NORTH CAROLINA DIVISION OF PUBLIC HEALTH
REVIEW OF BASELINE FISH TISSUE METALS DATA FOR THE DAN RIVER FOLLOWING THE DUKE ENERGY COAL ASH SPILL NEAR EDEN, N.C.

Division of Public Health
N.C. Department of Health and Human Services
Raleigh, North Carolina
November 13, 2014

Human Health Summary

The North Carolina Department of Environment and Natural Resources (N.C. DENR) is periodically collecting fish from the Dan River to evaluate potential environmental impacts resulting from the February 2, 2014 Duke Energy coal ash spill. DENR's initial ("baseline") fish collections took place from February 24th to March 5th, 2014. DENR considers these fish collections to have been prior to when increased metal concentrations would be expected in the fish due to the coal ash spill. The baseline fish data includes 82 fish fillet samples made up of 16 species collected from 5 locations in the Dan River. Each fillet was analyzed for 16 metals. The N.C. Department of Health and Human Services Division of Public Health (N.C. DHHS DPH) is reviewing the Dan River fish tissue data to determine the potential for negative health affects to people that eat the fish. Two samples collected in the Dan River at the location near Eden N.C. exceeded a DPH screening level for fish ingestion (1 Golden Redhorse for mercury and 1 Redbreast Sunfish for thallium). The Eden N.C. location is upstream of the coal ash spill and fish from this area are isolated by a dam from the coal ash spill effects. Four samples collected at the Danville Virginia location exceeded a N.C. DPH screening level (4 Largemouth Bass for mercury). In North Carolina there is a statewide fish consumption advisory for mercury in Largemouth Bass (http://epi.publichealth.nc.gov/oee/mercury/safefish.html). The baseline fish tissue data do not provide information to evaluate potential long-term uptake of metals from the coal ash spill into the fish. Because of this, DPH is not changing its fish consumption recommendations for the Dan River in North Carolina until fish data to evaluate long-term uptake of metals are available. At this time we will continue to recommend that persons avoid eating fish or shellfish taken from the Dan River in North Carolina downstream of the coal ash spill to the N.C.-Virginia state line.

The N.C. DPH continues to recommend that persons not eat fish or shellfish collected in the Dan River from the coal ash spill location near Eden N.C. (spill site GPS coordinates 36.492071, -79.711608) downstream to the N.C.-Virginia state line.

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Public Health Implications of DENR's Baseline Fish Tissue Data

The DPH has completed review of the first set of fish collected in the Dan River by DENR after the February 2, 2014 Duke Energy coal ash spill near Eden N.C. These samples were collected by DENR between February 24th and March 5th, 2014. The fish were collected at 3 locations in N.C. and 2 in Virginia (see Appendix Figure 1). The DPH received the data on October 10, 2014. Additional fish collections have been completed in the Dan River and that data will be reviewed when they become available. The most upstream DENR fish sampling location is near Eden N.C. and is upstream of the coal ash spill. Fish collected at the Eden location are isolated by a dam from the portion of the river that was affected by the coal ash spill. The remaining 4 fish collection locations were downstream of the coal ash spill, extending approximately 80 miles. The most downstream location is in Virginia upstream of the dam above Kerr Reservoir. The GPS coordinates and identifiers of the fish collection locations are listed in Appendix Table 1.

The baseline fish data included analysis of 82 fish fillet samples from 16 species, each analyzed for 16 metals. Each fillet sample was prepared from one fish. Appendix Table 2 summarizes the number of fillet samples by species analyzed at each of the sampled locations. The metals analyzed were selected by the Dan River interagency work group which was formed to address ecological and public health issues associated with the coal ash spill. The work group includes N.C. and Virginia state environmental and public health agency representatives, as well as representatives from the U.S. Environmental Protection Agency (EPA) and the U.S. Fish and Wildlife Service (FWS).

The N.C. DHHS DPH is the state agency responsible for recommending fish consumption advisories for people that eat fish caught in North Carolina waters. The DPH uses fillet data for these evaluations because this best represents the part of the fish most commonly eaten. Some contaminants will be present at different concentrations in different parts of the fish, such as in muscle or the liver. DENR also analyzed some fish as "whole body" samples. Whole body fish data are used to evaluate potential adverse effects to fish predators such as larger fish or birds and mammals that eat fish. DPH did not evaluate the whole body data for public health impacts.

