Environmental and Social Risk Assessment for 2,4-D

Wisconsin Department of Natural Resources

2020

ESRA for 2,4-D

Environmental Management Unit Assessment

Pesticide:	**2,4-D**		***Specific Formulation:***
Hazard Status:	2,4-D is a highly hazardous pesticide (HHP) based on its classification in the Acute Toxicity hazard group and demonstration of the potential for acute toxicity to mammals and birds (Criterion 2) per the FSC Pesticides Policy (FSC-POL-30-001 V3-0 EN) and the FSC Lists of Highly Hazardous Pesticides (FSC-POL-30-001a EN). However, risks from other FSC hazard groups and toxicity categories were not precluded from this assessment.		
Exposure Elements	**Minimum list of values**	**Description of why/why not a risk on the Management Unit**	**Management Unit Mitigation strategies defined to minimize risk**
Environmental	**Soil (erosion, degradation, biota, carbon storage)**	**Minimal indication of adverse effects to Soil was found when 2,4-D is used according to label instructions in forestry applications. Additional considerations are provided below.** The off-site transport of 2,4-D by runoff and sediment losses could cause substantial damage to sensitive, but not tolerant, species under conditions that favor runoff and sediment loss – i.e., high rainfall rates and clay or loam soil. (2) 2,4-D has a low binding affinity in mineral soils and sediment. (3) Relatively conservative estimates of pesticide transport by wind erosion of soil (Worksheets G07a-c, Attachment 1 for 2,4-D acid/salts; Attachment 2 for esters) suggest that wind erosion is not likely to result in exposures of concern. (2) Data indicates that 2,4-D degrades rapidly in soils (half-life = 6.2 days). (3)	**Follow all pesticide label application instructions. Follow applicable criterion and indicators from the FSC US FM Standard V1.0 (e.g., Criterion 4.3 for worker safety, Criterion 7.3 for worker training, Criterion 6.5 for protecting water resources, and Criteria 8.1 and 8.2 for Monitoring). Applicators or persons supervising application of restricted use pesticides are required to be certified in accordance with EPA regulations and state, territorial and tribal laws. Additional risk mitigation strategies are provided below. Organizations should take reasonable steps to avoiding environmental and social impacts by considering the mitigation strategies provided below, as well as application-, Organization-, or location-specific strategies.** **General consideration of exposure variables designed to mitigate risk:** -Know and understand the specific pesticide formulation and/or tank mixture, as its unique

	Water (ground water, surface waters, water supplies)	**Minimal indication of adverse effects to Water was found when 2,4-D is used according to label instructions in forestry applications. Additional considerations are provided below.** This chemical has properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. Application around a cistern or well may result in contamination of drinking water or groundwater. (1) 2,4-D has been detected in groundwater at approximately 15 ppb. This is below the DWLOCs determined to be protective in the human health risk assessment for 2,4-D and is also below the maximum contaminant level (MCL) for 2,4-D set at 70 ppb by the EPA Office of Water. (3)	formulation may provide a different risk characterization. -Understand how the mixture of active ingredients affects the pesticides risk profile. -Seek to minimize the frequency, interval, and amount of application. -Use the most efficient and effective method of application by seeking to minimize risk to environmental and social values. -Understand the site (e.g., soil type, topography, etc.) and climatic (e.g., wind, temperature, and humidity) conditions and the likely effect on risk to environmental and social values. -Have appropriate waste management systems in place. **Forestry Use Restrictions (per label):** • Do not allow sprays to contact conifer shoot growth (current year's new growth) or injury may occur. • Do not apply to nursery seed beds. • For conifer release, do not use on plantations where pine or larch are among the desired species. • For broadcast applications, do not apply more than a total of 8.42 pints of DMA 4 IVM (4 lb of acid equivalent) per acre per 12-month period. • Limited to one broadcast application, one basal spray or cut surface application, or one injection application per year. • For basal spray, cut surface stumps, and frill applications, do not apply more than 16.84 pints of DMA 4 IVM (8 lb of acid equivalent) per 100 gallons of spray \ solution. (1) **Mitigating Risk to the Environment:** *reduce contact with water resources and minimize application amounts and number of applications.*
	Atmosphere (air quality, greenhouse gasses)	**Minimal indication of adverse effects to Atmosphere was found when 2,4-D is used according to label instructions in forestry applications.**	
Environmental	**Non-target Species (vegetation, wildlife, bees and other pollinators, pets)**	**Minimal indication of adverse effects to Non-target Species was found when 2,4-D is used according to label instructions in forestry applications. Additional considerations are provided below.** Because 2,4-D is an effective herbicide, unintended effects on nontarget vegetation are plausible. The effective use of 2,4-D is achieved by applying it to target vegetation at a time and in a manner that will minimize effects on nontarget plant species. If applied properly and with care,	

