

## APPENDIX Q: Herbicide Information Summary and Project Design Criteria Crosswalk

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Mt. Hood National Forest and Columbia River Gorge National Scenic Area  
PDC Information incorporated by Jennie O'Connor, Mt. Hood National Forest, Sandy OR  
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The following information is designed to aid in the understanding of herbicides used for invasive plant treatment. Any attempt to summarize the complex information about herbicides is prone to over simplification and errors. The information in these tables should be used as an introduction to the herbicides, but should not be the sole source of information used for analysis purposes. It is important to refer to the respective risk assessments prepared by Syracuse Environmental Research Associates, Inc. (SERA) and peer-reviewed literature for effects analysis information.

These tables have five columns labeled herbicide characteristics, basic hazard identification, risk characterization, label restrictions and information, and project design criteria (PDC). Herbicide characteristics are general pieces of information about the herbicide and its use, often taken from the *Herbicide Handbook* (Weed Science Society of America, 2002) or the respective risk assessments (SERA, 2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f). Qualitative statements (e.g., highly water soluble) are based on information in charts on water solubility and soil mobility found at the end of the document. These categories are not absolute, but have been gleaned from a variety of sources. These charts (water solubility and soil mobility) need to be completed and updated, as they are a work in progress.

To better understand each herbicide, it is important to recognize the difference between the inherent risks from the chemical (i.e., hazard identification) from those risks associated with the intended use, which take into account application and exposure amounts (i.e., risk characterization). The hazard identification and risk characterization information is mostly taken from the respective risk assessments for each herbicide, prepared by SERA, Inc., as well as analysis results from the Invasive Plant FEIS (USDA Forest Service, 2005a). The Invasive Plant FEIS already has conducted the analysis of effects from the hazard identification and risk characterization information. It need not be repeated. Standards added to Mt. Hood Land and Resource Management Plan and Columbia River Gorge National Scenic Area Management Plan from the Invasive Plant ROD (USDA Forest Service, 2005b) further reduce the potential risks listed in the risk characterization column. PDC (Section 2.2 of this EIS) focus on reducing risks remaining after the application and exposure amounts are taken into consideration (i.e., risk characterization), along with compliance with label directions and new Forest Plan standards.

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We have also included brief summaries of some label restrictions or information. Please note: the label restrictions column in these tables is not a comprehensive listing of all label requirements. The information is largely brief excerpts of *some* requirements from *some* formulations. Labels are also updated and revised periodically, so it is important to obtain and read the full label for complete information. Labels may be downloaded from the following website: [www.cmds.net/manuf/default.asp](http://www.cmds.net/manuf/default.asp).

This version of the table contains, for each herbicide, the priority target species for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon. The herbicide became a first priority for the identified invasive plants based on efficacy of the herbicide on that species, as per recommendations from the local State and County weed specialists. Environmental and seasonal variables, as well as infestations that contain several species, may require using a different herbicide in a given treatment area.

Herbicide grazing restrictions are summarized in the table on pages 35-36.

Acronyms used in the table include:

- LOC= Level of Concern. The concentration in media or some other estimate of exposure above which there may be effects.
- RfD = Reference dose. The RfD is a numerical estimate of a daily exposure to the human population, including sensitive subgroups such as children, that is not likely to cause harmful effects during a lifetime. RfDs are generally used for health effects that are thought to have a threshold or minimum dose for producing effects.

**The use of product names is for illustrative purposes only and is not intended as a recommendation for use or an endorsement of these products by the USDA Forest Service.**

Active Ingredient: **Chlorsulfuron** Trade Name(s): **Telar, Glean, Corsair**

Mode of Action: Acetolactate synthesis inhibitor Chemical Family: Sulfonylurea

Forest-Scenic Area target species: Known infestations – thistles, houndstongue

Invasive plants in close proximity – perennial pepperweed, whitetop, puncture vine

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: “Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . .” And A.2. states: “Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants FEIS* (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives.”

<b>Chlorsulfuron</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
SELECTIVE: controls broadleaf weeds some and grasses			Supplemental label for mix with clopyralid for control of yellow starthistle in Oregon	
Very high water solubility at pH 7; decreases to medium solubility at pH 5	Leaching, runoff	Rainfall post treatment: Off target movement and non-target effects.	Do not contaminate water	C.3. – Precipitation
Moderate affinity for organic material, but adsorption to clay is low	High mobility in soils		Treatment of powdery, dry soil and light sandy soils when there is little likelihood of rainfall soon after treating may result in off target movement and possible damage to susceptible crops when soil particles are moved by wind or water.	G.2. – Chlorsulfuron use on soils
In H <sub>2</sub> O, degraded by sunlight	Half-live in water is 1 month	Very low application rates; therefore, little potential to enter ground water		A.8. – Application rates C.2. – Drift F.1. – Aquatic buffers