DENR considers these initial fish collections to represent "baseline" metal concentrations in the fish. Baseline levels are levels that would not yet have been impacted by the fish taking up metals from the coal ash spill. Samples from later fish collections can be compared to the baseline data set to determine if the fish over time are accumulating coal-ash-related metals into their tissues. Concentrations of certain metals are normally present in fish and other living organisms, including people. The presence of a metal in fish tissue does not necessarily mean it is harmful. Some metals are necessary to maintain good health both in fish and people, such as zinc or iron. Other metals, such as mercury and lead, are not needed by the body and can be harmful at very low concentrations. All metals, even those needed in small amounts for good health, can cause negative health effects if taken up at elevated concentrations.

Coal ash related metals may be present in the water, in the sediment, or in the organisms living in the river. Fish can take up metals through their gills, by eating other contaminated organisms in the river, or through their skin from direct contact with the water or the sediment. Not all metals in the water or sediment may be bioavailable, or present in a form that can be taken up by organisms. However, as environmental conditions in the river change, the bioavailability of metals can also change. These changes are influenced by conditions such as storm flows, drought, hurricanes or significant sediment disturbances such as dredging. The potential impact of these conditions on bioavailability will vary with each metal. In addition, different species of fish, and fish at different ages, may take up metals at different rates.

Evaluation of Fish Tissue Data for Consumption Advisories

The DPH compares the concentrations of contaminants found in fish fillet tissue to "human health screening levels" to determine if a fish consumption advisory is needed. Screening levels are developed using laboratory and epidemiological study data and represent concentrations of a substance that may be harmful to people eating contaminated fish over very long periods of time. Children may be more sensitive to the potential harmful effects of some metals, such as mercury. We also know that some contaminants stay in the body longer than others and some can be passed from the mother to an unborn child, or to a baby through breast milk. These factors are considered when screening levels are developed.

Fish consumption advisories are presented as a recommended maximum number of meals of fish on a per-week or per-month basis for a specific species of fish. The DPH uses very health-protective considerations when identifying how much fish is safe for people to eat. The DPH advisory method is protective of people that may rely on fish they catch as the primary protein source in their diet and people who will eat fish daily throughout their lifetime. The DPH had statewide fish tissue action levels for the metals mercury and selenium prior to the Dan River coal ash spill. Screening levels were developed for the additional metals associated with the coal ash spill. The screening levels are listed in Appendix Table 3.

Public Health Summary of DENR's Baseline Fish Tissue Data for the Dan River Coal Ash Spill

The baseline Dan River fish fillet tissue data collected by N.C. DENR are summarized below. Data summary tables follow in the Appendix.

Baseline fish collection: February 24 – March 5, 2014
Total number of fillet samples analyzed: 82
Total number of species included in fillets: 16
Fish tissue analyses: 16 metals

Number of fish collected in N.C. that exceeded a N.C. DPH health screening level: 2 (2% of all fillet samples)

- 1 Golden Redhorse fillet collected near Eden N.C. exceeded the mercury action level (10% of Golden Redhorse samples collected in N.C.)

- 1 Redbreast Sunfish collected near Eden N.C. exceeded the thallium screening level (12% of Redbreast Sunfish samples collected in N.C.)
    - The remaining 81 thallium results were reported as not-detected, but the reporting limit concentration was greater than the health screening level

Number of fish collected in Virginia that exceeded a N.C. DPH health screening level: 4 (5% of all fillet samples)

- 4 Largemouth Bass fillets collected at Danville Virginia exceeded the mercury action value

The health screening level for thallium is less than the lowest concentration that can be detected in fish tissue by the DENR analytical method. It is not known if the thallium concentrations in the tissue samples reported as not-detected could negatively impact the health of fish consumers.

Appendix Table 4 summarizes exceedances of N.C. DPH screening levels in the N.C. DENR baseline fish fillet samples. Appendix Table 5 summarizes DENR's baseline fillet data by sample location.

Public Health Conclusions for the Baseline Dan River Fish Tissue Samples

1. The N.C. DPH continues to recommend that persons do not eat fish or shellfish collected in the Dan River from the coal ash spill location near Eden N.C. (spill site GPS coordinates 36.492071, -79.711608) downstream to the N.C.-Virginia state line.
2. The baseline N.C. DENR Dan River fish collections do not provide data to evaluate the long-term uptake of metals released from the coal ash into fish.
3. There is uncertainty in the evaluation of the potential health impacts associated with thallium because of the analytical method is not sensitive enough to detect thallium levels could be harmful to human health.
4. The N.C. DPH will evaluate future fish tissue data sets provided by N.C. DENR and other agencies to monitor if ingesting the fish from the Dan River downstream from the coal ash spill could adversely affect people's health.
5. There is a statewide fish consumption advisory for mercury that includes the Dan River. It recommends that pregnant women, women who could become pregnant and children under age 15 should not eat any largemouth bass. All other people should limit eating largemouth bass to one meal a week or less (http://epi.publichealth.nc.gov/oee/mercury/safefish.html).

