Hexazinone

HERBICIDE INFORMATION PROFILE

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE, PACIFIC NORTHWEST REGION

Healthy Forests Make A World Of Difference

This information profile is produced by the USDA Forest Service, Pacific Northwest Region, for employees, forest workers, and for the public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions for the herbicide hexazinone and its formulations. A list of definitions is included in Section VIII of the information profile. For general information on herbicide use by the Forest Service, refer to the PNW Region Treatment Methods Profile for Herbicides.

I. BASIC INFORMATION

COMMON NAME: Hexazinone

CHEMICAL NAME: 3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4 (1H,3H)-dione

REGISTERED HEXAZINONE PRODUCTS

Manufactured by DuPont	Manufactured by Pro-Serve:
Velpar®	Pronone® 10G
Velpar® ULW	Pronone® MG
Velpar® L	Pronone® Power Pellet

REGISTERED USE STATUS: "General Use"

FORMULATIONS: Commercial hexazinone products generally contain one or more inert ingredients. An inert ingredient is anything added to the product other than an active ingredient. The names of inert ingredients are not usually listed on the label.
All inert ingredients used by DuPont in Velpar® formulations are listed in alphabetical order. The presence and amounts of each inert in each formulation is not released by the manufacturer.

acetic acid
diisopropyl naphthalene sulfate
ethanol
hydroxypropyl methyl cellulose
hydrous sodium silico aluminate
lactose
polyethoxylated dinomyl phenyl
potassium dihydrogen phosphate
sodium alginate
sodium benzoate
sodium sulfosuccinic acid
sodium tallowate
sugar
water

(Baer, C.; 1991)

All inert ingredients used by Pro-Serve in Pronone® 10G are listed in alphabetical order. Pronone® MG is the same product, manufactured to a different size granule. The presence or absence, and amount of each inert is not released by the manufacturer. The identity of the inerts in other Pronone® formulations is not released.

acetic acid
diisopropyl naphthalene sulfate
ethanol
ethyleneoxide-propyleneoxide copolymer
hydroxypropyl methyl cellulose
hydrous sodium silico aluminate
lactose
montmorillonite clay
polyethoxylated dinomyl phenyl
potassium dihydrogen phosphate
sodium alginate
sodium benzoate
sodium sulfosuccinic acid
sodium tallowate
sugar
water

(Cochran, R; 1992)

No ingredient in any hexazinone formulation was categorized by EPA to have evidence or suggestion of toxic effects. Hexazinone inert ingredients were categorized as either: low priority for health effects testing based on absence of data or suspect chemical structure suspect to cause toxic effects *(List 3);* or generally recognized to be safe *(List 4).*

Residue Assay Methods: Gas/liquid chromatography, high performance liquid chromatography, and mass spectrometry are available for residue assay. These methods have been accepted by EPA, but the Forest Service does not have information on their accuracy for measuring hexazinone residues. The Forest Service will try to verify the recovery rates for these methods.

II. Herbicide Uses

Registered Forestry, Rangeland, Right-of-Way Uses: Forestry uses on Christmas tree plantations, conifer nurseries, conifer release, forest plantings, terrestrial food crop use on pastures, rangeland, and fallowland; terrestrial non-food crop use on rights-of-way and industrial and facility sites.

Operational Details:

Target Plants: Hexazinone is used to control broadleaf weeds, grasses and woody plants.

Mode of Action: Hexazinone inhibits photosynthesis. It is readily absorbed through leaves and roots and moves in an upward direction through the plant.

Method of Application: Aerial broadcast; basal soil treatment; undiluted spot treatment; tree or brush injection.

Use Rates: Use 0.45 to 12 pounds active ingredient per acre. Do not use on gravelly or rocky soils, exposed subsoils, clay knobs, or sandy soil with 85% or more sand. Use the higher amounts on soil with more clay or organic matter.

Special Precautions:

Always read all of the information on the product label before using any pesticide. Read the label for application restrictions.

Timing of Application: Do not apply over snow or frozen ground. Apply after ground thaws; broadcast application in the spring; best performance when application is followed by rainfall and warmer temperatures; do not apply to saturated soils. In low-moisture areas, can be applied in fall before snowfall.

Drift Control: Prevent drift of spray to desirable plants. Use directional spray equipment to prevent contact with conifer foliage if application is after bud break. Do not apply within three times the height or canopy diameter (whichever is greater) of desirable trees.

