

**Table G-1. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Arsenic in the St. Louis River Area of Concern**

Arsenic (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
<1.27	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64	IT Corp. 1996
<1.27	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64	IT Corp. 1996
<1.27	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64	IT Corp. 1996
<1.27	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64	IT Corp. 1996
<1.52	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4	IT Corp. 1996
<1.52	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4	IT Corp. 1996
<1.52	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4	IT Corp. 1996
<1.52	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4	IT Corp. 1996
<1.62	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08	IT Corp. 1996
<1.62	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08	IT Corp. 1996
<1.62	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08	IT Corp. 1996
<1.62	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08	IT Corp. 1996
<2.04	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76	IT Corp. 1996
<2.04	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76	IT Corp. 1996
<2.04	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76	IT Corp. 1996
<2.04	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76	IT Corp. 1996
<2.15	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12	IT Corp. 1996
<2.15	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12	IT Corp. 1996
<2.15	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12	IT Corp. 1996
<2.15	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12	IT Corp. 1996
<2.20	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93	IT Corp. 1996
<2.20	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93	IT Corp. 1996
<2.20	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93	IT Corp. 1996
<2.20	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93	IT Corp. 1996
<2.54	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1	IT Corp. 1996
<2.54	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1	IT Corp. 1996
<2.54	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1	IT Corp. 1996
<2.54	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1	IT Corp. 1996
<2.84	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15	IT Corp. 1996
<2.84	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15	IT Corp. 1996

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Arsenic (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
<2.84	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15	IT Corp. 1996
<2.84	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15	IT Corp. 1996
<3.45	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54	IT Corp. 1996
<3.45	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54	IT Corp. 1996
<3.45	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54	IT Corp. 1996
<3.45	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54	IT Corp. 1996
3.70	D-S Harbor - NW of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4	Wenck Associates Inc. 1995
3.70	D-S Harbor - NW of Lakehead Dock	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	Adult	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
3.70	D-S Harbor - NW of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
3.70	D-S Harbor - NW of Lakehead Dock	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
<4.00	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	100	IT Corp. 1996
<4.00	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	100	IT Corp. 1996
<4.00	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	100	IT Corp. 1996
<4.00	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	100	IT Corp. 1996
4.40	D-S Harbor - Hallett Coal Dock #6	48 hour	Cladoceran	<i>Daphnia magna</i>	Unknown	95 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
4.40	D-S Harbor - NE of Sanitary District Plant	48 hour	Cladoceran	<i>Daphnia magna</i>	Unknown	100 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
4.40	D-S Harbor - NE of Sanitary District Plant	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	100 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
4.40	D-S Harbor - Hallett Coal Dock #6	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	86.6 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
4.60	Superior Bay	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	Adult	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
4.60	Superior Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
4.60	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
4.60	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7	Wenck Associates Inc. 1995
4.80	D-S Harbor - North of MN Power & Light Dock	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	100 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
4.80	D-S Harbor - North of MN Power & Light Dock	48 hour	Cladoceran	<i>Daphnia magna</i>	Unknown	100 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
5.40	D-S Harbor - Allouez Bay	48 hour	Cladoceran	<i>Daphnia magna</i>	Unknown	100 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
5.40	D-S Harbor - Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	100 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
8.21	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
8.21	D-S Harbor - Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
8.70	Brule River - above Stones Bridge	48 hour	Cladoceran	<i>Daphnia magna</i>	Unknown	95 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
8.70	Brule River - above Stones Bridge	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	100 % survival	Not toxic	NR	Smith <i>et al.</i> 1992

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Arsenic (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
14.2	D-S Harbor - Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
14.2	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	78 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
17.7	D-S Harbor - Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
17.7	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
19.0	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58	MPCA 1993
19.3	D-S Harbor - Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
19.3	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	NR	Crane <i>et al.</i> 1997
20.2	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88	MPCA 1993
20.5	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
<21.1	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR	IT Corp. 1996
<21.1	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR	IT Corp. 1996
<21.1	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR	IT Corp. 1996
<21.1	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR	IT Corp. 1996
21.6	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12	MPCA 1993
23.1	D-S Harbor - Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
23.1	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
24.3	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
25.0	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95	IT Corp. 1996
25.0	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95	IT Corp. 1996
25.0	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95	IT Corp. 1996
25.0	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95	IT Corp. 1996
27.5	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	55 % survival	Toxic	NR	Crane <i>et al.</i> 1997
27.5	D-S Harbor - Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
28.1	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42	IT Corp. 1996
28.1	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42	IT Corp. 1996
28.1	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42	IT Corp. 1996
28.1	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42	IT Corp. 1996
30.9	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16	IT Corp. 1996
30.9	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16	IT Corp. 1996
30.9	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16	IT Corp. 1996

**Table G-1. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Arsenic in the St. Louis River Area of Concern**

Arsenic (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
30.9	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16	IT Corp. 1996
39.7	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37	IT Corp. 1996
39.7	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37	IT Corp. 1996
39.7	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37	IT Corp. 1996
39.7	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37	IT Corp. 1996

D-S = Duluth-Superior; LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.020	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08
0.020	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08
0.020	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08
0.020	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08
0.110*	St. Louis Bay-East of Erie Pier	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.28
0.110*	St. Louis Bay-East of Erie Pier	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Toxic	0.28
0.124*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16
0.124*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 red. biolum.^	Toxic	0.16
0.124*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16
0.141*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35
0.141*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35
0.141*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 red. biolum.^	Toxic	0.35
0.150*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	0.89
0.150*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	0.89
0.177*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69
0.177*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 red. biolum.^	Not toxic	1.69
0.177*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69
0.200*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4
0.200*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 red. biolum.^	Not toxic	0.12
0.200*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4
0.200*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4
0.200*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12
0.200*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12
0.200*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 red. biolum.^	Toxic	0.4
0.200*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4
0.200*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08
0.200*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08
0.200*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08
0.200	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64
0.200	St. Louis River-Keene Creek	10 day	Amphipod	<i>Chironomus tentans</i>	JUV	92 % survival	Not toxic	4.64
0.200	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64
0.200	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64
0.200*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24
0.200*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24
0.200*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24
0.200*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2
0.200*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4

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Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.200*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
0.200*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 red. biolum.^	Toxic	0.14
0.200*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14
0.200*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2
0.200*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14
0.200*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	25.2 red. biolum.^	Toxic	0.2
0.200*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	0.59
0.200*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2
0.200*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14
0.200*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 red. biolum.^	Toxic	0.08
0.200*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	0.14
0.200*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	45.3 red. biolum.^	Toxic	0.14
0.200*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.08 EC50 biolum.#	Not toxic	0.14
0.200*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	64 % survival	Not toxic	0.14
0.200*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59
0.201*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.8 red. biolum.^	Not toxic	0.86
0.201*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.18 EC50 biolum.#	Not toxic	0.86
0.201*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	0.86
0.201*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	0.86
0.204*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 red. biolum.^	Not toxic	1.37
0.204*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37
0.204*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37
0.204*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37
0.204*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37
0.217*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	0.81
0.217*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	0.81
0.217*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.9 red. biolum.^	Toxic	0.81
0.217*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.06 EC50 biolum.#	Not toxic	0.81
0.243*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65
0.243*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65
0.243*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65
0.243*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.65
0.243*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65
0.249*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98
0.249*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98
0.249*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 red. biolum.^	Not toxic	2.98
0.260*	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47

**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.260*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 red. biolum.^	Toxic	4.47
0.260*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47
0.260*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47
0.263*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44
0.263*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 red. biolum.^	Not toxic	1.44
0.263*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44
0.287*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 red. biolum.^	Not toxic	4.02
0.287*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02
0.287*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02
0.287*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02
0.287*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02
0.288*	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67.5 % survival	Not toxic	0.56
0.288*	St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 red. biolum.^	Not toxic	0.56
0.288*	St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.12 EC50 biolum.#	Not toxic	0.56
0.288*	St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	0.56
0.308*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 red. biolum.^	Toxic	1.02
0.308*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02
0.308*	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02
0.308*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02
0.310	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7
0.310	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7
0.310	Superior Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	6.7
0.310	Superior Bay	48-h	Cladoceran	<i>Ceriodaphnia dubia</i>	Adult	100 % survival	Not toxic	6.7
0.324*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	0.61
0.324*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.36 EC50 biolum.#	Not toxic	0.61
0.324*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 red. biolum.^	Not toxic	0.61
0.324*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	0.61
0.326*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	78 % survival	Not toxic	1.85
0.326*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.75 EC50 biolum.#	Not toxic	1.85
0.326*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.9 red. biolum.^	Not toxic	1.85
0.326*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	1.85
0.335*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77
0.335*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77
0.335*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77
0.335*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 red. biolum.^	Not toxic	5.77
0.335*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 red. biolum.^	Toxic	1.71
0.335*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71

**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.335*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71
0.335*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71
0.335*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71
0.356*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 red. biolum.^	Not toxic	1.82
0.356*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82
0.356*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82
0.356*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82
0.388*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07
0.388*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07
0.388*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 red. biolum.^	Toxic	3.07
0.409*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 red. biolum.^	Not toxic	NR
0.409*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	12 % survival	Toxic	NR
0.409*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	60 % survival	Not toxic	NR
0.409*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.4 EC50 biolum.#	Not toxic	NR
0.424*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7
0.424*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7
0.424*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
0.424*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7
0.424*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 red. biolum.^	Not toxic	2.7
0.424*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7
0.424*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
0.424*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7
0.424*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 red. biolum.^	Not toxic	2.7
0.424*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7
0.440	Duluth-Superior Harbor-Hallett Coal Dock #6	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	86.6 % survival	Not toxic	NR
0.440	Duluth-Superior Harbor-Hallett Coal Dock #6	48-h	Cladoceran	<i>Daphnia magna</i>	Unknown	95 % survival	Not toxic	NR
0.450	Duluth-Superior Harbor-Northwest side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4
0.450	Duluth-Superior Harbor-Northwest side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4
0.450	Duluth-Superior Harbor-Northwest side of Lakehead Dock	48-h	Cladoceran	<i>Ceriodaphnia dubia</i>	Adult	100 % survival	Not toxic	8.4
0.450	Duluth-Superior Harbor-Northwest side of Lakehead Dock	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4
0.450*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.4
0.450*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.4
0.450*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.46 EC50 biolum.#	Not toxic	2.4
0.450*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	35.18 red. biolum.^	Toxic	2.4
0.469*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 red. biolum.^	Toxic	1
0.469*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1
0.469*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1



**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.469*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1
0.469*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1
0.502*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59
0.502*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59
0.502*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59
0.502*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 red. biolum.^	Not toxic	2.59
0.511*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.68
0.511*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.83 EC50 biolum.#	Not toxic	0.68
0.511*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.31 red. biolum.^	Toxic	0.68
0.514*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	1.75
0.514*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.87 red. biolum.^	Toxic	1.75
0.514*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.75
0.514*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	1.75
0.530*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.8
0.530*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	1.8
0.532*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82
0.532*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 red. biolum.^	Toxic	0.82
0.532*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82
0.532*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82
0.555*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	2.2
0.555*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.2
0.555*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.31 red. biolum.^	Not toxic	2.2
0.555*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.2
0.566*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 EC50 biolum.#	Not toxic	3.2
0.566*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	45.6 red. biolum.^	Toxic	3.2
0.566*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	50 % survival	Not toxic	3.2
0.570	Duluth-Superior Harbor-Allouez Bay	48-h	Cladoceran	<i>Daphnia magna</i>	Unknown	100 % survival	Not toxic	NR
0.570	Duluth-Superior Harbor-Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	100 % survival	Not toxic	NR
0.590	Duluth-Superior Harbor-North of Minnesota	48-h	Cladoceran	<i>Daphnia magna</i>	Unknown	100 % survival	Not toxic	NR
0.590	Duluth-Superior Harbor-North of Minnesota	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	100 % survival	Not toxic	NR
0.593*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.02
0.593*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	3.02
0.593*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.02
0.593*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.02
0.599*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.23 EC50 biolum.#	Toxic	2.82
0.599*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.17 red. biolum.^	Not toxic	2.82
0.599*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.82

**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.599*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67.5 % survival	Not toxic	2.82
0.608*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	27.4 red. biolum.^	Toxic	2.19
0.608*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.18 EC50 biolum.#	Not toxic	2.19
0.608*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.19
0.608*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	2.19
0.612*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82
0.612*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82
0.612*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 red. biolum.^	Not toxic	2.82
0.612*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82
0.630*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	1.55
0.630*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.7 red. biolum.^	Not toxic	1.55
0.630*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	1.55
0.637*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24
0.637*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24
0.637*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24
0.637*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24
0.637*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	2.24
0.656*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	1.1
0.656*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	1.1
0.656*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.1
0.656*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.1
0.662*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.69
0.662*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1 red. biolum.^	Not toxic	3.69
0.662*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.69
0.662*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.69
0.668*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 red. biolum.^	Not toxic	2.34
0.668*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34
0.668*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34
0.668*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34
0.668*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34
0.672*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	1.94
0.672*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	40.37 red. biolum.^	Toxic	1.94
0.672*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	1.94
0.672*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.94
0.673*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91
0.673*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91
0.673*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 red. biolum.^	Not toxic	2.91

**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.673*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91
0.677*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 red. biolum.^	Toxic	1.87
0.677*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87
0.677*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87
0.677*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87
0.677*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87
0.679*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.2 EC50 biolum.#	Toxic	8.4
0.679*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.4
0.679*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	3 % survival	Toxic	8.4
0.679*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	81.5 red. biolum.^	Toxic	8.4
0.679*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85
0.679*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.85
0.679*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85
0.679*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85
0.679*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85
0.681*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	3.2
0.681*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.2
0.681*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	3.2
0.681*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.2
0.688*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72
0.688*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72
0.688*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72
0.688*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72
0.688*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	6.72
0.695*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.9 red. biolum.^	Toxic	2.37
0.695*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.37
0.695*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	2.37
0.695*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.64 EC50 biolum.#	Not toxic	2.37
0.700*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	7.1
0.700*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	7.1
0.725*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 red. biolum.^	Not toxic	2.43
0.725*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43
0.725*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43
0.740*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36
0.740*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36
0.740*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 red. biolum.^	Not toxic	4.36
0.740*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36

**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.740*	St. Louis Bay-East of Erie Pier	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	2.9
0.740*	St. Louis Bay-East of Erie Pier	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.9
0.745*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	2.34
0.745*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.34
0.745*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.28 EC50 biolum.#	Toxic	2.34
0.745*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.82 red. biolum.^	Not toxic	2.34
0.750*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81
0.750*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 red. biolum.^	Not toxic	13.81
0.750*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81
0.750*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81
0.757*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
0.757*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4
0.757*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 red. biolum.^	Not toxic	3.4
0.757*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
0.757*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4
0.757*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 red. biolum.^	Not toxic	3.4
0.757*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4
0.757*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4
0.757*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4
0.757*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4
0.766*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25
0.766*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 red. biolum.^	Toxic	3.25
0.766*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25
0.790*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.6
0.790*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	2.6
0.802*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.735
0.802*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.735
0.802*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.735
0.802*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.735
0.802*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.735
0.820*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.3
0.820*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	2.3
0.850*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	2.5
0.850*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Toxic	2.5
0.889*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	2.67
0.889*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	31.2 red. biolum.^	Toxic	2.67
0.889*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	91 % survival	Not toxic	2.67

**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.889*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	2.67
0.890*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.9
0.890*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	2.9
0.900*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	3.32
0.900*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.1 red. biolum.^	Not toxic	3.32
0.900*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	55 % survival	Not toxic	3.32
0.900*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	3.32
0.905*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 red. biolum.^	Toxic	13.91
0.905*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91
0.905*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91
0.905*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91
0.905*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91
0.913*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84
0.913*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 red. biolum.^	Not toxic	4.84
0.913*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84
0.913*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84
0.920*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.14
0.920*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.14
0.920*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.4 red. biolum.^	Toxic	3.14
0.921*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97
0.921*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97
0.921*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97
0.921*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97
0.921*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 red. biolum.^	Toxic	8.97
0.924*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.35
0.924*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35
0.924*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35
0.924*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35
0.938*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63
0.938*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63
0.938*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 red. biolum.^	Toxic	2.63
0.938*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63
0.940*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42
0.940*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42
0.940*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 red. biolum.^	Toxic	1.42
0.940*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42
0.942*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.2 EC50 biolum.#	Toxic	3.07

**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.942*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.07
0.942*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	3.07
0.942*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.07
0.964*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	35 % survival	Not toxic	3.38
0.964*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.38
0.964*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	19.2 red. biolum.^	Not toxic	3.38
0.964*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.34 EC50 biolum.#	Toxic	3.38
0.970*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.41
0.970*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.8 red. biolum.^	Not toxic	4.41
0.970*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.41
0.970*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.3 EC50 biolum.#	Toxic	4.41
0.970*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	12
0.970*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	12
0.999*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97
0.999*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.97
0.999*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97
0.999*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97
0.999*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97
1.01	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4
1.01	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4
1.01	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4
1.01*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	3.9
1.01*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	3.9
1.01	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4
1.01*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34
1.01*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 red. biolum.^	Not toxic	5.34
1.01*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34
1.01*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34
1.01*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	2.93
1.01*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	13.8 red. biolum.^	Not toxic	2.93
1.01*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	2.93
1.02*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13
1.02*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13
1.02*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13
1.02*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 red. biolum.^	Toxic	4.13
1.03*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.24
1.03*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.12 EC50 biolum.#	Toxic	4.24

**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
1.03*	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	41 % survival	Toxic	4.24
1.03*	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	53.2 red. biolum.^	Toxic	4.24
1.04*	Duluth-Superior Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99
1.04*	Duluth-Superior Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.99
1.04*	Duluth-Superior Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99
1.04*	Duluth-Superior Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77
1.04*	Duluth-Superior Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77
1.04*	Duluth-Superior Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 red. biolum.^	Toxic	6.77
1.04*	Duluth-Superior Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77
1.04*	Duluth-Superior Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77
1.04*	Duluth-Superior Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	3.99
1.04*	Duluth-Superior Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	10 % survival	Toxic	3.99
1.04*	Duluth-Superior Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	66.5 red. biolum.^	Toxic	3.99
1.04*	Duluth-Superior Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	3.99
1.04*	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
1.04*	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95
1.04*	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
1.04*	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 red. biolum.^	Toxic	3.95
1.04*	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 red. biolum.^	Toxic	3.95
1.04*	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95
1.05*	Duluth-Superior Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05
1.05*	Duluth-Superior Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05
1.05*	Duluth-Superior Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05
1.05*	Duluth-Superior Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 red. biolum.^	Toxic	4.05
1.05*	Duluth-Superior Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05
1.07*	Lower St. Louis River		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.57 EC50 biolum.#	Not toxic	2.37
1.07*	Lower St. Louis River		10 day	Diptera	<i>Chironomus tentans</i>	LAR	77.5 % survival	Not toxic	2.37
1.07*	Lower St. Louis River		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.22 red. biolum.^	Not toxic	2.37
1.07*	Lower St. Louis River		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.37
1.08*	Duluth-Superior Harbor-Howards Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3
1.08*	Duluth-Superior Harbor-Howards Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	3
1.10*	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98
1.10*	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 red. biolum.^	Toxic	13.98
1.10*	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98
1.10*	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98
1.13*	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	2.88
1.13*	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.45 EC50 biolum.#	Toxic	2.88

**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
1.13*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	2.88
1.13*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 red. biolum.^	Toxic	8.26
1.13*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26
1.13*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26
1.13*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26
1.14*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98
1.14*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98
1.14*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98
1.14*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 red. biolum.^	Not toxic	3.98
1.15*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.02
1.15*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02
1.15*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	4.02
1.15*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	4.02
1.17*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	2.8
1.21	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42
1.21*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	3
1.21	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42
1.21	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42
1.21	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42
1.21*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87
1.21*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 red. biolum.^	Not toxic	3.87
1.21*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87
1.21*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87
1.21*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87
1.22	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76
1.22	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76
1.22	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76
1.22	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76
1.27*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11
1.27*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11
1.27*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 red. biolum.^	Not toxic	4.11
1.27*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11
1.27*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11
1.27*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11
1.28*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47
1.28*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47
1.28*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47



**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
1.28*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 red. biolum.^	Toxic	3.47
1.29*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	6.5
1.29*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	6.5
1.32*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.2
1.32*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	55 % survival	Toxic	2.2
1.34*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	5.2
1.34*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	78 % survival	Not toxic	5.2
1.39*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5
1.39*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5
1.41	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16
1.41	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16
1.41	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16
1.41	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16
1.42*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.975
1.42*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.975
1.42*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.975
1.42*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.975
1.42*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 red. biolum.^	Toxic	11.975
1.42*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	10.68
1.42*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.34 EC50 biolum.#	Toxic	10.68
1.42*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.8 red. biolum.^	Not toxic	10.68
1.42*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05
1.42*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05
1.42*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 red. biolum.^	Not toxic	4.05
1.42*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05
1.44	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93
1.44	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93
1.44	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93
1.44	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93
1.45*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	44 % survival	Not toxic	3.76
1.45*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.1 red. biolum.^	Not toxic	3.76
1.45*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	3.76
1.45*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.25 EC50 biolum.#	Toxic	3.76
1.46*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.6
1.46*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	6.6
1.51*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.2
1.51*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.2

**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
1.54*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 red. biolum.^	Not toxic	5.59
1.54*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59
1.54*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59
1.54*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59
1.56*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54
1.56*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54
1.56*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 red. biolum.^	Toxic	4.54
1.56*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54
1.57*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 red. biolum.^	Toxic	2.13
1.57*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13
1.57*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13
1.57*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13
1.62*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03
1.62*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 red. biolum.^	Toxic	6.03
1.62*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03
1.67*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 red. biolum.^	Not toxic	4.7
1.67*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7
1.67*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7
1.67*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7
1.70	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15
1.70	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15
1.70	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15
1.70	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15
1.89*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84
1.89*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84
1.89*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84
1.89*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84
1.89*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 red. biolum.^	Not toxic	29.84
1.97*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48
1.97*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48
1.97*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 red. biolum.^	Toxic	4.48
2.00	Duluth-Superior Harbor-NW of Western Lake Superior	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	100 % survival	Not toxic	NR
2.00	Duluth-Superior Harbor-NW of Western Lake Superior	48-h	Cladoceran	<i>Daphnia magna</i>	Unknown	100 % survival	Not toxic	NR
2.27*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49
2.27*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	17.49
2.27*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49
2.27*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49

**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
2.57	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88
2.66*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19
2.66*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19
2.66*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19
2.66*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 red. biolum.^	Toxic	14.19
2.66	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12
2.82	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1
2.82	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1
2.82	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1
2.82	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1
2.86	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12
2.86	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12
2.86	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12
2.86	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12
3.01	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58
3.57	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37
3.57	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37
3.57	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37
3.57	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37
4.26	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95
4.26	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95
4.26	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95
4.26	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95
4.68	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR
4.68	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR
4.68	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR
4.68	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR
6.13	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54
6.13	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54
6.13	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54
6.13	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54
7.00	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	NR
7.00	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
7.00	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	NR
7.00	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	NR

\* = SEM measurement; ^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. Biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.

**Table G-2. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Cadmium in the St. Louis River Area of Concern**

Cadmium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
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LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

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**Table G-3. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Chromium in the St. Louis River Area of Concern**

Chromium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
3.10	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95	IT Corp. 1996
3.10	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95	IT Corp. 1996
3.10	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95	IT Corp. 1996
3.10	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95	IT Corp. 1996
4.50	St. Louis River - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64	IT Corp. 1996
4.50	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64	IT Corp. 1996
4.50	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64	IT Corp. 1996
4.50	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64	IT Corp. 1996
22.9	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42	IT Corp. 1996
22.9	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42	IT Corp. 1996
22.9	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42	IT Corp. 1996
22.9	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42	IT Corp. 1996
30.5	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08	IT Corp. 1996
30.5	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08	IT Corp. 1996
30.5	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08	IT Corp. 1996
30.5	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08	IT Corp. 1996
39.0	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4	Wenck Associates Inc. 1995
39.0	D-S Harbor - NW side of Lakehead Dock	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
39.0	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
39.0	D-S Harbor - NW side of Lakehead Dock	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
41.2	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16	IT Corp. 1996
41.2	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16	IT Corp. 1996
41.2	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16	IT Corp. 1996
41.2	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16	IT Corp. 1996
45.5	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4	IT Corp. 1996
45.5	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4	IT Corp. 1996
45.5	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4	IT Corp. 1996
45.5	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4	IT Corp. 1996
47.0	Superior Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
47.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
47.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7	Wenck Associates Inc. 1995
47.0	Superior Bay	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995

**Table G-3. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Chromium in the St. Louis River Area of Concern**

Chromium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
50.5	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15	IT Corp. 1996
50.5	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15	IT Corp. 1996
50.5	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15	IT Corp. 1996
50.5	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15	IT Corp. 1996
51.3	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93	IT Corp. 1996
51.3	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93	IT Corp. 1996
51.3	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93	IT Corp. 1996
51.3	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93	IT Corp. 1996
67.6	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88	MPCA 1993
74.0	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	100	IT Corp. 1996
74.0	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	100	IT Corp. 1996
74.0	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	100	IT Corp. 1996
74.0	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	100	IT Corp. 1996
86.7	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR	IT Corp. 1996
86.7	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR	IT Corp. 1996
86.7	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR	IT Corp. 1996
86.7	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR	IT Corp. 1996
88.3	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12	IT Corp. 1996
88.3	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12	IT Corp. 1996
88.3	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12	IT Corp. 1996
88.3	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12	IT Corp. 1996
90.5	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76	IT Corp. 1996
90.5	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76	IT Corp. 1996
90.5	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76	IT Corp. 1996
90.5	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76	IT Corp. 1996
104	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1	IT Corp. 1996
104	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1	IT Corp. 1996
104	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1	IT Corp. 1996
104	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1	IT Corp. 1996
111	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58	MPCA 1993
207	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12	MPCA 1993
216	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54	IT Corp. 1996

**Table G-3. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Chromium in the St. Louis River Area of Concern**

Chromium (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
216	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54	IT Corp. 1996
216	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54	IT Corp. 1996
216	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54	IT Corp. 1996
247	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37	IT Corp. 1996
247	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37	IT Corp. 1996
247	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37	IT Corp. 1996
247	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37	IT Corp. 1996

\* = SEM measurement; ^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
1.17*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.83 EC50 biolum.#	Not toxic	0.68
1.17*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.31 red. biolum.^	Toxic	0.68
1.17*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.68
1.20*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 red. biolum.^	Toxic	0.08
1.20*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08
1.20*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08
1.20*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08
1.80*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	0.86
1.80*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.8 red. biolum.^	Not toxic	0.86
1.80*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	0.86
1.80*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.18 EC50 biolum.:	Not toxic	0.86
1.85*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59
1.85*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
1.85*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	0.59
2.17*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.24 EC50 biolum.:	Not toxic	0.35
2.17*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35
2.17*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 red. biolum.^	Toxic	0.35
2.20*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4
2.20*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4
2.20*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4
2.20*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4
2.20*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 red. biolum.^	Toxic	0.4
2.20*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4
2.23*	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02
2.23*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02
2.23*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02
2.23*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 red. biolum.^	Toxic	1.02
2.26*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	0.56
2.26*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67.5 % survival	Not toxic	0.56
2.26*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Chironomus tentans</i>	NA	12 red. biolum.^	Not toxic	0.56



**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
2.26*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.12 EC50 biolum.#	Not toxic	0.56
2.29*	St. Louis Bay-East of Erie Pier	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.28
2.29*	St. Louis Bay-East of Erie Pier	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Toxic	0.28
2.48*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 red. biolum.^	Toxic	0.16
2.48*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16
2.48*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16
2.60*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2
2.60*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2
2.60*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	25.2 red. biolum.^	Toxic	0.2
2.60*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2
2.72*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37
2.72*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37
2.72*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37
2.72*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37
2.72*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 red. biolum.^	Not toxic	1.37
2.88*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12
2.88*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12
2.88*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12
2.88*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 red. biolum.^	Not toxic	0.12
3.05*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 red. biolum.^	Not toxic	0.61
3.05*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	0.61
3.05*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	0.61
3.05*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.36 EC50 biolum.#	Not toxic	0.61
3.17*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	45.3 red. biolum.^	Toxic	0.14
3.17*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	64 % survival	Not toxic	0.14
3.17*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.08 EC50 biolum.#	Not toxic	0.14
3.17*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	0.14
3.71*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.18 EC50 biolum.#	Not toxic	2.19
3.71*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	27.4 red. biolum.^	Toxic	2.19
3.71*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	2.19

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3.71*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.19
3.72*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24
3.72*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24
3.72*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 red. biolum.^	Toxic	0.24
3.72*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24
3.87*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	0.89
3.87*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	0.89
4.05*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	1.1
4.05*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.1
4.05*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	1.1
4.05*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.1
4.58*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14
4.58*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 red. biolum.^	Toxic	0.14
4.58*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.83 EC50 biolum.#	Not toxic	0.14
4.58*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14
4.79*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42
4.79*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42
4.79*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42
4.79*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 red. biolum.^	Toxic	1.42
4.90*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7
4.90*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7
4.90*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
4.90*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7
4.90*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 red. biolum.^	Not toxic	2.7
4.90*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
4.90*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 red. biolum.^	Not toxic	2.7
4.90*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7
4.90*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7
4.90*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7
4.96*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
4.96*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 red. biolum.^	Not toxic	1.82
4.96*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82
4.96*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82
5.37*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.46 EC50 biolum.#	Not toxic	2.4
5.37*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.4
5.37*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	35.18 red. biolum.^	Toxic	2.4
5.37*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.4
5.40*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.2 EC50 biolum.#	Toxic	8.4
5.40*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	3 % survival	Toxic	8.4
5.40*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	81.5 red. biolum.^	Toxic	8.4
5.40*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.4
5.64*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	2.2
5.64*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.2
5.64*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.2
5.64*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.31 red. biolum.^	Not toxic	2.2
5.65*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69
5.65*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69
5.65*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 red. biolum.^	Not toxic	1.69
5.69*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.87 red. biolum.^	Toxic	1.75
5.69*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	1.75
5.69*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	1.75
5.69*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.75
5.74*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87
5.74*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87
5.74*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87
5.74*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 red. biolum.^	Toxic	1.87
5.74*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87
5.96*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65
5.96*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65
5.96*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
5.96*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.65
5.96*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65
6.01*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.35
6.01*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35
6.01*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35
6.01*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35
6.31*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44
6.31*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 red. biolum.^	Not toxic	1.44
6.31*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44
6.36*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.17 red. biolum.^	Not toxic	2.82
6.36*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67.5 % survival	Not toxic	2.82
6.36*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.82
6.36*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.23 EC50 biolum.#	Toxic	2.82
6.43*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	3.02
6.43*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.02
6.43*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.02
6.43*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.02
6.58*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	7.1
6.58*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	7.1
6.67*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 red. biolum.^	Not toxic	NR
6.67*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.4 EC50 biolum.#	Not toxic	NR
6.67*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	60 % survival	Not toxic	NR
6.67*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	12 % survival	Toxic	NR
6.68*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47
6.68*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47
6.68*	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47
6.68*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 red. biolum.^	Toxic	4.47
6.78*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91
6.78*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91
6.78*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 red. biolum.^	Not toxic	2.91

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
6.78*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91
6.82*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 red. biolum.^	Toxic	1.71
6.82*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71
6.82*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71
6.82*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71
6.82*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71
7.03*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	78 % survival	Not toxic	1.85
7.03*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	1.85
7.03*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.9 red. biolum.^	Not toxic	1.85
7.03*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.75 EC50 biolum.#	Not toxic	1.85
7.06*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77
7.06*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 red. biolum.^	Not toxic	5.77
7.06*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77
7.06*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77
7.27*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.37
7.27*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	2.37
7.27*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.9 red. biolum.^	Toxic	2.37
7.27*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.64 EC50 biolum.#	Not toxic	2.37
7.64*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24
7.64*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24
7.64*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24
7.64*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24
7.64*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	2.24
7.94*	St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.4 red. biolum.^	Toxic	3.14
7.94*	St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.14
7.94*	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.14
8.47*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82
8.47*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82
8.47*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82
8.47*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 red. biolum.^	Not toxic	2.82

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
8.47*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07
8.47*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 red. biolum.^	Toxic	3.07
8.47*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07
9.48*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 red. biolum.^	Toxic	3.25
9.48*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25
9.48*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25
9.78	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93
9.78	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93
9.78	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93
9.78	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93
9.90*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.7 red. biolum.^	Not toxic	1.55
9.90*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	1.55
9.90*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	1.55
9.95*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 red. biolum.^	Not toxic	2.98
9.95*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98
9.95*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98
9.95*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98
9.95*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98
10.6*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85
10.6*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.85
10.6*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85
10.6*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85
10.6*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85
10.7	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64
10.7	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64
10.7	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64
10.7	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64
10.9*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	0.81
10.9*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.9 red. biolum.^	Toxic	0.81
10.9*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.06 EC50 biolum.#	Not toxic	0.81

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
10.9*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	0.81
11.1*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59
11.1*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 red. biolum.^	Not toxic	2.59
11.1*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59
11.1*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59
11.1*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26
11.1*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26
11.1*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26
11.1*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 red. biolum.^	Toxic	8.26
11.7*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72
11.7*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	6.72
11.7*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72
11.7*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72
11.7*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72
12.0*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	3.2
12.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	3.2
12.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.2
12.0*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.2
12.5*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	40.37 red. biolum.^	Toxic	1.94
12.5*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.94
12.5*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	1.94
12.5*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	1.94
13.7*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.37
13.7*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.57 EC50 biolum.#	Not toxic	2.37
13.7*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77.5 % survival	Not toxic	2.37
13.7*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.22 red. biolum.^	Not toxic	2.37
13.8*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02
13.8*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02
13.8*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 red. biolum.^	Not toxic	4.02
13.8*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
13.8*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02
14.0*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.6
14.0*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	2.6
14.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	17.49
14.6*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49
14.6*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49
14.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49
14.8*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	50 % survival	Not toxic	3.2
14.8*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 EC50 biolum.#	Not toxic	3.2
14.8*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	45.6 red. biolum.^	Toxic	3.2
15.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.82 red. biolum.^	Not toxic	2.34
15.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.34
15.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.28 EC50 biolum.#	Toxic	2.34
15.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	2.34
15.8*	St. Louis Bay-East of Erie Pier	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	2.9
15.8*	St. Louis Bay-East of Erie Pier	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.9
16.6*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 red. biolum.^	Not toxic	2.34
16.6*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34
16.6*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34
16.6*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34
16.6*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34
16.8*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.735
16.8*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.735
16.8*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.735
16.8*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.735
16.8*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.735
16.9*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81
16.9*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81
16.9*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 red. biolum.^	Not toxic	13.81
16.9*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81



**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
17.6*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	55 % survival	Not toxic	3.32
17.6*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	3.32
17.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	3.32
17.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.1 red. biolum.^	Not toxic	3.32
18.0	Duluth-Superior Harbor-Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	100 % survival	Not toxic	NR
18.0	Duluth-Superior Harbor-Allouez Bay	48-h	Cladoceran	<i>Daphnia magna</i>	Unknown	100 % survival	Not toxic	NR
19.0*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	2.9
19.0*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.9
19.7*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.3
19.7*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	2.3
20.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7
20.0	Superior Bay	48-h	Cladoceran	<i>Ceriodaphnia dubia</i>	Adult	100 % survival	Not toxic	6.7
20.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7
20.0	Superior Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	6.7
20.2*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	2.5
20.2*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Toxic	2.5
20.6*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 red. biolum.^	Not toxic	4.84
20.6*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84
20.6*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84
20.6*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84
21.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4
21.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4
21.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4
21.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 red. biolum.^	Not toxic	3.4
21.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
21.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
21.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 red. biolum.^	Not toxic	3.4
21.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4
21.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4
21.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
22.2*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	2.93
22.2*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	2.93
22.2*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	13.8 red. biolum.^	Not toxic	2.93
22.4*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02
22.4*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.02
22.4*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	4.02
22.4*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	4.02
23.0	Duluth-Superior Harbor-North of Minnesota	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	100 % survival	Not toxic	NR
23.0	Duluth-Superior Harbor-North of Minnesota	48-h	Cladoceran	<i>Daphnia magna</i>	Unknown	100 % survival	Not toxic	NR
23.1*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.2 EC50 biolum.#	Toxic	3.07
23.1*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.07
23.1*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.07
23.1*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	3.07
23.2*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.45 EC50 biolum.#	Toxic	2.88
23.2*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	2.88
23.2*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	2.88
23.5*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	31.2 red. biolum.^	Toxic	2.67
23.5*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	2.67
23.5*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	91 % survival	Not toxic	2.67
23.5*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	2.67
23.6	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4
23.6	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4
23.6	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4
23.6	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4
24.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	35 % survival	Not toxic	3.38
24.7*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.38
24.7*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.34 EC50 biolum.#	Toxic	3.38
24.7*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	19.2 red. biolum.^	Not toxic	3.38
25.0*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36
25.0*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
25.0*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36
25.0*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 red. biolum.^	Not toxic	4.36
25.0	Duluth-Superior Harbor-Hallett Coal Dock #6	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	86.6 % survival	Not toxic	NR
25.0	Duluth-Superior Harbor-Hallett Coal Dock #6	48-h	Cladoceran	<i>Daphnia magna</i>	Unknown	95 % survival	Not toxic	NR
25.0*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 red. biolum.^	Toxic	13.91
25.0*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91
25.0*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91
25.0*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91
25.0*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91
26.4*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	12
26.4*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	12
26.5*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.69
26.5*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1 red. biolum.^	Not toxic	3.69
26.5*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.69
26.5*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.69
27.0*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.34 EC50 biolum.#	Toxic	10.68
27.0*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	10.68
27.0*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.8 red. biolum.^	Not toxic	10.68
27.0*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95
27.0*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 red. biolum.^	Toxic	3.95
27.0*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
27.0*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95
27.0*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
27.0*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 red. biolum.^	Toxic	3.95
28.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 red. biolum.^	Not toxic	5.34
28.6*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34
28.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34
28.6*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34
30.0*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5
30.0*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
31.6*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98
31.6*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98
31.6*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 red. biolum.^	Toxic	13.98
31.6*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98
32.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97
32.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97
32.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 red. biolum.^	Toxic	8.97
32.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97
32.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97
33.0	Duluth-Superior Harbor-Northwest side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4
33.0	Duluth-Superior Harbor-Northwest side of Lakehead Dock	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4
33.0	Duluth-Superior Harbor-Northwest side of Lakehead Dock	48-h	Cladoceran	<i>Ceriodaphnia dubia</i>	Adult	100 % survival	Not toxic	8.4
33.0	Duluth-Superior Harbor-Northwest side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4
33.0*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.41
33.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.3 EC50 biolum.#	Toxic	4.41
33.0*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.41
33.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.8 red. biolum.^	Not toxic	4.41
33.8*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	41 % survival	Toxic	4.24
33.8*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.12 EC50 biolum.#	Toxic	4.24
33.8*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.24
33.8*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	53.2 red. biolum.^	Toxic	4.24
34.7*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87
34.7*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87
34.7*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87
34.7*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 red. biolum.^	Not toxic	3.87
34.7*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87
35.2*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13
35.2*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13
35.2*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13
35.2*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 red. biolum.^	Toxic	4.13

