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Kingston Ash Recovery Project
Non-Time-Critical Removal Action

River System Sampling and Analysis Plan
Task Completion Technical Memorandum
Turtle Sampling

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for the Tennessee Valley Authority

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Table of Contents

1. PURPOSE 1
2. BACKGROUND 1
3. SAMPLING AND ANALYSIS ACTIVITIES 2
4. ANALYTICAL DATA REVIEW 3
5. DATA QUALITY SUMMARY 4
6. DATA SUMMARY 5

List of Tables

Table 1. Summary of Turtle Field Activities 2
Table 2. Applicable TVA Documents and Standard Operating Procedures 3
Table 3. Data Review Summary 4
Table 4. Summary of Turtle Data Quality 5
Table 5. 2009 Common Musk Turtle Blood Sampling in Ash-Impacted Areas 6
Table 6. 2010 Common Musk Turtle Blood Sampling at Emory River Miles 0.5 through 4.5 7
Table 7. 2009 Common Musk Turtle Blood Sampling at Clinch River Mile 2.5 8
Table 8. 2010 Common Musk Turtle Blood Sampling at Clinch River Miles 2.5 and 4.0 9
Table 9. 2010 Common Musk Turtle Blood Sampling at Tennessee River Mile 566.0 10
Table 10. 2010 Common Musk Turtle Blood Sampling at Tennessee River Miles 569.5 and 571.5 11
Table 11. 2009 Snapping Turtle Blood Sampling in Ash-Impacted Areas 12
Table 12. 2010 Snapping Turtle Blood Sampling at Emory River Miles 0.5 through 4.5 13
Table 13. 2009 Snapping Turtle Blood Sampling at Clinch River Mile 2.0 14
Table 14. 2010 Snapping Turtle Blood Sampling at Clinch River Mile 4.0 15
Table 15. 2010 Snapping Turtle Blood Sampling at Tennessee River Miles 563.0 and 566.0 16
Table 16. 2009 Snapping Turtle Blood Sampling at Clinch River Miles 6.5 and 8.0 17
Table 17. 2009 Snapping Turtle Blood Sampling at the Timberlake Reference 18
Table 18. 2010 Snapping Turtle Blood Sampling at Tennessee River Miles 569.5 and 571.5 19
Table 19. 2010 Eastern Spiny Softshell Turtle Blood Sampling at Emory River Miles 0.5 through 5.0 20
Table 20. 2010 Eastern Spiny Softshell Turtle Blood Sampling at Clinch River Miles 2.0, 2.5, and 4.0 21
Table 21. 2010 Eastern Spiny Softshell Turtle Sampling at Tennessee River Miles 563.0 and 566.0 22
Table 22. 2010 Eastern Spiny Softshell Turtle Blood Sampling at Tennessee River Mile 571.5 23
Table 23. 2010 Eastern Spiny Softshell Turtle Blood Sampling at Emory River Miles 0.5 through 5.0 24
Table 24. 2010 Eastern Spiny Softshell Turtle Blood Carapace Sampling at Clinch River Miles 2.0, 2.5, and 4.0 25
Table 25. 2010 Eastern Spiny Softshell Turtle Carapace Sampling at Tennessee River Miles 563.0 and 566.0 26
Table 26. 2010 Eastern Spiny Softshell Turtle Carapace Sampling at Tennessee River Mile 571.5 27

List of Figures (Attached)

Figure 1. Turtle Sampling, 2009 and 2010
Figure 2. Field Crew Checking Turtle Trap
Figure 3. Field Crew Measuring Carapace Length of Snapping Turtle
Figure 4a. Field Crew Collecting Blood Sample from Snapping Turtle
Figure 4b. Field Crew Collecting Toenail Sample from Eastern Spiny Softshell Turtle
Figure 4c. Field Crew Collecting Carapace Sample From Eastern Spiny Softshell Turtle

Appendices

Appendix A: Summary of Turtle Sampling Collections
Appendix B: Summary of Reptile Shipments

List of Acronyms

COC	chain-of-custody
CRM	Clinch River Mile
DQO	data quality objective
EDD	electronic data deliverable
EE/CA	Engineering Evaluation/Cost Analysis
EEMBAY	East Embayment
ERM	Emory River Mile
KIF	Kingston Fossil Plant
MDL	method detection limit
ND	not detected
Pace Analytical	Pace Analytical Services, Inc.
PIT	passive integrated transponder
QC	quality control
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
TM	Technical Memorandum
TRM	Tennessee River Mile
TVA	Tennessee Valley Authority
Virginia Tech	Virginia Polytechnic Institute and State University
WEMBAY	West Embayment
WP	Work Package

1. PURPOSE

The purpose of this Technical Memorandum (TM) is to summarize the completion of the 2009 and 2010 turtle sampling as described in the approved *Kingston Ash Recovery Project Non-Time-Critical Removal Action for the River System Sampling and Analysis Plan (SAP), Rev. 3, May 24, 2010, Document No. EPA-AO-021*. This TM is one of a series being prepared to summarize the field work and data collection activities as SAP tasks are completed. The TM series is intended to provide interim presentations of data that will become the bases for the nature and extent of contamination section of the River System Engineering Evaluation/Cost Analysis (EE/CA) Report. No data evaluation or conclusions are presented.

2. BACKGROUND

While turtle biosurveys are not required in the Baseline Ecological Risk Assessment, Section 2.2.9 of the SAP discusses how these data will be used to support the overall evaluation of ecological risk within the river system. Concentrations of ash-related constituents may bioaccumulate in wildlife over time and adversely affect wildlife populations. In addition, some wildlife are a food source for higher-level predators. To estimate the potential ingestion of ash-related constituents in wildlife by ecological receptors, the concentrations of those constituents in wildlife tissues must be determined.

When possible, risks to turtles will be assessed primarily through comparisons of measured concentrations in blood and other tissues with effects values from scientific literature in order to evaluate potential impacts of ash related constituents on these species. Literature values may be of limited availability for most constituents and species; therefore, body burden concentrations may be only supplemental evidence of exposure. Metal and metalloid concentrations in turtles will be compared between impacted and unimpacted sites, as well as between years. Elevated concentrations at impacted sites and changes in concentrations over time may indicate environmental stress and potential risk to reptiles.

Turtle sampling efforts began in 2009, approximately eight months after the spill, in order to provide concentrations for future site comparisons. These sampling efforts were continued in 2010. In 2009, two species of turtles, the common musk turtles (*Sternotherus odoratus*) and common snapping turtles (*Chelydra serpentina*), were collected for blood analysis of metals and metalloids. In 2010, an additional target species was included, eastern spiny softshell turtles (*Apalone spinifera spinifera*). In addition to blood samples, toenail and carapace samples were also collected for analysis of metals/metalloids (carapace samples were only collected from softshell turtles).

In 2009, sampling locations were selected to provide representative measurement of turtles found in sites impacted by ash (East Embayment, West Embayment, Ash Pond, Emory River, and the downstream Clinch River), and in sites near the Kingston Fossil Plant (KIF) not impacted by ash (the upstream Clinch River above the Emory River confluence and a reference pond in Knox County). In 2010, sampling locations for sites impacted by ash were focused on the Emory River, the downstream Clinch River, and the downstream Tennessee River, and one reference area on the upstream Tennessee River. Blood, toenail, and carapace samples (softshell turtles only) were collected from each target species, with a target range of 10 to 20 blood samples in 2009 (for musk and snapping turtles), and a target of 20 blood samples, 20 toenail samples, and 20 carapace samples in 2010 (for musk, snapping, and softshell turtles).

3. SAMPLING AND ANALYSIS ACTIVITIES

Field activities occurred in the summer of 2009 and 2010 in accordance with Standard Operating Procedure (SOP) TVA-KIF-SOP-17 *Turtle Sampling* (originally issued September 2009; Revision 1 issued May 2010). Turtle sampling was typically conducted Monday through Friday, from August 12 through October 30, 2009 and from May 26 through September 1, 2010. Field crews deployed traps early in the week and returned to check each trap the following day. Traps were pulled out of the water at the end of each week. Target species captured were collected and brought back to the sampling lab for processing. Processing consisted of weighing, measuring plastron length, measuring carapace length and width, marking with a unique sample code (either by scute notching or passive integrated transponder (PIT) tagging), and collecting a blood, toenail, and carapace (softshell only) sample. Processed turtles were then returned to their points of capture and released. In 2010, turtles of any species found dead in traps were collected and frozen (if the specimen was a target species, toenail and carapace samples were collected prior to freezing). Specimens recaptured from the previous year were weighed, measured, and sampled; however, recaptures from the same year were only weighed and measured, with no additional samples collected.

All tissue samples were immediately frozen upon collection in labeled, individual vials and custody sealed. Samples were then shipped to the lab on dry ice for chemical analysis. There were no quality assurance/quality control (QC) samples collected in either sampling year, given that all equipment was in sealed packaging and certified clean from the manufacturer. Field duplicates and collocated samples were not applicable for these collections. Field collection activities for 2009 and 2010 are summarized in Table 1.

Table 1. Summary of Turtle Field Activities

Summary	2009	2010
Field Collection Period	August 12 through October 30[a]	May 26 through September 1
Number Blood Samples[b]	46	230
Number Toenail Samples[b]	Not collected	234
Number Carapace Samples[b]	Not collected	81

Notes:

[a]One additional blood sample was collected after the collection period ended (November 18) from a snapping turtle found hibernating on site.

[b]See Appendix A for collection details.

Sampling and analysis were performed in accordance with the *Quality Assurance Project Plan For The Tennessee Valley Authority Kingston Ash Recovery Project* hereinafter referred to as the TVA-KIF-QAPP, the listed SOPs, field guides, and work package WP-1015. Table 2 identifies the applicable TVA documents and SOPs associated with this turtle sampling. In some cases, the target number of each species could not be obtained from each sampling location.

In 2009, all field samples were shipped to Pace Analytical Services, Inc., Green Bay, Wisconsin (Pace Analytical) for analysis. In 2010, samples were shipped to two labs: Pace Analytical and Virginia Polytechnic Institute and State University (Virginia Tech). The first 20 blood and carapace samples collected from each species at each location were analyzed by Pace Analytical. Any additional blood, toenail, or carapace samples collected above the target number of 20 were sent to Virginia Tech. In addition, all toenail samples and any deceased whole body turtles recovered opportunistically during the field season were also shipped to Virginia Tech. Blood and carapace samples were analyzed for a suite of 26 metals/metalloids and percent moisture. The chemical analyses to be performed on toenail and whole

body turtles have not yet been determined. These samples will be held at Virginia Tech until a decision on analysis is made (*personal communication*, Dr. William Hopkins).

Table 2. Applicable TVA Documents and Standard Operating Procedures

Document	Document Number
TVA KIF Ash Recovery Project Quality Assurance Project Plan	TVA-KIF-QAPP
TVA-KIF Work Package: Turtles	WP-1015
STANDARD OPERATION PROCEDURES	
Turtle Sampling	TVA-KIF-SOP-17
Field Documentation	TVA-KIF-SOP-06
Sample Labeling, Packing, and Shipping	TVA-KIF-SOP-07
Decontamination of Equipment	TVA-KIF-SOP-08
Field Quality Control Sampling	TVA-KIF-SOP-11
Management and Implementation of EQuIS™-Based Chain-of-Custody	TVA-KIF-SOP-18

Note: For definitions, see the Acronyms section.

4. ANALYTICAL DATA REVIEW

TVA's contracted laboratories were required to submit three types of deliverables: a limited (Level 1) data package containing sample results and batch QC sample results; a fully-documented (Level 4) data package including raw data for all analyses; and electronic data deliverables (EDDs) for storage in TVA's EarthSoft EQuIS® database.

EDDs were subjected to completeness and correctness testing during loading to TVA's EQuIS database; once loaded to the EQuIS database, the data were subjected to verification. As defined in the TVA-KIF-QAPP, data verification involved comparison of the data loaded in the EQuIS database to the results reported in the Level 1 data package. In addition, data verification included review of the batch QC summary forms for compliance with the applicable methods and for data usability with respect to the project data quality objectives (DQOs) and the TVA-KIF-QAPP.

Following receipt of the Level 4 data package, data were subjected to validation. As defined in the TVA-KIF-QAPP, data validation included review of raw data and associated QC summary forms for compliance with the applicable methods and for data usability with respect to the appropriate guidance documents. As stated in the TVA-KIF-QAPP: "Initially, 100% of the chemical analysis data will be reported in full documentation data packages for independent data validation. Depending on the nature and frequency of issues identified during data validation, the percentage of data undergoing full data validation may be reduced to a lesser percentage (such as 20%) or data verification may be substituted. The reduction in full data validation may be matrix specific, laboratory specific, or analyte specific. If after the percentage of full data validation has decreased, a trend in frequency of reporting issues, method non-compliances, or data usability issues is identified, data validation will be conducted for specific data points or the percentage of full data validation percentage may be increased until the issues have been minimized to their initial frequency." Data validation expands upon the completeness, correctness, and usability assessment performed during verification to include evaluation of instrumental QC analyses, review of sample preparation information, and recalculation of reported results from raw data. A summary of the data review effort is presented in Table 3.