III. Environmental Effects/Fate

Soil:

Residual Soil Activity: Hexazinone may remain in the soil at low concentrations for up to three years after application.

Adsorption: Hexazinone is only minimally adsorbed to soil but is highly adsorbed to the leaf-litter layer. Adsorption may be related to some chemical characteristics of the soil. Organic matter content of the soil does not affect hexazinone adsorption. In experiments, hexazinone has moved both vertically and horizontally in water in the soil *(USDA, 1984).*

In laboratory tests, hexazinone mobility in soils of different textures ranged from "Immobile" to "Intermediate" as classified by the EPA. Fine-textured soils (e.g. clay loam) adsorbed hexazinone more than coarse-textured soils (e.g. sandy loam). *(Priester & Sheftic, 1989).* This study was released to the Forest Service, but is not released by the manufacturer to the public for review.

Persistence and Agents of Degradation: Hexazinone is persistent in soil. In the field, it degrades to one-half of its initial concentration in 1 to 6 months. Degradation rate depends on weather conditions and soil type. Hexazinone may persist longer in areas with more leaf litter

and during cooler weather. Hexazinone is broken down primarily by soil microorganisms. Hexazinone may also be degraded by light.

METABOLITES/DEGRADATION PRODUCTS AND POTENTIAL ENVIRONMENTAL EFFECTS: Hexazinone will release carbon dioxide upon breakdown. Carbon dioxide is a normal atmospheric component. No information is available on the possible effects on the environment of other metabolites of hexazinone found in the soil: these include 3-cyclohexyl-1-methyl-6-methylamino-1,3,5-triazine- 2,4(1H,3H)dione; 3-(4-hydroxycyclohexyl)-6-(dimethyl-amino)-1-methyl-1- (1H,3H)-dione; and the triazine trione.

WATER:

SOLUBILITY: Powder and granule formulations dissolve well in water. The liquid formulation disperses in water.

POTENTIAL FOR LEACHING INTO GROUND WATER: Hexazinone persists in water in the soil, where light is absent. It is relatively mobile, depending on soil type. EPA has identified a potential for groundwater contamination. They will review results of new environmental fate studies before deciding what specific groundwater studies may be required. *(Tinsworth, 1989)*

SURFACE WATERS: Hexazinone does have some potential to move through buffer zones and into surface streams, though it degrades rapidly in surface waters when light stimulates chemical reactions. Water monitoring after forestry applications of hexazinone detected residues intermittently for at least eight months in one study, and over a year in another *(Mayack et. al., 1982; Bouchard, 1983).*

AIR:

VOLATILIZATION: Hexazinone does not evaporate easily.

POTENTIAL FOR BY-PRODUCTS FROM BURNING OF TREATED VEGETATION: Hexazinone residues in smoke were below detectable limits when treated forest vegetation was burned *(McMahon et. al., 1990).* Combustion products of hexazinone have not been identified or measured in smoke from burning vegetation.

IV. ECOLOGICAL EFFECTS

Please refer to Section X for definitions of ecotoxicological categories.

SOIL MICROORGANISMS: In one study, hexazinone was found to temporarily depress the development of mycorrhizal fungi *(Chakravarty, 1988).* Other studies showed no effects on soil fungi and bacteria *(USDA-Forest Service, 1984).*

Tests of Velpar® formulation showed no effect on soil microbial processes. *(Batelle-Institut e.V., 1989).*

PLANTS: Hexazinone is highly toxic to many non-target plants. Because of hexazinone's toxicity, mobility, and persistence, some applications have been observed to cause damage to off-site plants *(Allender, 1991; Wan, 1990).*

AQUATIC ANIMALS: Hexazinone is practically non-toxic to fish, fresh water invertebrates and mollusks, and is slightly toxic to crustaceans. No toxicity studies have been reported for amphibians. No chronic studies have been reported for aquatic organisms. Acute toxic level:

Species	LC50
crustaceans	78 to >1000 ppm
fish	>274 to >505 ppm

Species	EC50
invertebrate	145.3 ppm
mollusks	>320 ppm

DuPont has tested the Velpar® L formulation for acute toxicity to aquatic invertebrates and fish. Velpar® L was chosen for testing because it has the largest proportion of inert ingredients of the three Velpar® formulations. The formulation was found to be less toxic than hexazinone to the tested organisms. Results of these tests have been provided to the Forest Service *(in Baer, 1992a).* The studies are not released to the public by the manufacturer.

