

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

Pesticide Active Ingredient: Imazapyr

Version 1.0

2021

Environmental Assessment

<p>Pesticide: Imazapyr</p>	<p>Hazard Status: Imazapyr 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).</p>		
<p>Specific Formulation (CAS#):</p>	<p>Alligare Imazapyr 2 SL (81510-83-0): isopropylamine salt of imazapyr – 27.8%, other ingredients – 72.2% Alligare Imazapyr 4 SL (81510-83-0): isopropylamine salt of imazapyr – 52.6%, other ingredients – 47.4% Arsenal (81510-83-0): isopropylamine salt of imazapyr – 27.8%, other ingredients – 72.2% Ecomazapyr 2 SL (81510-83-0): isopropylamine salt of imazapyr – 27.8%, other ingredients – 72.2% Habitat (81510-83-0): isopropylamine salt of imazapyr – 27.77%, other ingredients – 72.23% Polaris (81510-83-0): isopropylamine salt of imazapyr – 27.7%, other ingredients – 72.3%</p>		
<p>Exposure Elements</p>	<p>Minimum list of values</p>	<p>Description of why/why not a risk</p>	<p>Mitigation strategies defined to minimize risk¹</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Environmental</p>	<p>Soil (erosion, degradation, biota, carbon storage)</p>	<p>Minimal indication of adverse effects to soil was found when imazapyr is used according to label instructions in forestry applications. Additional considerations are provided below.</p> <p>Imazapyr has minimal documented adverse effects on soil microorganisms at concentrations expected within the top twelve inches of soil (1).</p> <p>Increasing adverse effects on cellulose breakdown are documented only when imazapyr concentrations reach levels far higher than anticipated in soil (1).</p>	<p>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). Additional risk mitigation strategies are provided below. Applicators 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.</p> <p>General consideration of exposure variables designed to mitigate risk: -Know and understand the specific pesticide formulation and/or tank mixture, as its unique formulation may provide a different risk characterization.</p>
	<p>Water (ground water, surface waters, water supplies)</p>	<p>Some indication of adverse effects to water was found when imazapyr is used according to label instructions in forestry applications. These are as follows below.</p> <p>As an effective herbicide, aquatic applications will damage aquatic macrophytes. Some sensitive species of algae may be damaged in the event of an extreme accidental spill (1).</p> <p>Expected imazapyr concentrations in water are far below the level of concern for toxicity in fish and aquatic invertebrates. Risk characterization assessment for amphibians is unavailable due to lack of relevant toxicity data (1). However, individual studies using Oregon spotted frogs and Bullfrogs have concluded that imazapyr</p>	

		<p>use poses no significant risk to those species (4,5).</p> <p>Contamination of runoff water will impact sensitive nontarget plant species. Risks are greater in areas with predominantly clay soils and high precipitation and are lower in areas with sandy soil (1).</p> <p>Similarly, contaminated irrigation water will impact sensitive nontarget plant species (1).</p>	<p>-Understand how the mixture of active ingredients affects the pesticide's 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>
Environmental	<p>Atmosphere (air quality, greenhouse gasses)</p>	<p>Minimal indication of adverse effects to atmosphere was found when imazapyr is used according to label instructions in forestry applications.</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>Non-target species (vegetation, wildlife, bees and other pollinators, pets)</p>	<p>Imazapyr is hazardous to terrestrial macrophytes and as such nontarget macrophytes are at risk for spray drift and direct spray (1). Additional information for other non-target species is provided below.</p> <p>Despite data limited by the number of species available, imazapyr does not pose risk to mammals, birds, honeybees, fish, and aquatic invertebrates; it is classified as "practically non-toxic" by the EPA (1).</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>Adverse effects on microorganisms are not documented at expected imazapyr soil concentrations (1).</p>	<p>Mitigating Risk to the Environment: <i>Reduce contact with water resources, follow all label requirements, and minimize application amounts and number of applications.</i></p> <p>-Do not apply 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 contaminate water when disposing of equipment, washwater, or rinsate" (3). Additionally, "Do not use on food or feed crops. Do not treat irrigation ditches, or water used for crop irrigation or for domestic uses. Do not apply where runoff or irrigation water may flow onto agricultural land as injury to crops may result" (3).</p> <p>-Do not apply directly to water, or to</p>
Environmental	<p>Non-timber forest products (as FSC-STD-01-001 V5-2 FSC Principles and Criteria, criterion 5.1)</p>	<p>Minimal indication of adverse effects to non-timber forest products was found when imazapyr is used according to label instructions in forestry applications. Additional considerations are provided below.</p>	<p>-Do not apply where runoff or irrigation water may flow onto agricultural land as injury to crops may result" (3).</p> <p>-Do not apply directly to water, or to</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)	areas where surface water is present, or to intertidal areas below the mean high-water mark (4); -Do not contaminate water when cleaning equipment or disposing of equipment washwaters or rinsate. This herbicide is phytotoxic at extremely low concentrations. Non-target plants may be adversely affected from drift (3); -Do not apply where runoff or irrigation water may flow onto agricultural land as injury to crops may result. Keep from contact with fertilizers, insecticides, fungicides and seeds.
	High Conservation Values (particularly HCV 1-4)	Minimal indication of adverse effects to high conservation values was found when imazapyr is used according to label instructions in forestry applications. Additional considerations are provided below. Unintentional secondary effects on habitat, landscape and ecosystem are possible due to changes in vegetation (1).	-Do not apply where runoff or irrigation water may flow onto agricultural land as injury to crops may result. Keep from contact with fertilizers, insecticides, fungicides and seeds. -Do not apply 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 (3); -Minimize risk of spray drift: unintentional spray drift has potential to significantly increase risk to the environment and public welfare.
	Landscape (aesthetics, cumulative impacts)	Minimal indication of adverse effects to landscape values was found when glyphosate is used according to label instructions in forestry applications. Additional considerations are provided, below. Unintentional habitat/landscape effects are possible, primarily due to changes in vegetation (1).	-Do not apply 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 (3); -Minimize risk of spray drift: unintentional spray drift has potential to significantly increase risk to the environment and public welfare.
	Ecosystem services (water, soil, carbon sequestration, tourism)	Minimal indication of adverse effects to ecosystem services was found when imazapyr is used according to label instructions in forestry applications. Additional considerations are provided, below. Unintentional habitat/landscape/ecosystem effects are possible, primarily due to changes in vegetation (1).	-Minimize risk of spray drift: unintentional spray drift has potential to significantly increase risk to the environment and public welfare.