		2,4-D could have only minor effects on nontarget vegetation. Nonetheless, in the normal course of applying herbicide formulations at rates that are effective in weed control, drift or runoff are likely to cause adverse effects on terrestrial plants. (2) Terrestrial animals might be exposed to any applied herbicide from direct spray, the ingestion of contaminated media (vegetation, prey species, or water), grooming activities, or indirect contact with contaminated vegetation. The highest exposures for terrestrial vertebrates will occur after the consumption of contaminated vegetation or contaminated insects. (2) Among mammals, dogs are more sensitive than other species to the effects of 2,4-D due to their limited capacity to excrete organic acids. (2) Based on classification schemes for acute toxicity developed by U.S. EPA, 2,4-D is slightly to moderately toxic to mammals; practically non-toxic to moderately toxic to birds; and practically non-toxic to honey bees. (2) A honey bee acute toxicity study indicated that 2,4-D is practically non-toxic to the honey bee. 2,4-D is toxic to terrestrial plants; it is more toxic to dicots than to monocots. (3) For the DMA salt of 2,4-D, the risk characterization for fish is simple and unambiguous: there is no basis for suggesting that adverse effects are plausible even at the highest application rate under normal conditions of exposure – i.e., the highest HQ is 0.02. Concern for acute toxicity is triggered only in the case of an accidental spill at the highest application rate. (2)	**Environmental Hazards** This product is toxic to fish and aquatic invertebrates. For terrestrial uses: Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Drift or runoff may adversely affect aquatic invertebrates and non-target plants. Drift and runoff may be hazardous to aquatic organisms in water adjacent to treated areas. Do not contaminate water when disposing of equipment washwaters or rinsate. (1) **Mitigating Risk to Workers:** *When applying pesticides, label instructions should be followed.* **DANGER!** Corrosive • Causes Irreversible Eye Damage • Harmful If Swallowed, Inhaled Or Absorbed Through The Skin Do not get in eyes, on skin, or on clothing. Avoid breathing vapor or spray mist. Wash thoroughly with soap and water after handling. Personal Protective Equipment (PPE) Some materials that are chemical-resistant to this product are made of any waterproof material. If you want more options, follow the instructions for category A on an EPA chemical resistance category selections chart. For all pesticide applications, Personal Protective Equipment (PPE) should be worn as follows: • chemical-resistant gloves, • overalls or long-sleeved shirt and long pants, • shoes/boots plus socks, • eye protection (goggles, or safety glasses with side shields), • an appropriate respirator if called for in applicable Safety Data Sheets.