Table 3. Data Review Summary

No. COCs	Matrix	No. Samples	No. Equipment Blank Samples	No. Analytical Results	Percentage Validated
81	Blood	269	0	7,242	100%
	Carapace	70		1,820	
Total	**-**	**339**	**-**	**9,062**	**-**

Note: Summary includes only those samples analyzed at Pace.

5. DATA QUALITY SUMMARY

Data validation was performed based on the sample results, summary QC data, and raw data provided by the laboratory. Data validation includes a review of the following QC measures (where applicable):

- Sample condition upon laboratory receipt;
- Initial calibration linearity;
- Blank analysis results greater than the method detection limit (MDL);
- Sample preparation and holding times;
- Initial calibration verification/continuing calibration verification standard recoveries;
- Inductively coupled plasma interference check standard results;
- MDLs and linear ranges;
- Internal standard recoveries;
- Percent moisture;
- Pre and Post matrix spike/matrix spike duplicate;
- Laboratory duplicate precision;
- Quantitation of positive results;
- Laboratory control sample/laboratory control sample duplicate recoveries and precision;
- Analytical sequence;
- Reporting limit standard recoveries;
- MDL verification standards; and
- Standard reference material recoveries.

The data met the DQOs defined for this task and are acceptable for use. Table 4 summarizes the data quality based on the review performed and as compared to the data quality measures identified in the TVA-KIF-QAPP. The text of the data validation reports for the samples included in this TM will be included in the EE/CA Report.

Table 4. Summary of Turtle Data Quality

Matrix	Analytical Results (Total Count)	Acceptable (No Qualification)[a]		Acceptable (Estimated)[b]		Blank Qualified[c]		Rejected[d]	
Blood	7,242	5,111	*71%*	1,775	*25%*	107	*1%*	249	*3%*
Carapace	1,820	1,577	*87%*	174	*10%*	69	*4%*	0	*0%*

Notes: Summary includes only those samples analyzed at Pace.

[a]Acceptable, No Qualification – Qualification of data was not warranted based on a review of the applicable QC measures.

[b]Acceptable, Estimated – Quantitation or detection limit is approximate due to limitations or bias identified during a review of the applicable QC measures.

[c]Blank Qualified – Result is considered "not-detected" because it was detected in an associated blank at a similar level.

[d]Rejected – Unreliable result or detection limit; analyte may or may not be present in sample.

[e]Most rejected results are percent moisture results qualified as unusable due to limited sample mass and/or extended frozen storage prior to moisture determination. A few results were also rejected due to very low matrix spike recoveries.

6. DATA SUMMARY

Summary statistics for each turtle species are provided in Tables 5 through 26 for each location collected in 2009 and 2010. Rejected percent moisture results were due to small sample sizes and uncertainty in holding times; as a result, the data for each species are presented in wet weight until the percent moistures issues have been clarified.

Table 5. 2009 Common Musk Turtle Blood Sampling in Ash-Impacted Areas

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	0.79 / 25.3	ND	ND	ND			0 / 18	0
Antimony	mg/kg	0.017 / 0.1	ND	ND	ND			0 / 18	0
Arsenic	mg/kg	0.014 / 0.1	ND	0.096	0.096	CHURCHSLOUGHTRAP	10/30/2009	1 / 18	0.096
Barium	mg/kg	0.018 / 0.1	ND	0.026	0.48	EEMBAY	10/07/2009	10 / 18	0.2173
Beryllium	mg/kg	0.0029 / 0.1	ND	ND	ND			0 / 18	0
Boron	mg/kg	0.057 / 2	ND	ND	ND			0 / 18	0
Cadmium	mg/kg	0.0053 / 0.1	ND	ND	ND			0 / 18	0
Calcium	mg/kg	44.4 / 101	ND	64.5	150	EEMBAY	10/07/2009	11 / 18	95.64
Chromium	mg/kg	0.095 / 0.2	ND	ND	ND			0 / 18	0
Cobalt	mg/kg	0.0044 / 0.1	ND	0.06	0.14	ERM1.0	08/28/2009	4 / 18	0.0925
Copper	mg/kg		0.38	0.38	1.5	EEMBAYMENTTRAP	08/25/2009	18 / 18	0.665
Iron	mg/kg		117	117	301	EEMBAYMENTTRAP	08/25/2009	18 / 18	218
Lead	mg/kg	0.0094 / 0.1	ND	0.011	0.032	EEMBAY	10/07/2009	9 / 18	0.018
Magnesium	mg/kg	44.4 / 101	ND	54.2	75.6	CHURCHSLOUGHTRAP	10/30/2009	8 / 18	65.24
Manganese	mg/kg	0.075 / 0.51	ND	0.14	0.39	CHURCHSLOUGHTRAP	10/30/2009	9 / 18	0.2444
Mercury	mg/kg	0.004 / 0.025	ND	0.036	0.036	CHURCHSLOUGHTRAP	10/30/2009	1 / 18	0.036
Molybdenum	mg/kg	0.0096 / 1	ND	ND	ND			0 / 18	0
Nickel	mg/kg	0.03 / 0.1	ND	0.034	0.052	EEMBAY	09/30/2009	6 / 18	0.04333
Potassium	mg/kg		583	583	1110	CHURCHSLOUGHTRAP	10/30/2009	18 / 18	837.6
Selenium	mg/kg		0.42	0.42	1.3	CHURCHSLOUGHTRAP	10/30/2009	18 / 18	0.6633
Silver	mg/kg	0.0027 / 0.051	ND	ND	ND			0 / 18	0
Sodium	mg/kg		1850	1850	2260	ERM3.0TRAP	08/25/2009	18 / 18	2111
Strontium	mg/kg	0.013 / 0.1	ND	0.05	0.41	EEMBAY	10/07/2009	16 / 18	0.1679
Thallium	mg/kg	0.013 / 0.1	ND	ND	ND			0 / 18	0
Vanadium	mg/kg	0.049 / 0.2	ND	ND	ND			0 / 18	0
Zinc	mg/kg		3.7	3.7	7.3	EEMBAYMENTTRAP	08/25/2009	18 / 18	5.394

Notes:
For definitions, see the Acronyms section.

Table 6. 2010 Common Musk Turtle Blood Sampling at Emory River Miles 0.5 through 4.5

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
% Moisture	%		90.1	90.1	90.1	ERM3.0	05/27/2010	1 / 1	90.1
Aluminum	mg/kg	3.5 / 4.5	ND	ND	ND			0 / 23	0
Antimony	mg/kg	0.012 / 0.016	ND	ND	ND			0 / 23	0
Arsenic	mg/kg	0.024 / 0.058	ND	ND	ND			0 / 23	0
Barium	mg/kg	0.04 / 0.048	ND	0.043	0.88	ERM4.0	05/27/2010	11 / 23	0.2428
Beryllium	mg/kg	0.026 / 0.059	ND	ND	ND			0 / 23	0
Boron	mg/kg	0.36 / 0.47	ND	ND	ND			0 / 23	0
Cadmium	mg/kg	0.0066 / 0.0085	ND	0.0068	0.019	ERM0.5	06/10/2010	7 / 23	0.009729
Calcium	mg/kg		47.3	47.3	235	ERM2.0	05/28/2010	23 / 23	93.38
Chromium	mg/kg	0.11 / 0.19	ND	ND	ND			0 / 23	0
Cobalt	mg/kg	0.012 / 0.016	ND	0.048	0.19	ERM3.5	05/27/2010	22 / 23	0.1116
Copper	mg/kg		0.41	0.41	1.7	ERM4.5	06/10/2010	23 / 23	0.7822
Iron	mg/kg		30.9	30.9	273	ERM4.0	05/27/2010	23 / 23	153.5
Lead	mg/kg	0.024 / 0.029	ND	0.035	0.14	ERM0.5	06/08/2010	5 / 23	0.064
Magnesium	mg/kg	41.7 / 49.6	ND	48.6	77.1	ERM2.0	05/28/2010	19 / 23	60.09
Manganese	mg/kg	0.15 / 0.18	ND	0.17	1.5	ERM0.5	06/08/2010	19 / 23	0.3637
Mercury	mg/kg	0.01 / 0.026	ND	0.013	0.17	ERM0.5	06/10/2010	10 / 23	0.0359
Molybdenum	mg/kg	0.03 / 0.04	ND	ND	ND			0 / 23	0
Nickel	mg/kg	0.084 / 0.11	ND	ND	ND			0 / 23	0
Potassium	mg/kg	208 / 705	ND	472	1200	ERM0.5	06/08/2010	21 / 23	733.1
Selenium	mg/kg		0.18	0.18	0.92	ERM3.0	06/10/2010	23 / 23	0.4696
Silver	mg/kg	0.0025 / 0.0032	ND	ND	ND			0 / 23	0
Sodium	mg/kg		2060	2060	2700	ERM3.5	05/28/2010	23 / 23	2343
Strontium	mg/kg		0.074	0.074	0.52	ERM2.0	05/28/2010	23 / 23	0.1713
Thallium	mg/kg	0.012 / 0.015	ND	ND	ND			0 / 23	0
Vanadium	mg/kg	0.04 / 0.091	ND	ND	ND			0 / 23	0
Zinc	mg/kg		3.2	3.2	10.9	ERM0.5	06/08/2010	23 / 23	6.183

Notes:
For definitions, see the Acronyms section.

Table 7. 2009 Common Musk Turtle Blood Sampling at Clinch River Mile 2.5

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	0.83 / 0.88	ND	ND	ND			0 / 6	0
Antimony	mg/kg	0.018 / 0.019	ND	ND	ND			0 / 6	0
Arsenic	mg/kg	0.015 / 0.016	ND	ND	ND			0 / 6	0
Barium	mg/kg		0.032	0.032	0.35	CRM2.5	09/23/2009	6 / 6	0.0905
Beryllium	mg/kg	0.0031 / 0.0033	ND	ND	ND			0 / 6	0
Boron	mg/kg	0.061 / 0.14	ND	ND	ND			0 / 6	0
Cadmium	mg/kg	0.0056 / 0.02	ND	ND	ND			0 / 6	0
Calcium	mg/kg		62.7	62.7	184	CRM2.5	09/23/2009	6 / 6	90.37
Chromium	mg/kg	0.12 / 0.12	ND	ND	ND			0 / 6	0
Cobalt	mg/kg		0.051	0.051	0.16	CRM2.5	09/17/2009	6 / 6	0.09983
Copper	mg/kg		0.5	0.5	1	CRM2.5	09/17/2009	6 / 6	0.7317
Iron	mg/kg		128	128	304	CRM2.5	09/23/2009	6 / 6	216.5
Lead	mg/kg	0.01 / 0.01	ND	0.01	0.022	CRM2.5	09/23/2009	5 / 6	0.0152
Magnesium	mg/kg	47.1 / 48.8	ND	58.2	70.8	CRM2.5	09/23/2009	5 / 6	65.32
Manganese	mg/kg		0.13	0.13	0.39	CRM2.5	09/23/2009	6 / 6	0.2733
Mercury	mg/kg	0.0058 / 0.014	ND	ND	ND			0 / 6	0
Molybdenum	mg/kg	0.011 / 0.022	ND	ND	ND			0 / 6	0
Nickel	mg/kg		0.036	0.036	0.45	CRM2.5	09/17/2009	6 / 6	0.1118
Potassium	mg/kg		545	545	1050	CRM2.5	09/23/2009	6 / 6	812.2
Selenium	mg/kg		0.56	0.56	1.2	CRM2.5	09/23/2009	6 / 6	0.79
Silver	mg/kg	0.0028 / 0.0099	ND	ND	ND			0 / 6	0
Sodium	mg/kg		1980	1980	2390	CRM2.5	09/23/2009	6 / 6	2145
Strontium	mg/kg		0.085	0.085	0.36	CRM2.5	09/23/2009	6 / 6	0.143
Thallium	mg/kg	0.014 / 0.015	ND	ND	ND			0 / 6	0
Vanadium	mg/kg	0.052 / 0.055	ND	ND	ND			0 / 6	0
Zinc	mg/kg		4.6	4.6	5.9	CRM2.5	09/23/2009	6 / 6	5.167

Notes:
For definitions, see the Acronyms section.

