

Supplement Analysis
for the
Transmission System Vegetation Management Program EIS
(DOE/EIS-0285/SA-821)

Bonneville Power Administration
Department of Energy



Introduction

In June 2000, Bonneville Power Administration (Bonneville) issued the Transmission System Vegetation Management Program Final EIS (Final EIS), which considered alternative ways to manage vegetation along Bonneville transmission facilities. In July 2000, the Bonneville Administrator issued a Record of Decision (ROD) that selected alternatives from the Final EIS for inclusion in a vegetation management program and set the policy and direction for managing vegetation at and along Bonneville transmission facilities, including in rights-of-way and access roads throughout the service area. Bonneville adopted a vegetation management program direction that is cost-effective, sensitive to environmental concerns, responsive to public and agency comment, and consistent with integrated vegetation management strategies.

Chapter II of the Final EIS discusses several different vegetation management methods, including: manual cutting, mechanical cutting, biological control agents, and herbicides and growth regulators. The Final EIS outlines a process to approve new techniques and additional herbicides (see Chapter II, Approving New Techniques for Use). The Final EIS provides that Bonneville will analyze and document new techniques and additional herbicides in a supplement analysis. As part of the approval process, Bonneville will review technique and herbicide effectiveness, costs, environmental impacts, and solicit public input as appropriate. If environmental impacts are equivalent or less than those discussed in the Final EIS, Bonneville will add the techniques and/or herbicides to the vegetation management program toolbox.

Chapter VI of the Final EIS is organized by discussion of environmental consequences to resources from each of the vegetation management techniques considered. The Final EIS describes potential impacts to each of these resources by general impacts first and then by impacts that could occur with different vegetation management techniques that are not already captured in the discussion of general impacts. The FEIS also identifies impacts specific to manual, mechanical, biological, herbicide, and debris disposal techniques. Each resource discussion concludes with identification of mitigation measures to consider for that particular resource.

Since Bonneville issued the Final EIS and ROD, techniques and herbicides for vegetation control have become available or have become more widely used and accepted. This supplement analysis analyzes two manual techniques and five herbicides that Bonneville did not consider in the Final EIS. Bonneville compared the impacts disclosed in the Final EIS to the effects of the proposed methods and herbicides.

On December 2, 2021, Bonneville provided notice seeking comment on this supplement analysis; on January 18, 2022, the comment opportunity closed. Bonneville received comments from eight entities. Bonneville considered these comments, in addition to feedback received during discussions with

notified parties, in developing this supplement analysis. Substantive comments are summarized in the Comments and Response section and addressed where appropriate within this document.

Bonneville prepared this supplement analysis to determine if the proposed techniques and herbicides represent substantial changes and if significant new circumstances have occurred, consistent with 10 CFR § 1021.314(c) and 40 CFR § 1502.9(c).

Proposed Activities

For this supplement analysis, Bonneville evaluated helicopter-assisted tree pruning and felling and five herbicides—2,4-D choline, aminocyclopyrachlor, florpyrauxifen-benzyl, indaziflam, and triclopyr choline (Proposed Herbicides)—for inclusion in the Transmission System Vegetation Management Program. The Environmental Protection Agency (EPA) has federal responsibility for regulating herbicides through the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and other federal laws. Six herbicide products (Freelexx[®], Method 240SL[®], TerraVue[®], Rejuvra[®]/Esplanade 200 SC[®], and Vastlan[®]) which contain 2,4-D choline, aminocyclopyrachlor, florpyrauxifen-benzyl, indaziflam, and triclopyr choline, respectively, have been registered by the Environmental Protection Agency for the uses consistent with the uses proposed by BPA in this supplement analysis.

These techniques and herbicides can provide more cost-effective and efficient removal of vegetation near Bonneville transmission lines and facilities and would complement other efforts to minimize the effects of potential wildfires. Bonneville would employ these techniques and herbicides in accordance with all local, state, and federal regulated practices.

The Final EIS outlines seven planning steps to use for site-specific vegetation management projects. Environmental compliance for site-specific actions, including Endangered Species Act (ESA) and National Historic Preservation Act (NHPA) compliance, occurs during project planning and would be documented within the seventh step, which involves “prepar[ing] appropriate environmental documentation.” Outreach to, and coordination with, land managers such as the US Forest Service (USFS), landowners, and tribes would occur during the planning steps for each site-specific action. Each planning step includes a set of mitigation measures which may avoid or reduce potential environmental impacts and allow for safe operation and maintenance of the transmission system.

Helicopter Tree Pruning and Felling

Background

Conifer trees growing along the edges of rights-of-way corridors tend to develop greater limb growth within the corridors where there is less competition for light than on the opposite side of trees in heavily forested conditions. Low-elevation heavy snows in coniferous forests tend to load up limbs on the line side of the corridor trees. These conditions, along with high winds or saturated soils, frequently cause trees to lean or fall into the lines. Fire hazards and outages can result when gusty, high winds blow individual limbs out of the first row of trees bordering the right-of-way, or blow down trees that had disproportionate limb weight on the line side of the trees. Bonneville’s vegetation management program actively evaluates trees on the edge of the right-of-way that pose a threat to the transmission line and mitigates those threats as part of the scheduled maintenance program.

Helicopter tree pruning and felling are techniques that can be efficient and cost effective in locations where terrain can be challenging and/or where ground access is unsafe. Using these methods can greatly increase safety and reduce workload for ground-based crews, resulting in more timely, efficient, and cost-effective treatment of corridors following wildfire recovery. Within the framework of Chapter II of the Final EIS, helicopter tree pruning and felling are considered manual control techniques. Bonneville would limit helicopter operations to situations where the aforementioned conditions exist.

Bonneville would consider the following best management practices for helicopter tree pruning or felling operations:

- Implementation of seasonal and daily timing of operations to avoid, minimize, and reduce potential noise impacts.
- Establishment of avoidance buffers within 50 feet of roads and state highways to prevent limbs from falling onto roads.
- Use of a ground spotter with helicopter radio contact when pruning along and over driveways and gravel roads. The spotter can momentarily hold vehicles from using the transportation facilities while pruning is occurring. Upon completion of pruning, the spotter can also drive the road or driveway and remove any limbs that fall into the road or driveway, or onto adjacent fences.
- Review of potential impacts from helicopter operations in areas where there are known above-ground archaeological features. When there would be potential effects from helicopter operations on archaeological features through vibrations, rotor wash (air turbulence caused by the rotor blades of the helicopter), and/or dropping of trimmed tree material, then consultation would occur.
- Locating helicopter service landing locations at existing landings or staging locations, if possible, to obviate the need for grading or ground disturbing work.
- Utilization of a towable chipper to clean up limbs along driveways, fence lines, irrigated pastures, and other high-visibility locations, as requested by landowners.
- Inclusion of signage on the bottom of helicopters so the helicopters are not mistaken for law enforcement.

Helicopter Tree Pruning: One option for side trimming rights-of-way or corridors involves tree pruning using an aerially applied multi-blade saw suspended from a helicopter. Helicopter pruning operations are generally conducted during daylight hours in relatively good weather, with lower wind speeds and good visibilities. On-the-ground spotters are in communication with the helicopter pilot throughout the operation to ensure safe working conditions. The saws are generally applied to the upper portion of the trees first, trimming lower sections in subsequent passes as needed to achieve vegetation management objectives. This method can typically prune trees along approximately two to six line miles per day, depending upon site-specific circumstances. Side trimming can remove several feet of vegetation growing into infrastructure or rights-of-way. Upon completion of a helicopter pruning operation, Bonneville would dispose of cut limbs using one of the disposal methods identified in the Final EIS.

Helicopter Tree Felling: Helicopter tree felling may be utilized along rights-of-ways to mitigate trees requiring a climber or crane. Helicopter tree felling can remove sections from the top of the tree. Similar to helicopter pruning operations, helicopter tree felling is generally conducted during daylight hours in relatively good weather, with lower wind speeds and good visibilities. Helicopter tree felling generally uses a type of grappling hook to hold the tree to be felled, and then a saw blade protrudes to lop off the tree. The capabilities of the aerial equipment and the requirements of the tree felling operation determine how many times this technique is applied to each tree. Typically, a portion of the tree at a height that would not endanger the line remains after cutting. Cut rates are generally 25 to 100 trees per hour, depending upon site-specific circumstances. Vegetation can be disposed of or relocated in accordance with the disposal methods identified in the Final EIS.

Environmental Effects

The environmental effects of helicopter tree felling and pruning would be broadly consistent with those attributed to manual cutting methods in Chapter II of the Final EIS, including chainsaw cutting involving topping and pruning. Manual methods are considered to be more selective than mechanical methods, which are considered non-selective. While the Final EIS does not describe aerial manual methods, Chapter II of the Final EIS does describe aerial herbicide applications and reseeding, which includes the use of helicopters for vegetation management activities.

The environmental consequences of manual treatment and helicopter use discussed in Chapter VI of the Final EIS encompass many impacts that could reasonably be expected for helicopter tree pruning and felling.

Such methods would temporarily result in increased noise from helicopter operation and sustained rotor wash while work is performed. Increased noise would typically be transient as the helicopter travels down the line and would last as little as a day or up to a week or more, depending upon the particular location. Helicopter tree pruning and felling may temporarily affect nearby species including, but not limited to, ESA-listed threatened and endangered species and humans living or recreating nearby. These increased sound levels would be consistent with those attributed in the Final EIS to use of the chainsaw as a manual control method (see Chapter VI, Wildlife; Recreation; Residential, Commercial, and Industrial; Worker Health and Safety) and to use of the helicopter for aerial herbicide application and reseeding (see Chapter VI, Consequences of ROW Methods Package Alternatives, Alternative R4), including implementation of associated mitigation measures.

Helicopter felling and pruning would likely decrease disturbance to vegetation within the right-of-way, as fewer vehicles would be accessing the right-of-way compared to the use of ground-based manual cutting methods. Bonneville would dispose of cut trees and limbs in a manner consistent with the disposal methods identified in Chapter II of the Final EIS, with no additional effects anticipated as a result of such disposal. In some cases, it is likely that there would be fewer vehicles within the right-of-way, limiting potential ground disturbances to lower levels than may be experienced with use of ground crews.

Compared to manual methods, helicopter felling and pruning could provide for increased worker safety, especially in steep, difficult, or hazardous terrain where navigation and staging for ground crews can be difficult. Use of a helicopter also includes the potential, however slight, for a crash to occur, similar to the potential effects described for Worker Safety and use of Biological Agents (as illustrated in Table II-3, Final EIS).

Helicopter felling and pruning may have the potential to effect ground-level archaeological resources through vibration, rotor wash, or dropping of cut material. As described in best management practices above, when helicopter operations would have the potential to effect archaeological features through vibration, rotor wash, or the dropping of trimmed tree material, Bonneville will conduct consultation, consistent with the seven planning steps for site-specific vegetation management projects described in the Final EIS.

Bonneville would reduce these potential effects through implementation of the minimization measures identified in the Final EIS and the best management practices included as part of the proposed action. Effects associated with helicopter use would be consistent with those described in the Final EIS for manual methods and helicopter herbicide applications, including reseeding.

Each site-specific vegetation management project will undergo the site-specific seven step process and result in an additional supplement analysis that will document environmental regulatory compliance

including, but not limited to, compliance with the NHPA and the ESA. Site-specific supplement analyses of helicopter tree pruning or felling are subject to consideration of the environmental impacts and potential mitigation measures discussed throughout Chapters II through VI of the Final EIS and this supplement analysis.

Based on the potential environmental impacts described above, the effects of helicopter tree pruning and felling are consistent with those disclosed in the Final EIS and, in the right circumstances, these manual aerial methods could reduce such impacts and increase safety for personnel. Impacts to other resources (including soils, water, fish and other aquatic species, wildlife, land use—including agriculture, timber, commercial, and industrial land uses, land ownership/management, public health and safety, visual resources, air quality, and socioeconomics) would not substantially deviate, and would be consistent with, those described in the Final EIS for other vegetation management tools in Bonneville's vegetation management program.

Effectiveness and Cost

Under suitable circumstances, helicopter tree pruning and felling are more timely, effective, and cost-efficient methods than the other vegetation management tools analyzed in the Final EIS. The use of helicopters in less accessible locations would improve efficiency and worker safety compared to ground-based manual techniques.

2,4-D Choline, Aminocyclopyrachlor, Florpyrauxifen-Benzyl, Indaziflam, and Triclopyr Choline

Background

To manage incompatible and/or invasive vegetation and ensure electrical safety, Bonneville sometimes landscapes and maintains bare-ground conditions along rights-of-way and access roads and within Bonneville facilities pursuant to the Final EIS. 2,4-D choline, aminocyclopyrachlor, florpyrauxifen-benzyl, indaziflam, and triclopyr choline are herbicides proposed for use along rights-of-way and access roads, and/or at Bonneville electrical and non-electrical facilities (including substations, switches, maintenance facilities, storage yards, and radio sites) where bare-ground conditions are desired (see Table 1 at the end of the document). In bare-ground treatment areas, typical herbicide use may extend ten feet beyond the fence at the facilities, or as needed to prevent vegetation from growing on the ground mat or switch platforms. Within the right-of-way or along access roads, Bonneville would limit potential herbicide use to the width of the right-of-way and within 10 feet from the centerline of access roads.

The Proposed Herbicides have properties that lower risk to human health and safety and non-target organisms and improve effectiveness on certain undesirable vegetation. In certain circumstances, vegetation management is more effective when a variety of herbicides are used or rotated, as vegetation can become resistant to particular herbicides. A Bonneville contractor specifically suggested using aminocyclopyrachlor and indaziflam in Eastern Washington to provide wider selection and rotation of herbicides. Other treatment methods listed in the EIS, such as manual treatment, can be less effective in controlling unwanted and/or invasive weeds in bare ground, landscaped areas, along access roads, and along the right-of-way. Non-treatment could result in the spread of vegetation to areas already managed for total vegetation control and could subsequently result in human health and safety concerns.

The EPA has federal responsibility for regulating herbicides and the Proposed Herbicides are used in products registered by the EPA for the proposed uses. Bonneville would apply the Proposed Herbicides in a manner consistent with their respective labels and applicable state and federal regulations. Bonneville would use the herbicide application methods identified in the Final EIS (see Chapter II, Herbicide Control Methods: Application) for each of the Proposed Herbicides as appropriate per the

label instructions and restrictions. Table 1 provides a summary of proposed uses for each of the Proposed Herbicides (please see Table 1 at end of document).

Environmental Effects

The Proposed Herbicides are compatible with the herbicide and growth regulator treatment methods described within the Final EIS (See Chapter II, Herbicide Control Methods: Active Ingredients). The environmental consequences described in Chapter VI of the Final EIS for herbicides and growth regulator treatment encompass any impacts that could reasonably be expected with use of the Proposed Herbicides.

