BIVALVE BIOACCUMULATION CORRELATION ANALYSIS

CANNELTON INDUSTRIES SUPERFUND SITE

TANNERY BAY, SAULT STE MARIE, MI

VOLUME 2: APPENDICES

PREPARED FOR

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
COASTAL PROTECTION AND RESTORATION DIVISION
77 WEST JACKSON BOULEVARD SR 6J
CHICAGO, IL 60604

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Prepared for

National Oceanic and Atmospheric Administration
Coastal Protection and Restoration Division

77 West Jackson Boulevard SR 6J
Chicago, IL 60604

Prepared by

RIDOLFI Inc.

and

Kern Statistical Services, Inc.

and

Arkansas State University

May 2006

LIST OF APPENDICES

APPENDIX A

Pictures of Experimental Setup and Procedures

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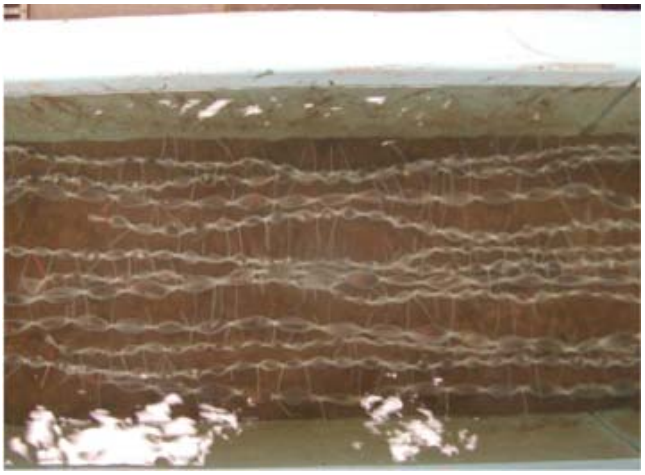
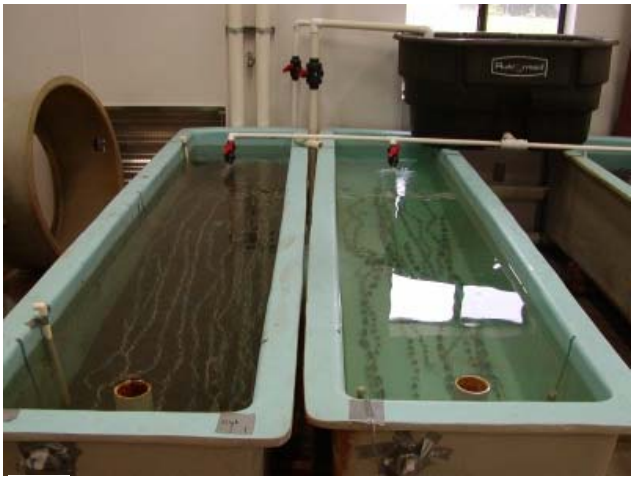
Figure 1. Flow-through troughs utilized for exposure regime at Mammoth Springs National Fish Hatchery A) introduction of bivalve sleeves from transport coolers into mesocosms B) placement of *Corbicula fluminea* sleeve in control mesocosm C) placement of *Elliptio complanata* sleeve into mesocosm

A



B

C



D

Figure 2. A) flow through water source used for renewal in mesocosms B) bivalves secured with netting placed in mesocosm on sediment surface C) medium and high sediment metal exposures D) control and low sediment metal exposures.

APPENDIX B
Description of Mussel Collection

Phelps Dodge Industries, Inc.

Bio-Uptake Investigation Oversight

January 2005

Final Report

Introduction

This report is in response by a request by the Environmental Protection Agency (EPA) under the advisory direction of the National Oceanic and Atmospheric Association (NOAA) to conduct a study to compare the bio-accumulation of metals between the Asian clam, *Corbicula fluminea* and the eastern elliptio, *Elliptio complanata*. *Elliptio complanata* will potentially replace *C. fluminea* for a third bio-monitoring event in the St. Mary's River in Sault Ste. Marie. Tannery Bay, within the St. Mary's river, was contaminated with metals from Cannelton Industries.

Background

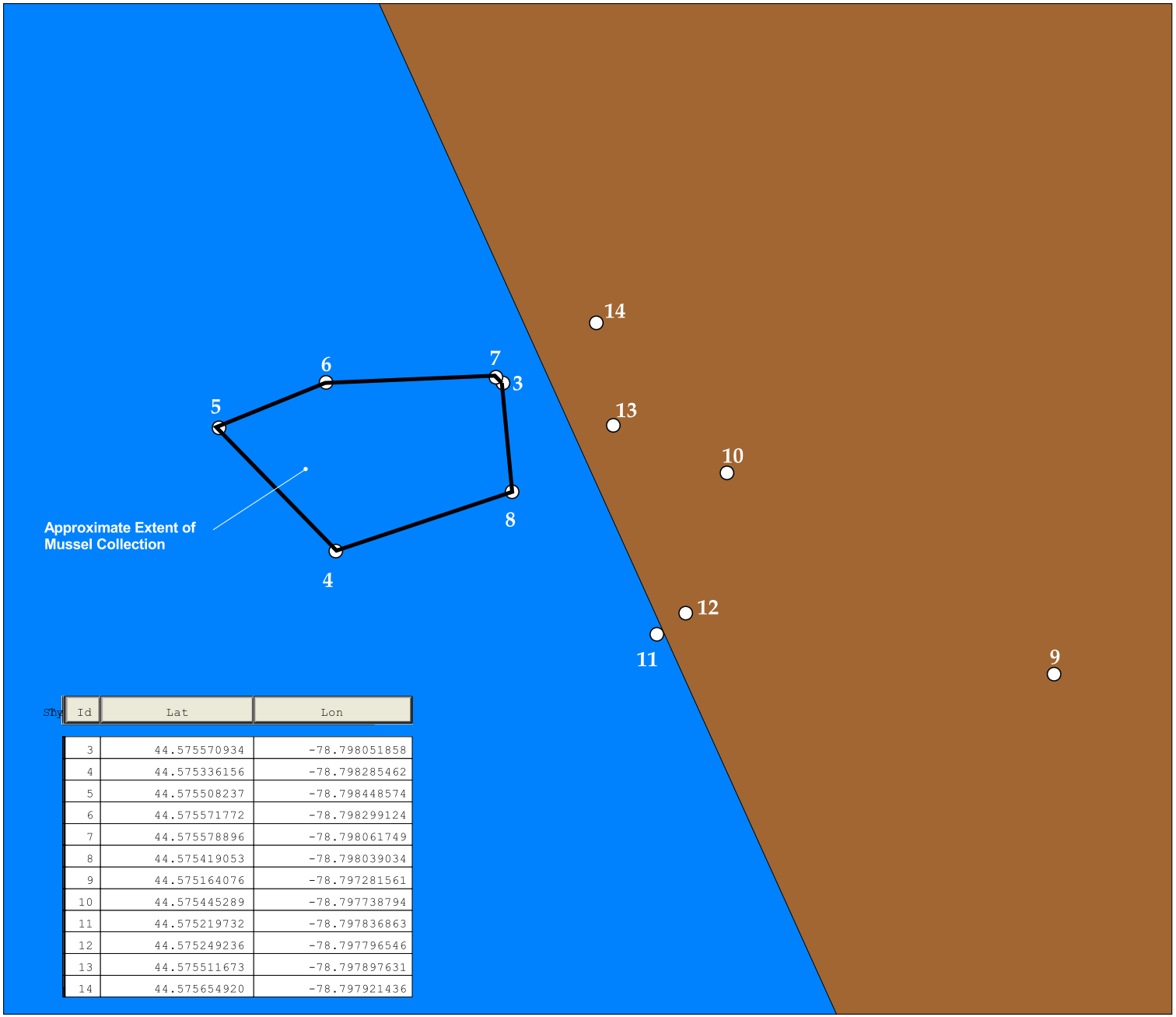
As an amendment to the 1992 Record of Decision (ROD), caged bivalve biomonitoring was required for the Cannelton site to verify effectiveness of remediation (Sprenger and Kracko, 1992). In 1997 and 2000, *Corbicula fluminea* was used for a 55-day in situ deployment study to assess the bio-accumulation of the contaminated sediments (Applied Biomonitoring and HydroQual, Inc. 2002).

Corbicula fluminea, a species introduced into North America, is found widely throughout the southern United States and has only been recorded in Michigan from approximately 1993. Distribution in northern climates is thought to be temperature limited. Since it has not been introduced into the St. Mary's River at Tannery Bay, the Michigan Department of Natural Resources became concerned over the use of this species in this area. *Corbicula fluminea* is known to biofoul uptake pipes. Because the potential introduction of *C. fluminea* into Tannery Bay could cause biofouling in the area, a decision was made by the Department of Natural Resources to not permit the use of *C. fluminea* in 2004, and to encourage the use of native species instead.

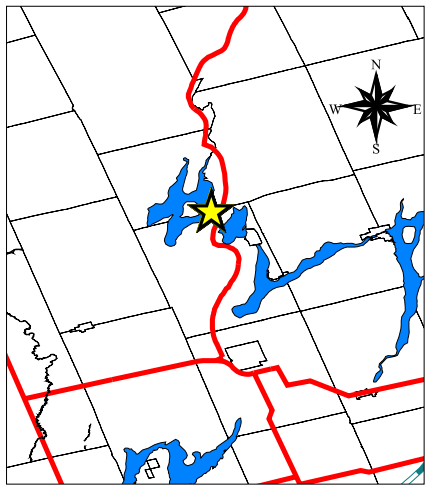
Elliptio complanata is a native mussel within the family Unionidae that is found in northern Michigan and the east coast of the United States. Because of its availability and use in previous studies (e. g. Campbell and Evens, 1991; Curry, 1977; Day et al. 1990), its use for *in situ* studies at the Cannelton site is being considered. Furthermore, its native status reduces the risk of introduction of a non-native species.

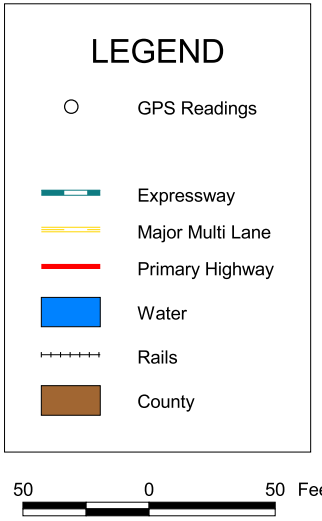
In 1986, the zebra mussel, *Dreissena polymorpha*, was found in Lake St. Clair, in Michigan. Likely introduced via ballast water, the spread of the zebra mussel is of concern because of economic and biological implications. The zebra mussels settle on native unionids, and can be introduced into other waters via native mussels. Techniques to avoid the introduction of zebra mussels have been evaluated (Cope et al. 2002).

The primary objective of this study was to compare bio-uptake of *Corbicula fluminea* with *Elliptio complanata* to see if *E. complanata* could be used for future in-situ investigations. This was done by conducting a correlation study using sediments of three different concentrations (low, medium and high) from Tannery Bay. Arkansas State University took the lead to deploy and monitor mussels in the four different sediment treatments—three levels of contaminant concentrations, and one control treatment. NOAA and Ridolfi coordinated collection and shipment of the sediments to ASU. CDM's role was 1) to oversee collection of *E. complanata* from Balsam Lake, Ontario, Canada, and 2) to check for any zebra mussel infestations on mussels in Balsam Lake, 3) to pack and ship mussels to Arkansas State University, and 4) to observe and assist with the correlation investigations for this study.



Id	Lat	Lon
3	44.575570934	-78.798051858
4	44.575336156	-78.798285462
5	44.575508237	-78.798448574
6	44.575571772	-78.798299124
7	44.575578896	-78.798061749
8	44.575419053	-78.798039034
9	44.575164076	-78.797281561
10	44.575445289	-78.797738794
11	44.575219732	-78.797836863
12	44.575249236	-78.797796546
13	44.575511673	-78.797897631
14	44.575654920	-78.797921436





Notes:
(1) Coordinate recorded using a Garmin handheld GPS unit that is accurate to approximately 20 to 25 feet. All GPS locations in Lat. / Lon.

CDM
One Woodward Ave., Suite 1500
Detroit, Michigan 48226
Phone: (313) 963-1313
Fax: (313) 963-3130

Prepared By:
A. Santini
Date:
7/2/04

Mussel Collection at the Balsam Lake Resort, Ontario

GPS Locations from Mussel Collection on June 30, 2004

Figure No. 1

Figure 2. Divers on Balsam Lake

Mussel collection

Four-hundred *Elliptio complanata* were collected from Balsam Lake, Ontario, Canada on June 30, 2004. The mussels were taken from the water at approximately 25 feet off the dock of the Balsam Resort, located off Highway 35 (Figure 1). Volunteer divers from the Scarborough Diver Club, coordinated by Dan Johnson of Phelps-Dodge collected the mussels (Figures 2 and 3). Mussels collected were to be between 47 to 65 mm in length. Hand-held calipers were used to measure each mussel collected. Several mussels showed wear on the umbo (the upper portion of the shell), so mussels with minimal wear in this area were selected for shipment. The average size of the mussels collected was 52.8 mm.

Figure 3. Mussels in Balsam Lake. Arrows point to mussels in the substrate.

Evaluation of potential zebra mussel infestation

Balsam Lake is part of the Trent-Severn Waterway and is connected to waters of the Great Lakes that are infested with zebra mussels. To the east the waterways are connected to the Bay of Quinte on Lake Ontario and to the west it is connected to the Georgian Bay on Lake Huron. In addition, local mussel experts in Ontario reported zebra mussel infestations in Balsam Lake (Janet Metcalfe-Smith, Environment Canada, personal communication). Because of the potential for zebra mussel infestation, mussels taken from Balsam Lake were inspected for juvenile zebra mussels settling on the shells. In addition, five areas of fixed structures such as docks and boulders were inspected for zebra mussel juvenile or adult infestations.

Mussel packing

Mussels were packed according to protocols established during discussions with the U. S. Geological Survey biologists (Teresa J. Newton, U. S. G. S., LaCrosse, Wisconsin, personal communication). For shipping they were wrapped in brown paper towels, then placed into coolers in between a layer of wet burlap bags, purchased from a feed store.

Figure 4. Ice packed into freezer bags placed in coolers with Elliptio complanata.

The burlap bags were placed on top of ice packed into freezer bags (Figure 4). A Chain of Custody (COC) was placed in each cooler. Mussels were then shipped via Federal Express to Arkansas

State University's Ecotox lab in Jonesboro, Arkansas.

CDM personnel traveled to the EcoTox lab at Arkansas State University in Joneboro, Arkansas on July 2 to assure that mussels arrived and to assess or observe any mortality of mussels. Only one mussel died in shipment.

Observation and Assistance with deployment for correlation study

On July 6, 2004 CDM personnel traveled to the Mammoth Spring National Fish Hatchery in Mammoth Spring, Arkansas to observe and assist with pre-deployment procedures. Prior to pre-deployment procedures, sediments from Tannery Bay were shipped to the hatchery and allowed to settle. Chronium concentrations were identified as low, medium or high.

Figure 5. ASU personnel weighing bivalves prior to placing them in plastic mesh netting.

Two populations of *Corbicula fluminea* were used: one from the Strawberry River in northeastern Arkansas and another from the Saline River in south central Arkansas. *Corbicula fluminea* and *Elliptio complanata* were weighed and measured according to protocols in the WP correlation study proposal. Whole Animal Wet Weight (WAWW) was measured prior to placing each individual *C. fluminea* or *E. complanata*. WAWW was recorded by hand and on data sheets and electronically into a computer connected to an electronic balance (Figure 5). Each animal was then placed into mesh tubes made from plastic netting. The netting was tied off with nylon cable ties to separate individuals and prevent the bivalves from shifting in the tube. At deployment, the bivalves were placed in control, low, medium, or high treatments (Figure 6).

Figure 6. Four fiberglass tanks used as mesocosms with low, medium, high and control treatments.

On August 11, a little over halfway through the study, CDM communicated with personnel at ASU to check status of the mussels at the Mammoth Springs Hatchery. No problems were reported.

On September 2, 2004, CDM personnel traveled to the EcoTox lab at ASU in Jonesboro, Arkansas to assist with the processing of mussels after the 55-day deployment. Bivalves were brought to the lab after their standard 24-hour purging.

WAWW was once again taken for each bivalve in order to assess growth rates. After WAWW was finished for all individuals from each treatment or replicate, tissues from each animal were removed. The tissue and shell were then weighed individually. Tissues were composited by individual replicate for each treatment (50 *C. fluminea*, 20 *E. dilatata*), and frozen.

Processing all bivalves took two days, and tissues arrived at Battelle labs on September 9. (Jerry Farris, Arkansas State University, personal communication). Battelle analyzed mussel and clam tissues for contaminant concentrations.

Figure 7. Weighing individual shells after shucking.

Future directions

Pending the results from the correlation study, standards to compare past monitoring with *Corbicula fluminea* to future monitoring with *Elliptio complanata* will be established. In situ studies can then be conducted in Tannery Bay using only *E. complanata*.

Literature cited

Applied Biomonitoring and HydroQual, Inc. 2002. Post-baseline clam monitoring study. Report to Phelps-Dodge Corporation. 99 pp.

Campbell, J., and R.D. Evans, 1991. Cadmium concentrations in the freshwater mussel *Elliptio complanata* and their relationship to water chemistry. Archives of Environmental Contamination and Toxicology 20: 125-131.

Cope, W. G., T. J. Newton, and C. M. Gatenby, 2002. Evaluation of techniques to prevent introduction of zebra mussels (*Dreissena polymorpha*) during native mussel (Unionidea) conservation activities. U. S. Fish and Wildlife Service report. 25 pp.

Curry, C. A. 1977. The freshwater clam (*Elliptio complanata*), a practical tool for monitoring water quality. Water Pollution Research Journal of Canada 13:45-52.

Day, K.E., J.L. Metcalfe, and S.P. Batchelor, 1990. Changes in intracellular free amino acids in tissues of the caged mussel, *Elliptio complanata*, exposed to contaminated environments. Archives of Environmental Contamination and Toxicology 19(6):816-827.

Sprenger, M. D. and K. Kracko, 1992. Final report for supplemental environmental investigation. Cannelton Industries Site, Sault Ste. Marie, MI. Prepared for Environmental Response Branch, Emergency Response Division, Office of Emergency and Remedial Response, USEPA.

APPENDIX C

Measured Physicochemical Data Measured in Source Water and Overlying Water from Exposure Mesocosms

Physicochemical parameters measured in source water and overlying water from exposure mesocosms from July 9 to Sept 5, 2004. Mean ±1SD provided.

Site	Temp °C			pH			DO (mg/L)		
	Mean	STDEV	n	Mean	STDEV	n	Mean	STDEV	n
Spring	18.0	3.3	5	7.03	0.58	4	9.43	0.95	5
Pond	24.3	1.3	5	7.49	0.49	4	9.50	0.55	5
Mixing Reservoir	18.5	2.9	6	7.21	0.57	4	8.88	1.60	6
Control	18.4	2.7	7	7.18	0.58	5	8.25	1.25	7
Low	18.3	2.6	7	7.20	0.58	5	8.21	1.15	7
Medium	18.3	2.6	7	7.20	0.58	5	8.21	1.23	7
High	18.3	2.6	7	7.19	0.58	5	8.17	1.23	7

	Conductivity (µs/cm)			Alkalinity (mg/L)			Hardness (mg/L)		
	Mean	STDEV	n	Mean	STDEV	n	Mean	STDEV	n
Spring	421	45	4	253	14	3	260	10	3
Pond	399	23	4	242	12	3	240	36	3
Mixing Reservoir	405	32	5	268	12	3	263	15	3
Control	408	44	6	261	11	3	253	12	3
Low	410	45	6	253	16	3	250	10	3
Medium	412	47	6	258	9	3	260	17	3
High	413	48	6	257	15	3	260	10	3

APPENDIX D
Chain of Custody Forms

Ridolfi-Task 4

SAMPLE CUSTODY RECORD

(SOP# MSL-A-001 & MSL-A-002)

Date: 7-15-04

Battelle
... Putting Technology To Work
Pacific Northwest Division
Marine Sciences Laboratory
1529 West Sequim Bay Road
Sequim, Washington 98382

Project Name: Cannelton / ASU / Mammoth
Project Manager: JERRY L. FARRIS
Phone Number: 870-972-2570

Shipment Method: COURIER / FEDEX
Preservation: Blue Ice.

