Office of Pesticide Programs' Aquatic Life Benchmarks

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Introduction

The aquatic life benchmarks (for freshwater species) provided in the table below are based on toxicity values reviewed by EPA and used in the Agency's most recent risk assessments developed as part of the decision-making process for pesticide registration. The Office of Pesticide Programs (OPP) in EPA relies on studies required under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as specified at 40 CFR Part 158, as well as a wide range of environmental laboratory and field studies available in the public scientific literature to assess environmental risk. Each Aquatic Life Benchmark is based on the most sensitive, scientifically acceptable toxicity endpoint available to EPA for a given taxon (for example, freshwater fish) of all scientifically acceptable toxicity data available to EPA. EPA's goal is to add to these benchmarks annually.

Relationship to Ambient Water Quality Criteria

Both OPP and EPA's Office of Water (OW) have responsibilities for evaluating aquatic toxicity data to assess the ecological effects of chemicals in surface water. Effects assessments under both program offices are developed with high quality data pursuant to parallel but somewhat different rigorously peer-reviewed assessment methods.

- OW uses aquatic toxicity data to develop ambient water quality criteria that can be adopted by states and tribes to establish water quality standards under the Clean Water Act. Criteria are available for roughly 16 pesticides. Procedures for deriving the criteria are described in *Guidelines*[a], and require, for acute criteria, that data be available for at least 8 families.
- OPP uses aquatic toxicity data in ecological risk assessments for large numbers of pesticide registration decisions under FIFRA. OPP's procedures for effects assessment are described in the *Overview Document*[b]; and rely, at a minimum, on data for the most sensitive tested effects concentration for each taxon.
- Both the OW and OPP methods assess and characterize effects to protect aquatic communities.

The table below provides aquatic toxicity benchmarks, a reference for the most recent risk assessment conducted by OPP for each pesticide, and ambient water quality criteria, if available.

Use of Aquatic Life Benchmarks

EPA worked initially with the USGS to identify aquatic ecotoxicity benchmarks values from risk assessments developed by EPA for individual pesticides during the recently completed re-registration program. The *Overview Document* and ecological risk assessments developed for individual pesticides provide useful information for understanding how these ecotoxicity benchmarks were developed and the uncertainties associated with each benchmark. Comparing a measured concentration of a pesticide in water with an aquatic life benchmark can be helpful in interpreting monitoring data, and to identify and prioritize sites and pesticides that may require further investigation.

These aquatic benchmarks are extracted from the most recent publically available OPP risk assessment for the pesticide and are based on the most sensitive aquatic toxicity data of the distribution for each taxa. Benchmarks, developed for baseline risk assessments, are estimates of the concentrations below which pesticides are not expected to harm aquatic life. OPP may further refine a risk assessment based on the full distribution of toxicity data for a given species, using point estimates, species sensitivity distribution approaches, or probabilistic methods.

OPP and OW are actively working together to harmonize the high quality, peer-reviewed scientific approaches that now underlie both programs. A harmonized approach will result in consistent tools and approaches for all stakeholder communities to use in ensuring the protection of aquatic ecosystems.

OPP Aquatic Life Benchmarks (µg / L)
(freshwater)

Pesticide	Year Updated	CAS number	Fish		Invertebrates		Nonvascular Plants	Vascular Plants
			Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]
2,4-D	2014	94-75-7			12500			
2,4-D acids and salts		94-75-7	12075	14200	12500	16050	3880	13.1
2,4-D esters		.	130	79.2	1100	200	66	330
2,4-D, 2-ethylhexyl ester	2014	1928-43-4		79.2	1700		152	330
2,4-D, Butoxyethyl ester	2014	1929-73-3	214			200		
2,4-D, Diethanolamine salt	2014	5742-	> 40800			16050		299.2

		19-8						
2,4-D, Dimethylamine salt	2014	2008-39-1	139000	23600			3880	
2,4-D, Isopropyl ester	2014	94-11-1	130		1100			
2,4-DB		94-82-6	1000		7500		932	
2,4-DB-DMAS		2758-42-1	1567		10150			
3, 6-dichlorosalicylic acid (DCSA)		3401-80-7	> 50000		44500		138000	> 73000
3-chloroacrylic acid degradate of Telone		.	34750		27500		430	220
3-chloroallyl alcohol degradate of Telone		.	493		1150		32900	1694
3-Trifluoromethyl-4-Nitrophenol (TFM)		88-30-2	300		1900		1200	
Abamectin	2014	71751-41-2	1.6	0.52	0.17		> 100000	3900
Acephate		30560-19-1	416000	5760	550	150	> 50000	
Acequinocyl		57960-19-7	33500	520	1.2	0.98	960	
Acetamiprid	2013		> 50000	19200	10.5	2.1	> 1000	> 1000
Acetochlor		34256-82-1	190	130	4100	22.1	1.43	3.4
Acetochlor degradate ethanesulfonic acid (ESA)		187022-11-3	> 90000		> 62500		9900	
Acifluorfen sodium		62476-59-9	8500	< 1500	14050		> 265	378
Acrolein		107-02-8	7	11.4	> 15.5	7.1	28	72
Alachlor		15972-60-8	900	187	1250	110	1.64	2.3
Alachlor ethane sulfonic acid		.	> 52000		> 52000			
Alachlor oxanilic acid		.	> 500000		> 47500			
Aldicarb		116-06-3	26	0.46	10	1	> 5000	
Aldicarb sulfone		1646-88-4	21000		140			
Aldicarb sulfoxide		1646-87-3	3570		21.5			
Aliphatic Oils- 100 Paraffine Oil		64742-54-7	> 50000		205			
Aliphatic Oils- 70 Orchard Spray		64742-55-8			1200			
Aliphatic Oils- 90 Neutral Oil		8012-95-1	> 50000		10			
Aliphatic Oils- GB-1111		.	> 60000		50			
Aliphatic Oils- N65DW		.	> 250000000					
Aliphatic Oils- VHVI-4		.	> 38000		< 450			
Allethrin		584-79-2	9.5		1.05			
Alpha-cypermethrin	2014	67375-30-8	1.1	0.14	0.0018	0.00059	> 33.5	> 1.39
Alpha-cypermethrin degradate (3-phenoxybenzoic acid) 3-phenoxybenzoic acid	2014		6650		44500			
Aluminum Phosphide	2014	20859-73-8						
Ametryn	2014	834-12-8	1800	700	14000	240	3.67	13
Aminocyclopyrachlor acid	2013	858956-08-8	> 60000	11000	19850	< 370	7400	> 122000
Aminocyclopyrachlor ester	2013		6500		9950			
Aminopyralid	2013	150114-71-9	> 50000	1360	> 49300	102000	18000	> 88000
Amitraz		33089-61-1	170	> 1.5	17.5	1.1		
Amitraz BTS 27271		33089-61-1	14200		1295			
Amitraz BTS 27919		33089-61-1	33100		> 50000			
Ancymidol	2014	12771-68-5			> 48200			292
Antimycin A		1397-94-0	0.0045		0.004			