In preparing this supplement analysis, Bonneville analyzed the Proposed Herbicides for ecological and human toxicities and characteristics. A Fact Sheet developed for each of the Proposed Herbicides is attached to this document. In addition, Table 2 provides a summary of the ecological toxicities and characteristics of each of the Proposed Herbicides (please see Table 2 at end of document). These toxicities are within the range of those disclosed in Table VI-7 of the Final EIS. The Proposed Herbicides' respective ecological toxicities range from moderately toxic to practically non-toxic, depending on the chemical and test species.

Table 2 also describes the Proposed Herbicides' persistence and solubility properties as well as potential for offsite movement (leaching). The persistence, solubilities, and leaching potential of the Proposed Herbicides fall within the range of effects of herbicides as documented in Table VI-7 in the Final EIS.

Human health toxicity for the Proposed Herbicides falls within the range of human health toxicities (acute oral, dermal and inhalation, and chronic) described in the Final EIS, including Table VI-9. The human health toxicities of 2,4-D choline are similar or less than other formulations of 2,4-D; the human health toxicities of aminocyclopyrachlor and florpiauxifen-benzyl are similar to metsulfuron-methyl; the human health toxicities of Indaziflam are similar to sulfometuron-methyl; and, the human health toxicities of triclopyr choline are similar to or less than other formulations of triclopyr.

Because vegetation can develop resistance to particular herbicides, addition of the Proposed Herbicides to the rotation of available herbicides may result in more effective and efficient vegetation management control, lessening the frequency of herbicide application, thereby reducing overall environmental impacts.

Bonneville has identified and mapped water bodies, ESA-listed threatened and endangered species and their designated critical habitat, water supply facilities, and land ownership occurring within the vegetation management areas. Appropriate buffers and mitigation measures currently exist within this framework, as described in Chapters II and VI of the Final EIS. Bonneville would apply these mitigation measures where appropriate to address environmental and human concerns. The Proposed Herbicides are within the maximum exposure scenarios of the herbicides previously analyzed in the Final EIS. Bonneville would continue to apply all herbicides—including both the Proposed Herbicides and others previously considered—in accordance with all applicable federal, tribal, state, and local regulations.

Each site-specific vegetation management project would undergo the site-specific seven-step process and result in an additional supplement analysis to document environmental regulatory compliance. Site-specific vegetation management supplement analyses using the Proposed Herbicides are subject to consideration of the environmental impacts and potential mitigation measures discussed in Chapter VI of the Final EIS. There are no other additional effects from use of these herbicides that are not already disclosed within the Final EIS.

Effectiveness and Cost

When selected in suitable circumstances, each of the Proposed Herbicides could be the most effective and cost-efficient method of vegetation management available. The addition of these herbicides to the vegetation management program would result in additional herbicides available for rotation and would be more effective reducing plant resistance and ultimately reducing the quantity of herbicides applied.

Comments and Responses

Bonneville received comments from the Cultural Resource Department of the Squaxin Island Tribe, the Spokane Tribe of Indians, the Coquille Indian Tribe, the State of Idaho, the Confederated Tribes of the Umatilla Indian Reservation, the Washington State Department of Ecology, the US Forest Service, and a private individual. As of the date of this document, comments received are available at:

<https://publiccomments.bpa.gov/CommentList.aspx?ID=429>. Bonneville considered these comments, in addition to feedback received during discussions with notified parties, in development of this supplement analysis.

- Several comments received relate to NHPA Section 106 consultation, ESA consultation, and other regulatory processes that are considered and documented during the site-specific supplement analysis. Comments specific to consideration of tribal first foods and coordination with the federal land manager would also be considered and documented during the site-specific supplement analysis.
- The Confederated Tribes of the Umatilla Indian Reservation submitted comments and requested a technical-level meeting, which was held on February 25, 2022. Consistent with that meeting, Bonneville environmental and vegetation management staff coordinated with Bonneville fish and wildlife staff regarding the Proposed Herbicides. The Confederated Tribes of the Umatilla Indian Reservation also commented regarding tribal First Foods—which could be considered through ongoing coordination processes with the tribe—and site-specific vegetation management projects. As a result of the coordination, Bonneville added a best management practice to consult when there would be potential effects from helicopter operations in areas where there are known above-ground archaeological features.
- The Washington Department of Ecology (WDE) provided a comment concerning the determination of dangerous waste, as defined by Washington Administrative Code (WAC) Chapter 173-303. Normal use of the Proposed Herbicides by Bonneville or its contractors is not anticipated to result in excess product, or “waste,” requiring disposal. It is not expected that any excess product requiring disposal would meet the definition of dangerous waste. If a situation occurs where herbicides require disposal, Bonneville has WDE-approved processes and programs in place to determine whether or not wastes are dangerous wastes according to the WAC. All records are maintained and all reporting is completed as per the WAC and other applicable laws and regulations.
- The USFS provided comment on the use of several herbicides, and Bonneville incorporated the restriction of use of aminocyclopyrachlor on USFS land as requested.
- One commenter noted that “. . . when the analytic time horizon is lengthened, repeated application of herbicide yields diminishing returns over time as undesirable plant communities

adapt.”. This comment underscores Bonneville’s rationale for increasing the number of effective herbicides that can be used in a rotation for more effective vegetation management.

- Bonneville received comments related to other vegetation management and right-of-way processes outside the scope of this supplement analysis, including efforts to provide pollinator habitat, including milkweed for monarch butterflies.
- Bonneville received comments related to its other ongoing coordination efforts with tribes and agencies.
- Bonneville received comments that were outside the scope of this supplement analysis including, but not limited to, comments concerning consideration of pygmy rabbit habitat in transmission planning and access roads typically used by hunters to poach deer and elk.
- Bonneville received comments that were not substantive.

Overall, based on this supplement analysis, including consideration of received comments, Bonneville concludes that the additional methods and Proposed Herbicides would not change the scope or nature of work being implemented within the Transmission System Vegetation Management Program and the additions are similar to the methods and herbicides that were considered in the Final EIS. Therefore, there would be no substantial changes in the action and impacts to affected resources would not substantially deviate from those described in the Final EIS. The additions to the Transmission System Vegetation Management Program would not represent a significant new circumstance or information relevant to environmental concerns.

Findings

Bonneville finds that the types of actions and the potential impacts related to the proposed activities have been examined, reviewed, and consulted upon and are similar to those analyzed in the Transmission System Vegetation Management Program Final EIS (DOE/EIS-0285) and ROD. There are no substantial changes in the EIS’s Proposed Action and no significant new circumstances or information relevant to environmental concerns bearing on the EIS’s Proposed Action or its impacts within the meaning of 10 CFR § 1021.314(c)(1) and 40 CFR § 1502.9(d). Therefore, no further NEPA analysis or documentation is required.

/s/ Michelle Eraut

Michelle Eraut
Deputy Executive Manager

Katey Grange
NEPA Compliance Officer

Table 1. List of Proposed Herbicides for Use

Herbicide (Active Ingredient)	Herbicide Product Name	Registered Label Uses	Facilities Where Registered Use is Appropriate		
			Rights -of- way	Electric Yards (bare ground)	Non-Electric (landscaping)
2,4-D Choline	Freelexx®	Noxious weeds, broadleaf weeds, brush, & trees	X		X
Aminocyclopyrachlor*	Method 240SL®	Noxious weeds, broadleaf weeds, and woody species		X	X
Florpyrauxifen-Benzyl	TerraVue®**	See label of pre-formulated product. For TerraVue: broadleaf weeds, noxious weeds, certain annual grasses, and certain woody plants and vines	X	X	X
Indaziflam	Esplanade 200 SC®	Annual grasses and broadleaf weeds	X	X	X
Indaziflam	Rejuvra®	Annual grasses and broadleaf weeds	X		
Triclopyr Choline	Vastlan®	Woody plants and vines, broadleaf weeds	X		X

*Not permitted in Oregon for use on utility rights-of-ways and facilities as per OAR 603-057-0392 (7)(c). Consistent with the terms of its coordination with the US Forest Service, Bonneville would not use Aminocyclopyrachlor anywhere on National Forest Service lands in or through forested habitat or anywhere near trees.

** TerraVue® contains the active ingredients florpyrauxifen-benzyl + aminopyralid. Aminopyralid is already a BPA-approved active ingredient.

Table 2. Herbicide Ecological Toxicities and Characteristics¹

Herbicide	Acute Toxicity ²				Physical Properties			Off-site Movement Potential	
	Mammals	Avian	Aquatic	Microorganisms	Persistence	Solubility (mg/)	Adsorption (K(oc))	Groundwater Leaching	Surface Water Runoff
2,4-D Choline	Moderately Toxic	Moderately Toxic	Slightly Toxic	Bees: Practically Non-Toxic	Low	569	76	Moderate	Moderate
Aminocyclopyrachlor*	Practically Non-Toxic	Practically Non-Toxic	Practically Non-Toxic to Slightly Toxic	Practically Non-Toxic	High	4,200	2.0-26	High	Low
Florpyrauxifen-Benzyl**	Practically Non-Toxic	Practically Non-Toxic	Practically Non-Toxic	Bees: Practically Non-Toxic	Moderate	15	32,280	Low	High
Indaziflam	Practically Non-Toxic	Practically Non-Toxic	Highly Toxic	Honey Bee: Practically Non-Toxic	Moderate	2.8	496	Moderate	Moderate
Triclopyr Choline	Moderately Toxic	Slightly Toxic	Practically Non-Toxic	Honey Bee: Practically Non-Toxic	Moderate	Very High	59	Moderate	Low

Herbicide	Acute Toxicity ²				Physical Properties			Off-site Movement Potential	
	Mammals	Avian	Aquatic	Microorganisms	Persistence	Solubility (mg/)	Adsorption (K(oc))	Groundwater Leaching	Surface Water Runoff
Range Analyzed in Final EIS (Table VI-4)	Practically Non-Toxic to Moderately Toxic	Practically Non-Toxic to Moderately Toxic	Practically Non-Toxic to Highly Toxic	Practically Non-Toxic to Slightly Toxic	Low to High	1 to 2,100,000	2 to 24,000	Low to High	Low to High

1. Summary table of herbicide toxicities and characteristics. See attached fact sheets for additional, detailed herbicide information.

2. Avian toxicity ratings for mammals and birds see Table VI-6 of Final EIS;

*Not permitted in Oregon for use on utility right-of ways & facilities as per OAR 603-057-0392 (7)(c). Consistent with coordination with the USFS, Bonneville would not use aminocyclopyrachlor anywhere on National Forest Service lands in or through forested habitat or anywhere near where trees are present.

** To be used only as a component of a terrestrially-applied pre-formulated herbicide mixture with other approved active ingredients

Attachments:

Bonneville Fact Sheets

2,4-D

Aminocyclopyrachlor

Florpyrauxifen-Benzyl

Indaziflam

Trichlopyr

2,4-D

HERBICIDE FACT SHEET

U.S. DEPARTMENT OF ENERGY
BONNEVILLE POWER ADMINISTRATION

This fact sheet is one of a series issued by the Bonneville Power Administration for their workers and the general public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions. A list of definitions is included in Section VIII of this fact sheet.

I. BASIC INFORMATION

COMMON NAME: 2,4-D

CHEMICAL NAME: 2,4-dichlorophenoxyacetic acid, including, but not limited to:

Acids and Salts:

Cas Nos. 2008-39-1, 1929-73-3, 5742-19-8, 2702-72-9, 32341-80-3,
1048373-72-3

Esters:

Cas Nos. 1928-43-4, 25168-26-7, 94-11-1

CHEMICAL TYPE: Chlorinated phenoxy compound

PESTICIDE CLASSIFICATION: Herbicide

REGISTERED USE STATUS: General Use Pesticide. Restricted Use in Washington for Some Locations. Date and Elevation Restrictions for Aerial Applications in Idaho.

FORMULATIONS: Commercial herbicide products generally contain one or more ingredients. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, the United States Environmental Protection Agency (USEPA) announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52FR13305). This policy focuses on the regulation of inert ingredients. USEPA's strategy for implementing this policy included the development of four lists of inerts, based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3, and inerts of minimal concern were placed on List 4.

The inert ingredients of the 2,4-D formulations are not classified by the USEPA as inert ingredients of toxicological concerns to humans or the environment.

RESIDUE ANALYTICAL METHODS: EPA Method 600/4-88-039 515.1; 515.2; 555.

II. HERBICIDE USES

REGISTERED FORESTRY, RANGELAND AND RIGHT-OF-WAY USES: 2,4-D is registered for use in crop and non-crop sites for selective and total weed control. For terrestrial and aquatic uses.

OPERATIONAL DETAILS:

TARGET PLANTS: 2,4-D is used for control of grasses, broadleaf weeds, and woody plants.

MODE OF ACTION: Plant growth regulator (synthetic auxin herbicide).

METHOD OF APPLICATION AND RATES: Aerial and ground broadcast, spot and localized applications. Rates depend on formulation.

SPECIAL PRECAUTIONS:

TIMING OF APPLICATION: Timing is dependent on the target plant.

DRIFT CONTROL: Care should be exercised not to overspray or apply the herbicide to adjacent non-target areas. Drift control is achieved by observing weather conditions and following label and sprayer instructions. Spray droplet size should be 150 microns or larger.

RESTRICTIONS/WARNINGS/LIMITATIONS: Do not apply through any type of irrigation system. Groundwater advisory. Various state use restrictions.

III. ENVIRONMENTAL EFFECTS/FATE

SOIL:

RESIDUAL SOIL ACTIVITY: The half-life of 2,4-D acid ranges from 1.1 to 42.5 days with a median half-life of 6.1 days.

ADSORPTION: The $K_{(oc)}$ of 2,4-D is 20 to 600 depending on formulation.

PERSISTENCE AND AGENTS OF DEGRADATION: 2,4-D acid can be moderately persistent in the plant and soils. The primary route of degradation is microbial activity in the terrestrial environment and photodegradation in water.

METABOLITES/DEGRADATION PRODUCTS AND POTENTIAL ENVIRONMENTAL EFFECTS: 2,4-D acid degrades to many less toxic chemicals. Three major degradates were identified in the submitted environmental fate studies for 2,4-D: 1,2,4-benzenetriol (maximum formed = 37%); 2,4-dichlorophenol (2,4-DCP) (maximum formed = 32.6%); and chlorohydroquinone (CHQ) (maximum formed = 16%).

WATER:

SOLUBILITY: The solubility of 2,4-D acid 569 mg/l in water (20° C). Other formulations range from practically insoluble to 806,000 mg/l.

POTENTIAL FOR LEACHING INTO SURFACE AND GROUND WATER: 2,4-D is moderately persistent with a low soil adsorption coefficient. There is a moderate potential for 2,4-D to leach into groundwater.

AIR:

VOLATILIZATION: Low (1.4×10^{-7} mm Hg at 25° C).

POTENTIAL FOR BYPRODUCTS FROM BURNING OF TREATED VEGETATION: Not known.