Line	Field Sample ID	Collection Date/Time	Matrix	No. of Containers	Test Parameters: Metals					Laboratory ID	Observations/Comments
1	3-4	071504 / 0930	Sed	1	✓	22	41.1			ASU Ecotox	
2	3-3	071504/0930	Sed	1	✓		2			ASU Ecotox	
3	3-2	071504/0930	Sed	1	✓		3			ASU Ecotox	
4	~~3-1~~	~~071504/0930~~	~~Sed~~	~~1~~	~~✓~~		—			~~ASU Ecotox~~	
5	STO	071504/0930	Tissue	1	✓		4			"	
6	BTO	071504/0930	Tissue	1	✓		5			"	
7	SBTO	071504/0930	Tissue	1	✓	22	41.6			"	
8											
9											
10											
11											
12											
13											
14											
15											

Relinquished By: JERRY L. FARRIS — Company: ARK. STATE UNIV. — Signature/Printed Name — Date/Time: 7-15-04 1830

Received By: MLFMcGahan — Company: MSL — Signature/Printed Name — Date/Time: 07/16/04 1110

Relinquished By: — Company: — Signature/Printed Name — Date/Time

Received By: — Company: — Signature/Printed Name — Date/Time

Rev. 020102COC

Distribution: White - Laboratory, Project Files Yellow - Laboratory, Client Pink - Sampler

LOG-IN CHECKLIST

Reference SOP# MSL-A-001

Central File #: 2241 Sample No(s): 1-6 Project Manager: Nicholay

TO BE COMPLETED BY PROJECT MANAGER (prior to arrival when possible)

Matrix: _____ WP# _____

Yes	No	
☐	☐	Navy-type Project (requires high-level sample tracking procedures)
☐	☐	Filter Samples: Amount: Entire sample Half of sample
☐	☐	Freeze dry sample(s) - samples will be weighed and placed in ultralow temp freezer (Lab# 130)
☐	☐	Special instructions: _____

Sample Preservation Instructions: _____

Date To Archive: _____ Date To Dispose: _____

TO BE COMPLETED UPON SAMPLE ARRIVAL/LOG-IN

Yes	No	N/A	Indicate in Appropriate Box
☐	☒	☐	Was a custody seal present?
☐	☐	☒	Was the custody seal intact?
☒	☐	☐	Was cooler(s) temperature(s) within acceptable range of 4±2°C? 3.3 °C (if multiple coolers, note temp. of each) _____ °C
☐	☐	☒	Was Project Manager notified of any custody/login discrepancies (cooler temp, sponsor codes, etc)? Comment/Remedy: _____
☒	☐	☐	Were all chain of custody forms signed and dated?
☐	☒	☐	Were samples filtered at MSL?

Sample condition(s): (Acceptable) Other (explain): _____

Container type: Teflon Poly (Glass) (Spex) Other _____

Notes: _____

Completed By: _____ Date/Time: 07/16/04 1110

SAMPLE PRESERVATION

☒ Sample(s) were preserved at MSL

☐ Sample(s) were preserved prior to arrival at MSL (noted on CoC / Sample / per PM Instruction)

☐ Random pH checked for ~10% of samples (use dip paper) Sample IDs: _____

☐ Complete pH check required for project (use pH meter and record on pH Record form)

If preservation necessary, record Acid Lot#

Type: ☐	0.2% HNO3	Notes: _____
☐	0.5% HCl (Hg samples)	Notes: _____
☒	Refrigerate/Freeze	Notes: fois the lab
☐	Other	Notes: _____

Completed By: _____ Date/Time: 07/16/04 1110

cc: Project Manager/Central File
Login File 2241

SAMPLE LOGIN
(SOP# MSL-A-001)

Project Manager: Niewolny
Date Received: 07/16/04
Batch: 1

PROJECT: Ridolfi-Task 4

SPONSOR CODE	Site Description	BATTELLE CODE	MATRIX	STORAGE LOCATION	PARAMETERS REQUESTED	COLLECTION DATE	INITIALS
3-4	na	2241-1*	sediment	Refrigerator- Hg Lab	metals	07/15/04	MLFM
3-3	na	2241-2*	sediment	Refrigerator- Hg Lab	metals	07/15/04	MLFM
3-2	na	2241-3*	sediment	Refrigerator- Hg Lab	metals	07/15/04	MLFM
STO	na	2241-4	tissue	Refrigerator- Hg Lab	metals	07/15/04	MLFM
BTO	na	2241-5	tissue	Refrigerator- Hg Lab	metals	07/15/04	MLFM
SBTO	na	2241-6	tissue	Refrigerator- Hg Lab	metals	07/15/04	MLFM

*Received in 500ml glass jar, small amount removed and put into spex jar.
Both jars put into Refrigerator in Hg Lab

[illegible] [illegible] [illegible] seds-deep [illegible] waters - Prep lab

SAMPLE CUSTODY RECORD

(SOP# MSL-A-001 & MSL-A-002)

Date: 0[illegible]204

Battelle
. . . Putting Technology To Work
Pacific Northwest Division
Marine Sciences Laboratory
1529 West Sequim Bay Road
Sequim, Washington 98382

Project Name: Cannelton/Mammoth/ASU
Project Manager: Jerry Farris
Phone Number: (870) 972 - 2570

Shipment Method: Blue Ice
Preservation: Fed Ex

Line	Field Sample ID	Collection Date/Time	Matrix	No. of Containers	Test Parameters: Raw			Filt		Laboratory ID	Observations/Comments
1	1	090204/0500	Water	1	2241.	8	2241-		12	ASU Ecotox	
2	2	|	|	1	|	9			13		
3	3	|	|	1	|	10			14		
4	4	|	|	1	|	11	2241.		15		
5	2	090204/0530	Sediments	1	|	~~12~~	16				
6	3	|	|	1	|	~~13~~	17				
7	4	|	|	1	2241.	~~14~~	18				
8											
9											
10											
11											
12											
13											
14											
15											

Relinquished By: Jacob Sawyer — Signature/Printed Name
Company: ASU Ecotox
Date/Time: 090204/0930

Received By: [signature] MLF McGahan — Signature/Printed Name
Company: MSL
Date/Time: 09/03/04 1200

Relinquished By: Signature/Printed Name
Company:
Date/Time

Received By: Signature/Printed Name
Company:
Date/Time

Ridolfi - Task 4 Batch 2

LOG-IN CHECKLIST

Reference SOP# MSL-A-001

Central File #: 2241 Sample No(s): 7-18 Project Manager: Niewolny

TO BE COMPLETED BY PROJECT MANAGER (prior to arrival when possible)

Matrix: _____ WP# W65756

Yes	No	
☐	☒	Navy-type Project (requires high-level sample tracking procedures)
☒	☐	Filter Samples: Amount: Entire sample (Half of sample)
☒	☐	Freeze dry sample(s) - samples will be weighed and placed in ultralow temp freezer (Lab# 130)
☐	☐	Special instructions: _____

Sample Preservation Instructions: HNO_3 – Metals Analysis

Date To Archive: _____ Date To Dispose: _____

TO BE COMPLETED UPON SAMPLE ARRIVAL/LOG-IN

Yes	No	N/A	Indicate in Appropriate Box
☐	☒	☐	Was a custody seal present?
☐	☐	☒	Was the custody seal intact?
☒	☐	☐	Was cooler(s) temperature(s) within acceptable range of 4±2°C? 2.2 °C (if multiple coolers, note temp. of each) °C
☐	☐	☒	Was Project Manager notified of any custody/login discrepancies (cooler temp, sponsor codes, etc)? Comment/Remedy: _____
☒	☐	☐	Were all chain of custody forms signed and dated?
☒	☐	☐	Were samples filtered at MSL?

Sample condition(s): (Acceptable) Other (explain):

Container type: (Teflon) Poly Glass ~~Spex~~ Other: _____

Notes: _____

Completed By: [signature] Date/Time: 09/03/04 1210

SAMPLE PRESERVATION

☒ Sample(s) were preserved at MSL

☐ Sample(s) were preserved prior to arrival at MSL (noted on CoC / Sample / per PM Instruction)

☐ Random pH checked for ~10% of samples (use dip paper) Sample IDs: _____

☐ Complete pH check required for project (use pH meter and record on pH Record form)

If preservation necessary, record Acid Lot#

Type:		Notes:
☒	0.2% HNO3	Lot # 120305D
☐	0.5% HCl (Hg samples)	Notes:
☐	Refrigerate/Freeze	Notes:
☐	Other	Notes:

Completed By: [signature] Date/Time: 13:05 9/03/04

Revsed 031303

preblank KJA 16, 17, 18 Seds in freezer

cc: Project Manager/Central File
Login File 2241

SAMPLE LOGIN

(SOP# MSL-A-001)

Project Manager: Niewolny
Date Received: 09/03/04
Batch: 2

PROJECT: Ridolfi-Task 4

SPONSOR CODE	Site Description	BATTELLE CODE	MATRIX	STORAGE LOCATION	PARAMETERS REQUESTED	COLLECTION DATE	INITIALS
1	ASU Ecotox	2141-8	raw water	Prep Lab K-3-A	Total Metals	09/02/04	MLFM
2	ASU Ecotox	2141-9	raw water	Prep Lab K-3-A	Total Metals	09/02/04	MLFM
3	ASU Ecotox	2141-10	raw water	Prep Lab K-3-A	Total Metals	09/02/04	MLFM
4	ASU Ecotox	2141-11	raw water	Prep Lab K-3-A	Total Metals	09/02/04	MLFM
1	ASU Ecotox	2141-12	filt. water	Prep Lab K-3-A	Dissolved Metals	09/02/04	MLFM
2	ASU Ecotox	2141-13	filt. water	Prep Lab K-3-A	Dissolved Metals	09/02/04	MLFM
3	ASU Ecotox	2141-14	filt. water	Prep Lab K-3-A	Dissolved Metals	09/02/04	MLFM
4	ASU Ecotox	2141-15	filt. water	Prep Lab K-3-A	Dissolved Metals	09/02/04	MLFM
2	ASU Ecotox	2141-16	sediment	Deep Freezer	Total Metals	09/02/04	MLFM
3	ASU Ecotox	2141-17	sediment	Deep Freezer	Total Metals	09/02/04	MLFM
4	ASU Ecotox	2141-18	sediment	Deep Freezer	Total Metals	09/02/04	MLFM

SAMPLE CUSTODY RECORD

(SOP# MSL-A-001 & MSL-A-002)

Date: 090704

Battelle
. . . Putting Technology To Work
Pacific Northwest Division
Marine Sciences Laboratory
1529 West Sequim Bay Road
Sequim, Washington 98382

Project Name: Cannelton/Mammoth/ASU
Project Manager: Jerry Farris
Phone Number: 870. 972. 2570

Shipment Method: Fed Ex
Preservation: Blue Ice

Line	Field Sample ID	Collection Date/Time	Matrix	No. of Containers	Test Parameters					Laboratory ID	Observations/Comments
1	Control - 1	090704 0900	Visceral mass	9						ASU Ecotox	
2	Low - 2	" "	" "	" "						" "	
3	Medium - 3	" "	" "	" "						" "	
4	High - 4	" "	" "	" "						" "	
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											

Relinquished By:	Company:	Received By:	Company:
Jacob Sawyer	ASU Ecotox	MLF McGahan	MSL
Signature/Printed Name	090704 1805 Date/Time	Signature/Printed Name	09/09/04 1250 Date/Time
Relinquished By:	Company:	Received By:	Company:
Signature/Printed Name	Date/Time	Signature/Printed Name	Date/Time

Rev. 020102COC

Distribution: White - Laboratory, Project Files Yellow - Laboratory, Client Pink - Sampler

LOG-IN CHECKLIST Kiddi: Task 4 – Batch 3 Reference SOP# MSL-A-001

Central File #: 2341 Sample No(s): LS-19-54 Project Manager: Nieuwehuy

TO BE COMPLETED BY PROJECT MANAGER (prior to arrival when possible)

Matrix: _____ WP# _____

Yes	No	
☐	☒	Navy-type Project (requires high-level sample tracking procedures)
☐	☒	Filter Samples: *Amount:* Entire sample Half of sample
☒	☐	Freeze dry sample(s) - samples will be weighed and placed in ultralow temp freezer (Lab# 130)
☐	☒	Special instructions: _____

Sample Preservation Instructions: _____

Date To Archive: _____ Date To Dispose: _____

TO BE COMPLETED UPON SAMPLE ARRIVAL/LOG-IN

Yes	No	N/A	Indicate in Appropriate Box
☐	☒	☐	Was a custody seal present?
☐	☐	☒	Was the custody seal intact?
☒	☐	☐	Was cooler(s) temperature(s) within acceptable range of 4±2°C? 5.3 °C (if multiple coolers, note temp. of each) _____ °C
☐	☐	☒	Was Project Manager notified of any custody/login discrepancies (cooler temp, sponsor codes, etc)? Comment/Remedy: _____
☒	☐	☐	Were all chain of custody forms signed and dated?
☐	☒	☐	Were samples filtered at MSL?

Sample condition(s): (Acceptable) Other (explain):

Container type: Teflon Poly Glass (Spex) Other: _____

Notes: _____

Completed By: [signature] Date/Time: 09/09/04 1250

SAMPLE PRESERVATION

☒ Sample(s) were preserved at MSL

☐ Sample(s) were preserved prior to arrival at MSL (noted on CoC / Sample / per PM Instruction)

☐ Random pH checked for ~10% of samples (use dip paper) Sample IDs: _____

☐ Complete pH check required for project (use pH meter and record on pH Record form)

If preservation necessary, record Acid Lot#

Type:	☐	0.2% HNO3	Notes: _____
	☐	0.5% HCl (Hg samples)	Notes: _____
	☒	Refrigerate/(Freeze)	Notes: Deep freezer
	☐	Other	Notes: _____

Completed By: 09/09/04 [signature] Date/Time: 09/09/04 1250

Revsed 031303

Tissues Should arrive Wed - 9/8

cc: Project Manager/Central File
Login File

2241

SAMPLE LOGIN

(SOP# MSL-A-001)

Project Manager: Niewolny
Date Received: 09/09/04
Batch: 3

PROJECT: Ridolfi-Task 4

SPONSOR CODE	Site Description	BATTELLE CODE	MATRIX	STORAGE LOCATION	PARAMETERS REQUESTED	COLLECTION DATE	INITIALS
1-S-1	Control Tank-Saline River Corbicula	2241-19	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
1-S-2	Control Tank-Saline River Corbicula	2241-20	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
1-S-3	Control Tank-Saline River Corbicula	2241-21	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
1-B-1	Control Tank-Balsam Lake Elliptio	2241-22	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
1-B-2	Control Tank-Balsam Lake Elliptio	2241-23	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
1-B-3	Control Tank-Balsam Lake Elliptio	2241-24	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
1-SB-1	Control Tank-Strawberry Riiver Corbicula	2241-25	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
1-SB-2	Control Tank-Strawberry Riiver Corbicula	2241-26	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
1-SB-3	Control Tank-Strawberry Riiver Corbicula	2241-27	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
2-S-1	Low Conc. Tank-Saline River Corbicula	2241-28	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
2-S-2	Low Conc. Tank-Saline River Corbicula	2241-29	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
2-S-3	Low Conc. Tank-Saline River Corbicula	2241-30	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
2-B-1	Low Conc.Tank-Balsam Lake Elliptio	2241-31	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
2-B-2	Low Conc.Tank-Balsam Lake Elliptio	2241-32	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
2-B-3	Low Conc.Tank-Balsam Lake Elliptio	2241-33	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
2-SB-1	Low Conc.Tank-Strawberry Riiver Corbicula	2241-34	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
2-SB-2	Low Conc.Tank-Strawberry Riiver Corbicula	2241-35	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
2-SB-3	Low Conc.Tank-Strawberry Riiver Corbicula	2241-36	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
3-S-1	Med. Conc. Tank-Saline River Corbicula	2241-37	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
3-S-2	Med. Conc. Tank-Saline River Corbicula	2241-38	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
3-S-3	Med. Conc. Tank-Saline River Corbicula	2241-39	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM

cc: Project Manager/Central File
Login File

2241

SAMPLE LOGIN

(SOP# MSL-A-001)

Project Manager: Niewolny
Date Received: 09/09/04
Batch: 3

PROJECT: Ridolfi-Task 4

SPONSOR CODE	Site Description	BATTELLE CODE	MATRIX	STORAGE LOCATION	PARAMETERS REQUESTED	COLLECTION DATE	INITIALS
3-B-1	Med. Conc. Tank-Balsam Lake Elliptio	2241-40	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
3-B-2	Med. Conc. Tank-Balsam Lake Elliptio	2241-41	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
3-B-3	Med. Conc. Tank-Balsam Lake Elliptio	2241-42	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
3-SB-1	Med. Conc Tank-Strawberry Riiver Corbicula	2241-43	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
3-SB-2	Med. Conc Tank-Strawberry Riiver Corbicula	2241-44	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
3-SB-3	Med. Conc Tank-Strawberry Riiver Corbicula	2241-45	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
4-S-1	High Conc. Tank-Saline River Corbicula	2241-46	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
4-S-2	High Conc. Tank-Saline River Corbicula	2241-47	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
4-S-3	High Conc. Tank-Saline River Corbicula	2241-48	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
4-B-1	High Conc. Tank-Balsam Lake Elliptio	2241-49	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
4-B-2	High Conc. Tank-Balsam Lake Elliptio	2241-50	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
4-B-3	High Conc. Tank-Balsam Lake Elliptio	2241-51	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
4-SB-1	High Cond. Tank-Strawberry Riiver Corbicula	2241-52	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
4-SB-2	High Cond. Tank-Strawberry Riiver Corbicula	2241-53	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM
4-SB-3	High Cond. Tank-Strawberry Riiver Corbicula	2241-54	Tisue	Deep Freezer	Total Metals	09/02/04	MLFM

APPENDIX E
Bivalve Growth Data

T_0 Tissue Samples

Strawberry River
Corbicula SB T_0

Corbicula no.	Visceral Mass (g)	Shell Mass (g)
1	0.445	2.260
2	0.336	1.481
3	0.369	1.791
4	0.256	1.353
5	0.434	2.010
6	0.380	1.752
7	0.436	2.342
8	0.450	1.960
9	0.374	1.996
10	0.490	2.487
11	0.361	1.948
12	0.443	2.354
13	0.393	1.840
14	0.508	2.027
15	0.440	2.229
16	0.389	1.897
17	0.305	1.721
18	0.284	1.421
19	0.358	1.732
20	0.261	1.316
21	0.341	2.026
22	0.356	1.643
23	0.346	1.920
24	0.420	2.108
25	0.376	1.950
26	0.329	1.725
27	0.443	2.011
28	0.373	2.036
29	0.410	1.962
30	0.382	1.983
31	0.369	1.837
32	0.490	2.186
33	0.366	1.768
34	0.327	1.593
35	0.334	1.481
36	0.313	1.462
37	0.281	1.551
38	0.343	1.613
39	0.447	2.013
40	0.407	1.892
41	0.317	1.688
42	0.321	1.565
43	0.355	1.681
44	0.324	1.405
45	0.230	1.258
46	0.350	1.687
47	0.361	1.457
48	0.346	1.676
49	0.318	1.611
50	0.317	1.502
Total mass	**18.404**	**90.207**
Average mass	**0.368**	**1.804**
STDEV	**0.062**	**0.289**