Tests in British Columbia found Velpar® L and Pronone® 10G formulations to be less acutely toxic to salmon and trout than hexazinone *(Wan, et. al., 1988).*

Salmonids	LC50
Velpar® L	904 mg/l
Pronone® 10G	1686 mg/l

TERRESTRIAL ANIMALS: Hexazinone is practically non-toxic to birds and slightly toxic to mammals.
ACUTE TOXIC LEVELS:

Species	LD50
birds	2,258 mg/kg
mammals	1,690 mg/kg

DuPont has submitted to EPA a new study of acute toxicity of hexazinone to honey bees. Hexazinone was found to be practically nontoxic (LD50 >100 micrograms/bee) *(Hoxter, et. al., 1989).* EPA has not required any label precautions to protect honeybees.

When hexazinone is ingested by animals, it is broken down into metabolites which are rapidly excreted in the urine and feces. Hexazinone does not accumulate in the tissues of exposed animals.

Velpar® formulations have been tested for acute toxicity to mammals in laboratory environments. No tests of formulations for acute toxicity to wildlife species have been reported. Hexazinone and its formulations have not been tested for chronic toxicity on wildlife species. Testing on laboratory mammals of hexazinone and its formulations is reported in Section V.

One study in forests treated with Pronone® 10G showed no acute or chronic health effects on rodent species over two years of monitoring. Low concentrations of hexazinone were detected in animals for up to one year after application *(Penner, 1989).*

THREATENED AND ENDANGERED SPECIES: Hexazinone has been identified as a hazard to endangered plant species found on forests and rangelands *(EPA, 1988a).* The finding is based on hexazinone's toxicity to nontarget plants and its intended uses.

V. HEALTH EFFECTS TESTING

The data here are results of laboratory animal studies. For pure hexazinone, the Environmental Protection Agency has evaluated these studies during the registration process.

Studies of the acute toxicity of Velpar® formulations of hexazinone have been submitted to EPA to meet data requirements. Results of these tests have been provided to the Forest Service *(Baer, 1992b).* Most of these studies are classified as Confidential or Trade Secret by the manufacturer, and are not released to the public. The Forest Service will try to determine whether EPA has accepted these tests, and disclose its findings in future editions of this profile.

The acute oral toxicity of Pronone® 10G is disclosed: Pronone® MG is the same formulation. EPA accepted data for Velpar® to represent the acute oral toxicity of Pronone® Power Pellet *(Cochran, 1992).*

EPA waived some specific formulation tests when hexazinone test results were Slightly Toxic or Practically Nontoxic, and the formulation was predicted to have similar results. Actual formulation tests are noted for each category of acute toxicity. Numerical results are only noted where formulations showed significantly greater toxicity than pure hexazinone.

ACUTE TOXICITY:

ACUTE ORAL TOXICITY (tests in male rats):

Hexazinone
Median lethal dose: 1,690 mg/kg
Slightly Toxic (Category III).

The Environmental Protection Agency requires

an additional test in female rats in order to fully evaluate the acute toxicity of hexazinone. Depending on the results of this test, additional tests of dermal and inhalation toxicity may also be required.

Velpar®, Velpar® ULW, and Velpar® L have been tested. Only Velpar® ULW was more toxic than hexazinone. This data was used to estimate the toxicity of Pronone® Power Pellet.

Velpar® ULW
(Pronone Power Pellet)
Median lethal dose: 1,200 mg/kg
Slightly Toxic (Category III).

ACUTE DERMAL TOXICITY (tests on male rabbits):

Hexazinone
Median lethal dose: >5,278 mg/kg
Practically Nontoxic (Category IV).

Velpar® ULW, and Velpar® L have been tested. EPA waived this test for Velpar® (90% hexazinone) based on the results for hexazinone. Studies indicated possible greater toxicity for Velpar® ULW.

Velpar® ULW
Median lethal dose >2,000 mg/kg
Slightly Toxic (Category III)

PRIMARY IRRITATION SCORE (tests in rabbits):

Hexazinone
Not an irritant (Category IV)

Velpar® ULW, and Velpar® L have been tested. EPA waived this test for Velpar® (90% hexazinone) based on the results for hexazinone.