<b>Chlorsulfuron</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Degradation by soil microbes is slow	Half-life in field avg 40 days (range 4-6 wks); shorter at lower pH			
	Low toxicity to soil microorganisms	Exposure far below level of concern		
In field, degraded primarily by hydrolysis, but rates are slow	Persistent		Residues may injure susceptible plants up to 4yrs after application in high pH soils	E.1. – Botanical buffers
Absorbed thru roots and foliage; active in soil as a pre-emergent			Do not apply thru irrigation system	
Resistant Biotypes may develop			Application should be based on IPM principles	
Maintains native perennial grasses				
Potent herbicide. Requires small amounts of AI to be effective.	May damage non-target plants and trees; Wind erosion concern	Adverse effects on some nontarget plants are plausible		A.8. – Application rates E.1. – Botanical buffers
	Can cause body weight loss in mammals	Worker and public exposures below level of concern (LOC) except workers using ground broadcast applications, which is slightly above LOC at high application rate (0.14 lb/acre)	Do not apply in a way that will contact workers or other persons, either directly or through drift.	A.8. – Application rates D.1. – Personal protective equipment
	Mild eye and skin irritant	Mild irritation to skin and eyes from exposures to high levels from mishandling	Only protected handlers may be in the area during application.	A.8. – Application rates D.1. – Personal protective equipment
	May alter insulin production, cholesterol levels, and triglycerides at high doses	Exposures far below levels of concern		A.8. – Application rates

<b>Chlorsulfuron</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Does not bioaccumulate or bioconcentrate	No evidence of reproductive risk, malformations, cancer, or mutagenicity			A.8. – Application rates
	Can cause mild body weight loss in mammals and birds	Exposures well below levels of concern		
		No plausible risk to insectivorous species		
	Very low toxicity to fish, no effects to egg & fry	Exposures far below levels of concern	Do not contaminate water	A.8 – Application rates F.1. – Aquatic buffers
	Very low toxicity to aquatic invertebrates	Exposures far below levels of concern	Do not contaminate water	A.8 – Application rates F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Exposures far below levels of concern	Do not contaminate water	A.8 – Application rates F.1. – Aquatic buffers H.2. – Salamanders and mollusks
	Aquatic plants are susceptible to chlorsulfuron, algae is less susceptible	Peak exposures could damage aquatic plants at typical and high application rates; algae may be damaged at high rates	Do not contaminate water	A.8 – Application rates F.1. – Aquatic buffers
	Low toxicity to bees or beetles	Exposure below level of concern		

Active Ingredient: **Clopyralid**

Trade Name(s): **Transline**

Mode of Action: Plant growth regulator

Chemical Family: Not known

Forest-Scenic Area target species: Known infestations – hawkweeds, knapweeds (not Russian), thistles, tansy ragwort, scotch broom, rush skeleton

Invasive plants in close proximity – Mediterranean sage

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: “Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . .” And A.2. states: “Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives.”

<b>Clopyralid</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Extremely SELECTIVE for broadleaves.  Post emergent herbicide		Selectivity reduces threat to non-target plants	Avoid non-target contact with spray in treated areas	E.1. – Botanical buffers
Targets: knapweeds and families Asteraceae, Fabaceae, Solanaceae. Canada thistle; Does NOT effect conifers, grasses are tolerant			Supplemental label for control on tree plantations and forest sites	
High water solubility	0.01 % of that applied may reach stream after first significant rainfall	Contamination threat to water resources and non-target species	Do not contaminate water. Do not apply directly to water or to areas where surface water is present. Do not contaminate irrigation ditches.	C.3. – Precipitation D.7. – Water intake F.1. – Aquatic buffer
Photo degradation and hydrolysis do not occur	8-40 day ½ life in water			A.8 – Application rate C.2. – Drift F.1. – Aquatic buffers

<b>Clopyralid</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Weakly adsorbed to soil	Very high mobility in soil		Users are advised not to apply where soils have a rapid to very rapid permeability throughout the profile (such as loamy sand to sand) and the water table is shallow.	F.1 – Aquatic buffers G.1 – Low risk herbicides
Degraded by soil microbes	Half-life in field avg 40 days (range 12-70 days)	Relatively rapid breakdown reduces potential for run-off or leaching		
	Low toxicity to soil organisms	Exposures far below level of concern		A.8. – Application rate
Non-microbial degradation does not occur			Do not use hay or straw from treated areas for composting or mulching on susceptible plants	
Contaminated with hexachlorobenzene (HCB) (less than that in picloram)	HCB is a persistent carcinogen and it bioaccumulates	Exposure levels far below level of concern. Clopyralid does not present any substantial cancer risk.		A.8. – Application rate
Does not bioaccumulate or bioconcentrate	No evidence of reproductive risk, malformations, cancer, or mutagenicity	Exposures far below levels of concern		A.8. – Application rate
	High acute doses cause depression of central nervous system in mammals	Exposures far below levels of concern		A.8. – Application rate
	Chronic doses cause weight loss, thicken stomach lining in mammals	Exposures far below levels of concern		A.8. – Application rate
	Low toxicity to birds	Exposures far below levels of concern		A.8. – Application rate
		Chronic risk to insect-eating birds or mammals unknown		A.8. – Application rates

<b>Clopyralid</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
	Slight skin and eye irritation		Avoid contact with skin and eyes or clothing. Avoid breathing spray mist. Applicators and handlers must wear long-sleeved shirt and long pants, waterproof gloves, shoes plus socks	A.8. – Application rates  D.1 – Personal protective equipment
Potent herbicide. Requires small amounts of AI to be effective.	May damage susceptible non-target terrestrial plants	Adverse effects on some non-target plant species due to drift are likely under certain conditions		C.2. – Drift  E.1. – Botanical buffers
	Low toxicity to birds and mammals	Exposures below levels of concern	No grazing restriction	A.8. – Application rates
	low toxicity to fish or aquatic invertebrates	Exposures very far below levels of concern		A.8. – Applications rates  F.1. – Aquatic buffers
	No chronic tests to fish, or eggs and fry studies available; use surrogate	Exposures very far below levels of concern		A.8. – Applications rates  F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Exposures far below levels of concern		A.8. – Applications rates  F.1. – Aquatic buffers  H.2. – Salamanders and mollusks
	Aquatic plants and algae are not susceptible	Exposures far below levels of concern		A.8. – Applications rates  F.1. – Aquatic buffers
	Low toxicity to bees and earthworms	Exposures far below level of concern		A.8. – Applications rates