Saline River
Corbicula S T_0

Corbicula no.	Visceral Mass (g)	Shell Mass (g)
1	1.204	5.139
2	1.154	4.261
3	1.030	4.027
4	1.046	3.145
5	0.748	2.556
6	1.245	5.894
7	1.267	5.366
8	1.045	3.222
9	1.167	5.840
10	0.988	3.983
11	1.117	4.744
12	1.054	4.359
13	1.107	3.674
14	1.098	3.575
15	0.658	6.197
16	0.951	3.983
17	1.716	9.464
18	1.464	7.701
19	1.007	4.162
20	0.911	3.567
21	1.131	4.269
22	1.184	5.271
23	1.335	5.001
24	1.118	4.964
25	0.870	3.838
26	1.040	3.997
27	0.953	3.951
28	1.083	4.339
29	0.883	4.486
30	1.482	6.744
31	0.788	3.434
32	0.941	3.533
33	1.118	3.389
34	0.975	4.399
35	0.956	3.389
36	1.088	4.158
37	1.137	5.139
38	1.036	4.328
39	0.927	3.784
40	0.943	3.588
41	1.107	4.754
42	0.992	3.911
43	1.268	9.603
44	0.921	5.076
45	1.132	4.410
46	0.978	3.598
47	0.803	3.897
48	1.154	4.873
49	1.127	4.011
50	0.745	4.624
Total mass	**53.192**	**229.617**
Average mass	**1.064**	**4.592**
STDEV	**0.191**	**1.392**

Balsam Lake
Elliptio B T_0

Elliptio no.	Visceral Mass (g)	Shell Mass (g)
1	3.900	9.508
2	2.458	5.061
3	2.455	3.934
4	3.132	6.520
5	2.543	5.248
6	3.469	7.780
7	2.675	4.554
8	2.864	4.356
9	3.259	5.770
10	2.618	4.897
11	1.905	3.683
12	3.538	6.779
13	2.309	6.190
14	3.227	5.720
15	2.430	3.859
16	2.333	5.073
17	2.080	3.044
18	2.738	4.230
19	2.379	5.173
20	2.262	4.641
Total mass	**54.574**	**106.020**
Average mass	**2.729**	**5.301**
STDEV	**0.530**	**1.516**

Control Tank
Strawberry River *Corbicula*

1-SB-1

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	5.523	5.517	0.803	3.656	-0.006
2	2.816	2.855	0.430	1.882	0.039
3	4.858	4.846	0.667	3.171	-0.012
4	3.800	3.777	0.563	2.550	-0.023
5	3.272	3.315	0.535	2.131	0.043
6	3.545	3.639	0.592	2.377	0.094
7	3.002	3.041	0.466	2.025	0.039
8	2.908	2.957	0.427	2.054	0.049
9	2.581	2.623	0.348	1.762	0.042
10	2.299	2.336	0.363	1.576	0.037
11	2.945	2.974	0.462	1.998	0.029
12	3.004	3.010	0.458	1.994	0.006
13	2.208	2.237	0.307	1.482	0.029
14	2.930	2.961	0.410	1.982	0.031
15	2.080	2.121	0.296	1.415	0.041
16	2.118	2.127	0.277	1.440	0.009
17	2.849	2.907	0.468	1.939	0.058
18	2.151	2.173	0.305	1.428	0.022
19	3.028	3.035	0.744	2.094	0.007
20	2.533	2.556	0.387	1.702	0.023
21	3.074	3.069	0.433	2.133	-0.005
22	3.601	3.664	0.613	2.488	0.063
23	5.233	5.272	0.776	3.572	0.039
24	4.569	4.543	0.727	2.998	-0.026
25	3.392	3.439	0.532	2.262	0.047
27	2.557	2.674	0.358	1.737	0.117
28	2.492	2.452	0.345	1.659	-0.040
29	2.844	2.869	0.400	1.925	0.025
30	2.050	1.994	0.298	1.399	-0.056
31	2.260	2.351	0.310	1.548	0.091
32	2.698	2.705	0.343	1.809	0.007
33	2.367	2.414	0.326	1.613	0.047
34	3.130	3.177	0.395	2.128	0.047
35	3.132	3.196	0.457	2.066	0.064
36	4.450	4.704	0.628	2.986	0.254
37	2.843	2.827	0.357	1.975	-0.016
38	2.695	2.731	0.345	1.862	0.036
39	2.030	2.043	0.263	1.371	0.013
40	2.511	2.579	0.302	1.719	0.068
41	2.831	2.846	0.392	1.953	0.015
42	3.150	3.176	0.411	2.210	0.026
43	3.188	3.191	0.471	2.045	0.003
44	2.404	2.018	0.296	1.657	-0.386
45	2.543	2.529	0.328	1.751	-0.014
46	2.589	2.578	0.348	1.763	-0.011
47	2.503	2.545	0.364	1.709	0.042
48	2.254	2.296	0.325	1.539	0.042
49	2.750	2.667	0.369	1.852	-0.083
50	2.523	2.531	0.331	1.754	0.008
Total mass	**145.113**	**146.087**	**21.151**	**98.141**	**0.974**
Average	**2.961**	**2.981**	**0.432**	**2.003**	**0.020**
STDEV	**0.796**	**0.811**	**0.138**	**0.522**	**0.077**

1-SB-2

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	2.875	2.908	0.388	1.984	0.033
2	3.014	3.100	0.410	2.157	0.086
3	3.170	3.227	0.546	2.086	0.057
4	4.691	4.719	0.341	1.818	0.028
5	2.509	2.577	0.730	3.046	0.068
6	2.507	2.570	0.437	1.738	0.063
7	2.408	2.432	0.373	1.651	0.024
8	2.226	2.294	0.367	1.526	0.068
9	3.312	3.383	0.513	2.302	0.071
10	3.407	3.423	0.487	2.310	0.016
11	2.524	2.575	0.355	1.749	0.051
12	2.771	2.810	0.397	1.864	0.039
13	3.377	3.382	0.559	2.203	0.005
14	2.292	2.332	0.388	1.537	0.040
15	3.238	3.250	0.560	2.051	0.012
16	2.878	2.926	0.471	1.932	0.048
17	2.272	2.316	0.350	1.557	0.044
18	3.119	3.175	0.531	2.143	0.056
19	2.284	2.369	0.358	1.589	0.085
20	3.073	3.113	0.507	2.090	0.040
21	2.247	2.287	0.320	1.564	0.040
22	2.297	2.350	0.351	1.615	0.053
23	2.731	2.574	0.377	1.703	-0.157
24	3.630	2.186	0.293	1.467	-1.444
25	2.209	2.017	0.281	1.380	-0.192
26	2.598	2.211	0.357	1.427	-0.387
27	2.494	2.026	0.263	1.378	-0.468
28	2.634	2.016	0.280	1.344	-0.618
29	2.578	1.981	0.272	1.337	-0.597
30	1.892	2.662	0.387	1.806	0.770
31	1.940	2.692	0.360	1.820	0.752
32	1.981	2.543	0.368	1.727	0.562
33	2.141	2.627	0.345	1.838	0.486
34	1.983	2.250	0.291	1.530	0.267
35	2.147	3.740	0.573	2.547	1.593
36	2.518	2.803	0.395	1.887	0.285
37	1.888	2.818	0.402	1.899	0.930
38	2.388	2.488	0.343	1.717	0.100
39	1.924	1.979	0.255	1.333	0.055
40	2.192	2.244	0.293	1.554	0.052
41	2.157	2.268	0.317	1.532	0.111
42	2.467	2.579	0.353	1.755	0.112
43	2.271	2.344	0.318	1.601	0.073
44	2.232	2.306	0.330	1.553	0.074
45	1.977	2.050	0.240	1.390	0.073
46	2.129	2.205	0.298	1.464	0.076
47	2.814	2.879	0.434	1.936	0.065
48	1.841	1.902	0.252	1.254	0.061
49	1.895	1.926	0.272	1.280	0.031
50	1.557	1.674	0.230	1.100	0.117
Total mass	**125.699**	**129.508**	**18.918**	**87.071**	**3.809**
Average	**2.514**	**2.590**	**0.378**	**1.741**	**0.076**
STDEV	**0.569**	**0.556**	**0.103**	**0.363**	**0.413**

1-SB-3

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	2.879	2.901	0.399	1.967	0.022
2	2.828	2.829	0.389	1.977	0.001
3	4.323	4.315	0.613	2.842	-0.008
4	1.975	1.992	0.308	1.363	0.017
5	2.056	2.099	0.292	1.436	0.043
6	2.319	2.336	0.338	1.603	0.017
7	2.595	2.557	0.374	1.770	-0.038
8	2.278	2.272	0.314	1.580	-0.006
9	2.552	2.539	0.379	1.762	-0.013
10	2.272	2.378	0.342	1.550	0.106
11	2.080	1.972	0.321	1.421	-0.108
12	2.189	2.211	0.283	1.516	0.022
13	2.610	2.553	0.374	1.806	-0.057
14	2.403	2.601	0.356	1.692	0.198
15	4.739	4.813	0.696	3.156	0.074
16	1.943	2.006	0.277	1.353	0.063
17	3.285	3.396	0.461	2.263	0.111
18	2.869	2.763	0.480	1.936	-0.106
19	2.950	2.847	0.461	2.035	-0.103
20	2.088	2.119	0.316	1.432	0.031
21	3.649	3.198	0.565	2.492	-0.451
22	2.668	2.573	0.422	1.852	-0.095
23	3.270	3.156	0.479	2.355	-0.114
24	2.424	2.412	0.352	1.674	-0.012
25	2.941	2.896	0.422	2.016	-0.045
26	2.790	2.838	0.430	1.885	0.048
27	5.101	5.142	0.669	3.447	0.041
28	2.842	2.891	0.384	1.948	0.049
29	2.856	2.911	0.403	1.933	0.055
30	1.489	1.510	0.152	1.019	0.021
31	2.143	2.183	0.286	1.473	0.040
32	2.686	2.756	0.320	1.906	0.070
33	3.198	3.291	0.429	2.245	0.093
34	2.226	2.290	0.273	1.567	0.064
35	3.638	3.715	0.494	2.514	0.077
36	2.629	2.632	0.295	1.787	0.003
37	3.326	3.414	0.435	2.371	0.088
38	2.242	2.286	0.259	1.580	0.044
39	4.192	4.213	0.565	2.812	0.021
40	1.952	1.992	0.236	1.379	0.040
41	3.465	3.527	0.426	2.545	0.062
42	4.366	4.390	0.558	3.009	0.024
43	2.559	2.625	0.328	1.806	0.066
45	2.702	2.736	0.360	1.885	0.034
46	2.325	2.357	0.340	1.594	0.032
47	2.600	2.629	0.316	1.828	0.029
48	2.174	2.233	0.293	1.522	0.059
49	3.001	3.063	0.373	2.106	0.062
50	2.018	2.069	0.258	1.406	0.051
Total mass	**136.705**	**137.427**	**18.895**	**94.416**	**0.722**
Average	**2.790**	**2.805**	**0.386**	**1.927**	**0.015**
STDEV	**0.765**	**0.762**	**0.111**	**0.512**	**0.091**

Control Tank

Saline River *Corbicula*

1-S-1

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	5.708	5.718	0.957	3.526	0.010
2	7.417	7.443	1.090	4.657	0.026
3	5.529	5.522	0.918	3.216	-0.007
4	5.832	5.836	0.930	3.143	0.004
5	5.914	5.929	1.031	3.521	0.015
6	6.571	6.573	1.043	4.216	0.002
7	7.571	7.576	1.264	4.231	0.005
8	6.612	6.634	1.009	4.386	0.022
9	3.613	3.644	0.525	2.354	0.031
10	8.372	8.418	1.254	5.485	0.046
11	7.446	7.448	1.045	4.713	0.002
12	5.275	5.307	0.857	3.500	0.032
13	6.033	6.046	0.955	3.687	0.013
14	5.195	5.218	0.858	3.305	0.023
15	5.721	5.719	0.849	3.465	-0.002
16	4.179	4.196	0.672	2.804	0.017
17	5.616	5.629	0.861	3.499	0.013
18	10.658	10.715	1.384	7.210	0.057
19	6.964	6.974	1.179	4.237	0.010
20	6.708	6.710	0.875	4.276	0.002
21	7.143	7.155	1.166	4.172	0.012
22	7.115	7.110	1.260	4.361	-0.005
23	3.906	3.925	0.573	2.623	0.019
24	6.784	6.783	1.075	4.135	-0.001
25	3.675	3.691	0.501	2.452	0.016
26	5.410	5.384	0.809	3.506	-0.026
27	8.470	8.478	1.331	5.697	0.008
28	3.609	3.606	0.478	2.399	-0.003
29	5.409	5.379	0.706	2.796	-0.030
30	7.203	7.177	1.051	4.513	-0.026
31	5.646	5.632	0.924	3.355	-0.014
32	5.375	5.413	0.769	3.518	0.038
33	4.359	4.363	0.585	2.918	0.004
34	5.975	5.921	0.872	3.907	-0.054
35	3.581	3.608	0.543	2.363	0.027
36	4.951	4.936	0.705	3.288	-0.015
37	6.718	6.791	1.126	3.875	0.073
38	5.998	6.012	0.936	3.849	0.014
39	3.537	3.515	0.557	2.164	-0.022
40	3.647	3.639	0.581	2.330	-0.008
41	5.633	5.651	0.883	3.670	0.018
42	5.407	5.400	0.958	3.157	-0.007
43	6.795	6.791	1.190	4.265	-0.004
44	3.907	3.856	0.557	2.298	-0.051
45	4.288	4.295	0.734	2.607	0.007
46	3.611	3.613	0.518	2.399	0.002
47	5.369	5.285	0.863	3.031	-0.084
48	4.167	4.167	0.529	2.759	0.000
49	3.816	3.825	0.569	2.518	0.009
50	5.752	5.751	0.837	3.796	-0.001
Total mass	**284.190**	**284.407**	**43.742**	**178.152**	**0.217**
Average	**5.684**	**5.688**	**0.875**	**3.563**	**0.004**
STDEV	**1.523**	**1.530**	**0.246**	**0.986**	**0.026**

1-S-2

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total growth (g) (Final mass - Initial mass)
1	5.878	5.875	0.820	3.569	-0.003
2	7.121	7.138	1.332	4.005	0.017
3	5.031	5.033	0.998	2.622	0.002
4	7.958	7.987	1.271	4.927	0.029
5	5.819	5.835	0.966	3.263	0.016
6	6.719	6.724	1.103	4.068	0.005
7	6.536	6.532	1.131	3.785	-0.004
8	4.968	4.964	0.838	2.765	-0.004
9	6.125	6.122	1.058	3.865	-0.003
10	6.350	6.362	1.060	3.903	0.012
11	5.142	5.157	0.827	3.371	0.015
13	5.991	5.995	0.975	3.448	0.004
15	6.856	6.860	1.070	3.731	0.004
16	5.638	5.636	0.936	3.160	-0.002
17	4.912	4.929	0.848	3.088	0.017
18	4.250	4.241	0.494	2.792	-0.009
19	4.477	4.486	0.723	2.826	0.009
20	5.500	5.492	0.975	3.207	-0.008
21	6.363	6.355	1.236	3.662	-0.008
22	5.336	5.343	0.962	3.228	0.007
23	7.346	7.352	1.169	4.696	0.006
24	8.182	8.197	1.208	4.975	0.015
25	6.511	6.507	1.165	3.749	-0.004
26	6.097	6.107	0.941	3.951	0.010
27	7.301	7.308	1.245	4.303	0.007
28	4.730	4.742	0.629	3.050	0.012
29	7.978	7.966	1.243	4.881	-0.012
30	4.539	4.556	0.770	2.643	0.017
31	6.166	6.187	0.915	3.593	0.021
32	8.185	8.181	1.206	5.304	-0.004
33	6.438	6.424	0.928	3.990	-0.014
34	5.769	5.748	0.805	3.043	-0.021
35	5.023	5.026	0.740	2.906	0.003
36	5.379	5.377	0.844	3.455	-0.002
37	3.744	3.762	0.628	2.396	0.018
38	6.825	6.834	0.946	4.500	0.009
39	7.600	7.602	1.222	4.701	0.002
40	6.069	6.068	0.866	3.770	-0.001
41	6.612	6.619	1.015	4.150	0.007
42	6.468	6.474	1.100	4.071	0.006
43	4.135	4.143	0.527	2.666	0.008
44	5.813	5.837	0.855	3.663	0.024
45	5.420	5.435	0.728	3.282	0.015
46	5.357	5.343	0.909	2.877	-0.014
47	7.582	7.600	1.068	5.064	0.018
48	6.781	6.775	0.805	3.420	-0.006
49	5.110	5.118	0.903	4.478	0.008
50	5.280	5.293	0.735	3.411	0.013
Total mass	**289.410**	**289.647**	**45.738**	**176.273**	**0.237**
Average	**6.029**	**6.034**	**0.953**	**3.672**	**0.005**
STDEV	**1.103**	**1.103**	**0.201**	**0.728**	**0.011**

1-S-3

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total growth (g) (Final mass-Initial mass)
1	6.663	6.588	1.171	3.747	-0.075
2	6.946	6.912	1.098	4.076	-0.034
3	6.165	6.116	0.882	3.862	-0.049
4	6.317	6.351	0.934	3.783	0.034
5	6.440	6.462	0.960	3.801	0.022
6	3.961	3.938	0.575	2.576	-0.023
7	6.390	6.368	0.992	3.827	-0.022
8	6.860	6.798	1.041	4.441	-0.062
9	7.441	7.449	1.230	4.661	0.008
10	4.810	4.799	0.740	3.097	-0.011
12	6.001	5.952	0.825	3.397	-0.049
13	5.455	5.409	0.809	3.267	-0.046
14	6.197	6.148	0.907	3.383	-0.049
15	4.837	4.861	0.694	3.226	0.024
16	4.329	4.318	0.687	2.680	-0.011
17	5.080	5.033	0.782	2.828	-0.047
18	4.875	4.876	0.749	3.122	0.001
19	7.182	7.164	1.172	4.515	-0.018
20	4.410	4.415	0.615	2.828	0.005
21	5.601	5.641	0.916	3.691	0.040
22	5.687	5.661	0.896	3.468	-0.026
23	7.501	7.463	1.207	4.339	-0.038
24	7.356	7.319	1.035	4.818	-0.037
25	6.811	6.770	0.848	3.990	-0.041
26	5.410	5.431	0.764	3.646	0.021
27	5.687	5.688	0.794	3.427	0.001
28	7.655	7.668	1.142	4.583	0.013
30	5.458	5.467	0.878	3.414	0.009
31	8.224	8.265	1.164	5.301	0.041
32	4.887	4.877	0.781	2.943	-0.010
33	4.925	4.981	0.662	3.183	0.056
34	5.242	5.128	0.754	2.688	-0.114
35	5.598	5.599	1.026	3.195	0.001
36	3.649	3.673	0.522	2.395	0.024
37	4.769	4.772	0.716	3.029	0.003
38	6.198	6.227	0.844	4.177	0.029
39	4.654	4.712	0.672	3.059	0.058
40	4.540	4.546	0.699	2.842	0.006
41	6.227	6.228	0.895	3.944	0.001
42	5.031	5.017	0.715	3.228	-0.014
43	3.316	3.341	0.471	2.192	0.025
44	4.523	4.541	0.542	3.039	0.018
45	3.292	3.316	0.419	2.168	0.024
46	3.495	3.513	0.534	2.269	0.018
47	3.607	3.638	0.504	2.384	0.031
49	4.145	4.150	0.678	2.457	0.005
50	4.751	4.759	0.650	3.052	0.008
Total mass	**258.598**	**258.348**	**38.591**	**160.038**	**-0.250**
Average	**5.502**	**5.497**	**0.821**	**3.405**	**-0.005**
STDEV	**1.246**	**1.235**	**0.210**	**0.743**	**0.036**

