

**Appendix 27: Raw Data for 96-hour Toxicity of  
Manganese on *Lampsilis siliquoidea***

## **Raw Laboratory Data**

96 Hour Water Column Acute Test Data Sheet / 7 Treatments												
Toxicant: Manganese						Species: <i>Lampsilis siliquoides</i>						
Rate: MnSO <sub>4</sub> · H <sub>2</sub> O 0.20g/L						MnCl <sub>2</sub> · 4H <sub>2</sub> O 0.30g/L 50% addition						
Water: EPA (MHRW) B 8-26-09						Culture: <i>Lampsilis</i> UMissouri State - Barnhart Lab						
Start Date/Time: 9/8/09 5pm						Age: drop off 2/3/09			Initials: AD			
Temp/Light: 20°C 16:8						Glassware: 50ml beakers 40ml overlying H <sub>2</sub> O						
Treatment	rep	Survival					Chem					
		0h	24h	48h	72h	96h	0h	24h	48h	72h	96h	
A Control	1	S	S	S	S	S	temp	20.4	20.3	20.4	19.6	19.1
	2	S	S	S	S	S	pH	7.9				7.9
	3	S	S	S	S	S	cond	316				322
	4	S	S	S	S	S	D.O.	7.08				7.50
							Alk	62	x	x	x	62
							Hard	92	x	x	x	90
B 4.7	1	S	S	S	S	S	temp	20.5	20.2	20.3	19.5	19.1
	2	S	S	S	S	S	pH	7.9				7.9
	3	S	S	S	S	S	cond	324				328
	4	S	S	S	S	S	D.O.	7.83				7.69
							Alk	62	x	x	x	62
							Hard	98	x	x	x	100
C 9.4	1	S	S	S	S	S	temp	20.4	20.3	20.4	19.6	19.0
	2	S	S	S	S	S	pH	7.9				7.9
	3	S	S	S	S	S	cond	341				345
	4	S	S	S	S	S	D.O.	7.87				7.65
							Alk	62	x	x	x	62
							Hard	110	x	x	x	110
D 18.8	1	S	S	S	S	S	temp	20.4	20.2	20.3	19.6	19.0
	2	S	S	S	S	S	pH	7.7				7.9
	3	S	S	S	S	S	cond	376				380
	4	S	S	S	S	S	D.O.	7.83				7.72
							Alk	62	x	x	x	62
							Hard	120	x	x	x	124
E 37	1	4/4	4/4	4/4	4/4	4/4	temp	20.5	20.2	20.3	19.6	19.0
	2	S	S	S	4	4	pH	7.7				7.9
	3	S	S	S	S	3	cond	447				450
	4	S	S	S	S	4	D.O.	7.94				7.76
							Alk	62	x	x	x	62
							Hard	152	x	x	x	152
F 75	1	S	2	0	0	0	temp	20.5	20.2	20.3	19.7	19.1
	2	S	2	0	0	0	pH	7.7				7.9
	3	S	0	0	0	0	cond	582				590
	4	S	2	0	0	0	D.O.	7.88				7.70
							Alk	62	x	x	x	62
							Hard	220	x	x	x	224
G 150	1	S	0	0	0	0	temp	20.5	20.3	20.4	19.7	19.2
	2	S	0	0	0	0	pH	7.7				7.9
	3	S	0	0	0	0	cond	840				850
	4	S	1	0	0	0	D.O.	7.88				7.80
							Alk	62	x	x	x	62
							Hard	N/A	x	x	x	N/A
Initials	1	AD	AD	AD	AD	AD						

nominal  
45.5  
(40.0-51.8)

## **Analytical Chemistry Data**



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## LABORATORY REPORT

This report contains 6 pages.  
(including the cover page)

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Client Name: Illinois Natural History Survey

Report #: 233658

Sampling Point: 1A Control

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	< 0.010	mg/L	---	09/21/09 15:22	2147454

Sampling Point: 1B 4.7ppm

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	4.5	mg/L	---	09/21/09 15:39	2147455

Sampling Point: 1C 9.4ppm

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	9.2	mg/L	---	09/21/09 15:44	2147456

