



ERNSLAW ONE LIMITED

**Environmental and Social Risk
Assessment (ESRA) for
Haloxyfop
for use in Ernslaw's FSC Certified
plantation forests**

Prepared by the NZ FSC Economic Chamber Cluster Group

ESRA Haloxyfop

This document follows the format specified in Annex 2 of the FSC™ Pesticides Policy [FSC-POL-30-001 V3-0 EN](#). Refer <https://fsc.org/en/document-centre/documents/resource/208>

Date	September 2021
Proposed chemical pesticide	Products containing Haloxyfop
Pesticide type	Herbicide
CAS number(s)	<ul style="list-style-type: none"> 69806-40-2 Haloxyfop R methyl ester ☞ identified by FSC as Highly Hazardous – Restricted 69806-34-4 Haloxyfop 72619-32-0 Haloxyfop-P methyl ester (Haloxyfop-R methyl ester in some SDSs) 116661-27-9 Haloxyfop Methyl (S-) isomer
Common trade name(s) (Listed brand names may have different formulations including combinations with other chemical pesticides)	<p>Numerous trade names. Note: Most formulations available in NZ use CAS 72619-32-0. Formulations using CAS number 69806-40-2 are highlighted (yellow). All are emulsifiable concentrates (EC). Haloxyfop products include:</p> <ul style="list-style-type: none"> Agpro Haloxyfop 100 (72619-32-0 Haloxyfop P Methyl ester) Corteva Verdict® 520 and Gallant Ultra (Haloxyfop P Methyl ester and Haloxyfop Methyl (S-) isomer) Dow Gallant (Haloxyfop P Methyl ester) Farmalinx Haloxyfop 520 EC (Haloxyfop P Methyl ester) Imtrade Haloxyfop 900 EC (Haloxyfop P Methyl ester) Kenso Agcare Haloxyken 520 (Haloxyfop R methyl ester) Nufarm CREST®520 (Haloxyfop P Methyl ester) Ravensdown Valiant® 520 (Haloxyfop P Methyl ester) Lonza Ignite (Haloxyfop P Methyl) Relyon Circus 520 EC (69806-34-4 Haloxyfop) <p>To be imported, manufactured, sold, or used in New Zealand, an agricultural chemical must be registered under the Agricultural Compounds and Veterinary Medicines (ACVM) Act 1997. Refer www.mpi.govt.nz/agriculture/agricultural-compounds-vet-medicines/acvm-registers-and-lists/</p>
Classification description: ¹ (GHS7 system) ² for CAS 69806-40-2 as identified by FSC nb. Other formulations may differ	<p>Acute Toxicity 3 - H301: Toxic if swallowed Eye Irritant 2 - H319: Causes serious eye irritation. Reproductive 2: H361: Suspected of damaging fertility or the unborn child Carcinogenic 1: H350: May causing cancer</p>

¹ <https://www.epa.govt.nz/database-search/chemical-classification-and-information-database-ccid/view/41F2C748-9757-4F4A-B421-5462ABD5B8DB>

² <https://www.epa.govt.nz/industry-areas/hazardous-substances/new-zealands-new-hazard-classification-system/>