Control Tank
Balsam Lake *Elliptio*

1-B-1

Elliptio no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	15.990	15.180	3.735	7.378	-0.810
2	12.178	11.918	2.827	5.626	-0.260
3	14.561	14.286	3.315	7.413	-0.275
4	11.428	11.434	2.875	5.253	0.006
5	11.341	11.322	2.718	4.970	-0.019
6	10.788	10.818	2.885	4.549	0.030
7	12.861	12.829	2.761	6.177	-0.032
8	15.457	15.461	3.153	7.293	0.004
9	14.527	14.019	3.911	6.505	-0.508
10	14.353	14.256	3.364	6.931	-0.097
11	13.797	12.479	2.925	6.491	-1.318
12	15.678	15.266	3.984	6.383	-0.412
13	16.861	16.495	3.380	8.701	-0.366
14	17.694	16.965	4.225	8.818	-0.729
15	15.175	15.108	3.573	7.279	-0.067
16	10.506	10.367	2.553	4.470	-0.139
17	13.365	13.159	3.625	6.520	-0.206
18	9.632	9.159	2.499	3.692	-0.473
19	16.219	15.456	3.589	7.233	-0.763
20	13.208	12.497	3.134	6.256	-0.711
Total mass	**275.619**	**268.474**	**65.031**	**127.938**	**-7.145**
Average	**13.781**	**13.424**	**3.252**	**6.397**	**-0.357**
STDEV	**2.268**	**2.158**	**0.498**	**1.342**	**0.360**

1-B-2

Elliptio no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	15.696	14.806	4.010	6.544	-0.890
2	11.622	11.912	2.829	5.159	0.290
3	15.520	15.168	3.375	7.236	-0.352
4	14.210	13.312	3.068	6.072	-0.898
5	15.145	14.631	3.219	7.082	-0.514
6	19.663	19.491	5.057	8.830	-0.172
7	10.749	10.459	2.702	4.203	-0.290
8	17.141	16.369	3.740	8.099	-0.772
9	24.762	24.252	5.785	12.684	-0.510
10	13.987	13.768	2.681	6.822	-0.219
11	7.679	7.568	1.858	3.389	-0.111
12	12.876	12.616	2.778	6.319	-0.260
13	12.566	12.512	2.840	5.813	-0.054
14	10.728	11.602	2.866	4.821	0.874
15	12.599	12.263	3.068	5.471	-0.336
16	13.363	13.453	3.114	5.827	0.090
17	15.045	14.648	3.787	7.522	-0.397
18	14.175	13.806	3.689	6.538	-0.369
19	10.225	10.396	2.892	4.486	0.171
20	10.144	10.132	2.542	4.764	-0.012
Total mass	**277.895**	**273.164**	**65.900**	**127.681**	**-4.731**
Average	**13.895**	**13.658**	**3.295**	**6.384**	**-0.237**
STDEV	**3.748**	**3.564**	**0.887**	**2.011**	**0.414**

1-B-3

Elliptio no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	17.212	16.647	3.710	8.796	-0.565
2	9.851	9.597	2.637	3.730	-0.254
3	17.778	17.942	4.697	9.418	0.164
4	16.959	16.527	4.411	8.347	-0.432
6	15.966	15.349	3.398	7.789	-0.617
7	19.170	18.526	3.856	10.186	-0.644
8	16.104	15.335	3.499	8.145	-0.769
9	15.340	14.689	3.172	7.938	-0.651
10	10.441	10.231	3.204	4.523	-0.210
11	10.252	10.264	2.683	4.292	0.012
12	12.162	11.940	3.214	5.340	-0.222
13	18.346	18.226	4.813	9.294	-0.120
14	8.708	8.593	2.221	3.740	-0.115
15	14.593	14.303	3.525	6.731	-0.290
16	13.261	12.693	2.905	5.843	-0.568
17	17.020	16.743	4.514	8.343	-0.277
18	9.278	9.317	2.394	3.902	0.039
19	10.946	10.874	2.537	4.879	-0.072
20	11.518	11.654	2.866	5.723	0.136
Total mass	**264.905**	**259.450**	**64.256**	**126.959**	**-5.455**
Average	**13.942**	**13.655**	**3.382**	**6.682**	**-0.287**
STDEV	**3.433**	**3.305**	**0.788**	**2.156**	**0.286**

Low Concentration Tank
Strawberry River *Corbicula*

2-SB-1

Corbicula no.	Initial mass (g)	Final Mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	3.945	3.959	0.506	2.681	0.014
2	2.625	2.645	0.383	1.849	0.020
3	2.648	2.689	0.394	1.840	0.041
4	4.133	4.165	0.595	2.747	0.032
5	2.534	2.568	0.404	1.726	0.034
6	2.973	3.020	0.423	2.052	0.047
7	1.891	1.928	0.283	1.304	0.037
8	2.358	2.424	0.329	1.683	0.066
10	4.503	4.506	0.752	2.894	0.003
11	4.767	4.806	0.750	3.071	0.039
12	2.393	2.485	0.354	1.675	0.092
13	3.108	3.166	0.453	2.212	0.058
14	2.799	2.833	0.420	1.896	0.034
15	2.829	2.880	0.464	1.848	0.051
16	2.671	2.729	0.395	1.845	0.058
17	3.314	3.433	0.538	2.318	0.119
18	2.195	2.222	0.340	1.477	0.027
19	3.017	3.065	0.461	2.114	0.048
20	2.748	2.783	0.391	1.880	0.035
21	4.830	4.813	0.710	3.007	-0.017
22	2.128	2.172	0.314	1.517	0.044
23	3.285	3.373	0.475	2.298	0.088
24	2.704	2.761	0.384	1.876	0.057
25	2.584	2.651	0.393	1.822	0.067
26	2.364	2.454	0.370	1.678	0.090
27	1.853	1.892	0.282	1.245	0.039
28	2.757	2.801	0.405	1.925	0.044
29	2.866	2.944	0.450	1.990	0.078
30	2.323	2.380	0.342	1.615	0.057
31	1.889	1.899	0.285	1.301	0.010
32	2.313	2.371	0.330	1.619	0.058
33	2.276	2.327	0.363	1.546	0.051
34	3.409	3.469	0.495	2.361	0.060
35	2.877	2.938	0.407	2.042	0.061
36	2.149	2.171	0.312	1.478	0.022
37	2.628	2.670	0.391	1.823	0.042
38	2.436	2.480	0.356	1.705	0.044
39	2.475	2.551	0.350	1.727	0.076
40	2.108	2.147	0.278	1.463	0.039
41	2.212	2.269	0.350	1.584	0.057
42	2.115	2.139	0.290	1.482	0.024
43	2.375	2.447	0.337	1.682	0.072
44	1.593	1.651	0.236	1.110	0.058
45	3.275	3.364	0.456	2.295	0.089
46	2.194	2.237	0.319	1.512	0.043
47	3.005	3.051	0.463	2.044	0.046
48	2.113	2.177	0.300	1.468	0.064
49	2.096	2.137	0.308	1.462	0.041
50	2.366	2.404	0.361	1.621	0.038
Total mass	**133.049**	**135.446**	**19.747**	**91.410**	**2.397**
Average	**2.715**	**2.764**	**0.403**	**1.866**	**0.049**
STDEV	**0.721**	**0.717**	**0.113**	**0.450**	**0.025**

2-SB-2

Corbicula no.	Initial mass (g)	Final Mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	4.412	4.441	0.688	2.965	0.029
3	4.558	4.549	0.530	3.004	-0.009
4	2.921	2.940	0.409	2.048	0.019
5	3.542	3.576	0.501	2.469	0.034
6	2.669	2.687	0.384	1.819	0.018
7	4.146	4.144	0.524	2.634	-0.002
8	4.612	4.623	0.813	2.891	0.011
9	3.292	3.355	0.473	2.327	0.063
10	4.446	4.468	0.651	2.947	0.022
11	3.098	3.149	0.457	2.148	0.051
12	2.592	2.646	0.338	1.852	0.054
13	3.871	3.795	0.478	2.668	-0.076
14	2.914	2.929	0.422	2.027	0.015
15	4.871	4.758	0.702	3.222	-0.113
16	3.349	3.333	0.460	2.308	-0.016
17	2.430	2.376	0.355	1.698	-0.054
18	5.125	5.130	0.744	3.421	0.005
19	2.684	2.726	0.389	1.864	0.042
20	2.050	2.088	0.304	1.412	0.038
21	2.288	2.318	0.355	1.558	0.030
22	2.459	2.468	0.380	1.699	0.009
23	2.837	2.899	0.421	1.985	0.062
24	2.822	2.886	0.397	1.975	0.064
25	1.583	1.613	0.208	1.100	0.030
26	3.378	3.389	0.535	2.322	0.011
27	2.429	2.480	0.312	1.691	0.051
28	3.416	3.425	0.539	2.340	0.009
29	2.449	2.490	0.318	1.719	0.041
30	2.825	2.838	0.368	1.985	0.013
31	2.928	2.919	0.423	2.021	-0.009
32	2.159	2.177	0.324	1.457	0.018
33	1.773	1.793	0.214	1.204	0.020
34	2.250	2.250	0.318	1.541	0.000
35	2.342	2.378	0.296	1.664	0.036
36	2.436	2.499	0.332	1.722	0.063
37	1.488	1.506	0.179	1.013	0.018
38	2.992	3.040	0.479	1.545	0.048
39	3.348	3.420	0.269	2.332	0.072
40	2.285	2.282	0.374	2.101	-0.003
41	2.706	2.754	0.401	1.871	0.048
42	2.757	2.832	0.390	1.908	0.075
43	2.504	2.561	0.389	1.722	0.057
44	2.843	2.969	0.477	1.961	0.126
45	2.333	2.359	0.322	1.614	0.026
46	2.570	2.581	0.329	1.810	0.011
47	2.692	2.685	0.355	1.863	-0.007
48	2.410	2.441	0.321	1.734	0.031
49	2.912	2.902	0.391	2.027	-0.010
50	2.278	2.315	0.336	1.543	0.037
Total mass	**144.074**	**145.182**	**20.374**	**98.751**	1.108
Average	**2.940**	**2.963**	**0.416**	**2.015**	0.023
STDEV	**0.835**	**0.823**	**0.133**	**0.533**	0.039

2-SB-3

Corbicula no.	Initial mass (g)	Final Mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	1.948	1.718	0.245	1.347	-0.230
2	2.853	2.461	0.395	1.986	-0.392
3	2.074	1.944	0.263	1.466	-0.130
4	2.571	2.228	0.329	1.805	-0.343
5	2.034	1.807	0.290	1.410	-0.227
6	3.080	2.692	0.374	2.123	-0.388
7	2.229	2.273	0.277	1.585	0.044
8	2.171	2.249	0.309	1.511	0.078
9	1.937	1.975	0.259	1.336	0.038
10	1.796	1.833	0.246	1.237	0.037
11	2.457	2.501	0.344	1.652	0.044
12	3.204	3.257	0.433	2.263	0.053
13	2.466	2.517	0.349	1.711	0.051
14	2.743	2.850	0.406	1.944	0.107
15	2.584	2.662	0.366	1.831	0.078
16	1.773	1.823	0.236	1.235	0.050
17	2.257	2.280	0.346	1.519	0.023
18	3.027	3.090	0.499	2.058	0.063
19	2.234	2.289	0.305	1.580	0.055
20	2.529	2.590	0.393	1.778	0.061
21	2.326	2.399	0.370	1.628	0.073
22	1.646	1.705	0.253	1.148	0.059
23	2.715	2.774	0.412	1.908	0.059
24	2.183	2.241	0.288	1.561	0.058
25	2.885	2.951	0.397	2.068	0.066
26	2.825	2.882	0.367	1.977	0.057
28	2.532	2.568	0.337	1.758	0.036
29	2.663	2.702	0.342	1.868	0.039
30	3.387	3.421	0.437	2.336	0.034
31	2.431	2.470	0.335	1.694	0.039
32	2.142	2.167	0.313	1.482	0.025
33	2.280	2.319	0.311	1.585	0.039
34	2.223	2.250	0.330	1.502	0.027
35	2.685	2.699	0.357	1.837	0.014
36	2.456	2.529	0.348	1.717	0.073
37	2.735	2.782	0.388	1.913	0.047
38	3.961	4.069	0.574	2.799	0.108
39	3.288	3.330	0.458	2.278	0.042
40	2.818	2.867	0.381	1.982	0.049
41	3.252	3.286	0.431	2.247	0.034
42	1.449	1.487	0.256	1.450	0.038
43	3.661	3.714	0.552	2.494	0.053
44	2.749	2.777	0.361	1.945	0.028
45	3.333	3.389	0.460	2.265	0.056
46	2.092	2.108	0.194	1.018	0.016
47	3.164	3.198	0.468	2.119	0.034
48	2.973	3.019	0.422	2.041	0.046
49	2.348	2.406	0.314	1.648	0.058
50	2.281	2.327	0.305	1.599	0.046
Total mass	**125.450**	**125.875**	**17.425**	**87.244**	**0.425**
Average	**2.560**	**2.569**	**0.356**	**1.780**	**0.009**
STDEV	**0.527**	**0.546**	**0.080**	**0.364**	**0.117**

Low Concentration Tank
Saline River *Corbicula*

2S-1

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	6.492	6.478	0.911	3.848	-0.014
2	6.855	6.771	1.051	4.402	-0.084
3	7.501	7.497	0.982	4.891	-0.004
4	6.501	6.509	0.969	4.224	0.008
5	6.737	6.706	1.050	3.954	-0.031
6	6.561	6.556	0.837	4.357	-0.005
7	6.631	6.626	0.988	3.891	-0.005
8	8.410	8.404	1.289	5.572	-0.006
9	7.860	7.891	1.101	5.322	0.031
10	7.510	7.502	1.116	4.233	-0.008
11	7.311	7.308	1.182	4.503	-0.003
12	7.357	7.346	1.190	4.468	-0.011
13	8.032	8.069	1.077	5.320	0.037
14	9.277	9.330	1.321	6.000	0.053
15	9.194	9.203	1.264	6.046	0.009
16	8.258	8.205	1.181	5.467	-0.053
17	6.655	6.620	1.053	3.944	-0.035
18	8.399	8.329	1.148	5.669	-0.070
19	9.261	9.205	1.437	5.665	-0.056
20	6.551	6.514	1.009	3.950	-0.037
21	5.842	5.772	1.066	2.980	-0.070
22	6.438	6.408	1.057	4.118	-0.030
23	7.183	7.160	1.206	4.336	-0.023
24	6.338	6.294	0.973	4.065	-0.044
25	9.568	9.624	1.293	6.249	0.056
26	6.982	6.970	1.101	4.238	-0.012
27	6.068	6.047	0.969	3.370	-0.021
28	7.610	7.606	1.144	4.547	-0.004
29	7.028	7.003	1.024	4.408	-0.025
30	8.042	8.098	1.110	5.185	0.056
31	6.857	6.908	1.019	4.137	0.041
32	5.348	5.304	0.835	3.215	-0.044
33	7.188	7.204	0.956	4.693	0.016
34	5.811	5.825	0.828	3.432	0.014
35	6.766	6.758	1.033	4.228	-0.008
36	6.826	6.817	1.093	4.343	-0.009
39	8.134	8.117	1.151	5.158	-0.017
40	7.282	7.254	1.052	4.382	-0.028
41	6.016	6.045	0.907	3.884	0.029
42	7.114	7.103	1.167	4.338	-0.011
43	7.388	7.410	1.233	4.678	0.022
44	6.880	6.903	1.064	4.010	0.023
45	4.557	4.562	0.804	2.738	0.005
46	8.103	8.110	1.187	4.978	0.007
47	6.298	6.298	1.057	3.305	0.000
48	5.900	5.901	0.920	3.283	0.001
49	6.510	6.535	0.873	4.184	0.025
Total mass	**335.440**	**335.105**	**50.278**	**208.178**	**-0.335**
Average	**7.137**	**7.130**	**1.070**	**4.429**	**-0.007**
STDEV	**1.048**	**1.055**	**0.139**	**0.816**	**0.032**

2S-2

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	6.619	6.557	1.092	3.891	-0.062
2	5.391	5.315	0.849	2.984	-0.076
3	5.614	5.538	0.735	3.596	-0.076
4	7.426	7.356	0.993	4.697	-0.070
5	6.514	6.460	0.881	3.949	-0.054
6	6.416	6.336	0.940	3.880	-0.080
7	5.259	5.191	0.731	2.681	-0.068
8	6.357	6.262	1.137	3.372	-0.095
9	5.547	5.498	0.889	3.286	-0.049
10	7.815	7.773	1.263	4.777	-0.042
11	7.934	7.858	1.139	4.988	-0.076
12	5.637	5.560	0.828	4.244	-0.077
13	6.576	6.539	0.872	5.213	-0.037
14	7.938	7.903	0.996	5.206	-0.035
15	5.872	5.800	0.858	3.361	-0.072
16	6.038	5.934	0.964	3.126	-0.104
17	5.958	5.924	0.889	3.639	-0.034
18	6.360	6.324	0.916	3.975	-0.036
19	6.965	6.878	1.048	3.673	-0.087
20	4.793	4.768	0.681	2.984	-0.025
21	5.640	5.443	0.700	2.860	-0.197
22	7.290	7.245	1.181	4.370	-0.045
23	9.278	9.222	1.403	5.899	-0.056
24	5.253	4.928	0.727	2.725	-0.325
25	8.009	7.948	1.169	5.009	-0.061
26	6.342	6.338	0.948	3.895	-0.004
27	6.908	6.938	1.009	4.071	0.030
28	7.792	7.803	1.220	4.721	0.011
29	4.923	4.852	0.735	2.432	-0.071
30	7.342	7.351	1.100	4.429	0.009
31	7.527	7.538	0.918	5.063	0.011
32	6.615	6.635	0.965	4.239	0.020
33	4.995	4.993	0.784	2.916	-0.002
34	6.253	6.268	0.880	3.877	0.015
35	7.143	7.150	1.084	4.573	0.007
36	8.220	8.241	1.117	5.216	0.021
37	6.214	6.230	0.979	3.597	0.016
38	5.930	5.903	1.050	3.302	-0.027
39	5.752	5.738	0.917	3.226	-0.014
40	5.911	5.899	0.789	2.861	-0.012
41	4.849	4.851	0.768	4.097	0.002
42	7.200	7.208	1.257	3.318	0.008
43	5.558	5.554	0.864	3.319	-0.004
44	4.469	4.363	0.663	2.386	-0.106
45	5.915	5.899	1.020	3.433	-0.016
46	5.371	5.326	0.723	3.542	-0.045
47	8.248	8.219	1.099	5.472	-0.029
48	7.831	7.829	1.175	4.916	-0.002
49	8.580	8.581	1.200	5.427	0.001
50	8.770	8.727	1.251	5.383	-0.043
Total mass	**327.157**	**324.994**	**48.376**	**198.056**	**-2.163**
Average	**6.543**	**6.500**	**0.968**	**3.961**	**-0.043**
STDEV	**1.162**	**1.180**	**0.179**	**0.902**	**0.069**

2S-3

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	5.878	5.862	0.797	3.386	-0.016
2	6.377	6.384	0.879	3.811	0.007
4	6.834	6.845	0.945	4.104	0.011
5	6.522	6.530	0.839	4.355	0.008
6	6.228	6.236	0.952	3.409	0.008
7	7.316	7.342	1.143	4.551	0.026
8	5.601	5.599	0.904	3.277	-0.002
9	5.817	5.802	0.935	3.427	-0.015
10	5.979	5.977	0.920	3.825	-0.002
11	7.135	7.135	1.064	4.579	0.000
12	6.934	6.937	1.047	4.338	0.003
13	6.980	6.980	0.993	4.533	0.000
14	6.484	6.491	1.096	3.735	0.007
15	6.523	6.421	1.051	4.001	-0.102
16	5.497	5.489	0.800	3.044	-0.008
17	6.032	6.030	0.957	3.234	-0.002
18	5.911	5.910	1.082	3.277	-0.001
19	5.956	5.971	0.897	3.290	0.015
20	7.280	7.263	0.948	4.403	-0.017
21	5.437	5.437	0.889	3.034	0.000
22	9.717	9.722	1.554	6.156	0.005
23	6.736	6.724	0.907	3.725	-0.012
24	7.404	7.402	1.276	4.316	-0.002
25	6.622	6.632	1.071	4.148	0.010
26	4.936	4.945	0.743	2.813	0.009
27	8.177	8.091	1.184	5.165	-0.086
28	6.484	6.413	0.978	3.753	-0.071
29	8.139	7.832	1.198	4.137	-0.307
30	7.175	7.169	1.145	4.411	-0.006
31	7.959	7.948	1.074	5.148	-0.011
32	7.634	7.629	0.999	4.626	-0.005
33	5.701	5.676	0.811	3.834	-0.025
34	6.415	6.377	1.066	3.835	-0.038
35	8.111	8.095	1.201	5.229	-0.016
36	6.820	6.809	0.968	4.336	-0.011
37	7.122	7.118	0.714	4.532	-0.004
38	6.758	6.749	0.870	4.125	-0.009
39	5.464	5.369	0.789	3.511	-0.095
40	5.878	5.895	0.958	3.349	0.017
41	4.935	4.942	0.705	2.531	0.007
42	5.496	5.486	1.136	2.603	-0.010
43	4.681	4.699	0.881	2.845	0.018
44	6.080	6.076	0.822	3.869	-0.004
45	4.649	4.644	0.771	2.516	-0.005
46	7.425	7.447	1.145	4.644	0.022
47	5.787	5.780	0.974	2.982	-0.007
48	5.274	5.275	0.765	3.272	0.001
49	6.298	6.310	0.927	3.949	0.012
Total mass	**310.598**	**309.895**	**46.710**	**185.973**	**-0.703**
Average	**6.486**	**6.471**	**0.979**	**3.886**	**-0.015**
STDEV	**1.019**	**1.008**	**0.164**	**0.765**	**0.051**