Arsenic Acid	**2014**	**7778-39-4**	25000		7500		9.2	> 9800
Arsenic Trioxide	**2014**	**1327-53-3**	12800					
Asulam sodium		**2302-17-2**	> 87500		13550		180	140
Atrazine	**2014**	**1912-24-9**	2650		360	60	< 1	0.001
Azinphos methyl		**86-50-0**	0.18	0.055	0.08	0.036		
Azoxystrobin		**131860-33-8**	235	147	130	44	49	3400
Benfluralin		**1861-40-1**	34.85	1.9	1090	15.5	> 100	
Bensulide		**741-58-2**	360	374	290		1500	
Bentazon		**25057-89-0**	> 50000		> 50000		4500	5350
Bentazon, sodium salt		**50723-80-3**	> 50000		31150		60	5350
Bifenazate	**2014**	**149877-41-8**	290		250	150	890	> 3820
Bifenazate degradate D1989	**2014**	**149877-41-8**			125			
Bifenazate degradate D-3598	**2014**	**149877-41-8**	22		25.5		780	
Bifenazate degradate D-9472	**2014**	**149877-41-8**	115		390		710	
Bifenthrin		**82657-04-3**	0.075	0.04	0.8	0.0013		
Bioallethrin		**28057-48-9**	4.7					
Bispyrabac sodium	**2013**	**125401-92-5**	> 51000	9200	> 49600	110000	250	12
Boric Acid Salts		**10043-35-3**	> 400000		66500			
Boscalid		**188425-85-6**	1350	116	> 533	298	1340	3900
Bromacil		**314-40-9**	18000	3000	60500	8200	6.8	45
Bromoxynil	**2014**	**1689-84-5**						
Bromoxynil Heptanoate	**2014**	**56634-95-8**	14.5		15.5			219
Bromoxynil Octanoate	**2014**	**1689-99-2**		18	5.5	2.5	51	
Bromoxynil phenol		**1689-84-5**	1050		9610			
Butylate		**2008-41-5**	105		5950			
Cacodylate Acid	**2014**	**75-60-5**	8500		9050			30900
Captan	**2014**	**133-06-2**	13.1	16.5	4200	560	320	> 12700
Captan degradate (1,2,3,6-Tetrahydrophthalimide)	**2014**	**1469-48-3**	> 60000		> 56500		> 181000	
Captan degradate (tetrahydrophthalimic acid)	**2014**		> 63000					
Carbaryl		**63-25-2**	110	6	0.85	0.5	660	1500
Carbendazim	**2013**	**10605-21-7**						
Carbofuran		**1563-66-2**	44	5.7	1.115	0.75		
Carboxin		**5234-68-4**	600		42200		370	670
Chlorantraniliprole		**500008-45-7**	> 600	110	4.9	4.5	1800	2000
Chlorfenapyr		**122453-73-0**	3.72	3.68	2.915	3.57		
Chlorfenapyr Metabolite CL303094		**.**			280			
Chlorfenapyr Metabolite CL303195		**.**			850			
Chlorfenapyr Metabolite CL303267		**122454-23-3**	35		53.5			
Chlorfenapyr Metabolite CL312094		**122453-73-0**	> 464					

Chlorfenapyr Metabolite CL325195		**122453-73-0**	1050					
Chlorflurenol methyl ester		**2536-31-4**						
Chlormequat chloride		**999-81-5**	> 50000		8450	5000	> 207000	2800
Chloropicrin	**2014**	**76-06-2**	5.5		60			6.5
Chlorothalonil		**1897-45-6**	5.25	3	1.8	0.6	6.8	630
Chlorothalonil degradate (SDS-3701)		**.**	4600		13000		33700	
Chlorpyrifos		**2921-88-2**	0.9	0.57	0.05	0.04	140	
Chlorpyrifos-methyl		**5598-13-0**	7		0.085			
Chlorsulfuron	**2014**	**64902-72-3**	> 150000	32000	> 185000	20000	50	0.35
Chromated Arsenicals	**2014**					< 0.95		
Clethodim		**99129-21-2**	7500		2850		11000	1100
Clodinafop-propargyl	**2014**	**105512-06-9**	120		> 1000		3000	> 2400
Clodinafop-propargyl Degradate (CGA-193469)	**2014**	**114420-56-3**			> 4600	2600		
Clodinafop-propargyl Degradate (CGA-302371)	**2014**	**514797-96-7**	> 47700		> 49450		30600	
Clofentezine		**74115-24-5**	> 7.3	6	> 40	26.2		
Clomazone		**81777-89-1**	1450	350	2700	2200	167	30200
Clopyralid		**1702-17-6**	984000		56500			
Clothianidin	**2013**	**210880-92-5**	> 50750	9700	11	1.1	64000	121000
Copper		**7440-50-8**	15.7	9.01	2.05	1.11	3.1	2300
Coumafos		**56-72-4**	140	11.7	0.037	0.037		
Coumaphos	**2014**	**56-72-4**	140	11.7	0.037	0.0337		
Cyanamide		**420-04-2**	23000	< 507	1650	100	650	2330
Cyantraniliprole	**2014**	**736994-63-1**	> 5000	10700	10.2	6.56	> 10000	12100
Cyazofamid	**2013**	**120116-88-3**	> 53.5	90.1	> 650	< 87		> 1220
Cycloate		**1134-23-2**	2250		1300			
Cyfluthrin	**2013**	**68359-37-5**	0.034	0.01	0.0125	0.0074	> 181	
Cyfluthrin, beta	**2013**	**68359-37-5**	0.034		0.145			
Cyhexatin		**13121-70-5**						
Cypermethrin		**52315-07-8**	0.195	0.14	0.21	0.069		
Cyphenothrin		**39515-40-7**	0.17		0.215			
Cyprodinil		**121552-61-2**	1205	230	16	8	2250	
Cyromazine		**66215-27-8**	> 44850	14000	> 46400	310		
Dacthal (DCPA)		**1861-32-1**	15000		13500		> 11000	> 11000
Daminozide		**1596-84-5**	224000		35500		> 99800	
Dazomet	**2014**	**533-74-4**						
Dazomet (degradate methyl isothiocyanate (MITC))		**533-74-4**	25.6		27.5	25	254	590
Dazomet degradate (Methyl Isothiocyanate)	**2014**	**556-61-6**	26.5		27.5	25	200	590
Deltamethrin		**52918-63-5**	0.29	0.017	0.055	0.0041		
Diazinon		**333-41-5**	45	< 0.55	0.105	0.17	3700	
		1918-						