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
36.5*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48
36.5*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48
36.5*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 red. biolum.^	Toxic	4.48
37.7	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08
37.7	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08
37.7	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08
37.7	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08
39.2*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84
39.2*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84
39.2*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84
39.2*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 red. biolum.^	Not toxic	29.84
39.2*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84
39.7*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77
39.7*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 red. biolum.^	Toxic	6.77
39.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77
39.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77
39.7*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77
40.9*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 red. biolum.^	Not toxic	3.98
40.9*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98
40.9*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98
40.9*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98
43.6*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05
43.6*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05
43.6*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 red. biolum.^	Not toxic	4.05
43.6*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05
44.1*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 red. biolum.^	Not toxic	4.11
44.1*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11
44.1*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11
44.1*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11
44.1*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
44.1*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11
44.1*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13
44.1*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13
44.1*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 red. biolum.^	Toxic	2.13
44.1*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13
44.5*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99
44.5*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.99
44.5*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99
44.8*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54
44.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 red. biolum.^	Toxic	4.54
44.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54
44.8*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54
47.0	Duluth-Superior Harbor-Northeast of Western Lake Superior	48-h	Cladoceran	<i>Daphnia magna</i>	Unknown	100 % survival	Not toxic	NR
47.0	Duluth-Superior Harbor-Northeast of Western Lake Superior	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	100 % survival	Not toxic	NR
49.3*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	6.5
49.3*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	6.5
49.5*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	3.99
49.5*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	66.5 red. biolum.^	Toxic	3.99
49.5*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	3.99
49.5*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	10 % survival	Toxic	3.99
50.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	3.76
50.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.25 EC50 biolum.#	Toxic	3.76
50.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.1 red. biolum.^	Not toxic	3.76
50.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	44 % survival	Not toxic	3.76
51.1*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.6
51.1*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	6.6
51.7*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63
51.7*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63
51.7*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 red. biolum.^	Toxic	2.63
51.7*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
56.2	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42
56.2	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42
56.2	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42
56.2	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42
57.7*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19
57.7*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19
57.7*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 red. biolum.^	Toxic	14.19
57.7*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19
57.8*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.97
57.8*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97
57.8*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97
57.8*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97
57.8*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97
66.6	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12
66.9*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 red. biolum.^	Toxic	4.05
66.9*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05
66.9*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05
66.9*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05
66.9*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05
71.3	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58
72.3*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47
72.3*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 red. biolum.^	Toxic	3.47
72.3*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47
72.3*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47
77.1*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59
77.1*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59
77.1*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 red. biolum.^	Not toxic	5.59
77.1*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59
81.2	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88
82.1*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 red. biolum.^	Not toxic	2.43

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
82.1*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43
82.1*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43
86.8*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.975
86.8*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.975
86.8*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 red. biolum.^	Toxic	11.975
86.8*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.975
86.8*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.975
94.5	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	1.8
94.5	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.8
96.0	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16
96.0	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16
96.0	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16
96.0	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16
101	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15
101	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15
101	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15
101	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15
104	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	3.9
104	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	3.9
113	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	2.8
130*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03
130*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 red. biolum.^	Toxic	6.03
130*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03
131*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82
131*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82
131*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 red. biolum.^	Toxic	0.82
131*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82
132	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.2
132	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	55 % survival	Toxic	2.2
136*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 red. biolum.^	Not toxic	4.7



**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
136*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7
136*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7
136*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7
144	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1
144	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1
144	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1
144	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1
163	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	3
176	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76
176	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76
176	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76
176	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76
194*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1
194*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1
194*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1
194*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 red. biolum.^	Toxic	1
194*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1
194	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	5.2
194	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	78 % survival	Not toxic	5.2
215	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3
215	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	3
234	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR
234	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR
234	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR
234	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR
239	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95
239	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95
239	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95
239	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95
269	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.2

**Table G-4. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Lead in the St. Louis River Area of Concern**

Lead (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
269	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.2
308	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54
308	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54
308	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54
308	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54
370	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37
370	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37
370	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37
370	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37
389	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	NR
389	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
389	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	NR
389	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	NR
668	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12
668	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12
668	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12
668	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12

\* = SEM measurement; ^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. Biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.  
 LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

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**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.578*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2
0.578*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	25.2 red. biolum.^	Toxic	0.2
0.578*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2
0.578*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2
0.592*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77
0.592*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77
0.592*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 red. biolum.^	Toxic	6.77
0.592*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77
0.592*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77
0.715*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08
0.715*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08
0.715*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 red. biolum.^	Toxic	0.08
0.715*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08
0.873*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	3 % survival	Toxic	8.4
0.873*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.2 EC50 biolum.#	Toxic	8.4
0.873*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.4
0.873*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	81.5 red. biolum.^	Toxic	8.4
0.906*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14
0.906*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 red. biolum.^	Toxic	0.14
0.906*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14
0.906*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14
0.981*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26
0.981*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26
0.981*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 red. biolum.^	Toxic	8.26
0.981*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26
1.50*	St. Louis Bay-East of Erie Pier	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Toxic	0.28
1.50*	St. Louis Bay-East of Erie Pier	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.28
1.70*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 red. biolum.^	Toxic	0.16
1.70*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16
1.70*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Chironomus tentans</i>	NA	100 EC50 biolum.#	Not toxic	0.16
1.98*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	1.55

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
1.98*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.7 red. biolum.^	Not toxic	1.55
1.98*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	1.55
2.01*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12
2.01*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12
2.01*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 red. biolum.^	Not toxic	0.12
2.01*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12
2.01*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35
2.01*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35
2.01*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 red. biolum.^	Toxic	0.35
2.01*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65
2.01*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65
2.01*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65
2.01*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.65
2.01*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65
2.04*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4
2.04*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 red. biolum.^	Toxic	0.4
2.04*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4
2.04*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4
2.04*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4
2.04*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4
2.15*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59
2.15*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	0.59
2.15*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
2.49*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48
2.49*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48
2.49*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 red. biolum.^	Toxic	4.48
2.51*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.08 EC50 biolum.#	Not toxic	0.14
2.51*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	64 % survival	Not toxic	0.14
2.51*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	0.14
2.51*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	45.3 red. biolum.^	Toxic	0.14
2.59*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
2.59*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71
2.59*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 red. biolum.^	Toxic	1.71
2.59*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71
2.59*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71
2.64*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24
2.64*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24
2.64*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24
2.64*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 red. biolum.^	Toxic	0.24
2.90*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 red. biolum.^	Not toxic	1.69
2.90*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69
2.90*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69
3.08*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 red. biolum.^	Not toxic	1.44
3.08*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44
3.08*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44
3.27*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37
3.27*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37
3.27*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37
3.27*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37
3.27*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 red. biolum.^	Not toxic	1.37
3.45*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47
3.45*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47
3.45*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 red. biolum.^	Toxic	4.47
3.45*	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47
3.70*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	0.86
3.70*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	0.86
3.70*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.18 EC50 biolum.#	Not toxic	0.86
3.70*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.8 red. biolum.^	Not toxic	0.86
3.76*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.36 EC50 biolum.#	Not toxic	0.61
3.76*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 red. biolum.^	Not toxic	0.61
3.76*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	0.61
3.76*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	0.61



**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3.90*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	6.72
3.90*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72
3.90*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72
3.90*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72
3.90*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72
3.93*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	0.89
3.93*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	0.89
3.94*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.31 red. biolum.^	Toxic	0.68
3.94*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.68
3.94*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.83 EC50 biolum.#	Not toxic	0.68
4.31*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02
4.31*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02
4.31*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02
4.31*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 red. biolum.^	Not toxic	4.02
4.31*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02
4.44*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97
4.44*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97
4.44*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97
4.44*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97
4.44*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 red. biolum.^	Toxic	8.97
4.54*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
4.54*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
4.54*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 red. biolum.^	Not toxic	2.7
4.54*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7
4.54*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7
4.54*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7
4.54*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 red. biolum.^	Not toxic	2.7
4.54*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7
4.54*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7
4.54*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7
4.70*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
4.70*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 red. biolum.^	Toxic	13.91
4.70*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91
4.70*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91
4.70*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91
5.21*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98
5.21*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98
5.21*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98
5.21*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98
5.21*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 red. biolum.^	Not toxic	2.98
5.53*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	0.56
5.53*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 red. biolum.^	Not toxic	0.56
5.53*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.12 EC50 biolum.#	Not toxic	0.56
5.53*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67.5 % survival	Not toxic	0.56
5.57*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 red. biolum.^	Toxic	3.07
5.57*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07
5.57*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07
5.61*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82
5.61*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82
5.61*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 red. biolum.^	Not toxic	1.82
5.61*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82
5.78*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	3.2
5.78*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	3.2
5.78*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.2
5.78*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.2
5.94*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49
5.94*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49
5.94*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49
5.94*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	17.49
6.06*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.9 red. biolum.^	Toxic	0.81
6.06*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	0.81
6.06*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.06 EC50 biolum.#	Not toxic	0.81

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
6.06*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	0.81
6.22*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.75 EC50 biolum.#	Not toxic	1.85
6.22*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	78 % survival	Not toxic	1.85
6.22*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.9 red. biolum.^	Not toxic	1.85
6.22*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	1.85
7.01*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	27.4 red. biolum.^	Toxic	2.19
7.01*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	2.19
7.01*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.19
7.01*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.18 EC50 biolum.#	Not toxic	2.19
7.22*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 red. biolum.^	Toxic	3.25
7.22*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25
7.22*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25
7.42*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.46 EC50 biolum.#	Not toxic	2.4
7.42*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.4
7.42*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.4
7.42*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	35.18 red. biolum.^	Toxic	2.4
7.45	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64
7.45	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64
7.45	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64
7.45	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64
7.52*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02
7.52*	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02
7.52*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 red. biolum.^	Toxic	1.02
7.52*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02
7.90*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.4 EC50 biolum.#	Not toxic	NR
7.90*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 red. biolum.^	Not toxic	NR
7.90*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	12 % survival	Toxic	NR
7.90*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	60 % survival	Not toxic	NR
7.97*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.85
7.97*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85
7.97*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
7.97*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85
7.97*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85
8.18*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	1.75
8.18*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.75
8.18*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	1.75
8.18*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.87 red. biolum.^	Toxic	1.75
8.39*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	2.24
8.39*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24
8.39*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24
8.39*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24
8.39*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24
8.49*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	7.1
8.49*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	7.1
8.67*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	2.3
8.67*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.3
8.86*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19
8.86*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19
8.86*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 red. biolum.^	Toxic	14.19
8.86*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19
9.19*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.735
9.19*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.735
9.19*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.735
9.19*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.735
9.19*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.735
9.23*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.02
9.23*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.02
9.23*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	3.02
9.23*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.02
9.42*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77
9.42*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77
9.42*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
9.42*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 red. biolum.^	Not toxic	5.77
9.48*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.975
9.48*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 red. biolum.^	Toxic	11.975
9.48*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.975
9.48*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.975
9.48*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.975
9.84*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.4 red. biolum.^	Toxic	3.14
9.84*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.14
9.84*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.14
10.2*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36
10.2*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 red. biolum.^	Not toxic	4.36
10.2*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36
10.2*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36
10.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
10.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4
10.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4
10.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 red. biolum.^	Not toxic	3.4
10.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4
10.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
10.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4
10.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4
10.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 red. biolum.^	Not toxic	3.4
10.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4
10.7*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.37
10.7*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.64 EC50 biolum.#	Not toxic	2.37
10.7*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	2.37
10.7*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.9 red. biolum.^	Toxic	2.37
10.8*	St. Louis Bay-East of Erie Pier	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.9
10.8*	St. Louis Bay-East of Erie Pier	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	2.9
10.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	1.1
10.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.1

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
10.8*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	1.1
10.8*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.1
10.9*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.2
10.9*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.31 red. biolum.^	Not toxic	2.2
10.9*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	2.2
10.9*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.2
11.9*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 red. biolum.^	Toxic	1.87
11.9*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87
11.9*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87
11.9*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87
11.9*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87
12.0*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 red. biolum.^	Not toxic	3.87
12.0*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87
12.0*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87
12.0*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87
12.0*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87
12.0*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84
12.0*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84
12.0*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84
12.0*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 red. biolum.^	Not toxic	4.84
12.3*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81
12.3*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 red. biolum.^	Not toxic	13.81
12.3*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81
12.3*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81
12.4*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.17 red. biolum.^	Not toxic	2.82
12.4*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.23 EC50 biolum.#	Toxic	2.82
12.4*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.82
12.4*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67.5 % survival	Not toxic	2.82
12.4*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	50 % survival	Not toxic	3.2
12.4*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 EC50 biolum.#	Not toxic	3.2
12.4*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	45.6 red. biolum.^	Toxic	3.2

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
12.6*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91
12.6*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 red. biolum.^	Not toxic	2.91
12.6*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91
12.6*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91
12.8*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	10.68
12.8*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.34 EC50 biolum.#	Toxic	10.68
12.8*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.8 red. biolum.^	Not toxic	10.68
12.9*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1 red. biolum.^	Not toxic	3.69
12.9*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.69
12.9*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.69
12.9*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.69
13.1*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	2.5
13.1*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Toxic	2.5
13.3*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34
13.3*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34
13.3*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34
13.3*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 red. biolum.^	Not toxic	5.34
13.3*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	1.8
13.3*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.8
13.4*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	3.32
13.4*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.1 red. biolum.^	Not toxic	3.32
13.4*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	55 % survival	Not toxic	3.32
13.4*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	3.32
13.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	1.94
13.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	1.94
13.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.94
13.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	40.37 red. biolum.^	Toxic	1.94
13.7*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	12
13.7*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	12
14.4*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 red. biolum.^	Not toxic	2.43
14.4*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
14.4*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43
14.4	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42
14.4	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42
14.4	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42
14.4	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42
14.5*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.99
14.5*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99
14.5*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99
15.0*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	2.6
15.0*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.6
15.3*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	2.9
15.3*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.9
15.4*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5
15.4*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5
15.5*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95
15.5*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
15.5*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95
15.5*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
15.5*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 red. biolum.^	Toxic	3.95
15.5*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 red. biolum.^	Toxic	3.95
15.5*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 red. biolum.^	Not toxic	2.34
15.5*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34
15.5*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34
15.5*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34
15.5*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34
15.8*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	2.88
15.8*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.45 EC50 biolum.#	Toxic	2.88
15.8*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	2.88
15.8*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35
15.8*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35
15.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.35



**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
15.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35
16.0*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42
16.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42
16.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 red. biolum.^	Toxic	1.42
16.0*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42
16.0*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77.5 % survival	Not toxic	2.37
16.0*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.22 red. biolum.^	Not toxic	2.37
16.0*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.37
16.0*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.57 EC50 biolum.#	Not toxic	2.37
16.2*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13
16.2*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 red. biolum.^	Toxic	4.13
16.2*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13
16.2*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13
16.3*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	2.34
16.3*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.34
16.3*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.28 EC50 biolum.#	Toxic	2.34
16.3*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.82 red. biolum.^	Not toxic	2.34
16.7*	St. Louis Bay-St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84
16.7*	St. Louis Bay-St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 red. biolum.^	Not toxic	29.84
16.7*	St. Louis Bay-St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84
16.7*	St. Louis Bay-St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84
16.7*	St. Louis Bay-St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84
16.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05
16.7*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05
16.7*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 red. biolum.^	Not toxic	4.05
16.7*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05
17.2*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	2.67
17.2*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	2.67
17.2*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	91 % survival	Not toxic	2.67
17.2*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	31.2 red. biolum.^	Toxic	2.67
17.4*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.02

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
17.4*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	4.02
17.4*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	4.02
17.4*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02
17.6*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59
17.6*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59
17.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59
17.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 red. biolum.^	Not toxic	2.59
18.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.3 EC50 biolum.#	Toxic	4.41
18.8*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.41
18.8*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.41
18.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.8 red. biolum.^	Not toxic	4.41
18.8*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98
18.8*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98
18.8*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98
18.8*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 red. biolum.^	Not toxic	3.98
18.9*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	2.93
18.9*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	13.8 red. biolum.^	Not toxic	2.93
18.9*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	2.93
19.0*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	6.5
19.0*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	6.5
19.9*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98
19.9*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98
19.9*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98
19.9*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 red. biolum.^	Toxic	13.98
20.0*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.07
20.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.07
20.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.2 EC50 biolum.#	Toxic	3.07
20.0*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	3.07
20.4	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95
20.4	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95
20.4	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
20.4	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95
20.9*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.6
20.9*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	6.6
20.9*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 red. biolum.^	Not toxic	2.82
20.9*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82
20.9*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82
20.9*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82
21.1*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 red. biolum.^	Not toxic	4.11
21.1*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11
21.1*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11
21.1*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11
21.1*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11
21.1*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11
21.6*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13
21.6*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13
21.6*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 red. biolum.^	Toxic	2.13
21.6*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13
22.6*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.34 EC50 biolum.#	Toxic	3.38
22.6*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	19.2 red. biolum.^	Not toxic	3.38
22.6*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.38
22.6*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	35 % survival	Not toxic	3.38
23.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	3.76
23.7*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.1 red. biolum.^	Not toxic	3.76
23.7*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	44 % survival	Not toxic	3.76
23.7*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.25 EC50 biolum.#	Toxic	3.76
24.1*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59
24.1*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59
24.1*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 red. biolum.^	Not toxic	5.59
24.1*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59
24.2*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05
24.2*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
24.2*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05
24.2*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05
24.2*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 red. biolum.^	Toxic	4.05
24.5*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	41 % survival	Toxic	4.24
24.5*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.24
24.5*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.12 EC50 biolum.#	Toxic	4.24
24.5*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	53.2 red. biolum.^	Toxic	4.24
25.1	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08
25.1	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08
25.1	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08
25.1	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08
25.3	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4
25.3	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4
25.3	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4
25.3	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4
25.5*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97
25.5*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97
25.5*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97
25.5*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97
25.5*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.97
25.6*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63
25.6*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 red. biolum.^	Toxic	2.63
25.6*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63
25.6*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63
26.7*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	3.9
26.7*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	3.9
26.9	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93
26.9	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93
26.9	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93
26.9	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93
29.1*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.2

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
29.1*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	55 % survival	Toxic	2.2
29.4*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	5.2
29.4*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	78 % survival	Not toxic	5.2
32.6*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	10 % survival	Toxic	3.99
32.6*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	3.99
32.6*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	3.99
32.6*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	66.5 red. biolum.^	Toxic	3.99
39.3*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	3
40.1*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3
40.1*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	3
40.2*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47
40.2*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 red. biolum.^	Toxic	3.47
40.2*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47
40.2*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47
42.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54
42.7*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 red. biolum.^	Toxic	4.54
42.7*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54
42.7*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54
53.2	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12
54.6*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03
54.6*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 red. biolum.^	Toxic	6.03
54.6*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03
61.2	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58
61.9	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16
61.9	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16
61.9	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16
61.9	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16
63.2*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7
63.2*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7
63.2*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7
63.2*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 red. biolum.^	Not toxic	4.7

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
64.6	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88
65.3*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.2
65.3*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.2
72.6	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15
72.6	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15
72.6	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15
72.6	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15
73.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 red. biolum.^	Toxic	0.82
73.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82
73.6*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82
73.6*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82
78.0*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1
78.0*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1
78.0*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 red. biolum.^	Toxic	1
78.0*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1
78.0*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1
101	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	NR
101	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	NR
101	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
101	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	NR
121	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1
121	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1
121	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1
121	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1
122	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12
122	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12
122	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12
122	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12
187	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR
187	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR
187	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR

**Table G-5. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Copper in the St. Louis River Area of Concern**

Copper (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
187	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR
194*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	2.8
199	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76
199	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76
199	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76
199	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76
248	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54
248	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54
248	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54
248	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54
291	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37
291	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37
291	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37
291	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37

\* = SEM measurement; ^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. Biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.

LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

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**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
<0.004	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35
<0.004	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 % red. biolum.^	Toxic	0.35
<0.004	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 mg growth	Not toxic	0.35
0.005	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93
0.005	St. Louis River - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93
0.005	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93
0.005	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93
<0.005	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12
<0.005	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12
<0.005	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 % red. biolum.^	Not toxic	0.12
<0.005	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12
<0.006	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16
<0.006	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 % red. biolum.^	Toxic	0.16
<0.006	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16
<0.008	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59
<0.008	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
<0.008	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	0.59
<0.009	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.83 EC50 biolum.#	Not toxic	0.68
<0.009	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.68
<0.009	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.31 % red. biolum.^	Toxic	0.68
<0.010	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 % red. biolum.^	Toxic	0.08
<0.010	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08
<0.010	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08
<0.010	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08
<0.013	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 % red. biolum.^	Toxic	0.24
<0.013	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24
<0.013	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24
<0.013	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24
<0.014	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2
<0.014	D-S Harbor	10 day	Amphipod	<i>Chironomus tentans</i>	JUV	86 % survival	Not toxic	0.2
<0.014	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
<0.014	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	25.2 % red. biolum.^	Toxic	0.2
<0.015	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 % red. biolum.^	Toxic	0.4
<0.015	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4
<0.015	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4
<0.015	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4
<0.015	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4
<0.015	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4
<0.017	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 % red. biolum.^	Not toxic	0.56
<0.017	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.12 EC50 biolum.#	Not toxic	0.56
<0.017	St. Louis River - Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	0.56
<0.017	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67.5 % survival	Not toxic	0.56
<0.02	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.08 EC50 biolum.#	Not toxic	0.14
<0.02	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7
<0.02	Superior Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	6.7
<0.02	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7
<0.02	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	0.14
<0.02	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	45.3 % red. biolum.^	Toxic	0.14
<0.02	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	64 % survival	Not toxic	0.14
<0.02	Superior Bay	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	6.7
<0.023	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 % red. biolum.^	Toxic	0.14
<0.023	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14
<0.023	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14
<0.023	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14
0.025	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.1
0.025	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	1.1
0.025	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	1.1
0.025	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.1
0.026	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 % red. biolum.^	Toxic	1.02
0.026	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02
0.026	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02
0.026	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.026	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.18 EC50 biolum.#	Not toxic	0.86
0.026	St. Louis River - Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	0.86
0.026	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.8 % red. biolum.^	Not toxic	0.86
0.026	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	0.86
0.028	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42
0.028	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 % red. biolum.^	Toxic	1.42
0.028	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42
0.028	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42
0.028	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	1.69
0.028	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69
0.028	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69
0.030	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64
0.030	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR
0.030	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64
0.030	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	NR
0.030	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64
0.030	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64
0.032	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87
0.032	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87
0.032	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87
0.032	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 % red. biolum.^	Toxic	1.87
0.032	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87
0.034	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.36 EC50 biolum.#	Not toxic	0.61
0.034	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	0.61
0.034	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	0.61
0.034	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 % red. biolum.^	Not toxic	0.61
0.034	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77
0.034	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77
0.034	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77
0.034	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 % red. biolum.^	Not toxic	5.77
0.040	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.040	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42
0.040	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42
0.040	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42
0.041	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.18 EC50 biolum.#	Not toxic	2.19
0.041	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.19
0.041	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	27.4 % red. biolum.^	Toxic	2.19
0.041	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	2.19
0.044	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR
0.044	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR
0.049	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82
0.049	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 % red. biolum.^	Not toxic	1.82
0.049	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82
0.049	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82
0.050	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.46 EC50 biolum.#	Not toxic	2.4
0.050	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.4
0.050	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	35.18 % red. biolum.^	Toxic	2.4
0.050	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.4
0.050	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.2
0.050	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	2.2
0.050	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.31 % red. biolum.^	Not toxic	2.2
0.050	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.2
0.051	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65
0.051	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.65
0.051	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65
0.051	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65
0.051	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65
0.052	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35
0.052	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.35
0.052	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35
0.052	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35
0.052	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.052	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 % red. biolum.^	Toxic	3.07
0.052	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07
0.055	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71
0.055	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71
0.055	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	1.71
0.055	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71
0.055	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71
0.056	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.06 EC50 biolum.#	Not toxic	0.81
0.056	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	0.81
0.056	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	0.81
0.056	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.9 % red. biolum.^	Toxic	0.81
0.057	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.02
0.057	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.02
0.057	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	3.02
0.057	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.02
0.058	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47
0.058	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47
0.058	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47
0.058	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 % red. biolum.^	Toxic	4.47
0.059	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.23 EC50 biolum.#	Toxic	2.82
0.059	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67.5 % survival	Not toxic	2.82
0.059	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.17 % red. biolum.^	Not toxic	2.82
0.059	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.82
0.064	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37
0.064	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37
0.064	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37
0.064	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37
0.064	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 % red. biolum.^	Not toxic	1.37
0.066	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	2.37
0.066	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.37
0.066	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.9 % red. biolum.^	Toxic	2.37

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.066	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.64 EC50 biolum.#	Not toxic	2.37
0.069	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	10 % survival	Toxic	3.99
0.069	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	66.5 % red. biolum.^	Toxic	3.99
0.069	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	3.99
0.069	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	3.99
0.069	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	60 % survival	Not toxic	NR
0.069	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.4 EC50 biolum.#	Not toxic	NR
0.069	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 % red. biolum.^	Not toxic	NR
0.069	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	12 % survival	Toxic	NR
0.071	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44
0.071	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44
0.071	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 % red. biolum.^	Not toxic	1.44
0.072	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1
0.072	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 % red. biolum.^	Toxic	1
0.072	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1
0.072	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1
0.072	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1
0.072	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	78 % survival	Not toxic	1.85
0.072	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.75 EC50 biolum.#	Not toxic	1.85
0.072	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	1.85
0.072	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.9 % red. biolum.^	Not toxic	1.85
0.076	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82
0.076	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82
0.076	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82
0.076	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 % red. biolum.^	Not toxic	2.82
0.076	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98
0.076	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98
0.076	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 % red. biolum.^	Not toxic	2.98
0.076	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98
0.076	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98
0.077	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	2.24

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.077	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24
0.077	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24
0.077	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24
0.077	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24
0.078	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 % red. biolum.^	Not toxic	2.91
0.078	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91
0.078	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91
0.078	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91
0.078	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59
0.078	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	2.59
0.078	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59
0.078	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59
0.080	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	1.75
0.080	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.75
0.080	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.87 % red. biolum.^	Toxic	1.75
0.080	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	1.75
0.088	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 % red. biolum.^	Not toxic	2.7
0.088	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7
0.088	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
0.088	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7
0.088	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7
0.088	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7
0.088	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7
0.088	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 % red. biolum.^	Not toxic	2.7
0.088	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7
0.088	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
0.089	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85
0.089	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.85
0.089	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85
0.089	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85
0.089	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85



**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.089	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.7 % red. biolum.^	Not toxic	1.55
0.089	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	1.55
0.089	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	1.55
0.093	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34
0.093	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34
0.093	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34
0.093	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34
0.093	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	2.34
0.094	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	3 % survival	Toxic	8.4
0.094	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.2 EC50 biolum.#	Toxic	8.4
0.094	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.4
0.094	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	81.5 % red. biolum.^	Toxic	8.4
0.096	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.14
0.096	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.4 % red. biolum.^	Toxic	3.14
0.096	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.14
0.100	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84
0.100	St. Louis River - Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84
0.100	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84
0.100	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 % red. biolum.^	Not toxic	4.84
0.101	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81
0.101	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 % red. biolum.^	Not toxic	13.81
0.101	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81
0.101	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81
0.104	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	1.94
0.104	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	40.37 % red. biolum.^	Toxic	1.94
0.104	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.94
0.104	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	1.94
0.121	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.34
0.121	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.28 EC50 biolum.#	Toxic	2.34
0.121	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	2.34
0.121	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.82 % red. biolum.^	Not toxic	2.34

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.122	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 % red. biolum.^	Toxic	0.82
0.122	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82
0.122	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82
0.122	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82
0.128	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.2
0.128	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	3.2
0.128	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	3.2
0.128	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.2
0.130	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25
0.130	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25
0.130	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 % red. biolum.^	Toxic	3.25
0.137	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	45.6 % red. biolum.^	Toxic	3.2
0.137	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 EC50 biolum.#	Not toxic	3.2
0.137	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	50 % survival	Not toxic	3.2
0.150	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4
0.150	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4
0.150	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4
0.150	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4
0.159	St. Louis Bay - St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63
0.159	St. Louis Bay - St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63
0.159	St. Louis Bay - St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 % red. biolum.^	Toxic	2.63
0.159	St. Louis Bay - St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63
0.160	D-S Harbor - North of MN Power & Light Dock	10 day	Diptera	<i>Chironomus tentans</i>	?	100 % survival	Not toxic	NR
0.160	D-S Harbor - North of MN Power & Light Dock	48 hour	Cladoceran	<i>Daphnia magna</i>	?	100 % survival	Not toxic	NR
0.160	Brule River - above Stones Bridge	48 hour	Cladoceran	<i>Daphnia magna</i>	?	95 % survival	Not toxic	NR
0.160	Brule River - above Stones Bridge	10 day	Diptera	<i>Chironomus tentans</i>	?	100 % survival	Not toxic	NR
0.161	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91
0.161	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 % red. biolum.^	Toxic	13.91
0.161	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91
0.161	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91
0.161	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.168	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.74
0.168	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.74
0.168	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.74
0.168	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.74
0.168	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.74
0.180	D-S Harbor - Hallett Coal Dock #6	48 hour	Cladoceran	<i>Daphnia magna</i>	?	95 % survival	Not toxic	NR
0.180	D-S Harbor - Hallett Coal Dock #6	10 day	Diptera	<i>Chironomus tentans</i>	?	86.6 % survival	Not toxic	NR
0.182	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72
0.182	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72
0.182	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72
0.182	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	6.72
0.182	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72
0.184	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.2 EC50 biolum.#	Toxic	3.07
0.184	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	3.07
0.184	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.07
0.184	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.07
0.188	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.45 EC50 biolum.#	Toxic	2.88
0.188	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	2.88
0.188	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	2.88
0.189	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49
0.189	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49
0.189	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49
0.189	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	17.49
0.190	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4
0.190	D-S Harbor - NW side of Lakehead Dock	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	8.4
0.190	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4
0.190	D-S Harbor - NW side of Lakehead Dock	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4
0.194	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	3.32
0.194	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	55 % survival	Not toxic	3.32
0.194	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.1 % red. biolum.^	Not toxic	3.32
0.194	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	3.32

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.200	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	2.93
0.200	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	13.8 % red. biolum.^	Not toxic	2.93
0.200	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	2.93
0.209	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.34 EC50 biolum.#	Toxic	3.38
0.209	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	19.2 % red. biolum.^	Not toxic	3.38
0.209	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	35 % survival	Not toxic	3.38
0.209	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.38
0.210	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
0.210	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
0.210	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95
0.210	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 % red. biolum.^	Toxic	3.95
0.210	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95
0.210	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 % red. biolum.^	Toxic	3.95
0.210	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	NR
0.210	D-S Harbor - Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
0.211	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
0.211	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4
0.211	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4
0.211	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 % red. biolum.^	Not toxic	3.4
0.211	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
0.211	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4
0.211	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4
0.211	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4
0.211	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 % red. biolum.^	Not toxic	3.4
0.211	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4
0.215	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	4.02
0.215	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.02
0.215	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02
0.215	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	4.02
0.220	D-S Harbor - City of Superior WWTP	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	79 % survival	Not toxic	NR
0.220	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.221	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26
0.221	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26
0.221	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26
0.221	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 % red. biolum.^	Toxic	8.26
0.224	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.8 % red. biolum.^	Not toxic	10.68
0.224	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	10.68
0.224	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.34 EC50 biolum.#	Toxic	10.68
0.229	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36
0.229	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36
0.229	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 % red. biolum.^	Not toxic	4.36
0.229	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36
0.230	D-S Harbor - City of Superior WWTP	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
0.233	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	91 % survival	Not toxic	2.67
0.233	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	2.67
0.233	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	31.2 % red. biolum.^	Toxic	2.67
0.233	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	2.67
0.240	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR
0.240	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR
0.240	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	NR
0.240	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	NR
0.250	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1
0.250	D-S Harbor - Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	?	100 % survival	Not toxic	NR
0.250	D-S Harbor - Allouez Bay	48 hour	Cladoceran	<i>Daphnia magna</i>	?	100 % survival	Not toxic	NR
0.250	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1
0.250	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1
0.250	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1
0.252	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.22 % red. biolum.^	Not toxic	2.37
0.252	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.57 EC50 biolum.#	Not toxic	2.37
0.252	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.37
0.252	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77.5 % survival	Not toxic	2.37
0.260	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.260	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR
0.260	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR
0.260	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR
0.262	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1 % red. biolum.^	Not toxic	3.69
0.262	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.69
0.262	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.69
0.262	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.69
0.264	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.97
0.264	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97
0.264	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97
0.264	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97
0.264	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97
0.269	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59
0.269	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59
0.269	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59
0.269	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 % red. biolum.^	Not toxic	5.59
0.269	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05
0.269	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 % red. biolum.^	Toxic	4.05
0.269	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05
0.269	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05
0.269	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05
0.280	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR
0.280	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR
0.288	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98
0.288	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98
0.288	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 % red. biolum.^	Toxic	13.98
0.288	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98
0.291	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	41 % survival	Toxic	4.24
0.291	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	53.2 % red. biolum.^	Toxic	4.24
0.291	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.12 EC50 biolum.#	Toxic	4.24
0.291	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.24

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.309	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 % red. biolum.^	Not toxic	2.43
0.309	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43
0.309	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43
0.310	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08
0.310	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	55 % survival	Toxic	NR
0.310	D-S Harbor - Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR
0.310	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08
0.310	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08
0.310	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08
0.312	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02
0.312	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 % red. biolum.^	Not toxic	4.02
0.312	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02
0.312	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02
0.312	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02
0.319	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88
0.336	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13
0.336	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13
0.336	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13
0.336	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 % red. biolum.^	Toxic	4.13
0.348	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.98
0.348	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.98
0.348	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 % red. biolum.^	Toxic	11.98
0.348	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.98
0.348	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	-9 mg growth	Not determined	11.98
0.350	D-S Harbor - Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
0.350	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR
0.360	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76
0.360	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR
0.360	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
0.360	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76
0.360	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.360	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76
0.360	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76
0.364	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 % red. biolum.^	Not toxic	3.98
0.364	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98
0.364	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98
0.364	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98
0.370	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95
0.370	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95
0.370	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95
0.370	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95
0.389	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 % red. biolum.^	Toxic	3.47
0.389	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47
0.389	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47
0.389	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47
0.398	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34
0.398	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34
0.398	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34
0.398	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 % red. biolum.^	Not toxic	5.34
0.413	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12
0.430	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84
0.430	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84
0.430	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84
0.430	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84
0.430	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	29.84
0.432	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03
0.432	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 % red. biolum.^	Toxic	6.03
0.432	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03
0.433	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87
0.433	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 % red. biolum.^	Not toxic	3.87
0.433	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87
0.433	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87



**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.433	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87
0.440	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7
0.440	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7
0.440	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 % red. biolum.^	Not toxic	4.7
0.440	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7
0.440	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15
0.440	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15
0.440	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15
0.440	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15
0.460	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	NR
0.460	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	NR
0.463	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54
0.463	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54
0.463	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 % red. biolum.^	Toxic	4.54
0.463	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54
0.490	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	NR
0.500	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	NR
0.500	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
0.500	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR
0.502	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97
0.502	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	8.97
0.502	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97
0.502	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97
0.502	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97
0.520	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
0.520	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
0.529	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 % red. biolum.^	Not toxic	4.11
0.529	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11
0.529	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11
0.529	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11
0.540	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.540	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR
0.540	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	NR
0.540	D-S Harbor - Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR
0.559	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77
0.559	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77
0.559	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77
0.559	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77
0.559	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 % red. biolum.^	Toxic	6.77
0.573	D-S Harbor - Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
0.573	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	78 % survival	Not toxic	NR
0.589	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58
0.611	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99
0.611	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.99
0.611	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99
0.611	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.1 % red. biolum.^	Not toxic	3.76
0.611	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	44 % survival	Not toxic	3.76
0.611	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.25 EC50 biolum.#	Toxic	3.76
0.611	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	3.76
0.656	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05
0.656	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 % red. biolum.^	Not toxic	4.05
0.656	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05
0.656	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05
0.671	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11
0.671	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.8 % red. biolum.^	Not toxic	4.41
0.671	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.41
0.671	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11
0.671	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.41
0.671	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.3 EC50 biolum.#	Toxic	4.41
0.700	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	100
0.700	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	100
0.700	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	100

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
0.700	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	100
0.702	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 % red. biolum.^	Toxic	2.13
0.702	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13
0.702	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13
0.702	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13
0.710	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR
0.710	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
0.720	D-S Harbor - Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR
0.720	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	NR
0.720	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
0.750	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
0.760	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16
0.760	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16
0.760	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16
0.760	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16
0.790	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
0.870	D-S Harbor - City of Superior WWTP	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	NR
0.870	D-S Harbor - City of Superior WWTP	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR
0.920	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR
0.966	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19
0.966	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19
0.966	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19
0.966	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 % red. biolum.^	Toxic	14.19
0.980	D-S Harbor - Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR
0.980	D-S Harbor - NE of Sanitary District Plant	10 day	Diptera	<i>Chironomus tentans</i>	?	100 % survival	Not toxic	NR
0.980	D-S Harbor - NE of Sanitary District Plant	48 hour	Cladoceran	<i>Daphnia magna</i>	?	100 % survival	Not toxic	NR
1.26	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 % red. biolum.^	Toxic	4.48
1.26	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48
1.26	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48
1.31	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR
1.31	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR

**Table G-6. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Mercury in the St. Louis River Area of Concern**

Mercury (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
1.31	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR
1.31	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR
1.42	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54
1.42	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54
1.42	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54
1.42	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54
1.50	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
1.50	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
2.15	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12
2.15	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12
2.15	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12
2.15	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12
2.73	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37
2.73	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37
2.73	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37
2.73	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37

\* = SEM measurement; ^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.

LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

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**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
4.35*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35	MPCA 1997b
4.35*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35	MPCA 1997b
4.35*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 red. biolum.^	Toxic	0.35	MPCA 1997b
5.24*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59	MPCA 1997b
5.24*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59	MPCA 1997b
5.24*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	0.59	MPCA 1997b
6.19*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 red. biolum.^	Toxic	0.16	MPCA 1997b
6.19*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16	MPCA 1997b
6.19*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16	MPCA 1997b
6.73*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 red. biolum.^	Toxic	0.08	MPCA 1997b
6.73*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08	MPCA 1997b
6.73*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08	MPCA 1997b
6.73*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08	MPCA 1997b
7.76*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.31 red. biolum.^	Toxic	0.68	MPCA 1997b
7.76*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.83 EC50 biolum.#	Not toxic	0.68	MPCA 1997b
7.76*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.68	MPCA 1997b
7.79*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4	MPCA 1997b
7.79*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4	MPCA 1997b
7.79*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4	MPCA 1997b
7.79*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 red. biolum.^	Toxic	0.4	MPCA 1997b
7.79*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4	MPCA 1997b
7.79*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4	MPCA 1997b
7.90*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	25.2 red. biolum.^	Toxic	0.2	MPCA 1997b
7.90*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2	MPCA 1997b
7.90*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2	MPCA 1997b
7.90*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2	MPCA 1997b
9.17*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 red. biolum.^	Toxic	0.14	MPCA 1997b
9.17*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14	MPCA 1997b
9.17*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14	MPCA 1997b
9.17*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14	MPCA 1997b
10.2*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 red. biolum.^	Toxic	0.24	MPCA 1997b
10.2*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24	MPCA 1997b
10.2*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24	MPCA 1997b



**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
10.2*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24	MPCA 1997b
11.1*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	45.3 red. biolum.^	Toxic	0.14	MPCA 1997b
11.1*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.08 EC50 biolum.#	Not toxic	0.14	MPCA 1997b
11.1*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	64 % survival	Not toxic	0.14	MPCA 1997b
11.1*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	0.14	MPCA 1997b
11.2*	St. Louis Bay-East of Erie Pier	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Toxic	0.28	Crane <i>et al.</i> 1997
11.2*	St. Louis Bay-East of Erie Pier	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.28	Crane <i>et al.</i> 1997
13.5*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 red. biolum.^	Not toxic	1.37	MPCA 1997c
13.5*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37	MPCA 1997c
13.5*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37	MPCA 1997c
13.5*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37	MPCA 1997c
13.5*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37	MPCA 1997c
14.8*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	0.89	Crane <i>et al.</i> 1997
14.8*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	0.89	Crane <i>et al.</i> 1997
15.0*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 red. biolum.^	Toxic	1.02	MPCA 1997b
15.0*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02	MPCA 1997b
15.0*	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02	MPCA 1997b
15.0*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02	MPCA 1997b
16.6*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.18 EC50 biolum.#	Not toxic	0.86	MPCA 1997b
16.6*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.8 red. biolum.^	Not toxic	0.86	MPCA 1997b
16.6*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	0.86	MPCA 1997b
16.6*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	0.86	MPCA 1997b
16.7*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 red. biolum.^	Not toxic	0.56	MPCA 1997b
16.7*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67.5 % survival	Not toxic	0.56	MPCA 1997b
16.7*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	0.56	MPCA 1997b
16.7*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.12 EC50 biolum.#	Not toxic	0.56	MPCA 1997b
16.7*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 red. biolum.^	Not toxic	1.44	MPCA 1997c
16.7*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44	MPCA 1997c
16.7*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44	MPCA 1997c
17.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.1	MPCA 1997b
17.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	1.1	MPCA 1997b
17.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.1	MPCA 1997b
17.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	1.1	MPCA 1997b

**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
18.3*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87	MPCA 1997c
18.3*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87	MPCA 1997c
18.3*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 red. biolum.^	Toxic	1.87	MPCA 1997c
18.3*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87	MPCA 1997c
18.3*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87	MPCA 1997c
18.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 red. biolum.^	Not toxic	1.69	MPCA 1997c
18.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69	MPCA 1997c
18.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69	MPCA 1997c
19.9*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12	MPCA 1997b
19.9*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 red. biolum.^	Not toxic	0.12	MPCA 1997b
19.9*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12	MPCA 1997b
19.9*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12	MPCA 1997b
20.0*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	0.61	MPCA 1997b
20.0*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.36 EC50 biolum.#	Not toxic	0.61	MPCA 1997b
20.0*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	0.61	MPCA 1997b
20.0*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 red. biolum.^	Not toxic	0.61	MPCA 1997b
22.5*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47	MPCA 1997b
22.5*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 red. biolum.^	Toxic	4.47	MPCA 1997b
22.5*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47	MPCA 1997b
22.5*	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47	MPCA 1997b
25.2*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77	MPCA 1997b
25.2*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 red. biolum.^	Not toxic	5.77	MPCA 1997b
25.2*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77	MPCA 1997b
25.2*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77	MPCA 1997b
26.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98	MPCA 1997c
26.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98	MPCA 1997c
26.7*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98	MPCA 1997c
26.7*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 red. biolum.^	Not toxic	2.98	MPCA 1997c
26.7*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98	MPCA 1997c
27.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42	MPCA 1997b
27.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 red. biolum.^	Toxic	1.42	MPCA 1997b
27.8*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42	MPCA 1997b
27.8*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42	MPCA 1997b

**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
28.4*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	1.55	MPCA 1997b
28.4*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	1.55	MPCA 1997b
28.4*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.7 red. biolum.^	Not toxic	1.55	MPCA 1997b
28.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	0.81	MPCA 1997b
28.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	0.81	MPCA 1997b
28.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.9 red. biolum.^	Toxic	0.81	MPCA 1997b
28.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.06 EC50 biolum.#	Not toxic	0.81	MPCA 1997b
28.5*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	7.1	Crane <i>et al.</i> 1997
28.5*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	7.1	Crane <i>et al.</i> 1997
29.3*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 red. biolum.^	Not toxic	1.82	MPCA 1997b
29.3*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82	MPCA 1997b
29.3*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82	MPCA 1997b
29.3*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82	MPCA 1997b
29.5*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65	MPCA 1997c
29.5*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65	MPCA 1997c
29.5*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.65	MPCA 1997c
29.5*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65	MPCA 1997c
29.5*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65	MPCA 1997c
29.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24	MPCA 1997c
29.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24	MPCA 1997c
29.7*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24	MPCA 1997c
29.7*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24	MPCA 1997c
29.7*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	2.24	MPCA 1997c
32.0*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71	MPCA 1997c
32.0*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 red. biolum.^	Toxic	1.71	MPCA 1997c
32.0*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71	MPCA 1997c
32.0*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71	MPCA 1997c
32.0*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71	MPCA 1997c
32.8*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	78 % survival	Not toxic	1.85	MPCA 1997b
32.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.75 EC50 biolum.#	Not toxic	1.85	MPCA 1997b
32.8*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	1.85	MPCA 1997b
32.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.9 red. biolum.^	Not toxic	1.85	MPCA 1997b
33.7*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02	MPCA 1997c

**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
33.7*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 red. biolum.^	Not toxic	4.02	MPCA 1997c
33.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02	MPCA 1997c
33.7*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02	MPCA 1997c
33.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02	MPCA 1997c
34.3*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.4 EC50 biolum.#	Not toxic	NR	MPCA 1997b
34.3*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	12 % survival	Toxic	NR	MPCA 1997b
34.3*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 red. biolum.^	Not toxic	NR	MPCA 1997b
34.3*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	60 % survival	Not toxic	NR	MPCA 1997b
34.9*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7	MPCA 1997c
34.9*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 red. biolum.^	Not toxic	2.7	MPCA 1997c
34.9*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7	MPCA 1997c
34.9*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7	MPCA 1997c
34.9*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7	MPCA 1997c
34.9*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
34.9*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7	MPCA 1997c
34.9*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 red. biolum.^	Not toxic	2.7	MPCA 1997c
34.9*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7	MPCA 1997c
34.9*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
37.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35	MPCA 1997b
37.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.35	MPCA 1997b
37.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35	MPCA 1997b
37.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35	MPCA 1997b
40.5*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07	MPCA 1997b
40.5*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07	MPCA 1997b
40.5*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 red. biolum.^	Toxic	3.07	MPCA 1997b
40.5*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	27.4 red. biolum.^	Toxic	2.19	MPCA 1997b
40.5*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.18 EC50 biolum.#	Not toxic	2.19	MPCA 1997b
40.5*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	2.19	MPCA 1997b
40.5*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.19	MPCA 1997b
43.7*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.75	MPCA 1997b
43.7*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.87 red. biolum.^	Toxic	1.75	MPCA 1997b
43.7*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	1.75	MPCA 1997b
43.7*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	1.75	MPCA 1997b

**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
45.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85	MPCA 1997c
45.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85	MPCA 1997c
45.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85	MPCA 1997c
45.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85	MPCA 1997c
45.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.85	MPCA 1997c
46.6*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.2	MPCA 1997b
46.6*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.2	MPCA 1997b
46.6*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	2.2	MPCA 1997b
46.6*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.31 red. biolum.^	Not toxic	2.2	MPCA 1997b
47.9*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.2	MPCA 1997b
47.9*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.2	MPCA 1997b
47.9*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	3.2	MPCA 1997b
47.9*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	3.2	MPCA 1997b
49.2*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.4 red. biolum.^	Toxic	3.14	MPCA 1997b
49.2*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.14	MPCA 1997b
49.2*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.14	MPCA 1997b
50.0*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25	MPCA 1997c
50.0*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25	MPCA 1997c
50.0*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 red. biolum.^	Toxic	3.25	MPCA 1997c
51.0*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 red. biolum.^	Not toxic	2.82	MPCA 1997b
51.0*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82	MPCA 1997b
51.0*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82	MPCA 1997b
51.0*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82	MPCA 1997b
51.6*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72	MPCA 1997c
51.6*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72	MPCA 1997c
51.6*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72	MPCA 1997c
51.6*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72	MPCA 1997c
51.6*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	6.72	MPCA 1997c
52.1*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 red. biolum.^	Not toxic	2.59	MPCA 1997b
52.1*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59	MPCA 1997b
52.1*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59	MPCA 1997b
52.1*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59	MPCA 1997b
53.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	1.94	MPCA 1997b

**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
53.7*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	40.37 red. biolum.^	Toxic	1.94	MPCA 1997b
53.7*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.94	MPCA 1997b
53.7*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	1.94	MPCA 1997b
54.0*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.46 EC50 biolum.#	Not toxic	2.4	MPCA 1997b
54.0*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	35.18 red. biolum.^	Toxic	2.4	MPCA 1997b
54.0*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.4	MPCA 1997b
54.0*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.4	MPCA 1997b
55.1 *	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	1.8	Crane <i>et al.</i> 1997
55.1 *	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.8	Crane <i>et al.</i> 1997
57.6*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34	MPCA 1997c
57.6*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 red. biolum.^	Not toxic	2.34	MPCA 1997c
57.6*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34	MPCA 1997c
57.6*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34	MPCA 1997c
57.6*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34	MPCA 1997c
57.7	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64	IT Corp. 1996
57.7	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64	IT Corp. 1996
57.7	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64	IT Corp. 1996
57.7	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64	IT Corp. 1996
58.7*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.17 red. biolum.^	Not toxic	2.82	MPCA 1997b
58.7*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67.5 % survival	Not toxic	2.82	MPCA 1997b
58.7*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.82	MPCA 1997b
58.7*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.23 EC50 biolum.#	Toxic	2.82	MPCA 1997b
59.7*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91	MPCA 1997b
59.7*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91	MPCA 1997b
59.7*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 red. biolum.^	Not toxic	2.91	MPCA 1997b
59.7*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91	MPCA 1997b
62.3*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	3.02	MPCA 1997b
62.3*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.02	MPCA 1997b
62.3*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.02	MPCA 1997b
62.3*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.02	MPCA 1997b
62.4*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	2.6	Crane <i>et al.</i> 1997
62.4*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.6	Crane <i>et al.</i> 1997
64.6*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	2.5	Crane <i>et al.</i> 1997

**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
64.6*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Toxic	2.5	Crane <i>et al.</i> 1997
66.0*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 red. biolum.^	Not toxic	4.84	MPCA 1997b
66.0*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84	MPCA 1997b
66.0*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84	MPCA 1997b
66.0*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84	MPCA 1997b
66.4*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49	MPCA 1997b
66.4*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49	MPCA 1997b
66.4*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	17.49	MPCA 1997b
66.4*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49	MPCA 1997b
68.3*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.82 red. biolum.^	Not toxic	2.34	MPCA 1997b
68.3*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	2.34	MPCA 1997b
68.3*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.34	MPCA 1997b
68.3*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.28 EC50 biolum.#	Toxic	2.34	MPCA 1997b
68.6*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	3 % survival	Toxic	8.4	MPCA 1997b
68.6*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.4	MPCA 1997b
68.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.2 EC50 biolum.#	Toxic	8.4	MPCA 1997b
68.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	81.5 red. biolum.^	Toxic	8.4	MPCA 1997b
69.2*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.9 red. biolum.^	Toxic	2.37	MPCA 1997b
69.2*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.37	MPCA 1997b
69.2*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	2.37	MPCA 1997b
69.2*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.64 EC50 biolum.#	Not toxic	2.37	MPCA 1997b
69.2*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26	MPCA 1997b
69.2*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26	MPCA 1997b
69.2*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26	MPCA 1997b
69.2*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 red. biolum.^	Toxic	8.26	MPCA 1997b
71.5*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	2.3	Crane <i>et al.</i> 1997
71.5*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.3	Crane <i>et al.</i> 1997
71.8*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.735	MPCA 1997c
71.8*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.735	MPCA 1997c
71.8*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.735	MPCA 1997c
71.8*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.735	MPCA 1997c
71.8*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.735	MPCA 1997c
73.3*	St. Louis Bay-East of Erie Pier	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.9	Crane <i>et al.</i> 1997

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Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
73.3*	St. Louis Bay-East of Erie Pier	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	2.9	Crane <i>et al.</i> 1997
73.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4	MPCA 1997c
73.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
73.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
73.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 red. biolum.^	Not toxic	3.4	MPCA 1997c
73.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
73.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4	MPCA 1997c
73.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4	MPCA 1997c
73.4*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 red. biolum.^	Not toxic	3.4	MPCA 1997c
73.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
73.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4	MPCA 1997c
73.7*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43	MPCA 1997c
73.7*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 red. biolum.^	Not toxic	2.43	MPCA 1997c
73.7*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43	MPCA 1997c
76.9*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81	MPCA 1997b
76.9*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 red. biolum.^	Not toxic	13.81	MPCA 1997b
76.9*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81	MPCA 1997b
76.9*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81	MPCA 1997b
77.5*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	2.9	Crane <i>et al.</i> 1997
77.5*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.9	Crane <i>et al.</i> 1997
77.6*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	50 % survival	Not toxic	3.2	MPCA 1997b
77.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 EC50 biolum.#	Not toxic	3.2	MPCA 1997b
77.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	45.6 red. biolum.^	Toxic	3.2	MPCA 1997b
78.4*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5	Crane <i>et al.</i> 1997
78.4*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5	Crane <i>et al.</i> 1997
82.1*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	12	Crane <i>et al.</i> 1997
82.1*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	12	Crane <i>et al.</i> 1997
83.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	13.8 red. biolum.^	Not toxic	2.93	MPCA 1997b
83.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	2.93	MPCA 1997b
83.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	2.93	MPCA 1997b
88.3*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	3.32	MPCA 1997b
88.3*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.1 red. biolum.^	Not toxic	3.32	MPCA 1997b
88.3*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	55 % survival	Not toxic	3.32	MPCA 1997b



**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
88.3*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	3.32	MPCA 1997b
88.3*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91	MPCA 1997c
88.3*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91	MPCA 1997c
88.3*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 red. biolum.^	Toxic	13.91	MPCA 1997c
88.3*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91	MPCA 1997c
88.3*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91	MPCA 1997c
91.3*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.69	MPCA 1997b
91.3*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1 red. biolum.^	Not toxic	3.69	MPCA 1997b
91.3*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.69	MPCA 1997b
91.3*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.69	MPCA 1997b
91.3*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	3.07	MPCA 1997b
91.3*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.07	MPCA 1997b
91.3*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.07	MPCA 1997b
91.3*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.2 EC50 biolum.#	Toxic	3.07	MPCA 1997b
93.5*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	2.67	MPCA 1997b
93.5*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	2.67	MPCA 1997b
93.5*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	91 % survival	Not toxic	2.67	MPCA 1997b
93.5*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	31.2 red. biolum.^	Toxic	2.67	MPCA 1997b
95.5*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.45 EC50 biolum.#	Toxic	2.88	MPCA 1997b
95.5*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	2.88	MPCA 1997b
95.5*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	2.88	MPCA 1997b
96.2*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63	MPCA 1997b
96.2*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63	MPCA 1997b
96.2*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63	MPCA 1997b
96.2*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 red. biolum.^	Toxic	2.63	MPCA 1997b
99.2*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 red. biolum.^	Not toxic	4.36	MPCA 1997b
99.2*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36	MPCA 1997b
99.2*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36	MPCA 1997b
99.2*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36	MPCA 1997b
100	Duluth-Superior Harbor-Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	100 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
100	Duluth-Superior Harbor-Allouez Bay	48-h	Cladoceran	<i>Daphnia magna</i>	Unknown	100 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
103*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 red. biolum.^	Toxic	3.95	MPCA 1997c
103*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 red. biolum.^	Toxic	3.95	MPCA 1997c

**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
103*	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
103*	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95	MPCA 1997c
103*	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
103*	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95	MPCA 1997c
106*	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02	MPCA 1997b
106*	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.02	MPCA 1997b
106*	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	4.02	MPCA 1997b
106*	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	4.02	MPCA 1997b
107*	Duluth-Superior Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.34 EC50 biolum.#	Toxic	3.38	MPCA 1997b
107*	Duluth-Superior Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.38	MPCA 1997b
107*	Duluth-Superior Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	35 % survival	Not toxic	3.38	MPCA 1997b
107*	Duluth-Superior Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	19.2 red. biolum.^	Not toxic	3.38	MPCA 1997b
109*	Duluth-Superior Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.3 EC50 biolum.#	Toxic	4.41	MPCA 1997b
109*	Duluth-Superior Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.8 red. biolum.^	Not toxic	4.41	MPCA 1997b
109*	Duluth-Superior Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.41	MPCA 1997b
109*	Duluth-Superior Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.41	MPCA 1997b
112*	Duluth-Superior Harbor-Howards Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	3.9	Crane <i>et al.</i> 1997
112*	Duluth-Superior Harbor-Howards Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	3.9	Crane <i>et al.</i> 1997
115*	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97	MPCA 1997c
115*	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97	MPCA 1997c
115*	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97	MPCA 1997c
115*	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.97	MPCA 1997c
115*	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97	MPCA 1997c
116*	Lower St. Louis River		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.22 red. biolum.^	Not toxic	2.37	MPCA 1997b
116*	Lower St. Louis River		10 day	Diptera	<i>Chironomus tentans</i>	LAR	77.5 % survival	Not toxic	2.37	MPCA 1997b
116*	Lower St. Louis River		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.57 EC50 biolum.#	Not toxic	2.37	MPCA 1997b
116*	Lower St. Louis River		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.37	MPCA 1997b
120	Duluth-Superior Harbor-Hallett Coal Dock #6		48-h	Cladoceran	<i>Daphnia magna</i>	Unknown	95 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
120	Duluth-Superior Harbor-North of Minnesota		10 day	Diptera	<i>Chironomus tentans</i>	Unknown	100 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
120	Duluth-Superior Harbor-North of Minnesota		48-h	Cladoceran	<i>Daphnia magna</i>	Unknown	100 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
120	St. Louis River-Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42	IT Corp. 1996
120	St. Louis River-Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93	IT Corp. 1996
120	St. Louis River-Keene Creek		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42	IT Corp. 1996

**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
120	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42	IT Corp. 1996
120	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42	IT Corp. 1996
120	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93	IT Corp. 1996
120	Duluth-Superior Harbor-Hallett Coal Dock #6	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	86.6 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
120	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93	IT Corp. 1996
120	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93	IT Corp. 1996
122*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97	MPCA 1997c
122*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97	MPCA 1997c
122*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 red. biolum.^	Toxic	8.97	MPCA 1997c
122*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97	MPCA 1997c
122*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97	MPCA 1997c
122*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05	MPCA 1997c
122*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05	MPCA 1997c
122*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05	MPCA 1997c
122*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 red. biolum.^	Toxic	4.05	MPCA 1997c
122*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05	MPCA 1997c
124*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98	MPCA 1997b
124*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 red. biolum.^	Toxic	13.98	MPCA 1997b
124*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98	MPCA 1997b
124*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98	MPCA 1997b
125*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87	MPCA 1997c
125*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87	MPCA 1997c
125*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87	MPCA 1997c
125*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 red. biolum.^	Not toxic	3.87	MPCA 1997c
125*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87	MPCA 1997c
125*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99	MPCA 1997c
125*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.99	MPCA 1997c
125*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99	MPCA 1997c
125*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	10.68	MPCA 1997b
125*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.34 EC50 biolum.#	Toxic	10.68	MPCA 1997b
125*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.8 red. biolum.^	Not toxic	10.68	MPCA 1997b
139*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 red. biolum.^	Not toxic	29.84	MPCA 1997c
139*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84	MPCA 1997c

**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
139*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84	MPCA 1997c
139*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84	MPCA 1997c
139*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84	MPCA 1997c
143	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4	IT Corp. 1996
143	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4	IT Corp. 1996
143	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4	IT Corp. 1996
143	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4	IT Corp. 1996
145*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34	MPCA 1997b
145*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34	MPCA 1997b
145*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 red. biolum.^	Not toxic	5.34	MPCA 1997b
145*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34	MPCA 1997b
145*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	3	Crane <i>et al.</i> 1997
146*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59	MPCA 1997b
146*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59	MPCA 1997b
146*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 red. biolum.^	Not toxic	5.59	MPCA 1997b
146*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59	MPCA 1997b
149*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.24	MPCA 1997b
149*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.12 EC50 biolum.#	Toxic	4.24	MPCA 1997b
149*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	41 % survival	Toxic	4.24	MPCA 1997b
149*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	53.2 red. biolum.^	Toxic	4.24	MPCA 1997b
151*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	2.8	Crane <i>et al.</i> 1997
151*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	3	Crane <i>et al.</i> 1997
151*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3	Crane <i>et al.</i> 1997
152*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47	MPCA 1997b
152*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 red. biolum.^	Toxic	3.47	MPCA 1997b
152*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47	MPCA 1997b
152*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47	MPCA 1997b
161*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11	MPCA 1997b
161*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11	MPCA 1997b
161*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11	MPCA 1997b
161*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11	MPCA 1997b
161*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 red. biolum.^	Not toxic	4.11	MPCA 1997b
161*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11	MPCA 1997b

**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
161*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	6.5	Crane <i>et al.</i> 1997
161*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	6.5	Crane <i>et al.</i> 1997
165*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	55 % survival	Toxic	2.2	Crane <i>et al.</i> 1997
165*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.2	Crane <i>et al.</i> 1997
167*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 red. biolum.^	Not toxic	4.05	MPCA 1997b
167*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05	MPCA 1997b
167*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05	MPCA 1997b
167*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05	MPCA 1997b
167	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08	IT Corp. 1996
167	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08	IT Corp. 1996
167	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08	IT Corp. 1996
167	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08	IT Corp. 1996
168*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54	MPCA 1997b
168*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54	MPCA 1997b
168*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 red. biolum.^	Toxic	4.54	MPCA 1997b
168*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54	MPCA 1997b
171*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	3.99	MPCA 1997b
171*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	3.99	MPCA 1997b
171*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	10 % survival	Toxic	3.99	MPCA 1997b
171*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	66.5 red. biolum.^	Toxic	3.99	MPCA 1997b
172*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98	MPCA 1997b
172*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98	MPCA 1997b
172*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98	MPCA 1997b
172*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 red. biolum.^	Not toxic	3.98	MPCA 1997b
174*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48	MPCA 1997c
174*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 red. biolum.^	Toxic	4.48	MPCA 1997c
174*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48	MPCA 1997c
176*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13	MPCA 1997b
176*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13	MPCA 1997b
176*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13	MPCA 1997b
176*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 red. biolum.^	Toxic	2.13	MPCA 1997b
177*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.2	Crane <i>et al.</i> 1997
177*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.2	Crane <i>et al.</i> 1997

**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
178*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.6	Crane <i>et al.</i> 1997
178*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	6.6	Crane <i>et al.</i> 1997
178*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13	MPCA 1997b
178*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13	MPCA 1997b
178*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13	MPCA 1997b
178*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 red. biolum.^	Toxic	4.13	MPCA 1997b
184*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	3.76	MPCA 1997b
184*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.25 EC50 biolum.#	Toxic	3.76	MPCA 1997b
184*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.1 red. biolum.^	Not toxic	3.76	MPCA 1997b
184*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	44 % survival	Not toxic	3.76	MPCA 1997b
184*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	5.2	Crane <i>et al.</i> 1997
184*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	78 % survival	Not toxic	5.2	Crane <i>et al.</i> 1997
203*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 red. biolum.^	Toxic	11.975	MPCA 1997c
203*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.975	MPCA 1997c
203*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.975	MPCA 1997c
203*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.975	MPCA 1997c
203*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.975	MPCA 1997c
210	Duluth-Superior Harbor-Northeast of Western Lake	10 day	Diptera	<i>Chironomus tentans</i>	Unknown	100 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
210	Duluth-Superior Harbor-Northeast of Western Lake	48-h	Cladoceran	<i>Daphnia magna</i>	Unknown	100 % survival	Not toxic	NR	Smith <i>et al.</i> 1992
221*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77	MPCA 1997c
221*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77	MPCA 1997c
221*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77	MPCA 1997c
221*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77	MPCA 1997c
221*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 red. biolum.^	Toxic	6.77	MPCA 1997c
229*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82	MPCA 1997b
229*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82	MPCA 1997b
229*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82	MPCA 1997b
229*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 red. biolum.^	Toxic	0.82	MPCA 1997b
233*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19	MPCA 1997b
233*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19	MPCA 1997b
233*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 red. biolum.^	Toxic	14.19	MPCA 1997b
233*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19	MPCA 1997b
243*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03	MPCA 1997c

**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
243*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03	MPCA 1997c
243*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 red. biolum.^	Toxic	6.03	MPCA 1997c
252*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 red. biolum.^	Not toxic	4.7	MPCA 1997b
252*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7	MPCA 1997b
252*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7	MPCA 1997b
252*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7	MPCA 1997b
253	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12	MPCA 1996
258	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16	IT Corp. 1996
258	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16	IT Corp. 1996
258	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16	IT Corp. 1996
258	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16	IT Corp. 1996
278	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58	MPCA 1996
281	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88	MPCA 1996
315	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15	IT Corp. 1996
315	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15	IT Corp. 1996
315	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15	IT Corp. 1996
315	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15	IT Corp. 1996
357*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 red. biolum.^	Toxic	1	MPCA 1997c
357*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1	MPCA 1997c
357*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1	MPCA 1997c
357*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1	MPCA 1997c
357*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1	MPCA 1997c
409	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95	IT Corp. 1996
409	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95	IT Corp. 1996
409	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95	IT Corp. 1996
409	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95	IT Corp. 1996
423	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1	IT Corp. 1996
423	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1	IT Corp. 1996
423	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1	IT Corp. 1996
423	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1	IT Corp. 1996
452	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76	IT Corp. 1996
452	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76	IT Corp. 1996
452	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76	IT Corp. 1996

**Table G-7. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Zinc in the St. Louis River Area of Concern**

Zinc (mg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
452	St. Louis River-Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76	IT Corp. 1996
501	St. Louis River-Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12	IT Corp. 1996
501	St. Louis River-Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12	IT Corp. 1996
501	St. Louis River-Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12	IT Corp. 1996
501	St. Louis River-Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12	IT Corp. 1996
609	St. Louis River-Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR	IT Corp. 1996
609	St. Louis River-Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR	IT Corp. 1996
609	St. Louis River-Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR	IT Corp. 1996
609	St. Louis River-Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR	IT Corp. 1996
1089	St. Louis River-Keene Creek		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	IT Corp. 1996
1089	St. Louis River-Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	NR	IT Corp. 1996
1089	St. Louis River-Keene Creek		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	NR	IT Corp. 1996
1089	St. Louis River-Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	NR	IT Corp. 1996
1246	St. Louis River-Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54	IT Corp. 1996
1246	St. Louis River-Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54	IT Corp. 1996
1246	St. Louis River-Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54	IT Corp. 1996
1246	St. Louis River-Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54	IT Corp. 1996
1498	St. Louis River-Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37	IT Corp. 1996
1498	St. Louis River-Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37	IT Corp. 1996
1498	St. Louis River-Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37	IT Corp. 1996
1498	St. Louis River-Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37	IT Corp. 1996

\* = SEM measurement; ^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. Biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.

LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.



**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
0.600*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14	MPCA 1997b
0.600*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 red. biolum.^	Toxic	0.14	MPCA 1997b
0.600*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14	MPCA 1997b
0.600*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14	MPCA 1997b
0.880*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08	MPCA 1997b
0.880*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08	MPCA 1997b
0.880*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08	MPCA 1997b
0.880*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2	MPCA 1997b
0.880*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26	MPCA 1997b
0.880*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26	MPCA 1997b
0.880*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26	MPCA 1997b
0.880*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 red. biolum.^	Toxic	0.08	MPCA 1997b
0.880*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2	MPCA 1997b
0.880*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	25.2 red. biolum.^	Toxic	0.2	MPCA 1997b
0.880*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2	MPCA 1997b
0.880*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 red. biolum.^	Toxic	8.26	MPCA 1997b
0.894*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59	MPCA 1997b
0.894*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59	MPCA 1997b
0.894*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	0.59	MPCA 1997b
1.03*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16	MPCA 1997b
1.03*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16	MPCA 1997b
1.03*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 red. biolum.^	Toxic	0.16	MPCA 1997b
1.08*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	64 % survival	Not toxic	0.14	MPCA 1997b
1.08*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.08 EC50 biolum.#	Not toxic	0.14	MPCA 1997b
1.08*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	45.3 red. biolum.^	Toxic	0.14	MPCA 1997b
1.08*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	0.14	MPCA 1997b
1.14*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35	MPCA 1997b
1.14*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35	MPCA 1997b
1.14*	Allouez Bay	30 minute	Bacteria	<i>Chironomus tentans</i>	NA	26.2 red. biolum.^	Toxic	0.35	MPCA 1997b
1.18*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24	MPCA 1997b
1.18*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24	MPCA 1997b

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1.18*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24	MPCA 1997b
1.18*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 red. biolum.^	Toxic	0.24	MPCA 1997b
1.21*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	81.5 red. biolum.^	Toxic	8.4	MPCA 1997b
1.21*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.2 EC50 biolum.#	Toxic	8.4	MPCA 1997b
1.21*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	3 % survival	Toxic	8.4	MPCA 1997b
1.21*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.4	MPCA 1997b
1.44*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 red. biolum.^	Not toxic	1.69	MPCA 1997c
1.44*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69	MPCA 1997c
1.44*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69	MPCA 1997c
1.52*	St. Louis Bay-East of Erie Pier	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Toxic	0.28	Crane <i>et al.</i> 1997
1.52*	St. Louis Bay-East of Erie Pier	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.28	Crane <i>et al.</i> 1997
1.62*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44	MPCA 1997c
1.62*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44	MPCA 1997c
1.62*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 red. biolum.^	Not toxic	1.44	MPCA 1997c
1.63*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4	MPCA 1997b
1.63*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4	MPCA 1997b
1.63*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 red. biolum.^	Toxic	0.4	MPCA 1997b
1.63*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4	MPCA 1997b
1.63*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4	MPCA 1997b
1.63*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4	MPCA 1997b
1.64*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71	MPCA 1997c
1.64*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 red. biolum.^	Toxic	1.71	MPCA 1997c
1.64*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71	MPCA 1997c
1.64*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71	MPCA 1997c
1.64*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71	MPCA 1997c
1.69*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12	MPCA 1997b
1.69*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12	MPCA 1997b
1.69*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 red. biolum.^	Not toxic	0.12	MPCA 1997b
1.69*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12	MPCA 1997b
1.73*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47	MPCA 1997b
1.73*	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47	MPCA 1997b

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1.73*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 red. biolum.^	Toxic	4.47	MPCA 1997b
1.73*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47	MPCA 1997b
1.88*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65	MPCA 1997c
1.88*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65	MPCA 1997c
1.88*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65	MPCA 1997c
1.88*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.65	MPCA 1997c
1.88*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65	MPCA 1997c
2.05*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 red. biolum.^	Not toxic	4.02	MPCA 1997c
2.05*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02	MPCA 1997c
2.05*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02	MPCA 1997c
2.05*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02	MPCA 1997c
2.05*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02	MPCA 1997c
2.16*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37	MPCA 1997c
2.16*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37	MPCA 1997c
2.16*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 red. biolum.^	Not toxic	1.37	MPCA 1997c
2.16*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37	MPCA 1997c
2.16*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37	MPCA 1997c
2.19*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	1.55	MPCA 1997b
2.19*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.7 red. biolum.^	Not toxic	1.55	MPCA 1997b
2.19*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	1.55	MPCA 1997b
2.22*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 red. biolum.^	Not toxic	2.98	MPCA 1997c
2.22*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98	MPCA 1997c
2.22*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98	MPCA 1997c
2.22*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98	MPCA 1997c
2.22*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98	MPCA 1997c
2.23*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 red. biolum.^	Toxic	13.91	MPCA 1997c
2.23*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91	MPCA 1997c
2.23*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91	MPCA 1997c
2.23*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91	MPCA 1997c
2.23*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91	MPCA 1997c
2.36*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.975	MPCA 1997c

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
2.36*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 red. biolum.^	Toxic	11.975	MPCA 1997c
2.36*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.975	MPCA 1997c
2.36*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.975	MPCA 1997c
2.36*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.975	MPCA 1997c
2.60*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	0.89	Crane <i>et al.</i> 1997
2.60*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	0.89	Crane <i>et al.</i> 1997
2.77*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 red. biolum.^	Not toxic	2.7	MPCA 1997c
2.77*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7	MPCA 1997c
2.77*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
2.77*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7	MPCA 1997c
2.77*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 red. biolum.^	Not toxic	2.7	MPCA 1997c
2.77*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7	MPCA 1997c
2.77*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7	MPCA 1997c
2.77*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7	MPCA 1997c
2.77*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7	MPCA 1997c
2.77*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
2.79*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72	MPCA 1997c
2.79*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	6.72	MPCA 1997c
2.79*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72	MPCA 1997c
2.79*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72	MPCA 1997c
2.79*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72	MPCA 1997c
2.85*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 red. biolum.^	Not toxic	0.61	MPCA 1997b
2.85*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.36 EC50 biolum.#	Not toxic	0.61	MPCA 1997b
2.85*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	0.61	MPCA 1997b
2.85*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	0.61	MPCA 1997b
3.08*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.06 EC50 biolum.#	Not toxic	0.81	MPCA 1997b
3.08*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.9 red. biolum.^	Toxic	0.81	MPCA 1997b
3.08*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	0.81	MPCA 1997b
3.08*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	0.81	MPCA 1997b
3.27*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.8 red. biolum.^	Not toxic	0.86	MPCA 1997b
3.27*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	0.86	MPCA 1997b

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
3.27*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.18 EC50 biolum.#	Not toxic	0.86	MPCA 1997b
3.27*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	0.86	MPCA 1997b
3.53*	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02	MPCA 1997b
3.53*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02	MPCA 1997b
3.53*	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 red. biolum.^	Toxic	1.02	MPCA 1997b
3.53*	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02	MPCA 1997b
3.59*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	78 % survival	Not toxic	1.85	MPCA 1997b
3.59*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.9 red. biolum.^	Not toxic	1.85	MPCA 1997b
3.59*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.75 EC50 biolum.#	Not toxic	1.85	MPCA 1997b
3.59*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	1.85	MPCA 1997b
3.70*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.31 red. biolum.^	Toxic	0.68	MPCA 1997b
3.70*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.68	MPCA 1997b
3.70*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.83 EC50 biolum.#	Not toxic	0.68	MPCA 1997b
3.77*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	2.24	MPCA 1997c
3.77*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24	MPCA 1997c
3.77*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24	MPCA 1997c
3.77*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24	MPCA 1997c
3.77*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24	MPCA 1997c
3.79*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 red. biolum.^	Toxic	4.48	MPCA 1997c
3.79*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48	MPCA 1997c
3.79*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48	MPCA 1997c
4.07*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 red. biolum.^	Toxic	3.25	MPCA 1997c
4.07*	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25	MPCA 1997c
4.07*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25	MPCA 1997c
4.15*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	7.1	Crane <i>et al.</i> 1997
4.15*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	7.1	Crane <i>et al.</i> 1997
4.29*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	3.2	MPCA 1997b
4.29*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	3.2	MPCA 1997b
4.29*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.2	MPCA 1997b
4.29*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.2	MPCA 1997b
4.30*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 red. biolum.^	Toxic	3.07	MPCA 1997b

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
4.30*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07	MPCA 1997b
4.30*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07	MPCA 1997b
4.37*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97	MPCA 1997c
4.37*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 red. biolum.^	Toxic	8.97	MPCA 1997c
4.37*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97	MPCA 1997c
4.37*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97	MPCA 1997c
4.37*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97	MPCA 1997c
4.45*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	0.56	MPCA 1997b
4.45*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.12 EC50 biolum.#	Not toxic	0.56	MPCA 1997b
4.45*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 red. biolum.^	Not toxic	0.56	MPCA 1997b
4.45*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67.5 % survival	Not toxic	0.56	MPCA 1997b
4.56*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	2.3	Crane <i>et al.</i> 1997
4.56*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.3	Crane <i>et al.</i> 1997
4.64*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85	MPCA 1997c
4.64*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.85	MPCA 1997c
4.64*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85	MPCA 1997c
4.64*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85	MPCA 1997c
4.64*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85	MPCA 1997c
4.66*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.99	MPCA 1997c
4.66*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99	MPCA 1997c
4.66*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99	MPCA 1997c
4.73*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	12	Crane <i>et al.</i> 1997
4.73*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	12	Crane <i>et al.</i> 1997
4.81*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59	MPCA 1997b
4.81*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 red. biolum.^	Not toxic	5.59	MPCA 1997b
4.81*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59	MPCA 1997b
4.81*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59	MPCA 1997b
4.97*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 red. biolum.^	Not toxic	5.77	MPCA 1997b
4.97*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77	MPCA 1997b
4.97*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77	MPCA 1997b
4.97*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77	MPCA 1997b