Low Concentration Tank
Balsam Lake *Elliptio*

2B-1

Elliptio no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	12.589	12.244	2.908	4.767	-0.345
2	10.358	10.376	1.968	5.678	0.018
3	13.635	13.269	2.996	5.493	-0.366
4	11.866	11.807	2.331	5.285	-0.059
5	12.401	12.266	2.443	5.501	-0.135
6	9.161	8.839	1.882	3.937	-0.322
7	16.535	16.421	2.638	8.297	-0.114
8	15.130	14.435	3.733	6.668	-0.695
9	13.638	13.163	2.916	6.553	-0.475
10	10.137	10.277	2.496	4.825	0.140
11	12.373	11.959	2.683	5.323	-0.414
12	14.477	14.437	2.862	7.555	-0.040
13	17.003	17.052	3.177	9.224	0.049
14	12.241	11.706	2.453	5.149	-0.535
15	11.484	11.645	2.237	5.540	0.161
16	14.468	14.630	3.612	5.706	0.172
17	11.638	11.563	2.686	5.431	-0.075
18	11.592	10.949	2.392	5.536	-0.643
19	16.814	16.714	4.565	7.908	-0.100
20	10.353	10.146	2.632	5.359	-0.217
Total mass	**257.893**	**253.898**	**55.610**	**119.735**	**-3.995**
Average	**12.895**	**12.695**	**2.781**	**5.987**	**-0.200**
STDEV	**2.274**	**2.295**	**0.629**	**1.322**	**0.263**

2B-2

Elliptio no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	13.948	14.262	2.771	7.225	0.314
2	11.463	11.491	2.691	5.323	0.028
3	11.070	11.034	2.866	4.833	-0.036
4	10.907	10.707	2.347	5.312	-0.200
5	14.786	15.297	3.432	7.295	0.511
6	8.731	8.458	2.283	3.655	-0.273
7	13.529	13.725	3.056	5.950	0.196
8	14.142	14.367	3.378	6.697	0.225
9	15.596	15.341	3.532	7.012	-0.255
10	14.971	14.972	3.666	7.534	0.001
11	18.139	17.676	4.804	8.424	-0.463
12	12.962	12.901	3.156	5.957	-0.061
13	12.976	12.180	2.971	6.403	-0.796
14	11.949	11.717	3.054	5.395	-0.232
15	13.327	13.040	3.046	6.300	-0.287
16	8.698	8.218	2.104	3.839	-0.480
17	11.101	10.687	2.756	4.005	-0.414
18	16.424	15.725	3.868	7.544	-0.699
19	12.689	12.460	3.151	5.984	-0.229
20	11.143	10.879	2.613	5.059	-0.264
Total mass	**258.551**	**255.137**	**61.545**	**119.746**	**-3.414**
Average	**12.928**	**12.757**	**3.077**	**5.987**	**-0.171**
STDEV	**2.405**	**2.451**	**0.612**	**1.323**	**0.328**

2B-3

Elliptio no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	12.167	11.504	3.202	5.248	-0.663
2	10.504	10.988	2.757	4.686	0.484
3	10.483	10.139	2.439	4.925	-0.344
4	13.147	12.550	2.966	5.854	-0.597
5	14.870	14.053	3.361	6.780	-0.817
6	16.479	15.874	3.875	6.736	-0.605
7	14.520	13.404	3.590	5.643	-1.116
8	10.109	10.171	2.752	4.256	0.062
9	14.391	14.128	3.500	6.910	-0.263
10	13.313	12.872	3.055	5.974	-0.441
11	14.531	13.999	3.669	6.615	-0.532
12	14.668	14.117	3.585	6.167	-0.541
13	12.070	11.977	2.952	5.627	-0.093
14	15.873	15.225	3.661	8.041	-0.648
15	16.277	15.968	4.225	7.319	-0.309
16	17.475	16.767	4.211	7.978	-0.708
17	17.224	17.397	4.265	7.842	0.173
18	14.506	14.532	3.012	7.405	0.026
19	13.350	13.235	2.781	6.039	-0.115
20	11.115	10.998	2.797	5.241	-0.117
Total mass	**277.062**	**269.898**	**66.695**	**125.286**	**-7.164**
Average	**13.853**	**13.495**	**3.334**	**6.264**	**-0.358**
STDEV	**2.245**	**2.122**	**0.544**	**1.113**	**0.383**

Medium Concentration Tank
Strawberry River *Corbicula*

3-SB-1

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	3.263	3.295	0.427	2.212	0.032
2	3.383	3.427	0.483	2.321	0.044
3	2.554	2.619	0.318	1.773	0.065
4	2.529	2.505	0.316	1.693	-0.024
5	1.834	1.866	0.213	1.269	0.032
6	3.244	3.329	0.390	2.276	0.085
7	2.773	2.803	0.333	1.897	0.030
8	2.724	2.776	0.361	1.898	0.052
9	1.956	2.018	0.242	1.380	0.062
10	2.366	2.386	0.322	1.622	0.020
11	2.190	2.234	0.263	1.515	0.044
12	3.869	3.973	0.560	2.632	0.104
13	2.454	2.521	0.290	1.779	0.067
14	2.711	2.823	0.403	1.928	0.112
15	2.525	2.549	0.278	1.724	0.024
16	1.646	1.706	0.198	1.155	0.060
17	2.024	2.089	0.247	1.412	0.065
18	2.795	2.863	0.400	1.898	0.068
19	1.668	1.699	0.197	1.163	0.031
20	3.098	3.168	0.432	2.162	0.070
21	2.183	2.217	0.278	1.513	0.034
22	3.440	3.487	0.506	2.304	0.047
23	3.537	3.593	0.439	2.493	0.056
24	2.495	2.552	0.360	1.744	0.057
25	2.548	2.597	0.337	1.742	0.049
26	2.084	2.105	0.255	1.410	0.021
27	2.252	2.294	0.284	1.547	0.042
28	2.258	2.287	0.325	1.498	0.029
29	3.964	3.969	0.592	2.497	0.005
30	2.581	2.592	0.366	1.765	0.011
31	3.002	3.048	0.394	2.100	0.046
32	2.795	2.851	0.372	1.977	0.056
33	2.521	2.564	0.305	1.782	0.043
34	2.586	2.628	0.322	1.766	0.042
35	3.197	3.221	0.341	2.216	0.024
36	2.912	2.948	0.347	2.026	0.036
37	2.898	2.952	0.371	2.000	0.054
38	4.185	4.194	0.631	2.748	0.009
39	2.834	2.904	0.368	1.981	0.070
40	1.802	1.814	0.242	1.229	0.012
41	2.553	2.603	0.299	1.799	0.050
42	4.649	4.687	0.649	3.125	0.038
43	2.794	2.852	0.325	1.970	0.058
44	2.989	3.013	0.315	1.992	0.024
45	4.502	4.489	0.481	2.940	-0.013
46	2.240	2.295	0.285	1.574	0.055
47	3.003	3.077	0.392	2.137	0.074
48	3.121	3.147	0.440	2.114	0.026
49	4.256	4.249	0.601	2.883	-0.007
50	2.332	2.356	0.310	1.585	0.024
Total mass	**140.129**	**142.224**	**18.155**	**96.186**	**2.095**
Average	**2.803**	**2.844**	**0.363**	**1.924**	**0.042**
STDEV	**0.703**	**0.700**	**0.108**	**0.456**	**0.026**

3-SB-2

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	2.441	2.512	0.354	1.695	0.071
2	2.691	2.748	0.406	1.874	0.057
3	2.410	2.460	0.357	1.661	0.050
4	3.098	3.191	0.457	2.128	0.093
5	2.059	2.138	0.310	1.462	0.079
6	2.717	2.795	0.448	1.894	0.078
7	1.837	1.864	0.290	1.216	0.027
8	2.866	2.936	0.381	1.973	0.070
9	2.414	2.462	0.351	1.677	0.048
10	2.322	2.349	0.307	1.608	0.027
11	2.001	2.061	0.292	1.402	0.060
12	5.211	5.238	0.785	3.527	0.027
13	2.357	2.425	0.357	1.671	0.068
14	2.317	2.365	0.334	1.608	0.048
15	2.352	2.384	0.331	1.638	0.032
16	2.439	2.483	0.362	1.709	0.044
17	2.621	2.666	0.398	1.762	0.045
18	2.071	2.105	0.335	1.333	0.034
19	2.022	2.071	0.243	1.448	0.049
20	2.677	2.718	0.369	1.828	0.041
21	2.885	2.889	0.416	2.033	0.004
22	3.075	3.112	0.489	2.055	0.037
23	2.914	2.991	0.444	2.054	0.077
24	2.881	2.957	0.443	2.025	0.076
25	3.103	3.152	0.423	2.154	0.049
26	2.357	2.415	0.361	1.656	0.058
27	1.397	1.418	0.212	0.940	0.031
28	2.843	2.928	0.434	2.016	0.085
29	4.595	4.609	0.682	3.027	0.014
30	2.813	2.848	0.422	1.895	0.035
31	3.280	3.352	0.534	2.307	0.072
32	2.296	2.357	0.334	1.612	0.061
33	3.212	3.270	0.482	2.249	0.058
34	4.081	4.124	0.668	2.692	0.043
35	2.662	2.692	0.364	1.823	0.030
36	3.102	3.163	0.474	2.162	0.061
37	2.170	2.214	0.327	1.508	0.044
38	2.191	2.214	0.318	1.506	0.023
39	2.485	2.553	0.341	1.696	0.068
40	2.572	2.659	0.376	1.818	0.087
41	2.728	2.794	0.397	1.882	0.066
42	2.788	2.857	0.413	1.926	0.069
43	2.071	2.102	0.296	1.413	0.031
44	3.200	3.257	0.484	2.247	0.057
45	2.605	2.644	0.371	1.778	0.039
46	3.074	3.156	0.470	2.116	0.082
47	2.102	2.140	0.330	1.435	0.038
48	3.017	3.116	0.461	2.132	0.099
49	3.103	3.173	0.441	2.169	0.070
50	2.761	2.852	0.423	1.941	0.091
Total mass	**135.286**	**137.979**	**20.107**	**93.391**	**2.693**
Average	**2.706**	**2.760**	**0.402**	**1.868**	**0.054**
STDEV	**0.648**	**0.649**	**0.104**	**0.433**	**0.022**

3SB-3

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	2.470	2.521	0.302	1.740	0.051
2	1.946	1.993	0.228	1.360	0.047
3	2.584	2.633	0.487	1.824	0.049
4	2.326	2.439	0.336	1.680	0.113
5	2.819	2.883	0.370	1.986	0.064
6	2.453	2.528	0.377	1.684	0.075
7	2.635	2.707	0.363	1.836	0.072
8	1.922	1.948	0.228	1.360	0.026
9	3.088	3.140	0.447	2.159	0.072
10	2.950	3.000	0.417	2.065	0.050
11	2.289	2.390	0.296	1.649	0.101
12	1.937	1.980	0.247	1.334	0.043
14	2.484	2.514	0.319	1.712	0.030
15	2.248	2.323	0.293	1.565	0.075
16	2.514	2.611	0.370	1.770	0.097
17	3.234	3.339	0.395	2.271	0.105
18	2.059	2.123	0.302	1.403	0.064
19	2.646	2.696	0.359	1.853	0.050
20	4.857	4.903	0.789	3.307	0.036
21	2.782	2.860	0.378	1.971	0.078
22	5.212	5.248	0.698	3.551	0.036
23	2.261	2.328	0.332	1.549	0.067
24	3.008	3.127	0.439	2.117	0.119
25	2.917	2.999	0.370	2.045	0.082
26	2.472	2.538	0.334	1.762	0.066
27	2.989	3.057	0.442	2.091	0.068
28	3.412	3.477	0.545	2.338	0.065
29	2.261	2.301	0.378	1.536	0.040
30	2.257	2.323	0.364	1.603	0.066
31	2.357	2.463	0.388	1.670	0.106
32	2.019	2.083	0.265	1.427	0.064
33	2.910	2.992	0.498	2.055	0.082
34	3.493	3.547	0.561	2.408	0.054
35	2.560	2.624	0.357	1.771	0.064
36	2.603	2.689	0.384	1.854	0.086
37	3.155	3.210	0.821	2.220	0.055
38	2.740	2.818	0.432	1.935	0.078
39	2.348	2.410	0.321	1.639	0.062
40	2.146	2.225	0.291	1.521	0.079
41	2.209	2.262	0.333	1.532	0.053
42	2.596	2.679	0.408	1.816	0.083
43	2.305	2.343	0.355	1.604	0.038
44	1.885	1.924	0.245	1.311	0.039
45	3.273	3.340	0.466	2.316	0.067
46	2.613	2.697	0.406	1.859	0.084
47	2.552	2.644	0.393	1.832	0.092
48	2.419	2.446	0.329	1.679	0.027
49	2.710	2.758	0.393	1.919	0.048
50	2.603	2.704	0.366	1.864	0.101
Total mass	**130.518**	**133.787**	**19.237**	**91.364**	**3.269**
Average	**2.664**	**2.730**	**0.393**	**1.865**	**0.067**
STDEV	**0.632**	**0.631**	**0.122**	**0.428**	**0.023**

Medium ConcentrationTank
Saline River *Corbicula*

3S-1

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g)(Final mass - Initial Mass)
1	7.694	7.698	1.142	4.870	0.004
2	6.858	6.861	1.111	4.379	0.003
3	5.789	5.782	0.874	3.257	-0.007
4	7.767	7.747	1.242	4.859	-0.020
5	8.572	8.538	1.207	5.389	-0.034
6	5.705	5.670	0.934	3.365	-0.035
7	9.667	9.650	1.366	6.175	-0.017
8	8.577	8.560	1.264	5.443	-0.017
9	8.599	8.569	1.438	4.877	-0.030
10	5.420	5.322	0.817	2.825	-0.098
12	6.543	6.573	0.988	4.368	0.030
13	6.405	6.339	1.005	3.464	-0.066
14	7.914	7.910	1.023	5.192	-0.004
15	6.903	6.853	1.211	3.768	-0.040
16	6.622	6.593	1.135	4.073	-0.029
17	6.259	6.215	1.066	3.288	-0.044
18	7.395	7.388	1.037	4.739	-0.007
19	4.733	4.708	0.658	2.323	-0.025
20	5.033	5.045	0.744	3.302	0.012
21	7.177	7.163	1.189	4.462	-0.014
22	5.780	5.690	0.984	3.170	-0.090
23	6.933	6.902	1.200	4.142	-0.031
24	5.855	5.849	0.866	3.802	-0.006
25	7.686	7.687	1.279	4.669	0.001
26	7.009	6.953	1.036	4.362	-0.046
27	7.519	7.482	0.934	4.674	-0.037
28	5.646	5.653	0.959	3.462	0.007
29	6.781	6.764	1.079	4.148	-0.017
30	7.175	7.181	0.914	4.585	0.006
31	6.295	6.272	0.933	3.122	-0.023
32	6.574	6.560	1.034	3.745	-0.014
33	6.998	6.992	0.998	4.585	-0.006
34	5.270	5.253	0.740	3.468	-0.017
35	6.518	6.560	1.091	4.169	0.042
36	7.642	7.598	1.180	4.598	-0.044
37	5.418	5.392	0.825	3.252	-0.026
38	6.367	6.354	0.985	4.142	-0.013
39	6.566	6.525	1.091	3.730	-0.041
40	7.364	7.318	1.159	4.459	-0.046
41	6.650	6.655	0.992	4.348	0.005
42	7.969	7.958	1.090	5.283	-0.011
43	6.028	6.032	0.849	3.940	0.004
44	6.370	6.322	0.813	4.174	-0.048
45	7.599	7.552	1.008	4.675	-0.047
46	6.760	6.720	1.022	3.983	-0.040
47	5.594	5.603	0.873	3.527	0.009
48	5.650	5.607	0.921	3.229	-0.043
49	8.440	8.448	1.172	5.786	0.008
50	7.715	7.653	1.295	4.246	-0.062
Total mass	**333.803**	**332.739**	**50.763**	**203.853**	**-1.064**
Average	**6.812**	**6.791**	**1.036**	**4.160**	**-0.022**
STDEV	**1.052**	**1.054**	**0.167**	**0.792**	**0.027**

3S-2

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	6.907	6.896	1.083	4.350	-0.011
3	4.731	4.723	0.746	3.065	-0.008
4	5.991	5.945	0.891	3.456	-0.046
5	9.078	9.051	1.231	5.764	-0.027
7	8.147	8.120	1.217	5.483	-0.027
8	5.474	5.441	0.875	3.318	-0.033
9	8.000	7.993	1.237	5.066	-0.007
10	6.071	6.054	0.984	3.339	-0.017
11	6.198	6.213	0.887	3.697	0.015
12	6.594	6.567	1.060	4.128	-0.027
13	7.614	7.577	1.304	4.757	-0.037
14	4.670	4.662	0.699	3.015	-0.008
15	8.460	8.429	1.181	5.582	-0.031
16	7.450	7.469	0.986	4.911	0.019
17	6.034	5.969	1.101	3.337	-0.065
18	6.225	6.182	1.648	3.984	-0.043
19	3.890	3.849	0.728	2.051	-0.041
20	5.120	5.164	1.049	3.442	0.044
22	6.615	6.578	0.922	3.657	-0.037
23	5.759	5.706	1.062	3.127	-0.053
24	6.945	6.914	0.898	4.653	-0.031
25	8.625	8.621	1.066	5.764	-0.004
26	6.423	6.343	1.065	3.697	-0.080
27	5.175	5.155	0.854	3.088	-0.020
28	8.023	8.016	1.292	4.462	-0.007
29	6.647	6.594	0.886	4.303	-0.053
30	5.225	5.208	0.680	3.334	-0.017
31	5.119	5.098	0.944	2.866	-0.021
32	5.713	5.678	0.975	3.093	-0.035
33	5.325	5.280	0.738	2.891	-0.045
34	6.485	6.487	0.959	4.071	0.002
35	6.059	6.011	0.990	3.746	-0.048
36	6.143	6.124	0.939	3.278	-0.019
37	6.557	6.584	1.091	4.064	0.017
38	5.451	5.441	0.861	3.268	-0.010
39	6.051	6.068	0.873	3.908	0.007
40	5.729	5.758	0.951	3.342	0.029
41	5.991	5.963	1.143	3.312	-0.028
42	7.036	6.997	1.009	4.123	-0.039
43	6.480	6.456	1.017	3.947	-0.024
44	4.978	4.930	0.673	2.689	-0.048
45	6.691	6.648	1.088	3.751	-0.043
46	8.407	8.261	1.186	4.906	-0.146
47	5.709	5.746	0.804	3.828	0.037
48	5.241	5.219	0.724	3.349	-0.022
49	6.949	6.798	1.046	4.153	-0.151
50	5.707	5.752	0.792	3.360	0.045
Total mass	**297.932**	**296.738**	**46.435**	**180.775**	**-1.194**
Average	**6.339**	**6.314**	**0.988**	**3.846**	**-0.025**
STDEV	**1.145**	**1.139**	**0.192**	**0.835**	**0.038**