Active Ingredient      **Glyphosate**      Trade Name(s):      **RoundUp, Rodeo, Accord, many others**

Aquatic formulations:      **Rodeo; Aquamaster**

Mode of Action:      Inhibits 3 amino acids and protein synthesis      Chemical Family: None generally accepted

Forest-Scenic Area target species:      Known infestations – hawkweeds, knotweeds, butter n’ eggs, houndstongue, blackberries, tansy ragwort, thistles, reed canarygrass, knapweeds, St. Johnswort, scotch broom, rush skeletonweed  
  
Invasive plants in close proximity – shining geranium, false broom, garlic mustard, leafy spurge, purple loosestrife, water hemlock, whitetop, Dalmatian toadflax, perennial peavine, perennial pepperweed, medusahead rye, Mediterranean sage

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: “Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . .” And A.2. states: “Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives.”

<b>Glyphosate</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Broad spectrum, NON selective	Will kill contacted desirable plants,	boom-spray drift may adversely affect non-target species	Keep people and pets off treated areas until spray solution has dried to prevent transfer of this product onto desirable vegetation.	C.2. – Drift  D.2., D.3., D.4., D.5., D.6., D.7. – Public notification  E.1. – Botanical buffers
Quickly absorbed by leaves and rapidly moves thru plant; no root absorption		No risk to non-target plants from runoff		E.1. – Botanical buffers
Aquatic Use formulations exist				G.1. – Soils & Aquatic labeled herbicides  F.3. – Wetlands
Very high water solubility	Runoff, leaching potential		Rainfall within 6 hours may reduce effectiveness;	C.3. – Precipitation

<b>Glyphosate</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Strongly adsorbed to soil particles, especially clay	Low mobility in soil	Low likelihood of runoff due to strong adsorption to soil; soil-bound glyphosate not available to plants		
No photo degradation or hydrolysis				
Degraded by soil microbes	Avg half-life 25-47 days (range 3-130 days)			
	May cause transient population decrease or increase in some bacteria & fungi			
Does not bioaccumulate or bioconcentrate	No evidence of dose-related reproductive risk, malformations, cancer, or mutagenicity	All exposures for workers and public far below level of concern		A.8. – Application rates D.1 – Personal protective equipment
	May damage mucosal tissue, weight loss in mammals; mild liver toxicity	All exposures for workers and public far below level of concern	Applicators and other handlers must wear long-sleeved shirt and long pants, shoes plus socks, and protective eyewear.	A.8. – Application rates D.1 – Personal protective equipment
	Mild to moderate irritant to skin and eyes.		Do not get in eyes or on clothing; Avoid breathing vapor or spray mist;	A.8. – Application rates D.1 – Personal protective equipment
	Can cause diarrhea, weight loss in mammals; weight loss in birds at very high doses; some mortality to pregnant rabbits observed	Mortality to some large vegetation-eating mammals plausible at highest application rates only; some risk to insect-eating birds & mammals at high rate		A.8. – Application rates
		Chronic risk to insect-eating birds at typical rate unknown; at highest rate, chronic risk to insect-eating birds and mammals unknown		A.8. – Application rates

<b>Glyphosate</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Surfactants (tallow amine or POEA) in non-aquatic use formulations very toxic to aquatic organisms	Low toxicity to fish; surfactant in some formulations much more toxic than glyphosate	Even aquatic formulation exceeds level of concern for <b>endangered fish</b> , with max risk assumptions; surfactant formulations may cause mortality at high application rate only	Follow label – no POEA to reach water	A.8. – Application rates A.9. – NPE application rate F.1. – Aquatic buffers
	Low toxicity to aquatic invertebrates	Exposures below level of concern		A.8. – Application rates F.1. – Aquatic buffers
	No malformations in amphibians; toxicity to amphibians is comparable to that of fish	At typical rate, all exposures below level of concern		A.8. – Application rates A.9. – NPE application rate F.1. – Aquatic buffers H.2. – Salamanders and mollusks
	Surfactants may be highly toxic to aquatic organisms		Do not apply (surfactant formulations) directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment.	A.8. – Application rates A.9. – NPE application rate B.7. – Rinse equipment F.1. – Aquatic buffers F.2. – NPE surfactant
	Aquatic plants and algae are susceptible to glyphosate; but it does not control submerged plants	Exposures below levels of concern; some algae growth stimulated at low concentrations	No restriction on the use of treated water for irrigation, recreation, or domestic purposes. If emerged weeds cover entire water body, treatment of aquatic weeds may result in oxygen depletion.	A.8. – Application rates D.7. – Water intake F.1. – Aquatic buffers

<b>Glyphosate</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
	Low or no toxicity to bees, beetles, spider mites, wasps, isopods, earthworms, or snails.	Highest application rate may pose risk to some individual bees, but not likely to populations		A.8. – Application rates  F.1. – Aquatic buffers

Active Ingredient: **Imazapic**

Trade Name(s): **Plateau**

Mode of Action: acetolactate synthesis inhibitor

Chemical Family: Imidazolinone

Forest-Scenic Area target species: Known infestations – butter n’ eggs, houndstongue

Invasive plants in close proximity – medusahead rye, Dyer’s toad, puncture vine

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: “Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . .” And A.2. states: “Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives.”