Dicamba acid		**00-9**	14000		> 50000		61	> 3250
Dicamba, dimethylamine salt		**2300-66-5**	488500		781500			
Dicamba, sodium salt		**1982-69-0**	253600		17300			
Dichlobenil		**1194-65-6**	2465	< 330	1850	560	1000	30
Dichloroprop (2,4-DP)	**2013**	**120-36-5**						
Dichlorvos (DDVP)		**62-73-7**	91.5	5.2	0.035	0.0058	14000	
Dicofol		**115-32-2**	26.5	4.4	70	19	> 5000	
Dicrotophos		**141-66-2**	3150		6.35	0.99		
Difenacoum		**56073-07-5**	32		305		320	
Difenoconazole	**2013**	**119446-68-3**	405	8.7	385	5.6	98	1900
Difenzoquat methyl sulfate		**43222-48-6**	23250		1265		630	120
Difethialone		**104653-34-1**	25.5		2.2			
Diflubenzuron		**35367-38-5**	64500	100	0.0014	0.00025	200	190
Dimethenamid		**87674-68-8**	3150	300	6000	1020	14	8.9
Dimethoate		**60-51-5**	3100	430	21.5	0.5	84	
Dimethomorph	**2014**	**110488-70-5**	3100	< 341	> 5300	110		
Dinotefuran	**2013**	**165252-70-0**	> 49550	> 6360	> 484150	> 95300	> 97600	> 110000
Dinotefuran degradate dn phosphate	**2013**				> 55300		> 100400	
Dinotefuran degradate MNG	**2013**						> 98700	
Diquat Dibromide		**85-00-7**	7400	122	385	< 36	9.4	0.75
Disulfoton		**298-04-4**	19.5	4	1.95	0.01		
Disulfoton sulfone		**2497-06-5**	> 4600		17.5	0.14		
Disulfoton sulfoxide		**2497-07-6**	30000		32	1.53		
Dithiopyr	**2013**	**97886-45-8**						
Diuron		**330-54-1**	200	26.4	80	200	2.4	15
Dodine		**2439-10-3**	285	99	8.9	7.3	0.95	
DSMA	**2014**	**144-21-8**					1500	
Dyes + Acids		**.**	> 48000	> 96000	> 48500			
Endosulfan		**115-29-7**	0.05	0.11	0.3	0.01	428	
Endosulfan sulfate		**1031-07-8**	1.9		150			
Endothall (acid)		**145-73-3**	24500	1300	46000	< 2200		
Endothall (dipotassium salt)		**2164-07-0**	4576	1790	31900			610
Endothall (N,N-dimethylalkylamine salt)		**66330-88-9**	7.5	56	6	2.3	2.3	740
EPN	**2013**	**2104-64-5**						
EPTC	**2014**	**759-94-4**	7000		3250	800	1400	5600
EPTC (S-Ethyl dipropylthiocarbamate)		**759-94-4**	7000		3245	810	1400	5600
Esbiol (s-bioallethrin)		**28434-00-6**	3.95					
Esbiothrin		**84030-86-4**			4.45			
Esfenvalerate		**66230-04-4**	0.035	0.035	0.025	0.017		
Ethalfluralin		**55283-68-6**	16	0.4	30	24	25	

