasses in Pasture, Rangeland, and CRP

Escort® XP Herbicide may be applied to established native grasses such as bluestems and grama, and on other established grasses such as bermudagrass, bluegrass, orchardgrass, bromegrass, fescue and timothy that were planted the previous growing season (or earlier) and are fully tillered, unless otherwise directed on this label. Specific application timing information on several of these grass species follows:

Grass	Minimum time from Grass establishment Escort® XP Herbicide application
Bermudagrass	2 months
Bluegrass, bromegrass, Orchardgrass	6 months
Timothy	12 months
Fescue	24 months

Rotation Intervals in Pasture, Rangeland, and CRP for Overseeding and Renovation

Location	Crop or Grass Species	Maximum Escort® XP Herbicide Rate on Pasture, Rangeland, and CRP (oz per A)	Minimum Rotation Interval (months)
AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA, WV	Alfalfa, red clover, white clover, sweet clover, bermudagrass, bluegrass, ryegrass, tall fescue	1/10 to 3/10	4
	Wheat (except durum)	1/10 to 3/10	1
	Durum, barley, oat	1/10 to 3/10	10

(continued)

Rotation Intervals in Pasture, Rangeland, and CRP for Overseeding and Renovation (continued)

Location	Crop or Grass Species	Maximum Escort® XP Herbicide Rate on Pasture, Rangeland, and CRP (oz per A)	Minimum Rotation Interval (months)
ALL STATES NOT INCLUDED ABOVE	Red clover, white clover, and sweet clover	1/10 to 2/10	12
	Bermudagrass, bluegrass, ryegrass	1/10 to 2/10	6
	Tall Fescue	1/10 to 2/10	18
	Wheat (except durum)	1/10 to 2/10	1
	Durum, barley, oat	1/10 to 2/10	10
ALL AREAS WITH SOIL PH OF 7.5 OR LESS	Russian wildrye	1/10 to 1/2	1
	Green needlegrass, switchgrass, sheep fescue	1/10 to 1	1
	Meadow brome, smooth brome, alta fescue, red fescue, meadow foxtail, orchardgrass, Russian wildrye, timothy	1/10 to 1	2
ALL AREAS WITH SOIL PH OF 7.9 OR LESS	Alkali sacaton, mountain brome, blue grama, thickspike wheatgrass	1/10 to 1	1
	Sideoats grama, switchgrass	1/10 to 1/2	2
	Western wheatgrass	1/10 to 1	2
	Sideoats grama, switchgrass, big bluestem	1/10 to 1	3

Fescue Precautions:

Note that Escort® XP Herbicide may temporarily stunt tall fescue, cause it to turn yellow, or cause seedhead suppression. To minimize these symptoms, take the following precautions:

- Do not use more than 4/10 ounce/acre of Escort® XP Herbicide.
- Tank mix Escort® XP Herbicide with 2,4-D.
- Use the lowest specified rate for target weeds.
- Use a non-ionic surfactant at 1/2 to 1 pint per 100 gallons of spray solution.
- Make application later in the spring after the new growth is 5 to 6 inches tall, or in the fall.
- Do not use surfactant when liquid nitrogen is used as a carrier.
- Do not use a spray adjuvant other than non-ionic surfactant.

The first cutting yields may be reduced due to seedhead suppression resulting from treatment with Escort® XP Herbicide.

Timothy Precautions:

Timothy should be at least 6 inches tall at application and be actively growing. Applications of Escort® XP Herbicide to timothy under any other conditions may cause crop yellowing and/or stunting. To minimize these symptoms, take the following precautions:

- Do not use more than 4/10 ounce/acre Escort® XP Herbicide.
- Tank mix Escort® XP Herbicide with 2, 4-D.
- Use the lowest specified rate for target weeds.
- Use a non-ionic surfactant at 1/2 pint per 100 gallons of spray solution (1/16%).
- Make applications in the late summer or fall.
- Do not use surfactant when liquid nitrogen is used as a carrier.
- Do not use spray adjuvant other than non-ionic surfactant.

Application of Escort® XP Herbicide to Pensacola bahiagrass, ryegrass (Italian or perennial) and Garrison's creeping foxtail may cause severe injury to and/or loss of forage.

Other Pasture and Rangeland Grasses

Varieties and species of forage grasses differ in their tolerance to herbicides. When using Escort® XP Herbicide on a particular grass for the first time, limit use to a small area. If no injury occurs throughout the season, larger acreage may be treated the following season.

Broadleaf forage species, such as alfalfa and clover, are highly sensitive to Escort® XP Herbicide and will be severely stunted or injured by Escort® XP Herbicide.

SPOT TREATMENTS

Escort® XP Herbicide may be used for use as spot treatment to control noxious and troublesome weeds on pasture, rangeland and CRP.

Application Information

Escort® XP Herbicide may be used to control many species of weeds, including noxious weeds, in forage grasses growing on pasture, rangeland, and CRP. Refer to the "Weeds Controlled" section of the package label or supplemental labeling for a listing of susceptible weed species. If the sprayer is calibrated, consult the package label or other supplemental labeling to select the application rate per acre of Escort® XP Herbicide appropriate for the target weeds. Or mix one gram of Escort® XP Herbicide per one gallon of water along with a suitable surfactant. Spray to the point of wetting the entire surface of the target weeds, approximately 40 gallons of solution per acre. When applied in this manner there is no grazing restrictions following the use of Escort® XP Herbicide. Applications may be made at anytime of the year, except when the soil is frozen.

CROP ROTATION

Before using Escort® XP Herbicide, carefully consider your crop rotation plans and options. For rotational flexibility, do not treat all of your pasture, rangeland or CRP acres at the same time.

Minimum Rotational Intervals

Minimum rotation intervals* are determined by the rate of breakdown of Escort® XP Herbicide applied. Escort® XP Herbicide breakdown in the soil is affected by soil pH, presence of soil microorganisms, soil temperature, and soil moisture. Low soil pH, high soil temperature, and high soil moisture increase Escort® XP Herbicide breakdown in soil, while high soil pH, low soil temperature, and low soil moisture slow Escort® XP Herbicide breakdown.

Of these 3 factors, only soil pH remains relatively constant. Soil temperature, and to a greater extent, soil moisture, can vary significantly from year to year and from area to area. For this reason, soil temperatures and soil moisture should be monitored regularly when considering crop rotations.

* The minimum rotation interval represents the period of time from the last application to the anticipated date of the next planting.

Soil pH Limitations

Escort® XP Herbicide should not be used on soils having a pH above 7.9, as extended soil residual activity could extend crop rotation intervals beyond normal. Under certain conditions, Escort® XP Herbicide could remain in the soil for 34 months or more, injuring wheat and barley. In addition, other crops planted in high-pH soils can be extremely sensitive to low concentrations of Escort® XP Herbicide.

Checking Soil pH

Before using Escort® XP Herbicide, determine the soil pH of the areas of intended use. To obtain a representative pH value for the test area, take several 0" to 4" samples from different areas of the field and analyze them separately. Consult local extension publications for additional information on recommended soil sampling procedures.

BIOASSAY

A field bioassay must be completed before rotating to any crop or grass species/variety not listed in the Rotation Intervals Table, or if the soil pH is not in the specified range, or if the use rate applied is not specified in the table.

To conduct a field bioassay, grow test strips of the crop(s) or grass(es) you plan to grow the following year in fields previously treated with Escort® XP Herbicide. Crop or grass response to the bioassay will indicate whether or not to rotate to the crop(s) or grass(es) grown in the test strips.

If a field bioassay is planned, check with your local Agricultural dealer or Bayer CropScience LP representative for information detailing the field bioassay procedure.

GRAZING/HAYING

When used as directed, there is no grazing or haying restriction for use rates of 1 2/3 ounces per acre and less. Coveralls, shoes plus socks must be worn if cutting within 4 hours of treatment.

IMPORTANT PRECAUTIONS

- Do not apply more than 1 2/3 ounces of Escort® XP Herbicide per acre per year on pasture, rangeland or CRP.
- Grass species or varieties may differ in their response to various herbicides. Bayer CropScience LP recommends that you first consult your state experiment station, university, or extension agent as to sensitivity to any herbicide. If no information is available, limit the initial use of Escort® XP Herbicide to a small area. Components in a grass seed mixture will vary in tolerance to Escort® XP Herbicide so the final stand may not reflect the seed ratio.
- Under certain conditions such as heavy rainfall, high pH, prolonged cold weather, or wide fluctuations in day/night temperatures prior to or soon after Escort® XP Herbicide application, temporary discoloration and/or grass injury may occur. Escort® XP Herbicide should not be applied to grass that is stressed by severe weather conditions, drought, low fertility, water-saturated soils, disease, or insect damage as grass injury may result. Severe winter stress, drought, disease, or insect damage before or following application also may result in grass injury.
- Applications of Escort® XP Herbicide to pasture, rangeland, and CRP undersown with legumes may cause injury to the legumes. Legumes in a seeding mixture may be severely injured or killed following an application of Escort® XP Herbicide.
- Applications made to some established grasses may cause temporary stunting, yellowing or seedhead suppression (i.e. fescue, timothy).
- Applications made to newly established grasses less than 2 years from seeding may result in injury or loss.
- Do not apply to forage grasses known to be sensitive to Escort® XP Herbicide such as ryegrass (Italian and perennial), bahia or Garrison's creeping foxtail.
- Broadleaf forage species, such as alfalfa and clover, are highly sensitive to Escort® XP Herbicide and will be severely injured or killed.
- The control of weeds in wheel track areas may be reduced if ground applications are made when dry, dusty field conditions exist. The addition of 2,4-D or MCPA should improve weed control under these conditions.

NON-AGRICULTURAL USES

NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses. Do not enter or allow others to enter the treated area until sprays have dried.

Non-crop industrial weed control and selective weed control in turf (industrial, unimproved only) are not within the scope of the Worker Protection Standard.

NON-CROP SITES

Application Information

Escort® XP Herbicide is registered for weed control on private, public and military lands as follows: Uncultivated nonagricultural areas (including airports, highway, railroad and utility rights-of-way, sewage disposal areas); uncultivated agricultural areas - non-crop producing (including farmyards, fuel storage areas, fence rows, soil bank land, and barrier strips); industrial sites - outdoor (including lumberyards, pipeline and tank farms) including grazed areas on these sites. It may also be used for the control of certain noxious and troublesome weeds.

Consult the "Weeds Controlled" and "Brush Species Controlled" tables to determine the appropriate application rate.

Escort® XP Herbicide may be applied in tank mixture with other herbicides labeled for use on non-crop sites. Fully read the labels and follow all directions and restrictions on each label.

Applications may be made by ground or air. Use a sufficient volume of water to ensure thorough coverage of the target vegetation with the application equipment being used.

NATIVE GRASSES

Escort® XP Herbicide is registered for weed control and suppression in the establishment and maintenance of native grasses. It may be used where blue grama, bluestems (big, little, plains, sand, ww spar) brome grasses (meadow), buffalograss, green sprangletop, indiagrass, kleingrass, love-grasses (atherstone, sand, weeping, wilman), orchardgrass, sideoats

grama, switchgrass (blackwell), wheatgrass (bluebunch, intermediate, pubescent, Siberian, slender, streamband, tall, thickspike, western), and Russian wildrye are established. It may also be applied over these species in the seedling stage, except for orchardgrass and Russian wildrye.

When used as directed, there are no grazing or haying restrictions for use rates of 1 2/3 ounce per acre or less. At use rates greater than 1 2/3 ounce per acre and up to 3 1/3 ounce per acre, forage grasses may be cut for hay, fodder or green forage and fed to livestock, including lactating animals, 3 days after treatment.

Rotation Intervals for Overseeding and Renovation

Location	Crop or Grass Species	Maximum Escort® XP Herbicide Rate (oz per A)	Minimum Rotation Interval (months)
AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA, WV	Alfalfa, red clover, white clover, sweet clover, bermudagrass, bluegrass, ryegrass, tall fescue	1/10 to 3/10	4
	Wheat (except durum)	1/10 to 3/10	1
	Durum, barley, oat	1/10 to 3/10	10
ALL STATES NOT INCLUDED ABOVE	Red clover, white clover, and sweet clover	1/10 to 2/10	12
	Bermudagrass, bluegrass, ryegrass	1/10 to 2/10	6
	Tall Fescue	1/10 to 2/10	18
	Wheat (except durum)	1/10 to 2/10	1
ALL AREAS WITH SOIL PH OF 7.5 OR LESS	Durum, barley, oat	1/10 to 2/10	10
	Russian wildrye	1/10 to 1/2	1
	Green needlegrass, switchgrass, sheep fescue	1/10 to 1	1
	Meadow brome, smooth brome, alta fescue, red fescue, meadow foxtail, orchardgrass, Russian wildrye, timothy	1/10 to 1	2

(continued)

Rotation Intervals for Overseeding and Renovation *(continued)*

Location	Crop or Grass Species	Maximum Escort® XP Herbicide Rate (oz per A)	Minimum Rotation Interval (months)
ALL AREAS WITH SOIL PH OF 7.9 OR LESS	Alkali sacaton, mountain brome, blue grama, thickspike wheatgrass	1/10 to 1	1
	Sideoats grama, switchgrass	1/10 to 1/2	2
	Western wheatgrass	1/10 to 1	2
	Sideoats grama, switchgrass, big bluestem	1/10 to 1	3

Application Information

Apply Escort® XP Herbicide at the rate of 1/10 ounce per acre for the control and suppression* of bur buttercup (testiculate), common purslane, common sunflower*, cutleaf eveningprimrose*, flixweed*, lambsquarters* (common and slimleaf), marestalk*, pigweed (redroot and tumble), snow speedwell, tansymustard* and tumble mustard (Jim Hill mustard).

* Suppression is a visual reduction in weed competition (reduced population or vigor) as compared to untreated areas. Degree of suppression will vary with the size of weed and environmental conditions following treatment.

Application Timing

For established grasses, apply when weeds are in the seedling stage.

For grasses in the seedling stage, apply preplant or preemergence where the soil (seed bed) has been cultivated.

IMPORTANT PRECAUTIONS—NATIVE GRASSES

- Grass species or varieties may differ in their response to various herbicides. If no information is available, limit the initial use of Escort® XP Herbicide to a small area. Components in a grass seed mixture will vary in tolerance to Escort® XP Herbicide, so the final stand may not reflect the seed ratio.
- Under certain conditions such as heavy rainfall, high pH, prolonged cold weather, or wide fluctuations in day/night temperatures prior to or soon after Escort® XP Herbicide application, temporary discoloration and/or grass injury may occur. Injury may result when Escort® XP Herbicide is

applied to grass that is stressed by severe weather conditions, drought, low fertility, water-saturated soils, disease, or insect damage. Severe winter stress, drought, disease, or insect damage before or following application also may result in grass injury.

GRASS REPLANT INTERVALS

Following an application of Escort® XP Herbicide to non-crop areas, the treated sites may be replanted with various species of grasses at the intervals listed below.

For soils with a pH of 7.5 or less, observe the following replant intervals:

Species	Rate (ounces per acre)	Replant Interval (months)
Brome, Meadow	1/2—1	2
	1—2	3
Brome, Smooth	1/2—1	2
	1—2	4
Fescue, Alta	1/2—1	2
	1—2	4
Fescue, Red	1/2—1	2
	1—2	4
Fescue, Sheep	1/2—1	1
	1—2	4
Foxtail, Meadow	1/2—1	2
	1—2	4
Green Needlegrass	1/2—2	1
Orchardgrass	1/2—1	2
	1—2	4
Russian wildrye	1/2—1	1
	1	2
	2	3
Switchgrass	1/2—1	1
	1—2	3
Timothy	1/2—1	2
	1—2	4
Wheatgrass, Western	1/2—1	2
	1—2	3

For soils with a pH of 7.5 or greater observe the following replant intervals:

Species	Rate (ounces per acre)	Replant Interval (months)
Alkali Sacaton	1/2—1	1
	1—2	3
Bluestem, Big	1/2—2	3
Brome, Mountain	1/2—1	1
	1—2	2
Grama, Blue	1/2—2	1
Grama, Sideoats	1/2	2
	>1/2	>3
Switchgrass	1/2	2
	>1/2	>3
Wheatgrass, Thickspike	1/2—2	1
Wheatgrass, Western	1—2	2
	1/2—1	3

The specified intervals are for applications made in the Spring to early Summer. Because Escort® XP Herbicide degradation is slowed by cold or frozen soils, applications made in the late Summer or Fall should consider the intervals as beginning in the Spring following treatment.

Testing has indicated that there is considerable variation in response among the species of grasses when seeded into areas treated with Escort® XP Herbicide. If species other than those listed above are to be planted into areas treated with Escort® XP Herbicide, a field bioassay must be performed, or previous experience may be used, to determine the feasibility of replanting treated sites.

ADDITIONAL GRASS INFORMATION APPLICATION INFORMATION FOR GRASS ESTABLISHMENT

Escort® XP Herbicide may be used for the control or suppression of broadleaf weeds to aid in the establishment of the following perennial native or improved grasses:

Blue grama	Sideoats grama
Bluestems –	Switchgrass –
big	blackwell
little	Wheatgrasses –
plains	bluebunch
sand	crested
WW spar	intermediate
Buffalograss	pubescent
Green sprangletop	Siberian
Kleingrass	slender
Lovegrasses –	steambank
atherstone	tall
sand	thickspike
weeping	Western
wilman	Wildrye grass –
Orchardgrass	Russian

Maximize potential for grass establishment by consulting with the Natural Resource and Conservation Service of other government agencies or local experts concerning planting techniques and other cultural practices.

Performance from Escort® XP Herbicide may not always be satisfactory due to the inability of newly planted grass stands to sufficiently compete with weeds and the severity of weed pressure in new grass stands.

An additional herbicide application or mowing may be needed.

Use Rates and Application Timing for Grass Establishment Preplant (prior to planting) or Preemergence (after planting but before grass emergence)

Do not use more than 1/10 ounce per acre of Escort® XP Herbicide for grass establishment.

Apply Escort® XP Herbicide at 1/10 ounce per acre on all labeled grasses except orchardgrass and Russian wildrye grass. Do not apply Escort® XP Herbicide preplant or preemergence to orchardgrass and Russian wildrye grass as severe crop injury may result.

Early postemergence to new plantings

Apply Escort® XP Herbicide at 1/10 ounce per acre, plus a non-ionic surfactant at the rate of 2 to 4 pints per 100 gallons of spray solution on all labeled grasses anytime after grass emergence.

Do not use a spray adjuvant other than non-ionic surfactant.

Because grass species differ in time of emergence, apply only after the majority of grasses are in the 3 to 4 leaf stage.

Postemergence to stands with 1 – 5 leaf grasses planted the previous season

Apply Escort® XP Herbicide at 1/10 ounce per acre plus a non-ionic surfactant at the rate of 2 to 4 pints per 100 gallons of spray solution, on all labeled grasses when the majority of the grasses have one or more leaves.

Do not use a spray adjuvant other than non-ionic surfactant.

APPLICATION INFORMATION FOR ESTABLISHED GRASSES

Use Rates for Established Grasses

Apply up to 1 ounce Escort® XP Herbicide per acre as a broadcast application to established grasses. For spot applications, use 1 ounce per 100 gallons of water. Do not apply more than 1 2/3 ounces of Escort® XP Herbicide per acre per year.

Refer to the Weeds Controlled section of this label for a listing of the weeds controlled by Escort® XP Herbicide and the appropriate use rate to obtain control.

Application Timing – Established Grasses

Escort® XP Herbicide may be applied to established native grasses such as bluestems and grama, and on other established grasses such as bermudagrass, bluegrass, orchardgrass, bromegrass, fescue and timothy that were planted the previous growing season (or earlier) and are fully tillered, unless otherwise directed on this label. Specific application timing information on several of these grass species follows:

Grass	Minimum time from Grass establishment Escort® XP Herbicide application
Bermudagrass	2 months
Bluegrass, bromegrass, Orchardgrass	6 months
Timothy	12 months
Fescue	24 months

Fescue and Timothy Precautions

When used on fescue and timothy grasses, Escort® XP Herbicide may cause reduced first cutting yields due to temporary stunting, leaf yellowing, or seed head suppression. To help minimize these symptoms, follow the information below:

- Use the lowest labeled rate for the target weeds.
- Tank mix 2,4-D with Escort® XP Herbicide applications.
- Apply Escort® XP Herbicide at no more than 4/10 ounce per acre.
- Make applications when the grasses are 5 to 6 inches tall in late summer or fall.
- Use only a non-ionic surfactant at 1/2 pint per 100 gallons of spray solution.
- When liquid nitrogen is the spray carrier, do not include the surfactant.

Other Grasses:

Application of Escort® XP Herbicide to Pensacola bahiagrass, ryegrass (Italian or perennial) and Garrison's creeping foxtail may cause severe injury to and/or loss of forage.

Varieties and species of forage grasses differ in their tolerance to herbicides. When using Escort® XP Herbicide on a particular grass for the first time, limit use to a small area. If no injury occurs throughout the season, larger acreage may be treated the following season.

Broadleaf forage species, such as alfalfa and clover, are highly sensitive to Escort® XP Herbicide and will be severely stunted or injured by Escort® XP Herbicide.

CROP ROTATION

Before using Escort® XP Herbicide, carefully consider your crop rotation plans and options.

Minimum Rotational Intervals

Minimum rotation intervals* are determined by the rate of breakdown of Escort® XP Herbicide applied. Escort® XP Herbicide breakdown in the soil is affected by soil pH, presence of soil microorganisms, soil temperature, and soil moisture. Low soil pH, high soil temperature, and high soil moisture increase Escort® XP Herbicide breakdown in soil, while high soil pH, low soil temperature, and low soil moisture slow Escort® XP Herbicide breakdown.

Of these 3 factors, only soil pH remains relatively constant. Soil temperature, and to a greater extent, soil moisture, can vary significantly from year to year and from area to area. For this reason, monitor soil temperature and soil moisture on a regular basis when considering any crop rotations.

- * The minimum rotation interval represents the period of time from the last application to the anticipated date of the next planting.

Soil pH Limitations

Escort® XP Herbicide must not be used on soils having a pH above 7.9, as extended soil residual activity could extend crop rotation intervals beyond normal. Under certain conditions, Escort® XP Herbicide could remain in the soil for 34 months or more, injuring wheat and barley. In addition, other crops planted in high-pH soils can be extremely sensitive to low concentrations of Escort® XP Herbicide.

Checking Soil pH

Before using Escort® XP Herbicide, determine the soil pH of the areas of intended use. To obtain a representative pH value for the test area, take several 0" to 4" samples from different areas of the field and analyze them separately. Consult local extension publications for additional information on recommended soil sampling procedures.

BIOASSAY

A field bioassay must be completed before rotating to any crop or grass species/variety not listed in the Rotation Intervals Table, or if the soil pH is not in the specified range, or if the use rate applied is not specified in the table.

To conduct a field bioassay, grow test strips of the crop(s) or grass(es) you plan to grow the following year in fields previously treated with Escort® XP Herbicide. Crop or grass response to the bioassay will indicate whether or not to rotate to the crop(s) or grass(es) grown in the test strips.

If a field bioassay is planned, check with your local Agricultural dealer or Bayer CropScience LP representative for information detailing the field bioassay procedure.

IMPORTANT PRECAUTIONS

- Grass species or varieties may differ in their response to various herbicides. If no information is available, limit the initial use of Escort® XP Herbicide to a small area.

- Components in a grass seed mixture will vary in tolerance to Escort® XP Herbicide so the final stand may not reflect the seed ratio.
- Under certain conditions, such as heavy rainfall, high pH, prolonged cold weather, or wide fluctuations in day/night temperatures, prior to or soon after Escort® XP Herbicide application, temporary discoloration and/or grass injury may occur. Escort® XP Herbicide applied to grass that is stressed by severe weather conditions, drought, low fertility, water-saturated soils, disease, or insect damage can result in grass injury. Severe winter stress, drought, disease, or insect damage before or following application also may result in grass injury.
- Applications of Escort® XP Herbicide to lands undersown with legumes may cause injury to the legumes. Legumes in a seeding mixture may be severely injured or killed following an application of Escort® XP Herbicide.
- The control of weeds in wheel track areas may be reduced if ground applications are made when dry, dusty field conditions exist. The addition of 2,4-D or MCPA may improve weed control under these conditions.

WEEDS CONTROLLED 1/3 to 1/2 ounce per acre

Annual sowthistle	Corn cockle
Aster	Cow cockle
Bahiagrass	Crown vetch
Beebalm	Dandelion
Bittercress	Dogfennel
Bitter sneezeweed	False chamomile
Blackeyed-susan	Fiddleneck tarweed
Blue mustard	Field pennycress
Bur buttercup	Flixweed
Chicory	Goldenrod
Clover	Lambsquarters
Cocklebur	Marestail/horseweed****
Common chickweed	Maximillion sunflower
Common groundsel	Miners lettuce
Common purslane	Pennsylvania smartweed
Common yarrow	Plains coreopsis
Conical catchfly	Plantain

(continued)

WEEDS CONTROLLED *(continued)***1/3 to 1/2 ounce per acre**

Redroot pigweed	Treacle mustard
Redstem filaree	Tumble mustard
Rough fleabane	Wild carrot
Shepherd's purse	Wild garlic
Silky crazyweed (locoweed)	Wild lettuce
Smallseed falseflax	Wild mustard
Smooth pigweed	Wooly croton
Sweet clover	Wood sorrel
Tansymustard	Yankeweed

1/2 to 1 ounce per acre

Blackberry	Honeysuckle
Black henbane	Multiflora rose and other wild roses
Broom snakeweed*	Musk thistle***
Buckhorn plantain	Oxeye daisy
Bull thistle	Plumeless thistle
Common crupina	Prostrate knotweed
Common sunflower	Rosering gaillardia
Curly dock	Seaside arrowgrass
Dewberry	Sericea lespedeza
Dyer's woad	Tansy ragwort
Garlic mustard	Teasel
Gorse	Wild caraway
Halogeton	
Henbit	

1 to 2 ounces per acre

Common mullein	Purple loosestrife
Common tansy	Purple scabious
Field bindweed**	Scotch thistle
Greasewood	Scouringrush
Gumweed	Salsify
Houndstongue	Snowberry
Lupine	St. Johnswort
Old world climbing fern (Lygodium)	Sulphur cinquefoil
Perennial pepperweed	Western salsify
Poison hemlock	Whitetop (hoary cress)
	Wild Iris

1 1/2 to 2 ounces per acre

Canada thistle**	Tall larkspur
Dalmation toadflax**	Wild parsnip
Duncecap larkspur	Yellow toadflax**
Russian knapweed**	

2 ounces per acre

Onionweed

3 to 4 ounces per acre

Kudzu

* Apply fall through spring.

** Suppression, which is a visual reduction in weed competition (reduced population or vigor) as compared to untreated areas. Apply as a full coverage spray for best performance.

*** Certain biotypes of musk thistle are more sensitive to Escort® XP Herbicide and may be controlled with rates of 1/4 to 1/2 ounce per acre. Treatments of Escort® XP Herbicide may be applied from rosette through bloom stages of development.

**** Certain biotypes of maretail/horsetail are less sensitive to Escort® XP Herbicide and may be controlled by tank mixes with herbicides with a different mode of action.

Problem Weed Control

For broader spectrum control and for use on certain biotypes of broadleaf weeds which may be resistant to Escort® XP Herbicide and herbicides with the same mode of action, the following tank mixes may be used.

Dicamba + 2,4-D

Weed	Rate of Escort® XP Herbicide	Rate of dicamba (fluid ounces/acre)	Rate of 2,4-D (fluid ounces/acre)
Kochia control	1/2	8	16
Spotted knapweed control	1/2	8	16
Rush skeletonweed suppression	1	8	16

INDUSTRIAL TURFGRASS UNIMPROVED ONLY

Application Information

Escort® XP Herbicide is registered for selective weed control in unimproved industrial turfgrass where certain grasses are well established and desired as ground cover. Escort® XP Herbicide may also be used for the control of certain noxious and troublesome weeds in turfgrass.

In addition to conventional spray equipment, Escort® XP Herbicide may also be applied with invert emulsion equipment. When using an invert emulsion, mix the prescribed rate of Escort® XP Herbicide in the water phase. Consult the “Weeds Controlled” table to determine which weeds will be controlled by the following application rates:

Turfgrass Type	Rate of Escort® XP Herbicide (ounces/acre)
Fescue and Bluegrass	1/4 to 1/2
Crested Wheatgrass and Smooth Brome	1/4 to 1
Bermudagrass	1/4 to 2

Application Timing

Applications may be made at anytime of the year except when the soil is frozen.

When a spring application is made on fescue or bluegrass, a second application may be made during the summer after full seedhead maturation.

Growth Suppression and Seedhead Inhibition (Chemical Mowing)

Application Information

Escort® XP Herbicide may be used for growth suppression and seedhead inhibition in well established fescue and bluegrass turfgrass at the use rate of 1/4 to 1/2 ounce per acre.

Tank Mix Combination

Escort® XP Herbicide may be tank mixed with “Embark” for improved performance in the regulation of growth and seedhead suppression. Tank mix 1/4 to 1/2 ounce of Escort® XP Herbicide with 1/8 to 1/4 pint of “Embark”.

Application Timing

Application may be made after at least 2 to 3 inches of new growth has emerged until the appearance of the seed stalk.

IMPORTANT PRECAUTIONS —INDUSTRIAL TURFGRASS ONLY

- An application of Escort® XP Herbicide may cause temporary discoloration (chlorosis) or stunting of the turfgrasses. Use the lower specified rates for minimum discoloration or stunting.
- With fescue and bluegrass, sequential applications made during the same or consecutive growth periods (i.e. spring and fall) may result in excessive injury to turfgrass.
- Excessive injury may result when Escort® XP Herbicide is applied to turfgrass that is under stress from drought, insects, disease, cold temperatures (winter injury) or poor fertility.
- Escort® XP Herbicide is not recommended for use on bahiagrass.

BRUSH CONTROL

Application Information

Escort® XP Herbicide is registered for the control of undesirable brush growing in non-crop areas including grazed areas on these sites. Applications may be made by air, high volume ground application, low volume ground application and ultra-low volume ground application. Except as noted for multiflora rose, Escort® XP Herbicide must be applied as a spray to the foliage.

The application volume required will vary with the height and density of the brush and the application equipment used. Generally, aerial applications will require 15 to 25 gallons of water per acre; high volume ground application will require 100 to 400 gallons of water per acre; low volume ground application will require 20 to 50 gallons of water per acre; and ultra-low volume ground application will require 10 to 20 gallons of water per acre.

Regardless of the application volume and equipment used, thorough coverage of the foliage, particularly the terminal growing points, is necessary to optimize results.

BRUSH SPECIES CONTROLLED

Species	High Volume Rate (ounces/100 gallon)	Broadcast Rate (ounces/acre)
Ash	1—2	1—3
Aspen	1—2	1—3
Black locust	1—2	1—3
Blackberry	1—2	1—3
Camelthorn	1—2	1—3
Cherry	1—2	1—3
Cottonwood	1—2	2—3
Eastern red cedar	1—2	2—3
Elder	1—2	2—3
Elm	1—2	1—3
Firs	3	1—2
Hawthorn	1—2	1—3
Honeysuckle	1—2	1/2—1
Mulberry	1—2	2—3
Multiflora rose	1—2	1—3
Muscadine (wild grape)	1—2	2—3
Oaks	1—2	1—3
Ocean spray (Holodiscus)	1—2	2—3
Osage orange	1—2	2—3
Red maple	1—2	2—3
Salmonberry	1/2—1	1—3
Snowberry	1/2—1	1—3
Spruce (black and white)	3	2—3
Thimbleberry	1/2—1	1—3
Tree of heaven (Ailanthus)	1—2	1—2
Wild roses	1/2—1	1—3
Willow	1/2—1	1—3
Yellow poplar	1/2—1	1—3

For low volume and ultra-low volume ground applications, mix 4 to 8 ounces of Escort® XP Herbicide per 100 gallons of spray solution.

Application Timing

Make a foliar application of the specified rate of Escort® XP Herbicide during the period from full leaf expansion in the spring until the development of full fall coloration on deciduous species to be controlled. Coniferous species may be treated at anytime during the growing season.

Spot Treatment

Escort® XP Herbicide may be used for the control of many species of weeds including noxious/invasive weeds in certain established grasses growing on non-crop areas.

Refer to the "Weeds Controlled" section for a listing of susceptible weed species and the application rate per acre per the target weed.

Or, mix one gram of Escort® XP Herbicide per one gallon of water along with a surfactant. Spray to the point of wetting the entire surface of the target weeds, approximately 40 gallons of solution per acre.

Tank Mix Combinations—

Escort® XP Herbicide may be tank mixed with any product labeled for non-crop brush control at the application rates specified on the companion product's label for the pests specified on the product's companion label. Read and follow the label instructions of both products when tank mixing. Follow the most restrictive limitations of any of the product labels being tank mixed.

Low Rate Applications

Imazapyr (2 pound active per gallon)

Combine 1 to 2 ounces of Escort® XP Herbicide with 1 to 4 pints of imazapyr herbicide per acre and apply as a broadcast spray. For aerial applications use a minimum of 15 gallons per acre spray volume. In addition to species listed above controlled by Escort® XP Herbicide, this combination controls black gum, hophornbeam, sassafras, sweetgum, Vaccinium species, dogwood, myrtle dahoon, hickories, and persimmon.

Picloram* (2 pound active per gallon) + Imazapyr (2 pound active per gallon)

Combine 1 to 1 1/2 ounce of Escort® XP Herbicide with 2 to 8 fluid ounces of imazapyr and 1 to 2 pints of picloram per 100 gallons of water. Apply as a high volume spray. This tank mix controls cherry, elms, box elder, maples, hackberry, redbud, ash, oaks (including shingle oak), black locust, and sassafras.

*Picloram is a restricted use pesticide.

Spotgun Basal Soil Treatment

For control of multiflora rose, prepare a spray suspension of Escort® XP Herbicide by mixing 1 ounce per gallon of water. Mix vigorously until the Escort® XP Herbicide is dispersed and agitate periodically while applying the spray suspension.

Apply the spray preparation with an exact delivery handgun applicator. Apply at the rate of 4 milliliters for each 2 feet of rose canopy diameter. Direct the treatment to the soil within 2 feet of the stem union. When treating large plants and more than one delivery is required, make applications on opposite sides of the plant.

For best results, make applications from early spring to summer.

IMPORTANT PRECAUTIONS —NON-CROP BRUSH ONLY

- When using tank mixtures of Escort® XP Herbicide with companion herbicides, read and follow all use instructions, application rates, warnings, and precautions appearing on the labels. Follow the most restrictive label instructions for each of the herbicides used.

SPRAY EQUIPMENT

Low rates of Escort® XP Herbicide can kill or severely injure most crops. Following an Escort® XP Herbicide application, the use of spray equipment to apply other pesticides to crops on which Escort® XP Herbicide is not registered may result in their damage. The most effective way to reduce this crop damage potential is to use dedicated mixing and application equipment.

MIXING INSTRUCTIONS

1. Fill the tank 1/4 to 1/3 full of water.
2. While agitating, add the required amount of Escort® XP Herbicide.
3. Continue agitation until the Escort® XP Herbicide is fully dispersed, at least 5 minutes.
4. Once the Escort® XP Herbicide is fully dispersed, maintain agitation and continue filling tank with water. Escort® XP Herbicide must be thoroughly mixed with water before adding any other material.
5. As the tank is filling, add tank mix partners (if desired) then add the necessary volume of nonionic surfactant. Always add surfactant last.

6. If the mixture is not continuously agitated, settling will occur. If settling occurs, thoroughly re-agitate before using.
7. Escort® XP Herbicide spray preparations are stable if they are pH neutral or alkaline and stored at or below 100° F.
8. If Escort® XP Herbicide and a tank mix partner are to be applied in multiple loads, pre-slurry the Escort® XP Herbicide in clean water prior to adding to the tank. This will prevent the tank mix partner from interfering with the dissolution of the Escort® XP Herbicide.

PRODUCT PRECAUTIONS

- When used as directed, there is no grazing or haying restriction for use rates of 1 2/3 ounce per acre or less. At use rates greater than 1 2/3 ounce per acre and up to 3 1/3 ounce per acre, forage grasses may be cut for hay, fodder or green forage and fed to livestock, including lactating animals, 3 days after treatment.
- Injury to or loss of desirable trees or other plants may result if spray equipment is drained or flushed on or near these trees or plants, or on areas where their roots may extend, or in locations where the product may be washed or moved into contact with their roots.
- Treatment of powdery, dry soil or light, sandy soil when there is little likelihood of rainfall soon after treatment may result in off target movement and possible damage to susceptible crops when soil particles are moved by wind or water. Injury to crops may result if treated soil is washed, blown, or moved onto land used to produce crops. Exposure to Escort® XP Herbicide may injure or kill most crops. Injury may be more severe when the crops are irrigated. Do not apply Escort® XP Herbicide when these conditions are identified and powdery, dry soil or light or sandy soils are known to be prevalent in the area being treated.
- Applications made where runoff water flows onto agricultural land may injure crops. Applications made during periods of intense rainfall, to soils saturated with water, to surfaces paved with materials such as asphalt or concrete, or to soils through which rainfall will not readily penetrate may result in runoff and movement of Escort® XP Herbicide.
- Do not treat frozen or snow covered soil.
- Leave treated soil undisturbed to reduce the potential for Escort® XP Herbicide movement by soil erosion due to wind or water.

PRODUCT RESTRICTIONS

- Do not use on lawns, walks, driveways, tennis courts, or similar areas.
- Do not apply through any type of irrigation system.
- Do not use this product in the following counties of Colorado: Saguache, Rio Grande, Alamosa, Costilla and Conejos.
- Do not use this product in California.

SPRAYER CLEANUP

Sprayer equipment must be cleaned before Escort® XP Herbicide is sprayed. Follow the cleanup procedures specified on the labels of previously applied products. If no directions are provided, follow the six steps outlined below.

When multiple loads of Escort® XP Herbicide are applied, it is recommended that at the end of each day of spraying, the interior of the tank be rinsed with fresh water and then partially filled, and the boom and hoses flushed. This will prevent the buildup of dried pesticide deposits that can accumulate in the application equipment.

1. Drain tank; thoroughly rinse spray tanks, boom, and hoses with clean water. Loosen and physically remove any visible deposits.
2. Fill the tank with clean water and 1 gallon of ammonia (contains 3% active minimum) for every 100 gallons of water. Flush the hoses, boom, and nozzles with the cleaning solution. Then add more water to completely fill the tank. Circulate the cleaning solution through the tank and hoses for at least 15 minutes. Flush the hoses, boom, and nozzles again with the cleaning solution, and then drain the tank.
3. Remove the nozzles and screens and clean separately in a bucket containing cleaning agent and water.
4. Repeat step 2.
5. Rinse the tank, boom, and hoses with clean water.
6. Dispose of the rinsate on a labeled site or at an approved waste disposal facility. If a commercial cleaner is used follow the commercial cleaner directions for rinsate disposal.

Notes:

1. Mixing chlorine bleach with ammonia can cause dangerous gases to form. Clean spray equipment outdoors.
2. Use steam cleaning or other commercial cleaners to facilitate the removal of any caked pesticide deposits.

3. When Escort® XP Herbicide is tank mixed with other pesticides, all cleanout procedures for each product must be examined and the most rigorous procedure must be followed.
4. In addition to this cleanout procedure, all pre-cleanout guidelines on subsequently applied products must be followed as per the individual product labels.

SPRAY DRIFT MANAGEMENT

The interaction of many equipment and weather-related factors determines the potential for spray drift. The applicator is responsible for considering all these factors when making application decisions. Avoiding spray drift is the responsibility of the applicator.

IMPORTANCE OF DROPLET SIZE

The most effective drift management strategy is to apply the largest droplets which are consistent with pest control objectives. The presence of sensitive species nearby, the environmental conditions, and pest pressure may affect how an applicator balances drift control and coverage. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly or under unfavorable environmental conditions.

A droplet size classification system describes the range of droplet sizes produced by spray nozzles. The American Society of Agricultural and Biological Engineers (ASABE) provide a Standard that describes droplet size spectrum categories defined by a number of reference nozzles (fine, coarse, etc.). Droplet spectra resulting from the use of a specific nozzle may also be described in terms of volume mean diameter (VMD). Coarser droplet size spectra have larger VMD's and lower drift potential.

Controlling Droplet Size - General Techniques

- **Nozzle Type** - Select a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. The use of low-drift nozzles will reduce drift potential.
- **Pressure** - The lowest spray pressures recommended for the nozzle produce the largest droplets. Higher pressure reduces droplet size and does not improve canopy penetration. When higher flow rates are needed, using a higher-capacity nozzle instead of increasing pressure results in the coarsest droplet spectrum.
- **Flow Rate/Orifice Size** - Using the highest flow rate nozzles (largest orifice) that are consistent with pest control objectives reduces the potential for spray drift. Nozzles with higher rated flows produce coarser droplet spectra.

Controlling Droplet Size - Aircraft

- Nozzle Type - Solid stream, or other low drift nozzles produce the coarsest droplet spectra.
- Number of Nozzles - Using the minimum number of nozzles with the highest flow rate that provide uniform coverage will produce a coarser droplet spectrum
- Nozzle Orientation - Orienting nozzles in a manner that minimizes the effects of air shear will produce the coarsest droplet spectra. For some nozzles, such as solid stream, pointing the nozzles straight back parallel to the airstream will produce a coarser droplet spectrum than other orientations.
- Pressure - Selecting the pressure that produces the coarsest droplet spectrum for a particular nozzle and airspeed reduces spray drift potential. For some nozzle types, such as solid streams, lower pressures can produce finer droplet spectra and increase drift potential.

BOOM LENGTH (AIRCRAFT), AND APPLICATION HEIGHT

- Boom Length (aircraft) - Using shorter booms decreases drift potential. Boom lengths are expressed as a percentage of an aircraft's wingspan or a helicopter's rotor blade diameter. Shorter boom length and proper positioning can minimize drift caused by wingtip or rotor vortices.
- Application Height (aircraft) - Applications made at the lowest height that are consistent with pest control objectives and the safe operation of the aircraft will reduce the potential for spray drift.
- Application Height (ground) - Applications made at the lowest height consistent with pest control objectives, and that allow the applicator to keep the boom level with the application site and minimize bounce, will reduce the exposure of spray droplets to evaporation and wind, and reduce spray drift potential.

WIND

Drift potential is lowest when applications are made in light to gentle sustained winds (2-10 mph), which are blowing in a constant direction. Many factors, including droplet size and equipment type also determine drift potential at any given wind speed. **AVOID GUSTY OR WINDLESS CONDITIONS.**

Local terrain can also influence wind patterns. Every applicator is expected to be familiar with local wind patterns and how they affect spray drift.

TEMPERATURE AND HUMIDITY

Setting up equipment to produce larger droplets to compensate for droplet evaporation can reduce spray drift potential. Droplet evaporation is most severe when conditions are both hot and dry.

SURFACE TEMPERATURE INVERSIONS

Drift potential is high during a surface temperature inversion. Surface inversions restrict vertical air mixing, which may cause small suspended droplets to remain close to the ground and move laterally in a concentrated cloud. Surface inversions are characterized by increasing temperature with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Mist or fog may indicate the presence of an inversion in humid areas. Inversions may also be identified by producing smoke and observing its behavior. Smoke that remains close to the ground, or moves laterally in a concentrated cloud under low wind conditions indicates a surface inversion. Smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

SHIELDED SPRAYERS

Shielding the boom or individual nozzles can reduce the effects of wind. However, it is the responsibility of the applicator to verify that the shields are minimizing drift potential and not interfering with uniform deposition of the product.

AIR ASSISTED (AIR BLAST) FIELD CROP SPRAYERS

Air assisted field crop sprayers carry droplets to the target via a downward directed air stream. Some may reduce the potential for drift, but if a sprayer is unsuitable for the application and/or set up improperly, high drift potential can result. It is the responsibility of the applicator to determine that a sprayer is suitable for the intended application, that it is configured properly, and that drift potential has been minimized.

Note: Air assisted field sprayers can affect product performance by affecting spray coverage and canopy penetration. Read the specific crop use and application equipment instructions to determine if an air assisted field crop sprayer can be used.

SENSITIVE AREAS

Making applications when there is a sustained wind moving away from adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is an effective way to minimize the effect of spray drift.

DRIFT CONTROL ADDITIVES

Using product compatible drift control additives can reduce drift potential. When a drift control additive is used, read and carefully observe cautionary statements and all other information on the additive's label. If using an additive that increases viscosity, ensure that the nozzles and other application equipment will function properly with a viscous spray solution. Preferred drift control additives have been certified by the Chemical Producers and Distributors Association (CPDA).

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage and disposal.

Pesticide Storage: Store product in original container only. Store in a cool, dry place.

Pesticide Disposal: Waste resulting from the use of this product must be disposed of on site or at an approved waste disposal facility.

Container Handling:

Refer to the Net Contents section of this product's labeling for the applicable "Nonrefillable Container" or "Refillable Container" designation.

Nonrefillable Plastic and Metal Containers (Capacity Equal to or Less Than 50 Pounds): Nonrefillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then, for Plastic Containers, offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration. Do not burn, unless allowed by state and local ordinances. For Metal Containers, offer for recycling if available or reconditioning if appropriate, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

Nonrefillable Plastic and Metal Containers (Capacity Greater Than 50 Pounds): Nonrefillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. Then, for Plastic Containers, offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration. Do not burn, unless allowed by state and local ordinances. For Metal Containers, offer for recycling if available or reconditioning if appropriate, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

Nonrefillable Plastic and Metal Containers, e.g., Intermediate Bulk Containers [IBC] (Size or Shape Too Large to be Tipped, Rolled or Turned Upside Down): Nonrefillable container. Do not reuse or refill this container. Clean container promptly after emptying the contents from this container into application equipment or mix tank and before final disposal using the following pressure rinsing procedure. Insert a lance fitted with a suitable tank cleaning nozzle into the container and ensure that the water spray thoroughly covers the top, bottom, and all sides inside the container. The nozzle manufacturer generally provides instructions for the appropriate spray pressure, spray duration and/or spray volume. If the manufacturer's instructions are not available, pressure rinse the container for at least 60 seconds using a minimum pressure of 30 PSI with a minimum rinse volume of 10% of the container volume. Drain, pour or pump rinsate into application equipment or rinsate collection system. Repeat this pressure rinsing procedure two more times. Then, for Plastic Containers, offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration. For Metal Containers, offer for recycling if available or reconditioning if appropriate, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

STORAGE AND DISPOSAL *(continued)*

Nonrefillable Paper or Plastic Bags, Fiber Sacks including Flexible Intermediate Bulk Containers (FIBC) or Fiber Drums With Liners: Nonrefillable container. Do not reuse or refill this container. Completely empty paper or plastic bag, fiber sack or drum liner by shaking and tapping sides and bottom to loosen clinging particles. Empty residue into application or manufacturing equipment. Then offer for recycling if available or dispose of empty paper or plastic bag, fiber sack or fiber drum and liner in a sanitary landfill, or by incineration. Do not burn, unless allowed by state and local ordinances.

Refillable Fiber Drums With Liners: Refillable container (fiber drum only). Refilling Fiber Drum: Refill this fiber drum with Escort® XP Herbicide containing metsulfuron methyl only. Do not reuse this fiber drum for any other purpose. Cleaning before refilling is the responsibility of the refiller. Completely empty liner by shaking and tapping sides and bottom to loosen clinging particles. Empty residue into application or manufacturing equipment. Disposing of Fiber Drum and/or Liner: Do not reuse this fiber drum for any other purpose other than refilling (see preceding). Cleaning the container (liner and/or fiber drum) before final disposal is the responsibility of the person disposing of the container. Offer the liner for recycling if available or dispose of liner in a sanitary landfill, or by incineration. Do not burn, unless allowed by state and local ordinances. If drum is contaminated and cannot be reused, dispose of it in the manner required for its liner. To clean the fiber drum before final disposal, completely empty the fiber drum by shaking and tapping sides and bottom to loosen clinging particles. Empty residue into application or manufacturing equipment. Then offer the fiber drum for recycling if available or dispose of in a sanitary landfill, or by incineration. Do not burn, unless allowed by state and local ordinances.

All Other Refillable Containers: Refillable container. Refilling Container: Refill this container with Escort® XP Herbicide containing metsulfuron methyl only. Do not reuse this container for any other purpose. Cleaning before refilling is the responsibility of the refiller. Prior to refilling, inspect carefully for damage such as cracks, punctures, abrasions, worn out threads and closure devices. If damage is found, do not use the container, contact Bayer CropScience LP at the number below for instructions. Check for leaks after refilling and before transporting. If leaks are found, do not reuse or transport container, contact Bayer CropScience LP at the number below for instructions. Disposing of Container: Do not reuse this container for any other purpose other than refilling (see preceding). Cleaning the container before final disposal is the responsibility of the person disposing of the container. To clean the container before final disposal, use the following pressure rinsing procedure. Insert a lance fitted with a suitable tank cleaning nozzle into the container and ensure that the water spray thoroughly covers the top, bottom, and all sides inside the container. The nozzle manufacturer generally provides instructions for the appropriate spray pressure, spray duration and/or spray volume. If the manufacturer's instructions are not available, pressure rinse the container for at least 60 seconds using a minimum pressure of 30 PSI with a minimum rinse volume of 10% of the container volume. Drain, pour, or pump rinsate into application equipment or rinsate collection system. Repeat this pressure rinsing procedure two more times. Then, for Plastic Containers, offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration. Do not burn, unless allowed by state and local ordinances. For Metal Containers, offer for recycling if available or reconditioning if appropriate, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

Outer Foil Pouches of Water Soluble Packets (WSP): Nonrefillable container. Do not reuse or refill this container. Offer for recycling if available or, dispose of the pouch outer foil pouch in the trash as long as WSP is unbroken. If the outer pouch contacts the formulated product in any way, the pouch must be triple rinsed with clean water. Add the rinsate to the spray tank and dispose of the outer pouch as described previously.

Do not transport if this container is damaged or leaking. If the container is damaged, leaking or obsolete, or in the event of a major spill, fire or other emergency, contact Bayer CropScience LP at 1-800-334-7577, day or night.

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Embark is a registered trademark of PBI Gordon Corporation.

CONDITIONS OF SALE AND LIMITATIONS OF WARRANTY AND LIABILITY

Read the entire Directions for Use, Conditions, Disclaimer of Warranties and Limitations of Liability before using this product. If terms are not acceptable, return the unopened product container at once.

By using this product, user or buyer accepts the following Conditions, Disclaimer of Warranties and Limitations of Liability.

CONDITIONS: The directions for use of this product are believed to be adequate and must be followed carefully. However, it is impossible to eliminate all risks associated with the use of this product. Ineffectiveness, plant injury, other property damage, as well as other unintended consequences may result because of factors beyond the control of Bayer CropScience LP. Those factors include, but are not limited to, weather conditions, presence of other materials or the manner of use or application. All such risks shall be assumed by the user or buyer.

DISCLAIMER OF WARRANTIES: TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BAYER CROPSCIENCE LP MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE, THAT EXTEND BEYOND THE STATEMENTS MADE ON THIS LABEL. No agent of Bayer CropScience LP is authorized to make any warranties beyond those contained herein or to modify the warranties contained herein. TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BAYER CROPSCIENCE LP DISCLAIMS ANY LIABILITY WHATSOEVER FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT.

LIMITATIONS OF LIABILITY: TO THE EXTENT CONSISTENT WITH APPLICABLE LAW THE EXCLUSIVE REMEDY OF THE USER OR BUYER FOR ANY AND ALL LOSSES, INJURIES OR DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT, WHETHER IN CONTRACT, WARRANTY, TORT, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE, SHALL NOT EXCEED THE PURCHASE PRICE PAID, OR AT BAYER CROPSCIENCE LP'S ELECTION, THE REPLACEMENT OF PRODUCT.

For product information call: 1-800-331-2867

Produced for:
Bayer Environmental Science
A Division of Bayer CropScience LP
2 T. W. Alexander Drive
Research Triangle Park, NC 27709

Bayer



ESCORT® XP HERBICIDE

Version 1.0 / USA
102000030324

1/10
Revision Date: 06/16/2015
Print Date: 06/17/2015

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product identifier

Trade name ESCORT® XP HERBICIDE

Product code (UVP) 84100846

SDS Number 102000030324

EPA Registration No. 432-1549

Relevant identified uses of the substance or mixture and uses advised against

Use Herbicide

Restrictions on use See product label for restrictions.

Information on supplier

Supplier Bayer CropScience
2 T.W. Alexander Drive
Research Triangle PK, NC 27709
United States

Responsible Department Email: SDSINFO.BCS-NA@bayer.com

Emergency telephone no.