<b>Imazapic</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Features</b>
Selective against some broadleaves & some grasses				E.1. – Botanical buffers
Uptake by roots & leaves; active in soil as pre-emergent	May damage non-target plants and trees	Drift or runoff may cause some damage to susceptible species	Do not treat inside of irrigation ditches;  conduct small test areas to determine risk to desirable trees and plants	C.2. – Drift  E.1. – Botanical buffer  E.4 – Botanical buffer adaptive management
Very high water solubility	Leaching, runoff		Do not contaminate water	D.7. – Water Intake  F.1. – Aquatic Buffers
Adsorbs to OM in soil	Moderately mobile in soils, leachable in coarse soils			

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Imazapic				
Herbicide Characteristics	Basic Hazard Identification	Risk Characterization (SERA Risk Assess.)	Label Restrictions & Information	Project Design Features
Degraded by soil microbes	Half-life avg. 120d		Treatment of areas that were previously treated with chloresulfuron, metsulfuron methyl, sulfometuron or imazapyr may cause compound injury or death to desirable plants	E.1. – Botanical buffer  E.4. – Botanical buffer adaptive management
No info on toxicity to soil microbes				
In H2O, degraded by sunlight				
	Not irritating to skin, minimal irritation to eye	Mild eye irritation from mishandling; no exposure scenario exceeded RfD for workers or public except spill		D.1. – Personal protective equipment
Does not bioaccumulate or bioconcentrate	No adverse effects to mammal reproduction or development, not carcinogenic or mutagenic			
	Muscle, liver, & blood damage in dogs at high chronic doses	Exposures far below levels of concern		A.8. – Application rates
	Low toxicity to birds	Exposures far below levels of concern		A.8. – Application rates
		No plausible risk to insectivorous species		A.8. – Application rates
	Low toxicity to fish, no effects to egg & fry	Exposures far below levels of concern		A.8. – Application rates  F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Exposures far below levels of concern		A.8. – Application rates  F.1. – Aquatic buffers  H.2. – Salamanders and mollusks

<b>Imazapic</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Features</b>
	Aquatic plants sensitive, algae is not	Potential risk to aquatic plants at highest application rate only, no risk to algae		A.8. – Application rates F.1. – Aquatic buffers
	Low toxicity to bees	Exposure far below level of concern		A.8. – Application rates

Active Ingredient: **Imazapyr** Trade Name(s): **Arsenal, Chopper, Stalker**

Aquatic Formulation: **Habitat**

Mode of Action: acetolactate synthesis inhibitor Chemical Family: Imidazolinone

Forest-Scenic Area target species: Known infestations – knotweeds

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: “Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . .” And A.2. states: “Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives.”

<b>Imazapyr</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Features</b>
Non-selective				
Uptake by roots & leaves; active in soil as pre-emergent	May damage non-target plants; may be exuded into soil from roots of treated plants	Drift or runoff may cause some damage to susceptible species	Do not apply to irrigation ditches; prevent drift to desirable plants	C.2. – Drift D.7. – Water intake E.1. – Botanical buffer
Very high water solubility			Do not contaminate water	F.1. – Aquatic buffer
Weakly bound to soil, but OM and lower pH increase adsorption to moderate levels	Moderately mobile in soils			
Photodegrades in H <sub>2</sub> O	Half-life in water 1-2 d		May be used in intermittent drainages, flood plains, and bogs when no water is present	F.1. – Aquatic buffer F.3. – Wetlands
Degrades by soil microbes	Half-life in soil 25-142 d; weed control for 3 mo-2yrs			
	Slight effect on soil microbes at high doses	Peak concentrations in soil well below level of concern		A.8. – Application rates

<b>Imazapyr</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Features</b>
	Mildly irritating to eyes and skin	Mild eye irritation from mishandling; no exposure scenario exceeded RfD for workers or public except spill		D.1. – Personal protective equipment
Does not bioaccumulate or bioconcentrate	No adverse effects to mammal reproduction or development, not carcinogenic or mutagenic			
	No effects to birds or mammals even at high doses	Exposures all below level of concern		A.8. – Application rates
		No plausible risk to insectivorous species		A.8. – Application rates
	Low toxicity to North American fish	Exposures very far below levels of concern		A.8. – Application rates F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Exposures far below levels of concern		A.8. – Application rates F.1. – Aquatic buffers H.2. – Salamanders and mollusks
	Some aquatic plant species sensitive to imazapyr	Potential risk to aquatic plants at typical application rate, no risk to algae		A.8. – Application rates F.1. – Aquatic buffers
	Low or no toxicity to bees	Exposure well below level of concern		A.8. – Application rates

Active Ingredient: **Metsulfuron methyl**

Trade Name(s): **Escort**

Mode of Action acetolactate synthesis inhibitor

Chemical Family: Sulfonylurea

Forest-Scenic Area target species: Known infestations – butter n’ eggs, houndstongue, thistles, St. Johnswort, tansy ragwort

Invasive plants in close proximity – Dalmatian toadflax, Dyer’s toad, perennial pepperwood, whitetop

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: “Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . .” And A.2. states: “Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives.”