IV. ECOLOGICAL TOXICITY EFFECTS ON NON-TARGET SPECIES

MICROORGANISMS:

ACUTE CONTACT TOXICITY: LD₅₀ (honey bee contact) >100 µg/bee

OVERALL TOXICITY: Practically Non-Toxic

PLANTS: Contact will injure or kill target and non-target plants.

AQUATIC VERTEBRATES:

ACUTE TOXICITY: LC₅₀ (rainbow trout 96-hour) 1.1 - >240 mg/l

ACUTE TOXICITY: LC₅₀ (bluegill sunfish 96-hour) 0.9 - >524 mg/l

OVERALL TOXICITY: Highly Toxic - Practically Non-Toxic (Depending on Formulation)

AQUATIC FRESHWATER INVERTEBRATES:

ACUTE TOXICITY: LC₅₀ (*Daphnia magna* 48-hour) 5.8 - >184 mg/l

OVERALL TOXICITY: Moderately Toxic - Practically Non-Toxic (Depending on Formulation)

AQUATIC ESTUARINE/MARINE INVERTEBRATES:

ACUTE TOXICITY: LC₅₀ (Dungeness crab 96-hour) >10.0 mg/l

ACUTE TOXICITY: LC₅₀ (brown shrimp 96-hour) >2.0 mg/l

OVERALL TOXICITY: Moderately Toxic - Slightly Toxic (Depending on Formulation)

TERRESTRIAL ANIMALS:

AVIAN ACUTE ORAL TOXICITY: LD₅₀ (various birds) 219 - >2000 mg/kg

AVIAN SUBACUTE DIETARY TOXICITY: LC₅₀ (various birds) >1000 mg/kg

MAMMAL ACUTE ORAL TOXICITY: LD₅₀ (various mammals) >100 - >5000 mg/kg

OVERALL TOXICITY: Moderately Toxic to Practically Non-Toxic (Depending on Formulation)

BIOACCUMULATION POTENTIAL: Low Potential

THREATENED AND ENDANGERED SPECIES: All federally listed terrestrial and aquatic species may be adversely affected if certain formulated products are applied directly or indirectly to the species or habitat.

V. TOXICOLOGICAL DATA

ACUTE TOXICITY:

ACUTE ORAL TOXICITY: LD₅₀ (rat) >50 - >5000 mg/kg

ACUTE DERMAL TOXICITY: LD₅₀ (rabbit) >2000 -20,000 mg/kg

PRIMARY SKIN IRRITATION: Rabbit - Slight - Non-Irritant

PRIMARY EYE IRRITATION: Rabbit – Severe Irritant - Slight Irritant

ACUTE INHALATION: LC₅₀ (rat) >1.0 - >100.0 mg/l

OVERALL TOXICITY: Category 1 – Highly Toxic to Practically Non-Toxic (Depending on Formulation)

CHRONIC TOXICITY:

CARCINOGENICITY: IARC Group 2B - Possible human carcinogen. EPA Group D - Not Classifiable As To Human Carcinogenicity.

DEVELOPMENTAL/REPRODUCTIVE: Animal studies indicate limited ability to cause birth defects. Evidence suggests adverse reproductive effects at moderate doses.

MUTAGENICITY: Evidence suggests adverse effects on human chromosomes.

HAZARD: The end-use product labels for the 2,4-D formulations vary considerably between the *Caution* and *Danger* signal words due to various effects.

VI. HUMAN HEALTH EFFECTS

ACUTE TOXICITY (POISONING):

REPORTED EFFECTS: Nervous system from skin absorption. Dizziness, irritation and coughing from inhalation. Ingestion of large amounts of 2,4-D has caused death within 1 to 2 days. Ingestion of lower doses has resulted in neuromuscular problems. Existing medical conditions may be aggravated by exposure to 2,4-D.

CHRONIC TOXICITY:

REPORTED EFFECTS: Liver, kidney, digestive, muscular and nervous system damage.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM CONTACTING OR CONSUMING TREATED VEGETATION, WATER OR ANIMALS: See above.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM INERT INGREDIENTS CONTAINED IN THE FORMULATED PRODUCTS: None reported.

HEALTH EFFECTS OF EXPOSURE TO FORMULATED PRODUCTS: See above.

HEALTH EFFECTS ASSOCIATED WITH CONTAMINANTS: Past reports of dioxin contamination. Recent testing has shown 2,4-D manufactured in the U.S. to be relatively free of dioxin. Minor traces found do not have biological significance.

HEALTH EFFECTS ASSOCIATED WITH OTHER FORMULATIONS: None reported.

VII. SAFETY PRECAUTIONS

SIGNAL WORD AND DEFINITION:

Most Acid and Salt Formulations:

2,4-D - **DANGER** - CAUSES IRREVERSIBLE EYE DAMAGE. HARMFUL IF SWALLOWED OR ABSORBED THROUGH SKIN. AVOID BREATHING SPRAY MIST. DO NOT GET IN EYES, ON SKIN OR CLOTHING.

Most Esters:

2,4-D - **CAUTION** – HARMFUL IF SWALLOWED, ABSORBED THROUGH THE SKIN OR INHALED. AVOID BREATHING VAPORS AND SPRAY MIST. AVOID CONTACT WITH EYES, SKIN OR CLOTHING.

PROTECTIVE PRECAUTIONS FOR WORKERS: Applicators and other handlers must wear long-sleeved shirt and long pants, shoes plus socks, and protective eyewear where appropriate.

MEDICAL TREATMENT PROCEDURES (ANTIDOTES):

EYES: Imperative to flush eyes with water for a minimum of 15 minutes. Call physician immediately.

SKIN: Wash all exposed areas with soap and water. Call physician if irritation persists.

INGESTION: Rinse mouth thoroughly with water. Promptly drink a large quantity of milk, egg whites, gelatin or water. Do not induce vomiting. Call physician immediately.

INHALATION: Remove to fresh air. Call a physician if breathing difficulty persists.

HANDLING, STORAGE AND DISPOSAL: Store at room temperature or cooler. Do not reuse container. Rinse container and dispose accordingly.

EMERGENCY SPILL PROCEDURES AND HAZARDS: Contain and sweep up material of small spills and dispose as waste. Do not contaminate water, food, or feed by storage or disposal.

VIII. DEFINITIONS

adsorption – the process of attaching to a surface

avian – of, or related to, birds

CAEPA – California Environmental Protection Agency

carcinogenicity – ability to cause cancer

CHEMTREC – Chemical Transportation Emergency Center

dermal – of, or related to, the skin

EC₅₀ - median effective concentration during a bioassay

ecotoxicological – related to the effects of environmental toxicants on populations of organisms originating, being produced, growing or living naturally in a particular region or environment

FIFRA – Federal Insecticide, Fungicide and Rodenticide Act

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

half-life – the time required for half the amount of a substance to be reduced by natural processes
herbicide – a substance used to destroy plants or to slow down their growth
Hg – chemical symbol for mercury
IARC – International Agency for Research on Cancer
K(oc) – the tendency of a chemical to be adsorbed by soil, expressed as: $K(oc) = \text{conc. adsorbed}/\text{conc. dissolved}/\% \text{ organic carbon in soil}$
LC₅₀ – the concentration in air, water, or food that will kill approximately 50% of the subjects
LD₅₀ – the dose that will kill approximately 50% of the subjects
leach – to dissolve out by the action of water
mg/kg – weight ratio expressed as milligrams per kilogram
mg/l – weight-to-liquid ratio expressed as milligrams per liter
microorganisms – living things too small to be seen without a microscope
mPa – milli-Pascal (unit of pressure)
mutagenicity – ability to cause genetic changes
NFPA – National Fire Protection Association
NIOSH - National Institute for Occupational Safety and Health
NOEL - no observable effect level
non-target – animals or plants other than the ones that the pesticide is intended to kill or control
OSHA - Occupational Safety and Health Administration
Pa – Pascal (unit of pressure)
persistence – tendency of a pesticide to remain in the environment after it is applied
pesticides – substances including herbicides, insecticides, rodenticides, fumigants, repellents, growth regulators, etc., regulated under FIFRA
PPE – personal protective equipment
ppm – weight ratio expressed as parts per million
residual activity – the remaining amount of activity as a pesticide
T&E – Threatened and Endangered Species (from the Endangered Species Act)
µg – micrograms
volatility – the tendency to become a vapor at standard temperatures and pressures

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X. TOXICITY CATEGORY TABLES

TABLE I: HUMAN HAZARDS

Category	Signal Word	Route of Administration			Hazard	
		Acute Oral LD ₅₀ (mg/kg)	Acute Dermal LD ₅₀ (mg/kg)	Acute Inhalation LC ₅₀ (mg/l)	Eye irritation	Skin irritation
I (Highly Toxic)	DANGER (poison)	0-50	0-200	0-0.2	corrosive: corneal opacity not reversible within 7 days	corrosive
II (Moderately Toxic)	WARNING	>50-500	>200-2000	>0.2-2	corneal opacity reversible within 7 days; irritation persisting for 7 days	severe irritation at 72 hours
III (Slightly Toxic)	CAUTION	>500-5000	>2000-20.000	>2-20	no corneal opacity; irritation reversible within 7 days	moderate irritation at 72 hours
IV (Practically Non-toxic)	NONE	>5000	>20,000	>20	no irritation	moderate irritation at 72 hours

After *Pesticide User's Guide*, Ohio State University, Extension Bull. No. 745, 1998.

TABLE II: ECOTOXICOLOGICAL RISKS TO WILDLIFE (TERRESTRIAL AND AQUATIC)

Risk Category	Mammals Acute Oral LD ₅₀ (mg/kg)	Avian Acute Oral LD ₅₀ (mg/kg)	Avian Acute Dietary LC ₅₀ (mg/kg)	Fish or Aquatic Invertebrates Acute Concentration LC ₅₀ (mg/l)
Very Highly Toxic	<10	<10	<50	<0.1
Highly Toxic	10-50	10-50	50-500	0.1 – 1
Moderately Toxic	51-500	51-500	501-1,000	>1 – 10
Slightly Toxic	501-2,000	501-2,000	1,001-5,000	>10 – 100
Practically Non-toxic	>2,000	>2,000	>5,000	>100

Table II created from information contained in *Pesticides and Wildlife*, Whitford, Fred, et al., Purdue University Cooperative Extension Service PPP-30, 1998.

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This fact sheet was prepared by USDOE-Bonneville Power Administration, March 2000. Updated March 3, 2022.

Aminocyclopyrachlor

HERBICIDE FACT SHEET

U.S. DEPARTMENT OF ENERGY
BONNEVILLE POWER ADMINISTRATION

This fact sheet is one of a series issued by the Bonneville Power Administration for their workers and the general public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions. A list of definitions is included in Section VIII of this fact sheet.

I. BASIC INFORMATION

COMMON NAME: Method 240SL

CHEMICAL NAME: [6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylic acid]

CAS No. 858956-08-8

CHEMICAL TYPE: pyrimidine carboxylic acids class within the family of synthetic auxins

PESTICIDE CLASSIFICATION: Herbicide

REGISTERED USE STATUS: General Use Pesticide.

FORMULATIONS: Commercial herbicide products generally contain one or more ingredients. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, EPA announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52FR13305). This policy focuses on the regulation of inert ingredients. EPA's strategy for implementing this policy included the development of four lists of inerts, based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3, and inerts of minimal and no concern were placed on List 4A and 4B, respectively.

The contents of the aminocyclopyrachlor formulation for Method[®] 240SL herbicide are listed below:

Method [®] 240SL Herbicide (Bayer Environmental Science)			No inert ingredients listed.
Active Ingredient	Potassium salt of aminocyclopyrachlor	25.0 %	
Inert Ingredients		75.0 %	
Acid Equivalent	Aminocyclopyrachlor	21.1%	2 pounds acid per gallon

RESIDUE ANALYTICAL METHODS: Standard herbicide screening analysis.

II. HERBICIDE USES

REGISTERED FORESTRY, RANGELAND AND RIGHT-OF-WAY USES: Aminocyclopyrachlor is registered for control of broadleaf weeds, woody species, vines, and grasses in non-crop areas [private, public, and military lands: uncultivated non-agricultural areas (such as airports, highway, railroad and utility rights-of-way, sewage disposal areas), uncultivated non-crop agricultural areas (such as farmyards, fuel storage areas, fence rows, non-irrigation ditchbanks, barrier strips), outdoor industrial sites (such as lumberyards, pipeline, and tank farms), natural areas (such as wildlife management areas, wildlife openings, wildlife habitats, recreation areas, campgrounds, trailheads, and trails)], turf/lawns (residential, industrial, and institutional), golf courses, parks, cemeteries, athletic fields, and sod farms.

OPERATIONAL DETAILS:

TARGET PLANTS: Preemergence and/or postemergence control of the broadleaf weeds, vines, and brush species.

MODE OF ACTION: Synthetic auxin-type herbicide causing disorganized plant growth (pyrimidine carboxylic acid).

METHOD OF APPLICATION AND RATES: Soluble liquid that is mixed in water and applied as a spray at rates of 4-18 fluid ounces per acre per year (0.063-0.28 lb ae/A/year). When applied at lower rates, Method 240SL herbicide provides short-term control of weeds; when applied at higher rates, weed control spectrum is broadened and extended.

SPECIAL PRECAUTIONS:

TIMING OF APPLICATION: Apply in the fall, before the soil freezes, or in the spring after the soil thaws. Applications can be made anytime of the year except when snow or water prevents treating to the ground line.

DRIFT CONTROL: Avoid spraying to the point of excessive runoff as injury to desirable species or ground cover may occur. Apply only using nozzles which deliver coarse or greater (VMD >350 microns) droplets as defined by ASABE S572 standard. Do not apply with a nozzle height greater than 4 feet above the ground or canopy unless necessitated by the application equipment. Apply with the spray boom or nozzle height as low as possible. Do not apply when wind speed is greater than 10 mph. Use spray pressures no greater than are required to obtain adequate coverage. The use of drift control additives, shielded sprayers, or other drift control systems can help minimize spray drift. Do not apply during a temperature inversion.

Restrictions/Warnings/Limitations:

Do not use plant material treated with Method 240SL herbicide for mulch or compost.

Do not apply within the root zone of desirable trees and/or shrubs unless injury or loss can be tolerated. Root zones of desirable trees/shrubs may extend beyond the tree canopy.

Do not apply this product if site-specific characteristics and conditions exist that could contribute to movement and unintended root zone exposure to desirable trees or vegetation, unless injury or loss can be tolerated.

Do not make applications when circumstances favor movement from treatment site.

Do not apply to highways/roadsides or other non-crop areas during periods of intense rainfall or where prevailing soils are either saturated with water or of a type through which rainfall will not readily penetrate, as this may result in off-site movement.

Do not apply or otherwise permit this product or sprays containing this product to come into contact with any non-target crop or desirable vegetation.

Do not apply in or on dry or water containing irrigation ditches or canals including their outer banks.

Do not apply through any type of irrigation system.