APPENDIX

Figure 1. N.C. DENR baseline fish collection locations in the Dan River. Baseline fish collected February 24 – March 5, 2014. Source: N.C. DENR October 2014.

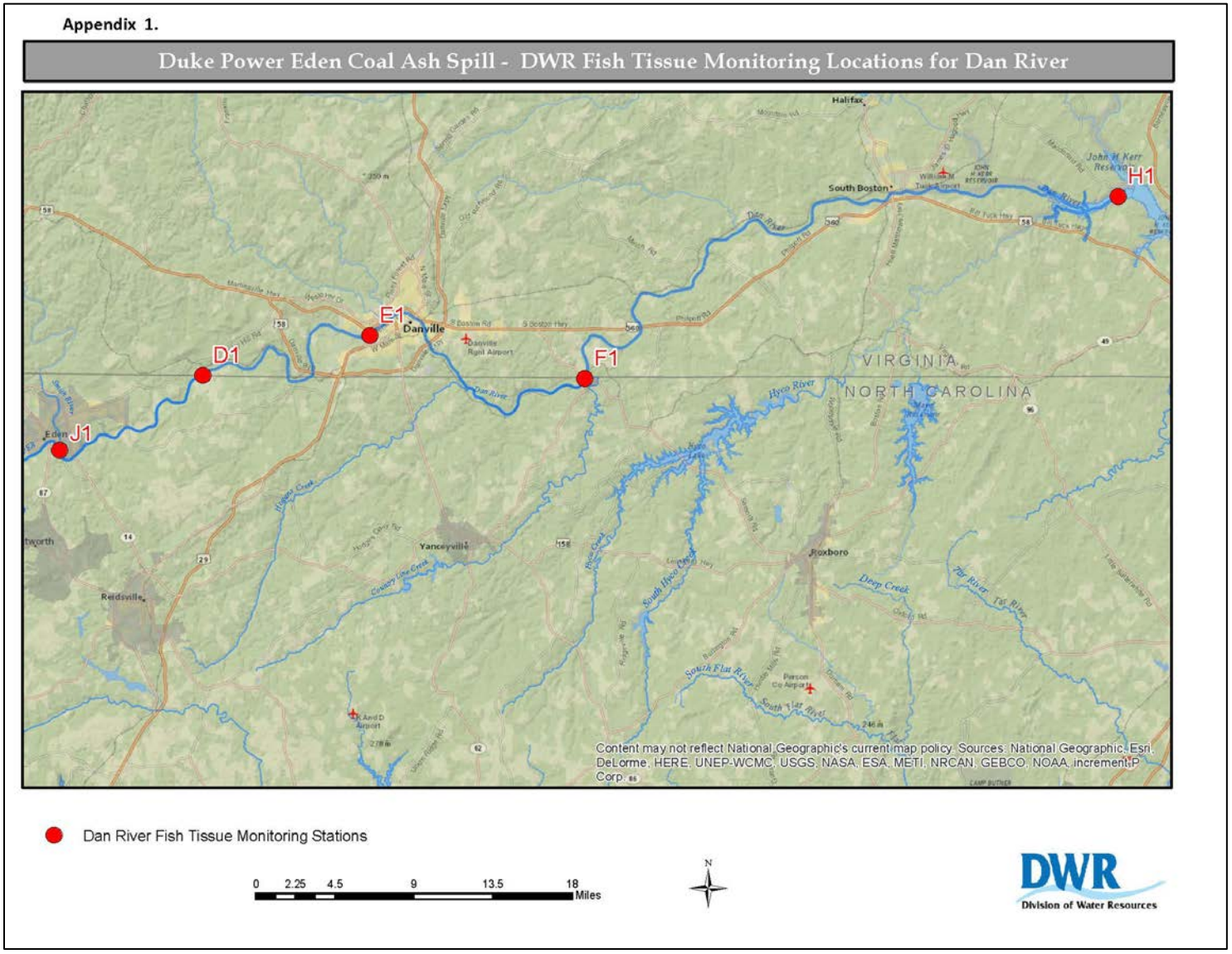

Table 1. N.C. DENR baseline Dan River fish collection locations for the Duke Energy coal ash spill of February 2, 2014. Fish collected February 24 – March 5, 2014. Locations listed from upstream to downstream.