		Based on reasonably comparable toxicity values from reproduction studies in birds and mammals (Table 4-14), birds appear to be substantially less sensitive than mammals to 2,4-D. (2) All of the hazard quotients for birds are associated with the consumption of contaminated insects. (2) As with mammals, secondary effects on some species of birds may occur through changes in vegetation that may impact food availability and habitat (Section 4.1.2.2). These effects may be beneficial to some species and detrimental to others, and the magnitude of any effects are likely to vary over time. In some instances, habitat changes could result in changes at the localized population levels of some bird species. (2) In addition to the direct effects mentioned above, secondary adverse effects in terrestrial and aquatic animals might result from adverse effects of 2,4-D on vegetation. These secondary effects associated with the depletion of vegetation are likely to vary over time and among different species of animals. Certain effects could be detrimental for some species – i.e., a reduction in the supply of preferred food or a degradation of habitat – but beneficial to other species – i.e., an increase in food or prey availability or an enhancement of habitat. (2)	**User Safety Recommendations** Users should: • Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet. • Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. • Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing. **Mitigating Risk to Public Access/Public Welfare:** - Reduce the possibility of public consumption of contaminated wild food (e.g., fruit or fungi) and public exposure to pesticides through public outreach and engagement, limiting access, and/or appropriate signage. For instance, users of the forest may be excluded from the area using barriers or signage until the pesticide dries. -Consider effects on local communities and indigenous peoples when considering limiting access to treatment areas. Entry Restrictions for Non-WPS Uses: Do not enter or allow people (or pets) to enter the treated area until sprays have dried. (1) **Minimizing Risk of Spray Drift:** *unintentional spray drift has potential to increase risk to the environment and public welfare.* **Spray Drift Management** A variety of factors including weather conditions (e.g., wind direction, wind speed, temperature, relative humidity) and method of application (e.g.,
	Non-timber Forest Products (as FSC-STD-01-001 V5-2 FSC Principles and Criteria, criterion 5.1)	**Minimal indication of adverse effects to Non-timber Forest Products was found when 2,4-D is used according to label instructions in forestry applications. Additional considerations are provided below.** Because 2,4-D is an effective herbicide, unintended effects on nontarget vegetation are plausible. The effective use of 2,4-D is achieved by applying it to target vegetation at a time and in a	

		manner that will minimize effects on nontarget plant species. If applied properly and with care, 2,4-D could have only minor effects on nontarget vegetation. Nonetheless, in the normal course of applying herbicide formulations at rates that are effective in weed control, drift or runoff are likely to cause adverse effects on terrestrial plants.	ground, aerial, airblast) can influence pesticide drift. The applicator must evaluate all factors and make appropriate adjustments when applying this product. **Droplet Size** When applying sprays that contain 2,4-D as the sole active ingredient, or when applying sprays that contain 2,4-D mixed with active ingredients that require a coarse or coarser spray, apply only as a coarse or coarser spray (ASABE Standard 572), or a volume mean diameter of 385 microns or greater for spinning atomizer nozzles. When applying sprays that contain 2,4-D mixed with other active ingredients that require a medium or finer spray, apply only as a medium or coarser spray (ASABE Standard 572), or a volume mean diameter of 300 microns or greater for spinning atomizer nozzles. **Wind Speed** Do not apply at wind speeds greater than 15 mph. Apply this product only if the wind direction favors on-target deposition and there are not sensitive areas (including residential areas, bodies of water, known habitat for beneficial nontarget plants) within 250 feet downwind. If applying a medium spray, leave one swath unsprayed at the downwind edge of the treated field. **Temperature Inversions** If applying at wind speeds less than 3 mph, the applicator must determine if: a) conditions of temperature inversion exist, or b) stable atmospheric conditions exist at or below nozzle height. Do not make applications into areas of temperature inversions or stable atmospheric conditions. **Susceptible Plants** Do not apply under circumstances where spray drift may occur to food, forage, or other plantings that might be damaged or crops thereof rendered unfit for sale, use or consumption. Susceptible crops include cotton, okra, flowers, fruit trees, grapes (in growing stage), fruit trees (foliage),
	High Conservation Values (particularly HCV 1-4)	**Minimal indication of adverse effects to High Conservation Values was found when 2,4-D is used according to label instructions in forestry applications.**	
	Landscape (aesthetics, cumulative impacts)	**Minimal indication of adverse effects to Landscape was found when 2,4-D is used according to label instructions in forestry applications.**	
	Ecosystem Services (water, soil, carbon sequestration, tourism)	**Minimal indication of adverse effects to Ecosystem Services was found when 2,4-D is used according to label instructions in forestry applications. Additional considerations are provided, below.** This chemical has properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. Application around a cistern or well may result in contamination of drinking water or groundwater. (1) The 2,4-D amine salts have been shown to dissociate rapidly in water. (3)	