Do 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 or irrigation ditches, either dry or containing water, or other channels that carry water that may be used for irrigation purposes.

Do not apply when powdery dry soil or light or sandy soils are known to be prevalent in the area to be treated. Treatment of powdery dry soil and light sandy 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. Injury to crops or desirable vegetation may result if treated soil is washed, blown, or moved onto land used to produce crops or land containing desirable vegetation.

Do not apply when soil is frozen or covered with snow.

Do not use on lawns, walks, paved driveways, tennis courts, or similar areas.

Do not apply more than 18 fluid ounces (0.28 pound ae) per acre per year.

Do not graze or feed forage, hay, or straw from treated areas to livestock.

Do not use plant material treated with this product for mulch or compost.

Do not plant the treated sites for at least one year after the application if non-crop sites treated are to be converted to a food, feed, or fiber agricultural crop, or to a horticultural crop. A field bioassay must then be completed before planting the desired crop.

Certain species, in particular, may be sensitive to low levels of Method 240SL including but not limited to conifers (such as Douglas fir, Norway spruce, ponderosa pine, and white pine), deciduous trees (such as aspen, Chinese tallow, cottonwood, honey locust, magnolia, poplar species, redbud, silver maple, and willow species), and ornamental shrubs (such as arborvitae, burning bush, crape myrtle, forsythia, hydrangea, ice plant, magnolia, purple plum, and yew).

Injury or loss of desirable trees may result if applied on or near desirable trees or vegetation, on areas where their roots extend, or in locations where the treated soil may be washed or moved into contact with their roots. Consider site-specific characteristics and conditions that could contribute to unintended root zone exposure to desirable trees or vegetation. Root zone areas of desirable trees or vegetation are affected by local conditions and can extend beyond the tree canopy. If further information is needed regarding root zone area, consult appropriate state extension service, professional consultant, or other qualified authority.

Injury to or loss of desirable trees or vegetation may result if equipment is drained or flushed on or near these trees or vegetation or on areas where their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots.

In non-crop areas adjacent to desirable vegetation, avoid overlapping spray applications and shut off spray to the spray boom while starting, turning, slowing, or stopping to avoid injury to desirable vegetation.

Applications made where runoff water flows onto agricultural land may injure or kill crops such as, but not limited to, sugar beets, potatoes, tomatoes, tobacco, soybeans, field beans, alfalfa, grapes, peaches, almonds, and vegetables.

Applications should be made 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.

Exposure may injure or kill most crops and may injure or kill desirable vegetation. Injury may be more severe when the crops or desirable vegetation are irrigated.

Caution is advised when using this product in areas where loss of desirable conifer or deciduous trees and/or shrubs, as well as other broadleaf plants, including but not limited to legumes and wildflowers, cannot be tolerated. Without prior experience, it is necessary that small areas containing these plants be tested for tolerance and its soil residues before any large-scale spraying occurs.

Low rates can injure or severely injure most crops. Following an application, the use of spray equipment to apply other pesticides to crops on which Method 240SL herbicide is not registered may result in their damage. The most effective way to reduce this crop damage potential is to use dedicated mixing and application equipment.

Leave treated soil undisturbed to reduce the potential for movement by soil erosion due to wind or water.

In the case of suspected off-site movement to cropland, soil samples should be quantitatively analyzed for Method 240SL herbicide, or any other herbicide which could be having an adverse effect on the crop, in addition to conducting the field bioassay.

May suppress or severely injure certain established grasses, such as some bromegrass and wheatgrass species, especially when the grass plants are stressed by adverse environmental conditions. Areas that contain these grass plants should recover as environmental conditions for good grass growth occur.

Keep out of reach of children.

Hazards to humans and domestic animals.

Caution. Causes moderate eye irritation. Avoid contact with eyes or clothing. Mixers, loaders, and applicators must wear long-sleeved shirt and long pants, shoes plus socks. Wash thoroughly with soap and water after handling and 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.

Environmental hazards. Do 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 washwaters or rinsate.

Surface water advisory. This product may impact surface water quality due to runoff of rainwater. This is especially true for poorly draining soils and soils with shallow ground water. This product is classified as having high potential for reaching surface water via runoff for several months after application. A level, well-maintained vegetative buffer strip between areas to which this product is applied and surface water features such as ponds, streams, and springs will reduce the potential loading of aminocyclopyrachlor from runoff water and sediment. Runoff of this product will be reduced by avoiding applications when rainfall is forecasted to occur within 48 hours.

Ground water advisory. Aminocyclopyrachlor has properties and characteristics associated with chemicals detected in ground water. This chemical may leach into ground water if used in areas where soils are permeable, particularly where the water table is shallow.

III. ENVIRONMENTAL EFFECTS/FATE

SOLUBILITY: 4,200 mg/l in water (pH 7 at 20° C).

VAPOR PRESSURE: 3.7×10^{-8} torr at 25° C.

HYDROLYSIS: Stable at pH 4, 7, and 9.

PHOTOLYSIS IN WATER: 1.2 days in natural water, pH 6.2, at 20° C.

PHOTOLYSIS ON SOIL: 129 days at 20° C.

AEROBIC SOIL METABOLISM: AVERAGE: 224 days.

ANAEROBIC SOIL METABOLISM: 6,932 days.

K_{oc}: 2.0-26 depending on soil. Average 11.68.

PERSISTENCE AND AGENTS OF DEGRADATION/DISSIPATION: Aminocyclopyrachlor is a persistent compound that will degrade primarily via photolysis post application. It slowly degrades by aerobic microbial metabolism with half-lives ranging from 114-433 days in different soils. It is stable to degradation via other pathways. It is expected to be highly mobile in the environment. The reported Terrestrial Field Dissipation half-lives are likely more a result of transport losses from runoff and leaching rather than degradation.

METABOLITES/DEGRADATION PRODUCTS AND POTENTIAL ENVIRONMENTAL EFFECTS: IN-LXT69, 5-chloro-2-cyclopropyl-pyrimidin-4-ylamine; IN-QFH57, 4-cyano-2-cyclopropyl-aH-imidazole-5-carboxylic acid; IN-Q3007, cyclopropanecarboxamide; IN-V0977, cyclopropanecarboxylic acid; IN-YY905, cyclopropanecarbamidine. The metabolites are not expected to occur in environmentally relevant concentrations.

POTENTIAL FOR LEACHING INTO SURFACE AND GROUND WATER: This product is classified as having high potential for reaching surface water via runoff for several months after application. This chemical may leach into groundwater if used in areas where soils are permeable, particularly where the water table is shallow.

POTENTIAL FOR BYPRODUCTS FROM BURNING OF TREATED VEGETATION: Information not available.

IV. ECOLOGICAL TOXICITY EFFECTS ON NON-TARGET SPECIES

TERRESTRIAL:

AVIAN ACUTE ORAL TOXICITY:	LD ₅₀ (bobwhite quail) >2075 mg/kg
AVIAN SUBACUTE DIETARY TOXICITY:	LC ₅₀ (mallard duck) >5290 mg/kg LC ₅₀ (bobwhite quail) >5290 mg/kg
HONEY BEE	LC ₅₀ >100 µg/bee (acute contact) and 112.03 µg/bee (oral)
EARTHWORM	LOAEC and NOAEC 334 mg/kg soil DW and 203 mg/kg soil DW, respectively.

SMALL MAMMAL ACUTE ORAL TOXICITY: LD₅₀ (rat) >5000 mg/kg

OVERALL TERRESTRIAL TOXICITY: Practically Non-Toxic

PLANTS: Highly toxic. Dicots are much more sensitive than monocots.

FRESHWATER AQUATIC SPECIES:

ACUTE TOXICITY: LC₅₀ (rainbow trout 96-hour) 122 mg/l (practically non-toxic)

ACUTE TOXICITY: LC₅₀ (bluegill sunfish 96-hour) 120 mg/l (practically non-toxic)

ACUTE TOXICITY: EC₅₀ (Daphnia 48-hour) 39.7 mg/l (slightly toxic)

OVERALL FRESHWATER AQUATIC TOXICITY: Practically Non-Toxic to Slightly Toxic

ESTUARINE/MARINE AQUATIC SPECIES:

ACUTE TOXICITY: LC₅₀ (sheepshead minnow 96-hour) 129 mg/l

ACUTE TOXICITY: LC₅₀ (mysid shrimp 96-hour) 122 mg/l

ACUTE TOXICITY: LC₅₀ (eastern oyster 96-hour) 118 mg/l

OVERALL ESTUARINE/MARINE TOXICITY: Practically Non-Toxic

BIOACCUMULATION POTENTIAL: Low tendency.

THREATENED AND ENDANGERED SPECIES: Federally listed terrestrial and aquatic plants may be adversely affected if the product is applied directly to plants and surface water.

V. TOXICOLOGICAL DATA

ACUTE TOXICITY:

ACUTE ORAL TOXICITY: LD₅₀ (rat) >5000 mg/kg

ACUTE DERMAL TOXICITY: LD₅₀ (rat) >5000 mg/kg

ACUTE INHALATION: LC₅₀ (rat 4-hour) >5.4 mg/l

OVERALL TOXICITY: Category IV – Practically Non-Toxic

CHRONIC TOXICITY:

CARCINOGENICITY: Not likely to be Carcinogenic to Humans.

DEVELOPMENTAL/REPRODUCTIVE: There is low concern for reproductive, developmental, or neurotoxicity for aminocyclopyrachlor.

MUTAGENICITY: Negative.

HAZARD: The end-use product labels for the aminocyclopyrachlor formulation Method® 240SL herbicide carries the *Caution!* signal word due to moderate eye irritation and need to avoid contact with eyes.

VI. HUMAN HEALTH EFFECTS

ACUTE TOXICITY (POISONING):

REPORTED EFFECTS: None reported.

CHRONIC TOXICITY:

REPORTED EFFECTS: Decreased body weights, body weight gains, food consumption, and food efficiency in both sexes of rats were observed at the LOAEL of 1044.6/1424.9 mg/kg/day.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM CONTACTING OR CONSUMING TREATED VEGETATION, WATER OR ANIMALS:

None reported.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM INERT INGREDIENTS CONTAINED IN THE FORMULATED PRODUCTS:

None reported.

HEALTH EFFECTS OF EXPOSURE TO FORMULATED PRODUCTS: None reported.

HEALTH EFFECTS ASSOCIATED WITH CONTAMINANTS: None reported.

HEALTH EFFECTS ASSOCIATED WITH OTHER FORMULATIONS: None reported.

VII. SAFETY PRECAUTIONS

SIGNAL WORD AND DEFINITION:

AMINOCYCLOPYRACHLOR (*METHOD® 240SL Herbicide*) - **Caution!** – MODERATE EYE IRRITATION. AVOID CONTACT WITH EYES.

PROTECTIVE PRECAUTIONS FOR WORKERS: Applicators and other handlers must wear all PPE with long-sleeved shirt and long pants, shoes plus socks and gloves.

MEDICAL TREATMENT PROCEDURES (ANTIDOTES):

EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a physician or poison control center immediately.

SKIN: Take off contaminated clothing and shoes immediately. Wash off immediately with plenty of water for at least 15 minutes. Call a physician or poison control center immediately.

INGESTION: Call a physician or poison control center immediately. Rinse out mouth and give water in small sips to drink. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Do not leave victim unattended.

INHALATION: Move to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a physician or poison control center immediately

HANDLING, STORAGE AND DISPOSAL: Handle an open container in a manner as to prevent spillage. Use only in area provided with appropriate exhaust ventilation. Wash hands thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, using the toilet or applying cosmetics. Remove Personal Protective Equipment (PPE) immediately after handling this product. Before removing gloves clean them with soap and water. Remove soiled clothing immediately and clean thoroughly before using again. Wash thoroughly and put on clean clothing.

EMERGENCY SPILL PROCEDURES AND HAZARDS: Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Collect and transfer the product into a properly labelled and tightly closed container. Clean contaminated floors and objects thoroughly, observing environmental regulations. Do not allow to enter soil, waterways or waste water canal.

VIII. DEFINITIONS

adsorption – the process of attaching to a surface

avian – of, or related to, birds

CAEPA – California Environmental Protection Agency

carcinogenicity – ability to cause cancer

CHEMTREC – Chemical Transportation Emergency Center

dermal – of, or related to, the skin

EC₅₀ - median effective concentration during a bioassay

ecotoxicological – related to the effects of environmental toxicants on populations of organisms originating, being produced, growing or living naturally in a particular region or environment

FIFRA – Federal Insecticide, Fungicide and Rodenticide Act

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

half-life – the time required for half the amount of a substance to be reduced by natural processes

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

Hg – chemical symbol for mercury

IARC – International Agency for Research on Cancer

K(oc) – the tendency of a chemical to be adsorbed by soil, expressed as: $K(oc) = \text{conc. adsorbed}/\text{conc. dissolved}/\% \text{ organic carbon in soil}$

LC₅₀ – the concentration in air, water, or food that will kill approximately 50% of the subjects

LD₅₀ – the dose that will kill approximately 50% of the subjects

leach – to dissolve out by the action of water

LOEC – lowest observed effect concentration

mg/kg – weight ratio expressed as milligrams per kilogram

mg/l – weight-to-liquid ratio expressed as milligrams per liter

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

mPa – milli-Pascal (unit of pressure)

mutagenicity – ability to cause genetic changes

NFPA – National Fire Protection Association

NIOSH - National Institute for Occupational Safety and Health

NOEL - no observable effect level

non-target – animals or plants other than the ones that the pesticide is intended to kill or control

OSHA - Occupational Safety and Health Administration

Pa – Pascal (unit of pressure)

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

pesticides – substances including herbicides, insecticides, rodenticides, fumigants, repellents, growth regulators, etc., regulated under FIFRA

PPE – personal protective equipment

ppm – weight ratio expressed as parts per million

residual activity – the remaining amount of activity as a pesticide

T&E – Threatened and Endangered Species (from the Endangered Species Act)

µg – micrograms

volatility – the tendency to become a vapor at standard temperatures and pressures

IX. INFORMATION SOURCES

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Bayer Environmental Science, Method® 240SL, Safety Data Sheet, SDS Number 102000030323, Version 2.0, September 2, 2015

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Syracuse Environmental Research Associates, Inc., Submitted to USDA Forest Service, Aminocyclopyrachlor Human Health and Ecological Risk Assessment FINAL REPORT, September 27, 2012

USEPA, Registration of the New Active Ingredient Aminocyclopyrachlor for Use on Non-Crop Areas, Sod Farms, Turf, and Residential Lawns, August 24, 2010

X. TOXICITY CATEGORY TABLES

TABLE I: HUMAN HAZARDS

Category	Signal Word	Route of Administration			Hazard	
		Acute Oral LD ₅₀ (mg/kg)	Acute Dermal LD ₅₀ (mg/kg)	Acute Inhalation LC ₅₀ (mg/l)	Eye irritation	Skin irritation
I (Highly Toxic)	DANGER (poison)	0-50	0-200	0-0.2	corrosive: corneal opacity not reversible within 7 days	corrosive
II (Moderately Toxic)	WARNING	>50-500	>200-2000	>0.2-2	corneal opacity reversible within 7 days; irritation persisting for 7 days	severe irritation at 72 hours
III (Slightly Toxic)	CAUTION	>500-5000	>2000-20.000	>2-20	no corneal opacity; irritation reversible within 7 days	moderate irritation at 72 hours
IV (Practically Non-toxic)	NONE	>5000	>20,000	>20	no irritation	moderate irritation at 72 hours

After *Pesticide User's Guide*, Ohio State University, Extension Bull. No. 745, 1998.