Location Description	County / State	GPS Coordinates	Site ID
Eden [a]	Rockingham / N.C.	36.47534, -79.75005	J1
Berry Hill Bridge Road	Rockingham / N.C.	36.53753, -79.61526	D1
Danville	Pittsylvania/ VA	36.57646, -79.43427	E1
Above Milton	Caswell / N.C.	36.52983, -79.24541	F1
Kerr Reservoir Delta at SR State Park (Kerr Flats VA)	Halifax / VA	36.69280, -78.66939	H1

[a] The fish collected at the Eden N.C. location are isolated by a dam from the downstream area of the Dan River impacted by the coal ash spill.

ID = identification

N.C. = North Carolina

N.C. DENR = North Carolina Department of Environment and Natural Resources

VA = Virginia

Table 2. Dan River baseline fish fillet metals sample summary by species and sample location. Locations arranged from upstream to downstream. N.C. DENR baseline fish tissue collections in the Dan River, February 24 – March 5, 2014.

	DENR Baseline Fish Collection Locations					
Species collected by N.C. DENR	**Eden N.C. [a]**	**Berry Hill N.C.**	**Danville VA**	**Milton N.C.**	**Kerr Flats VA**	**Total No. Collected**
Black Crappie					1	1
Bluegill Sunfish				1	7	8
Channel Catfish			1		1	2
Gizzard Shad					3	3
Golden Redhorse	6	3	1	1		11
Largemouth Bass [b]		1	6		6	13
Notchlip Redhorse				6		6
Quillback	1					1
Redbreast Sunfish	6	1	1	1		10
Redear Sunfish			2		5	8
Roanoke Bass	2					2
Shorthead Redhorse				3	1	4
Snail Bullhead	2					2
V-lip Redhorse		1				1
White Crappie					8	8
White Sucker	1	1		1		3
Totals	**18**	**7**	**12**	**13**	**32**	**82**

[a] The fish collected at the Eden N.C. location are isolated from the downstream area of the Dan River impacted by the coal ash spill

[b] There is statewide fish consumption advisory in N.C. for mercury in Largemouth Bass, see: http://epi.publichealth.nc.gov/oee/mercury/in_fish.html

N.C. = North Carolina

N.C. DENR = North Carolina Department of Environment and Natural Resources

VA = Virginia

Table 3. N.C. DPH human health screening levels for metals in Dan River fish fillet tissue. Source: N.C. DPH September 2014.

Metal	Fish Tissue Screening Levels for Ingestion (mg/kg) [a]
Aluminum	410
Antimony	0.16
Arsenic (as inorganic As)	0.027
Arsenic (as total As)	0.27
Barium	82
Beryllium	1.6
Boron	82
Cadmium	0.41
Calcium	Not Available
Chromium (VI)	1.2
Cobalt	0.12
Copper	16
Iron	290
Lead	Not Available
Lithium	0.82
Magnesium	Not Available
Manganese	58
Nickel	8.2
Silver	2.1
Sodium	Not Available
Thallium	0.00412
Vanadium	2.1
Zinc	120

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Table 3. Table continued from prior page.

Mercury (mg/kg) [a]	Women of Childbearing Age (15 to 44 years) and Children (<15 years)	Others
<0.4	2 meals per week	4 meals per week
0.4 to 1.0	Do not eat	1 meal per week
>1.0 to 3.0	Do not eat	1 meal per month
>3.0	Do not eat	Do not eat

Selenium (mg/kg) [a]	Advisory
<10.0	No advisory
10 to 20	1 meal per week
>20 to 50	1 meal per month
>50	Do not eat

[a] mg/kg = milligrams per kilogram wet weight fillet tissue

N.C. = North Carolina

N.C. DPH = North Carolina Division of Public Health, Department of Health and Human Services

N.C. DPH fish ingestion screening levels are based on one 170 gram (6 ounces, uncooked weight) fish meal per day for a 70 kg (154 pound) adult and an Acceptable Cancer Risk level of 1E-04 (1 excess cancer in 10,000 persons)

< = “less than”

> = “greater than”

Table 4. Human health screening level analysis summary for Dan River baseline fish fillet metals data. Fish collected in the Dan River February 24 – March 5, 2014. Includes samples collected at 3 North Carolina and 2 Virginia locations.