Emergency Telephone Number (24hr/ 7 days) 1-800-334-7577

Product Information Telephone Number 1-866-99BAYER (1-866-992-2937)

SECTION 2: HAZARDS IDENTIFICATION

Classification in accordance with regulation HCS 29CFR §1910.1200

This material is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

Other hazards

No particular hazards known.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Component Name	CAS-No.	Concentration % by weight
Metsulfuron-methyl	74223-64-6	60.0
Sulfonated aromatic polymer, sodium salt	68425-94-5	3.2



ESCORT® XP HERBICIDE

Version 1.0 / USA
102000030324

2/10
Revision Date: 06/16/2015
Print Date: 06/17/2015

SECTION 4: FIRST AID MEASURES

Description of first aid measures

General advice	When possible, have the product container or label with you when calling a poison control center or doctor or going for treatment.
Inhalation	Move to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a physician or poison control center immediately.
Skin contact	Take off contaminated clothing and shoes immediately. Wash off immediately with plenty of water for at least 15 minutes. Call a physician or poison control center immediately.
Eye contact	Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a physician or poison control center immediately.
Ingestion	Call a physician or poison control center immediately. Rinse out mouth and give water in small sips to drink. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Do not leave victim unattended.

Most important symptoms and effects, both acute and delayed

Symptoms To date no symptoms are known.

Indication of any immediate medical attention and special treatment needed

Treatment Appropriate supportive and symptomatic treatment as indicated by the patient's condition is recommended. There is no specific antidote.

SECTION 5: FIREFIGHTING MEASURES

Extinguishing media

Suitable	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Unsuitable	High volume water jet

Special hazards arising from the substance or mixture Dangerous gases are evolved in the event of a fire.

Advice for firefighters

Special protective equipment for fire-fighters Firefighters should wear NIOSH approved self-contained breathing apparatus and full protective clothing.

Further information Keep out of smoke. Fight fire from upwind position. Cool closed containers exposed to fire with water spray. Do not allow run-off from fire fighting to enter drains or water courses. Whenever possible, contain fire-fighting water by diking area with sand or earth.



ESCORT® XP HERBICIDE

Version 1.0 / USA
102000030324

3/10
Revision Date: 06/16/2015
Print Date: 06/17/2015

Flash point	not applicable
Autoignition temperature	> 400 °C / > 752 °F
Lower explosion limit	not applicable
Upper explosion limit	not applicable
Explosivity	no data available

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Precautions Keep unauthorized people away. Isolate hazard area. Avoid contact with spilled product or contaminated surfaces.

Methods and materials for containment and cleaning up

Methods for cleaning up Sweep up or vacuum up spillage and collect in suitable container for disposal. Clean contaminated floors and objects thoroughly, observing environmental regulations. Contaminated soil may have to be removed and disposed.

Additional advice Use personal protective equipment. Do not allow to enter soil, waterways or waste water canal. Do not allow product to contact non-target plants.

Reference to other sections Information regarding safe handling, see section 7.
Information regarding personal protective equipment, see section 8.
Information regarding waste disposal, see section 13.

SECTION 7: HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Ensure adequate ventilation. Handle and open container in a manner as to prevent spillage.

Hygiene measures Wash hands thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, using the toilet or applying cosmetics.
Remove Personal Protective Equipment (PPE) immediately after handling this product. Remove soiled clothing immediately and clean thoroughly before using again. Wash thoroughly and put on clean clothing.

Conditions for safe storage, including any incompatibilities



ESCORT® XP HERBICIDE

Version 1.0 / USA
102000030324

4/10
Revision Date: 06/16/2015
Print Date: 06/17/2015

Requirements for storage areas and containers

Keep containers tightly closed in a dry, cool and well-ventilated place. Store in a cool, dry place and in such a manner as to prevent cross contamination with other crop protection products, fertilizers, food, and feed. Store in original container and out of the reach of children, preferably in a locked storage area.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Components	CAS-No.	Control parameters	Update	Basis
Sucrose	57-50-1	10 mg/m ³ (TWA)	02 2012	ACGIH
Sucrose (Respirable.)	57-50-1	5 mg/m ³ (REL)	2010	NIOSH
Sucrose (Total)	57-50-1	10 mg/m ³ (REL)	2010	NIOSH
Sucrose (Total dust.)	57-50-1	15 mg/m ³ (PEL)	02 2006	OSHA Z1
Sucrose (Respirable fraction.)	57-50-1	5 mg/m ³ (PEL)	02 2006	OSHA Z1
Sucrose (Respirable fraction.)	57-50-1	5 mg/m ³ (TWA)	1989	OSHA Z1A
Sucrose (Total dust.)	57-50-1	15 mg/m ³ (TWA)	1989	OSHA Z1A
Sucrose (Respirable fraction.)	57-50-1	5 mg/m ³ (TWA)	06 2008	TN OEL
Sucrose (Total dust.)	57-50-1	15 mg/m ³ (TWA)	06 2008	TN OEL
Sucrose (Particulate.)	57-50-1	5ug/m ³ (AN ESL)	02 2013	TX ESL
Sucrose (Particulate.)	57-50-1	50ug/m ³ (ST ESL)	02 2013	TX ESL

Exposure controls

Personal protective equipment

In normal use and handling conditions please refer to the label and/or leaflet. In all other cases the following recommendations would apply.

Respiratory protection

When respirators are required, select NIOSH approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industry recommendations.

Hand protection

Chemical resistant nitrile rubber gloves

Eye protection

Safety glasses with side-shields

Skin and body protection

Wear long-sleeved shirt and long pants and shoes plus socks.

General protective measures

Follow manufacturer's instructions for cleaning/maintaining PPE. If



ESCORT® XP HERBICIDE

Version 1.0 / USA
102000030324

5/10
Revision Date: 06/16/2015
Print Date: 06/17/2015

no such instructions for washables, use detergent and warm/tepid water.

Keep and wash PPE separately from other laundry.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	light brown
Physical State	granular
Odor	slight
Odour Threshold	no data available
pH	5.0 at 1 % (as aqueous solution)
Vapor Pressure	no data available
Vapor Density (Air = 1)	no data available
Bulk density	690 kg/m ³ (bulk density tapped)
Evaporation rate	not applicable
Boiling Point	not applicable
Melting / Freezing Point	not applicable
Water solubility	dispersible
Minimum Ignition Energy	no data available
Decomposition temperature	no data available
Partition coefficient: n-octanol/water	not applicable
Viscosity	not applicable
Flash point	not applicable
Autoignition temperature	> 400 °C / > 752 °F
Lower explosion limit	not applicable
Upper explosion limit	not applicable
Explosivity	no data available



ESCORT® XP HERBICIDE

Version 1.0 / USA
102000030324

6/10
Revision Date: 06/16/2015
Print Date: 06/17/2015

SECTION 10: STABILITY AND REACTIVITY

Reactivity

Thermal decomposition	no data available
Chemical stability	Stable under normal conditions.
Possibility of hazardous reactions	No hazardous reactions when stored and handled according to prescribed instructions.
Conditions to avoid	no data available
Incompatible materials	no data available
Hazardous decomposition products	No decomposition products expected under normal conditions of use.

SECTION 11: TOXICOLOGICAL INFORMATION

Exposure routes Eye contact, Inhalation, Ingestion, Skin contact

Immediate Effects

Eye Causes eye irritation.

Information on toxicological effects

Acute oral toxicity	LD50 (rat) > 5,000 mg/kg
Acute inhalation toxicity	LC50 (rat) > 5.0 mg/l Exposure time: 4 h The value mentioned relates to the active ingredient metsulfuron methyl.
Acute dermal toxicity	LD50 (rabbit) > 5,000 mg/kg
Skin irritation	No skin irritation (rabbit)
Eye irritation	Slight irritation (rabbit)
Sensitisation	Non-sensitizing. (guinea pig) OECD Test Guideline 406, Buehler test

ACGIH

None.

NTP

None.

IARC

None.

OSHA

None.



ESCORT® XP HERBICIDE

Version 1.0 / USA
102000030324

7/10
Revision Date: 06/16/2015
Print Date: 06/17/2015

Further information

Only acute toxicity studies have been performed on the formulated product.

SECTION 12: ECOLOGICAL INFORMATION

Toxicity to fish	LC50 (Oncorhynchus mykiss (rainbow trout)) > 150 mg/l Exposure time: 96 h The value mentioned relates to the active ingredient metsulfuron methyl. LC50 (Lepomis macrochirus (Bluegill sunfish)) > 150 mg/l Exposure time: 96 h The value mentioned relates to the active ingredient metsulfuron methyl.
Toxicity to aquatic invertebrates	EC50 (Daphnia (water flea)) > 120 mg/l Exposure time: 48 h The value mentioned relates to the active ingredient metsulfuron methyl.
Toxicity to aquatic plants	EC50 (Anabaena flos-aquae (cyanobacterium)) 0.066 mg/l Exposure time: 72 h The value mentioned relates to the active ingredient metsulfuron methyl. EC50 (Lemna minor (Common duck-weed)) 0.00036 mg/l Exposure time: 14 d The value mentioned relates to the active ingredient metsulfuron methyl.
Environmental precautions	Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate surface or ground water by cleaning equipment or disposal of wastes, including equipment wash water.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods

Product	Do not contaminate water, food, or feed by disposal. Dispose of unused product by incineration at a licensed incineration plant, in accordance with all applicable national and local regulations.
Contaminated packaging	Consult state and local regulations regarding the proper disposal of container. Follow advice on product label and/or leaflet.
RCRA Information	Characterization and proper disposal of this material as a special or hazardous waste is dependent upon Federal, State and local laws and are the user's responsibility. RCRA classification may apply.



ESCORT® XP HERBICIDE

Version 1.0 / USA
102000030324

8/10
Revision Date: 06/16/2015
Print Date: 06/17/2015

SECTION 14: TRANSPORT INFORMATION

49CFR Not dangerous goods / not hazardous material

IMDG

UN number **3077**
Class 9
Packaging group III
Marine pollutant YES
Proper shipping name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID,
N.O.S.
(METSULFURON-METHYL MIXTURE)

IATA

UN number **3077**
Class 9
Packaging group III
Environm. Hazardous Mark YES
Proper shipping name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID,
N.O.S.
(METSULFURON-METHYL MIXTURE)

This transportation information is not intended to convey all specific regulatory information relating to this product. It does not address regulatory variations due to package size or special transportation requirements.

SECTION 15: REGULATORY INFORMATION

EPA Registration No. 432-1549

US Federal Regulations

TSCA list

Sulfonated aromatic polymer, sodium salt 68425-94-5

US. Toxic Substances Control Act (TSCA) Section 12(b) Export Notification (40 CFR 707, Subpt D)

None.

SARA Title III - Section 302 - Notification and Information

None.

SARA Title III - Section 313 - Toxic Chemical Release Reporting

None.

US States Regulatory Reporting

CA Prop65

This product does not contain any substances known to the State of California to cause cancer.

This product does not contain any substances known to the State of California to cause reproductive harm.

US State Right-To-Know Ingredients

None.

Canadian Regulations



ESCORT® XP HERBICIDE

Version 1.0 / USA
102000030324

9/10
Revision Date: 06/16/2015
Print Date: 06/17/2015

Canadian Domestic Substance List

None.

Environmental

CERCLA

None.

Clean Water Section 307 Priority Pollutants

None.

Safe Drinking Water Act Maximum Contaminant Levels

None.

EPA/FIFRA Information:

This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and for workplace labels of non-pesticide chemicals. Following is the hazard information required on the pesticide label:

Signal word: Caution!

Hazard statements: Causes eye irritation.
Avoid breathing dust or spray mist.
Avoid contact with skin, eyes and clothing.

SECTION 16: OTHER INFORMATION

Abbreviations and acronyms

49CFR	Code of Federal Regulations, Title 49
ACGIH	US. ACGIH Threshold Limit Values
CAS-Nr.	Chemical Abstracts Service number
EINECS	European inventory of existing commercial substances
ELINCS	European list of notified chemical substances
IARC	US. IARC Monographs on Occupational Exposures to Chemical Agents
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
N.O.S.	Not otherwise specified
NTP	US. National Toxicology Program (NTP) Report on Carcinogens
OECD	Organization for Economic Co-operation and Development
TDG	Transportation of Dangerous Goods
TWA	Time weighted average
UN	United Nations
WHO	World health organisation



ESCORT® XP HERBICIDE

Version 1.0 / USA
102000030324

10/10
Revision Date: 06/16/2015
Print Date: 06/17/2015

NFPA 704 (National Fire Protection Association):

Health - 1 Flammability - 1 Instability - 0 Others - none

HMIS (Hazardous Materials Identification System, based on the Third Edition Ratings Guide)

Health - 1 Flammability - 1 Physical Hazard - 0 PPE -

0 = minimal hazard, 1 = slight hazard, 2 = moderate hazard, 3 = severe hazard, 4 = extreme hazard

Reason for Revision: New Safety Data Sheet.

Revision Date: 06/16/2015

This information is provided in good faith but without express or implied warranty. The customer assumes all responsibility for safety and use not in accordance with label instructions. The product names are registered trademarks of Bayer.

Patriot

Active Ingredient

Metsulfuron Methyl

GROUP 2 HERBICIDE

Patriot®

Selective Herbicide

ACTIVE INGREDIENT:

Metsulfuron Methyl: Methyl 2-[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino] Carbonyl]amino]sulfonyl]benzoate	60.0%
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OTHER INGREDIENTS:

40.0%

TOTAL:

100.0%

**KEEP OUT OF REACH OF CHILDREN
CAUTION / PRECAUCION**

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand this label, find someone to explain it to you in detail.)

**SEE INSIDE BOOKLET FOR ADDITIONAL PRECAUTIONARY STATEMENTS
AND FIRST AID**

EPA Reg. No 228-391

For Chemical Spill, Leak, Fire,
or Exposure, Call CHEMTREC
(800) 424-9300

For Medical Emergencies Only,
Call (877) 325-1840

Manufactured for
Nufarm Americas Inc.
11901 S. Austin Avenue
Alsip, IL 60803



Nufarm

Grow a better tomorrow.

FIRST AID

IF SWALLOWED	<ul style="list-style-type: none">• Call a doctor or poison control center immediately for treatment advice.• Have person sip a glass of water if able to swallow.• Do not induce vomiting unless told to do so by a poison control center or doctor.• Do not give anything by mouth to an unconscious person.
IF ON SKIN OR CLOTHING	<ul style="list-style-type: none">• Take off contaminated clothing.• Rinse skin immediately with plenty of water for 15 to 20 minutes.• Call a poison control center or doctor for treatment advice.
IF IN EYES	<ul style="list-style-type: none">• Hold eye open and rinse slowly and gently with water for 15 to 20 minutes.• Remove contact lenses, if present, after first 5 minutes, rinsing eye.• Call a poison control center or doctor for treatment advice.
IF INHALED	<ul style="list-style-type: none">• Move person to fresh air.• If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible.• Call a poison control center or doctor for further treatment advice.

HOTLINE NUMBER

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact (877) 325-1840 for emergency medical treatment information.

PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS CAUTION / PRECAUCION

Causes eye irritation. Avoid contact with skin, eyes or clothing. Avoid breathing dust or spray mist.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Applicators and other handlers who handle this pesticide for any use covered by the Worker Protection Standard [(40 CFR Part 170)] must wear:

- Long-sleeved shirt and long pants.
- Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE, if no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Control Statements:

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides (40CFR 170.240 (d) (4-6), the handler PPE requirements may be reduced or modified as specified in the WPS.

IMPORTANT: When reduced PPE is worn because a closed system is being used, handlers must be provided all PPE specified above for "applicators and other handlers" and have such PPE immediately available for use in a emergency, such as a spill or equipment break-down.

USER SAFETY RECOMMENDATIONS

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS

Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.

This herbicide is injurious to plants at extremely low concentrations. Nontarget plants may be adversely affected from drift and run-off.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency in your State responsible for pesticide regulation.

This product must be used only in accordance with the instructions on this label.

Nufarm will not be responsible for losses or damages resulting from the use of this product in any manner not specified by Nufarm. User assumes all risks associated with such uses not on this label.

For tank mixes, use the most restrictive limitations from the labeling of the products being mixed. Use only those tank mix partners which are labeled for the appropriate use site. Do not use on food or feed crops except as specified by this label or supplemental labeling.

TANK MIXES

This product may be tank mixed with other herbicides registered for the use sites described in this label. Use only those tank mix partners which are labeled for the appropriate use site. When tank mixing, use the most restrictive label limitations for each of the products being used in the tank mix.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls, and
- Shoes plus socks.

NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries or greenhouses.

Keep people and pets off treated areas until sprays have dried.

Non-crop industrial weed control, selective weed control in turf (industrial, unimproved only), and weed control in pastures and rangeland are not within the scope of the Worker Protection Standard.

Keep unprotected persons out of treated areas until sprays have dried.

IMPORTANT

DO NOT USE ON FOOD OR FEED CROPS EXCEPT AS SPECIFIED BY THIS LABEL OR SUPPLEMENTAL LABELING. Injury to or loss of desirable trees or other plants may result from failure to observe the following: Do not apply Patriot (except as directed), or drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend or in locations where the chemical may be washed or moved into contact with their roots. Do not use on lawns, walks, driveways, tennis courts, or similar areas. Prevent drift of spray to desirable plants. Do not contaminate any body of water, including irrigation water. Keep from contact with fertilizers, insecticides, fungicides and seeds. Following a Patriot application, do not use sprayer for application to food or feed crops other than as directed by EPA registered label instructions. This is extremely important, as low rates of Patriot can kill or severely injure most crops (except small grains).

PRODUCT INFORMATION

Patriot is a water dispersible granule (WDG) that is mixed in water and applied as a spray. Patriot controls many annual and perennial weeds and woody plants in noncrop areas, conifer and hardwood plantations.

Patriot is mixed in water or can be preslurried in water and added to liquid nitrogen carrier solutions and applied as a uniform broadcast spray.

Patriot is noncorrosive, nonflammable, nonvolatile, and does not freeze.

Patriot controls many annual and perennial weeds and unwanted woody plants on private, public and military lands, on rights-of-way, industrial sites, non-crop areas, ditchbanks of dry drainage ditches, certain types of unimproved turf grass, and conifer and hardwood plantations, including grazed areas on these sites. Do not use on irrigation ditches.

Patriot may also be used for controlling and suppressing undesirable weeds and hardwoods in conifer plantations, on land primarily dedicated to the production of wheat (including durum), barley, triticale, fallow lands, pasture, and rangeland, CRP land and on irrigated or dry land grain sorghum in Colorado, Kansas, Nebraska, Oklahoma, and Texas (north of Interstate 20), as well as selected uncultivated agricultural areas (fence rows, farmyards, and rights-of-way). Patriot may also be used for controlling and suppressing undesirable weeds and hardwoods directly adjacent to treated pastures or rangeland, where grazing or harvesting for animal feed may occur.

Patriot controls weeds and woody plants primarily by postemergent activity. For best results, apply Patriot to young, actively growing weeds. Although Patriot has preemergence activity at the higher use rates, best results are generally obtained when Patriot is applied to foliage after emergence or dormancy break. Generally, for the control of annual weeds, Patriot provides best results when applied to young, actively growing weeds. For the control of perennial weeds, applications made at the bud/bloom stage or while the target weeds are in the fall rosette stage may provide the best results. The use rate depends upon the weed species and size at the time of application.

The degree and duration of control may depend on the following:

- Weed spectrum and infestation intensity
- Weed size at application
- Environmental conditions at and following treatment
- Soil pH, soil moisture, and soil organic matter.

Patriot may be applied on conifer and hardwood plantations and noncrop sites that contain areas of temporary surface water caused by the collection of water between planting beds, in equipment ruts, or in other depressions created by management activities. It is permissible to treat intermittently flooded low lying sites when no water is present. It is also permissible to treat marshes, swamps, and bogs after water has receded as well as seasonally dry floodplains where surface water is not present, terrestrial areas of deltas and low lying areas where water is drained but may be isolated in pockets due to uneven or unlevel conditions. Do not make applications to natural or man-made bodies of water such as lakes, reservoirs, ponds, streams and canals.

IMPORTANT INFORMATION PESTICIDE HANDLING

- Calibrate sprayers only with clean water away from the well site.
- Make scheduled checks of spray equipment.
- Assure accurate measurement of pesticides by all operation employees.
- Mix only enough product for the job at hand.
- Avoid overfilling of spray tank.
- Do not discharge excess material on the soil at a single spot in the field or mixing/loading station.
- Dilute and agitate excess solution and apply at labeled rates/uses.
- Avoid storage of pesticides near well sites.
- When triple rinsing the pesticide container, be sure to add the rinsate to the spray mix.

USE RESTRICTIONS

Injury to or loss of desirable trees or other plants may result from failure to observe the following.

- Do not drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the product may be washed or moved into contact with their roots.
- Treatment of powdery, dry soil or light, sandy soil when there is little likelihood of rainfall soon after treatment may result in off target movement and possible damage to susceptible crops when soil particles are moved by wind or water. Injury to crops may result if treated soil is washed, blown, or moved onto land used to produce crops. Exposure to this product may injure or kill most crops. Injury may be more severe when crops are irrigated. Do not apply this product when these conditions are identified and powdery, dry soil or light, and sandy soils are known to be prevalent in the area being treated.
- Do not apply to frozen ground as surface runoff may occur.
- Do not apply to snow-covered ground.
- Do not apply through any type of irrigation system.
- Do not apply to irrigated land where the tailwater will be used to irrigate crops.
- Do not contaminate any body of water, including irrigation water.
- Spraying and mixing equipment used with this product must not be used for subsequent application without adequately being cleaned to food or feed crops with the exception of pastures, rangeland, wheat, barley, grain sorghum, triticale, fallow and CRP lands as low rates of this product can kill or severely injure most food or feed crops.
- Do not apply to wheat, barley or pastures undersown with legumes, as injury to the forage may result.
- Do not use this product in the following counties of Colorado: Saguache, Rio Grande, Alamosa, Costilla and Conejos
- [Do not use this product in California.]
- Do not use on grasses grown for seed.
- Do not use on lawns, walks, driveways, tennis courts, or similar areas.
- When this product is used at rates of 1-2/3 ounce per acre or less, there are no grazing or haying restrictions on this product.

USE PRECAUTIONS

Injury to or loss of desirable trees or other plants may result from failure to observe the following.

- Prevent drift of spray to desirable plants.
- Applications made where runoff water flows onto agricultural land may injure crops. Applications made during periods of intense rainfall, to soils saturated with water, to surfaces paved with materials such as asphalt or concrete, or to soils through which rainfall will not readily penetrate may result in runoff and movement of this product. Treated soil should be left undisturbed to reduce the potential for this product movement by soil erosion due to wind or water.
- Applications of this product to pastures, rangeland or CRP undersown with legumes may cause injury to the legumes. Legumes in a seeding mixture may be severely injured or killed following an application of this product.
- Wheat and barley varieties may differ in their response to various herbicides. Nufarm recommends that you first consult your state experiment station, university, or extension agent as to sensitivity to any herbicide. If no information is available, limit the initial use of this product to a small area.
- Under certain conditions such as heavy rainfall, prolonged cold weather, or wide fluctuations in day/night temperatures prior to or soon after application of this product, temporary discoloration and/or crop injury may occur. This product should not be applied to wheat or barley that is stressed by severe weather conditions, drought, low fertility, water-saturated soil, disease, or insect damage, as crop injury may result. Risk of injury is greatest when crop is in the 2 to 5-leaf stage. Severe winter stress, drought, disease, or insect damage following application also may result in crop injury.
- To reduce the potential for movement of treated soil due to wind erosion, do not apply to powdery dry or light sandy soils until they have been stabilized by rainfall, trashy mulch, reduced tillage, or other cultural practices. Injury to immediately adjacent crops may occur when treated soil is blown onto land used to produce crops other than cereal grains or pasture/rangeland.
- For ground applications applied to weeds when dry, dusty field conditions exist, control of weeds in wheel track areas may be reduced. The addition of 2,4-D or MCPA should improve weed control under these conditions.
- Preplant or preemergence applications of 2,4-D or herbicides containing 2,4-D made within 2 weeks of planting spring cereals may cause crop injury when used in conjunction with early postemergence applications of this product. For increased crop safety, delay treatment of this product until crop tillering has begun.
- The combined treatment effects of this product postemergence preceded by preemergence wild oat herbicides may cause crop injury to spring wheat when crop stress (soil crusting, planting too deep, prolonged cold weather, or drought) causes poor seedling vigor.
- In the Pacific Northwest, to prevent cold weather-related crop injury, avoid making applications during winter months when weather conditions are unpredictable and can be severe.

ENVIRONMENTAL CONDITIONS AND BIOLOGICAL ACTIVITY

Patriot is absorbed primarily through the foliage of plants, and by the roots to a lesser degree. Plant cell division is generally inhibited in sensitive plants within a few hours following uptake. Two to 4 weeks after application, leaf growth slows followed by discoloration and tissue death. The final effects on annual weeds are evident about 4 to 6 weeks after application. The ultimate effect on perennial weeds and woody plants occurs in the growing season following application.

Warm, moist conditions following treatment promote the activity of Patriot while cold dry conditions may reduce or delay activity. Weeds and brush hardened off by cold weather or drought stress may not be controlled.

One to two inches of rainfall or sprinkler irrigation (enough to wet the top 2-3 inches of soil profile) may be needed to move this product into the weed root zone before the next flush of weeds emerge. The amount of moisture required for sufficient activation increases with crop or weed residue and for finer textured soils. Without sufficient rainfall or sprinkler irrigation to move this product into the weed root zone, weeds that germinate after treatment will not be controlled.

Application of this product provides the best control in vigorously growing grasses that shade competitive weeds. Weed control in areas of thin grass may not be as satisfactory. However, a grass canopy that is too dense at application can intercept a spray and reduce weed control.

This product is safe to grasses under normal conditions. However, grasses that are stressed from adverse environmental conditions (such as extreme temperatures or moisture), abnormal soil conditions, or cultural practices may be injured by applications of this product. In addition, different species of grass may be sensitive to treatment with this product under otherwise normal conditions. Application of this product to these species may result in injury.

The use of a surfactant can enhance the control of susceptible plants, except where noted. Apply at a minimum rate (concentration) of 1/4% volume/volume (1 quart per 100 gallons of spray solution) or at the manufacturer's specified rate. Use only EPA approved surfactants containing at least 80% active ingredient. Certain types of surfactants, such as those incorporating acetic acid (i.e. LI-700), may not be compatible with this product and may result in decreased performance. Certain surfactants may not be suitable for use on desirable plants such as turf and conifers, listed on this label. Consult the surfactant manufacturer's label for appropriate uses.

Weed and brush control may be reduced if rainfall, snowfall or sprinkler irrigation occurs within 4 hours following application.

RESISTANCE MANAGEMENT

This product contains the active ingredient metsulfuron methyl which is a Group 2 herbicide based on the mode of action classification system of the Weed Science Society of America.

When herbicides that affect the same biological site of action are used repeatedly over several years to control the same weed species in the same field, naturally-occurring resistant biotypes may survive a correctly applied herbicide treatment, propagate, and become dominant in that field. Adequate control of these resistant weed biotypes cannot be expected. If weed control is unsatisfactory, it may be necessary to retreat the problem area using a product affecting a different site of action.

To better manage herbicide resistance through delaying the proliferation and possible dominance of herbicide resistance weed biotypes, it may be necessary to change cultural practices within and between crop seasons such as using a combination of tillage, retreatment, tank-mix partners and/or sequential herbicide applications that have a different site of action. Weed escapes that are allowed to go to seed will promote the spread of resistant biotypes.

It is advisable to keep accurate records of pesticides applied to individual fields to help obtain information on the spread and dispersal of resistant biotypes. Consult your agricultural dealer, consultant, applicator, and/or appropriate state agricultural extension service representative for specific alternative cultural practices or herbicide guidance available in your area.

INTEGRATED PEST MANAGEMENT

This product may be used as a part of an Integrated Pest Management (IPM) program that can include biological, cultural, and genetic practices aimed at preventing economic pest damage. IPM principles and practices include field scouting or other detection methods, correct target pest identification, population monitoring and treating when target pest populations reach locally determined action thresholds. Consult your state cooperative extension service, professional consultants or other qualified authorities to determine appropriate action treatment threshold levels for treating specific pest/crop systems in your area.

SPRAY EQUIPMENT

For specific application equipment refer to the manufacturer's recommendations for additional information on GPA, pressure, speed, nozzle types and arrangements, nozzle heights above the target canopy etc.

Be sure to calibrate air or ground equipment properly before application. Select a spray volume and delivery system that will ensure thorough coverage and a uniform spray pattern with minimum drift. Use higher spray volumes to obtain better coverage when the crop canopy is dense. Avoid swath overlapping and shut off spray booms while starting, turning, slowing or stopping to avoid crop injury.

Do not make applications using equipment and/or spray volumes or under weather conditions that might cause spray to drift onto nontarget sites. For additional information on spray drift refer to the **Spray Drift Management** section of the label. Continuous agitation is required to keep this product in suspension.

Low rates of this product can kill or severely injure most crops. Following an application of this product, the use of the same spray equipment to apply other pesticides to crops on which this product is not registered may result in undesirable damage. The most effective way to reduce this crop damage potential is to use dedicated mixing and application equipment.

SPRAYER CLEANUP

Spray equipment must be cleaned before this product is sprayed. Follow the cleanup procedures specified on the labels of previously applied products. If no directions are provided, follow the six steps outlined below.

At the End of the Day

When multiple loads of this product are applied, it is advised that at the end of each day of spraying the interior of the tank be rinsed with fresh water then partially filled, and the boom and hoses flushed. This will prevent the buildup of dried pesticide deposits that can accumulate in the application equipment.

Before Spraying Crops Other than Wheat, Barley, Triticale, Grain Sorghum, Fallow, Pasture or Rangeland:

To avoid subsequent injury to desirable crops, thoroughly clean all mixing and spray equipment immediately following applications of this product as follows:

1. Drain tank; thoroughly rinse spray tanks, boom, and hoses with clean water. Loosen and physically remove any visible deposits.
2. Fill the tank with clean water and 1 gallon of household ammonia* (contains 3% active) for every 100 gallons of water. Flush the hoses, boom, and nozzles with the cleaning solution. Then add more water to completely fill the tank. Circulate the cleaning solution through the tank and hoses for at least 15 minutes. Flush the hoses, boom, and nozzles again with the cleaning solution, and then drain the tank.
3. Remove the nozzles and screens and clean separately in a bucket containing cleaning agent and water.
4. Repeat step 2.
5. Rinse tank, boom, and hoses with clean water.
6. If only ammonia is used as a cleaner, the rinsate solution may be applied back to use sites listed on this label. Do not exceed the maximum labeled use rate. If other cleaners are used, consult the cleaner label for rinsate disposal instructions. If no instructions are given, dispose of the rinsate on site or at an approved waste disposal facility.

Equivalent amounts of an alternate-strength ammonia solution or a Nufarm-approved cleaner can be used in the cleanout procedure. Carefully read and follow the individual cleaner instructions. Consult your agricultural dealer, applicator, or Nufarm representative for a listing of approved cleaners.

Notes:

1. **ATTENTION:** Do not use chlorine bleach with ammonia, as dangerous gases will form. Do not clean equipment in an enclosed area.
2. Steam-cleaning aerial spray tanks prior to performing the above cleanout procedure to facilitate the removal of any caked deposits.
3. When this product is tank mixed with other pesticides, all required cleanout procedures should be examined and the most rigorous procedure should be followed.
4. In addition to the cleanout procedure for this product, all pre-cleanout guidelines on subsequently applied products should be followed as per the individual labels.
5. Where spray equipment is frequently used for applications of this product and subsequent applications of other pesticides to sensitive crops during the same spray season, dedicate a sprayer to use only this product to further reduce the chance of crop injury.

SPRAY DRIFT MANAGEMENT

The interaction of many equipment and weather-related factors determines the potential for spray drift. The applicator is responsible for considering all of these factors when making applications.

AVOIDING SPRAY DRIFT IS THE RESPONSIBILITY OF THE APPLICATOR.

IMPORTANCE OF DROPLET SIZE

The most effective way to reduce drift potential is to apply large droplets (>150-200 microns). The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. The presence of sensitive species nearby, the environmental conditions, and pest pressure may affect how an applicator balances drift control and coverage. APPLYING LARGER DROPLETS REDUCES DRIFT POTENTIAL, BUT WILL NOT PREVENT DRIFT IF APPLICATIONS ARE MADE IMPROPERLY OR UNDER UNFAVORABLE ENVIRONMENTAL CONDITIONS! See, **Wind, Temperature and Humidity, and Temperature Inversions** sections of this label.

Controlling Droplet Size- General Techniques

- **Volume-** Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rate flows produce larger droplets.
- **Pressure-** Use the lower spray pressures specified for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. WHEN HIGHER FLOW RATES ARE NEEDED, USE A HIGHER-CAPACITY NOZZLE INSTEAD OF INCREASING PRESSURE.
- **Nozzle Type-** Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles.

Controlling Droplet Size- Aircraft

- **Number of Nozzles-** Use the minimum number of nozzles with the highest flow rate that provides uniform coverage.
- **Nozzle Orientation-** Orienting nozzles so that the spray is emitted backwards, parallel to the air stream will produce larger droplets than other orientations.
- **Nozzle Type-** Solid stream nozzles (such as disc and core with swirl plate removed) oriented straight back produce larger droplets than other nozzle types.
- **Boom Length-** The boom length should not exceed 3/4 of the wing or rotor length- longer booms increase drift potential.
- **Application Height-** Application more than 10 ft above the canopy increases the potential for spray drift.

BOOM HEIGHT

Setting the boom at the lowest labeled height (if specified) which provides uniform coverage reduces the exposure of droplets to evaporation and wind. For ground equipment, the boom should remain level with the crop and have minimal bounce.

WIND

Drift potential is lowest when applications are made in light to gentle sustained winds (2 to 10 mph) which are blowing in a constant direction. However, many factors, including droplet size and equipment type determine drift potential at any given wind speed. AVOID GUSTY OR WINDLESS CONDITIONS.

Note: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

TEMPERATURE AND HUMIDITY

Setting up equipment to produce larger droplets to compensate for droplet evaporation can reduce spray drift potential. Droplet evaporation is most severe when conditions are both hot and dry.

TEMPERATURE INVERSIONS

Drift potential is high during a temperature inversion. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain close to the ground and move laterally in a concentrated cloud. Temperature inversions are characterized by increasing temperature with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from the ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

SHIELDED SPRAYERS

Shielding the boom or individual nozzles can reduce the effects of wind. However, it is the responsibility of the applicator to verify that the shields are preventing drift and not interfering with uniform deposition of the product.

AIR ASSISTED (AIR BLAST) FIELD CROP SPRAYERS

Air assisted field crop sprayers carry droplets to the target via a downward directed air stream. Some may reduce the potential for drift, but if a sprayer is unsuitable for the application and/or set up improperly, high drift potential can result. It is the responsibility of the applicator to determine that a sprayer is suitable for the intended application, is configured properly, and that drift is not occurring.

Note: Air assisted field sprayers can affect product performance by affecting spray coverage and canopy penetration. Consult the application equipment section of this label to determine if use of an air assisted sprayer is specified.

SENSITIVE AREAS

Making applications when there is a sustained wind moving away from adjacent sensitive areas (e.g. residential areas, bodies of water, known habitat for threatened or endangered species, non target crops) is an effective way to minimize the effect of spray drift.

DRIFT CONTROL ADDITIVES

Using product compatible drift control additives can reduce drift potential. When a drift control additive is used, read and carefully observe cautionary statements and all other information on the additive's label. If using an additive that increases viscosity, ensure that the nozzles and other application equipment will function properly with a viscous spray solution.

INVASIVE SPECIES MANAGEMENT

This product may be considered for use on public, private, and tribal lands to treat certain weed species infestations that have been determined to be invasive, consistent with the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW) National Early Detection and Rapid Response (EDRR) System for invasive plants.

Effective EDRR systems address invasions by eradicating the invader where possible, and controlling them when the invasive species is too established to be feasibly eradicated. Once an EDRR assessment has been completed and action is recommended, a Rapid Response needs to be taken to quickly contain, deny reproduction, and if possible eliminate the invader. Consult your appropriate state extension service, forest service, or regional multidisciplinary invasive species management coordination team to determine the appropriate Rapid Response.

PREPARING FOR USE – SITE SPECIFIC CONSIDERATIONS

Understanding the risks associated with the application of this product is essential to aid in preventing off-site injury to desirable vegetation and agricultural crops. The risk of off-site movement both during and after application may be affected by a number of site specific factors such as the nature, texture and stability of the soil, the intensity and direction of prevailing winds, vegetative cover, site slope, rainfall, drainage patterns, and other local physical and environmental conditions. A careful evaluation of the potential for off-site movement from the intended application site, including movement of treated soil by wind or water erosion, must be made prior to using this product. This evaluation is particularly critical where desirable vegetation or crops are grown on neighboring land for which the use of this product is not labeled. If prevailing local conditions may be expected to result in off-site movement and cause damage to neighboring desirable vegetation or agricultural crops, do not apply this product.

Before applying this product, the user must read and understand all label directions, precautions and restrictions completely, including these requirements for a site specific evaluation. If you do not understand any of the instructions or precautions on the label, or are unable to make a site specific evaluation yourself, consult your local agricultural dealer, cooperative extension service, land managers, professional consultants, or other qualified authorities familiar with the area to be treated. If you still have questions regarding the need for site specific considerations, please call your local Nufarm representative.

TANK MIXES

This product may be tank mixed with other herbicides registered for the use sites described in this label. Use only those tank mix partners which are labeled for the appropriate use site. When tank mixing, use the most restrictive label limitations for each of the products being used in the tank mix.

CONIFER PLANTATIONS

Application Information

Apply Patriot to control many species of weeds and deciduous trees on sites where conifers are growing or are to be planted. Apply by ground equipment or by air (helicopter only). Refer to the **WEEDS CONTROLLED** and **BRUSH SPECIES CONTROLLED** for a listing of susceptible species.

Application Timing

Apply Patriot after weeds have emerged or after undesirable hardwoods have broken winter dormancy and have reached the point of full leaf expansion.

Conifer Site Preparation

Application Before Transplanting

After consulting the **WEEDS CONTROLLED** and **BRUSH SPECIES CONTROLLED** tables apply the rates of Patriot listed for the most difficult to control species on the site.

Southeast - Apply up to 4 ounce per acre for loblolly and slash pines. Transplant the following planting season.

Northeast and Lake States - Apply up to 2 ounce per acre for red pine. Transplant the following planting season. Apply up to 2 ounces per acre for black, white and Norway spruce. Transplant the following spring.

West - Apply up to 2 ounce per acre prior to planting Douglas fir, Sitka Spruce, Western Red Cedar, Western Hemlock, Ponderosa Pine, and Grand Fir in the Coast Rangeland and western slope of the Cascades in Oregon and Washington. These conifer species listed can be planted any time after application. Other conifer species can be planted providing the user has prior experience indicating acceptable tolerance to soil residues of this product.

Without prior experience, plant other species on a small scale to determine selectivity before large-scale plantings are made as unacceptable injury may occur. Nufarm will not assume responsibility for injury to any conifer species not listed on this label.

Tank Mix Combinations

For broader spectrum control, use the following products in combination with Patriot.

With Razor Pro or Credit 41 Extra or Credit Xtreme (Glyphosate)

Tank mix 1 to 2 ounces of this product with 10 to 24 fluid ounces of Razor Pro / Credit 41 Extra or 7 to 16 fluid ounces of Credit Xtreme per acre. Refer to the product container for a list of species controlled.

With Nufarm Polaris® AC Complete Herbicide (4 pounds per gallon active ingredient imazapyr)

Tank mix 1 to 2 ounces per acre of Patriot with labeled rate of Polaris AC Complete. Loblolly and slash pines may be transplanted the planting season following application. The combination controls ash, black gum, cherry, hawthorn, honeysuckle, hophorn beam, persimmon, oaks (red, white and water), sassafras, sweetgum, Vaccinium species, and suppresses blackberry, dogwood, elms, myrtle dahoon, hickories, and red maple.

With Razor Pro or Credit 41 Extra or Credit Xtreme + Polaris AC Complete

Tank mix 1/2 to 1 ounce per acre of Patriot with labeled rate Razor Pro / Credit 41 Extra / Credit Xtreme + Polaris AC Complete. Slash and loblolly pines may be transplanted the planting season following application. The combination controls cherry, dogwood, elms, oaks (red and water), persimmon, sassafras, sweetgum and suppresses hickory.

With Razor Pro or Credit 41 Extra or Credit Xtreme (Glyphosate) + Nufarm Polaris AC Complete Herbicide (4 pounds per gallon active ingredient imazapyr)

Tank mix 1/2 to 1 ounce of this product with 16 to 64 fluid ounces of Razor Pro / Credit 41 Extra or 7 to 16 fluid ounces of Credit Xtreme and 10 to 12 fluid ounces of Polaris AC Complete per acre. Slash and loblolly pines may be transplanted the planting season following application. This combinations controls cherry, dogwood, elms, oaks (red and water), persimmon, sassafras, sweetgum and suppresses hickory.

With Spyder Extra (sulfometuron)

Tank mix 1/2 to 1-1/2 ounces of Patriot per acre with labeled rate of Spyder Extra for herbaceous weed control. Refer to the product container and the "Weeds Controlled" section of this label for a listing of the weeds controlled. Loblolly and slash pines may be transplanted the planting season following application.

Tank mix 2 ounces of Patriot per with labeled rate of Spyder Extra for herbaceous weed control and early spring suppression of bull thistle and Canada thistle in the Coast Rangeland and western slope of the Cascade Mountains. Douglas fir may be transplanted at least 90 days following application.

VELPAR L or VELPAR DF

Tank mix 1 to 2 ounces of Patriot per acre with VELPAR L or VELPAR DF at the rates listed on the container for various soil textures. Loblolly and slash pines may be transplanted the planting season following application. Refer to the product container for a list of species controlled.

Release - Hardwood Control and Suppression

Use Patriot for application over the top of established slash and loblolly pine to control the species listed in **WEEDS CONTROLLED** and **BRUSH SPECIES CONTROLLED** section of this label. Apply 1 to 4 ounces per acre to control the species indicated, including kudzu.

Tank Mix Combinations

For broader spectrum control in Hardwood Control and Suppression use the following products in combination with Patriot: Arsenal Applicator's Concentrate / Polaris or VELPAR L / VELPAR DF.

Nufarm Polaris AC Complete

A tank mix of 1 to 2 ounces of Patriot per acre with labeled rate of Polaris AC Complete may be applied to loblolly pine. Refer to the Polaris AC Complete label regarding the use of surfactants and the appropriate application timing with respect to the age and development stage of the pines. The combination controls ash, black gum, cherry, hawthorn, honeysuckle, hophornbeam, oaks (red, white and water), sassafras, sweetgum, Vaccinium species, and suppresses blackberry, dogwood, elms, myrtle dahoon, hickories, persimmon, and red maple.

VELPAR L or VELPAR DF

Tank mix 1 to 2 ounces of Patriot per acre with VELPAR L OR VELPAR DF at the rates listed on the container for various soil textures. The combination may be applied to loblolly and slash pines.

Release - Herbaceous Weed Control

Patriot may be applied to transplanted loblolly and slash pine for the control of herbaceous competition. Consult the “Weeds Controlled” section for a listing of the susceptible species and specific application rates. Best results are obtained when Patriot is applied just before weed emergence until shortly after weed emergence.

Tank Mix Combinations

For broader spectrum control in Herbaceous Weed Control use the following products in combination Patriot: Polaris AC Complete or Spyder Extra or VELPAR L / VELPAR.

With Nufarm Polaris AC Complete

Tank mix 1/2 to 1 ounce of Patriot per acre with labeled rate Polaris AC Complete. The tank mix may be used on loblolly pine.

With Spyder Extra

Tank mix 1/2 to 1-1/2 ounces of Patriot per acre with labeled rate Spyder Extra. Best results are obtained when Patriot is applied just before weed emergence until shortly after weed emergence. The tank mix may be used on loblolly and slash pine.

VELPAR L or VELPAR DF

Tank mix 1/2 to 1 ounce of Patriot per acre with VELPAR L or VELPAR DF at the rates listed on the container for various soil textures. The combination may be applied to loblolly and slash pines.

Release- Directed Spray in Conifers

Western US

To release conifers from competing brush species, such as, blackberry, salmonberry, snowberry, thimbleberry and wild roses, mix 2 to 4 ounces of Patriot per 100 gallons of spray solution. Direct spray onto the foliage of competing brush species using a knapsack or backpack sprayer. For best results, apply any time after the brush species have reached full leaf stage but before autumn coloration. For best results at application, the majority of the brush must be less than six feet in height to help ensure adequate spray coverage. Thorough coverage of the target foliage is necessary to optimize results. Care must be taken to direct the Patriot spray solution away from the conifer foliage.

NOTE: Patriot may cause temporary yellowing and or growth suppression when the spray solution contacts conifer foliage. The use of a surfactant with Patriot may improve brush control results. When using a surfactant with Patriot, extra precaution must be taken to avoid contact with conifer foliage. Excessive drift onto conifers may result in severe injury.

IMPORTANT RESTRICTIONS—CONIFER PLANTATIONS ONLY

- Do not apply Patriot to conifers grown as ornamentals.

IMPORTANT PRECAUTIONS—CONIFER PLANTATIONS ONLY

- Applications of Patriot made to conifers that are suffering from loss of vigor caused by insects, diseases, drought, winter damage, animal damage, excessive soil moisture, planting shock, or other stresses may injure or kill the trees.
- Applications of Patriot made for herbaceous release should only be made after adequate rainfall has closed the planting slit and settled the soil around the roots following transplanting.
- Patriot applications may result in damage and mortality to other species of conifers when they are present on sites with those listed in the preceding directions for conifer plantations.

HARDWOOD PLANTATIONS

Application Information

Apply Patriot to control many species of weeds on sites where yellow poplar is growing or is to be planted, and on sites where red alder is to be planted. Apply at up to 2 ounces per acre by ground equipment or by air (helicopter only). Refer to the “Weeds Controlled” sections of this label for a listing of susceptible species.

Application Timing

This product may be applied as a site preparation treatment prior to planting red alder or yellow poplar, and may also be applied as a pre-planting site preparation treatment for red alder in tank mixes with other herbicides labeled for this use.

Patriot may also be applied over the top of planted yellow poplar seedlings after the soil has settled around the root systems but before the seedlings have broken dormancy (prior to bud break).

Hardwood Release

Herbaceous Weed Control

Patriot may be applied to yellow poplar for the control of herbaceous competition. Consult the “Weeds Controlled” for a listing of the susceptible species and specific application rates. Best results are obtained when Patriot is applied just before weed emergence until shortly after weed emergence.

Tank Mix Combinations

Tank mix 1/2 ounce of Patriot per acre with labeled rates of VELPAR L as specified on the package label for “RELEASE-HERBACEOUS WEED CONTROL” in pine plantations in the eastern U.S. Follow the VELPAR L label directions regarding altering the application rate by soil texture.

IMPORTANT PRECAUTIONS—HARDWOOD PLANTATIONS ONLY

- Application of VELPAR L and Patriot made to yellow poplar that are suffering from loss of vigor caused by insects, disease, drought, winter damage, animal damage, excessive soil moisture, planting shock or other stresses may injure or kill the seedlings.
- Applications of Patriot made for release should only be made after adequate rain-fall has closed the planting slit and settled the soil around the roots following transplanting.
- Do not use a surfactant for applications made over the tops of trees.
- Careful consideration must be given by an experienced and knowledgeable forester to match the requirements of yellow poplar to the conditions of the site. Treatment of yellow poplar planted on a site inadequate to meet its requirements may injure or kill the seedlings.

GRAIN SORGHUM, WHEAT (including durum), BARLEY, TRITICALE, PASTURE, RANGELAND GRASSES, AND FALLOW

APPLICATION INFORMATION

Use Rates

Wheat (including durum), Barley and Triticale

1/10 ounce Patriot per acre.

Grain Sorghum (Irrigated or dry land, in Colorado, Kansas, Nebraska, Oklahoma, and Texas [north of Interstate 20] only)

1/20 ounce Patriot per acre, plus labeled rate 2,4-D amine. Do not use surfactant or crop oil when applying to grain sorghum.

Pasture and Rangeland

1/10 to 4/10 ounce Patriot per acre as a broadcast treatment. For spot treatments, use up to 1 ounce per 100 gallons of water. Do not exceed 1-2/3 ounces of Patriot per acre per year.

Harvest aid (Wheat, Barley and Triticale)

1/10 ounce Patriot per acre in combination with 2,4-D or Credit 41 Extra / Credit Xtreme / Razor Pro aids in dry down of many broadleaf weeds.

Fallow

1/10 ounce Patriot per acre.

Application Timing-Wheat, Barley and Triticale)

Dryland Wheat, Barley and Triticale

(Except Durum or Wampum Variety) and Triticale
Apply after the crop is in the 2-leaf stage but before boot.

Durum and Wampum

Variety Spring Wheat

Apply after the crop is tillering but before boot. For durum and wampum varieties, use in combination with 2,4-D.

Irrigated Wheat, Barley and Triticale

Apply after the crop begins tillering but before boot. For best results, delay post-treatment irrigation for at least 3 days after treatment and do not exceed 1 inch of water.

Wheat, Barley and Triticale - Harvest Aid

Apply after reaching the hard dough stage, but no later than 10 days before harvest. See section of Harvest Aid Tank Mixtures.

Fallow

This product may be used as a fallow treatment in the spring or fall after weeds have emerged and are actively growing.

Do not apply during boot or early heading as crop injury may result.

Application Timing-Grain Sorghum

Crop Growth Stage: Apply with 2,4-D amine when grain sorghum is from 3 to 15 inches tall. If grain sorghum is taller than 10 inches to the top of the canopy, apply with drop nozzles and keep spray off of foliage. Apply before boot stage only. Read and follow all other use instructions and precautions provided on companion herbicide labels.

NOTE: Sorghum varieties can vary in sensitivity to 2,4-D amine. Spray only those varieties that are known to be tolerant to 2,4-D amine. Contact the seed company of your Local County Extension Service for additional information.

Weed Growth Stage: Apply with 2,4-D amine when all or a majority of the weeds have germinated and emerged. Spray when weeds are a maximum of 6 inches tall for best results. Review the **WEEDS CONTROLLED** section below for specific weeds controlled.

Grain Sorghum Precautions:

Temporary growth stunting and/or crop yellowing may occur soon after application, especially when crops are under stress conditions. Do not use this product on grain sorghum that is grown for seed production or for syrup. Do not use on forage sorghum. Wait a minimum of 30 days before using for silage or forage. Do not include surfactant or crop oil when preparing tankmixes. Do not apply under cold, wet weather conditions or to grain sorghum that is under stress caused by weather, insects, or disease as crop injury may result. Do not apply to long season grain sorghum varieties. Do not apply to grain sorghum that is planted after July 1- crop injury or delayed maturity may occur. Do not apply to grain sorghum more than once per year. This product must be used in combination with 2,4-D on grain sorghum. If using in areas where 2,4-D is restricted, follow all applicable restrictions. Do not use this product on grain sorghum in areas where 2,4-D use is prohibited.

ADDITIONAL GRASS INFORMATION
APPLICATION INFORMATION FOR GRASS ESTABLISHMENT

This product may be used for the control or suppression of broadleaf weeds to aid in the establishment of the following perennial native or improved grasses:

- Blue grama
- Bluestems – big, little, plains, sand, WW spar
- Buffalograss
- Green sprangletop
- Kleingrass
- Lovegrasses – atherstone, sand, weeping, wilman
- Orchardgrass
- Sideoats grama
- Switchgrass – Blackwell
- Wheatgrasses – bluebunch, crested, intermediate, pubescent, Siberian, slender, streambank, tall, thickspike, western
- Wildrye grass – Russian

Maximize potential for grass establishment by consulting with the Natural Resource and Conservation Service of other government agencies or local experts concerning planting techniques and other cultural practices.

Performance from this product may not always be satisfactory due to the inability of newly planted grass stands to sufficiently compete with weeds, and the severity of weed pressure in new grass stands.

An additional herbicide application or mowing may be needed.

Use Rates and Application Timing for Grass Establishment in Pasture, Rangeland and CRP Preplant (prior to planting) or Preemergence (after planting but before grass emergence)

Do not use more than 1/10 ounce per acre of this product for grass establishment.

Apply this product at 1/10 ounce per acre on all labeled grasses except orchardgrass and Russian wildrye grass. Do not apply this product preplant or preemergence to orchardgrass and Russian wildrye grass as severe crop injury may result.

Early postemergence to new plantings

Apply this product at 1/10 ounce per acre, plus a non-ionic surfactant at the rate of 2 to 4 pints per 100 gallons of spray solution on all labeled grasses anytime after grass emergence.