	<p>Specific Target Organ Toxicity (Repeat Exp.) 1: H372: Causes damage to organs through prolonged or repeated exposure</p> <p>Aquatic Acute1 - H400: Very toxic to aquatic life. Bioaccumulates.</p> <p>Aquatic Chronic 1 - H410: Very toxic to aquatic life with long lasting effects. Bioaccumulates.</p>
<p>FSC pesticide classification (prohibited HHP, highly restricted HHP, restricted HHP, or other chemical pesticide)</p>	<p>Restricted HHP (if formulation uses CAS 69806–40–2) ☞ other CAS formulations are classified by FSC as ‘other chemical’</p>
<p>Purpose of use (protection of vegetation, human health, native species, seeds or seedlings, weed control, others)</p>	<p>Weed control. Can be sprayed over newly established seedlings including Pinus and Eucalyptus species. kills grasses including difficult species like Flea Bain, Kikuyu and Pampas.</p>
<p>Location where used (forest, office, fire store, nursery)</p>	<p>Forest and nurseries.</p>
<p>Application method (hand, ground machine, aerial)</p>	<p>All methods, but often aerial application. Boom spraying, spot gun, knapsack, and aerial.</p>
<p>Scale and intensity of use</p>	<p>Variable. Dependent on the size of the operational area and method of application.</p>
<p>Alternatives considered (burning, mechanical land prep, hand, mechanical releasing, oversowing, grazing, weed mats, biological control, alternative chemicals)</p>	<p>A wide range of alternatives have been considered consistent with Criterion 10.7 of FSC-STD-01-001 V5-2 FSC Principles and Criteria.</p> <p>Further information on alternatives is within the Integrated Pest Management (IPM) section of Ernslaw’s Silvicultural manual.</p>
<p>Pesticide used individually or in conjunction with other pesticide(s)</p>	<ul style="list-style-type: none"> • Often used in conjunction with other herbicides including terbuthylazine, metsulfuron methyl and clopyralid to control broadleaf weeds. • Always check the product label, and if there are other pesticide additives, consult the appropriate ESRA. • Risks will likely increase with additional herbicide products, especially those known to have effects on the soil, water, air, and aquatic or terrestrial life. Little is known about potential compounding risks of mixes, as risk assessments are generally made on individual active ingredients.
<p>Reference documents</p>	<ul style="list-style-type: none"> • Integrated Pest Management section of Ernslaw’s Silviculture manual (IPM section 16) • FSC Pesticides Policy FSC-POL-30-001 V3-0 EN • FSC Lists of highly hazardous pesticides FSC-POL-30-001a V3-0 EN D2-0 • SDS Agpro Haloxyfop 100 • SDS Corteva Verdict® 520 and Gallant™ Ultra • SDS Farmalinx Haloxyfop 520 EC • SDS Imtrade Haloxyfop 900 EC • SDS Kenso Agcare Haloxyken 520 • SDS Nufarm CREST®520

	<ul style="list-style-type: none"> • SDS Ravensdown Valiant® 520 • SDS Lonza Ignite • SDS Relyon Circus 520 EC (698806-35-4) • Hamilton D 2006 Haloxyfop (including haloxyfop-r and haloxyfop-r methyl ester) Joint Meeting on 2010 Pesticide Residues (JMPR) FAO/WHO. • European Food Safety Authority (EFSA) 2014; Conclusion on the peer review of the pesticide risk assessment of confirmatory data submitted for the active substance haloxyfop-P1. 12(12):3931 • Pesticide properties database http://sitem.herts.ac.uk/ • APVMA website including the PubCRIS database https://portal.apvma.gov.au/pubcris • NZ EPA website including the Chemical Classification and Information Database (CCID) https://www.epa.govt.nz/database-search/chemical-classification-and-information-database-ccid/ • Herbiguide herbiguide.com.au/InformationHerbicides.aspx • PAN Pesticides Database http://pesticideinformation.org/Search_Chemicals.jsp
Note	<ul style="list-style-type: none"> • Haloxyfop products are sold as emulsifiable concentrates. The solvent, often Diethylene glycol monomethyl ether, may account for 50% by volume. The effects of the Haloxyfop have been separated from the solvent. However, GHS Hazards are for the product. • Haloxyfop variants have been described similarly in the SDS.

Risk profiling

The risk matrix below helps frame the level of risk for each ESRA exposure variable, and to also assist in comparing risk between the ESRA of different chemical pesticides. A score assessed as 3/2 means the likelihood is 'possible' and the consequence of the event 'minor'.

		LIKELIHOOD					
		1 - Negligible	2 - Unlikely	3 - Possible	4 - Likely	5 - Almost Certain	6 - Certain
CONSEQUENCE	6 - Catastrophic	Medium	High	Extreme	Extreme	Extreme	Extreme
	5 - Extreme	Medium	Medium	High	High	Extreme	Extreme
	4 - Major	Low	Medium	Medium	High	High	Extreme
	3 - Moderate	Low	Low	Medium	Medium	High	High
	2 - Minor	Low	Low	Low	Low	Medium	Medium
	1 - Insignificant	Low	Low	Low	Low	Low	Medium

Risk for some attributes will change between pre-control assessment risk and post mitigation control risk (residual risk), after initiating the mitigation control measures within the ESRA.