<b>Metsulfuron methyl</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Features</b>
Selective for some broad-leaf and woody species; can damage conifers				E.1 – Botanical buffers
Resistant biotypes may develop			Manage herbicide resistance, use IPM	
Potent herbicide; uptake by roots & leaves	May damage non-target plants and trees; highly potent herbicide at low rates	Drift, runoff or wind erosion, may cause damage to susceptible species	This herbicide is injurious to plants at extremely low concentrations. Non-target plants may be adversely affected from drift and runoff. Do not use on irrigation ditches.	C.2. – Drift D.7. – Water intake E.1. – Botanical buffers F.1. – Aquatic buffers
High water solubility	Runoff, leaching potential		Do not contaminate water; do not apply or rinse equipment near desirable plants;	B.7. – Rinse equipment E.1. – Botanical buffers F.1. – Aquatic buffers

<b>Metsulfuron methyl</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Features</b>
Low adsorption to clay, OM increases adsorption; active in soil as pre-emergent	Very high mobility in soils		Treatment of powdery, dry soil or light sandy soil when there is little likelihood of rainfall soon after treating may result in off target movement and possible damage to susceptible crops when soil particles are moved by wind or water.	C.1. – Wind C.3. – Precipitation
No photo degradation				
Slow microbial degradation at high pH, fast at low pH	Typical half-life 30 d (range 1-6 wks)			
	Short-term toxicity to soil microbes			F.3. – Wetlands
Degrades by hydrolysis			May be used in intermittent drainages, flood plains, marshes, and bogs when no water is present	F.1. – Aquatic buffers A.8. – Application rates
	May alter insulin production, cholesterol levels, and triglycerides at high doses	Exposures well below levels of concern even at highest application rates		A.8. – Application rates D.1. – Personal protective equipment
	Irritates skin and eyes	Mild eye irritation from mishandling; all exposures below levels of concern for workers and public	Applicator and other handlers must wear long-sleeved shirt, long pants, shoes plus socks	
Does not bioaccumulate or bioconcentrate	No adverse effects to mammal reproduction or development, not carcinogenic or mutagenic			
	Can cause body weight loss in mammals & birds	Exposures well below levels of concern even at highest application rates		A.8. – Application rates
		No plausible risk to insectivorous species		A.8. – Application rates

<b>Metsulfuron methyl</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Features</b>
	Low toxicity to fish, no effects to egg & fry	Exposures very far below levels of concern		A.8. – Application rates F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Exposures very far below levels of concern		A.8. – Application rates F.1. – Aquatic buffers H.2. – Salamanders and mollusks
	Can damage aquatic plants in acute exposures	Potential risk to aquatic plants at typical application rate, no risk to algae		A.8. – Application rates F.1. – Aquatic buffers
	Low or no toxicity to bees	Exposure well below level of concern		A.8. – Application rates F.1. – Aquatic buffers

Active Ingredient: **Picloram**

Trade Name(s): **Tordon 22K**

Mode of Action: Plant growth regulator

Chemical Family: Pyridicarboxylic acid or picolinic acid

Forest-Scenic Area target species: Known infestations – thistles, houndstongue, hawkweeds, Scotch broom, knapweeds, St. Johnswort, tansy ragwort

Invasive plants in close proximity – whitetop, leafy spurge, Mediterranean sage, puncture vine, rush skeletonweed, water hemlock

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: “Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . .” And A.2. states: “Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives.”

<b>Picloram</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Selective: rate and season dependant; pre-emergent and soil active		Off-site drift of picloram may cause damage to susceptible plant species	Minimize drift and runoff	C.2. – Drift  G.3. – Soils (picloram and sulfometuron methyl)  G.4. – One application per year
Target: composite, legume, buckwheat, and parsley families.  Less affected families: mustard, lily, figwort.				E.1. – Botanical buffer

<b>Picloram</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
High water solubility	Run-off, leaching potential;		Under some conditions, picloram may also have a high potential for runoff into surface water... Do not apply directly to water, to areas where surface water is present. Do not allow run-off or spray to contaminate wells, irrigation ditches or any body of water used for irrigation or domestic purposes.	D.7. – Water intake F.1. – Aquatic buffers G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
Photodegradation	Half-life in H2O is 2.6 days			
Weakly adsorbed to soils	Very high mobility in soils; leaching potential greatest in sandy soils with low OM	1-6% of application mobilized and reached drainage channels (monitoring results)	Picloram is known to leach through soil into ground water under certain conditions as a result of agricultural use. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground water contamination.	A.8. – Application rates G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
Degraded slowly in soil by microbes	Half-life avg. 90 days (range 20-300 d)		NTE 2 qts/ac/growing season as a broadcast application	G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
	Can inhibit microbial activity	Microbial activity inhibition likely at rates used by FS		G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
Contaminated with hexachlorobenzene HCB (more than clopyralid)	HCB is a persistent carcinogen and it bioaccumulates	Exposure levels below level of concern. Picloram does not present any substantial cancer risk.		A.8. – Application rates

<b>Picloram</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Does not bioaccumulate or bioconcentrate	No adverse effects to mammal reproduction or development, not carcinogenic or mutagenic			
	Weight loss and increased liver weight in mammals following long term exposure to high concentrations	No exposures for workers or public exceeded levels of concern except spill		A.8. – Application rates D.1. – Personal protective equipment
	Moderate eye irritant, can cause skin sensitization	Eye irritation and skin sensitization can occur with mishandling	Applicator and other handlers must wear long-sleeved shirt, long pants, shoes plus socks	A.8. – Application rates D.1. – Personal protective equipment
	Low in toxicity to mammals	Exposure to insect-eating mammals exceed acute levels of concern only at highest application rates		A.8. – Application rates
	Almost nontoxic to birds	Exposures below levels of concern		A.8. – Application rates
		Chronic risk to insect-eating birds or mammals unknown at typical and highest rates		A.8. – Application rates
	Toxic to fish	Exposures exceed level of concern for listed fish at typical and highest application rate		A.8. – Application rates F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Potential adverse effects to amphibians at typical and highest application rates		A.8. – Application rates F.1. – Aquatic buffers H.2. – Salamanders and mollusks
	Relatively nontoxic to bees	Exposures below level of concern even at highest application rates		A.8. – Application rates