TABLE II: ECOTOXICOLOGICAL RISKS TO WILDLIFE (TERRESTRIAL AND AQUATIC)

Risk Category	Mammals Acute Oral LD ₅₀ mg/kg)	Avian Acute Oral LD ₅₀ (mg/kg)	Avian Acute Dietary LC ₅₀ (mg/kg)	Fish or Aquatic Invertebrates Acute Concentration LC ₅₀ (mg/l)
Very Highly Toxic	<10	<10	<50	<0.1
Highly Toxic	10-50	10-50	50-500	0.1 – 1
Moderately Toxic	51-500	51-500	501-1,000	>1 – 10
Slightly Toxic	501-2,000	501-2,000	1,001-5,000	>10 – 100
Practically Non-toxic	>2,000	>2,000	>5,000	>100

Table II created from information contained in *Pesticides and Wildlife*, Whitford, Fred, et al., Purdue University Cooperative Extension Service PPP-30, 1998.

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This fact sheet was prepared by USDOE-Bonneville Power Administration, April 2020.

Florpyrauxifen-benzyl

HERBICIDE FACT SHEET

U.S. DEPARTMENT OF ENERGY
BONNEVILLE POWER ADMINISTRATION

This fact sheet is one of a series issued by the Bonneville Power Administration for their workers and the general public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions. A list of definitions is included in Section VIII of this fact sheet.

I. BASIC INFORMATION

COMMON NAME: Florpyrauxifen-benzyl

CHEMICAL NAME: 2-pyridinecarboxylic acid, 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-, phenyl methyl ester

Cas No. 1390661-72-9

CHEMICAL TYPE: Arylpicolinate (class of synthetic auxin)

PESTICIDE CLASSIFICATION: Herbicide

REGISTERED USE STATUS: General Use Pesticide

FORMULATIONS: Commercial herbicide products generally contain one or more ingredients. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, the United States Environmental Protection Agency (USEPA) announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52FR13305). This policy focuses on the regulation of inert ingredients. USEPA's strategy for implementing this policy included the development of four lists of inerts, based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3, and inerts of minimal concern were placed on List 4.

The inert ingredients of mixtures containing florpyrauxifen-benzyl are not classified by the USEPA as inert ingredients of toxicological concerns to humans or the environment.

Note: BPA would use florpyrauxifen-benzyl only as a component of a terrestrially-applied pre-formulated herbicide mixture with other approved active ingredients, e.g. with aminopyralid in TerraVue® herbicide.

The contents of ProcellaCOR™ SC are listed below:

Florpyrauxifen-benzyl: 2-pyridinecarboxylic acid, 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-, phenyl methyl ester.....	26.5%
Other Ingredients	73.5%
Total.....	100.00%

The contents of ProcellaCOR™ EC are listed below:

Florpyrauxifen-benzyl: 2-pyridinecarboxylic acid, 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-, phenyl methyl ester.....	2.7%
Other Ingredients	97.3%
Total.....	100.00%

The contents of TerraVue® are listed below:

Aminopyralid: 2-pyridinecarboxylic acid, 4-amino-3,6-dichloro-, potassium salt.....	71.01%
Florpyrauxifen-benzyl: 2-pyridinecarboxylic acid, 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-, phenyl methyl ester.....	6.00%
Other Ingredients	22.99%
Total.....	100.00%

II. HERBICIDE USES

PROCELLACOR™ SC AND EC (FLORPYRAUXIFEN-BENZYL):

REGISTERED FORESTRY, RANGELAND AND RIGHT-OF-WAY USES: No. ProcellaCOR™ SC and EC are selective systemic herbicides for management of freshwater aquatic vegetation in slow-moving/quiescent waters with little or no continuous outflow: ponds, lakes, reservoirs, freshwater marshes, wetlands, bayous, drainage ditches, and non-irrigation canals, including shoreline and riparian areas in or adjacent to these sites. Also for management of invasive freshwater aquatic vegetation in slow-moving/quiescent areas of rivers (coves, oxbows or similar sites).

OPERATIONAL DETAILS:

TARGET PLANTS: ProcellaCOR™ SC and EC are used to control aquatic plants and weeds.

MODE OF ACTION: ProcellaCOR™ SC and EC are absorbed by aquatic vascular plants through emergent or floating leaves and from water through submersed plant shoots and leaves where it is translocated to fast-growing plant tissues and deregulates plant growth metabolic pathways, resulting in death of susceptible species.

METHOD OF APPLICATION AND RATES:

ProcellaCOR™ SC: Aerial and ground broadcast, spot, and localized applications not to exceed 0.052 lbs/acre per application, or 0.104 lbs/acre per year.

ProcellaCOR™ EC: Aerial and ground broadcast, spot, and localized applications not to exceed 0.052 lbs/acre per application, or 0.104 lbs/acre per year.

FOR TERRAVUE® (AMINOPYRALID + FLORPYRAUXIFEN-BENZYL):

REGISTERED FORESTRY, RANGELAND AND RIGHT-OF-WAY USES: TerraVue® is registered for use in non-crop sites for control of annual and perennial broadleaf weeds including invasive and noxious weeds, certain annual grasses, and certain woody plants and vines. For terrestrial use only.

OPERATIONAL DETAILS:

TARGET PLANTS: TerraVue® is used to control annual and perennial broadleaf weeds including invasive and noxious weeds, certain annual grasses, and certain woody plants and vines.

MODE OF ACTION: TerraVue® is absorbed by the foliage and roots, and is translocated to fast-growing plant tissues where it deregulates plant growth metabolic pathways, resulting in death of susceptible species.

METHOD OF APPLICATION AND RATES: Ground broadcast, spot, or repeat applications not to exceed a total of 5.7 oz per acre of TerraVue (0.252 lbs aminopyralid and 0.0213 lbs florpyrauxifen-benzyl) per year as a result of broadcast, spot, or repeat applications.

SPECIAL PRECAUTIONS:

TIMING OF APPLICATION: Apply when vegetation is actively growing and not stressed by drought or other conditions. Increase herbicide rate within the labeled rate range as the season progresses and plants become more mature. Higher application rates will produce an increase in residual suppression.

DRIFT CONTROL: Care should be exercised not to overspray or apply the herbicide to adjacent non-target areas. Drift control is achieved by observing weather conditions and following label and sprayer instructions.

RESTRICTIONS/WARNINGS/LIMITATIONS: Restrictions in Hay or Manure Use. Do not reformulate or repackage this product into other end-use products. Do not treat frozen soil where runoff could damage sensitive plants. Use 2 or more gallons of spray solution per acre. Do not make more than two applications per year. Do not apply within 30 days of previous application. Do not contaminate water intended for irrigation or domestic purposes. Do not apply through any type of irrigation system. Non-target plant advisory. See label for more information.

III. ENVIRONMENTAL EFFECTS/FATE

FLORPYRAUXIFEN-BENZYL:

HALF-LIFE IN ATMOSPHERE: 1.12 days.

SOLUBILITY: Florpyrauxifen-benzyl: 15 µg/l in water (pH 7).

VAPOR PRESSURE: 4.6×10^{-5} Pa (3.5×10^{-7} Torr) at 25°C, Classified as "Non-volatile under field conditions."

HALF-LIFE IN WATER: Aerobic: 4-6 days;
Anaerobic: 2 days.

HALF-LIFE VIA HYDROLYSIS: 111 days (pH=7); Stable (pH=4); 1.23 days (pH=9)

PHOTOLYSIS IN WATER: 0.16 days.

PERSISTENCE IN WATER: DT₅₀ value 1.4 to 6.4 days

HALF-LIFE IN SOIL (20°C): Aerobic: 55.3 days;

Anaerobic: 41.5 days.

HALF-LIFE IN SEDIMENT: Aerobic: 8.36 days;

Anaerobic: 2.65 days.

K_{oc}: 32,280 L/kg_{oc}.

PERSISTENCE AND AGENTS OF DEGRADATION/DISSIPATION: Florpyrauxifen-benzyl degrades rapidly in atmosphere. In water, florpyrauxifen-benzyl is expected to dissipate quickly from water, due to its rapid photolysis and low persistence. In soils, it is moderately persistent, and shows low mobility.

METABOLITES/DEGRADATION PRODUCTS AND POTENTIAL ENVIRONMENTAL EFFECTS: Florpyrauxifen-benzyl transforms into several degradates that are expected to have the same or lesser toxicity and hazard concern than the parent; however, they are shown to be moderately to highly persistent in water, soils, and sediments.

POTENTIAL FOR LEACHING INTO SURFACE AND GROUND WATER: Florpyrauxifen-benzyl has a low potential to leach into groundwater and a high potential for surface water runoff.

POTENTIAL FOR BYPRODUCTS FROM BURNING OF TREATED VEGETATION: Information not available.

IV. ECOLOGICAL TOXICITY EFFECTS ON NON-TARGET SPECIES

FLORPYRAUXIFEN-BENZYL:

TERRESTRIAL:

AVIAN ACUTE ORAL TOXICITY: LD₅₀ (bobwhite quail) >2,250 mg AI/kg

AVIAN ACUTE DIETARY: LC₅₀ (mallard duck) >5,640 mg AI/kg diet

HONEY BEE: LD₅₀ >40 µg/bee (acute contact) and 105.4 µg/bee (oral)

SMALL MAMMAL ACUTE ORAL TOXICITY: LD₅₀ (rat) >5000 mg AI/kg

OVERALL TOXICITY: Practically Non-Toxic

PLANTS: Contact may injure or kill target and non-target plants.

AQUATIC:

ACUTE TOXICITY: LC₅₀ (freshwater, rainbow trout, 96-hr.) >49 µg AI/L

ACUTE TOXICITY: LC₅₀ (estuarine/marine, sheepshead minnow, 96-hr.) >40.3 µg AI/L

ACUTE TOXICITY: LC₅₀ (freshwater, scud, 96-hr.) >41.9 µg AI/L

ACUTE TOXICITY: EC₅₀ (marine, eastern oyster, 96 hour) >270 µg AI/L

OVERALL FRESHWATER AQUATIC TOXICITY: Practically Non-Toxic

BIOACCUMULATION POTENTIAL: Florpyrauxifen-benzyl is not expected to bioaccumulate in aquatic organisms due application rates that do not approach concentrations of concern, and because the chemical and degradation products would be metabolized by these organisms.

THREATENED AND ENDANGERED SPECIES: Application of Florpyrauxifen-benzyl may result in lethal or sub-lethal effects to federally listed terrestrial and aquatic plants, especially if the product is applied directly to the plants. Application may result in sub-lethal effects to fish, macroinvertebrates and other organisms.

V. TOXICOLOGICAL DATA

FLORPYRAUXIFEN-BENZYL:

ACUTE TOXICITY:

ACUTE ORAL TOXICITY: LD₅₀ (rat) >5000 mg/kg.

ACUTE DERMAL TOXICITY: LD₅₀ (rat) >5000 mg/kg

PRIMARY SKIN IRRITATION: Rabbit - Non-Irritating

PRIMARY EYE IRRITATION: Rabbit – Non-Irritating

ACUTE INHALATION: LC₅₀ (rat) >5.66 mg/l

OVERALL TOXICITY: Category IV – Practically Non-Toxic

CHRONIC TOXICITY:

CARCINOGENIC POTENTIAL: Not Likely To Be Carcinogenic To Humans

TERATOGENIC POTENTIAL: Florpyrauxifen-benzyl did not cause birth defects or any other fetal effects in laboratory animals.

REPRODUCTIVE TOXICITY: Florpyrauxifen-benzyl did not interfere with reproduction in laboratory animals.

MUTAGENICITY: In vitro genetic toxicity studies were negative.

HAZARD: The end-use product labels for florpyrauxifen-benzyl formulations ProcellaCOR™ and TerraVue® carry the *Caution* signal word due to moderate eye irritation hazard.

VI. Human Health Effects

FLORPYRAUXIFEN-BENZYL: No adverse acute or chronic effects, carcinogenicity, or mutagenicity were observed in toxicological studies, thus EPA concluded there were no risks of concern to human health. EPA also concluded that drinking water exposures to florpyrauxifen-benzyl do not pose a significant human health risk.

VII. SAFETY PRECAUTIONS

PROCELLACOR™ SC AND EC (FLORPYRAUXIFEN-BENZYL):

SIGNAL WORD AND DEFINITION:

CAUTION – Causes moderate eye irritation.

PROTECTIVE PRECAUTIONS FOR WORKERS: Applicators and other handlers must wear protective eyewear, long-sleeved shirt and long pants, shoes plus socks, and waterproof gloves.

MEDICAL TREATMENT PROCEDURES (ANTIDOTES):

EYES: Hold eyes open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. Call a poison control center or doctor for treatment advice.

SKIN: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

INGESTION: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Never give anything by mouth to an unconscious person.

INHALATION: Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice.

HANDLING: Keep out of reach of children. Do not swallow. Avoid contact with eyes, skin, and clothing. Avoid breathing vapor or mist. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation.

STORAGE: Store in a dry place. Store in original container. Keep container tightly closed when not in use. Do not store near food, foodstuffs, drugs or potable water supplies.

DISPOSAL: If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

EMERGENCY SPILL PROCEDURES AND HAZARDS: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. Spills or discharge to natural waterways is likely to kill aquatic organisms. Contain spilled material if possible. Small spills: Absorb with materials such as: Clay. Dirt. Sand. Sweep up. Collect in suitable and properly labeled containers. Large spills: Contact manufacturer for clean-up assistance.

VIII. DEFINITIONS

adsorption – the process of attaching to a surface

avian – of, or related to, birds

CAEPA – California Environmental Protection Agency

carcinogenicity – ability to cause cancer

CHEMTREC – Chemical Transportation Emergency Center

dermal – of, or related to, the skin

DT₅₀ – (Disappearance time 50): The time within which the initial concentration of the test substance is reduced by 50 percent.

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

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T&E – Threatened and Endangered Species (from the Endangered Species Act)

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volatility – the tendency to become a vapor at standard temperatures and pressures

IX. INFORMATION SOURCES

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II (Moderately Toxic)	WARNING	>50-500	>200-2000	>0.2-2	corneal opacity reversible within 7 days; irritation persisting for 7 days	severe irritation at 72 hours
III (Slightly Toxic)	CAUTION	>500-5000	>2000-20.000	>2-20	no corneal opacity; irritation reversible within 7 days	moderate irritation at 72 hours
IV (Practically Non-toxic)	NONE	>5000	>20,000	>20	no irritation	moderate irritation at 72 hours

After *Pesticide User's Guide*, Ohio State University, Extension Bull. No. 745, 1998.