3S-3

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	4.924	4.968	0.713	3.277	0.044
2	7.133	7.123	1.143	4.557	-0.010
3	6.061	6.061	1.123	3.545	0.000
4	5.008	4.995	0.838	3.023	-0.013
5	7.842	7.820	1.323	4.814	-0.022
6	5.670	5.647	0.891	3.578	-0.023
8	4.055	4.011	0.712	2.051	-0.044
10	5.644	5.666	0.846	3.694	0.022
11	5.602	5.569	0.843	3.295	-0.033
13	7.056	7.044	1.174	4.207	-0.012
15	6.531	6.509	0.990	3.966	-0.022
16	6.131	6.147	0.923	4.022	0.016
17	3.952	3.973	0.560	2.634	0.021
18	6.760	6.715	0.964	4.071	-0.045
20	10.615	10.598	1.472	6.904	-0.017
21	7.103	7.161	1.093	4.536	0.058
22	7.992	7.979	1.139	4.988	-0.013
23	5.706	5.532	0.921	3.092	-0.174
24	5.629	5.624	0.805	3.889	-0.005
26	6.495	6.469	0.779	4.144	-0.026
27	6.103	6.085	0.787	4.002	-0.018
28	6.293	6.241	0.909	3.651	-0.052
29	6.090	6.019	0.860	3.696	-0.071
30	6.958	6.929	0.942	4.117	-0.029
31	6.734	6.719	0.819	4.200	-0.015
32	5.906	5.881	0.879	3.613	-0.025
33	5.987	5.987	0.885	3.778	0.000
34	5.734	5.675	0.773	3.317	-0.059
35	5.803	5.809	0.785	3.773	0.006
36	5.784	5.782	0.785	3.610	-0.002
37	5.527	5.513	0.839	3.339	-0.014
38	7.055	7.057	1.025	4.306	0.012
39	5.442	5.393	0.814	2.913	-0.049
40	6.183	6.172	0.834	3.897	-0.011
41	6.326	6.277	0.966	3.608	-0.049
42	7.492	7.467	1.068	4.634	-0.025
43	8.021	8.007	1.196	5.132	-0.014
44	6.119	6.094	1.032	3.604	-0.025
45	7.944	7.917	1.135	4.997	-0.027
46	6.628	6.646	1.035	3.853	0.018
47	9.391	9.378	1.206	6.156	-0.013
48	7.082	7.085	0.964	4.559	0.003
49	6.614	6.590	1.080	3.869	-0.024
50	6.468	6.466	0.853	4.226	-0.002
Total mass	**283.593**	**282.810**	**41.723**	**175.137**	**-0.783**
Average	**6.445**	**6.428**	**0.948**	**3.980**	**-0.018**
STDEV	**1.207**	**1.209**	**0.178**	**0.843**	**0.035**

Medium Concentration Tank
Balsam Lake *Elliptio*

3-B-1

Elliptio no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	22.413	21.374	4.554	10.914	-1.039
2	13.310	12.803	2.771	5.456	-0.507
3	9.789	9.606	2.382	4.008	-0.183
4	11.846	11.850	2.893	5.441	0.004
5	11.364	11.742	2.648	4.824	0.378
6	12.887	12.562	2.837	5.746	-0.325
7	19.007	19.305	4.643	8.501	0.298
8	13.338	13.206	3.265	5.690	-0.132
9	11.761	12.227	2.616	5.257	0.466
10	15.304	15.045	3.622	6.048	-0.259
11	16.399	16.734	3.486	8.055	0.335
12	10.049	9.208	2.616	3.941	-0.841
13	12.320	12.472	2.715	5.619	0.152
14	8.475	8.569	1.988	3.722	0.094
15	11.998	11.891	2.949	5.070	-0.107
16	11.046	10.410	2.580	4.335	-0.636
17	10.923	11.065	2.331	5.259	0.142
18	9.620	9.670	2.387	3.853	0.050
19	15.872	15.579	3.904	6.907	-0.293
20	12.026	11.589	2.654	5.599	-0.437
Total mass	**259.747**	**256.907**	**59.841**	**114.245**	**-2.840**
Average	**12.987**	**12.845**	**2.992**	**5.712**	**-0.142**
STDEV	**3.380**	**3.313**	**0.716**	**1.762**	**0.409**

3-B-2

Elliptio no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	18.382	17.554	3.414	9.281	-0.828
2	11.114	11.485	2.419	4.696	0.371
3	19.477	19.752	4.543	7.962	0.275
4	10.052	10.321	2.362	4.526	0.269
5	18.086	17.446	3.325	9.005	-0.640
6	15.634	15.441	3.310	6.807	-0.193
7	11.008	10.650	2.152	4.795	-0.358
8	14.141	13.747	2.934	6.441	-0.394
9	11.708	11.627	2.298	4.648	-0.081
10	14.122	14.086	3.161	6.380	-0.036
11	10.940	11.076	2.545	4.984	0.136
12	11.490	10.716	2.254	5.022	-0.774
13	10.538	10.054	2.460	4.121	-0.484
14	15.638	15.490	3.632	8.000	-0.148
15	12.514	12.427	2.753	5.634	-0.087
16	11.256	11.244	2.597	4.985	-0.012
17	16.829	17.008	3.841	7.367	0.179
18	12.891	12.350	2.564	5.580	-0.541
19	15.830	15.129	3.583	6.790	-0.701
20	13.635	13.512	2.959	6.160	-0.123
Total mass	**275.285**	**271.115**	**59.106**	**123.184**	**-4.170**
Average	**13.764**	**13.556**	**2.955**	**6.159**	**-0.209**
STDEV	**2.887**	**2.838**	**0.633**	**1.533**	**0.367**

3-B-3

Elliptio no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	15.164	14.530	3.677	6.463	-0.634
2	9.074	8.429	2.006	3.642	-0.645
3	13.618	13.909	3.196	6.719	0.291
4	16.995	16.896	3.148	8.886	-0.099
5	12.516	11.678	2.706	5.910	-0.838
6	13.274	13.259	3.229	6.196	-0.015
7	17.086	16.021	4.168	7.828	-1.065
8	9.594	9.567	2.488	3.953	-0.027
9	17.565	17.206	4.089	8.266	-0.359
10	10.950	10.848	2.755	5.022	-0.102
11	11.029	10.757	2.549	5.434	-0.272
12	13.473	12.641	3.015	6.106	-0.832
13	16.861	16.119	4.003	7.752	-0.742
14	9.652	9.675	2.360	4.222	0.023
15	12.996	13.449	3.673	5.266	0.453
16	12.972	12.545	3.274	6.229	-0.427
17	15.613	15.302	3.721	7.182	-0.311
18	12.064	11.538	3.294	5.194	-0.526
19	10.008	9.748	2.632	4.729	-0.260
20	11.255	11.216	2.477	4.829	-0.039
Total mass	**261.759**	**255.333**	**62.460**	**119.828**	**-6.426**
Average	**13.088**	**12.767**	**3.123**	**5.991**	**-0.321**
STDEV	**2.713**	**2.623**	**0.623**	**1.460**	**0.395**

High Concentration Tank
Strawberry River *Corbicula*

4SB-1

Corbicula no.	Initial mass (g)	final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	3.107	3.198	0.628	2.137	0.091
2	2.605	2.686	0.409	1.853	0.081
3	4.802	4.876	0.760	3.188	0.074
4	3.150	3.240	0.559	2.151	0.090
5	3.228	3.309	0.473	2.225	0.081
6	3.578	3.683	0.611	2.464	0.105
7	2.136	2.175	0.287	1.499	0.039
8	3.061	3.133	0.450	2.121	0.072
9	2.231	2.319	0.297	1.601	0.088
10	2.999	3.054	0.465	2.060	0.055
11	3.847	3.871	0.548	2.601	0.024
12	5.063	5.120	0.767	3.392	0.057
13	2.994	3.032	0.474	2.055	0.038
14	2.958	2.985	0.427	2.017	0.027
15	2.338	2.394	0.304	1.650	0.056
16	2.570	2.624	0.363	1.790	0.054
17	3.730	3.802	0.576	2.546	0.072
18	2.810	2.897	0.448	1.968	0.087
19	2.526	2.616	0.412	1.785	0.090
20	3.316	3.384	0.462	2.233	0.068
21	4.319	4.380	0.660	2.921	0.061
22	2.630	2.684	0.393	1.816	0.054
23	1.771	1.810	0.240	1.213	0.039
26	2.744	2.843	0.451	1.906	0.099
27	2.715	2.781	0.370	1.925	0.066
28	3.246	3.375	0.505	2.314	0.129
29	3.282	3.363	0.519	2.329	0.081
30	2.191	2.262	0.323	1.566	0.071
31	2.569	2.622	0.384	1.800	0.053
32	2.270	2.355	0.307	1.649	0.085
33	2.549	2.586	0.368	1.781	0.037
34	2.870	2.940	0.420	2.050	0.070
35	3.053	3.121	0.466	2.096	0.068
36	2.362	2.447	0.368	1.660	0.085
37	1.842	1.864	0.255	1.251	0.022
38	2.935	2.982	0.430	1.999	0.047
39	3.209	3.289	0.526	2.247	0.080
40	3.106	3.164	0.435	2.150	0.058
41	3.679	3.732	0.547	2.540	0.053
42	3.766	3.807	0.524	2.628	0.041
43	3.468	3.540	0.545	2.395	0.072
44	2.539	2.617	0.363	1.812	0.078
45	2.988	3.074	0.436	2.055	0.086
47	3.102	3.178	0.433	2.178	0.076
48	2.344	2.421	0.338	1.677	0.077
49	2.353	2.354	0.270	1.627	0.001
50	2.303	2.322	0.339	1.620	0.019
Total mass	**139.244**	**142.311**	**20.935**	**96.521**	**3.067**
Average	**2.963**	**3.028**	**0.445**	**2.054**	**0.065**
STDEV	**0.694**	**0.688**	**0.121**	**0.442**	**0.025**

4SB-2

Corbicula no.	Initial mass (g)	final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	2.721	2.736	0.331	1.845	0.015
2	2.529	2.594	0.403	1.709	0.065
3	2.673	2.785	0.408	1.940	0.112
4	2.606	2.684	0.417	1.833	0.078
5	4.015	4.037	0.689	2.550	0.022
7	2.725	2.818	0.461	1.878	0.093
8	3.620	3.637	0.511	2.521	0.017
9	2.670	2.652	0.386	1.818	-0.018
10	2.869	2.957	0.423	2.078	0.098
11	2.601	2.697	0.391	1.828	0.096
12	2.754	2.807	0.390	1.918	0.053
13	3.149	3.258	0.495	2.254	0.109
14	1.821	1.840	0.256	1.241	0.019
15	2.333	2.391	0.358	1.654	0.058
16	3.276	3.324	0.489	2.277	0.048
17	2.911	2.972	0.454	2.018	0.061
18	2.553	2.598	0.372	1.794	0.045
19	2.570	2.681	0.432	1.777	0.111
20	2.808	2.879	0.456	1.899	0.071
21	3.223	3.262	0.448	2.310	0.039
22	3.342	3.469	0.520	2.364	0.117
23	2.833	2.905	0.402	2.003	0.072
24	2.840	2.937	0.461	1.965	0.097
25	2.870	2.941	0.421	1.994	0.071
26	2.090	2.168	0.321	1.467	0.078
27	2.477	2.514	0.392	1.684	0.037
28	2.194	2.260	0.332	1.535	0.066
29	2.893	2.979	0.479	2.022	0.086
30	3.239	3.309	0.525	2.193	0.070
31	2.572	2.636	0.398	1.807	0.064
32	2.279	2.332	0.340	1.572	0.053
33	2.078	2.151	0.303	1.484	0.073
35	2.263	2.365	0.349	1.613	0.102
36	2.597	2.662	0.374	1.801	0.065
37	3.010	3.062	0.464	2.087	0.052
38	2.322	2.404	0.324	1.708	0.082
39	1.953	1.977	0.277	1.385	0.024
40	2.871	2.936	0.429	2.022	0.065
41	2.033	2.066	0.268	1.415	0.033
42	2.343	2.400	0.340	1.636	0.057
43	2.940	2.972	0.375	2.028	0.032
44	2.194	2.250	0.306	1.535	0.056
45	2.422	2.504	0.316	1.706	0.082
46	1.215	1.314	0.170	0.898	0.099
47	2.376	2.472	0.341	1.699	0.096
48	2.742	2.817	0.394	1.940	0.075
49	2.922	3.057	0.462	2.085	0.135
50	2.417	2.504	0.360	1.734	0.087
Total mass	**126.754**	**129.972**	**19.013**	**88.544**	**3.218**
Average	**2.641**	**2.708**	**0.396**	**1.845**	**0.067**
STDEV	**0.479**	**0.478**	**0.086**	**0.318**	**0.031**

4SB-3

Corbicula no.	Initial mass (g)	final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	3.149	3.187	0.473	2.171	0.038
2	2.833	2.935	0.476	2.016	0.102
3	3.239	3.293	0.557	2.250	0.054
4	1.958	2.025	0.308	1.323	0.067
5	2.779	2.870	0.393	1.941	0.091
6	3.288	3.411	0.525	2.320	0.123
7	2.747	2.822	0.426	1.922	0.075
8	2.289	2.339	0.329	1.604	0.050
9	3.695	3.829	0.617	2.572	0.134
10	3.098	3.165	0.471	2.112	0.067
11	2.585	2.599	0.388	1.832	0.014
12	3.379	3.435	0.518	2.359	0.056
13	2.540	3.284	0.507	2.216	0.744
14	3.211	2.906	0.439	1.968	-0.305
15	2.868	2.804	0.400	1.904	-0.064
16	2.761	3.091	0.500	2.085	0.330
17	2.984	2.513	0.343	1.768	-0.471
18	2.484	2.858	0.441	1.985	0.374
19	2.801	3.483	0.520	2.313	0.682
20	3.379	2.476	0.340	1.684	-0.903
21	2.393	3.068	0.443	2.133	0.675
22	2.990	2.712	0.496	1.516	-0.218
23	2.722	2.153	0.315	1.468	-0.569
24	2.097	3.071	0.427	2.135	0.974
25	3.000	2.773	0.389	1.862	-0.227
26	2.709	2.239	0.306	1.545	-0.470
27	2.125	2.279	0.352	1.515	0.154
28	2.210	2.860	0.386	1.962	0.650
29	2.742	2.638	0.378	1.824	-0.104
30	2.652	2.874	0.422	1.975	0.322
31	2.774	2.405	0.375	1.651	-0.369
32	2.325	2.652	0.407	1.818	0.337
33	2.593	3.095	0.503	2.062	0.502
34	3.030	2.241	0.299	1.530	-0.789
35	2.178	2.108	0.272	1.444	-0.070
36	2.043	3.031	0.439	2.075	0.988
37	2.966	2.669	0.362	1.871	-0.297
38	2.665	3.074	0.502	2.080	0.509
39	2.984	3.293	0.454	2.263	0.309
40	3.181	2.251	0.294	1.536	-0.930
41	2.218	2.252	0.330	1.484	0.034
42	2.202	2.178	0.314	1.972	-0.024
43	2.109	2.866	0.406	1.852	0.757
44	2.754	2.662	0.310	2.328	-0.092
45	2.669	3.514	0.517	1.984	0.845
46	3.417	2.918	0.417	1.212	-0.499
47	2.811	1.794	0.261	1.893	-1.017
48	1.759	2.817	0.411	1.795	1.058
49	2.720	2.592	0.350	1.794	-0.138
50	2.550	2.610	0.322	1.822	0.060
Total mass	**135.385**	**139.014**	**20.430**	**94.746**	**3.629**

High Concentration Tank
Saline River *Corbicula*

4-S-1

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	6.513	6.478	1.007	4.021	-0.035
2	6.592	6.540	1.165	3.626	-0.052
3	5.804	5.748	1.007	3.300	-0.056
4	5.546	5.478	0.771	2.943	-0.068
5	6.382	6.330	1.118	3.894	-0.052
6	5.922	5.887	1.076	3.533	-0.035
7	6.834	6.812	1.163	4.110	-0.022
8	6.805	6.763	1.033	3.878	-0.042
9	4.688	4.668	0.763	2.896	-0.020
11	7.528	7.499	1.202	4.671	-0.029
12	7.236	7.183	1.108	4.301	-0.053
13	5.742	5.698	0.844	3.490	-0.044
14	8.028	8.005	1.260	5.134	-0.023
15	8.132	8.089	1.376	5.074	-0.043
16	6.475	6.453	0.982	4.049	-0.022
17	5.482	5.433	0.768	3.406	-0.049
18	7.143	7.094	1.113	4.635	-0.049
19	8.336	8.319	1.238	5.341	-0.017
20	6.660	6.622	1.071	4.003	-0.038
21	5.602	5.608	0.778	3.778	0.006
22	6.714	6.686	1.191	4.059	-0.028
23	6.360	6.342	0.924	3.889	-0.018
24	7.214	7.193	1.100	4.757	-0.021
25	5.672	5.634	0.802	3.457	-0.038
26	4.562	4.584	0.749	3.062	0.022
27	6.150	6.105	1.003	3.635	-0.045
28	6.670	6.616	1.117	4.088	-0.054
29	6.581	6.434	0.872	4.249	-0.147
30	7.689	7.597	1.068	4.190	-0.092
31	7.894	7.820	0.974	5.113	-0.074
32	6.067	6.041	0.916	3.966	-0.026
33	7.497	7.426	1.258	4.062	-0.071
34	5.403	5.319	0.899	2.802	-0.084
35	7.865	7.806	1.257	4.861	-0.059
36	7.389	7.311	1.212	4.373	-0.078
37	6.346	6.338	0.933	4.286	-0.008
38	7.608	7.556	1.210	4.572	-0.052
39	6.336	6.289	1.170	3.884	-0.047
40	5.207	5.177	0.907	3.171	-0.030
41	7.174	7.102	0.970	4.484	-0.072
42	5.852	5.779	0.899	3.135	-0.073
43	7.401	7.346	1.280	4.545	-0.055
44	6.396	6.378	0.952	4.152	-0.018
45	8.422	8.363	1.237	5.299	-0.059
46	6.418	6.414	0.905	4.247	-0.004
47	7.006	6.957	1.022	4.433	-0.039
48	5.711	5.674	0.872	3.553	-0.037
49	8.400	8.340	1.298	5.409	-0.060
50	5.290	5.249	0.780	3.322	-0.041
Total mass	**324.744**	**322.593**	**50.570**	**199.138**	**-2.151**
Average	**6.627**	**6.584**	**1.032**	**4.064**	**-0.044**
STDEV	**0.970**	**0.963**	**0.170**	**0.668**	**0.028**