Do not use a spray adjuvant other than non-ionic surfactant.

Because grass species differ in time of emergence, apply only after the majority of grasses are in the 3 to 4 leaf stage.

Postemergence to stands with 1-5 leaf grasses planted the previous season

Apply this product at 1/10 ounce per acre plus a non-ionic surfactant at the rate of 2 to 4 pints per 100 gallons of spray solution, on all labeled grasses when the majority of the grasses have one or more leaves.

Do not use a spray adjuvant other than non-ionic surfactant.

APPLICATION INFORMATION FOR ESTABLISHED GRASSES

Use Rates for Established Grasses

Apply up to 1 ounce of this product per acre as a broadcast application to established grasses. For spot applications, use 1 ounce per 100 gallons of water. Do not apply more than 1-2/3 ounces of this product per acre per year.

Refer to the “Weeds Controlled” section of this label for a listing of the weeds controlled by this product and the appropriate use rate to obtain control.

Application Timing – Established Grasses in Pastures, Rangeland and CRP

This product may be used on some native grasses such as bluestems and grama, and on other established grasses such as bermudagrass, bluegrass, orchardgrass, bromegrass, fescue and timothy that were planted the previous growing season (or earlier) and are fully tillered, unless otherwise directed on this label. Specific application information on several of these grass species follows:

Grass	Minimum Time from Grass Establishment to Patriot Application
Bermudagrass	2 months
Bluegrass, bromegrass, and orchardgrass	6 months
Timothy	12 months
Fescue	24 months

Fescue Precautions:

When used on fescue, this product may cause reduced first cutting yields due to temporary stunting, leaf yellowing, or seed head suppression. To help minimize these symptoms, follow the information below:

- Use the lowest labeled rate for the target weeds
- Tank mix this product with 2,4-D for applications
- Apply late in the spring or after the new growth is 5 to 6 inches tall, or in the fall
- Use only a non-ionic surfactant at 1/2 to 1 pint per 100 gallons of spray solution 9/16 to 1/8% v/v
- When liquid nitrogen is the spray carrier, do not include the surfactant

Timothy Precautions:

Timothy should be actively growing and at least 6" tall at application. Application under any other conditions may cause crop yellowing and/or stunting. To help minimize these symptoms, follow the information below:

- Use the lowest labeled rate for the target weeds
- Tank mix this product with 2,4-D for applications
- Apply in the late summer or fall
- Use only a non-ionic surfactant at 1/2 pint per 100 gallons of spray solution
- When liquid nitrogen is the spray carrier, do not include the surfactant

Ryegrass Pastures (Italian or perennial): Do not apply this product to ryegrass pasture as injury to or loss of the pasture may result.

Precautions for Sensitive Grasses:

Application of this product to Pensacola bahiagrass, ryegrass (Italian or perennial) and Garrison's creeping foxtail may cause severe injury to and/or loss of forage.

Varieties and species of forage grasses differ in their tolerance to herbicides. When using this product on a particular grass for the first time, limit use to a small area. In no injury occurs throughout the season, larger acreage may be treated the following season.

Broadleaf forage species, such as alfalfa and clover, are highly sensitive to this product and will be severely stunted or injured by use of this product.

WEEDS CONTROLLED

Apply when weeds are less than 4" tall or in diameter and are actively growing. See specific directions for each weed type. Effectiveness may be reduced if rainfall occurs within 4 hrs after application.

Grain Sorghum		
1/20 oz. per acre, plus 1/4 lb. active ingredient 2,4-D amine per acre		
Pigweed species	Puncture vine	Velvetleaf
Cereals, Pasture, Rangeland and Fallow		
1/10 oz. per acre		
Blue/purple mustard*	Groundsel (common)	Smallseed falseflax
Bur buttercup (testiculate)	Henbit	Smartweed (green, ladythumb, pale)
Coast fiddleneck (tarweed)	Kochia*	Snow speedwell
Common chickweed	Lambsquarters (common slimleaf)	Tansymustard*
Common purslane	Mayweed chamomile	Treacle mustard (Bushy Wallflower)
Conical catchfly	Miners lettuce	Tumble/Jim Hill mustard
Cowcockle	Pigweed (redroot, smooth, tumble)	Volunteer sunflower
False chamomile	Plains coreopsis	Waterpod
Field pennycress (fanweed)	Prickly lettuce*	Wild mustard
Filaree	Russian thistle*	
Flixweed*	Shepherd's purse	

Additional Weeds in Pasture/Rangeland Only 1/10 to 2/10 oz. per acre		
Bitter sneezeweed	Common mullein	Plantain
Buttercup	Curly dock	Wild garlic*
Carolina geranium	Dandelion	Woolly croton*
Common Broomweed	Marestail	
2/10 to 3/10 oz. per acre		
Annual Marshelder	Common yarrow	Pensacola bahiagrass*
Blackeyed-Susan	Dogfennel	Purple scabious
Buckbrush**	Horsemint (beebalm)	Western Snowberry**
Burclover	Musk thistle*	Wild carrot
4/10 oz. per acre		
Sericea lespedeza*		

Weed Suppressed** Wheat, Barley, Pasture, Rangeland and Fallow 1/10 oz. per acre		
Canada thistle*	Corn gromwell*	Sowthistle (annual)*
Common sunflower*	Knotweed (prostrate)*	Wild buckwheat*

Brush Suppressed (Pasture and Rangeland Only)** 3/10 oz. per acre		
Blackberry	Dewberry	Multiflora rose*

Weeds/Brush Suppressed with Spot Application (Pasture/Rangeland only) 1 oz. per 100 Gallons of water		
Blackberry	Dewberry	Multiflora rose*
Canada thistle*		

* See the Specific Weed Problems section.

**Weed suppression is a reduction in weed population and/or vigor as visually compared to an untreated area. The degree of suppression varies with the rate used, the size of the weeds, and the environmental conditions following treatment.

SPECIFIC WEED PROBLEMS

Note: Thorough spray coverage is very important.

Blue Mustard, Flixweed, and Tansy mustard: For best results, apply this product in tank mixtures with 2,4-D or MCPA postemergence to mustards before bloom.

Canada Thistle and Sowthistle: Apply this product with a surfactant, 2,4-D or MCPA in the spring after the majority of thistles have emerged while still small (rosette stage to 6" elongated stems) and actively growing to reduce the ability of emerged thistles to compete with the crop.

For spot applications to Canada thistle in pasture and rangeland, apply as foliar spray once plant is fully leafed. Apply to runoff and include a surfactant in the spray mix at 1 to 2 quarts, per 100 gallons of spray solution. Complete coverage of all foliage and stems is required for control. On tall, dense stands, it may be necessary to spray from both sides to obtain adequate coverage.

Corn Gromwell and Prostrate Knotweed: Apply this product with a surfactant when weeds are actively growing, are not larger than 2" tall and when crop canopy will allow thorough coverage. Tank mixing with 2,4-D or MCPA can improve results.

Kochia, Russian thistle, Prickly lettuce: Resistant biotypes of these weeds are known to occur. For best results, use in a tank mix with Banvel/Banvel SGF and 2,4-D or bromoxynil and 2,4-D (such as 3/4-1 pint. Buctril + 1/4 - 3/8 lb. active 2,4-D ester). Apply in the spring when kochia, Russian thistle, and prickly lettuce are less than 2" tall or 2" across and are actively growing. Refer to the Tank Mixtures section of this label for additional details.

Sunflower (common/volunteer): Apply with a surfactant, 2,4-D or MCPA after the majority of sunflowers have emerged, are 2" to 4" tall and are actively growing. Use spray volumes of at least 3 gallons per acre by air or 5 gallons per acre by ground (10 gallons per acre by ground in pastures).

Wild Buckwheat: For best results, apply in a tank mix with MCPA when plants have no more than 3 true leaves (not counting the cotyledons). If plants are not actively growing, delay treatment until environmental conditions favor active weed growth.

Musk Thistle: Apply at 2/10 to 3/10 ounce per acre in the spring or early summer prior to flowering or in the fall after newly emerged plants have reached the rosette stage of growth. Fall applications should be made before the soil freezes.

Multiflora Rose: For best control, apply as a broadcast application when multiflora rose is less than 3" tall. Application should be made in the spring, soon after multiflora rose is fully leafed. For spot application in pasture and rangeland, apply as a foliar spray once plant is fully leafed. Apply to runoff. Include a surfactant in the spray mix at 1 to 2 quarts per 100 gallons, of spray solution. Complete coverage of all foliage and stems is required for control. On tall, dense stands, it may be necessary to spray from both sides to obtain adequate coverage.

Blackberry and Dewberry: For spot applications in pasture and rangeland, apply as a foliar spray once plant is fully leafed. Apply to runoff and include a surfactant in the spray mix at 1 to 2 quarts per 100 gallons, of spray solution. Complete coverage of all foliage and stems is required for control. On tall, dense stands, it may be necessary to spray from both sides to obtain adequate coverage.

Pensacola bahiagrass control in established Bermudagrass pasture: Apply at 3/10 ounce per acre plus surfactant after green-up in the spring but before bahiagrass seedhead formation. Apply when moisture is sufficient to enhance grass growth.

This product effectively removes bahiagrass from bermudagrass pastures. In highly infested pastures, Patriot clears the areas of useful forage until the bermudagrass has time to cover the area. Therefore, do not apply to an entire farm or ranch in one year. Treatments should be made to different areas of a farm over a period of years. Pastures may be reestablished more quickly by fertilization (particularly with nitrogen and potassium) and/or replanting.

Under heavy bahiagrass pressure, grazing pressure, or adverse weather conditions (heat and drought), some regrowth of weeds may occur.

Note: Do not use this product for the control of common or Argentine bahiagrass. Do not apply this product in liquid fertilizer solutions for Pensacola bahiagrass control, as poor control and/or regrowth may occur.

Sericea lespedeza: Apply at 4/10 ounce per acre with a surfactant at 1 to 2 quarts per 100 gallons, of total spray solution. For best results, make applications to sericea lespedeza beginning at flower bud initiation through the full bloom stage of growth.

Note: Do not use if drought conditions exist at intended time of applications.

Wild Garlic: Apply 1/10 to 2/10 ounce per acre in early spring when wild garlic is less than 12" tall with 2" to 4" of new growth.

Wooly Croton: Apply 1/10 to 2/10 ounce per acre in late spring or early summer at preemergence through 2 true leaf stage.

SURFACTANTS

SPRAY ADJUVANTS

Applications of this product must include either a nonionic surfactant or a crop oil concentrate **except for grain sorghum**. In addition an ammonium nitrogen fertilizer may be used. Consult local Nufarm fact sheets, technical bulletins and service policies prior to using other adjuvant systems. If another herbicide is tank mixed with this product select adjuvants authorized for use with both products. Products must contain only EPA exempt ingredients.

Antifoaming agents may be needed. Consult your Ag dealer applicator or Nufarm representative for a listing of recommended surfactants.

Nonionic Surfactant (NIS)

Apply 0.06 to 0.50% v/v (1/2 to 4 pints per 100 gallons of spray solution). See **Tank Mixtures** section for additional information.

Surfactant products must contain at least 60% nonionic surfactant with a hydrophilic/lipophilic balance (HLB) greater than 12.

Surfactant Rate Exceptions:

- (1) On all spring wheat and spring or winter barley use 1/2 to 1 quart per 100 gallons;
- (2) On Fescue pastures use 1/4 to 1/2 quart per 100 gallons;
- (3) On Timothy pastures use 1/4 quart per 100 gallons.

Consult your agricultural dealer, applicator, or extension agent for a listing of approved surfactants.

Petroleum Crop Oil Concentrate (COC) or Modified Seed Oil (MSO)

Apply at 1% v/v (1 gallon per 100 gallons spray solution) or 2% under arid conditions.

Oil adjuvants must contain at least 80% high quality petroleum (mineral) or modified vegetable seed oil with at least 15% surfactant emulsifiers.

Ammonium Nitrogen Fertilizer

Use 2 quarts per acre of a high quality urea ammonium nitrate (UAN) such as 28%N or 32%N or 2 pounds/acre of a spray grade ammonium sulfate (AMS). Use 4 quarts per acre UAN or 4 pounds per acre AMS under arid conditions.

Do not use liquid nitrogen fertilizer as the total carrier solution.

Special Adjuvant Types

Combination adjuvant products may be used at doses that provide the required amount of NIS COC MSO and/or ammonium nitrogen fertilizer. Consult product literature for use rates and restrictions.

In addition to the adjuvants specified above other adjuvant types may be used if they provide the same functionality and have been evaluated and approved by Nufarm product management.

Antifoaming agent may be used if needed.

Do not use low rates of liquid fertilizer as a substitute for surfactant.

GROUND APPLICATION

For optimum spray coverage, use flat-fan or low volume flood nozzles.

For flood nozzles on 30" spacing, use at least 10 gallons spray solution per acre (GPA), nozzles no larger than TK 10 (or equivalent), and at least 30 pounds per square inch (psi). For 40" nozzle spacing, use at least 13 GPA; for 60" spacing, use at least 20 GPA. Overlap nozzles 100% for all spacings.

With Raindrop RA nozzles, use at least 30 GPA and ensure that nozzle spray patterns overlap 100%.

For flat-fan nozzles, use at least 3 GPA for applications to wheat or barley. Use at least 10 GPA for applications to pasture or rangeland. For grain sorghum, use 10-30 GPA and apply uniformly at 20-40 PSI with a properly calibrated low pressure boom sprayer using flat-fan nozzles. If applying to irrigated sorghum, delay first post-treatment irrigation for a minimum of 3 days after treatment. For the first post-treatment irrigation, do not exceed 1". Cultivate prior to treatment to cover exposed brace roots on grain sorghum. This will minimize injury from 2,4-D amine.

Use 50-mesh screens or larger.

AERIAL APPLICATION

Use nozzle types and arrangements that provide optimum spray distribution and maximum coverage.

Wheat, Barley, Triticale and Fallow

Use 1 to 5 GPA, use at least 3 GPA in Idaho, Oregon, or Utah. For Pasture and Rangeland – Use 2 to 5 GPA.

Grain Sorghum

Apply at the rate of 2-5 GPA. If applying to irrigated sorghum, delay first post-treatment irrigation for a minimum of 3 days after treatment. For the first post-treatment irrigation, do not exceed 1". Cultivate prior to treatment to cover exposed brace roots of grain sorghum. This will minimize injury from 2,4-D amine.

Pasture and Rangeland

Use 2 to 5 GPA. When applying this product by air in areas adjacent to sensitive crops, use solid stream nozzles oriented straight back. Adjust the swath to avoid spray drift damage to sensitive crops downwind and/or use ground equipment to treat the border edge of fields.

See the **SPRAY DRIFT MANAGEMENT** section of this label.

PRODUCT MEASUREMENT

Measure precisely using scales calibrated in ounces.

TANK MIXTURES

This product may be tank mixed with other suitable registered herbicides to control weeds listed under **WEEDS SUPPRESSED**, weeds resistant to this product, or weeds not listed under **WEEDS CONTROLLED**. Read and follow all manufacturer's label instructions for the companion herbicide. If those instructions conflict with this label, do not tank mix with this product.

Patriot Tank Mixtures in Cereals (Wheat, Barley and Triticale)

With 2,4-D (amine or ester) or MCPA (amine or ester)

Tank-mix with 2,4-D or MCPA (ester formulations provide best results, use 1/10 ounce of this product per acre; add 2,4-D or MCPA herbicides to the tank at 1/4 to 1/2 lb. active ingredient.

Surfactant may be added to the mixture at 1/2 to 1 quart per 100 gallons, of spray solution; however, adding surfactant may increase the potential for crop injury.

Apply with MCPA after the 3 to 5 leaf stage but before boot (with Durum and Wampam varieties, do not apply before tillering). Apply with 2,4-D after tillering (refer to appropriate 2,4-D manufacturer's label), but before boot.

With Diablo or Clash (dicamba)

For best results, apply this product at 1/10 ounce per acre; add 1/16 to 1/8 lb. Diablo / Clash, active ingredient Dicamba. Surfactant may be added to the mixture at 1/2 to 1 quart per 100 gallons, of spray solution; however, adding surfactant may increase the potential for crop injury. Also refer to Diablo / Clash labeling for application timing and restrictions.

With 2,4-D (amine or ester) and Diablo or Clash (dicamba)

Apply in a 3-way tank mix with formulations of Diablo / Clash and 2,4-D. Observe all applicable directions, restrictions and precautions on labels of all products used.

Use 1/10 ounce of this product + 0.063 to 0.083 pounds ai Dicamba (Diablo / Clash) + 4-6 ounce active 2,4-D ester or amine per acre. Use higher rates when weed infestation is heavy. Add 1-2 pint. of surfactant to the 3-way mixture if needed. Surfactant may not be needed with the higher phenoxy rates and ester phenoxy formulations. Consult the specific 2,4-D or Diablo / Clash label, or local recommendations for more information.

Apply this 3-way combination to winter wheat after the crop is tillering and prior to jointing (first node). In Spring wheat (including Durum wheat) apply after crop is tillering and before it exceeds the 5-leaf stage.

Do not apply this 3-way mixture at high rates more than once a year or more than twice per year at the low rates.

With Maestro (bromoxynil)

Apply with bromoxynil containing herbicides registered for use on wheat, barley, or fallow. For best results, add bromoxynil containing herbicides to the tank at 3 to 6 ounce active ingredient per acre (such as Maestro 2EC at 3/4 - 1-1/2 pints per acre).

Read and follow all label instructions on timing and precautions for these herbicides before using these tank mixtures. Follow the most restrictive labeling.

With grass control products

Tank mixtures with grass control products may result in poor grass control. Consult your state experiment station, university or extension agent, agricultural dealer, or crop consultant as potential for antagonism before using the mixture. If no information is available, limit the initial use of this product and the grass product to a small area.

Do not mix with Hoelon SEC, as grass control may be reduced.

To control wild oat, tank mix with Avenge or Assert

When tank mixing with Assert, always include 2,4-D ester, MCPA ester, or bromoxynil containing products (such as Maestro). Tank-mixed applications of this product plus Assert may cause temporary crop discoloration, stunting or injury when heavy rainfall occurs shortly after application.

With Victory (tribenuron methyl)

This product may be tank mixed with Victory based on local recommendations. Read and follow all label instructions on timing, precautions, and warning for these herbicides before using this tank mixture.

With Treaty Extra (thifensulfuron 50% & tribenuron 25%)

This product may be tank mixed with Treaty Extra based on local recommendations. Read and follow all label instructions on timing and precautions for these herbicides before using this tank mixture.

With Insecticides and Fungicides

This product may be tank mixed or used sequentially with insecticides and fungicides registered for use on cereal grains.

However, under certain conditions (drought stress, cold weather, or if the crop is in the 2-4 leaf stage), tank mixes or sequential applications with organophosphate insecticides (such as parathion, Di-Syston) may produce temporary crop yellowing or, in severe cases, crop injury.

The potential for crop injury is greatest when wide fluctuations in day/night temperatures occur just prior to or soon after application.

Test these mixtures in a small area before treating large areas.

Do not apply this product within 60 days of crop emergence where an organophosphate insecticide (such as Di-Syston) has been applied as an in-furrow treatment as crop injury may result.

Do not use with Malathion, as crop injury will result.

With Liquid Nitrogen Solution Fertilizer

Liquid nitrogen fertilizer solutions may be used as a carrier in place of water. Run a tank mix compatibility test before mixing this product in fertilizer solution.

This product must first be slurried with water and then added to liquid nitrogen solutions (e.g. 28-0-0, 32-0-0). Be sure agitator is running while this product is added. This mixture may result in temporary crop yellowing and stunting.

When using low rates of liquid nitrogen fertilizer in the spray solution (less than 50% of the spray solution volume), the addition of a surfactant is necessary. Add surfactant at 1/2 pint to 1 quart per 100 gallons, of spray solution (0.06-0.25% v/v) based on local recommendations.

When using high rates of liquid nitrogen fertilizer in the spray solution, adding surfactant increases the risk of crop injury. Consult your agricultural dealer, consultant, fieldman, or extension agent for specific instructions before adding an adjuvant to these tank mixtures.

When 2,4-D or MCPA is included with a fertilizer/Patriot mixture, ester formulations of 2,4-D or MCPA tend to be more compatible in combinations with this product (see manufacturer's label). Do not add surfactant when using this product in tank mix with 2,4-D ester or MCPA ester and liquid nitrogen fertilizer solutions.

Note: In certain areas east of the Mississippi river unacceptable crop response may occur with use of straight or dilute nitrogen fertilizer carrier solutions where cold temperatures or widely fluctuating day/night temperatures exist. In these areas consult your agricultural dealer, consultant, field advisor, or Nufarm representative for a specific guidance before using nitrogen fertilizer carrier solutions.

Liquid nitrogen fertilizer solutions that contain sulfur can increase crop response.

Do not use low rates of liquid fertilizer as a substitute for a surfactant.

Do not use with liquid fertilizer solutions with a pH less than 3.0.

Tank Mixtures in Harvest Aid

A tank mix of this product plus 2,4-D and surfactant, or Credit 41 Extra / Credit Xtreme (glyphosate), will typically aid in dry down of many broadleaved weeds, thereby aiding grain harvest. Postemergence application should be made to actively growing weeds after the crop is in the hard dough stage. If weeds are not dry within 10 days after application, delay harvest until weeds are dry.

See weeds listed in the **WEEDS CONTROLLED** chart of this label.

With 2,4-D

Mix 1/10 ounce this product plus 1/4 to 1/2 pounds active ingredient 2,4-D per acre on moderate weed infestations; higher rates of 2,4-D may be used on large weeds if permitted by the 2,4-D product labeling. Include 1 to 2 quarts surfactant per 100 gallons, spray solution. In addition to the weeds listed in the **WEEDS CONTROLLED** chart of this label, the 2,4-D combination will also dry down common cocklebur, marehail, puncturevine and common and wild sunflower. In areas where 2,4-D use is restricted, apply this product with surfactant only; however, this treatment may be less effective.

With Credit 41 Extra or Credit Xtreme (glyphosate)

Use 1/10 ounce Patriot plus the labeled rate of Credit 41 Extra / Credit Xtreme / Razor Pro (see Credit 41 Extra / Credit Xtreme / Razor Pro label for maximum season rate). Use an adjuvant for optimum activity - consult the Credit 41 Extra / Credit Xtreme / Razor Pro label or local recommendations for the amount of adjuvant to include.

Tank Mixtures in Fallow

This product may be used as a fallow treatment and may be tank mixed with other herbicides that are registered for use in fallow. If the label instructions conflict with this label do not tank mix that product with this product. Read and follow all label instructions on timing precautions, restrictions and warnings for any companion products before using these tank mixtures. Follow the most restrictive labeling.

Tank Mixtures in Pasture or Rangeland

Apply a tank-mix combination with Trooper P+D, Trooper 22K, 2,4-D, Credit 41 Extra / Credit Xtreme or Weedmaster in states where these products are labeled for postemergence control of the following weeds:

Annual marshelder	Carolina Horsenettle	Giant ragweed
Burclover	Common milkweed	Prickly lettuce
Common cocklebur	Common ragweed	Western ragweed

For best results, apply this product at 1/10 to 2/10 ounce per acre with one of the following products.

Product	Rate (oz product/A)
Trooper P&D	8 to 32
Trooper 22K	4 to 16
Diablo	4 to 32
Weedmaster	8 to 32
Remedy	8
Amber	0.35*
2,4-D	8 to 16 (oz ai/A)

*For suppression of Ragweed in Phenoxy Restricted and Herbicide Regulated Counties.

With Liquid Nitrogen Solution Fertilizer

Liquid nitrogen fertilizer solutions may be used, as a carrier in place of water. Run a tank mix compatibility test before mixing in fertilizer solution.

First, slurry this product with water and then add to liquid nitrogen solutions (e.g., 28-0-0, 32-0-0). Make sure agitator is running while this product is added. This mixture may result in temporary crop yellowing and stunting.

When using low rates of liquid nitrogen fertilizer in the spray solution (less than 50% of the spray solution volume), the addition of surfactant is necessary. Add surfactant at 1/4 pint per 100 gals, of spray solution (0.03% v/v).

When using high rates of liquid nitrogen fertilizer in the spray solution, adding surfactant increases the risk of crop injury. Consult your agricultural dealer, consultant, fieldman, or extension agent for specific instructions before adding an adjuvant to these tank mixtures.

When 2,4-D or MCPA is included with a fertilizer/Patriot mixture, ester formulations tend to be more compatible (see manufacturer's label). Do not add surfactant when using this product in tank mix with 2,4-D ester and liquid nitrogen fertilizer solutions.

Do not use low rates of liquid fertilizer as a substitute for a surfactant.

Do not use with liquid fertilizer solutions having a pH less than 3.0.

Tank Mixtures with MCPA, 2,4-D and/or Dicamba for Suppression of Winter Annual Broadleaf Weeds in Winter Wheat to be Grazed Out in the States of Texas, Oklahoma, New Mexico and Kansas

PRODUCT INFORMATION

Patriot may be tank mixed with MCPA, 2,4-D and/or dicamba for suppression of winter annual broadleaf weeds in winter wheat to be grazed out and not harvested for grain in the States of Texas, Oklahoma, New Mexico and Kansas.

DIRECTIONS FOR USE

For the suppression of winter annual broadleaf weeds (such as henbit and mustards) in winter wheat in the states of Texas, Oklahoma, New Mexico and Kansas, this product at 1/20 ounce per acre should be tank mixed with MCPA, 2,4-D and/or dicamba at label rates. Winter annual broadleaf weeds should be less than 1" tall or in the rosette stage for suppression. Add a Nufarm specified nonionic surfactant having at least 80% active ingredient at 1 to 2 quarts per 100 gallons of spray solution (0.25 to 0.5% v/v).

Rotational Intervals For Crops in Non-Irrigated Land Following Use of Patriot at 1/20 oz./A on Wheat That Will be Grazed Out

Crop	Soil pH	Minimum Cumulative Precipitation (inches)	Minimum Rotation Interval (months)
Sorghum, Grain	7.9 or lower	No restrictions	4
Cotton	7.9 or lower	No restrictions	10
Alfalfa	6.8 or lower	No restrictions	10
	6.9 to 7.9	No restrictions	22
Beans, Dry	6.8 or lower	No restrictions	10
	6.9 to 7.9	No restrictions	22

Rotation Intervals for crops not covered above following the use of this product at 1/20 ounce per acre on wheat that will be grazed out.

The minimum rotation interval is 22 months with at least 18" of cumulative precipitation during the period:

- To any crop not listed in the Rotation Intervals table above,
- If the soil pH is not in the specified range.

To rotate to a crop at an interval shorter than specified, a field bioassay must be successfully completed to rotate to that crop. See section on **Field Bioassay** for further information.

IMPORTANT RESTRICTIONS

This treatment is for use on winter wheat that will be grazed out and will not be harvested for grain.

IMPORTANT PRECAUTIONS

This product suppresses weeds by postemergence activity. For best results apply this product to young actively growing weeds. The degree and duration of suppression at 1/20 ounce per acre may depend upon the following factors:

- Weed spectrum and infestation,
- Intensity weed size at application, and
- Environmental condition at and following treatment.

CROP ROTATION

Before using this product, carefully consider your crop rotation plans and options. For rotational flexibility, do not treat all of your wheat, barley, triticale, fallow, pasture or rangeland acres at the same time.

Minimum Rotation Intervals Minimum rotation intervals* are determined by the rate of breakdown of Patriot. Breakdown in the soil is affected by soil pH, soil microorganisms, soil temperature, and soil moisture. Low soil pH, high soil temperature, and high soil moisture speed breakdown in soil, with high soil pH, low soil temperature, and low soil moisture slow breakdown.

Of these 3 factors, only soil pH remains relatively constant. Soil temperature and soil moisture can vary significantly from year to year and from area to area. For this reason, soil temperatures and soil moisture should be monitored closely when considering crop rotations.

*The minimum rotation interval represents the period of time from the last application to the earliest date of the next planting.

Soil pH Limitations

Do not use this product on soils having a pH above 7.9 as extended soil residual activity could require longer crop rotation intervals than normal. Under certain conditions, this product could remain in the soil for 34 months or more, injuring wheat and barley. In addition, other crops planted in high pH soil can be extremely sensitive to low concentrations of Patriot.

Checking Soil pH

Before using this product, determine the soil pH of the areas of intended use. To obtain a representative pH value for the test area, take several 0" to 4" samples from different areas of the field and analyze them separately. Consult local extension publications for additional information on recommended soil sampling procedures.

Rotation Intervals for Cereals

All Areas-Following Use of Patriot at 1/10 oz. per Acre

Crop	Soil pH	Minimum Cumulative Precipitation (inches)	Minimum Rotation Interval (months)
Winter and spring wheat	7.9 or lower	No restrictions	1
Durum wheat, barley, spring/winter oat	7.9 or lower	No restrictions	10

Rotation Intervals For Crops in Non-Irrigated Land

Following Use of Patriot at 1/10 oz. per Acre on Wheat, Barley, Triticale or Pasture

Geographic Location		Crop	Soil pH	Minimum Cumulative Precipitation (inches)	Minimum Rotation Interval (months)
State	County or Area				
Colorado	Statewide	Grain sorghum, Proso millet	7.9 or lower	No restrictions	10
		Flax, Sunflower, safflower	7.9 or lower	No restrictions	22
		Field Corn	7.9 or lower	No restrictions	12
		STS Soybeans	7.9 or lower	No restrictions	4
Idaho	Southern Idaho	Flax, Safflower, Sunflower	7.9 or lower	No restrictions	22
	Statewide	Peas, Lentils, Canola	6.8 or lower	18	10
		Peas	6.9 to 7.9	18	15
		Lentils	6.9 to 7.9	18	34
		Canola	6.9 to 7.9	18	22
		Condiment mustard	7.3 or lower	10	10
		Condiment mustard	7.4 or higher	28	34
		Chickpeas	7.3 or lower	10	10
		Chickpeas	7.4 or higher	28	34

(continued)

Rotation Intervals For Crops in Non-Irrigated Land (continued)
Following Use of Patriot at 1/10 oz. per Acre on Wheat, Barley, Triticale or Pasture

Geographic Location		Crop	Soil pH	Minimum Cumulative Precipitation (inches)	Minimum Rotation Interval (months)
State	County or Area				
Kansas	Statewide	Grain sorghum, Proso millet	7.9 or lower	No restrictions	10
		Flax, Safflower, Sunflower	7.9 or lower	No restrictions	22
	Central and Western Kansas (W. of the Flinthills)	Field Corn	7.9 or lower	15	12
	Western Kansas W. of Hwy. 183	Soybeans	7.5 or lower	22	22
			7.6 to 7.9	33	34
	Central Kansas-Generally E. of Hwy 183 and W. of the Flinthills	Soybeans	7.5 or lower	22	22
STS Soybeans		7.9 or lower	15	4	
Montana	Statewide	Grain sorghum, Proso Millet, Field Corn	7.9 or lower	22	22
		Alfalfa Hay Only	7.6 to 7.9	No restrictions	34
			7.5 or lower	No restrictions	22
		Flax, Safflower, Sunflower	7.9 or lower	No restrictions	22
Nebraska	Statewide	Grain sorghum, Proso millet	7.9 or lower	No restrictions	10
		Flax, Safflower, Sunflower	7.9 or lower	No restrictions	22
		STS Soybeans	7.9 or lower	No restrictions	4
	Generally W. of Hwy. 77 and E. of the Panhandle	Field corn	7.9 or lower	15	22
		Soybeans	7.5 or lower	22	22
			7.6 to 7.9	33	34
New Mexico	Statewide	Grain sorghum, Proso millet	7.9 or lower	No restrictions	10
		Flax, Safflower, Sunflower	7.9 or lower	No restrictions	22
		Cotton (dryland only)	7.9 or lower	30	22

(continued)

Rotation Intervals For Crops in Non-Irrigated Land (continued)
Following Use of Patriot at 1/10 oz. per Acre on Wheat, Barley, Triticale or Pasture

Geographic Location		Crop	Soil pH	Minimum Cumulative Precipitation (inches)	Minimum Rotation Interval (months)
State	County or Area				
North Dakota	W. of Hwy. 1	Grain sorghum, Proso millet, Field corn, Dry Beans, Flax, Safflower, Soybean, Sunflower	7.9 or lower	22	22
	E. of Hwy. 1	Grain sorghum, Proso millet, Field corn, Dry Beans, Flax, Safflower, Soybean, Sunflower	7.9 or lower	34	34
Oklahoma	Statewide	Grain sorghum, Proso millet	7.9 or lower	No restrictions	10
		Flax, Safflower, Sunflower	7.9 or lower	No restrictions	22
		Field corn	7.9 or lower	15	12
		STS Soybeans	7.9 or lower	No restrictions	4
Oregon	Statewide	Peas, Lentils, Canola	6.8 or lower	18	10
		Peas	6.9 to 7.9	18	15
		Lentils	6.9 to 7.9	18	34
		Canola	6.9 to 7.9	18	22
		Condiment mustard	7.3 or lower	10	10
		Condiment mustard	7.4 or higher	28	34
		Chickpeas	7.3 or lower	10	10
		Chickpeas	7.4 or higher	28	34
South Dakota	Statewide	Flax, Safflower, Soybean, Sunflower	7.9 or lower	No restrictions	22
	S. of Hwy. 212 & E. of Missouri River, & S. of Hwy. 34 & W. of Missouri River	Grain sorghum, Proso millet	7.9 or lower	13	12
	Generally E. of Missouri River, & S. of Hwy. 14 & W. of Missouri River	Field Corn	7.9 or lower	15	12

(continued)

Rotation Intervals For Crops in Non-Irrigated Land (continued)
Following Use of Patriot at 1/10 oz. per Acre on Wheat, Barley, Triticale or Pasture

Geographic Location		Crop	Soil pH	Minimum Cumulative Precipitation (inches)	Minimum Rotation Interval (months)
State	County or Area				
Texas	Statewide	Grain sorghum, Proso millet	7.9 or lower	No restrictions	10
		Flax, Safflower, Soybean, Sunflower	7.9 or lower	No restrictions	22
	Panhandle	Field corn	7.9 or lower	15	12
		Cotton (dryland only)	7.9 or lower	30	22
	N. Central Texas*	Field corn	7.9 or lower	15	12
		Cotton (dryland only)	7.9 or lower	25	14
*The counties of N. Central Texas are: Archer, Baylor, Bell, Bosque, Bowie, Callahan, Camp, Cass, Clay Collin, Cooke, Coryell, Dallas, Delta, Denton, Eastland, Ellis, Falls, Fannin, Foard, Franklin, Grayson, Hardeman, Haskell, Hill, Hood, Hopkins, Hunt, Jack, Johnson, Kaufman, Knox, Lamar, Limestone, McLennan, Milam, Montague, Morris, Navarro, Palo Pinto, Parker, Rains, Red River, Robertson, Rockwall, Shackelford, Somervell, Stephens, Tarrant, Throckmorton, Titus, Upshur, Van Zandt, Wilbarger, Wichita, Williamson, Wise, Wood, Young.					
Utah	Statewide	Flax, Safflower, Sunflower	7.9 or lower	No restrictions	22
Washington	Statewide	Peas, Lentils, Canola	6.8 or lower	18	10
		Peas	6.9 to 7.9	18	15
		Lentils	6.9 to 7.9	18	34
		Canola	6.9 to 7.9	18	22
Wyoming	Statewide	Flax, Safflower, Sunflower	7.9 or lower	No restrictions	22
	Southern Wyoming	Grain sorghum, Proso millet	7.9 or lower	No restrictions	10
	Southern Wyoming (Goshen, Laramie and Platte counties only)	Field corn	7.9 or lower	15	12
	Northern Wyoming	Grain sorghum, Proso Millet, Field Corn	7.9 or lower	22	22

Rotation Intervals not covered above - The minimum rotation interval is 34 months with at least 28" of cumulative precipitation during the period:

- for any major field crop not listed (see the **Rotation Intervals** table);
- if the soil pH is not in the specified range;
- if the use rate applied is not specified in the table;
- or if the minimum cumulative precipitation has not occurred since application.

Before rotation to a major field crop at an interval shorter than specified, a field bioassay is required for that crop. A field bioassay is required before rotation to any minor crops (as determined by the USDA criteria). See section on **Field Bioassay** for further information.

Rotation Intervals in Pasture, Rangeland or CRP for Overseeding and Renovation
Minimum Rotation Intervals

Geographic Location	Crop / Grass	Maximum Rate Used (oz./A)	Minimum Rotation Interval (months)
AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA, WV	Alfalfa, red clover, white clover, sweet clover, bermudagrass, bluegrass, ryegrass, tall fescue	1/10 to 3/10	4
	Wheat (except durum)	1/10 to 3/10	1
	Durum, barley, oats	1/10 to 3/10	10
All Other States	Red clover, white clover, sweet clover	1/10 to 2/10	12
	Bermudagrass, bluegrass, ryegrass	1/10 to 2/10	6
	Tall fescue	1/10 to 2/10	18
	Wheat (except durum)	1/10 to 2/10	1
	Durum, barley, oats	1/10 to 2/10	10
All Areas with Soil pH of 7.5 or Less	Russian wildrye	1/10 to 1/2	1
	Green needlegrass, switchgrass, sheep fescue	1/10 to 1	1
	Meadow brome, smooth brome, alta fescue, red fescue, meadow foxtail, orchardgrass, Russian wildrye, timothy	1/10 to 1	2
All Areas with Soil pH of 7.9 or Less	Alkali sacaton, mountain brome, blue grass thickspike wheatgrass	1/10 to 1	1
	Sideoats grama, switchgrass	1/10 to 1/2	2
	Western wheatgrass	1/10 to 1	2
	Sideoats grama, Switchgrass, big bluestem	1/10 to 1	3

Rotation Intervals not covered above - The minimum rotation interval for crops not listed is at least 34 months with at least 28" of cumulative precipitation during the period:

- for any major field crop not listed (see the **Rotation Intervals** table);
- if the soil pH is not in the specified range;
- if the use rate applied is not specified in the table

Before rotation to a major field crop at an interval shorter than specified, a field bioassay is required for that crop. A field bioassay is required to any minor crops (as determined by the USDA criteria). See section on **Field Bioassay** for further information.

BIOASSAY

A field bioassay is required before rotating to any crop not listed (see the **Rotation Intervals** table), or if the soil pH is outside the specified range, or if the use rate is outside those in the table, or if the minimum cumulative precipitation has not occurred since application.

Field Bioassay

To conduct a field bioassay, grow test strips of the crop(s) you plan to grow following treatment with this product. Crop response to the bioassay will indicate whether or not rotation to the crop(s) grown in the test strips is advisable.

If a field bioassay is planned, check with your local experts for information detailing the field bioassay procedure.

GRAZING

When Patriot is used at rates of 1-2/3 ounce per acre or less, there are no grazing or haying restrictions on this product.

Treated vegetation may be cut for forage or hay.

NON-AGRICULTURAL USES

WEEDS CONTROLLED

1/3 TO 1/2 OUNCE PER ACRE

Annual sowthistle	Common groundsel	Goldenrod	Smallseed falseflax
Aster	Common purslane	Lambsquarters	Smooth pigweed
Bahiagrass	Common yarrow	Marestail/horseweed ****	Sweet clover
Beebalm	Conical catchfly	Maximillion sunflower	Tansymustard
Bittercress	Corn cockle	Miners lettuce	Treacle mustard
Bitter sneezeweed	Cow cockle	Pennsylvania smartweed	Tumble mustard
Blackeyed-susan	Crown vetch	Plains coreopsis	Wild carrot
Blue mustard	Dandelion	Plantain	Wild garlic
Bur buttercup	Dogfennel	Redroot pigweed	Wild lettuce
Chicory	False chamomile	Redstem filaree	Wild mustard
Clover	Fiddleneck tarweed	Rough fleabane	Wooly croton
Cocklebur	Field pennycress	Shepherd's purse	Wood sorrel
Common chickweed	Flixweed	Silky crazyweed (locoweed)	Yankweed

1/2 TO 1 OUNCE PER ACRE

Blackberry	Curly dock	Multiflora rose and other wild roses	Seaside arrowgrass
Black henbane	Dewberry	Musk thistle***	Sericea lespedeza
Broom snakeweed*	Dyer's woad	Oxeye daisy	Tansy ragwort
Buckhorn plantain	Goose	Plumeless thistle	Teasel
Bull thistle	Halogeton	Prostrate knotweed	Wild caraway
Common crupina	Henbit	Rosering gaillardia	
Common sunflower	Honeysuckle		

1 TO 2 OUNCES PER ACRE

Common mullein	Lupine	Purple scabious	Sulphur cinquefoil
Common tansy	Old world climbing fern (Lygodium)	Scotch thistle	Western salsify
Field bindweed**	Perennial pepperwood	Scouringrush	Whitetop (hoary cress)
Greasewood	Poison hemlock	Salsify	Wild iris
Gumweed	Purple loosestrife	Snowberry	
Houndstongue		St. Johnswort	

1 1/2 TO 2 OUNCES PER ACRE

Canada thistle**	Duncecap larkspur	Tall larkspur	Yellow toadflax**
Dalmation toadflax**	Russian knapweed**	Wild parsnip	

2 OUNCES PER ACRE

Onionweed

3 TO 4 OUNCES PER ACRE

Kudzu

* Apply fall through spring

** Suppression, which is a visual reduction in weed competition (reduced population or vigor) as compared to untreated areas. Apply as a full coverage spray for best performance.

*** Certain biotypes of musk thistle are more sensitive to this product and may be controlled with rates of 1/4 to 1/2 ounce per acre. Treatments of this product may be applied from rosette through bloom stages of development.

**** Certain biotypes of marestail/horsetail are less sensitive to this product and may be controlled by tank mixes with herbicides with a different mode of action.

Tank Mix Combinations for Problem Weed Control

For broader spectrum control and for use on certain biotypes of broadleaf weeds which may be resistant to this product and herbicides with the same mode of action, use the following tank mixes.

Diablo (dicamba) + 2,4-D

Kochia -

Combine 1/2 ounce of Patriot with 8 fluid ounces of dicamba and 16 fluid ounces of 2,4-D for the control of kochia.

Spotted knapweed -

Combine 1/2 ounce of Patriot with 8 ounces of dicamba and 16 fluid ounces of 2,4-D for the control of spotted knapweed.

Skeletonweed -

Combine 1 ounce of Patriot with 8 fluid ounces of dicamba and 16 fluid ounces of 2,4-D for the suppression of rush skeletonweed.

NONCROP (INDUSTRIAL) SITES

Application Information

Apply Patriot for general weed control on private, public and military lands as follows: Uncultivated areas (including airports, highway, railroad and utility rights-of-way, sewage disposal areas, etc.); uncultivated agricultural areas- noncrop producing (including farmyards, fuel storage areas, fence rows, soil bank land, barrier strips, etc.); industrial sites- outdoor (including lumberyards, pipeline and tank farms, etc.). It can also be used for the control of certain noxious and troublesome weeds.

Consult the **WEEDS CONTROLLED** Weeds Controlled and **BRUSH SPECIES CONTROLLED** tables to determine the appropriate application rate. Patriot may be applied in tank mixture with other herbicides labeled for use on non-crop sites. Fully read the labels and follow all directions and restrictions on each label.

This product may be applied in tank mixture with other herbicides labeled for use on non-crop sites. Fully read the labels and follow all the directions and restrictions on each label.

Applications may be made by ground or air. Use a sufficient volume of water to ensure thorough coverage of the target vegetation with the application equipment being used.

Application Timing

For best results, Patriot should be applied postemergence to young, actively growing weeds. Application may be made at any time of the year, except when the ground is frozen.

GRASS REPLANT INTERVALS

Following an application of Patriot to non-crop areas, the treated sites may be replanted with various species of grasses at the intervals listed below.

For soils with a pH of 7.5 or less, observe the following replant intervals:

Species	Rate (ounces per acre)	Replant Interval (months)
Brome, Meadow	1/2 - 1	2
	1 - 2	3
Brome, Smooth	1/2 - 1	2
	1 - 2	4
Fescue, Alta	1/2 - 1	2
	1 - 2	4
Fescue, Red	1/2 - 1	2
	1 - 2	4
Fescue, Sheep	1/2 - 1	1
	1 - 2	4
Foxtail, Meadow	1/2 - 1	2
	1 - 2	4
Green Needlegrass	1/2 - 2	1
Orchardgrass	1/2 - 1	2
	1 - 2	4
Russian wildrye	1/2 - 1	1
	1	2
	2	3
Switchgrass	1/2 - 1	1
	1 - 2	3
Timothy	1/2 - 1	2
	1 - 2	4
Wheatgrass, Western	1/2 - 1	2
	1 - 2	3

For soils with a pH of 7.5 or greater, observe the following replant intervals:

Species	Rate (ounces per acre)	Replant Interval (months)
Alkali Sacaton	1/2 - 1	1
	1 - 2	3
Bluestem, Big	1/2 - 2	3
Brome, Mountain	1/2 - 1	1
	1 - 2	2
Gramma, Blue	1/2 - 2	1
Gramma, Sideoats	1/2	2
	>1/2	>3
Switchgrass	1/2	2
	>1/2	>3
Wheatgrass, Thickspike	1/2 - 2	1
Wheatgrass, Western	1/2 - 1	2
	1 - 2	3

The specified intervals are for applications made in the Spring to early Summer. Because this product degrades slowly in cold or frozen soils, applications made in the late Summer or Fall should consider the intervals as beginning in the Spring following treatment.

Testing has indicated that there is considerable variation in response among the species of grasses when seeded into areas treated with this product. If species other than those listed above are to be planted into areas treated with this product, a field bioassay should be performed, or previous experience may be used, to determine the feasibility of replanting treated sites.

TURFGRASS, INDUSTRIAL (UNIMPROVED ONLY)

Application Information

Apply Patriot for selective weed control in unimproved industrial turfgrass where certain grasses are well established and desired as ground cover. Patriot also be used for the control of certain noxious and troublesome weeds in turfgrass.

In addition to conventional spray equipment, Patriot may also be applied with invert emulsion equipment. When using an invert emulsion, mix the prescribed rate of Patriot in the water phase.

Consult the **WEEDS CONTROLLED** table to determine which weeds will be controlled by the following rates:

Turfgrass type	Rate of Patriot (ounces/acre)
Fescue and Bluegrass	1/4 to 4/10
Crested Wheatgrass and Smooth Brome	1/4 to 1
Bermudagrass	1/4 to 2

Application Timing

Applications may be made at any time of the year, except when the soil is frozen.

When a spring application is made on fescue or bluegrass, a second application may be made during the summer after full seedhead maturation.

Growth Suppression and Seedhead Inhibition (Chemical Mowing)

Application Information

Apply Patriot for growth suppression and seedhead inhibition in well-established fescue and bluegrass turf at the use rate of 1/4 to 1/2 ounce per acre.

Tank Mix Combination

Patriot may be tank mixed with Nufarm T-Pac MEC Plant Growth Regulator or Embark for improved performance in the regulation of growth and seedhead suppression. Tank mix 1/4 to 1/2 ounce of Patriot with 2 to 4 ounces of Nufarm T-Pac MEC Plant Growth Regulator or Embark.

Application Timing

Application may be made after at least 2 to 3 inches of new growth has emerged until the appearance of the seed stalk.

Fescue Restrictions:

- Do not use more than 4/10 ounce of Patriot per acre
- Do not use a surfactant if liquid nitrogen is used as a carrier
- Do not use a spray adjuvant unless it is a non-ionic surfactant

Fescue Precautions:

This product may temporarily stunt tall fescue, cause it to turn yellow, or cause seedhead suppression. To minimize these symptoms, take the following precautions:

- Use a tank mix with 2,4-D
- Use the lowest specified rate for the target weeds
- Use a non-ionic surfactant at % to 1 pint per 100 gallons of spray solution
- Make application later in the spring after the new growth is 5 to 6 inches tall, or in the fall

Yields from the first cutting may be reduced.

IMPORTANT RESTRICTION-INDUSTRIAL TURF ONLY

- Do not use Patriot on bahiagrass.

IMPORTANT PRECAUTIONS-INDUSTRIAL TURF ONLY

- An application of Patriot may cause temporary discoloration (chlorosis) of the grasses. Use the lower specified rates for minimum discoloration.
- With fescue and bluegrass, sequential applications made during the same or consecutive growth periods (i.e. spring and fall) may result in excessive injury to turf.
- Excessive injury may result when Patriot is applied to turf that is under stress from drought, insects, disease, cold temperatures (winter injury) or poor fertility.

NATIVE GRASSES

Apply Patriot for weed control and suppression in the establishment and maintenance of native grasses. It may be used where blue grama, bluestems (big, little, plains, sand, ww spar) bromegrasses (meadow), buffalograss, green sprangletop, Indiangrass, kleingrass, lovegrasses (atherstone, sand, weeping, wilman), orchardgrass, sideoats grama, switchgrass (Blackwell), wheatgrass (bluebunch, intermediate, pubescent Siberian, slender, streamband, tall, thickspike, western), and Russian wildrye are established. It may also be applied over these species in the seedling stage, except for orchardgrass and Russian wildrye.

Application Information

Apply Patriot at the rate of 1/10 ounce per acre for the control and suppression* of bur buttercup (testiculate), common purslane, common sunflower*, cutleaf eveningprimrose*, flixweed*, lambsquarters* (common and slimleaf), marestail*, pigweed (redroot and tumble), snow speedwell, tansymustard* and tumble mustard (Jim Hill mustard).

*Suppression is a visual reduction in weed competition (reduced population or vigor) as compared to untreated areas. Degree of suppression will vary with the size of weed and environmental conditions following treatment.

Application Timing

For established grasses, apply when weeds are in the seedling stage. For grasses in the seedling stage, apply preplant or preemergence where the soil (seed bed) has been cultivated.

IMPORTANT RESTRICTIONS - NATIVE GRASSES

- Do not apply to grass that is stressed by severe weather conditions, drought, low fertility, water-saturated soils, disease or insect damage as grass injury may result.
- For application to Native Grasses- there are no grazing or haying restrictions on this product.

IMPORTANT PRECAUTIONS - NATIVE GRASSES

- Grass species or varieties may differ in their response to this herbicide. Consult with your state experiment station, university, or extension agent or other local experts as to sensitivity to this herbicide. If inadequate information is available, limit the initial use of this product to a small area. The types of grass in a grass seed mixture will vary in tolerance to this product, so the grasses in the final stand may not reflect the same ratio as in the seed mix.
- Under certain conditions such as heavy rainfall, high pH, prolonged cold weather, or wide fluctuations in day/night temperatures prior to or soon after this product application, temporary discoloration and/or grass injury may occur. Injury may result when this product is applied to grass that is stressed by severe weather conditions, drought, low fertility, water-saturated soils, disease, or insect damage as grass injury may result. Severe winter stress, drought, disease, or insect damage before or following application also may result in grass injury.

BRUSH CONTROL

Application Information

Apply Patriot for the control of undesirable brush growing in non-crop areas including grazed areas on these sites. Applications may be made by air, high volume ground application, low volume ground application and ultra-low volume ground application. Except as noted for multiflora rose, Patriot must be applied as a spray to the foliage.

The application volume required will vary with the height and density of the brush and the application equipment used. Generally, aerial applications will require 15 to 25 gallons of water per acre; high volume ground application will require 100 to 400 gallons of water per acre; low volume ground application will require 20 to 50 gallons of water per acre; and ultra-low volume ground application will require 10 to 20 gallons of water per acre.

Regardless of the application volume and equipment used, thorough coverage of the foliage is necessary to optimize results.

BRUSH SPECIES CONTROLLED

Species	High Volume Patriot Rate (ounces per 100 gallons)	Broadcast Patriot Rate (ounces per acre)
Ash	1 - 2	1 - 3
Aspen	1 - 2	1 - 3
Black locust	1 - 2	1 - 3
Blackberry	1 - 2	1 - 3
Camelthorn	1 - 2	1 - 3
Cherry	1 - 2	1 - 3
Cottonwood	1 - 2	2 - 3
Eastern red cedar	1 - 2	2 - 3
Elder	1 - 2	2 - 3
Elm	1 - 2	1 - 3
Firs	3	1 - 2
Hawthorn	1 - 2	1 - 3
Honeysuckle	1 - 2	1/2 - 1
Mulberry	1 - 2	2 - 3
Multiflora rose	1 - 2	1 - 3
Muscadine (wild grape)	1 - 2	2 - 3
Oaks	1 - 2	1 - 3
Ocean spray (<i>Holodiscus</i>)	1 - 2	2 - 3
Osage orange	1 - 2	2 - 3
Red maple	1 - 2	2 - 3
Salmonberry	1/2 - 1	1 - 3
Snowberry	1/2 - 1	1 - 3
Spruce (black and white)	3	2 - 3
Thimbleberry	1/2 - 1	1 - 3
Tree of heaven (<i>Ailanthus</i>)	1 - 2	1 - 2
Tulip tree (yellow poplar)	1/2 - 1	1 - 3
Wild roses	1/2 - 1	1 - 3
Willow	1/2 - 1	1 - 3

For low volume and ultra-low volume ground applications, mix 4 to 8 ounces of this product per 75 gallons of spray solution.