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Risk Category	Mammals Acute Oral LD ₅₀ mg/kg)	Avian Acute Oral LD ₅₀ (mg/kg)	Avian Acute Dietary LC ₅₀ (mg/kg)	Fish or Aquatic Invertebrates Acute Concentration LC ₅₀ (mg/l)
Very Highly Toxic	<10	<10	<50	<0.1
Highly Toxic	10-50	10-50	50-500	0.1 – 1
Moderately Toxic	51-500	51-500	501-1,000	>1 – 10
Slightly Toxic	501-2,000	501-2,000	1,001-5,000	>10 – 100
Practically Non-toxic	>2,000	>2,000	>5,000	>100

Table II created from information contained in *Pesticides and Wildlife*, Whitford, Fred, et al., Purdue University Cooperative Extension Service PPP-30, 1998.

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This fact sheet was prepared by USDOE-Bonneville Power Administration, March 2022.

Indaziflam

HERBICIDE FACT SHEET

U.S. DEPARTMENT OF ENERGY
BONNEVILLE POWER ADMINISTRATION

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I. BASIC INFORMATION

COMMON NAME: Indaziflam, Alion Herbicide, Esplanade 200 SC, and Marengo

CHEMICAL NAME: N-[(1R,2S)-2,3-dihydro-2,6-dimethyl-1H-inden-1-yl]-6-(1-fluoroethyl)-1,3,5-triazine-2,4-diamine

CAS No. 950782-86-2

CHEMICAL TYPE: Alkylazine

PESTICIDE CLASSIFICATION: Herbicide

REGISTERED USE STATUS: General Use Pesticide.

FORMULATIONS: Commercial herbicide products generally contain one or more ingredients. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, EPA announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52FR13305). This policy focuses on the regulation of inert ingredients. EPA's strategy for implementing this policy included the development of four lists of inerts, based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3, and inerts of minimal and no concern were placed on List 4A and 4B, respectively.

The contents of the Indaziflam formulation for Esplanade® 200 SC herbicide are listed below:

Esplanade® 200 SC Herbicide			No inert ingredients listed.
Active Ingredient	Indaziflam	19.05 %	
Inert Ingredients		80.95 %	

RESIDUE ANALYTICAL METHODS: Standard herbicide screening analysis.

II. HERBICIDE USES

REGISTERED FORESTRY, RANGELAND AND RIGHT-OF-WAY USES: Indaziflam is registered for application to residential and commercial areas (lawns, ornamentals, and hardscapes including patios, walkways, etc.), turf (parks, cemeteries, golf courses, sod farms, sports fields, and commercial lawns), field grown ornamentals and Christmas trees, commercial nursery and landscape plantings, and forestry sites. For terrestrial use only.

OPERATIONAL DETAILS:

TARGET PLANTS: Pre-emergent control of annual grasses and broadleaf weeds.

MODE OF ACTION: Inhibits cellulose biosynthesis (CB Inhibitor).

METHOD OF APPLICATION AND RATES: Spot, localized, broadcast, and aerial spray applications. The application rate is 3.5-7 fl oz per acre. Not to exceed 7 fl oz for a single application and must not exceed 10 fl oz per acre in a 12-month period. For aerial application (helicopter and fixed wing aircraft), use 5-30 gallons of spray volume per acre.

SPECIAL PRECAUTIONS:

TIMING OF APPLICATION: Timing is dependent on the target plant and desired results. Apply Esplanade 200 SC prior to weed seed germination as it does not generally control weeds that have emerged. For maximum weed control, Esplanade 200 SC needs to reach the soil surface and be activated by rainfall or adequate soil moisture. Apply Esplanade 200 SC in the spring for control of spring and summer germinating weeds and apply in the fall for control of winter weeds. For late fall applications, apply prior to when the ground freezes.

DRIFT CONTROL: Care should be exercised not to overspray or apply the herbicide to adjacent non-target areas. Drift control is achieved by observing weather conditions and following label and sprayer instructions. To reduce the potential for drift, the ground application equipment must be set to apply coarse or greater droplets (i.e., ASABE Standard 572.1) with corresponding spray pressure. Use high flow rate nozzles to apply the highest practical spray volume. With most nozzle types, narrower spray angles produce larger droplets. Follow the nozzle manufacturer's directions on pressure, orientation, spray volume, etc., in order to minimize drift and optimize coverage and control. For aerial applications the distance of the outer most nozzles on the boom must not exceed $\frac{3}{4}$ the length of the wingspan or rotor, and nozzles must always point backward, parallel with the air stream and never be pointed downwards more than 45 degrees. All aerial and ground application equipment must be properly maintained and calibrated using appropriate carriers.

Restrictions/Warnings/Limitations:

Do not apply to frozen or snow covered ground.

Do not graze or feed forage, hay, or straw from treated areas to livestock.

Do not apply directly to water or to soil where standing water is present.

Do not apply in or on irrigation ditches/canals including the outer banks.

Do not contaminate water intended for irrigation and domestic use.

Do not treat or allow spray drift or runoff to fall into irrigation ditches/canals or other channels that carry water that may be used for irrigation purposes.

Do not exceed 7 fl oz per acre in a single application.

Do not exceed 10 fl oz per acre within a calendar year or in a 12-month period from previous application.

Do not apply to newly seeded turf.

Do not apply through an irrigation or chemigation system.

Aerial applications are only allowed to release or re-establish desirable vegetation in non-crop areas such as parks and open space, wildlife management areas, recreational areas, fire rehabilitation areas, prairies, and fire breaks.

Do not apply or otherwise permit this product or sprays containing this product to come into contact with any non-target crop or desirable plants.

Do not make applications when circumstances favor movement from treatment sites.

Do not use on residential lawns or commercial lawns, golf courses, sod farms, or production and landscape ornamentals.

Do 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.

Applications to hardscapes (e.g. patios, paved parking lots, and walkways) may be made by spot application only.

Applications made to areas where runoff water flows onto agricultural land may injure crops.

Applications made during periods of intense rainfall, to soils saturated with water, or soils through which rainfall will not readily penetrate may result in runoff and movement of herbicide.

Treated soil should be left undisturbed to reduce the potential for herbicide movement by soil erosion, by wind, or water.

Applications should be made only when there is little or no risk of spray drift or movement of applied product into sensitive areas. Sensitive areas are defined as bodies of water (ponds, lakes, rivers, and streams), habitats of endangered species and non-labeled agricultural crop areas.

Avoid application to powdery, dry, light or sandy soil when there is little likelihood of rainfall soon after application. Injury to crops or desirable vegetation may result if treated soil is washed, blown, or moved into these areas.

If planning to plant desirable species in the treated area, avoid planting for at least eight months after application.

III. ENVIRONMENTAL EFFECTS/FATE

SOLUBILITY: pH 4: 0.0044 g/L at 20°C; pH 9: 0.0028 g/L at 20°C; Distilled water (pH 6.6-6.9): 0.0028 g/L at 20°C.

VAPOR PRESSURE: 2.5 x 10⁻⁸ PA at 20°C or 1.875 x 10⁻¹⁰ mm Hg; 6.8 x 10⁻⁸ PA at 25°C or 5.1 x 10⁻¹⁰ mm Hg; 6.9 x 10⁻⁶ PA at 50°C or 5.2 x 10⁻⁸ mm Hg.

HYDROLYSIS: Stable.

PHOTOLYSIS IN WATER: T_{1/2} of 3.7 days.

PHOTOLYSIS ON SOIL: T_{1/2} of 40.8 days.

AEROBIC SOIL METABOLISM: AVERAGE: T_{1/2} range from 35 to 178 days.

ANAEROBIC SOIL METABOLISM: T_{1/2} of >180 days.

K_{oc}: 496.

PERSISTENCE AND AGENTS OF DEGRADATION/DISSIPATION: The primary route of degradation is aerobic soil metabolism, aerobic aquatic metabolism, and aquatic photolysis.

METABOLITES/DEGRADATION PRODUCTS AND POTENTIAL ENVIRONMENTAL EFFECTS:

Degradation results in the production of metabolites: triazine-indanone (aerobic soil and aerobic aquatic metabolism), indaziflam-carboxylic acid (aerobic soil and aerobic aquatic metabolism), indaziflam-hydroxyethyl (aquatic photolysis), indaziflam-olefin (aquatic photolysis), fluoroethyl diamino triazine (FDAT; aerobic soil and aerobic aquatic metabolism), and fluoroethyl-triazinanedione (aerobic soil metabolism). Metabolites are only toxicologically significant in regards to impacts on non-target aquatic macrophytes.

POTENTIAL FOR LEACHING INTO SURFACE AND GROUND WATER: Moderately mobile to mobile in soil and likely that runoff events could move indaziflam off treated areas and into adjacent waterbodies. Metabolites are more mobile than the parent. The degradate FDAT is mobile to highly mobile and has the potential to leach to the ground water.

POTENTIAL FOR BYPRODUCTS FROM BURNING OF TREATED VEGETATION: Information not available.

IV. ECOLOGICAL TOXICITY EFFECTS ON NON-TARGET SPECIES

TERRESTRIAL:

AVIAN ACUTE ORAL TOXICITY:	LD ₅₀ (bobwhite quail) >2000 mg AI/kg
AVAIN SUBACUTE DIETARY	LC ₅₀ (mallard duck/bobwhite quail) >2000 mg AI/kg
HONEY BEE	LC ₅₀ >100 µg/bee (acute contact) and 120 µg/bee (oral)
EARTHWORM soil DW, respectively (No significant toxicity).	LOAEC and NOAEC 60.3 mg/kg soil DW and 34 mg/kg
SMALL MAMMAL ACUTE ORAL TOXICITY:	LD ₅₀ (rat) >=5000 mg/kg

OVERALL TOXICITY: Practically Non-Toxic

PLANTS: Contact may injure or kill target and non-target plants.

FRESHWATER AQUATIC SPECIES:

ACUTE TOXICITY: LC₅₀ (freshwater fish) 0.32 – 0.57 mg/L

ACUTE TOXICITY: LC₅₀ (marine/estuarine fish) 0.96 mg/L

ACUTE TOXICITY: EC₅₀ (Daphnia 48 hour) 9.88 mg/L

ACUTE TOXICITY: EC₅₀ (marine/estuarine invertebrates 96 hour) ~1 mg/L

OVERALL FRESHWATER AQUATIC TOXICITY: Highly Toxic

BIOACCUMULATION POTENTIAL: Does not bioaccumulate.

THREATENED AND ENDANGERED SPECIES: Federally listed terrestrial and aquatic plants and fish may be adversely affected if the product is applied directly to the plants, or indirectly to water as the result of drift or leaching.

V. TOXICOLOGICAL DATA

ACUTE TOXICITY:

ACUTE ORAL TOXICITY: LD₅₀ (rat) >=5000 mg/kg

ACUTE DERMAL TOXICITY: LD₅₀ (rat) >2000 mg/kg

ACUTE INHALATION: LC₅₀ (rabbit 4-hour) >3.624 mg/L

OVERALL TOXICITY: Category III – Slightly Toxic

CHRONIC TOXICITY:

CARCINOGENICITY: Not likely to be carcinogenic to humans.

DEVELOPMENTAL/REPRODUCTIVE: Some developmental and maternal toxicity in the offspring of pregnant rats, but not rabbits, characterized by decreased fetal and maternal body weights at 200 mg/kg/day.

MUTAGENICITY: No concerns for mutagenicity.

HAZARD: The end-use product labels for the indaziflam formulation Esplanade® 200 SC herbicide carries the *Caution* signal word due to harm if swallowed, inhaled, or absorbed through the skin. Avoid contact with skin, eyes, and clothing. Avoid breathing spray mist.

VI. HUMAN HEALTH EFFECTS

ACUTE TOXICITY (POISONING):

REPORTED EFFECTS: No symptoms known or expected.

CHRONIC TOXICITY:

REPORTED EFFECTS: No symptoms known or expected.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM CONTACTING OR CONSUMING TREATED VEGETATION, WATER OR ANIMALS: None.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM INERT INGREDIENTS CONTAINED IN THE FORMULATED PRODUCTS: None.

HEALTH EFFECTS OF EXPOSURE TO FORMULATED PRODUCTS: None reported.

HEALTH EFFECTS ASSOCIATED WITH CONTAMINANTS: None reported.

HEALTH EFFECTS ASSOCIATED WITH OTHER FORMULATIONS: None reported.

VII. SAFETY PRECAUTIONS

SIGNAL WORD AND DEFINITION:

Indaziflam (*Esplanade*[®] 200 SC Herbicide) – **CAUTION!** – HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH THE SKIN OR INHALED.

PROTECTIVE PRECAUTIONS FOR WORKERS: Applicators and other handlers must wear long-sleeved shirt and long pants, shoes plus socks and chemical-resistant gloves.

MEDICAL TREATMENT PROCEDURES (ANTIDOTES):

EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a physician or poison control center immediately.

SKIN: Take off contaminated clothing and shoes immediately. Wash off immediately with plenty of water for at least 15 minutes. Call a physician or poison control center immediately.

INGESTION: Call a physician or poison control center immediately. Rinse out mouth and give water in small sips to drink. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Do not leave victim unattended.

INHALATION: Move to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth if possible. Call a physician or poison control center immediately.

GENERAL ADVICE: When possible, have the product container or label with you when calling a poison control center or doctor or going for treatment.

HANDLING, STORAGE AND DISPOSAL: Handle an open container in a manner as to prevent spillage. Maintain exposure levels below the exposure limit through the use of general and local exhaust ventilation. Store in a cool, dry place and in such a manner as to prevent cross contamination with other crop protection products, fertilizers, food, and feed. Store in original container and out of the reach of children, preferably in a locked storage area. Protect from freezing. Do not reuse or refill this container. Triple rinse or pressure rinse container promptly after emptying. Offer for recycling, if available, or puncture and dispose of in a sanitary landfill.

EMERGENCY SPILL PROCEDURES AND HAZARDS: Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Collect and transfer the product into a properly labelled and tightly closed container. Clean contaminated floors and objects thoroughly, observing environmental regulations.