			soybeans (vegetative stage), ornamentals, sunflowers, tomatoes, beans, and other vegetables, or tobacco. Small amounts of spray drift that may not be visible may injure susceptible broadleaf plants. **Other State and Local Requirements** Applicators must follow all state and local pesticide drift requirements regarding application of 2,4-D herbicides. Where states have more stringent regulations, they must be observed. Equipment All aerial and ground application equipment must be properly maintained and calibrated using appropriate carriers or surrogates. (1)

(1) Dow AgroSciences, LLC (2013). Specimen Label (DMA 4 IVM). Retrieved from http://www.cdms.net/ldat/ld4JS003.pdf
(2) USDA, Forest Service (2006). 2,4-D Human Health and Ecological Risk Assessment Final Report. Retrieved from https://www.fs.fed.us/foresthealth/pesticide/pdfs/093006_24d.pdf
(3) U.S. Environmental Protection Agency (2005). 2,4-D RED Facts Retrieved from https://archive.epa.gov/pesticides/reregistration/web/html/24d_fs.html

Social Management Unit Assessment

Pesticide:	**2,4-D**		***Specific Formulation:***
Hazard Status:	2,4-D is a highly hazardous pesticide (HHP) based on its classification in the Acute Toxicity hazard group and demonstration of the potential for acute toxicity to mammals and birds (Criterion 2) per the FSC Pesticides Policy (FSC-POL-30-001 V3-0 EN) and the FSC Lists of Highly Hazardous Pesticides (FSC-POL-30-001a EN). However, risks from other FSC hazard groups and toxicity categories were not precluded from this assessment.		
Exposure Elements	**Minimum list of values**	**Description of why/why not a risk on the Management Unit**	**Management Unit Mitigation strategies defined to minimize risk**
	High Conservation Values (especially HCV 5-6)	**Minimal indication of adverse effects to High Conservation Values was found when 2,4-D is used according to label instructions in forestry applications.**	**Follow all pesticide label application instructions. Follow applicable criterion and indicators from the FSC US FM Standard V1.0 (e.g., Criterion 4.3 for worker safety, Criterion 7.3 for worker training, Criterion 6.5 for protecting water resources, and Criteria 8.1 and 8.2 for Monitoring). Applicators or persons supervising application of restricted use pesticides are required to be certified in accordance with EPA regulations and state, territorial and tribal laws. Additional risk mitigation strategies are provided below. Organizations should take reasonable steps to avoiding environmental and social impacts by considering the mitigation strategies provided below, as well as application-, Organization-, or location-specific strategies.** **General consideration of exposure variables designed to mitigate risk:** -Know and understand the specific pesticide formulation and/or tank mixture, as its unique formulation may provide a different risk characterization. -Understand how the mixture of active ingredients affects the pesticides risk profile. -Seek to minimize the frequency, interval, and amount of application.
	Health (fertility, reproductive health, respiratory health, dermatologic, neurological and gastrointestinal problems, cancer and hormonal imbalance)	**Minimal indication of adverse effects to Health was found when 2,4-D is used according to label instructions in forestry applications. Additional considerations are provided below.** Corrosive • Causes Irreversible Eye Damage • Harmful If Swallowed, Inhaled Or Absorbed Through The Skin (1) Do not get in eyes, on skin, or on clothing. Avoid breathing vapor or spray mist. Wash thoroughly with soap and water after handling. (1) In acute studies, 2,4-D generally has low acute toxicity (Toxicity Category III or IV) via the oral, dermal and inhalation routes of exposure. 2,4-D is not a skin irritant (Toxicity Category III or IV), nor a skin sensitizer. Although the 2,4-D ester forms are not eye irritants (Toxicity Category III or IV), the acid and salt forms are considered to be severe eye irritants (Toxicity Category I). (3)	