The formulations were not considered to be primary skin irritants, or skin sensitizers *(USDA, Forest Service, 1984).*

PRIMARY EYE IRRITATION (tests in rabbits):

Hexazinone
Severe eye irritant (Category I)

Velpar®, Velpar® ULW, and Velpar® L have been tested. EPA waived this test for Velpar® (90% hexazinone) based on the results for hexazinone. Studies indicated less eye irritation for Velpar® ULW than hexazinone.

Velpar® ULW
Moderately irritating (Category I)

ACUTE INHALATION (study in male rats):

Hexazinone
Median lethal concentration: >7.48 mg/l.
Slightly Toxic (Category III)

Velpar®, and Velpar® L have been tested. EPA waived this test for Velpar® ULW based on the results for Velpar®.

Velpar®L
Median lethal concentration: >5 mg/l
Slightly Toxic (Category III)

CHRONIC TOXICITY:

These data are also based on tests in laboratory animals. EPA requires these tests only for the active ingredient hexazinone. No tests of formulations for chronic toxicity have been reported. Please refer to Section X for an explanation of how NOEL (No Observable Effects Level) is calculated.

The Pacific Northwest Region FEIS risk assessment evaluated the quality of the testing that had been done on hexazinone up to 1988. Quality considerations for individual studies included: range of doses and species that were tested; length of test; identification of the most sensitive effect. Additionally, the degree of quantitative agreement among all tests for an effect was considered. Please refer to Section X for an explanation of qualitative ratings in this section.

SYSTEMIC TOXICITY:

NOEL for hexazinone: 10 mg/kg/day (rat and mice tests).

The PNW Region FEIS rated the quality of testing as

Marginally Adequate;

CARCINOGENICITY:

In laboratory tests, no cancer-causing effects were observed in male and female rats up to the highest dose of hexazinone tested (125 mg/kg). A study in mice is being re-evaluated by the Environmental Protection Agency.

The PNW Region FEIS rated the quality of testing as Adequate.

Of the three types of mutagenicity tests required for registration, results for two types were negative. The Environmental Protection Agency concluded that hexazinone is not a mutagen.

REPRODUCTIVE/DEVELOPMENTAL:

A three-generation rat study of reproductive effects of hexazinone found decreased weight of offspring at the highest test dose (125 mg/kg/day). The NOEL for these effects was therefore set at the next dose, 50 mg/kg/day. The EPA requires additional data for this study to meet full standards for acceptance.

Laboratory tests with hexazinone in pregnant rats indicated no evidence of birth defects at dose levels up to 100 mg/kg. Although higher doses did produce developmental effects, the Environmental Protection Agency concludes that hexazinone is not a teratogen.

The PNW Region FEIS evaluated the testing as Marginally Adequate for these effects.

OTHER POSSIBLE HEALTH EFFECTS

There was insufficient information available to evaluate the potential for effects to the nervous or immune systems. No studies of hexazinone effects to these systems were reported.

VI. HUMAN HEALTH EFFECTS

FOREST SERVICE EVALUATION OF HUMAN HEALTH RISKS:

The Pacific Northwest Region evaluated a range of hexazinone health effects data, including laboratory studies cited in Section V. Both quantitative (numerical) estimates of toxicity, and the quality of data used to make numerical estimates were evaluated.

The FEIS Quantitative Risk Assessment predicts the amount of human exposure—both to project workers and to the public—from typical forestry operations, and also from a large accidental spill. The Risk Assessment used this information to assess health risks from typical uses. These risks were compared to EPA standards of acceptable risk for human health effects. The FEIS risk assessment identified as "Moderate" or "High" any predicted risks from Forest Service operations that were greater than EPA standards. Specific mitigation measures were designed to reduce human exposure from these operations; they are mandatory for every applicable project on National Forest lands. The complete set of risk ratings is displayed in Section. X.

The quality of the existing data affects the reliability of these risk ratings. The FEIS judged the overall quality of available data on hexazinone toxicity to be "marginal, with usable information". There were studies of adequate quality and results did not vary greatly. Overall estimates were considered moderately reliable, but new studies would increase reliability, and could change the current estimates of health effects.

POTENTIAL FOR HEALTH EFFECTS TO THE PUBLIC:

Forest visitors and nearby residents could be exposed to herbicide drift, to vegetation with herbicide residues, and to accidental spraying. They also could eat food or drink water containing herbicide residues. No studies of public exposure were available; public doses were estimated based on the behavior of the herbicide in the environment. "Routine Application" estimates maximum possible public exposure under normal operating conditions. The "Large Spill" situation models the highest doses that could ever be reasonably be expected to occur. Typical public exposures and risks would be much lower than either situation.