Table 8. 2010 Common Musk Turtle Blood Sampling at Clinch River Miles 2.5 and 4.0

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	2.2 / 4.2	ND	ND	ND			0 / 41	0
Antimony	mg/kg	0.0079 / 0.015	ND	0.036	0.044	CRM4.0	05/28/2010	2 / 46	0.04
Arsenic	mg/kg	0.024 / 0.058	ND	0.024	0.11	CRM2.5	06/22/2010	28 / 46	0.06025
Barium	mg/kg	0.025 / 0.048	ND	0.04	1.1	CRM2.5	07/20/2010	23 / 46	0.2785
Beryllium	mg/kg	0.016 / 0.062	ND	ND	ND			0 / 46	0
Boron	mg/kg	0.23 / 0.43	ND	0.64	0.64	CRM4.0	06/08/2010	1 / 46	0.64
Cadmium	mg/kg	0.0041 / 0.016	ND	0.0072	0.14	CRM4.0	05/28/2010	17 / 46	0.01844
Calcium	mg/kg		50.8	50.8	306	CRM2.5	07/20/2010	46 / 46	103.1
Chromium	mg/kg	0.069 / 0.13	ND	0.15	0.15	CRM2.5	07/20/2010	1 / 46	0.15
Cobalt	mg/kg	0.0077 / 0.013	ND	0.014	0.26	CRM2.5	06/22/2010	44 / 46	0.1323
Copper	mg/kg		0.39	0.39	1.1	CRM2.5	07/13/2010	46 / 46	0.767
Iron	mg/kg		45.8	45.8	335	CRM4.0	05/27/2010	46 / 46	207.5
Lead	mg/kg	0.015 / 0.053	ND	0.024	0.12	CRM4.0	05/28/2010	14 / 46	0.04564
Magnesium	mg/kg	26.2 / 50	ND	53.3	89.2	CRM4.0	06/30/2010	43 / 46	67.59
Manganese	mg/kg	0.093 / 0.17	ND	0.19	1.4	CRM4.0	05/28/2010	44 / 46	0.4677
Mercury	mg/kg	0.0063 / 0.02	ND	0.011	0.12	CRM4.0	06/10/2010	27 / 46	0.03122
Molybdenum	mg/kg	0.019 / 0.036	ND	0.021	0.021	CRM4.0	05/28/2010	1 / 46	0.021
Nickel	mg/kg	0.053 / 0.1	ND	0.27	0.27	CRM2.5	07/23/2010	1 / 46	0.27
Potassium	mg/kg	131 / 750	ND	611	1290	CRM4.0	06/10/2010	42 / 46	933.2
Selenium	mg/kg		0.29	0.29	1.6	CRM4.0	05/27/2010	46 / 46	0.8567
Silver	mg/kg	0.0016 / 0.003	ND	0.0034	0.019	CRM4.0	05/28/2010	2 / 46	0.0112
Sodium	mg/kg		1940	1940	2630	CRM2.5	07/13/2010	46 / 46	2237
Strontium	mg/kg		0.051	0.051	1	CRM2.5	07/20/2010	46 / 46	0.222
Thallium	mg/kg	0.0075 / 0.014	ND	0.02	0.02	CRM4.0	05/28/2010	1 / 46	0.02
Vanadium	mg/kg	0.025 / 0.094	ND	0.031	0.031	CRM4.0	05/28/2010	1 / 46	0.031
Zinc	mg/kg		2.3	2.3	11.9	CRM4.0	05/28/2010	46 / 46	6.478

Notes:

For definitions, see the Acronyms section.

Table 9. 2010 Common Musk Turtle Blood Sampling at Tennessee River Mile 566.0

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	3.6 / 4.2	ND	ND	ND			0 / 24	0
Antimony	mg/kg	0.013 / 0.015	ND	ND	ND			0 / 24	0
Arsenic	mg/kg	0.025 / 0.029	ND	0.03	0.036	TRM566.0	07/28/2010	5 / 24	0.0324
Barium	mg/kg	0.041 / 0.048	ND	0.047	0.44	TRM566.0	07/27/2010	14 / 24	0.1214
Beryllium	mg/kg	0.027 / 0.062	ND	ND	ND			0 / 24	0
Boron	mg/kg	0.37 / 0.43	ND	ND	ND			0 / 24	0
Cadmium	mg/kg	0.0068 / 0.0079	ND	0.008	0.0082	TRM566.0	08/03/2010	2 / 24	0.0081
Calcium	mg/kg		64.4	64.4	158	TRM566.0	07/27/2010	24 / 24	89.95
Chromium	mg/kg	0.11 / 0.13	ND	ND	ND			0 / 24	0
Cobalt	mg/kg		0.066	0.066	0.18	TRM566.0	07/29/2010	24 / 24	0.1298
Copper	mg/kg		0.45	0.45	1	TRM566.0	08/03/2010	24 / 24	0.7867
Iron	mg/kg		58	58	253	TRM566.0	07/28/2010	24 / 24	157.2
Lead	mg/kg	0.025 / 0.029	ND	0.031	0.065	TRM566.0	07/27/2010	4 / 24	0.04525
Magnesium	mg/kg	43.3 / 49.6	ND	49.6	77	TRM566.0	08/03/2010	19 / 24	62.16
Manganese	mg/kg	0.15 / 0.16	ND	0.17	0.74	TRM566.0	07/28/2010	23 / 24	0.3391
Mercury	mg/kg	0.01 / 0.012	ND	0.012	0.017	TRM566.0	07/27/2010	6 / 24	0.01367
Molybdenum	mg/kg	0.032 / 0.036	ND	ND	ND			0 / 24	0
Nickel	mg/kg	0.088 / 0.1	ND	0.12	0.12	TRM566.0	07/27/2010	1 / 24	0.12
Potassium	mg/kg	595 / 1680	ND	730	1190	TRM566.0	07/27/2010	17 / 24	966.4
Selenium	mg/kg		0.3	0.3	0.69	TRM566.0	08/03/2010	24 / 24	0.5025
Silver	mg/kg	0.0026 / 0.003	ND	ND	ND			0 / 24	0
Sodium	mg/kg		1930	1930	2740	TRM566.0	07/28/2010	24 / 24	2217
Strontium	mg/kg		0.09	0.09	0.32	TRM566.0	07/27/2010	24 / 24	0.1419
Thallium	mg/kg	0.012 / 0.014	ND	ND	ND			0 / 24	0
Vanadium	mg/kg	0.041 / 0.094	ND	ND	ND			0 / 24	0
Zinc	mg/kg		4.5	4.5	11.5	TRM566.0	08/03/2010	24 / 24	7.479

Notes:

Data are presented in wet weight.
For definitions, see the Acronyms section.

Table 10. 2010 Common Musk Turtle Blood Sampling at Tennessee River Miles 569.5 and 571.5

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	3.5 / 4.2	ND	ND	ND			0 / 41	0
Antimony	mg/kg	0.013 / 0.015	ND	ND	ND			0 / 41	0
Arsenic	mg/kg	0.025 / 0.058	ND	0.026	0.037	TRM571.5	07/13/2010	2 / 41	0.0315
Barium	mg/kg	0.04 / 0.048	ND	0.041	0.45	TRM571.5	07/01/2010	19 / 41	0.1654
Beryllium	mg/kg	0.026 / 0.062	ND	ND	ND			0 / 41	0
Boron	mg/kg	0.37 / 0.43	ND	ND	ND			0 / 41	0
Cadmium	mg/kg	0.0067 / 0.016	ND	ND	ND			0 / 41	0
Calcium	mg/kg		67.2	67.2	253	TRM571.5	06/30/2010	41 / 41	105.5
Chromium	mg/kg	0.11 / 0.13	ND	ND	ND			0 / 41	0
Cobalt	mg/kg	0.012 / 0.015	ND	0.015	0.22	TRM571.5	07/20/2010	29 / 41	0.08652
Copper	mg/kg		0.24	0.24	1.1	TRM569.5	06/17/2010	41 / 41	0.6254
Iron	mg/kg		114	114	298	TRM571.5	07/20/2010	41 / 41	213.7
Lead	mg/kg	0.025 / 0.029	ND	0.026	0.14	TRM571.5	06/22/2010	21 / 41	0.06162
Magnesium	mg/kg		54.4	54.4	85.3	TRM571.5	06/30/2010	41 / 41	66.36
Manganese	mg/kg		0.23	0.23	1.7	TRM571.5	06/22/2010	41 / 41	0.6517
Mercury	mg/kg	0.01 / 0.012	ND	0.012	0.16	TRM571.5	06/30/2010	35 / 41	0.04834
Molybdenum	mg/kg	0.031 / 0.036	ND	ND	ND			0 / 41	0
Nickel	mg/kg	0.086 / 0.1	ND	ND	ND			0 / 41	0
Potassium	mg/kg	213 / 731	ND	762	1340	TRM569.5	06/17/2010	40 / 41	1013
Selenium	mg/kg		0.22	0.22	0.73	TRM571.5	07/01/2010	41 / 41	0.3849
Silver	mg/kg	0.0026 / 0.0099	ND	ND	ND			0 / 41	0
Sodium	mg/kg		1790	1790	2480	TRM569.5	06/17/2010	41 / 41	2159
Strontium	mg/kg		0.046	0.046	0.78	TRM571.5	06/30/2010	41 / 41	0.1868
Thallium	mg/kg	0.012 / 0.014	ND	ND	ND			0 / 41	0
Vanadium	mg/kg	0.041 / 0.094	ND	ND	ND			0 / 41	0
Zinc	mg/kg		4.4	4.4	13.5	TRM571.5	08/10/2010	41 / 41	8.312

Notes:

Data are presented in wet weight.
For definitions, see the Acronyms section.

Table 11. 2009 Snapping Turtle Blood Sampling in Ash-Impacted Areas

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	0.82 / 1.2	ND	ND	ND			0 / 7	0
Antimony	mg/kg	0.018 / 0.026	ND	ND	ND			0 / 7	0
Arsenic	mg/kg	0.015 / 0.021	ND	0.22	0.22	ASHPOND	11/19/2009	1 / 7	0.22
Barium	mg/kg	0.019 / 0.021	ND	0.024	0.12	ERM3.0	09/03/2009	4 / 7	0.051
Beryllium	mg/kg	0.0031 / 0.0045	ND	ND	ND			0 / 7	0
Boron	mg/kg	0.06 / 0.54	ND	ND	ND			0 / 7	0
Cadmium	mg/kg	0.0056 / 0.019	ND	ND	ND			0 / 7	0
Calcium	mg/kg	46.5 / 49.9	ND	67.3	114	ERM3.0	09/03/2009	6 / 7	85.72
Chromium	mg/kg	0.12 / 0.17	ND	ND	ND			0 / 7	0
Cobalt	mg/kg	0.0047 / 0.022	ND	0.047	0.047	ASHPOND	11/19/2009	1 / 7	0.047
Copper	mg/kg	0.17 / 0.18	ND	0.31	0.63	ERM0.5	09/11/2009	6 / 7	0.49
Iron	mg/kg		98.1	98.1	250	ERM0.5	09/11/2009	7 / 7	169.7
Lead	mg/kg	0.0099 / 0.011	ND	0.011	0.083	ERM3.0	09/03/2009	5 / 7	0.028
Magnesium	mg/kg	46.5 / 49.9	ND	56.4	69	ASHPOND	11/19/2009	4 / 7	63.18
Manganese	mg/kg		0.21	0.21	1.3	ERM3.0	09/03/2009	7 / 7	0.6557
Mercury	mg/kg	0.0042 / 0.036	ND	0.058	0.096	ERM1.2	08/31/2009	3 / 7	0.08333
Molybdenum	mg/kg	0.01 / 0.015	ND	ND	ND			0 / 7	0
Nickel	mg/kg	0.031 / 0.034	ND	0.04	0.44	ASHPOND	11/19/2009	5 / 7	0.1318
Potassium	mg/kg		491	491	1150	ERM0.5	09/11/2009	7 / 7	845.1
Selenium	mg/kg		0.34	0.34	4.5	ASHPOND	11/19/2009	7 / 7	1.067
Silver	mg/kg	0.0028 / 0.0041	ND	ND	ND			0 / 7	0
Sodium	mg/kg		2140	2140	2740	ERM3.0	09/03/2009	7 / 7	2364
Strontium	mg/kg	0.014 / 0.015	ND	0.05	0.29	ASHPOND	11/19/2009	6 / 7	0.1283
Thallium	mg/kg	0.014 / 0.02	ND	ND	ND			0 / 7	0
Vanadium	mg/kg	0.051 / 0.075	ND	ND	ND			0 / 7	0
Zinc	mg/kg		3.5	3.5	9.7	ERM3.0	09/03/2009	7 / 7	6.457

Notes:

Data are presented in wet weight.
For definitions, see the Acronyms section.