Sampling Point: 1D 18.8ppm

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	19	mg/L	---	09/21/09 15:50	2147457

Sampling Point: 1E 37ppm

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	34	mg/L	---	09/21/09 15:56	2147458

Client Name: Illinois Natural History Survey

Report #: 233658

Sampling Point: 1F 75ppm

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL↑	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	73	mg/L	---	09/21/09 16:01	2147459

Sampling Point: 1G 150ppm

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL↑	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	150	mg/L	---	09/21/09 16:07	2147460

Sampling Point: 2A Control

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL↑	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	< 0.010	mg/L	---	09/21/09 16:23	2147461

Sampling Point: 2B 4.7ppm

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL↑	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	4.6	mg/L	---	09/21/09 16:40	2147462

Sampling Point: 2C 9.4ppm

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL↑	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	11	mg/L	---	09/21/09 16:45	2147463

Client Name: Illinois Natural History Survey

Report #: 233658

Sampling Point: 2D 18.8ppm

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	18	mg/L	---	09/21/09 16:51	2147464

Sampling Point: 2E 37ppm

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	35	mg/L	---	09/21/09 16:57	2147465

Sampling Point: 2F 75ppm

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	72	mg/L	---	09/21/09 17:02	2147466

Sampling Point: 2G 150ppm

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	160	mg/L	---	09/21/09 17:08	2147467

† UL has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!



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Order # 182685  
 Batch # 833658

**CHAIN OF CUSTODY RECORD**

REPORT TO: Amy Dickinson  
 Dickinson@illinois.edu  
 217-265-7558

BILL TO: Amy Dickinson  
 UOFS/INHS  
 1816 S. Oak St.  
 Champaign, IL 61820

SAMPLER (Signature): Amy Dick

COMPLIANCE MONITORING: Yes  No

POPULATION SERVED: IL

SOURCE WATER: RW

PROJECT NAME: Lampisilis

FO#: Manganese

DATE: 9/18/09

TIME: 4:17 PM

TEST NAME: Mn only (2008)

SAMPLE REMARKS: NOT SPIKED

CHLORINATED: YES  NO

# OF CONTAINERS: 1

MATRIX CODE: RW SW

TURNAROUND TIME: \_\_\_\_\_

LAB Number	COLLECTION		SAMPLING SITE	TEST NAME	PROJECT NAME	FO#	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
	DATE	TIME							
1	9/18/09	4:17 PM	1A	Control	Mn only (2008)	NOT SPIKED	1	RW SW	
2	9/18/09	4:17 PM	1B	4.7 ppm		SPIKED			
3	9/18/09	4:17 PM	1C	9.4 ppm		SPIKED			
4	9/18/09	4:17 PM	1D	18.8 ppm		SPIKED			
5	9/18/09	4:17 PM	1E	37 ppm		SPIKED			
6	9/18/09	4:17 PM	1F	75 ppm		SPIKED			
7	9/18/09	4:17 PM	1G	150 ppm		SPIKED			
8	9/18/09	4:17 PM	2A	Control		NOT SPIKED			
9	9/18/09	4:17 PM	2B	4.7 ppm		SPIKED			
10	9/18/09	4:17 PM	2C	9.4 ppm		SPIKED			
11	9/18/09	4:17 PM	2D	18.8 ppm		SPIKED			
12	9/18/09	4:17 PM	2E	37 ppm		SPIKED			
13	9/18/09	4:17 PM	2F	75 ppm		SPIKED			
14	9/18/09	4:17 PM	2G	150 ppm		SPIKED			

RELINQUISHED BY: (Signature) Dungel DATE: 9/16/09 TIME: 2:00 PM

RECEIVED BY: (Signature) \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

RELINQUISHED BY: (Signature) \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

RECEIVED BY: (Signature) \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

UNIT: IL STATE: IL POPULATION SERVED: IL SOURCE WATER: RW

CONDITIONS UPON RECEIPT (check one):  
 Ambient  Upon Receipt  N/A

TURNAROUND TIME (TAT) - SURCHARGES:  
 IV\* = Immediate Verbal: (3 working days) 100%  
 IW\* = Immediate Written: (3 working days) 125%  
 SP\* = Weekend, Holiday CALL  
 STAT\* = Less than 48 hours CALL