Application Timing

Make a foliar application of the specified rate of this product during the period of full leaf expansion in the spring until the development of full fall coloration on deciduous species to be controlled. Coniferous species may be treated at anytime during the growing season.

Spot Treatment

This product may be used for the control of many species of weeds including noxious/invasive weeds in certain established grasses growing on non-crop areas.

Refer to the **WEEDS CONTROLLED** section for a listing of susceptible weed species and the application rate per acre per the target weed.

Or, mix one gram of this product per one gallon of water along with a surfactant. Spray to the point of wetting the entire surface of the target weeds, approximately 40 gallons of solution per acre.

Tank Mix Combinations

This product may be tank mixed with any product labeled for non-crop brush control at the application rates specified on the companion product's label for the species specified on the product's companion label. Read and follow the label instructions of both products when tank mixing. Follow the most restrictive limitations of the products labels being tank mixed.

Accord

After consulting **BRUSH SPECIES CONTROLLED** table, tank mix the prescribed rate of Patriot with the rate of Accord indicated for the various application methods on the Accord label. Refer to the Accord label for list of species controlled.

Nufarm Polaris Herbicide (2 pounds per gallon active ingredient imazapyr)

Combine 1 to 2 ounces of this product with 1 to 4 pints of Nufarm Polaris (2 pounds per gallon imazapyr) per acre and apply as a broadcast spray. Aerial applications should use a minimum of 15 gallons per acre spray volume. In addition to species listed above controlled by this product, this combination controls black gum, hophornbeam, sassafras, sweetgum, Vaccinium species, dogwood, myrtle dahoon, hickories, and persimmon.

Tahoe 3A or Relegate (triclopyr)

After consulting the **BRUSH SPECIES CONTROLLED** table, tank mix the prescribed rate of Patriot with the rate of Tahoe 3A or Relegate indicated for the various application methods on the Tahoe 3A / Relegate label. Refer to the Tahoe 3A / Relegate label for list of species controlled.

KRENITE S

After consulting the **BRUSH SPECIES CONTROLLED** table, tank mix the prescribed rate of Patriot with the rate of KRENITE S indicated for the various application methods on the KRENITE S label. Refer to the KRENITE S label for list of species controlled.

Trooper 22K (picloram)

After consulting the **BRUSH SPECIES CONTROLLED** table, tank mix the prescribed rate of Patriot with the rate of Trooper 22K indicated for the various application methods on the Trooper 22K label. Refer to the Trooper 22K label for list of species controlled.

Trooper 22K is a restricted use pesticide.

Trooper 22K (2 pounds per gallon active ingredient picloram) + Nufarm Polaris Herbicide (2 pounds per gallon active ingredient imazapyr)

Combine 1 to 1-1/2 ounce of this product with 2 to 8 fluid ounces of Nufarm Polaris (2 pounds per gallon imazapyr) and 1 to 2 pints of Trooper 22K (2 pounds per gallon picloram) per 100 gallons of water. Apply as a high volume spray. This tank mix controls cherry, elms, box elder, maples, hackberry, redbud, ash, oaks (including shingle oak), black locust and sassafras.

Trooper 22K is a restricted use pesticide.

Spotgun Basal Soil Treatment

For control of multiflora rose, prepare a spray suspension of this product by mixing 1 ounce per gallon of water. Mix vigorously until this product is dispersed and agitate periodically while applying the spray suspension.

Apply the spray preparation with an exact delivery handgun applicator. Apply at the rate of 4 milliliters for each 2 feet of rose canopy diameter. Direct the treatment to the soil within 2 feet of stem union. When treating large plants and more than one delivery is required, make applications on opposite sides of the plant.

Applications should be made from early spring to summer.

IMPORTANT RESTRICTONS - NON-CROP BRUSH ONLY

- When using tank mixtures of this product with companion herbicides, read and follow all the use instructions, application rates, warnings and precautions appearing on the labels. Follow the most restrictive label instruction for each of the herbicides used.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

STORAGE AND SPILL PROCEDURES: Store upright at room temperature. Avoid exposure to extreme temperatures. In case of spillage or leakages, soak up with an absorbent material such as sand, sawdust, earth, Fuller's earth, etc. Dispose of with chemical waste.

PESTICIDE DISPOSAL: Pesticide, spray mixture or rinse water that cannot be used according to label instructions must be disposed of at or by an approved waste disposal facility.

CONTAINER HANDLING:

Nonrefillable Plastic and Metal Containers (Capacity Equal to or Less Than 50 Pounds): Nonrefillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying. **Triple rinse as follows:** Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then, for Plastic Containers, offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration. Do not burn, unless allowed by state and local ordinances. For Metal Containers, offer for recycling if available or reconditioning if appropriate, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

Nonrefillable Plastic and Metal Containers (Capacity Greater Than 50 Pounds): Nonrefillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying. **Triple rinse as follows:** Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. Then, for Plastic Containers, offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration. Do not burn, unless allowed by state and local ordinances. For Metal Containers, offer for recycling if available or reconditioning if appropriate, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

WARRANTY DISCLAIMER

The directions for use of this product must be followed carefully. TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, (1) THE GOODS DELIVERED TO YOU ARE FURNISHED "AS IS" BY MANUFACTURER OR SELLER AND (2) MANUFACTURER AND SELLER MAKE NO WARRANTIES, GUARANTEES, OR REPRESENTATIONS OF ANY KIND TO BUYER OR USER, EITHER EXPRESS OR IMPLIED, OR BY USAGE OF TRADE, STATUTORY OR OTHERWISE, WITH REGARD TO THE PRODUCT SOLD, INCLUDING, BUT NOT LIMITED TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, USE, OR ELIGIBILITY OF THE PRODUCT FOR ANY PARTICULAR TRADE USAGE. UNINTENDED CONSEQUENCES, INCLUDING BUT NOT LIMITED TO INEFFECTIVENESS, MAY RESULT BECAUSE OF SUCH FACTORS AS THE PRESENCE OR ABSENCE OF OTHER MATERIALS USED IN COMBINATION WITH THE GOODS, OR THE MANNER OF USE OR APPLICATION, INCLUDING WEATHER, ALL OF WHICH ARE BEYOND THE CONTROL OF MANUFACTURER OR SELLER AND ASSUMED BY BUYER OR USER. THIS WRITING CONTAINS ALL OF THE REPRESENTATIONS AND AGREEMENTS BETWEEN BUYER, MANUFACTURER AND SELLER, AND NO PERSON OR AGENT OF MANUFACTURER OR SELLER HAS ANY AUTHORITY TO MAKE ANY REPRESENTATION OR WARRANTY OR AGREEMENT RELATING IN ANY WAY TO THESE GOODS.

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If you do not agree with or do not accept any of the directions for use, the warranty disclaimers, or limitations on liability, do not use the product, and return it unopened to the Seller, and the purchase price will be refunded.

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1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Patriot Selective Herbicide

EPA Reg. No.: 228-391

Product Type: Herbicide

Company Name: Nufarm Americas Inc
11901 S. Austin Avenue
Alsip, IL 60803
1-800-345-3330

Telephone Numbers: For Chemical Emergency, Spill, Leak, Fire, Exposure, or Accident,
Call CHEMTREC Day or Night: 1-800-424-9300
For Medical Emergencies Only, Call 1-877-325-1840

This product is an EPA FIFRA registered pesticide. Some classifications on this SDS are not exactly the same as on the FIFRA label. Certain sections are superseded by federal law governed by EPA for a registered pesticide. Please see Section 15. REGULATORY INFORMATION for explanation.

2. HAZARDS IDENTIFICATION

PHYSICAL HAZARDS:

Not hazardous

HEALTH HAZARDS:

Carcinogen

Category 1A

Specific Target Organ Toxicity – Repeat Exposure

Category 1

ENVIRONMENTAL HAZARDS:

Hazardous to aquatic environment, acute

Category 1

Hazardous to aquatic environment, chronic

Category 1

SIGNAL WORD:

DANGER

HAZARD STATEMENTS:

May cause cancer by inhalation. Causes damage to lungs through prolonged or repeated exposure. Very toxic to aquatic life with long lasting effects.



PRECAUTIONARY STATEMENTS

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust. Wash thoroughly after handling. Do not eat, drink, or smoke when using this product. Use personal protective equipment as required. Avoid release to the environment.

IF exposed or concerned: Get medical advice. Get medical advice if you feel unwell. Collect spillage.

Store locked up.

Dispose of contents in accordance with local, state, and federal regulations.

3. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENTS	CAS NO.	% BY WEIGHT
Metsulfuron-methyl	74223-64-6	58.2 – 61.8
Kaolin	1332-58-7	13.3 – 14.7
Crystalline Silica (quartz)	14808-60-7	< 0.2
Titanium dioxide	13463-67-7	< 0.3
Other Ingredients	Trade Secret	Trade Secret

Synonyms: Mixture containing Metsulfuron methyl (Methyl 2-[[[(4-methoxy-6-methyl-1,3,5-triazin-2-ly) amino]carbonyl]amino] sulfonyl]benzoate)

Ingredients not precisely identified are proprietary or non-hazardous. Values are not product specifications.

4. FIRST AID MEASURES

If on Skin or Clothing: Take off contaminated clothing. Wash with soap and water. Get medical attention if irritation develops and persists.

If in Eyes: Hold eye open and rinse slowly and gently with water for several minutes. Remove contact lenses, if present, then continue rinsing eye. Get medical attention if irritation occurs and persists.

If Swallowed: Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. If symptoms develop, get medical advice.

If Inhaled: Move person to fresh air. If symptoms develop, get medical advice.

Most important symptoms/effects, acute and delayed: May cause mild eye irritation. Prolonged or repeated inhalation may cause lung damage or cancer.

Indication of immediate medical attention and special treatment if needed: For ingestion there is no specific antidote available. Treat symptomatically.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Use extinguishing media suitable for surrounding materials. Dry chemical, carbon dioxide, foam, water spray or fog.

Special Fire Fighting Procedures: Firefighters should wear NIOSH approved self-contained breathing apparatus and full fire-fighting turn out gear. Dike area to prevent runoff and contamination of water sources. Dispose of fire control water later.

Unusual Fire and Explosion Hazards: Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source, is a potential dust explosion hazard. If water is used to fight fire, contain runoff, using dikes to prevent contamination of water supplies. Dispose of fire control water later. Decontaminate tools and equipment following cleanup.

Hazardous Decomposition Materials (Under Fire Conditions): May produce gases such as oxides of carbon, hydrogen, nitrogen and sulfur.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Wear appropriate protective gear for the situation. See Personal Protection information in Section 8.

Environmental Precautions: Prevent material from entering public sewer systems or any waterways. Do not flush to drain. Large spills to soil or similar surfaces may necessitate removal of topsoil. The affected area should be removed and placed in an appropriate container for disposal.

Methods for Containment: Dike spill using absorbent or impervious materials such as earth, sand or clay. Collect and contain contaminated absorbent and dike material for disposal.

Methods for Cleanup and Disposal: Avoid creation of dusty conditions. If dry, sweep or scoop up material and place into container for disposal. If wet, pump any free liquid into an appropriate closed container. Decontaminate tools and equipment following cleanup. See Section 13: DISPOSAL CONSIDERATIONS for more information.

Other Information: Large spills may be reportable to the National Response Center (800-424-8802) and to state and/or local agencies.

7. HANDLING AND STORAGE

HANDLING:

Avoid contact with eyes or clothing. Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove clothing/Personal Protective Equipment (PPE) immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. If pesticide gets on skin, wash immediately with soap and

SAFETY DATA SHEET

Patriot Selective Herbicide

water. Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

STORAGE:

Store product in original container only. Do not contaminate water, other pesticides, fertilizer, food or feed in storage. Store in a cool, dry place. Do not contaminate water, food or feed by storage or disposal.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls:

Where engineering controls are indicated by specific use conditions or a potential for excessive exposure, use local exhaust ventilation at the point of generation. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment).

Personal Protective Equipment:

Eye/Face Protection: To avoid contact with eyes, wear chemical goggles. An emergency eyewash or water supply should be readily accessible to the work area.

Skin Protection: To avoid contact with skin, wear long-sleeved shirt and long pants, shoes, socks, and chemical-resistant gloves. Washing facilities should be readily accessible to the work area.

Respiratory Protection: Not normally required. If vapors or mists exceed acceptable levels, wear NIOSH approved air-purifying respirator with cartridges/canisters approved for use against pesticides.

General Hygiene Considerations: Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this material: 1) do not store, use and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored; 2) wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics or using the toilet.

Exposure Guidelines:

Component	OSHA		ACGIH		Unit
	TWA	STEL	TWA	STEL	
Metsulfuron-methyl	NE	NE	NE	NE	
Kaolin	15 (T) 5 (R)	NE	2.0 (R)	NE	mg/m ³
Crystalline Silica (quartz)	30 / %SiO ₂ +2 (T) 10 / %SiO ₂ +2 (R)	NE	0.025 (R)	NE	mg/m ³
Titanium dioxide	15 (T)	NE	10	NE	mg/m ³
Other Ingredients	NE	NE	NE	NE	

NE = Not Established

T= Total Dust

R= Respirable Fraction

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Light brown granular solid
Odor:	Mild
Odor threshold:	No data available
pH:	4.01 (1% w/w dispersion in DIW)
Melting point/freezing point:	No data available
Initial boiling point and boiling range	No data available
Flash point:	No data available
Evaporation rate:	No data available
Flammability (solid, gas):	No data available
Upper/lower flammability or explosive limits:	No data available
Vapor pressure:	No data available
Vapor density:	Not applicable
Relative density:	1.3976 g/cc
Solubility(ies):	No data available
Partition coefficient: n-octanol/water:	No data available
Autoignition temperature:	No data available
Decomposition temperature:	No data available

SAFETY DATA SHEET

Patriot Selective Herbicide

Viscosity: Not applicable due to product form (solid)

Note: Physical data are typical values, but may vary from sample to sample. A typical value should not be construed as a guaranteed analysis or as a specification.

10. STABILITY AND REACTIVITY

Reactivity: Not reactive.

Chemical Stability: This material is stable under normal handling and storage conditions.

Possibility of Hazardous Reactions: Will not occur.

Conditions to Avoid: Excessive heat. Do not store near heat or flame.

Incompatible Materials: Strong oxidizing agents: bases and acids.

Hazardous Decomposition Products: Under fire conditions may produce gases such as oxides of carbon, hydrogen, nitrogen and sulfur.

11. TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, eye and skin contact.

Symptoms of Exposure:

Eye Contact: Slightly irritating based on toxicity studies.

Skin Contact: Mildly toxic and non-irritating based on toxicity studies.

Ingestion: Slightly toxic based on toxicity studies.

Inhalation: Low inhalation toxicity. May cause cancer or lung damage through prolonged or repeated exposure.

Delayed, immediate and chronic effects of exposure: None expected.

Toxicological Data:

Data from laboratory studies on a substantially similar product are summarized below:

Oral: Rat LD₅₀: >5,000 mg/kg

Dermal: Rat LD₅₀: >5,000 mg/kg

Inhalation: Rat 4-hr LC₅₀: >5 mg/L (based on data for Metsulfuron methyl)

Eye Irritation: Rabbit: Slight irritation

Skin Irritation: Rabbit: Mildly irritating

Skin Sensitization: Not a contact sensitizer in guinea pigs following repeated skin exposure.

Subchronic (Target Organ) Effects: Repeated overexposure to metsulfuron-methyl may cause decreased body weight gain and decreased liver weights. Prolonged or repeated inhalation may cause cancer or lung damage.

Carcinogenicity / Chronic Health Effects: There was no evidence of carcinogenicity in animal studies using metsulfuron-methyl.

Reproductive Toxicity: Animal tests with metsulfuron-methyl have not demonstrated reproductive effects.

Developmental Toxicity: Animal tests with metsulfuron-methyl have not demonstrated developmental effects.

Genotoxicity: There have been some positive and negative studies, but the weight of evidence is that metsulfuron-methyl is not mutagenic.

Assessment Carcinogenicity:

This product contains substances that are considered to be probable or suspected human carcinogens as follows:

Component	Regulatory Agency Listing As Carcinogen			
	ACGIH	IARC	NTP	OSHA
Metsulfuron Methyl	No	No	No	No
Kaolin	A4	No	No	No
Crystalline Silica (quartz)	A2	1	Known	No
Titanium dioxide	A4	2B	No	No
Other Ingredients	No	No	No	No

12. ECOLOGICAL INFORMATION

Ecotoxicity:

Data on Metsulfuron-methyl technical:

Bluegill 96-hour LC₅₀: >150 mg/l

Rainbow Trout 96-hour EC₅₀: >150 mg/l

Daphnia 48-hour EC₅₀: >150 mg/l

Green Algae 72-hour EC₅₀: 0.045 mg/l

Bobwhite Quail 8-day Dietary LC₅₀: >5,620 ppm

Mallard Duck 8-day Dietary LC₅₀: >5,620 ppm

Mallard Duck Oral LD₅₀: >2,510 mg/kg

Honey Bee Contact LD₅₀: >25 ug/bee

Environmental Fate:

Metsulfuron-methyl is relatively mobile in most soils, but will be retained longer in soils with higher percentages of organic matter. It is more mobile in alkaline soils than in acidic soils. Metsulfuron-methyl will degrade faster under acidic conditions, and in soils with higher moisture contents and higher temperature. Metsulfuron-methyl is stable to photolysis, but will break down in ultraviolet light. Half-life estimates in soil range from 14 to 180 days, with an average of 30 days. Metsulfuron-methyl is stable to hydrolysis at neutral and alkaline pHs. The estimated half-life in acidic water is 3 weeks.

13. DISPOSAL CONSIDERATIONS**Waste Disposal Method:**

Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility. Contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste Representative at the nearest EPA Regional Office for guidance.

Container Handling and Disposal:

Non-refillable container. Do not reuse or refill this container. Offer for recycling, if available. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or mix tank. Fill the container half full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times.

14. TRANSPORTATION INFORMATION

Follow the precautions indicated in Section 7: HANDLING AND STORAGE of this SDS.

DOT

Non Regulated

IMDG

UN 3077, Environmentally hazardous substance, solid, nos, (Metsulfuron-methyl), 9, III, Marine Pollutant

IATA

UN 3077, Environmentally hazardous substance, solid, nos, (Metsulfuron-methyl), 9, III,

15. REGULATORY INFORMATION**EPA FIFRA INFORMATION**

This chemical is a pesticide product registered by the United States Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets (SDS), and for workplace labels of non-pesticide chemicals. The hazard information required on the pesticide label is reproduced below. The pesticide label also includes other important information, including directions for use.

CAUTION. Harmful if absorbed through skin. Causes moderate eye irritation. Avoid contact with skin, eyes or clothing.

U.S. FEDERAL REGULATIONS

TSCA Inventory: This product is exempted from TSCA because it is solely for FIFRA regulated use.

SARA Hazard Notification/Reporting:**Hazard Categories Under Criteria of SARA Title III Rules (40 CFR Part 370):**

Chronic Health

Section 313 Toxic Chemical(s):

None

Reportable Quantity (RQ) under U.S. CERCLA:


None

RCRA Waste Code:

Under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste.

State Information:

Other state regulations may apply. Check individual state requirements.

California Proposition 65:  **ATTENTION.** This product can expose you to chemicals including silica, crystalline and titanium dioxide which are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

16. OTHER INFORMATION**National Fire Protection Association (NFPA) Hazard Rating:**

Rating for this product: Health: 1 Flammability: 1 Reactivity: 0

Hazards Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

This Safety Data Sheet (SDS) serves different purposes than and DOES NOT REPLACE OR MODIFY THE EPA-ACCEPTED PRODUCT LABELING (attached to and accompanying the product container). This SDS provides important health, safety and environmental information for employers, employees, emergency responders and others handling large quantities of the product in activities generally other than product use, while the labeling provides that information specifically for product use in the ordinary course.

Use, storage and disposal of pesticide products are regulated by the EPA under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) through the product labeling, and all necessary and appropriate precautionary, use, storage, and disposal information is set forth on that labeling. It is a violation of Federal law to use a pesticide product in any manner not prescribed on the EPA-accepted label.

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THE COMMONWEALTH OF MASSACHUSETTS

EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS



Department of Agricultural Resources

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METSULFURON METHYL

In addition to the review that is presented below, a comprehensive review available from USDA Forest Service provides information that incorporates more recent studies and data. The US Forest Service risk assessment report is available at: <http://www.fs.fed.us/foresthealth/pesticide/risk.shtml>

Review conducted by MDAR and MassDEP for use in Sensitive Areas of Rights-of-Way in Massachusetts

Common Trade Names: Escort, Escort XP (2)

Chemical Name: Methyl 2 E[C[(4-Methoxy—6-methyl-1,3,5-Triazifl—2-yl) aminolcarbonyl] amino] sulfonyl.]benzoate] (9)

CAS NO.: 74223-64-6

GENERAL INFORMATION

Metsulfuron methyl is a sulfonyl urea herbicide initially registered by E.I. DuPont in 1986. It is a foliar herbicide registered for use on wheat and barley and non-cropland sites such as Right of Way (9).

ENVIRONMENTAL FATE

Mobility

Metsulfuron methyl is a relatively new herbicide. The studies reviewed here have been provided by the registrant, EI DuPont.

The soil water partition coefficients (Kd) of Metsulfuron Methyl have been determined in four different soils: Cecil sand, Flanagan silt loam, Fallsington silt loam, and keyport silt loam. The Kd values range from 0.36 for Cecil sand to 1.40 for Flanagan silt loam, and Kom values ranged from 29 for Fallsington silt loam to 120 for Cecil sand (100). The values for Kd and Kom indicate that metsulfuron methyl is not adsorbed well to soil and that the organic content of the soil is not the only adsorption component. The silt and clay contents appear to influence adsorption, but there are probably other factors also involved.

The previous study also determined the Rf values for soil. Thin layer chromatography was performed on four soils for metsulfuron methyl. The Rf values ranged from 0.64 to 1.00; only one value was less than 0.90 (100). This result confirms the validity of the Kd values, indicating that metsulfuron methyl is mobile and that the organic matter content of the Soil is a significant component of adsorption.

Metsulfuron methyl was applied to tops of 12 inch columns [containing four different soils], and eluted with 20 inches of water in 20 hours. Following the percolation of the total volume of water, 106% of the metsulfuron

methyl was eluted from the Fallsington sandy loam, 96% from the Flanagan silt loam, 81% for Keyport silt loam and 93% for Myakka sand (100). The breakthrough volumes for the Fallsington, Flangan, Keyport and Myakka soils were 6.5, 4.5, 6.9 and 5.8 inches of water respectively (101).

Metsulfuron methyl is relatively mobile in most soils, but will be retained longer in soils with higher percentages of organic matter.

Persistence

There are two studies which have reviewed the persistence of metsulfuron methyl in the soil. One study was conducted in the southern United States and the second was in the northern United States and Canada. The results of the studies indicate a somewhat contradictory picture of the persistence of metsulfuron methyl.

The soil half-lives in Delaware, North Carolina, Mississippi and Florida were 1 week, 4 weeks, 3 weeks and 1 week respectively following an application in mid to late summer (102). The results are varied and indicate that either climatic or soil factors determine the persistence. The climate is sufficiently similar to be able to discount that as a factor. However, both of the locations where the shortest half-lives were observed had the highest organic matter content in the soils. Furthermore, the half—lives correspond with the organic matter content.

The half—lives following spring applications were 4 and 56 weeks for two sites in Colorado, 6 weeks in North Dakota and 28 weeks in Idaho (103). In contrast to the southern United States study there does not appear to be any correlation with climatic or soil characteristics. There appears to be a slightly shorter half—life in acidic soils in the same location.

Metsulfuron methyl was also applied in the fall and the half-lives determined in two sites in Colorado, North Dakota and Idaho. These half—lives were 8 weeks, 12 weeks, 42 weeks and 28 weeks respectively. As was expected there were longer half—lives following fall applications in North Dakota (6 weeks vs. 42 weeks) however, in Idaho there was no change at all, which is unexpected.

In Canada following spring applications the reported half-lives were 10 weeks, 4 weeks, 4 weeks and 6 weeks for Alberta, 2 locations in Saskatchewan and Manitoba (103). One would expect longer half lives in Northern locations due to the effects of temperature on degradation rates. The results from Canada are generally shorter than those in the U.S. locations, which is unexpected.

Therefore, the half-life of Metsulfuron methyl in the soil is variable and dependent on the location. It is shorter when applied in the spring but appears independent of other environmental factors in most locations.

TOXICITY REVIEW

Acute (Mammalian)

The toxicology database for Metsulfuron methyl has been reviewed and accepted by the EPA (9). DuPont supplied excerpts from their monograph on Ally herbicide (112). Summaries of studies were supplied by DuPont for subchronic, chronic and reproductive studies.

Technical metsulfuron methyl has been tested in two acute oral LD50 studies in CrI:CD Rats. In the first study the LD50 was greater than 5,000 mg/kg and in the second it was greater than 25,000 mg/kg (the maximum feasible dose) (112). Clinical signs included salivation, chromodacryorrhea, stained face, stained perineal area and weight loss (112).

In a 10—dose subacute study using male rats, a single repeated dose of 3,400 mg/kg/day for 10 days over a 2 week period was administered. This was followed by a two week recovery period. No deaths occurred and slight weight loss was the only clinical sign observed. In addition, no gross or microscopic changes were observed (112). The dermal LD50 is greater than 2,000 mg/kg in male and female rabbits (112). Technical metsulfuron methyl caused mild erythema as a 40% solution in guinea pigs. There was no reaction observed at the 4% concentration. No response occurred when treated animals were challenged (112).

In rabbits, moderate areas of slight corneal clouding and severe to moderate conjunctivitis were observed in both washed and unwashed eyes following treatment with technical metsulfuron methyl. The unwashed eyes were

normal in 3 days and the washed eyes in 14 days (112).

Metabolism

Elimination of metsulfuron methyl in the rat is rapid, with 91% of a radioactive dose excreted over 96 hours (9). The routes of elimination were not specified within the report.

Subchronic/Chronic (Mammalian)

Ninety day feeding studies have been done with metsulfuron methyl in rats and mice. The rat study was done in conjunction with a one generation reproduction study (see Developmental Study Section). In this study rats received 0, 100, 1000, or 7500 ppm (0, 5.7, 57, 428 mg/kg/d) (a) in their diets. Effects observed at the high dose were: a decrease in body weight and an increase in total serum protein in the females, and a decrease in liver weight and a decrease in cytoplasmic clearing of hepatocytes in the males the NOEL in this study was 1000 ppm (104).

The 90 day mouse study was done in conjunction with the 18 month mouse study. Groups of 90 mice per sex per dose received 0, 5, 25, 500, 2500 or 5000 ppm (0, 0.66, 3.3, 66.6, 333.3, 666.6 mg/kg/d) in their diets. Clinical evaluations were made at 1, 2, 3, 6, 12 and 18 months. Ten animals per group were sacrificed at the 90 day time point for pathological evaluation. The 2500 ppm group was sacrificed at 12 months. Sporadic effects were observed on the body weight, food consumption, and organ weights. These were not dose related, resulting in a NOEL of 5000 ppm in diet for mice (111).

In the twenty-one day dermal rabbit study, the intact skin of male and female New Zealand White Rabbits received doses of 0, 125, 500 and 2,000 mg/kg for 6 hrs/day for 21 days. Clinical signs observed were sporadic weight loss and diarrhea in a few rabbits. These effects were not dose related. Non dose related histological effects were observed in male rabbits. This effect was characterized as mild testicular atrophy occurring sporadically at all doses (112, 108).

Feeding studies in dogs have been done with purebred beagles. The animals received metsulfuron methyl in diets at dose levels of 0, 50, 500 and 5000 ppm (0, 0.2, 2, 20 mg/kg/d) for one year. There was a decrease in food consumption in the high dose males. There was a decrease in serum lactate dehydrogenase in all groups of both sexes at two or more doses these values were within the historical controls. The NOEL was 500 ppm in the males and 5000 ppm in females (112).

In a chronic feeding study in rats, the animals received metsulfuron methyl at doses of 0, 5, 25, 500, 2500 or 5000 ppm (0, 0.28, 1.4, 28.6, 143 or 286 mg/kg/d. Interim sacrifices were done at 13 and 52 weeks (105).

At the 13 week sacrifice there was a decrease in body weight in the 2500 and 5000 ppm groups; there was a decrease in absolute liver weight at 2500 and 5000 ppm males. There was a decrease in the relative liver weights in the 2500 and 5000 ppm females.

(a) In these discussions the assumptions made for estimated conversion of ppm (diet) to mg/kg/D were:

Species Body weight (kg) Intake (kg)

Rat 0.35 0.020 Mouse 0.03 0.004 Dog 10 0.4

When data were presented as ppm, the dose was estimated in mg/kg and is presented in parenthesis.

Findings at the 52 week sacrifice included increase in kidney weight (2500 ppm males) and increased absolute brain weights (at doses of 25, 500, 2500 and 5000 ppm) in males and at doses of 2,500 and 5000 ppm in females. There was an increase in absolute heart weight at 2500 ppm in males and at 2500 and 5000 ppm in females. The absolute organ weights were back to normal at termination. Relative brain weights of the 2500 and 5000 ppm groups were increased (105)

Oncogenicity Studies

There were no gross or histopathological changes observed in mice receiving up to 5000 ppm metsulfuron methyl in their diets (112, 111). Similar results were obtained in the 104 week rat study; there were no histopathological changes observed which were attributable to metsulfuron methyl (105, 112). EPA concludes that there were no

oncogenic effects in rats or mice at the highest dose tested; 5000 ppm in both cases (9).

Mutagenicity Testing

Metsulfuron methyl was negative in the unscheduled DNA synthesis assay; in *vivo* bone marrow cytogenic assay in rats (doses were 500, 1,000, and 5,000 mg/kg bw); CHO/HGPRT Assay; *Salmonella typhimurium* reverse mutation assay four strains with and without S9 metabolic activation; and also in the *vivo* mouse micronucleus assay at doses of 166, 500, 1666, 3000 and 5000 mg/kg (112). The only positive mutagenicity assay was in the *in vitro* assay for chromosome aberrations in Chinese Hamster Ovary at high doses (greater than 2.63 mM, 1.0 mg/mL). In this assay no increases in structural aberrations were observed at 0.13 or 1.32 mM (0.05 or 0.5 mg/mL) (112).

Developmental Studies

Several studies have been done to investigate the effects of Metsulfuron methyl on reproduction and development in rats and rabbits.

Pregnant Cr1: COBS CD(SD) BR rats received metsulfuron methyl at doses of 0, 40, 250 or 1000 mg/kg by the oral route on days 5 to 14 of gestation. There were 25 rats per group. Maternal toxicity was observed at doses of 250 and 1000 mg/kg/d. The maternal toxicity NOEL was 40 mg/kg/d. There was no evidence of "teratogenic" response or embryo fetal toxicity (112).

In the rabbit study, New Zealand white rabbits received 0, 25, 100, 300 or 700 mg/kg/d on days 6 to 18 gestation. There was a dose related increase in maternal deaths; 1, 2 and 12 deaths at doses of 100, 300 and 700 mg/kg respectively. The maternal toxicity NOEL was 25 mg/kg/d and there was no evidence of teratogenic or embryolethal effects observed in this study (112).

Several multigenerational studies have been done with Metsulfuron methyl. A four litter reproduction study was done concurrently with the chronic bioassay. Rats from each treatment were separated from the main study and bred. The doses were 0, 5, 25, 500, 2500, and 5000 ppm (0, 0.28, 1.4, 28.6, 143 and 286 mg/kg/d). There was a dose dependent decrease in body weight in the parental (P1) generation at doses of 25 ppm and greater in males and females. This effect was not present in dams during gestation or lactation (106).

Overall fertility in the P1 and filial (F1) matings was low in both control and treated groups with no apparent cause. There was a decrease in pup size in the F1a but not the F1b, F2a, or F2b litters. The gestation index was 100% for all groups in both filial generations with the exception of F2a when it was 90%. On the basis of the lower body weights and lower growth rates, the NOEL was 25 ppm for this study (106).

In a 90 day, 2 generation 4 litter protocol, rats received 0, 25, 500 or 5000 ppm (0, 1.4, 28.6, 286 mg/kg/d) Metsulfuron methyl in their diets for 90 days prior to mating. In this protocol the parental generation was bred twice first to produce the F1a and then the F1b. The F1b rats were then fed the appropriate diet for 90 days (after weaning). There was a decrease in litter size in the 5000 ppm group in the F2a generation, but not in any other generation. The NOEL for this study was 500 ppm (107).

In a 90 day feeding, one generation rat study, 16 male and 16 female rats received 0, 100, 1000 or 7500 ppm in their diet prior to mating. There were no differences observed in reproduction and lactation performance or litter survival among groups. There was an overall low fertility in the control and treated groups. This result made the effects of metsulfuron methyl on fertility difficult to assess from this study (104).

Tolerances and Guidelines

Tolerances have been set for metsulfuron methyl in barley wheat (from 0.05 to 20 ppm, depending on the commodity) and in meat and meat byproducts (0.1 ppm). The tolerance in milk is 0.05 ppm (8, 9). The acceptable daily intake is 0.0125 mg/kg/d based on a one year dog NOEL of 1.25 mg/kg/d using a safety factor of 100 (9).

Avian

Metsulfuron methyl has been tested in two species of birds, the mallard duck and the bobwhite quail. The acute oral LD50 is greater than 2150 mg/kg in the duck. Two, 8 day dietary studies have been done. The 8 day LC50 is greater than 5620 ppm in both the duck and the quail (9).

Invertebrates

The 48 hour LC50 for Daphnia is greater than 150 ppm and the acute toxicity in the honeybee is greater than 25 mg/bee (9).

Aquatic

Metsulfuron methyl has acute LC50 of greater than 150 ppm in both the rainbow trout and the bluegill sunfish (9).

Summary

Metsulfuron methyl has a moderate to high mobility in the soil profile and is relatively persistent in the environment, especially when applied in the fall. These factors would be of concern under most circumstances. However, metsulfuron methyl is applied at very low rates (3-4 ozs./A) and therefore the amounts which reach the soil are quite low. Consequently, Metsulfuron methyl should not impact groundwater as a result of leaching or migrate from the target area. Metsulfuron methyl has low toxicity (EPA Toxicity Category III) for acute dermal exposure and primary eye irritation and is category IV for all other acute exposures. The chronic studies indicate no oncogenicity response and the systemic NOEL's are 500 ppm in rats and 5000 ppm in mice. There was no evidence of teratological effects in the rat or the rabbit at the highest dose tested in both species. While there was evidence of maternal toxicity at 40 mg/kg/d in the rat and 100 mg/kg/d in the rabbits.

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100. DuPont Soil Column Leaching Studies with [14C] DPX-T6376] (AMR 82-82).
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104. DuPont HL 180-82; 90 day feeding one generation Reproduction Study in Rats.
105. DuPont HLO-61-85; Chronic Feeding Study with Concurrent Two Generation Reproduction Study in Rats - Chronic.
106. DuPont HLO-65-85 Chronic Feeding Reproduction Phase.
107. DuPont HLR-524-84 Two generation, Four Litter Reproductive Study in Rats.
108. DuPont HLR 137-83 Subchronic Dermal Study (21 Days) in Rabbits.
111. DuPont HLR 463-84 Ninety-Day and Long Term Feeding Study in Mice.
112. Ally Herbicide Product Monograph



Metsulfuron-methyl

Pesticide Fact Sheet: Forestry Use

Product Information

- Metsulfuron-methyl is the common name for the active ingredient in **Escort**, a pre- and post-emergence herbicide commonly used in forestry and right-of-way vegetation management.
- **Escort** (60% metsulfuron-methyl and 40% inert ingredients) is formulated as a dispersible granule that is mixed with water and applied as a foliar spray. The final mix typically includes 0.25 to 0.50% of added surfactant by volume.
- Northwest forestry vegetation managers usually apply 0.3 to 1.2 ounces active ingredient per acre in a water solution.
- Users typically apply metsulfuron-methyl in the spring (when the leaves are fully out) until fall (when colors start to change) to control blackberries and other broadleaf plants.
- For comparative purposes, the Environmental Protection Agency (EPA) categorizes pesticides by their short-term toxicity on a scale of I (most toxic) to IV (least toxic). Most undiluted metsulfuron-methyl formulations are Toxicity Category IV.

Public Health

- Researchers use animal studies to define the potential for a pesticide to

cause harmful effects to human health. It is important to know that these tests are carried out using doses high enough to cause toxicity (poisoning). Effects seen at toxic doses in animals are unlikely to occur after short-term, low-level exposure in humans. The level of exposure must be considered to estimate the risk of harmful effects.

- Based on laboratory studies, metsulfuron-methyl is classified as practically non-toxic to mammals on a short term (acute) basis.
- Metsulfuron-methyl is broken down quickly and eliminated from the body. Laboratory rats dosed with metsulfuron-methyl eliminated 91% of the pesticide in 96 hours.
- There is no evidence that metsulfuron-methyl causes birth defects, reproductive problems, nerve damage, or cancer.

Wildlife Effects

- Based on laboratory and field studies, metsulfuron-methyl is classified as practically non-toxic to fish, birds, and bees on a short term (acute) basis.
- Metsulfuron-methyl is not expected to bioaccumulate in mammals.

Environmental Fate

- Metsulfuron-methyl is stable to breakdown by water (hydrolysis) at neutral and alkaline pHs. It has an

estimated 3-week half-life in water at acidic pH.

- Warm, moist conditions promote metsulfuron-methyl activity. Cold, dry weather will reduce or delay activity.
- The half-life of metsulfuron-methyl in soil ranges from 14 to 180 days, with a typical half-life of 30 days. The breakdown of metsulfuron-methyl in soils is largely dependent on soil temperature, soil moisture content, and soil pH. Metsulfuron-methyl degrades faster under acidic conditions and in soils with high moisture content and high temperature. Metsulfuron-methyl is more mobile in alkaline soils than in acidic soils.
- Metsulfuron-methyl is stable in the presence of sunlight.
- Metsulfuron-methyl is biologically active at low concentrations, and small amounts of drift can cause damage to adjacent plants or trees. Note that drift damage to plants is not a good indicator of human health risks because the chemical's mode of action is specific to plants.
- Metsulfuron-methyl is classified as highly mobile and can travel through soil with water and enter groundwater. It can also move with runoff and enter surface water. Its low application rates minimize

potential impacts on surface or groundwater. Right-of-way uses should be evaluated for potential surface and groundwater contamination.

Risk Assessment

▪ The EPA has evaluated use practices, environmental fate, potential exposure routes, and toxicity of atrazine and has set a Reference Dose (RfD) for metsulfuron-methyl of 0.25 mg/kg/day. A 70 kg (154 lb) person would have an RfD of 17.5 mg/day. The RfD is the amount of daily pesticide exposure judged to pose no appreciable risk over a 70-year lifetime. The RfD for metsulfuron-methyl is based on the results of the most sensitive animal studies (rat) and includes built-in safety measures.

▪ EPA has determined that the expected exposure associated with metsulfuron-methyl in right-of-way use will not result in adverse health effects. However, you should take reasonable precautions to avoid exposure. Do not walk through freshly-sprayed vegetation. Do not eat berries, mushrooms, or other edibles, or drink the water from newly-treated areas. If you are concerned about exposure, consult the resources listed in **Additional Information**.

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▪ Wauchope, R.D., T.M. Butler, A.G. Hornsby, P.W.M. Augustijn-Beckers, and J.P. Burt. 1992. The SCS/ARS/CES Pesticide Properties Database for Environmental Decision-Making. *In* Reviews of Environmental Contamination and Toxicology. Springer-Verlag Publishers. New York.

Additional Information: Oregon

- Oregon State University Extension Environmental Chemistry and Toxicology Program
1-541-737-5993 Extension Specialist
- Oregon Poison Control
1-800-222-1222 (National)
1-503-494-8968 (Portland)
1-800-452-7165 (Outside Portland)
- Oregon Department of Agriculture
1-503-986-4550
1-503-986-4635 (Pesticide Division)
- Oregon Health Division Pesticide Analytical Response Center
1-503-731-4025 (8 a.m.-5 p.m., M-F)
1-503-731-4030 (evenings, weekends)

Washington

- Poison Control Center
1-800-222-1222 (National)
1-206-526-2121 (Seattle)
1-800-732-6985 (Outside Seattle)
- Washington Department of Agriculture, Pesticide Management Division
1-877-301-4555 (toll free)
1-360-902-2040 (Olympia)
1-509-576-3064 (Yakima)
- Washington State University Food and Environmental Quality Laboratory
100 Sprout Road
Richland, WA 99352-1643
1-509-372-7462 (phone)
1-509-372-7460 (fax)
- Washington Department of Health
1-800-525-0127
1-360-236-3360 (Pesticide Program)
1-888-586-9427 (toll free)

Nationwide

- National Pesticide Information Center
1-800-858-PEST (7378)
<http://npic.orst.edu/>
- Extension Toxicology Network (EXTOXNET)
<http://ace.orst.edu/info/extoxnet/>
- DuPont Agricultural Products
P.O. Box 80038 Wilmington, DE 19880-0038
1-800-441-7515
1-800-441-3637 (emergency phone)
1-302-992-2276 (fax)



Metsulfuron-methyl

Roadside Vegetation Management Herbicide Fact Sheet

This fact sheet was developed by Oregon State University and Intertox, Inc. to assist interested parties in understanding the risks associated with pesticide use in Washington State Department of Transportation's (WSDOT) Integrated Vegetation Management program.

Introduction

Metsulfuron-methyl is an herbicide used to control select broadleaf weeds, trees and brush, and some annual grasses. It stops cell division in the shoots and roots of the plant causing plants to die. Metsulfuron-methyl is the active ingredient (60%) in the herbicide products **Escort XP** and **Metsulfuron Methyl 60 DF** used by the Washington State Department of Transportation (WSDOT) for pre- and post-emergent (before and after growth begins) selective broadleaf treatment. Metsulfuron-methyl also has agricultural and forestry uses.

WSDOT assessed the potential risks to humans, wildlife, and aquatic animals exposed to metsulfuron-methyl in their Integrated Vegetation Management (IVM) program. Evaluating potential risks takes into account both the toxicity of a pesticide and the characteristics of possible exposure.

Laboratory Testing: Before pesticides are registered by the U.S. Environmental Protection Agency (EPA), they must undergo laboratory testing for short-term (acute) and long-term (chronic) health effects. Laboratory animals are purposely fed doses high enough to cause toxic effects. These tests help scientists determine how chemicals might affect humans, domestic animals, or wildlife in cases of overexposure. Pesticide products used according to label directions are unlikely to cause toxic effects. The amount of pesticide that people and pets may be exposed to is low compared to the doses fed to laboratory animals.

Application Rates and Use Patterns on Highway Rights-of-Way

Typical rights-of-way application rates for Escort range from 0.5 to 2 ounces of product per acre, or a maximum of about 0.075 pounds of metsulfuron-methyl per acre. Applicators use truck-mounted hand guns, hose reels, or side booms, to apply Escort from April to September. WSDOT workers applied an average of 100 pounds of metsulfuron-methyl per year statewide in 2004 and 2005.

Human Health Effects

The U.S. Environmental Protection Agency (EPA) classifies Metsulfuron methyl as toxicity class III (low toxicity) with a signal word of CAUTION. (See Toxicity Category and Signal Word table).

Toxicity Category and Signal Word

	High Toxicity (Danger)	Moderate Toxicity (Warning)	Low Toxicity (Caution)	Very Low Toxicity (Caution)
Oral LD50	Less than 50 mg/kg	50-500 mg/kg	500-5000 mg/kg	Greater than 5000 mg/kg
Dermal LD50	Less than 200 mg/kg	200-2000 mg/kg	2000-5000 mg/kg	Greater than 5000 mg/kg
Inhalation LC50	Less than 0.05 mg/l	0.05-0.5 mg/l	0.5-2.0 mg/l	Greater than 2.0 mg/l
Eye Effects	Corrosive	Irritation persisting for 7 days	Irritation reversible in 7 days	Minimal effects, gone in 24 hrs
Skin Effects	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation

Highlighted categories specify the range for metsulfuron-methyl use cited in this fact sheet.

Acute toxicity: Metsulfuron-methyl has low to very low toxicity if people eat, touch, or inhale residues. The technical material is very irritating but not corrosive to the eyes of laboratory rabbits, moderately irritating to the skin and not a skin sensitizer.

Chronic toxicity: Metsulfuron-methyl caused slight changes in body and organ weights, but no changes in cellular structure, when fed to rats at moderate to high doses for two years. Metsulfuron only caused a decrease in food consumption at the highest doses tested when fed to dogs for one year.

Reproductive effects: Metsulfuron-methyl did not affect reproduction or survivability of the offspring when fed to rats over two generations at moderate to high doses; the offspring had slightly lower growth rates. Metsulfuron-methyl did not cause birth defects when fed to rats during pregnancy. However, it did cause offspring deaths when high doses were fed to rabbits during pregnancy.

Carcinogenic effects: Rats fed metsulfuron-methyl for two years showed no increase in the number of tumors. Multiple studies of metsulfuron-methyl indicate that it is not a mutagen (causes mutation). The EPA has not evaluated this substance for evidence of its ability to cause cancer in humans.

Fate in humans and animals: Metsulfuron-methyl is broken down quickly and eliminated from the body. Rats eliminate low doses in 9 to 16 hours and high doses in 23 to 29 hours. Metsulfuron-methyl does not bioaccumulate (build up) in fish.

Wildlife Effects

Effects on mammals: Metsulfuron-methyl is practically nontoxic to mammals based on an acute oral LD50 of greater than 5,000 mg/kg in rats. The LD50 for rabbits exposed by skin contact ranges from >2,000 mg/kg to >8,000 mg/kg. (See LD50/LC50 text box and Wildlife Toxicity Category table).

Effects on birds: Metsulfuron-methyl is practically nontoxic to birds. The acute oral and dietary LD50 for mallards and bobwhite quail is >5,000 mg/kg.

Effects on fish: Metsulfuron-methyl is practically nontoxic to fish.

Effects on aquatic invertebrates: Metsulfuron-methyl is practically nontoxic to aquatic insects.

LD50/LC50: Acute toxicity is commonly measured by the lethal dose (LD) or lethal concentration (LC) that causes death in 50 percent of treated laboratory animals. LD50 indicates the dose of a chemical per unit body weight of an animal and is expressed as milligrams per kilogram (mg/kg). LC50 is the concentration of a chemical per volume of air or water and is expressed as milligrams per liter (mg/L). Chemicals are highly toxic when the LD50 or LC50 value is small and practically nontoxic when the value is large. However, the LD50 and LC50 do not reflect potential health effects such as cancer, birth defects, or reproductive toxicity that may occur at levels of exposure below those that cause death.

Wildlife Toxicity Category

Risk Category	Mammals	Birds	Fish or Aquatic Insects
	Acute Oral or Dermal LD ₅₀ (mg/kg)	Acute Oral LD ₅₀ (mg/kg)	Acute LC ₅₀ (mg/L)
Practically nontoxic	>2,000	>2,000	>100
Slightly toxic	501-2,000	501-2,000	>10-100
Moderately toxic	51-500	51-500	>1-10
Highly toxic	10-50	10-50	0.1-1
Very highly toxic	<10	<10	<0.1

Highlighted categories specify the range for metsulfuron-methyl use cited in this fact sheet.

Environmental Fate

The half-life of metsulfuron-methyl ranges from 14 to 180 days with a typical time of 30 days. (See Half-life text box). Breakdown is faster in moist, warm soils. It is highly mobile in the environment and has the potential to contaminate groundwater. Plants rapidly take up metsulfuron-methyl at the roots and through the leaves. It moves throughout the plant, but it does not last.

Half-life is the time required for half of the compound to degrade.

1 half-life = 50% degraded
2 half-lives = 75% degraded
3 half-lives = 88% degraded
4 half-lives = 94% degraded
5 half-lives = 97% degraded

Remember: the amount of a chemical remaining after a half-life will always depend on the amount of the chemical originally applied.

Human Health Risk Assessment

WSDOT evaluated several human exposure scenarios, including adults and children eating drift-contaminated garden vegetables or children directly touching drift-contaminated berries or sprayed vegetation. For each exposure scenario, WSDOT evaluated conditions of average exposure and extremely conservative conditions of maximum exposure. Metsulfuron-methyl poses a negligible risk of adverse non-cancer effects to WSDOT workers and the public under conditions of average and maximum exposure. All hazard quotients are below 1. (See Human Cancer/Non-cancer text box and Human Risk Classification Under Conditions of Average Exposure table).

Human Cancer/Non-cancer Risk Classification: Scientists estimate non-cancer health risks by generating a hazard quotient (HQ). This number is the exposure divided by the toxicity. When the HQ is less than 1, exposures are unlikely to cause any adverse health effects. When the HQ is greater than 1, potential non-cancer health effects may be possible. Risk assessments for chemicals that cause cancer (carcinogens) estimate the probability of an individual developing cancer over a lifetime. Cancer risks estimated in this way are very conservative, and actual cancer risks are likely to be much lower. Cancer risk estimates of less than 1 in 100,000 are within the range considered negligible by most regulatory agencies.

Human Risk Classifications Under Conditions of Average Exposure

Hazard Quotient (Non-cancer Risk)	Cancer Risk	Potential Risks and Management Priority
Less than 1	Less than 1 in 100,000	Negligible
Between 1 and 10	Between 1 in 10,000 and 1 in 100,000	Low
Between 10 and 100	Between 4 in 1,000 and 1 in 10,000	Moderate
Greater than 100	Greater than 4 in 1,000	High

Note: Highlighted categories specify the range of potential risk for specific exposure scenarios involving metsulfuron methyl.

Wildlife Risk Assessment

Wildlife risk assessment considers pesticide behavior in the environment and routes of exposure. Indirect exposure to mammals and birds can occur when they eat contaminated prey or vegetation. Direct exposure can occur when mammals and birds contact pesticide residues with their skin or eyes or when they inhale vapors or particulates. WSDOT’s current application rates and use patterns for glyphosate pose a negligible to low risk to mammals. The estimated dietary exposure to rats, deer mice, and meadow voles range from 5,800 to 50,000 times lower than the rat LD50 of >5,000 mg/kg. The risk from WSDOT’s current application practices for metsulfuron-methyl is negligible for birds. The estimated dietary exposure to bobwhite quail, marsh wrens, and American robins are approximately 2,700 to 31,600 times lower than the bobwhite quail LD50 of >5,000 mg/kg.

Aquatic Risk Assessment

WSDOT takes extra precautions applying herbicides near open water, wetlands, or wellhead protection zones. However, contamination may result from application drift, rainfall runoff, or residue leaching through the soil into groundwater. Fish and aquatic insect exposure to metsulfuron-methyl occurs primarily through direct contact with contaminated surface waters. WSDOT's current use of metsulfuron-methyl poses a low risk to fish and aquatic insects in all areas of the state.

Additional Resources

- National Pesticide Information Center 1-800-858-PEST (7378) and <http://npic.orst.edu>
- Extension Toxicology Network (EXTOXNET) <http://extoxnet.orst.edu>
- Washington State Department of Transportation, Roadside Maintenance Branch 1-360-705-7865
- Washington Department of Agriculture, Pesticide Management Division 1-877-301-4555 (toll free)

Garlon 4 Ultra

Active Ingredient

Triclopyr

Specimen Label

TRICLOPYR	GROUP	4	HERBICIDE
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Dow AgroSciences



SPECIALTY HERBICIDE

®Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow

For the control of woody plants and vines, and annual and perennial broadleaf weeds on

- o Forest sites,
- o non cropland areas including: electrical power and utility rights-of-way, industrial sites, non-irrigation ditch banks, pipelines, railroads, roadsides; and
- o natural areas and wildlife habitat and management areas;
- o including grazed areas on all of these listed sites.

Active Ingredient:

triclopyr: 2-[(3,5,6-trichloro-2-pyridinyl)oxy] acetic acid, butoxyethyl ester	60.45%
Other Ingredients.....	39.55%
Total.....	100.00%

Acid equivalent: triclopyr – 43.46% - 4 lb/gal

Precautionary Statements

Hazards to Humans and Domestic Animals

EPA Reg. No. 62719-527

Keep Out of Reach of Children

CAUTION

Causes Moderate Eye Irritation • Harmful If Swallowed • Prolonged Or Frequently Repeated Skin Contact May Cause Allergic Reactions In Some Individuals

Avoid contact with skin, eyes, or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet.

