



**Minnesota Department of Natural Resources  
Pesticide Environmental and Social Risk  
Assessment**

**Pesticide Active Ingredient: Triclopyr**

**Version 1.0**

**2021**

## Environmental Assessment

<b>Pesticide: Triclopyr</b>	<b>Hazard Status:</b> Triclopyr is not considered a highly hazardous pesticide (HHP) per the FSC Pesticides Policy (FSC-POL-30-001 V3-0 EN) and the FSC Lists of Highly Hazardous Pesticides (FSC-POL-30-001a EN).		
<b>Specific Formulation (CAS#):</b>	<p><b>Crossbow*</b> (1929-73-3, 64700-56-7): 2,4-d – 34.4%; triclopyr-2-butoxyethyl ester – 16.5%; other ingredients – 49.1%</p> <p><b>Element 4, Garlon 4</b> (64700-56-7): triclopyr-2-butoxyethyl ester – 61.6 %, other ingredients – 38.4%;</p> <p><b>Garlon 3A</b> (57213-69-1): triclopyr trimethylamine salt – 44.4%, other ingredients – 55.6%</p> <p><b>Garlon 4 Ultra</b> (64700-56-7): triclopyr-2-butoxyethyl ester – 60.45%, other ingredients – 39.55%;</p> <p><b>Garlon XRT</b> (64700-56-7): triclopyr-2-butoxyethyl ester – 83.9%, other ingredients – 16.1%</p> <p><b>Milestone VM Plus*</b> (57213-69-1, 566191-89-7): triclopyr trimethylamine salt – 16.22%; aminopyralid – 2.22%, other ingredients – 81.56%</p> <p><b>Pathfinder II</b> (64700-56-7): triclopyr-2-butoxyethyl ester – 13.6%, other ingredients – 86.4%</p> <p><b>Vastlan</b> (1048373-85-8): triclopyr choline salt – 54.72%, other ingredients – 45.28%</p> <p>*Formulation contains another pesticide requiring an ESRA</p>		
<b>Exposure Elements</b>	<b>Minimum list of values</b>	<b>Description of why/why not a risk</b>	<b>Mitigation strategies defined to minimize risk<sup>1</sup></b>
<b>Environmental</b>	<b>Soil (erosion, degradation, biota, carbon storage)</b>	<p><b>Minimal indication of adverse effects to Soil was found when triclopyr is used according to label instructions in forestry applications. Additional considerations are provided, below.</b></p> <p>Potential for erosion if groundcover is exposed to herbicide, as well as adverse effects on terrestrial invertebrates (1). Adverse effects on terrestrial microorganisms is unlikely (1).</p>	<p><b>Follow all pesticide label application instructions. Follow applicable criterion and indicators from the FSC US FM Standard V1.0 (e.g., Criterion 4.3 for worker safety, Criterion 7.3 for worker training, Criterion 6.5 for protecting water resources, and Criteria 8.1 and 8.2 for Monitoring). Applicators or persons supervising application of restricted use pesticides are required to be certified in accordance with EPA regulations and state, territorial and tribal laws. Additional risk mitigation strategies are provided below. Organizations should take reasonable steps to avoiding environmental and social impacts by considering the mitigation strategies provided below as well as</b></p>
	<b>Water (ground water, surface waters, water supplies)</b>	<p><b>Water contamination is possible, which would adversely affect aquatic plants (including algae):</b></p> <p>Low risk to nontarget species, including humans, associated with contaminated surface water (1).</p> <p>Substantial drift or off-site transport via runoff could result in acute effects in sensitive fish or aquatic vegetation (1).</p> <p>Triclopyr BEE (butoxyethyl ester) has been found to be much more toxic than triclopyr TEA (trimethylamine salt), and triclopyr acid to terrestrial plants and most groups of</p>	