PLEASE CALL: Expedited service not available for all testing

UL-SBN-SHIP-F-002-09 Effective Date: 05/09/2009

MATRIX CODES:  
 DW-DRINKING WATER  
 RW-REGULATED WATER  
 GW-GROUND WATER  
 EW-EXPOSURE WATER  
 SW-SWIFT WATER  
 SW-POOL WATER  
 WW-WASTE WATER

SW = Standard Written: (15 working days) 0%  
 RW\* = Rush Written: (5 working days) 75%  
 RV\* = Rush Verbal: (5 working days) 50%

Sample analysis will be provided according to the standard UL-GSA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agree to in writing by UL.

## **Statistical Analyses**

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

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SPEARMAN-KARBER

TRIM: 5.00%  
LC50: 62.804  
95% LOWER CONFIDENCE: 52.653  
95% UPPER CONFIDENCE: 74.911

---

CONC. mg/L	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
4.50	20.	0.	.00	.9537D-04
10.10	20.	0.	.00	.9537D-04
18.50	20.	0.	.00	.9537D-04
34.50	19.	0.	.00	.1907D-03
72.50	20.	14.	70.00	.5766D+01
154.90	20.	19.	95.00	.2003D-02

THE BINOMIAL TEST SHOWS THAT 34.50 AND 154.90 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 99.9978 PERCENT. AN APPROXIMATE LC50 FOR THIS DATA SET IS 61.327

---

RESULTS USING MOVING AVERAGE  
SPAN G LC50 95% CONFIDENCE LIMIT  
3 .067 70.90 57.55 91.56

---

\*\*\*\*\* RESULTS CALCULATED BY PROBIT METHOD  
ITERATIONS G H GOODNESS OF FIT  
9 .173 1.00 .44

SLOPE = 5.98  
95% CONFIDENCE LIMITS: 3.49 AND 8.47

LC50= 66.74  
95% CONFIDENCE LIMITS: 55.05 AND 81.07

LC1 = 27.26  
95% CONFIDENCE LIMITS: 13.87 AND 36.86

---

DATE: September 8, 2009 TEST NUMBER: DURATION: 24 h  
SAMPLE: Manganese SPECIES: Lampsilis siliquoidea

METHOD	LC50	CONFIDENCE LIMITS LOWER	CONFIDENCE LIMITS UPPER	SPAN
BINOMIAL	61.327	34.500	154.900	120.400
MAA	70.898	57.550	91.555	34.005
PROBIT	66.743	55.047	81.066	26.019
SPEARMAN	62.804	52.653	74.911	22.257

\*\*\*\* = LIMIT DOES NOT EXIST

---

SPEARMAN-KARBER

TRIM: .00%  
LC50: 50.012  
95% CONFIDENCE LIMITS  
ARE UNRELIABLE.

---

CONC. mg/L	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
4.50	20.	0.	.00	.9537D-04
10.10	20.	0.	.00	.9537D-04
18.50	20.	0.	.00	.9537D-04
34.50	19.	0.	.00	.1907D-03
72.50	20.	20.	100.00	.9537D-04
154.90	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 34.50 AND 72.50 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 99.9997 PERCENT. AN APPROXIMATE LC50 FOR THIS DATA SET IS 49.974

---

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

---

DATE: September 8, 2009 TEST NUMBER: DURATION: 48 h  
SAMPLE: Manganese SPECIES: Lampsilis siliquoidea

METHOD	LC50	CONFIDENCE LOWER	LIMITS UPPER	SPAN
BINOMIAL	49.974	34.500	72.500	38.000
MAA	*****	*****	*****	*****
PROBIT	*****	*****	*****	*****
SPEARMAN	50.012	*****	*****	*****

\*\*\*\* = LIMIT DOES NOT EXIST

---

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

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SPEARMAN-KARBER

TRIM: .00%  
LC50: 48.247  
95% LOWER CONFIDENCE: 44.987  
95% UPPER CONFIDENCE: 51.743

---

CONC. mg/L	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
4.50	20.	0.	.00	.9537D-04
10.10	20.	0.	.00	.9537D-04
18.50	20.	0.	.00	.9537D-04
34.50	19.	1.	5.26	.3815D-02
72.50	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 34.50 AND 72.50 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 99.9961 PERCENT. AN APPROXIMATE LC50 FOR THIS DATA SET IS 47.517