Personal Protective Equipment (PPE)

Applicators and other handlers who handle this pesticide must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves made of barrier laminate, nitrile rubber ≥14 mils, neoprene rubber ≥14 mils, or viton ≥14 mils
- Shoes plus socks

Follow the manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR 170.240(d)(4-6)), the handler PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations

Users should:

- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

First Aid

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

If swallowed: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-992-5994 for emergency medical treatment information.

Environmental Hazards

This pesticide is toxic to fish. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.

This chemical has properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.

Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Read all Directions for Use carefully before applying.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical-resistant gloves made of barrier laminate, nitrile rubber ≥14 mils, neoprene rubber ≥14 mils, or viton ≥14 mils
- Shoes plus socks

Non-Agricultural Use Requirements

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for Agricultural Pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

Entry Restrictions for Non-WPS Uses: Do not enter or allow others to enter the treated area until sprays have dried.

Storage and Disposal

Do not contaminate water, food, or feed by storage and disposal.

Pesticide Storage: Store above 28°F or agitate before use.

Pesticide Disposal: Wastes resulting from the use of this product must be disposed of on site or at an approved waste disposal facility. Open dumping is prohibited.

Storage and Disposal (Cont.)

Nonrefillable containers 5 gallons or less:

Container Handling: Nonrefillable container. Do not reuse or refill this container.

Triple rinse or pressure rinse container (or equivalent) promptly after emptying. **Triple rinse** as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. **Pressure rinse** as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 psi for at least 30 seconds. Drain for 10 seconds after the flow begins to drip. Then offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities.

Refillable containers 5 gallons or larger:

Container Handling: Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or a mix tank. Fill the container about 10% full with water and, if possible, spray all sides while adding water. If practical, agitate vigorously or recirculate water with the pump for two minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times. Then offer for recycling if available, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities.

Nonrefillable containers 5 gallons or larger:

Container Handling: Nonrefillable container. Do not reuse or refill this container.

Triple rinse or pressure rinse container (or equivalent) promptly after emptying. **Triple rinse** as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. **Pressure rinse** as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 psi for at least 30 seconds. Drain for 10 seconds after the flow begins to drip. Then offer for recycling if available, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities.

Product Information

Garlon 4 Ultra specialty herbicide is recommended for the control of woody plants and vines, and herbaceous broadleaf weeds on forest sites, conifer plantations, non-cropland areas, including airports, barrow ditches, communication transmission lines, electrical power and utility rights-of-way, fencerows, gravel pits, industrial sites, military lands, mining and drilling areas, non-irrigation ditch banks, oil and gas pads, parking lots, petroleum tank farms, pipelines, railroads, roadsides, storage areas, storm water retention areas, substations, unimproved rough turf grasses, vacant lots and other non-crop residential areas; and natural areas (open space) for example campgrounds, parks, prairie management, trials and trialheads, recreation areas, wildlife openings, and wildlife habitat and management areas including grazed area on all these listed sites.

Use Precautions

When applying this product in tank mix combination, follow all applicable use directions and precautions on each manufacturer's label. It is the pesticide user's responsibility to ensure that all products in the listed mixtures are registered for the intended use. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

Sprays applied directly to Christmas trees may result in conifer injury. When treating unwanted vegetation in Christmas tree plantations, care should be taken to direct sprays away from conifers.

Garlon 4 Ultra is formulated as a low volatile ester. However, the combination of spray contact with impervious surfaces, such as roads and rocks, and increasing ambient air temperatures, may result in an increase in the volatility potential for this herbicide, increasing a risk for off-target injury to sensitive crops such as grapes and tomatoes.

Use Restrictions

Chemigation: Do not apply this product through any type of irrigation system.

Do not apply Garlon 4 Ultra directly to, or otherwise permit it to come into direct contact with cotton, grapes, peanuts, soybeans, tobacco, vegetable crops, flowers, citrus, or other desirable broadleaf plants. Do not permit spray mists containing it to drift onto such plants.

It is permissible to treat non-irrigation ditch banks, seasonally dry wetlands (such as flood plains, deltas, marshes, swamps, or bogs) and transitional areas between upland and lowland sites where surface water is not present except in isolated pockets due to uneven or unlevel conditions. Do not apply to open water (such as lakes, reservoirs, rivers, streams, creeks, salt water bays, or estuaries).

Do not apply on ditches that are used to transport irrigation water. Do not apply where runoff or irrigation water may flow onto agricultural land as injury to crops may result.

Do not apply this product using mist blowers.

Maximum Use Rates

- Apply no more than 2 lb ae of triclopyr (2 quarts of Garlon 4 Ultra) per acre per growing season on range and pasture sites, or any area where grazing or harvesting hay is allowed.
- On forestry sites, apply no more than 6 lb ae of triclopyr (6 quarts of Garlon 4 Ultra) per acre per year.
- For all use sites other than range, pasture, forestry sites, and grazed /hayed areas, apply no more than 8 lb ae triclopyr (8 quarts of Garlon 4 Ultra) per acre per year.
- See Table 1 below for relationship between mixing rate, spray volume, and maximum application rate.

Grazing

- There are no grazing restrictions for livestock or dairy animals on treated areas
- Portions of grazed areas that intersect treated non-cropland and rights-of-way sites may be treated at up to 8 lb ae per acre if the area to be treated on the day of application comprises no more than 10% of the total grazable area.

Haying (harvesting of dried forage)

- Do not harvest hay for 14 days after application.

Slaughter Restriction: During the season of application, withdraw livestock from grazing treated grass at least 3 days before slaughter.

Avoid Injurious Spray Drift

Make applications only when there is little or no hazard from spray drift. Small quantities of spray, which may not be visible, may seriously injure susceptible plants. Do not spray when wind is blowing toward susceptible crops or ornamental plants that are near enough to be injured. It is suggested that a continuous smoke column at or near the spray site or a smoke generator on the spray equipment be used to detect air movement, lapse conditions, or temperature inversions (stable air). If the smoke layers or indicates a potential of hazardous spray drift, do not spray.

Aerial Application (Helicopter Only): For aerial application on rights-of-way or other areas near susceptible crops, apply through a Microfoil¹ or Thru-Valve¹ boom, or other drift control application equipment and/or use an agriculturally labeled drift control additive. If a spray thickening agent is used, follow all use recommendations and precautions on the product label. Spray only when the wind velocity is low (follow state regulations). Avoid application during air inversions.

¹ Reference within this label to a particular piece of equipment produced by or available from other parties is provided without consideration for use by the reader at its discretion and subject to the reader's independent circumstances, evaluation, and expertise. Such reference by Dow AgroSciences is not intended as an endorsement of such equipment, shall not constitute a warranty (express or implied) of such equipment, and is not intended to imply that other equipment is not available and equally suitable. Any discussion of methods of use of such equipment does not imply that the reader should use the equipment other than as advised in directions available from the equipment's manufacturer. The reader is responsible for exercising its own judgment and expertise, and consulting with sources other than Dow AgroSciences, in selecting and determining how to use its equipment.

Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment and weather related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions.

The following drift management requirements must be followed to avoid off-target drift movement from aerial applications:

- The distance of the outer most operating nozzles on the boom must not exceed 3/4 the length of the rotor.
- Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees.

Where states have more stringent regulations, they must be observed.

The applicator should be familiar with and take into account the information covered in the following Aerial Drift Reduction Advisory. [This information is advisory in nature and does not supersede mandatory label requirements.]

Aerial Drift Reduction Advisory

Information on Droplet Size: The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversions).

Controlling Droplet Size:

- **Volume** - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- **Pressure** - Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of Nozzles** - Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle Orientation** - Orienting nozzles so that the spray is released parallel to the airstream produces larger droplets than other orientations and is the recommended practice. Significant deflection from horizontal will reduce droplet size and increase drift potential.
- **Nozzle Type** - Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift.

Boom Length: For some use patterns, reducing the effective boom length to less than 3/4 of the rotor length may further reduce drift without reducing swath width.

Application Height: Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

Swath Adjustment: When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller drops, etc.).

Wind: Drift potential is lowest between wind speeds of 2 to 10 mph. However, many factors, including droplet size and equipment type, determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. **Note:** Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

Temperature and Humidity: When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

Temperature Inversions: Applications should not occur during a local, low level temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of the smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

Sensitive Areas: The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

Ground Equipment: To aid in reducing spray drift potential when making ground applications near susceptible crops or other desirable broadleaf plants, Garlon 4 Ultra should be used in thickened (high viscosity) spray mixtures using an agriculturally labeled drift control additive, high viscosity invert system, or equivalent as directed by the manufacturer. When using a spray thickening or inverting additive, follow all use directions and precautions on the product label. With ground equipment, spray drift can be reduced by keeping the spray boom as low as possible; by applying 20 gallons or more of spray per acre; by keeping the operating spray pressures at the lower end of the manufacturer's recommended pressures for the specific nozzle type used (low pressure nozzles are available from spray equipment manufacturers); and by spraying when wind velocity is low. Do not apply with nozzles that produce a fine droplet spray. Select nozzles and pressures which provide adequate plant coverage, but minimize the production of fine spray particles.

High Volume Leaf-Stem Treatment: To minimize spray drift, keep sprays no higher than brush tops and keep spray pressures low enough to provide coarse spray droplets. A agriculturally labeled thickening agent may be used to reduce spray drift.

Mixing Directions for all use sites

Garlon 4 Ultra may be foliarly applied by diluting with water or by preparing an oil-water emulsion. For woody plant control, an oil-water emulsion performs more dependably under a broader range of conditions than a straight water dilution and is recommended for aerial applications.

Oil-Water Mixture Sprays

Prepare a premix of oil, surfactant and Garlon 4 Ultra in a separate container using diesel fuel, fuel oil, or kerosene plus an emulsifier such as Sponto 712 or Triton X-100. Use a jar test to check spray mix compatibility before preparing oil-water emulsion sprays in the mixing tank. Do not allow any water or mixtures containing water to get into the premix or Garlon 4 Ultra since a thick "invert" (water in oil) emulsion may form that will be difficult to break. Such an emulsion may also be formed if the premix of Garlon 4 Ultra is put into the mixing tank before the addition of water. Fill the spray tank about one-half full with water, then slowly add the premix with continuous agitation and complete filling the tank with water. Continue moderate agitation.

Oil Mixture Sprays for Basal Treatment

Prepare oil-based spray mixtures using either a commercially available basal oil, kerosene diesel fuel, or No. 1 or No. 2 fuel oil. Substitute other oils or diluents only as recommended by the oil or diluent's manufacturer. When mixing an oil mixture, read and follow the use directions and precautions on the manufacturer's product label. Add Garlon 4 Ultra to the required amount of oil in the spray tank or mixing tank and mix thoroughly. If the mixture stands over four hours, reagitation is required.

Oil Mixtures of Garlon 4 Ultra and Tordon 22K: Tordon 22K and Garlon 4 Ultra may be used in tank mix combination for basal bark treatment of woody plants. These herbicides are incompatible and will not form a stable mixture when mixed together directly in oil. Make a stable tank mixture for basal bark application by first combining each product with a compatibility agent prior to final mixing in the desired ratio. Tordon 22K is not registered for use in the states of California and Florida.

Herbicide Resistance Management:

Triclopyr, the active ingredient in this product, is a Group 4 herbicide based on the mode of action classification system of the Weed Science Society of America.

Any weed population may contain or develop plants resistant to Group 4 herbicides. Resistant weeds may dominate the weed population if these herbicides are used repeatedly in the same field. Such resistant weed plants may not be effectively managed using Group 4 herbicides but may be effectively managed utilizing other herbicides alone or in mixtures from a different herbicide Groups that are labeled for control of these weeds and/or by using cultural or mechanical practices. However, a herbicide mode of action classification by itself may not adequately address specific weeds that are resistant to specific herbicides.

Rotate the use of Garlon 4 Ultra or other Group 4 herbicides within a growing season sequence or among growing seasons with different herbicide groups that control the same weeds in a field.

Use tank mixtures with herbicides from a different group if such use is permitted; where information on resistance in target weed species is available, use less the resistance-prone partner at a rate that will control the target weed(s) equally as well as the more resistance-prone partner. Consult your local extension service or certified crop advisor if you are unsure as to which active ingredient is less prone to resistance.

Adopt an integrated weed management program for herbicide use that includes scouting and uses historical information related to herbicide use and crop rotation that considers tillage (or other mechanical control methods), cultural, biological, and other management practices.

Scout after a herbicide application to monitor weed populations for early signs of resistance development. Indicators of possible herbicide resistance include: (1) failure to control a weed species normally controlled by the herbicide at the dose applied, especially if control is achieved on adjacent weeds; (2) a spreading patch of non-controlled plants of a particular weed species; (3) surviving plants mixed with controlled individuals of the same species. If resistance is suspected, prevent weed seed production in the affected area by an alternative herbicide

from a different group or by mechanical method such as hoeing, mowing or tillage. Prevent movement of resistant weed seeds to other fields by cleaning harvesting and tillage equipment when moving between fields, and planting clean seed.

If a weed population continues to progress after treatment with this product, discontinue use of this product, and switch to another management strategy or herbicide with a different mode of action, if available.

Contact your local extension specialist or certified crop advisor for additional pesticide resistance management or integrated weed management recommendations for specific use sites.

Plants Controlled by Garlon 4 Ultra

Woody Plants Controlled

Common Name	Scientific Name	Life Cycle	Plant Family
acacia, twisted	<i>Acacia tortuosa</i>	perennial	Fabaceae
alder	<i>Aldus spp.</i>	perennial	Betulaceae
arrowwood	<i>Viburnum ventanum</i>	perennial	Caprifoliaceae
ash	<i>Fraxinus spp.</i>	perennial	Oleaceae
aspen	<i>Populus tremuloides</i>	perennial	Salicaceae
bear clover (bearmat)	<i>Chamaebatia foliolosa</i>	perennial	Fabaceae
beech	<i>Fagus spp.</i>	perennial	Fagaceae
birch	<i>Betula spp.</i>	perennial	Betulaceae
blackberry	<i>Rubus spp.</i>	perennial	Rosaceae
blackbrush	<i>Acacia rigidula</i>	perennial	Fabaceae
blackgum	<i>Nyssa salvatica</i>	perennial	Cornaceae
boxelder (1)	<i>Acer negundo</i>	perennial	Aceraceae
Brazilian pepper	<i>Schinus terebinthifolius</i>	perennial	Anacardiaceae
buckthorn	<i>Rhamnus spp.</i>	perennial	Rhamnaceae
casacara	<i>Rhamnus pushiana</i>	perennial	Rhamnaceae
ceanothus	<i>Ceanothus spp.</i>	perennial	Rhamnaceae
cherry	<i>Prunus spp.</i>	perennial	Rosaceae
cherry, choke	<i>Prunus virginiana</i>	perennial	Rosaceae
chinquapin	<i>Quercus muhlenbergii</i>	perennial	Fagaceae
cottonwood	<i>Populus deltoides</i>	perennial	Salicaceae
crataegus (hawthorn)	<i>Crataegus spp.</i>	perennial	Rosaceae
creeper, virginia (1)	<i>Parthenocissus quinquefolia</i>	perennial	Vitaceae
dogwood	<i>Cornus spp.</i>	perennial	Cornaceae
douglas-fir	<i>Psuedotsuga menziesii</i>	perennial	Pinaceae
elderberry	<i>Sambucus Canadensis</i>	perennial	Caprifoliaceae
elm	<i>Ulmus, spp</i>	perennial	Ulmaceae
elm, winged	<i>Ulmus alata</i>	perennial	Ulmaceae
gallberry	<i>Ilex coriacea</i>	perennial	Aquifoliaceae
granjeno	<i>Celtis ehrenbergiana</i>	perennial	Ulmaceae
guajillo	<i>Acacia berlandieri</i>	perennial	Fabaceae
guava	<i>Psidium guajava</i>	perennial	Myrtaceae
gorse	<i>Ulex europaeus</i>	perennial	Fabaceae
hazel	<i>Corylus americana</i>	perennial	Betulaceae
hickory	<i>Carya spp.</i>	perennial	Juglandaceae
hornbeam	<i>Carpinus spp.</i>	perennial	Betulaceae
huisache (suppression)	<i>Acacia farnesiana</i>	perennial	Fabaceae
ivy, poison	<i>Toxicodendron radicans</i>	perennial	Anacardiaceae
kudzu	<i>Pueraria lobata</i>	perennial	Fabaceae
locust	<i>Robinia spp.</i>	perennial	Fabaceae
madrone	<i>Arbutus spp.</i>	perennial	Ericaceae
magnolia, sweetbay	<i>Magnolia virginiana</i>	perennial	Magnoliaceae
maples	<i>Acer spp.</i>	perennial	Aceraceae
maple, bigleaf (1)	<i>Acer macrophyllum</i>	perennial	Aceraceae
milkweed vine (1)	<i>Asclepias spp.</i>	perennial	Asclepiaceae
mulberry	<i>Morus spp.</i>	perennial	Moraceae
myrtle. wax	<i>Morella cerifera</i>	perennial	Myricaceae
oaks	<i>Quercus spp.</i>	perennial	Fagaceae

Plants Controlled by Garlon 4 Ultra (Cont.)

Woody Plants Controlled

Common Name	Scientific Name	Life Cycle	Plant Family
oak, poison	<i>Toxicodendron diversilobum</i>	perennial	Anacardiaceae
osage orange	<i>Maclura pomifera</i>	perennial	Moraceae
peppervine	<i>Ampelopsis arborea</i>	perennial	Vitaceae
persimmon	<i>Disospyros spp.</i>	perennial	Ebenaceae
pine	<i>Pinus spp.</i>	perennial	Pinaceae
poplar	<i>Populus spp.</i>	perennial	Salicaceae
poplar, tulip	<i>Liriodendron tulipifera</i>	perennial	Magnoliaceae
primrose, willow	<i>Ludwigia peruviana</i>	perennial	Onagraceae
rose, wild	<i>Rosa spp.</i>	perennial	Rosaceae
salmonberry	<i>Rubus spectabilis</i>	perennial	Rosaceae
saltbush (silver myrtle)	<i>Baccharis spp</i>	perennial	Asteraceae
saltcedar	<i>Tamarix spp.</i>	perennial	Tamariaceae
sassafras	<i>Sassafras spp.</i>	perennial	Lauraceae
scotchbroom	<i>Cytisus scoparius</i>	perennial	Fabaceae
sumac	<i>Rhus spp.</i>	perennial	Anacardiaceae
sweetgum	<i>Liquidamber styraciflura</i>	perennial	Hamamelidaceae
sycamore	<i>Platanus occidentalis</i>	perennial	Plantanaceae
tanoak	<i>Notholithocarpus densiflorus</i>	perennial	Fagaceae
tree of heaven	<i>Ailanthus altissima</i>	perennial	Simaroubaceae
trumpet creeper (1)	<i>Campsis radicans</i>	perennial	Bignoniaceae
willow	<i>Salix spp.</i>	perennial	Saliciaceae

¹For best control, use either a basal bark or cut stump treatment.

²For complete control, re-treatment may be necessary.

Annual and Perennial Broadleaf Weeds

Common Name	Scientific Name	Life Cycle	Plant Family
beggarweed, creeping	<i>Desmodium incanum</i>	perennial	Fabaceae
bindweed, field (top growth)	<i>Convolvulus arvensis</i>	perennial	Convolvulaceae
burdock, common	<i>Arctium minus</i>	biennial	Asteraceae
carrot, wild	<i>Daucus carota</i>	biennial	Apiaceae
chicory	<i>Cichorium intybus</i>	perennial	Asteraceae
cinquefoil, sulfur (2)	<i>Potentilla recta</i>	perennial	Rosaceae
clover	<i>Trifolium spp.</i>	perennial	Fabaceae
dandelion (top growth)	<i>Taraxacum officinale</i>	perennial	Asteraceae
dock, curly	<i>Rumex crispus</i>	perennial	Polygonaceae
dogfennel	<i>Eupatorium capillifolium</i>	perennial	Asteraceae
goldenrod	<i>Solidago spp.</i>	perennial	Asteraceae
ivy, ground	<i>Glechoma hederacea</i>	perennial	Lamiaceae
kudzu	<i>Pueraria montana</i>	perennial	Fabaceae
lambsquarters	<i>Chenopodium spp.</i>	annual	Chenopodiaceae
lespedeza, annual	<i>Lespedeza striata</i>	annual	Fabaceae
lespedeza, Sericea (1)	<i>Lespedeza cuneata</i>	perennial	Fabaceae
lettuce, prickly	<i>Lactuca serriola</i>	annual	Asteraceae
matchweed	<i>Lippia nodiflora</i>	perennial	Verbanaceae
medic, black	<i>Medicago lupulina</i>	perennial	Fabaceae
mustard	<i>Brassica spp.</i>	annual	Brassicaceae
muistard, garlic (4)	<i>Alliaria petiolata</i>	biennial	Brassicaceae
plantain	<i>Plantago spp.</i>	annual	Plantaginaceae
ragweed, common	<i>Ambrosia artemisiifolia</i>	annual	Asteraceae
ragweed, western	<i>Ambrosia psilostachya</i>	perennial	Asteraceae
smartweed, Pennsylvania	<i>Polygonum pennsylvanicum</i>	annual	Polygonaceae
soda apple, tropical (3)	<i>Solanum viarum</i>	perennial	Solanaceae
thistle, bull	<i>Cirsium vulgare</i>	biennial	Asteraceae
thistle, Canada	<i>Cirsium arvense</i>	perennial	Asteraceae
vetch	<i>Vicia spp.</i>	perennial	Fabaceae
violet, wild	<i>Viola papilionacea</i>	perennial	Violaceae
yarrow, common	<i>Achillea millefolium</i>	perennial	Asteraceae

1. **Sericea lespedeza:** Apply 1 to 2 pints of Garlon 4 Ultra per acre. For best results, apply after maximum foliage development in the late spring to early summer, but prior to bloom.
2. **Sulfur cinquefoil:** Apply 1 to 2 pints of Garlon 4 Ultra per acre. For best results, apply to plants in the rosette stage.
3. **Tropical soda apple:** Apply 2 pints of Garlon 4 Ultra per acre when tropical soda apple plants reach the first flower stage. For best results, apply in a total spray volume of 40 gallons per acre using ground equipment. An agricultural surfactant may be added at the manufacturer's recommended rate to provide more complete wetting and coverage of the foliage. Spot treatments may be used to control sparse plant stands. For spot treatment use a 1 to 1.5% solution of Garlon 4 Ultra in water (1 to 1 1/2 gallons of Garlon 4 Ultra in 100 gallons total spray mixture) and spray the entire plant to completely wet the foliage. **In Florida,** control of tropical soda apple may be improved by using the following management practices:
 - Mow plants to a height of 3 inches every 50 to 60 days or whenever they reach flowering. Continue the mowing operation through April.
 - In late May to June (50 to 60 days after the April mowing), apply Garlon 4 Ultra as a broadcast treatment.
 - Use spot treatment to control any remaining plants or thin stands of plants that germinate following a broadcast treatment
4. **Garlic mustard:** apply as a 1.25 to 2.5% v/v foliar spray-to-wet application

Use Information

Use Garlon 4 Ultra at rates of 1 to 8 quarts per acre to control broadleaf weeds and woody plants. It is suggested that rates higher in this rate range be used to control woody plants. In all cases, use the amount specified in enough water to give uniform and complete coverage of the plants to be controlled. The order of addition to the spray tank is water, spray thickening agent (if used), surfactant (if used), additional herbicide (if used), and Garlon 4 Ultra. If a standard agricultural surfactant is used, use at a rate of 1 to 2 quarts per acre. Use continuous adequate agitation.

Before using any recommended tank mixtures, read the directions and all precautions on both labels.

For best results apply when woody plants and weeds are actively growing. When hard to control species such as ash, blackgum, choke cherry, elm, maples (other than vine or big leaf), oaks, pines, or winged elm are prevalent, during applications made during late summer when the plants are mature, or during drought conditions, use the higher rates of Garlon 4 Ultra alone or in combination with Graslan L or Tordon 22K herbicide. Graslan L and Tordon 22K are restricted use pesticides. Graslan L and Tordon 22K are not registered for use in the states of California and Florida.

When using Garlon 4 Ultra in combination with Freelexx or a 2,4-D low volatile ester herbicide, generally the higher rates of Garlon 4 Ultra should be used for satisfactory brush control.

Use the higher dosage rates when brush approaches an average of 15 feet in height or when the brush covers more than 60% of the area to be treated. If lower rates are used on hard to control species, resprouting may occur the year following treatment.

On sites where easy to control brush species dominate, rates less than those listed may be effective. Consult state or local extension personnel for such information.

Foliage Treatment With Ground Equipment

High Volume Foliage Treatment

For control of woody plants, use Garlon 4 Ultra at the rate of 2 to 6 quarts per 100 gallons of spray mixture, or Garlon 4 Ultra at 2 to 4 quarts may be tank mixed with labeled rates of Freelexx or a 2,4-D low volatile ester herbicide, Graslan L, or Tordon 22K and diluted to make 100 gallons of spray. Do not apply more than 2 gallons of Garlon 4 Ultra per acre. Apply at a volume of 100 to 400 gallons of total spray per acre depending upon size and density of woody plants. Graslan L and Tordon 22K are not registered for use in the states of California and Florida. When tank mixing, follow applicable use directions and precautions on each manufacturer's label.

Depending upon the size and density of the woody plants, apply sufficient spray volume to thoroughly wet all leaves, stems, and root collars. To minimize spray drift, select the minimum spray pressure that provides adequate plant coverage without forming a mist and direct sprays no higher than the top of the target plants. Use a drift control additive cleared for application to growing crops to reduce spray drift. Before using any tank mixture, read the directions and use precautions on both labels. For best results, apply when woody plants and weeds are actively growing.

Table 1: The following table is provided as a guide to the user to achieve the proper rate of Garlon 4 Ultra on forestry and non cropland sites

Total Spray Volume (gallons/acre)	Rate of Garlon 4 Ultra	
	Forestry Sites (qt/100 gallons of spray) ¹	Non-Cropland Sites (qt/100 gallons of spray) ²
400	1.5	2
300	2	2.7
200	3	4
100	6	8
50	12	16
40	15	20
30	20	26.7
20	30	40
10	60	80

¹Do not exceed the maximum use rate of 6 quarts of Garlon 4 Ultra (6 lb ae of triclopyr) per acre per year.

²Do not exceed the maximum use rate of 8 quarts of Garlon 4 Ultra (8 lb ae of triclopyr) per acre per year for non-grazable areas, or 2 quarts (2 lb ae of triclopyr) per acre per year for grazed areas, except on portions of grazed areas that meet the following requirement. Portions of grazed areas that intersect treated non-cropland, rights-of-way and forestry sites may be treated at up to 8 lb ae per acre if the area to be treated on the day of application comprises no more than 10% of the total grazable area.

Low Volume Foliar Treatment

To control susceptible woody plants, mix up to 5% v/v of Garlon 4 Ultra in water and apply 10 to 100 gallons of finished spray. The spray concentration of Garlon 4 Ultra and total spray volume per acre should be adjusted according to the size and density of target woody plants and kind of spray equipment used. With low volume sprays, use sufficient spray volume to obtain uniform coverage of target plants including the surfaces of all foliage, stems, and root collars (see Use Precautions and Restrictions). For best results, a surfactant should be added to all spray mixtures. Match equipment and delivery rate of spray nozzles to height and density of woody plants. When treating tall, dense brush, a truck mounted spray gun with spray tips that deliver up to 2 gallons per minute at 40 to 60 psi may be required. Backpack or other types of specialized spray equipment with spray tips that deliver less than 1 gallon of spray per minute may be appropriate for short, low to moderate density brush.

See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Tank Mixing: As a low volume foliar spray, up to 9 quarts of Garlon 4 Ultra may be applied in tank mix combination with labeled rates of Tordon 22K or Graslan L in 10 to 100 gallons of finished spray. Graslan L and Tordon 22K are not registered for use in the states of California and Florida.

Broadcast Applications With Ground Equipment

Apply Garlon 4 Ultra using equipment that will assure thorough and uniform coverage at spray volumes applied. See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Woody Plant Control

Foliage Treatment: Use 4 to 8 quarts of Garlon 4 Ultra in enough water to make 5 gallons or more per acre of total spray, or 1 1/2 to 3 quarts of Garlon 4 Ultra may be combined with labeled rates of Freelexx or a 2,4-D low volatile ester, Graslan L, or Tordon 22K in sufficient water to make 5 gallons or more per acre of total spray. Graslan L and Tordon 22K are not registered for use in the states of California and Florida.

Broadleaf Weed Control

Use Garlon 4 Ultra at rates of 1 to 4 quarts in a total volume of 5 gallons or more per acre as a water spray mixture. Apply anytime weeds are actively growing. Garlon 4 Ultra at 0.25 to 3 quarts may be tank mixed with labeled rates of Freelexx or a 2,4-D amine or low volatile ester, Tordon 22K, or Graslan L to improve the spectrum of activity. For thickened (high viscosity) spray mixtures, Garlon 4 Ultra can be mixed with diesel oil or other inverting agent. When using an inverting agent, read and follow the use directions and precautions on the product label. Graslan L and Tordon 22K are not registered for use in the states of California and Florida.

Aerial Application (Helicopter Only)

Aerial sprays should be applied using suitable drift control (see Use Precautions and Restrictions).

Foliage Treatment (Utility and Pipeline Rights-of-Way)

Use 4 to 8 quarts of Garlon 4 Ultra alone, or 3 to 4 quarts of Garlon 4 Ultra in a tank mix combination with labeled rates of Freelexx or a 2,4-D low volatile ester, Graslan L or Tordon 22K and apply in a total spray volume of 10 to 30 gallons per acre. Use the higher rates and volumes when plants are dense or under drought conditions. Graslan L and Tordon 22K are not registered for use in the states of California and Florida.

Portions of grazed areas that intersect treated non-cropland, rights-of-way and forestry sites may be treated at up to 8 lb ae per acre if the area to be treated on the day of application comprises no more than 10% of the total grazable area.

Basal Bark, Dormant Stem and Cut Surface Treatments for use on all sites

Individual plant treatments such as basal bark and cut surface applications may be used on any use site listed on this label at a maximum use rate of 8 quarts of Garlon 4 Ultra (8 lb ae of triclopyr) per acre. These types of applications are made directly to ungrazed parts of plants and, therefore, are not restricted by the grazing maximum rate of 2 quarts of Garlon 4 Ultra (2 lb ae of triclopyr) per acre.

Conventional Basal Bark Treatment

To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 1 to 5 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Apply with backpack sprayer or power spraying equipment using low pressure (20 to 40 psi). Spray the basal parts of brush and tree trunks to a height of 12 to 15 inches from the ground, thoroughly wetting the indicated area. Spray until runoff at the ground line is noticeable. Old or rough bark requires more spray than smooth young bark. Apply anytime, including the winter months, except when snow or water prevent spraying to the ground line. **Mixing with oil requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Low Volume Basal Bark Treatment

To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 20 to 30 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Apply with a backpack or sprayer using low pressure and a solid cone or flat fan nozzle. Spray the basal parts of brush and tree trunks to a height of 12 to 15 inches from the ground in a manner that thoroughly wets the lower stems, including the root collar area, but not to the point of runoff. Herbicide concentration should vary with size and susceptibility of species treated. Treatments may be applied throughout the year including when snow is present. Efficacy may be reduced when stem surfaces are saturated with water. See Table 1 for relationship between mixing rate, spray volume and maximum application rate. **Mixing with oil requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Garlon 4 Ultra Plus Milestone for basal bark applications

Mix Garlon 4 Ultra with Milestone in a commercially available basal diluent (or other oils or basal diluents as recommended by the manufacturer); the basal oil should be compatible with a water soluble herbicide such as Milestone. Make a stable tank mixture for basal bark application by first combining each product with a compatibility agent prior to final mixing in the desired ratio. If using a tank mix, mix the oil-based products such as Garlon 4 Ultra thoroughly with basal oil and add any other oil-based products before adding the water based products. If the mixture stands for more than 30 minutes, reagitation may be required. Oil and water based mixtures can separate over time. Long-term storage is not recommended without vigorous agitation prior to use or without a recommended compatibility agent.

Garlon 4 Ultra Plus Tordon 22K in Oil Tank Mix: Garlon 4 Ultra and Tordon 22K may be used in tank mix combination as a low volume basal bark treatment to improve control of certain woody species such as ash, elm, maple, poplar, aspen, hackberry, oak, oceanspray, birch, hickory, pine, tanoak, cherry, locust, sassafras, and multiflora rose. (See product bulletin for mixing instructions.) Tordon 22K is not registered for use in the states of California and Florida.

Streamline Basal Bark Treatment (Southern States)

To control or suppress susceptible woody plants for conifer release, mix 20 to 30 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Streamline basal bark treatments are most effective on stems less than 4 inches in basal diameter. Apply with a backpack sprayer or using equipment that provides a directed straight stream spray. Apply the spray in a 2- to 3-inch wide band to one side of stems less than 3 inches in basal diameter. When the optimum amount of spray mixture is applied, the treated zone should widen to encircle the stem within approximately 30 minutes. Treat both sides of stems which are 3 to 4 inches in basal diameter. Direct the spray at bark that is approximately 12 to 24 inches above ground. Pines (loblolly, slash, shortleaf, and Virginia) up to 2 inches in diameter breast height (dbh) can be controlled by directing the spray at a point approximately 4 feet above ground. Vary spray mixture concentration with size and susceptibility of the species being treated. Better control is achieved when spray is applied to thin juvenile bark and above rough thickened mature bark. This technique is not recommended for scrub and live oak species, including blackjack, turkey, post, live, bluejack and laurel oaks, or bigleaf maple. Apply anytime, including winter months, except when snow or water prevents spraying at the desired height above ground level. **Note:** Best

results with some hardwood species occur when applications are made from approximately 6 weeks prior to leaf expansion in the spring until approximately 2 months after leaf expansion is completed. **Mixing with oil requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Low Volume Stem Bark Band Treatment (North Central and Lake States)

The treatment band may be positioned at any height up to the first major branch. For best results apply the band as low as possible. Spray mixture concentration should vary with size and susceptibility of species to be treated. **Mixing with oil requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Thinline Basal Bark Treatment

To control susceptible woody plants with stems less than 6 inches in diameter, apply Garlon 4 Ultra, either undiluted or mixed at 50 to 75% v/v with oil, in a thin stream to all sides of the lower stems. The stream should be directed horizontally to apply a narrow band of Garlon 4 Ultra around each stem or clump. Use a minimum of 2 to 15 milliliters of Garlon 4 Ultra or oil mixture with Garlon 4 Ultra to treat single stems and from 25 to 100 milliliters to treat clumps of stems. Use an applicator metered or calibrated to deliver the small amounts required. **Mixing with oil requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Dormant Stem Treatment

Dormant stem treatments will control susceptible woody plants and vines with stems less than 2 inches in diameter. Plants with stems greater than 2 inches in diameter may not be controlled and resprouting may occur. This treatment method is best suited for sites with dense, small diameter brush. Dormant stem treatments of Garlon 4 Ultra can also be used as a chemical side-trim for controlling lateral branches of larger trees that encroach onto roadside, utility, or other rights-of-way.

High volume and low volume applications using backpacks deliver approximately the same amount of herbicide per acre but differ in delivery volumes to achieve that rate.

High Volume Applications

Mix 4 to 8 quarts of Garlon 4 Ultra in 2 to 3 gallons of crop oil concentrate or other recommended oil and add this mixture to enough water to make 100 gallons of spray solution. Use continuous adequate agitation. Apply using low pressure (20 to 40 psi). In western states, apply anytime after woody plants are dormant and most of the foliage has dropped. In other areas apply anytime within 10 weeks of budbreak, generally February through April. Garlon 4 Ultra may be mixed with 4 quarts of Weedone 170 herbicide to improve the control of black cherry and broaden the spectrum of herbicidal activity. Do not apply to wet or saturated bark as poor control may result.

Low Volume Applications

Mix Garlon 4 Ultra at 4 to 6 gallons and 2 to 3 gallons of crop oil concentrate or other recommended oil and add this mixture to enough water to make 100 gallons of spray solution. Use continuous adequate agitation. Apply with backpack or other low volume spraying equipment, using low pressure (20 to 40 psi). Garlon 4 Ultra may be mixed with other herbicides to broaden the spectrum of herbicidal activity. Do not apply to wet or saturated bark as poor control may result.

Cut Surface

Cut surface applications with Garlon 4 Ultra can be made anytime after cutting up to re-sprouting. After re-sprouting basal bark or foliar applications are more suitable.

Basal Cut Stump Treatment

To control resprouting, mix 20 to 30 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Apply with a backpack or sprayer using low pressures and a solid cone or flat fan nozzle. Spray the root collar area and any exposed roots of root suckering species, sides of the stump, and the outer portion of the cut surface, including the cambium, until thoroughly wet, but not to the point of runoff. Spray mixture concentration should vary with size and susceptibility of species treated, using the higher rate for larger stumps, stumps with thicker bark or harder to control plants. Apply anytime, including in winter months, except when snow or water prevent spraying to the ground line. **Mixing with oil requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Cut Stump Treatment

To control resprouting of difficult to control species like saltcedar and other *Tamarix* species, bigleaf maple, tanoak, Oregon myrtle, and other susceptible species, apply Garlon 4 Ultra as a 50% dilution v/v in water by spraying all the exposed cambium layer on the freshly cut surface, or use undiluted Garlon 4 Ultra immediately after cutting. Use of undiluted Garlon 4 Ultra is most effective for hard-to-control species. Treatments may be applied throughout the year; however, control may be reduced with treatment during periods of moisture stress as in late summer or

early spring sap flow. Cut stumps so that they are approximately level to facilitate uniform coverage of Garlon 4 Ultra. Use an applicator that can be calibrated to deliver the small amounts of material required.

Forest Management Applications

All application methods described on this label may be used on forest management sites.

For broadcast applications, apply 1 to 6 quarts of Garlon 4 Ultra per acre in a total spray volume of 5 to 25 gallons per acre by air or 10 to 100 gallons per acre by ground. Use spray volumes sufficient to provide thorough coverage of treated foliage. Nozzles or additives that produce larger droplets of spray may require higher spray volumes to provide adequate coverage.

Plant Back Interval for Conifers: Conifers planted sooner than one month after treatment with Garlon 4 Ultra at less than 4 quarts per acre or sooner than two months after treatment at 4 to 6 quarts per acre may be injured. When tank mixtures of herbicides are used for forest site preparation, labels for all products in the mixture should be consulted and the longest recommended waiting period observed.

Forest Site Preparation (Not For Conifer Release)

Southern States Including Alabama, Arkansas, Delaware, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia: To control susceptible woody plants and broadleaf weeds, apply Garlon 4 Ultra at a rate of 4 to 6 quarts per acre. To broaden the spectrum of woody plants and broadleaf weeds controlled, apply 2 to 4 quarts of Garlon 4 Ultra per acre in tank mix combination with labeled rates of Graslan L or Tordon 22K. Graslan L and Tordon 22K are not registered for use in the state of Florida. Where grass control is also desired, Garlon 4 Ultra, alone or in combination with Tordon 22K or Graslan L, may be applied with labeled rates of other herbicides registered for grass control in forests. Use of tank mix products must be in accordance with the most restrictive of label limitations and precautions. Do not exceed labeled application rates. Garlon 4 Ultra cannot be tank mixed with any product containing a label prohibition against such mixing.

In Western, Northeastern, North Central, and Lake States (States Not Listed Above as Southern States): To control susceptible woody plants and broadleaf weeds, apply Garlon 4 Ultra at a rate of 3 to 6 quarts per acre. To broaden the spectrum of woody plants and broadleaf weeds controlled, apply 1.5 to 3 quarts per acre of Garlon 4 Ultra in tank mix combination with labeled rates of Graslan L, Tordon 22K, or Freelexx or a 2,4-D low volatile ester or Freelexx. Graslan L and Tordon 22K are not registered for use in the state of California. Where grass control is also desired, Garlon 4 Ultra, alone or in tank mix combination with Graslan L or Tordon 22K, may be applied with labeled rates of other herbicides registered for grass control in forests. When applying tank mixes, follow applicable use directions and precautions on each product label.

Southern Coastal Flatwoods: To control susceptible broadleaf weeds and woody species such as gallberry and wax-myrtle, and for partial control of saw-palmetto, apply 2 to 4 quarts of Garlon 4 Ultra per acre. To broaden the spectrum of species controlled to include fetterbush, staggerbush, titi, and grasses, apply 2 to 3 quarts per acre of Garlon 4 Ultra in tank mix combination with labeled rates of Arsenal Applicator's Concentrate herbicide. Where control of gallberry, wax-myrtle, broadleaf weeds, and grasses is desired, apply 2 to 3 quarts of Garlon 4 Ultra per acre in tank mix combination with labeled rates of Accord Concentrate or Accord SP herbicide.

These treatments may be broadcast during site preparation of flat planted or bedded sites or, on bedded sites, applied in bands over the top of beds. For best results, apply in late summer or fall. Efficacy may not be satisfactory when applications are made in early season prior to August.

Note: Do not apply after planting pines.

Directed Sprays Applications for Conifer Release

To release conifers from competing hardwoods and brush such as red maple, sugar maple, striped maple, sweetgum, red and white oaks, ash, hickory, alder, birch, aspen, pin cherry, *Ceanothus* spp., blackberry, chinquapin, and poison oak, mix 4 to 20 quarts of Garlon 4 Ultra in enough water to make 100 gallons of spray mixture. This spray mixture should be directed onto foliage of competitive hardwoods using backpack sprayers with flat fan nozzles or equivalent anytime after the hardwoods and brush have reached full leaf size, but before autumn coloration. The majority of treated hardwoods and brush should be less than 6 feet in height to ensure adequate spray coverage. Care should be taken to direct spray solutions away from contact with conifer foliage, particularly foliage of desirable pines. See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Note: Spray may cause temporary damage and growth suppression where contact with conifers occurs; however, injured conifers should recover and grow normally. Over-the-top spray applications can kill pines.

Broadcast Applications for Mid-Rotation Understory Brush Control in Southern Coastal Flatwoods Pine Stands (Ground Equipment Only)

For control of susceptible species, such as gallberry and wax-myrtle, and broadleaf weeds, apply 2 to 4 quarts of Garlon 4 Ultra per acre. To broaden the spectrum of woody plants controlled to include fetterbush, staggerbush, and titi, apply 2 to 3 quarts of Garlon 4 Ultra per acre in tank mix combination with labeled rates of Arsenal Applicator's Concentrate. Saw-palmetto will be partially controlled by use of Garlon 4 Ultra at 4 quarts per acre or by mixtures of Garlon 4 Ultra at 2 to 3 quarts per acre in tank mix combination with either Arsenal Applicator's Concentrate or Escort herbicide. These mixtures should be broadcast applied over target understory brush species, **but to prevent injury to pines, make applications underneath the foliage of pines.** Apply sprays in 30 gallons or more per acre of total volume. For best results, apply in late summer or fall. Efficacy may not be satisfactory when applications are made in early season prior to August.

Broadcast Applications for Conifer Release in the Pacific Northwest and California

Dormant Conifers Before Bud Swell (Excluding Pines): To control or suppress deciduous hardwoods such as vine maple, bigleaf maple, alder, scotch broom, or willow **before leaf-out**, or evergreen hardwoods such as madrone, chinquapin, and *Ceanothus* spp., use Garlon 4 Ultra at 1 to 2 quarts per acre. Use diesel or fuel oil as a diluent, or use water plus 1 to 2 gallons per acre of diesel oil or a suitable surfactant or oil substitute at manufacturer's recommended rates. **Mixing with oil as the only diluent requires vigorous agitation to form an oil solution.** Once a solution is formed it will stay stable.

Conifer Plantations (Excluding Pines) After Hardwoods Begin Growth and Before Conifer Bud Break ("Early Foliar" Hardwood Stage): Use Garlon 4 Ultra at 1 to 1.5 quarts alone or with Freelexx or 2,4-D low volatile ester herbicide in water carrier to provide no more than 3 lb ae per acre from both products. After conifer bud break, these sprays may cause more serious injury to the crop trees. Use of a surfactant may cause unacceptable injury to conifers especially after bud break.

Conifer Plantations (Excluding Pines) After Conifers Harden Off In Late Summer and While Hardwoods Are Still Growing Actively: Use Garlon 4 Ultra at rates of 1 to 1.5 quarts per acre alone or with Freelexx or a 2,4-D low volatile ester. Treat as soon after conifer bud hardening as possible so that hardwoods and brush are actively growing. Use of oil, oil substitute, or surfactant may cause unacceptable injury to the conifers.

Broadcast Applications for Conifer Release in the Eastern United States

To release spruce, fir, red pine, and white pine from competing hardwoods such as red maple, sugar maple, striped maple, alder, birch (white, yellow, and grey), aspen, ash, pin cherry, and *Rubus* spp. and perennial and annual broadleaf weeds, use Garlon 4 Ultra at rates of 1.5 to 3 quarts per acre alone or with Freelexx or a 2,4-D amine or low volatile ester. Apply in late summer or early fall after conifers have formed their overwintering buds and hardwoods are in full leaf and prior to autumn coloration.

Broadcast Applications for Conifer Release in the Lake States Region

To release spruce, fir, and red pine from competing hardwoods such as aspen, birch, maple, cherry, willow, oak, hazel, and *Rubus* spp. and perennial and annual broadleaf weeds, use Garlon 4 Ultra at rates of 1.5 to 3 quarts per acre. Apply in late summer or early fall after conifers have formed their overwintering buds and hardwoods are in full leaf and prior to autumn coloration.

Basal Bark and Dormant Stem Treatments

Individual plant treatments such as basal bark and cut surface applications may be used on any use site listed on this label at a maximum use rate of 8 lb ae of triclopyr per acre. See above in the section **Basal Bark, Dormant Stem and Cut Surface Treatments for use on all site** for more use information.

Low Volume Basal Bark Treatment

To control susceptible woody plants such as mesquite, huisache, red maple, red and white oak, birches and aspen with stems less than 6 inches in basal diameter.

Streamline Basal Bark Treatment

To control or suppress susceptible woody plants such as mesquite, huisache, red maple, white and red oak, elbowbush, greenbriar, hackberry, pricklyash, yaupon and wild grape

Cut Stump, Basal Cut Stump, Dormant Stem, Thinline Basal Bark Treatments

To control resprouting, apply undiluted Garlon 4 Ultra to wet the cambium and adjacent wood around the entire circumference of cut stumps. Treatments may be applied throughout the year; however, control may be reduced with treatment during periods of moisture stress as in late summer. Cut stumps so that they are approximately level to facilitate uniform coverage of Garlon 4 Ultra. Use an applicator which can be calibrated to deliver the small amounts of material required.

Growing Point and Leaf Base (Crown) Treatment of Yucca

Prepare a 2% v/v solution of Garlon 4 Ultra in basal oil, diesel or fuel oil (13 fl oz of Garlon 4 Ultra in 5 gallons of spray mixture). Thoroughly wet the center of the plant including growing point and leaf bases to the soil surface. Complete coverage of leaves is not necessary.

Terms and Conditions of Use

If terms of the following Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies are not acceptable, return unopened package at once to the seller for a full refund of purchase price paid. To the extent permitted by law, otherwise, use by the buyer or any other user constitutes acceptance of the terms under Warranty Disclaimer, Inherent Risks of Use and Limitation of Remedies.

Warranty Disclaimer

Dow AgroSciences warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. To the extent permitted by law, Dow AgroSciences **MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.**

Inherent Risks of Use

It is impossible to eliminate all risks associated with use of this product. Plant injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperature, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Dow AgroSciences or the seller. To the extent permitted by law, all such risks shall be assumed by buyer.

Limitation of Remedies

To the extent permitted by law, the exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at Dow AgroSciences' election, one of the following:

1. Refund of purchase price paid by buyer or user for product bought, or
2. Replacement of amount of product used.

To the extent permitted by law, Dow AgroSciences shall not be liable for losses or damages resulting from handling or use of this product unless

Dow AgroSciences is promptly notified of such loss or damage in writing. To the extent permitted by law, in no case shall Dow AgroSciences be liable for consequential or incidental damages or losses.

The terms of the Warranty Disclaimer, Inherent Risks of Use and this Limitation of Remedies cannot be varied by any written or verbal statements or agreements. No employee or sales agent of Dow AgroSciences or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or this Limitation of Remedies in any manner.

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**Produced for
Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis, IN 46268**

Label Code: D02-329-005
Replaced Label: D02-329-004
LOES Number: 010-02127
EPA accepted 02/05/18

Revisions:

1. Updated list of use sites.
2. Updated the Resistance Management. Updated Spray Drift Management.
3. Corrected Active Ingredient statement.
4. Updated Agricultural Use Requirements and Non-Agricultural Use Requirements.
5. Updated PPE and User Safety.
6. Updated and reformatted the Plant Controlled section.
7. Revised and renamed the Application Methods for all use sites to Use Information
8. Added Maximum Use Rates section under Use Restrictions.
9. Updated Grazing and Haying restrictions for consistency with other triclopyr labels.
10. Updated rate for Tank Mixing as a low volume foliar spray from 12 to 9 quarts.
11. Updated title for Basal Bark Treatment to Conventional Basal Bark Treatment.
12. Updated Low Volume Basal Bark Treatment section.
13. Updated Dormant Stem Treatment section.
14. Added section for Rangeland and Permanent Grass Pastures, Basal Bark and Dormant Stem Treatments and CRP.

SAFETY DATA SHEET

DOW AGROSCIENCES LLC

Product name: GARLON™ 4 Ultra Herbicide

Issue Date: 05/04/2015

Print Date: 05/17/2015

DOW AGROSCIENCES LLC encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. IDENTIFICATION

Product name: GARLON™ 4 Ultra Herbicide

Recommended use of the chemical and restrictions on use

Identified uses: End use herbicide product

COMPANY IDENTIFICATION

DOW AGROSCIENCES LLC
9330 ZIONSVILLE RD
INDIANAPOLIS IN 46268-1053
UNITED STATES

Customer Information Number:

800-992-5994

info@dow.com

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 800-992-5994

Local Emergency Contact: 352-323-3500

2. HAZARDS IDENTIFICATION

Hazard classification

This material is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

Skin sensitisation - Sub-category 1B

Label elements

Hazard pictograms



Signal word: **WARNING!**

Hazards

May cause an allergic skin reaction.

Precautionary statements**Prevention**

Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

Contaminated work clothing should not be allowed out of the workplace.

Wear protective gloves.

Response

IF ON SKIN: Wash with plenty of soap and water.

If skin irritation or rash occurs: Get medical advice/ attention.

Wash contaminated clothing before reuse.

Disposal

Dispose of contents/ container to an approved waste disposal plant.

Other hazards

no data available

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature: Mixture

This product is a mixture.

Component**CASRN****Concentration**

Triclopyr-2-butoxyethyl ester	64700-56-7	60.5%
Ethylene glycol monobutyl ether	111-76-2	0.5%
Balance	Not available	39.0%

4. FIRST AID MEASURES

Description of first aid measures

General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice.

Skin contact: Take off contaminated clothing. Wash skin with soap and plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice. Wash clothing before reuse. Shoes and other leather items which cannot be decontaminated should be disposed of properly.

Eye contact: Hold eyes open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. Call a poison control center or doctor for treatment advice.

Ingestion: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Never give anything by mouth to an unconscious person.

Most important symptoms and effects, both acute and delayed: Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

Indication of any immediate medical attention and special treatment needed

Notes to physician: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label with you when calling a poison control center or doctor, or going for treatment.

5. FIREFIGHTING MEASURES

Suitable extinguishing media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective. Water fog, applied gently may be used as a blanket for fire extinguishment.

Unsuitable extinguishing media: Do not use direct water stream. May spread fire.

Special hazards arising from the substance or mixture

Hazardous combustion products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Nitrogen oxides. Hydrogen chloride. Carbon monoxide. Carbon dioxide. Phosgene.

Unusual Fire and Explosion Hazards: Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Do not use direct water stream. May spread fire. Move container from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Water fog, applied gently may be used as a blanket for fire extinguishment. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.

Special protective equipment for firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is

not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Isolate area. Keep unnecessary and unprotected personnel from entering the area. Refer to section 7, Handling, for additional precautionary measures. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Contain spilled material if possible. Small spills: Absorb with materials such as: Clay. Dirt. Sand. Sweep up. Collect in suitable and properly labeled containers. Large spills: Contact Dow AgroSciences for clean-up assistance. See Section 13, Disposal Considerations, for additional information.

7. HANDLING AND STORAGE

Precautions for safe handling: Keep out of reach of children. Do not swallow. Avoid breathing vapor or mist. Avoid contact with eyes, skin, and clothing. Use with adequate ventilation. Wash thoroughly after handling. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Conditions for safe storage: Store in a dry place. Store in original container. Keep container tightly closed when not in use. Do not store near food, foodstuffs, drugs or potable water supplies.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure limits are listed below, if they exist.