Exposure	List of values	HHP Hazards (Acute, chronic, environmental)	Assessment of Other potential risks – Pre-controls ^{1,2}	Assessment of Other potential risks - Post mitigation controls ^{1,2}	Descriptor of why / why not a risk ³	Mitigation strategies defined to minimise risk
Environmental	Soil (erosion, degradation, biota, carbon storage)	Na	3/3 = Medium	3/2 = Low	Risks vary and include: <ul style="list-style-type: none"> Classed as very toxic to the soil environment (NZ only). Very high to moderate mobility depending on conditions (K_{Foc} 27 – 500 ml/g). Two metabolites have very highly mobile (K_{Foc} 14 – 38 ml/g) and one is moderate to low. Moderate to high persistence in soil (DT50 (field) 55-100 days. Low biodegradability (OECD Test). Factors affecting persistence include temperature, rainfall, and soil type. Moderate bioaccumulation risk (BCF 100-3000, LogP 3 - 5). Potential increased erosion due to vegetation dieback. Risk increases with scale and intensity, especially in the erosion-prone hill country where infrastructure and slopes near waterways are prone to surface erosion. The risks reduce if oversown or hydro seeded cut/fill batters are not sprayed. 	Refer to NZS Standard 8409:2021 Management of Agrichemicals, especially section 5.2 Safe use of plant protection products. Although Ernslaw's mitigation measures should significantly reduce pre-control risks, not all risk can be eliminated as seen in the post-mitigation controls column. Depending on the residual risk, some sites may require more stringent versions of individual mitigation measures than those in the Silvicultural manual (which is informed by NZS Standard 8409:2021 Management of Agrichemicals). Appendix 1 describes mitigation measures for other pesticides that may be used in conjunction with Haloxyfop to improve the efficacy of the treatment.
	Water (groundwater, surface water, water supplies)	Na	3/3 = Medium	3/2 = Low	Risk levels to water vary and include: <ul style="list-style-type: none"> Entering water. There are three pathways to enter the water: directly into waterways from the spray, overland flow from rain, and via the soil to groundwater. <ul style="list-style-type: none"> Moderate to high risk of migration into water sources via all three routes because Triclopyr and its metabolite have moderate to very high mobility and are persistent. There are risks of leaching to groundwater. Risks when in water: <ul style="list-style-type: none"> Hazard classed as very toxic to aquatic life with long-lasting effects. Moderately persistent in water (DT50 (pH7) 5 -48 days but reduces in alkaline water. The risk profile to water increases with: <ul style="list-style-type: none"> Site factors that increase the potential for surface runoff, e.g. steep slopes, poorly draining soils and soils with shallow groundwater. Site factors that increase the potential of leaching to groundwater, e.g. sites with permeable soils with shallow water tables. Poor product application, e.g. spraying before heavy rain, direct spray or drift over water, or locating storage or load zones that increase the risk to water from accidental spillage. Haloxyfop has been approved by the NZ EPA to be sprayed over water with restrictions including a maximum application rate 0.75 kg ai/ha, up to 3 times per year, minimum application interval 30 days, EEL water 0.884 µg/L, TEL drinking water 0.0021 mg/L. 	
	Atmosphere (air quality, greenhouse gases)	Na	1/1 = Low	1/1 = Low	Risks are low, but aerial spraying will result in having pesticide in the air over the application area until the spray settles. No foreseen risks to the atmosphere.	
	Non-target species (vegetation, wildlife, bees and other pollinators, pets)	Na	Fish 3/4 = Medium Aquatic organisms 3/2 = Low Bees 2/2 = Low Birds 2/2 = Low Vegetation 4/4 = High Soil organisms 3/2 = low	Fish 3/3 = Medium Aquatic organisms 3/2 = Low Bees 2/2 = Low Birds 2/2 = Low Vegetation 2/2 = Low Soil organisms 3/2 = low	Haloxyfop environmental risks (pre mitigation controls) range from no risk to severe risk depending on non-target species: <ul style="list-style-type: none"> Aquatic: <ul style="list-style-type: none"> Hazard coded as very toxic to aquatic life (acute and chronic) High acute toxic to fish on an acute basis (LC50/EC50 between 0.1 and 1mg/L in the most sensitive species tested, e.g. LC50 (rainbow trout) (96hr) >0.92mg/L, (fathead minnows) 0.54mg/L). Data deficient on <i>chronic</i> toxicity for fish. No or low acute toxicity to aquatic invertebrates on an acute basis (EC50 (48hrs) (Daphnia (water flea)) 38 mg/L). Data deficient on <i>chronic</i> toxicity for aquatic invertebrates. Data deficient for sediment-dwelling organisms Low acute toxicity to aquatic algae (ErC50 (green algae) > 31 mg/l). Low acute toxicity to aquatic plants (EC50 (14 days) (common duckweed) 0.00036 mg/L). Terrestrial: <ul style="list-style-type: none"> Hazard coded as very toxic to the soil environment (NZ only). Severely affects non-target vegetation sensitive to Haloxyfop. Low to no acute toxicity to arthropods (LC50 (worm) 671 mg/kg). Moderate to no acute toxicity to birds on an acute basis (LD50 501-2150 mg/kg, LC50 (bobwhite quail) > 1517mg/kg body weight). Non-toxic to bees (LD50 (48hrs) >200ug/bee). 	
	Non-timber forest products (as FSC-STD-01-001 V5-2 FSC principles and criteria, criterion 5.1)	Na	2/2 = Low Aquaculture 3/4 = Medium	2/2 = Low Aquaculture 2/2 = Low	Risks are likely to be low because, under the canopy, non-timber products have not been established. Haloxyfop is typically used to release newly established trees from weed infestation. However, risks will occur where: <ul style="list-style-type: none"> Aquaculture is nearby as Haloxyfop is highly mobile, e.g. koura ponds, as koura can be highly sensitive to some pesticides. 	
	High conservation values (particularly HCV 1-4)	Na	4/5 = High	2/2 = Low	The risk of Haloxyfop to high conservation values in some situations could be extreme. Poor application adjoining or near a high conservation value area will compound the risk. Haloxyfop is a selective herbicide that will kill some plant species or cause dieback in others.	