---

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

---

DATE: September 8, 2009 TEST NUMBER: DURATION: 72 h  
SAMPLE: Manganese SPECIES: *Lampsilis siliquoidea*

METHOD	LC50	CONFIDENCE LOWER	CONFIDENCE UPPER	LIMITS SPAN
BINOMIAL	47.517	34.500	72.500	38.000
MAA	*****	*****	*****	*****
PROBIT	*****	*****	*****	*****
SPEARMAN	48.247	44.987	51.743	6.757

\*\*\*\* = LIMIT DOES NOT EXIST

---

SPEARMAN-KARBER

TRIM: .00%  
LC50: 43.315  
95% LOWER CONFIDENCE: 38.121  
95% UPPER CONFIDENCE: 49.217

---

CONC. mg/L	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
4.50	20.	0.	.00	.9537D-04
10.10	20.	0.	.00	.9537D-04
18.50	20.	0.	.00	.9537D-04
34.50	19.	4.	21.05	.9605D+00
72.50	20.	20.	100.00	.9537D-04
154.90	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 34.50 AND 72.50 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 99.0394 PERCENT. AN APPROXIMATE LC50 FOR THIS DATA SET IS 43.163

---

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

---

DATE: September 8, 2009 TEST NUMBER: DURATION: 96 h  
SAMPLE: Manganese SPECIES: *Lampsilis siliquoidea*

METHOD	LC50	LOWER	UPPER	SPAN
BINOMIAL	43.163	34.500	72.500	38.000
MAA	*****	*****	*****	*****
PROBIT	*****	*****	*****	*****
SPEARMAN	43.315	38.121	49.217	11.097

\*\*\*\* = LIMIT DOES NOT EXIST

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**Appendix 28: Raw Data for 96-hour Toxicity of  
Manganese on *Megalonaias nervosa***

## **Raw Laboratory Data**

96 Hour Water Column Acute Test Data Sheet/ 6 treatments												
Toxicant: Manganese			Species: <i>Megalania nervosa</i>									
Rate: MnSO4 · H2O 0.8094 / 2L			MnCl2 · 4H2O 1.214g / 2L 50% <sup>senio-dilution</sup>									
Water: EPA (MHRW) · B 10/16/09			Culture: Tony Brady FWS, Geneva, WI									
Start Date/Time: 10/23/09			Age: Drop off date 10/21/09			Initials: AD, KM						
Temp/Light: 20°C 16:8			Glassware: 50ml glassware beakers, 40ml overlying H2O									
Treatment	rep	Survival					Chem	0h	24h	48h	72h	96h
		0h	24h	48h	72h	96h						
A Control	1	S	S	S	S	S	temp	20.8	20.9	20.9	20.9	20.8
	2	S	S	S	S	S	pH	8.0	8.1	8.1	8.0	8.0
	3	S	S	S	S	S	cond	303	297	303	305	315
	4	S	4/4*	4/4*	4/4*	4/4*	D.O.	8.34	8.04	8.13	8.31	8.00
							Alk	60	x	x	x	60
						Hard	90	x	x	x	92	
B 18.75	1	S	S	S	S	S	temp	20.8	20.9	20.9	20.9	20.8
	2	S	S	S	S	S	pH	7.9	7.9	7.7	7.6	7.8
	3	S	S	S	S	S	cond	375	362	371	379	383
	4	S	S	S	S	S	D.O.	8.33	8.10	8.19	8.31	7.92
							Alk	60	x	x	x	60
						Hard	112	x	x	x	112	
C 37.5	1	S	2	2	2	2	temp	20.8	20.9	20.9	20.9	20.8
	2	S	4	3	2	2	pH	7.9	7.7	7.6	7.6	7.7
	3	S	3	3	0	0	cond	445	442	458	478	495
	4	S	5	4	3	3	D.O.	8.26	8.11	8.25	8.42	7.94
			Ab				Alk	60	x	x	x	60
						Hard	INT	x	x	x	INT	
D 75	1	S	1	0	0	0	temp	20.8	20.9	20.8	20.9	20.9
	2	S	0	0	0	0	pH	7.9	7.7	7.6	7.5	7.7
	3	S	0	0	0	0	cond	582	569	567	581	589
	4	S	0	0	0	0	D.O.	8.29	8.07	8.26	8.32	7.91
							Alk	60	x	x	x	62
						Hard	INT	x	x	x	INT	
E 150	1	S	0	0	0	0	temp	20.8	20.9	20.8	20.9	20.9
	2	S	0	0	0	0	pH	7.8	7.7	7.6	7.5	7.6
	3	S	0	0	0	0	cond	841	826	817	851	848
	4	S	0	0	0	0	D.O.	8.33	8.03	8.22	8.40	7.88
							Alk	60	x	x	x	62
						Hard	INT	x	x	x	INT	
F 300	1	S	0	0	0	0	temp	20.8	20.9	20.8	20.9	20.9
	2	S	0	0	0	0	pH	7.7	7.7	7.6	7.5	7.6
	3	S	0	0	0	0	cond	1333	1301	1300	1325	1340
	4	S	0	0	0	0	D.O.	8.27	7.98	8.20	8.22	7.94
							Alk	60	x	x	x	62
						Hard	INT	x	x	x	INT	
Initials		AD	KM	KM	AD	AD						

