NORTH CAROLINA DIVISION OF PUBLIC HEALTH
REVIEW OF BASELINE – ROUND 2 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
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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 near Eden North Carolina. DENR's first round of baseline fish collections took place from February 24 to March 5, 2014[1]. DENR conducted a second baseline fish sampling event from April 9 – 24, 2014. DENR considers the "baseline" data to represent conditions prior to potential uptake of coal ash spill-related metals into the fish tissue. The round 2 baseline sampling effort included fillet tissue from 113 fish from 15 species collected at 4 Dan River sites in North Carolina waters. DENR produced 75 fillet samples and each was analyzed for 16 metals. The 4 locations included Eden, Berry Hill, Milton and the Kerr Reservoir near the Satterwhite Point Recreation Area. The Eden location is upstream of the coal ash spill and fish from this area are isolated from moving downstream by a dam.

The N.C. Department of Health and Human Services (DHHS) Division of Public Health (DPH) is reviewing the fish tissue data to determine the potential for negative health effects to people that may eat the fish. Sixteen (21%) of the fillet samples collected in April 2014 exceeded either a mercury or arsenic level of concern for fish ingestion. Mercury was detected in all 75 (100%) of the fillet samples and 7 (9%) of the detections exceeded the N.C. action level. Arsenic was detected in 30 (40%) fillet samples. All arsenic screening level exceedances were in striped bass (9/12, 75%). The human health screening level exceedances are summarized in Table 1.

Table 1. N.C. DENR Dan River April 2014 round 2 baseline fish tissue samples exceeding N.C. DPH screening levels for ingestion.

Species	Location	No. Samples at Location	No. Exceedances at Location (Percent)	Metal
Walleye	Milton	1	1 (100%)	Mercury
Striped Bass	Milton	12	2 (17%) 9 (75%)	Mercury Arsenic
Largemouth Bass	Kerr Reservoir, Satterwhite Pt. Rec. Area	11	4 (36%)	Mercury

In North Carolina there is a statewide largemouth bass consumption advisory for mercury (Appendix Table 4) (http://epi.publichealth.nc.gov/oee/mercury/safefish.html). We do not know if the arsenic levels observed in the striped bass[2] are typical of this particular species of fish in the Dan River. There was no previous collection of striped bass in the Dan River. Baseline data does not provide information

[1] 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. (available at: http://epi.publichealth.nc.gov/oee/hace/by_site.html)

[2] Commonly referred to as rockfish (scientific name: *Morone saxatillis*)

to evaluate potential long-term impacts associated with the coal ash spill to the fish, or to persons that eat the fish. For that reason, DPH is not modifying its fish consumption recommendations for the Dan River in North Carolina until fish data is available to evaluate potential long-term impacts. We continue to recommend that persons avoid eating fish or shellfish taken from the Dan River in North Carolina downstream of the coal ash spill in Rockingham and Caswell Counties.

The N.C. Division of Public Health 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 in Rockingham and Caswell Counties.

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Public Health Implications of DENR's Baseline Fish Tissue Data

The DPH has completed review of the second round of fish collected from April 9 -24, 2014 in the Dan River by DENR to evaluate impacts related to the February 2, 2014 Duke Energy coal ash spill near Eden N.C. The fish were collected at 4 locations in N.C. (see Appendix Figure 1 and Table 2). The DPH received the data from DENR in January 2015. 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 location 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 fish collections were downstream of the coal ash spill location, extending more than 80 miles into the Kerr Reservoir.

The round 2 data included analysis of 75 fish fillet samples from 15 species, each analyzed for 16 metals. Appendix Table 3 summarizes the number of fillet samples by species and sample location. 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 DPH is 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-eating predators such as larger fish, birds and mammals. DPH did not evaluate the whole body data for public health impacts.

DENR considers the April 2014 fish collections to represent a second round of baseline metal concentrations in the fish. Baseline levels are those representing metal concentrations in fish before the fish could have been impacted by metals from the coal ash spill. Samples from future fish collections can be compared to the baseline data set to determine if the fish 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 be harmful if accumulated to elevated levels.

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 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 are not anticipated to 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 an infant 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 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. Prior to the Dan River coal ash spill DPH had statewide fish tissue action levels for the metals mercury and selenium. DPH developed screening levels for the additional fish tissue metals to be analyzed in response to the coal ash spill. The fish tissue screening levels are listed in Appendix Table 4.

Public Health Summary of DENR's Round 2 Baseline Fish Tissue Data for the Dan River Coal Ash Spill

The round 2 baseline Dan River fish fillet tissue data is summarized below. Data summary tables follow in the Appendix.