	List of values	HHP Hazards (Acute, chronic, environmental)	Assessment of Other potential risks – Pre-controls ^{1,2}	Assessment of Other potential risks - Post mitigation controls ^{1,2}	Descriptor of why / why not a risk ²	Mitigation strategies defined to minimise risk
Environmental	Landscape (aesthetics, cumulative impacts)	Na	Small scale 1/1 = Large aerial 6/3 = High	Small scale 1/1 = low Large aerial 4/3 = Medium	The risk increases with scale and intensity. Large operational areas may significantly impact aesthetics. This could depend on the location of the treatment area and public sentiment. For example, treatment size, visibility, proximity to and type/sensitivity of neighbours, impact on public recreation, perceived impact on nearby parks, forest, or spray sensitive land users like orchards or organic farming.	
	Ecosystem services (water, soil, carbon sequestration, tourism)	Na	2/2 = Low	2/2 = Low	Risks are likely low. Haloxypop is not considered persistent, bioaccumulating and toxic (PBT), or very persistent and very bioaccumulating (vPvB). Refer to the water, soil, atmosphere and non-target species exposure variable assessments. However, specific circumstances may raise the risk profile. For example, if the treatment area was part of a municipal water catchment zone.	
Social	High conservation values (esp. HCV 5-6)	Na	2/2 = Low	2/2 = Low	The risk is likely to be low in most situations.	
	Health (fertility, reproductive health, respiratory health, dermatologic, neurological and gastrointestinal problems, cancer and hormone imbalance)	Na	3/3 = Medium	2/2 = Low	<p>The risks to health of Haloxypop are likely to be low when used according to label, SDS and good practice:</p> <ul style="list-style-type: none"> The following are oral, dermal or inhalation toxicity risks: <ul style="list-style-type: none"> Low to high acute oral toxicity (LD50 (rats) 337-4700 mg/kg). Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, consuming large amounts may cause serious injury. Acute dermal toxicity: Prolonged skin contact is unlikely to result in absorption of harmful amounts (LD50, (rat), >2,000 mg/kg). Brief contact is essentially non-irritating to the skin. Low acute inhalation toxicity (LC50 (rat) (4hrs) > 5.41 mg/L). Not likely to be an aspiration hazard. Excessive exposure may irritate nose and throat. May cause slight eye irritation. Corneal injury is unlikely. Carcinogenicity, mutagenicity, teratogenicity, reproduction, and endocrine risks: <ul style="list-style-type: none"> Carcinogenicity: Classed as a suspected human carcinogen (NZ). Haloxypop did not cause cancer in laboratory rats; however, there was a slightly increased incidence of malignant liver tumours in female mice in a lifetime dietary feeding study. Mutagenicity: Not mutagenic. In vitro genetic toxicity studies and animal genetic toxicity studies were negative. Teratogenicity: Likely to be teratogenic. Oral doses of 50 mg/kg/day of Haloxypop-ethoxyethyl in rats between days 6 and 16 of pregnancy caused developmental abnormalities in the offspring's urinogenital system and death to the foetus. Oral doses of 7.5 mg/kg/day of Haloxypop-methyl given to rats from days 6 to 15 of pregnancy caused delayed bone formation in the offspring. Reproduction or