Species Collected by N.C. DENR	No. of Fillets Analyzed	No. of SL Exceedances (%) [a]	SL Exceeded	Collection Location
Black Crappie	1	0		
Bluegill Sunfish	8	0		
Channel Catfish	2	0		
Gizzard Shad	3	0		
Golden Redhorse	11	1 (9%)	Mercury	Eden N.C.
Largemouth Bass [b]	13	4 (31%)	Mercury	Danville VA
Notchlip Redhorse	6	0		
Quillback	1	0		
Redbreast Sunfish	10	1 (10%)	Thallium	Eden N.C.
Redear Sunfish	8	0		
Roanoke Bass	2	0		
Shorthead Redhorse	4	0		
Snail Bullhead	2	0		
V-lip Redhorse	1	0		
White Crappie	8	0		
White Sucker	3	0		
Total all species	**82**	**6 (7%)**		

[a] Percent of total number of samples of each species in the baseline collection that exceed the human health screening level

[b] In N.C. there is statewide fish consumption advisory for mercury in Largemouth Bass

N.C. DENR = North Carolina Department of Environment and Natural Resources

No. = number

SL = N.C. DPH human health screening level for fish ingestion

VA = Virginia

Table 5. N.C. DENR baseline fish fillet tissue metals data for the Dan River summarized by collection location and species. Baseline fish collected February 24 – March 5, 2014. The Dan River Duke Energy coal ash spill occurred February 2, 2014. Locations arranged from upstream to downstream. Fish collected near the Eden N.C. location are isolated by a dam from the effects of the coal ash spill. Bold / shaded numbers indicate an exceedance of a N.C. DPH screening level.

	Metal	Mercury	Total Arsenic	Cadmium	Total Chromium	Copper	Nickel	Lead	Zinc	Selenium	Aluminum	Thallium[a]	Iron	Magnesium	Barium	Manganese	Silver
	NC DPH Screening Level	**0.4 (graduated)**	**total 0.27**	**0.41**	**1.2**	**16**	**8.2**	**NA**	**120**	**10.0 (graduated)**	**410**	**0.00412**	**290**	**NA**	**82**	**58**	**2.1**
	NC DENR Sample Reporting Limits	NA	0.10	0.10	0.10	NA	0.10	0.10	NA	NA	1.00	0.10	NA	NA	0.20	0.20	0.10
Species		**Eden, NC Location (DENR Site J1)**															
Golden Redhorse	No. of fillet samples	6															
	No.of detects	6	0	0	0	6	0	0	6	6	1	0	6	6	2	6	0
	Low detect value	0.14	NA	NA	NA	0.32	NA	NA	3.20	0.23	4.20	NA	2.60	180.00	0.26	0.55	NA
	High detect value	**0.48**	NA	NA	NA	0.46	NA	NA	7.00	0.41	4.20	NA	13.00	280.00	0.43	1.90	NA
	Mean detected value	0.24	NA	NA	NA	0.39	NA	NA	4.73	0.33	4.20	NA	5.98	255.00	0.35	1.01	NA
	No. detects > SL	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quillback	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	0	1	1	1	0	1	1	1	1	0
	Detected value	0.36	NA	NA	NA	0.38	NA	NA	5.00	0.65	1.30	NA	10.00	200.00	0.33	4.00	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Redbreast Sunfish	No. of fillet samples	6															
	No.of detects	6	0	0	0	6	0	0	6	6	1	1	6	6	0	0	0
	Low detect value	0.05	NA	NA	NA	0.30	NA	NA	5.40	0.20	1.70	**0.13**	1.50	190.00	NA	NA	NA
	High detect value	0.21	NA	NA	NA	0.57	NA	NA	7.70	0.79	1.70	0.13	3.60	240.00	NA	NA	NA
	Mean detected value	0.11	NA	NA	NA	0.38	NA	NA	6.68	0.42	1.70	0.13	2.68	220.00	NA	NA	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Roanoke Bass	No. of fillet samples	2															
	No.of detects	2	0	0	0	2	0	0	2	2	0	0	2	2	0	0	0
	Low detect value	0.03	NA	NA	NA	0.29	NA	NA	4.10	0.17	NA	NA	2.10	230.00	NA	NA	NA
	High detect value	0.21	NA	NA	NA	0.29	NA	NA	4.90	0.29	NA	NA	2.30	260.00	NA	NA	NA
	Mean detected value	0.12	NA	NA	NA	0.29	NA	NA	4.50	0.23	NA	NA	2.20	245.00	NA	NA	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Snail Bullhead	No. of fillet samples	2															
	No.of detects	2	0	0	0	2	0	0	2	2	0	0	2	2	0	1	0
	Low detect value	0.03	NA	NA	NA	0.36	NA	NA	4.80	0.20	NA	NA	1.80	220.00	NA	0.25	NA
	High detect value	0.11	NA	NA	NA	0.41	NA	NA	6.70	0.41	NA	NA	8.30	270.00	NA	0.25	NA
	Mean detected value	0.07	NA	NA	NA	0.39	NA	NA	5.75	0.31	NA	NA	5.05	245.00	NA	0.25	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Sucker	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	0	1	1	0	0	1	1	0	1	0
	Detected value	0.10	<0.10	<0.10	<0.20	0.34	<0.10	<0.10	4.40	0.29	<1.00	<0.10	5.00	280.00	<0.20	0.52	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 5 Continued.