Round 2 baseline fish collection:	April 9 – 24, 2014 (coal ash spill date: February 2, 2014)
Total number of fillet samples analyzed:	75
Total number of filleted species analyzed:	15
Fish tissue analyses:	16 metals

Number of fish that exceeded a N.C. DPH health screening level: 16 (21% of all fillet samples)

- 1/1 (100%) Walleye collected near Milton N.C. exceeded the mercury action level
- 2/12 (17%) Striped bass collected near Milton N.C. exceeded the mercury action level
- 9/12 (75%) Striped bass collected near Milton N.C. exceeded the arsenic screening level
- 4/11 (36%) Largemouth bass collected in Kerr Reservoir in N.C. exceeded the mercury action level

There were no detections of thallium in the fillet samples, but 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 5 summarizes round 2 exceedances of N.C. DPH action or screening levels. Appendix Table 6 provides round 2 summary statistics by locations and species.

Arsenic exceedances discussion: The total arsenic concentration in 9 of 12 striped bass collected near Milton exceeds the total arsenic screening level. The total arsenic analysis did not separate the more toxic-to-human inorganic arsenic species from the non-toxic organic arsenic species. The scientific literature suggests that approximately 10% of the total arsenic detected in fish may represent the toxic inorganic form. We do not know if the arsenic levels seen in the striped bass represent typical levels for this species in the Dan River. The scientific literature[3,4] indicates that species such as striped bass that spend part of their lifecycle in estuarine or marine water can have higher levels of arsenic relative to species isolated to freshwater environments. However, the striped bass caught near Milton in the Dan River are an isolated freshwater population because of dams in the river which prevent their migration to the ocean.

<u>Public Health Conclusions for the April 2014 Round 2 Baseline Dan River Fish Tissue Samples</u>

1. The N.C. DPH continues to recommend that people do not eat fish or shellfish collected in the Dan River downstream of the location of the coal ash spill near Eden N.C. in Rockingham and Caswell Counties, N.C (spill site GPS coordinates 36.492071, -79.711608).
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 and accumulated in the fish.
3. The total arsenic concentrations observed in 9 of 12 striped bass are higher than the screening level.
4. There is uncertainty in the evaluation of the potential health impacts associated with thallium because the analytical method is not sensitive enough to detect thallium levels that could be harmful to human health.
5. The N.C. DPH will evaluate future fish tissue data provided by N.C. DENR and other agencies to monitor if ingesting the fish from the Dan River downstream of the coal ash spill location could adversely affect people's health.
6. 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).

[3] L. Williams, R. A. Schoof, J. W. Yager & J. W. Goodrich-Mahoney (2006): Arsenic Bioaccumulation in Freshwater Fishes, Human and Ecological Risk Assessment: An International Journal, 12:5, 904-923

[4] R. Greene and C. Crecelius (2006): Total and Inorganic Arsenic in Mid-Atlantic Marine Fish and Shellfish and Implications for Fish Advisories, Integrated Environmental Assessment and Management, 2:4: 344-354

APPENDIX

Figure 1. N.C. DENR round 2 baseline fish collection locations in the Dan River. Fish collected April 9 - 24, 2014. J1: Eden, D1: Berry Hill, F1: Milton. Source: N.C. DENR

