**2,4-D DEA (diethanolamine)**

**Type**
Terrestrial herbicide - selective, systemic, post-emergent, plant growth regulator.

**Controls**
For control of broadleaf weeds in non-crop areas, lawns, ponds, ditch banks, pastures, rangelands, also for control of trees by injection.

**Mode of Action**
2,4-D is thought to increase cell plasticity and the rate of protein and ethylene production; resulting in abnormally rapid cell division and lethal tissue damage.

**Thurston County Review Summary:**
The hazards associated with the herbicide active ingredient 2,4-D are considered: high for mobility, moderate for persistence, and low for bioaccumulation. Exposures to 2,4-D after an herbicidal application to lawn can expose children and adults to concentrations that are considered high in hazard for toxicity. These potential exposures cause herbicides with 2,4-D as an active ingredient to fail Thurston County’s review criteria.

**MOBILITY**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Reference</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solubility (mg/L)</td>
<td>806</td>
<td>3</td>
<td>Moderate</td>
</tr>
<tr>
<td>Soil Sorption (Kd=mL/g)</td>
<td>&lt;3</td>
<td>3</td>
<td>High</td>
</tr>
<tr>
<td>Organic Sorption (Koc=mL/g)</td>
<td>&lt;120</td>
<td>3</td>
<td>High</td>
</tr>
</tbody>
</table>

**Mobility Summary:**
The active ingredient in its diethanolamine form will dissociate to 2,4-D acid within the first few minutes following application. 2,4-D acid is moderately soluble in water and adheres very poorly to all soil types, therefore the hazard for it move off the site of application with water is considered high in hazard.

**PERSISTENCE**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Reference</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vapor Pressure (mm Hg)</td>
<td>0.00000001</td>
<td>3</td>
<td>High</td>
</tr>
<tr>
<td>Biotic or Aerobic Half-life (days)</td>
<td>6</td>
<td>3</td>
<td>Low</td>
</tr>
<tr>
<td>Abiotic Half-life (days)</td>
<td>Not found</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terrestrial Field Test Half-life (days)</td>
<td>1-30 (mean = 6)</td>
<td>3</td>
<td>Low</td>
</tr>
<tr>
<td>Hydrolysis Half-life (days)</td>
<td>Stable</td>
<td></td>
<td>High</td>
</tr>
<tr>
<td>Anaerobic Half-life (days)</td>
<td>41-333</td>
<td>3</td>
<td>High</td>
</tr>
<tr>
<td>Aquatic Field Test Half-life (days)</td>
<td>15</td>
<td>3</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

**Persistence Summary:**
2,4-D is not likely to dissipate into the air after it is applied to plants or soil. If there is no rain following an application then 2,4-D will likely degrade to half the original concentration within a week, although, in some field studies it has taken up to four weeks. If it rains within a week of its application the active ingredient may leach into the soil and increase its persistence considerably. The persistence hazard of 2,4-D dimethylamine salt and 2,4-D acid is considered low to moderate.

**BIOACCUMULATION**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Reference</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioaccumulation Factor</td>
<td>Not found</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bioconcentration Factor</td>
<td>&lt;7</td>
<td>4</td>
<td>Low</td>
</tr>
<tr>
<td>Octanol/Water Partition Coefficient</td>
<td>log Kow = -1.7</td>
<td>3</td>
<td>Low</td>
</tr>
</tbody>
</table>

**Bioaccumulation Summary:**
2,4-D DEA and 2,4-D acid have a low affinity to organic matter, bioconcentration studies show that accumulation in tissue is short lived and the calculated bioconcentration factor is low. The hazard for bioaccumulation is considered low.
ACUTE TOXICITY

Acute Toxicity Summary:

<table>
<thead>
<tr>
<th>Test Subject</th>
<th>Value</th>
<th>Reference</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammalian (LD50)</td>
<td>866 mg/kg</td>
<td>3</td>
<td>Moderate</td>
</tr>
<tr>
<td>Avian (LD50)</td>
<td>500 mg/kg</td>
<td>2</td>
<td>Moderate</td>
</tr>
<tr>
<td>Honey bee or insect (LD50)</td>
<td>&quot;practically non-toxic&quot;</td>
<td>3</td>
<td>Low</td>
</tr>
<tr>
<td>Annelida -worms (LC50)</td>
<td>Not found</td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Fish (LC50)</td>
<td>250 mg/L</td>
<td>2</td>
<td>Low</td>
</tr>
<tr>
<td>Crustacean (LC50)</td>
<td>184 mg/L</td>
<td>1</td>
<td>Low</td>
</tr>
<tr>
<td>Mollusk (LC50)</td>
<td>Not found</td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Amphibian (LD50 or LC50)</td>
<td>&quot;practically non-toxic&quot;</td>
<td>3</td>
<td>Low</td>
</tr>
</tbody>
</table>

Potential exposures to adults mixing and applying 2,4-D products, adults performing yardwork in treated turf, or children playing in lawns treated with a 2,4-D herbicide is rated as high in hazard for toxicity. Single-dose toxicity testing of 2,4-D indicates that it is moderately toxic to mammals and birds, and practically non-toxic to bees, frogs, and aquatic organisms.

Acute Toxicity Risk Assessment Summary

For lack of an adequate assessment of developmental toxicity an additional 10-fold safety factor (uncertainty factor) was added to the EPA's risk assessment scenarios. The dose of concern was calculated using an uncertainty factor of 1,000 and the No Observeable Adverse Effect Level (NOAEL) of 67 mg/kg/day from a neurotoxicity study for single-dose toxicity, and a NOAEL of 25 mg/kg/day from a short-term reproductive test.

The short-term exposure to a child entering treated turf grass can cause an exposure that is more than half of the EPA's dose of concern, which Thurston County rates as high in hazard. The short-term exposure to an adult performing yardwork in treated turf is also considered high in hazard for toxicity.

The risk to a residential applicator, mixing a product and using a hose-end sprayer for a broadcast application to 0.5 acres of turf, is considered high in hazard. Mixing and spraying a ready-to-use product with a hose-end sprayer (or ready-to-use sprayer) or applying granular formulations by hand or with a belly grinder (to 0.023 acres) is considered moderate in hazard. Only applications with granular product using a broadcast spreader, or mixing and applying with a hand-held pump are considered low in hazard to the applicator.
### Chronic Toxicity Summary:

A re-evaluation of the carcinogenic potential was conducted for the USEPA's 2005 Reregistration Eligibility Decision (RED) document and the classification changed from 2B "probable human carcinogen" to D "not classifiable to human carcinogenicity" and is not considered a mutagen (Reference 3). There is the potential that 2,4-D causes endocrine disruption but no study has proven a correlation, further testing may be required by the EPA.

There are no long-term exposures expected from residential use of 2,4-D herbicides, so the hazard for toxicity from a long-term exposure is considered low although exposures from one to thirty days in duration are considered high in hazard.

### Chronic Toxicity Risk Assessment Summary:

"Short-term" exposure scenario assessment conducted for 2,4-D is 1-30 days in duration so it is included in this chronic toxicity section and not the acute toxicity section (1-6 day exposures). Short-term exposure to women ages 13-49, to treated turf grass, are at EPA's level of concern and are considered high in hazard.

### Degradation Products:

1,2,4-benzenetriol, 2,4-dichlorophenol (2,4-DCP), 2,4-dichloroanisole (2,4-DCA), 4-chlorophenol, chlorohydroquinone (CHQ), volatile organics, bound residues, and carbon dioxide (Reference 3).

### Comments:

Some 2,4-D products are considered corrosive and can cause irreversible eye damage (EPA Category I), slight skin irritants (EPA Category IV) but are not considered skin sensitizers (Reference 2 and 3).

### References

3. USEPA. Prevention, Pesticides and Toxic Substances (7508C). Reregistration Eligibility Decision for 2,4-D. June 2005.