Date: April 2005
Calculator: Elisabeth Harrahy

SECONDARY VALUES FOR IRON (CAS Number 7439-89-6)

A search was conducted for information on the toxicity of iron to fish and aquatic life using the ECOTOX database.

Fish and Aquatic Life Secondary Values

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 iron to fish and other aquatic life, it was determined that data are available to meet only five out of the eight requirements. However, because data are available for a Daphnid species, it was possible to calculate secondary values for iron.

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 = 1,202.45 µg/L (*Cyprinus carpio*)

SAV = GMAV/SAF
= 1,202.45 / 6.1
= 197.12 µg/L

Secondary chronic value (SCV) = SAV/secondary acute to chronic ratio (SACR)
=197.12 / 18
= **10.95 µg/L**

Warm Water Sportfish, Warm Water Forage Fish, Limited Forage Fish

The lowest GMAV in the cold water database (for *Cyprinus carpio*) is also the lowest GMAV in the warm water sportfish, warm water forage fish, and limited forage fish databases. Therefore the secondary values for water bodies classified as warm water sportfish, warm water forage fish, and limited water forage fish will be the same as for those calculated for cold water.

Limited Aquatic Life

Toxicity data for all fish species drop out of the database.

Lowest GMAV = 9,688.55 μg/L (*Daphnia* sp.)

SAV = GMAV/SAF
= 9,688.55 / 6.1
= 1,588.29 μg/L

SCV = SAV/SACR
=1,588.29 / 18
= **88.24 μg/L**

Table 1. Requirements for calculation of an acute toxicity criterion for protection of aquatic life for iron 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.					
2. At least one non-salmonid fish from another family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species.					
Ictalurus punctatus	**channel catfish**	**96-h/LC50**	**>500,000**	**1**	**ECOTOX**
Lepomis macrochirus	**bluegill**	**96-h/LC50**	**20,260**	**2**	**ECOTOX**
Morone saxatilis	**striped bass**	**96-h/LC50**	**4,000**	**3**	**ECOTOX**
Morone saxatilis	**striped bass**	**96-h/LC50**	**6,000**	**3**	**ECOTOX**
Species mean acute value (SMAV):			4,898.98		
3. At least one planktonic crustacean (e.g., cladoceran, copepod).					
Daphnia magna	**water flea**	**48-h/EC50**	**9,600**	**4**	**ECOTOX**
Daphnia pulex	**water flea**	**48-h/LC50**	**12,930**	**2**	**ECOTOX**
Daphnia pulex	**water flea**	**48-h/LC50**	**15,810**	**2**	**ECOTOX**
Daphnia pulex	**water flea**	**48-h/LC50**	**17,350**	**2**	**ECOTOX**
Daphnia pulex	**water flea**	**48-h/LC50**	**9,000**	**5**	**ECOTOX**
Daphnia pulex	**water flea**	**48-h/LC50**	**2,800**	**5**	**ECOTOX**
SMAV:			9,777.91		
Genus mean acute value (GMAV):			9,688.55		

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

Asellus aquaticus	**aquatic sowbug**	**96-h/EC50**	**124,000**	**6**	**ECOTOX**
Crangonyx pseudogracilis	**scud**	**96-h/EC50**	**120,000**	**6**	**ECOTOX**
Orconectes limosus	**crayfish**	**96-h/LC50**	**32,000**	**7**	**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.

Cyprinus carpio	**carp**	**96-h/LC50**	**560**	**8**	**ECOTOX**
Cyprinus carpio	**carp**	**96-h/LC50**	**1,360**	**8**	**ECOTOX**
Cyprinus carpio	**carp**	**96-h/LC50**	**2,250**	**8**	**ECOTOX**
Cyprinus carpio	**carp**	**96-h/LC50**	**1,220**	**8**	**ECOTOX**
SMAV:			1202.45		
Gambusia affinis	**western mosquitofish**	**96-h/LC50**	**26,000**	**9**	**ECOTOX**
Pimephales promelas	**fathead minnow**	**96-h/LC50**	**21,840**	**2**	**ECOTOX**

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

Physa gyrina	**pouch snail**	**96-h/LC50**	**12,090**	**2**	**ECOTOX**
Tubifex tubifex	**tubificid worm**	**96-h/EC50**	**101,840**	**10**	**ECOTOX**

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.

---

[1]Clemens, H.P. and K.E. Sneed. 1959. Lethal doses of several commercial chemicals for fingerling channel catfish. U.S. Fish and Wildlife Service Report Fish No. 316, U.S.D.I., Washington, D.C. 10 p.

[2]Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. 1985. Recommendations on numerical values for regulating iron and chloride concentrations for the purpose of protecting warmwater species of aquatic life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY. 73 p.

[3]Hughes, J.S. 1973. Acute toxicity of thirty chemicals to striped bass (Morone saxatilis). La. Dep. Wildl. Fish. 318-334-2417. 15 p.

[4]Biesinger, K.E. and G.M. Christensen. 1972. Effects of various metals on survival, growth, reproduction and metabolism of *Daphnia magna*. J. Fish. Res. Board Can. 29:1691-1700.
[5]Lee, D.R. 1976. Development of an invertebrate bioassay to screen petroleum refinery effluents discharged into freshwater. Ph.D. Thesis, VPI and State University, Blacksburg, VA. 108 p.
[6]Martin, T.R. and D.M. Holdich. 1986. The acute lethal toxicity of heavy metals to Peracarid crustaceans (with particular reference to freshwater Asellids and Gammarids. Water Research 20(9):1137-1147.
[7]Boutet, C. and C. Chaisemartin. 1973. Specific toxic properties of metallic salts in *Austropotamobius pallipes pallipes* and *Orconectes limosus*. C.R. Soc. Biol. (Paris) 167(12):1933-1938.
[8]Alam, M.K. and O.E. Maughan. 1995. Acute toxicity of heavy metals to common carp (*Cyprinus carpio*). J. Environ. Sci. Health Part A 30(8):1807-1816.
[9]Wallen, I.E., W.C. Greer, and R. Lasater. 1957. Toxicity to Gambusia affinis of certain pure chemicals in turbid waters. Sewage Ind. Wastes 29(6):695-711.
[10]Khangarot, B.S. 1991. Toxicity of metals to a freshwater tubificid worm, *Tubifex tubifex* (Muller). Bull. Environ. Contam. Toxicol. 46:906-912.