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
4.97*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87	MPCA 1997c
4.97*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87	MPCA 1997c
4.97*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87	MPCA 1997c
4.97*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 red. biolum.^	Toxic	1.87	MPCA 1997c
4.97*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87	MPCA 1997c
5.03*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19	MPCA 1997b
5.03*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19	MPCA 1997b
5.03*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 red. biolum.^	Toxic	14.19	MPCA 1997b
5.03*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19	MPCA 1997b
5.05*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 red. biolum.^	Not toxic	1.82	MPCA 1997b
5.05*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82	MPCA 1997b
5.05*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82	MPCA 1997b
5.05*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82	MPCA 1997b
5.29*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43	MPCA 1997c
5.29*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 red. biolum.^	Not toxic	2.43	MPCA 1997c
5.29*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43	MPCA 1997c
5.30*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4	MPCA 1997c
5.30*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4	MPCA 1997c
5.30*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
5.30*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
5.30*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4	MPCA 1997c
5.30*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
5.30*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 red. biolum.^	Not toxic	3.4	MPCA 1997c
5.30*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
5.30*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4	MPCA 1997c
5.30*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 red. biolum.^	Not toxic	3.4	MPCA 1997c
5.31*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.735	MPCA 1997c
5.31*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.735	MPCA 1997c
5.31*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.735	MPCA 1997c
5.31*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.735	MPCA 1997c
5.31*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.735	MPCA 1997c

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
5.35*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	1.1	MPCA 1997b
5.35*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.1	MPCA 1997b
5.35*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	1.1	MPCA 1997b
5.35*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.1	MPCA 1997b
5.60*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 red. biolum.^	Not toxic	3.87	MPCA 1997c
5.60*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87	MPCA 1997c
5.60*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87	MPCA 1997c
5.60*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87	MPCA 1997c
5.60*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87	MPCA 1997c
5.61*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34	MPCA 1997c
5.61*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34	MPCA 1997c
5.61*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34	MPCA 1997c
5.61*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34	MPCA 1997c
5.61*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 red. biolum.^	Not toxic	2.34	MPCA 1997c
5.77*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05	MPCA 1997c
5.77*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 red. biolum.^	Toxic	4.05	MPCA 1997c
5.77*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05	MPCA 1997c
5.77*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05	MPCA 1997c
5.77*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05	MPCA 1997c
5.78*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 red. biolum.^	Not toxic	5.34	MPCA 1997b
5.78*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34	MPCA 1997b
5.78*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34	MPCA 1997b
5.78*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34	MPCA 1997b
5.80*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	1.75	MPCA 1997b
5.80*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.75	MPCA 1997b
5.80*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.87 red. biolum.^	Toxic	1.75	MPCA 1997b
5.80*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	1.75	MPCA 1997b
6.18*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.94	MPCA 1997b
6.18*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	1.94	MPCA 1997b
6.18*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	40.37 red. biolum.^	Toxic	1.94	MPCA 1997b
6.18*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	1.94	MPCA 1997b



**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
6.19*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	1.8	Crane <i>et al.</i> 1997
6.19*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.8	Crane <i>et al.</i> 1997
6.27*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97	MPCA 1997c
6.27*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97	MPCA 1997c
6.27*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97	MPCA 1997c
6.27*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97	MPCA 1997c
6.27*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.97	MPCA 1997c
6.35*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	2.6	Crane <i>et al.</i> 1997
6.41*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.19	MPCA 1997b
6.41*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	2.19	MPCA 1997b
6.41*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	27.4 red. biolum.^	Toxic	2.19	MPCA 1997b
6.41*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.18 EC50 biolum.#	Not toxic	2.19	MPCA 1997b
6.59*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36	MPCA 1997b
6.59*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36	MPCA 1997b
6.59*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 red. biolum.^	Not toxic	4.36	MPCA 1997b
6.59*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36	MPCA 1997b
6.94*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.4 red. biolum.^	Toxic	3.14	MPCA 1997b
6.94*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.14	MPCA 1997b
6.94*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.14	MPCA 1997b
7.00*	St. Louis Bay-East of Erie Pier	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	2.9	Crane <i>et al.</i> 1997
7.00*	St. Louis Bay-East of Erie Pier	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.9	Crane <i>et al.</i> 1997
7.14*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84	MPCA 1997b
7.14*	St. Louis River-Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84	MPCA 1997b
7.14*	St. Louis River-Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 red. biolum.^	Not toxic	4.84	MPCA 1997b
7.14*	St. Louis River-Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84	MPCA 1997b
7.25*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	2.5	Crane <i>et al.</i> 1997
7.25*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Toxic	2.5	Crane <i>et al.</i> 1997
7.37*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82	MPCA 1997b
7.37*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82	MPCA 1997b
7.37*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82	MPCA 1997b
7.37*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 red. biolum.^	Toxic	0.82	MPCA 1997b

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
7.54*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81	MPCA 1997b
7.54*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81	MPCA 1997b
7.54*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 red. biolum.^	Not toxic	13.81	MPCA 1997b
7.54*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81	MPCA 1997b
7.67*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.69	MPCA 1997b
7.67*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1 red. biolum.^	Not toxic	3.69	MPCA 1997b
7.67*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.69	MPCA 1997b
7.67*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.69	MPCA 1997b
7.71*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.2	MPCA 1997b
7.71*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.31 red. biolum.^	Not toxic	2.2	MPCA 1997b
7.71*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.2	MPCA 1997b
7.71*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	2.2	MPCA 1997b
7.72*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	55 % survival	Not toxic	3.32	MPCA 1997b
7.72*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.1 red. biolum.^	Not toxic	3.32	MPCA 1997b
7.72*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	3.32	MPCA 1997b
7.72*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	3.32	MPCA 1997b
7.96*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
7.96*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95	MPCA 1997c
7.96*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
7.96*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95	MPCA 1997c
7.96*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 red. biolum.^	Toxic	3.95	MPCA 1997c
7.96*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 red. biolum.^	Toxic	3.95	MPCA 1997c
7.96*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.82 red. biolum.^	Not toxic	2.34	MPCA 1997b
7.96*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	2.34	MPCA 1997b
7.96*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.34	MPCA 1997b
7.96*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.28 EC50 biolum.#	Toxic	2.34	MPCA 1997b
8.00*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.45 EC50 biolum.#	Toxic	2.88	MPCA 1997b
8.00*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	2.88	MPCA 1997b
8.00*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	2.88	MPCA 1997b
8.04*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	6.5	Crane <i>et al.</i> 1997
8.04*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	6.5	Crane <i>et al.</i> 1997

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
8.22*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	12 % survival	Toxic	NR	MPCA 1997b
8.22*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	60 % survival	Not toxic	NR	MPCA 1997b
8.22*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.4 EC50 biolum.#	Not toxic	NR	MPCA 1997b
8.22*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 red. biolum.^	Not toxic	NR	MPCA 1997b
8.23*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.9	Crane <i>et al.</i> 1997
8.23*	St. Louis Bay-South of DM & IR Taconite Storage Facility	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	2.9	Crane <i>et al.</i> 1997
8.43*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03	MPCA 1997c
8.43*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03	MPCA 1997c
8.43*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 red. biolum.^	Toxic	6.03	MPCA 1997c
8.43*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 red. biolum.^	Not toxic	4.05	MPCA 1997b
8.43*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05	MPCA 1997b
8.43*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05	MPCA 1997b
8.43*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05	MPCA 1997b
8.43*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	91 % survival	Not toxic	2.67	MPCA 1997b
8.43*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	2.67	MPCA 1997b
8.43*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	2.67	MPCA 1997b
8.43*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	31.2 red. biolum.^	Toxic	2.67	MPCA 1997b
8.50*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42	MPCA 1997b
8.50*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42	MPCA 1997b
8.50*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42	MPCA 1997b
8.50*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 red. biolum.^	Toxic	1.42	MPCA 1997b
8.50*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49	MPCA 1997b
8.50*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49	MPCA 1997b
8.50*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49	MPCA 1997b
8.50*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	17.49	MPCA 1997b
8.52*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5	Crane <i>et al.</i> 1997
8.52*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5	Crane <i>et al.</i> 1997
8.57*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63	MPCA 1997b
8.57*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 red. biolum.^	Toxic	2.63	MPCA 1997b
8.57*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63	MPCA 1997b
8.57*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63	MPCA 1997b

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
8.62*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.46 EC50 biolum.#	Not toxic	2.4	MPCA 1997b
8.62*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.4	MPCA 1997b
8.62*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.4	MPCA 1997b
8.62*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	35.18 red. biolum.^	Toxic	2.4	MPCA 1997b
8.72*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	1.35	MPCA 1997b
8.72*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35	MPCA 1997b
8.72*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35	MPCA 1997b
8.72*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35	MPCA 1997b
8.72*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 red. biolum.^	Toxic	6.77	MPCA 1997c
8.72*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77	MPCA 1997c
8.72*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77	MPCA 1997c
8.72*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77	MPCA 1997c
8.72*	Duluth-Superior Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77	MPCA 1997c
9.02*	Spirit Lake-Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.6	Crane <i>et al.</i> 1997
9.02*	Spirit Lake-Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	6.6	Crane <i>et al.</i> 1997
9.14*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13	MPCA 1997b
9.14*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13	MPCA 1997b
9.14*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 red. biolum.^	Toxic	4.13	MPCA 1997b
9.14*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13	MPCA 1997b
9.30*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	3.02	MPCA 1997b
9.30*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.02	MPCA 1997b
9.30*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.02	MPCA 1997b
9.30*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.02	MPCA 1997b
9.32*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13	MPCA 1997b
9.32*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 red. biolum.^	Toxic	2.13	MPCA 1997b
9.32*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13	MPCA 1997b
9.32*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13	MPCA 1997b
9.45*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98	MPCA 1997b
9.45*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98	MPCA 1997b
9.45*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 red. biolum.^	Toxic	13.98	MPCA 1997b
9.45*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98	MPCA 1997b

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
9.48*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.3 EC50 biolum.#	Toxic	4.41	MPCA 1997b
9.48*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.41	MPCA 1997b
9.48*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.8 red. biolum.^	Not toxic	4.41	MPCA 1997b
9.48*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.41	MPCA 1997b
9.57*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	13.8 red. biolum.^	Not toxic	2.93	MPCA 1997b
9.57*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	2.93	MPCA 1997b
9.57*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	2.93	MPCA 1997b
9.69*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	10.68	MPCA 1997b
9.69*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	14.8 red. biolum.^	Not toxic	10.68	MPCA 1997b
9.69*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.34 EC50 biolum.#	Toxic	10.68	MPCA 1997b
9.69*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59	MPCA 1997b
9.69*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59	MPCA 1997b
9.69*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 red. biolum.^	Not toxic	2.59	MPCA 1997b
9.69*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59	MPCA 1997b
9.86*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67.5 % survival	Not toxic	2.82	MPCA 1997b
9.86*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.82	MPCA 1997b
9.86*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.23 EC50 biolum.#	Toxic	2.82	MPCA 1997b
9.86*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.17 red. biolum.^	Not toxic	2.82	MPCA 1997b
9.98*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	3.07	MPCA 1997b
9.98*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.2 EC50 biolum.#	Toxic	3.07	MPCA 1997b
9.98*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.07	MPCA 1997b
9.98*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	3.07	MPCA 1997b
10.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 red. biolum.^	Not toxic	4.11	MPCA 1997b
10.0*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11	MPCA 1997b
10.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11	MPCA 1997b
10.0*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11	MPCA 1997b
10.0*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11	MPCA 1997b
10.0*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11	MPCA 1997b
10.1*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	5.2	Crane <i>et al.</i> 1997
10.1*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	78 % survival	Not toxic	5.2	Crane <i>et al.</i> 1997
10.3*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 red. biolum.^	Not toxic	2.91	MPCA 1997b

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
10.3*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91	MPCA 1997b
10.3*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91	MPCA 1997b
10.3*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91	MPCA 1997b
10.5*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 EC50 biolum.#	Not toxic	3.2	MPCA 1997b
10.5*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	45.6 red. biolum.^	Toxic	3.2	MPCA 1997b
10.5*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	50 % survival	Not toxic	3.2	MPCA 1997b
10.7	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64	IT Corp. 1996
10.7	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64	IT Corp. 1996
10.7	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64	IT Corp. 1996
10.7	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64	IT Corp. 1996
10.7*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 red. biolum.^	Not toxic	3.98	MPCA 1997b
10.7*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98	MPCA 1997b
10.7*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98	MPCA 1997b
10.7*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98	MPCA 1997b
11.0*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.37	MPCA 1997b
11.0*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	2.37	MPCA 1997b
11.0*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.64 EC50 biolum.#	Not toxic	2.37	MPCA 1997b
11.0*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.9 red. biolum.^	Toxic	2.37	MPCA 1997b
11.3*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84	MPCA 1997c
11.3*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 red. biolum.^	Not toxic	29.84	MPCA 1997c
11.3*	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84	MPCA 1997c
11.3*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84	MPCA 1997c
11.3*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84	MPCA 1997c
11.9*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 red. biolum.^	Not toxic	4.02	MPCA 1997b
11.9*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.58 EC50 biolum.#	Not toxic	4.02	MPCA 1997b
11.9*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.02	MPCA 1997b
11.9*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02	MPCA 1997b
11.9*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82	MPCA 1997b
11.9*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82	MPCA 1997b
11.9*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82	MPCA 1997b
11.9*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 red. biolum.^	Not toxic	2.82	MPCA 1997b

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
12.2*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	3	Crane <i>et al.</i> 1997
12.2*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3	Crane <i>et al.</i> 1997
12.3*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	3.9	Crane <i>et al.</i> 1997
12.3*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	3.9	Crane <i>et al.</i> 1997
12.4*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.38	MPCA 1997b
12.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.34 EC50 biolum.#	Toxic	3.38	MPCA 1997b
12.4*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	19.2 red. biolum.^	Not toxic	3.38	MPCA 1997b
12.4*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	35 % survival	Not toxic	3.38	MPCA 1997b
12.8*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	3.99	MPCA 1997b
12.8*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	10 % survival	Toxic	3.99	MPCA 1997b
12.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	66.5 red. biolum.^	Toxic	3.99	MPCA 1997b
12.8*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	3.99	MPCA 1997b
13.0*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	44 % survival	Not toxic	3.76	MPCA 1997b
13.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.1 red. biolum.^	Not toxic	3.76	MPCA 1997b
13.0*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	3.76	MPCA 1997b
13.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.25 EC50 biolum.#	Toxic	3.76	MPCA 1997b
13.0	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95	IT Corp. 1996
13.0	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95	IT Corp. 1996
13.0	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95	IT Corp. 1996
13.0	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95	IT Corp. 1996
13.3*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 red. biolum.^	Toxic	3.47	MPCA 1997b
13.3*	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47	MPCA 1997b
13.3*	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47	MPCA 1997b
13.3*	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47	MPCA 1997b
13.5*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	3	Crane <i>et al.</i> 1997
13.6*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	41 % survival	Toxic	4.24	MPCA 1997b
13.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.12 EC50 biolum.#	Toxic	4.24	MPCA 1997b
13.6*	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	53.2 red. biolum.^	Toxic	4.24	MPCA 1997b
13.6*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.24	MPCA 1997b
13.7*	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77.5 % survival	Not toxic	2.37	MPCA 1997b
13.7*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.57 EC50 biolum.#	Not toxic	2.37	MPCA 1997b

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
13.7*	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.37	MPCA 1997b
13.7*	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	9.22 red. biolum.^	Not toxic	2.37	MPCA 1997b
13.8*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	55 % survival	Toxic	2.2	Crane <i>et al.</i> 1997
13.8*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.2	Crane <i>et al.</i> 1997
14.2*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	2.8	Crane <i>et al.</i> 1997
15.1*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1	MPCA 1997c
15.1*	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 red. biolum.^	Toxic	1	MPCA 1997c
15.1*	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1	MPCA 1997c
15.1*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1	MPCA 1997c
15.1*	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1	MPCA 1997c
16.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7	MPCA 1997b
16.0*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 red. biolum.^	Not toxic	4.7	MPCA 1997b
16.0*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7	MPCA 1997b
16.0*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7	MPCA 1997b
16.6*	Duluth-Superior Harbor-Howards Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.2	Crane <i>et al.</i> 1997
16.6*	Duluth-Superior Harbor-Howards Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.2	Crane <i>et al.</i> 1997
17.2	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42	IT Corp. 1996
17.2	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42	IT Corp. 1996
17.2	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42	IT Corp. 1996
17.2	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42	IT Corp. 1996
17.7*	Duluth-Superior Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54	MPCA 1997b
17.7*	Duluth-Superior Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54	MPCA 1997b
17.7*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54	MPCA 1997b
17.7*	Duluth-Superior Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 red. biolum.^	Toxic	4.54	MPCA 1997b
28.7	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08	IT Corp. 1996
28.7	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08	IT Corp. 1996
28.7	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08	IT Corp. 1996
28.7	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08	IT Corp. 1996
30.4	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4	IT Corp. 1996
30.4	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4	IT Corp. 1996
30.4	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4	IT Corp. 1996



**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
30.4	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4	IT Corp. 1996
34.4	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16	IT Corp. 1996
34.4	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16	IT Corp. 1996
34.4	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16	IT Corp. 1996
34.4	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16	IT Corp. 1996
41.6	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93	IT Corp. 1996
41.6	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93	IT Corp. 1996
41.6	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93	IT Corp. 1996
41.6	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93	IT Corp. 1996
44.2	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15	IT Corp. 1996
44.2	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15	IT Corp. 1996
44.2	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15	IT Corp. 1996
44.2	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15	IT Corp. 1996
62.1	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12	IT Corp. 1996
62.1	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12	IT Corp. 1996
62.1	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12	IT Corp. 1996
62.1	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12	IT Corp. 1996
65.6	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76	IT Corp. 1996
65.6	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76	IT Corp. 1996
65.6	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76	IT Corp. 1996
65.6	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76	IT Corp. 1996
72.6	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR	IT Corp. 1996
72.6	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR	IT Corp. 1996
72.6	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR	IT Corp. 1996
72.6	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR	IT Corp. 1996
73.2	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1	IT Corp. 1996
73.2	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1	IT Corp. 1996
73.2	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1	IT Corp. 1996
73.2	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1	IT Corp. 1996
93.0	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	NR	IT Corp. 1996
93.0	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	NR	IT Corp. 1996

**Table G-8. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Nickel in the St. Louis River Area of Concern**

Nickel (mg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
93.0	St. Louis River-Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	IT Corp. 1996
93.0	St. Louis River-Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	NR	IT Corp. 1996
145	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37	IT Corp. 1996
145	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37	IT Corp. 1996
145	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37	IT Corp. 1996
145	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37	IT Corp. 1996
166	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54	IT Corp. 1996
166	St. Louis River-Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54	IT Corp. 1996
166	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54	IT Corp. 1996
166	St. Louis River-Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54	IT Corp. 1996

\* = SEM measurement; ^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. Biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.

LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

**Table G-9. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polychlorinated Biphenyls (PCBs) in the St. Louis River Area of Concern**

Total PCBs (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
59.0	D-S Harbor - City of Superior WWTP	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
78.5	D-S Harbor - City of Superior WWTP	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	79 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
109	D-S Harbor - City of Superior WWTP	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 mg growth	Not toxic	NR	Crane <i>et al.</i> 1997
109	D-S Harbor - City of Superior WWTP	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
120	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
120	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
134	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
145	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
145	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR	Crane <i>et al.</i> 1997
203	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
203	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
208	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
208	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
241	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
241	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
259	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
270	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
283	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
283	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
326	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR	Crane <i>et al.</i> 1997
326	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
346	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
396	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
424	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
491	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
816	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
816	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997

^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
35.0	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08
35.0	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08
35.0	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 mg growth	Not toxic	0.08
35.0	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 % red. biolum.^	Toxic	0.08
52.9	St. Louis River - Miller & Coffee Creek Embayment		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93
52.9	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93
52.9	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93
52.9	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93
59.9	Allouez Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35
59.9	Allouez Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35
59.9	Allouez Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 % red. biolum.^	Toxic	0.35
62.0	Allouez Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59
62.0	Allouez Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	0.59
62.0	Allouez Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
68.1	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14
68.1	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14
68.1	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 % red. biolum.^	Toxic	0.14
68.1	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14
81.3	Allouez Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02
81.3	Allouez Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02
81.3	Allouez Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02
81.3	Allouez Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 % red. biolum.^	Toxic	1.02
102	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 % red. biolum.^	Not toxic	0.12
102	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12
102	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12
102	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12
154	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2
154	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2
154	D-S Harbor		30 minute	Bacteria	<i>Chironomus tentans</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2
154	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	25.2 % red. biolum.^	Toxic	0.2
273	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16
273	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 % red. biolum.^	Toxic	0.16
273	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16

**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
277	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77
277	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77
277	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77
277	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 % red. biolum.^	Not toxic	5.77
279	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42
279	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 % red. biolum.^	Toxic	1.42
279	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42
279	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42
299	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82
299	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82
299	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82
299	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 % red. biolum.^	Not toxic	2.82
333	Lower St. Louis River		10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91
333	Lower St. Louis River		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 % red. biolum.^	Not toxic	2.91
333	Lower St. Louis River		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91
333	Lower St. Louis River		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91
340	Superior Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	6.7
340	Superior Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7
340	Superior Bay		48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	6.7
340	Superior Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7
344	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87
344	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87
344	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 % red. biolum.^	Toxic	1.87
344	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87
344	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87
496	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4
496	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4
496	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 % red. biolum.^	Toxic	0.4
496	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4
496	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4
496	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4
528	Spirit Lake - Grassy Point		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR
528	Spirit Lake - Grassy Point		10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR

**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
529	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59
529	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	2.59
529	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59
529	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59
534	Lower St. Louis River		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7
534	Lower St. Louis River		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 % red. biolum.^	Not toxic	2.7
534	Lower St. Louis River		10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7
534	Lower St. Louis River		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
534	Lower St. Louis River		10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7
534	Lower St. Louis River		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 % red. biolum.^	Not toxic	2.7
534	Lower St. Louis River		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7
534	Lower St. Louis River		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
534	Lower St. Louis River		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7
534	Lower St. Louis River		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7
604	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34
604	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34
604	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34
604	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	2.34
604	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34
675	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69
675	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69
675	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	1.69
689	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82
689	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82
689	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82
689	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 % red. biolum.^	Not toxic	1.82
725	Spirit Lake - Grassy Point		10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	NR
725	Spirit Lake - Grassy Point		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR
748	Lower St. Louis River		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25
748	Lower St. Louis River		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 % red. biolum.^	Toxic	3.25
748	Lower St. Louis River		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25
773	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35
773	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35

**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
773	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.35
773	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35
905	St. Louis Harbor		10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	85 % survival	Not toxic	0.7
905	St. Louis Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Not toxic	0.7
905	St. Louis Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Not toxic	0.7
905	St. Louis Harbor		10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	0.7
905	St. Louis Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	87.5 % survival	Not toxic	0.7
905	St. Louis Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Not determined	0.7
905	St. Louis Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.74 % weight using UV light	Not toxic	0.7
905	St. Louis Harbor		10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.65 mg growth	Toxic	0.7
905	St. Louis Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival/normal & UV	Toxic	0.7
905	St. Louis Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival/normal & UV	Toxic	0.7
940	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24
940	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24
940	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	2.24
940	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24
940	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24
1002	St. Louis River - Lower St. Louis River		10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84
1002	St. Louis River - Lower St. Louis River		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84
1002	St. Louis River - Lower St. Louis River		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84
1002	St. Louis River - Lower St. Louis River		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 % red. biolum.^	Not toxic	4.84
1536	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85
1536	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85
1536	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.85
1536	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85
1536	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85
1817	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34
1817	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34
1817	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34
1817	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 % red. biolum.^	Not toxic	5.34
1846	St. Louis Harbor		10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	100 % survival	Not toxic	4.1
1846	St. Louis Harbor		10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.83 % weight using UV light	Toxic	4.1
1846	St. Louis Harbor		10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.85 mg growth	Not toxic	4.1

**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
1846	St. Louis Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.05 % weight using UV light	Not toxic	4.1
1846	St. Louis Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72.5 % survival/normal & UV	Not toxic	4.1
1846	St. Louis Harbor		10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	87.5 % survival/normal & UV	Not toxic	4.1
1846	St. Louis Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.93 mg growth	Not toxic	4.1
1846	St. Louis Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Toxic	4.1
1846	St. Louis Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	4.1
1846	St. Louis Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.1
1846	St. Louis Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.08 % weight using UV light	Not toxic	4.1
1846	St. Louis Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival/normal & UV	Not toxic	4.1
2000	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.65
2000	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65
2000	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65
2000	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65
2000	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65
2489	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98
2489	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98
2489	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98
2489	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98
2489	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 % red. biolum.^	Not toxic	2.98
2684	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
2684	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95
2684	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95
2684	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 % red. biolum.^	Toxic	3.95
2684	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
2684	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 % red. biolum.^	Toxic	3.95
2742	Spirit Lake - Grassy Point		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	NR
2742	Spirit Lake - Grassy Point		10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	NR
2967	Spirit Lake - Grassy Point		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
2967	Spirit Lake - Grassy Point		10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR
4227	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4
4227	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4
4227	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 % red. biolum.^	Not toxic	3.4
4227	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4



**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
4227	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4
4227	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
4227	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 % red. biolum.^	Not toxic	3.4
4227	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
4227	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4
4227	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4
4276	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02
4276	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02
4276	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02
4276	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 % red. biolum.^	Not toxic	4.02
4276	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02
4296	Lower St. Louis River		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37
4296	Lower St. Louis River		10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37
4296	Lower St. Louis River		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37
4296	Lower St. Louis River		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37
4296	Lower St. Louis River		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 % red. biolum.^	Not toxic	1.37
4422	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
4813	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76
4813	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76
4813	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76
4813	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76
5159	St. Louis River - Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4
5159	St. Louis River - Keene Creek		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4
5159	St. Louis River - Keene Creek		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4
5159	St. Louis River - Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4
5224	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1
5224	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1
5224	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1
5224	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1
5224	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 % red. biolum.^	Toxic	1
5451	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
5568	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11
5568	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11

**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
5568	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11
5568	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11
5568	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11
5568	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 % red. biolum.^	Not toxic	4.11
5680	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 % red. biolum.^	Toxic	0.24
5680	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24
5680	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24
5680	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24
5695	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR
5782	D-S Harbor - Slip C		10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR
5782	D-S Harbor - Slip C		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR
6141	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
6688	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 % red. biolum.^	Not toxic	2.43
6688	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43
6688	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43
6826	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
6826	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
7025	Spirit Lake - Grassy Point		10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	NR
7025	Spirit Lake - Grassy Point		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	NR
7092	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
7092	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR
7201	D-S Harbor - Slip C		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
7247	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR
7247	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
7349	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54
7349	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 % red. biolum.^	Toxic	4.54
7349	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54
7349	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54
7504	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44
7504	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 % red. biolum.^	Not toxic	1.44
7504	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44
7802	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR
7802	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR

**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
7829	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99
7829	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.99
7829	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99
7930	D-S Harbor - NW side of Lakehead Dock		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4
7930	D-S Harbor - NW side of Lakehead Dock		10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4
7930	D-S Harbor - NW side of Lakehead Dock		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4
7930	D-S Harbor - NW side of Lakehead Dock		48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	8.4
8078	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 % red. biolum.^	Not toxic	3.87
8078	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87
8078	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87
8078	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87
8078	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87
8292	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05
8292	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 % red. biolum.^	Not toxic	4.05
8292	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05
8292	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05
8482	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81
8482	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 % red. biolum.^	Not toxic	13.81
8482	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81
8482	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81
8692	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
8692	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
8765	St. Louis Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Toxic	6.1
8765	St. Louis Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 % weight using UV light	Not toxic	6.1
8765	St. Louis Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	82.5 % survival/normal & UV	Not toxic	6.1
8765	St. Louis Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	2.5 % survival/normal & UV	Toxic	6.1
8765	St. Louis Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.08 mg growth	Not determined	6.1
8765	St. Louis Harbor		10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.54 mg growth	Toxic	6.1
8765	St. Louis Harbor		10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	6.1
8765	St. Louis Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	42.5 % survival	Toxic	6.1
8765	St. Louis Harbor		10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	75 % survival	Toxic	6.1
8765	St. Louis Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	92.5 % survival	Not toxic	6.1
9244	Spirit Lake - Grassy Point		10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR

**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
9244	Spirit Lake - Grassy Point		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	NR
9593	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13
9593	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 % red. biolum.^	Toxic	2.13
9593	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13
9593	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13
9710	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63
9710	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 % red. biolum.^	Toxic	2.63
9710	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63
9710	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63
9874	St. Louis River - Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1
9874	St. Louis River - Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1
9874	St. Louis River - Keene Creek		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1
9874	St. Louis River - Keene Creek		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1
9893	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82
9893	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 % red. biolum.^	Toxic	0.82
9893	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82
9893	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82
10199	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 % red. biolum.^	Toxic	3.47
10199	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47
10199	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47
10199	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47
10370	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	8.97
10370	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97
10370	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97
10370	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97
10370	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97
10719	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98
10719	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98
10719	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 % red. biolum.^	Not toxic	3.98
10719	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98
10955	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49
10955	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49
10955	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49

**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
10955	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	17.49
11499	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR
11499	St. Louis Bay - Miller & Coffee Creek Embayment		10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR
11625	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 % red. biolum.^	Toxic	4.48
11625	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48
11625	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48
11744	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97
11744	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97
11744	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.97
11744	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97
11744	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97
12401	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05
12401	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05
12401	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05
12401	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 % red. biolum.^	Toxic	4.05
12401	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05
12940	Allouez Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47
12940	Allouez Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47
12940	Allouez Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47
12940	Allouez Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 % red. biolum.^	Toxic	4.47
13337	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77
13337	D-S Harbor		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77
13337	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77
13337	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 % red. biolum.^	Toxic	6.77
13337	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77
14225	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54
14225	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54
14225	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54
14225	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54
14568	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36
14568	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36
14568	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 % red. biolum.^	Not toxic	4.36
14568	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36

**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
14749	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98
14749	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 % red. biolum.^	Toxic	13.98
14749	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98
14749	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98
16294	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.74
16294	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.74
16294	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.74
16294	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.74
16294	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.74
18737	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15
18737	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15
18737	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15
18737	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15
20340	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	6.72
20340	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72
20340	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72
20340	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72
20340	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72
20748	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37
20748	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37
20748	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37
20748	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37
22450	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	29.84
22450	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84
22450	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84
22450	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84
22450	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84
24200	St. Louis River		10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88
26567	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19
26567	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 % red. biolum.^	Toxic	14.19
26567	St. Louis Bay		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19
26567	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19
36423	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13

**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
36423	Spirit Lake		10 day	Amphipod	<i>Hyaella azteca</i>	JUV	90 % survival	Not toxic	4.13
36423	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13
36423	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 % red. biolum.^	Toxic	4.13
40938	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyaella azteca</i>	JUV	0.14 mg growth	Toxic	8.08
40938	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08
40938	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyaella azteca</i>	JUV	48 % survival	Toxic	8.08
40938	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08
41803	D-S Harbor - Minnesota Slip		10 day	Amphipod	<i>Hyaella azteca</i>	JUV	89 % survival	Not toxic	NR
43411	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 % red. biolum.^	Not toxic	5.59
43411	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59
43411	D-S Harbor		10 day	Amphipod	<i>Hyaella azteca</i>	JUV	95 % survival	Not toxic	5.59
43411	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59
44342	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 % red. biolum.^	Toxic	3.07
44342	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07
44342	Spirit Lake		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07
44857	D-S Harbor - Slip C		10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR
44857	D-S Harbor - Slip C		10 day	Amphipod	<i>Hyaella azteca</i>	JUV	92 % survival	Not toxic	NR
48194	St. Louis River - Keene Creek		10 day	Amphipod	<i>Hyaella azteca</i>	JUV	90 % survival	Not toxic	100
48194	St. Louis River - Keene Creek		10 day	Amphipod	<i>Hyaella azteca</i>	JUV	0.18 mg growth	Not toxic	100
48194	St. Louis River - Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	100
48194	St. Louis River - Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	100
50690	D-S Harbor - Minnesota Slip		10 day	Amphipod	<i>Hyaella azteca</i>	JUV	100 % survival	Not toxic	NR
52144	D-S Harbor		10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7
52144	D-S Harbor		10 day	Amphipod	<i>Hyaella azteca</i>	JUV	88 % survival	Not toxic	4.7
52144	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 % red. biolum.^	Not toxic	4.7
52144	D-S Harbor		30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7
56816	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71
56816	Spirit Lake		10 day	Amphipod	<i>Hyaella azteca</i>	JUV	90 % survival	Not toxic	1.71
56816	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71
56816	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	1.71
56816	Spirit Lake		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71
58370	St. Louis River		10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58
63454	D-S Harbor		10 day	Amphipod	<i>Hyaella azteca</i>	JUV	85 % survival	Not toxic	6.03

**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)		Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
63454	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03
63454	D-S Harbor		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 % red. biolum.^	Toxic	6.03
72623	St. Louis River - Keene Creek		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42
72623	St. Louis River - Keene Creek		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42
72623	St. Louis River - Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42
72623	St. Louis River - Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42
159070	St. Louis River - Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64
159070	St. Louis River - Keene Creek		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64
159070	St. Louis River - Keene Creek		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64
159070	St. Louis River - Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64
288267	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91
288267	St. Louis Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91
288267	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91
288267	St. Louis Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91
288267	St. Louis Bay		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 % red. biolum.^	Toxic	13.91
314638	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR
314638	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR
314638	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR
314638	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR
607636	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12
607636	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12
607636	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12
607636	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12
705683	St. Louis River - Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95
705683	St. Louis River - Keene Creek		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95
705683	St. Louis River - Keene Creek		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95
705683	St. Louis River - Keene Creek		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95
788663	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	-9 mg growth	Not determined	11.16
788663	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16
788663	St. Louis River - Stryker Bay		10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16
788663	St. Louis River - Stryker Bay		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16
1199107	Spirit Lake		15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.98
1199107	Spirit Lake		10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.98



**Table G-10. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Total Polycyclic Aromatic Hydrocarbons (PAHs) in the St. Louis River Area of Concern**

Total PAHs (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
1199107	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 % red. biolum.^	Toxic	11.98
1199107	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.98
1199107	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.98
1201142	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26
1201142	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26
1201142	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 % red. biolum.^	Toxic	8.26
1201142	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26
3306000	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12

^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.

LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

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**Table G-11. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benz(a)anthracene in the St. Louis River Area of Conc**

Benz(a)-anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
3.50	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	0.59
3.50	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 mg growth	Not toxic	0.59
4.40	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08
4.40	D-S Harbor - Miller & Coffee Creek Embayment	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 % red. Biolum.^	Toxic	0.08
4.40	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08
4.40	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08
6.10	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35
6.10	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 % red. biolum.^	Toxic	0.35
6.10	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35
6.40	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93
6.40	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93
6.40	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93
6.40	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93
7.00	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12
7.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 % red. biolum.^	Not toxic	0.12
7.00	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12
7.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12
7.20	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02
7.20	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 % red. Biolum.^	Toxic	1.02
7.20	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02
7.20	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02
8.10	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 % red. biolum.^	Toxic	0.14
8.10	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14
8.10	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14
8.10	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14
20.3	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2
20.3	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2
20.3	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	25.2 % red. biolum.^	Toxic	0.2
20.3	D-S Harbor	30 minute	Bacteria	<i>Chironomus tentans</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2
22.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87
22.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87
22.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87
22.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87
22.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 % red. biolum.^	Toxic	1.87
23.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82
23.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82
23.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82
23.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 % red. Biolum.^	Not toxic	2.82
23.2	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42



**Table G-11. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benz(a)anthracene in the St. Louis River Area of Conc**

Benz(a)-anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
23.2	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42
23.2	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42
23.2	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 % red. Biolum.^	Toxic	1.42
24.0	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91
24.0	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91
24.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91
24.0	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 % red. biolum.^	Not toxic	2.91
28.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR
28.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR
28.0	Spirit Lake - Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 % red. biolum.^	Not toxic	5.77
28.0	Spirit Lake - Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77
28.0	Spirit Lake - Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77
28.0	Spirit Lake - Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77
31.8	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 % red. biolum.^	Toxic	0.16
31.8	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16
31.8	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16
43.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	1.69
43.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69
43.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69
48.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59
48.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59
48.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. Biolum.^	Not toxic	2.59
48.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59
49.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4
49.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4
49.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4
49.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4
49.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4
49.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 % red. biolum.^	Toxic	0.4
<50.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7
<50.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7
<50.0	Superior Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	6.7
<50.0	Superior Bay	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	6.7
53.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34
53.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34
53.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	2.34
53.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34
53.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34
56.5	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7

**Table G-11. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benz(a)anthracene in the St. Louis River Area of Conc**

Benz(a)-anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
56.5	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7
56.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
56.5	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7
56.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 % red. biolum.^	Not toxic	2.7
56.5	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7
56.5	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7
56.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
56.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 % red. biolum.^	Not toxic	2.7
74.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82
74.0	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82
74.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82
74.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 % red.biolum.^	Not toxic	1.82
77.8	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35
77.8	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35
77.8	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35
77.8	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.35
84.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR
84.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	NR
85.0	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84
85.0	St. Louis River - Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84
85.0	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 % red. biolum.^	Not toxic	4.84
85.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	2.24
85.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24
85.0	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84
85.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24
85.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24
85.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24
98.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 % red. biolum.^	Toxic	3.25
98.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC 50 biolum.#	Toxic	3.25
98.0	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25
140	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85
140	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85
140	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.85
140	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85
140	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85
209	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 % red. biolum.^	Not toxic	5.34
209	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34
209	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34
209	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34

**Table G-11. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benz(a)anthracene in the St. Louis River Area of Conc**

Benz(a)-anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
213	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65
213	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.65
213	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65
213	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65
213	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65
222	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98
222	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98
222	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98
222	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 % red. biolum.^	Not toxic	2.98
222	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98
260	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	NR
260	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	NR
270	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR
270	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
333	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
333	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 % red. biolum.^	Toxic	3.95
333	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95
333	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
333	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95
333	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 % red. biolum.^	Toxic	3.95
345	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1
345	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1
345	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1
345	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1
345	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 % red. biolum.^	Toxic	1
359	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4
359	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
359	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 % red. biolum.^	Not toxic	3.4
359	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4
359	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4
359	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4
359	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 % red. biolum.^	Not toxic	3.4
359	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
359	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4
359	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4
362	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02
362	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 % red. biolum.^	Not toxic	4.02
362	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02
362	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02

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Benz(a)-anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
362	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02
460	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 % red. biolum.^	Toxic	4.54
460	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54
460	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54
460	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54
470	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
482	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 % red. biolum.^	Not toxic	2.43
482	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43
482	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43
505	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37
505	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37
505	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37
505	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37
505	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 % red. biolum.^	Not toxic	1.37
580	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
580	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 % red. biolum.^	Not toxic	1.44
580	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44
580	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44
600	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR
603	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24
603	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 % red. biolum.^	Toxic	0.24
603	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24
603	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24
610	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR
610	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR
656	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11
656	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11
656	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11
656	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11
656	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 % red. biolum.^	Not toxic	4.11
656	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11
698	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97
698	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	8.97
698	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97
698	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97
698	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97
730	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
740	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
780	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	NR

**Table G-11. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benz(a)anthracene in the St. Louis River Area of Conc**

Benz(a)-anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
780	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	NR
792	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76
792	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76
792	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76
792	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76
793	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4
793	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4
793	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4
793	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59	Not toxic	6.4
801	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87
801	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87
801	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87
801	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 % red. biolum.^	Not toxic	3.87
801	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87
860	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR
860	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
867	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63
867	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 % red. biolum.^	Toxic	2.63
867	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63
867	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63
880	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
880	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
920	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR
920	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
950	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4
950	D-S Harbor - NW side of Lakehead Dock	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	8.4
950	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.99
950	D-S Harbor - NW side of Lakehead Dock	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4
950	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99
950	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99
950	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4
1000	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	NR
1000	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR
1000	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR
1000	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR
1071	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 % red. biolum.^	Toxic	0.82
1071	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82
1071	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82
1071	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82

**Table G-11. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benz(a)anthracene in the St. Louis River Area of Conc**

Benz(a)-anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
1100	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
1100	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
1122	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97
1122	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97
1122	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.97
1122	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97
1122	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97
1124	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48
1124	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48
1124	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 % red. biolum.^	Toxic	4.48
1150	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77
1150	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8% red. biolum.^	Toxic	6.77
1150	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77
1150	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77
1150	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77
1201	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 % red. biolum.^	Not toxic	4.05
1201	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05
1201	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05
1201	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05
1205	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 % red. biolum.^	Not toxic	13.81
1205	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81
1205	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81
1205	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81
1226	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 % red. biolum.^	Toxic	13.98
1226	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98
1226	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98
1226	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98
1243	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 % red. biolum.^	Toxic	3.47
1243	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47
1243	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47
1243	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47
1268	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1
1268	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1
1268	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1
1268	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1
1278	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 % red. biolum.^	Toxic	4.05
1278	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05
1278	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05
1278	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05

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Benz(a)-anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
1278	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05
1286	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84
1286	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84
1286	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84
1286	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84
1286	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	29.84
1368	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98
1368	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98
1368	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 % red. biolum.^	Not toxic	3.98
1368	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98
1369	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47
1369	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47
1369	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 % red. biolum.^	Toxic	4.47
1369	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47
1395	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 % red. biolum.^	Toxic	2.13
1395	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13
1395	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13
1395	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13
1400	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR
1400	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR
1483	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49
1483	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49
1483	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	17.49
1483	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49
1530	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.74
1530	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.74
1530	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.74
1530	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.74
1530	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.74
1623	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42
1623	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42
1623	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42
1623	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42
1649	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36
1649	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36
1649	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 % red. biolum.^	Not toxic	4.36
1649	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36
1976	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19
1976	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19

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3.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
1976	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19
1976	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 % red. biolum.^	Toxic	14.19
2105	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72
2105	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72
2105	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72
2105	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	6.72
2105	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72
2429	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15
2429	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15
2429	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15
2429	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15
2500	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88
2606	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54
2606	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54
2606	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54
2606	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54
3510	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 % red. biolum.^	Toxic	3.07
3510	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07
3510	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07
3600	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR
3600	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR
3612	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37
3612	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37
3612	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37
3612	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37
4100	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	NR
4137	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 % red. biolum.^	Toxic	8.26
4137	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26
4137	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26
4137	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26
4382	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13
4382	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13
4382	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 % red. biolum.^	Toxic	4.13
4382	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13
4788	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59
4788	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 % red. biolum.^	Not toxic	5.59
4788	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59
4788	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59
4935	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71



**Table G-11. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benz(a)anthracene in the St. Louis River Area of Conc**

Benz(a)-anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
4935	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71
4935	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71
4935	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71
4935	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	1.71
5167	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7
5167	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7
5167	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 % red. biolum.^	Not toxic	4.7
5167	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7
5300	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR
6161	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03
6161	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 % red. biolum.^	Toxic	6.03
6161	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03
6744	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95
6744	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95
6744	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95
6744	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95
6914	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91
6914	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91
6914	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 % red. biolum.^	Toxic	13.91
6914	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91
6914	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91
7600	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58
8977	St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08
8977	St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08
8977	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08
8977	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08
10117	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	100
10117	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	100
10117	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	100
10117	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	100
11111	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64
11111	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64
11111	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64
11111	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64
39106	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR
39106	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR
39106	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR
39106	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR
54893	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12

**Table G-11. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benz(a)anthracene in the St. Louis River Area of Conc**

Benz(a)-anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
54893	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12
54893	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12
54893	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12
104603	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16
104603	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16
104603	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16
104603	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16
116582	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.98
116582	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.98
116582	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.98
116582	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 % red. biolum.^	Toxic	11.98
116582	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.98
230000	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12

^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.

LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

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**Table G-12. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benzo(a)pyrene in the St. Louis River Area of Concern**

Benzo(a)-pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
3.50	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35	MPCA 1997b
3.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35	MPCA 1997b
3.50	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 mg growth	Toxic	0.35	MPCA 1997b
3.70	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93	IT Corp. 1996
3.70	St. Louis River - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93	IT Corp. 1996
3.70	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93	IT Corp. 1996
3.70	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93	IT Corp. 1996
4.00	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59	MPCA 1997b
4.00	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59	MPCA 1997b
4.00	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	0.59	MPCA 1997b
4.30	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08	MPCA 1997b
4.30	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08	MPCA 1997b
4.30	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 % red. biolum.^	Toxic	0.08	MPCA 1997b
4.30	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08	MPCA 1997b
5.50	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02	MPCA 1997b
5.50	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02	MPCA 1997b
5.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02	MPCA 1997b
5.50	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 % red. biolum.^	Toxic	1.02	MPCA 1997b
8.00	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14	MPCA 1997b
8.00	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14	MPCA 1997b
8.00	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14	MPCA 1997b
8.00	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 % red. biolum.^	Toxic	0.14	MPCA 1997b
9.00	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12	MPCA 1997b
9.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 % red. biolum.^	Not toxic	0.12	MPCA 1997b
9.00	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12	MPCA 1997b
9.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12	MPCA 1997b
15.2	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 % red. biolum.^	Toxic	1.42	MPCA 1997b
15.2	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42	MPCA 1997b
15.2	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42	MPCA 1997b
15.2	D-S Harbor	10 day	Amphipod	<i>Chironomus tentans</i>	JUV	100 % survival	Not toxic	1.42	MPCA 1997b
17.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87	MPCA 1997c
17.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 % red. biolum.^	Toxic	1.87	MPCA 1997c
17.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87	MPCA 1997c
17.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87	MPCA 1997c

**Table G-12. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benzo(a)pyrene in the St. Louis River Area of Concern**

Benzo(a)-pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
17.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87	MPCA 1997c
20.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
20.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
21.6	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2	MPCA 1997b
21.6	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	25.2 % red. biolum.^	Toxic	0.2	MPCA 1997b
21.6	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2	MPCA 1997b
21.6	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2	MPCA 1997b
28.3	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59	MPCA 1997b
28.3	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59	MPCA 1997b
28.3	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	2.59	MPCA 1997b
28.3	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59	MPCA 1997b
32.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82	MPCA 1997b
32.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82	MPCA 1997b
32.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82	MPCA 1997b
32.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 % red. biolum.^	Not toxic	2.82	MPCA 1997b
32.5	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77	MPCA 1997b
32.5	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 % red. biolum.^	Not toxic	5.77	MPCA 1997b
32.5	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77	MPCA 1997b
32.5	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77	MPCA 1997b
36.0	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91	MPCA 1997b
36.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91	MPCA 1997b
36.0	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 % red. biolum.^	Not toxic	2.91	MPCA 1997b
36.0	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91	MPCA 1997b
36.1	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 % red. biolum.^	Toxic	0.16	MPCA 1997b
36.1	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16	MPCA 1997b
36.1	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16	MPCA 1997b
39.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4	MPCA 1997b
39.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 % red. biolum.^	Toxic	0.4	MPCA 1997b
39.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4	MPCA 1997b
39.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4	MPCA 1997b
39.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4	MPCA 1997b
39.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4	MPCA 1997b
<50.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
<50.0	Superior Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	6.7	Wenck Associates Inc. 1995

**Table G-12. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benzo(a)pyrene in the St. Louis River Area of Concern**

Benzo(a)-pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
50.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69	MPCA 1997c
<50.0	Superior Bay	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
<50.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7	Wenck Associates Inc. 1995
50.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69	MPCA 1997c
50.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	1.69	MPCA 1997c
71.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
71.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
72.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	2.34	MPCA 1997c
72.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34	MPCA 1997c
72.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34	MPCA 1997c
72.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34	MPCA 1997c
72.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34	MPCA 1997c
78.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24	MPCA 1997c
78.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24	MPCA 1997c
78.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24	MPCA 1997c
78.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	2.24	MPCA 1997c
78.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24	MPCA 1997c
83.6	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35	MPCA 1997b
83.6	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35	MPCA 1997b
83.6	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35	MPCA 1997b
83.6	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.35	MPCA 1997b
88.3	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7	MPCA 1997c
88.3	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7	MPCA 1997c
88.3	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 % red. biolum.^	Not toxic	2.7	MPCA 1997c
88.3	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7	MPCA 1997c
88.3	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7	MPCA 1997c
88.3	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
88.3	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7	MPCA 1997c
88.3	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 % red. biolum.^	Not toxic	2.7	MPCA 1997c
88.3	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7	MPCA 1997c
88.3	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
104	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82	MPCA 1997b
104	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 % red. biolum.^	Not toxic	1.82	MPCA 1997b
104	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82	MPCA 1997b



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Benzo(a)-pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
104	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82	MPCA 1997b
106	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25	MPCA 1997c
106	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 % red. biolum.^	Toxic	3.25	MPCA 1997c
106	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25	MPCA 1997c
110	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84	MPCA 1997b
110	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84	MPCA 1997b
110	St. Louis River - Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84	MPCA 1997b
110	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 % red. biolum.^	Not toxic	4.84	MPCA 1997b
192	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.74 % weight using UV light	Not toxic	0.7	Ankley <i>et al.</i> 1994
192	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
192	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.65 mg growth	Toxic	0.7	Ankley <i>et al.</i> 1994
192	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
192	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
192	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	85 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
192	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Not toxic	0.7	Ankley <i>et al.</i> 1994
192	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
192	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87.5 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
192	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Not determined	0.7	Ankley <i>et al.</i> 1994
196	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85	MPCA 1997c
196	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85	MPCA 1997c
196	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85	MPCA 1997c
196	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.85	MPCA 1997c
196	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85	MPCA 1997c
201	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65	MPCA 1997c
201	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65	MPCA 1997c
201	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.65	MPCA 1997c
201	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65	MPCA 1997c
201	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65	MPCA 1997c
210	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
210	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
230	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
230	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
233	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98	MPCA 1997c
233	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98	MPCA 1997c

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Benzo(a)-pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
233	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98	MPCA 1997c
233	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98	MPCA 1997c
233	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 % red. biolum.^	Not toxic	2.98	MPCA 1997c
248	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34	MPCA 1997b
248	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34	MPCA 1997b
248	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34	MPCA 1997b
248	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 % red. biolum.^	Not toxic	5.34	MPCA 1997b
285	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
285	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Toxic	4.1	Ankley <i>et al.</i> 1994
285	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
285	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.93 mg growth	Not toxic	4.1	Ankley <i>et al.</i> 1994
285	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.85 mg growth	Not toxic	4.1	Ankley <i>et al.</i> 1994
285	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.08 % weight using UV light	Not toxic	4.1	Ankley <i>et al.</i> 1994
285	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72.5 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
285	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.05 % weight using UV light	Not toxic	4.1	Ankley <i>et al.</i> 1994
285	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	87.5 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
285	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	100 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
285	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.83 % weight using UV light	Toxic	4.1	Ankley <i>et al.</i> 1994
285	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
320	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 % red. biolum.^	Toxic	1	MPCA 1997c
320	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1	MPCA 1997c
320	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1	MPCA 1997c
320	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1	MPCA 1997c
320	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1	MPCA 1997c
357	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02	MPCA 1997c
357	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02	MPCA 1997c
357	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02	MPCA 1997c
357	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02	MPCA 1997c
357	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54	MPCA 1997b
357	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54	MPCA 1997b
357	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 % red. biolum.^	Toxic	4.54	MPCA 1997b
357	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 % red. biolum.^	Not toxic	4.02	MPCA 1997c
357	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54	MPCA 1997b
381	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c

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Benzo(a)-pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
381	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95	MPCA 1997c
381	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 % red. biolum.^	Toxic	3.95	MPCA 1997c
381	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 % red. biolum.^	Toxic	3.95	MPCA 1997c
381	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95	MPCA 1997c
381	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
422	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4	IT Corp. 1996
422	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4	IT Corp. 1996
422	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4	IT Corp. 1996
422	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4	IT Corp. 1996
437	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4	MPCA 1997c
437	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
437	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 % red. biolum.^	Not toxic	3.4	MPCA 1997c
437	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4	MPCA 1997c
437	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4	MPCA 1997c
437	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4	MPCA 1997c
437	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
437	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
437	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
437	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 % red. biolum.^	Not toxic	3.4	MPCA 1997c
466	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 % red. biolum.^	Not toxic	1.44	MPCA 1997c
466	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44	MPCA 1997c
466	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44	MPCA 1997c
470	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
509	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 % red. biolum.^	Not toxic	2.43	MPCA 1997c
509	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43	MPCA 1997c
509	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43	MPCA 1997c
522	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24	MPCA 1997b
522	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24	MPCA 1997b
522	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 % red. biolum.^	Toxic	0.24	MPCA 1997b
522	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24	MPCA 1997b
560	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37	MPCA 1997c
560	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37	MPCA 1997c
560	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 % red. biolum.^	Not toxic	1.37	MPCA 1997c
560	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37	MPCA 1997c

**Table G-12. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benzo(a)pyrene in the St. Louis River Area of Concern**

Benzo(a)-pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
560	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37	MPCA 1997c
588	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76	IT Corp. 1996
588	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76	IT Corp. 1996
588	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76	IT Corp. 1996
588	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76	IT Corp. 1996
590	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
590	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
610	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
610	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
689	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97	MPCA 1997c
689	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97	MPCA 1997c
689	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97	MPCA 1997c
689	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97	MPCA 1997c
689	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	8.97	MPCA 1997c
732	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1	IT Corp. 1996
732	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1	IT Corp. 1996
732	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1	IT Corp. 1996
732	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1	IT Corp. 1996
750	D-S Harbor - NW side of Lakehead Dock	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
750	D-S Harbor - NW side of Lakehead Dock	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
750	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
750	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
750	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
750	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
750	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4	Wenck Associates Inc. 1995
780	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
790	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
790	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
830	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
830	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
858	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.99	MPCA 1997c
858	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99	MPCA 1997c
858	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99	MPCA 1997c
860	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997

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Benzo(a)-pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
860	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
862	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82	MPCA 1997b
862	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82	MPCA 1997b
862	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82	MPCA 1997b
862	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 % red. biolum.^	Toxic	0.82	MPCA 1997b
867	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11	MPCA 1997b
867	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11	MPCA 1997b
867	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11	MPCA 1997b
867	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 % red. biolum.^	Not toxic	4.11	MPCA 1997b
867	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11	MPCA 1997b
867	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11	MPCA 1997b
920	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
920	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
925	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42	IT Corp. 1996
925	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42	IT Corp. 1996
925	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42	IT Corp. 1996
925	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42	IT Corp. 1996
940	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	NR	Crane <i>et al.</i> 1997
940	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1000	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1000	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1019	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87	MPCA 1997c
1019	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87	MPCA 1997c
1019	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 % red. biolum.^	Not toxic	3.87	MPCA 1997c
1019	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87	MPCA 1997c
1019	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87	MPCA 1997c
1022	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48	MPCA 1997c
1022	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48	MPCA 1997c
1022	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 % red. biolum.^	Toxic	4.48	MPCA 1997c
1072	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84	MPCA 1997c
1072	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84	MPCA 1997c
1072	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84	MPCA 1997c
1072	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84	MPCA 1997c
1072	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	29.84	MPCA 1997c

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Benzo(a)-pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1119	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77	MPCA 1997c
1119	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77	MPCA 1997c
1119	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 % red. biolum.^	Toxic	6.77	MPCA 1997c
1119	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77	MPCA 1997c
1119	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77	MPCA 1997c
1190	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98	MPCA 1997b
1190	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 % red. biolum.^	Toxic	13.98	MPCA 1997b
1190	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98	MPCA 1997b
1190	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98	MPCA 1997b
1192	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05	MPCA 1997b
1192	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 % red. biolum.^	Not toxic	4.05	MPCA 1997b
1192	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05	MPCA 1997b
1192	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05	MPCA 1997b
1250	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 % red. biolum.^	Toxic	2.63	MPCA 1997b
1250	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63	MPCA 1997b
1250	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63	MPCA 1997b
1250	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63	MPCA 1997b
1290	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49	MPCA 1997b
1290	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49	MPCA 1997b
1290	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49	MPCA 1997b
1290	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	17.49	MPCA 1997b
1300	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR	Crane <i>et al.</i> 1997
1300	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1314	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81	MPCA 1997b
1314	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 % red. biolum.^	Not toxic	13.81	MPCA 1997b
1314	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81	MPCA 1997b
1314	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81	MPCA 1997b
1322	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47	MPCA 1997b
1322	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47	MPCA 1997b
1322	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 % red. biolum.^	Toxic	4.47	MPCA 1997b
1322	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47	MPCA 1997b
1351	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13	MPCA 1997b
1351	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13	MPCA 1997b
1351	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13	MPCA 1997b

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Benzo(a)-pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1351	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 % red. biolum.^	Toxic	2.13	MPCA 1997b
1353	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 % red. biolum.^	Toxic	3.47	MPCA 1997b
1353	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47	MPCA 1997b
1353	St. Louis Bay	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	94 % survival	Not toxic	3.47	MPCA 1997b
1353	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47	MPCA 1997b
1415	Spirit Lake	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	100 % survival	Not toxic	3.98	MPCA 1997b
1415	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98	MPCA 1997b
1415	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98	MPCA 1997b
1415	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 % red. biolum.^	Not toxic	3.98	MPCA 1997b
1580	St. Louis Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	2.5 % survival/normal & UV	Toxic	6.1	Ankley <i>et al.</i> 1994
1580	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	6.1	Ankley <i>et al.</i> 1994
1580	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.54 mg growth	Toxic	6.1	Ankley <i>et al.</i> 1994
1580	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	75 % survival	Toxic	6.1	Ankley <i>et al.</i> 1994
1580	St. Louis Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	0.08 mg growth	Not determined	6.1	Ankley <i>et al.</i> 1994
1580	St. Louis Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	42.5 % survival	Toxic	6.1	Ankley <i>et al.</i> 1994
1580	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 % weight using UV light	Not toxic	6.1	Ankley <i>et al.</i> 1994
1580	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82.5 % survival/normal & UV	Not toxic	6.1	Ankley <i>et al.</i> 1994
1580	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92.5 % survival	Not toxic	6.1	Ankley <i>et al.</i> 1994
1580	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Toxic	6.1	Ankley <i>et al.</i> 1994
1616	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97	MPCA 1997c
1616	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97	MPCA 1997c
1616	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.97	MPCA 1997c
1616	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97	MPCA 1997c
1616	St. Louis Bay	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	90 % survival	Not toxic	3.97	MPCA 1997c
1696	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05	MPCA 1997c
1696	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05	MPCA 1997c
1696	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05	MPCA 1997c
1696	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 % red. biolum.^	Toxic	4.05	MPCA 1997c
1696	D-S Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	85 % survival	Not toxic	4.05	MPCA 1997c
1719	St. Louis Bay	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	87 % survival	Not toxic	6.72	MPCA 1997c
1719	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72	MPCA 1997c
1719	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72	MPCA 1997c
1719	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	6.72	MPCA 1997c
1719	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72	MPCA 1997c

**Table G-12. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benzo(a)pyrene in the St. Louis River Area of Concern**

Benzo(a)-pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1749	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.74	MPCA 1997c
1749	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.74	MPCA 1997c
1749	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.74	MPCA 1997c
1749	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.74	MPCA 1997c
1749	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.74	MPCA 1997c
1900	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36	MPCA 1997b
1900	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36	MPCA 1997b
1900	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 % red. biolum.^	Not toxic	4.36	MPCA 1997b
1900	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36	MPCA 1997b
2588	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54	IT Corp. 1996
2588	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54	IT Corp. 1996
2588	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54	IT Corp. 1996
2588	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54	IT Corp. 1996
2902	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15	IT Corp. 1996
2902	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15	IT Corp. 1996
2902	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15	IT Corp. 1996
2902	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15	IT Corp. 1996
2926	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 % red. biolum.^	Toxic	14.19	MPCA 1997b
2926	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19	MPCA 1997b
2926	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19	MPCA 1997b
2926	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19	MPCA 1997b
3300	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR	Crane <i>et al.</i> 1997
3300	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
3648	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07	MPCA 1997b
3648	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 % red. biolum.^	Toxic	3.07	MPCA 1997b
3648	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07	MPCA 1997b
3744	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37	IT Corp. 1996
3744	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37	IT Corp. 1996
3744	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37	IT Corp. 1996
3744	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37	IT Corp. 1996
3900	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
3900	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
3920	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59	MPCA 1997b
3920	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59	MPCA 1997b



**Table G-12. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benzo(a)pyrene in the St. Louis River Area of Concern**

Benzo(a)-pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
3920	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59	MPCA 1997b
3920	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 % red. biolum.^	Not toxic	5.59	MPCA 1997b
4262	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26	MPCA 1997b
4262	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26	MPCA 1997b
4262	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26	MPCA 1997b
4262	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 % red. biolum.^	Toxic	8.26	MPCA 1997b
4685	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13	MPCA 1997b
4685	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 % red. biolum.^	Toxic	4.13	MPCA 1997b
4685	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13	MPCA 1997b
4685	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13	MPCA 1997b
4901	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	1.71	MPCA 1997c
4901	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71	MPCA 1997c
4901	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71	MPCA 1997c
4901	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71	MPCA 1997c
4901	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71	MPCA 1997c
5300	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88	MPCA 1993
6226	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	100	IT Corp. 1996
6226	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	100	IT Corp. 1996
6226	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	100	IT Corp. 1996
6226	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	100	IT Corp. 1996
6383	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7	MPCA 1997b
6383	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7	MPCA 1997b
6383	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7	MPCA 1997b
6383	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 % red. biolum.^	Not toxic	4.7	MPCA 1997b
6455	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03	MPCA 1997c
6455	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 % red. biolum.^	Toxic	6.03	MPCA 1997c
6455	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03	MPCA 1997c
6463	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08	IT Corp. 1996
6463	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08	IT Corp. 1996
6463	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08	IT Corp. 1996
6463	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08	IT Corp. 1996
7129	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95	IT Corp. 1996
7129	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95	IT Corp. 1996
7129	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95	IT Corp. 1996

**Table G-12. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Benzo(a)pyrene in the St. Louis River Area of Concern**

Benzo(a)-pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
7129	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95	IT Corp. 1996
7876	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64	IT Corp. 1996
7876	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64	IT Corp. 1996
7876	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64	IT Corp. 1996
7876	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64	IT Corp. 1996
8942	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 % red. biolum.^	Toxic	13.91	MPCA 1997c
8942	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91	MPCA 1997c
8942	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91	MPCA 1997c
8942	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91	MPCA 1997c
8942	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91	MPCA 1997c
10000	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58	MPCA 1993
23866	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12	IT Corp. 1996
23866	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12	IT Corp. 1996
23866	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12	IT Corp. 1996
23866	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12	IT Corp. 1996
39106	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR	IT Corp. 1996
39106	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR	IT Corp. 1996
39106	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR	IT Corp. 1996
39106	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR	IT Corp. 1996
71130	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16	IT Corp. 1996
71130	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16	IT Corp. 1996
71130	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16	IT Corp. 1996
71130	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16	IT Corp. 1996
88090	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.98	MPCA 1997c
88090	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 % red. biolum.^	Toxic	11.98	MPCA 1997c
88090	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.98	MPCA 1997c
88090	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.98	MPCA 1997c
88090	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.98	MPCA 1997c
170000	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12	MPCA 1993

^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.  
 LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

**Table G-13. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Chrysene in the St. Louis River Area of Concern**

Chrysene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
3.70	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93	IT Corp. 1996
3.70	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93	IT Corp. 1996
3.70	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93	IT Corp. 1996
3.70	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93	IT Corp. 1996
5.60	D-S Harbor - Miller & Coffee Creek Embayment	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08	MPCA 1997b
5.60	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08	MPCA 1997b
5.60	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08	MPCA 1997b
5.60	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 % red. biolum.^	Toxic	0.08	MPCA 1997b
7.30	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59	MPCA 1997b
7.30	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59	MPCA 1997b
7.30	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	0.59	MPCA 1997b
8.50	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02	MPCA 1997b
8.50	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 % red. biolum.^	Toxic	1.02	MPCA 1997b
8.50	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02	MPCA 1997b
8.50	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 % red. biolum.^	Toxic	0.35	MPCA 1997b
8.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35	MPCA 1997b
8.50	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35	MPCA 1997b
8.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02	MPCA 1997b
9.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12	MPCA 1997b
9.00	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12	MPCA 1997b
9.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 % red. biolum.^	Not toxic	0.12	MPCA 1997b
9.00	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12	MPCA 1997b
10	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 % red. biolum.^	Toxic	0.14	MPCA 1997b
10	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14	MPCA 1997b
10	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14	MPCA 1997b
10	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14	MPCA 1997b
23	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2	MPCA 1997b
23	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2	MPCA 1997b
23	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2	MPCA 1997b
23	D-S Harbor	30 minute	Bacteria	<i>Chironomus tentans</i>	NA	25.2 % red. biolum.^	Toxic	0.2	MPCA 1997b
30	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77	MPCA 1997b
30	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77	MPCA 1997b
30	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77	MPCA 1997b
30	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 % red. biolum.^	Not toxic	5.77	MPCA 1997b
33	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
33	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
34	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16	MPCA 1997b
34	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 % red. biolum.^	Toxic	0.16	MPCA 1997b
34	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16	MPCA 1997b

**Table G-13. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Chrysene in the St. Louis River Area of Concern**

Chrysene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
35	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87	MPCA 1997c
35	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87	MPCA 1997c
35	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 % red. biolum.^	Toxic	1.87	MPCA 1997c
35	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87	MPCA 1997c
35	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87	MPCA 1997c
37	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82	MPCA 1997b
37	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 % red. biolum.^	Not toxic	2.82	MPCA 1997b
37	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82	MPCA 1997b
37	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82	MPCA 1997b
40	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91	MPCA 1997b
40	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91	MPCA 1997b
40	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 % red. biolum.^	Not toxic	2.91	MPCA 1997b
40	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91	MPCA 1997b
41	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42	MPCA 1997b
41	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42	MPCA 1997b
41	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 % red. biolum.^	Toxic	1.42	MPCA 1997b
41	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42	MPCA 1997b
<50	Superior Bay	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
<50	Superior Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
<50	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7	Wenck Associates Inc. 1995
<50	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
52	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4	MPCA 1997b
52	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4	MPCA 1997b
52	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4	MPCA 1997b
52	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4	MPCA 1997b
52	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 % red. biolum.^	Toxic	0.4	MPCA 1997b
52	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4	MPCA 1997b
56	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69	MPCA 1997c
56	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	1.69	MPCA 1997c
56	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69	MPCA 1997c
59	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	2.59	MPCA 1997b
59	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59	MPCA 1997b
59	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59	MPCA 1997b
59	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59	MPCA 1997b
73	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 % red. biolum.^	Not toxic	2.7	MPCA 1997c
73	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7	MPCA 1997c
73	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
73	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7	MPCA 1997c
73	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
73	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7	MPCA 1997c

**Table G-13. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Chrysene in the St. Louis River Area of Concern**

Chrysene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
73	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 % red. biolum.^	Not toxic	2.7	MPCA 1997c
73	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7	MPCA 1997c
73	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7	MPCA 1997c
73	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7	MPCA 1997c
78	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34	MPCA 1997c
78	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34	MPCA 1997c
78	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34	MPCA 1997c
78	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34	MPCA 1997c
78	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	2.34	MPCA 1997c
86	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 % red. biolum.^	Not toxic	1.82	MPCA 1997b
86	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82	MPCA 1997b
86	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82	MPCA 1997b
86	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82	MPCA 1997b
93	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
93	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
102	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35	MPCA 1997b
102	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.35	MPCA 1997b
102	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35	MPCA 1997b
102	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35	MPCA 1997b
106	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84	MPCA 1997b
106	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84	MPCA 1997b
106	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 % red. biolum.^	Not toxic	4.84	MPCA 1997b
106	St. Louis River - Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84	MPCA 1997b
107	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 % red. biolum.^	Toxic	3.25	MPCA 1997c
107	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25	MPCA 1997c
107	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25	MPCA 1997c
111	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24	MPCA 1997c
111	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24	MPCA 1997c
111	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24	MPCA 1997c
111	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	2.24	MPCA 1997c
111	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24	MPCA 1997c
147	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85	MPCA 1997c
147	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.85	MPCA 1997c
147	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85	MPCA 1997c
147	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85	MPCA 1997c
147	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85	MPCA 1997c
191	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65	MPCA 1997c
191	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65	MPCA 1997c
191	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.65	MPCA 1997c
191	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65	MPCA 1997c

**Table G-13. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Chrysene in the St. Louis River Area of Concern**

Chrysene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
191	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65	MPCA 1997c
224	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.65 mg growth	Toxic	0.7	Ankley <i>et al.</i> 1994
224	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
224	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Not toxic	0.7	Ankley <i>et al.</i> 1994
224	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	85 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
224	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
224	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
224	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
224	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Not determined	0.7	Ankley <i>et al.</i> 1994
224	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87.5 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
224	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.74 % weight using UV light	Not toxic	0.7	Ankley <i>et al.</i> 1994
245	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98	MPCA 1997c
245	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98	MPCA 1997c
245	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 % red. biolum.^	Not toxic	2.98	MPCA 1997c
245	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98	MPCA 1997c
245	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98	MPCA 1997c
247	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34	MPCA 1997b
247	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34	MPCA 1997b
247	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 % red. biolum.^	Not toxic	5.34	MPCA 1997b
247	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34	MPCA 1997b
304	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4	IT Corp. 1996
304	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4	IT Corp. 1996
304	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4	IT Corp. 1996
304	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4	IT Corp. 1996
330	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
330	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
340	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
340	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
354	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1	MPCA 1997c
354	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1	MPCA 1997c
354	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1	MPCA 1997c
354	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 % red. biolum.^	Toxic	1	MPCA 1997c
354	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1	MPCA 1997c
364	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95	MPCA 1997c
364	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 % red. biolum.^	Toxic	3.95	MPCA 1997c
364	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
364	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
364	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95	MPCA 1997c
364	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 % red. biolum.^	Toxic	3.95	MPCA 1997c
385	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76	IT Corp. 1996

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Chrysene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
385	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76	IT Corp. 1996
385	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76	IT Corp. 1996
385	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76	IT Corp. 1996
387	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Toxic	4.1	Ankley <i>et al.</i> 1994
387	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72.5 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
387	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
387	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	100 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
387	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.08 % weight using UV light	Not toxic	4.1	Ankley <i>et al.</i> 1994
387	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
387	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
387	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.93 mg growth	Not toxic	4.1	Ankley <i>et al.</i> 1994
387	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	87.5 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
387	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.05 % weight using UV light	Not toxic	4.1	Ankley <i>et al.</i> 1994
387	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.83 % weight using UV light	Toxic	4.1	Ankley <i>et al.</i> 1994
387	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.85 mg growth	Not toxic	4.1	Ankley <i>et al.</i> 1994
404	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37	MPCA 1997c
404	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 % red. biolum.^	Not toxic	1.37	MPCA 1997c
404	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37	MPCA 1997c
404	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37	MPCA 1997c
404	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37	MPCA 1997c
467	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 % red. biolum.^	Not toxic	3.4	MPCA 1997c
467	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4	MPCA 1997c
467	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4	MPCA 1997c
467	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
467	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
467	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
467	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4	MPCA 1997c
467	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4	MPCA 1997c
467	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 % red. biolum.^	Not toxic	3.4	MPCA 1997c
467	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
482	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02	MPCA 1997c
482	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02	MPCA 1997c
482	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02	MPCA 1997c
482	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 % red. biolum.^	Not toxic	4.02	MPCA 1997c
482	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02	MPCA 1997c
556	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 % red. biolum.^	Toxic	0.24	MPCA 1997b
556	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24	MPCA 1997b
556	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24	MPCA 1997b
556	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24	MPCA 1997b
570	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997

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Chrysene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
632	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43	MPCA 1997c
632	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 % red. biolum.^	Not toxic	2.43	MPCA 1997c
632	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43	MPCA 1997c
690	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
710	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 % red. biolum.^	Not toxic	1.44	MPCA 1997c
710	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44	MPCA 1997c
710	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44	MPCA 1997c
740	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
740	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
740	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
761	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1	IT Corp. 1996
761	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1	IT Corp. 1996
761	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1	IT Corp. 1996
761	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1	IT Corp. 1996
772	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11	MPCA 1997b
772	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11	MPCA 1997b
772	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11	MPCA 1997b
772	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11	MPCA 1997b
772	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 % red. biolum.^	Not toxic	4.11	MPCA 1997b
772	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11	MPCA 1997b
779	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54	MPCA 1997b
779	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54	MPCA 1997b
779	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54	MPCA 1997b
779	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 % red. biolum.^	Toxic	4.54	MPCA 1997b
790	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
790	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
830	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
830	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
920	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87	MPCA 1997c
920	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87	MPCA 1997c
920	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87	MPCA 1997c
920	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
920	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
920	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87	MPCA 1997c
920	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 % red. biolum.^	Not toxic	3.87	MPCA 1997c
940	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
940	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
960	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
960	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1000	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4	Wenck Associates Inc. 1995



**Table G-13. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Chrysene in the St. Louis River Area of Concern**

Chrysene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1000	D-S Harbor - NW side of Lakehead Dock	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
1000	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
1000	D-S Harbor - NW side of Lakehead Dock	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
1008	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 % red. biolum.^	Toxic	0.82	MPCA 1997b
1008	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82	MPCA 1997b
1008	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82	MPCA 1997b
1008	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82	MPCA 1997b
1045	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 % red. biolum.^	Not toxic	13.81	MPCA 1997b
1045	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81	MPCA 1997b
1045	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81	MPCA 1997b
1045	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81	MPCA 1997b
1054	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54	IT Corp. 1996
1054	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54	IT Corp. 1996
1054	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54	IT Corp. 1996
1054	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54	IT Corp. 1996
1100	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1100	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	NR	Crane <i>et al.</i> 1997
1100	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1100	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1102	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63	MPCA 1997b
1102	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63	MPCA 1997b
1102	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63	MPCA 1997b
1102	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 % red. biolum.^	Toxic	2.63	MPCA 1997b
1114	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99	MPCA 1997c
1114	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99	MPCA 1997c
1114	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.99	MPCA 1997c
1200	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1200	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1273	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97	MPCA 1997c
1273	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	8.97	MPCA 1997c
1273	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97	MPCA 1997c
1273	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97	MPCA 1997c
1273	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97	MPCA 1997c
1336	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98	MPCA 1997b
1336	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 % red. biolum.^	Not toxic	3.98	MPCA 1997b
1336	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98	MPCA 1997b
1336	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98	MPCA 1997b
1352	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05	MPCA 1997b
1352	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 % red. biolum.^	Not toxic	4.05	MPCA 1997b
1352	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05	MPCA 1997b

**Table G-13. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Chrysene in the St. Louis River Area of Concern**

Chrysene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1352	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05	MPCA 1997b
1371	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 % red. biolum.^	Toxic	4.48	MPCA 1997c
1371	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48	MPCA 1997c
1371	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48	MPCA 1997c
1423	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98	MPCA 1997b
1423	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98	MPCA 1997b
1423	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98	MPCA 1997b
1423	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 % red. biolum.^	Toxic	13.98	MPCA 1997b
1467	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.74	MPCA 1997c
1467	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.74	MPCA 1997c
1467	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.74	MPCA 1997c
1467	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.74	MPCA 1997c
1467	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.74	MPCA 1997c
1513	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	17.49	MPCA 1997b
1513	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49	MPCA 1997b
1513	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49	MPCA 1997b
1513	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49	MPCA 1997b
1517	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13	MPCA 1997b
1517	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13	MPCA 1997b
1517	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13	MPCA 1997b
1517	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 % red. biolum.^	Toxic	2.13	MPCA 1997b
1567	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	29.84	MPCA 1997c
1567	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84	MPCA 1997c
1567	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84	MPCA 1997c
1567	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84	MPCA 1997c
1567	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84	MPCA 1997c
1580	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47	MPCA 1997b
1580	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47	MPCA 1997b
1580	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 % red. biolum.^	Toxic	4.47	MPCA 1997b
1580	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47	MPCA 1997b
1586	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37	IT Corp. 1996
1586	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37	IT Corp. 1996
1586	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37	IT Corp. 1996
1586	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37	IT Corp. 1996
1588	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.97	MPCA 1997c
1588	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97	MPCA 1997c
1588	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97	MPCA 1997c
1588	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97	MPCA 1997c
1588	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97	MPCA 1997c
1588	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36	MPCA 1997b

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Chrysene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1588	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 % red. biolum.^	Not toxic	4.36	MPCA 1997b
1588	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36	MPCA 1997b
1588	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36	MPCA 1997b
1604	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.08 mg growth	Not determined	6.1	Ankley <i>et al.</i> 1994
1604	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92.5 % survival	Not toxic	6.1	Ankley <i>et al.</i> 1994
1604	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	6.1	Ankley <i>et al.</i> 1994
1604	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.54 mg growth	Toxic	6.1	Ankley <i>et al.</i> 1994
1604	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	2.5 % survival/normal & UV	Toxic	6.1	Ankley <i>et al.</i> 1994
1604	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82.5 % survival/normal & UV	Not toxic	6.1	Ankley <i>et al.</i> 1994
1604	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	42.5 % survival	Toxic	6.1	Ankley <i>et al.</i> 1994
1604	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 % weight using UV light	Not toxic	6.1	Ankley <i>et al.</i> 1994
1604	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Toxic	6.1	Ankley <i>et al.</i> 1994
1604	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	75 % survival	Toxic	6.1	Ankley <i>et al.</i> 1994
1628	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 % red. biolum.^	Toxic	3.47	MPCA 1997b
1628	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47	MPCA 1997b
1628	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47	MPCA 1997b
1628	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47	MPCA 1997b
1672	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15	IT Corp. 1996
1672	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15	IT Corp. 1996
1672	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15	IT Corp. 1996
1672	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15	IT Corp. 1996
1700	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR	Crane <i>et al.</i> 1997
1700	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1748	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05	MPCA 1997c
1748	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 % red. biolum.^	Toxic	4.05	MPCA 1997c
1748	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05	MPCA 1997c
1748	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05	MPCA 1997c
1748	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05	MPCA 1997c
1881	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72	MPCA 1997c
1881	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72	MPCA 1997c
1881	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72	MPCA 1997c
1881	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	6.72	MPCA 1997c
1881	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72	MPCA 1997c
1948	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42	IT Corp. 1996
1948	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42	IT Corp. 1996
1948	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42	IT Corp. 1996
1948	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42	IT Corp. 1996
2278	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19	MPCA 1997b
2278	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19	MPCA 1997b
2278	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19	MPCA 1997b

