



Minnesota Department of Natural Resources Pesticide Environmental and Social Risk Assessment

Pesticide Active Ingredient: Hexazinone

Version 1.1

2022

Environmental Assessment

Pesticide: Hexazinone	Hazard Status: Hexazinone 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#):	Velpar DF (432-1576): hexazinone – 75%; other ingredients 25% Velpar L (432-1573): hexazinone – 25%; other ingredients 75%
Environmental values	Description of why/why not a risk
Soil (erosion, degradation, biota, carbon storage)	<p>Minimal indication of adverse effects to soil was found when hexazinone is used according to label instructions in forestry applications. Additional considerations are provided below.</p> <p>Hexazinone is moderately persistent and highly mobile in soil (3, 4). Hexazinone is known to leach through soil into ground water under certain conditions. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground-water contamination (1, 2).</p> <p>Leaching of hexazinone to greater soil depths has been documented on sites with less humus cover (3).</p> <p>Potential for erosion due to vegetation dieback increases risk for movement, particularly on sites with greater slopes.</p> <p>Lab studies have shown hexazinone can inhibit soil microbial growth at high concentrations. Field studies of hexazinone and terrestrial microorganisms have shown no effect on soil bacteria and fungi where application rates exceeded the maximum label rate (3).</p>
Water (ground water, surface waters, water supplies)	<p>Some indication of adverse effects to water was found when hexazinone is used according to label instructions in forestry applications. These are as follows below.</p> <p>Hexazinone is moderately persistent (reported half-life liquid formulation of 11-180 days and 77 days; reported half-life of granular formulation of 10-30 days) and highly mobile (3).</p> <p>It can contaminate ground water and surface water due to runoff, leaching, spills, or drift over surface water (1, 2, 3, 4).</p> <p>It can runoff sites that are steeply sloped, are bare of surface impediments such as vegetation, and are poorly drained. The risk of leaching into groundwater goes up on sites with too little organic matter, coarse textured soils, and shallow water tables. Selection of loading and mixing locations can influence the risk that accidental spills could contaminate water.</p>

<p>Atmosphere (air quality, greenhouse gasses)</p>	<p>No indication of adverse effects to atmosphere was found when hexazinone is used according to label instructions in forestry applications.</p> <p>Spraying during atmospheric inversions increases the risk that pesticide can move laterally by air off of treatment site (1, 2).</p>
<p>Non-target species (vegetation, wildlife, bees and other pollinators, pets)</p>	<p>Risk of adverse effects varies with non-target species.</p> <p>Hexazinone is hazardous to a broad spectrum of plant life disrupting photosynthesis and inhibiting RNA, protein, and lipid production. Hexazinone exceeds levels of concern (LOC) for terrestrial and aquatic plants at all broadcast application label rates. It can alter aquatic communities by killing algae, resulting in disruptive and negative effects on aquatic communities (3).</p> <p>Non-target plants are at risk for spray drift, direct spray, and runoff. Ash, quaking aspen, big-tooth aspen, balsam poplar, birch, black cherry, elm, hazel, hickory, red maple, oak, and willows include native woody plants that are sensitive to hexazinone (1, 2).</p> <p>Hexazinone is practically non-toxic to birds, fish, and aquatic invertebrates, and it has low acute toxicity in mammals. Hexazinone does not accumulate in fish (3).</p> <p>Hexazinone exceeds the small mammal LOC at higher application rates. Application of liquid formulations will result in greater concentrations of hexazinone in vegetation in comparison to granular applications. This could result in adverse effects in grazing mammals that browse on contaminated vegetation over long periods of time (3).</p> <p>Hexazinone, because of its effects on vegetation, can reduce food availability or habitat for both mammals and birds in the year after treatment. This is not considered an adverse effect because after a year, increases in forage have been observed (3).</p>
<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 hexazinone is used according to label instructions in forestry applications.</p> <p>Studies of hexazinone effects on wild blueberry noted increased levels of dieback at higher application rates and increased level of dieback with later (late-spring and early-summer) applications (5, 6).</p> <p>A study documented persistence of hexazinone in vegetation used by Native Americans in California for basket making, medicine, and food (7).</p>
<p>High Conservation Values (particularly HCV 1-4)</p>	<p>There is some indication of adverse effects to HCV 1-4.</p>

