

Type	Terrestrial herbicide - systemic
Controls	Grasses and broadleaf weeds.
Mode of Action	Inhibits a plants ability to produce an enzyme needed to produce specific amino acids essential for plant life (this enzyme is not present in animals - only in plants and microorganisms).

**Thurston County Review Summary:**

Terrestrial herbicides containing imazamox as the sole active ingredient pass the Thurston County review criteria. Runoff of imazamox herbicides can pose a risk to non-target plants in areas surrounding the application site but risk of toxicity to humans, animals, birds, fish, and other aquatic organisms is considered low in hazard. Imazamox is rated high in hazard for the potential to move off the site of application with rain or irrigation water and moderate in hazard for persistence. Imazamox is not expected to bioaccumulate.

**MOBILITY**

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	4,413	1	High
Soil Sorption (Kd=mL/g)	0.05 - 2.7	2	High
Organic Sorption (Koc=mL/g)	5 - 143	2	High

**Mobility Summary:**

Imazamox is very soluble in water and adheres poorly to all soil types. The potential for imazamox to move off the site of application with rain or irrigation water is rated high. Soil metabolites of imazamox include chemicals CL 312,622 and CL 354,825 which range from moderately mobile to highly mobile in soil.

**PERSISTENCE**

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.000000098	2	High
Biotic or Aerobic Half-life (days)	27	2	Moderate
Abiotic Half-life (days)	Value not found		
Terrestrial Field Test Half-life (days)	15 - 130 (56 average)	2	Moderate - high
Hydrolysis Half-life (days)	Stable	2	High
Anaerobic Half-life (days)	Stable	4	High
Aquatic Field Test Half-life (days)	38	2	Moderate

**Persistence Summary:**

On land imazamox is mainly degraded by soil microbes. Although there is variability in the amount of time it takes imazamox to degrade to half of the application rate, the average of field tests reported by the EPA suggest that it is about 56 days and the International Union of Pure and Applied Chemistry (IUPAC) comes up with an average field half life of 17 days. If imazamox leaches into the soil with rain or irrigation water, it is likely to persist for several months. The hazard for persistence of imazamox from terrestrial applications is rated moderate in hazard (because it will likely degrade to half of the applied concentration within 60 days).

**BIOACCUMULATION**

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	0.1	2	Low
Octanol/Water Partition Coefficient	Kow = 5.36	1	Low

**Bioaccumulation Summary:**

Imazamox does not have a strong affinity to bind with organic solvents and testing indicates that it does not accumulate in fish tissue. Metabolism tests with rats shows that imazamox is quickly eliminated unmetabolized from the body when administered intravenously or when eaten. The hazard for imazamox to bioaccumulate is rated low.

# ACUTE TOXICITY HAZARD - ECOTOXICITY

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	>2,000 mg/Kg	1	Low
Avian (LD50)	>1,950 mg/kg	1	Low
Honey bee or insect (LD50)	>40 ug/bee	3	Low
Annelida -worms (LC50)	>901	3	Moderate
Fish (LC50)	>122 mg/L	3	Low
Crustacean (LC50)	137 mg/L	3	Low
Mollusk (LC50)	Value not found		
Amphibian (LD50 or LC50)	Value not found		

## Acute Toxicity Testing and Ecotoxicity Summary:

Single-dose testing with imazamox indicates that it is low in toxicity to birds, insects, mammals, fish, and aquatic invertebrates. Long-term toxicity testing with fish and other aquatic organisms was not performed (or required by EPA). Risk evaluation for mammals following terrestrial application to rice fields, at maximum application rates, did not exceed the level of concern for any diet scenario or animal size. Risk assessments performed for the United States Department of Agriculture - Forest Service determined that the largest exposure to small animals would be from eating treated insects. These potential exposures were calculated to be at least 10 times less than the dose of concern. The worst-case exposure to birds was calculated to be to a large bird eating exclusively treated vegetation for a long period of time. The worst-case potential bird exposure was 17 times less than the dose of concern.

The hazard of toxicity to non-target organisms from imazamox, used as a terrestrial herbicide, is rated low in hazard.

# ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Adult applicator with backpack sprayer	All potential routes	9 mg/kg/day	Up to 0.04 mg/kg/day	>200	4	Low
Adult applicator with broadcast ground sprayer	All potential routes	9 mg/kg/day	Up to 0.08 mg/kg/day	>100	4	Low
Woman eating treated vegetation	Oral	9 mg/kg bw/day	0.6 mg/kg bw/day	15	4	Low
Child drinking contaminated water	Oral	9 mg/kg bw/day	0.012 mg/kg bw/day	750	4	Low

## Acute Toxicity Risk Assessment Summary:

In 1997, the EPA set a reference dose at 3 mg/kg/day for use in imazamox exposure risk assessments - Thurston County uses this reference dose as the "dose of concern". In 2001, the EPA concluded that the use of 3 mg/kg/day was inappropriate because the endpoint of "decreased weight gain" was not biologically significant. Instead, the EPA suggested that the highest dose tested for these studies should be used as the actual no observable adverse effect level (rat = 1,068 mg/kg/day and rabbit = 900 mg/kg/day). Using the no observable adverse effect level of 900 mg/kg/day changes the dose of concern from 3 mg/kg/day to 9 mg/kg/day. Thurston County agrees with the reasoning behind this change and utilizes 9 mg/kg/day to assess risk for both short-term exposures and long-term exposures.

Worst-case applicator exposures are expected to be from the use of broadcast ground sprayers and backpack sprayers. These potential exposures to applicators are calculated to be 100 to 200 times less than the dose of concern and are rated very low in hazard. The worst-case scenario calculated for people interacting with vegetation sprayed with imazamox involved eating it (not a typical post-application exposure assessment). Potential exposures to people contacting or eating treated vegetation are at least 15 times less than the dose of concern and are rated low in hazard. The risk of toxicity from a potential exposure to a child drinking water contaminated from runoff of a terrestrial herbicide application, is also rated low in hazard.

Short-term post-application exposures to imazamox from terrestrial herbicidal use are rated low in hazard.

# CHRONIC TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	"Not likely to be a human carcinogen"	- -	4	Low
Mutagenicity	Value not found	"Negative"	1	Low
Neurotoxicity - (NOAEL)	1,639 mg/kg/day	"No evidence of neurotoxicity"	4	Low
Endocrine Disruption	1,639 mg/kg/day	None	4	Low
Developmental Toxicity (NOAEL)	900 mg/kg/day	No effects observed	1	Low
Reproductive Toxicity (NOAEL)	1,639 mg/kg/day	No effects observed	1	Low
Chronic Toxicity (NOAEL)	1,068 mg/kg/day	Reduced food consumption and body weight	4	Check risk

## Chronic Toxicity Hazard Summary:

Imazamox testing indicates that there was no reproductive or developmental toxicity observed at the highest doses tested, all mutagenicity tests evaluated by the EPA were negative, and there were no effects on organs associated with endocrine function (Reference 4).

# CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Woman eating treated vegetation	Oral	9 mg/kg bw/day	0.21 mg/kg/day	>40	4	Low
Man drinking treated water	Oral	9 mg/kg bw/day	0.0018 mg/kg bw/day	5,000	4	Low
Adult subsistence fish diet	Oral	9 mg/kg bw/day	0.000006 mg/kg bw/day	1,500,000	4	Low
Other long-term exposures were not evaluated						

## Chronic Toxicity Risk Assessment Summary:

Long-term exposure risk assessments were evaluated for drinking water, subsistence fish diets, and for eating treated vegetation (not fruit or vegetables). All of these scenarios were calculated to produce very small exposures and are all rated low in hazard.

## Metabolites and Degradation Products:

Soil metabolites include chemicals CL 312,622 and CL 354,825. Other degradation chemicals of imazamox include; CL 303,190, CL 299,263 and CL 263,284 (Reference 4).

## Comments:

Imazamox is considered slightly irritating to the skin (EPA Toxicity Category IV), and moderately irritating to eyes (EPA Toxicity Category III) and is not a dermal sensitizer (Reference 1).

## References

- USEPA. Office of Prevention, Pesticides and Toxic Substances. Pesticide Fact Sheet: Imazamox (Raptor Herbicide), Conditional Registration. May 22, 1997
- USEPA. Office of Prevention, Pesticides and Toxic Substances. Ecological Risk Assessment Evaluating Imazamox (PC 129171) for the Proposed New Use for the Control of Weeds in Clearfield rice (imidazolonone-tolerant rice). 9/24/2008.
- International Union of Pure & Applied Chemistry. Pesticide Properties Database. Imazamox. Accessed 8/26/11. <http://sitem.herts.ac.uk/aeru/iupac/>
- Syracuse Environmental Research Associates, Inc. Imazamox - Human Health and Ecological Risk Assessment - Final Report. SERA TR-052-24-02a. December 10, 2010.