Date: March 31, 2009
Calculator: James Schmidt (updated due to species variability)

SECONDARY VALUES FOR TRICLOPYR (CAS No. 55335-06-3)

A search was conducted for information on the chemical properties and toxicity of triclopyr to human health and to fish and aquatic life using the following databases and search engines: ECOTOX (toxicity to fish and aquatic life), IRIS (Integrated Risk Information System; toxicity to human health), CHEMFATE (environmental fate), BIODEG (degradation), HSDB (Hazardous Substances Data Bank), CCRIS (Chemical Carcinogenesis Research Info System), ATSDR ToxFAQs (Agency for Toxic Substances and Disease Registry chemical fact sheets), and EXTOXNET (Extension Toxicology Network's pesticide information project). This search yielded some useful information on triclopyr's properties and toxicity.

Fish and Aquatic Life Secondary Values

To derive an acute toxicity criterion for fish and aquatic life, acute toxicity test results are required for at least one species in each of eight different families. Specific requirements and the data available to meet these requirements are found in Table 1. Following a search for information on the toxicity of triclopyr to fish and other aquatic life, it was determined that data are available to meet three out of the eight requirements. Because data are available for a Daphnid species, it was still possible to calculate a secondary acute value for triclopyr.

Cold Water

To calculate a secondary acute value (SAV), the lowest genus mean acute value (GMAV) in the database is divided by the secondary acute factor (SAF; an adjustment factor corresponding to the number of satisfied requirements).

SAF for three out of eight requirements met = 8.0
Lowest GMAV = 1,950.37 µg/L (*Oncorhynchus*)

SAV = GMAV/SAF
= 1950.37 µg/L / 8.0
= 243.8 µg/L

There are currently no chronic data available for triclopyr that meet acceptability requirements. Therefore, a secondary chronic value (SCV) may be calculated using default acute-chronic ratios only.

SACR (secondary acute-chronic ratio) = Geometric mean of three species mean acute-chronic ratios (SMACRs).

SMACR 1 = 18 (default)
SMACR 2 = 18 (default)

SMACR 3 = 18 (default)

SACR = geometric mean of 18, 18, and 18 = 18

SCV = SAV/SACR
= 243.8 µg/L / 18
= 13.54 µg/L

So for cold water-designated waters, the secondary acute value is 243.8 µg/L and the secondary chronic value is 13.54 µg/L for triclopyr.

Warm Water Sportfish

Cold water fish drop out of the database when calculating secondary values for warm water sportfish-designated waters.

SAF for three out of eight requirements met = 8.0
Lowest GMAV = 121,655.25 µg/L (*Lepomis macrochirus*)

SAV = GMAV/SAF
= 121,655.25 µg/L / 8.0
= 15,206.91 µg/L

SCV = SAV/SACR
= 15,206.91 µg/L / 18
= 844.83 µg/L

So for warm water sportfish-designated waters, the secondary acute value is 15,207 µg/L and the secondary chronic value is 845 µg/L for triclopyr.

Warm Water Forage Fish

Cold water fish and all game fish drop out of the database when calculating secondary values for warm water forage fish-designated waters.

SAF for three out of eight requirements met = 8.0
Lowest GMAV = 132,900 µg/L (*Daphnia magna*)

SAV = GMAV/SAF
= 132,900 µg/L / 8.0
= 16,612.50 µg/L

SCV = SAV/SACR
= 16,612.50 µg/L / 18
= 922.92 µg/L

So for warm water forage fish-designated waters, the secondary acute value is 16,612 μg/L and the secondary chronic value is 923 μg/L for triclopyr.

Limited Forage Fish and Limited Aquatic Life

Because the lowest GMAV in the warm water forage fish database is for *Daphnia magna*, an invertebrate species that will not drop out of the database for any of the remaining water body use designations, secondary values calculated for warm water forage fish-designated waters will apply for limited forage fish and limited aquatic life-designated waters as well.

Table 1. Requirements for calculation of an acute toxicity criterion for protection of aquatic life for tryclopyr, and corresponding acute toxicity data.

Species Name	Common Name	Duration/ Endpoint	Value µg/L	Reference #[a]	Source
1. At least one salmonid fish in the family Salmonidae, in the class Osteichthyes.					
Oncorhynchus gorbuscha	**pink salmon**	**96-h/LC50**	**5,300**	**3**	**AQUIRE**
Oncorhynchus gorbuscha	**pink salmon**	**96-h/LC50**	**500**	**3**	**AQUIRE**
Species Mean Acute Value (SMAV) = 1,627.88					
Oncorhynchus kisutch	**Coho salmon**	**96-h/LC50**	**840**	**4**	**AQUIRE**
Oncorhynchus kisutch	**Coho salmon**	**96-h/LC50**	**2,200**	**5**	**AQUIRE**
Oncorhynchus kisutch	**Coho salmon**	**96-h/LC50**	**9,600**	**3**	**AQUIRE**
Oncorhynchus kisutch	**Coho salmon**	**96-h/LC50**	**1,000**	**3**	**AQUIRE**
Oncorhynchus kisutch	**Coho salmon**	**96-h/LC50**	**260**	**6**	**AQUIRE**
Oncorhynchus kisutch	**Coho salmon**	**96-h/LC50**	**1,300**	**6**	**AQUIRE**
SMAV = 1,347.87					
# Oncorhynchus mykiss	**rainbow trout**	**96-h/LC50**	**>100,000**	**2**	**AQUIRE**
Oncorhynchus mykiss	**rainbow trout**	**96-h/LC50**	**2,200**	**5**	**AQUIRE**
Oncorhynchus mykiss	**rainbow trout**	**96-h/LC50**	**7,500**	**3**	**AQUIRE**
Oncorhynchus mykiss	**rainbow trout**	**96-h/LC50**	**1,100**	**3**	**AQUIRE**
# Oncorhynchus mykiss	**rainbow trout**	**96-h/LC50**	**117,000**	**1**	**AQUIRE**
# Excluded results due to high variability, and other species tending more towards the lower end of the range.					
SMAV = 2,628.00					
Oncorhynchus nerka	**sockeye salmon**	**96-h/LC50**	**1,400**	**5**	**AQUIRE**
Oncorhynchus nerka	**sockeye salmon**	**96-h/LC50**	**1,200**	**5**	**AQUIRE**
Oncorhynchus nerka	**sockeye salmon**	**96-h/LC50**	**7,500**	**3**	**AQUIRE**
Oncorhynchus nerka	**sockeye salmon**	**96-h/LC50**	**400**	**3**	**AQUIRE**
SMAV = 1,498.33					