reproductive toxicity: Classed as suspected human reproductive or developmental toxicant (NZ). Conflicting information. In animal studies, did not interfere with reproduction (SDS). Endocrine disruption potential: unlikely to be an endocrine disruptor in mammals. However, no firm conclusion can be drawn on birds and fish. Specific Target Organ Systemic Toxicity risks: Hazard classified 'as may cause organ damage from repeated oral exposure at high doses'. <ul style="list-style-type: none"> Specific Target Organ Systemic Toxicity (Single Exposure): Evaluation of available data suggests that this material is not an STOT-SE toxicant. Chronic toxicity: <ul style="list-style-type: none"> Toxic to human target organs and systems. For similar active ingredient(s) in animals, effects have been reported on kidneys, blood, testes, thyroid and liver. Doses of 100 mg/kg/day of Haloxypop-methyl caused kidney damage in adult rats. Doses of 0.6 mg/kg/day for 2 years in mice caused reduced body weight gains and increased liver weights in mice. In dogs, 5 mg/kg/day causes a significant decrease in serum cholesterol, as well as a decrease in thyroid weight. The Australian Acceptable Daily Intake (ADI) for Haloxypop for a human is 0.0003 mg/kg/day, set for the public for daily, lifetime exposure (based on the NOEL of 0.3 mg/kg/day). 	Refer to NZS Standard 8409:2021 Management of Agrichemicals, especially section 5.2 Safe use of plant protection products.
	Welfare	Na	3/3 = Medium	2/2 = Low	<p>Haloxypop products are sold as emulsifiable concentrates. The solvent, often Diethylene glycol monomethyl ether, may account for 50% by volume. The solvent hazards are included.</p> <p>Australian GHS hazardous substances classification codes for health and environmental hazards include:</p> <ul style="list-style-type: none"> Acute toxicity - Category 4 – Oral, Acute aquatic toxicity - Category 1, Chronic aquatic toxicity - Category 1, H302: Harmful if swallowed, H315: Causes skin irritation, H320: Causes eye irritation, H332: Harmful if inhaled, H335: May cause respiratory irritation, H400: Very toxic to aquatic life, H410: Very toxic to aquatic life with long lasting effects Note: Australian SDSs are not consistent in their listing of hazard classifications. Refer to safe work Australia's summary tables https://www.safeworkaustralia.gov.au/system/files/documents/1702/classification_and_labelling_workplace_hazardous_chemicals_poster_a4.pdf <p>NZ hazardous substances classification codes for health and environmental hazards taken from the NZ EPA CCID database:</p> <ul style="list-style-type: none"> Health: Classification 6.1D (All), 6.1D (O), 6.4A, 6.7B, 6.8B, 6.9A (O), 6.9A (All), Environment: 9.1C (All), 9.1C (C), 9.3B. Note: NZ SDSs may have some, all, or additional hazard classifications. <p>Refer to NZ EPA for definitions of hazardous substances classification codes https://www.epa.govt.nz/industry-areas/hazardous-substances/rules-for-hazardous-substances/hazardous-substances-classification-codes/</p> <p>Refer to health and other social exposure elements as that can also influence welfare too.</p>	Appendix 1 describes mitigation measures for other pesticides that may be used in conjunction with Haloxypop to improve the efficacy of the treatment.