	<p>HCV 1 could be adversely impacted where as hexazinone exceeds endangered species LOCs for mammals that consume insects and grass (3).</p> <p>HCV 4 (Critical Ecosystem Services: Drinking Water) could be adversely impacted if measures aren't taken to reduce the risk of off-site movement of hexazinone into water.</p>
Landscape (aesthetics, cumulative impacts)	<p>Minimal indication of adverse effects to landscape values was found when hexazinone is used according to label instructions in forestry applications, but that is dependent on location and scale of use.</p>
Ecosystem services (water, soil, carbon sequestration, tourism)	<p>There is some indication of adverse effects to ecosystem services if hexazinone moves into surface or ground water during or following forestry applications.</p>

<p>Mitigation strategies defined to minimize environmental risk¹</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:</p> <ul style="list-style-type: none"> -Know and understand the specific pesticide formulation and/or tank mixture, as its unique formulation may provide a different risk characterization. -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 and social values. -Have appropriate waste management systems in place. <p>Mitigating Risk to the Environment:</p> <p>Project proposers, applicators, and workers should:</p> <ul style="list-style-type: none"> - Use appropriate rates by geographical area, as specified on this label. - Use soil sampling to determine texture and percent organic matter as required by DNR Forestry to appropriately select an application rate. - Choose proper mixing/loading site. - Follow appropriate application procedures to minimize potential for hexazinone movement into ground water. - 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 wash waters or rinsate (1, 2). - Not apply when powdery dry soil or light or sandy soils are known to be prevalent in the area to be treated. Treatment of such soils, when there is little 	

likelihood of rainfall soon after treatment, may result in off target movement and possible damage to susceptible crops and desirable vegetation when soil particles are moved by wind or water (1).

- Not apply within the root zone of desirable sensitive trees and/or shrubs unless injury or loss can be tolerated. Root zones of desirable trees/shrubs may extend beyond the tree canopy (1, 2).
- Not apply or otherwise permit this product or sprays containing this product to come into contact with any non-target crop or desirable vegetation (1, 2, 3).
- Not apply if site-specific characteristics and conditions exist that unmitigated could contribute to movement and unintended root zone exposure to desirable trees or vegetation (1, 2).
- Not make applications when circumstances favor movement from treatment site (1, 2).
- Not use on frozen soils (1, 2).
- Not use more than one application per year (1, 2).
- Ensure adequate moisture is available during and following treatment. Moisture is required to activate both approved formulations in the soil. Best results are obtained when the soil is moist at the time of application and 1/4–1/2 inches of rainfall occurs within 2 weeks after application (1, 2).
- Ensure, a level and well-maintained vegetative buffer strip (of at least 100 feet) is present between treatment unit and surface water features such as ponds, streams, and springs. This will reduce the potential loading of hexazinone from runoff water and sediment (3).
- Ensure applications are only made when there is little or no hazard from spray drift. Very small quantities of spray, which may not be visible, may seriously injure susceptible plants (1, 2).
- Do not apply on project sites that intersect with HCV 4 features including drinking water supply management areas and wellhead protection areas.

¹ Mitigation strategies have been categorized to avoid redundancy.