Oncorhynchus tshawytscha	**Chinook salmon**	**96-h/LC50**	**9,700**	**3**	**AQUIRE**
Oncorhynchus tshawytscha	**Chinook salmon**	**96-h/LC50**	**1,100**	**3**	**AQUIRE**

SMAV = 3,266.50

Genus Mean Acute Value (GMAV; Oncorhynchus sp.) = 1,950.37

2. At least one non-salmonid fish from another family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species.

Lepomis macrochirus	**bluegill**	**96-h/LC50**	**>100,000**	**2**	**AQUIRE**
Lepomis macrochirus	**bluegill**	**96-h/LC50**	**148,000**	**1**	**AQUIRE**

SMAV = 121,655.25

3. At least one planktonic crustacean (e.g., cladoceran, copepod).

Daphnia magna	**water flea**	**48-h/EC50**	**132,900**	**1**	**AQUIRE**

SMAV = 132,900

4. At least one benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish).

5. At least one insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge).

6. At least one fish or amphibian from a family in the phylum Chordata not already represented in one of the other subdivisions.

7. At least one organism from a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca).

8. At least one organism from a family in any order of insect or any other phylum not already represented in subdivisions 1 through 7.

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[1]Office of Pesticide Programs. 2000. Environmental Effects Database (EEDB). Environmental Fate and Effects Division, U.S. EPA, Washington, D.C.

[2]Johnson, W.W. and M.T. Finley. 1980. Handbook of acute toxicity of chemicals to fish and aquatic invertebrates. Resource Publication No. 137, U.S. Department of Interior, U.S. Fish and Wildlife Service, Washington, D.C. 98 pp.

[3]Wan, M.T., D.J. Moul, and R.G. Watts. 1987. Acute toxicity to juvenile Pacific salmonids of garlon 3A, garlon 4, triclopyr, triclopyr ester, and their transformation products: 3,5,6-tricloro-2… Bull. Environ. Contam. Toxicol. 39(4):721-728.

[4]Johansen, J.A. and G.H. Geen. 1990. Sublethal and acute toxicity of the ethylene glycol butyl ether ester formulation of triclopyr to juvenile Coho salmon (*Oncorhynchus kisutch*). Arch. Environ. Contam. Toxicol. 19(4):610-616.

[5]Servizi, J.A., R.W. Gordon, and D.W. Martens. 1987. Acute toxicity of garlon 4 and Roundup herbicides to salmon, *Daphnia*, and trout. Bull. Environ. Contam. Toxicol. 39(1):15-22.

[6]Mayes, M.A., P.G. Murphy, D.L. Hopkins, F.M. Gersich, and F.A. Blanchard. 1986. The toxicity and metabolism of triclopyr butoxethyl ester: Coho salmon. Toxicologist 6:26.

HUMAN HEALTH

To calculate a criteria or secondary value for the protection of human health, it is first necessary to determine if the substance has been shown to be carcinogenic (which will result in the calculation of a human cancer criteria or secondary value) or not (which will result in the calculation of a human threshold criteria or secondary value). The U.S. EPA has not yet classified triclopyr's carcinogenicity due to insufficient data. Because there is no oral reference dose available either, it is not possible to calculate a secondary threshold value for the protection of human health at this time.

Chemical	CAS #	Category	Type of Secondary Value	Water Body Classification	Value (µg/L)
Triclopyr	55335-06-3	Fish and Aquatic	Acute	Cold	328
Triclopyr	55335-06-3	Fish and Aquatic	Chronic	Cold	18
Triclopyr	55335-06-3	Fish and Aquatic	Acute	WWSF	15,207
Triclopyr	55335-06-3	Fish and Aquatic	Chronic	WWSF	845
Triclopyr	55335-06-3	Fish and Aquatic	Acute	WWFF, LFF, LAL	16,612
Triclopyr	55335-06-3	Fish and Aquatic	Chronic	WWFF, LFF, LAL	923
Triclopyr	55335-06-3	Human Health	-	-	Insufficient Data

Cold = cold water designated water bodies
WWSF = warm water sportfish designated water bodies
WWFF = warm water forage fish designated water bodies
LFF = limited forage fish designated water bodies
LAL = limited aquatic life designated water bodies (includes wetlands)