

PESTICIDE TYPE	HERBICIDE
Chemical Class	Glutamine synthetase inhibitor
Common Trade Names	Liberty® ULTRA Herbicide – Powered by Glu-L™ Technology, L-Glufosinate Liquid Formulation
Major Degradate	MPP, NAG, HOE 086486, CO ₂
Application Rate (lb a.i./A/year)	Max Single: 0.184 – 0.359 Max Annual: 0.367 – 0.727
Registration Status	EPA: Registered Oct. 2024 Minnesota: 2024
Toxicity Profile for Applicators	Signal word: DANGER Category II: Oral (acid) Category III: Oral (ammonium), Inhalation, Dermal, eye (acid) Category IV: Eye Irritant (acid), Skin Irritant
Basic Manufacturer	BASF, MITSUI
MDA Laboratory Capabilities	In discussion
HUMAN HEALTH	
Non-Cancer	Acute PAD: 0.5 mg/kg Chronic PAD: 0.015 mg/kg/day
Cancer	Not likely to be carcinogenic to humans
<i>Acute and chronic population adjusted doses (PAD) include all relevant uncertainty and safety factors.</i>	
ENVIRONMENTAL AQUATIC TOXICITY	
Fish	Acute: >46,450 ppb Chronic: 24,000 ppb
Invertebrate	Acute: >5,150 ppb Chronic: 28,000 ppb
Aquatic Plants (IC ₅₀)	Vascular: 590 ppb Non-vascular: 26 ppb
POLLINATOR TOXICITY	
Honey Bee (adult LD ₅₀)	Acute Contact: > 36.4 µg ae/bee Acute Oral: > 39.08 µg ae/bee
<i>Level of Concern (LOC) has been applied to all values. Toxicity values refer to the technical grade active ingredient (TGAi).</i>	

INTRODUCTION

Glufosinate-P, or L-glufosinate, is an herbicide active ingredient recently registered by the EPA as a foliar spray for broadleaf and grassy weed control. Registered uses for glufosinate-P include canola, corn, cotton, and soybean (conventional and glufosinate-resistant varieties).

Glufosinate-P is an enriched isomer of the herbicide glufosinate (also known as racemic glufosinate), an active ingredient registered since 2000. Racemic glufosinate is a mixture of two stereoisomers, D-glufosinate and L-glufosinate, of which only the latter has herbicidal properties. The newly registered glufosinate-P only contains the herbicidal-active isomer, L-glufosinate. Two distinctive forms of glufosinate-P were granted registration: glufosinate-P-ammonium (BASF) and glufosinate-P free acid (MITSUI). However, the EPA considers both chemicals to be the same active ingredient as they exist in the same form in the environment.

Glufosinate-P is a glutamine synthetase inhibitor (Group 10) which acts by preventing the conversion of glutamate and ammonia to glutamine in plant cells. The resulting accumulation of ammonia inhibits photosynthesis, killing the plant.

The Minnesota Department of Agriculture’s (MDA) extensive review of the EPA-approved glufosinate-P labels and risk assessments for issues relevant to Minnesota is summarized below.

PROJECTED USE IN MINNESOTA

Glufosinate-P has the same management benefits as racemic glufosinate products, including flexible application timing, which allows for postemergence weed control in glufosinate-resistant crops or early-season use on non-tolerant crops. As glufosinate-P only contains the herbicidal glufosinate isomer, glufosinate-P products require approximately half the application rate as racemic glufosinate, potentially reducing the number of containers needing to be purchased, rinsed, and recycled. Glufosinate-P products, however, may have more restrictive risk mitigation requirements than racemic glufosinate.

Application methods for glufosinate-P are limited to aerial and ground boom. Single application rates range from 0.184 to 0.359 pounds acid equivalent per acre (lb ae/A) and annual application rates range from 0.367 to 0.727 lb ae/A, depending on the application method.

Six glufosinate-P products are currently registered by the EPA. As of January 2025, only one is registered in Minnesota.

- **Liberty® ULTRA Herbicide** – Powered by Glu-L™ Technology (EPA Reg. No. 7969-500) – Nonselective, post-emergence foliar herbicide containing 18.7% glufosinate-P-ammonium that provides control of a broad spectrum of broadleaf and grassy weeds in LibertyLink or glufosinate-resistant crops.

LABEL ENVIRONMENTAL HAZARDS

Environmental Hazards

- **Surface Water Advisory** – Do not apply directly to water or to areas where surface water is present. Do not apply to intertidal areas below the mean high-water mark. Do not contaminate water by cleaning of equipment or disposal of equipment washwater or rinsate. This pesticide is toxic to vascular plants and needs to be used strictly in accordance with the drift and runoff precautions on this label in order to minimize off-site exposures. Under some conditions, this product may have a potential to run off to surface water or adjacent land. Where possible, use methods which reduce soil erosion, including no till, limited till, and contour plowing; these methods also reduce runoff.
- **Pollinator Advisory Statement** – This product contains a herbicide. Follow all label directions and precautions to minimize potential off-target exposure to prevent effects to non-target plants adjacent to the treated site which may serve as habitat or forage for pollinators.