Table 12. 2010 Snapping Turtle Blood Sampling at Emory River Miles 0.5 through 4.5

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	3.3 / 4.2	ND	ND	ND			0 / 8	0
Antimony	mg/kg	0.012 / 0.015	ND	0.014	0.11	ERM0.5	06/10/2010	2 / 8	0.062
Arsenic	mg/kg	0.027 / 0.058	ND	ND	ND			0 / 8	0
Barium	mg/kg	0.038 / 0.048	ND	0.047	0.33	ERM3.0	05/28/2010	4 / 8	0.2018
Beryllium	mg/kg	0.024 / 0.06	ND	ND	ND			0 / 8	0
Boron	mg/kg	0.34 / 0.43	ND	ND	ND			0 / 8	0
Cadmium	mg/kg	0.0063 / 0.015	ND	0.095	0.095	ERM0.5	06/10/2010	1 / 8	0.095
Calcium	mg/kg		77.3	77.3	182	ERM0.5	06/10/2010	8 / 8	111.8
Chromium	mg/kg	0.11 / 0.13	ND	ND	ND			0 / 8	0
Cobalt	mg/kg	0.012 / 0.014	ND	0.014	0.12	ERM0.5	06/10/2010	5 / 8	0.04
Copper	mg/kg		0.35	0.35	0.72	ERM0.5	06/10/2010	8 / 8	0.4713
Iron	mg/kg		56.8	56.8	206	ERM3.0	05/28/2010	8 / 8	157.4
Lead	mg/kg	0.023 / 0.029	ND	0.046	0.13	ERM0.5	06/10/2010	3 / 8	0.07467
Magnesium	mg/kg	40 / 50	ND	52.6	68.2	ERM3.0	07/13/2010	7 / 8	59.93
Manganese	mg/kg		0.2	0.2	1.1	ERM0.5	05/28/2010	8 / 8	0.5888
Mercury	mg/kg	0.0096 / 0.012	ND	0.024	0.17	ERM0.5	06/10/2010	7 / 8	0.07557
Molybdenum	mg/kg	0.029 / 0.036	ND	ND	ND			0 / 8	0
Nickel	mg/kg	0.081 / 0.1	ND	0.12	0.12	ERM0.5	06/10/2010	1 / 8	0.12
Potassium	mg/kg		422	422	1180	ERM0.5	06/10/2010	8 / 8	822.9
Selenium	mg/kg		0.15	0.15	0.45	ERM3.0	05/28/2010	8 / 8	0.3413
Silver	mg/kg	0.0024 / 0.0097	ND	ND	ND			0 / 8	0
Sodium	mg/kg		2180	2180	3400	ERM3.5	05/28/2010	8 / 8	2526
Strontium	mg/kg		0.05	0.05	0.32	ERM3.0	05/28/2010	8 / 8	0.1693
Thallium	mg/kg	0.011 / 0.014	ND	0.1	0.1	ERM0.5	06/10/2010	1 / 8	0.1
Vanadium	mg/kg	0.044 / 0.091	ND	ND	ND			0 / 8	0
Zinc	mg/kg		3.3	3.3	9	ERM0.5	05/28/2010	8 / 8	6.813

Notes:

Data are presented in wet weight.
For definitions, see the Acronyms section.

Table 13. 2009 Snapping Turtle Blood Sampling at Clinch River Mile 2.0

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	0.85 / 0.88	ND	ND	ND			0 / 2	0
Antimony	mg/kg	0.018 / 0.019	ND	ND	ND			0 / 2	0
Arsenic	mg/kg	0.015 / 0.016	ND	ND	ND			0 / 2	0
Barium	mg/kg	0.032 / 0.053	ND	ND	ND			0 / 2	0
Beryllium	mg/kg	0.014 / 0.015	ND	ND	ND			0 / 2	0
Boron	mg/kg	0.062 / 0.064	ND	ND	ND			0 / 2	0
Cadmium	mg/kg	0.013 / 0.014	ND	ND	ND			0 / 2	0
Calcium	mg/kg		89	89	165	CRM2.0TRAP	10/16/2009	2 / 2	127
Chromium	mg/kg	0.12 / 0.12	ND	ND	ND			0 / 2	0
Cobalt	mg/kg	0.0049 / 0.02	ND	ND	ND			0 / 2	0
Copper	mg/kg		0.29	0.29	0.59	CRM2.0TRAP	10/16/2009	2 / 2	0.44
Iron	mg/kg		78.5	78.5	244	CRM2.0TRAP	10/16/2009	2 / 2	161.3
Lead	mg/kg	0.031 / 0.06	ND	ND	ND			0 / 2	0
Magnesium	mg/kg		63.6	63.6	71.6	CRM2.0TRAP	10/16/2009	2 / 2	67.6
Manganese	mg/kg		0.19	0.19	1	CRM2.0TRAP	10/16/2009	2 / 2	0.595
Mercury	mg/kg	0.0041 / 0.041	ND	0.1	0.1	CRM2.0TRAP	10/16/2009	1 / 2	0.1
Molybdenum	mg/kg	0.011 / 0.013	ND	ND	ND			0 / 2	0
Nickel	mg/kg	0.038 / 0.046	ND	ND	ND			0 / 2	0
Potassium	mg/kg		577	577	1140	CRM2.0TRAP	10/16/2009	2 / 2	858.5
Selenium	mg/kg		0.21	0.21	0.5	CRM2.0TRAP	10/16/2009	2 / 2	0.355
Silver	mg/kg	0.0029 / 0.003	ND	ND	ND			0 / 2	0
Sodium	mg/kg		1990	1990	2920	CRM2.0TRAP	10/16/2009	2 / 2	2455
Strontium	mg/kg	0.015 / 0.046	ND	0.11	0.11	CRM2.0TRAP	10/16/2009	1 / 2	0.11
Thallium	mg/kg	0.014 / 0.015	ND	ND	ND			0 / 2	0
Vanadium	mg/kg	0.105 / 0.11	ND	ND	ND			0 / 2	0
Zinc	mg/kg		3	3	8.9	CRM2.0TRAP	10/16/2009	2 / 2	5.95

Notes:

Data are presented in wet weight.
For definitions, see the Acronyms section.

Table 14. 2010 Snapping Turtle Blood Sampling at Clinch River Mile 4.0

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	2.2 / 3.9	ND	ND	ND			0 / 5	0
Antimony	mg/kg	0.0079 / 0.014	ND	0.044	0.044	CRM4.0	05/28/2010	1 / 5	0.044
Arsenic	mg/kg	0.026 / 0.053	ND	ND	ND			0 / 5	0
Barium	mg/kg	0.025 / 0.044	ND	0.04	0.17	CRM4.0	06/09/2010	3 / 5	0.12
Beryllium	mg/kg	0.016 / 0.058	ND	ND	ND			0 / 5	0
Boron	mg/kg	0.23 / 0.4	ND	ND	ND			0 / 5	0
Cadmium	mg/kg	0.0041 / 0.015	ND	0.013	0.013	CRM4.0	05/28/2010	1 / 5	0.013
Calcium	mg/kg		75	75	212	CRM4.0	06/09/2010	5 / 5	130.8
Chromium	mg/kg	0.069 / 0.12	ND	ND	ND			0 / 5	0
Cobalt	mg/kg	0.0077 / 0.013	ND	0.014	0.03	CRM4.0	05/28/2010	3 / 5	0.02133
Copper	mg/kg		0.48	0.48	0.71	CRM4.0	06/10/2010	5 / 5	0.576
Iron	mg/kg		174	174	217	CRM4.0	06/09/2010	5 / 5	199.4
Lead	mg/kg		0.032	0.032	0.12	CRM4.0	05/28/2010	5 / 5	0.0614
Magnesium	mg/kg		57.9	57.9	80.7	CRM4.0	06/09/2010	5 / 5	68.92
Manganese	mg/kg		0.94	0.94	1.4	CRM4.0	05/28/2010	5 / 5	1.078
Mercury	mg/kg		0.073	0.073	0.12	CRM4.0	06/10/2010	5 / 5	0.096
Molybdenum	mg/kg	0.019 / 0.034	ND	0.021	0.021	CRM4.0	05/28/2010	1 / 5	0.021
Nickel	mg/kg	0.053 / 0.094	ND	ND	ND			0 / 5	0
Potassium	mg/kg		738	738	1290	CRM4.0	06/10/2010	5 / 5	940.4
Selenium	mg/kg		0.29	0.29	0.45	CRM4.0	05/28/2010	5 / 5	0.376
Silver	mg/kg	0.0016 / 0.0028	ND	0.019	0.019	CRM4.0	05/28/2010	1 / 5	0.019
Sodium	mg/kg		2130	2130	2500	CRM4.0	06/09/2010	5 / 5	2380
Strontium	mg/kg		0.051	0.051	0.26	CRM4.0	06/09/2010	5 / 5	0.1338
Thallium	mg/kg	0.0075 / 0.013	ND	0.02	0.02	CRM4.0	05/28/2010	1 / 5	0.02
Vanadium	mg/kg	0.025 / 0.087	ND	0.031	0.031	CRM4.0	05/28/2010	1 / 5	0.031
Zinc	mg/kg		7.5	7.5	11.9	CRM4.0	05/28/2010	5 / 5	9

Notes:

Data are presented in wet weight.
For definitions, see the Acronyms section.

Table 15. 2010 Snapping Turtle Blood Sampling at Tennessee River Miles 563.0 and 566.0

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	3.5 / 4.1	ND	ND	ND			0 / 17	0
Antimony	mg/kg	0.013 / 0.015	ND	ND	ND			0 / 17	0
Arsenic	mg/kg	0.025 / 0.052	ND	ND	ND			0 / 17	0
Barium	mg/kg	0.041 / 0.047	ND	0.045	0.084	TRM566.0	07/29/2010	5 / 17	0.0662
Beryllium	mg/kg	0.026 / 0.059	ND	ND	ND			0 / 17	0
Boron	mg/kg	0.37 / 0.43	ND	ND	ND			0 / 17	0
Cadmium	mg/kg	0.0067 / 0.014	ND	ND	ND			0 / 17	0
Calcium	mg/kg		69.8	69.8	139	TRM563.0	08/17/2010	17 / 17	95.52
Chromium	mg/kg	0.11 / 0.13	ND	ND	ND			0 / 17	0
Cobalt	mg/kg	0.012 / 0.014	ND	0.014	0.052	TRM566.0	08/05/2010	11 / 17	0.02145
Copper	mg/kg		0.32	0.32	0.64	TRM563.0	08/17/2010	17 / 17	0.4706
Iron	mg/kg		138	138	271	TRM566.0	07/29/2010	17 / 17	208
Lead	mg/kg	0.025 / 0.028	ND	0.026	0.14	TRM563.0	08/17/2010	14 / 17	0.06586
Magnesium	mg/kg		54	54	76.8	TRM563.0	08/17/2010	17 / 17	61.47
Manganese	mg/kg		0.19	0.19	1.4	TRM563.0	08/17/2010	17 / 17	0.9118
Mercury	mg/kg		0.037	0.037	0.11	TRM566.0	07/30/2010	17 / 17	0.06959
Molybdenum	mg/kg	0.031 / 0.036	ND	ND	ND			0 / 17	0
Nickel	mg/kg	0.086 / 0.1	ND	ND	ND			0 / 17	0
Potassium	mg/kg		820	820	1300	TRM566.0	07/29/2010	17 / 17	1057
Selenium	mg/kg		0.27	0.27	0.5	TRM566.0	08/05/2010	17 / 17	0.3888
Silver	mg/kg	0.0026 / 0.003	ND	ND	ND			0 / 17	0
Sodium	mg/kg		2040	2040	2400	TRM563.0	08/19/2010	17 / 17	2218
Strontium	mg/kg		0.043	0.043	0.18	TRM566.0	07/29/2010	17 / 17	0.08888
Thallium	mg/kg	0.012 / 0.014	ND	ND	ND			0 / 17	0
Vanadium	mg/kg	0.04 / 0.089	ND	ND	ND			0 / 17	0
Zinc	mg/kg		6.7	6.7	12.2	TRM563.0	08/17/2010	17 / 17	8.806

Notes:

Data are presented in wet weight.
For definitions, see the Acronyms section.