	List of values	HHP Hazards (Acute, chronic, environmental)	Assessment of Other potential risks – Pre-controls ^{1,2}	Assessment of Other potential risks - Post mitigation controls ^{1,2}	Descriptor of why / why not a risk ²	Mitigation strategies defined to minimise risk
Social	Food and water	Na	3/3 = Medium	2/2 = Low	The risks to health are likely low: <ul style="list-style-type: none"> • Haloxyfop is used in food-producing primary sectors. For example, in pasture management, citrus and pip fruit, and with crops like asparagus, onions and peas. • Eliminate the potential risk of accidental or ongoing oral ingestion of Haloxyfop by pesticide workers with poor on-the-job personal hygiene around food and drink. 	Refer to NZS Standard 8409:2021 Management of Agrichemicals, especially section 5.2 Safe use of plant protection products. Although Ernslaw's mitigation measures should significantly reduce pre-control risks, not all risk can be eliminated as seen in the post-mitigation controls column. Depending on the residual risk, some sites may require more stringent versions of individual mitigation measures than those in the Silvicultural manual (which is informed by NZS Standard 8409:2021 Management of Agrichemicals).
	Social infrastructure (schools and hospitals, recreational infrastructure, infrastructure adjacent to the management unit)	Na	1/1 = Low to 3/5 = High	1/1 = Low to 3/2 = Medium	Risk is likely low if the treatment area is well within the forest and away from in-forest or adjoining infrastructure. The risk is likely to increase with scale and intensity. For example, if the operation is on a boundary close to infrastructure or where there are in-forest rights. However, access and recreation would likely be restricted only during the operation.	
	Economic viability (agriculture, livestock, tourism)	Na	1/1 = Low to 3/5 = High	1/1 = Low to 3/3 = Medium	Risk is likely low if the treatment area is well within the forest. Risk increases with scale, intensity and operational complexity, especially if the operation is on a boundary. For example, an aerial overspray could have an economic impact on adjoining agriculture or horticulture, leading to costly compensation or legal action. Organics are especially vulnerable.	
	Rights (legal and customary)	Na	2/2 = Low	2/2 = Low	Risks to rights are likely to be low unless in specific situations like easements for water extraction or grazing. Operational areas will likely be closed off to those with rights only during the operation, e.g. utility companies or those with road access easements.	
	Other	Na	----	----	----	
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1 = The risk profile is only for the pesticide listed in the table. Often other pesticides are added to improve treatment efficacy, or with haloxyfop Diethylene glycol monoethyl ether, for solubility. Also, risk will vary between sites, methods and scale and intensity of the treatment.

2 = It is recommended to take a precautionous approach when using all pesticides. New research may bring to light risks that were not identified in previous assessments. The EFSA peer review identified a critical area of concern due to a lack of information to conclude the impact on consumer use for some uses. Therefore, research is not exhaustive and the effects on some exposure variables are not known or fully understood. **Also, between SDS's there can be conflicting data, variation in both amount and quality of information, and differing judgements of risks. Therefore, consider reviewing SDS's of similar pesticide products.** For example, Verdict 520's datasheet is much more detailed than other brands and includes information on the solvent diethylene glycol monoethyl ether which often accounts for up to half of the product mix.