	Metal	Mercury	Total Arsenic	Cadmium	Total Chromium	Copper	Nickel	Lead	Zinc	Selenium	Aluminum	Thallium [a]	Iron	Magnesium	Barium	Manganese	Silver
	NC DPH Screening Level	0.4 (graduated)	total 0.27	0.41	1.2	16	8.2	NA	120	10.0 (graduated)	410	0.00412	290	NA	82	58	2.1
	NC DENR Sample Reporting Limits	NA	0.10	0.10	0.10	NA	0.10	0.10	NA	NA	1.00	0.10	NA	NA	0.20	0.20	0.10
Species		Berry Hill, NC Location (DENR Site D1)															
Golden Redhorse	No. of fillet samples	3															
	No.of detects	3	0	1	0	3	0	1	3	3	0	0	3	3	2	3	0
	Low detect value	0.16	NA	0.36	NA	0.29	NA	7.90	6.10	0.27	NA	NA	3.30	250.00	0.32	0.76	NA
	High detect value	0.29	NA	0.36	NA	0.40	NA	7.90	7.10	0.34	NA	NA	4.50	270.00	0.47	2.30	NA
	Mean detected value	0.21	NA	0.36	NA	0.35	NA	7.90	6.47	0.31	NA	NA	3.90	260.00	0.40	1.39	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Largemouth Bass	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	1	1	1	0	0	1	1	0	0	0
	Detected value	0.26	<0.10	<0.10	<0.20	0.23	<0.10	0.23	4.00	0.33	<1.00	<0.10	1.70	240.00	<0.20	<0.20	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Redbreast Sunfish	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	0	1	1	1	0	1	1	0	0	0
	Detected value	0.07	<0.10	<0.10	<0.20	0.15	<0.10	<0.10	5.10	0.39	3.10	<0.10	1.70	230.00	<0.20	<0.20	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V-lip Redhorse	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	0	1	1	1	0	1	1	1	1	0
	Detected value	0.11	<0.10	<0.10	<0.20	0.30	<0.10	<0.10	4.20	0.53	1.00	<0.10	2.60	260.00	0.25	0.58	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Sucker	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	0	1	1	0	0	1	1	0	1	0
	Detected value	0.13	<0.10	<0.10	<0.20	0.59	<0.10	<0.10	4.80	0.30	<1.00	<0.10	4.50	250.00	<0.20	0.53	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 5 Continued.

	Metal	Mercury	Total Arsenic	Cadmium	Total Chromium	Copper	Nickel	Lead	Zinc	Selenium	Aluminum	Thallium [a]	Iron	Magnesium	Barium	Manganese	Silver
	NC DPH Screening Level	0.4 (graduated)	total 0.27	0.41	1.2	16	8.2	NA	120	10.0 (graduated)	410	0.00412	290	NA	82	58	2.1
	NC DENR Sample Reporting Limits	NA	0.10	0.10	0.10	NA	0.10	0.10	NA	NA	1.00	0.10	NA	NA	0.20	0.20	0.10
Species		Danville, VA Location (DENR Site E1)															
Channel Catfish	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	0	1	1	0	0	1	1	0	0	0
	Detected value	0.08	<0.10	<0.10	<0.20	0.22	<0.10	<0.10	4.00	0.24	<1.00	<0.10	3.00	200.00	<0.20	<0.20	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Golden Redhorse	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	1	1	1	0	0	1	1	1	1	0
	Detected value	0.34	<0.10	<0.10	<0.20	0.27	<0.10	0.11	5.10	0.37	<1.00	<0.10	4.30	220.00	0.23	1.30	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Largemouth Bass	No. of fillet samples	6															
	No.of detects	6	0	0	0	6	0	0	6	6	0	0	6	6	0	0	0
	Low detect value	0.33	NA	NA	NA	0.12	NA	NA	3.60	0.32	NA	NA	1.40	220.00	NA	NA	NA
	High detect value	0.64	NA	NA	NA	0.22	NA	NA	4.40	0.45	NA	NA	2.70	260.00	NA	NA	NA
	Mean detected value	0.51	NA	NA	NA	0.18	NA	NA	4.05	0.38	NA	NA	1.97	243.33	NA	NA	NA
	No. detects > SL	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mean > SL values	0.59															
Redbreast Sunfish	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	0	1	1	0	0	1	1	0	1	0
	Detected value	0.07	<0.10	<0.10	<0.20	0.30	<0.10	<0.10	5.90	0.35	<1.00	<0.10	3.00	190.00	<0.20	0.20	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Redear Sunfish	No. of fillet samples	3															
	No.of detects	3	1	0	0	3	0	0	3	3	1	0	3	3	0	0	0
	Low detect value	0.20	0.30	NA	NA	0.21	NA	NA	6.30	0.44	1.10	NA	1.90	210.00	NA	NA	NA
	High detect value	0.21	0.30	NA	NA	0.36	NA	NA	9.10	0.48	1.10	NA	2.40	220.00	NA	NA	NA
	Mean detected value	0.21	0.30	NA	NA	0.27	NA	NA	7.33	0.47	1.10	NA	2.13	213.33	NA	NA	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 5 Continued.