4-S-2

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	5.590	5.591	1.047	3.361	0.001
2	6.384	6.396	1.071	4.020	0.012
3	5.231	5.235	0.846	3.258	0.004
4	8.726	8.741	1.236	5.751	0.015
5	6.760	6.752	1.132	4.124	-0.008
6	7.116	7.099	1.148	3.999	-0.017
7	7.561	7.570	1.224	4.754	0.009
8	5.402	5.389	0.985	3.179	-0.013
9	8.123	8.127	1.060	5.453	0.004
10	5.772	5.740	0.879	3.199	-0.032
11	5.833	5.810	0.938	3.451	-0.023
12	6.923	6.935	1.060	4.388	0.012
13	6.587	6.580	1.122	3.950	-0.007
14	8.955	8.965	1.330	5.728	0.010
15	7.097	7.133	1.053	4.636	0.036
16	6.981	7.010	0.972	4.412	0.029
17	5.639	5.626	0.924	3.360	-0.013
18	4.262	4.324	0.633	2.779	0.062
20	7.612	7.634	1.179	4.809	0.022
21	5.502	5.499	1.011	2.964	-0.003
22	5.427	5.457	0.853	3.374	0.030
23	5.018	5.021	0.683	2.903	0.003
24	5.532	5.541	0.843	3.378	0.009
25	5.404	5.425	0.892	3.277	0.021
26	6.503	6.497	1.068	4.094	-0.006
27	6.554	6.553	0.874	4.538	-0.001
28	6.125	6.123	1.014	3.632	-0.002
29	5.954	5.886	1.061	3.222	-0.068
30	6.548	6.540	0.916	3.834	-0.008
31	6.340	6.327	1.215	3.804	-0.013
32	6.298	6.289	0.862	3.556	-0.009
33	6.405	6.391	0.879	3.629	-0.014
34	6.992	7.000	1.118	4.390	0.008
35	6.904	6.926	1.236	4.392	0.022
36	6.248	6.272	1.061	3.846	0.024
37	6.273	6.295	1.092	4.045	0.022
38	4.895	4.924	0.788	2.984	0.029
39	4.979	4.989	0.666	3.316	0.010
40	7.854	7.873	1.318	5.118	0.019
41	5.211	5.202	1.006	2.783	-0.009
42	4.995	4.958	0.914	3.014	-0.037
43	6.234	6.228	0.982	3.949	-0.006
44	6.862	6.878	1.005	4.469	0.016
45	6.022	6.053	0.863	3.934	0.031
46	6.937	6.917	1.052	3.933	-0.020
47	5.331	5.327	1.019	3.173	-0.004
49	6.609	6.588	1.052	4.068	-0.021
50	5.732	5.774	0.814	3.872	0.042
Total mass	**302.212**	**302.420**	**47.996**	**186.102**	**0.208**
Average	**6.296**	**6.300**	**1.000**	**3.877**	**0.004**
STDEV	**0.994**	**0.994**	**0.158**	**0.735**	**0.021**

4-S-3

Corbicula no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	6.921	6.920	1.077	4.365	-0.001
2	6.172	6.194	1.149	3.863	0.022
3	8.449	8.487	1.435	5.505	0.038
4	8.132	8.150	1.397	5.203	0.018
5	5.540	5.551	0.965	3.135	0.011
6	4.961	4.971	0.946	3.082	0.010
7	4.886	4.892	0.846	3.100	0.006
8	5.364	5.363	0.921	3.185	-0.001
9	4.968	4.988	0.845	3.181	0.020
10	5.813	5.801	0.826	3.305	-0.012
11	6.076	6.060	1.179	3.551	-0.016
12	7.033	7.044	1.208	4.326	0.011
13	4.403	4.432	0.818	2.640	0.029
14	6.670	6.677	1.011	4.330	0.007
15	5.527	5.571	0.812	3.605	0.044
16	5.028	5.073	0.755	4.075	0.045
17	6.620	6.606	1.150	3.204	-0.014
18	5.576	5.582	0.943	3.095	0.006
19	5.783	5.785	0.990	3.411	0.002
20	6.134	6.143	1.111	3.431	0.009
22	5.688	5.659	0.900	3.677	-0.029
23	6.338	6.359	1.047	4.031	0.021
24	7.180	7.202	1.213	4.659	0.022
25	4.617	4.641	0.801	2.853	0.024
26	5.542	5.541	1.135	3.019	-0.001
27	6.433	6.459	1.053	3.977	0.026
28	6.879	6.898	1.154	4.360	0.019
29	6.713	6.737	1.322	4.015	0.024
30	7.070	7.049	1.206	4.104	-0.021
31	7.408	7.411	1.331	4.164	0.003
32	4.965	5.005	0.766	3.064	0.040
33	5.373	5.401	0.841	3.413	0.028
34	5.285	5.321	0.732	3.410	0.036
35	6.207	6.156	0.853	3.987	-0.051
36	5.245	5.181	0.908	2.858	-0.064
37	5.371	5.335	0.856	2.889	-0.036
38	5.139	5.092	0.812	2.629	-0.047
39	6.173	6.200	0.801	3.930	0.027
40	7.236	7.231	1.051	3.951	-0.005
43	5.380	5.402	0.694	3.492	0.022
44	6.513	6.536	1.072	3.934	0.023
45	6.136	6.152	0.941	3.975	0.016
46	7.326	7.369	1.280	4.448	0.043
47	4.597	4.629	0.729	2.962	0.032
48	5.553	5.583	0.756	3.548	0.030
49	7.309	7.330	1.098	4.399	0.021
50	6.121	6.144	0.868	4.107	0.023
Total mass	**283.843**	**284.313**	**46.594**	**173.447**	**0.470**
Average	**6.039**	**6.049**	**0.991**	**3.690**	**0.010**
STDEV	**0.946**	**0.948**	**0.193**	**0.643**	**0.025**

High Concentration Tank
Balsam Lake *Elliptio*

4B-1

Elliptio no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	15.424	15.609	3.262	7.288	0.185
2	13.557	13.824	2.988	6.504	0.257
3	13.530	13.127	3.485	6.127	-0.403
4	11.473	10.942	2.706	5.008	-0.531
5	13.261	13.239	2.922	6.143	-0.022
6	14.103	14.422	3.309	6.872	0.319
7	12.927	12.559	3.220	6.180	-0.368
8	16.505	16.577	4.427	7.127	0.072
9	15.799	16.610	3.575	8.134	0.811
10	13.789	13.692	3.227	6.332	-0.097
11	11.928	11.852	2.320	5.639	-0.076
12	15.465	15.564	3.726	7.429	0.099
13	13.870	13.818	2.875	6.837	-0.052
14	13.347	13.562	3.397	6.514	0.215
15	16.495	16.703	3.605	7.769	0.208
16	9.509	9.385	2.010	4.408	-0.124
17	10.096	10.306	2.621	4.425	0.210
18	8.789	8.611	2.057	4.037	-0.178
19	8.200	7.980	2.253	3.587	-0.220
20	8.672	8.705	2.219	3.453	0.033
Total mass	**256.749**	**257.087**	**60.214**	**119.813**	**0.338**
Average	**12.837**	**12.854**	**3.011**	**5.991**	**0.017**
STDEV	**2.623**	**2.769**	**0.634**	**1.397**	**0.299**

4B-2

Elliptio no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	11.103	10.562	2.282	4.725	-0.541
2	15.751	15.493	3.471	7.455	-0.258
3	13.431	13.335	2.727	6.222	-0.096
4	9.383	9.122	2.016	4.130	-0.261
5	10.762	10.981	2.665	7.757	0.219
6	16.622	16.257	3.892	8.266	-0.365
7	16.425	16.482	3.646	7.716	0.057
8	16.248	16.610	3.698	8.296	0.362
9	9.758	9.778	2.474	4.709	0.020
10	11.614	11.499	2.780	5.004	-0.115
11	14.039	13.444	3.302	6.747	-0.595
12	12.873	12.819	3.171	5.250	-0.054
13	12.935	13.087	2.814	6.355	0.152
14	9.605	9.851	2.191	4.483	0.246
15	10.618	10.178	2.782	4.920	-0.440
16	15.684	15.031	3.101	7.264	-0.653
17	9.399	9.824	2.310	4.366	0.425
18	14.539	14.628	4.083	6.716	0.089
19	11.892	11.420	3.337	4.469	-0.472
20	10.493	10.651	2.620	4.866	0.158
Total mass	**253.174**	**251.052**	**59.362**	**119.726**	**-2.122**
Average	**12.659**	**12.553**	**2.968**	**5.986**	**-0.106**
STDEV	**2.547**	**2.500**	**0.593**	**1.442**	**0.327**

4B-3

Elliptio no.	Initial mass (g)	Final mass (g)	Final visceral mass (g)	Final shell mass (g)	Total Growth (g) (Final mass - Initial Mass)
1	18.871	18.902	4.175	9.417	0.031
2	13.512	13.564	3.294	7.101	0.052
3	14.824	14.731	3.640	7.529	-0.093
4	10.881	10.668	2.716	4.876	-0.213
5	13.528	13.283	3.643	6.125	-0.245
6	19.408	18.870	4.363	9.434	-0.538
7	14.192	14.044	3.512	6.851	-0.148
8	12.628	12.178	2.772	6.017	-0.450
9	15.617	15.359	4.170	6.773	-0.258
10	12.339	12.019	3.241	5.263	-0.320
11	15.655	14.844	3.467	7.321	-0.811
12	13.127	13.260	2.513	7.139	0.133
13	16.413	15.982	4.413	7.109	-0.431
14	18.060	18.308	4.490	8.656	0.248
15	10.937	10.588	2.847	4.789	-0.349
16	11.792	11.544	2.879	5.977	-0.248
17	11.640	11.424	2.919	4.814	-0.216
18	8.565	8.464	1.894	3.886	-0.101
19	14.690	14.759	3.278	6.931	0.069
20	8.972	8.979	2.218	3.915	0.007
Total mass	**275.651**	**271.770**	**66.444**	**129.923**	**-3.881**
Average	**13.783**	**13.589**	**3.322**	**6.496**	**-0.194**
STDEV	**3.001**	**2.994**	**0.744**	**1.608**	**0.253**

APPENDIX F
Analytical Chemistry Data

BATTELLE MARINE SCIENCES LABORATORY
1529 West Sequim Bay Road

Sequim, Washington 98382-9099
360-681-3689

Ridlofi, Inc. Task 4

ASU Ecotox/Ridolfi Inc./NOAA - Cannelton Study

ANALYSIS OF TISSUE

(Samples Received 7/16/04 and 9/9/04)

NOT BLANK CORRECTED-REPORTED ON DRY WEIGHT (DW) BASIS

MSL Code	Collection Date	Sponsor ID	Site Descripton	Percent Moisture	Total Lipids	As	Cd	Cr	Pb
			Analytical Method	Freeze-Dried	Bligh-Dyer	ICP-MS 6100	ICP-MS 6100	ICP-MS 6100	ICP-MS 6100
			Units	%	% DW	ug/g DW	ug/g DW	ug/g DW	ug/g DW
			Analysis Date	11/15/04	11/18-23/04	11/23/04	11/23/04	11/23/04	11/23/04
2241-4	7/15/04	STO	NA	82.1	9.8	6.66	1.95	1.87	0.395
2241-5	7/15/04	BTO	NA	87.0	5.5	2.68	1.97	2.31	0.415
2241-6	7/15/04	SBTO	NA	92.0	8.5	4.62	0.835	1.26	0.336
2241-19	9/2/04	1-S-1	Control-Saline Corbicula	81.9	9.1	6.25	2.00	1.77	0.278
2241-20	9/2/04	1-S-2	Control -Saline Corbicula	82.2	10.0	6.59	2.14	1.98	0.367
2241-21	9/2/04	1-S-3	Control -Saline Corbicula	81.4	9.8	6.56	2.08	2.02	0.418
2241-22r1	9/2/04	1-B-1	Control -Balsam Lake Elliptio	85.4	5.3	2.85	2.47	3.11	0.812
2241-22r2	9/2/04	1-B-1	Control -Balsam Lake Elliptio	NA	5.3	NA	NA	NA	NA
2241-23r1	9/2/04	1-B-2	Control -Balsam Lake Elliptio	86.0	5.5	2.98	2.88	2.87	0.664
2241-23r2	9/2/04	1-B-2	Control -Balsam Lake Elliptio	NA	NA	3.00	2.86	2.87	0.656
2241-24	9/2/04	1-B-3	Control -Balsam Lake Elliptio	85.9	5.1	3.29	2.94	2.97	0.814
2241-25	9/2/04	1-SB-1	Control -Strawberry Corbicula	79.3	9.2	5.14	1.17	1.55	0.476
2241-26	9/2/04	1-SB-2	Control -Strawberry Corbicula	80.0	8.3	4.98	1.26	1.93	0.438
2241-27	9/2/04	1-SB-3	Control -Strawberry Corbicula	78.6	10.7	4.91	1.19	1.59	0.391
2241-28	9/2/04	2-S-1	Low . -Saline Corbicula	82.7	10.4	6.38	2.11	4.66	0.308
2241-29	9/2/04	2-S-2	Low . -Saline Corbicula	81.6	10.6	6.86	2.22	4.63	0.311
2241-30	9/2/04	2-S-3	Low . -Saline Corbicula	81.9	10.2	6.94	2.39	5.00	0.343
2241-31	9/2/04	2-B-1	Low .-Balsam Lake Elliptio	84.8	5.5	2.98	2.83	5.27	0.813
2241-32	9/2/04	2-B-2	Low .-Balsam Lake Elliptio	85.7	5.9	3.18	2.70	4.95	0.647
2241-33	9/2/04	2-B-3	Low .-Balsam Lake Elliptio	86.1	5.4	2.92	2.46	5.46	0.629
2241-34	9/2/04	2-SB-1	Low .-Strawberry Corbicula	83.1	10.1	4.86	1.12	5.74	0.426
2241-35	9/2/04	2-SB-2	Low .-Strawberry Corbicula	79.6	10.6	4.98	1.14	7.02	0.468
2241-36	9/2/04	2-SB-3	Low .-Strawberry Corbicula	78.9	11.9	4.81	1.12	6.16	0.472
2241-37	9/2/04	3-S-1	Med. . -Saline Corbicula	83.7	10.4	6.74	2.20	7.92	0.300
2241-	9/2/04	3-S-2	Med. . -Saline Corbicula	82.2	10.6	6.90	2.31	6.62	0.273

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2241-39r1	9/2/04	3-S-3	Med. . -Saline	Corbicula	82.0	10.2		6.67		2.18		9.47		0.307					
2241-39r2	9/2/04	3-S-3	Med. . -Saline	Corbicula	NA	NA		6.76		2.18		9.28		0.309					
2241-40	9/2/04	3-B-1	Med. . -Balsam Lake	Elliptio	85.8	5.3		3.12		2.76		7.15		0.538					
2241-41	9/2/04	3-B-2	Med. . -Balsam Lake	Elliptio	88.2	4.8		2.97		2.99		8.71		0.584					
2241-42	9/2/04	3-B-3	Med. . -Balsam Lake	Elliptio	81.2	9.7		5.05		1.31		10.0		0.422					
2241-43	9/2/04	3-SB-1	Med. -Strawberry	Corbicula	79.9	9.0		4.91		1.14		7.88		0.352					
2241-44	9/2/04	3-SB-2	Med. -Strawberry	Corbicula	81.1	10.9		5.07		1.27		9.45		0.381					
2241-45	9/2/04	3-SB-3	Med. -Strawberry	Corbicula	86.1	4.6		2.87		2.82		6.40		0.540					
2241-46	9/2/04	4-S-1	High . -Saline	Corbicula	82.3	10.9		7.14		2.50		99.7		1.46					
2241-47	9/2/04	4-S-2	High . -Saline	Corbicula	83.1	10.1		6.52		2.30		121		1.79					
2241-48	9/2/04	4-S-3	High . -Saline	Corbicula	83.0	11.1		6.89		2.66		123		1.83					
2241-49	9/2/04	4-B-1	High . -Balsam Lake	Elliptio	85.8	6.0		3.00		3.02		27.6		0.883					
2241-50	9/2/04	4-B-2	High . -Balsam Lake	Elliptio	85.5	6.0		2.81		2.76		27.1		0.892					
2241-51r1	9/2/04	4-B-3	High . -Balsam Lake	Elliptio	85.6	5.5		2.87		2.59		22.9		0.832					
2241-51r2	9/2/04	4-B-3	High . -Balsam Lake	Elliptio	NA	5.7		NA		NA		NA		NA					
2241-52 [A]	9/2/04	4-SB-1	High -Strawberry	Corbicula	80.3	10.8		5.33	A	1.57	A	200	A	2.58	A				
2241-53	9/2/04	4-SB-2	High -Strawberry	Corbicula	80.4	10.2		5.06		1.46		159		2.24					
2241-54	9/2/04	4-SB-3	High -Strawberry	Corbicula	80.5	11.1		4.95		1.41		156		2.18					
Blank 111904r4	Method Blank				NA	0.1	U	0.166		0.00760	U	0.175		0.00806	U				
Blank 111904r5	Method Blank				NA	0.1	U	0.128	U	0.00760	U	0.0998		0.00806	U				
2004 Method Detection Limits					NA	0.1		0.128		0.00760		0.0859		0.00806					
STANDARD REFERENCE MATERIAL																			
DORM2 111904r1			SRM		NA	NA		16.6		0.0522		30.8		0.0643					
DORM2 111904r2			SRM		NA	NA		16.9		0.0411		31.9		0.0618					
	certified value				NA	NA		18.0		0.043		34.7		0.065					
	Percent Difference				NA	NA		8%		21%	#	11%		1%					
	Percent Difference				NA	NA		6%		4%		8%		5%					
1566b 111904r1			SRM		NA	NA		6.87		2.19		1.03		0.267					
1566b 111904r2			SRM		NA	NA		7.11		2.27		0.984		0.268					
	certified value				NA	NA		7.65		2.48		NA		0.308					
	Percent Difference				NA	NA		10%		12%		NA		13%					
	Percent Difference				NA	NA		7%		8%		NA		13%					
1640 direct 1123046100a			SRM		NA	NA		28.9		23.9		38.8		25.3					
1641 direct 1129046100			SRM		NA	NA		29.8		24.4		39.9		25.7					
	certified value				NA	NA		26.67		22.79		38.6		27.89					
	Percent Difference				NA	NA		8%		5%		1%		9%					
	Percent Difference				NA	NA		12%		7%		3%		8%					

BLANK SPIKE RESULTS

Amount Spiked				NA	NA		3.00	3.00		3.00		3.00	
Blank 111904r4	Method Blank			NA	0.1	U	0.166	0.00760	U	0.175		0.00806	U
LCS111904L1r1	Blk Spike			NA	NA		2.75	2.78		3.15		2.96	
Amount Recovered				NA	NA		2.58	2.78		2.98		2.96	
Percent Recovery				NA	NA		86%	93%		99%		99%	
Amount Spiked				NA	NA		3.00	3.00		3.00		3.00	
Blank 111904r4	Method Blank			NA	0.1	U	0.166	0.00760	U	0.175		0.00806	U
LCS111904L1r2	Blk Spike Dup			NA	NA		2.73	2.83		3.06		3.00	
Amount Recovered				NA	NA		2.56	2.83		2.89		3.00	
Percent Recovery				NA	NA		85%	94%		96%		100%	
RPD				NA	NA		0.8%	1.8%		3.1%		1.3%	
Amount Spiked				NA	NA		15.0	15.0		15.0		15.0	
Blank 111904r4	Method Blank			NA	0.1	U	0.166	0.00760	U	0.175		0.00806	U
LCS111904L2r1	Blk Spike			NA	NA		13.6	14		14.9		14.6	
Amount Recovered				NA	NA		13.4	14.0		14.7		14.6	
Percent Recovery				NA	NA		90%	93%		98%		97%	
Amount Spiked				NA	NA		15.0	15.0		15.0		15.0	
Blank 111904r4	Method Blank			NA	0.1	U	0.166	0.00760	U	0.175		0.00806	U
LCS111904L2r2	Blk Spike Dup			NA	NA		14.1	14.1		14.8		15	
Amount Recovered				NA	NA		13.9	14.1		14.6		15.0	
Percent Recovery				NA	NA		93%	94%		98%		100%	
RPD				NA	NA		3.7%	0.7%		0.7%		2.7%	

MATRIX SPIKE RESULTS

Amount Spiked				NA	NA		3.02	3.02		3.02		3.02	
2241-23r1	9/2/04	1-B-2	Control Tank-Balsam Lake Elliptio	86.0	5.5		2.98	2.88		2.87		0.664	
2241-23MS				NA	NA		5.51	5.55		5.65		3.50	
Amount Recovered				NA	NA		2.53	2.67		2.78		2.84	
Percent Recovery				NA	NA		84%	88%		92%		94%	
Amount Spiked				NA	NA		3.02	3.02		3.02		3.02	
2241-23r1	9/2/04	1-B-2	Control Tank-Balsam Lake Elliptio	86.0	5.5		2.98	2.88		2.87		0.664	
2241-23MSD				NA	NA		5.37	5.64		6.71		3.50	
Amount Recovered				NA	NA		2.39	2.76		3.84		2.84	
Percent Recovery				NA	NA		79%	91%		127%	#	94%	
RPD				NA	NA		5.7%	3.3%		32.0%	#	0.0%	
Amount Spiked				NA	NA		14.8	2.99		14.8		2.99	
2241-39r1	9/2/04	3-S-3	Med. Conc. Tank-Saline River Corbicula	82.0	10.2		6.67	2.18		9.47		0.307	
2241-39MS				NA	NA		21.4	4.98		25.5		3.17	
Amount Recovered				NA	NA		14.73	2.80		16.03		2.86	
Percent Recovery				NA	NA		100%	94%		109%		96%	
Amount Spiked				NA	NA		15.1	2.99		15.1		2.99	
2241-	9/2/04	3-S-3	Med. Conc. Tank-Saline	82.0	10.2		6.67	2.18		9.47		0.307	