Table 16. 2009 Snapping Turtle Blood Sampling at Clinch River Miles 6.5 and 8.0

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	0.84 / 0.88	ND	ND	ND			0 / 3	0
Antimony	mg/kg	0.018 / 0.019	ND	ND	ND			0 / 3	0
Arsenic	mg/kg	0.015 / 0.016	ND	ND	ND			0 / 3	0
Barium	mg/kg		0.026	0.026	0.11	CRM6.5	09/11/2009	3 / 3	0.054
Beryllium	mg/kg	0.0031 / 0.0033	ND	ND	ND			0 / 3	0
Boron	mg/kg	0.061 / 0.064	ND	ND	ND			0 / 3	0
Cadmium	mg/kg	0.0057 / 0.0059	ND	ND	ND			0 / 3	0
Calcium	mg/kg		77.7	77.7	111	CRM6.5	09/21/2009	3 / 3	98.9
Chromium	mg/kg	0.12 / 0.12	ND	ND	ND			0 / 3	0
Cobalt	mg/kg	0.017 / 0.034	ND	ND	ND			0 / 3	0
Copper	mg/kg		0.34	0.34	0.48	CRM8.0	09/21/2009	3 / 3	0.43
Iron	mg/kg		64.4	64.4	160	CRM6.5	09/21/2009	3 / 3	124.1
Lead	mg/kg	0.01 / 0.01	ND	0.01	0.038	CRM6.5	09/11/2009	2 / 3	0.024
Magnesium	mg/kg	47.4 / 49.5	ND	58.1	60.8	CRM6.5	09/11/2009	2 / 3	59.45
Manganese	mg/kg		0.32	0.32	0.8	CRM6.5	09/11/2009	3 / 3	0.5167
Mercury	mg/kg	0.0043 / 0.033	ND	0.041	0.041	CRM6.5	09/21/2009	1 / 3	0.041
Molybdenum	mg/kg	0.01 / 0.013	ND	ND	ND			0 / 3	0
Nickel	mg/kg		0.034	0.034	0.057	CRM8.0	09/21/2009	3 / 3	0.04333
Potassium	mg/kg		407	407	855	CRM6.5	09/21/2009	3 / 3	695.7
Selenium	mg/kg		0.19	0.19	0.44	CRM6.5	09/21/2009	3 / 3	0.32
Silver	mg/kg	0.0029 / 0.003	ND	ND	ND			0 / 3	0
Sodium	mg/kg		2210	2210	2770	CRM8.0	09/21/2009	3 / 3	2413
Strontium	mg/kg		0.084	0.084	0.29	CRM8.0	09/21/2009	3 / 3	0.1647
Thallium	mg/kg	0.014 / 0.015	ND	ND	ND			0 / 3	0
Vanadium	mg/kg	0.052 / 0.054	ND	ND	ND			0 / 3	0
Zinc	mg/kg		2.1	2.1	4.1	CRM6.5	09/11/2009	3 / 3	3.433

Notes:

Data are presented in wet weight.
For definitions, see the Acronyms section.

Table 17. 2009 Snapping Turtle Blood Sampling at the Timberlake Reference

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	24.6 / 25.6	ND	ND	ND			0 / 10	0
Antimony	mg/kg	0.098 / 0.1	ND	ND	ND			0 / 10	0
Arsenic	mg/kg	0.098 / 0.1	ND	ND	ND			0 / 10	0
Barium	mg/kg	0.098 / 0.11	ND	0.17	0.39	TIMBERLAKETRAP	08/25/2009	6 / 10	0.2333
Beryllium	mg/kg	0.098 / 0.1	ND	ND	ND			0 / 10	0
Boron	mg/kg	2 / 2	ND	ND	ND			0 / 10	0
Cadmium	mg/kg	0.098 / 0.1	ND	ND	ND			0 / 10	0
Calcium	mg/kg	98.2 / 102	ND	108	181	TIMBERLAKETRAP	08/25/2009	5 / 10	133.6
Chromium	mg/kg	0.1 / 0.11	ND	ND	ND			0 / 10	0
Cobalt	mg/kg	0.098 / 0.1	ND	ND	ND			0 / 10	0
Copper	mg/kg	0.49 / 0.51	ND	0.55	0.86	TIMBERLAKETRAP	08/24/2009	2 / 10	0.705
Iron	mg/kg		26.9	26.9	176	TIMBERLAKETRAP	08/24/2009	10 / 10	99.41
Lead	mg/kg	0.098 / 0.1	ND	0.1	0.1	TIMBERLAKETRAP	08/24/2009	1 / 10	0.1
Magnesium	mg/kg	98.2 / 102	ND	ND	ND			0 / 10	0
Manganese	mg/kg	0.49 / 0.51	ND	0.57	2.1	TIMBERLAKETRAP	08/24/2009	7 / 10	1.293
Mercury	mg/kg	0.02 / 0.02	ND	0.022	0.031	TIMBERLAKETRAP	08/24/2009	2 / 10	0.0265
Molybdenum	mg/kg	0.98 / 1	ND	ND	ND			0 / 10	0
Nickel	mg/kg	0.098 / 0.1	ND	ND	ND			0 / 10	0
Potassium	mg/kg		203	203	876	TIMBERLAKETRAP	08/24/2009	10 / 10	547.5
Selenium	mg/kg	0.2 / 0.2	ND	0.2	0.4	TIMBERLAKETRAP	08/24/2009	6 / 10	0.29
Silver	mg/kg	0.049 / 0.051	ND	ND	ND			0 / 10	0
Sodium	mg/kg		2380	2380	3580	TIMBERLAKETRAP	08/25/2009	10 / 10	2816
Strontium	mg/kg		0.18	0.18	0.43	TIMBERLAKETRAP	08/24/2009	10 / 10	0.279
Thallium	mg/kg	0.098 / 0.1	ND	ND	ND			0 / 10	0
Vanadium	mg/kg	0.2 / 0.2	ND	ND	ND			0 / 10	0
Zinc	mg/kg		2.3	2.3	6.7	TIMBERLAKETRAP	08/24/2009	10 / 10	4.44

Notes:

Data are presented in wet weight.
For definitions, see the Acronyms section.

Table 18. 2010 Snapping Turtle Blood Sampling at Tennessee River Miles 569.5 and 571.5

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	3.6 / 4.2	ND	ND	ND			0 / 21	0
Antimony	mg/kg	0.013 / 0.015	ND	ND	ND			0 / 21	0
Arsenic	mg/kg	0.025 / 0.057	ND	0.037	0.037	TRM571.5	07/13/2010	1 / 21	0.037
Barium	mg/kg	0.041 / 0.048	ND	0.045	0.37	TRM571.5	06/30/2010	10 / 21	0.1698
Beryllium	mg/kg	0.026 / 0.061	ND	ND	ND			0 / 21	0
Boron	mg/kg	0.37 / 0.43	ND	ND	ND			0 / 21	0
Cadmium	mg/kg	0.0068 / 0.016	ND	ND	ND			0 / 21	0
Calcium	mg/kg		67.2	67.2	253	TRM571.5	06/30/2010	21 / 21	120.2
Chromium	mg/kg	0.11 / 0.13	ND	ND	ND			0 / 21	0
Cobalt	mg/kg	0.013 / 0.015	ND	0.015	0.056	TRM571.5	07/13/2010	9 / 21	0.02289
Copper	mg/kg		0.24	0.24	0.75	TRM571.5	06/30/2010	21 / 21	0.459
Iron	mg/kg		167	167	256	TRM571.5	07/20/2010	21 / 21	214
Lead	mg/kg	0.025 / 0.028	ND	0.026	0.14	TRM571.5	06/22/2010	18 / 21	0.06567
Magnesium	mg/kg		56.6	56.6	85.3	TRM571.5	06/30/2010	21 / 21	65.72
Manganese	mg/kg		0.37	0.37	1.7	TRM571.5	06/22/2010	21 / 21	0.919
Mercury	mg/kg		0.017	0.017	0.16	TRM571.5	06/30/2010	21 / 21	0.0709
Molybdenum	mg/kg	0.031 / 0.036	ND	ND	ND			0 / 21	0
Nickel	mg/kg	0.087 / 0.1	ND	ND	ND			0 / 21	0
Potassium	mg/kg		924	924	1340	TRM569.5	06/17/2010	21 / 21	1096
Selenium	mg/kg		0.24	0.24	0.44	TRM571.5	06/30/2010	21 / 21	0.3471
Silver	mg/kg	0.0026 / 0.0099	ND	ND	ND			0 / 21	0
Sodium	mg/kg		1790	1790	2370	TRM569.5	06/17/2010	21 / 21	2142
Strontium	mg/kg		0.046	0.046	0.78	TRM571.5	06/30/2010	21 / 21	0.229
Thallium	mg/kg	0.012 / 0.014	ND	ND	ND			0 / 21	0
Vanadium	mg/kg	0.041 / 0.093	ND	ND	ND			0 / 21	0
Zinc	mg/kg		6.5	6.5	13.5	TRM571.5	08/10/2010	21 / 21	9.733

Notes:

Data are presented in wet weight.
For definitions, see the Acronyms section.

Table 19. 2010 Eastern Spiny Softshell Turtle Blood Sampling at Emory River Miles 0.5 through 5.0

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
% Moisture	%		95.8	95.8	95.8	ERM2.0	07/29/2010	1 / 1	95.8
Aluminum	mg/kg	3.4 / 4.2	ND	ND	ND			0 / 20	0
Antimony	mg/kg	0.012 / 0.015	ND	0.018	0.018	ERM1.0	07/27/2010	1 / 20	0.018
Arsenic	mg/kg	0.025 / 0.058	ND	0.031	0.24	ERM0.5	06/24/2010	7 / 20	0.09814
Barium	mg/kg	0.039 / 0.048	ND	0.067	0.12	ERM3.0	05/28/2010	4 / 20	0.09225
Beryllium	mg/kg	0.026 / 0.062	ND	ND	ND			0 / 20	0
Boron	mg/kg	0.36 / 0.43	ND	ND	ND			0 / 20	0
Cadmium	mg/kg	0.0068 / 0.016	ND	ND	ND			0 / 20	0
Calcium	mg/kg		58.9	58.9	141	ERM3.0	05/28/2010	20 / 20	78.71
Chromium	mg/kg	0.11 / 0.14	ND	ND	ND			0 / 20	0
Cobalt	mg/kg		0.012	0.012	0.11	ERM3.0	05/28/2010	20 / 20	0.0507
Copper	mg/kg	0.12 / 0.14	ND	0.14	0.4	ERM3.5	06/17/2010	17 / 20	0.2465
Iron	mg/kg		29	29	318	ERM4.5	08/11/2010	20 / 20	145.7
Lead	mg/kg	0.024 / 0.029	ND	0.028	0.03	ERM0.5	06/09/2010	4 / 20	0.02875
Magnesium	mg/kg	41.3 / 50	ND	44.2	86.2	ERM4.5	08/11/2010	11 / 20	65.07
Manganese	mg/kg	0.15 / 0.18	ND	ND	ND			0 / 20	0
Mercury	mg/kg	0.0099 / 0.012	ND	0.011	0.12	ERM3.0	05/28/2010	11 / 20	0.03227
Molybdenum	mg/kg	0.03 / 0.036	ND	ND	ND			0 / 20	0
Nickel	mg/kg	0.084 / 0.1	ND	ND	ND			0 / 20	0
Potassium	mg/kg	242 / 741	ND	689	1260	ERM4.5	08/11/2010	9 / 20	965.8
Selenium	mg/kg	0.058 / 0.063	ND	0.075	1.4	ERM4.5	08/11/2010	19 / 20	0.5933
Silver	mg/kg	0.0025 / 0.003	ND	0.0031	0.025	ERM2.0	07/13/2010	7 / 20	0.01017
Sodium	mg/kg		1970	1970	3190	ERM5.0	08/05/2010	20 / 20	2612
Strontium	mg/kg		0.045	0.045	0.27	ERM3.0	05/28/2010	20 / 20	0.109
Thallium	mg/kg	0.012 / 0.014	ND	ND	ND			0 / 20	0
Vanadium	mg/kg	0.041 / 0.093	ND	ND	ND			0 / 20	0
Zinc	mg/kg	1.9 / 2	ND	2.4	8.3	ERM0.5	06/24/2010	19 / 20	4.795

Notes:

Data are presented in wet weight.

For definitions, see the Acronyms section.