Active Ingredient: **Sethoxydim**

Trade Name(s): **POAST**

Mode of Action: Inhibits acetyl co-enzyme (ACE)

Chemical Family: Cyclohexanedione or cyclohexenone

Forest-Scenic Area target species: Known infestations – reed canarygrass

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: “Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . .” And A.2. states: “Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives.”

<b>Sethoxydim</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Selective for annual and perennial grasses			Low likelihood of impacting non-target plants from drift	E.1. – Botanical buffers C.2. – Drift
Soil activity prevents germination of grasses				
Absorbed rapidly by foliage and roots. Systemic				
Broadleaf and sedges are tolerant			Some herbicide resistance can develop	
Very high water solubility	Leaching, run-off potential		Do not contaminate water.	F.1. – Aquatic buffers
Medium mobility in soil				
Photodegrades	Phytolysis in <4 hours in soil; <1 hr in water	Low soil persistence		
Degraded by soil microbes	5-25 day ½ life (avg is 5 days)	Rapidly degraded		
	Causes skin and eye irritation	Skin or eye irritation from mishandling.	Applicators and other handlers must wear coveralls over short-sleeved shirt and short pants; chemical resistant gloves and footwear, plus socks; protective eyewear; etc.	D.1 – Personal protective equipment

<b>Sethoxydim</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Does not bioaccumulate or bioconcentrate	Not mutagenic or carcinogenic			A.8. – Application rates
	Can cause liver and blood toxicity in chronic doses	All chronic exposures well below level of concern for workers and public		A.8. – Application rates
	Decreased reproduction and maternal toxicity in high doses	All acute exposures below level of concern except for drinking water contaminated by accidental spill		A.8. – Application rates
	Reproductive and neurological effects to small mammals at high doses	Exposures below levels of concern for mammals		A.8. – Application rates
	Low toxicity to birds but reduced hatching for chronic exposures	Exposures below levels of concern except chronic dose for grass-eating bird at highest application rate		A.8. – Application rates
		Chronic risk to insect-eating birds or mammals unknown at typical and highest rates		
	Highly toxic to fish due to petroleum inert	Exposure exceeds level of concern for federally listed fish at typical rate, and max exposure assumptions	This product is toxic to aquatic organisms. Do not apply directly to water or to areas where surface water is present.	A.8. – Application rates C.3. – Precipitation F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Plausible risk to amphibians		A.8. – Application rates F.1. – Aquatic buffers H.2 – Salamander and mollusk
	Nontoxic to bees	Exposure below level of concern		A.8. – Application rates

Active Ingredient: **Sulfometuron methyl**      Trade Name(s): **Oust XP**  
 Mode of Action:      acetolactate synthesis inhibitor      Chemical Family:      Sulfonylurea  
 Forest-Scenic Area target species:      Known infestations – reed canarygrass  
    Invasive plants in close proximity – whitetop

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: “Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . .” And A.2. states: “Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives.”

<b>Sulfometuron methyl</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Non-selective Pre-emergent and post emergent.			If a surfactant is used, contact with tree foliage may injure or kill trees.	A.8. – Application rates A.9. – NPE application rate E.1. – Botanical buffers
Target: annual and perennial broadleaf weeds, some grasses and some woody tree species			Do not apply more than 8 oz/ac/yr	A.8. – Application rates
Potent herbicide; uptake by roots & leaves	May damage non-target plants and trees; highly potent herbicide at low rates	Drift, runoff or wind erosion, may cause damage to susceptible species	Potential for drift is an issue. Use weather and droplet size criteria	C.1. – Wind C.2. – Drift C.3. – Precipitation E.1. – Botanical buffers

<b>Sulfometuron methyl</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Only medium solubility in water; difficult to create high concentrations	May leach or runoff into water	Low application rates and microbe degradation pose little risk for water contamination	Do not treat dry or frozen soils, unless rainfall is anticipated	A.8. – Application rates G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
High mobility in soil			Treatment of powdery, dry soil and light sandy soils when there is little likelihood of rainfall soon after treating may result in off target movement and possible damage to susceptible crops when soil particles are moved by wind or water.	C.3. – Precipitation G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
Degraded by microbes, light and hydrolysis	30 day ½ life in silt loam soils			
	Some growth inhibition to soil microbes in lab, but not demonstrated while in soil	Percolation could inhibit growth of microbes if lab results are relevant in the field		G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
Does not bioaccumulate or bioconcentrate	Not mutagenic, carcinogenic			A.8. – Application rates
	Reproductive and immune system effects to mammals at higher doses; very high doses cause neurotoxic effects	Exposures far below levels of concern		A.8. – Application rates
	Irritating to skin and eyes at high doses	Mild irritation to skin and eyes from exposures to high levels from mishandling	Only protected handlers may be in the area during treatment	A.8. – Application rates D.1. – Personal protective equipment