¹ Mitigation strategies have been categorized to avoid redundancy

Sources

- (1) USDA/Forest Service. (2011). Imazapyr 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/Imazapyr_TR-052-29-03a.pdf.
- (2) U.S. Environmental Protection Agency. (2015, December). Imazapyr Proposed Interim Registration Review Decision Case Number 3078 (Docket Number EPA-HQ-OP-2009-0361). Retrieved from <https://www.regulations.gov/document?D=EPA-HQ-OPP-2014-0200-0019>.
- (3) SSI Maxim (2018). Pesticide Product Label [Arsenal]. Retrieved from https://www3.epa.gov/pesticides/chem_search/ppls/034913-00023-20180328.pdf.
- (4) Trumbo, J. and Waligora, D. "The impact of the herbicides imazapyr and triclopyr triethylamine on bullfrog tadpoles." California Fish and Game 95, no. 3 (2009): 122-127.
- (5) Yahnke, Amy E., Christian E. Grue, Marc P. Hayes, and Alexandra T. Troiano. "Effects of the herbicide imazapyr on juvenile Oregon spotted frogs." Environmental toxicology and chemistry 32, no. 1 (2013): 228-235.

Social Assessment

Pesticide: Imazapyr	Hazard Status: Imazapyr 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).		
Specific Formulation (CAS#):	<p>Alligare Imazapyr 2 SL (81510-83-0): isopropylamine salt of imazapyr – 27.8%, other ingredients – 72.2% Alligare Imazapyr 4 SL (81510-83-0): isopropylamine salt of imazapyr – 52.6%, other ingredients – 47.4% Arsenal (81510-83-0): isopropylamine salt of imazapyr – 27.8%, other ingredients – 72.2% Ecomazapyr 2 SL (81510-83-0): isopropylamine salt of imazapyr – 27.8%, other ingredients – 72.2% Habitat (81510-83-0): isopropylamine salt of imazapyr – 27.77%, other ingredients – 72.23% Polaris (81510-83-0): isopropylamine salt of imazapyr – 27.7%, other ingredients – 72.3%</p>		
Exposure Elements	Minimum list of values	Description of why/why not a risk	Mitigation strategies defined to minimize risk¹
Social	High Conservation Values (especially HCV 5-6)	<p>Minimal indication of adverse effects to high conservation values was found when imazapyr is used according to label instructions in forestry applications. Additional considerations are provided below.</p> <p>Unintentional secondary effects on habitat, landscape and ecosystem are possible due to changes in vegetation (1).</p>	<p>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). Additional risk mitigation strategies are provided below. Applicators should take reasonable steps to avoid environmental and social impacts by considering the mitigation strategies provided below, as well as application-, Organization-, or location-specific strategies.</p> <p>General consideration of exposure variables designed to mitigate risk:</p> <ul style="list-style-type: none"> -Know and understand the specific pesticide formulation, as its unique formulation may provide a different risk characterization. -Understand the mixture of active ingredients. -Seek to minimize the frequency, interval, and amount of application. -Use the most efficient and effective method of application by seeking to minimize risk to environmental and social values. -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
	Health (fertility, reproductive health, respiratory health, dermatologic, neurological and gastrointestinal problems, cancer and hormonal imbalance)	<p>Minimal indication of adverse effects to human health was found when imazapyr is used according to label instructions in forestry applications. Additional considerations are provided below.</p> <p>Minimal to no risk to worker health due to acute or long-term exposure if proper protective and safety procedures are followed. No indication of health risk to general public (1).</p> <p>Eye irritation is possible for workers handling highly concentrated imazapyr solutions for longer periods of time. Workers who use highly concentrated imazapyr should use special caution to prevent prolonged skin contact (1).</p>	
	Welfare	<p>Minimal indication of adverse effects to welfare was found when imazapyr is used according to label instructions in forestry applications.</p>	
	Food and water	Minimal indication of adverse effects to food and	