Component	Regulation	Type of listing	Value/Notation
Triclopyr-2-butoxyethyl ester	Dow IHG	TWA	2 mg/m ³
	Dow IHG	TWA	SKIN, DSEN, BEI
Ethylene glycol monobutyl ether	ACGIH	TWA	20 ppm
	OSHA Z-1	TWA	240 mg/m ³ 50 ppm
	ACGIH	TWA	BEI
	OSHA Z-1	TWA	Absorbed via skin

RECOMMENDATIONS IN THIS SECTION ARE FOR MANUFACTURING, COMMERCIAL BLENDING AND PACKAGING WORKERS. APPLICATORS AND HANDLERS SHOULD SEE THE PRODUCT LABEL FOR PROPER PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING.

Exposure controls

Engineering controls: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations.

Individual protection measures

Eye/face protection: Use safety glasses (with side shields).

Skin protection

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Butyl rubber. Chlorinated polyethylene. Neoprene. Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"). Viton. Polyvinyl chloride ("PVC" or "vinyl"). Nitrile/butadiene rubber ("nitrile" or "NBR"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Other protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Respiratory protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. For most conditions no respiratory protection should be needed; however, if discomfort is experienced, use an approved air-purifying respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Physical state	Liquid.
Color	Yellow
Odor	Mild
Odor Threshold	no data available
pH	3.36 1% pH Electrode (1% aqueous suspension)
Melting point/range	Not applicable
Freezing point	No test data available
Boiling point (760 mmHg)	No test data available
Flash point	closed cup > 100 °C (> 212 °F) <i>Pensky-Martens Closed Cup ASTM D 93</i>
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammability (solid, gas)	no data available
Lower explosion limit	No test data available
Upper explosion limit	No test data available
Vapor Pressure	No test data available
Relative Vapor Density (air = 1)	No test data available
Relative Density (water = 1)	1.11 at 20 °C (68 °F) <i>Digital Density Meter (Oscillating Coil)</i>
Water solubility	emulsifies

Partition coefficient: n-octanol/water	no data available
Auto-ignition temperature	> 325 °C (> 617 °F)
Decomposition temperature	No test data available
Dynamic Viscosity	23.4 mPa.s at 20 °C (68 °F) 10.8 mPa.s at 40 °C (104 °F)
Kinematic Viscosity	No test data available
Explosive properties	No
Oxidizing properties	No significant increase (>5C) in temperature.
Liquid Density	1.11 g/cm ³ at 20 °C (68 °F) <i>Digital density meter</i>
Molecular weight	no data available

NOTE: The physical data presented above are typical values and should not be construed as a specification.

10. STABILITY AND REACTIVITY

Reactivity: no data available

Chemical stability: Thermally stable at typical use temperatures.

Possibility of hazardous reactions: Polymerization will not occur.

Conditions to avoid: Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Hazardous decomposition products: Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Hydrogen chloride. Nitrogen oxides. Phosgene.

11. TOXICOLOGICAL INFORMATION

Toxicological information on this product or its components appear in this section when such data is available.

Acute toxicity

Acute oral toxicity

Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury.

LD50, Rat, female, 3,200 mg/kg

Acute dermal toxicity

Prolonged skin contact is unlikely to result in absorption of harmful amounts.

LD50, Rat, male and female, > 5,000 mg/kg

Acute inhalation toxicity

Prolonged exposure is not expected to cause adverse effects. Based on the available data, respiratory irritation was not observed.

LC50, Rat, male and female, 4 Hour, dust/mist, > 5.05 mg/l No deaths occurred at this concentration.

Skin corrosion/irritation

Brief contact may cause moderate skin irritation with local redness. May cause drying and flaking of the skin.

Serious eye damage/eye irritation

May cause slight eye irritation. Corneal injury is unlikely.

Sensitization

Has demonstrated the potential for contact allergy in mice.

For respiratory sensitization:
No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)

Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Specific Target Organ Systemic Toxicity (Repeated Exposure)

For the active ingredient(s):
In animals, effects have been reported on the following organs:
Kidney.
Liver.

Carcinogenicity

For the minor component(s): In long-term animal studies with ethylene glycol butyl ether, small but statistically significant increases in tumors were observed in mice but not rats. The effects are not believed to be relevant to humans. If the material is handled in accordance with proper industrial handling procedures, exposures should not pose a carcinogenic risk to man. For similar active ingredient(s). Triclopyr. Did not cause cancer in laboratory animals.

Teratogenicity

For the active ingredient(s): Has been toxic to the fetus in laboratory animals at doses toxic to the mother. Did not cause birth defects in laboratory animals.

Reproductive toxicity

For similar active ingredient(s). Triclopyr. In laboratory animal studies, effects on reproduction have been seen only at doses that produced significant toxicity to the parent animals.

Mutagenicity

For the active ingredient(s): In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

Aspiration Hazard

Based on available information, aspiration hazard could not be determined.

Carcinogenicity**Component**

Ethylene glycol monobutyl ether

List

ACGIH

Classification

A3: Confirmed animal carcinogen with unknown relevance to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicological information on this product or its components appear in this section when such data is available.

Toxicity**Acute toxicity to fish**

For similar material(s):

Material is highly toxic to aquatic organisms on an acute basis (LC50/EC50 between 0.1 and 1 mg/L in the most sensitive species tested).

For similar material(s):

LC50, Lepomis macrochirus (Bluegill sunfish), 96 Hour, 0.44 mg/l, OECD Test Guideline 203 or Equivalent

LC50, Oncorhynchus mykiss (rainbow trout), 96 Hour, 0.984 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates

For similar material(s):

EC50, Daphnia magna (Water flea), 48 Hour, 0.35 mg/l, OECD Test Guideline 202 or Equivalent

Acute toxicity to algae/aquatic plants

For similar material(s):

EbC50, Pseudokirchneriella subcapitata (green algae), 72 Hour, Biomass, 11 mg/l, OECD Test Guideline 201 or Equivalent

Toxicity to Above Ground Organisms

Based on information for a similar material:

Material is slightly toxic to birds on an acute basis (LD50 between 501 and 2000 mg/kg).

Based on information for a similar material:

oral LD50, Colinus virginianus (Bobwhite quail), 1,350 mg/kg

Persistence and degradability**Triclopyr-2-butoxyethyl ester****Biodegradability:** Chemical degradation (hydrolysis) is expected in the environment.

Material is expected to biodegrade very slowly (in the environment). Fails to pass OECD/EEC tests for ready biodegradability.

10-day Window: Fail

Biodegradation: 18 %**Exposure time:** 28 d

Method: OECD Test Guideline 301B or Equivalent

Theoretical Oxygen Demand: 1.39 mg/mg

Biological oxygen demand (BOD)

Incubation Time	BOD
	0.004 mg/mg

Stability in Water (1/2-life)

Hydrolysis, half-life, 8.7 d, pH 7, Half-life Temperature 25 °C

Photodegradation

Atmospheric half-life: 5.6 Hour

Method: Estimated.

Ethylene glycol monobutyl ether

Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Material is ultimately biodegradable (reaches > 70% mineralization in OECD test(s) for inherent biodegradability).

10-day Window: Pass

Biodegradation: 90.4 %

Exposure time: 28 d

Method: OECD Test Guideline 301B or Equivalent

Theoretical Oxygen Demand: 2.30 mg/mg

Chemical Oxygen Demand: 2.21 mg/g Dichromate

Biological oxygen demand (BOD)

Incubation Time	BOD
5 d	5.2 %
10 d	57 %
20 d	72.2 %

Balance

Biodegradability: No relevant data found.

Bioaccumulative potential

Triclopyr-2-butoxyethyl ester

Bioaccumulation: Bioconcentration potential is moderate (BCF between 100 and 3000 or Log Pow between 3 and 5).

Partition coefficient: n-octanol/water(log Pow): 4.62

Bioconcentration factor (BCF): 110 Fish.

Ethylene glycol monobutyl ether

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).

Partition coefficient: n-octanol/water(log Pow): 0.81 Measured

Bioconcentration factor (BCF): 3.2

Balance

Bioaccumulation: No relevant data found.

Mobility in soil

Triclopyr-2-butoxyethyl ester

Calculation of meaningful sorption data was not possible due to very rapid degradation in the soil.

For the degradation product:

Triclopyr.

Potential for mobility in soil is very high (Koc between 0 and 50).

Ethylene glycol monobutyl ether

Potential for mobility in soil is high (Koc between 50 and 150).

Partition coefficient(Koc): 67 Estimated.

Balance

No relevant data found.

13. DISPOSAL CONSIDERATIONS

Disposal methods: If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

14. TRANSPORT INFORMATION

DOT

Not regulated for transport

Classification for SEA transport (IMO-IMDG):

Proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.(Triclopyr-2-butoxyethyl ester)
UN number	UN 3082
Class	9
Packing group	III
Marine pollutant	Triclopyr-2-butoxyethyl ester
Transport in bulk according to Annex I or II of MARPOL 73/78 and the	Consult IMO regulations before transporting ocean bulk

IBC or IGC Code**Classification for AIR transport (IATA/ICAO):**

Proper shipping name	Environmentally hazardous substance, liquid, n.o.s.(Triclopyr-2-butoxyethyl ester)
UN number	UN 3082
Class	9
Packing group	III

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Acute Health Hazard
Chronic Health Hazard

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

United States TSCA Inventory (TSCA)

This product contains chemical substance(s) exempt from U.S. EPA TSCA Inventory requirements. It is regulated as a pesticide subject to Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requirements.

Federal Insecticide, Fungicide and Rodenticide Act

EPA Registration Number: 62719-527

This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and for workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label:

CAUTION

Causes moderate eye irritation

Harmful if swallowed

Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

16. OTHER INFORMATION

Hazard Rating System

NFPA

Health	Fire	Reactivity
2	1	0

Revision

Identification Number: 101188950 / A211 / Issue Date: 05/04/2015 / Version: 7.0

DAS Code: GF-1529

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

Absorbed via skin	Absorbed via skin
ACGIH	USA. ACGIH Threshold Limit Values (TLV)
BEI	Biological Exposure Indices
Dow IHG	Dow Industrial Hygiene Guideline
OSHA Z-1	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
SKIN, DSEN, BEI	Absorbed via Skin, Skin Sensitizer, Biological Exposure Indice
TWA	8-hour, time-weighted average

Information Source and References

This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

DOW AGROSCIENCES LLC urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ

between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

EPA R.E.D. FACTS

TRICLOPYR

Pesticide Reregistration

All pesticides sold or distributed in the United States must be registered by EPA, based on scientific studies showing that they can be used without posing unreasonable risks to people or the environment. Because of advances in scientific knowledge, the law requires that pesticides which were first registered before November 1, 1984, be reregistered to ensure that they meet today's more stringent standards.

Under the Food Quality Protection Act of 1996, EPA must consider the increased susceptibility of infants and children to pesticide residues in food, as well as aggregate exposure of the public to pesticide residues from all sources, and the cumulative effects of pesticides and other compounds with a common mechanism of toxicity in establishing or reassessing tolerances.

In evaluating pesticides for reregistration, EPA obtains and reviews a complete set of studies from pesticide producers, describing the human health and environmental effects of each pesticide. The Agency develops any mitigation measures or regulatory controls needed to effectively reduce each pesticide's risks. EPA then reregisters pesticides that meet the safety standard of the FQPA and can be used without posing unreasonable risks to human health or the environment.

When a pesticide is eligible for reregistration, EPA explains the basis for its decision in a Reregistration Eligibility Decision (RED) document. This fact sheet summarizes the information in the RED document for reregistration case 2710, that includes triclopyr acid, triclopyr triethylamine salt (TEA) and triclopyr butoxyethyl ester (BEE).

Use Profile

Triclopyr TEA and BEE products are used as selective herbicides to control broad leaf weeds and brush on a variety of sites-- rights-of-way, pasture and rangelands, forests, rice, and turf, including home lawns. Triclopyr products are formulated as soluble concentrates, emulsifiable concentrates, liquids (pressurized and ready-to-use), granulars, wettable powders and pellets.

Regulatory History

Triclopyr TEA was first registered in 1979 as an herbicide on non-crop areas and in forestry use for the control of broadleaf weeds and woody plants. Triclopyr BEE was subsequently registered in 1980 for use on the same sites. Both formulations were registered for use on turf sites in 1984. In 1985, triclopyr BEE was registered for use on rangeland and permanent grass pastures. Most recently (1995), triclopyr TEA was registered for use on rice

to control broadleaf weed species. A Data Call-In Notice (DCI) was issued in August 1991 requiring the submission of product chemistry, residue chemistry, ecological and environmental fate data for both TEA and BEE and toxicological data for TEA. At the time of the RED assessments, there were 12 registered products containing triclopyr BEE and 24 products containing triclopyr TEA.

Human Health Assessment Toxicity

Technical triclopyr acid was found to be slightly toxic by oral and dermal routes and has been placed in Toxicity Category III for these effects. Acceptable studies for acute inhalation, primary eye irritation, primary dermal irritation and dermal sensitization were not available for the technical grade of triclopyr acid. Available data indicate that both BEE and TEA are slightly toxic by oral (Toxicity Category III) and dermal (Toxicity Category III) routes of exposure, and practically non-toxic by inhalation (Toxicity Category IV) and do not cause dermal irritation. In a primary eye irritation study triclopyr TEA was found to be corrosive while BEE was found to be minimally irritating. Both TEA and BEE were found to cause dermal sensitization in test animals.

The Agency has classified triclopyr as a Group D chemical (not classifiable as to human carcinogenicity). This decision was based on increases in mammary tumors in both the female rat and mouse, and adrenal pheochromocytomas in the male rat, which were considered to be only a marginal response, and the absence of additional support from structural analogs or genotoxicity.

The Reference Dose (RfD), the amount of triclopyr residues that could be consumed daily over a lifetime without adverse effects, was established at 0.05 mg/kg/day, based on the 2-generation reproduction toxicity study in rats with a NOEL of 5.0 mg/kg/day, the lowest dose tested. At the next dose level (25 mg/kg/day), an increased incidence of proximal tubular degeneration of the kidneys was observed in P1 and P2 parental rats in this study.

For the acute dietary risk assessment, the endpoint of concern was the maternal and developmental NOEL of 30 mg/kg/day from a developmental toxicity study in rabbits based on a decreased number of live fetuses and other effects at the 100 mg/kg dose.

Because reliable pre- and post-natal data indicate no special sensitivity of young animals to triclopyr residues, EPA finds that an uncertainty factor of 100 (10 for interspecies differences in response, and 10 for intraspecies differences) is adequately protective of infants and children. Therefore, for risk assessment purposes the chronic dietary (RfD) calculations include a factor of 100, and the acute dietary risk assessments assume that a margin of exposure (MOE) of 100 or greater is acceptable.

Dietary Exposure/Risk

People may be exposed to residues of triclopyr through the diet. Triclopyr tolerances have been established for grass forage and hay, meat, meat byproducts, milk and eggs, and rice. EPA's tolerance reassessment indicates only minor changes to the current tolerance expression and tolerance values are needed, provided the label restrictions required by this RED are implemented limiting grazing and application rates.

Calculations using existing triclopyr tolerances result in a TMRC (theoretical maximum residue contribution) which represents < 1% of the RfD for the general population and < 3% of the RfD for children less than one year old, considering food only. These small percentages of the RfD generally indicate little concern for dietary risk.

Chronic aggregate dietary risk estimates, including both food and an upper bound estimate of triclopyr residues in drinking water, account for 16% of the RfD for females 13+ years, and 49% of the RfD for children ages 1 to 6.

The acute dietary (food only) MOE for the most sensitive subgroup, females of child bearing age, is 2500. The acute aggregate dietary MOE for the sub-population of greatest concern (pregnant females 13+) including food and drinking water is 1250.

Both triclopyr and the insecticide chlorpyrifos produce the metabolite 3,5,6-trichloro-2-pyridinol (TCP). TCP is similar in toxicity to triclopyr and less toxic than chlorpyrifos. EPA's aggregate assessment of the known, likely sources of exposure to TCP from both triclopyr and chlorpyrifos uses results in an acute MOE of 600 for females 13 + years. Aggregate chronic exposures could account for up to 90% of the provisional RfD for TCP for non-nursing infants less than 1 year old. Because these estimates include many upper bound exposure assumptions and still fall within acceptable limits, EPA believes that the risks posed by dietary exposure to the metabolite TCP are not of concern.

Occupational and Residential Exposure/Risk

Dermal absorption is calculated to be < 2% based on a study with human volunteers and a rabbit dermal absorption study. Neither occupational nor residential risk assessments for short-term and intermediate-term dermal exposure to triclopyr have been conducted because no adverse effects were seen at the highest dose tested of 1000 mg/kg/day in a 21-day dermal toxicity study in rabbits.

Because the acute inhalation LC₅₀ was determined to be > 2.6 mg/L, significant toxicity resulting from inhalation exposure would not be expected, and a separate risk assessment for the inhalation route of exposure is not warranted.

Homeowner exposure to triclopyr is expected to be minimal because of low dermal and inhalation toxicity, and because methods typically used by homeowners do not provide significant exposure (e.g., weed stick), and

treatment areas are usually limited in size. Also, the percent active ingredient and the application rates of homeowner products are less than those for agricultural or industrial use products. No chronic residential or occupational exposures are anticipated.

EPA is working with other agencies and the Native American tribes in California to determine the potential exposure to forestry herbicides that may be occurring to Native Americans through their use of forest plant materials in the making of baskets, for medicinal purposes and in other activities. Work currently underway will characterize the dissipation rate and frequency of occurrence of three herbicides (glyphosate, hexazinone, and triclopyr) in plants of interest to Native Americans. Because this work is ongoing, these unique exposures are not reflected in the triclopyr RED assessments.

FQPA Summary and Findings

Reliable data indicate no special sensitivity of infants and children to triclopyr residues. An uncertainty factor of 100 has been applied in both the chronic and acute dietary risk assessments. Both acute and chronic aggregate dietary (food + drinking water) risks are well within the acceptable range for triclopyr and for the identified sources of TCP, a metabolite common to both triclopyr and chlorpyrifos. EPA has not made a final determination regarding a possible common mechanism of toxicity for triclopyr and other substances or how to include this pesticide in a cumulative risk assessment. For the purposes of the tolerance reassessment in this RED, EPA considered only the risks of triclopyr and TCP in its assessments.

Environmental Fate/Ecological Risks

Triclopyr acid is somewhat persistent, and is mobile. The predominant degradation pathway for triclopyr in water is photodegradation. The predominant degradation pathway in soil is microbial degradation to the major degradate TCP, which is both persistent and mobile.

Triclopyr acid was found to be slightly toxic to birds and practically non-toxic to mammals, insects, freshwater fish and invertebrates. Triclopyr TEA was practically non-toxic to slightly toxic to birds and estuarine/marine invertebrates and practically non-toxic to freshwater fish, freshwater invertebrates and estuarine/marine fish. Testing with BEE indicated it to be slightly toxic to birds, moderately toxic to highly toxic to freshwater fish and estuarine/marine invertebrates, slightly to moderately toxic to freshwater invertebrates, and highly toxic to estuarine/marine fish.

Using current maximum permissible application rates (i.e., up to 12.12 lbs/ae/A), levels of concern (LOE) are exceeded for many species. However, calculating RQs at the revised, lower maximum rates established by the RED indicates that only chronic risk to mammals, acute risk to fish (BEE) and acute risk to non-target plants remain problematical.

Factors that lessen the Agency's concern for these LOC exceedances include several worst-case exposure assumptions that are unlikely under actual use conditions. For example: The screening level chronic assessment is based on 0-hour residues and does not take into account degradation--actual environmental concentrations would be less. Acute risks to fish were calculated assuming direct application to shallow aquatic habitat, which is not currently allowed--flowing water systems would result in rapid dissipation of triclopyr. Because triclopyr is an herbicide, risk to non-target plants is anticipated. However, potential damage to non-targets will be minimized by new spray drift management requirements and reduced application rates. Also, the registrant, Dow Agrosciences (formerly DowElanco), has provided the Agency with survey data indicating that typical application rates range from 0.5 to 4 lbs ae/A, generally much lower than the maximum rates allowed by current labels, and that more than 95% of triclopyr applications occur only once a year or less frequently.

EPA is concerned about the potential chronic toxicity and persistence of the triclopyr degradate, TCP, in the aquatic environment and is requiring additional confirmatory data to better characterize the fate of TCP and its chronic toxicity to fish, particularly salmonid species.

Risk Mitigation Measures

In order to reduce risk to non-target plants and animals, pesticide handlers and the environment, EPA is requiring the following changes to triclopyr use practices and labeling:

! The maximum application rate permitted on pasture and rangeland and all other sites where cattle can be grazed will be 1 lb/ae/A per year; for forestry applications the maximum will be 6 lbs/ae/A; for all other sites the maximum allowed rate will be 8 lb ae/A for the BEE and 9 lb/ae/A for the TEA.

! Labels must include best management practices for spray drift.

! A label statement warning users of the potential of triclopyr to leach to ground water in certain situations is required.

! A restriction against grazing lactating dairy animals until the following season is required. All conflicting grazing instructions must be removed. Labels must specify a 14 day PHI for grass hay, and retain the existing pre-slaughter interval of 3 days.

! An REI of 48 hours for triclopyr TEA, and 12 hours for triclopyr BEE is established for uses within the scope of the Worker Protection Standard; early entry PPE consisting of coveralls, chemical resistant gloves, protective eyewear--for TEA formulations, and shoes+sox) is required.

! Homeowner reentry is restricted until sprays have dried and dusts have settled.

! Additional confirmatory data are required to better characterize the fate of the degradate, TCP, in the aquatic environment and its chronic toxicity to fish. EPA is also requiring product-specific data including product chemistry and acute toxicity studies, and revised Confidential Statements of Formula (CSFs).

Regulatory Conclusion

EPA has determined that the reassessed tolerances for triclopyr meet the safety standard under the FQPA, and that there is a reasonable certainty that no harm will result to infants and children or to the general population from aggregate exposure to triclopyr or TCP residues. The use of currently registered products containing triclopyr in accordance with labeling required by this RED will not pose unreasonable risks of adverse effects to humans or the environment. Therefore, all currently registered uses of these products are eligible for reregistration.

Triclopyr products will be reregistered once the required product-specific data, revised Confidential Statements of Formula, and revised labeling are received and accepted by EPA. These products will be reregistered once any required confirmatory generic data, product specific data, CSFs, and revised labeling are received and accepted by EPA. Products which contain active ingredients in addition to triclopyr will be reregistered when all of their other active ingredients also are eligible for reregistration.

For More Information

EPA is requesting public comments on the Reregistration Eligibility Decision (RED) document for triclopyr during a 60-day time period, as announced in a Notice of Availability published in the Federal Register. To obtain a copy of the RED document or to submit written comments, please contact the Pesticide Docket, Public Response and Program Resources Branch, Field and External Affairs Division (7506C), Office of Pesticide Programs (OPP), US EPA, Washington, DC 20460, telephone 703-305-5805.

Electronic copies of the RED and this fact sheet are available on our website at www.epa.gov/REDS.

Printed copies of the RED and fact sheet can be obtained from EPA's National Center for Environmental Publications and Information (EPA/NCEPI), PO Box 42419, Cincinnati, OH 45242-0419, telephone 513-489-8190, fax 513-489-8695.

Following the comment period, the triclopyr RED document also will be available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161, telephone 703-605-6000.

For more information about EPA's pesticide reregistration program, the triclopyr RED, or reregistration of individual products containing triclopyr, please contact the Special Review and Reregistration Division (7508W), OPP, US EPA, Washington, DC 20460, telephone 703-308-8000.

For information about the health effects of pesticides, or for assistance in recognizing and managing pesticide poisoning symptoms, please contact the National Pesticides Telecommunications Network (NPTN). Call toll-free 1-800-858-7378, between 9:30 am and 7:30 pm Eastern Standard Time, Monday through Friday.

What is triclopyr ?

Triclopyr is a man-made [herbicide](#) used to control both broadleaf and woody plants. It was first registered in 1979 for use in forestry and it is used in both agricultural and non-agricultural settings. Certain products may have limited use for campsites, roadside applications, and some ornamental lawns. [Always read the label](#) for your product's use sites and instructions.¹



photo credit: blickpixel, pixabay

Broadleaf weeds often controlled with triclopyr include nettles, docks, brambles, and woody plants. Triclopyr is a selective herbicide, meaning it only controls certain types of plants. Grasses tend to be less sensitive to triclopyr than other weeds.²

What are some products that contain triclopyr ?

There are over 200 [products](#) containing triclopyr.³ Many of these products have other [active ingredients](#) in addition to triclopyr. Products may be ready-to-use, concentrated liquids, granules, or mixable powders. Products with triclopyr can be applied aerially or by ground application. They may be applied on tree bark, injected into tree trunks or soil, or sprayed on plant leaves.⁴

Products with triclopyr may have acid, salt, or ester forms. These forms tend to behave similarly in terms of toxicity and their movement in the environment.^{5,6}

Triclopyr is commonly used on pastures and rice. It is also commonly used for turf, landscaping, and [lawn care](#).¹ One type of triclopyr (a salt form) can be used on aquatic weeds.⁷ Triclopyr is not allowed for use in certified organic production.⁸

How does triclopyr work ?

Triclopyr is a systemic herbicide. It affects actively growing plants by mimicking a specific type of plant growth hormone, known as an auxin.⁹ Plants rapidly take in triclopyr through leaves and roots. It causes uncontrolled plant growth and plant death.⁴ After absorbing the herbicide, plants die slowly (within weeks).¹⁰

How might I be exposed to triclopyr ?

If you are in an area during or shortly after application, you could contact it, breathe it in, or get it in your eyes. Most triclopyr incidents that were reported to the US Environmental Protection Agency (EPA) from 2000 to 2014 involved homeowners who were mixing or applying products.¹¹

While accidents can happen, [following label instructions](#) and taking steps to [minimize exposure](#) can help reduce risks. If any exposures occur, be sure to follow the First Aid instructions on the product label carefully. For additional treatment advice, contact the Poison Control Center at 800-222-1222. If you wish to [discuss a pesticide problem](#), please call 800-858-7378.

What are some signs and symptoms from a brief exposure to triclopyr ?

The salt form of triclopyr can cause permanent eye damage. The ester form of triclopyr may cause eye irritation. All forms of triclopyr were low in toxicity on the skin.⁵ Rabbits had some skin irritation when exposed to triclopyr for 24 hours.¹² The salt and ester forms are dermal sensitizers, meaning after multiple exposures there could be signs of allergic reactions.⁵



Triclopyr is low in toxicity if inhaled.⁵ Rats that inhaled moderate doses for four hours had teary eyes and salivation.¹²

If eaten, triclopyr is low in toxicity.⁵ Rats showed signs of lethargy, teary eyes, and shallow breathing after eating large doses of triclopyr.¹²

What happens to triclopyr when it enters the body ?

Triclopyr is not absorbed well through the skin. A study with rabbits measured that 1.5% of a dose was absorbed through skin. In a study with human skin, it was estimated that less than 2% of the dose was absorbed.⁵

Triclopyr residues were measured in fat, ovaries, livers, and kidneys of rats that had eaten triclopyr.^{5,12} The EPA sets [tolerances](#), which are legal limits for the amount of triclopyr that can be in milk and other animal products.¹³

Triclopyr mainly leaves the body in urine.⁵ Within 24 hours, 93-94% of a single dose eaten by rats was excreted.¹²

Is triclopyr likely to contribute to the development of [cancer](#) ?

More studies may be needed to determine if triclopyr exposures could be linked to human cancer risks. The EPA has determined triclopyr is “unable to be classified as to human carcinogenicity.”⁵ There is only weak evidence for breast cancer in female rats and kidney tumors in male rats.^{5,7} Tests show triclopyr is unlikely to damage genetic material.⁵

Has anyone studied non-cancer effects from long-term exposure to triclopyr ?

Triclopyr is moderate in toxicity over long-term ingestion exposures. Rats fed moderate doses of triclopyr for 90 days had changes in their kidneys. Parts of kidneys that filter salts and vitamins from the blood were affected. Dogs fed moderate doses for a year had changes in their blood, liver function, weight gain, and kidney weights.⁵

Studies show that dogs were more sensitive to triclopyr than rats when fed triclopyr over longer periods of time.⁷ Results of one study suggest that it may be more difficult for dogs to excrete triclopyr compared to other animals.¹⁴ Always take steps to [minimize your pets' exposure](#) when using pesticides.

Triclopyr is low to moderate in developmental toxicity and moderate in reproductive toxicity. When moderate doses of triclopyr were fed to pregnant rabbits daily for 13 days, some pregnancies were lost and there were changes in fetal skeletal growth. Similar effects were seen when high doses were fed to pregnant rats for 10 days.⁵

In another study, two generations of male and female rats were fed triclopyr daily for 10 to 12 weeks before mating. There were fewer offspring and more lost pregnancies in both generations.⁵

The EPA has not tested triclopyr for endocrine disruption potential.¹⁵

Are children more sensitive to triclopyr than adults?

There is no evidence to suggest that children are more sensitive to triclopyr than adults.⁵ However, young children may act in ways that put them at greater risk of being exposed. For example, they may spend more time near the floor or ground. They may also be more likely to place their hands in their mouths after touching treated surfaces. Take steps to keep children away from pesticides.

What happens to triclopyr in the environment?

Ester and salt forms of triclopyr rapidly turn into the triclopyr acid form in the environment. Most triclopyr is [soluble in water](#), meaning it dissolves easily. However, the ester form is less soluble. Triclopyr has a low [vapor pressure](#), meaning it is not likely to release fumes into the environment.⁵

Triclopyr in water breaks down faster with light. The [half-life](#) of triclopyr in water with light is around 1 day.⁵ Without light, it is stable in water with a half-life of 142 days.⁴

Triclopyr breaks down relatively quickly in soils. It is mainly broken down by microbes.⁵ The [soil half-life](#) ranges from 8 to 46 days.^{5,10} In deeper soils with less oxygen, the half-life is longer.⁵ Triclopyr is mobile in soils.^{2,5} However, movement studies show that triclopyr was not measured in soils deeper than 15 to 90 centimeters (about 6 to 35 inches).^{4,5} Its movement in soil is affected by the amount of compost and rain, among other factors.^{10,16} Use NPIC's Herbicide Properties Tool ([HPT](#)) to find out how triclopyr can move in the environment.

As a systemic herbicide, triclopyr is absorbed through plant leaves and roots. It tends to accumulate in the growing points in a plant. The half-life in plants can vary widely with the type of plant. Barley and wheat plants broke down 85% of triclopyr within 3 days of application.¹⁰ The half-life in grass was between 5 and 20 days.¹⁶ The half-life in plants ranges from 3 to 24 days.^{2,5,16}

Can triclopyr affect fish or other [wildlife](#) ?

Triclopyr is practically non-toxic to slightly toxic to birds.⁵ Long-term exposures to birds (acid form) may affect eggshell thickness.⁴ While the salt form is practically non-toxic to slightly toxic to shellfish, the ester form is moderately to highly toxic.⁵ All forms of triclopyr can be toxic to algae.⁴

For fish, the acid and salt forms are practically non-toxic, but the ester form is moderately to highly toxic.⁵ The ester form can bioaccumulate (build up) in fish.⁴ However, the ester form rapidly degrades to the acid form in the environment and fish are not likely to contact large amounts of the pesticide.^{4,5} A breakdown product of triclopyr called TCP* is slightly to moderately toxic to fish and shellfish.^{4,5}



photo credit: Larry Perez, National Park Service

For water fleas, the acid and salt forms are practically non-toxic, but the ester form is slightly to moderately toxic.⁵

Triclopyr is practically non-toxic to bees.^{4,5} Data is not currently available on the long-term toxicity of triclopyr to bees.⁴ Changes in vegetation, rather than toxicity of triclopyr itself, may affect [populations](#) of beetles, butterflies, and spiders.⁷

*TCP: trichloropyridinol

Where can I get more information?

For more detailed information about triclopyr please visit the list of [referenced resources](#) or call the National Pesticide Information Center, Monday - Friday, between 8:00am - 12:00pm PT (11:00am - 3:00pm ET) at 800-858-7378 or visit us on the web at npic.orst.edu. NPIC provides objective, science-based answers to questions about pesticides.

Date Reviewed: April 2018

Please cite as: Strid, A.; Hanson, W.; Hallman, A.; Jenkins, J. 2018. *Triclopyr General Fact Sheet*; National Pesticide Information Center, Oregon State University Extension Services. npic.orst.edu/factsheets/triclopyr/gen.html.

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Krenite S

Active Ingredient

Fosamine Ammonium

SPECIMEN LABEL

Krenite® S

Brush Control Agent

Water-Soluble Liquid

Manufactured for:

ALBAUGH, INC.

1525 NE 36th Street
Ankeny, Iowa 50021

**FOR CHEMICAL SPILL, LEAK,
FIRE, OR EXPOSURE, CALL
CHEMTREC (800) 424-9300**

AD052510
PRODUCT OF CHINA

ACTIVE INGREDIENT:

Ammonium salt of fosamine [ethyl hydrogen
(aminocarbonyl) phosphonate]

BY WEIGHT

41.5%

OTHER INGREDIENTS

58.5%

TOTAL

100.0%

Contains 4 Lbs. Active Ingredient per Gallon.

EPA Reg. No. 42750-247

KEEP OUT OF REACH OF CHILDREN CAUTION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand the label, find someone to explain it to you in detail.)

FIRST AID

IF IN EYES:

- Hold eye open and rinse slowly and gently with water for 15-20 minutes.
- Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
- Call a poison control center or doctor for treatment advice.

Have the product container label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-424-9300 for medical emergencies involving this product.

See inside booklet for additional PRECAUTIONARY STATEMENTS.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION! Causes (moderate) eye injury (irritation). Avoid contact with eyes or clothing.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Applicators and other handlers must wear:

1. Long-sleeved shirt and long pants
2. Shoes plus socks

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

USERS SHOULD: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

ENVIRONMENTAL HAZARDS

Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water by cleaning of equipment or disposal of equipment washwaters.

PRODUCT INFORMATION

KRENITE® S brush control agent is a water-soluble liquid to be diluted with water and applied as a foliar spray for control and/or suppression of many woody species.

KRENITE® S may be applied for use in pine plantations and non-crop sites, including highway rights-of-way, industrial sites, railroad rights-of-way, storage areas, utility and pipeline rights-of-way.

This product may be applied in pine plantations and non-crop sites that contain areas of temporary surface water caused by collection of water between planting beds, in equipment ruts, or in other depressions created by management activities. It is permissible to treat intermittent drainage, intermittently flooded low-lying sites, seasonally dry flood plains and transitional areas between upland and lowland sites when no water is present. It is also permissible to treat marshes, swamps and bogs after water has receded, as well as seasonally dry flood deltas. **DO NOT** make applications to natural or man-made bodies of water, such as lakes, reservoirs, ponds, streams and canals.

KRENITE® S is non-flammable and nonvolatile.

ENVIRONMENTAL CONDITIONS AND BIOLOGICAL ACTIVITY

A KRENITE® S spray directed to only part of susceptible brush species will provide control of the portion sprayed, resulting in a trimming effect. Treatment with KRENITE® S generally does not immediately affect deciduous woody plants; they retain normal foliage for the remainder of the growing season. Treated susceptible plants do not produce foliage or grow the following spring. Coniferous species treated with KRENITE® S generally displays visible symptoms following application.

Effectiveness may be reduced if, following treatment, rainfall occurs on the same day.

RESISTANCE

When herbicides that affect the same biological site of action are used repeatedly over several years to control the same weed species in the same field, naturally-occurring resistant biotypes may survive a correctly applied herbicide treatment, propagate, and become dominant in that field. Adequate control of these resistant weed biotypes cannot be expected. If weed control is unsatisfactory, it may be necessary to retreat the problem area using a product affecting a different site of action.

To better manage herbicide resistance through delaying the proliferation and possible dominance of herbicide resistant weed biotypes, it may be necessary to change cultural practices within and between crop seasons such as using a combination of tillage, retreatment, tank-mix partners and/or sequential herbicide applications that have a different site of action. Weed escapes that are allowed to go to seed will promote the spread of resistant biotypes.

It is advisable to keep accurate records of pesticides applied to individual fields to help obtain information on the spread and dispersal of resistant biotypes. Consult your agricultural dealer, consultant, applicator, and/or appropriate state agricultural extension service representative for specific alternative cultural practices or herbicide recommendations available in your area.

INTEGRATED PEST MANAGEMENT

This product may be used as part of an Integrated Pest Management (IPM) program that can include biological, cultural, and genetic practices aimed at preventing economic pest damage. IPM principles and practices include field scouting or other detection methods, correct target pest identification, population monitoring, and treating when target pest populations reach locally determined action thresholds. Consult your state cooperative extension service, professional consultants or other qualified authorities to determine appropriate action treatment threshold levels for treating specific pest/crop systems in your area.

TANK MIXES

KRENITE® S herbicide may be tank mixed with other herbicides and/or adjuvant registered for use in pine plantations and non-crop sites. Follow all use directions, precautions, and restrictions on labels of tank-mixed products.

SPRAY EQUIPMENT

KRENITE® S may be applied using high volume or low volume ground sprayers as well as aircraft (helicopter only). Application equipment must be calibrated before making applications of KRENITE® S.

SPRAY ADJUVANTS

A penetrating type oil-based adjuvant (surfactant or crop oil concentrate) may be used with KRENITE® S. The adjuvant should be mixed in the spray solution at a minimum concentration of 1/4% by volume (1 quart per 100 gallons of spray solution) or at the manufacturer's recommended dosage.

If foaming is a problem during mixing, an anti-foam agent may be added.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

Do not apply this product through any type of irrigation system.

Do not use on food or feed crops.

KRENITE® S must be used only in accordance with the labeling, or in supplemental Albaugh, Inc. labeling.

AGRICULTURAL USES

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

1. Coveralls
2. Shoes plus socks

PINE PLANTATIONS PREPARATION SITE

KRENITE® S may be applied for the post-harvest (pre-plant) control of undesirable pine and hardwood seedlings and saplings and suppression of brush and vines to aid site planting preparation for southern pines and/or genetically improved pines.

APPLICATION INFORMATION

Apply as a foliar spray from mid-summer to when the target tree pests begin defoliation in late summer or fall. Applications of KRENITE® S may be made by ground or air (helicopter only) equipment. Use sufficient water to ensure complete coverage of the vegetation, 20 to 50 gallons per acre by ground and 10 to 15 gallons per acre by air.

USE RATES AND PLANTS CONTROLLED

Pine Seedlings and Saplings

Apply 2 to 4 quarts of KRENITE® S per acre for the control of seedling and sapling pines when burning is allowed on the site.

Apply 4 to 6 quarts per acre of KRENITE® S to control seedling and sapling pines when burning is not allowed on the site.

Use the higher rate when either pine saplings predominate or when high infestations of seedling pines are in the area to be sprayed.

Combinations of Pine and Hardwood Seedlings and Saplings

To control a combination of pine and hardwood seedlings and saplings, apply a tank mixture of KRENITE® S at use rates indicated for spraying pine seedlings and saplings plus Imazapyr (4 pound active per gallon) at 8 to 20 ounces per acre. This tank mix may be applied for the control of Ash, Blackberry, Black gum, Black locust, Box elder, Cherry, Dogwood, Elms (winged, slippery), Oaks (red, white), Red maple, Sassafras, and Sourwood.

Follow all use directions, precautions and restrictions on Imazapyr product labels.

Brush and Vine Suppression

The application of KRENITE® S plus Imazapyr will also provide suppression of brush and vines, such as, American beautyberry (French mulberry), Baccharis (groundsel tree), Vaccinium (blueberry) species, Wax myrtle (bayberry) and Wild grape.

*Suppression – a visible reduction in plant population and/or plant vigor as compared to an untreated area and generally not accepted as control.

Do not apply more than 3 gallons of KRENITE® S per acre per year.

NON-AGRICULTURAL USES

NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

Do not enter or allow entry into treated areas until sprays have dried to perform hand tasks.

NON-CROP SITES

KRENITE® S may be applied for general weed control as follows: uncultivated non-agricultural areas (such as airports, highway, railroad and utility rights-of-way, sewage disposal areas); uncultivated agricultural areas (non-crop producing, which includes: farmyards, fuel storage areas, fence rows, barrier strips); industrial sites (outdoor, such as lumberyards, pipeline and tank farms).

APPLICATION INFORMATION

Make a foliar application of the recommended rate of KRENITE® S from full leaf expansion in the spring to the development of full canopy coloration in the fall for deciduous species to be controlled. Coniferous species, listed in the "USE RATES AND PLANTS CONTROLLED" chart below, may be treated at anytime during the growing season.

LOW- AND HIGH-VOLUME DIRECTED SPRAYS

Prepare either a low-volume or high-volume spray solution of KRENITE® S. For the low-volume directed spray application, do not exceed a spray concentration of 30% by volume. For the high-volume directed spray application, do not use a spray concentration of less than 1.5% by volume.

Prepare the desired volume of spray solution by mixing the amount of this product in water as shown in the Spray Solution Table. Apply a quantity of spray solution which will thoroughly and uniformly cover the target plant foliage (spray to wet for high-volume applications). Rate and volume per acre will depend on the plant species, the height and density of plant growth as well as the type of application equipment used. On tall or dense stands of brush it may be necessary to spray from opposite sides in order to obtain thorough coverage of the foliage. Use the higher rate range on stands where difficult-to-control species are dominant. See the "USE RATES AND PLANTS CONTROLLED" section of the label for use rates and a listing of **difficult-to-control species.

Do not apply more than 6 gallons of KRENITE® S per acre per year.

AERIAL and BROADCAST APPLICATIONS

Prepare a spray solution using 1-1/2 to 3 gallons of KRENITE® S in 10 to 40 gallons of water (see Spray Solution Table). For broadcast ground applications, use this product at the rate of 1.5 to 6 gallons per acre. Do not apply more than 6 gallons per acre when using ground equipment. For aerial applications, use this product at the rate of 1.5 to 3 gallons per acre. Do not apply more than 3 gallons of KRENITE® S per acre when using aerial equipment. Use sufficient spray volume to uniformly and thoroughly cover the foliage. Use the higher concentrations on stands in which difficult-to-control species are predominant (see "USE RATES AND PLANTS CONTROLLED" section for a listing of **difficult-to-control species).

SPRAY SOLUTION TABLE

Desired Volume	Amount of KRENITE® S						
	1.5%	2%	3%	4%	10%	20%	30%
5 Gal	**	**	**	0.8 qt	0.5 gal	1 gal	1.5 gal
10 Gal	0.6 qt	0.8 qt	1.2 qt	1.6 qt	1 gal	2 gal	3 gal
20 Gal	1.2 qt	1.6 qt	0.6 gal	0.8 gal	2 gal	4 gal	6 gal
30 Gal	0.45 gal	0.6 gal	0.9 gal	1.2 gal	3 gal	6 gal	**
40 Gal	0.6 gal	0.8 gal	1.2 gal	1.6 gal	4 gal	**	**
50 Gal	0.75 gal	1 gal	1.5 gal	2 gal	5 gal	**	**
100 Gal	1.5 gal	2 gal	3 gal	4 gal	**	**	**

USE RATES AND PLANTS CONTROLLED

KRENITE® S effectively controls or suppresses (**difficult-to-control listings) the following plants when applied at the use rates shown.

**Suppression – a visible reduction in plant population and/or plant vigor as compared to an untreated area and generally not accepted as control.

1-1/2 to 6 gal KRENITE® S per acre			
Alder, red	<i>Alnus rubra</i>	Oak, red	<i>Quercus rubra</i>
Ash, white	<i>Fraxinus Americana</i>	Oak, water	<i>Quercus arkansana</i>
Aspen, quaking	<i>Populus tremuloides</i>	Oak, white	<i>Quercus alba</i>
Birch	<i>Betula</i> sp.	Persimmon**	<i>Diospyros virginiana</i>
Blackberry	<i>Rubus</i> sp.	Pine, loblolly	<i>Pinus taeda</i>
Blackgum	<i>Nyssa sylvatica</i>	Pine, Virginia	<i>Pinus virginiana</i>
Cherry, black**	<i>Prunus serotina</i>	Poplar, yellow (tulip tree)**	<i>Liriodendron tulipifera</i>
Cherry, pin	<i>Prunus pensylvanica</i>	Salmonberry	<i>Rubus spectabilis</i>
Chokecherry, common**	<i>Prunus virginiana</i>	Sassafras**	<i>Sassafras sassafras</i>
Elm**	<i>Ulmus</i> sp.	Sourwood**	<i>Oxydendrum arboretum</i>
Fern, bracken	<i>Pteridium acquilinum</i>	Spurge, leafy***	<i>Euphorbia esula</i>
Hawthorn**	<i>Crataegus</i> sp.	Sumac	<i>Rhus</i> sp.
Hickory**	<i>Carya</i> sp.	Sweetgum	<i>Liquidambar styraciflua</i>
Locust, black	<i>Robinia pseudoaccacia</i>	Tallow, Chinese	<i>Sapium Sebiferum</i>
Maple, bigleaf**	<i>Acer macrophyllum</i>	Thimbleberry	<i>Rubus parviflorus</i>
Maple, red**	<i>Acer rubrum</i>	Willow**	<i>Salix</i> sp.
Maple, vine	<i>Acer circinatum</i>		

2 to 6 gal KRENITE® S per acre			
Basswood, American**	<i>Tilia Americana</i>	Grape, wild	<i>Vitis</i> sp.
Bindweed, field***	<i>Convolvulus arvensis</i>	Pine, Eastern white	<i>Pinus strobes</i>
Cottonwood, Eastern	<i>Populus deltoids</i>	Plum, wild	<i>Prunus munsoniana</i>
Elder, American	<i>Sambucus canadensis</i>	Rose, multiflora	<i>Rosa multiflora</i>
Elm, slippery	<i>Ulmus rubra</i>	Sycamore	<i>Platanus occidentalis</i>
Elm, winged**	<i>Ulmus alata</i>	Tree-of-heaven	<i>Ailanthus altissima</i>

**Difficult-to-control or Suppression

Suppression – A visible reduction in plant population and/or plant vigor as compared to an untreated area and generally not accepted as control.

***Make applications after plants begin to bloom.

TANK MIXTURES

KRENITE® S plus ESCORT XP

KRENITE® S plus ESCORT XP may be applied for the control of Eastern red cedar and improved control of Ailanthus (tree of heaven), Ash, Cherry, Elm and Red maple.

Apply 1.5 to 3 gallons of KRENITE® S plus 1 to 2 ounces of ESCORT XP per acre. Apply a quantity of spray solution that will thoroughly and uniformly cover the target brush/trees without causing unnecessary run-off (spray to wet). If the site contains difficult-to-control species (see ** in “USE RATES AND PLANTS CONTROLLED” section), use the higher rates of both KRENITE® S and ESCORT XP.

Follow the use directions, precautions and restrictions on the ESCORT XP label.

KRENITE® S plus imazapyr

KRENITE® S plus imazapyr herbicide (2 pounds active ingredient per gallon) may be applied for the control of Box elder, Hackberry, Persimmon, Wild pecan and Dogwood and for improved control of Ash, Black Cherry, Elm, Maple, Sassafras and Willow.

Apply 1.5 to 3 gallons of KRENITE® S plus 8 to 20 ounces of imazapyr per acre. Apply a quantity of the spray solution that will thoroughly and uniformly cover the target brush without causing unnecessary run-off (spray to wet). If the site contains difficult-to-control species (see ** in “USE RATES AND PLANTS CONTROLLED” section), use the higher rates of both KRENITE® S and imazapyr.

Follow the use directions, precautions and restrictions on the Imazapyr label.

KRENITE® S plus picloram

KRENITE® S plus picloram (2 pound active per gallon) herbicide may be applied for the control of Hackberry, Persimmon, and Walnut for improved control of Cherry, Elm, Hickory, Locust, Oak, Poplar, Sassafras, Sumac, and Sweet gum.

Apply 1.5 to 3 gallons of KRENITE® S plus 1 to 2 pints of picloram per acre. Apply a quantity of the spray solution that will thoroughly and uniformly cover the target brush without causing unnecessary run-off (spray to wet). If the site contains difficult-to-control species (see ** in “USE RATES AND PLANTS CONTROLLED” section), use the higher rates of both KRENITE® S and picloram.

Follow the use directions, precautions and restrictions on the picloram label.

SIDE TRIMMING

For control of only a portion of a plant, direct the spray solution to thoroughly cover (spray to wet) only the portion of the plant to be controlled.

Do not apply more than 6 gallons of KRENITE® S per acre when side trimming.

CUT SURFACE APPLICATIONS

KRENITE® S may be used for controlling the re-sprouting of cut stumps of the plants listed in the “USE RATES AND PLANTS CONTROLLED” section. Control of re-sprouting in plants listed as “difficult to control” may not be as effective.

KRENITE® S may either be used undiluted or mixed with water. Use the method that is best suited for the particular application equipment. When mixing with water a ratio of no less than 1 part KRENITE® S to 1 part water on a volume basis must be used. Apply the undiluted or mixed solution to wet the area adjacent to the cambium and bark around the entire circumference and the sides of the cut stumps. The sides of the stumps should be wet down to the root collar area.

Apply with appropriate application equipment using low spray pressure. Applications can be made any time of the year, except during periods of heavy sap flow in the spring. Applications should be made soon after cutting, before the stump surface forms a layer of callous tissue (hardens off).

To prevent freezing of the spray solution, add ethylene glycol (commercial antifreeze) to the water used in preparing the spray solution. Add the antifreeze according to the manufacturer’s label for preventing freezing of water at the lowest expected ambient temperature. KRENITE® S will freeze at -11°F. A 1:1 aqueous dilution of KRENITE® S will freeze at 21°F.

A spray pattern indicator may be used in the spray solution to facilitate application. The user should check the compatibility of the spray indicator with the spray solution prior to using large quantities.

ADDITIONAL USE INSTRUCTIONS – PINE PLANTATIONS AND NON-CROP SITES

MIXING INSTRUCTIONS

1. Fill spray tank 1/2 full of water.
2. With the agitator running, add the desired amount of KRENITE® S.
3. If using a tank mix partner, add the recommended amount. Follow the use precautions and directions on the tank mix partner label.
4. Add spray adjuvant as last ingredient prior to filling the spray tank with water.
5. Agitate the spray solution thoroughly.

After KRENITE® S has been thoroughly mixed in the spray tank, agitation of the spray solution is not required.

SPRAY CLEAN-UP

Thoroughly clean all mixing and spray equipment immediately following applications of KRENITE® S. Flush tank, pump, hoses and boom with several changes of water after removing the nozzle tips and screens (clean these parts separately).

Dispose of the rinsate on a labeled site or at an approved waste disposal facility.

SPRAY DRIFT MANAGEMENT

The interaction of many equipment- and weather-related factors determines the potential for spray drift. The applicator is responsible for considering all of these factors when making applications.

AVOIDING SPRAY DRIFT IS THE RESPONSIBILITY OF THE APPLICATOR.

IMPORTANCE OF DROPLET SIZE

The most effective way to reduce drift potential is to apply large droplets (>150–200 microns). The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. The presence of sensitive species nearby, the environmental conditions, and pest pressure may affect how an applicator balances drift control and coverage.

APPLYING LARGER DROPLETS REDUCES DRIFT POTENTIAL, BUT WILL NOT PREVENT DRIFT IF APPLICATIONS ARE MADE IMPROPERLY OR UNDER UNFAVORABLE ENVIRONMENTAL CONDITIONS!

See “Wind”, “Temperature and Humidity”, and “Temperature Inversions” sections of this label.

CONTROLLING DROPLET SIZE – GENERAL TECHNIQUES

- Volume – Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- Pressure – Use the lower spray pressures recommended for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. WHEN HIGHER FLOW RATES ARE NEEDED, USE A HIGHER CAPACITY NOZZLE INSTEAD OF INCREASING PRESSURE.
- Nozzle Type – Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles.

CONTROLLING DROPLET SIZE – AIRCRAFT (HELICOPTER)

- Number of Nozzles – Use the minimum number of nozzles with the highest flow rate that provide uniform coverage.
- Nozzle Orientation – Orienting nozzles so that the spray is emitted backwards, parallel to the airstream will produce larger droplets than other orientations.
- Nozzle Type – Solid stream nozzles (such as disc and core with swirl plate removed) oriented straight back produce larger droplets than other nozzle types.

BOOM LENGTH AND HEIGHT

- Boom Length (helicopter) – For helicopters use a boom length and position that prevents droplets from entering the rotor vortices.
- Boom Height (helicopter) – Application more than 10 feet above the canopy increases the potential for spray drift.
- Boom Height (ground) – Setting the boom at the lowest height which provides uniform coverage reduces the exposure of droplets to evaporation and wind. The boom should remain level with the crop and have minimal bounce.