39r1			River Corbicula						
2241-39MSD				NA	NA	21.1	4.89	22.9	3.13
Amount Recovered				NA	NA	14.43	2.71	13.43	2.82
Percent Recovery				NA	NA	96%	91%	89%	94%
RPD				NA	NA	4.1%	3.3%	19.6%	1.4%

REPLICATE RESULTS

2241-22r1	9/2/04	1-B-1	Control Tank-Balsam Lake Elliptio	85.4	5.3	2.85	2.47	3.11	0.812
2241-22r2	9/2/04	1-B-1	Control Tank-Balsam Lake Elliptio	NA	5.3	NA	NA	NA	NA
Mean				NA	5.3	NA	NA	NA	NA
RPD				NA	0.0%	NA	NA	NA	NA
2241-23r1	9/2/04	1-B-2	Control Tank-Balsam Lake Elliptio	86.0	5.5	2.98	2.88	2.87	0.664
2241-23r2	9/2/04	1-B-2	Control Tank-Balsam Lake Elliptio	NA	NA	3.00	2.86	2.87	0.656
Mean				NA	NA	3.0	2.9	2.9	0.7
RPD				NA	NA	0.7%	0.7%	0.0%	1.2%
2241-39r1	9/2/04	3-S-3	Med. Conc. Tank-Saline River Corbicula	82.0	10.2	6.67	2.18	9.47	0.307
2241-39r2	9/2/04	3-S-3	Med. Conc. Tank-Saline River Corbicula	NA	NA	6.76	2.18	9.28	0.309
Mean				NA	NA	6.7	2.2	9.4	0.3
RPD				NA	NA	1.3%	0.0%	2.0%	0.6%
2241-51r1	9/2/04	4-B-3	High Conc. Tank-Balsam Lake Elliptio	85.6	5.5	2.87	2.59	22.9	0.832
2241-51r2	9/2/04	4-B-3	High Conc. Tank-Balsam Lake Elliptio	NA	5.7	NA	NA	NA	NA
Mean				NA	5.6	NA	NA	NA	NA
RPD				NA	3.1%	NA	NA	NA	NA

NA Not available/applicable
A In original analysis, internal standard was not added. Results reported are from reanalysis.
U Not detected at or above DL shown
Outside DQO - see narrative

APPROVALS:

Project Manager Date QA/QC Reviewer Date

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Ridlofi, Inc. Task 4
ASU Ecotox/Ridolfi Inc./NOAA - Cannelton Study
ANALYSIS OF SEDIMENT
(Samples Received 7/16/04 and 9/3/04)

MSL Code	Collection Date	Sponsor ID	Percent Moisture	NOT BLANK CORRECTED REPORTED ON DRY WEIGHT (DW) BASIS As	Cd	Cr	Pb
			Analytical Method	GFAA	ICP-OES	ICP-OES	ICP-OES
			Units	ug/g DW	ug/g DW	ug/g DW	ug/g DW
			Analysis Date	11/30/04	11/29/04	11/29/04	11/29/04
2241-1	7/15/04	3-4	71.4	11.9	19.1	13931	157
2241-2	7/15/04	3-3	47.4	8.16	3.42	4139	57.8
2241-3r1	7/15/04	3-2	26.7	2.92	0.464	578	23.0
2241-3r2	7/15/04	3-2	NA	3.09	0.477	509	20.0
2241-16	9/2/04	2	24.4	3.12	0.415	405	21.6
2241-17	9/2/04	3	44.6	7.53	2.04	2832	42.2
2241-18	9/2/04	4	74.0	14.8	24.9	17167	192
Blank 112204				0.065 U	0.0421 U	0.0546 U	0.675 #
2004 Method Detection Limits				0.065	0.0421	0.0546	0.0769
STANDARD REFERENCE MATERIAL							
2704 112204				23.5	3.25	126	151
		certified value		23.4	3.45	135	161
		percent difference		0%	6%	6%	6%
MESS-3 112204				22.9	0.0421 U	96	19.7
		certified value		21.2	0.24	105	21.1
		percent difference		8%	NA #	9%	7%
BLANK SPIKE RESULTS							
Amount Spiked				25.0	25.0	25.0	25.0
Blank 112204				0.065 U	0.211 U	0.273 U	0.675
LCS 112204L1				26.4	25.0	25.2	26.2
Amount Recovered				26.4	25.0	25.2	25.5
Percent Recovery				106%	100%	101%	102%
Amount Spiked				NA	100	100	100
Blank 112204				0.065 U	0.211 U	0.273 U	0.675
LCS 112204L2				NA	100	101	104
Amount Recovered				NA	100	101	103
Percent Recovery				NA	100%	101%	103%

MATRIX SPIKE RESULTS

Amount Spiked				25.0	25.0	5128	25.0
2241-16	9/2/04	2	24.4	3.12	0.415	405	21.6
2241-16MS				31.0	25.8	5610	47.6
Amount Recovered				27.9	25.4	5205	25.9
Percent Recovery				112%	101%	102%	104%
Amount Spiked				25.4	25.4	4785	25.4
2241-16	9/2/04	2	24.4	3.12	0.415	405	21.6
2241-16MSD				31.1	25.3	5242	48.5
Amount Recovered				27.9	24.9	4837	26.8
Percent Recovery				110%	98%	101%	106%
RPD				**1%**	**4%**	**0%**	**2%**

REPLICATE ANALYSIS RESULTS

2241-3r1	7/15/04	3-2	26.7	2.92	0.464	578	23.0
2241-3r2	7/15/04	3-2	NA	3.09	0.477	509	20.0
Mean				3.01	0.470	543	21.5
RPD				**5%**	**3%**	**13%**	**14%**

NA Not available/applicable
U Not detected at or above DL shown
RPD Relative percent difference
Outside DQO range - see narrative

APPROVALS:

Project Manager Date

QA/QC Reviewer Date

PROJECT: Ridolfi, Inc. Task 4 (ASU Ecotox / Ridolfi Inc. / NOAA - Cannelton Study)
PARAMETER: Metals on dry weight basis
MATRIX: Tissue

LABORATORY: Battelle Marine Sciences Laboratory, Sequim, Washington
Project Manager: Laurie Niewolny 360-681-3689 or laurie.niewolny@pnl.gov

SAMPLE CUSTODY: Thirty-nine (39) tissue samples were received on 7/16/04 and 9/9/04. The tissue samples were received in good condition. Upon arrival, both cooler temperatures were measured at 2.2˚C and 5.3˚C, respectively. These temperatures were within 4˚C ±2˚C for unpreserved samples. The samples were assigned a Battelle Central File (CF) identification number (2241) and entered into Battelle's log-in system.

QA/QC DATA QUALITY OBJECTIVES:

Analyte	Reference Method	Method Blank	Range of Recovery	SRM Accuracy	Relative Precision
Arsenic	GFAA (EPA 200.9)	≤5xMDL	75-125%	≤20%	≤20%
Cadmium	ICP/OES (EPA 200.7)	≤5xMDL	75-125%	≤20%	≤20%
Chromium	ICP/OES (EPA 200.7)	≤5xMDL	75-125%	≤20%	≤20%
Lead	ICP/OES (EPA 200.7)	≤5xMDL	75-125%	≤20%	≤20%

METHOD: Four metals were analyzed: arsenic (As), cadmium (Cd), chromium (Cr), and lead (Pb). As soon as possible after receipt, the tissue samples were froze to –80°C and freeze-dried to obtain the percentage of moisture. Aliquots of the freeze-dried, homogeneous tissue sample were digested for metals analysis and extracted for the percentage of lipids (Bligh-Dyer 1959). The digestion for metals analysis was a nitric/hydrofluoric acid combination. All analytes were determined via inductively coupled plasma-mass spectroscopy (ICP/MS) following EPA Method 200.8 (EPA 1991). Sample 2241*52 did not receive internal standard so it was reanalyzed several days later. The corresponding ICP/MS direct SRMs are reported (1640) to show the machine was running within limits.

HOLDING TIMES: The sample was received on 7/16/04 and 9/9/04. As soon as possible after receipt, the tissue samples were froze to –80°C and freeze-dried to obtain the percentage of moisture. The samples were analyzed on the following dates:

Lipids analysis:	11/18/04 - 11/23/04
ICP/MS analysis:	11/23/04
Reanalysis of sample 2241*52:	11/29/04

METHOD BLANKS: Two method blanks were analyzed with the set of samples. One blank had a detectable arsenic level and both blanks had detectable chromium but none were greater than 5x the MDL. No corrective action was taken. Data is not blank corrected.

MATRIX AND BLANK SPIKES: Two matrix spike/matrix spike duplicate pairs and two blank spike/blank spike duplicate pairs were prepared at multiple concentrations depending on the analyte and based on previous data. Recoveries of all metals were within the QC limits of 75% to 125% with the exception of one matrix spike duplicate where chromium was recovered at 127%. This was due to the sample being slightly underspiked. This affected the RPD of the MS/MSD pair causing it to exceed the QC limit (≤20%). The other MS/MSD pair RPD was within the QC limit for chromium. No corrective action was taken. All other RPD values for MS/MSD precision were within the QC limit.

SRM: Two different SRMs, DORM-2 and 1566b, were analyzed in duplicate for all four metals. All metals recovered within DQOs with the exception of Cd in one replicate of DORM-2. DORM-2 is certified within 10x of the MDL for Cd Cadmium in the other replicate of DORM-2 and in both replicates of 1566b recovered within the QC limit of ≤20%. No corrective action was taken.

REPLICATES: The tissue samples were digested and analyzed with a duplicate. Precision of duplicate analysis is reported by calculating the relative percent difference (RPD) of replicate results. The RPDs ranged from 3% to 14%, all of which were within the QC limits of ≤20%.

REFERENCES:

Bligh, E.G. and W.J. Dyer. 1959. “A Rapid Method of Total Lipid Extraction and Purification.” Canadian Journal of Biochemistry and Physiology. Vol. 37, No. 8, pp. 911-917.

EPA. 1991. *Methods for the Determination of Metals in Environmental Samples.* EPA-600/4-91-010. Environmental Protection Agency, Environmental Services Division, Monitoring Management Branch. Cincinnati, Ohio.

QUALITY ASSURANCE REVIEW

This report summarizes the review of analytical results generated in support of the NOAA Cannelton Study (Task 4). The criteria applied for this validation are consistent with U.S. EPA analytical methods and laboratory established criteria. Analyses were performed by Batelle Marine Science Laboratory of Sequim, Washington. Sample results are presented with associated data qualifiers in the attached table. Results are reported on a dry weight basis and are not blank corrected.

Sediment Analyses – Metals

Six sediment samples were analyzed for arsenic, cadmium, chromium and lead. Analyses for cadmium, chromium and lead were performed using the Inductively Coupled Plasma–Atomic Emission Spectrometric method (ICP–AES, Method 200.7). Arsenic analyses were performed by the Graphite Furnace Atomic Absorption method (GFAA, Method 200.9). The laboratory provided hard copy and electronic results (field samples and QC samples), case narratives, and copies of chain-of-custody documents and log-in documents.

Sample Documentation, Custody and Holding Conditions / Times: All samples were handled and delivered to the laboratory according to chain-of-custody procedure. No preservatives were added to the samples. The samples were received in two shipments (July 16, 2004 and September 3, 2004). Cooler temperatures were noted as 3.3°C. and 2.2°C., within the recommended temperature range (4 ± 2°C.). The laboratory noted that custody seals were not present on the coolers. Samples were freeze-dried and held at –80°C. until analysis. Maximum holding time for frozen sample material is generally recommended as one year. All sample analyses were performed within the recommended holding time and are considered acceptable.

Initial/Continuing Calibration: Calibration data were not provided by the laboratory and were therefore not reviewed for this report.

Blanks: One preparation blank was analyzed for the target analytes. Arsenic, cadmium and chromium were not reported as detected in the blank. Lead was detected in the blank at concentration of 0.675

µg/g (MDL = 0.0769 µg/g). The lowest reported lead result for an associated sample is 20.0 µg/g, which is about >30X the blank amount. EPA Method 200.7 does not provide numeric criteria for blank performance. EPA's *National Functional Guidelines for Inorganic Data Review* indicates that sample results greater than 10X the concentration of an associated blank do not require qualification. Therefore, blank results are considered acceptable and no associated data are qualified.

Initial/continuing calibration blank results were not provided by the laboratory and were therefore not reviewed for this report.

Blank Spike Analysis: Two spiked preparation blanks were analyzed. Recoveries range from 100% to 106%, and are considered acceptable.

Interference Check Samples: Results for interference check samples were not provided by the laboratory and were therefore not reviewed for this report.

Replicate Sample Analysis: One laboratory duplicate sample was analyzed for the metals target analytes. Relative Percent Differences (RPDs) range from 3% to 14% and are considered acceptable.

Matrix Spike Sample Analyses: One matrix spike/matrix spike duplicate (MS/MSD) pair was analyzed. All metals target analytes were added to the spiked samples. All percent recoveries (%R) and RPDs were within laboratory–specified limits (75 - 125%R; 20% RPD).

ICP Serial Dilution: Results for ICP serial dilution were not provided by the laboratory and were therefore not reviewed for this report.

Standard Reference Materials: The laboratory analyzed standard reference material for internal quality control purposes. NIST 2704 (Buffalo River Sediment) and NRCC MESS-3 (Beaufort Sea Sediment) were each analyzed once. Relative to the certified values, recoveries for NIST 2704 range from 93.3% to 100%. Results for NRC MESS-3 range from 91.4% to 93.4%, with the exception of cadmium (0% R). The laboratory narrative indicates that sample dilution may have interfered with the cadmium detection. The certified value for cadmium (0.24 µg/g) is well above the MDL (0.0421 µg/g).

Three project sample results are close to the MESS-3 cadmium value (Sample 2 = 0.415 µg/g; sample 3-2 = 0.464 µg/g; sample 3-2 replicate = 0.477 µg/g. It is possible that these results are biased low and they are therefore qualified as estimated ("J"). All other reference material results are considered reasonable and acceptable.

Overall Assessment: Recommended sample holding times and conditions were met for all analytes in all samples. Lead was detected in the preparation blank; all associated results are greater than 10 times the blank concentration, and thus no associated results require qualification. Other analytes were not detected in the preparation blank. Acceptance criteria for replicate sample analyses and MS/MSD analyses were met. Results for all laboratory standard reference materials are considered acceptable with the exception of the cadmium result for NRC MESS-3 (no recovery of the analyte). Three associated results are qualified as estimated ("J").

Tissue Analyses – Metals, Percent Lipids

Thirty-nine tissue samples were analyzed for arsenic, cadmium, chromium, lead and percent lipids. Tissues were analyzed for metals by the Inductively Coupled Plasma–Mass Spectrometric method (ICP–MS, Method 200.8); tissues were extracted for total lipids using the method of Bligh-Dyer (1959). The laboratory provided hard copy results (field samples and QC samples), case narratives, and copies of chain-of-custody documents and log-in documents.

Sample Documentation, Custody and Holding Conditions / Times: All samples were handled and delivered to the laboratory according to chain-of-custody procedure. No preservatives were added to the samples. The samples were received in two shipments (July 16, 2004 and September 9, 2004). Cooler temperatures were noted as 3.3°C. and 5.3°C., within the recommended temperature range (4 ± 2°C.). The laboratory noted that custody seals were not present on the coolers. Samples were freeze-dried and held at –80°C. until analysis. Maximum holding time for frozen sample material is generally recommended as one year. All sample analyses were performed within the recommended holding time and are considered acceptable.

ICP-MS Tune Analysis: ICP-MS tuning data were not provided by the laboratory and were therefore not reviewed for this report.

Initial/Continuing Calibration: Metals calibration data were not provided by the laboratory and were therefore not reviewed for this report.

Blanks: Two metals preparation blanks were analyzed for the target analytes. Cadmium and lead were not reported as detected in either blank. Arsenic was detected in one blank at concentration of 0.166 µg/g (MDL = 0.128 µg/g). The lowest reported arsenic result for an associated sample is 2.68 µg/g, which is about >16X the blank amount. Chromium was detected in both blanks at concentrations of 0.175 µg/g and 0.0998 µg/g (MDL = 0.0859). Three associated samples have chromium results less than 1.75 µg/g, which is 10X the highest blank amount. EPA Method 200.8 does not provide numeric criteria for blank performance. EPA's *National Functional Guidelines for Inorganic Data Review* indicates that sample results greater than 10X the concentration of an associated blank do not require qualification. Therefore, blank results for arsenic are considered acceptable and no associated data are qualified. Results for the three chromium determinations (samples SBTO, 1-SB-1, 1-SB-3) are qualified as nondetects ("U").

Two method blanks were analyzed for lipids; both were nondetects at 0.1% total lipids.

Metals initial/continuing calibration blank results were not provided by the laboratory and were therefore not reviewed for this report.

Blank Spike Analysis: Two metals spiked preparation blanks were analyzed as duplicate pairs. Recoveries range from 86% to 100%; RPDs range from 0.7% to 3.7%. Recoveries and RPDs are considered acceptable.

Interference Check Samples: Results for metals interference check samples were not provided by the laboratory and were therefore not reviewed for this report.

Replicate Sample Analysis: Two laboratory duplicate samples were analyzed for the metals target analytes and two laboratory duplicate samples were analyzed for lipids. RPDs for the metals duplicates range from 0% to 2.0% and are considered acceptable. RPDs for the lipids duplicates are 0% and 3.1% and are considered acceptable.

Matrix Spike Sample Analyses: Two metals MS/MSD pairs were analyzed. All metals target analytes were added to the spiked samples. All percent recoveries and RPDs were within laboratory–specified limits (75 - 125%R; 20% RPD) with one exception: the chromium MSD recovery for sample 1-B-2 is 127%. Since the MS recovery is 92%, the RPD is 32%. The laboratory narrative attributes the exception to the sample "being slightly underspiked." The spike level (3.02 µg/g) was similar to the unspiked sample concentration (2.87µg/g). In the MS/MSD with acceptable recoveries, the spike and sample concentration were somewhat higher (about 15 µg/g and 9.47 µg/g, respectively), but the RPD was close to the control limit (19.6%). This suggests that chromium may be somewhat nonhomogeneous in the tissue matrix. Because this exception is relatively minor, no associated data are qualified.

Standard Reference Materials: The laboratory analyzed standard reference material for internal quality control purposes. NIST 1566b (Oyster Tissue), NIST 1640 (Natural Water) and NRC DORM-2 (Dogfish Muscle Tissue) were each analyzed twice for the metals target analytes. Relative to the certified values, recoveries for NIST 1566b range from 86.7% to 92.9%. Results for NIST 1640 range from 90.7% to 112%. Results for NRC DORM-2 range from 88.8% to 98.9, with the exception of cadmium (121%R vs. control limit of 120%R). The exception is minor and no associated results are qualified. Therefore, all reference material results are considered reasonable and acceptable.

ICP-MS Internal Standards: Data for ICP-MS internal standards were not provided by the laboratory and were therefore not reviewed for this report.

Overall Assessment: Recommended sample holding times and conditions were met for all analytes in all samples. Arsenic was detected in one preparation blank; all associated results are greater than 10 times the blank concentration, and thus no associated results require qualification. Chromium was detected in both preparation blanks; three associated results are less than 10 times the higher of the two blank concentrations and thus are qualified as nondetects ("U"). Other analytes were not detected in the

preparation blanks. Acceptance criteria for replicate sample analyses and MS/MSD analyses were met with the exception of chromium in one MS/MSD sample. The exception is minor and no associated results are qualified; however, the results suggest that chromium may be somewhat nonhomogeneous in the tissue matrix. Results for all laboratory standard reference materials are considered acceptable.