Ethephon		**16672-87-0**	44000		15850	17000	23500	2500
Ethion	**2013**	**563-12-2**						
Ethofumesate	**2013**	**26225-79-6**	8750	2560	147000	300	> 2760	
Ethoprop		**13194-48-4**	150	24	22	0.8	8400	
Etofenprox		**80844-07-1**	1.35	23	0.4	0.17	> 18.8	> 26
Etoxazole	**2013**	**153233-91-1**	> 150	15	3.55	0.13		
ETU (common degradate of Mancozeb and Maneb)		**.**	> 251000	37320	134500	2		
Fenamidone	**2013**	**161326-34-7**	370	< 8.6	24.5	12.5	70	> 880
Fenamiphos		**22224-92-6**	4.75	3.8	0.95	0.12		
Fenarimol		**60168-88-9**	450	180	3400	113	100	
Fenbutatin- oxide		**13356-08-6**	0.85	0.31	15.5	16		
Fenhexamid	**2014**	**126833-17-8**	670	101	> 9400	1000	4820	> 2300
Fenitrothion		**122-14-5**	860	46	1.15	0.087		
Fenoxaprop-p-ethyl		**71283-80-2**	155	22	> 529		430	> 3000
Fenoxycarb		**72490-01-8**	800	48	200	0.0016		
Fenpropathrin		**39515-41-8**	1.1	0.091	0.265	0.064		
Fenpyrazamine	**2014**	**473798-59-3**	2600	370	2750	340	11	1100
Fenpyrazamine degradate- 2-Cyano-N-isopropyl-2-(otolyl)acetamide (MCNI)	**2014**				> 25000			
Fenpyrazamine degradate- 5-Amino-2-isopropyl-4-(o-tolyl)-1H-pyrazol-3-one(S-2188-DC)	**2014**		> 44500		> 47000		32000	
Fenpyrazamine degradate- 5-Amino-4-hydroxy-2-isopropyl-4-(o-tolyl)pyrazol-3-one(S-2188-OH)	**2014**		> 48500		> 49000		55000	
Fenpyroximate	**2013**	**134098-61-6**	0.22	0.11	0.8	0.56	1.9	> 190
Fenthion		**55-38-9**	415	7.5	2.6	0.013	400	> 2800
Fipronil		**120068-37-3**	41.5	6.6	0.11	0.011	140	> 100
Fipronil degradate MB45950		**.**	41.5	6.6	1.065	0.11	140	> 100
Fipronil degradate MB46136		**.**	12.5	0.67	0.36	0.037	140	> 100
Fipronil degradate MB46513		**.**	10	0.59	100	10.3	140	> 100
Florasulam		**145701-23-1**	> 50000	119000	> 146000	38900	3.45	1.18
Fluazinam	**2014**	**079622-59-6**	18	0.69	90	68	1.1	
Flubendiamide		**272451-65-7**	> 32.55	60.5	> 27.4	41.5	> 69.3	> 54.6
Fludioxonil		**131341-86-1**	235	19	450	< 19	70	> 1000
Flumetsulam	**2014**	**98967-40-9**	> 146500	197000	127000	111000	3.21	3.1
Flumiclorac-pentyl		**87546-18-7**	550		> 19000			
Flumioxazin	**2013**	**103361-09-7**	1150	7.7	2750	28	0.83	0.49
Fluometuron		**2164-17-2**	320		110		30	220
Fluopicolide	**2014**	**239110-15-7**	174.5	151	> 850	190	< 1.4	> 3200
Fluopicolide degradate- 3-chloro-5-trifluoromethylpyridine-2-carboxylic acid	**2014**	**239110-15-7**	51000					
Fluopicolide degradate- BAM	**2014**	**239110-15-7**	123000	10000	92050	320000	> 10000	
Fluridone		**59756-60-4**	2800	480	650			
Fluroxypyr		**69377-81-7**	7150		> 50000		> 100000	

Fluroxypyr MHE		**81406-37-3**	6600		> 54.5	60	290	> 2300
Flurprimidol		**56425-91-3**	8600	944	5900	2960	840	10400
Flutolanil		**66332-96-5**	1250	233	> 3400	530	8010	8010
Flutriafol	**2013**	**76674-21-0**	16500	4800	33550	310	460	780
Folpet	**2014**	**133-07-3**	7.5	8.8	10			
Fomesafen Sodium		**108731-70-0**	63000	9400	188000	50000	92	210
Foramsulfuron	**2014**	**173159-57-4**	> 50000	10500	> 51250	100000	3300	0.65
Formetanate HCl		**23422-53-9**	1350	480	45	0.5		
Fosamine Ammonium		**25954-13-6**	188500		762000		> 15000	> 21000
Fosthiazate	**2014**	**98886-44-3**	55500	2320	130	61	> 4510	
Gamma-cyhalothrin		**76703-62-3**	0.0145		0.00024		> 2850	
Glufosinate	**2014**	**77182-82-8**	> 156000	50000	325500	31000	72	1470
Glufosinate ammonium		**77182-82-2**	> 160000		334000	32000	7800	1470
Glufosinate degradate 2-acetamido-4-methylphosphinico-butanoic acid (NAG)	**2014**	**77182-82-8**	> 50450				> 357000	
Glufosinate degradate 2-methylphosphinico-acetic acid (MPA)	**2014**	**77182-82-8**	> 49450		18500		53000	> 97200
Glufosinate degradate 3-methylphosphinicopropionic acid (MPP)	**2014**	**77182-82-8**	> 50000	26000	21000	< 6430	> 1000000	> 103000
Glufosinate degradate Methylphosphinico-formic acid (MPF)	**2014**	**77182-82-8**	> 51000		> 49100		> 94800	
Glyphosate		**1071-83-6**	21500	1800	26600	49900	12100	11900
Glyphosate degradate aminomethyl phosphoric acid (AMPA)		**1066-51-9**	249500		341500			
Glyphosate isopropylamine salt		**38641-94-0**	34700					
Hexaflumuron		**86479-06-3**	> 127.8		0.0555			
Hexazinone		**51235-04-2**	137000	17000	75800	20000	7	37.4
Hexythiazox	**2014**	**78587-05-0**	> 60			6.1	> 120	> 120
Hydramethylnon		**67485-29-4**	45		570			
Hymexazol		**10004-44-1**	> 50000		15400		40900	8800
Imazamox		**114311-32-9**	> 59500		> 61000		> 40	11
Imazapic acid	**2013**	**104098-48-8**	> 50000	96000	> 50000	96000	> 44.1	6.1
Imazapic ammonium	**2013**							
Imazapyr		**81334-34-1**	> 50000	43100	> 50000	97100	12200	24
Imazethapyr (ammonium salt)	**2013**	**81335-77-5**	120000		500000		59200	
Imazethapyr CL266858	**2013**							
Imazethapyr CL271197	**2013**							
Imazethapyr CL290084	**2013**							
Imazosulfuron	**2013**	**122548-33-8**	> 34500	2900	> 45500	840	206	1.46
Imazosulfuron degradate (IPSN)	**2013**					11000		> 113000
Imidacloprid		**138261-41-3**	> 41500	1200	34.5	1.05	> 10000	
Indoxacarb	**2014**	**173584-44-6**	145	150	300	75	> 110	> 84
Indoxacarb degradate (IN-JT333)	**2013**		12	5.5	> 14.5	3.6		
Indoxacarb degradate- (IN-JT333) (methyl-7-chloro-2,5-dihydro -2-[[[4(trifluoromethoxy)phenyl]amino]carbonyl]indeno[1,2e][1,3,4]oxadiazine -4a(3H)-carboxylate)	**2014**		12	5.5	> 14.5	3.6		