<b>Sulfometuron methyl</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
	Causes hemolytic anemia and weight loss in mammals	Exposures far below levels of concern		A.8. – Application rates
	Slightly toxic to fish. Highly toxic to embryo hatch	Exposures very far below level of concern	Do not apply directly to water or where surface water is present	A.8. – Application rates F.1. – Aquatic buffers
	Can cause malformations in amphibians	Exposures very far below level of concern		A.8. – Application rates F.1. – Aquatic buffers H.2. – Salamanders and mollusks
	Low toxicity to bee	Exposures well below level of concern		A.8. – Application rates

Active Ingredient: **Triclopyr** Trade Name(s): **Garlon 4, Remedy, PathFinder, Redeem**  
 Aquatic formulation: **Garlon 3A**  
 Mode of Action: Plant growth regulator Chemical Family: Pyridinecarboxylic acid  
 Forest-Scenic Area target species: Known infestations – knotweeds, thistles, English ivy, blackberries, scotch broom  
 Invasive plants in close proximity – garlic mustard, policeman’s helmet

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: “Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . .” And A.2. states: “Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives.”

<b>Triclopyr</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization* (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Selective for broadleaf and woody plants				
Target: Woody and herbaceous plants, especially root- or stem-sprouting species				
Absorbed thru roots, foliage and green bark.	Non-target plant effects possible; some bryophytes and lichens sensitive to triclopyr		Do not apply through any type of irrigation system.	
Two forms: salt (acid) (Garlon 3A) and ester (Garlon 4)	Ester form more toxic and volatile		Apply at cool temps with no wind. Combustible.	C.1. – Wind
Salt formulation is highly soluble in water	Runoff, leaching		Do not contaminate water when cleaning equipment.	A.3. – Equipment B.7. – Rinse equipment D.7. – Water intake
Ester formulation has medium water solubility.	Less mobile			

<b>Triclopyr</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization* (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
Low adsorption to soils, varies with clay and OM content	Very high mobility in soils		The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.	A.1. Regional standard – Application method  G.1. – Low risk herbicides
Degraded by photolysis in soil and water	½ life 2-6 hours in water			
Degraded by microbes in soil	½ life avg 30days in soils; range 10-46 days			
	Inhibits growth of soil fungi and bacteria	Transient inhibition in the growth of some bacteria or fungi might be expected		A.1. Regional standard – Application method
	Can cause severe eye damage		Applicators and other handlers must wear long-sleeved shirt and long pants; shoes plus socks; protective eyewear; chemical resistant gloves.	D.1. – Personal protective equipment
Does not bioaccumulate or bioconcentrate	Ester has much higher lipophilic tendency ( $K_{ow} = 10,233$ ) than salt ( $K_{ow} = 0.35$ )			
	Adverse effects to mammal reproduction or development only at doses that are maternally toxic		Except for lactating dairy animals, there are no grazing restrictions	A.8. – Application rates
	Evidence for carcinogenicity is marginal (not convincing, but not entirely negative)			A.8. – Application rates

<b>Triclopyr</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization* (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
	Effects to kidney are basis of risk to for acute and chronic exposures humans	At high application rates, chronic exposures to workers exceed level of concern; acute exposures do not exceed level of concern for workers. At high application rates, some acute and chronic exposures exceed level of concern for public. No exposures exceed level of concern at typical application rate.	Do not apply this product in a way that will contact workers or other persons, either directly or through drift.	A.8. – Application rates C.2. – Drift D.1. – Personal protective equipment
	For wildlife, acute lethality only at very high doses, but effects to kidney and liver at lower doses	Acute exposures below level of concern at typical application rate, but exceed level of concern for grass and insect eating mammals		A.1. Regional standard – Application method A.8. – Application rates
	Primary effect from chronic doses is to the kidney	Using protective assumptions, chronic exposures exceed level of concern for grass-eating mammals. Risk from chronic exposure to contaminated insects unknown.		A.1. Regional standard – Application method A.8. – Application rates D.1. – Personal protective equipment
	Formulations contain inerts that are neurotoxic (Garlon 3A = ethanol)  (Garlon 4 = kerosene)	Exposures very far below level of concern; less toxic than triclopyr		A.8. – Application rates D.1. – Personal protective equipment
	Ester more toxic to birds that salt form	Several scenarios exceed level of concern at typical and highest application rates for acute and chronic exposures		A.1. Regional standard – Application method A.8. – Application rates

<b>Triclopyr</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization* (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
	Salt/acid formulation low toxicity to fish; has aquatic use label	Exposures exceed level of concern for <u>federally listed</u> fish at typical rate, but not other fish even at highest application rate	(Garlon 3A) Permissible to treat flood plains, marshes, swamps, bogs etc. Permissible to treat non-irrigation ditch banks. When making application to banks or shorelines of moving water sites, minimize overspray to open water.	A.1. Regional standard – Application method A.8. – Application rates  F.1. – Aquatic buffers
	Ester formulation toxic to fish and aquatic invertebrates	Exposures exceed level of concern for <u>federally listed</u> fish at typical rate, but not other fish even at highest application rate	(Garlon 4) This pesticide is toxic to fish. Do not apply directly to water, to areas where surface water is present... Do not contaminate water when disposing of equipment wash waters.	A.1. Regional standard – Application method A.8. – Application rates  B.7. – Rinse equipment  F.1. – Aquatic buffers
	Metabolite TCP much more toxic to fish than the salt form, about the same toxicity as ester	At typical application rate, no TCP exposures exceed level of concern. At highest application rate, chronic exposure exceeds level of concern		A.8. – Application rates  F.1. – Aquatic buffers
	Ester form much more toxic to aquatic plants and algae than salt form	Only <u>salt</u> form exceeds level of concern for aquatic plants; algae not at risk from either form		A.1. Regional standard – Application method A.8. – Application rates  F.1. – Aquatic buffers
	Ester formulation much more toxic to amphibians than salt formulation	At typical application rate, risk to amphibians from either form is low. At highest rate, exposure to run-off of either form could adversely affect responsiveness of tadpoles.		A.8. – Application rates  F.1. – Aquatic buffers  H.2. – Salamanders and mollusks