WIND

Drift potential increases at wind speeds of less than 3 mph (due to inversion potential) or more than 10 mph. However, many factors, including droplet size and equipment type determine drift potential at any given wind speed. AVOID GUSTY OR WINDLESS CONDITIONS.

Note: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

TEMPERATURE AND HUMIDITY

When making applications in hot and dry conditions, set up equipment to produce larger droplets to reduce effects of evaporation.

TEMPERATURE INVERSIONS

Drift potential is high during a temperature inversion. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain close to the ground and move laterally in a concentrated cloud. Temperature inversions are characterized by increasing temperature with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

SHIELDED SPRAYERS

Shielding the boom or individual nozzles can reduce the effects of wind. However, it is the responsibility of the applicator to verify that the shields are preventing drift and not interfering with uniform deposition of the product.

IMPORTANT PRECAUTIONS – PINE PLANTATIONS AND NON-CROP SITES

- Cutting of treated stems of brush before they are completely dead may result in sprouting.
- Do not use for the control of woody plants on lawns, walks, driveways, tennis courts or similar areas.
- Drift or spray mist contact with desirable trees, shrubs, or other plants may result in injury.
- Not registered for sale or use in California or Arizona.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

PESTICIDE STORAGE: Do not store below 10°F. Store product in original container only. Store in a cool, dry place.

PESTICIDE DISPOSAL: Waste resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTAINER HANDLING: Refer to the Net Contents section of this product's labeling for the applicable "Nonrefillable Container" or "Refillable Container" designation.

Nonrefillable Rigid Plastic and Metal Containers (Capacity Equal to or Less Than 5 Gallons):

Nonrefillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying.

Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then, for Plastic Containers, offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration. Do not burn, unless allowed by state and local ordinances. For Metal Containers, offer for recycling, if available, or reconditioning, if appropriate, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

Nonrefillable Rigid Plastic and Metal Containers (Capacity Greater Than 5 Gallons):

Nonrefillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying.

Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. Then, for Plastic Containers, offer for recycling, if available, or puncture and dispose of in a sanitary landfill, or by incineration. Do not burn, unless allowed by state and local ordinances.

For Metal Containers, offer for recycling, if available, or reconditioning, if appropriate, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

Nonrefillable Rigid Plastic and Metal Containers, e.g., Intermediate Bulk Containers (IBC) [Size or Shape Too Large to be Tipped, Rolled or Turned Upside Down]:

Nonrefillable container. Do not reuse or refill this container. Clean container promptly after emptying the contents from this container into application equipment or mix tank and before final disposal using the following pressure rinsing procedure. Insert a lance fitted with a suitable tank cleaning nozzle into the container and ensure that the water spray thoroughly covers the top, bottom and all sides inside the container. The nozzle manufacturer generally provides instructions for the appropriate spray pressure, spray duration and/or spray volume. If the manufacturer's instructions are not available, pressure rinse the container for at least 60 seconds using a minimum pressure of 30 PSI with a minimum rinse volume of 10% of the container volume. Drain, pour or pump rinsate into application equipment or rinsate collection system. Repeat this pressure rinsing procedure two more times. Then, for Plastic Containers, offer for recycling, if available, or puncture and dispose of in a sanitary landfill, or by incineration. For Metal Containers, offer for recycling, if available, or reconditioning if appropriate, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

All Refillable Containers:

Refillable container.

Refilling Container: Refill this container with KRENITE® S containing ammonium salt of fosamine only. Do not reuse this container for any other purpose. Cleaning before refilling is the responsibility of the refiller. Prior to refilling, inspect carefully for damage such as cracks, punctures, abrasions, worn out threads and closure devices. If damage is found, do not use container, contact Albaugh, Inc. at the number below for instructions. Check for leaks after refilling and before transporting. If leaks are found, do not reuse or transport container; contact Albaugh, Inc. at the number below for instructions.

Disposing of Container: Do not reuse this container for any other purpose other than refilling (see proceeding). Cleaning the container before final disposal is the responsibility of the person disposing of the container. To clean the container before final disposal, use the following pressure rinsing procedure. Insert a lance fitted with a suitable tank cleaning nozzle into the container and ensure that the water spray thoroughly covers the top, bottom and all sides inside the container. The nozzle manufacturer generally provides instructions for the appropriate spray pressure, spray duration and/or spray volume. If the manufacturer's instructions are not available, pressure rinse the container for at least 60 seconds using a minimum pressure of 30 PSI with a minimum rinse volume of 10% of the container volume. Drain, pour or pump rinsate into application equipment or rinsate collection system. Repeat this pressure rinsing procedure two more times. Then, for Plastic Containers, offer for recycling, if available, or puncture and dispose of in a sanitary landfill, or by incineration. Do not burn, unless allowed by state and local ordinances. For Metal Containers, offer for recycling, if available, or reconditioning if appropriate, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

Do not transport if container is damaged or leaking. If the container is damaged, leaking or obsolete, or in the event of a major spill, fire or other emergency, contact Albaugh, Inc. at 1-800-424-9300, day or night.

NOTICE TO BUYER: Purchase of this material does not confer any rights under patents of countries outside of the United States.

LIMITATION OF WARRANTY AND LIABILITY

NOTICE: Read This Limitation of Warranty and Liability Before Buying or Using This Product. If the Terms Are Not Acceptable, Return the Product at Once, Unopened, and the Purchase Price Will Be Refunded.

It is impossible to eliminate all risks associated with the use of this product. Such risks arise from weather conditions, soil factors, off-target movement, unconventional fanning techniques, presence of other materials, the manner of use or application, or other unknown factors, all of which are beyond the control of Albaugh, Inc. These risks can cause: ineffectiveness of the product; crop injury, or; injury to non-target crops or plants.

Albaugh, Inc. does not agree to be an insurer of these risks. **TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, WHEN YOU BUY OR USE THIS PRODUCT, YOU AGREE TO ACCEPT THESE RISKS.**

Albaugh, Inc. warrants that this product conforms to the chemical description on the label thereof and is reasonably fit for the purpose stated in the Directions for Use, subject to the inherent risks described above, when used in accordance with the Directions for Use under normal conditions.

ALBAUGH, INC. MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS OR OF MERCHANTABILITY OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

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Albaugh, Inc. or its Ag Retailer must have prompt notice of any claim so that an immediate inspection of buyer's or user's growing crops can be made. Buyer and all users shall promptly notify Albaugh, Inc. or an Albaugh, Inc. Ag Retailer of any claims, whether based on contract, negligence, strict liability, other tort or otherwise or be barred from any remedy.

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ESCORT® is a registered trademark of E.I. DuPont de Nemours and Company.

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

COMPANY ADDRESS: ALBAUGH, LLC
Ankeny, IA 50021

EMERGENCY TELEPHONE NUMBERS:
(800) 424-9300 (CHEMTREC, transportation and spills)

PRODUCT NAME : KRENITE S
CHEMICAL NAME : Ammonium salt of Fosamine
PRODUCT USE : Herbicide
PRODUCT CODE : EPA Reg. No 42750-247

SECTION 2 - HAZARDS IDENTIFICATION SUMMARY

(As defined by OSHA Hazard Communication Standard, 29 CFR 1910.1200)

Colorless liquid

HEALTH HAZARDS: Causes moderate to severe eye irritation.**PHYSICAL HAZARDS:** May release toxic gasses when burned**ENVIRONMENTAL HAZARDS:** May be toxic to non-target plants**SECTION 3 - COMPOSITION, INFORMATION OF INGREDIENTS**

COMPONENT	PERCENTAGE	CAS NUMBER
Ammonium Salt of Fosamine	41.5 %	25954-13-6
Inert Ingredients	58.5 %	n/a

SECTION 4 - FIRST AID MEASURES

First Aid responders should use protective equipment in Section 8 if there is a potential for exposure to product.

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.**IF SWALLOWED:** Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person.**IF ON SKIN OR CLOTHING:** Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.**IF INHALED:** Move person to fresh air, if person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.**NOTE TO PHYSICIAN:** No known antidote, treat symptomatically

Have a product container or label with you when calling a poison control center or doctor, or going for treatment.

SECTION 5 - FIRE FIGHTING MEASURES

National Fire Protection Rating (NFPA)

HEALTH	1
FLAMMABILITY	0
REACTIVITY	0
4=Severe 3=Serious 2=Moderate 1=Slight 0=Minimal	

FLASHPOINT: N/A

EXTINGUISHING MEDIA: Use water spray, foam or dry chemical.

FIRE AND EXPLOSION HAZARD: May decompose in fire due releasing irritating or toxic gases.

FIRE FIGHTING INSTRUCTIONS: Evacuate area and fight fire upwind from a safe distance to avoid hazardous vapors and decomposition products. Foam or dry chemical extinguishing systems recommended to prevent environmental damage due to water runoff.

Minimize use of water to prevent environmental contamination. Contact your State Pesticide or Environmental Control Agency, or nearest EPA Regional Office for guidance on disposal.

FIRE FIGHTING EQUIPMENT: Self-contained breathing apparatus with full facepiece. Full firefighting turn-out gear (Bunker gear).

SECTION 6 - ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILLS OR LEAKS: Clean up spills immediately, observing precautions in Section 8 of this document. Isolate hazard area. Keep unnecessary and unprotected personnel from entering.

SMALL SPILL: Absorb small spills on sand, vermiculite or other inert absorbent. Place contaminated material in appropriate container for disposal.

LARGE SPILL: Dike large spills using absorbent or impervious material such as clay or sand. Recover and contain as much free liquid as possible for reuse. Allow absorbed material to solidify, and scrape up for disposal. After removal, scrub the area with detergent and water and neutralize with dilute alkaline solutions of soda ash, or lime. Minimize use of water to prevent environmental contamination

SECTION 7 - HANDLING AND STORAGE

KEEP OUT OF REACH OF CHILDREN!

Wear proper safety equipment specified in Section 8 when mixing, loading or otherwise handling concentrate.

HANDLING: Use only in a well-ventilated area. Wear appropriate safety equipment when handling.

STORAGE: Keep away from food, feed and drinking water. Do not store below 10°F. Store product in original container only. Store in a cool, dry place.

SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION**EXPOSURE LIMITS (8 hour TWA, ppm):**

COMPONENT	OSHA PEL	ACIGH TLV
Ammonium Salt of Fosamine	Not listed	Not listed

ENGINEERING CONTROLS: Proper ventilation is required when handling or using this product to minimize exposure to airborne contaminants. Local mechanical exhaust ventilation may be required. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

PERSONAL PROTECTIVE EQUIPMENT:

EYE PROTECTION - Safety glasses or goggles when mixing, loading or cleaning equipment is recommended.

CLOTHING – Long-sleeved shirt and long pants. Shoes plus socks,

GLOVES – Waterproof gloves when mixing, loading or cleaning equipment is recommended.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS:

Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Remove PPE immediately after handling this product. Wash outside of gloves before removing. As soon as possible wash thoroughly and change into clean clothing.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Colorless liquid
Odor:	Irritating odor
pH:	5.2 – 6.2
Melting Point:	Not applicable
Boiling Point:	No data
Flash Point:	Not applicable
Evaporation Rate:	No data
Flammability:	Not flammable
Flammability Limits:	Not applicable
Vapor Pressure:	0.53 mPa (25°C) (Fosamine ammonium)
Vapor Density:	Not applicable
Density:	1.15 – 1.19 g/ml (9.60 – 9.93 lb/gl)*
Solubility:	Emulsifies
Partition Coefficient:	log Pow = -2.9 (25°C) (Fosamine ammonium)
Auto-Ignition Temperature:	No data
Decomposition Temperature:	No data
Viscosity:	6.0 mPa (20°C); 2.8 mPa (40°C)

*Listed density is an approximate value and does not necessarily represent that of a specific batch.

SECTION 10 - STABILITY AND REACTIVITY

PRODUCT REACTIVITY: None known.

CHEMICAL STABILITY: Stable, however may decompose if heated.

HAZARDOUS REACTION/POLYMERIZATION: Product will not undergo polymerization.

CONDITIONS TO AVOID: Avoid temperatures above (115°F, 46°C) and below 25°F (-5°C).

INCOMPATIBLE MATERIALS: Strong oxidizers or bases, mild and galvanized steel.

HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide, Nitrogen oxides, phosphorous oxides.

SECTION 11 - TOXICOLOGICAL INFORMATION**ACUTE TOXICITY:**

Oral LD ₅₀ (rat)	- > 5,000 mg/kg
Dermal LD ₅₀ (rat)	- > 2,000 mg/kg
Inhalation LC ₅₀ (rat)	- > 4.1 mg/L
Eye Irritation (rabbit)	- Slight
Skin Irritation (rabbit)	- Slight
Sensitization (guinea pig)	- Non-sensitizer

CARCINOGEN STATUS:

OSHA	- Not listed
NTP	- Not listed
IARC	- Not listed

TERATOGENICITY: No evidence of reproductive or developmental toxicity.

MUTAGENICITY: No evidence of mutagenic effects during in vivo or in vitro studies.

SECTION 12 - ECOLOGICAL INFORMATION

ENVIRONMENTAL SUMMARY: Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water by cleaning of equipment or disposal of equipment washwaters.

FATE: Fosamine is slightly persistent with a soil half life of 1 - 2 weeks. It is moderately mobile depending on soil type.

FISH TOXICITY: (Fosamine ammonium)

96 hour LC ₅₀ , Rainbow trout –	330 mg/L
96 hour LC ₅₀ , Bluegill –	590 mg/L

AVIAN TOXICITY: (Fosamine ammonium)

Oral LD ₅₀ , Bobwhite quail –	> 5,000 mg/Kg
Oral LD ₅₀ , Mallard duck –	> 5,000 mg/Kg

BEE: (Fosamine ammonium) > 100 ug/Bee

SECTION 13 - DISPOSAL CONSIDERATIONS

Do not contaminate water, food or feed by storage or disposal.

WASTE: Waste resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTAINER: Non-refillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying.

Refillable container. Refill this container with KRENITE S containing ammonium salt of fosamine only. Do not reuse this container for any other purpose. Cleaning before refilling is the responsibility of the refiller.

Refer to the product label for additional and complete Container Handling instructions

SECTION 14 - TRANSPORT INFORMATION

SHIPPING DESCRIPTION: Not regulated by DOT
(Ground transport)

TRANSPORT HAZARD CLASS: N/A
UN NUMBER: N/A
DOT PACKING GROUP: PG III

SECTION 15 - REGULATORY INFORMATION

CERCLA REPORTABLE QUANTITY: Not listed

SARA TITLE III STATUS:
311/312 Hazard Categories – Immediate Health
313 Toxic Chemicals – None known

CALIFORNIA PROP 65: Not listed

TSCA: This product is exempted from TSCA because it is solely for FIFRA regulated use.

SECTION 16 - OTHER INFORMATION

HMIS HAZARD RATINGS	HEALTH	1
	FLAMMABILITY	1
	PHYSICAL HAZARD	0
	4=Severe 3=Serious 2=Moderate 1=Slight 0=Minimal	

DISCLAIMER: The information presented herein is based on available data from reliable sources and is correct to the best of Albaugh's knowledge. Albaugh makes no warranty, express or implied, regarding the accuracy of the data or the results obtained from the use of this product. Nothing herein may be construed as recommending any practice or any product in violation of any law or regulations. The user is solely responsible for determining the suitability of any material or product for a specific purpose and for adopting any appropriate safety precautions.

This Safety Data Sheet (SDS) serves different purposes than and DOES NOT REPLACE OR MODIFY THE EPA APPROVED PRODUCT LABELING (attached to and accompanying the product container). This SDS provides important health, safety, and environmental information for employers, employees, emergency responders and others handling large quantities of the product in activities generally other than product use, while the labeling provides that information specifically for product use in the ordinary course. Use, storage and disposal of pesticide products are regulated by the EPA under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) through the product labeling, and all necessary and appropriate precautionary, use, storage, and disposal information is set forth on that labeling.

It is a violation of federal law to use a pesticide product in any manner not prescribed on the EPA-approved label.

REVISED DATE: December, 2014

REFERENCE: Revised for GHS compliance



R.E.D. FACTS

Fosamine ammonium

Pesticide Reregistration

All pesticides sold or distributed in the United States must be registered by EPA, based on scientific studies showing that they can be used without posing unreasonable risks to people or the environment. Because of advances in scientific knowledge, the law requires that pesticides which were first registered years ago be reregistered to ensure that they meet today's more stringent standards.

In evaluating pesticides for reregistration, EPA obtains and reviews a complete set of studies from pesticide producers, describing the human health and environmental effects of each pesticide. The Agency imposes any regulatory controls that are needed to effectively manage each pesticide's risks. EPA then reregisters pesticides that can be used without posing unreasonable risks to human health or the environment.

When a pesticide is eligible for reregistration, EPA announces this and explains why in a Reregistration Eligibility Decision (RED) document. This fact sheet summarizes the information in the RED document for reregistration case 2355, fosamine ammonium.

Use Profile

Fosamine ammonium is an herbicide/plant growth regulator used to control brush and herbaceous plants on noncropland. It is applied to nonagricultural rights-of-way (e.g. highways, railroads, and utilities), industrial sites, and fencerows.

Fosamine ammonium is formulated in end use products as a water soluble liquid. It is applied once per year from Spring to early Fall, by aircraft, backpack and handwands. After application, the brush control effects of the pesticide are achieved by inhibiting bud growth the following year.

Use practice limitations prohibit fosamine ammonium from being used on croplands or in irrigation systems. It may not be applied directly to water, or areas where surface water is present, including intertidal areas. Soils treated with this herbicide cannot be converted to food/feed croplands within one year of treatment.

Fosamine ammonium is not registered for use in California and Arizona.

Regulatory

Fosamine ammonium was first registered as a pesticide in the U.S. in

History 1975. It was registered for non-cropland (non-food use) areas such as railroads, pipelines, utility and highway rights-of way, reforestation areas, drainage ditch banks, storage areas, industrial plants, and other similar sites. However, this product was voluntarily cancelled on June 22, 1994.

A second product was registered in 1980 with the same uses as the original product except for reforestation uses. This product currently is marketed under two trade names. The registrant requested to voluntarily cancel direct applications to water, ditch banks, and to other sites which are adjacent to and surrounding domestic water supply reservoirs, supply streams, lakes and ponds. The Agency is processing this request, which involves publishing a Notice of Intent to delete these uses in the Federal Register. Because there are no other current registrants and there are outstanding environmental data requirements to support continued registration of these uses, the Agency expects that these sites will be deleted from the label by early 1995.

Human Health Assessment

Toxicity

Fosamine ammonium is classified as Toxicity Category II for acute dermal studies in mammalian species. This classification represents the second most severe level of acute toxicity for studies using laboratory animals (Toxicity Category I is the highest). Fosamine ammonium is very mildly toxic for acute oral and acute inhalation (Toxicity Category IV), and is not a dermal sensitizer.

In one subchronic oral study, the laboratory animals given the highest dose of fosamine ammonium exhibited some statistically significant effects, including effects to the kidneys, bladder and decreases in body weight. There were no subchronic neurotoxic effects of fosamine ammonium at any dose level.

Fosamine ammonium displayed some mutagenic potential in one in vitro test for chromosome aberrations, while four other tests were negative for mutagenic potential.

Dietary Exposure

Since there are no registered food uses for fosamine ammonium, no dietary exposure is expected.

Occupational and Residential Exposure

Based on current use patterns, workers may be exposed to fosamine ammonium during and after application of the pesticide. Worker exposure estimates are based on the assumption that workers wear long pants, long sleeved shirt, shoes, and no gloves, except for workers using backpacks (who are assumed to wear chemical resistant gloves). The primary route of exposure to fosamine ammonium is expected to be dermal. Another potential route of exposure is through inhalation. However, based on the exposure assumptions, the potential for inhalation exposure is negligible.

Human Risk Assessment

Since no food uses are registered, fosamine ammonium poses no human dietary risks. Regarding acute toxicity, fosamine ammonium falls in Toxicity Category II for acute dermal exposure. However, the mild skin effects observed with this chemical do not trigger any significant toxicological concerns. The herbicide/plant growth regulator is of low toxicity by the oral and inhalation routes. Based on the mixed results of studies suggesting mutagenetic potential, the Agency is requiring additional testing with germ cells as a confirmatory study.

Based on the current use pattern of fosamine ammonium, the estimated exposure to workers, which is likely to reflect a worse-case scenario, does not pose a serious threat to workers. However, there are no known significant acute or chronic toxicological endpoints that warrant the establishment of risk mitigation measures or minimum personal protective equipment (PPE) requirements to protect handlers of the pesticide. Clothing as described in the exposure assessment will provide adequate protection to handlers. In addition, EPA is requiring application restrictions and user safety recommendations on end-use product labeling.

Environmental Assessment

Environmental Fate

Fosamine ammonium is not very persistent under aerobic or anaerobic conditions and degrades rapidly in most soils. Dissipation of fosamine ammonium is dependent on rapid, microbial mediated degradation. Thus, in field studies fosamine ammonium was found to be highly soluble in water and is mobile in various soils. However, in the sterile conditions of the laboratory, fosamine ammonium is stable to hydrolysis. Although fosamine ammonium is a mobile compound, there is little evidence that leaching is a major route of dissipation. Data on the residues of fosamine ammonium indicate they are also relatively mobile.

Fosamine ammonium may be found in surface waters with low microbiological activities or long hydrological residence times.

Exposure of fosamine ammonium to non-target aquatic plants can result from spray drift from treated areas, surface runoff, or wind blown soil particles. However, no acute risk quotients exceed the level of concern, so no acute effects to aquatic plants are expected from the normal use of fosamine ammonium.

The risk to terrestrial non-target plants cannot be determined until Tier I and Tier II data requirements have been fulfilled. Results of the most sensitive terrestrial plant species tested are needed in order to conduct an acute risk assessment.

Any movement of fosamine ammonium from the treatment site via spray drift, surface runoff, or wind blown soil particles can adversely affect non-target and endangered/threatened plants. Direct application of rights-of-way are a special concern, because large numbers of endangered plants grow in rights-of-way areas. Thus applications of fosamine ammonium at

the registered rates may pose a significant risk to endangered plant species inhabiting treated rights-of-way.

EPA has been working with the U.S. Fish and Wildlife Service and other federal and state agencies to develop a program to avoid jeopardizing endangered species. The Endangered Species Program is expected to be final soon. Further limitations on the use of fosamine ammonium may be imposed at that time.

Further droplet size spectrum and field drift studies are due to the Agency at the end of June 1995 as part of the spray drift data requirements to be submitted by the Spray Drift Task Force. If the new data suggest substantially different drift potential, the Agency will reassess its impact on the associated environmental risks at that time.

Ecological Effects

Exposure to non-target aquatic organisms can result from spray drift and runoff from treated areas. However, acute effects to freshwater fish and aquatic invertebrates are not expected from the normal use of fosamine ammonium. Fosamine ammonium is practically nontoxic to coldwater and warmwater fish, and does not appear to bioaccumulate in fish. However, a nine percent fish mortality was observed in the accumulation in fish study. Fosamine ammonium is practically nontoxic to freshwater invertebrates and to estuarine species.

Fosamine ammonium is practically nontoxic to honey bees, which are used to assess the effects on non-target insects.

Fosamine ammonium is practically nontoxic to avian species on an acute oral and a subacute dietary basis. Mixed results were found in the avian reproductive studies. In one mallard duck study, there was some indication of chronic reproductive effects. However, in another avian reproductive study, using the bob white quail as the test organism, there were no reproductive effects at any dose level.

Fosamine ammonium is practically nontoxic to small mammalian species. Acute oral and subacute dietary risks to non-endangered and endangered non-target mammals are not expected to result from current label uses.

Ecological Effects Risk Assessment

Based on the data, fosamine ammonium dissipation is predominantly dependent on rapid microbial-mediated degradation. It is also mobile in mineral soils. However, fosamine ammonium should not pose a threat to groundwater or surface waters because it rapidly degrades in aerobic and anaerobic environments. There are no Maximum Concentration Levels

(MCLs) or drinking water health advisories for fosamine ammonium or its degradates.

The health and environmental data on fosamine ammonium indicate a low level of toxicity of this pesticide. However, the inconclusive results in the avian reproductive studies have led the Agency to require a new mallard duck reproduction study on a confirmatory basis. In addition, risk mitigation measures are required to reduce the potential for avian reproductive effects.

Additional Data Required

EPA is requiring the following additional generic data for fosamine ammonium to confirm its regulatory assessments and conclusions: Certification of limits (62-2), Avian reproduction, mallards (71-4b), In-vivo cytogenetics (84-2a), Droplet size spectrum and field drift data (201-1, 202-1), Method validation for worker exposure (231, 232), Terrestrial plant (122-1, 123-1), and Aerobic aquatic (164-2, 162-4) if aquatic sites are not deleted.

The Agency also is requiring product-specific data including product chemistry and acute toxicity studies, revised Confidential Statements of Formula (CSFs) and revised labeling for reregistration.

Product Labeling Changes Required

All fosamine ammonium end-use products must comply with EPA's current pesticide product labeling requirements, and with the following:

a) Within the Environmental Hazards section of the Precautionary Statement of the label:

"Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters or rinsate."

b) To reduce environmental loading and potential exposure to non-target species, the product label must include language to limit use as outlined below:

i) the end-use product can be applied only once annually during the period after spring growth has hardened to the development of fall coloration in deciduous species, and

ii) the maximum application rate for low shrubs/brush is 16 lb a.i./A, and for tall dense woody species with very heavy foliage can be 24 lb a.i./A.

c) The end-use product labels cannot include directions for applications to aquatic sites. The current, sole registrant has submitted an application for amended registration to delete these uses from its product registration. Future submissions of appropriate data to support registration for these uses will be considered by the Agency.

d) The Agency is requiring the following labelling statements to be located on all end-use products containing fosamine ammonium:

Application Restrictions:

"Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during applications."

Entry Restrictions

The Agency is establishing the following entry restrictions for the occupational uses of fosamine ammonium end-use products:

For liquid applications:

"Do not enter or allow others to enter the treated area until sprays have dried."

Other Labelling Requirements:

User Safety Recommendations:

"Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet."

"Users should remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing."

"Users should remove clothing immediately after handling this product. If gloves are worn, wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing."

These statements must be included on the labels, as they are appropriate, after product-specific PPE requirements are set by the Agency. Although it is not required under the current labeling, it is assumed that the workers wear long pants, long sleeved shirts, shoes, and socks.

**Regulatory
Conclusion**

The use of currently registered products containing fosamine ammonium in accordance with approved labeling, except use in aquatic sites, will not pose unreasonable risks or adverse effects to humans or the environment. The registrant has voluntarily requested cancellation of the aquatic uses. The Agency is not including the aquatic uses in its eligibility decision, because of the inadequate environmental data and the impending deletion of those uses from all current registrations. Therefore, all uses of fosamine ammonium products, other than application to aquatic sites, are considered eligible for reregistration.

Fosamine ammonium products will be reregistered once the required, product-specific data, revised Confidential Statements of Formula, and revised labeling are received and accepted by EPA.

**For More
Information**

EPA is requesting public comments on the Reregistration Eligibility Decision (RED) document for fosamine ammonium during a 60-day time period, as announced in a Notice of Availability published in the Federal Register. To obtain a copy of the RED document or to submit written comments, please contact the Pesticide Docket, Public Response and Program Resources Branch, Field Operations Division (7506C), Office of

Pesticide Programs (OPP), US EPA, Washington, DC 20460, telephone 703-305-5805.

Electronic copies of the RED and this fact sheet can be downloaded from the Pesticide Special Review and Reregistration Information System at 703-308-7224. They also are available on the Internet on EPA's gopher server, *GOPHER.EPA.GOV*, or using ftp on *FTP.EPA.GOV*, or using WWW (World Wide Web) on *WWW.EPA.GOV*.

Printed copies of the RED and fact sheet can be obtained from EPA's National Center for Environmental Publications and Information (EPA/NCEPI), PO Box 42419, Cincinnati, OH 45242-0419, telephone 513-489-8190, fax 513-489-8695.

Following the comment period, the fosamine ammonium RED document also will be available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161, telephone 703-487-4650.

For more information about EPA's pesticide reregistration program, the fosamine ammonium RED, or reregistration of individual products containing fosamine ammonium, please contact the Special Review and Reregistration Division (7508W), OPP, US EPA, Washington, DC 20460, telephone 703-308-8000.

For information about the health effects of pesticides, or for assistance in recognizing and managing pesticide poisoning symptoms, please contact the National Pesticides Telecommunications Network (NPTN). Call toll-free 1-800-858-7378, between 8:00 am and 6:00 pm Central Time, Monday through Friday.

Quest Water Conditioning Agent

Active Ingredient

Blend of Ammonium Salts of Polyacrylic

Hydroxy Carboxylic & Phosphoric Acids




WATER CONDITIONING AGENT AND AMMONIUM SULFATE REPLACEMENT

***ACTIVE INGREDIENTS:**

Proprietary blend of the ammonium salts of polyacrylic, hydroxy carboxylic and phosphoric acids	50.00%
Components ineffective as water conditioners	50.00%
TOTAL	100.00%

*All ingredients are accepted for use under CFR 40, 180.

<p>KEEP OUT OF REACH OF CHILDREN WARNING</p> <p>Causes skin irritation May be harmful if swallowed May be harmful in contact with skin May cause allergic skin reaction May be harmful if inhaled Causes eye irritation</p> <p>See Inside Panel for Additional Precautionary Statements</p>	
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SN 020515

NET CONTENTS:

**Manufactured For
HELENA CHEMICAL COMPANY
225 SCHILLING BOULEVARD, SUITE 300
COLLIERVILLE, TN 38017 • (901) 761-0050**

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS WARNING

BEFORE USING THIS PRODUCT, READ ALL PRECAUTIONS, DIRECTIONS FOR USE, CONDITIONS OF SALE – LIMITED WARRANTY AND LIMITATIONS OF LIABILITY AND REMEDIES.

Causes skin irritation. May be harmful if swallowed. May be harmful in contact with skin. May cause allergic skin reaction. May be harmful if inhaled. Causes eye irritation. Do not eat, drink, or smoke when using this product. Wash hands and face thoroughly after handling. Avoid breathing spray mist. Avoid contact with skin, eyes, or clothing. In addition, follow precautionary statements on accompanying pesticide(s) label(s) that are applied with this product.

FIRST AID	
IF SWALLOWED:	<ul style="list-style-type: none"> • Call a poison control center or doctor immediately for treatment advice. • Have person sip a glass of water if able to swallow. • Do not induce vomiting unless told to by a poison control center or doctor. • Do not give anything to an unconscious or convulsing person.
IF ON SKIN OR CLOTHING:	<ul style="list-style-type: none"> • Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice.
IF INHALED:	<ul style="list-style-type: none"> • Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. • Call a poison control center or doctor for further treatment advice.
IF IN EYES:	<ul style="list-style-type: none"> • Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses, if present, after the first 5 minutes, then continue rinsing. • Call a poison control center or doctor for treatment advice.
HOT LINE NUMBER	
For help in chemical emergencies involving spills, leak, fire or exposure call toll free 1-800-424-9300.	

STORAGE AND DISPOSAL
<p>Store in original container only. Product may crystallize at temperatures less than 33°F. Keep container tightly closed and do not allow other chemicals to be introduced into the container. Do not contaminate water sources by runoff from cleaning of equipment washwaters or spray waste.</p> <p>CONTAINER DISPOSAL: Triple rinse (or equivalent) and add rinsate to spray tank, then offer for recycling or reconditioning, or puncture and dispose of according to state and local authorities. If burned, stay out of smoke.</p> <p>For help in chemical emergencies involving spills, leak, fire or exposure call toll free 1-800-424-9300.</p>

GENERAL INFORMATION

QUEST® is a water-conditioning agent and activator designed to enhance pesticide performance by modifying factors such as pH and hard water. In addition, the buffers, sequestrants, and chelating agents making up **QUEST®** are combined with ammoniacal nitrogen. Ammoniacal nitrogen has been recognized as an effective enhancer of herbicide uptake by some plant species. As a result of these activities, **QUEST®** can positively affect pesticide spray application and pesticide efficacy.

Never mix **QUEST®** with undiluted pesticides which are incompatible with low pH (acid conditions). Spray mixes containing **QUEST®** should not be utilized in combination with herbicides containing DSMA.

Do not mix **QUEST®** with spray mixes containing fixed copper fungicides (products such as cupric hydroxide, tribasic copper, COPPER COUNT N, or copper oxychloride).

Do not apply this product in such a manner as to directly or through drift expose workers or other persons. Do not spray pesticides if conditions of thermal inversion exist, or if wind direction and speed may cause drift onto adjacent areas. With both aerial and ground application, the use of a drift control spray deposition additive (in accordance with pesticide label directions) may reduce the potential for drift to occur. Drift minimization is the responsibility of the applicator. Consult your local state agricultural authorities for information regarding avoiding or minimizing spray drift.

DIRECTIONS FOR USE

FOR USE WITH PRODUCTS REGISTERED FOR: AGRICULTURAL, AQUATIC, FORESTRY, INDUSTRIAL, MUNICIPAL, NON-CROPLAND, ORNAMENTAL, RIGHTS-OF-WAY, TURF AND OTHER USES.

In all applications of **QUEST®** read and follow directions for use on the pesticide(s) label as to procedures, dosage rates, timing of application and restrictions for the crop on which the pesticide is to be applied. **QUEST®** can increase the activity of some herbicides. The use of test areas is recommended when applying during periods of high humidity or high temperature or to other situations where field experience is limited.

The addition of an adjuvant to some pesticides or pesticide tank mix combinations may cause phytotoxicity to the foliage and/or fruit of susceptible crops. Prior to the addition of **QUEST®** to spray mixes, the user or application advisor must have experience with the combination or must have conducted a phytotoxicity trial or must take the recommendations from the labels of the products, with which it is to be tank mixed.

RECOMMENDED USE RATES

The following use rates are recommended for **QUEST®**.

GROUND: Use 1–5 pints per 100 gallons of spray (0.125–0.75% v/v).

AERIAL: Use 2–4 pints per 100 gallons of spray (0.25–0.50% v/v).

WATER CONDITIONING: Use 1 to 5 pints per 100 gallons of water as a general use water conditioning agent for pH reduction and hard water sequestering.

NOTE: **QUEST®** is a water conditioning agent. **QUEST®** does not replace the need for a crop oil concentrate or nonionic surfactant. If the pesticide label recommends it, then additional crop oil concentrate or nonionic surfactant should be added.

MIXING

Prior to any pesticide application, all spray mixing and application equipment must be thoroughly cleaned. Carefully observe all cleaning directions on the pesticide label.

1. Fill spray tank one-half full with water and begin agitation
2. Add **QUEST**[®]
3. Add pesticides and/or fertilizers as directed by manufacturer's label or in the following sequence:
 - A. Micronutrients and fertilizers
 - B. Dry flowables or water dispersible granules
 - C. Flowables
 - D. Water soluble pesticides
 - E. Emulsifiable concentrates
4. Continue agitation and complete filling of spray tank

Terminology on this label is consistent with the definitions approved by Subcommittee E-35.22 on Pesticide Formulations and Application Systems under the jurisdiction of ASTM Subcommittee E-35.

CONDITIONS OF SALE – LIMITED WARRANTY AND LIMITATIONS OF LIABILITY AND REMEDIES

Read the Conditions of Sale–Warranty and Limitations of Liability and Remedies before using this product. If the terms are not acceptable, return the product, unopened, and the full purchase price will be refunded.

The directions on this label are believed to be reliable and must be followed carefully. Insufficient control of pests and/or injury to the crop to which the product is applied may result from the occurrence of extraordinary or unusual weather conditions or the failure to follow the label directions or good application practices, all of which are beyond the control of Helena Chemical Company (the "Company") or seller. In addition, failure to follow label directions may cause injury to crops, animals, man or the environment. The Company warrants that this product conforms to the chemical description on the label and is reasonably fit for the purpose referred to in the directions for use subject to the factors noted above which are beyond the control of the Company. The Company makes no other warranties or representations of any kind, express or implied, concerning the product, including no implied warranty of merchantability or fitness for any particular purpose, and no such warranty shall be implied by law.

The exclusive remedy against the Company for any cause of action relating to the handling or use of this product shall be limited to, at Helena Chemical Company's election, one of the following:

1. Refund of the purchase price paid by buyer or user for product bought, or
2. Replacement of the product used

To the extent allowed by law, the Company shall not be liable and any and all claims against the Company are waived for special, indirect, incidental, or consequential damages or expense of any nature, including, but not limited to, loss of profits or income. The Company and the seller offer this product and the buyer and user accept it, subject to the foregoing conditions of sale and limitation of warranty, liability and remedies.

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Safety Data Sheet

Report Date 07-Jul-15

Page 1 of 4

1. Identification

Product Name : QUEST (WA)
Synonyms : None
Product Use : Water Conditioning Agent
Manufacturer/Supplier : Helena Chemical Company
Address : 225 Schilling Blvd. Collierville, TN 38017
General Information : 901-761-0050
Transportation Emergency Number : CHEMTREC:800-424-9300

2. Hazard Identification



Signal Word : Warning
Skin Irritation : Slightly irritating to the skin based on 4 hour exposure.
Eye Irritation : Minimally irritating
Acute Toxicity Oral : LD50 = 5,000 mg/kg (rat)
Acute Toxicity Dermal : LD50 > 2,000 mg/kg (rat)

Hazard Categories : Skin sensitizer-1B; Skin irritation-2; Eye irritation-2B;
Oral/Dermal/Inhalation Toxicity-5/5/5

Hazard Statement : May be harmful if swallowed
May be harmful in contact with skin
Causes eye irritation
Causes skin irritation
May be harmful if inhaled
May cause an allergic skin reaction

3. Composition / Information on Ingredients

Component	CAS Number	Weight %
Blend of Ammonium Sulfate, Phosphoric Acid, and Carbamide	Proprietary	56.00
Constituents ineffective as spray adjuvant	Proprietary	44.00

4. First Aid Measures

Eye : Hold eye open and rinse slowly and gently with water for 15 to 20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing. Call a poison control center or doctor for treatment advice.

Skin : Take off contaminated clothing. Rinse skin immediately with plenty of water for 15 to 20 minutes. Call a poison control center or doctor for treatment advice.

Inhalation : Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth to mouth if possible. Call a poison control center or doctor for further treatment advice.

Ingestion : Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to by a poison control center or doctor. Do not give anything if unconscious or convulsing.

Indication of Immediate Medical Attention and Special Treatment Needed : Treat symptomatically.



Safety Data Sheet

Report Date 07-Jul-15

Page 2 of 4

5. Fire Fighting Measures

- Extinguishing Media** : Non-combustible, aqueous liquid. Use extinguishing media suitable to underlying cause of fire.
- Specific Hazards Arising from the Chemical** : Product may produce toxic fumes under fire conditions.
- Special Fire Fight Proc** : Use self-contained breathing apparatus and full protective clothing. Use water spray to cool containers exposed to fire.

6. Accidental Release Measures

- Personal Precautions** : Keep unprotected and unnecessary personnel out of spill area. Avoid contact with skin, eyes or clothing. Avoid breathing spray mist if present.
- Protective Equipment** : Splashproof goggles or face shield, impervious gloves, impervious apron and footwear. Eyewash station and emergency shower should be available in work area. Respiratory protection not normally needed; use NIOSH-approved respirator for ammonia if vapors are present.
- Emergency Procedures** : Contain spilled product. Do not contaminate water supplies, lakes, streams, ponds or drains if spilled.
- Methods and Materials for Containment and Cleanup** : Collect and reuse spilled liquid, if uncontaminated. If contaminated, absorb spill with inert material, such as clay or sand. Collect and place in suitable container for proper disposal.

7. Handling and Storage

- Precautions for Safe Handling** : Keep out of reach of children. Keep container tightly closed and do not allow other chemicals to be introduced into the container. Do not contaminate water sources by runoff from cleaning of equipment washwaters or spray waste.
- Conditions for Safe Storage** : Store in original container only. Product may crystallize at temperatures below 33 Degrees F. Do not store with food, feed or other material to be used or consumed by humans or animals.

8. Exposure Controls / Personal Protection

- TLV/PEL** : Not established for mixture.
- Appropriate Engineering Controls** : Local exhaust sufficient.
- Personal Protective Equipment** : Splashproof goggles or face shield, impervious gloves, impervious apron and footwear. Eyewash station and emergency shower should be available in work area. Respiratory protection not normally needed; use NIOSH-approved respirator for ammonia.

9. Physical and Chemical Properties

- Odor/Appearance** : Clear colorless/pale yellow liquid; odorless.
- Flash Point, °F** : Not flammable
- Boiling Point, °F** : >100 Degrees C.
- Melting Point(Freezing point), °C** : <10 Degrees C.
- Vapor Pressure, mm Hg @ 20 °C** : 23.76 mmHg at 25 Degrees C.
- Vapor Density** : Not determined
- Solubility in Water** : Dissolves
- Molecular Formula** : Not applicable, formulated mixture.
- Density, g/mL @ 25 °C** : 1.305



Safety Data Sheet

Report Date 07-Jul-15

Page 3 of 4

Evaporation Rate(Butyl Acetate = 1) : No information found
Octanol/Water Partition Coefficient : No information found
pH : 2.0-4.0
Flammable Limits (approximate volume % in air) : Not applicable
Auto-ignition Temperature : Not applicable
Decomposition temperature : No information found

10. Stability and Reactivity

Reactivity : Not reactive
Chemical Stability : Stable
Hazardous Decomposition Products : May produce ammonia gas, nitrogen oxides and oxides of carbon under fire conditions.
Hazardous Polymerization : Will not occur
Conditions to Avoid : Avoid extreme heat and open flames. Ammonia gas will be emitted if exposed to extreme heat or flames.
Incompatible Materials : Avoid contact with potassium chlorate and potassium nitrate.

11. Toxicological Information

Acute Toxicity (Oral LD50) : 5,000 mg/kg
Acute Toxicity (Dermal LD50) : >2,000 mg/kg
Acute Toxicity Inhalation LC50 : >5.01 mg/L
Likely Routes of Exposure : Skin and eyes.
Skin Irritation : Slightly irritating to the skin based on 4-hour exposure.
Eye Irritation : Minimally irritating.
Skin Sensitization : May cause allergic skin reaction in sensitive individuals.
Carcinogenic : Not listed by IARC, NTP or OSHA.
Chronic Effects : None currently known.
Other Hazards : No information found.

12. Ecological Information

Ecotoxicity : No information found
Persistence and Degradability : No information found
Bioaccumulative Potential : No information found
Mobility in Soil : No information found
Other Adverse Effects : None currently known.

13. Disposal Considerations

Waste Disposal Method : This material must be disposed of according to Federal, State or Local procedures under the Resource Conservation and Recovery Act.

14. Transport Information

UN Proper Shipping Name : Not regulated by DOT, IATA or IMDG.
Transport Hazard Class : None



Safety Data Sheet

Report Date **07-Jul-15**

Page 4 of 4

UN Identification Number : None
Packaging Group : None
Environmental Hazards : No information found
Transport in Bulk : No information found
Special Precautions for Transportation : No information found
Freight Classification : Fertilizing Compound, (Manufactured Fertilizer), Liquid, NOIBN (NMFC Item 68140, Sub 6, Class 70)

15. Regulatory Information

National Fire Protection Association Rating :

Health: 2 Fire: 0 Reactivity: 0
Rating Level: (4-Extreme, 3-High, 2-Moderate, 1-Slight, 0-Minimum)

S.A.R.A Title III Hazard Classification (Yes/No) :

Immediate(Acute) Health: Y
Delayed (Chronic) Health: N
Sudden Release of Pressure: N
Fire: N
Reactive: N

16. Other Information

Data of Preparation/Revision : 07-July-2015

Reign Deposition Aid & Drift Control Agent

Active Ingredient

Polyacrylamide

Reign®



DEPOSITION AID DRIFT CONTROL AGENT

Principal Functioning Agents:

Polyvinyl polymer (polyacrylamide).....	1%
Constituents Ineffective as Spray Adjuvants	99%
TOTAL	100%

CA Reg. No. 34704-50045
WA Reg. No. 34704-05010

KEEP OUT OF REACH OF CHILDREN

CAUTION

NET CONTENTS: 2.5 U.S. GALLONS (9.462 L)



B2412

Loveland Products, Inc. • PO Box 1286 • Greeley, CO 80632-1286



CAUTION: May Cause Irritation to Skin and Eyes, Harmful if inhaled or absorbed through skin. Avoid contact with skin, eyes or clothing. Avoid breathing spray mist. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum or smoking tobacco. Remove and wash contaminated clothing before reuse. PERSONAL PROTECTIVE EQUIPMENT: Wear chemical-resistant gloves, long-sleeved shirt and long pants, shoes plus socks when mixing or applying REIGN®.

First Aid: If in Eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice. **If on Skin or Clothing:** Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. **If Swallowed:** Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person. **If Inhaled:** Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible.

FOR A MEDICAL EMERGENCY INVOLVING THIS PRODUCT, CALL 1-866-944-8565.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. REIGN is an effective, easy-to-use adjuvant for deposition improvement and drift retardation in spraying operations. REIGN is compatible with most water soluble and wettable powder pesticides, desiccants and cotton defoliants when applied by aerial application or standard ground equipment. REIGN will retard, but not totally eliminate drift.

THIS PRODUCT CAN BE USED IN THE FOLLOWING SETTINGS: AGRICULTURAL, AQUATIC, FORESTRY, INDUSTRIAL, MUNICIPAL, NON-CROPLAND, ORNAMENTAL, RIGHTS-OF-WAY AND TURF. (NOT FOR AQUATIC USE IN WASHINGTON.)

REIGN DIRECTIONS FOR USE

- Step 1: Select correct rate from chart below.
- Step 2: Fill mix tank with water and pesticide. Then start to agitate.
- Step 3: Add REIGN.
- Step 4: If additional surfactant or other spray adjuvants are used, they should be added after REIGN.
- Step 5: Continue to agitate mix tank at least 2 minutes before spraying.
- Step 6: Follow all cleanup precautions on label of pesticide used.

SUGGESTED USE RATES

Spray Pressure	Nozzle Orientation	Amount of REIGN*
AERIAL APPLIED		
below 45 psi.....	Straight Back.....	2 to 4 qts
below 45 psi.....	45° Angle Back.....	3 to 5 qts
GROUND APPLIED		
low (below 30 psi).....	Flat Fan, Flood.....	1 to 3 qts
low (below 30 psi).....	Off-Center.....	2 to 3 qts
medium (30 to 50 psi).....	Flat Fan, Flood.....	2 to 3 qts
medium (30 to 50 psi).....	Off-Center.....	3 to 4 qts
medium (30 to 50 psi).....	Spray Guns.....	3 to 5 qts
high (50 to 150 psi).....	Spray Guns**.....	3 to 10 qts

*per 100 gallons of spray solution; **for home and garden sprayers, use approximately 1/4 cup of REIGN per 5 gallons spray solution

Environmental Hazards: Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.

STORAGE AND DISPOSAL

STORAGE: Store in cool, dry place. Store in original container. Keep tightly closed. Do not reuse empty container.

DISPOSAL: Do not contaminate water, food or feed by storage or disposal. Wastes may be disposed of on-site or at an approved waste disposal facility. Triple rinse (or equivalent) adding rinse water to spray tank. Offer container for recycling or dispose of container in sanitary landfill, or by other procedures approved by appropriate authorities. Recycling decontaminated containers is the best option of container disposal. The Agricultural Container Recycling Council (ACRC) operates the national recycling program. To contact your state and local ACRC recycler visit the ACRC web page at www.acrecycle.org.

For help with any spill, leak, fire or exposure involving this material, call day or night CHEMTREC 1-800-424-9300.

CONDITIONS OF SALE AND LIMITATION OF WARRANTY AND LIABILITY

BEFORE BUYING OR USING THIS PRODUCT, read the Directions for Use and the following Conditions of Sale and Limitation of Warranty and Liability. By buying or using this product, the buyer or user accepts the following Conditions of Sale and Limitation of Warranty and Liability, which no employee or agent of LOVELAND PRODUCTS, INC. or the seller is authorized to vary. LOVELAND PRODUCTS, INC. warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated in the Directions for Use, when the product is used in accordance with such Directions for Use under normal conditions of use. LOVELAND PRODUCTS, INC. MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THE BUYER'S OR USER'S EXCLUSIVE REMEDY FOR ANY INJURY, LOSS, OR DAMAGE RESULTING FROM THE HANDLING OR USE OF THIS PRODUCT SHALL BE LIMITED TO ONE OF THE FOLLOWING, AT THE ELECTION OF LOVELAND PRODUCTS, INC. OR THE SELLER: DIRECT DAMAGES NOT EXCEEDING THE PURCHASE PRICE OF THE PRODUCT OR REPLACEMENT OF THE PRODUCT. LOVELAND PRODUCTS, INC. AND THE SELLER SHALL NOT BE LIABLE TO THE BUYER OR USER OF THIS PRODUCT FOR ANY CONSEQUENTIAL, SPECIAL, OR INDIRECT DAMAGES, OR DAMAGES IN THE NATURE OF A PENALTY.

REIGN® is a registered trademark of Loveland Products, Inc.

REIGN 2.5GL/B2412



SAFETY DATA SHEET

SDS NUMBER: 1000013533-17-LPI

SDS REVISIONS: SEC 2, 3

DATE OF ISSUE: 11/15/17

REIGN®
SUPERSEDES: 10/16/15

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT, CALL CHEMTREC - DAY OR NIGHT 1-800-424-9300

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

1.1 PRODUCT IDENTIFIER:

TRADE NAME: **REIGN®**

1.2 RECOMMENDED USE:

DEPOSITION AND DRIFT CONTROL AGENT

1.3 SUPPLIER DETAILS:

LOVELAND PRODUCTS, INC.
P.O. Box 1286 • Greeley, CO 80632-1286

1.4 24 Hour Emergency Phone: 1-800-424-9300 - Medical Emergencies: 1-866-944-8565 - Product Information: 1-888-574-2878 (LPI-CUST) U.S. Coast Guard National Response Center: 1-800-424-8802

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification according to 29 CFR 1910.1200

Acute Toxicity – Oral	Category 5	H303
Acute Toxicity – Dermal	Category 5	H313
Eye Damage/Irritation	Category 2B	H320
Skin Corrosion/Irritation	Category 3	H316
Acute Toxicity – Inhalation	Category 5	H333

2.2 Label elements

No pictogram required.

Signal word:

WARNING

Hazard Statements:

H303 – May be harmful if swallowed.
H313 – May be harmful in contact with skin.
H320 – Causes eye irritation
H316 – Causes mild skin irritation.
H333 – May be harmful if inhaled.

Precautionary

Statements:

(General):

P101 – If medical advice is needed, have the product label or container at hand.
P102 – Keep out of reach of children.
P103 – Read label before use.

Precautionary

Statements:

(Prevention):

P261 – Avoid breathing dust/fume/gas/mist/vapors/spray.
P264 – Wash hands, face, and other affected areas thoroughly after handling.
P270 – Do not eat, drink, or smoke when using this product.
P271 – Use only outdoors or in a well-ventilated area.
P280 – Wear protective gloves/protective clothing/eye protection/face protection.
P273 – Avoid release to the environment.

Precautionary

Statement:

(Response):

P301+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P352 – Rinse mouth.
P302+P313+P312: IF ON SKIN: Get medical advice attention. Call a POISON CENTER or doctor/physician if you feel unwell.
P362 – Take off contaminated clothing and wash before reuse.
P352 – Wash with soap and water.
P333+P313: If skin irritation occurs: Get medical advice/attention.
P304+P312: IF INHALED: Call a POISON CENTER or doctor/physician if you feel unwell.
P340 – Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338 – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.
P337+P313: If eye irritation persists: Get medical advice/attention.

2.3 Other hazards

None known



SAFETY DATA SHEET

SDS NUMBER: 1000013533-17-LPI

SDS REVISIONS: SEC 2, 3

DATE OF ISSUE: 11/15/17

REIGN®
SUPERSEDES: 10/16/15

3. COMPOSITION, INFORMATION ON INGREDIENTS

3.1 Substances

3.2 Mixtures

Classification according to 29 CFR 1910.1200

Chemical Name:	CAS No.	Concentration [%]
Proprietary blend of Polyvinyl Polymers and formulation aids	n/a	100.00

4. FIRST AID MEASURES

4.1 Description of First Aid Measures

General Advice: Get medical attention if symptoms occur.

Eye contact:	Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
Skin contact:	Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
Ingestion:	Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.
Inhalation:	Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferable by mouth-to-mouth, if possible. Call a poison control center or doctor for treatment advice.

4.2 Most Important Symptoms and Effects, Acute and Delayed

Symptoms: May be harmful if swallowed.

4.3 Immediate Medical Attention and Special Treatment

Treatment: Treat symptomatically. Symptoms may be delayed.

FOR A MEDICAL EMERGENCY INVOLVING THIS PRODUCT CALL: 1-866-944-8565

Take container, label or product name with you when seeking medical attention.