indoxacarb degradate (IN-MP819)	**2013**		> 184	84.9	32	8		
Indoxacarb degradate- (IN-MP819) (Indenol[1 ,2-e][1 ,3,4]oxadlazine-1 (2H)-carboxylic acid, 7-chloro-3,5-dlhydno-2-[[[4-(triftuoromethoxy)phenyl]amino]carbonyl]-, methyl ester)	**2014**		> 184	84.9	32	8		
Indoxacarb degradate (KN127)	**2013**		197					
Iodomethane		**74-88-4**	665		285			
Iodosulfuron-methyl-sodium	**2014**	**144550-36-7**	> 44050	10200	> 43450	9100	41	0.7
Iodosulfuron-methyl-sodium Degradate (Metsulfuron)	**2014**	**74223-64-6**	> 75000	4500	> 75000	100000	31	0.36
Ipconazole		**125225-28-7**	765	0.18	850			
Iprodione	**2014**	**36734-19-7**		260	120		> 130	> 12640
Isoxaben		**82558-50-7**	> 550	400	> 650	690	> 1400	
Isoxaflutole		**141112-29-0**	> 850		> 750		110	4.9
Isoxaflutole - rpa202248 (degradate)		**.**	> 15300		> 29800		5000	75
Kresoxim methyl		**143390-89-0**	95	87	166	55	29.2	> 305
Kresoxim-methyl	**2014**	**143390-89-0**	95	87	166	55	29.2	> 301
Kresoxim-methyl degradate (BF490-1)	**2014**		> 52000		> 50000			
Lactofen		**77501-63-4**	230	1.4	2425		0.99	0.6
Lambda-cyhalothrin		**91465-08-6**	0.105	0.031	0.0035	0.002	> 310	
Limonene		**138-86-3**	40000		19500			
Lindane (gamma HCH)		**58-89-9**	0.85	2.9	0.5	54		
Linuron		**330-55-2**	1500	5.58	60	0.09	13.7	2.5
Magnesium phosphide								
Malathion	**2013**	**121-75-5**	16.5	8.6	0.295	0.035	2400	> 9630
Mancozeb		**8018-01-7**	230		290		47	
Mandipropamid		**374726-62-2**		220	3550		> 2500	> 7900
Maneb		**12427-38-2**	21		60		13.4	
MCPA acid		**94-74-6**					300	170
MCPA DMAS		**2039-46-5**	48000	12000	41000	11000	160	130
MCPA EHE		**29450-45-1**	380		90		170	20
MCPA sodium salt		**3653-48-3**	> 34000		> 92000			
MCPB sodium salt		**6062-26-6**	1950		25000		380	210
Mecoprop (MCPP)-P acid		**16484-77-8**			> 45500	50800		
Mecoprop (MCPP)-P DMAS		**66423-09-4**	> 46500				14	1300
Mefenoxam		**70630-17-0**	> 60500		20950	100		77000
Mesosulfuron-methyl	**2014**	**208465-21-8**	> 45750	29600	> 45100	1700	2400	0.64
Mesosulfuron-methyl degradate (F092944) (2-Amino-4,6-dimethoxypyrimidine)	**2014**		48500		> 50000	24000	120000	> 100000
Mesosulfuron-methyl degradate (F147447) (6-Methanesulfonamidomethyl- 1,2-benzisothiazol-3(2H)-one 1,l dioxide)	**2014**						> 92000	> 90900
Mesosulfuron-methyl degradate (F160459) (Methyl 2-[3-(4-hydroxy-6-methoxypyrimidine-2- yl)ureidosulfonyl]-4-methanesulfonamido-methyl benzoate)	**2014**						98000	1500
Mesosulfuron-methyl degradate (F160460) (2-[3-(4-hydroxy-6-methoxypyrimidin-2-yl) ureidosulfonyl]-4-methanesulfonamidomethyl-benzoic acid)	**2014**							> 94710
Mesotrione		**104206-82-8**	> 60000	11000	420000	180000	1900	9.8

Metalaxyl		**57837-19-1**	65000	9100	14000	100	140000	92000
Metaldehyde		**108-62-3**	34500		> 38830			
Metam sodium (degradate methyl isothiocyanate (MITC))		**137-42-8**	25.6		27.5	25	254	590
Metam sodium and Metam potassium degradate- Methyl isothiocyanate (MITC)	**2014**	**137-42-8**	26.5		27.5	25	200	590
Methamidophos		**10265-92-6**	12500	48.9	13	4.5	> 50000	
Methanearsonic Acid, disodium salt DSMA		**144-21-8**	> 56000		76500		1500	72700
Methanearsonic Acid, sodium salt MSMA		**2163-80-6**	6650		38750		2800	53000
Methidathion		**950-37-8**	1.1	6.3	1.5	0.66		
Methiocarb		**2032-65-7**	218	50	3.5	0.1		
Methomyl		**16752-77-5**	160	12	2.5	0.7		
Methoprene		**40596-69-8**	380	48	165	51		
Methoxychlor		**72-43-5**	7.5		0.7			
Methoxyfenoxide	**2014**	**161050-58-4**	> 2100	530	25	6.3	> 3400	
Methyl Bromide	**2014**	**74-83-9**	1950		1300		2200	
Methyl bromide degradate- bromide ion	**2014**		8000000	7800	2900000	7800	2500000	
Methyl paraoxon		**950-35-6**			1.15	1		
Methyl parathion		**298-00-0**	925	< 10	0.485	0.25	15000	18000
Metofluthrin	**2014**	**240494-70-6**	0.6		2.35			
Metribuzin		**21087-64-9**	21000	3000	2100	1290	8.7	130
Metsulfuron		**74223-64-6**	> 75000	4500	> 75000		31	0.36
Mevinphos	**2013**	**7786-34-7**						
Molinate		**2212-67-1**	105	390	170	340	220	3300
MSMA	**2014**	**2163-80-6**	> 42500		38500		5630	104000
Myclobutanil		**88671-89-0**	1200	980	5500		830	
Nabam	**2013**	**142-59-6**						
Naled		**300-76-5**	46	2.9	0.07	0.045	25	> 1800
Napropamide		**15299-99-7**	3200	1100	7150	1100	3400	
Niclosamide	**2014**	**50-65-7**	15		17	56	41	
Nicosulfuron	**2013**	**111991-09-4**	> 500000		> 500000	43000		
Norflurazon		**27314-13-2**	4050	770	> 7500	1000	9.7	58.2
Novaluron	**2013**	**116714-46-6**	> 490	6.16	0.075	0.03	3549	> 75.4
Orthosulfamuron		**213464-77-8**	> 61000	6100	> 48650	6500	80	0.7
Oryzalin		**19044-88-3**	1440	220	750	358	42	> 15.4
Oxadiazon		**19666-30-9**	440	0.88	1090	30	5.2	41
Oxamyl		**23135-22-0**	2100	770	90	27	120	30000
Oxydemeon-Methyl	**2014**	**301-12-2**	365	5	95	46	> 100000	
Oxydemeton methyl		**301-12-2**	365	5	95	46	> 100000	
Oxyfluorfen		**42874-03-3**	101.5	1.3	40	13	0.29	0.35
Oxypyrimidine (diazinon degradate)		**4562-27-0**	> 50500		> 51000		> 109000	