VIII. DEFINITIONS

adsorption – the process of attaching to a surface

avian – of, or related to, birds

CAEPA – California Environmental Protection Agency

carcinogenicity – ability to cause cancer

CHEMTREC – Chemical Transportation Emergency Center

dermal – of, or related to, the skin

EC₅₀ - median effective concentration during a bioassay

ecotoxicological – related to the effects of environmental toxicants on populations of organisms originating, being produced, growing or living naturally in a particular region or environment

FIFRA – Federal Insecticide, Fungicide and Rodenticide Act

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

half-life – the time required for half the amount of a substance to be reduced by natural processes

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

Hg – chemical symbol for mercury

IARC – International Agency for Research on Cancer

K(oc) – the tendency of a chemical to be adsorbed by soil, expressed as: $K(oc) = \text{conc. adsorbed}/\text{conc. dissolved}/\% \text{ organic carbon in soil}$

LC₅₀ – the concentration in air, water, or food that will kill approximately 50% of the subjects

LD₅₀ – the dose that will kill approximately 50% of the subjects

leach – to dissolve out by the action of water

LOEC – lowest observed effect concentration

mg/kg – weight ratio expressed as milligrams per kilogram

mg/l – weight-to-liquid ratio expressed as milligrams per liter

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

mPa – milli-Pascal (unit of pressure)

mutagenicity – ability to cause genetic changes

NFPA – National Fire Protection Association

NIOSH - National Institute for Occupational Safety and Health

NOEL - no observable effect level

non-target – animals or plants other than the ones that the pesticide is intended to kill or control

OSHA - Occupational Safety and Health Administration

Pa – Pascal (unit of pressure)

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

pesticides – substances including herbicides, insecticides, rodenticides, fumigants, repellents, growth regulators, etc., regulated under FIFRA

PPE – personal protective equipment

ppm – weight ratio expressed as parts per million

residual activity – the remaining amount of activity as a pesticide

T&E – Threatened and Endangered Species (from the Endangered Species Act)

µg – micrograms

volatility – the tendency to become a vapor at standard temperatures and pressures

X. INFORMATION SOURCES

Bayer Environmental Science, Esplanade® 200 SC, Package Label, 80878486

Bayer Environmental Science, Esplanade® 200 SC, Safety Data Sheet, SDS Number 102000023686, Version 2.1, June 14, 2016

New York State, Department of Environmental Conservation, Registration of the New Active Ingredient Indaziflam as Contained in Alion Herbicide (EPA Reg. No. 264-1106), Esplanade 200 SC (EPA Reg. No. 432-1516), and Marengo (EPA Reg. No. 432-1518) and the Withdrawal of Specticle 20 WSP (EPA Reg. No. 432-1499), October 05, 2012

USEPA, Pesticide Fact Sheet, Conditional Registration, July 26, 2010

X. TOXICITY CATEGORY TABLES

TABLE I: HUMAN HAZARDS

Category	Signal Word	Route of Administration			Hazard	
		Acute Oral LD ₅₀ (mg/kg)	Acute Dermal LD ₅₀ (mg/kg)	Acute Inhalation LC ₅₀ (mg/l)	Eye irritation	Skin irritation
I (Highly Toxic)	DANGER (poison)	0-50	0-200	0-0.2	corrosive: corneal opacity not reversible within 7 days	corrosive
II (Moderately Toxic)	WARNING	>50-500	>200-2000	>0.2-2	corneal opacity reversible within 7 days; irritation persisting for 7 days	severe irritation at 72 hours
III (Slightly Toxic)	CAUTION	>500-5000	>2000-20.000	>2-20	no corneal opacity; irritation reversible within 7 days	moderate irritation at 72 hours
IV (Practically Non-toxic)	NONE	>5000	>20,000	>20	no irritation	moderate irritation at 72 hours

After *Pesticide User's Guide*, Ohio State University, Extension Bull. No. 745, 1998.

TABLE II: ECOTOXICOLOGICAL RISKS TO WILDLIFE (TERRESTRIAL AND AQUATIC)

Risk Category	Mammals Acute Oral LD ₅₀ mg/kg)	Avian Acute Oral LD ₅₀ (mg/kg)	Avian Acute Dietary LC ₅₀ (mg/kg)	Fish or Aquatic Invertebrates Acute Concentration LC ₅₀ (mg/l)
Very Highly Toxic	<10	<10	<50	<0.1
Highly Toxic	10-50	10-50	50-500	0.1 – 1
Moderately Toxic	51-500	51-500	501-1,000	>1 – 10
Slightly Toxic	501-2,000	501-2,000	1,001-5,000	>10 – 100
Practically Non-toxic	>2,000	>2,000	>5,000	>100

Table II created from information contained in *Pesticides and Wildlife*, Whitford, Fred, et al., Purdue University Cooperative Extension Service PPP-30, 1998.

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This fact sheet was prepared by USDOE-Bonneville Power Administration, February 2020.

Triclopyr

HERBICIDE FACT SHEET

U.S. DEPARTMENT OF ENERGY
BONNEVILLE POWER ADMINISTRATION

This fact sheet is one of a series issued by the Bonneville Power Administration for their workers and the general public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions. A list of definitions is included in Section VIII of this fact sheet.

I. BASIC INFORMATION

COMMON NAME: triclopyr

CHEMICAL NAME: 3,5,6-trichloro-2-pyridinyloxyacetic acid

Cas No. 55335-06-3

Of the parent chemical, four forms are used in herbicide formulations:

ACID: 3,5,6-trichloro-2-pyridinyloxyacetic acid, Cas No. 55335-06-3;

BEE: 3,5,6-trichloro-2-pyridinyloxyacetic acid, butoxyethyl ester, Cas No. 64700-56-7;

COLN: 2-[(3,5,6-trichloro-2-pyridinyl)oxy]acetic acid, choline salt, Cas No. 104837-85-8; and

TEA: 2-[(3,5,6-trichloro-2-pyridinyl)oxy]acetic acid, triethylamine salt, Cas No. 57213-69-1.

CHEMICAL TYPE: Pyridinyloxyacetic acids

PESTICIDE CLASSIFICATION: Herbicide

REGISTERED USE STATUS: General Use Pesticide.

FORMULATIONS: Commercial herbicide products generally contain one or more ingredients. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, the United States Environmental Protection Agency (USEPA) announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52FR13305). This policy focuses on the regulation of inert ingredients. USEPA's strategy for implementing this policy included the development of four lists of inerts, based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3, and inerts of minimal concern were placed on List 4.

The inert ingredients of the triclopyr formulations are not classified by the USEPA as inert ingredients of toxicological concerns to humans or the environment.

The contents of several examples of herbicide products containing triclopyr are listed below:

Trycera® Herbicide		
Triclopyr (ACID)		29.4 %
Inert		70.6 %
Garlon® 4 Herbicide		
Triclopyr (BEE)		61.6 %
Inert		38.4 %
Garlon® XRT Herbicide		
Triclopyr (BEE)		83.9 %
Inert		16.1 %
Pathfinder® II Herbicide		
Triclopyr (BEE)		13.6 %
Inert		86.4 %
Vastlan® Herbicide		
Triclopyr (COLN)		54.7 %
Inert		45.3 %
Garlon® 3A Herbicide		
Triclopyr (TEA)		44.4 %
Inert		55.6 %

RESIDUE ANALYTICAL METHODS: Standard herbicide screening analysis.

II. HERBICIDE USES

REGISTERED FORESTRY, RANGELAND AND RIGHT-OF-WAY USES: All triclopyr formulations are registered for use in non-crop sites for selective control of woody plants and weeds. Triclopyr BEE is for terrestrial use only. Triclopyr ACID, COLN, and TEA formulations are labeled for aquatic use.

OPERATIONAL DETAILS:

TARGET PLANTS: Triclopyr is used to control woody plants and weeds.

MODE OF ACTION: Triclopyr is a synthetic mimic of the auxin hormone. It is absorbed by the foliage and roots, and is translocated to fast-growing plant tissues where it deregulates plant growth metabolic pathways, resulting in death of susceptible species.

METHOD OF APPLICATION AND RATES (ALL FORMULATIONS): Aerial (helicopter only) and ground broadcast, spot, and localized applications in rights-of-way not to exceed 9 lbs a.e./ acre per single application or per year.

SPECIAL PRECAUTIONS:

TIMING OF APPLICATION: Apply foliar treatment anytime plant is growing. Bark treatments can be applied any time. Dormant stem applications are made when the plant is dormant.

DRIFT CONTROL: Care should be exercised not to overspray or apply the herbicide to adjacent non-target areas. Drift control is achieved by observing weather conditions and following label and sprayer instructions.

RESTRICTIONS/WARNINGS/LIMITATIONS: Do not apply through any type of irrigation system. Non-target plant advisory. Grazing, haying, and slaughter restrictions (see individual labels).

III. ENVIRONMENTAL EFFECTS/FATE

Note: Tank mixes of triclopyr (COLN) and triclopyr (TEA) rapidly or instantaneously dissolve and dissociate into the triclopyr (ACID) form (plus triethylamine and choline portions). Triclopyr (BEE) typically converts to the triclopyr (ACID) form (plus butoxyethanol portion) in less than 1 day via aerobic/anaerobic metabolism in soil and aquatic systems. Triclopyr (ACID) (which forms from triclopyr BEE, COLN, and TEA) is a weak acid that will dissociate into the triclopyr anion at pH values that are typical in the environment. The triclopyr anion is expected to be the predominant portion present in the environment when any of the four forms of triclopyr are used. The environmental effects/fate information below will focus on the triclopyr (ACID) and (BEE) forms.

SOIL:

RESIDUAL SOIL ACTIVITY:

	Triclopyr (ACID) half-life (days)	Triclopyr (BEE) half-life (days)
Soil Photolysis (25°C, pH 7, Loam)	Stable	No data
Aerobic Soil Metabolism (25°C)	13 (clay) to 21 (sandy clay loam)	0.2 (loam) to 0.6 (sandy loam)
Anaerobic Soil Metabolism (25°C)	69 (clay) to 170 (sandy loam)	No data

ADSORPTION: The $K_{(oc)}$ of triclopyr (BEE) is 780. The mean $K_{(oc)}$ of triclopyr (ACID), and by extension triclopyr (COLN) and triclopyr (TEA), is 59.2, and ranges between 25 and 134 depending on the soil type and soil pH.

PERSISTENCE AND AGENTS OF DEGRADATION: Triclopyr (BEE) and (TEA) are moderately persistent in the plant and soils. The primary route of degradation is microbial activity.

METABOLITES/DEGRADATION PRODUCTS AND POTENTIAL ENVIRONMENTAL EFFECTS:

Butoxyethanol, trimethylamine and choline are not considered toxicological residues of concern because they rapidly dissociate by microbial degradation. There are two major breakdown products (>10% formation): 3,5,6-trichloro-2-pyridinol (TCP) and 3,6-dichloro-2-pyridinol (3,6-DCP). TCP is a slightly to moderately persistent degradate (estimated half-life of 20 to 70 days) that forms in aerobic/anaerobic soil and aquatic systems. 3,6-DCP is a degradate that forms in some anaerobic soil systems and aerobic aquatic systems. There is evidence that 3,6-DCP is relatively stable in the conditions in which it is present. There are several minor breakdown products that may be formed in very small amounts (<10% formation). 5-Chloropyridin-2-ol (5-CLP) and 6-Chloropyridin-2-ol (6-CLP) are considered minor breakdown products; however, 5-CLP and 6-CLP (combined) were observed as a major degradate in one aerobic aquatic study (Max 26%) and were also shown to be relatively stable.

WATER:

SOLUBILITY: Triclopyr (ACID): 440 mg/l (25° C)
Triclopyr (BEE): 7.4 mg/l (25° C).
Triclopyr (COLN): Dissolves in seconds
Triclopyr (TEA): 412,000 mg/l (25° C).

POTENTIAL FOR GROUNDWATER LEACHING AND SURFACE WATER RUNOFF: Triclopyr (ACID) , and by extension triclopyr (COLN) and triclopyr (TEA), has a moderate potential to leach into groundwater and a low potential for surface water runoff. Triclopyr (BEE) has a low potential to leach into groundwater and a moderate potential for surface water runoff.

AIR:

VOLATILIZATION: Triclopyr ACID, BEE, and TEA are considered non-volatile (vapor pressures from 3.6×10^{-7} to 3.6×10^{-6} torr). There is no data available for triclopyr (COLN).

POTENTIAL FOR BYPRODUCTS FROM BURNING OF TREATED VEGETATION: Not known.

IV. ECOLOGICAL TOXICITY EFFECTS ON NON-TARGET SPECIES

Note: For the reasons described in the environmental effects/fate section above, information below will focus on the triclopyr (ACID) and (BEE) forms, including the TCP degradate, unless otherwise noted.

FOR TRICLOPYR ACID AND BEE (INCLUDING TCP DEGRADATE)

MICROORGANISMS (ACUTE CONTACT TOXICITY):

HONEY BEE:

ACID, LD₅₀: >100 ug/bee

BEE (97.7%), LD₅₀: >100 ug/bee

TCP degradate: No Data

OVERALL TOXICITY:

ACID: PRACTICALLY NON-TOXIC

BEE: PRACTICALLY NON-TOXIC

TCP DEGRADATE: NO DATA

PLANTS:

CONTACT WILL INJURE OR KILL TARGET AND NON-TARGET PLANTS.