\* one crushed 10/24/09

INT = interference

## **Analytical Chemistry Data**



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## LABORATORY REPORT

This report contains 9 pages.  
(including the cover page)

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### Laboratory Report

Client: Illinois Natural History Survey  
Attn: Amy Dickinson  
1910 South Griffith Drive  
Champaign, IL 61820

Report: 235939  
Priority: Standard Written  
Status: Final  
PWS ID: Not Supplied

Copies to: None

Sample Information					
UL ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
2170629	1A Control Mn IN	200.7	10/23/09 00:00	Client	10/28/09 09:30
2170630	1B 18.75ppm Mn IN	200.7	10/23/09 00:00	Client	10/29/09 09:30
2170631	1C 37.5ppm Mn IN	200.7	10/23/09 00:00	Client	10/29/09 09:30
2170632	1D 75ppm Mn IN	200.7	10/23/09 00:00	Client	10/29/09 09:30
2170633	1E 150ppm Mn IN	200.7	10/23/09 00:00	Client	10/29/09 09:30
2170634	1F 300ppm Mn IN	200.7	10/23/09 00:00	Client	10/29/09 09:30
2170635	2A Control Mn OUT	200.7	10/27/09 00:00	Client	10/29/09 09:30
2170636	2B 18.75ppm Mn OUT	200.7	10/27/09 00:00	Client	10/29/09 09:30
2170637	2C 37.5ppm Mn OUT	200.7	10/27/09 00:00	Client	10/29/09 09:30
2170638	2D 75ppm Mn OUT	200.7	10/27/09 00:00	Client	10/29/09 09:30
2170639	2E 150ppm Mn OUT	200.7	10/27/09 00:00	Client	10/29/09 09:30
2170640	2F 300ppm Mn OUT	200.7	10/27/09 00:00	Client	10/29/09 09:30
2170641	3A Control Mn Filtered OUT	200.7	10/27/09 00:00	Client	10/29/09 09:30
2170642	3B 18.75ppm Mn Filtered OUT	200.7	10/27/09 00:00	Client	10/29/09 09:30
2170643	3C 37.5ppm Mn Filtered OUT	200.7	10/27/09 00:00	Client	10/29/09 09:30
2170644	3D 75ppm Mn Filtered OUT	200.7	10/27/09 00:00	Client	10/29/09 09:30
2170645	3E 150ppm Mn Filtered OUT	200.7	10/27/09 00:00	Client	10/29/09 09:30
2170646	3F 300ppm Mn Filtered OUT	200.7	10/27/09 00:00	Client	10/29/09 09:30

### Report Summary

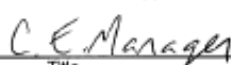
Project: M. Nervosa Mn

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call Kelly Trott at (574) 233-4777.