Oxytetracycline (hydrochloride salt)		**2058-46-0**	> 47450		> 51000			
Paclobutrazol	**2014**	**76738-62-0**	7950	49	120	9	40800	8
Paraquat dichloride		**1910-42-5**	6000	< 369	600	< 36.9	0.396	71
Pebulate		**1114-71-2**	3150		3315		230	1800
Pendimethalin		**40487-42-1**	69	6.3	140	14.5	5.2	12.5
Penoxsulam	**2013**	**219714-96-2**	> 51000	10200	> 49150	2950	92	3
Pentachloroaniline (PCA)		**527-20-8**	28		150			
Pentachlorobenzene (PCB)		**608-93-5**	70		80			
Pentachloronitrobenzene (PCNB)		**82-68-8**	50	13	385	18		
Pentachlorophenol (PCP)		**87-86-5**	47.5		25			
Penthiopyrad	**2013**	**183675-82-3**	145	100	1265.5	471	1200	> 1205
Permethrin		**52645-53-1**	0.395	0.0515	0.0106	0.0014	68	
Phorate		**298-02-2**	1.175	0.34	0.3	0.21	> 1300	
Phosmet	**2014**	**732-11-6**	35	3.2	1	0.8		
Phosphine								
Phthalimide (PI)	**2014**	**133-07-3**	19000		19500			
Picloram Acid		**1918-02-1**	2750		17200		36900	
Picloram Potassium Salt		**2545-60-0**	6500	550	34150	11800		
Picloram TIPA Salt		**6753-47-5**	187500					
Picoxystrobin	**2014**	**117428-22-5**	32.5	36	12	1	4	210
Pinoxaden		**243973-20-8**	10000				1200	4300
Pinoxaden (NOA 447204)		**.**	> 60000		> 60000		95600	> 93500
Pinoxaden (NOA 497854)		**.**	> 51500	> 960	> 50500	5800	> 100000	10000
Piperalin		**3478-94-2**	385		945			
Piperonyl Butoxide		**51-03-6**	950	40	255	30		
Pirimicarb		**23103-98-2**	14500		9.5			
Pirimiphos Methyl		**29232-93-7**	202	180	55		1200	
Polybutene		**9003-29-6**						
Prallethrin		**23031-36-9**	6	3	3.1	0.65		
Prodiamine	**2013**	**29091-21-2**	> 6.5		> 6.5	1.5		
Profenofos		**41198-08-7**	7.05	2	0.465	0.2		
Prohexadione Calcium	**2014**	**127277-53-6**	> 47300		> 50000	12500	> 1100	> 1200
Prometon	**2014**	**1610-18-0**	6000	19700	12850	3450	98	
Prometryn	**2014**	**7287-19-6**	1455	620	4850	1000	1.04	11.9
Propachlor		**1918-16-7**	85		395		13.5	
Propanil		**709-98-8**	1150	9.1	600	86	16	110
Propargite		**2312-35-8**	59	16	37	9	66.2	75000
Propazine	**2014**	**139-40-2**	> 2190	560	> 2660	47	24.8	100
Propetamphos		**31218-83-4**	94		1.65			
Propiconazole		**60207-**	425	95	650	260	21	4828

		90-1						
Propionic Acid		79-09-4	25500		11350			
Propoxur		114-26-1	1850		5.5			
Propylene Oxide	2014	75-56-9	42000		68500		> 860	> 870
Propyzamide		23950-58-5	36000	7700	> 2800	600	> 4000	1180
Pymetrozine	2014	123312-89-0	> 64000	11700	43500	25	17000	> 109000
Pyraclostrobin		175013-18-0	3.1	2.35	7.85	4	1.5	1720
Pyraflufen-ethyl	2013	129630-19-9	> 42.5	3.4	> 41	81	1.5	16
Pyrasulfotole	2013	365400-11-9	> 48000	580	> 47900	12800	8300	28
Pyrethrin		8003-34-7	2.55	1.9	5.8	0.86		
Pyridaben		96489-71-3	0.36	0.087	0.265	0.044	> 665	> 16.2
Pyridalyl		179101-81-6	250	49	2.1	4.4		
Pyrifluquinazon	2014	337458-27-2	1950		1.4	< 1.4	3300	
Pyrifluquinazon degradate IV-01 (1,2,3,4-tetrahydro-3-[(3-pyridylmethyl)amino]-6-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]quinazolin-2-one)	2014				0.7			
Pyrifluquinazon degradate IV-02 (1,2,3,4-tetrahydro-3-[(3-pyridylmethyl)amino]-6-[1,2,2,2-tetrafluoro-1-(trifluoromethylene)ethyl]quinazolin-2-one)	2014				0.55			
Pyrifluquinazon degradate IV-203 (1,2,3,4-tetrahydro-6-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]quinazolin-2,4-dione)	2014				> 395			
Pyrifluquinazon degradate IV-28 (4-hydroxy-3-[(pyridine-3-ylmethylene)amino]-6-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]-3-4-dihydro-1H-quinazolin-2-one)	2014				1.15			
Pyrimethanil		53112-28-0	5050	20	1500	1000	1800	7800
Pyrimidinone	2014	67485-29-4	45		570			
Pyriproxyfen		95737-68-1	> 162.5	4.3	200	0.015	56	> 180
Pyroxsulam		422556-08-9	> 43500	10100	> 49500	10400	111	2.57
Quinclorac		84087-01-4	15800	16000	14900	110000	> 500	> 500
Quizalofop ethyl		76578-14-8	230	11	1060		> 1770	> 82.8
Resmethrin		10453-86-8	0.14	0.32	1.55			
Rimsulfuron		122931-48-0	> 195000		> 180000		> 29	11.6
Rotenone		83-79-4	0.97	1.01	1.85	1.25		
Saflufenacil	2013	372137-35-4	> 54000	997	> 49000	1330	42	87
Sethoxydim		74051-80-2	85000		39050			> 281
Siduron		1982-49-6	4050	15	> 6850	6	212	212
Simazine	2014	122-34-9	3200		500		2.24	140
S-Metolachlor		87392-12-9	1600	30	550	1	8	21
S-Metolachlor degradate ESA		.	24000		> 54000		> 99450	> 95100
S-Metolachlor degradate OA		.	> 46550		7700		57100	> 95100
Sodium Arsenite	2014	7784-46-5			2445	370		
Sodium chlorate		7775-09-9	> 500000		460000	500000	133000	43000
Sodium cyanide		143-33-9	94					
Sodium fluoroacetate		62-74-8	27000		175000			
Sodium Metabisulfite	2014	7681-57-4						