AQUATIC VERTEBRATES (ACUTE TOXICITY):

RAINBOW TROUT (96-HR):

ACID (technical), LC₅₀: 117 mg/l

BEE (96.9%), LC₅₀: 0.65 mg/l

TCP degradate (99.9%), LC₅₀: 12.6 mg/l

BLUEGILL SUNFISH (96-HR):

ACID (technical), LC₅₀: 148 mg/l

BEE (96.9%), LC₅₀: 0.36 mg/l

TCP degradate (99.9%), LC₅₀: 12.5 mg/l

OVERALL TOXICITY:

ACID: PRACTICALLY NON-TOXIC

BEE: HIGHLY TOXIC

TCP DEGRADATE: SLIGHTLY TOXIC

AQUATIC FRESHWATER INVERTEBRATES (ACUTE TOXICITY):

***DAPHNIA MAGNA* (48-HR):**

ACID (technical), EC₅₀: 132.9 mg/l

BEE (96.4%), EC₅₀: 12 mg/l

BEE (96.4%), EC₅₀: 1.7 mg/l

BEE (Garlon 4 Tech., 62.3%), EC₅₀: 0.35 mg/l

TCP degradate (99.9%), EC₅₀: 10.4 mg/l

OVERALL TOXICITY:

ACID: PRACTICALLY NON-TOXIC

BEE: SLIGHTLY TOXIC TO HIGHLY TOXIC

TCP DEGRADATE: SLIGHTLY TOXIC

AQUATIC ESTUARINE/MARINE INVERTEBRATES (ACUTE TOXICITY):

GRASS SHRIMP (96-HR):

ACID: No Data

TEA (46.2%) LC₅₀: 234 mg/l

BEE (96.1%), LC₅₀: 2.48 mg/l

BEE (Garlon 4, Tech., 62.4%), LC₅₀: 1.7 mg/l

TCP degradate (99.9%), LC₅₀: 83 mg/l

EASTERN OYSTER 96-HOUR:

ACID: No Data

TEA (46.2%), EC₅₀: 41.5 mg/l

BEE (96.1%), EC₅₀: 0.46 mg/l

BEE (Garlon 4 Tech., 62.9%), EC₅₀: 0.32 mg/l

TCP degradate (99.9%), EC₅₀: 9.3 mg/l

OVERALL TOXICITY:

ACID: NO DATA

TEA: PRACTICALLY NON-TOXIC TO SLIGHTLY TOXIC

BEE: MODERATELY TOXIC TO HIGHLY TOXIC

TCP DEGRADATE: SLIGHTLY TOXIC TO MODERATELY TOXIC

AVIAN (ACUTE ORAL TOXICITY):

MALLARD DUCK:

ACID (Tech.), LD₅₀: 1,698 mg/kg

BEE: No Data

TCP degradate: No Data

BOBWHITE QUAIL:

ACID: No Data

BEE (Tech. 96/1%), LD₅₀: 735 mg/kg

BEE (Garlon 4, 62.9%), LD₅₀: 849.2 mg/kg

TCP degradate (99.9%): LD₅₀: >2,000 mg/kg

OVERALL TOXICITY:

ACID: SLIGHTLY TOXIC

BEE: SLIGHTLY TOXIC

TCP DEGRADATE: PRACTICALLY NON-TOXIC

AVIAN (SUBACUTE DIETARY):

MALLARD DUCK:

ACID (Tech., 99.9%), LC₅₀: >5,620 mg/kg

BEE (Tech., 93%), LC₅₀: >10,000 mg/kg

BEE (96.9%), LC₅₀: >5,401 mg/kg

TCP degradate, LC₅₀: >5,620 mg/kg

BOBWHITE QUAIL:

ACID (Tech.), LC₅₀: 2,934 mg/kg

BEE (Tech., 93%), LC₅₀: 9,026 mg/kg

BEE (96.9%), LC₅₀: 5,401 mg/kg

TCP degradate, LC₅₀: No Data

OVERALL TOXICITY:

ACID: PRACTICALLY NON-TOXIC TO SLIGHTLY TOXIC

BEE: PRACTICALLY NON-TOXIC

TCP DEGRADATE: PRACTICALLY NON-TOXIC

BIOACCUMULATION POTENTIAL:

ACID: LOW POTENTIAL

BEE: HIGH POTENTIAL

TCP DEGRADATE: NO DATA

V. TOXICOLOGICAL DATA

TRICLOPYR (ACID)

ACUTE TOXICITY:

ACUTE ORAL TOXICITY: LD₅₀ (female rats): 1,030 mg/kg

ACUTE DERMAL TOXICITY: LD₅₀ (female rats): >2,000 mg/kg

PRIMARY SKIN IRRITATION: Causes mild skin irritation.

PRIMARY EYE IRRITATION: Causes serious eye damage.

ACUTE INHALATION: LC₅₀ (rat): 1.32 mg/l

OVERALL TOXICITY: Category I – Highly Toxic

CHRONIC TOXICITY:

CARCINOGENICITY: EPA Group D - Not classifiable as a human carcinogen.

DEVELOPMENTAL/REPRODUCTIVE: Positive for adverse developmental and reproductive effects.

MUTAGENICITY: In vitro genetic toxicity studies were negative.

HAZARD: The end-use product labels for the triclopyr (ACID) formulations carry the *Danger* signal word due to potential irreversible eye damage.

TRICLOPYR (BEE)

ACUTE TOXICITY:

ACUTE ORAL TOXICITY: LD₅₀ (female rats): 1,338 mg/kg

ACUTE DERMAL TOXICITY: LD₅₀ (rabbit): >2,000 mg/kg

PRIMARY SKIN IRRITATION: Brief contact may cause slight skin irritation with local redness. Repeated contact may cause severe skin irritation with local redness and discomfort.

PRIMARY EYE IRRITATION: May cause pain disproportionate to the level of irritation to eye tissues. May cause slight eye irritation. Corneal injury is unlikely.

ACUTE INHALATION: LC₅₀ (rat): >5.2 mg/l

OVERALL TOXICITY: Category III – Slightly Toxic

CHRONIC TOXICITY:

CARCINOGENICITY: EPA Group D - Not classifiable as a human carcinogen.

DEVELOPMENTAL/REPRODUCTIVE: In laboratory animal studies, effects on reproduction have been seen only at doses that produced significant toxicity to the parent animals.

MUTAGENICITY: In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

HAZARD: The end-use product labels for the triclopyr (BEE) formulations carry the *Caution* signal word due to potential moderate irritation.

FOR TRICLOPYR (COLN)

ACUTE TOXICITY:

ACUTE ORAL TOXICITY (FOR SIMILAR MATERIALS): LD₅₀ (female rat): 1,000 mg/kg

ACUTE DERMAL TOXICITY (FOR SIMILAR MATERIALS): LD₅₀ (male and female rats): >5,000 mg/kg

PRIMARY SKIN IRRITATION: Brief contact is essentially non-irritating to skin.

PRIMARY EYE IRRITATION: May cause moderate eye irritation. May cause slight corneal injury.

ACUTE INHALATION (FOR SIMILAR MATERIALS): LC₅₀ (male and female rats): >5.85 mg/l

OVERALL TOXICITY: Category II – Moderately Toxic

CHRONIC TOXICITY:

CARCINOGENICITY: EPA Group D - Not classifiable as a human carcinogen.

DEVELOPMENTAL/REPRODUCTIVE: In laboratory animal studies, effects on reproduction have been seen only at doses that produced significant toxicity to the parent animals.

MUTAGENICITY: In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

HAZARD: The end-use product labels for the triclopyr (COLN) formulations carry the *Warning* signal word due to potential substantial but temporary eye injury.

FOR TRICLOPYR (TEA)

ACUTE TOXICITY:

ACUTE ORAL TOXICITY: LD₅₀ (female rats): 4,100 mg/kg

ACUTE DERMAL TOXICITY: LD₅₀ (male and female rabbits): >5000 mg/kg

PRIMARY SKIN IRRITATION: Brief contact is essentially non-irritating to skin.

PRIMARY EYE IRRITATION: May cause moderate eye irritation. May cause moderate corneal injury.

ACUTE INHALATION: LC₅₀ (rat): >5.4 mg/l

OVERALL TOXICITY: Category I – Highly Toxic

CHRONIC TOXICITY:

CARCINOGENICITY: EPA Group D - Not classifiable as a human carcinogen.

DEVELOPMENTAL/REPRODUCTIVE: In laboratory animal studies, effects on reproduction have been seen only at doses that produced significant toxicity to the parent animals.

MUTAGENICITY: In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

HAZARD: The end-use product labels for the triclopyr (TEA) formulations carry the *Danger* signal word due to corrosive potential irreversible eye damage.

VI. HUMAN HEALTH EFFECTS

ACUTE TOXICITY (POISONING):

REPORTED EFFECTS: Severe eye irritation and skin irritation.

CHRONIC TOXICITY:

REPORTED EFFECTS: None reported.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM CONTACTING OR CONSUMING TREATED VEGETATION, WATER OR ANIMALS: See effects reported under acute toxicity.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM INERT INGREDIENTS CONTAINED IN THE FORMULATED PRODUCTS: Kerosene is an ingredient in Triclopyr (BEE). In a lifetime animal dermal carcinogenicity study, an increased incidence of skin tumors was observed when kerosene was applied at doses that also produced skin irritation. This response was similar to that produced in skin by other types of chronic chemical/physical irritation. No increase in tumors was observed when non-irritating dilutions of kerosene were applied at equivalent doses, indicating that kerosene is unlikely to cause skin cancer in the absence of long-term continued skin irritation.

HEALTH EFFECTS OF EXPOSURE TO FORMULATED PRODUCTS: Triclopyr (ACID) and triclopyr (TEA) are severe eye irritants. Triclopyr (COLN) is a moderate eye irritant.

HEALTH EFFECTS ASSOCIATED WITH CONTAMINANTS: None reported.

HEALTH EFFECTS ASSOCIATED WITH OTHER FORMULATIONS: None reported.

VII. SAFETY PRECAUTIONS

SIGNAL WORD AND DEFINITION:

TRICLOPYR (ACID) - **DANGER** – CORROSIVE. CAUSES IRREVERSIBLE EYE DAMAGE. HARMFUL IF SWALLOWED OR ABSORBED THROUGH SKIN. PROLONGED OR FREQUENTLY REPEATED SKIN CONTACT MAY CAUSE ALLERGIC REACTION IN SOME INDIVIDUALS.

TRICLOPYR (BEE) - **CAUTION** – HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH THE SKIN.

TRICLOPYR (COLN) - **WARNING** – MAY BE FATAL IF SWALLOWED. CAUSES SUBSTANTIAL BUT TEMPORARY EYE INJURY. PROLONGED OR FREQUENTLY REPEATED SKIN CONTACT MAY CAUSE ALLERGIC REACTIONS IN SOME INDIVIDUALS.

TRICLOPYR (TEA) - **DANGER** – CORROSIVE. CAUSES IRREVERSIBLE EYE DAMAGE. HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH THE SKIN. PROLONGED OR REPEATED CONTACT WITH THIS HERBICIDE MAY CAUSE ALLERGIC SKIN REACTIONS

PROTECTIVE PRECAUTIONS FOR WORKERS: Applicators and other handlers must wear protective eyewear (ACID, COLN, and TEA), protective gloves (chemical resistant), long-sleeved shirt and long pants, shoes and socks.

MEDICAL TREATMENT PROCEDURES (ANTIDOTES):

EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

SKIN: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

INGESTION: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow (ACID, COLN, and TEA only). Do not induce vomiting unless told to do so by the poison control center or doctor. Never give anything by mouth to an unconscious person.

INHALATION: Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice.

HANDLING: ALL: Keep away from heat, sparks and flame. Keep out of reach of children. Do not swallow. No smoking, open flames or sources of ignition in handling and storage area. Do not get in eyes. Avoid contact with skin and clothing. Avoid breathing vapor or mist. Use with adequate ventilation. Wash thoroughly after handling. Keep container closed. TEA: Containers, even those that have been emptied, can contain vapors. Do not cut, drill, grind, weld, or perform similar operations on or near empty containers. Electrically ground and bond all equipment. Vapors are heavier than air and may travel a long distance and accumulate in low lying areas. Ignition and/or flash back may occur. Use of non-sparking or explosion-proof equipment may be necessary, depending upon the type of operation.

STORAGE: ALL: Store in a dry place. Store in original container. Keep container tightly closed when not in use. Do not store near food, foodstuffs, drugs or potable water supplies. ACID: Store at temperatures above 28 °F. BEE: Avoid temperatures below -10 °C. TEA: Minimize sources of ignition, such as static build-up, heat, spark or flame.

DISPOSAL: If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

EMERGENCY SPILL PROCEDURES AND HAZARDS: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. Spills or discharge to natural waterways is likely to kill aquatic organisms. Contain spilled material if possible. Small spills: Absorb with materials such as: Clay. Dirt. Sand. Sweep up. Collect in suitable and properly labeled containers. Large spills: Contact manufacturer for clean-up assistance.

VIII. DEFINITIONS

adsorption – the process of attaching to a surface

avian – of, or related to, birds

CAEPA – California Environmental Protection Agency

carcinogenicity – ability to cause cancer

CHEMTREC – Chemical Transportation Emergency Center

dermal – of, or related to, the skin

EC₅₀ - median effective concentration during a bioassay

ecotoxicological – related to the effects of environmental toxicants on populations of organisms originating, being produced, growing or living naturally in a particular region or environment

FIFRA – Federal Insecticide, Fungicide and Rodenticide Act

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

half-life – the time required for half the amount of a substance to be reduced by natural processes

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

Hg – chemical symbol for mercury

IARC – International Agency for Research on Cancer

K(oc) – the tendency of a chemical to be adsorbed by soil, expressed as: $K(oc) = \text{conc. adsorbed}/\text{conc. dissolved}/\% \text{ organic carbon in soil}$

LC₅₀ – the concentration in air, water, or food that will kill approximately 50% of the subjects

LD₅₀ – the dose that will kill approximately 50% of the subjects

leach – to dissolve out by the action of water

mg/kg – weight ratio expressed as milligrams per kilogram

mg/l – weight-to-liquid ratio expressed as milligrams per liter

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

mPa – milli-Pascal (unit of pressure)

mutagenicity – ability to cause genetic changes

NFPA – National Fire Protection Association

NIOSH - National Institute for Occupational Safety and Health

NOEL - no observable effect level

non-target – animals or plants other than the ones that the pesticide is intended to kill or control

OSHA - Occupational Safety and Health Administration

Pa – Pascal (unit of pressure)

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

pesticides – substances including herbicides, insecticides, rodenticides, fumigants, repellents, growth regulators, etc., regulated under FIFRA

PPE – personal protective equipment

ppm – weight ratio expressed as parts per million

residual activity – the remaining amount of activity as a pesticide

T&E – Threatened and Endangered Species (from the Endangered Species Act)

µg – micrograms

volatility – the tendency to become a vapor at standard temperatures and pressures

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X. TOXICITY CATEGORY TABLES

TABLE I: HUMAN HAZARDS

Category	Signal Word	Route of Administration			Hazard	
		Acute Oral LD ₅₀ (mg/kg)	Acute Dermal LD ₅₀ (mg/kg)	Acute Inhalation LC ₅₀ (mg/l)	Eye irritation	Skin irritation
I (Highly Toxic)	DANGER (poison)	0-50	0-200	0-0.2	corrosive: corneal opacity not reversible within 7 days	corrosive
II (Moderately Toxic)	WARNING	>50-500	>200-2000	>0.2-2	corneal opacity reversible within 7 days; irritation persisting for 7 days	severe irritation at 72 hours
III (Slightly Toxic)	CAUTION	>500-5000	>2000-20.000	>2-20	no corneal opacity; irritation reversible within 7 days	moderate irritation at 72 hours
IV (Practically Non-toxic)	NONE	>5000	>20,000	>20	no irritation	moderate irritation at 72 hours

After *Pesticide User's Guide*, Ohio State University, Extension Bull. No. 745, 1998.

TABLE II: ECOTOXICOLOGICAL RISKS TO WILDLIFE (TERRESTRIAL AND AQUATIC)

Risk Category	Mammals Acute Oral LD ₅₀ mg/kg)	Avian Acute Oral LD ₅₀ (mg/kg)	Avian Acute Dietary LC ₅₀ (mg/kg)	Fish or Aquatic Invertebrates Acute Concentration LC ₅₀ (mg/l)
Very Highly Toxic	<10	<10	<50	<0.1
Highly Toxic	10-50	10-50	50-500	0.1 – 1
Moderately Toxic	51-500	51-500	501-1,000	>1 – 10
Slightly Toxic	501-2,000	501-2,000	1,001-5,000	>10 – 100
Practically Non-toxic	>2,000	>2,000	>5,000	>100

Table II created from information contained in *Pesticides and Wildlife*, Whitford, Fred, et al., Purdue University Cooperative Extension Service PPP-30, 1998.

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This fact sheet was prepared by USDOE-Bonneville Power Administration, March 2000, Updated March 2022.