<b>Triclopyr</b>				
<b>Herbicide Characteristics</b>	<b>Basic Hazard Identification</b>	<b>Risk Characterization* (SERA Risk Assess.)</b>	<b>Label Restrictions &amp; Information</b>	<b>Project Design Criteria</b>
	Practically non-toxic to bees	Exposure exceeds level of concern only for highest application rates		A.8. – Application rates F.1. – Aquatic buffers

\*Results of these risk characterizations are from scenarios where triclopyr is broadcast sprayed over a large area. A standard in each Forest Plan that was added by the Invasive Plant Program ROD (USDA Forest Service, 2005b) prohibits this type of application. Triclopyr is restricted to selective application methods only. Therefore, in practice, it is not plausible to create the exposures causing concern during use of triclopyr for invasive plant treatment in the USDA Forest Service, Pacific Northwest Region.

### Water Solubility Chart

Solubility Class	Water Solubility (ppm=mg/L)	Examples
Very High	3,000 – 1,000,000	chlorsulfuron, glyphosate, imazapic, imazapyr, picloram, sethoxydim,
High	300-3,000	clopyralid, metsulfuron methyl, 2,4-D
Medium	30-300	sulfometuron, triclopyr
Low	2-30	
Slight	0.5-2	
Immobile	<0.5	DDT (0.0012)

From Jay Davis, US Fish and Wildlife Service

### Mobility in Soil (Koc)

Mobility Class	Koc in Soil	Examples
Very High	0-35	clopyralid, picloram, metsulfuron methyl, triclopyr
High	36-100	sulfomet., chlrosulfuron,
Medium	100-1,000	imazapic, imazapyr, sethoxydim, atrazine
Low	1,000-3,000	glyphosate
Slight	3,000-10,000	Trifluralin
Immobile	>10,000	chlorpyrifos, DDT

Adapted from Jay Davis, US Fish and Wildlife Service

Mobility class categories by S.Bautista and are general breakdowns, not a definitive classification

### Grazing Restriction Table (Sources are Trade Name Labels for Specific Herbicides)

Livestock Use Restrictions by Herbicide*			
Herbicide	Brand Name	Restriction	Remarks
Chlorsulfuron	Telar, Glean, Corsair, Landmark (oust + telar)	None	
Clopyralid	Transline, Redeem (Clopyralid + Triclopyr)	Redeem: Do not graze treated areas until poisonous plants are dry and no longer palatable to livestock. Withdraw livestock from grazing treated grass at least 3 days prior to slaughter.	See label for cropland grazing restrictions post treatment in pastures. Redeem: Herbicide application may increase palatability of certain poisonous plants.
Glyphosate	RoundUp, Rodeo, etc.	None	RoundUp: ingestion of this product or large amounts of freshly sprayed vegetation may cause temporary gastrointestinal irritation.
Imazapic	Plateau	Plateau: None. Plateau DG: Do not use on areas to be grazed.	
Imazapyr	Arsenal, Chopper, Stalker	Arsenal: none. Chopper: none. Stalker: none.	
Metsulfuron methyl	(Escort)/Sulfon ylurea	None.	

This table is not meant to be an inclusive or up-to-date list; please refer to product labels for the most accurate and inclusive information.

**Grazing Restriction Table (Sources are Trade Name Labels for Specific Herbicides)**

<b>Livestock Use Restrictions by Herbicide*(continued)</b>			
<b>Herbicide</b>	<b>Brand Name</b>	<b>Restriction</b>	<b>Remarks</b>
Picloram	Tordon	Tordon 101/22K/K: allow one week of grazing/feeding in non-exposure area before moving livestock onto broadleaf cropland. Tordon 22K: herbicide application may increase palatability of certain poisonous plants. Do not graze treated areas until poisonous plants are dry and no longer palatable to livestock. Meat grazing animals up to two weeks after treatment should be removed from treated areas 3 days prior to slaughter.	
Sethoxydim	Poast	None	
Sulfometuron methyl	(Oust)/Sulfonyl urea, & Landmark (oust + telar)	None	
Triclopyr	(Garlon, Pathfinder, Remedy)/Synthetic auxin, Redeem (Clopyralid + Triclopyr)	Forestry Garlon 4, Garlon 4, & Remedy: 2 quarts per acre or less, no restriction. If less than 25% of the grazing area is treated, there is no restriction. Slaughter: remove animals from treated area 3 days prior to slaughter. Garlon 3A: none. Remove animals from treated area 3 days prior to slaughter.  Pathfinder II & Remedy RTU: 2.5 gallons per acre or less, no restriction. If less than 25% of the grazing area is treated, there is no restriction. Slaughter: remove animals from treated area 3 days prior to slaughter. Redeem: Do not graze treated areas until poisonous plants are dry and no longer palatable to livestock. Withdraw livestock from grazing treated grass at least 3 days prior to slaughter.	

This table is not meant to be an inclusive or up-to-date list; please refer to product labels for the most accurate and inclusive information.

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