Sodium Tetrathiocarbonate		**7345-69-9**	3350		3300		17000	
Sodium tetrathiocarbonate degradate carbon disulfide		**75-15-0**	435		430		520	
Spinosad		**168316-95-8**	2970	498	7000	0.6	90	10600
Spirodiclofen	**2013**	**148477-71-8**	> 17.55	1.95	> 22.75	11.1	> 60	
Spiromesifen	**2013**	**283594-90-1**	8.4	0.49	> 46.15	0.25	> 94	> 101.3
Spiromesifen-enol	**2013**		> 51000	9200	> 50500			
Spirotetramat		**203313-25-1**	705	534	330	100	4050	4490
Spirotetramat enol degradate		**.**	> 50000		37450		> 100000	5400
Spirotetramat keto hydroxy degradate		**.**			> 50000			
Sulfentrazone		**122836-35-5**	46900	2950	30200	200	1.8	28.8
Sulfometuron Methyl	**2014**	**74222-97-2**	> 74000		> 75000	97000	4.3	0.45
Sulfosulfuron		**141776-32-1**	> 47500	100000	> 48000	102000	400	1
Sulfoxaflor	**2014**	**946578-00-3**	> 181500	660	> 200000	50500	81200	> 99000
Sulfoxaflor degradate- N-(methyl(oxido){1-[6-(trifluoromethyl) pyridin-3-yl]ethyl}-λ4-sulfanylidene) urea	**2014**		> 239000		> 102500			
Sulfur dioxide								
Sumithrin		**26002-80-2**	7.9	1.1	2.2	0.47		
Tau-Fluvalinate		**102851-06-9**	0.175		0.47	0.1		
Tebuconazole		**107534-96-3**	1135	12	1440	120	1450	151.5
Tebufenozide		**112410-23-8**	1500	< 48	1900	4.3	> 740	
Tebupirimphos		**96182-53-5**	44.5	130	0.039	0.011	630	8800
Tebuthiuron		**34014-18-1**	53000	9300	148500	21800	50	135
Tefluthrin	**2013**	**79538-32-2**	0.03	0.004	0.035	0.008		
Telone		**542-75-6**	540		45	70	7900	20000
Tembotrione	**2013**	**335104-84-2**	> 50000	604	24450	5100	310	5.2
Temephos		**3383-96-8**	1745		5			
Terbacil		**5902-51-2**	23100	1200	32500	640	11	140
Terbufos		**13071-79-9**	0.385	0.64	0.1	0.03		
Terbuthylazine		**5915-41-3**	1700		25450			
Tetrachlorvinphos		**961-11-5**	265		0.95		510	
Tetraconazole	**2013**	**112281-77-3**	1925	300	1315	190		310
Tetramethrin		**7696-12-0**	1.85		22.5			
TFM (3-Trifluoromethyl-4-nitrophenol)	**2013**	**88-30-2**	300		1900		1200	
Thiacloprid	**2013**	**111988-49-9**	12600	918	18.9	0.97	45000	> 95400
Thiacloprid amide	**2013**		> 39300		15600	100		
Thiacloprid sulfonic acid	**2013**		> 47550		> 48050		> 100000	
Thiamethoxam		**153719-23-4**	> 50000	20000	17.5		> 97000	> 90000
Thiencarbazone-methyl		**317815-83-1**	> 52000	4800	> 47000	3540	298	0.8
Thiobencarb		**28249-77-6**	280		50	1	17	770
Thiodicarb		**59669-26-0**	605	25	2.65	9	> 8300	
Thiophanate methyl		**23564-05-8**	4150	2	2700	3	930	> 4700