Table 20. 2010 Eastern Spiny Softshell Turtle Blood Sampling at Clinch River Miles 2.0, 2.5, and 4.0

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	3.5 / 5	ND	ND	ND			0 / 16	0
Antimony	mg/kg	0.012 / 0.018	ND	ND	ND			0 / 16	0
Arsenic	mg/kg	0.024 / 0.07	ND	0.03	0.09	CRM2.5	06/29/2010	6 / 16	0.05467
Barium	mg/kg	0.04 / 0.057	ND	0.049	0.049	CRM2.5	06/30/2010	1 / 16	0.049
Beryllium	mg/kg	0.026 / 0.075	ND	ND	ND			0 / 16	0
Boron	mg/kg	0.36 / 0.52	ND	ND	ND			0 / 16	0
Cadmium	mg/kg	0.0068 / 0.019	ND	ND	ND			0 / 16	0
Calcium	mg/kg		47.2	47.2	107	CRM2.5	07/14/2010	16 / 16	67.98
Chromium	mg/kg	0.11 / 0.16	ND	ND	ND			0 / 16	0
Cobalt	mg/kg		0.014	0.014	0.17	CRM2.5	06/29/2010	16 / 16	0.05863
Copper	mg/kg	0.12 / 0.18	ND	0.17	0.37	CRM4.0	07/22/2010	13 / 16	0.2623
Iron	mg/kg		45.4	45.4	325	CRM2.5	06/30/2010	16 / 16	187
Lead	mg/kg	0.024 / 0.035	ND	0.031	0.045	CRM2.0	07/22/2010	3 / 16	0.04
Magnesium	mg/kg	41.7 / 60.2	ND	49.3	80.2	CRM2.5	06/30/2010	12 / 16	67.24
Manganese	mg/kg	0.15 / 0.21	ND	0.3	0.3	CRM2.5	06/30/2010	1 / 16	0.3
Mercury	mg/kg	0.01 / 0.014	ND	0.011	0.054	CRM4.0	08/05/2010	12 / 16	0.01967
Molybdenum	mg/kg	0.03 / 0.044	ND	ND	ND			0 / 16	0
Nickel	mg/kg	0.084 / 0.12	ND	ND	ND			0 / 16	0
Potassium	mg/kg	625 / 904	ND	697	1230	CRM2.5	06/30/2010	12 / 16	980.8
Selenium	mg/kg		0.11	0.11	1.5	CRM2.5	06/29/2010	16 / 16	0.7319
Silver	mg/kg	0.0025 / 0.009	ND	0.0047	0.019	CRM2.5	07/14/2010	5 / 16	0.01042
Sodium	mg/kg		2010	2010	2820	CRM4.0	08/05/2010	16 / 16	2374
Strontium	mg/kg		0.06	0.06	0.17	CRM2.5	07/14/2010	16 / 16	0.07863
Thallium	mg/kg	0.012 / 0.017	ND	ND	ND			0 / 16	0
Vanadium	mg/kg	0.041 / 0.11	ND	ND	ND			0 / 16	0
Zinc	mg/kg	1.9 / 1.9	ND	2.4	10.6	CRM2.5	07/14/2010	15 / 16	6.533

Notes:

Data are presented in wet weight.

For definitions, see the Acronyms section.

Table 21. 2010 Eastern Spiny Softshell Turtle Sampling at Tennessee River Miles 563.0 and 566.0

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
% Moisture	%		95.4	95.4	98.3	TRM566.0	07/30/2010	2 / 2	96.85
Aluminum	mg/kg	3.1 / 4.1	ND	ND	ND			0 / 18	0
Antimony	mg/kg	0.011 / 0.015	ND	0.011	0.011	TRM563.0	08/17/2010	1 / 18	0.011
Arsenic	mg/kg	0.022 / 0.056	ND	ND	ND			0 / 18	0
Barium	mg/kg	0.036 / 0.047	ND	0.052	0.078	TRM563.0	08/20/2010	2 / 18	0.065
Beryllium	mg/kg	0.023 / 0.059	ND	ND	ND			0 / 18	0
Boron	mg/kg	0.32 / 0.42	ND	ND	ND			0 / 18	0
Cadmium	mg/kg	0.006 / 0.015	ND	ND	ND			0 / 18	0
Calcium	mg/kg		53.8	53.8	124	TRM563.0	08/20/2010	18 / 18	71.46
Chromium	mg/kg	0.099 / 0.13	ND	ND	ND			0 / 18	0
Cobalt	mg/kg		0.015	0.015	0.16	TRM563.0	08/17/2010	18 / 18	0.06261
Copper	mg/kg	0.11 / 0.15	ND	0.16	0.46	TRM563.0	08/20/2010	15 / 18	0.2607
Iron	mg/kg		12.8	12.8	237	TRM563.0	08/20/2010	18 / 18	154.1
Lead	mg/kg	0.022 / 0.028	ND	0.028	0.086	TRM566.0	08/11/2010	4 / 18	0.04775
Magnesium	mg/kg	37.8 / 48.6	ND	44.2	68.9	TRM563.0	08/17/2010	13 / 18	60.27
Manganese	mg/kg	0.13 / 0.17	ND	ND	ND			0 / 18	0
Mercury	mg/kg	0.0091 / 0.012	ND	0.012	0.027	TRM566.0	08/05/2010	7 / 18	0.01514
Molybdenum	mg/kg	0.028 / 0.036	ND	ND	ND			0 / 18	0
Nickel	mg/kg	0.077 / 0.1	ND	ND	ND			0 / 18	0
Potassium	mg/kg	566 / 730	ND	595	1060	TRM566.0	07/29/2010	12 / 18	933.5
Selenium	mg/kg	0.053 / 0.068	ND	0.081	0.65	TRM563.0	08/19/2010	15 / 18	0.4021
Silver	mg/kg	0.0023 / 0.0092	ND	0.0055	0.024	TRM563.0	08/19/2010	3 / 18	0.01297
Sodium	mg/kg		2180	2180	3190	TRM566.0	07/30/2010	18 / 18	2511
Strontium	mg/kg	0.035 / 0.041	ND	0.044	0.25	TRM563.0	08/20/2010	17 / 18	0.09435
Thallium	mg/kg	0.011 / 0.014	ND	ND	ND			0 / 18	0
Vanadium	mg/kg	0.036 / 0.091	ND	ND	ND			0 / 18	0
Zinc	mg/kg	1.7 / 1.9	ND	2.9	8	TRM566.0	08/11/2010	17 / 18	5.441

Notes:

Data are presented in wet weight.

For definitions, see the Acronyms section.

Table 22. 2010 Eastern Spiny Softshell Turtle Blood Sampling at Tennessee River Mile 571.5

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	3.5 / 4.2	ND	ND	ND			0 / 10	0
Antimony	mg/kg	0.013 / 0.015	ND	ND	ND			0 / 10	0
Arsenic	mg/kg	0.025 / 0.054	ND	ND	ND			0 / 10	0
Barium	mg/kg	0.041 / 0.048	ND	0.075	0.078	TRM571.5	07/15/2010	2 / 10	0.0765
Beryllium	mg/kg	0.026 / 0.058	ND	ND	ND			0 / 10	0
Boron	mg/kg	0.37 / 0.43	ND	ND	ND			0 / 10	0
Cadmium	mg/kg	0.0067 / 0.015	ND	ND	ND			0 / 10	0
Calcium	mg/kg		53.3	53.3	163	TRM571.5	07/15/2010	10 / 10	77.01
Chromium	mg/kg	0.11 / 0.22	ND	ND	ND			0 / 10	0
Cobalt	mg/kg		0.015	0.015	0.12	TRM571.5	07/15/2010	10 / 10	0.0792
Copper	mg/kg	0.13 / 0.13	ND	0.18	0.43	TRM571.5	07/15/2010	9 / 10	0.2878
Iron	mg/kg		46	46	331	TRM571.5	07/22/2010	10 / 10	214.9
Lead	mg/kg	0.025 / 0.029	ND	0.036	0.041	TRM571.5	07/22/2010	2 / 10	0.0385
Magnesium	mg/kg	42.6 / 44.4	ND	50	85.6	TRM571.5	07/15/2010	9 / 10	69.09
Manganese	mg/kg	0.15 / 0.18	ND	ND	ND			0 / 10	0
Mercury	mg/kg	0.01 / 0.012	ND	0.01	0.023	TRM571.5	07/15/2010	4 / 10	0.01475
Molybdenum	mg/kg	0.031 / 0.036	ND	ND	ND			0 / 10	0
Nickel	mg/kg	0.086 / 0.1	ND	ND	ND			0 / 10	0
Potassium	mg/kg	639 / 679	ND	772	1230	TRM571.5	07/15/2010	8 / 10	1048
Selenium	mg/kg	0.06 / 0.062	ND	0.098	0.83	TRM571.5	09/01/2010	9 / 10	0.4287
Silver	mg/kg	0.0026 / 0.003	ND	0.0039	0.01	TRM571.5	08/12/2010	3 / 10	0.0074
Sodium	mg/kg		1780	1780	2970	TRM571.5	08/31/2010	10 / 10	2262
Strontium	mg/kg		0.05	0.05	0.28	TRM571.5	07/15/2010	10 / 10	0.1015
Thallium	mg/kg	0.012 / 0.014	ND	ND	ND			0 / 10	0
Vanadium	mg/kg	0.04 / 0.088	ND	ND	ND			0 / 10	0
Zinc	mg/kg		3.3	3.3	9.7	TRM571.5	08/12/2010	10 / 10	6.33

Notes:

Data are presented in wet weight.

For definitions, see the Acronyms section.

Table 23. 2010 Eastern Spiny Softshell Turtle Blood Sampling at Emory River Miles 0.5 through 5.0

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	15.1 / 173	ND	61.5	61.5	ERM1.0	07/27/2010	1 / 21	61.5
Antimony	mg/kg	0.055 / 0.63	ND	ND	ND			0 / 21	0
Arsenic	mg/kg	0.11 / 1.316	ND	0.55	0.55	ERM3.0	07/23/2010	1 / 21	0.55
Barium	mg/kg	0.17 / 1.3	ND	0.3	14.6	ERM3.5	06/17/2010	7 / 21	2.757
Beryllium	mg/kg	0.11 / 1.3	ND	ND	ND			0 / 21	0
Boron	mg/kg	1.6 / 17.9	ND	ND	ND			0 / 21	0
Cadmium	mg/kg	0.029 / 0.33	ND	ND	ND			0 / 21	0
Calcium	mg/kg	182 / 2080	ND	ND	ND			0 / 21	0
Chromium	mg/kg	0.61 / 6.3	ND	ND	ND			0 / 21	0
Cobalt	mg/kg	0.053 / 0.61	ND	0.06	0.09	ERM4.0	07/09/2010	2 / 21	0.075
Copper	mg/kg	0.55 / 6.2	ND	ND	ND			0 / 21	0
Iron	mg/kg	45.6 / 521	ND	1080	1080	ERM4.0	07/09/2010	1 / 21	1080
Lead	mg/kg	0.11 / 1.2	ND	0.54	0.54	ERM1.0	07/27/2010	1 / 21	0.54
Magnesium	mg/kg	182 / 2080	ND	ND	ND			0 / 21	0
Manganese	mg/kg	0.64 / 7.4	ND	2	4.9	ERM4.0	07/09/2010	4 / 21	3.825
Mercury	mg/kg	0.044 / 0.5	ND	0.072	0.46	ERM2.0	07/29/2010	6 / 21	0.1977
Molybdenum	mg/kg	0.13 / 1.5	ND	ND	ND			0 / 21	0
Nickel	mg/kg	0.37 / 4.2	ND	0.9	0.9	ERM0.5	06/09/2010	1 / 21	0.9
Potassium	mg/kg	2740 / 31200	ND	ND	ND			0 / 21	0
Selenium	mg/kg	0.26 / 2.9	ND	0.33	1.4	ERM3.0	07/23/2010	14 / 21	0.7636
Silver	mg/kg	0.011 / 0.12	ND	0.06	0.65	ERM4.0	08/18/2010	7 / 21	0.2093
Sodium	mg/kg		2070	2070	2720	ERM2.0	07/13/2010	21 / 21	2418
Strontium	mg/kg	0.17 / 1.9	ND	0.26	0.48	ERM2.0	07/29/2010	5 / 21	0.37
Thallium	mg/kg	0.052 / 0.6	ND	ND	ND			0 / 21	0
Vanadium	mg/kg	0.17 / 2.184	ND	ND	ND			0 / 21	0
Zinc	mg/kg	8.2 / 94	ND	14.3	26.3	ERM2.0	07/13/2010	7 / 21	19.31

Notes:

Data are presented in wet weight.

For definitions, see the Acronyms section.