		<p>water was found when imazapyr is used according to label instructions in forestry applications. Additional considerations are provided below.</p> <p>Risk of contact with contaminated vegetation, fruit, and water. These scenarios are extremely low risk due to the implausibility of acute or long-term occurrences (1). Of these, the predominant route of exposure is through consumption of contaminated vegetation (1).</p>	<p>and social values.</p> <p>-Have appropriate waste management systems in place.</p> <p>Mitigating Risk to Workers: <i>When applying pesticides, label instructions should be followed.</i></p> <p>Personal Protective Equipment (PPE): Some materials that are chemical-resistant to this product are listed below. Applicators and other handlers must wear:</p>
Social	<p>Social Infrastructure; (schools and hospitals, recreational infrastructure, infrastructure adjacent to the management unit)</p>	<p>Minimal indication of adverse effects to social infrastructure was found when imazapyr is used according to label instructions in forestry applications.</p>	<ul style="list-style-type: none"> • Long-sleeved shirt and long pants; • Chemical-resistant gloves, such as barrier laminate, butyl rubber or polyethylene; • Shoes plus socks. <p>Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions exist for washables, use detergent and hot water. Keep and wash PPE separately from other laundry. Do not enter treated areas without protective clothing until sprays have dried. (3)</p>
	<p>Economic viability (agriculture, livestock, tourism)</p>	<p>Minimal indication of adverse effects to economic viability was found when imazapyr is used according to label instructions in forestry applications. However, additional considerations are provided below.</p> <p>There is a potential for spray drift to adversely affect sensitive terrestrial and aquatic plant species.</p> <p>Sensitive species will be affected up to 900 feet downwind of application site, regardless of application method, and will likely be affected well beyond 900 feet (1). Risk characterization is similar for aquatic plant species.</p> <p>Given no documented adverse effects on animals (1), there is low risk for economic viability of livestock or tourism.</p>	<p><i>Applicators should:</i></p> <ul style="list-style-type: none"> -Avoid breathing spray mist. Avoid contact with skin, eyes or clothing. -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 the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing (3). <p>Mitigating Risk to Public Access/Public Welfare:</p> <ul style="list-style-type: none"> -Reduce the possibility of public consumption of

	Rights (legal and customary)	Minimal indication of adverse effects to rights was found when imazapyr is used according to label instructions in forestry applications.	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; -Consider effects on local communities and indigenous peoples when considering limiting access to treatment areas;
	Others	No additional values were identified in this assessment.	-Do not allow children or pets to enter the treated area until it has dried. Minimizing Risk to Food and Water Resources: -Minimize spray drift - unintentional spray drift has potential to significantly increase risk to the environment and public welfare. -Do not apply where runoff or irrigation water may flow onto agricultural land as injury to crops may result. -Do not apply directly to water bodies including lakes, streams, rivers, ponds.

¹ Mitigation strategies have been categorized to avoid redundancy

Sources:

- (1) USDA/Forest Service. (2011). Imazapyr 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/Imazapyr_TR-052-29-03a.pdf.
- (2) U.S. Environmental Protection Agency. (2015, December). Imazapyr Proposed Interim Registration Review Decision Case Number 3078 (Docket Number EPA-HQ-OP-2009-0361). Retrieved from <https://www.regulations.gov/document?D=EPA-HQ-OPP-2014-0200-0019>.
- (3) SSI Maxim (2018). Pesticide Product Label [Arsenal]. Retrieved from https://www3.epa.gov/pesticides/chem_search/ppls/034913-00023-20180328.pdf.