		2,4-D is a Group D chemical (not classifiable) with regard to human carcinogenicity, and is not mutagenic; however, cytogenic effects were observed. (2) The W.H.O. does not regard 2,4-D and its salts and esters as either genotoxic or carcinogenic. (2) Based on central and upper-bound hazard quotients, adverse health outcomes are plausible following an accidental spill of 2,4-D into a small body of water. (2) The only hazard quotients indicating that adverse health outcomes are plausible, for the general public, following longer-term exposure to 2,4-D are those associated with ingestion of contaminated fruits and vegetation by an adult female. (2)	-Use the most efficient and effective method of application by seeking to minimize risk to environmental and social values. -Understand the site (e.g., soil type, topography, etc.) and climatic (e.g., wind, temperature, and humidity) conditions and the likely effect on risk to environmental and social values. -Have appropriate waste management systems in place. **Forestry Use Restrictions (per label):** • Do not allow sprays to contact conifer shoot growth (current year's new growth) or injury may occur. • Do not apply to nursery seed beds. • For conifer release, do not use on plantations where pine or larch are among the desired species. • For broadcast applications, do not apply more than a total of 8.42 pints of DMA 4 IVM (4 lb of acid equivalent) per acre per 12-month period. • Limited to one broadcast application, one basal spray or cut surface application, or one injection application per year. • For basal spray, cut surface stumps, and frill applications, do not apply more than 16.84 pints of DMA 4 IVM (8 lb of acid equivalent) per 100 gallons of spray \ solution. (1) **Mitigating Risk to the Environment:** *reduce contact with water resources and minimize application amounts and number of applications.* **Environmental Hazards** This product is toxic to fish and aquatic invertebrates. For terrestrial uses: Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Drift or runoff may adversely affect
Social	**Welfare**	**Minimal indication of adverse effects to Welfare was found when 2,4-D is used according to label instructions in forestry applications.**	
	Food and water	**Minimal indication of adverse effects to Food and Water was found when 2,4-D is used according to label instructions in forestry applications. Additional considerations are provided below.** 2,4-D has been detected in groundwater at approximately 15 ppb. This is below the DWLOCs determined to be protective in the human health risk assessment for 2,4-D and is also below the maximum contaminant level (MCL) for 2,4-D set at 70 ppb by the EPA Office of Water. (3) The only hazard quotients indicating that adverse health outcomes are plausible, for the general	

		public, following longer-term exposure to 2,4-D are those associated with ingestion of contaminated fruits and vegetation by an adult female. (2)	aquatic invertebrates and non-target plants. Drift and runoff may be hazardous to aquatic organisms in water adjacent to treated areas. Do not contaminate water when disposing of equipment washwaters or rinsate. (1) **Mitigating Risk to Workers:** *When applying pesticides, label instructions should be followed.* **DANGER!** Corrosive • Causes Irreversible Eye Damage • Harmful If Swallowed, Inhaled Or Absorbed Through The Skin Do not get in eyes, on skin, or on clothing. Avoid breathing vapor or spray mist. Wash thoroughly with soap and water after handling. Personal Protective Equipment (PPE) Some materials that are chemical-resistant to this product are made of any waterproof material. If you want more options, follow the instructions for category A on an EPA chemical resistance category selections chart. For all pesticide applications, Personal Protective Equipment (PPE) should be worn as follows: • chemical-resistant gloves, • overalls or long-sleeved shirt and long pants, • shoes/boots plus socks, • eye protection (goggles, or safety glasses with side shields), • an appropriate respirator if called for in applicable Safety Data Sheets. **User Safety Recommendations** Users should: - Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet. - Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
	Social Infrastructure (schools and hospitals, recreational infrastructure, infrastructure adjacent to the management unit)	**Minimal indication of adverse effects to Social Infrastructure was found when 2,4-D is used according to label instructions in forestry applications.**	
	Economic viability (agriculture, livestock, tourism)	**Minimal indication of adverse effects to Economic Viability was found when 2,4-D is used according to label instructions in forestry applications.**	
	Rights (legal and customary)	**Minimal indication of adverse effects to rights was found when 2,4-D is used according to label instructions in forestry applications.**	
	Others	**No additional values were identified in this assessment.**	

			• Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing. **Mitigating Risk to Public Access/Public Welfare:** - Reduce the possibility of public consumption of contaminated wild food (e.g., fruit or fungi) and public exposure to pesticides through public outreach and engagement, limiting access, and/or appropriate signage. For instance, users of the forest may be excluded from the area using barriers or signage until the pesticide dries. -Consider effects on local communities and indigenous peoples when considering limiting access to treatment areas. Entry Restrictions for Non-WPS Uses: Do not enter or allow people (or pets) to enter the treated area until sprays have dried. (1) **Minimizing Risk of Spray Drift:** *unintentional spray drift has potential to increase risk to the environment and public welfare.* **Spray Drift Management** A variety of factors including weather conditions (e.g., wind direction, wind speed, temperature, relative humidity) and method of application (e.g., ground, aerial, airblast) can influence pesticide drift. The applicator must evaluate all factors and make appropriate adjustments when applying this product. **Droplet Size** When applying sprays that contain 2,4-D as the sole active ingredient, or when applying sprays that contain 2,4-D mixed with active ingredients that require a coarse or coarser spray, apply only as a coarse or coarser spray (ASABE Standard

			572), or a volume mean diameter of 385 microns or greater for spinning atomizer nozzles. When applying sprays that contain 2,4-D mixed with other active ingredients that require a medium or finer spray, apply only as a medium or coarser spray (ASABE Standard 572), or a volume mean diameter of 300 microns or greater for spinning atomizer nozzles. **Wind Speed** Do not apply at wind speeds greater than 15 mph. Apply this product only if the wind direction favors on-target deposition and there are not sensitive areas (including residential areas, bodies of water, known habitat for beneficial nontarget plants) within 250 feet downwind. If applying a medium spray, leave one swath unsprayed at the downwind edge of the treated field. **Temperature Inversions** If applying at wind speeds less than 3 mph, the applicator must determine if: a) conditions of temperature inversion exist, or b) stable atmospheric conditions exist at or below nozzle height. Do not make applications into areas of temperature inversions or stable atmospheric conditions. **Susceptible Plants** Do not apply under circumstances where spray drift may occur to food, forage, or other plantings that might be damaged or crops thereof rendered unfit for sale, use or consumption. Susceptible crops include cotton, okra, flowers, fruit trees, grapes (in growing stage), fruit trees (foliage), soybeans (vegetative stage), ornamentals, sunflowers, tomatoes, beans, and other vegetables, or tobacco. Small amounts of spray drift that may not be visible may injure susceptible broadleaf plants. **Other State and Local Requirements** Applicators must follow all state and local pesticide drift requirements regarding application of 2,4-D herbicides. Where states have more stringent regulations, they must be observed.

			Equipment All aerial and ground application equipment must be properly maintained and calibrated using appropriate carriers or surrogates. (1)

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(2) USDA, Forest Service (2006). 2,4-D Human Health and Ecological Risk Assessment Final Report. Retrieved from https://www.fs.fed.us/foresthealth/pesticide/pdfs/093006_24d.pdf
(3) U.S. Environmental Protection Agency (2005). 2,4-D RED Facts. Retrieved from https://archive.epa.gov/pesticides/reregistration/web/html/24d_fs.html