MITIGATING MEASURES TO REDUCE HEXAZINONE RISKS TO PUBLIC:

"High" risk of general health effects, and "High" risk of reproductive effects if exposed to concentrated hexazinone from a large spill:

Prevent all public contact with accidental spills (emergency spill notification system, restrict public access to spill site).

PROBABILITY OF A WORKER RECEIVING A DOSE WHICH AFFECTS GENERAL HEALTH OR REPRODUCTION:

Worker exposure and dose were estimated for typical forestry applications. Studies are available that measure actual worker doses of herbicide for some typical forestry applications. Worker doses do not account for any reduction in exposure from following safety precautions or mitigating measures (such as wearing protective clothing).

MITIGATING MEASURES TO REDUCE IDENTIFIED HEXAZINONE RISKS TO WORKERS:

The R6 FEIS did not identify any specific mitigating measures to reduce exposure in hexazinone applications. Mitigating Measure 13 requires workers applying any herbicide to wear protective clothing. Mitigating Measure 23 requires worker and public exposure monitoring for all herbicide application projects.

ACUTE TOXICITY (POISONING):

REPORTED EFFECTS: Hexazinone has not been reported to have caused any deaths or hospitalized cases. Inhalation of hexazinone dust caused vomiting after 24 hours in one reported incident.

A forestry application crew reported frequent headaches after handling and breathing odors when working with a Velpar® L formulation. The project report identified as possible contributing factors:

- Ammonia odor from a dye additive.
- Accidental contact with Velpar® L, aggravated by leaking, malfunctioning equipment.
- Physical stress from wearing protective clothing (respirators, goggles, rubber gloves) in hot humid weather.

The crew also reported traveling to work in a contained vehicle with the formulated herbicide, an unsafe transport practice that may increase worker exposure *(Goetzinger, undated).*

CHRONIC TOXICITY:

REPORTED EFFECTS: There are no reported cases of long-term health effects in humans due to hexazinone exposure.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM CONTACTING OR CONSUMING TREATED VEGETATION, WATER, OR ANIMALS: The metabolism of hexazinone in animals is not adequately understood for EPA to set allowable residue levels. Until these studies are completed, do not graze domestic animals on treated areas within 30 days following treatment *(EPA, 1988a).*

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM INERT INGREDIENTS CONTAINED IN THE FORMULATED PRODUCT: Specific toxicity information is not available for every inert ingredient. No ingredient in any hexazinone formulation was categorized by EPA to have evidence or suggestion of toxic effects. Hexazinone inert ingredients were categorized as either: low priority for health effects testing based on absence of data or suspect chemical structure suspect to cause toxic effects (List 3); or generally recognized to be safe *(List 4).*

HEALTH EFFECTS OF EXPOSURE TO FORMULATED PRODUCTS: Direct contact of the eyes with liquid hexazinone formulations will have corrosive effects and could cause irreversible eye injury.

HEALTH EFFECTS ASSOCIATED WITH CONTAMINANTS: No toxic contaminants have been found in hexazinone.

EPA required tests of hexazinone formulations for nitrosamine contaminants because of certain chemicals used in its manufacture. Tests of six formulation samples did not contain any detectable amounts. Health effects from nitrosamine as a hexazinone contaminant would be reflected in test results for hexazinone itself *(Liao, et. al.; 1989).*

HEALTH EFFECTS ASSOCIATED WITH OTHER FORMULATIONS: Hexazinone is not commercially formulated with other herbicides.

SOCIETAL PERCEPTIONS:

Public opinion about herbicide use in general ranges from a perception that herbicides are completely safe, to a perception that they are very hazardous. A full range of opinion is available in the FEIS. Beginning in 1992, the PNW Region will publish a bibliography of recent anecdotal and scientific accounts, and an analysis of reported worker health effects. These information profiles will be updated to reflect the results of these reviews as needed.