**Table G-13. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Chrysene in the St. Louis River Area of Concern**

Chrysene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
2278	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 % red. biolum.^	Toxic	14.19	MPCA 1997b
2303	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 % red. biolum.^	Toxic	6.77	MPCA 1997c
2303	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77	MPCA 1997c
2303	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77	MPCA 1997c
2303	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77	MPCA 1997c
2303	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77	MPCA 1997c
2728	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07	MPCA 1997b
2728	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 % red. biolum.^	Toxic	3.07	MPCA 1997b
2728	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07	MPCA 1997b
2900	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88	MPCA 1993
3400	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
3400	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR	Crane <i>et al.</i> 1997
3770	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08	IT Corp. 1996
3770	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08	IT Corp. 1996
3770	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08	IT Corp. 1996
3770	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08	IT Corp. 1996
3942	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 % red. biolum.^	Toxic	8.26	MPCA 1997b
3942	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26	MPCA 1997b
3942	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26	MPCA 1997b
3942	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26	MPCA 1997b
4068	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13	MPCA 1997b
4068	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13	MPCA 1997b
4068	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13	MPCA 1997b
4068	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 % red. biolum.^	Toxic	4.13	MPCA 1997b
4669	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	100	IT Corp. 1996
4669	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	100	IT Corp. 1996
4669	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	100	IT Corp. 1996
4669	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	100	IT Corp. 1996
4706	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71	MPCA 1997c
4706	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71	MPCA 1997c
4706	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71	MPCA 1997c
4706	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71	MPCA 1997c
4706	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	1.71	MPCA 1997c
4786	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59	MPCA 1997b
4786	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59	MPCA 1997b
4786	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59	MPCA 1997b
4786	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 % red. biolum.^	Not toxic	5.59	MPCA 1997b
5780	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95	IT Corp. 1996
5780	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95	IT Corp. 1996
5780	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95	IT Corp. 1996

**Table G-13. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Chrysene in the St. Louis River Area of Concern**

Chrysene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
5780	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95	IT Corp. 1996
6271	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91	MPCA 1997c
6271	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91	MPCA 1997c
6271	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 % red. biolum.^	Toxic	13.91	MPCA 1997c
6271	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91	MPCA 1997c
6271	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91	MPCA 1997c
6410	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7	MPCA 1997b
6410	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7	MPCA 1997b
6410	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7	MPCA 1997b
6410	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 % red. biolum.^	Not toxic	4.7	MPCA 1997b
6500	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
7800	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58	MPCA 1993
8054	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03	MPCA 1997c
8054	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 % red. biolum.^	Toxic	6.03	MPCA 1997c
8054	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03	MPCA 1997c
8861	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64	IT Corp. 1996
8861	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64	IT Corp. 1996
8861	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64	IT Corp. 1996
8861	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64	IT Corp. 1996
9800	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
23866	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12	IT Corp. 1996
23866	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12	IT Corp. 1996
23866	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12	IT Corp. 1996
23866	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12	IT Corp. 1996
36313	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR	IT Corp. 1996
36313	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR	IT Corp. 1996
36313	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR	IT Corp. 1996
36313	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR	IT Corp. 1996
83682	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16	IT Corp. 1996
83682	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16	IT Corp. 1996
83682	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16	IT Corp. 1996
83682	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16	IT Corp. 1996
88050	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.98	MPCA 1997c
88050	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 % red. biolum.^	Toxic	11.98	MPCA 1997c
88050	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.98	MPCA 1997c
88050	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.98	MPCA 1997c
88050	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.98	MPCA 1997c
190000	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12	MPCA 1993

**Table G-13. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Chrysene in the St. Louis River Area of Concern**

Chrysene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
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^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.  
LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

**Table G-14. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluoranthene in the St. Louis River Area of Concern**

Fluoranthene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
6.20	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 % red. biolum.^	Toxic	0.08	MPCA 1997b
6.20	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08	MPCA 1997b
6.20	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 mg growth	Not toxic	0.08	MPCA 1997b
6.20	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08	MPCA 1997b
10.8	Allouez Bay - Miller & Coffee Creek Embayment	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35	MPCA 1997b
10.8	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35	MPCA 1997b
10.8	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 % red. biolum.^	Toxic	0.35	MPCA 1997b
11.0	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93	IT Corp. 1996
11.0	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93	IT Corp. 1996
11.0	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93	IT Corp. 1996
11.0	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93	IT Corp. 1996
11.9	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59	MPCA 1997b
11.9	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	0.59	MPCA 1997b
11.9	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59	MPCA 1997b
12.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12	MPCA 1997b
12.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 % red. biolum.^	Not toxic	0.12	MPCA 1997b
12.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12	MPCA 1997b
12.0	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12	MPCA 1997b
12.4	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14	MPCA 1997b
12.4	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14	MPCA 1997b
12.4	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14	MPCA 1997b
12.4	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 % red. biolum.^	Toxic	0.14	MPCA 1997b
15.3	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 % red. biolum.^	Toxic	1.02	MPCA 1997b
15.3	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02	MPCA 1997b
15.3	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02	MPCA 1997b
15.3	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02	MPCA 1997b
32.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2	MPCA 1997b
32.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2	MPCA 1997b
32.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2	MPCA 1997b
32.0	D-S Harbor	30 minute	Bacteria	<i>Chironomus tentans</i>	NA	25.2 % red. biolum.^	Toxic	0.2	MPCA 1997b
53.1	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16	MPCA 1997b
53.1	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 % red. biolum.^	Toxic	0.16	MPCA 1997b
53.1	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16	MPCA 1997b
54.5	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77	MPCA 1997b
54.5	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77	MPCA 1997b
54.5	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 % red. biolum.^	Not toxic	5.77	MPCA 1997b

**Table G-14. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluoranthene in the St. Louis River Area of Concer**

Fluoranthene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
54.5	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77	MPCA 1997b
59.0	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91	MPCA 1997b
59.0	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 % red. biolum.^	Not toxic	2.91	MPCA 1997b
59.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91	MPCA 1997b
59.0	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91	MPCA 1997b
63.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82	MPCA 1997b
63.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82	MPCA 1997b
63.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82	MPCA 1997b
63.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 % red. biolum.^	Not toxic	2.82	MPCA 1997b
69.9	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42	MPCA 1997b
69.9	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42	MPCA 1997b
69.9	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42	MPCA 1997b
69.9	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 % red. biolum.^	Toxic	1.42	MPCA 1997b
78.5	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87	MPCA 1997c
78.5	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87	MPCA 1997c
78.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87	MPCA 1997c
78.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87	MPCA 1997c
78.5	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 % red. biolum.^	Toxic	1.87	MPCA 1997c
90.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
90.0	Superior Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
90.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7	Wenck Associates Inc. 1995
90.0	Superior Bay	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
90.5	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	2.59	MPCA 1997b
90.5	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59	MPCA 1997b
90.5	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59	MPCA 1997b
90.5	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59	MPCA 1997b
92.8	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
92.8	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 % red. biolum.^	Not toxic	2.7	MPCA 1997c
92.8	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7	MPCA 1997c
92.8	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
92.8	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 % red. biolum.^	Not toxic	2.7	MPCA 1997c
92.8	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7	MPCA 1997c
92.8	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7	MPCA 1997c
92.8	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7	MPCA 1997c
92.8	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7	MPCA 1997c
92.8	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7	MPCA 1997c



**Table G-14. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluoranthene in the St. Louis River Area of Concer**

Fluoranthene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
95.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4	MPCA 1997b
95.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4	MPCA 1997b
95.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 % red. biolum.^	Toxic	0.4	MPCA 1997b
95.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4	MPCA 1997b
95.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4	MPCA 1997b
95.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4	MPCA 1997b
98.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
98.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
111	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69	MPCA 1997c
111	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	1.69	MPCA 1997c
111	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69	MPCA 1997c
117	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82	MPCA 1997b
117	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82	MPCA 1997b
117	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82	MPCA 1997b
117	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 % red. biolum.^	Not toxic	1.82	MPCA 1997b
127	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	2.34	MPCA 1997c
127	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34	MPCA 1997c
127	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34	MPCA 1997c
127	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34	MPCA 1997c
127	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34	MPCA 1997c
143	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 % red. biolum.^	Toxic	3.25	MPCA 1997c
143	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25	MPCA 1997c
143	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25	MPCA 1997c
158	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35	MPCA 1997b
158	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35	MPCA 1997b
158	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35	MPCA 1997b
158	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.35	MPCA 1997b
160	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
160	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
170	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24	MPCA 1997c
170	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24	MPCA 1997c
170	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24	MPCA 1997c
170	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	2.24	MPCA 1997c
170	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24	MPCA 1997c
181	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
181	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Not determined	0.7	Ankley <i>et al.</i> 1994

**Table G-14. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluoranthene in the St. Louis River Area of Concer**

Fluoranthene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
181	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
181	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.65 mg growth	Toxic	0.7	Ankley <i>et al.</i> 1994
181	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.74 % weight using UV light	Not toxic	0.7	Ankley <i>et al.</i> 1994
181	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	85 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
181	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
181	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
181	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87.5 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
181	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Not toxic	0.7	Ankley <i>et al.</i> 1994
246	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84	MPCA 1997b
246	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 % red. biolum.^	Not toxic	4.84	MPCA 1997b
246	St. Louis River - Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84	MPCA 1997b
246	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84	MPCA 1997b
308	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85	MPCA 1997c
308	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85	MPCA 1997c
308	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.85	MPCA 1997c
308	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85	MPCA 1997c
308	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85	MPCA 1997c
335	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 % red. biolum.^	Not toxic	5.34	MPCA 1997b
335	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34	MPCA 1997b
335	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34	MPCA 1997b
335	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34	MPCA 1997b
362	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72.5 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
362	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	87.5 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
362	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Toxic	4.1	Ankley <i>et al.</i> 1994
362	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
362	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.93 mg growth	Not toxic	4.1	Ankley <i>et al.</i> 1994
362	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
362	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
362	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.05 % weight using UV light	Not toxic	4.1	Ankley <i>et al.</i> 1994
362	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.85 mg growth	Not toxic	4.1	Ankley <i>et al.</i> 1994
362	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.83 % weight using UV light	Toxic	4.1	Ankley <i>et al.</i> 1994
362	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	100 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
362	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.08 % weight using UV light	Not toxic	4.1	Ankley <i>et al.</i> 1994
438	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65	MPCA 1997c
438	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.65	MPCA 1997c
438	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65	MPCA 1997c

**Table G-14. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluoranthene in the St. Louis River Area of Concern**

Fluoranthene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
438	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65	MPCA 1997c
438	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65	MPCA 1997c
458	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
458	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95	MPCA 1997c
458	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 % red. biolum.^	Toxic	3.95	MPCA 1997c
458	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95	MPCA 1997c
458	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 % red. biolum.^	Toxic	3.95	MPCA 1997c
458	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
530	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98	MPCA 1997c
530	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98	MPCA 1997c
530	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 % red. biolum.^	Not toxic	2.98	MPCA 1997c
530	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98	MPCA 1997c
530	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98	MPCA 1997c
640	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
640	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
670	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
670	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
679	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76	IT Corp. 1996
679	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76	IT Corp. 1996
679	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76	IT Corp. 1996
679	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76	IT Corp. 1996
730	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 % red. biolum.^	Not toxic	4.02	MPCA 1997c
730	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02	MPCA 1997c
730	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02	MPCA 1997c
730	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02	MPCA 1997c
730	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02	MPCA 1997c
776	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4	IT Corp. 1996
776	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4	IT Corp. 1996
776	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4	IT Corp. 1996
776	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4	IT Corp. 1996
804	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
804	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4	MPCA 1997c
804	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4	MPCA 1997c
804	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 % red. biolum.^	Not toxic	3.4	MPCA 1997c
804	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 % red. biolum.^	Not toxic	3.4	MPCA 1997c
804	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c

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Fluoranthene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
804	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
804	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4	MPCA 1997c
804	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4	MPCA 1997c
804	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
950	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1	MPCA 1997c
950	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1	MPCA 1997c
950	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 % red. biolum.^	Toxic	1	MPCA 1997c
950	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1	MPCA 1997c
950	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1	MPCA 1997c
970	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1080	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	8.97	MPCA 1997c
1080	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97	MPCA 1997c
1080	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97	MPCA 1997c
1080	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97	MPCA 1997c
1080	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97	MPCA 1997c
1084	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 % red. biolum.^	Not toxic	1.44	MPCA 1997c
1084	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44	MPCA 1997c
1084	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44	MPCA 1997c
1107	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37	MPCA 1997c
1107	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37	MPCA 1997c
1107	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37	MPCA 1997c
1107	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 % red. biolum.^	Not toxic	1.37	MPCA 1997c
1107	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37	MPCA 1997c
1118	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 % red. biolum.^	Not toxic	4.11	MPCA 1997b
1118	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11	MPCA 1997b
1118	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11	MPCA 1997b
1118	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11	MPCA 1997b
1118	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11	MPCA 1997b
1118	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11	MPCA 1997b
1190	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54	MPCA 1997b
1190	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54	MPCA 1997b
1190	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54	MPCA 1997b
1190	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 % red. biolum.^	Toxic	4.54	MPCA 1997b
1200	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1200	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1300	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997

**Table G-14. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluoranthene in the St. Louis River Area of Concer**

Fluoranthene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1300	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1363	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43	MPCA 1997c
1363	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 % red. biolum.^	Not toxic	2.43	MPCA 1997c
1363	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43	MPCA 1997c
1388	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24	MPCA 1997b
1388	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 % red. biolum.^	Toxic	0.24	MPCA 1997b
1388	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24	MPCA 1997b
1388	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24	MPCA 1997b
1400	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1400	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1400	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1437	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.99	MPCA 1997c
1437	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99	MPCA 1997c
1437	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99	MPCA 1997c
1560	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 % red. biolum.^	Not toxic	3.87	MPCA 1997c
1560	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87	MPCA 1997c
1560	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87	MPCA 1997c
1560	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87	MPCA 1997c
1560	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87	MPCA 1997c
1600	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1600	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1600	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1600	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1651	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05	MPCA 1997b
1651	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 % red. biolum.^	Not toxic	4.05	MPCA 1997b
1651	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05	MPCA 1997b
1651	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05	MPCA 1997b
1700	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1700	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1700	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1745	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.08 mg growth	Not determined	6.1	Ankley <i>et al.</i> 1994
1745	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92.5 % survival	Not toxic	6.1	Ankley <i>et al.</i> 1994
1745	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	6.1	Ankley <i>et al.</i> 1994
1745	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.54 mg growth	Toxic	6.1	Ankley <i>et al.</i> 1994
1745	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	75 % survival	Toxic	6.1	Ankley <i>et al.</i> 1994
1745	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	2.5 % survival/normal & UV	Toxic	6.1	Ankley <i>et al.</i> 1994

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Fluoranthene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1745	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Toxic	6.1	Ankley <i>et al.</i> 1994
1745	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82.5 % survival/normal & UV	Not toxic	6.1	Ankley <i>et al.</i> 1994
1745	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 % weight using UV light	Not toxic	6.1	Ankley <i>et al.</i> 1994
1745	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	42.5 % survival	Toxic	6.1	Ankley <i>et al.</i> 1994
1775	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1	IT Corp. 1996
1775	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1	IT Corp. 1996
1775	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1	IT Corp. 1996
1775	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1	IT Corp. 1996
1900	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1900	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1900	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1900	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1900	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	NR	Crane <i>et al.</i> 1997
1900	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1901	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 % red. biolum.^	Toxic	2.13	MPCA 1997b
1901	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13	MPCA 1997b
1901	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13	MPCA 1997b
1901	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13	MPCA 1997b
1917	St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54	IT Corp. 1996
1917	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54	IT Corp. 1996
1917	St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54	IT Corp. 1996
1917	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54	IT Corp. 1996
2048	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 % red. biolum.^	Not toxic	13.81	MPCA 1997b
2048	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81	MPCA 1997b
2048	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81	MPCA 1997b
2048	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81	MPCA 1997b
2160	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49	MPCA 1997b
2160	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49	MPCA 1997b
2160	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49	MPCA 1997b
2160	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	17.49	MPCA 1997b
2180	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98	MPCA 1997b
2180	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98	MPCA 1997b
2180	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98	MPCA 1997b
2180	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 % red. biolum.^	Toxic	13.98	MPCA 1997b
2200	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
2200	D-S Harbor - NW side of Lakehead Dock	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995

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Fluoranthene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
2200	D-S Harbor - NW side of Lakehead Dock	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
2200	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4	Wenck Associates Inc. 1995
2204	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 % red. biolum.^	Not toxic	3.98	MPCA 1997b
2204	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98	MPCA 1997b
2204	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98	MPCA 1997b
2204	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98	MPCA 1997b
2223	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 % red. biolum.^	Toxic	4.47	MPCA 1997b
2223	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47	MPCA 1997b
2223	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47	MPCA 1997b
2223	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47	MPCA 1997b
2382	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47	MPCA 1997b
2382	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47	MPCA 1997b
2382	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47	MPCA 1997b
2382	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 % red. biolum.^	Toxic	3.47	MPCA 1997b
2505	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82	MPCA 1997b
2505	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82	MPCA 1997b
2505	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82	MPCA 1997b
2505	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 % red. biolum.^	Toxic	0.82	MPCA 1997b
2549	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77	MPCA 1997c
2549	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77	MPCA 1997c
2549	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 % red. biolum.^	Toxic	6.77	MPCA 1997c
2549	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77	MPCA 1997c
2549	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77	MPCA 1997c
2580	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48	MPCA 1997c
2580	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48	MPCA 1997c
2580	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 % red. biolum.^	Toxic	4.48	MPCA 1997c
2636	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.74	MPCA 1997c
2636	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.74	MPCA 1997c
2636	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.74	MPCA 1997c
2636	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.74	MPCA 1997c
2636	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.74	MPCA 1997c
2708	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 % red. biolum.^	Toxic	2.63	MPCA 1997b
2708	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63	MPCA 1997b
2708	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63	MPCA 1997b
2708	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63	MPCA 1997b
2760	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42	IT Corp. 1996

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2760	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42	IT Corp. 1996
2760	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42	IT Corp. 1996
2760	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42	IT Corp. 1996
2811	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84	MPCA 1997c
2811	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84	MPCA 1997c
2811	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84	MPCA 1997c
2811	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	29.84	MPCA 1997c
2811	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84	MPCA 1997c
2839	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15	IT Corp. 1996
2839	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15	IT Corp. 1996
2839	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15	IT Corp. 1996
2839	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15	IT Corp. 1996
2860	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36	MPCA 1997b
2860	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36	MPCA 1997b
2860	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36	MPCA 1997b
2860	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 % red. biolum.^	Not toxic	4.36	MPCA 1997b
2865	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97	MPCA 1997c
2865	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.97	MPCA 1997c
2865	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97	MPCA 1997c
2865	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97	MPCA 1997c
2865	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97	MPCA 1997c
2900	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR	Crane <i>et al.</i> 1997
2900	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
3026	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05	MPCA 1997c
3026	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05	MPCA 1997c
3026	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05	MPCA 1997c
3026	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 % red. biolum.^	Toxic	4.05	MPCA 1997c
3026	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05	MPCA 1997c
3100	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88	MPCA 1993
3348	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37	IT Corp. 1996
3348	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37	IT Corp. 1996
3348	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37	IT Corp. 1996
3348	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37	IT Corp. 1996
4130	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72	MPCA 1997c
4130	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72	MPCA 1997c
4130	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72	MPCA 1997c



**Table G-14. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluoranthene in the St. Louis River Area of Concer**

Fluoranthene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
4130	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	6.72	MPCA 1997c
4130	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72	MPCA 1997c
6710	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19	MPCA 1997b
6710	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19	MPCA 1997b
6710	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 % red. biolum.^	Toxic	14.19	MPCA 1997b
6710	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19	MPCA 1997b
7406	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13	MPCA 1997b
7406	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13	MPCA 1997b
7406	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13	MPCA 1997b
7406	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 % red. biolum.^	Toxic	4.13	MPCA 1997b
7507	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07	MPCA 1997b
7507	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07	MPCA 1997b
7507	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 % red. biolum.^	Toxic	3.07	MPCA 1997b
7800	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26	MPCA 1997b
7800	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26	MPCA 1997b
7800	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 % red. biolum.^	Toxic	8.26	MPCA 1997b
7800	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26	MPCA 1997b
8419	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	1.71	MPCA 1997c
8419	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71	MPCA 1997c
8419	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71	MPCA 1997c
8419	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71	MPCA 1997c
8419	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71	MPCA 1997c
8618	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08	IT Corp. 1996
8618	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08	IT Corp. 1996
8618	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08	IT Corp. 1996
8618	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08	IT Corp. 1996
8863	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95	IT Corp. 1996
8863	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95	IT Corp. 1996
8863	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95	IT Corp. 1996
8863	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95	IT Corp. 1996
9100	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR	Crane <i>et al.</i> 1997
9100	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
9100	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58	MPCA 1993
9297	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91	MPCA 1997c
9297	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91	MPCA 1997c
9297	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91	MPCA 1997c

**Table G-14. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluoranthene in the St. Louis River Area of Concer**

Fluoranthene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
9297	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91	MPCA 1997c
9297	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 % red. biolum.^	Toxic	13.91	MPCA 1997c
9339	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	100	IT Corp. 1996
9339	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	100	IT Corp. 1996
9339	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	100	IT Corp. 1996
9339	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	100	IT Corp. 1996
9500	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
9946	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 % red. biolum.^	Not toxic	5.59	MPCA 1997b
9946	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59	MPCA 1997b
9946	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59	MPCA 1997b
9946	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59	MPCA 1997b
12943	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7	MPCA 1997b
12943	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7	MPCA 1997b
12943	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 % red. biolum.^	Not toxic	4.7	MPCA 1997b
12943	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7	MPCA 1997b
13000	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
16802	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03	MPCA 1997c
16802	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 % red. biolum.^	Toxic	6.03	MPCA 1997c
16802	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03	MPCA 1997c
23910	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64	IT Corp. 1996
23910	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64	IT Corp. 1996
23910	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64	IT Corp. 1996
23910	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64	IT Corp. 1996
67039	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR	IT Corp. 1996
67039	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR	IT Corp. 1996
67039	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR	IT Corp. 1996
67039	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR	IT Corp. 1996
76372	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12	IT Corp. 1996
76372	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12	IT Corp. 1996
76372	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12	IT Corp. 1996
76372	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12	IT Corp. 1996
163180	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16	IT Corp. 1996
163180	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16	IT Corp. 1996
163180	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16	IT Corp. 1996
163180	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16	IT Corp. 1996
246002	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.98	MPCA 1997c

**Table G-14. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluoranthene in the St. Louis River Area of Concer**

Fluoranthene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
246002	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 % red. biolum.^	Toxic	11.98	MPCA 1997c
246002	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.98	MPCA 1997c
246002	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.98	MPCA 1997c
246002	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.98	MPCA 1997c
530000	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12	MPCA 1993

^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.

LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

**Table G-15. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Pyrene in the St. Louis River Area of Concern**

Pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
6.80	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08	MPCA 1997b
6.80	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 % red. biolum.^	Toxic	0.08	MPCA 1997b
6.80	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 mg growth	Not toxic	0.08	MPCA 1997b
6.80	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08	MPCA 1997b
9.30	St. Louis River - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93	IT Corp. 1996
9.30	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93	IT Corp. 1996
9.30	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93	IT Corp. 1996
9.30	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93	IT Corp. 1996
11.8	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35	MPCA 1997b
11.8	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35	MPCA 1997b
11.8	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 % red. biolum.^	Toxic	0.35	MPCA 1997b
12.0	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12	MPCA 1997b
12.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12	MPCA 1997b
12.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12	MPCA 1997b
12.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 % red. biolum.^	Not toxic	0.12	MPCA 1997b
12.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14	MPCA 1997b
12.5	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14	MPCA 1997b
12.5	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14	MPCA 1997b
12.5	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 % red. biolum.^	Toxic	0.14	MPCA 1997b
12.8	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	0.59	MPCA 1997b
12.8	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59	MPCA 1997b
12.8	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59	MPCA 1997b
17.6	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 % red. biolum.^	Toxic	1.02	MPCA 1997b
17.6	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02	MPCA 1997b
17.6	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02	MPCA 1997b
17.6	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02	MPCA 1997b
27.8	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2	MPCA 1997b
27.8	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	25.2 % red. biolum.^	Toxic	0.2	MPCA 1997b
27.8	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2	MPCA 1997b
27.8	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2	MPCA 1997b
47.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 % red. biolum.^	Not toxic	5.77	MPCA 1997b
47.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77	MPCA 1997b
47.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77	MPCA 1997b
47.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77	MPCA 1997b
48.2	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 % red. biolum.^	Toxic	0.16	MPCA 1997b
48.2	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16	MPCA 1997b

**Table G-15. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Pyrene in the St. Louis River Area of Concern**

Pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
48.2	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16	MPCA 1997b
<50.0	Superior Bay	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
<50.0	Superior Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
<50.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
<50.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7	Wenck Associates Inc. 1995
52.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91	MPCA 1997b
52.0	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 % red. biolum.^	Not toxic	2.91	MPCA 1997b
52.0	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91	MPCA 1997b
52.0	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91	MPCA 1997b
53.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 % red. biolum.^	Not toxic	2.82	MPCA 1997b
53.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82	MPCA 1997b
53.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82	MPCA 1997b
53.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82	MPCA 1997b
57.4	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42	MPCA 1997b
57.4	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42	MPCA 1997b
57.4	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42	MPCA 1997b
57.4	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 % red. biolum.^	Toxic	1.42	MPCA 1997b
60.5	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87	MPCA 1997c
60.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87	MPCA 1997c
60.5	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 % red. biolum.^	Toxic	1.87	MPCA 1997c
60.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87	MPCA 1997c
60.5	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87	MPCA 1997c
71.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
71.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
79.5	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	2.59	MPCA 1997b
79.5	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59	MPCA 1997b
79.5	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59	MPCA 1997b
79.5	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59	MPCA 1997b
84.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4	MPCA 1997b
84.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4	MPCA 1997b
84.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4	MPCA 1997b
84.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 % red. biolum.^	Toxic	0.4	MPCA 1997b
84.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4	MPCA 1997b
84.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4	MPCA 1997b
95.0	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7	MPCA 1997c
95.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c

**Table G-15. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Pyrene in the St. Louis River Area of Concern**

Pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
95.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 % red. biolum.^	Not toxic	2.7	MPCA 1997c
95.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7	MPCA 1997c
95.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
95.0	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7	MPCA 1997c
95.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7	MPCA 1997c
95.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 % red. biolum.^	Not toxic	2.7	MPCA 1997c
95.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7	MPCA 1997c
95.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7	MPCA 1997c
99.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69	MPCA 1997c
99.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69	MPCA 1997c
99.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	1.69	MPCA 1997c
105	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34	MPCA 1997c
105	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34	MPCA 1997c
105	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34	MPCA 1997c
105	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34	MPCA 1997c
105	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	2.34	MPCA 1997c
106	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 % red. biolum.^	Not toxic	1.82	MPCA 1997b
106	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82	MPCA 1997b
106	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82	MPCA 1997b
106	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82	MPCA 1997b
130	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
130	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
137	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25	MPCA 1997c
137	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25	MPCA 1997c
137	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 % red. biolum.^	Toxic	3.25	MPCA 1997c
145	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.35	MPCA 1997b
145	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35	MPCA 1997b
145	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35	MPCA 1997b
145	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35	MPCA 1997b
158	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24	MPCA 1997c
158	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24	MPCA 1997c
158	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	2.24	MPCA 1997c
158	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24	MPCA 1997c
158	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24	MPCA 1997c
190	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Not determined	0.7	Ankley <i>et al.</i> 1994
190	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.74 % weight using UV light	Not toxic	0.7	Ankley <i>et al.</i> 1994

**Table G-15. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Pyrene in the St. Louis River Area of Concern**

Pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
190	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
190	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.65 mg growth	Toxic	0.7	Ankley <i>et al.</i> 1994
190	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	85 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
190	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
190	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
190	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
190	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87.5 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
190	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Not toxic	0.7	Ankley <i>et al.</i> 1994
196	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 % red. biolum.^	Not toxic	4.84	MPCA 1997b
196	St. Louis River - Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84	MPCA 1997b
196	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84	MPCA 1997b
196	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84	MPCA 1997b
255	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85	MPCA 1997c
255	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85	MPCA 1997c
255	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85	MPCA 1997c
255	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85	MPCA 1997c
255	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.85	MPCA 1997c
343	Spirit Lake - Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65	MPCA 1997c
343	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65	MPCA 1997c
343	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.65	MPCA 1997c
343	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65	MPCA 1997c
343	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65	MPCA 1997c
351	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34	MPCA 1997b
351	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 % red. biolum.^	Not toxic	5.34	MPCA 1997b
351	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34	MPCA 1997b
351	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34	MPCA 1997b
401	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	100 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
401	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.83 % weight using UV light	Toxic	4.1	Ankley <i>et al.</i> 1994
401	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.85 mg growth	Not toxic	4.1	Ankley <i>et al.</i> 1994
401	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.05 % weight using UV light	Not toxic	4.1	Ankley <i>et al.</i> 1994
401	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72.5 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
401	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.08 % weight using UV light	Not toxic	4.1	Ankley <i>et al.</i> 1994
401	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
401	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.93 mg growth	Not toxic	4.1	Ankley <i>et al.</i> 1994
401	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
401	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Toxic	4.1	Ankley <i>et al.</i> 1994

**Table G-15. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Pyrene in the St. Louis River Area of Concern**

Pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
401	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	87.5 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
401	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
430	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
430	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 % red. biolum.^	Toxic	3.95	MPCA 1997c
430	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95	MPCA 1997c
430	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 % red. biolum.^	Toxic	3.95	MPCA 1997c
430	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
430	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95	MPCA 1997c
447	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98	MPCA 1997c
447	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98	MPCA 1997c
447	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98	MPCA 1997c
447	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 % red. biolum.^	Not toxic	2.98	MPCA 1997c
447	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98	MPCA 1997c
480	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
480	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
523	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4	IT Corp. 1996
523	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4	IT Corp. 1996
523	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4	IT Corp. 1996
523	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4	IT Corp. 1996
580	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
580	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
679	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76	IT Corp. 1996
679	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76	IT Corp. 1996
679	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76	IT Corp. 1996
679	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76	IT Corp. 1996
693	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1	MPCA 1997c
693	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 % red. biolum.^	Toxic	1	MPCA 1997c
693	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1	MPCA 1997c
693	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1	MPCA 1997c
693	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1	MPCA 1997c
718	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4	MPCA 1997c
718	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4	MPCA 1997c
718	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
718	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
718	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 % red. biolum.^	Not toxic	3.4	MPCA 1997c
718	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c



**Table G-15. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Pyrene in the St. Louis River Area of Concern**

Pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
718	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
718	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4	MPCA 1997c
718	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 % red. biolum.^	Not toxic	4.02	MPCA 1997c
718	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02	MPCA 1997c
718	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02	MPCA 1997c
718	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02	MPCA 1997c
718	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02	MPCA 1997c
718	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4	MPCA 1997c
718	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 % red. biolum.^	Not toxic	3.4	MPCA 1997c
805	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 % red. biolum.^	Not toxic	1.37	MPCA 1997c
805	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37	MPCA 1997c
805	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37	MPCA 1997c
805	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37	MPCA 1997c
805	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37	MPCA 1997c
840	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1000	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1031	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 % red. biolum.^	Toxic	0.24	MPCA 1997b
1031	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24	MPCA 1997b
1031	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24	MPCA 1997b
1031	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24	MPCA 1997b
1064	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11	MPCA 1997b
1064	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11	MPCA 1997b
1064	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11	MPCA 1997b
1064	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11	MPCA 1997b
1064	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11	MPCA 1997b
1064	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 % red. biolum.^	Not toxic	4.11	MPCA 1997b
1099	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 % red. biolum.^	Not toxic	1.44	MPCA 1997c
1099	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44	MPCA 1997c
1099	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44	MPCA 1997c
1100	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1100	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1100	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1200	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1200	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1200	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1252	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 % red. biolum.^	Not toxic	2.43	MPCA 1997c

**Table G-15. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Pyrene in the St. Louis River Area of Concern**

Pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1252	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43	MPCA 1997c
1252	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43	MPCA 1997c
1296	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1	IT Corp. 1996
1296	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1	IT Corp. 1996
1296	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1	IT Corp. 1996
1296	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1	IT Corp. 1996
1300	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1300	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1317	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99	MPCA 1997c
1317	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.99	MPCA 1997c
1317	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99	MPCA 1997c
1333	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87	MPCA 1997c
1333	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87	MPCA 1997c
1333	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 % red. biolum.^	Not toxic	3.87	MPCA 1997c
1333	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87	MPCA 1997c
1333	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87	MPCA 1997c
1340	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54	MPCA 1997b
1340	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54	MPCA 1997b
1340	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54	MPCA 1997b
1340	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 % red. biolum.^	Toxic	4.54	MPCA 1997b
1384	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97	MPCA 1997c
1384	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	8.97	MPCA 1997c
1384	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97	MPCA 1997c
1384	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97	MPCA 1997c
1384	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97	MPCA 1997c
1400	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1400	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1400	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1400	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1400	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1500	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1500	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	NR	Crane <i>et al.</i> 1997
1519	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05	MPCA 1997b
1519	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05	MPCA 1997b
1519	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05	MPCA 1997b
1519	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 % red. biolum.^	Not toxic	4.05	MPCA 1997b

**Table G-15. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Pyrene in the St. Louis River Area of Concern**

Pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1572	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54	IT Corp. 1996
1572	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54	IT Corp. 1996
1572	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54	IT Corp. 1996
1572	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54	IT Corp. 1996
1600	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1600	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1635	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 % red. biolum.^	Not toxic	13.81	MPCA 1997b
1635	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81	MPCA 1997b
1635	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81	MPCA 1997b
1635	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81	MPCA 1997b
1689	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13	MPCA 1997b
1689	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13	MPCA 1997b
1689	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13	MPCA 1997b
1689	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 % red. biolum.^	Toxic	2.13	MPCA 1997b
1700	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1700	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1714	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	17.49	MPCA 1997b
1714	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49	MPCA 1997b
1714	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49	MPCA 1997b
1714	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49	MPCA 1997b
1796	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82	MPCA 1997b
1796	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82	MPCA 1997b
1796	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 % red. biolum.^	Toxic	0.82	MPCA 1997b
1796	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82	MPCA 1997b
1800	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4	Wenck Associates Inc. 1995
1800	D-S Harbor - NW side of Lakehead Dock	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
1800	D-S Harbor - NW side of Lakehead Dock	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
1800	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
1826	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98	MPCA 1997b
1826	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98	MPCA 1997b
1826	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 % red. biolum.^	Not toxic	3.98	MPCA 1997b
1826	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98	MPCA 1997b
1836	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	2.5 % survival/normal & UV	Toxic	6.1	Ankley <i>et al.</i> 1994
1836	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	42.5 % survival	Toxic	6.1	Ankley <i>et al.</i> 1994
1836	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	6.1	Ankley <i>et al.</i> 1994
1836	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92.5 % survival	Not toxic	6.1	Ankley <i>et al.</i> 1994

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Pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1836	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.54 mg growth	Toxic	6.1	Ankley <i>et al.</i> 1994
1836	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.08 mg growth	Not determined	6.1	Ankley <i>et al.</i> 1994
1836	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 % weight using UV light	Not toxic	6.1	Ankley <i>et al.</i> 1994
1836	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82.5 % survival/normal & UV	Not toxic	6.1	Ankley <i>et al.</i> 1994
1836	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Toxic	6.1	Ankley <i>et al.</i> 1994
1836	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	75 % survival	Toxic	6.1	Ankley <i>et al.</i> 1994
1838	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98	MPCA 1997b
1838	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98	MPCA 1997b
1838	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98	MPCA 1997b
1838	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 % red. biolum.^	Toxic	13.98	MPCA 1997b
1946	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.74	MPCA 1997c
1946	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.74	MPCA 1997c
1946	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.74	MPCA 1997c
1946	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.74	MPCA 1997c
1946	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.74	MPCA 1997c
2128	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47	MPCA 1997b
2128	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47	MPCA 1997b
2128	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 % red. biolum.^	Toxic	3.47	MPCA 1997b
2128	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47	MPCA 1997b
2133	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63	MPCA 1997b
2133	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 % red. biolum.^	Toxic	2.63	MPCA 1997b
2133	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63	MPCA 1997b
2133	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63	MPCA 1997b
2191	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48	MPCA 1997c
2191	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48	MPCA 1997c
2191	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 % red. biolum.^	Toxic	4.48	MPCA 1997c
2212	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	29.84	MPCA 1997c
2212	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84	MPCA 1997c
2212	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84	MPCA 1997c
2212	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84	MPCA 1997c
2212	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84	MPCA 1997c
2308	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36	MPCA 1997b
2308	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36	MPCA 1997b
2308	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 % red. biolum.^	Not toxic	4.36	MPCA 1997b
2308	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36	MPCA 1997b
2400	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997

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Pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
2400	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR	Crane <i>et al.</i> 1997
2429	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15	IT Corp. 1996
2429	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15	IT Corp. 1996
2429	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15	IT Corp. 1996
2429	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15	IT Corp. 1996
2503	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47	MPCA 1997b
2503	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47	MPCA 1997b
2503	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47	MPCA 1997b
2503	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 % red. biolum.^	Toxic	4.47	MPCA 1997b
2505	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97	MPCA 1997c
2505	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97	MPCA 1997c
2505	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.97	MPCA 1997c
2505	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97	MPCA 1997c
2505	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97	MPCA 1997c
2597	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42	IT Corp. 1996
2597	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42	IT Corp. 1996
2597	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42	IT Corp. 1996
2597	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42	IT Corp. 1996
2632	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05	MPCA 1997c
2632	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 % red. biolum.^	Toxic	4.05	MPCA 1997c
2632	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05	MPCA 1997c
2632	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05	MPCA 1997c
2632	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05	MPCA 1997c
2819	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37	IT Corp. 1996
2819	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37	IT Corp. 1996
2819	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37	IT Corp. 1996
2819	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37	IT Corp. 1996
2933	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	6.72	MPCA 1997c
2933	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72	MPCA 1997c
2933	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72	MPCA 1997c
2933	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72	MPCA 1997c
2933	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72	MPCA 1997c
3000	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88	MPCA 1993
3143	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77	MPCA 1997c
3143	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77	MPCA 1997c
3143	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77	MPCA 1997c

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Pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
3143	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 % red. biolum.^	Toxic	6.77	MPCA 1997c
3143	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77	MPCA 1997c
5216	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07	MPCA 1997b
5216	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07	MPCA 1997b
5216	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 % red. biolum.^	Toxic	3.07	MPCA 1997b
5291	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 % red. biolum.^	Toxic	14.19	MPCA 1997b
5291	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19	MPCA 1997b
5291	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19	MPCA 1997b
5291	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19	MPCA 1997b
5412	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13	MPCA 1997b
5412	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 % red. biolum.^	Toxic	4.13	MPCA 1997b
5412	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13	MPCA 1997b
5412	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13	MPCA 1997b
5794	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71	MPCA 1997c
5794	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71	MPCA 1997c
5794	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71	MPCA 1997c
5794	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71	MPCA 1997c
5794	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	1.71	MPCA 1997c
5858	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26	MPCA 1997b
5858	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26	MPCA 1997b
5858	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 % red. biolum.^	Toxic	8.26	MPCA 1997b
5858	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26	MPCA 1997b
6615	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	100	IT Corp. 1996
6615	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	100	IT Corp. 1996
6615	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	100	IT Corp. 1996
6615	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	100	IT Corp. 1996
6658	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91	MPCA 1997c
6658	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91	MPCA 1997c
6658	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91	MPCA 1997c
6658	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 % red. biolum.^	Toxic	13.91	MPCA 1997c
6658	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91	MPCA 1997c
6822	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08	IT Corp. 1996
6822	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08	IT Corp. 1996
6822	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08	IT Corp. 1996
6822	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08	IT Corp. 1996
6936	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95	IT Corp. 1996

**Table G-15. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Pyrene in the St. Louis River Area of Concern**

Pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
6936	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95	IT Corp. 1996
6936	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95	IT Corp. 1996
6936	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95	IT Corp. 1996
7200	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR	Crane <i>et al.</i> 1997
7200	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
7426	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59	MPCA 1997b
7426	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59	MPCA 1997b
7426	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59	MPCA 1997b
7426	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 % red. biolum.^	Not toxic	5.59	MPCA 1997b
7700	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
8500	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58	MPCA 1993
9800	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
9844	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 % red. biolum.^	Not toxic	4.7	MPCA 1997b
9844	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7	MPCA 1997b
9844	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7	MPCA 1997b
9844	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7	MPCA 1997b
12481	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03	MPCA 1997c
12481	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 % red. biolum.^	Toxic	6.03	MPCA 1997c
12481	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03	MPCA 1997c
19691	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64	IT Corp. 1996
19691	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64	IT Corp. 1996
19691	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64	IT Corp. 1996
19691	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64	IT Corp. 1996
50119	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12	IT Corp. 1996
50119	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12	IT Corp. 1996
50119	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12	IT Corp. 1996
50119	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12	IT Corp. 1996
67039	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR	IT Corp. 1996
67039	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR	IT Corp. 1996
67039	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR	IT Corp. 1996
67039	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR	IT Corp. 1996
155612	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.98	MPCA 1997c
155612	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 % red. biolum.^	Toxic	11.98	MPCA 1997c
155612	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.98	MPCA 1997c
155612	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.98	MPCA 1997c
155612	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.98	MPCA 1997c

**Table G-15. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Pyrene in the St. Louis River Area of Concern**

Pyrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
158996	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16	IT Corp. 1996
158996	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16	IT Corp. 1996
158996	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16	IT Corp. 1996
158996	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16	IT Corp. 1996
410000	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12	MPCA 1993

^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.

LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.



**Table G-16. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Anthracene in the St. Louis River Area of Concern**

Anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
1.40	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08
1.40	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08
1.40	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 mg growth	Toxic	0.08
1.40	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08
2.50	Allouez Bay - Miller & Coffee Creek Embayment	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 % red. biolum.^	Toxic	0.35
2.50	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35
2.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35
2.60	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14
2.60	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14
2.60	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14
2.60	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 % red. biolum.^	Toxic	0.14
2.70	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
2.70	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	0.59
2.70	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59
3.20	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93
3.20	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93
3.20	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93
3.20	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93
3.40	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 % red. biolum.^	Toxic	1.02
3.40	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02
3.40	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02
3.40	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02
4.00	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12
4.00	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12
4.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12
4.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 % red. biolum.^	Not toxic	0.12
4.90	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	25.2 % red. biolum.^	Toxic	0.2
4.90	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2
4.90	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2
4.90	D-S Harbor	30 minute	Bacteria	<i>Chironomus tentans</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2
8.00	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91
8.00	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 % red. biolum.^	Not toxic	2.91
8.00	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91
8.00	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91
9.00	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82

**Table G-16. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Anthracene in the St. Louis River Area of Concern**

Anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
9.00	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82
9.00	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82
9.00	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 % red. biolum.^	Not toxic	2.82
10.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77
10.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 % red. biolum.^	Not toxic	5.77
10.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77
10.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77
11.5	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 % red. biolum.^	Toxic	1.87
11.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87
11.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87
11.5	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87
11.5	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87
11.8	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16
11.8	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16
11.8	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 % red. biolum.^	Toxic	0.16
12.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59
12.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59
12.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59
12.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	2.59
12.4	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 % red. biolum.^	Toxic	1.42
12.4	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42
12.4	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42
12.4	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42
13.5	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7
13.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 % red. biolum.^	Not toxic	2.7
13.5	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7
13.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
13.5	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7
13.5	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7
13.5	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7
13.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
13.5	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7
13.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 % red. biolum.^	Not toxic	2.7
14.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR
14.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR

**Table G-16. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Anthracene in the St. Louis River Area of Concern**

Anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
16.2	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Not toxic	0.7
16.2	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 Percent survival/normal & UV	Toxic	0.7
16.2	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.65 mg growth	Toxic	0.7
16.2	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.74 Percent weight using UV light	Not toxic	0.7
16.2	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 Percent survival/normal & UV	Toxic	0.7
16.2	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 Percent survival/normal & UV	Toxic	0.7
16.2	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Not toxic	0.7
16.2	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87.5 % survival	Not toxic	0.7
16.2	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Not determined	0.7
16.2	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	85 % survival	Not toxic	0.7
17.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34
17.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34
17.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34
17.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34
17.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	2.34
25.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25
25.5	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25
25.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 % red. biolum.^	Toxic	3.25
26.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR
26.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4
26.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	NR
26.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4
26.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4
26.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 % red. biolum.^	Toxic	0.4
26.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4
26.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4
27.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.35
27.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35
27.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35
27.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35
28.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69
28.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	1.69
28.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82
28.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69
28.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82

**Table G-16. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Anthracene in the St. Louis River Area of Concern**

Anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
28.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 % red. biolum.^	Not toxic	1.82
28.0	St. Louis Bay	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	70 % survival	Not toxic	1.82
29.0	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 % red. biolum.^	Not toxic	4.84
29.0	St. Louis River - Lower St. Louis River	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	92 % survival	Not toxic	4.84
29.0	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84
29.0	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84
30.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	2.24
30.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24
30.0	D-S Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	98 % survival	Not toxic	2.24
30.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24
30.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24
<50.0	Superior Bay	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	6.7
<50.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7
<50.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7
<50.0	Superior Bay	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	90 % survival	Not toxic	6.7
59.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34
59.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34
59.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 % red. biolum.^	Not toxic	5.34
59.0	Spirit Lake	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	100 % survival	Not toxic	5.34
68.9	St. Louis Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	72.5 Percent survival/normal & UV	Not toxic	4.1
68.9	St. Louis Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	80 % survival	Not toxic	4.1
68.9	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.08 Percent weight using UV light	Not toxic	4.1
68.9	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 Percent survival/normal & UV	Not toxic	4.1
68.9	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.85 mg growth	Not toxic	4.1
68.9	St. Louis Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	0.05 Percent weight using UV light	Not toxic	4.1
68.9	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	87.5 Percent survival/normal & UV	Not toxic	4.1
68.9	St. Louis Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	0.04 mg growth	Toxic	4.1
68.9	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	100 % survival	Not toxic	4.1
68.9	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.1
68.9	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.93 mg growth	Not toxic	4.1
68.9	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.83 Percent weight using UV light	Toxic	4.1
72.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.85
72.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85
72.0	D-S Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	88 % survival	Not toxic	3.85
72.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85

**Table G-16. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Anthracene in the St. Louis River Area of Concern**

Anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
72.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85
89.3	Spirit Lake	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	88 % survival	Not toxic	3.95
89.3	Spirit Lake	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	70 % survival	Toxic	3.95
89.3	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 % red. biolum.^	Toxic	3.95
89.3	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
89.3	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 % red. biolum.^	Toxic	3.95
89.3	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
100	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	NR
100	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR
100	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	90 % survival	Not toxic	NR
100	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	75 % survival	Not toxic	NR
111	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65
111	Spirit Lake	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	87 % survival	Not toxic	1.65
111	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.65
111	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65
111	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65
115	D-S Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	97 % survival	Not toxic	2.98
115	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98
115	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98
115	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 % red. biolum.^	Not toxic	2.98
115	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98
140	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	96 % survival	Not toxic	NR
154	D-S Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	87 % survival	Not toxic	3.4
154	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4
154	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4
154	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
154	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 % red. biolum.^	Not toxic	3.4
154	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
154	D-S Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	87 % survival	Not toxic	3.4
154	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4
154	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 % red. biolum.^	Not toxic	3.4
154	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4
160	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR
160	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	90 % survival	Not toxic	NR
170	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	96 % survival	Not toxic	NR

**Table G-16. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Anthracene in the St. Louis River Area of Concern**

Anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
170	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR
170	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
172	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 % red. biolum.^	Not toxic	4.02
172	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02
172	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02
172	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02
172	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02
180	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
187	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37
187	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37
187	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 % red. biolum.^	Not toxic	1.37
187	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37
187	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37
190	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR
190	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR
190	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR
212	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11
212	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 % red. biolum.^	Not toxic	4.11
212	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11
212	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11
212	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11
212	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11
217	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63
217	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63
217	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63
217	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 % red. biolum.^	Toxic	2.63
220	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	NR
220	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
220	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR
220	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	NR
227	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 % red. biolum.^	Toxic	1
227	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1
227	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1
227	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1
227	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1
230	D-S Harbor - NW side of Lakehead Dock	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	8.4
230	D-S Harbor - NW side of Lakehead Dock	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4

**Table G-16. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Anthracene in the St. Louis River Area of Concern**

Anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
230	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4
230	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4
235	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47
235	St. Louis Bay	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	94 % survival	Not toxic	3.47
235	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47
235	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 % red. biolum.^	Toxic	3.47
249	D-S Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	98 % survival	Not toxic	1.44
249	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44
249	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 % red. biolum.^	Not toxic	1.44
250	St. Louis Bay	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	90 % survival	Not toxic	3.97
250	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.97
250	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97
250	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97
250	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97
254	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05
254	D-S Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	85 % survival	Not toxic	4.05
254	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05
254	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 % red. biolum.^	Toxic	4.05
254	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05
260	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	90 % survival	Not toxic	NR
260	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	85 % survival	Not toxic	NR
260	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR
260	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	96 % survival	Not toxic	NR
260	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
294	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	0.11 mg growth	Toxic	11.76
294	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	100 % survival	Not toxic	11.76
294	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76
294	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76
303	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54
303	D-S Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	69 % survival	Not toxic	4.54
303	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 % red. biolum.^	Toxic	4.54
303	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54
304	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24
304	D-S Harbor	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	72 % survival	Not toxic	0.24
304	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 % red. biolum.^	Toxic	0.24
304	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24
304	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyaella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4

**Table G-16. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Anthracene in the St. Louis River Area of Concern**

Anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
304	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4
304	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4
304	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4
305	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43
305	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43
305	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 % red. biolum.^	Not toxic	2.43
307	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87
307	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87
307	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87
307	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87
307	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 % red. biolum.^	Not toxic	3.87
310	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR
310	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	NR
312	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99
312	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.99
312	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99
326	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05
326	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05
326	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 % red. biolum.^	Not toxic	4.05
326	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05
336	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81
336	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 % red. biolum.^	Not toxic	13.81
336	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81
336	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81
344	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	75 % survival	Toxic	6.1
344	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	2.5 Percent survival/normal & UV	Toxic	6.1
344	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.08 mg growth	Not determined	6.1
344	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 Percent weight using UV light	Not toxic	6.1
344	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.54 mg growth	Toxic	6.1
344	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82.5 Percent survival/normal & UV	Not toxic	6.1
344	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Toxic	6.1
344	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	42.5 % survival	Toxic	6.1
344	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92.5 % survival	Not toxic	6.1
344	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 Percent survival/normal & UV	Toxic	6.1
347	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97
347	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	8.97
347	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97



**Table G-16. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Anthracene in the St. Louis River Area of Concern**

Anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
347	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97
347	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97
348	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 % red. biolum.^	Toxic	4.48
348	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48
348	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48
393	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82
393	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 % red. biolum.^	Toxic	0.82
393	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82
393	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82
402	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 % red. biolum.^	Toxic	4.47
402	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47
402	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47
402	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47
407	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13
407	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13
407	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 % red. biolum.^	Toxic	2.13
407	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13
568	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49
568	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49
568	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49
568	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	17.49
570	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98
570	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 % red. biolum.^	Toxic	13.98
570	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98
570	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98
581	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98
581	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98
581	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98
581	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 % red. biolum.^	Not toxic	3.98
620	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88
627	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 % red. biolum.^	Toxic	6.77
627	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77
627	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77
627	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77
627	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77
659	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 % red. biolum.^	Not toxic	4.36
659	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36

**Table G-16. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Anthracene in the St. Louis River Area of Concern**

Anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
659	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36
659	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36
729	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54
729	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54
729	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54
729	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54
751	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	29.84
751	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84
751	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84
751	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84
751	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84
789	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1
789	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1
789	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1
789	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1
820	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15
820	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15
820	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15
820	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15
850	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	NR
914	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.74
914	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.74
914	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.74
914	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.74
914	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.74
981	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 % red. biolum.^	Toxic	14.19
981	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19
981	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19
981	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19
1145	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37
1145	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37
1145	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37
1145	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37
1342	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	6.72
1342	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72
1342	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72
1342	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72

**Table G-16. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Anthracene in the St. Louis River Area of Concern**

Anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
1342	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72
1400	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR
1452	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7
1452	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 % red. biolum.^	Not toxic	4.7
1452	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7
1452	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7
1454	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08
1454	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08
1454	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08
1454	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08
1606	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03
1606	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 % red. biolum.^	Toxic	6.03
1606	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03
1800	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58
2109	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59
2109	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59
2109	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59
2109	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 % red. biolum.^	Not toxic	5.59
2272	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13
2272	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 % red. biolum.^	Toxic	4.13
2272	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13
2272	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13
2273	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42
2273	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42
2273	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42
2273	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42
2634	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07
2634	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07
2634	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 % red. biolum.^	Toxic	3.07
2685	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	100
2685	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	100
2685	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	100
2685	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	100
2800	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR
2800	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR
3661	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95
3661	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95

**Table G-16. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Anthracene in the St. Louis River Area of Concern**

Anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3661	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95
3661	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95
3756	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71
3756	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	1.71
3756	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71
3756	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71
3756	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71
3990	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91
3990	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 % red. biolum.^	Toxic	13.91
3990	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91
3990	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91
3990	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91
5285	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26
5285	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26
5285	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26
5285	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 % red. biolum.^	Toxic	8.26
12658	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64
12658	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64
12658	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64
12658	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64
16760	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR
16760	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR
16760	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR
16760	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR
46025	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16
46025	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16
46025	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16
46025	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16
50119	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12
50119	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12
50119	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12
50119	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12
97366	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.98
97366	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 % red. biolum.^	Toxic	11.98
97366	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.98
97366	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.98
97366	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.98
170000	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12

**Table G-16. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Anthracene in the St. Louis River Area of Concern**

Anthracene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
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^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.  
LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

Reference
MPCA 1997b
MPCA 1997b
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MPCA 1997b
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Crane *et al.* 1997  
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Ankley *et al.* 1994  
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MPCA 1997c  
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Crane *et al.* 1997  
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Ankley *et al.* 1994  
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Crane *et al.* 1997  
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Wenck Associates Inc. 1995  
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Wenck Associates Inc. 1995  
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Crane *et al.* 1997  
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Ankley *et al.* 1994  
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Crane *et al.* 1997  
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**Table G-17. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluorene in the St. Louis River Area of Concern**

Fluorene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
0.50	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08	MPCA 1997b
0.50	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08	MPCA 1997b
0.50	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 mg growth	Not toxic	0.08	MPCA 1997b
0.50	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 % red. biolum.^	Toxic	0.08	MPCA 1997b
0.90	D-S Harbor - Miller & Coffee Creek Embayment	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 % red. biolum.^	Toxic	0.14	MPCA 1997b
0.90	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14	MPCA 1997b
0.90	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14	MPCA 1997b
0.90	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14	MPCA 1997b
1.40	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2	MPCA 1997b
1.40	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2	MPCA 1997b
1.40	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	25.2 % red. biolum.^	Toxic	0.2	MPCA 1997b
1.40	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2	MPCA 1997b
1.40	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35	MPCA 1997b
1.40	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 % red. biolum.^	Toxic	0.35	MPCA 1997b
1.40	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35	MPCA 1997b
1.50	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93	IT Corp. 1996
1.50	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93	IT Corp. 1996
1.50	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93	IT Corp. 1996
1.50	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93	IT Corp. 1996
2.00	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12	MPCA 1997b
2.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 % red. biolum.^	Not toxic	0.12	MPCA 1997b
2.00	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12	MPCA 1997b
2.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12	MPCA 1997b
2.60	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 % red. biolum.^	Toxic	1.02	MPCA 1997b
2.60	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02	MPCA 1997b
2.60	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02	MPCA 1997b
2.60	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02	MPCA 1997b
2.70	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59	MPCA 1997b
2.70	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59	MPCA 1997b
2.70	Allouez Bay	30 minute	Bacteria	<i>Chironomus tentans</i>	NA	0 % red. biolum.^	Not toxic	0.59	MPCA 1997b
4.00	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91	MPCA 1997b
4.00	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 % red. biolum.^	Not toxic	2.91	MPCA 1997b
4.00	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91	MPCA 1997b
4.00	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91	MPCA 1997b
5.50	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16	MPCA 1997b
5.50	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 % red. biolum.^	Toxic	0.16	MPCA 1997b

**Table G-17. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluorene in the St. Louis River Area of Concern**

Fluorene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
5.50	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16	MPCA 1997b
6.00	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77	MPCA 1997b
6.00	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 % red. biolum.^	Not toxic	5.77	MPCA 1997b
6.00	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77	MPCA 1997b
6.00	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77	MPCA 1997b
6.65	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42	MPCA 1997b
6.65	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42	MPCA 1997b
6.65	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42	MPCA 1997b
6.65	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 % red. biolum.^	Toxic	1.42	MPCA 1997b
8.00	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82	MPCA 1997b
8.00	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 % red. biolum.^	Toxic	1.87	MPCA 1997c
8.00	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87	MPCA 1997c
8.00	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87	MPCA 1997c
8.00	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87	MPCA 1997c
8.00	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87	MPCA 1997c
8.00	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82	MPCA 1997b
8.00	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82	MPCA 1997b
8.00	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 % red. biolum.^	Not toxic	2.82	MPCA 1997b
8.75	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 % red. biolum.^	Not toxic	2.7	MPCA 1997c
8.75	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7	MPCA 1997c
8.75	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7	MPCA 1997c
8.75	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 % red. biolum.^	Not toxic	2.7	MPCA 1997c
8.75	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
8.75	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7	MPCA 1997c
8.75	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7	MPCA 1997c
8.75	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7	MPCA 1997c
8.75	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
8.75	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7	MPCA 1997c
9.50	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	2.59	MPCA 1997b
9.50	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59	MPCA 1997b
9.50	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59	MPCA 1997b
9.50	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59	MPCA 1997b
10.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82	MPCA 1997b
10.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82	MPCA 1997b
10.0	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82	MPCA 1997b
10.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 % red. biolum.^	Not toxic	1.82	MPCA 1997b

**Table G-17. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluorene in the St. Louis River Area of Concern**

Fluorene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
11.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
11.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
11.3	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 % red. biolum.^	Toxic	3.25	MPCA 1997c
11.3	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25	MPCA 1997c
11.3	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25	MPCA 1997c
12.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4	MPCA 1997b
12.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4	MPCA 1997b
12.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4	MPCA 1997b
12.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4	MPCA 1997b
12.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4	MPCA 1997b
12.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 % red. biolum.^	Toxic	0.4	MPCA 1997b
13.7	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Not determined	0.7	Ankley <i>et al.</i> 1994
13.7	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87.5 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
13.7	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Not toxic	0.7	Ankley <i>et al.</i> 1994
13.7	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
13.7	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
13.7	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
13.7	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.74 % weight using UV light	Not toxic	0.7	Ankley <i>et al.</i> 1994
13.7	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	85 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
13.7	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
13.7	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.65 mg growth	Toxic	0.7	Ankley <i>et al.</i> 1994
14.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34	MPCA 1997c
14.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34	MPCA 1997c
14.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34	MPCA 1997c
14.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34	MPCA 1997c
14.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	2.34	MPCA 1997c
14.1	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35	MPCA 1997b
14.1	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35	MPCA 1997b
14.1	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35	MPCA 1997b
14.1	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.35	MPCA 1997b
20.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	2.24	MPCA 1997c
20.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24	MPCA 1997c
20.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24	MPCA 1997c
20.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24	MPCA 1997c
20.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24	MPCA 1997c
20.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	1.69	MPCA 1997c

**Table G-17. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluorene in the St. Louis River Area of Concern**

Fluorene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
20.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69	MPCA 1997c
20.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69	MPCA 1997c
22.0	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84	MPCA 1997b
22.0	St. Louis River - Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84	MPCA 1997b
22.0	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 % red. biolum.^	Not toxic	4.84	MPCA 1997b
22.0	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84	MPCA 1997b
22.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
22.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
29.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 % red. biolum.^	Not toxic	1.37	MPCA 1997c
29.0	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37	MPCA 1997c
29.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37	MPCA 1997c
29.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37	MPCA 1997c
29.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37	MPCA 1997c
30.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85	MPCA 1997c
30.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85	MPCA 1997c
30.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.85	MPCA 1997c
30.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85	MPCA 1997c
30.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85	MPCA 1997c
33.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.65	MPCA 1997c
33.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65	MPCA 1997c
33.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65	MPCA 1997c
33.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65	MPCA 1997c
33.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65	MPCA 1997c
42.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34	MPCA 1997b
42.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34	MPCA 1997b
42.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 % red. biolum.^	Not toxic	5.34	MPCA 1997b
42.0	Spirit Lake - Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34	MPCA 1997b
43.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
43.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
48.8	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
48.8	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Toxic	4.1	Ankley <i>et al.</i> 1994
48.8	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	87.5 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
48.8	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.93 mg growth	Not toxic	4.1	Ankley <i>et al.</i> 1994
48.8	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	100 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
48.8	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
48.8	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72.5 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994

**Table G-17. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluorene in the St. Louis River Area of Concern**

Fluorene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
48.8	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.05 % weight using UV light	Not toxic	4.1	Ankley <i>et al.</i> 1994
48.8	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.85 mg growth	Not toxic	4.1	Ankley <i>et al.</i> 1994
48.8	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.83 % weight using UV light	Toxic	4.1	Ankley <i>et al.</i> 1994
48.8	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.08 % weight using UV light	Not toxic	4.1	Ankley <i>et al.</i> 1994
48.8	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
<50.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
<50.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7	Wenck Associates Inc. 1995
<50.0	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4	Wenck Associates Inc. 1995
<50.0	D-S Harbor - NW side of Lakehead Dock	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
<50.0	Superior Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
<50.0	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
<50.0	Superior Bay	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	6.7	Wenck Associates Inc. 1995
<50.0	D-S Harbor - NW side of Lakehead Dock	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4	Wenck Associates Inc. 1995
50.9	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24	MPCA 1997b
50.9	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 % red. biolum.^	Toxic	0.24	MPCA 1997b
50.9	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24	MPCA 1997b
50.9	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24	MPCA 1997b
51.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98	MPCA 1997c
51.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11	MPCA 1997b
51.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98	MPCA 1997c
51.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11	MPCA 1997b
51.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11	MPCA 1997b
51.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 % red. biolum.^	Not toxic	2.98	MPCA 1997c
51.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98	MPCA 1997c
51.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
51.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95	MPCA 1997c
51.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 % red. biolum.^	Toxic	3.95	MPCA 1997c
51.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 % red. biolum.^	Toxic	3.95	MPCA 1997c
51.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
51.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95	MPCA 1997c
51.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11	MPCA 1997b
51.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 % red. biolum.^	Not toxic	4.11	MPCA 1997b
51.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98	MPCA 1997c
51.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11	MPCA 1997b
58.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47	MPCA 1997b
58.0	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47	MPCA 1997b

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Fluorene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
58.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47	MPCA 1997b
58.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 % red. biolum.^	Toxic	3.47	MPCA 1997b
59.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
59.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
71.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
71.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
74.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
74.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
83.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
83.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
86.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
90.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4	MPCA 1997c
90.5	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
90.5	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 % red. biolum.^	Not toxic	3.4	MPCA 1997c
90.5	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
90.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4	MPCA 1997c
90.5	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
90.5	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
90.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4	MPCA 1997c
90.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4	MPCA 1997c
90.5	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 % red. biolum.^	Not toxic	3.4	MPCA 1997c
91.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05	MPCA 1997b
91.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05	MPCA 1997b
91.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 % red. biolum.^	Not toxic	4.05	MPCA 1997b
91.0	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05	MPCA 1997b
94.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63	MPCA 1997b
94.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 % red. biolum.^	Toxic	2.63	MPCA 1997b
94.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63	MPCA 1997b
94.0	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63	MPCA 1997b
97.0	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97	MPCA 1997c
97.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97	MPCA 1997c
97.0	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97	MPCA 1997c
97.0	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.97	MPCA 1997c
97.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97	MPCA 1997c
97.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
100	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997



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Fluorene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
100	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
104	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 % red. biolum.^	Toxic	4.05	MPCA 1997c
104	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05	MPCA 1997c
104	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05	MPCA 1997c
104	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05	MPCA 1997c
104	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05	MPCA 1997c
110	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
110	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
110	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR	Crane <i>et al.</i> 1997
110	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
110	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
110	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
123	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02	MPCA 1997c
123	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02	MPCA 1997c
123	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02	MPCA 1997c
123	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 % red. biolum.^	Not toxic	4.02	MPCA 1997c
123	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02	MPCA 1997c
130	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
130	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
133	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 % red. biolum.^	Not toxic	13.81	MPCA 1997b
133	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81	MPCA 1997b
133	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81	MPCA 1997b
133	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81	MPCA 1997b
140	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
140	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
140	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
153	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13	MPCA 1997b
153	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13	MPCA 1997b
153	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13	MPCA 1997b
153	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 % red. biolum.^	Toxic	2.13	MPCA 1997b
160	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
160	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	NR	Crane <i>et al.</i> 1997
163	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76	IT Corp. 1996
163	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76	IT Corp. 1996
163	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76	IT Corp. 1996
163	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76	IT Corp. 1996

**Table G-17. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluorene in the St. Louis River Area of Concern**

Fluorene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
164	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1	MPCA 1997c
164	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1	MPCA 1997c
164	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1	MPCA 1997c
164	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 % red. biolum.^	Toxic	1	MPCA 1997c
164	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1	MPCA 1997c
165	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4	IT Corp. 1996
165	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4	IT Corp. 1996
165	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4	IT Corp. 1996
165	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4	IT Corp. 1996
183	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1	IT Corp. 1996
183	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1	IT Corp. 1996
183	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1	IT Corp. 1996
183	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1	IT Corp. 1996
187	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99	MPCA 1997c
187	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99	MPCA 1997c
187	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.99	MPCA 1997c
194	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87	MPCA 1997c
194	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87	MPCA 1997c
194	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87	MPCA 1997c
194	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 % red. biolum.^	Not toxic	3.87	MPCA 1997c
194	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87	MPCA 1997c
198	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47	MPCA 1997b
198	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47	MPCA 1997b
198	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47	MPCA 1997b
198	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 % red. biolum.^	Toxic	4.47	MPCA 1997b
211	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	17.49	MPCA 1997b
211	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49	MPCA 1997b
211	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49	MPCA 1997b
211	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49	MPCA 1997b
227	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44	MPCA 1997c
227	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 % red. biolum.^	Not toxic	1.44	MPCA 1997c
227	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44	MPCA 1997c
236	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 % red. biolum.^	Not toxic	2.43	MPCA 1997c
236	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43	MPCA 1997c
236	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43	MPCA 1997c
238	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 % red. biolum.^	Toxic	4.48	MPCA 1997c

**Table G-17. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluorene in the St. Louis River Area of Concern**

Fluorene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
238	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48	MPCA 1997c
238	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48	MPCA 1997c
243	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98	MPCA 1997b
243	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98	MPCA 1997b
243	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98	MPCA 1997b
243	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 % red. biolum.^	Not toxic	3.98	MPCA 1997b
275	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82	MPCA 1997b
275	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 % red. biolum.^	Toxic	0.82	MPCA 1997b
275	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82	MPCA 1997b
275	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82	MPCA 1997b
315	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 % red. biolum.^	Not toxic	4.36	MPCA 1997b
315	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36	MPCA 1997b
315	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36	MPCA 1997b
315	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36	MPCA 1997b
345	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54	IT Corp. 1996
345	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54	IT Corp. 1996
345	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54	IT Corp. 1996
345	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54	IT Corp. 1996
368	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	42.5 % survival	Toxic	6.1	Ankley <i>et al.</i> 1994
368	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92.5 % survival	Not toxic	6.1	Ankley <i>et al.</i> 1994
368	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	6.1	Ankley <i>et al.</i> 1994
368	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 % weight using UV light	Not toxic	6.1	Ankley <i>et al.</i> 1994
368	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Toxic	6.1	Ankley <i>et al.</i> 1994
368	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82.5 % survival/normal & UV	Not toxic	6.1	Ankley <i>et al.</i> 1994
368	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.54 mg growth	Toxic	6.1	Ankley <i>et al.</i> 1994
368	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	75 % survival	Toxic	6.1	Ankley <i>et al.</i> 1994
368	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	2.5 % survival/normal & UV	Toxic	6.1	Ankley <i>et al.</i> 1994
368	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.08 mg growth	Not determined	6.1	Ankley <i>et al.</i> 1994
380	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
383	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37	IT Corp. 1996
383	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37	IT Corp. 1996
383	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37	IT Corp. 1996
383	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37	IT Corp. 1996
384	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77	MPCA 1997c
384	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77	MPCA 1997c
384	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77	MPCA 1997c

**Table G-17. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluorene in the St. Louis River Area of Concern**

Fluorene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
384	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77	MPCA 1997c
384	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 % red. biolum.^	Toxic	6.77	MPCA 1997c
398	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72	MPCA 1997c
398	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72	MPCA 1997c
398	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72	MPCA 1997c
398	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	6.72	MPCA 1997c
398	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72	MPCA 1997c
417	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.74	MPCA 1997c
417	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.74	MPCA 1997c
417	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.74	MPCA 1997c
417	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.74	MPCA 1997c
417	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.74	MPCA 1997c
417	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54	MPCA 1997b
417	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54	MPCA 1997b
417	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 % red. biolum.^	Toxic	4.54	MPCA 1997b
417	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54	MPCA 1997b
440	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88	MPCA 1993
487	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42	IT Corp. 1996
487	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42	IT Corp. 1996
487	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42	IT Corp. 1996
487	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42	IT Corp. 1996
519	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19	MPCA 1997b
519	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 % red. biolum.^	Toxic	14.19	MPCA 1997b
519	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19	MPCA 1997b
519	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19	MPCA 1997b
536	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15	IT Corp. 1996
536	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15	IT Corp. 1996
536	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15	IT Corp. 1996
536	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15	IT Corp. 1996
539	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98	MPCA 1997b
539	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 % red. biolum.^	Toxic	13.98	MPCA 1997b
539	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98	MPCA 1997b
539	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98	MPCA 1997b
539	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08	IT Corp. 1996
539	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08	IT Corp. 1996
539	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08	IT Corp. 1996

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Fluorene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
539	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08	IT Corp. 1996
550	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	100	IT Corp. 1996
550	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	100	IT Corp. 1996
550	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	100	IT Corp. 1996
550	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	100	IT Corp. 1996
581	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97	MPCA 1997c
581	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	8.97	MPCA 1997c
581	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97	MPCA 1997c
581	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97	MPCA 1997c
581	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97	MPCA 1997c
604	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7	MPCA 1997b
604	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7	MPCA 1997b
604	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 % red. biolum.^	Not toxic	4.7	MPCA 1997b
604	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7	MPCA 1997b
729	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13	MPCA 1997b
729	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13	MPCA 1997b
729	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 % red. biolum.^	Toxic	4.13	MPCA 1997b
729	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13	MPCA 1997b
744	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 % red. biolum.^	Toxic	6.03	MPCA 1997c
744	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03	MPCA 1997c
744	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03	MPCA 1997c
780	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
983	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84	MPCA 1997c
983	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84	MPCA 1997c
983	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84	MPCA 1997c
983	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84	MPCA 1997c
983	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	29.84	MPCA 1997c
1125	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 % red. biolum.^	Not toxic	5.59	MPCA 1997b
1125	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59	MPCA 1997b
1125	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59	MPCA 1997b
1125	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59	MPCA 1997b
1200	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58	MPCA 1993
1436	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71	MPCA 1997c
1436	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71	MPCA 1997c
1436	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71	MPCA 1997c
1436	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71	MPCA 1997c

**Table G-17. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluorene in the St. Louis River Area of Concern**

Fluorene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1436	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	1.71	MPCA 1997c
1455	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 % red. biolum.^	Toxic	3.07	MPCA 1997b
1455	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07	MPCA 1997b
1455	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07	MPCA 1997b
2600	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR	Crane <i>et al.</i> 1997
2600	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
3272	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 % red. biolum.^	Toxic	13.91	MPCA 1997c
3272	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91	MPCA 1997c
3272	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91	MPCA 1997c
3272	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91	MPCA 1997c
3272	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91	MPCA 1997c
5010	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95	IT Corp. 1996
5010	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95	IT Corp. 1996
5010	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95	IT Corp. 1996
5010	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95	IT Corp. 1996
7542	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR	IT Corp. 1996
7542	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR	IT Corp. 1996
7542	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR	IT Corp. 1996
7542	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR	IT Corp. 1996
8093	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26	MPCA 1997b
8093	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26	MPCA 1997b
8093	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 % red. biolum.^	Toxic	8.26	MPCA 1997b
8093	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26	MPCA 1997b
8578	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64	IT Corp. 1996
8578	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64	IT Corp. 1996
8578	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64	IT Corp. 1996
8578	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64	IT Corp. 1996
28640	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12	IT Corp. 1996
28640	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12	IT Corp. 1996
28640	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12	IT Corp. 1996
28640	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12	IT Corp. 1996
33473	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16	IT Corp. 1996
33473	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16	IT Corp. 1996
33473	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16	IT Corp. 1996
33473	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16	IT Corp. 1996
78786	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.98	MPCA 1997c

**Table G-17. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Fluorene in the St. Louis River Area of Concern**

Fluorene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
78786	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 % red. biolum.^	Toxic	11.98	MPCA 1997c
78786	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.98	MPCA 1997c
78786	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.98	MPCA 1997c
78786	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.98	MPCA 1997c
170000	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12	MPCA 1993

^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.

LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

**Table G-18. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Phenanthrene in the St. Louis River Area of Conce**

Phenanthrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
3.70	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08
3.70	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08
3.70	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 mg growth	Not toxic	0.08
3.70	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 % red. biolum.^	Toxic	0.08
6.60	St. Louis River - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93
6.60	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93
6.60	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93
6.60	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93
7.90	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14
7.90	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14
7.90	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 % red. biolum.^	Toxic	0.14
7.90	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14
8.00	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12
8.00	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12
8.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 % red. biolum.^	Not toxic	0.12
8.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12
9.20	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35
9.20	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35
9.20	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 % red. biolum.^	Toxic	0.35
12.9	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59
12.9	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59
12.9	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	0.59
15.2	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02
15.2	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02
15.2	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 % red. biolum.^	Toxic	1.02
15.2	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02
18.3	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2
18.3	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2
18.3	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2
18.3	D-S Harbor	30 minute	Bacteria	<i>Chironomus tentans</i>	NA	25.2 % red. biolum.^	Toxic	0.2
21.5	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77
21.5	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77
21.5	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77
21.5	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 % red. biolum.^	Not toxic	5.77
35.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82



**Table G-18. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Phenanthrene in the St. Louis River Area of Conce**

Phenanthrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
35.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82
35.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82
35.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 % red. biolum.^	Not toxic	2.82
36.0	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 % red. biolum.^	Not toxic	2.91
36.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91
36.0	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91
36.0	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91
36.4	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16
36.4	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 % red. biolum.^	Toxic	0.16
36.4	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16
41.2	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42
41.2	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42
41.2	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42
41.2	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 % red. biolum.^	Toxic	1.42
42.5	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59
42.5	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59
42.5	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59
42.5	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	2.59
43.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87
43.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87
43.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87
43.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 % red. biolum.^	Toxic	1.87
43.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87
<50.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	6.7
<50.0	Superior Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	6.7
<50.0	Superior Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	6.7
<50.0	Superior Bay	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	6.7
53.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82
53.0	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82
53.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82
53.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 % red. biolum.^	Not toxic	1.82
55.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7
55.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 % red. biolum.^	Not toxic	2.7
55.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 % red. biolum.^	Not toxic	2.7
55.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7

**Table G-18. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Phenanthrene in the St. Louis River Area of Conce**

Phenanthrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
55.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7
55.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7
55.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR
55.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	NR
55.0	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7
55.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7
55.0	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7
55.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7
65.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	2.34
65.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34
65.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34
65.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34
65.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34
70.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR
70.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR
74.2	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.65 mg growth	Toxic	0.7
74.2	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.74 % weight using UV light	Not toxic	0.7
74.2	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	85 % survival	Not toxic	0.7
74.2	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival/normal & UV	Toxic	0.7
74.2	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	0.7
74.2	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival/normal & UV	Toxic	0.7
74.2	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Not toxic	0.7
74.2	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Not toxic	0.7
74.2	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87.5 % survival	Not toxic	0.7
74.2	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Not determined	0.7
78.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25
78.5	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25
78.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 % red. biolum.^	Toxic	3.25
90.4	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35
90.4	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35
90.4	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35
90.4	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.35
96.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69
96.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	2.24
96.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24

**Table G-18. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Phenanthrene in the St. Louis River Area of Conce**

Phenanthrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
96.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24
96.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24
96.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24
96.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	1.69
96.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69
107	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4
107	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4
107	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4
107	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 % red. biolum.^	Toxic	0.4
107	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4
107	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4
133	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85
133	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85
133	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.85
133	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85
133	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85
151	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 % red. biolum.^	Not toxic	4.84
151	St. Louis River - Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84
151	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84
151	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84
181	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34
181	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34
181	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34
181	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 % red. biolum.^	Not toxic	5.34
213	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
213	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95
213	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 % red. biolum.^	Toxic	3.95
213	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 % red. biolum.^	Toxic	3.95
213	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95
213	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95
220	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.08 % weight using UV light	Not toxic	4.1
220	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Toxic	4.1
220	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.83 % weight using UV light	Toxic	4.1
220	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival/normal & UV	Not toxic	4.1
220	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	4.1

**Table G-18. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Phenanthrene in the St. Louis River Area of Conce**

Phenanthrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
220	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72.5 % survival/normal & UV	Not toxic	4.1
220	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.05 % weight using UV light	Not toxic	4.1
220	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.85 mg growth	Not toxic	4.1
220	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.1
220	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.93 mg growth	Not toxic	4.1
220	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	87.5 % survival/normal & UV	Not toxic	4.1
220	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	100 % survival	Not toxic	4.1
280	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65
280	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65
280	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.65
280	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65
280	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65
300	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR
300	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
330	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	NR
330	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	NR
376	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98
376	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 % red. biolum.^	Not toxic	2.98
376	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98
376	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98
376	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98
420	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
423	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81
423	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81
423	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81
423	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 % red. biolum.^	Not toxic	13.81
470	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
470	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
472	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4
472	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4
472	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4
472	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4
476	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37
476	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 % red. biolum.^	Not toxic	1.37
476	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37

**Table G-18. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Phenanthrene in the St. Louis River Area of Conce**

Phenanthrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
476	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37
476	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37
515	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4
515	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4
515	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
515	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4
515	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 % red. biolum.^	Not toxic	3.4
515	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4
515	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4
515	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4
515	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4
515	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 % red. biolum.^	Not toxic	3.4
520	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
540	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
550	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR
550	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	NR
550	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	NR
566	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76
566	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76
566	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76
566	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76
590	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
590	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR
600	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR
600	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR
622	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1
622	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1
622	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1
622	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 % red. biolum.^	Toxic	1
622	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1
645	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11
645	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11
645	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11
645	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11
645	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11

**Table G-18. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Phenanthrene in the St. Louis River Area of Conce**

Phenanthrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
645	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 % red. biolum.^	Not toxic	4.11
650	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	NR
650	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR
670	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
670	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR
673	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 % red. biolum.^	Not toxic	3.87
673	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87
673	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87
673	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87
673	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87
700	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR
700	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR
707	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02
707	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02
707	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02
707	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02
707	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 % red. biolum.^	Not toxic	4.02
710	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54
710	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54
710	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54
710	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54
744	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05
744	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05
744	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05
744	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 % red. biolum.^	Not toxic	4.05
774	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98
774	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98
774	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 % red. biolum.^	Not toxic	3.98
774	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98
780	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR
780	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR
785	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82
785	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82
785	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82
785	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 % red. biolum.^	Toxic	0.82

**Table G-18. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Phenanthrene in the St. Louis River Area of Conce**

Phenanthrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
848	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 % red. biolum.^	Toxic	2.13
848	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13
848	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13
848	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13
853	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99
853	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99
853	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.99
900	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	100 % survival	Not toxic	8.4
900	D-S Harbor - NW side of Lakehead Dock	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	8.4
900	D-S Harbor - NW side of Lakehead Dock	48 hour	Cladoceran	<i>Ceriodaphnia dubia</i>	ADT	100 % survival	Not toxic	8.4
900	D-S Harbor - NW side of Lakehead Dock	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Not toxic	8.4
930	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1
930	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1
930	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR
930	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR
930	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1
930	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1
943	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 % red. biolum.^	Toxic	3.47
943	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47
943	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47
943	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47
953	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24
953	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24
953	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 % red. biolum.^	Toxic	0.24
953	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24
978	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15
978	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15
978	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15
978	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15
1000	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR
1007	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	2.5 % survival/normal & UV	Toxic	6.1
1007	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Toxic	6.1
1007	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82.5 % survival/normal & UV	Not toxic	6.1
1007	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 % weight using UV light	Not toxic	6.1
1007	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	42.5 % survival	Toxic	6.1

**Table G-18. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Phenanthrene in the St. Louis River Area of Conce**

Phenanthrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
1007	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	75 % survival	Toxic	6.1
1007	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.08 mg growth	Not determined	6.1
1007	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	6.1
1007	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.54 mg growth	Toxic	6.1
1007	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92.5 % survival	Not toxic	6.1
1040	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 % red. biolum.^	Toxic	2.63
1040	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63
1040	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63
1040	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63
1068	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05
1068	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05
1068	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05
1068	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 % red. biolum.^	Toxic	4.05
1068	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05
1093	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97
1093	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.97
1093	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97
1093	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97
1093	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97
1101	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37
1101	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37
1101	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37
1101	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37
1110	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49
1110	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	17.49
1110	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49
1110	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49
1163	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36
1163	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36
1163	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36
1163	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 % red. biolum.^	Not toxic	4.36
1200	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88
1361	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43
1361	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 % red. biolum.^	Not toxic	2.43
1361	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43



**Table G-18. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Phenanthrene in the St. Louis River Area of Conce**

Phenanthrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
1460	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 % red. biolum.^	Toxic	6.77
1460	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77
1460	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77
1460	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77
1460	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77
1472	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08
1472	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08
1472	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08
1472	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08
1561	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.74
1561	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.74
1561	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.74
1561	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.74
1561	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.74
1702	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48
1702	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 % red. biolum.^	Toxic	4.48
1702	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48
1799	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 % red. biolum.^	Not toxic	1.44
1799	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44
1799	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44
1850	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54
1850	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54
1850	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 % red. biolum.^	Toxic	4.54
1850	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54
2195	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97
2195	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97
2195	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97
2195	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97
2195	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	8.97
2374	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	100
2374	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	100
2374	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	100
2374	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	100
2416	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72
2416	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72

**Table G-18. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Phenanthrene in the St. Louis River Area of Conce**

Phenanthrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
2416	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	6.72
2416	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72
2416	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72
2658	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47
2658	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47
2658	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 % red. biolum.^	Toxic	4.47
2658	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47
2664	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98
2664	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 % red. biolum.^	Toxic	13.98
2664	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98
2664	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98
3072	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 % red. biolum.^	Toxic	4.13
3072	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13
3072	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13
3072	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13
3241	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	29.84
3241	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84
3241	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84
3241	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84
3241	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84
3800	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58
4500	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	NR
4593	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 % red. biolum.^	Toxic	14.19
4593	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19
4593	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19
4593	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19
5407	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	1.71
5407	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71
5407	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71
5407	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71
5407	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71
6057	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07
6057	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07
6057	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 % red. biolum.^	Toxic	3.07
6656	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42

**Table G-18. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Phenanthrene in the St. Louis River Area of Conce**

Phenanthrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
6656	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42
6656	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42
6656	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42
6921	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7
6921	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 % red. biolum.^	Not toxic	4.7
6921	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7
6921	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7
7716	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59
7716	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59
7716	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59
7716	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 % red. biolum.^	Not toxic	5.59
8400	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR
8625	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03
8625	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 % red. biolum.^	Toxic	6.03
8625	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03
8774	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91
8774	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91
8774	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91
8774	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 % red. biolum.^	Toxic	13.91
8774	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91
9249	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95
9249	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95
9249	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95
9249	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95
10000	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR
10000	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR
15412	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26
15412	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26
15412	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26
15412	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 % red. biolum.^	Toxic	8.26
21229	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR
21229	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR
21229	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR
21229	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR
26723	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64

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Phenanthrene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)
26723	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64
26723	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64
26723	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64
71130	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16
71130	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16
71130	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16
71130	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16
76372	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12
76372	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12
76372	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12
76372	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12
261748	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.98
261748	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 % red. biolum.^	Toxic	11.98
261748	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.98
261748	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.98
261748	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.98
670000	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12

^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.  
 LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

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**Table G-19. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Naphthalene in the St. Louis River Area of Concern**

Napthalene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
0.500	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.2	MPCA 1997b
0.500	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.2	MPCA 1997b
0.500	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	25.2 mg growth	Toxic	0.2	MPCA 1997b
0.500	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.3 % red. biolum.^	Toxic	0.08	MPCA 1997b
0.500	D-S Harbor - Miller & Coffee Creek Embayment	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.08	MPCA 1997b
0.500	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.94 EC50 biolum.#	Not toxic	0.2	MPCA 1997b
0.500	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	0.08	MPCA 1997b
0.500	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.08	MPCA 1997b
1.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.48 EC50 biolum.#	Toxic	3.47	MPCA 1997b
1.00	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	94 % survival	Not toxic	3.47	MPCA 1997b
1.00	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	3.47	MPCA 1997b
1.00	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.18 % red. biolum.^	Toxic	3.47	MPCA 1997b
1.50	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	0.59	MPCA 1997b
1.50	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	0.59	MPCA 1997b
1.50	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.96 EC50 biolum.#	Not toxic	0.59	MPCA 1997b
1.50	St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.93	IT Corp. 1996
1.50	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	2.93	IT Corp. 1996
1.50	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.04 mg growth	Toxic	2.93	IT Corp. 1996
1.50	St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	2.93	IT Corp. 1996
2.70	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	0.14	MPCA 1997b
2.70	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.3 % red. biolum.^	Toxic	0.14	MPCA 1997b
2.70	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	58 % survival	Not toxic	0.14	MPCA 1997b
2.70	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	17.83 EC50 biolum.#	Not toxic	0.14	MPCA 1997b
3.00	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.7 % red. biolum.^	Toxic	1.02	MPCA 1997b
3.00	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	1.02	MPCA 1997b
3.00	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.81 EC50 biolum.#	Not toxic	1.02	MPCA 1997b
3.00	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.02	MPCA 1997b
4.00	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	4.11	MPCA 1997b
4.00	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	15.5 % red. biolum.^	Not toxic	4.11	MPCA 1997b
4.00	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.11	MPCA 1997b
4.00	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.24 EC50 biolum.#	Toxic	4.11	MPCA 1997b
4.00	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	4.11	MPCA 1997b
4.00	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	4.11	MPCA 1997b
4.00	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.72 EC50 biolum.#	Not toxic	1.42	MPCA 1997b
4.00	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Not toxic	1.42	MPCA 1997b

**Table G-19. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Naphthalene in the St. Louis River Area of Concern**

Napthalene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
4.00	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	1.42	MPCA 1997b
4.00	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	41.98 % red. biolum.^	Toxic	1.42	MPCA 1997b
4.40	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.2 % red. biolum.^	Toxic	0.35	MPCA 1997b
4.40	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	11.24 EC50 biolum.#	Not toxic	0.35	MPCA 1997b
4.40	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	0.35	MPCA 1997b
6.50	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.36 EC50 biolum.#	Toxic	4.05	MPCA 1997b
6.50	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	67 % survival	Not toxic	4.05	MPCA 1997b
6.50	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.3 % red. biolum.^	Not toxic	4.05	MPCA 1997b
6.50	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	4.05	MPCA 1997b
9.10	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87.5 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
9.10	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
9.10	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.74 % weight using UV light	Not toxic	0.7	Ankley <i>et al.</i> 1994
9.10	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.65 mg growth	Toxic	0.7	Ankley <i>et al.</i> 1994
9.10	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
9.10	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
9.10	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Not determined	0.7	Ankley <i>et al.</i> 1994
9.10	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Not toxic	0.7	Ankley <i>et al.</i> 1994
9.10	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival/normal & UV	Toxic	0.7	Ankley <i>et al.</i> 1994
9.10	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	85 % survival	Not toxic	0.7	Ankley <i>et al.</i> 1994
9.20	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	22.95 % red. biolum.^	Toxic	0.16	MPCA 1997b
9.20	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.16	MPCA 1997b
9.20	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	0.16	MPCA 1997b
11.5	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	0.4	MPCA 1997b
11.5	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	0.4	MPCA 1997b
11.5	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.4	MPCA 1997b
11.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	0.24	MPCA 1997b
11.5	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	0.24	MPCA 1997b
11.5	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.05 % red. biolum.^	Toxic	0.24	MPCA 1997b
11.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	0.4	MPCA 1997b
11.5	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	0.4	MPCA 1997b
11.5	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	39.7 % red. biolum.^	Toxic	0.4	MPCA 1997b
11.5	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.24	MPCA 1997b
14.0	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.2 % red. biolum.^	Not toxic	4.84	MPCA 1997b
14.0	St. Louis River - Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.84	MPCA 1997b
14.0	St. Louis River - Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	4.84	MPCA 1997b

**Table G-19. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Naphthalene in the St. Louis River Area of Concern**

Napthalene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
14.0	St. Louis River - Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.09 EC50 biolum.#	Toxic	4.84	MPCA 1997b
17.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	28.8 % red. biolum.^	Toxic	3.25	MPCA 1997c
17.5	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.25	MPCA 1997c
17.5	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.42 EC50 biolum.#	Toxic	3.25	MPCA 1997c
27.3	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	2.7	MPCA 1997c
27.3	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.44 mg growth	Not toxic	2.7	MPCA 1997c
27.3	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.7	MPCA 1997c
27.3	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
27.3	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.52 EC50 biolum.#	Not toxic	2.7	MPCA 1997c
27.3	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	2.7	MPCA 1997c
27.3	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.7	MPCA 1997c
27.3	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12 % red. biolum.^	Not toxic	2.7	MPCA 1997c
27.3	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.3 % red. biolum.^	Not toxic	2.7	MPCA 1997c
27.3	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not toxic	2.7	MPCA 1997c
28.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	2.82	MPCA 1997b
28.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	2.82	MPCA 1997b
28.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.2 % red. biolum.^	Not toxic	2.82	MPCA 1997b
28.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.82	MPCA 1997b
31.6	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.35	MPCA 1997b
31.6	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	1.35	MPCA 1997b
31.6	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.35	MPCA 1997b
31.6	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	1.35	MPCA 1997b
36.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	100 EC50 biolum.#	Not toxic	0.12	MPCA 1997b
36.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.73 EC50 biolum.#	Not toxic	5.77	MPCA 1997b
36.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	5.77	MPCA 1997b
36.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.77	MPCA 1997b
36.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	6.4 % red. biolum.^	Not toxic	5.77	MPCA 1997b
36.0	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	0.12	MPCA 1997b
36.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.4 % red. biolum.^	Not toxic	0.12	MPCA 1997b
36.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	0.12	MPCA 1997b
45.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	2.34	MPCA 1997c
45.0	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	2.34	MPCA 1997c
45.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	2.34	MPCA 1997c
45.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.34	MPCA 1997c
45.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	2.34	MPCA 1997c

**Table G-19. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Naphthalene in the St. Louis River Area of Concern**

Napthalene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
47.0	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	48 % survival	Toxic	8.08	IT Corp. 1996
47.0	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	53 % survival	Toxic	8.08	IT Corp. 1996
47.0	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.14 mg growth	Toxic	8.08	IT Corp. 1996
47.0	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 mg growth	Toxic	8.08	IT Corp. 1996
50.0	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.89 % red. biolum.^	Not toxic	2.91	MPCA 1997b
50.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	2.91	MPCA 1997b
50.0	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	2.91	MPCA 1997b
50.0	Lower St. Louis River	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	2.91	MPCA 1997b
53.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.45 % red. biolum.^	Toxic	2.63	MPCA 1997b
53.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	2.63	MPCA 1997b
53.0	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	2.63	MPCA 1997b
53.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.32 EC50 biolum.#	Toxic	2.63	MPCA 1997b
56.2	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
56.2	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	100 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
56.2	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	87.5 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
56.2	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.85 mg growth	Not toxic	4.1	Ankley <i>et al.</i> 1994
56.2	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72.5 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
56.2	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.83 % weight using UV light	Toxic	4.1	Ankley <i>et al.</i> 1994
56.2	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.08 % weight using UV light	Not toxic	4.1	Ankley <i>et al.</i> 1994
56.2	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival/normal & UV	Not toxic	4.1	Ankley <i>et al.</i> 1994
56.2	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.93 mg growth	Not toxic	4.1	Ankley <i>et al.</i> 1994
56.2	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.1	Ankley <i>et al.</i> 1994
56.2	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.04 mg growth	Toxic	4.1	Ankley <i>et al.</i> 1994
56.2	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.05 % weight using UV light	Not toxic	4.1	Ankley <i>et al.</i> 1994
58.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
58.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
59.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.8 % red. biolum.^	Toxic	1.87	MPCA 1997c
59.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	1.87	MPCA 1997c
59.0	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.87	MPCA 1997c
59.0	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	1.87	MPCA 1997c
59.0	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.07 EC50 biolum.#	Not toxic	1.87	MPCA 1997c
63.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR	Crane <i>et al.</i> 1997
63.0	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
63.0	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
63.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997

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Napthalene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
65.0	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	2.13	MPCA 1997b
65.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.47 EC50 biolum.#	Toxic	2.13	MPCA 1997b
65.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	2.13	MPCA 1997b
65.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.6 % red. biolum.^	Toxic	2.13	MPCA 1997b
68.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-2.8 % red. biolum.^	Not toxic	1.82	MPCA 1997b
68.0	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	1.82	MPCA 1997b
68.0	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Not toxic	1.82	MPCA 1997b
68.0	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.56 EC50 biolum.#	Not toxic	1.82	MPCA 1997b
74.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
74.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
80.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.97 EC50 biolum.#	Not toxic	5.34	MPCA 1997b
80.0	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	18.8 % red. biolum.^	Not toxic	5.34	MPCA 1997b
80.0	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	5.34	MPCA 1997b
80.0	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	5.34	MPCA 1997b
91.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	1.37	MPCA 1997c
91.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.52 EC50 biolum.#	Not toxic	1.37	MPCA 1997c
91.0	Lower St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	52 % survival	Not toxic	1.37	MPCA 1997c
91.0	Lower St. Louis River	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	1.37	MPCA 1997c
91.0	Lower St. Louis River	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.2 % red. biolum.^	Not toxic	1.37	MPCA 1997c
99.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
99.0	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
104	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.1 % red. biolum.^	Not toxic	13.81	MPCA 1997b
104	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.88 EC50 biolum.#	Not toxic	13.81	MPCA 1997b
104	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	62 % survival	Not toxic	13.81	MPCA 1997b
104	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	98 % survival	Not toxic	13.81	MPCA 1997b
110	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
113	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	11.76	IT Corp. 1996
113	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.11 mg growth	Toxic	11.76	IT Corp. 1996
113	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.02 mg growth	Toxic	11.76	IT Corp. 1996
113	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	67 % survival	Not toxic	11.76	IT Corp. 1996
120	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
120	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
130	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
130	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
130	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	NR	Crane <i>et al.</i> 1997

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Napthalene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
130	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
132	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	1.65	MPCA 1997c
132	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	1.65	MPCA 1997c
132	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.42 EC50 biolum.#	Not toxic	1.65	MPCA 1997c
132	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	1.65	MPCA 1997c
132	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.53 mg growth	Not toxic	1.65	MPCA 1997c
140	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
140	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
140	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
146	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	2.59	MPCA 1997b
146	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	2.59	MPCA 1997b
146	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	2.59	MPCA 1997b
146	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97.5 % survival	Not toxic	2.59	MPCA 1997b
155	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.29 EC50 biolum.#	Not toxic	1.69	MPCA 1997c
155	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.1 % red. biolum.^	Not toxic	1.69	MPCA 1997c
155	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	84 % survival	Not toxic	1.69	MPCA 1997c
157	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92.5 % survival	Not toxic	6.1	Ankley <i>et al.</i> 1994
157	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82.5 % survival/normal & UV	Not toxic	6.1	Ankley <i>et al.</i> 1994
157	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0 % survival/normal & UV	Toxic	6.1	Ankley <i>et al.</i> 1994
157	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	0.54 mg growth	Toxic	6.1	Ankley <i>et al.</i> 1994
157	St. Louis Harbor	10 day	Oligochaete	<i>Lumbriculus variegatus</i>	ADT	75 % survival	Toxic	6.1	Ankley <i>et al.</i> 1994
157	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	2.5 % survival/normal & UV	Toxic	6.1	Ankley <i>et al.</i> 1994
157	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.08 mg growth	Not determined	6.1	Ankley <i>et al.</i> 1994
157	St. Louis Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	42.5 % survival	Toxic	6.1	Ankley <i>et al.</i> 1994
157	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.8 % weight using UV light	Not toxic	6.1	Ankley <i>et al.</i> 1994
157	St. Louis Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Toxic	6.1	Ankley <i>et al.</i> 1994
163	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	2.24	MPCA 1997c
163	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.3 EC50 biolum.#	Not toxic	2.24	MPCA 1997c
163	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	2.24	MPCA 1997c
163	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	95 % survival	Not toxic	2.24	MPCA 1997c
163	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	2.24	MPCA 1997c
179	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.85	MPCA 1997c
179	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.64 mg growth	Not toxic	3.85	MPCA 1997c
179	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	3.82 EC50 biolum.#	Not toxic	3.85	MPCA 1997c
179	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.85	MPCA 1997c

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Napthalene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
179	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.85	MPCA 1997c
190	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.58 mg growth	Not toxic	2.98	MPCA 1997c
190	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	10.5 % red. biolum.^	Not toxic	2.98	MPCA 1997c
190	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	2.98	MPCA 1997c
190	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.92 EC50 biolum.#	Not toxic	2.98	MPCA 1997c
190	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	97 % survival	Not toxic	2.98	MPCA 1997c
214	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20.9 % red. biolum.^	Toxic	4.05	MPCA 1997c
214	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.35 mg growth	Not toxic	4.05	MPCA 1997c
214	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	58 % survival	Not toxic	4.05	MPCA 1997c
214	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.05	MPCA 1997c
214	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	4.05	MPCA 1997c
218	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	5.59	MPCA 1997b
218	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4 % red. biolum.^	Not toxic	5.59	MPCA 1997b
218	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	5.59	MPCA 1997b
218	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	5.59	MPCA 1997b
228	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
228	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	23.7 % red. biolum.^	Toxic	3.95	MPCA 1997c
228	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	70 % survival	Toxic	3.95	MPCA 1997c
228	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.51 EC50 biolum.#	Not toxic	3.95	MPCA 1997c
228	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	3.95	MPCA 1997c
228	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.7 % red. biolum.^	Toxic	3.95	MPCA 1997c
230	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
240	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	4.7	MPCA 1997b
240	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	88 % survival	Not toxic	4.7	MPCA 1997b
240	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	12.7 % red. biolum.^	Not toxic	4.7	MPCA 1997b
240	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	2.55 EC50 biolum.#	Not toxic	4.7	MPCA 1997b
247	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.97	MPCA 1997c
247	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	3.97	MPCA 1997c
247	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.97	MPCA 1997c
247	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.97	MPCA 1997c
247	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.97	MPCA 1997c
290	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
310	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
310	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
335	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	95 % survival	Not toxic	2.43	MPCA 1997c



**Table G-19. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Naphthalene in the St. Louis River Area of Concern**

Napthalene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
335	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.67 EC50 biolum.#	Not toxic	2.43	MPCA 1997c
335	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.5 % red. biolum.^	Not toxic	2.43	MPCA 1997c
370	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
385	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	33.03 % red. biolum.^	Toxic	4.47	MPCA 1997b
385	Allouez Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.82 EC50 biolum.#	Not toxic	4.47	MPCA 1997b
385	Allouez Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	4.47	MPCA 1997b
385	Allouez Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Not toxic	4.47	MPCA 1997b
390	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
400	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
412	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30 % red. biolum.^	Toxic	4.54	MPCA 1997b
412	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	5 % survival	Not toxic	4.54	MPCA 1997b
412	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	69 % survival	Not toxic	4.54	MPCA 1997b
412	D-S Harbor	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	4.54	MPCA 1997b
416	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.02 EC50 biolum.#	Toxic	6.77	MPCA 1997c
416	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	6.77	MPCA 1997c
416	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	6.77	MPCA 1997c
416	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	30.8 % red. biolum.^	Toxic	6.77	MPCA 1997c
416	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	6.77	MPCA 1997c
430	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	70 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
430	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
451	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	67.9 % red. biolum.^	Toxic	14.19	MPCA 1997b
451	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.16 EC50 biolum.#	Toxic	14.19	MPCA 1997b
451	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	14.19	MPCA 1997b
451	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	14.19	MPCA 1997b
485	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	0.82	MPCA 1997b
485	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	59 % survival	Not toxic	0.82	MPCA 1997b
485	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	26.1 % red. biolum.^	Toxic	0.82	MPCA 1997b
485	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	0.82	MPCA 1997b
496	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.76 EC50 biolum.#	Not toxic	4.02	MPCA 1997c
496	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.1 % red. biolum.^	Not toxic	4.02	MPCA 1997c
496	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	57 % survival	Toxic	4.02	MPCA 1997c
496	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.02	MPCA 1997c
496	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	4.02	MPCA 1997c
530	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR	Crane <i>et al.</i> 1997
530	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997

**Table G-19. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Naphthalene in the St. Louis River Area of Concern**

Napthalene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
549	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	17.49	MPCA 1997b
549	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	17.49	MPCA 1997b
549	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.49 EC50 biolum.#	Not toxic	17.49	MPCA 1997b
549	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Not toxic	17.49	MPCA 1997b
553	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.5 EC50 biolum.#	Not toxic	3.99	MPCA 1997c
553	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	86 % survival	Not toxic	3.99	MPCA 1997c
553	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.99	MPCA 1997c
558	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	3.4	MPCA 1997c
558	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.9 % red. biolum.^	Not toxic	3.4	MPCA 1997c
558	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	3.4	MPCA 1997c
558	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
558	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
558	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.2 % red. biolum.^	Not toxic	3.4	MPCA 1997c
558	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.74 EC50 biolum.#	Not toxic	3.4	MPCA 1997c
558	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	3.4	MPCA 1997c
558	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.49 mg growth	Not toxic	3.4	MPCA 1997c
558	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.37 mg growth	Not toxic	3.4	MPCA 1997c
594	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	26.54	IT Corp. 1996
594	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	83 % survival	Not toxic	26.54	IT Corp. 1996
594	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Toxic	26.54	IT Corp. 1996
594	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.3 mg growth	Not toxic	26.54	IT Corp. 1996
626	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	8.6 % red. biolum.^	Not toxic	3.98	MPCA 1997b
626	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	3.98	MPCA 1997b
626	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	3.98	MPCA 1997b
626	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.37 EC50 biolum.#	Toxic	3.98	MPCA 1997b
749	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.17 mg growth	Toxic	45.37	IT Corp. 1996
749	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	45.37	IT Corp. 1996
749	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	58 % red. biolum.^	Toxic	6.03	MPCA 1997c
749	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	6.03	MPCA 1997c
749	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.07 mg growth	Toxic	45.37	IT Corp. 1996
749	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	92 % survival	Not toxic	45.37	IT Corp. 1996
749	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	4.07 EC50 biolum.#	Not toxic	6.03	MPCA 1997c
767	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	20 % red. biolum.^	Toxic	4.48	MPCA 1997c
767	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.29 EC50 biolum.#	Toxic	4.48	MPCA 1997c
767	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	16 % survival	Toxic	4.48	MPCA 1997c

**Table G-19. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Naphthalene in the St. Louis River Area of Concern**

Napthalene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
850	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
850	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	82 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
961	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	6.4	IT Corp. 1996
961	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.4	IT Corp. 1996
961	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.59 mg growth	Not toxic	6.4	IT Corp. 1996
961	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	6.4	IT Corp. 1996
1012	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.23 mg growth	Toxic	3.87	MPCA 1997c
1012	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	75 % survival	Not toxic	3.87	MPCA 1997c
1012	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	3.87	MPCA 1997c
1012	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.41 EC50 biolum.#	Toxic	3.87	MPCA 1997c
1012	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.1 % red. biolum.^	Not toxic	3.87	MPCA 1997c
1032	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	63 % survival	Toxic	1	MPCA 1997c
1032	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	52.4 % red. biolum.^	Toxic	1	MPCA 1997c
1032	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.77 EC50 biolum.#	Not toxic	1	MPCA 1997c
1032	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	1	MPCA 1997c
1032	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	1	MPCA 1997c
1100	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	87 % survival	Not toxic	5.88	MPCA 1993
1141	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	5.4 % red. biolum.^	Not toxic	1.44	MPCA 1997c
1141	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.14 EC50 biolum.#	Not toxic	1.44	MPCA 1997c
1141	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	1.44	MPCA 1997c
1300	Spirit Lake - Grassy Point	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
1300	Spirit Lake - Grassy Point	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	65 % survival	Toxic	NR	Crane <i>et al.</i> 1997
1408	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	23.1	IT Corp. 1996
1408	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	23.1	IT Corp. 1996
1408	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	23.1	IT Corp. 1996
1408	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.35 mg growth	Not toxic	23.1	IT Corp. 1996
1514	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	77 % survival	Not toxic	6.15	IT Corp. 1996
1514	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.84 mg growth	Toxic	6.15	IT Corp. 1996
1514	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	83 % survival	Not toxic	6.15	IT Corp. 1996
1514	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.15 mg growth	Toxic	6.15	IT Corp. 1996
1736	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	-0.6 % red. biolum.^	Not toxic	4.36	MPCA 1997b
1736	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.96 EC50 biolum.#	Not toxic	4.36	MPCA 1997b
1736	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	68 % survival	Not toxic	4.36	MPCA 1997b
1736	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	85 % survival	Not toxic	4.36	MPCA 1997b
1970	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	3 % survival	Toxic	8.97	MPCA 1997c

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Napthalene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
1970	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	8.97	MPCA 1997c
1970	D-S Harbor	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.05 EC50 biolum.#	Toxic	8.97	MPCA 1997c
1970	D-S Harbor	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	8.97	MPCA 1997c
1970	D-S Harbor	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	8.97	MPCA 1997c
2802	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.23 mg growth	Not toxic	100	IT Corp. 1996
2802	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	60 % survival	Toxic	100	IT Corp. 1996
2802	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.18 mg growth	Not toxic	100	IT Corp. 1996
2802	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	100	IT Corp. 1996
2831	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	6.72	MPCA 1997c
2831	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	87 % survival	Not toxic	6.72	MPCA 1997c
2831	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.35 EC50 biolum.#	Not toxic	6.72	MPCA 1997c
2831	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.46 mg growth	Not toxic	6.72	MPCA 1997c
2831	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	88 % survival	Not toxic	6.72	MPCA 1997c
2881	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	82 % survival	Not toxic	13.98	MPCA 1997b
2881	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	56 % survival	Not toxic	13.98	MPCA 1997b
2881	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	13.98	MPCA 1997b
2881	St. Louis Bay	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	29.59 % red. biolum.^	Toxic	13.98	MPCA 1997b
3339	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.35 EC50 biolum.#	Toxic	4.13	MPCA 1997b
3339	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	4.13	MPCA 1997b
3339	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	21.7 % red. biolum.^	Toxic	4.13	MPCA 1997b
3339	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	4.13	MPCA 1997b
3534	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.06 EC50 biolum.#	Not toxic	3.74	MPCA 1997c
3534	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	65 % survival	Not toxic	3.74	MPCA 1997c
3534	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0 % red. biolum.^	Not toxic	3.74	MPCA 1997c
3534	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.57 mg growth	Not toxic	3.74	MPCA 1997c
3534	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	3.74	MPCA 1997c
4100	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	93 % survival	Not toxic	9.58	MPCA 1993
7764	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	45 % survival	Not toxic	29.84	MPCA 1997c
7764	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.43 mg growth	Not toxic	29.84	MPCA 1997c
7764	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	29.84	MPCA 1997c
7764	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.12 EC50 biolum.#	Not toxic	29.84	MPCA 1997c
7764	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	7.4 % red. biolum.^	Not toxic	29.84	MPCA 1997c
8101	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.07 mg growth	Not determined	NR	IT Corp. 1996
8101	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	NR	IT Corp. 1996
8101	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	8 % survival	Toxic	NR	IT Corp. 1996

**Table G-19. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Naphthalene in the St. Louis River Area of Concern**

Napthalene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
8101	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.24 mg growth	Not determined	NR	IT Corp. 1996
10000	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	32.24 % red. biolum.^	Toxic	3.07	MPCA 1997b
10000	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.73 EC50 biolum.#	Not toxic	3.07	MPCA 1997b
10000	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Not toxic	3.07	MPCA 1997b
15292	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	42.1 % red. biolum.^	Toxic	1.71	MPCA 1997c
15292	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	1.27 EC50 biolum.#	Not toxic	1.71	MPCA 1997c
15292	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	1.71	MPCA 1997c
15292	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	1.71	MPCA 1997c
15292	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.4 mg growth	Not toxic	1.71	MPCA 1997c
21756	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	12 % survival	Toxic	11.98	MPCA 1997c
21756	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.98	MPCA 1997c
21756	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.98	MPCA 1997c
21756	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	84.7 % red. biolum.^	Toxic	11.98	MPCA 1997c
21756	Spirit Lake	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.38 EC50 biolum.#	Toxic	11.98	MPCA 1997c
23431	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	11.16	IT Corp. 1996
23431	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	11.16	IT Corp. 1996
23431	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	11.16	IT Corp. 1996
23431	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	11.16	IT Corp. 1996
26723	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	4.64	IT Corp. 1996
26723	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	1.13 mg growth	Not determined	4.64	IT Corp. 1996
26723	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	4.64	IT Corp. 1996
26723	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.16 mg growth	Toxic	4.64	IT Corp. 1996
35714	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.56 mg growth	Not determined	3.42	IT Corp. 1996
35714	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	38 % survival	Toxic	3.42	IT Corp. 1996
35714	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.2 mg growth	Not toxic	3.42	IT Corp. 1996
35714	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	52 % survival	Toxic	3.42	IT Corp. 1996
147971	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	Not determined	Not determined	50.12	IT Corp. 1996
147971	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	8 % survival	Toxic	50.12	IT Corp. 1996
147971	St. Louis River - Stryker Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.09 mg growth	Not determined	50.12	IT Corp. 1996
147971	St. Louis River - Stryker Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	50.12	IT Corp. 1996
228613	St. Louis Bay	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	13.91	MPCA 1997c
228613	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	Not determined	Not determined	13.91	MPCA 1997c
228613	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	93.4 % red. biolum.^	Toxic	13.91	MPCA 1997c
228613	St. Louis Bay	10 day	Diptera	<i>Chironomus tentans</i>	LAR	18 % survival	Toxic	13.91	MPCA 1997c
228613	St. Louis Bay	15 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.4 EC50 biolum.#	Toxic	13.91	MPCA 1997c

**Table G-19. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Naphthalene in the St. Louis River Area of Concern**

Napthalene (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
440000	St. Louis River	10 day	Diptera	<i>Chironomus tentans</i>	LAR	63 % survival	Toxic	6.12	MPCA 1993
616570	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	30 % survival	Toxic	12.95	IT Corp. 1996
616570	St. Louis River - Keene Creek	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0.65 mg growth	Not determined	12.95	IT Corp. 1996
616570	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	75 % survival	Toxic	12.95	IT Corp. 1996
616570	St. Louis River - Keene Creek	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0.1 mg growth	Toxic	12.95	IT Corp. 1996
1137000	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	0.06 EC50 biolum.#	Toxic	8.26	MPCA 1997b
1137000	Spirit Lake	30 minute	Bacteria	<i>Photobacterium phosphoreum</i>	NA	99.9 % red. biolum.^	Toxic	8.26	MPCA 1997b
1137000	Spirit Lake	10 day	Diptera	<i>Chironomus tentans</i>	LAR	0 % survival	Toxic	8.26	MPCA 1997b
1137000	Spirit Lake	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	0 % survival	Toxic	8.26	MPCA 1997b

^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.

LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

**Table G-20. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Toxic Equivalents (TEQs) for Wildlife in the St. Louis River Area of Concern**

TEQ (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
0.008	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.011	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.011	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 mg growth	Not toxic	NR	Crane <i>et al.</i> 1997
0.012	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.012	D-S Harbor - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR	Crane <i>et al.</i> 1997
0.012	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.032	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.043	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.043	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.076	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.076	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.086	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR	Crane <i>et al.</i> 1997
0.086	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.102	D-S Harbor - City of Superior WWTP	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	79 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.106	D-S Harbor - City of Superior WWTP	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.109	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.109	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.159	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.232	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.232	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.259	D-S Harbor - City of Superior WWTP	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.259	D-S Harbor - City of Superior WWTP	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.259	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.259	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.312	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.379	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.396	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997

^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.

LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.

**Table G-21. A Summary of the Available Data on the Biological Effects Associated with Sediment-sorbed Toxic Equivalents (TEQs) for Human Health in the St. Louis River Area of Concern**

TEQ (µg/kg)	Area	Test Duration	Test Organism	Species	Life Stage	End-Point Measured	Result	TOC (%)	Reference
0.008	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	89 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.011	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.011	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.012	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	92 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.012	D-S Harbor - Slip C	10 day	Diptera	<i>Chironomus tentans</i>	LAR	55 % survival	Toxic	NR	Crane <i>et al.</i> 1997
0.012	D-S Harbor - Minnesota Slip	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	100 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.023	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	93 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.043	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.043	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.076	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	98 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.076	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	78 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.086	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	85 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.086	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	68 % survival	Toxic	NR	Crane <i>et al.</i> 1997
0.102	D-S Harbor - city of Superior WWTP	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	79 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.106	D-S Harbor - city of Superior WWTP	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.109	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.109	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.156	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.223	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	72 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.223	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.259	D-S Harbor - city of Superior WWTP	10 day	Diptera	<i>Chironomus tentans</i>	LAR	62 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.259	D-S Harbor - city of Superior WWTP	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.259	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Diptera	<i>Chironomus tentans</i>	LAR	80 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.259	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	90 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.307	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.379	D-S Harbor - Slip C	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997
0.390	St. Louis Bay - Miller & Coffee Creek Embayment	10 day	Amphipod	<i>Hyalella azteca</i>	JUV	96 % survival	Not toxic	NR	Crane <i>et al.</i> 1997

^ = relative to control; D-S = Duluth-Superior; # = expressed as % DW sediment; red. biolum. = reduced bioluminescence; EC50 = effective concentration affecting 50% of the population.  
 LAR = larvae; JUV = juvenile; TOC = total organic carbon; NR = not reported.