Thiram		**137-26-8**	21	530	105	170.6	140	1600
Tolclofos-methyl	**2014**	**57018-04-9**	345	< 12	350	26	780	
Tolclofos-methyl degradate- O-methyl O-(2,6-dichloro-4-methylphenyl)hydrogen phosphorothioate(DM-TM)	**2014**		> 55000		> 47500		> 97000	
Topramezone	**2014**	**210631-68-8**	> 14190	2930	14850	48600	19000	6.7
Topramezone primary degradate (M670H05)	**2014**		52650		> 50000			360
Tralkoxydim		**87820-88-0**	> 3750		> 87000	2100	7700	2600
Tralomethrin		**66841-25-6**	0.8	0.088	0.0195	0.0044		
Triadimefon	**2013**	**43121-43-3**	2050	41	800	52	17000	
Triallate		**2303-17-5**	600	38	45.5	13	120	2400
Triasulfuron		**82097-50-5**	> 50000	68600	> 50000	105000		
Triazine DACT degradate		**.**	> 50000		> 50000			
Triazine DEA degradate		**.**					1000	
Triazine DIA degradate		**.**	8500		63000		2500	
Triazine HA degradate		**2163-68-0**	> 1500		> 2050		> 10000	
Tribenuron methyl	**2013**	**101200-48-0**	> 50000	11800	360000	< 28000	22	2
Tribufos		**78-48-8**	122.5	3.5	3.4	1.56	148	1100
Trichlorfon		**52-68-6**	79	110	2.65	0.0057		
Triclopyr acid		**55335-06-3**	58500		66450		29800	
Triclopyr butoxyethyl ester (BEE)		**64700-56-7**	130	19	125		70	860
Triclopyr degradate (TCP)		**55335-06-3**	950		6700		2300	
Triclopyr triethylamine (TEA)		**57213-69-1**	39600	> 32200	173000	25000	4100	6100
Trifloxystrobin	**2014**	**141517-21-7**	7.15	4.3	12.65	2.76	37.1	> 1930
Trifloxystrobin degradate CGA-321113	**2014**	**141517-21-7**	> 53000		> 47650	3200	77100	
Trifloxysulfuron-Sodium (CGA-362622)	**2014**	**290332-10-4**	> 51500	9520	> 54000	549	6.5	0.24
Trifloxysulfuron-Sodium degradate- CGA 382997	**2014**		> 48350		> 49750		> 95850	
Trifloxysulfuron-Sodium degradate- CGA-368732	**2014**		> 52000		> 59500		23000	
Triflumizole		**68694-11-1**	290	33	700	67	140	720
Trifluralin		**1582-09-8**	20.5	1.14	280	2.4	7.52	43.5
Trinexapac-ethyl	**2014**	**95266-40-3**	17500	410	> 72750	2400	350	190
Triphenyltin Hydroxide (TPTH)	**2014**	**76-87-9**	3.55	0.065	5	< 0.2	14	8.3
Urea sulfate		**21351-39-3**	40000				11500	
Vinclozolin		**50471-44-8**	1420	60	2000	790	< 1060	> 900
Zeta-cypermetherin		**52315-07-8**	0.195	0.14	0.0018	0.00059		
Zinc Phosphide		**1314-84-7**						
Ziram		**137-30-4**	4.85	101	24	39	67	370
Zoxamide		**156052-68-5**	78	3.48	> 390	39	10	19

Footnotes

- [1] Benchmark = Toxicity value x LOC. For acute fish, toxicity value is generally the lowest 96-hour LC50 in a standardized test (usually with rainbow trout, fathead minnow, or bluegill), and the LOC is 0.5.
- [2] Benchmark = Toxicity value x LOC. For chronic fish, toxicity value is usually the lowest NOEAC from a life-cycle or early life stage test (usually with rainbow trout or fathead minnow), and the LOC is 1.

- [3] Benchmark = Toxicity value x LOC. For acute invertebrate, toxicity value is usually the lowest 48- or 96-hour EC_{50} or LC_{50} in a standardized test (usually with midge, scud, or daphnids), and the LOC is 0.5.
- [4] Benchmark = Toxicity value x LOC. For chronic invertebrates, toxicity value is usually the lowest NOAEC from a life-cycle test with invertebrates (usually with midge, scud, or daphnids), and the LOC is 1.
- [5] Benchmark = Toxicity value x LOC. For acute nonvascular plants, toxicity value is usually a short-term (less than 10 days) EC_{50} (usually with green algae or diatoms), and the LOC is 1.
- [6] Benchmark = Toxicity value x LOC. For acute vascular plants, toxicity value is usually a short-term (less than 10 days) EC50 (usually with duckweed) and the LOC is 1.
- [7] An acute-to-chronic ratio was used to calculate the chronic endpoint and benchmark, which may underestimate chronic toxicity.
- [8] Although the underlying acute toxicity value is greater than or equal to the chronic toxicity value, the acute benchmark is lower than the chronic benchmark because acute and chronic toxicity values were multiplied by LOC values of 0.5 and 1, respectively.
- [9] Original toxicity values are in micrograms of acid equivalents per liter. For 2,4-D and 2,4-DB, the toxicity values selected were the lowest available values for the acid or salt forms. For MCPA, acute toxicity values were the lowest for the acid, salt or ester forms, and chronic toxicity values were the lowest of the acid and salt forms. For Dicamba the toxicity values were the lowest of the acid or salt forms. (Selection was consistent with risk quotients in the cited USEPA references.)
- [10] The acute toxicity values were the lowest of the acid, salt or ester forms, and the chronic toxicity values were the lowest of the acid and salt forms of triclopyr. (Selection was consistent with risk quotients in the cited USEPA reference.)
- [11] Toxicity values and benchmarks apply to permethrin. If monitoring data represent only the *cis* isomer of permethrin in water, comparison with benchmarks may underestimate potential toxicity.

Generic footnotes

- Empty cells indicate that acceptable aquatic toxicity values are not available.
- Benchmarks preceded by a "greater-than" symbol (for example, >265,000) were derived from a "greater-than" value and may overestimate toxicity. Conversely, benchmarks preceded by a "less-than" symbol (for example, <1,500) were derived from a "less-than" value and may underestimate toxicity.

Definitions

- CCC = Criterion continuous concentration
- CMC = Criterion maximum concentration
- EC_{50} = 50 percent effect concentration
- LC_{50} = 50 percent lethal concentration
- LOC = level of concern
- NOAEC = no-observed-adverse-effects concentration
- µg/L = microgram per liter
- — = no benchmark available

References

[a]Stephan, C.E, D.I. Mount, D.J. Hanson, J.H. Gentile, G.A. Chapman, and W.A. Brungs. 1985. Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses. EPA PB85-227049.

[b]U.S. EPA. 2004. Overview of the Ecological Risk Assessment Process in the Office of Pesticide Programs. Office of Prevention, Pesticides, and Toxic Substances. Office of Pesticide Programs. Washington, D.C. January 23, 2004.