VII. SAFETY PRECAUTIONS

SIGNAL WORD AND DEFINITION:

Velpar® L and Velpar® ULW:
DANGER - CAUSES EYE DAMAGE

Velpar®:
WARNING - MAY IRRITATE EYES, NOSE, THROAT AND SKIN

Pronone® 10G, MG, Power Pellet:
CAUTION

PROTECTIVE PRECAUTIONS FOR WORKERS: To avoid eye damage, all mixers, loaders and applicators must wear protective goggles, face shields, or safety glasses. Avoid contact with skin and clothing. Workers performing hand tasks should delay entry into treated areas until sprays have dried. Workers performing other tasks should wear protective eye equipment if entering treated area before sprays have dried. All exposed workers should wash thoroughly with soap and water after handling and should remove and wash contaminated clothing before reuse.

MEDICAL TREATMENT PROCEDURES (ANTIDOTES): In case of contact, flush skin and eyes with plenty of water; for eyes, get medical attention and flush with water for at least 15 minutes. If inhaled, bring affected individual to fresh air. If breathing is difficult, give oxygen; if not breathing, give artificial respiration. If swallowed, immediately give two glasses of water and induce vomiting. Never give anything by mouth to an unconscious person. Call a physician. In case of emergency, call your local poison control center for advice.

HANDLING, STORAGE, AND DISPOSAL: The powdered form of the material may form explosive mixtures under severe dusting conditions. The liquid is flammable and its vapor forms an explosive mixture with air. Heating can release vapors which can be ignited. Do not dispose of wastes or container wash water into surface water or sanitary sewer systems. Remove non-usable solid material and/or contaminated soil for disposal in an approved and permitted landfill. Dispose of emptied bag in a sanitary landfill or by incineration. Bags may be burned if allowed by state and local authorities. If burned, stay out of smoke.

EMERGENCY (SPILL) HAZARDS AND PROCEDURES: For dike spills, present liquid from entering sewers, waterways or low areas. Soak up liquid with sawdust, sand, oil dry, or other absorbent material—shovel or sweep up. If spill area is on ground near valuable plants or trees, remove top three inches of soil after initial cleanup. Use appropriate personal protective equipment during cleanup, including protection for the eyes. In case of a large spill, call CHEMTREC at 1-800-424-9300 for advice.

VIII. DEFINITIONS

acute toxicity - the amount of a substance, as a single dose, to cause poisoning in a test animal

adsorption - the process of attaching to a surface

basal treatment - applied to the stem of a plant just above the soil

broadcast application - applied over an entire area

carcinogenicity - ability to cause cancer

chronic toxicity - toxic effects produced in test animals exposed for long periods to a chemical

dermal - of, or related to, the skin

EC50 - the concentration which will cause a toxic effect in 50% of the subjects

formulation - the form in which the pesticide is supplied by the manufacturer for use

herbicide - a substance used to destroy plants or to slow down their growth

LC50 - the concentration in air or water which will kill 50% of the subjects

LD50 - the dose which will kill 50% of the subjects

leach - to dissolve out by the action of water

mg/kg - milligrams of the substance per kilogram of body weight

mg/l - milligrams of dissolved substance per liter of water

microorganisms - living things too small to be seen without a microscope

mutagenicity - ability to cause genetic changes

non-target - animals or plants other than the ones which the pesticide is intended to kill

persistence - tendency of a pesticide to remain in the environment after it is applied

ppb - parts per billion parts

ppm - parts per million parts

residual activity - the remaining amount of activity as a pesticide

teratogen - a compound having the property of causing birth defects

volatility - the tendency to become a vapor at relatively low temperature

IX Information Sources:

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Chapter IV, Environmental Consequences: Human Health Effects Characterization and Management of Risk
Appendix C: Herbicide Use and Efficacy
Appendix D: Quantitative Risk Analysis
Appendix J: Herbicide Review with Wildlife-oriented Effects

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For more information on hexazinone, contact your local Forest Service office.

March 1992

This Hexazinone Information Profile is based on the "Hexazinone Pesticide Fact Sheet" developed by Information Ventures, Inc. under USDA Forest Service Contract Number 53-3187-104.

X. Toxicity and Risk Categories

Table of Categories of Toxicity

Estimates of Health Risks to the public and to workers from Forest Service Operations

The FEIS predicts levels of human exposure (dose) for project workers and for the public, for both a typical field project and for a large accidental spill. These dose levels are compared to the highest dose level in animal tests that showed no health effect (No Observed Effects Level). The risk is ranked from "Negligible" to "High" based on the margin between the expected human dose and the highest NOEL—"no effect" dose. A "High" risk rating means that the highest NOEL dose is not more than ten times larger than predicted human dose under the specified conditions. A "Moderate" risk rating means that the highest NOEL dose is between 10 and 100 times larger than the expected human dose.

