

**Date:** March 31, 2009

**Calculator:** James Schmidt (modified GMAVs for coldwater)

### SECONDARY VALUES FOR SODIUM NITRITE (CAS No. 7632-00-0)

A search was conducted for information on the toxicity of sodium nitrite to fish and aquatic life using the ECOTOX database (U.S. EPA) and the MSDS sheet for the corrosion inhibitor, CorrShield NT 4203.

#### FISH AND AQUATIC LIFE

To derive an acute toxicity criterion for 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 sodium nitrite to fish and other aquatic life, it was determined that data are available to meet five out of the eight requirements. Because data are available for a Daphnid species, it is possible to calculate a secondary acute value for this substance.

#### 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 five out of eight requirements met = 6.1

Lowest GMAV = 669.21 µg/L (*Oncorhynchus*)

$$\begin{aligned}\text{SAV} &= \text{GMAV}/\text{SAF} \\ &= 669.21 \text{ µg/L} / 6.1 \\ &= \mathbf{109.71 \text{ µg/L}}\end{aligned}$$

SACR (secondary acute-chronic ratio) = Geometric mean of three species mean acute-chronic ratios (SMACRs). Default = 18

$$\begin{aligned}\text{SCV} &= \text{SAV}/\text{SACR} \\ &= 109.71 \text{ µg/L} / 18 \\ &= \mathbf{6.09 \text{ µg/L}}\end{aligned}$$

#### Warm Water Sport Fish

Cold water fish drop out of the database.

Lowest GMAV = 2,622.40 µg/L (*Pimephales promelas*)

$$\begin{aligned}\text{SAV} &= \text{GMAV}/\text{SAF} \\ &= 2622.40 \text{ µg/L} / 6.1\end{aligned}$$

$$= 429.90 \mu\text{g/L}$$

$$\begin{aligned}\text{SCV} &= \text{SAV/SACR} \\ &= 429.90 \mu\text{g/L} / 18 \\ &= 23.88 \mu\text{g/L}\end{aligned}$$

#### Warm Water Forage Fish and Limited Forage Fish

Because the lowest GMAV for the warm water forage fish database was for a species that will not drop out of the warm water forage fish or the limited forage fish databases, the acute and chronic secondary values for these two classifications will be the same as those for warm water sport fish.

#### Limited Aquatic Life

All fish drop out of the database.

Lowest GMAV = 5,700  $\mu\text{g/L}$  (*Procambarus clarkii*)

$$\begin{aligned}\text{SAV} &= \text{GMAV/SAF} \\ &= 5700 \mu\text{g/L} / 6.1 \\ &= 934.42 \mu\text{g/L}\end{aligned}$$

$$\begin{aligned}\text{SCV} &= \text{SAV/SACR} \\ &= 934.42 \mu\text{g/L} / 18 \\ &= 51.91 \mu\text{g/L}\end{aligned}$$

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

Species Name	Common Name	Duration/ Endpoint	Value µg/L	Reference # <sup>a</sup>	Source
1. At least one salmonid fish in the family Salmonidae, in the class Osteichthyes.					
<i>Oncorhynchus mykiss</i>	rainbow trout	96-h/LC50	303,000		MSDS Sheet
<i>Oncorhynchus mykiss</i>	rainbow trout	96-h/LC50			ECOTOX
(I chose not to list each of the 79 LC50 values that was used to calculate the SMAV for this species. Please see Excel spreadsheet for more detail.)					
<b>Species Mean Acute Value (SMAV) for all ECOTOX values = 656.89</b> (ignored the MSDS value since it is more than one order of magnitude higher)					
<i>Oncorhynchus clarki</i>	cutthroat trout	96-h/LC50	480	4	ECOTOX
<i>Oncorhynchus clarki</i>	cutthroat trout	96-h/LC50	560	4	ECOTOX
SMAV = 518.46					
<i>Oncorhynchus tshawytscha</i>	Chinook salmon	96-h/LC50	880	5	ECOTOX
<b>GMAV = 669.21</b>					
2. At least one non-salmonid fish from another family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species.					
<i>Ictalurus punctatus</i>	channel catfish	96-h/LC50	7,100	2	ECOTOX
<i>Ictalurus punctatus</i>	channel catfish	96-h/LC50	7,550	3	ECOTOX
SMAV = 7,321.54					
<i>Micropterus salmoides</i>	largemouth bass	96-h/LC50	140,200	2	ECOTOX

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

<i>Daphnia magna</i>	water flea	48-h/LC50	638,000		MSDS Sheet
----------------------	------------	-----------	---------	--	------------
4. At least one benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish).
 

<i>Procambarus clarkii</i>	crayfish	96-h/LC50	5,700	1	ECOTOX
----------------------------	----------	-----------	-------	---	--------
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.
 

<i>Pimephales promelas</i>	fathead minnow	96-h/LC50	2,300	6	ECOTOX
<i>Pimephales promelas</i>	fathead minnow	96-h/LC50	2,990	6	ECOTOX
<i>Pimephales promelas</i>	fathead minnow	96-h/LC50	930,000		MSDS Sheet

SMAV = 2,622.40 (ignored the MSDS value since it is more than one order of magnitude higher).
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.

---

<sup>1</sup>Gutzmer, M.P. and J.R. Tomasso. 1985. Nitrite toxicity to the crayfish, *Procambarus clarkii*. Bull. Environ. Contam. Toxicol. 34(3):369-376.

<sup>2</sup>Palachek, R.M. and J.R. Tomasso. 1984. Toxicity of nitrite to channel catfish, tilapia, and largemouth bass. Can. J. Fish. Aquat. Sci. 41(12):1739-1744.

<sup>3</sup>Konikoff, M. 1975. Toxicity of nitrite to channel catfish. Prog. Fish Cult. 37(2):96-98.

<sup>4</sup>Thurston, R.V., R.C. Russo, and C.E. Smith. 1978. Acute toxicity of ammonia and nitrite to cutthroat trout fry. Trans. Am. Fish. Soc. 107(2):361-368.

<sup>5</sup>Westin, D.T. 1974. Nitrate and nitrite toxicity to salmonid fishes. Prog. Fish-Cult. 36(2):86-89.

<sup>6</sup>Russo, R.C. and R.V. Thurston. 1977. The acute toxicity of nitrite to fishes. In: R.A. Tubb (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology, 118-131.