		<p>aquatic organisms (1): "Acute toxicity data for aquatic animals generally indicate that triclopyr ACID and TEA are practically non-toxic to fish and invertebrates, while triclopyr BEE is moderately to highly toxic to these same taxa on an acute exposure basis" (1). Additionally, EPA explains that "The chronic toxicity of triclopyr ACID and TEA to freshwater fish and invertebrates is relatively similar to acute toxicity values and range from 24 to 74 mg a.i./L. In contrast, the chronic toxicity of triclopyr BEE to freshwater fish and invertebrates tends to be much greater than the ACID or TEA active ingredients" (1). However, once it enters the environment, triclopyr BEE is rapidly converted to the less toxic acid form.</p> <p>Higher rates of rainfall make surface water contamination more likely. However, because "triclopyr BEE is not persistent in soil or surface water, longer-term risks to aquatic animals after terrestrial applications of triclopyr BEE appear to be negligible" (1).</p>	<p><b>application-, Organization-, or location-specific strategies.</b></p> <p><b>General consideration of exposure variables designed to mitigate risk:</b></p> <ul style="list-style-type: none"> <li>-Know and understand the specific pesticide formulation and/or tank mixture, as its unique formulation may provide a different risk characterization.</li> <li>-Understand how the mixture of active ingredients affects the pesticides risk profile.</li> <li>-Seek to minimize the frequency, interval, and amount of application.</li> <li>-use the most efficient and effective method of application by seeking to minimize risk to environmental and social values.</li> <li>-Understand the site (e.g., soil type, topography, etc.) and climatic (e.g., wind, temperature, and humidity) conditions and the likely effect on risk to environmental and social values.</li> <li>-Have appropriate, waste management systems in place.</li> </ul>
<b>Environmental</b>	<b>Atmosphere (air quality, greenhouse gasses)</b>	<p><b>Minimal indication of adverse effects to atmosphere was found when triclopyr is used according to label instructions in forestry applications. Additional considerations are provided, below.</b></p> <p>Triclopyr BEE is more volatile than Triclopyr TEA (1).</p>	<p><b>Mitigating Risk to the Environment:</b> <i>reduce contact with water resources and minimize application amounts and number of applications.</i></p>
	<b>Non-target species (vegetation, wildlife, bees and other pollinators, pets)</b>	<p><b>Negative impacts on non-target species exist for plants and mammals.</b></p> <p>Developmental and reproductive effects are documented in mammals at acute, subchronic, and chronic toxicity studies (1).</p> <p>Large mammals are the nontarget organisms at the greatest risk, and contaminated vegetation is the predominant exposure scenario (1).</p> <p>Overt and severe maternal toxicity has been shown to have adverse developmental and reproductive effects. Developmental effects have been indicated as delayed</p>	<p><i>General and non-target species:</i></p> <ul style="list-style-type: none"> <li>-Minimize risk of spray drift: unintentional spray drift has potential to significantly increase risk to the environment and public welfare. Follow product-specific guidelines for reducing spray drift for specific application scenarios (2).</li> <li>-Do not apply where runoff or irrigation water may flow onto agricultural land as injury to crops may result (3).</li> </ul>

		<p>growth in offspring, rather than frank abnormalities and occur only at doses of frank maternal toxicity (1).</p> <p>Potential for adverse effects on birds, but avian studies are not as numerous or detailed as those involving mammals (1). Triclopyr BEE is more toxic to fish than triclopyr acid (TEA); nonetheless, application of triclopyr BEE up to 3 lb a.e./acre does not reach a level of concern. However, accidental spill scenarios would likely result in substantial adverse effects on fish (1).</p> <p>Triclopyr BEE has been found to be much more toxic than triclopyr TEA, and triclopyr acid to terrestrial plants and most groups of aquatic organisms (1).</p> <p>Direct spray, substantial drift, and substantial runoff from the application site are expected to cause damage to aquatic and terrestrial macrophytes and algae, given that triclopyr is an effective herbicide (1).</p> <p>Triclopyr is considered “practically non-toxic” to bees (1); general risks to terrestrial invertebrates is secondary to changes in vegetation cover (i.e. changes in terrestrial invertebrate populations comes as a result of changes to vegetation) (1).</p>	<p>-Reduce volatilization potential by minimizing spray contact with nonpermeable surfaces (roads, rocks), especially during higher air temperatures (3).</p> <p><i>Water:</i></p> <p>-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 (3).</p> <p>-Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority</p> <p>-Do not apply to open water (2).</p> <p>-Do not apply to saltwater bays or estuaries (2).</p> <p>-Do not apply on ditches that are used to transport irrigation water (3).</p>
<b>Environmental</b>	<p><b>Non-timber forest products (as FSC-STD-01-001 V5-2 FSC Principles and Criteria, criterion 5.1)</b></p>	<p><b>Minimal indication of adverse effects to non-timber forest products was found when triclopyr is used according to label instructions in forestry applications. Additional considerations are provided below.</b></p> <p>Secondary effects to habitats and food availability could occur, which would affect virtually all nontarget organisms. These secondary effects caused by herbicide or mechanical methods could either be detrimental or beneficial to affected species (1).</p>	
	<p><b>High Conservation Values (particularly HCV 1-4)</b></p>	<p><b>Minimal indication of adverse effects to high conservation values was found when triclopyr is used according to label instructions in forestry applications. Additional considerations are provided below.</b></p>	

		Unintentional secondary effects on habitat, landscape and ecosystem are possible (1).	
	<b>Landscape (aesthetics, cumulative impacts)</b>	<b>Minimal indication of adverse effects to landscape was found when triclopyr is used according to label instructions in forestry applications. Additional considerations are provided below.</b>  Unintentional habitat/ landscape effects are possible (1).	
	<b>Ecosystem services (water, soil, carbon sequestration, tourism)</b>	<b>Minimal indication of adverse effects to ecosystem services was found when triclopyr is used according to label instructions in forestry applications. Additional considerations are provided below.</b>  Potential for secondary effects on terrestrial or aquatic animals and plants, including changes in food availability and habitat quality (1).	