Note: This report may not be reproduced, except in full, without written approval from Underwriters Laboratories (UL).

  
Authorized Signature

  
Title

11/5/2009  
Date

Client Name: Illinois Natural History Survey  
Report #: 235939

Client Name: Illinois Natural History Survey

Report #: 235939

Sampling Point: 1A Control Mn IN

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	< 0.010	mg/L	---	11/03/09 09:52	2170629

Sampling Point: 1B 18.75ppm Mn IN

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	18	mg/L	---	11/03/09 10:07	2170630

Sampling Point: 1C 37.5ppm Mn IN

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	33	mg/L	---	11/03/09 10:13	2170631

Sampling Point: 1D 75ppm Mn IN

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	70	mg/L	---	11/03/09 10:18	2170632

Sampling Point: 1E 150ppm Mn IN

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	140	mg/L	---	11/03/09 10:23	2170633

Client Name: Illinois Natural History Survey

Report #: 235939

Sampling Point: 1F 300ppm Mn IN

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	290	mg/L	---	11/03/09 10:28	2170634

Sampling Point: 2A Control Mn OUT

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	0.12	mg/L	---	11/03/09 10:33	2170635

Sampling Point: 2B 18.75ppm Mn OUT

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	18	mg/L	---	11/03/09 10:38	2170636

Sampling Point: 2C 37.5ppm Mn OUT

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	35	mg/L	---	11/03/09 10:43	2170637

Sampling Point: 2D 75ppm Mn OUT

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-96-5	Manganese	200.7	0.05 ^	0.010	74	mg/L	---	11/03/09 10:48	2170638

Client Name: Illinois Natural History Survey

Report #: 235939

Sampling Point: 2E 150ppm Mn OUT

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-95-5	Manganese	200.7	0.05 ^	0.010	140	mg/L	---	11/03/09 11:03	2170639

Sampling Point: 2F 300ppm Mn OUT

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-95-5	Manganese	200.7	0.05 ^	0.010	290	mg/L	---	11/03/09 11:08	2170640

Sampling Point: 3A Control Mn Filtered OUT

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-95-5	Manganese	200.7	0.05 ^	0.010	0.69	mg/L	---	11/03/09 11:13	2170641

Sampling Point: 3B 18.75ppm Mn Filtered OUT

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-95-5	Manganese	200.7	0.05 ^	0.010	16	mg/L	---	11/03/09 11:18	2170642

Sampling Point: 3C 37.5ppm Mn Filtered OUT

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-95-5	Manganese	200.7	0.05 ^	0.010	34	mg/L	---	11/03/09 11:33	2170643

Client Name: Illinois Natural History Survey

Report #: 235939

Sampling Point: 3D 75ppm Mn Filtered OUT

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-95-5	Manganese	200.7	0.05 ^	0.010	68	mg/L	---	11/03/09 11:38	2170644

Sampling Point: 3E 150ppm Mn Filtered OUT

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-95-5	Manganese	200.7	0.05 ^	0.010	150	mg/L	---	11/03/09 11:43	2170645

Sampling Point: 3F 300ppm Mn Filtered OUT

PWS ID: Not Supplied

Metals									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
7439-95-5	Manganese	200.7	0.05 ^	0.010	290	mg/L	---	11/03/09 11:48	2170646

† UL has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

### Lab Definitions

**Continuing Calibration Check Standard (CCC), Continuing Calibration Verification (CCV)** - is a single level, working standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. The CCC is used to validate the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of the check standard may be varied, when prescribed by the reference method, so that the entire linear range of the calibration curve is validated on a regular basis.

**Internal Standards (IS)** - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

**Laboratory Duplicate (LD)** - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

**Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)** - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control.

**Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB)** - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

**Laboratory Trip Blank (LTB)** - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The LTB container follows the collection bottles to and from the collection site, but the LTB is not opened at any time during the trip. LTB is not exposed to site conditions or pumping and collection equipment. The LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

**Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Matrix Duplicate (LFD)** - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix.

**Matrix Spike Sample (MS) / Laboratory Fortified Matrix (LFM)** - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results.

**Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV)** - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis. The QCS is analyzed with every new calibration curve and at least quarterly unless the reference method requires a more frequent usage.

**Reporting Limit Check (RLC)** - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

**Surrogate Standard (SS) / Surrogate Analyte (SUR)** - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.





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**CHAIN OF CUSTODY RECORD**

Page 2 of 2

REPORT TO: dickins@illinois.edu SAMPLER (Signature): Amy Dickins STATE (of sample origin): IL PWS ID: — PROJECT NAME: M. nervosa FID: —

BILL TO: Amy Dickins  
1910 S. Griggs Dr.  
Champaign, IL 61820 COMPLIANCE MONITORING: Yes / No POPULATION SERVED: — SOURCE WATER: RW SAMPLE REMAINS: Mn # OF CONTAINERS: 1 RW SW

LAB Number	COLLECTION		SAMPLING SITE	TEST NAME	SAMPLE REMAINS	PRESERVED		# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
	DATE	TIME				YES	NO			
1	2/7/0	6:43	10/31/09	Manganese / 200.8				1 RW SW		
2	6:44									
3	6:45									
4	6:46									
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										

RECEIVED BY (Signature): Amy Dickins DATE: 10/31/09 TIME: 2:18 PM RECEIVED BY (Signature): Gregor DATE: 10/31/09 TIME: 11:30 AM

RECEIVED BY (Signature): Amy Dickins DATE: 10/31/09 TIME: 2:18 PM RECEIVED BY (Signature): Gregor DATE: 10/31/09 TIME: 11:30 AM

RECEIVED BY (Signature): Amy Dickins DATE: 10/31/09 TIME: 2:18 PM RECEIVED BY (Signature): Gregor DATE: 10/31/09 TIME: 11:30 AM

RECEIVED BY (Signature): Amy Dickins DATE: 10/31/09 TIME: 2:18 PM RECEIVED BY (Signature): Gregor DATE: 10/31/09 TIME: 11:30 AM

LAB COMMENTS: All samples SPIKED w/ Manganese except Controls (A) @ rates of 18.75 ppm - 300 ppm as labeled.

TURNAROUND TIME (TAT) - SLACKWARES: — Base Wet / Bld: X Ambient: — °C Upon Receipt: X N/A

MAINTAIN CODES:  
 DW - DRINKING WATER  
 RW - RECREATION WATER  
 OW - OUTDOOR WATER  
 EW - EXPOSURE WATER  
 SW - SURFACE WATER  
 PW - POOL WATER  
 WW - WASTE WATER

SW - Standard method (15 working days) 60%  
 RW\* - Rapid method (15 working days) 50%  
 RW\*\* - Rapid method (15 working days) 75%  
 LW\* - Immediate method (3 working days) 100%  
 LW\*\* - Immediate method (3 working days) 125%  
 SP\* - weekend, holiday  
 SP\*\* - weekend, holiday  
 STAT\* - Less than 48 hours  
 UL-SM-SH-F-002-09 EFFECTIVE DATE: 03/08/2009

Sample analysis will be provided according to the standard UL GSA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agree to in writing by UL.

## **Statistical Analyses**

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

---

SPEARMAN-KARBER

TRIM: .00%  
LC50: 41.635  
95% LOWER CONFIDENCE: 35.554  
95% UPPER CONFIDENCE: 48.758

---

CONC. mg/L	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
18.00	20.	0.	.00	.9537D-04
34.00	20.	6.	30.00	.5766D+01
72.00	20.	19.	95.00	.2003D-02
140.00	20.	20.	100.00	.9537D-04
290.00	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 18.00 AND 72.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 99.9979 PERCENT. AN APPROXIMATE LC50 FOR THIS DATA SET IS 41.760

---

RESULTS USING MOVING AVERAGE

SPAN	G	LC50	95% CONFIDENCE LIMIT
3	.051	42.22	34.88 50.21

---

\*\*\*\*\* RESULTS CALCULATED BY PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT
7	.175	1.00	.98