NOTES TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. FIRE FIGHTING MEASURES

5.1 EXTINGUISHING MEDIA:

Suitable Extinguishing Media: Water spray, dry chemical, foam, or carbon dioxide (CO₂).

5.2 SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE:

Specific Hazards During Firefighting: During a fire, hazardous by-products can be released.

5.3 SPECIAL PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

Special Protective Equipment for Firefighters: Self-contained breathing apparatus and full protective gear should be worn in fighting large fires involving chemicals. Use water spray to keep fire exposed containers cool. Keep people away. Isolate fire and deny unnecessary entry.



SAFETY DATA SHEET

SDS NUMBER: 1000013533-17-LPI

SDS REVISIONS: SEC 2, 3

DATE OF ISSUE: 11/15/17

REIGN®
SUPERSEDES: 10/16/15

6. ACCIDENTAL RELEASE MEASURES

6.1 PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions: Avoid inhalation of vapors and spray mist and contact with skin and eyes. Ensure adequate ventilation. Wear suitable protective clothing.

6.2 ENVIRONMENTAL PRECAUTIONS

Environmental Precautions: Prevent further leakage or spillage if safe to do so. Do not contaminate water. Do not allow to enter drains, sewers, or watercourses.

6.3 METHODS AND MATERIALS FOR CONTAINMENT AND CLEAN-UP

Methods for Clean-Up: Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. After removal flush contaminated area thoroughly with water.
Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to Remove residual contamination.
Never return spills to original containers for re-use.

7. HANDLING AND STORAGE

7.1 PRECAUTIONS FOR SAFE HANDLING:

Advice on Safe Handling: Avoid inhalation of mists, vapors / spray and contact with eyes, skin and clothing. Do not breathe mists or vapor. Wear personal protective equipment. Do not use in areas without adequate ventilation. Avoid prolonged exposure. Wash thoroughly after handling. Do not empty into drains. Handle and open container with care. Use care in handling/storage. Wash before eating, drinking and/or smoking.

7.2 CONDITIONS FOR SAFE STORAGE:

Requirements for Storage Areas and Containers: Store in cool, dry place. Store in original container. Keep tightly closed. Do not reuse empty container. Product will become thicker at cold temperatures but effectiveness will not be affected. Warm product before use. Do not contaminate water, food or feed by storage or disposal.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 CONTROL PARAMETERS:

OCCUPATIONAL EXPOSURE LIMITS

U.S. Workplace Exposure Level (ACGIH) Guides

Components	Type	Value
No listings	TWA	

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Specimen
No listings		

8.2 EXPOSURE CONTROLS:

Engineering Measures

Provide adequate general and local exhaust ventilation. Observe Occupational Exposure Limits and minimize the risk of inhalation of vapors and spray mists. Provide eyewash station and safety shower.

Individual Protection Measures:

Eye / Face Protection: Goggles or shielded safety glasses are recommended.
Skin Protection: Coveralls worn over long-sleeved shirt and long pants. Chemical-resistant gloves. Chemical-resistant footwear plus socks.
Respiratory Protection: In case of inadequate ventilation or risk of inhalation of mists or vapors, use suitable respiratory equipment such as MSHA/NIOSH TC-21C or NIOSH approved respirator with N, R, P or HE filter. Wear respiratory protection during operations where spraying or misting occurs. If respirators are used, a program should be in place to assure compliance with 29 CFR 1910.134, the OSHA Respiratory Protection standard. Wear air supplied respiratory protection if exposure concentrations are unknown.



SAFETY DATA SHEET

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9. PHYSICAL AND CHEMICAL PROPERTIES

- 9.1 APPEARANCE :** Viscous liquid.
ODOR: Mild.
ODOR THRESHOLD: No data available.
COLOR: Clear.
pH: 6 – 7
MELTING POINT / FREEZING POINT: No data available
BOILING POINT: No data available
FLASH POINT: >212 °F (>100 °C) / TCC
FLAMMABILITY (solid, gas): No data available.
UPPER / LOWER FLAMMABILITY OR EXPLOSIVE LIMITS: No data available.
VAPOR PRESSURE: No data available.
SOLUBILITY: Dispersible
PERCENT VOLATILE (by volume): No data available
PARTITION CO-EFFICIENT, n-OCTANOL / WATER: No data available.
AUTO-IGNITION TEMPERATURE: No data available.
DECOMPOSITION TEMPERATURE: No data available
VISCOSITY, kinematic (104°F): No data available
SPECIFIC GRAVITY (Water = 1): 0.99 – 1.03 g/ml
DENSITY: 8.26 – 8.60 lbs/gal | 0.99 - 1.03 kg/L

Note: These physical data are typical values based on material tested but may vary from sample to sample.
Typical values should not be construed as a guaranteed analysis of any specific lot or as specification items.

10. STABILITY AND REACTIVITY

- 10.1 REACTIVITY**
Stable
- 10.2 CHEMICAL STABILITY**
Stable under normal temperature conditions
- 10.3 POSSIBILITY OF HAZARDOUS REACTIONS**
No reactions known under normal use conditions. Will not polymerize.
- 10.4 CONDITIONS TO AVOID**
Avoid strong oxidizing materials.
- 10.5 INCOMPATIBLE MATERIALS**
Strong oxidizers.
- 10.6 HAZARDOUS DECOMPOSITION PRODUCTS**
Oxides of carbon, oxides of nitrogen, and ammonia.

11. TOXICOLOGICAL INFORMATION

- 11.1 LIKELY ROUTES OF EXPOSURE**
Eye contact. Inhalation. Skin contact.
LC₅₀ (rat): No data available
LD₅₀ Oral (male rat): > 4,500 mg/kg
LD₅₀ Dermal (rabbit): >4,500 mg/kg
Acute Toxicity Estimates: No data available
Skin Irritation (rabbit): No data available.
Eye Irritation (rabbit): No data available
Specific Target Organ Toxicity: Single exposure: No data available.
Aspiration: No data available
Skin Sensitization (guinea pig): Not a sensitizer
Carcinogenicity: No data available
Germ Cell Mutagenicity: No data available
Interactive Effects: None known



SAFETY DATA SHEET

SDS NUMBER: 1000013533-17-LPI

SDS REVISIONS: SEC 2, 3

DATE OF ISSUE: 11/15/17

REIGN®
SUPERSEDES: 10/16/15

12. ECOLOGICAL INFORMATION

12.1 ECOTOXICITY

The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. This product is not intended for use in aquatic settings.

Ecotoxicological Data

Species	Test Results
No data available	

Drift or runoff may adversely affect non-target plants.
Do not apply directly to water.
Do not contaminate water when disposing of equipment wash water.
Do not apply when weather conditions favor drift from target area.

12.2 PERSISTENCE AND DEGRADABILITY

Biodegradability: No data available

12.3 BIOACCUMULATIVE POTENTIAL

Bioaccumulation: No data available.

12.4 MOBILITY IN SOIL

No data available.

12.5 OTHER ADVERSE EFFECTS

Assessment: No data available.

13. DISPOSAL CONSIDERATIONS

13.1 WASTE TREATMENT METHODS

P501 - Wastes may be disposed of on site or at an approved waste disposal facility. Triple rinse (or equivalent), adding rinse water to spray tank. Offer container for recycling or dispose of in a sanitary landfill or by other procedures approved by appropriate authorities. Recycling decontaminated containers is the best option of container disposal. The Agricultural Container Recycling Council (ACRC) operates the national recycling program. To contact your state and local ACRC recycler visit the ACRC web page at <http://www.acrecycle.org/>. Do not contaminate water, food or feed by storage or disposal.

14. TRANSPORT INFORMATION

14.1 LAND TRANSPORT

DOT Shipping Description: NOT REGULATED.

U.S. Surface Freight Classification: ADHESIVES, ADJUVANTS, SPREADERS OR STICKERS (NMFC 4610; CLASS 60)

15. REGULATORY INFORMATION

15.1 SAFETY, HEALTH AND ENVIRONMENTAL REGULATIONS

NFPA & HMIS Hazard Ratings:

NFPA

1	Health	0	Least
0	Flammability	1	Slight
0	Instability	2	Moderate
		3	High
		4	Severe

HMIS

1	Health
0	Flammability
0	Reactivity
B	PPE

SARA Hazard Notification/Reporting

SARA Title III Hazard Category:

Immediate	<u>Y</u>	Fire	<u>N</u>	Sudden Release of Pressure	<u>N</u>
Delayed	<u>N</u>	Reactive	<u>N</u>		

Reportable Quantity (RQ) under U.S. CERCLA: Acrylamide (CAS: 79-06-1) 5,000 lbs.

SARA, Title III, Section 313: Acrylamide (CAS: 79-06-1)

RCRA Waste Code: U007 (Acrylamide)

CA Proposition 65: **WARNING:** This product contains chemicals known to the State of California to cause cancer or birth defects or other reproductive harm.



SAFETY DATA SHEET

SDS NUMBER: 1000013533-17-LPI

SDS REVISIONS: SEC 2, 3

DATE OF ISSUE: 11/15/17

REIGN®
SUPERSEDES: 10/16/15

16. OTHER INFORMATION

SDS STATUS: Sections 2 and 3 revised.

PREPARED BY: Registrations and Regulatory Affairs

REVIEWED BY: Environmental Health and Safety

CA REG. NO.: 34704-50045

WA REG. NO.: 34704-05010

Disclaimer and Limitation of Liability: This data sheet was developed from information on the constituent materials identified herein and does not relate to the use of such materials in combination with any other material or process. No warranty is expressed or implied with respect to the completeness or ongoing accuracy of the information contained in this data sheet, and LOVELAND PRODUCTS, INC. disclaims all liability for reliance on such information. This data sheet is not a guarantee of safety. Users are responsible for ensuring that they have all current information necessary to safely use the product described by this data sheet for their specific purpose.

MSO Surfactant

Active Ingredients

Methylated Vegetable Oil

Alcohol Ethoxylate

Phosphatidylcholine



MISO[®] CONCENTRATE with LECI-TECH



Methylated Seed Oil
MODIFIED VEGETABLE OIL and SURFACTANT BLEND

Principal Functioning Agents:

Methylated vegetable oil, alcohol ethoxylate, phosphatidylcholine.....100%
TOTAL..... **100%**

Surfactant content: 15%
CA Reg. No. 34704-50053
WA Reg. No. 34704-07001



**KEEP OUT OF REACH OF CHILDREN
CAUTION**

CAUTION: Harmful if inhaled or absorbed through skin. Avoid contact with skin, eyes, or clothing. Avoid breathing spray mist. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum or smoking tobacco. Remove and wash contaminated clothing before reuse. **Personal Protective Equipment:** Wear chemical-resistant gloves, long-sleeved shirt and long pants, and shoes plus socks.

First Aid: If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. **If in eyes:** Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. **If swallowed:** Call a poison control center or doctor immediately for treatment advice. Have a person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person. **If inhaled:** Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible.

FOR A MEDICAL EMERGENCY INVOLVING THIS PRODUCT, CALL 1-866-944-8565.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment.

NET CONTENTS.

30 GAL. (113.55 L)

275 GAL. (1040.87 L)

_____ GAL. (_____ L)

GENERAL: MISO[®] CONCENTRATE with LECI-TECH[®] is a spray adjuvant formulated to enhance activity of post-applied herbicides. Post-applied herbicides such as, but not limited to, Pursuit[®], Accent[®], and Poast[®] have demonstrated improved performances when used with methylated seed oil. Refer to pesticide label being used regarding specific adjuvant use recommendations. MISO CONCENTRATE with LECI-TECH is designed to replace non-ionic surfactants and petroleum-based crop oils. MISO CONCENTRATE with LECI-TECH is formulated from agriculturally derived oil. MISO CONCENTRATE with LECI-TECH contains high-quality surfactants and emulsifiers for easy mixing in spray solutions. For tank mix compatibility concerns, conduct a jar test of the proposed mixture to ensure compatibility of all components. Mix components in the same ratio as the proposed tank mix.

DIRECTIONS FOR USE: Fill spray tank ½ full with water and begin agitation. Add pesticides, as directed by label, while maintaining agitation. After pesticides are thoroughly mixed, add MISO CONCENTRATE with LECI-TECH at recommended rate. The rates listed are suggested use rates. Refer to pesticide label being used regarding specific adjuvant use recommendations. The higher rate should be used if plants are stressed at the time of treatment. MISO CONCENTRATE with LECI-TECH may be mixed with UAN solutions when directed by the pesticide label. Do not add adjuvant at a level that would exceed 5% of the finished spray volume unless otherwise specified by the pesticide label.

**THIS PRODUCT CAN BE USED IN THE FOLLOWING SETTINGS: AGRICULTURAL, AQUATIC (WETLANDS)*, FORESTRY, INDUSTRIAL, MUNICIPAL, NON-CROPLAND, ORNAMENTAL, RIGHTS-OF-WAY AND TURF.
*(NOT FOR AQUATIC USE IN CALIFORNIA AND WASHINGTON.)**

SUGGESTED USE RATES:

1 to 2 pints per acre MISO CONCENTRATE with LECI-TECH

Important: This product has demonstrated excellent plant safety; however, not all species and varieties have been tested. Before treating a large area, treat a small area and observe prior to full scale application.

NOTE: Before the use in aquatic settings, please refer to the Pesticide label being used and follow all environmental protection measures for aquatic species. (Not for aquatic use in California and Washington.)

STORAGE AND DISPOSAL

STORAGE: Store in cool, dry place. Store in original container. Keep container tightly closed. Do not reuse empty container.

DISPOSAL: Do not contaminate water, food or feed by storage or disposal. Wastes may be disposed of on-site or at an approved waste disposal facility. Triple rinse (or equivalent) adding rinse water to spray tank. Offer container for recycling or dispose of container in sanitary landfill, or by other procedures approved by appropriate authorities. Recycling decontaminated containers is the best option of container disposal. The Agricultural Container Recycling Council (ACRC) operates the national recycling program. To contact your state and local ACRC recycler visit the ACRC web page at www.acrcycle.org.

For help with any spill, leak, fire or exposure involving this material, call day or night CHEMTREC 1-800-424-9300.

CONDITIONS OF SALE AND LIMITATION OF WARRANTY AND LIABILITY

BEFORE BUYING OR USING THIS PRODUCT, read the Directions for Use and the following Conditions of Sale and Limitation of Warranty and Liability. By buying or using this product, the buyer or user accepts the following Conditions of Sale and Limitation of Warranty and Liability, which no employee or agent of LOVELAND PRODUCTS, INC. or the seller is authorized to vary. LOVELAND PRODUCTS, INC. warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated in the Directions for Use, when the product is used in accordance with such Directions for Use under normal conditions of use. LOVELAND PRODUCTS, INC. MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THE BUYER'S OR USER'S EXCLUSIVE REMEDY FOR ANY INJURY, LOSS, OR DAMAGE RESULTING FROM THE HANDLING OR USE OF THIS PRODUCT SHALL BE LIMITED TO ONE OF THE FOLLOWING, AT THE ELECTION OF LOVELAND PRODUCTS, INC. OR THE SELLER: DIRECT DAMAGES NOT EXCEEDING THE PURCHASE PRICE OF THE PRODUCT OR REPLACEMENT OF THE PRODUCT. LOVELAND PRODUCTS, INC. AND THE SELLER SHALL NOT BE LIABLE TO THE BUYER OR USER OF THIS PRODUCT FOR ANY CONSEQUENTIAL, SPECIAL, OR INDIRECT DAMAGES, OR DAMAGES IN THE NATURE OF A PENALTY.

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ACCENT[®] is a registered trademark of E.I. duPont de Nemours and Company; POAST[®] and PURSUIT[®] are registered trademarks of BASF.



SAFETY DATA SHEET

M^{SO}® CONCENTRATE WITH LECI-TECH®

SDS NUMBER: 1000011026-17-LPI

SDS REVISIONS: SEC. 8.2

DATE OF ISSUE: 03/27/17

SUPERSEDES: 01/21/16

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT, CALL CHEMTREC - DAY OR NIGHT 1-800-424-9300

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

1.1 PRODUCT IDENTIFIER:

TRADE NAME: M^{SO}® CONCENTRATE WITH LECI-TECH®

1.2 RECOMMENDED USE:

SPRAY ADJUVANT

1.3 SUPPLIER DETAILS:

LOVELAND PRODUCTS, INC.
P.O. Box 1286 • Greeley, CO 80632-1286

1.4 24 Hour Emergency Phone: 1-800-424-9300 - Medical Emergencies: 1-866-944-8565 - Product Information: 1-888-574-2878 (LPI-CUST) U.S. Coast Guard National Response Center: 1-800-424-8802

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification according to 29 CFR 1910.1200

Acute Toxicity - Inhalation
Eye Damage/Irritation

Category 4
Category 2B

H332
H320

2.2 Label elements



Signal word:

WARNING

Hazard Statement:

H332 – Harmful if inhaled.
H320 – Causes eye irritation.
H303 – May be harmful if swallowed.
H313 – Maybe harmful in contact with skin.

Precautionary Statement:

P261 – Avoid breathing dust/fume/gas/mist/vapors/spray.
P271 – Use only outdoors or in a well-ventilated area.
P264 – Wash hands and face thoroughly after handling.

(Prevention):
Precautionary Statement:

P304+P340 – IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P312 – Call a POISON CENTER or doctor/physician if you feel unwell.
P305+P351+P358 – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.
P337+P313 – If eye irritation persists: Get medical advice/attention.

Precautionary Statement:
(General):

P101+P102+P103 – If medical advice is needed, have product container or label available. Keep out of reach of children. Read label before use

2.3 Other hazards

None known



SAFETY DATA SHEET

SDS NUMBER: 1000011026-17-LPI

SDS REVISIONS: SEC. 8.2

MSO® CONCENTRATE WITH LECI-TECH®

DATE OF ISSUE: 03/27/17

SUPERSEDES: 01/21/16

3. COMPOSITION, INFORMATION ON INGREDIENTS

3.1 Substances

3.2 Mixtures

Classification according to 29 CFR 1910.1200

Chemical Name:	CAS No.	Concentration [%]
Phosphatidylcholine	97281-47-5	
Methylated vegetable oil	67784-80-9	
Alcohol ethoxylate	34398-01-1	100.00

4. FIRST AID MEASURES

4.1 Description of First Aid Measures

General Advice: Get medical attention if symptoms occur.

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

If swallowed: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferable by mouth-to-mouth, if possible. Call a poison control center or doctor for treatment advice.

4.2 Most Important Symptoms and Effects, Acute and Delayed

Symptoms: Causes eye irritation.

4.3 Immediate Medical Attention and Special Treatment

Treatment: Treat symptomatically. Symptoms may be delayed.

FOR A MEDICAL EMERGENCY INVOLVING THIS PRODUCT CALL: 1-866-944-8565

Take container, label or product name with you when seeking medical attention.

NOTES TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. FIRE FIGHTING MEASURES

5.1 EXTINGUISHING MEDIA:

Suitable Extinguishing Media: Dry chemical, carbon dioxide (CO₂), alcohol foam, foam, water spray or fog. Do not use water jet as this will spread the fire.

5.2 SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE:

Specific Hazards During Firefighting: During a fire, hazardous by-products can be released.

5.3 SPECIAL PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

Special Protective Equipment for Firefighters: Self-contained breathing apparatus and full protective gear should be worn in fighting large fires involving chemicals. Use water spray to keep fire exposed containers cool. Keep people away. Isolate fire and deny unnecessary entry.



SAFETY DATA SHEET

MSO® CONCENTRATE WITH LECI-TECH®

SDS NUMBER: 1000011026-17-LPI

SDS REVISIONS: SEC. 8.2

DATE OF ISSUE: 03/27/17

SUPERSEDES: 01/21/16

6. ACCIDENTAL RELEASE MEASURES

6.1 PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions: Avoid inhalation of vapors and spray mist and contact with skin and eyes. Ensure adequate ventilation. Wear suitable protective clothing.

6.2 ENVIRONMENTAL PRECAUTIONS

Environmental Precautions: Prevent further leakage or spillage if safe to do so. Do not contaminate water. Do not allow to enter drains, sewers, or watercourses.

6.3 METHODS AND MATERIALS FOR CONTAINMENT AND CLEAN-UP

Methods for Clean-Up: Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. After removal flush contaminated area thoroughly with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to Remove residual contamination. Never return spills to original containers for re-use.

7. HANDLING AND STORAGE

7.1 PRECAUTIONS FOR SAFE HANDLING:

Advice on Safe Handling: Avoid inhalation of mists, vapors / spray and contact with eyes, skin and clothing. Do not breathe mists or vapor. Wear personal protective equipment. Do not use in areas without adequate ventilation. Avoid prolonged exposure. Wash thoroughly after handling. Do not empty into drains. Handle and open container with care. Use care in handling/storage. Wash before eating, drinking and/or smoking.

7.2 CONDITIONS FOR SAFE STORAGE:

Requirements for Storage Areas and Containers: Store in cool, dry place. Store in original container. Keep tightly closed. Do not reuse empty container. Product will become thicker at cold temperatures but effectiveness will not be affected. Warm product before use. Do not contaminate water, food or feed by storage or disposal.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 CONTROL PARAMETERS:

OCCUPATIONAL EXPOSURE LIMITS

U.S. Workplace Exposure Level (ACGIH) Guides

Components	Type	Value
No listings	TWA	

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Specimen
No listings		

8.2 EXPOSURE CONTROLS:

Engineering Measures

Provide adequate general and local exhaust ventilation. Observe Occupational Exposure Limits and minimize the risk of inhalation of vapors and spray mists. Provide eyewash station and safety shower.

Individual Protection Measures:

Eye / Face Protection: Goggles or shielded safety glasses are recommended.
Skin Protection: Wear protective gloves. Long-sleeved shirt, long pants, and socks.
Respiratory Protection: In case of inadequate ventilation or risk of inhalation of mists or vapors, use suitable respiratory equipment such as MSHA/NIOSH TC-21C or NIOSH approved respirator with N, R, P or HE filter. If respirators are used, a program should be in place to assure compliance with 29 CFR 1910.134, the OSHA Respiratory Protection standard. Wear air supplied respiratory protection if exposure concentrations are unknown.



SAFETY DATA SHEET

SDS NUMBER: 1000011026-17-LPI

SDS REVISIONS: SEC. 8.2

MSO® CONCENTRATE WITH LECI-TECH®

DATE OF ISSUE: 03/27/17

SUPERSEDES: 01/21/16

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 APPEARANCE :	Liquid
ODOR:	Fatty.
ODOR THRESHOLD:	No data available.
COLOR:	Yellow.
pH:	6.9 (1% solution)
MELTING POINT / FREEZING POINT:	No data available
BOILING POINT:	>200°F (>93.4°C)
FLASH POINT:	>212°F (>100°C) / TCC
FLAMMABILITY (solid, gas):	No data available.
UPPER / LOWER FLAMMABILITY OR EXPLOSIVE LIMITS:	No data available.
VAPOR PRESSURE:	No data available.
SOLUBILITY:	Emulsifies
PARTITION CO-EFFICIENT, n-OCTANOL / WATER:	No data available.
AUTO-IGNITION TEMPERATURE:	No data available.
DECOMPOSITION TEMPERATURE:	No data available.
VISCOSITY, kinematic:	115.5 centistokes @ 68°F (20°C)
SPECIFIC GRAVITY (Water = 1):	0.90 g/ml
DENSITY:	7.51 lbs./gal / 0.9 kg/L

Note: These physical data are typical values based on material tested but may vary from sample to sample.
Typical values should not be construed as a guaranteed analysis of any specific lot or as specification items.

10. STABILITY AND REACTIVITY

10.1 REACTIVITY

Stable

10.2 CHEMICAL STABILITY

Stable under normal temperature conditions

10.3 POSSIBILITY OF HAZARDOUS REACTIONS

No reactions known under normal use conditions. Will not polymerize.

10.4 CONDITIONS TO AVOID

High alkaline conditions.

10.5 INCOMPATIBLE MATERIALS

Strong oxidizers.

10.6 HAZARDOUS DECOMPOSITION PRODUCTS

None known.

11. TOXICOLOGICAL INFORMATION

11.1 LIKELY ROUTES OF EXPOSURE

Eye contact. Skin contact.

LC₅₀ (rat): >2.01 mg/L (4 HR)

LD₅₀ Oral (female rat): >2,000 mg/kg

LD₅₀ Dermal (rat): >4,000 mg/kg

Acute Toxicity Estimates: No data available

Skin Irritation (rabbit): May be irritating.

Eye Irritation (rabbit): Irritating.

Specific Target Organ Toxicity: Single exposure: No data available.

Aspiration: No data available

Skin Sensitization (mouse): Not a sensitizer

Carcinogenicity: No data available

Germ Cell Mutagenicity: No data available

Interactive Effects: None known



SAFETY DATA SHEET

MSO® CONCENTRATE WITH LECI-TECH®

SDS NUMBER: 1000011026-17-LPI

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12. ECOLOGICAL INFORMATION

12.1 ECOTOXICITY

The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Ecotoxicological Data

Species	Test Results
No data available.	

Drift or runoff may adversely affect non-target plants.
Do not apply directly to water.
Do not contaminate water when disposing of equipment wash water.
Do not apply when weather conditions favor drift from target area.

12.2 PERSISTENCE AND DEGRADABILITY

Biodegradability: No data available

12.3 BIOACCUMULATIVE POTENTIAL

Bioaccumulation: No data available.

12.4 MOBILITY IN SOIL

No data available.

12.5 OTHER ADVERSE EFFECTS

Assessment: No data available.

13. DISPOSAL CONSIDERATIONS

13.1 WASTE TREATMENT METHODS

Wastes may be disposed of on site or at an approved waste disposal facility. Triple rinse (or equivalent), adding rinse water to spray tank. Offer container for recycling or dispose of in a sanitary landfill or by other procedures approved by appropriate authorities. Recycling decontaminated containers is the best option of container disposal. The Agricultural Container Recycling Council (ACRC) operates the national recycling program. To contact your state and local ACRC recycler visit the ACRC web page at <http://www.acrecycle.org/>. Do not contaminate water, food or feed by storage or disposal.

14. TRANSPORT INFORMATION

14.1 LAND TRANSPORT

DOT Shipping Description: NOT REGULATED.

U.S. Surface Freight Classification: ADHESIVES, ADJUVANTS, SPREADERS OR STICKERS (NMFC 4610; CLASS 60)

15. REGULATORY INFORMATION

15.1 SAFETY, HEALTH AND ENVIRONMENTAL REGULATIONS

NFPA & HMIS Hazard Ratings:

NFPA

1	Health	0	Least
0	Flammability	1	Slight
0	Instability	2	Moderate
		3	High
		4	Severe

HMIS

1	Health
0	Flammability
0	Reactivity
B	PPE

SARA Hazard Notification/Reporting

SARA Title III Hazard Category:	Immediate	<u>Y</u>	Fire	<u>N</u>	Sudden Release of Pressure	<u>N</u>
	Delayed	<u>N</u>	Reactive	<u>N</u>		

Reportable Quantity (RQ) under U.S. CERCLA: Not listed

SARA, Title III, Section 313: Not listed

RCRA Waste Code: Not listed

CA Proposition 65: Not applicable



SAFETY DATA SHEET

SDS NUMBER: 1000011026-17-LPI

SDS REVISIONS: SEC. 8.2

MSO® CONCENTRATE WITH LECI-TECH®

DATE OF ISSUE: 03/27/17

SUPERSEDES: 01/21/16

16. OTHER INFORMATION

SDS STATUS: Section 8.2 revised

PREPARED BY: Registrations and Regulatory Affairs

REVIEWED BY: Environmental Health and Safety

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CA REG. NO.: 34704-50053

WA REG. NO.: 34704-07001

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Thinvert RTU

Active Ingredient

Paraffinic Oil/Emulsifier/Surfactant

Blend

THINVERT®

RTU (Ready to Use)

THINVERT® RTU Deposition Aid is designed for use as a part of the THINVERT® Application System. This system combines a unique spray nozzle and the spray fluid into a coordinated unit for ground and aerial application to railroads, roadsides, rangeland, cropland, industrial sites, forests, and landscape areas, and for control of invasive weed species on wetlands, ditchbanks, and marginal areas using herbicides that are approved for aquatic sites. Add active ingredients according to instructions on the label

Principal functioning agents:

Paraffinic oil blend.....	31.6%
Emulsifier/surfactant blend.....	1.8%
Inert ingredients.....	67%

CAUTION

Keep out of reach of children

Observe other cautions below

Harmful if swallowed. Avoid contact with skin and eyes. Avoid breathing spray mix or vapors. Wear eye protection when mixing to protect eyes. Liquid may cause eye injury. In case of contact with eyes, flush immediately with clean water and get medical attention for eyes. Observe all precautions on the labels of products mixed with this product.

NET CONTENTS: _____ Gallons

WSI

Waldrum Specialties, Inc.
P.O. Box 1146, Southampton, PA 18966
Phone 215 348-5535 FAX 215 348-5541
Web: <http://www.waldrumspecialties.com>
email info@waldrumspecialties.com

THINVERT® RTU

Directions for use

General Information

THINVERT® RTU is formulated for use as a part of the THINVERT® Application System. It can be used with THINVERT Backpack nozzles, THINVERT Widecast™ nozzles, or the RADIARC® Sprayer to increase spray deposition, reduce spray evaporation, and control spray drift. THINVERT RTU is a ready-to-use thin invert emulsion that can be used with conventional pumps and spray systems to apply herbicides, insecticides, fungicides and plant growth regulators to railroads, rangeland, cropland, industrial sites, forests and landscape areas, and for control of invasive weed species on wetlands, ditchbanks, and marginal areas using herbicides that are approved for aquatic sites. Avoid applications that may leave a sheen on the water surface. Make aquatic applications directly to plant foliage only.

Preparing tank mixes with common herbicides:

Add water soluble or emulsifiable herbicides such as Accord®, Rodeo®, Arsenal®, Habitat®, Garlon® 3A, Garlon® 4 or Krenite® to THINVERT RTU while agitating vigorously. If dry flowable herbicides such as Escort® or Oust® are used, mix them with a small quantity of water and add them slowly to the spray tank. Continue agitation.

Do not add surfactants to THINVERT/herbicide mixtures. If unsprayed mixtures remain in the spray tank over night, agitate thoroughly before spraying and circulate material in the hoses.

Nozzle selection:

THINVERT spray nozzles are patented, specially designed nozzles that form small uniform droplets when used with THINVERT emulsions. They give effective coverage of leaf surfaces with economical low spray volumes, and minimize spray drift and evaporation of spray droplets.

THINVERT® Backpack nozzles:

- #71510 – 6" swath for individual plant sprays
- #71531 – 2-3' swath for individual plant sprays
- #81531 – 2-3' swath for brush and tree control
- #15105 – 1-2" swath for tall trees
- #73019 – 5-6" swath for broadcast applications

THINVERT® Widecast™ Nozzles

- #1534 – for cut stubble and foliar applications mounted on skidder, truck, or ATV

THINVERT - The RADIARC® Sprayer with Special Low-volume patterns can be used. (Contact Waldrum Specialties for details)

Garlon® 3A, Garlon® 4 Ultra, Accord® and Rodeo are registered trademarks of Dow AgroSciences. Escort XP®, Oust XP® and Krenite S® are registered trademarks of DuPont. Arsenal® and Habitat® are registered trademarks of BASF. THINVERT® and RADIARC® are registered trademarks of Waldrum Specialties, Inc. THINVERT formulations and THINVERT spray nozzles are patented products of Waldrum Specialties, Inc.

Ingredients in THINVERT® RTU are exempt from the requirements of crop tolerance under Title 40, CFR, 180.1001 (c)

WSI warrants THINVERT® RTU to conform to the label description. It is suitable for the purposes described on the label. No other warranty is expressed or implied.

WSI WaldrumSpecialties, Inc

email: info@waldrumspecialties.com

web: www.waldrumspecialties.com

215 348-5535 FAX 215 348-5541

SAFETY DATA SHEET

Date Revised 02/04/2016

SDS #21

Product and Company Designation

Product Name	THINVERT® RTU (Ready to Use)
Description	Deposition Aid

Manufacturer: Arborchem Products Co, 943 Nixon Drive, Mechanicsburg, PA 17055

Emergency Contact: In the event of chemical emergencies involving a spill, leak, fire exposure, or accident involving chemicals – call **CHEMTREC (800) 424-9300**

HAZARDS IDENTIFICATION

GHS CLASSIFICATIONS:

Health: Eye contact slightly irritating, but does not injure eye tissue. Skin contact: Frequent or prolonged contact may irritate and cause dermatitis, low order of toxicity. If swallowed, do not induce vomiting. Keep at rest. Get prompt medical attention. Inhalation: High vapor/aerosol concentration greater than 700 ppm are irritating to the eyes at elevated temperatures, well above ambient, may cause headaches, dizziness, anesthesia. Drowsiness and irritation of mucus membranes in eyes, noze, throat and respiratory passages.

GHS Label:



Signal Word: **WARNING**

HAZARD STATEMENTS:

- H302** – If swallowed, do not induce vomiting
- H316** - Causes mild skin irritation
- H 319** – Eye contact slightly irritating
- H322** – Irritation of mucus membranes

Precautionary Statements:

Prevention:

- P261 – Avoid breathing dust/fumes/gas/mist/vapors/spray
- P264 – Wash hands, face, and other affected areas thoroughly after handling
- P270 – Do not eat, drink, or smoke when using this product
- P271 – Use only outdoors or in a well ventilated area
- P280 – Wear protective gloves, protective clothing, and eye and/or face protection

Response:

- P301 + P312 – IF SWALLOWED: Call a POISON CENTER or doctor / physician if you feel unwell
- P330 – Rinse Mouth
- P302 + P352 – IF ON SKIN: Wash with plenty of soap and water
- P332 + P313 – If skin irritation occurs: Get medical advice / attention
- P362 + P364 – Take off contaminated clothing and wash before reuse
- P304 + P312 – IF INHALED: Call a POISON CENTER or doctor / physician if you feel unwell
- P305 + P351 + P338 – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing
- P337 + P313 – If eye irritation persists: Get medical advice / attention

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Percentage
Proprietary blend of Surfactants and Coupling Agents	N/A	100%

4. FIRST AID MEASURES

EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lens, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

SKIN: Remove contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

INHALED: After vapor exposure, remove to fresh air. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self contained breathing apparatus. Keep person warm and at rest in a position comfortable for breathing. If breathing is difficult give oxygen. If breathing has stopped, trained personnel should immediately begin artificial respiration. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. If heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR). Seek immediate medical attention. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

INGESTION: Call a poison control center or doctor immediately for treatment advice. Have the person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Use water spray, alcohol foam, dry chemical, or carbon dioxide (CO₂)

FIRE FIGHTING PROCEDURES: Fight fire from a safe distance and protected location. Fight fire upwind to avoid hazardous vapors and decomposing products. Heat may build pressure and rupture closed containers, spreading fire and increasing the risk of injury. Use water spray/fog for cooling containers and

2. Physical and chemical properties

Appearance	White viscous liquid
Odor	Alcohol
pH	5 – 7
Freeze/Melting Point	Not Determined
Specific Gravity	Not Determined
Boiling Point	Not determined
Solubility in water	Emulsifiable
Viscosity	Variable
Odor Threshold	Not Determined
Evaporation Rate	Not Determined
Upper / Lower Flammability Limits	Not Determined
Vapor Pressure	Not Determined
Vapor Density	Not Determined
Partition Coefficient	Not Determined
Auto-Ignition Point	Not Determined

3. Composition/Information on Ingredients

Proprietary isoparaffinic hydrocarbon blend	31.2%%
Other ingredients including	
Proprietary emulsifiers and surfactants	1.7 %
Water	<u>67.1%</u>
	100%

4. First Aid Measures

Eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lens, if present after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

Skin: Remove contaminated clothing. Rinse skin immediately with plenty of water for 15 or 20 minutes. Call a poison control center or doctor for treatment advice.

Inhaled: High vapor/aerosol concentrations greater than 700 ppm (attainable at elevated temperatures well above ambient) are irritating to the eyes and the respiratory tract, and may cause headaches, dizziness, anesthesia, drowsiness, nausea, and mucous membrane irritation of the eyes, nose, throat, and respiratory passages.

Ingestion: Small amounts of this product aspirated into the respiratory system during ingestion or vomiting may cause mild to severe pulmonary injury with minimal toxicity.

5. Fire Fighting Procedures

Extinguishing media: Use water spray, alcohol foam, dry chemical, or carbon dioxide. (CO₂)

Fire fighting procedures: Fight fire from a safe distance and protected location. Fight fire upwind to avoid hazardous vapors and decomposing products. Heat may build pressure and rupture closed containers, spreading fire and increasing risk of injury. Use water spray/fog for cooling

firefighters. Minimize run off if possible. Notify proper authorities if liquid material enters the sewer or public waters.

FIRE FIGHTING EQUIPMENT: As with any fire, wear self-contained breathing apparatus pressure demand, (MSHA/NIOSH approved or equivalent) and full protective gear

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel

PERSONAL PROTECTIVE EQUIPMENT: The proper personal protective equipment for incidental releases (such as 1 liter of product released in a well ventilated area), use impermeable gloves, goggles, face shield, and appropriate body protection. In the event of a large release, use impermeable gloves, chemically resistant suit and boots, and hard hat. Self-Contained Breathing Apparatus or respirator may be required where engineering controls are not adequate or conditions for potential exposure exist. When respirators are required, select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with the latest OSHA and/or ANSI recommendations

ENVIRONMENTAL PRECAUTIONS: Stop spill at source. Construct temporary dikes of dirt, sand, or appropriate readily available material to prevent spreading of material. Close cap or valves and/or block or plug hole in leaking container and transfer to another container. Keep from entering storm sewers and ditches which lead to waterways, and if necessary, call the local fire or police department for immediate assistance

CONTAINMENT AND CLEANUP: Absorb spilled liquid with polypads or other absorbent materials. If necessary neutralize using suitable buffering material (acid with soda ash or base with phosphoric acid), and test area with litmus paper to confirm neutralization. Clean up with non-combustible absorbent (such as sand, soil, and so on). Shovel up and place all spill residue in suitable containers. Dispose of at an appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal

7. HANDLING AND STORAGE

HANDLING: Follow all SDS / label precautions when using this product. Do not reuse the container

STORAGE: Minimize exposure to prolonged periods of high temperature for product integrity

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Facilities storing or utilizing this material should be equipped with an eyewash station and safety shower

RESPIRATORY PROTECTION: For most conditions, no respiratory protection should be needed; however, use NIOSH/MSHA approved organic vapor respirator as necessary

EYE PROTECTION: Wear OSHA standard chemical splash goggles or safety glasses

SKIN PROTECTION: Clean body-covering clothing should be worn. Use impervious gloves such as neoprene and rubber boots

9. PHYSICAL AND CHEMICAL PROPERTIES

ENVIRONMENTAL DATA: No Information Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Do not contaminate water, food, or feed by disposal

PRODUCT DISPOSAL: P501 – Disposal of contents / container must be in compliance with local, state, and federal laws and regulations (contact local or state environmental agency for specific rules).

EMPTY CONTAINER: Empty containers must be handled properly due to product residue

14. TRANSPORTATION INFORMATION

SHIPPING DESCRIPTION: Not Regulated for ground transportation by US DOT

15. REGULATORY INFORMATION

SARA TITLE III (Superfund Amendments and Reauthorization Act)

311 / 312 Hazard Categories – Acute Health Hazard

313 Reportable Ingredients – None

302 / 304 Emergency Planning – None

CALIFORNIA SAFE DRINKING WATER & TOXIC ENFORCEMENT ACT (PROPOSITION 65) – This product contains no chemicals known to the state of California to cause cancer or reproductive toxicity

TRACE ELEMENTS: Trace ingredients (if any) are present in < 1% concentration (< 0.1% for potential carcinogens, reproductive toxins, respiratory tract mutagens, and sensitizers). None of the trace ingredients contribute a significant additional hazard at the concentrations that may be present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), US State equivalents, and Canadian Hazardous Material Identification System Standard (CPR 4)

16. OTHER INFORMATION

16. Other Information

Reason for Issue: update to hazard classification

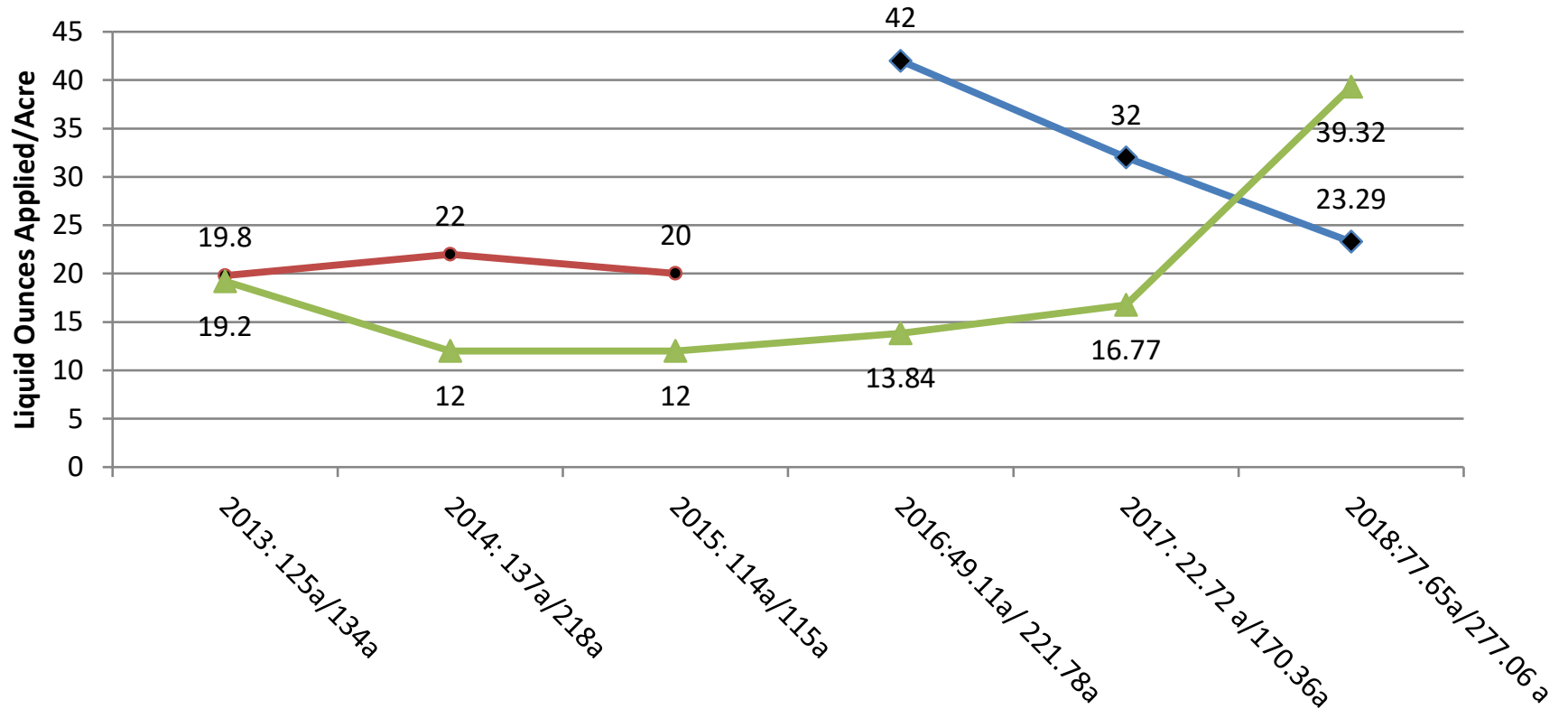
Approval by: Roy R. Johnson, President, Waldrum Specialties Inc

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Vermont Electric Cooperative, Inc.
Transmission & Distribution Utility Corridor
Historical Herbicide Use Data
2012-2017

VEC ROW Herbicide Use History

Glyphosate/Fosamine & Imazapyr *



Treatment Year/**Transmission Acres**/**Distribution Acres**

Note: Fosamine, Glyphosate & Imazapyr are measured by liquid volume

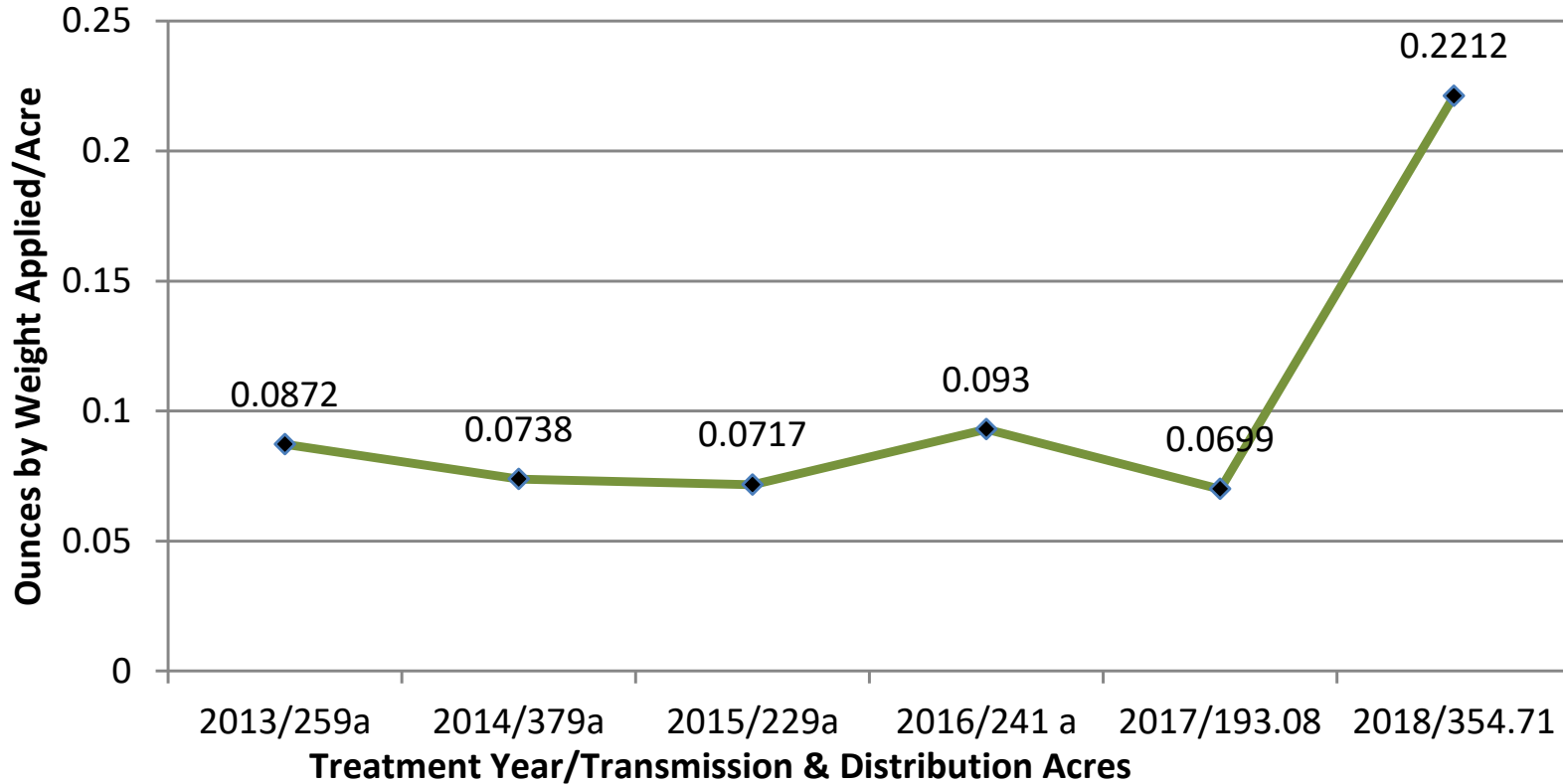
See separate chart for Metsulfuron Methyl use rate.

*2017/18 Transmission mix in Thinvert as the carrier

◆ Distribution Krenite/Polaris ● Distribution Glyphosate/Polaris ▲ Transmission Glyphosate/Polaris

VEC ROW Herbicide Use History

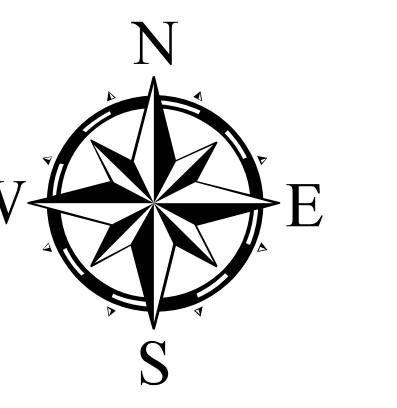
Metsulfuron Methyl in Ounces*



Note: Metsulfuron Methyl is measured by weight & mixed at a rate of 2-4 oz/100 gallons water.

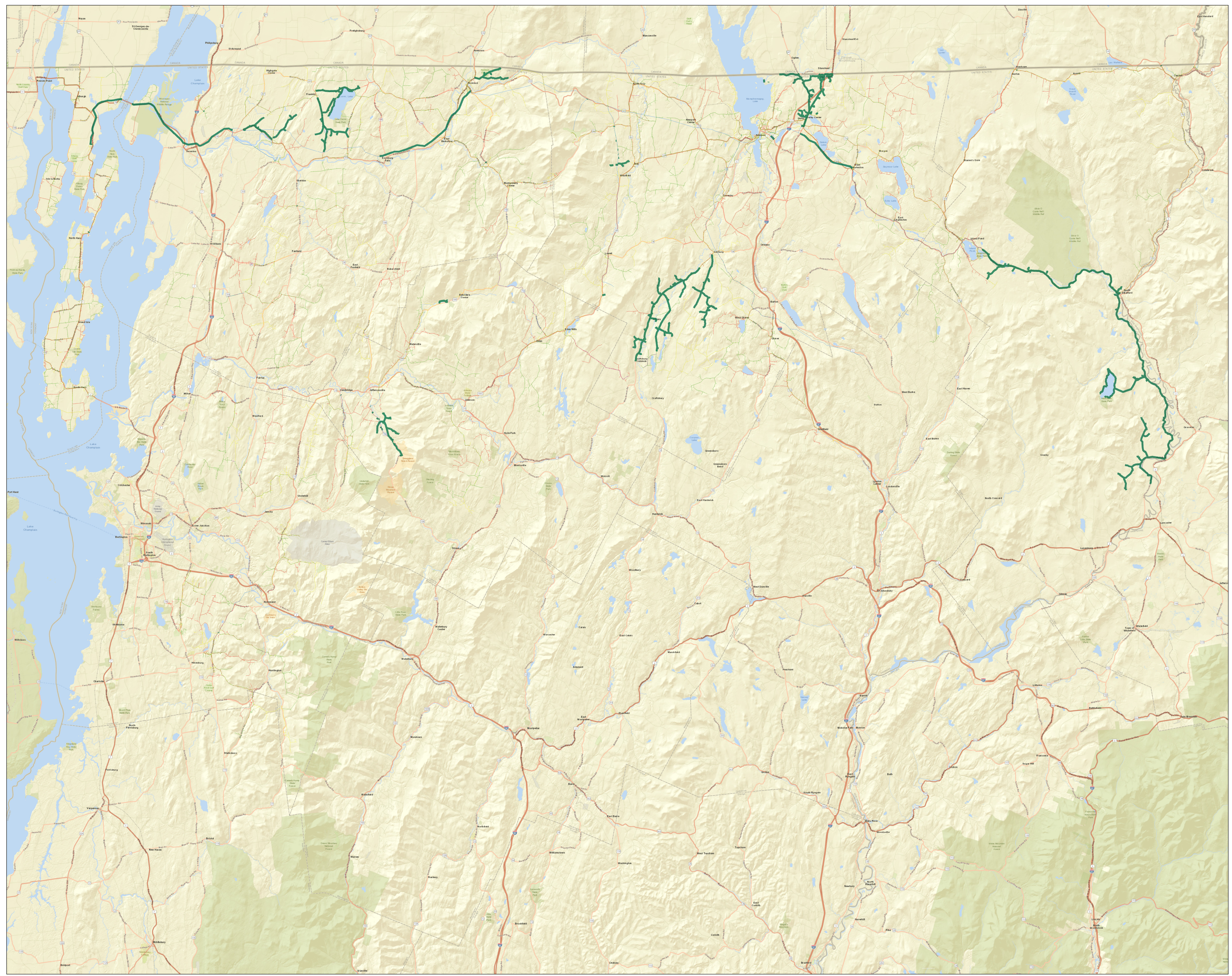
*2017/18 Transmission in Thinvert as carrier

◆ Metsulfuron Methyl



Proposed Herbicide Treatment Areas 2020

- 2020 Proposed Herbicide Treatment Areas
- Transmission Overhead
- Primary Overhead Distribution



Date: 3/12/2020