Sources

- (1) Bayer Environmental Science. Pesticide Product Label [Velpar® L DU]. Retrieved from: <https://www.environmentalscience.bayer.us/-/media/prf/unitedstates/documents/resource-library/product-labels/velpar-l.ashx>
- (2) Bayer Environmental Science. Pesticide Product Label [Velpar® DF DU]. Retrieved from: <https://www.environmentalscience.bayer.us/-/media/prf/unitedstates/documents/resource-library/product-labels/velpar-df.ashx>
- (3) USDA/Forest Service. 2005. Hexazinone Human Health and Ecological Risk Assessment. Prepared by Syracuse Environmental Research Associates, Inc. under USDA Forest Service Contract GS-10F-0082F. Retrieved from: https://www.fs.fed.us/foresthealth/pesticide/pdfs/102505_hexazinone_ra.pdf
- (4) EPA Reregistration Eligibility Decision (R.E.D.) Facts: Hexazinone. USDA Forest Service. 1994. Retrieved from: https://www3.epa.gov/pesticides/chem_search/reg_actions/reregistration/fs_PC-107201_1-Sep-94.pdf
- (5) Jensen, K.I.N., and E.G. Specht. 2002. Response of lowbush blueberry (*Vaccinium angustifolium*) to hexazinone applied early in the fruiting year. Canadian Journal of Plant Science. 82(4): 781-783. Retrieved from: <https://cdns.cdnsciencepub.com/doi/pdf/10.4141/P01-188>
- (6) Yarborough, D.E., Hanchar, J.J., Skinner S.P., and A.A. Ismail. 1986. Weed response yield and economics of hexazinone and nitrogen use in lowbush blueberry *Vaccinium-angustifolium* production. Weed Science. 34(5): 723-729. Retrieved from: <https://www.cambridge.org/core/journals/weed-science/article/abs/weed-response-yield-and-economics-of-hexazinone-and-nitrogen-use-in-low-bush-blueberry-production/51FA4691323B46EC6ED05F98CE73D6BF>
- (7) Segawa, R., Ando, C., Bradley, A., Walters, J., Sava, R., Gana, C., and K.S. Goh. 2001. Dissipation and off-site movement of forestry herbicides in plants of importance to California Tribes. Retrieved from: https://www.researchgate.net/publication/267398545_Dissipation_and_Off-site_Movement_of_Forestry_Herbicides_in_Plants_of_Importance_to_California_Tribes/link/551b7f4c0cf2fdce84389e40/download

Social Assessment

Pesticide: Hexazinone	Hazard Status: Hexazinone 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#):	Velpar DF (432-1576): hexazinone – 75%; other ingredients 25% Velpar L (432-1573): hexazinone – 25%; other ingredients 75%
Social values	Description of why/why not a risk
High Conservation Values (especially HCV 5-6)	Minimal indication of adverse effects to high conservation values was found when hexazinone is used according to label instructions in forestry applications. Additional considerations are provided below.
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 hexazinone is used according to label instructions in forestry applications.</p> <p>Risk does exist to workers if label, SDS, and safe industry practices aren't followed (3).</p> <p>Velpar® L VU carries with it a flammability risk that Velpar® DF VU does not carry (1).</p> <p>Hexazinone poses the greatest health risk to workers applying and handling the pesticide, and of that group, pregnant women and developing fetuses are most at risk as a result of excessive exposure (3).</p> <p>For accidental exposure, hexazinone poses the greatest risk to the eyes (1, 2, 3).</p> <p>Both Velpar DF and Velpar L pose an inhalation risk in enclosed spaces. The liquid formulation has had more significant impacts in lab animals, possibly due to the ethanol component of the formulation (3).</p> <p>According to the U.S. EPA, hexazinone is a Group D carcinogen and is not classified as carcinogenic to humans (3, 4).</p>
Welfare	Minimal indication of adverse effects to welfare was found when hexazinone is used according to label instructions in forestry applications.
Food and water	<p>Minimal indication of adverse effects to food was found when hexazinone is used according to label instructions in forestry applications.</p> <p>Risk does exist to workers handling or applying hexazinone that do not practice good on-the-job hygiene ensuring they have removed hexazinone residues prior to ingesting food and water (1, 2, 3).</p>