	Metal	Mercury	Total Arsenic	Cadmium	Total Chromium	Copper	Nickel	Lead	Zinc	Selenium	Aluminum	Thallium [a]	Iron	Magnesium	Barium	Manganese	Silver
	NC DPH Screening Level	0.4 (graduated)	total 0.27	0.41	1.2	16	8.2	NA	120	10.0 (graduated)	410	0.00412	290	NA	82	58	2.1
	NC DENR Sample Reporting Limits	NA	0.10	0.10	0.10	NA	0.10	0.10	NA	NA	1.00	0.10	NA	NA	0.20	0.20	0.10
Species		Milton, NC Location (DENR Site F1)															
Bluegill Sunfish	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	0	1	1	0	0	1	1	0	0	0
	Detected value	0.04	<0.10	<0.10	<0.20	0.16	<0.10	<0.10	4.50	0.18	<1.00	<0.10	1.30	220.00	<0.20	<0.20	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Golden Redhorse	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	0	1	1	0	0	1	1	0	1	0
	Detected value	0.12	<0.10	<0.10	<0.20	0.39	<0.10	<0.10	4.60	0.34	<1.00	<0.10	4.50	260.00	<0.20	1.10	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Notchlip Redhorse	No. of fillet samples	6															
	No.of detects	6	1	0	0	6	0	0	6	6	1	0	6	6	6	6	0
	Low detect value	0.08	0.10	NA	NA	0.28	NA	NA	4.20	0.25	1.50	NA	3.30	250.00	0.20	0.58	NA
	High detect value	0.21	0.10	NA	NA	0.43	NA	NA	5.60	0.44	1.50	NA	6.90	270.00	0.38	1.00	NA
	Mean detected value	0.14	0.10	NA	NA	0.37	NA	NA	4.85	0.31	1.50	NA	4.92	253.33	0.29	0.80	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Redbreast Sunfish	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	0	1	1	0	0	1	1	0	1	0
	Detected value	0.05	<0.10	<0.10	<0.20	0.34	<0.10	<0.10	6.40	0.34	<1.00	<0.10	3.60	170.00	<0.20	0.76	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shorthead Redhorse	No. of fillet samples	3															
	No.of detects	3	0	0	0	3	0	0	3	3	0	0	3	3	3	3	0
	Low detect value	0.08	NA	NA	NA	0.30	NA	NA	4.30	0.28	NA	NA	3.60	250.00	0.32	1.30	NA
	High detect value	0.10	NA	NA	NA	0.33	NA	NA	4.50	0.39	NA	NA	5.20	280.00	0.41	1.40	NA
	Mean detected value	0.09	NA	NA	NA	0.32	NA	NA	4.40	0.34	NA	NA	4.23	263.33	0.35	1.33	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Sucker	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	0	1	1	0	0	1	1	0	1	0
	Detected value	0.08	<0.10	<0.10	<0.20	0.41	<0.10	<0.10	4.90	0.32	<1.00	<0.10	3.70	260.00	<0.20	0.99	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 5 Continued.