Endangered Species Protections

- **Endangered and Threatened Species Protection Requirements** – Currently, no glufosinate-P use limitations exist in Minnesota for listed species. Check [Bulletins Live! Two](#) before applying.
- **Mandatory Spray Drift Management** – Applicators must comply with spray drift mitigations and buffers listed on the label.
- **Mandatory Runoff Mitigation** – Do not apply when soils are saturated or above field capacity or during rain. Applicators must achieve the minimum mitigation points required by the label unless certain field/application parameters are present (see www.epa.gov/pesticides/mitigation-menu for more info).

TOXICOLOGY AND EXPOSURE

EPA's screening models generate high-end, conservative exposure estimates for active ingredients and toxicologically significant degradates. Model inputs include annual usage at maximum use rates, maximum treated acres, maximum food residues, peak runoff, and drift scenarios, etc. Some proposed products, application rates, and use scenarios are not relevant to Minnesota. EPA's estimates, therefore, may not reflect future use and impacts in Minnesota.

Human Health

- **Carcinogenic Effects** – EPA classified glufosinate-P as “not likely to be carcinogenic to humans.”
- **Drinking Water Guidance** – Estimated drinking water concentrations for glufosinate-P are 201 µg/L (acute) and 24.4 µg/L (chronic). Acute and chronic dietary (food and drinking water) exposures and risk estimates are below the EPA's LOC.
- **Occupational Exposure** – Short- to intermediate-term occupational handling exposures are possible. The EPA determined risk estimates were not of concern with baseline attire, label-required PPE, and following the label restricted-entry interval of 12 hours.

Non-target Species

- **Aquatic Life Exposure** – Acute exposure to glufosinate-P is practically non-toxic for freshwater fish and aquatic invertebrates. Chronic toxicity assays in freshwater fish

and aquatic invertebrates led to a reduction in post-hatch survival and a reduction in offspring/females, respectively. All proposed uses of glufosinate-P exceed the EPA's LOC for risk to non-vascular aquatic plants.

- **Terrestrial Life Exposure** – The acute risk of glufosinate-P to mammals, birds, reptiles, and terrestrial-phase amphibians is expected to be low. Acute contact exposure for non-bee terrestrial invertebrates could pose a risk and may adversely affect populations and communities. Chronic risk concerns exist for mammals, non-bee terrestrial invertebrates, and upland terrestrial and semi-aquatic plants. For mammals, small, medium, and large-sized animals feeding on grasses and broadleaf plants treated with glufosinate-P or exposed arthropods are at risk for chronic exposure. Chronic risks are not expected for birds, reptiles, or terrestrial-phase amphibians.
- **Pollinators** - Glufosinate-P is practically non-toxic to adult honey bees on an acute contact or oral exposure basis and practically non-toxic to larval honey bees on an acute oral exposure basis. However, chronic risks of concern were identified, including reduction in adult bee emergence, and feeding.

ENVIRONMENTAL FATE

Glufosinate-P has low persistence and high mobility in soil and is not likely to volatilize from soil or water. Glufosinate-P may be transported to surface water via spray drift and runoff or to groundwater via leaching.

Soil

- **Half-life** – Aerobic: 1.71 to 22.9 days (20 – 22°C)
Anaerobic: 56 days (22°C)
- **Mobility** – K_{Foc} values range from 16.5 to 605 L/kg_{oc}
Solubility in water (20°C) is 1.37 x 10⁶ mg/L
- **Photolysis Half-life** – 17 days (25°C)
- **Persistence** – DT₅₀ values range from 1.1 to 30 days

Aquatic

- **Half-Life** (20°C) – Aerobic: 1.52 to 36.1 days
Anaerobic: 387 days
- **Photolysis Half-life** – 87 days (pH 8.3); Stable at pH 5, 7 (25°C)
- **Hydrolysis Half-life** – Stable at pH 5, 7, and 9 (25°C)

Air

- **Volatilization** – Nonvolatile; Vapor pressure (20°C) = <7.5 x 10⁻⁹ torr;
Henry's law constant (20°C) = 2.2 x 10⁻¹⁷ atm-m³ mol⁻¹

Degradates

Glufosinate can form five major degradates, MPP, MPA, NAG, HOE 086486, and CO₂, and one minor degradate, HOE 065594. All degradates are equally or less toxic than the parent compound. The parent chemical, glufosinate, is the only Residue of Concern (ROC) for ecological risk. The human health drinking water assessment includes the parent compound and MPP as ROCs. Glufosinate ammonium, NAG, and MPP are ROCs for tolerance enforcement and risk assessment for plant and livestock commodities.