Estimated Health Risks To The Public		
Situation	**General Health**	**Reproductio**
Routine Application	Low	Low
Large Spill	High	Moderate

Estimated Health Risks To Project Workers		
Situation	**General Health**	**Reproduction**
Aerial Mixer/Loader	Low	Low
Backpack Sprayer	Low	Moderate
Right-of-way Mixer/Loader	Negligible	Negligible
Hack-and Squirt	N/A*	N/A*

* Hexazinone was presumed not to be used in hack-and-squirt operations.

Ecotoxological Categories

Mammalian (Acute Oral):	
mg/kg	***Risk Category***
<10	very highly toxic
10-50	highly toxic
51-500	moderately toxic
501-2000	slightly toxic
>2000	practically non toxic

Avian (Acute Oral):	
mg/kg	***Risk Category***
<10	very highly toxic
10-50	highly toxic
51-500	moderately toxic
501-2000	slightly toxic
>2000	practically non toxi

Avian (Dietary):	
ppm	***Risk Category***
<50	very highly toxic
50-500	highly toxic
501-1000	moderately toxic
1001-5000	slightly toxic
>5000	practically non toxic

Aquatic Organisms:	
ppm	***Risk Category***
<0.1	very highly toxic
0.1-1	highly toxic
>1-10	moderately toxic
>10-100	slightly toxic
>100	practically non toxi

Estimated Health Risks To The Public		
Situation	**General Health**	**Reproduction**
Routine Application	Low	Low
Large Spill	High	Moderate

Mammalian (Acute Oral):	
mg/kg	***Risk Category***
<10	very highly toxic
10-50	highly toxic
51-500	moderately toxic
501-2000	slightly toxic
>2000	practically non toxic

Estimated Health Risks To Project Workers		
Situation	**General Health**	**Reproduction**
Aerial Mixer/Loader	Low	Low
Backpack Sprayer	Low	Moderate
Right-of-way Mixer/Loader	Negligible	Negligible
Hack-and Squirt	N/A*	N/A*

Avian (Acute Oral):	
mg/kg	***Risk Category***
<10	very highly toxic
10-50	highly toxic
51-500	moderately toxic
501-2000	slightly toxic
>2000	practically non toxi

Avian (Dietary):	
ppm	***Risk Category***
<50	very highly toxic
50-500	highly toxic
501-1000	moderately toxic
1001-5000	slightly toxic
>5000	practically non tox

Aquatic Organisms:	
ppm	***Risk Category***
<0.1	very highly toxi
0.1-1	highly toxic
>1-10	moderately toxic
>10-100	slightly toxic
>100	practically non tox

Human Hazards				
		Route of Administration		
Risk Category	**Signal Word**	**Oral (mg/kg)**	**Dermal (mg/kg)**	**Inhalation (mg/kg)**
I	**DANGER--Poison**	0-50	0-200	0-0.2
II	**WARNING**	>50-500	>200-2000	>0.2-2.0
III	**CAUTION**	>500-5000	>2000-20,000	>2.0-20
IV	**NONE**	>5000	>20,000	>20

	Hazard	
Category	**Eye Irritation**	**Skin Irritation**
I	Corrosive: corneal opacity not reversible within 7 days	corrosive
II	corneal opacity reversible within 7 days; irritation persisting for 7 days	severe irritation at 72 hours
III	no corneal opacity; irritation reversible within 7 days	moderate irritation at 72 hours
IV	no irritation	mild or slight irritation at 72 hours

Categories of Quality of Health Effects Data	
Inadequate:	Inadequate information available for evaluating toxicity. There were too few studies of sufficient quality to yield useful or reliable information.
Marginal-Inadequate:	Some useful information exists for evaluating toxicity. There were studies of marginal quality that provided useful information, but studies were inconsistent and some contained flaws. It is likely that new studies would change estimates of health effects.
Marginal:	Marginal but useful information available for evaluating toxicity. There were studies of adequate quality, and results did not vary greatly, but more information would increase reliability. Although new studies may change estimates of health effects, the results are considered moderately reliable.
Adequate:	Adequate information is available. Studies are of sufficient quality and quantity that estimates of human health are considered reliable. New studies are unlikely to change estimates of health effects.