Table 24. 2010 Eastern Spiny Softshell Turtle Blood Carapace Sampling at Clinch River Miles 2.0, 2.5, and 4.0

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	17.6 / 148	ND	36.8	36.8	CRM4.0	08/10/2010	1 / 18	36.8
Antimony	mg/kg	0.064 / 0.54	ND	ND	ND			0 / 18	0
Arsenic	mg/kg	0.12 / 2.07	ND	ND	ND			0 / 18	0
Barium	mg/kg	0.2 / 1.7	ND	0.23	1.6	CRM2.5	06/30/2010	4 / 18	1.02
Beryllium	mg/kg	0.13 / 2.2	ND	ND	ND			0 / 18	0
Boron	mg/kg	1.8 / 15.4	ND	ND	ND			0 / 18	0
Cadmium	mg/kg	0.033 / 0.28	ND	ND	ND			0 / 18	0
Calcium	mg/kg	212 / 1790	ND	232	232	CRM4.0	07/22/2010	1 / 18	232
Chromium	mg/kg	0.66 / 6.2	ND	12.8	12.8	CRM4.0	07/20/2010	1 / 18	12.8
Cobalt	mg/kg	0.062 / 0.52	ND	0.16	0.17	CRM4.0	07/20/2010	2 / 18	0.165
Copper	mg/kg	0.63 / 5.4	ND	ND	ND			0 / 18	0
Iron	mg/kg	53 / 446	ND	6390	6390	CRM4.0	07/20/2010	1 / 18	6390
Lead	mg/kg	0.12 / 1	ND	ND	ND			0 / 18	0
Magnesium	mg/kg	212 / 1790	ND	ND	ND			0 / 18	0
Manganese	mg/kg	0.75 / 6.3	ND	1.3	28.9	CRM4.0	07/20/2010	6 / 18	7.667
Mercury	mg/kg	0.051 / 0.43	ND	0.12	0.12	CRM4.0	07/22/2010	1 / 18	0.12
Molybdenum	mg/kg	0.15 / 1.3	ND	ND	ND			0 / 18	0
Nickel	mg/kg	0.43 / 3.6	ND	27.4	27.4	CRM2.5	07/14/2010	1 / 18	27.4
Potassium	mg/kg	3180 / 26800	ND	ND	ND			0 / 18	0
Selenium	mg/kg	0.3 / 5	ND	0.39	1.2	CRM4.0	08/05/2010	8 / 18	0.8525
Silver	mg/kg	0.013 / 0.11	ND	0.087	10.8	CRM2.5	07/14/2010	7 / 18	1.95
Sodium	mg/kg		1330	1330	4680	CRM2.5	06/30/2010	18 / 18	2537
Strontium	mg/kg	0.19 / 1.6	ND	0.54	0.64	CRM4.0	07/22/2010	2 / 18	0.59
Thallium	mg/kg	0.061 / 0.51	ND	ND	ND			0 / 18	0
Vanadium	mg/kg	0.4 / 2.77	ND	ND	ND			0 / 18	0
Zinc	mg/kg	9.6 / 80.6	ND	18	31.3	CRM4.0	07/22/2010	5 / 18	24.02

Notes:

Data are presented in wet weight.

For definitions, see the Acronyms section.

Table 25. 2010 Eastern Spiny Softshell Turtle Carapace Sampling at Tennessee River Miles 563.0 and 566.0

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	17.6 / 415	ND	33.6	41.6	TRM563.0	08/17/2010	2 / 20	37.6
Antimony	mg/kg	0.064 / 1.5	ND	ND	ND			0 / 20	0
Arsenic	mg/kg	0.12 / 4.75	ND	ND	ND			0 / 20	0
Barium	mg/kg	0.2 / 4.8	ND	0.21	0.86	TRM566.0	07/29/2010	3 / 20	0.4467
Beryllium	mg/kg	0.13 / 3.1	ND	ND	ND			0 / 20	0
Boron	mg/kg	1.8 / 43	ND	3.9	3.9	TRM563.0	08/17/2010	1 / 20	3.9
Cadmium	mg/kg	0.033 / 0.79	ND	ND	ND			0 / 20	0
Calcium	mg/kg	212 / 5000	ND	ND	ND			0 / 20	0
Chromium	mg/kg	0.64 / 15.1	ND	ND	ND			0 / 20	0
Cobalt	mg/kg	0.062 / 1.5	ND	0.083	0.4	TRM563.0	08/17/2010	2 / 20	0.2415
Copper	mg/kg	0.63 / 15	ND	ND	ND			0 / 20	0
Iron	mg/kg	53 / 1250	ND	ND	ND			0 / 20	0
Lead	mg/kg	0.12 / 2.9	ND	ND	ND			0 / 20	0
Magnesium	mg/kg	212 / 5000	ND	ND	ND			0 / 20	0
Manganese	mg/kg	0.75 / 17.7	ND	0.78	10.3	TRM566.0	07/29/2010	8 / 20	3.923
Mercury	mg/kg	0.051 / 1.2	ND	0.091	0.091	TRM563.0	08/17/2010	1 / 20	0.091
Molybdenum	mg/kg	0.15 / 3.6	ND	ND	ND			0 / 20	0
Nickel	mg/kg	0.43 / 10.1	ND	9.7	14	TRM563.0	08/17/2010	2 / 20	11.85
Potassium	mg/kg	3180 / 75000	ND	ND	ND			0 / 20	0
Selenium	mg/kg	0.3 / 11.67	ND	0.45	0.45	TRM566.0	07/29/2010	1 / 20	0.45
Silver	mg/kg	0.013 / 0.25	ND	0.053	65.9	TRM563.0	08/19/2010	9 / 20	7.436
Sodium	mg/kg	212 / 4170	ND	1860	8560	TRM563.0	08/19/2010	18 / 20	2679
Strontium	mg/kg	0.19 / 4.6	ND	0.21	0.78	TRM563.0	08/17/2010	6 / 20	0.4617
Thallium	mg/kg	0.061 / 1.4	ND	ND	ND			0 / 20	0
Vanadium	mg/kg	0.2 / 6.17	ND	ND	ND			0 / 20	0
Zinc	mg/kg	9.6 / 226	ND	10.8	28.1	TRM563.0	08/17/2010	6 / 20	18.78

Notes:

Data are presented in wet weight.

For definitions, see the Acronyms section.

Table 26. 2010 Eastern Spiny Softshell Turtle Carapace Sampling at Tennessee River Mile 571.5

Analyte	Units (wet wt basis)	Detection Limit Range	Minimum	Minimum Detected Result	Maximum Detected Result	Location of Maximum Detected Result	Date of Maximum Detected Result	Number of Detections / Samples	Mean of Detections
Aluminum	mg/kg	8.9 / 296	ND	33	53	TRM571.5	07/15/2010	2 / 11	43
Antimony	mg/kg	0.032 / 1.1	ND	ND	ND			0 / 11	0
Arsenic	mg/kg	0.062 / 2.1	ND	ND	ND			0 / 11	0
Barium	mg/kg	0.1 / 3.4	ND	0.11	1.1	TRM571.5	07/20/2010	3 / 11	0.55
Beryllium	mg/kg	0.066 / 2.2	ND	ND	ND			0 / 11	0
Boron	mg/kg	0.92 / 30.7	ND	ND	ND			0 / 11	0
Cadmium	mg/kg	0.017 / 0.56	ND	ND	ND			0 / 11	0
Calcium	mg/kg	107 / 3570	ND	134	134	TRM571.5	07/22/2010	1 / 11	134
Chromium	mg/kg	0.31 / 10.8	ND	ND	ND			0 / 11	0
Cobalt	mg/kg	0.031 / 1	ND	0.062	0.1	TRM571.5	07/15/2010	2 / 11	0.081
Copper	mg/kg	0.32 / 10.7	ND	0.32	0.32	TRM571.5	07/22/2010	1 / 11	0.32
Iron	mg/kg	26.8 / 893	ND	ND	ND			0 / 11	0
Lead	mg/kg	0.062 / 2.1	ND	ND	ND			0 / 11	0
Magnesium	mg/kg	107 / 3570	ND	ND	ND			0 / 11	0
Manganese	mg/kg	0.38 / 11	ND	0.74	16.1	TRM571.5	09/01/2010	7 / 11	4.406
Mercury	mg/kg	0.026 / 0.86	ND	ND	ND			0 / 11	0
Molybdenum	mg/kg	0.078 / 2.6	ND	ND	ND			0 / 11	0
Nickel	mg/kg	0.22 / 7.2	ND	ND	ND			0 / 11	0
Potassium	mg/kg	1610 / 53600	ND	ND	ND			0 / 11	0
Selenium	mg/kg	0.15 / 5	ND	0.39	0.39	TRM571.5	08/31/2010	1 / 11	0.39
Silver	mg/kg	0.0064 / 0.21	ND	0.013	2.5	TRM571.5	07/22/2010	5 / 11	0.6738
Sodium	mg/kg	107 / 3570	ND	2220	3530	TRM571.5	07/22/2010	9 / 11	2532
Strontium	mg/kg	0.098 / 3.3	ND	0.33	0.41	TRM571.5	07/15/2010	2 / 11	0.37
Thallium	mg/kg	0.031 / 1	ND	ND	ND			0 / 11	0
Vanadium	mg/kg	0.2 / 3.4	ND	ND	ND			0 / 11	0
Zinc	mg/kg	4.8 / 161	ND	12.6	37.2	TRM571.5	07/22/2010	5 / 11	23.14

Notes:

Data are presented in wet weight.

For definitions, see the Acronyms section.

Figures

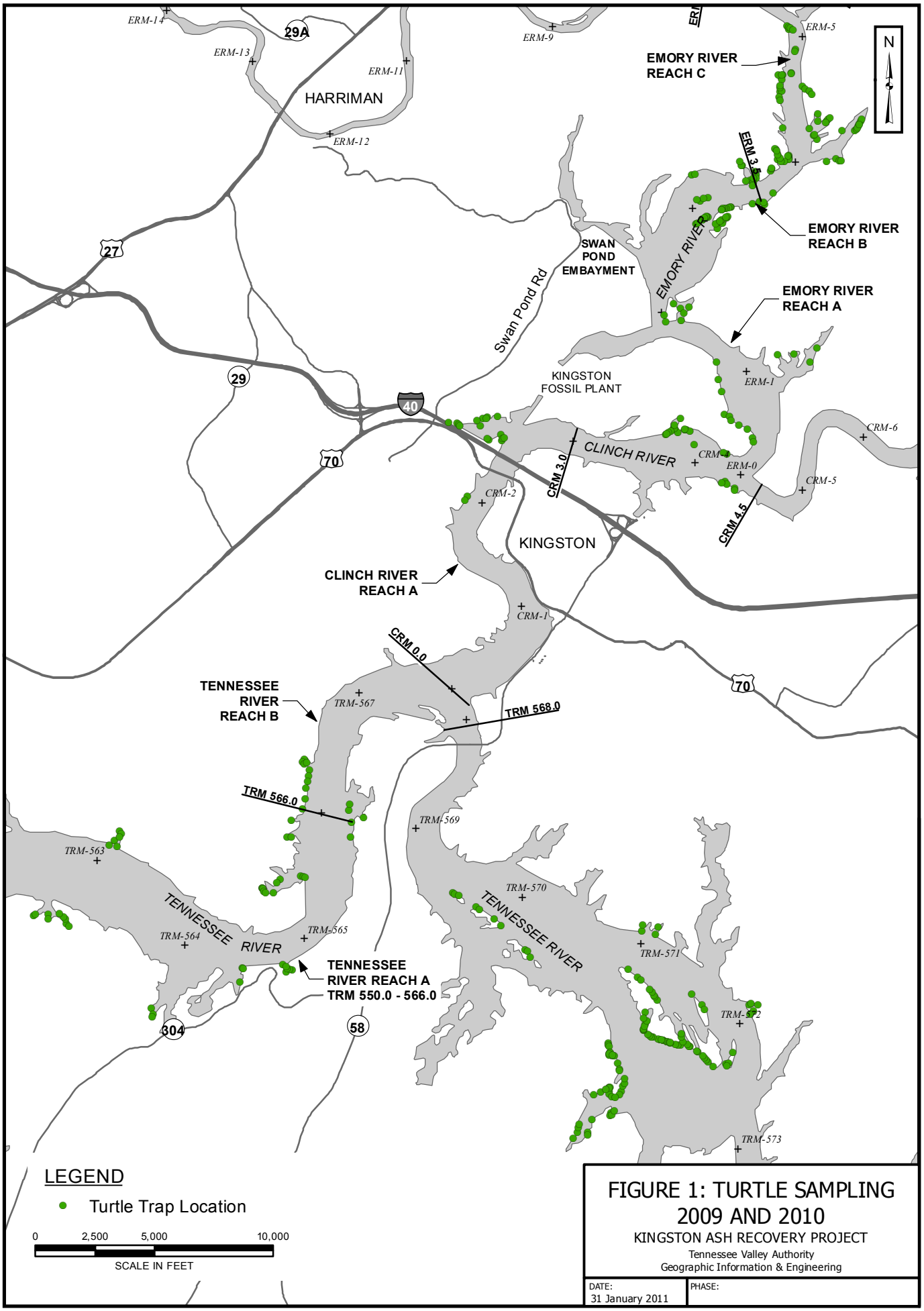


FIGURE 1: TURTLE SAMPLING 2009 AND 2010

KINGSTON ASH RECOVERY PROJECT

Tennessee Valley Authority
Geographic Information & Engineering

DATE: 31 January 2011

PHASE:

Filename: BiotaMaps_Turtles_20110127_8x11.pdf

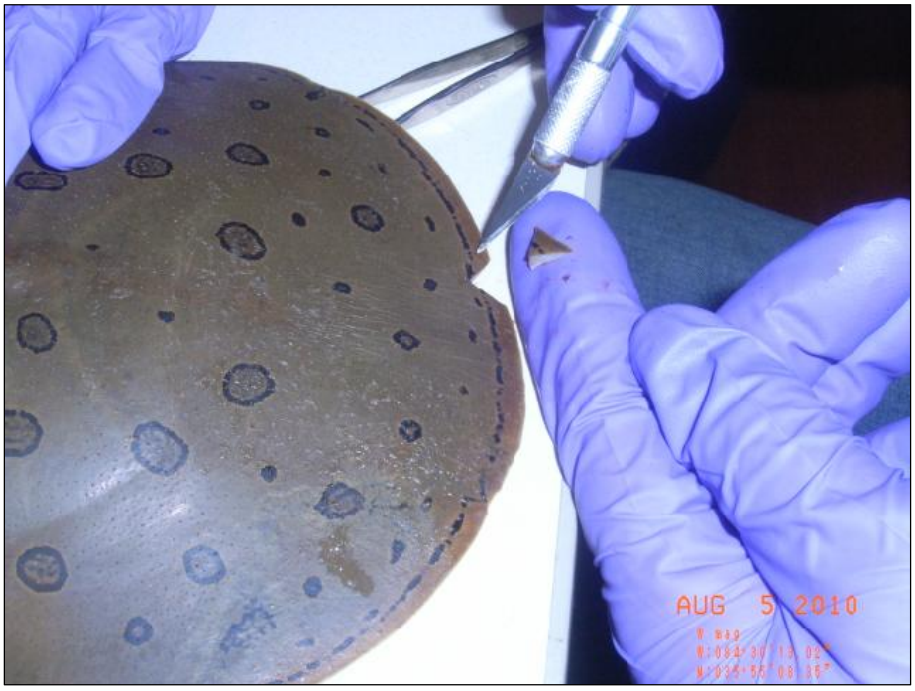
Figure 2. Field Crew Checking Turtle Trap

Figure 3. Field Crew Measuring Carapace Length of Snapping Turtle

Figure 4a. Field Crew Collecting Blood Sample from Snapping Turtle

Figure 4b. Field Crew Collecting Toenail Sample from Eastern Spiny Softshell Turtle

Figure 4c. Field Crew Collecting Carapace Sample From Eastern Spiny Softshell Turtle



Appendix A

Summary of Turtle Collections

Table A-1a. Common Musk Turtle Sample Summary, 2009

Location		Aliquot Type		
Site Name	**Type**	**Blood**	**Toenail[a]**	**Carapace[a]**
Timberlake Pond	Reference Site	0	-	-
Upstream Clinch River	Potentially Unaffected Site	0	-	-
Ash Spill Area[b]	Potentially Affected Sites	13	-	-
Emory River		5	-	-
Downstream Clinch River		6	-	-

Notes:

[a]Aliquot type not collected.

[b]Locations includes East Embayment, West Embayment, and Ash Pond.

Table A-1b. Snapping Turtle Sample Summary, 2009

Location		Aliquot Type		
Site Name	**Type**	**Blood**	**Toenail[a]**	**Carapace[a]**
Timberlake Pond	Reference Site	10	-	-
Upstream Clinch River	Potentially Unaffected Site	3	-	-
Ash Spill Area[b]	Potentially Affected Sites	1	-	-
Emory River		6	-	-
Downstream Clinch River		2	-	-

Notes:

[a]Aliquot type not collected.

[b]Locations includes East Embayment, West Embayment, and Ash Pond.

Table A-2a. Musk/Mud Turtle Sample Summary, 2010[a]

Location		Aliquot Type		
Site Name	**Type**	**Blood**	**Toenail**	**Carapace[b]**
Upstream Tennessee River	Reference Site	20	20	-
Emory River	Potentially Affected Sites	29	29	-
Clinch River		41	41	-
Downstream Tennessee River		24	24	-

Notes:

[a]Includes Common Musk, Loggerhead Musk, Stripe-necked Musk, and Eastern Mud Turtle.

[a]Aliquot type not collected.

Table A-2b. Snapping Turtle Sample Summary, 2010

Location		Aliquot Type		
Site Name	**Type**	**Blood**	**Toenail**	**Carapace[a]**
Upstream Tennessee River	Reference Site	21	21	-
Emory River	Potentially Affected Sites	8	8	-
Clinch River		5	4	-
Downstream Tennessee River		17	17	-

Note:

[a]Aliquot type not collected.

Table A-2c. Eastern Spiny Softshell Sample Summary, 2010

Location		Aliquot Type		
Site Name	**Type**	**Blood**	**Toenail**	**Carapace**
Upstream Tennessee River	Reference Site	10	11	11
Emory River	Potentially Affected Sites	21	21	32
Clinch River		16	18	18
Downstream Tennessee River		18	20	20

Appendix B

Summary of Reptile Shipments

Table B-1. Summary of Reptile Shipments, 2009

Shipment Date	COCs Shipped	Sample Type	Total Samples per COC	Shipment Sample Total
		Blood		
26-Aug-2009	BIORT0824Y09a	16	16	18
	BIORT0825Y09a	2	2	
3-Sep-2009	BIORT0828Y09a	1	1	2
	BIORT0831Y09a	1	1	
8-Oct-2009	BIORT0903Y09a	3	3	20
	BIORT0911Y09a	4	4	
	BIORT0917Y09a	2	2	
	BIORT0921Y09a	2	2	
	BIORT0923Y09a	4	4	
	BIORT0930Y09a	1	1	
	BIORT1007Y09a	4	4	
22-Oct-2009	BIORT1016Y09a	2	2	2
15-Dec-2009	BIORT1030Y09a	3	3	4
	BIORT1119Y09a	1	1	
	Total	**46**	**46**	**46**

Note: For definitions, see the Acronyms section.

Table B-2a. Summary of Reptile Shipments to Pace, 2010

Shipment Date	COCs Shipped	Sample Type			Total Samples per COC	Shipment Sample Total
		Blood	Toenail	Carapace		
24-Jun-2010	BIORT0527Y10A	6			6	57
	BIORT0527Y10B	7			7	
	BIORT0528Y10A	11		1	12	
	BIORT0608Y10A	4			4	
	BIORT0609Y10A	6		1	7	
	BIORT0610Y10A	15			15	
	BIORT0617Y10A	5		1	6	
29-Jul-2010	BIORT0610Y10B	2			2	97
	BIORT0622Y10A	4			4	
	BIORT0623Y10A	2		1	3	
	BIORT0624Y10A	1			1	
	BIORT0625Y10A	2			2	
	BIORT0629Y10A	2			2	
	BIORT0629Y10C			1	1	
	BIORT0630Y10A	**7**			7	
	BIORT0630Y10C			1	1	
	BIORT0701Y10A	5			5	
	BIORT0701Y10C			1	1	
	BIORT0702Y10A	3			3	
	BIORT0709Y10A	5			5	
	BIORT0709Y10C			1	1	
	BIORT0713Y10A	8			8	
	BIORT0713Y10C			2	2	
	BIORT0714Y10A	3			3	
	BIORT0714Y10C			1	1	
	BIORT0715Y10A	1			1	
	BIORT0715Y10C			1	1	
	BIORT0716Y10A	2			2	
	BIORT0720Y10A	16			16	
	BIORT0720Y10C			3	3	
	BIORT0721Y10A	3			3	
	BIORT0721Y10C			1	1	
	BIORT0722Y10A	8			8	
	BIORT0722Y10C			6	6	
	BIORT0723Y10A	3			3	
	BIORT0723Y10C			1	1	

Table B-2a. Summary of Reptile Shipments to Pace, 2010

Shipment Date	COCs Shipped	Sample Type			Total Samples per COC	Shipment Sample Total
		Blood	Toenail	Carapace		
8-Sep-2010	BIORT0727Y10A	15			15	139
	BIORT0727Y10C			1	1	
	BIORT0728Y10A	7			7	
	BIORT0728Y10C			1	1	
	BIORT0729Y10A	13			13	
	BIORT0729Y10C			8	8	
	BIORT0730Y10A	3			3	
	BIORT0730Y10C			1	1	
	BIORT0803Y10A	4			4	
	BIORT0803Y10C			1	1	
	BIORT0805Y10A	9			9	
	BIORT0805Y10C			7	7	
	BIORT0810Y10A	5			5	
	BIORT0810Y10C			2	2	
	BIORT0811Y10A	2			2	
	BIORT0811Y10C			2	2	
	BIORT0812Y10A	11			11	
	BIORT0812Y10C			7	7	
	BIORT0817Y10A	12			12	
	BIORT0817Y10C			7	7	
	BIORT0818Y10A	2			2	
	BIORT0818Y10C			1	1	
	BIORT0819Y10A	3			3	
	BIORT0819Y10C			3	3	
	BIORT0820Y10A	1			1	
	BIORT0820Y10C			1	1	
	BIORT0827Y10A	1			1	
	BIORT0831Y10A	2			2	
	BIORT0831Y10C			2	2	
	BIORT0901Y10A	2			2	
	BIORT0901Y10C			3	3	
	Total	223	0	70	293	293

Note: For definitions, see the Acronyms section.

Table B-2b. Summary of Reptile Shipments to Virginia Tech, 2010

Shipment Date	COCs Shipped	Sample Type				Total Samples per COC	Shipment Sample Total
		Blood	Toenail	Carapace	Whole Body		
2-Feb-2011	VAT-RT0527Y10		13			13	275
	VAT-RT0528Y10		11			11	
	VAT-RT0608Y10		4			4	
	VAT-RT0609Y10		5			5	
	BIORT0610Y10C		2			2	
	VAT-RT0610Y10		15			15	
	VAT-RT0615Y10	6	6			12	
	VAT-RT0617Y10		5			5	
	BIORT062210B		4			4	
	BIORT062310B		3			3	
	VAT-RT0623Y10	1				1	
	BIORT062510B		2			2	
	BIORT0629Y10B		2			2	
	BIORT0630Y10B		7			7	
	BIORT0701Y10B		5			5	
	BIORT0702Y10B		3			3	
	BIORT0709Y10B		6			6	
	VAT-RT0709Y10				1	1	
	BIORT0713Y10B		8			8	
	BIORT0714Y10B		3			3	
	BIORT0715Y10B		1			1	
	BIORT0716Y10B		2			2	
	BIORT0720Y10B		19			19	
	BIORT0721Y10B		4			4	
	BIORT0722Y10B		6			6	
	VAT-RT0722Y10				2	2	
	VAT-RT0723Y10				6	6	
	BIORT0723Y10B		3			3	
	BIORT0727Y10B		15			15	
	BIORT0728Y10B		7			7	
	BIORT0729Y10B		14			14	
	VAT-RT0729Y10				1	1	
	BIORT0730Y10B		3			3	
	BIORT0803Y10B		4			4	
	VAT-RT0803Y10				3	3	
	BIORT0805Y10B		9			9	

Table B-2b. Summary of Reptile Shipments to Virginia Tech, 2010

Shipment Date	COCs Shipped	Sample Type				Total Samples per COC	Shipment Sample Total
		Blood	Toenail	Carapace	Whole Body		
2-Feb-2011	VAT-RT0805Y10				1	1	275
	BIORT0810Y10B		5			5	
	BIORT0811Y10B		2			2	
	BIORT0812Y10B		11			11	
	BIORT0817Y10B		12			12	
	VAT-RT0817Y10				1	1	
	BIORT0818Y10B		2			2	
	VAT-RT0818Y10			2		2	
	BIORT0819Y10B		4			4	
	VAT-RT0819Y10			4	1	5	
	VAT-RT0820Y10			1		1	
	BIORT0820Y10B		1			1	
	VAT-RT0826Y10			3	6	9	
	VAT-RT0827Y10			1		1	
	BIORT0827Y10B		1			1	
	BIORT0831Y10B		2			2	
	VAT-RT0831Y10				1	1	
	BIORT0901Y10B		3			3	
	Total	7	234	11	23	275	275

Note: For definitions, see the Acronyms section.