<sup>1</sup> Mitigation strategies have been categorized to avoid redundancy

#### Sources

- (1) USDA/Forest Service. (2011). Triclopyr Human Health and Ecological Risk Assessment. Prepared by Syracuse Environmental Research Associates, Inc. under USDA Forest Service Contract AG-3187-C-06-0010. Retrieved from [https://www.fs.fed.us/foresthealth/pesticide/pdfs/181126Triclopyr-2011\\_RA.pdf](https://www.fs.fed.us/foresthealth/pesticide/pdfs/181126Triclopyr-2011_RA.pdf).
- (2) Dow AgroSciences LLC (2011). Pesticide Product Label [Element 3A]. Retrieved from <http://www.cdms.net/ldat/ld8R1006.pdf>.
- (3) Dow AgroSciences (2018). Pesticide Product Label [Garlon 4]. Retrieved from: [https://www3.epa.gov/pesticides/chem\\_search/ppls/062719-00527-20180205.pdf](https://www3.epa.gov/pesticides/chem_search/ppls/062719-00527-20180205.pdf).

## Social Assessment

<b>Pesticide: Triclopyr</b>	<b>Hazard Status:</b> Triclopyr is not considered a highly hazardous pesticide (HHP) per the FSC Pesticides Policy (FSC-POL-30-001 V3-0 EN) and the FSC Lists of Highly Hazardous Pesticides (FSC-POL-30-001a EN).		
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<b>Exposure Elements</b>	<b>Minimum list of values</b>	<b>Description of why/why not a risk</b>	<b>Mitigation strategies defined to minimize risk<sup>1</sup></b>
	<b>High Conservation Values (especially HCV 5-6)</b>	<b>Minimal indication of adverse effects to high conservation values was found when triclopyr is used according to label instructions in forestry applications.</b>	<b>Follow all pesticide label application instructions. Follow applicable criterion and indicators from the FSC US FM Standard V1.0 (e.g., Criterion 4.3 for worker safety, Criterion 7.3 for worker training, Criterion 6.5 for protecting water resources, and Criteria 8.1 and 8.2 for Monitoring). Applicators or persons supervising application of restricted use pesticides are required to be certified in accordance with EPA regulations and state, territorial and tribal laws. Additional risk mitigation strategies are provided below. Organizations should take reasonable steps to avoiding environmental and social impacts by considering the mitigation strategies provided below as well as application-, Organization-, or location-specific strategies.</b>
	<b>Health (fertility, reproductive health, respiratory health, dermatologic, neurological and gastrointestinal problems, cancer and hormonal imbalance)</b>	<p><b>Minimal indication of adverse effects to human health was found when triclopyr is used according to label instructions in forestry applications. However, additional considerations are provided below:</b></p> <p>Aquatic applications of triclopyr do not present identifiable risk to humans, while terrestrial applications present some risk to general public of non-accidental exposure through consumption of contaminated fruit or vegetation (1).</p> <p>For workers: triclopyr BEE exceeds chronic level of concern for typical application rates. Upper bounds for estimated exposures for both TEA and BEE formulations exceed the chronic level of concern (1). However, studies assessing realistic worker</p>	<p><b>General consideration of exposure variables designed to mitigate risk:</b></p> <p>-Know and understand the specific pesticide formulation, as its unique formulation may provide a different risk characterization.</p>