Social Infrastructure; (schools and hospitals, recreational infrastructure, infrastructure adjacent to the management unit)	<p>Minimal indication of adverse effects to social infrastructure was found when hexazinone is used according to label instructions in forestry applications.</p> <p>When adjacent or in close proximity to social infrastructure, risk increases with site-factors that enable off-site movement of hexazinone to non-target plants and water. When social infrastructure borders treatment units, risk of adverse effects due to over-spraying increase.</p>
Economic viability (agriculture, livestock, tourism)	<p>Minimal indication of adverse effects to economic viability was found when hexazinone is used according to label instructions in forestry applications.</p> <p>When adjacent or in close proximity to economic features like food producing land, risk increases with site-factors that enable off-site movement of hexazinone to non-target plants and water. When economic features border treatment units, risk of adverse effects due to over-spraying increase.</p>
Rights (legal and customary)	<p>Minimal indication of adverse effects to rights was found when hexazinone is used according to label instructions in forestry applications.</p>
Others	<p>No additional values were identified in this assessment.</p>

Mitigation strategies defined to minimize social risk¹	
<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 and/or tank mixture, as its unique formulation may provide a different risk characterization. -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 and social values.

-Have appropriate waste management systems in place.

-Liquid formulations carry higher risk in transport than granular formulations due to flammability of vapors (1).

To minimize risk to workers and the public, project proposers, applicators, handlers and workers should:

-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.

Follow label recommended Personal Protective Equipment (PPE) which include:

-Coveralls

-Chemical resistant gloves made of any waterproof material

-Protective eyewear

-Shoes plus socks

-Avoid contact with eyes or clothing.

-Wash hands thoroughly with soap and water before eating, drinking, chewing gum, using tobacco, or using the toilet.

-Remove and dispose of clothing immediately if pesticide drenches.

- Clean PPE separately from clothing.

- 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.

-Consider effects on local communities and indigenous peoples when considering limiting access to treatment areas.

To minimize risk to food and water resources, project proposers, applicators, handlers, and workers should:

- Not cut treated vegetation for feed, or graze livestock on treated areas for 60 days following application of Velpar® L VU Herbicide at broadcast rates greater than 4.5 pints and up to 3 gallons per acre and application of Velar® DF VU at 1.5 pounds per acre (1, 2).

- Make applications only when there is little or no hazard from spray drift. Very small quantities of spray, which may not be visible, may seriously injure susceptible plants (1, 2).

- 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 wash waters or rinsate (1, 2).

- Not apply through any type of irrigation system (1, 2).

- Not contaminate water intended for irrigation. To avoid injury to crops or other desirable vegetation, do not treat or allow spray drift or run-off to fall onto banks or bottoms of irrigation ditches, either dry or containing water, or other channels that carry water that may be used for irrigation purposes (1, 2).

-Not plant the treated sites in the same year as treatment.

¹ Mitigation strategies have been categorized to avoid redundancy.

Sources

- (1) Bayer Environmental Science. Pesticide Product Label [Velpar® L DU]. Retrieved from: <https://www.environmentalscience.bayer.us/-/media/prf/unitedstates/documents/resource-library/product-labels/velpar-l.ashx>
- (2) Bayer Environmental Science. Pesticide Product Label [Velpar® DF DU]. Retrieved from: <https://www.environmentalscience.bayer.us/-/media/prf/unitedstates/documents/resource-library/product-labels/velpar-df.ashx>
- (3) USDA/Forest Service. 2005. Hexazinone Human Health and Ecological Risk Assessment. Prepared by Syracuse Environmental Research Associates, Inc. under USDA Forest Service Contract GS-10F-0082F. Retrieved from: https://www.fs.fed.us/foresthealth/pesticide/pdfs/102505_hexazinone_ra.pdf
- (4) EPA Reregistration Eligibility Decision (R.E.D.) Facts: Hexazinone. USDA Forest Service. 1994. Retrieved from: https://www3.epa.gov/pesticides/chem_search/reg_actions/reregistration/fs_PC-107201_1-Sep-94.pdf