Species	Metal	Mercury	Total Arsenic	Cadmium	Total Chromium	Copper	Nickel	Lead	Zinc	Selenium	Aluminum	Thallium [a]	Iron	Magnesium	Barium	Manganese	Silver
	NC DPH Screening Level	**0.4 (graduated)**	**total 0.27**	**0.41**	**1.2**	**16**	**8.2**	**NA**	**120**	**10.0 (graduated)**	**410**	**0.00412**	**290**	**NA**	**82**	**58**	**2.1**
	NC DENR Sample Reporting Limits	NA	0.10	0.10	0.10	NA	0.10	0.10	NA	NA	1.00	0.10	NA	NA	0.20	0.20	0.10
		Kerr Flats, VA Location (DENR Site H1)															
Black Crappie	No. of fillet samples	1															
	No.of detects	1	1	0	0	1	0	0	1	1	0	0	1	1	0	1	0
	Detected value	0.07	0.15	<0.10	<0.20	0.28	<0.10	<0.10	4.50	0.35	<1.00	<0.10	1.40	250.00	<0.20	0.21	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bluegill Sunfish	No. of fillet samples	7															
	No.of detects	7	0	0	1	7	1	0	7	7	0	0	7	7	0	6	0
	Low detect value	0.05	NA	NA	0.41	0.16	0.20	NA	6.30	0.21	NA	NA	1.20	200.00	NA	0.27	NA
	High detect value	0.12	NA	NA	0.41	0.46	0.20	NA	8.90	0.63	NA	NA	3.30	260.00	NA	0.79	NA
	Mean detected value	0.08	NA	NA	0.41	0.30	0.20	NA	7.43	0.39	NA	NA	2.16	232.86	NA	0.43	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Channel Catfish	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	0	1	1	0	0	1	1	0	0	0
	Detected value	0.11	<0.10	<0.10	<0.20	0.13	<0.10	<0.10	2.90	0.33	<1.00	<0.10	1.70	220.00	<0.20	<0.20	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gizzard Shad	No. of fillet samples	3															
	No.of detects	3	0	0	0	3	1	0	3	3	0	0	3	3	3	3	0
	Low detect value	0.03	NA	NA	NA	0.37	0.10	NA	4.60	0.19	NA	NA	7.90	220.00	0.41	2.10	NA
	High detect value	0.04	NA	NA	NA	0.47	0.10	NA	5.20	0.48	NA	NA	8.00	230.00	1.20	4.60	NA
	Mean detected value	0.03	NA	NA	NA	0.41	0.10	NA	5.00	0.37	NA	NA	7.97	226.67	0.77	3.27	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Largemouth Bass	No. of fillet samples	6															
	No.of detects	6	2	0	0	6	1	1	6	6	2	0	6	6	0	0	0
	Low detect value	0.10	0.10	NA	NA	0.20	0.16	0.18	3.90	0.21	1.40	NA	1.40	230.00	NA	NA	NA
	High detect value	0.39	0.12	NA	NA	0.37	0.16	0.18	4.40	0.35	1.80	NA	2.30	270.00	NA	NA	NA
	Mean detected value	0.19	0.11	NA	NA	0.25	0.16	0.18	4.12	0.30	1.60	NA	1.83	255.00	NA	NA	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Redear Sunfish	No. of fillet samples	5															
	No.of detects	5	2	0	0	5	0	0	5	5	1	0	5	5	0	0	0
	Low detect value	0.07	0.10	NA	NA	0.14	NA	NA	4.80	0.40	9.00	NA	1.10	220.00	NA	NA	NA
	High detect value	0.15	0.13	NA	NA	0.24	NA	NA	5.90	0.70	9.00	NA	1.80	250.00	NA	NA	NA
	Mean detected value	0.11	0.12	NA	NA	0.18	NA	NA	5.30	0.57	9.00	NA	1.52	242.00	NA	NA	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shorthead Redhorse	No. of fillet samples	1															
	No.of detects	1	0	0	0	1	0	0	1	1	0	0	1	1	1	1	0
	Detected value	0.24	<0.10	<0.10	<0.20	0.36	<0.10	<0.10	4.60	0.28	<1.00	<0.10	4.40	270.00	0.27	0.90	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Crappie	No. of fillet samples	8															
	No.of detects	8	3	0	0	8	0	0	8	8	1	0	7	8	0	1	0
	Low detect value	0.04	0.10	NA	NA	0.16	NA	NA	3.50	0.28	1.10	NA	1.20	250.00	NA	0.20	NA
	High detect value	0.11	0.13	NA	NA	0.24	NA	NA	4.50	0.37	1.10	NA	1.50	270.00	NA	0.20	NA
	Mean detected value	0.07	0.12	NA	NA	0.20	NA	NA	4.09	0.33	1.10	NA	1.36	256.25	NA	0.20	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] The sample reporting limit for all not-detected thallium results is greater than the NC DPH screening level for ingesting fish

Bold, shaded values are greater than the NC DPH screening level for ingesting fish

No. = number

SL = screening level

N.C. = North Carolina DENR = Department of Environment and Natural Resources DPH = Division of Public Health, Department of Health and Human Services