		<p>exposures used in USFS programs show no indication of risk; realistically, eye irritation is the only adverse effect on workers associated with triclopyr application (1).</p> <p>High hazard quotients (HQs) associated with terrestrial applications are of concern, especially for females, given known adverse developmental effects in mammals (1). However, these effects are seen at doses that cause “frank signs of maternal toxicity” and “available toxicity studies suggest that overt and severe toxicity would not be associated with any of the upper bounds HQs” (1). Additional epidemiology studies on females of reproductive age with exposure to triclopyr is necessary, as some results have shown increase in the odds of miscarriage for women in the USFS who used herbicides.</p> <p>Overall, USFS asserts that there is no substantial or likely risk to acute or long-term exposure scenarios assuming adherence to proper worker protections (1).</p>	<p>-Understand how the mixture of active ingredients affects the pesticides risk profile.</p> <p>-Seek to minimize the frequency, interval, and amount of application.</p> <p>-use the most efficient and effective method of application by seeking to minimize risk to environmental and social values.</p> <p>-Understand the site (e.g., soil type, topography, etc.) and climatic (e.g., wind, temperature, and humidity) conditions and the likely effect on risk to environmental and social values.</p> <p>-Have appropriate waste management systems in place.</p> <p><b>Mitigating risk to water and food resources:</b> See Environmental Risk Assessment mitigation strategies.</p> <p><b>Mitigating Risk to Workers:</b> <i>When applying pesticides label instructions should be followed.</i></p>
<b>Social</b>	<b>Welfare</b>	<b>Minimal indication of adverse effects to welfare was found when triclopyr is used according to label instructions in forestry applications.</b>	<p>-Applicators and other handlers must wear personal protective equipment (PPE), including the following as found on the Element 3A pesticide label (2):</p> <ul style="list-style-type: none"> <li>• Long-sleeved shirt and long pants</li> <li>• Shoes plus socks</li> <li>• Protective eyewear</li> <li>• Chemical resistant gloves (&gt;14 mils) such as butyl rubber, natural rubber, neoprene rubber or nitrile rubber.</li> <li>• Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.</li> <li>• Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.</li> <li>• 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.</li> <li>• Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this</li> </ul>
	<b>Food and water</b>	<p><b>Risk of contact with contaminated vegetation, fruit, and water. However, these scenarios are extremely low risk due to the implausibility of acute or long-term occurrences. (1)</b></p> <p>Accidental spill into a small pond would also result in HQs above the level of concern to the general public for triclopyr TEA applications (1).</p>	
	<b>Social Infrastructure; (schools and hospitals, recreational infrastructure, infrastructure adjacent to the</b>	<b>Minimal indication of adverse effects to social infrastructure was found when triclopyr is used according to label instructions in forestry applications.</b>	

	management unit)		
	<b>Economic viability (agriculture, livestock, tourism)</b>	<p><b>Minimal indication of adverse effects to economic viability was found when triclopyr is used according to label instructions in forestry applications. Additional considerations are provided below:</b></p> <p>Risks to nontarget plant species due to drift, with highest risk due to aerial application and lowest from backpack application (1).</p> <p>Exposure of nontarget plants is possible through contaminated irrigation water, but concentrations will likely not reach level of concern (1).</p>	<p>product's concentrate. Do not reuse these items. 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.</p> <ul style="list-style-type: none"> <li>• Application crews should not walk through treated vegetation, as foliar application occurs up to shoulder high brush (1).</li> </ul> <p><b>Mitigating Risk to Public Access/Public Welfare:</b></p> <p>-Reduce the possibility of public consumption of contaminated wild food (e.g., fruit or fungi) and public exposure to pesticides through public outreach and engagement, limiting access, and/or appropriate signage. For instance, users of the forest may be excluded from the area using barriers or signage until the pesticide dries (3).</p> <p>-Consider effects on local communities and indigenous peoples when considering limiting access to treatment areas.</p> <p>-Do not allow children or pets to enter the treated area until it has dried.</p>
<b>Social</b>	<b>Rights (legal and customary)</b>	<p><b>Minimal indication of adverse effects to rights was found when triclopyr is used according to label instructions in forestry applications.</b></p>	
	<b>Others</b>	<p><b>No additional values were identified in this assessment.</b></p>	

<sup>1</sup> Mitigation strategies have been categorized to avoid redundancy

## Sources

- (1) (1) USDA/Forest Service. (2011). Triclopyr Human Health and Ecological Risk Assessment. Prepared by Syracuse Environmental Research Associates, Inc. under USDA Forest Service Contract AG-3187-C-06-0010. Retrieved from [https://www.fs.fed.us/foresthealth/pesticide/pdfs/181126Triclopyr-2011\\_RA.pdf](https://www.fs.fed.us/foresthealth/pesticide/pdfs/181126Triclopyr-2011_RA.pdf).
- (2) Dow AgroSciences LLC (2011). Pesticide Product Label [Element 3A]. Retrieved from <http://www.cdms.net/ldat/ld8R1006.pdf>.
- (3) Dow AgroSciences (2018). Pesticide Product Label [Garlon 4]. Retrieved from: [https://www3.epa.gov/pesticides/chem\\_search/ppls/062719-00527-20180205.pdf](https://www3.epa.gov/pesticides/chem_search/ppls/062719-00527-20180205.pdf).