SLOPE = 7.03

95% CONFIDENCE LIMITS: 4.09 AND 9.98

LC50= 41.09

95% CONFIDENCE LIMITS: 34.74 AND 49.37

LC1 = 19.19

95% CONFIDENCE LIMITS: 10.95 AND 24.72

---

DATE: 10/23/09                      TEST NUMBER:                      DURATION: 24 h  
SAMPLE: Manganese                      SPECIES: Megaloniaias nervosa

METHOD	LC50	CONFIDENCE LIMITS		
		LOWER	UPPER	SPAN
BINOMIAL	41.760	18.000	72.000	54.000
MAA	42.221	34.882	50.208	15.325
PROBIT	41.093	34.735	49.371	14.636
SPEARMAN	41.635	35.554	48.758	13.204

\*\*\*\* = LIMIT DOES NOT EXIST

---

SPEARMAN-KARBER

TRIM: .00%  
LC50: 37.497  
95% LOWER CONFIDENCE: 32.214  
95% UPPER CONFIDENCE: 43.646

---

CONC. mg/L	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
18.00	20.	0.	.00	.9537D-04
34.00	20.	8.	40.00	.2517D+02
72.00	20.	20.	100.00	.9537D-04
140.00	20.	20.	100.00	.9537D-04
290.00	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 18.00 AND 72.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 99.9998 PERCENT. AN APPROXIMATE LC50 FOR THIS DATA SET IS 37.326

---

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

---

DATE: 10/23/09      TEST NUMBER:      DURATION: 48 h  
SAMPLE: Manganese      SPECIES: Megaloniaias nervosa

METHOD	LC50	CONFIDENCE LIMITS		
	LOWER	UPPER	SPAN	
BINOMIAL	37.326	18.000	72.000	54.000
MAA	*****	*****	*****	*****
PROBIT	*****	*****	*****	*****
SPEARMAN	37.497	32.214	43.646	11.432

\*\*\*\* = LIMIT DOES NOT EXIST

---

SPEARMAN-KARBER

TRIM: .00%  
LC50: 31.531  
95% LOWER CONFIDENCE: 27.197  
95% UPPER CONFIDENCE: 36.555

---

CONC. mg/L	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
18.00	20.	0.	.00	.9537D-04
34.00	20.	13.	65.00	.1316D+02
72.00	20.	20.	100.00	.9537D-04
140.00	20.	20.	100.00	.9537D-04
290.00	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 18.00 AND 72.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 99.9998 PERCENT. AN APPROXIMATE LC50 FOR THIS DATA SET IS 30.384

---

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

---

DATE: 10/23/09 TEST NUMBER: DURATION: 72 h  
SAMPLE: Manganese SPECIES: Megaloniaias nervosa

METHOD	LC50	CONFIDENCE LIMITS		
		LOWER	UPPER	SPAN
BINOMIAL	30.384	18.000	72.000	54.000
MAA	*****	*****	*****	*****
PROBIT	*****	*****	*****	*****
SPEARMAN	31.531	27.197	36.555	9.358

\*\*\*\* = LIMIT DOES NOT EXIST

---

SPEARMAN-KARBER

TRIM: .00%  
LC50: 31.531  
95% LOWER CONFIDENCE: 27.197  
95% UPPER CONFIDENCE: 36.555

---

CONC. mg/L	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
18.00	20.	0.	.00	.9537D-04
34.00	20.	13.	65.00	.1316D+02
72.00	20.	20.	100.00	.9537D-04
140.00	20.	20.	100.00	.9537D-04
290.00	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 18.00 AND 72.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE

LEVEL ASSOCIATED WITH THESE LIMITS IS 99.9998 PERCENT.  
AN APPROXIMATE LC50 FOR THIS DATA SET IS 30.384

---

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

---

DATE: 10/23/09 TEST NUMBER: DURATION: 96 h  
SAMPLE: Manganese SPECIES: Megaloniaias nervosa

METHOD	CONFIDENCE LIMITS			
	LC50	LOWER	UPPER	SPAN
BINOMIAL	30.384	18.000	72.000	54.000
MAA	*****	*****	*****	*****
PROBIT	*****	*****	*****	*****
SPEARMAN	31.531	27.197	36.555	9.358

\*\*\*\* = LIMIT DOES NOT EXIST

---