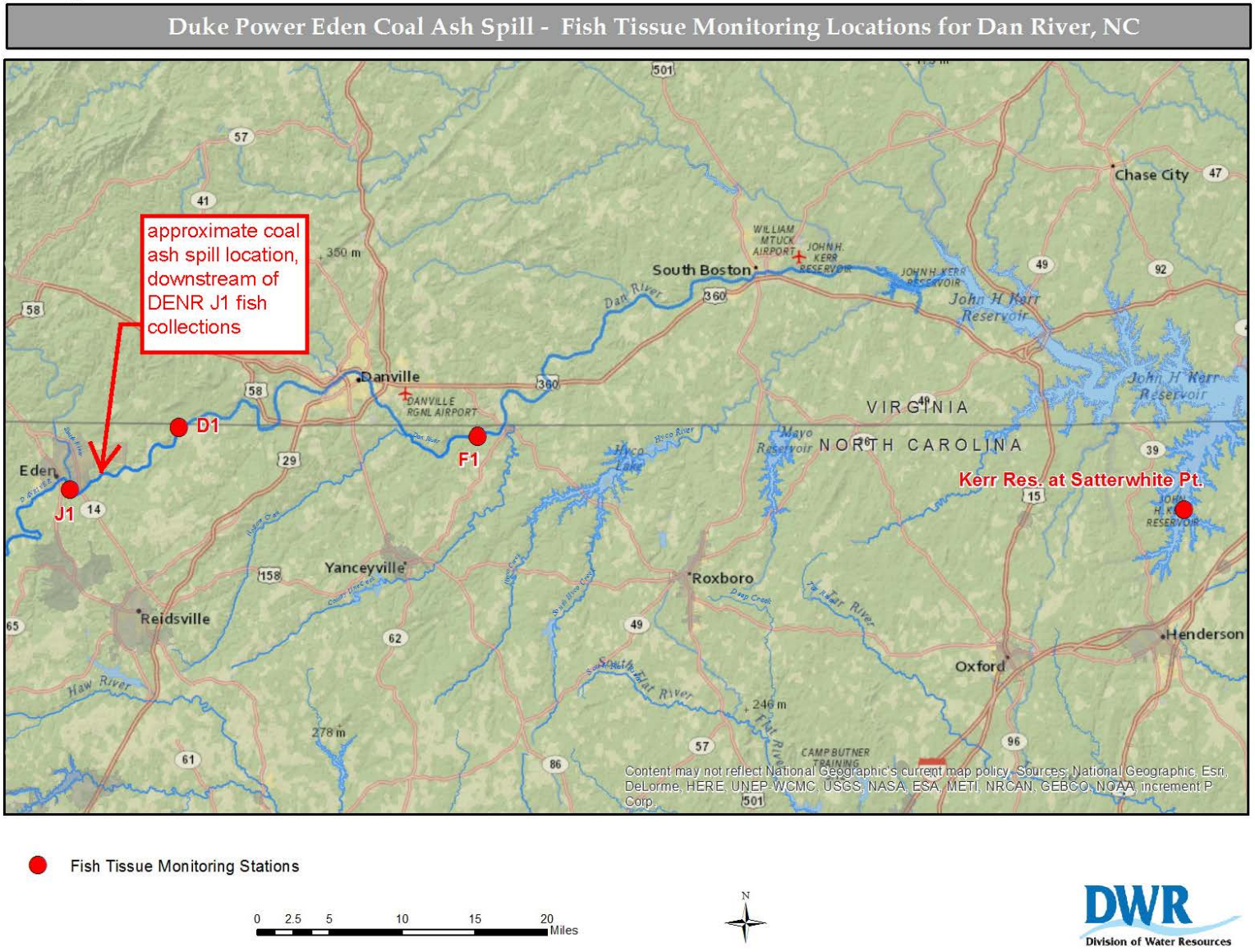

Table 2. N.C. DENR round 2 baseline Dan River fish collection locations for the Duke Energy coal ash spill of February 2, 2014. Locations listed from upstream to downstream.

Location Description	County / State	Site ID	Collection Date
Eden [a]	Rockingham / N.C.	J1	April 23, 2014
Berry Hill	Rockingham / N.C.	D1	April 14, 2014
Milton	Caswell / N.C.	E1	April 24, 2014
Kerr Reservoir nr Satterwhite Point Recreational Area	Vance / N.C.	Kerr Res.	April 9, 2014

[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

Table 3. Dan River round 2 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, April 9 - 24, 2014.

Species collected by N.C. DENR	DENR Round 2 Baseline Fish Collection Locations				Total No. Analytical Samples
	Eden N.C.[a]	Berry Hill N.C.	Milton N.C.	Kerr Res. N.C.	
Blue Catfish			3		3
Channel Catfish		6	6		12
Gizzard Shad		1			1
Golden Redhorse	2	2	1		5
Largemouth Bass [b]	2			11	13
Notchlip Redhorse			2		2
Quillback		2	1		3
Redbreast Sunfish	2	2			4
Redear Sunfish				2	2
Snail Bullhead	1				1
Striped Bass			12		12
V-lip Redhorse	2	2			4
Walleye			1		1
White Bass			5		5
Yellow Perch				7	7
Total No. Fillet Samples	**9**	**15**	**31**	**20**	**75**
No. Species	**5**	**6**	**8**	**3**	**15**

[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

No. = number

Table 4. 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)
Aluminum	410
Antimony	0.16
Arsenic (as inorganic As) [a]	0.027
Arsenic (as total As) [a]	0.27
Barium	82
Beryllium	1.6
Boron	82
Cadmium	0.41
Calcium	Not Available
Chromium, hexavalent	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 4. Table continued from the previous page

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

[a] Fish were analyzed for total arsenic

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 5. Human health screening level analysis summary for the DENR Dan River round 2 baseline fish fillet metals data. Fish collected in the Dan River April 9 - 24, 2014. All samples collected in North Carolina segments of the Dan River.

Species Collected by N.C. DENR	Total **No. of Fillets Analyzed** [a]	**No. of SL Exceedances (%)** [b]	**SL Exceeded**	**Collection Location with Exceedance**
Blue Catfish	3	0		
Channel Catfish	12	0		
Gizzard Shad	1	0		
Golden Redhorse	5	0		
Largemouth Bass [c]	13	4 (31%)	Mercury	Kerr Res.
Notchlip Redhorse	2	0		
Quillback	3	0		
Redbreast Sunfish	4	0		
Redear Sunfish	2	0		
Snail Bullhead	1	0		
Striped Bass	12	2 (17%) 9 (75%)	Mercury Arsenic	Milton, N.C.
V-lip Redhorse	4	0		
Walleye	1	1 (100%)	Mercury	Milton, N.C.
White Bass	5	0		
Yellow Perch	7	0		
Total all species	**75**	**16**		

[a] Total number of fillet samples collected per species in Round 2

[b] Percent of total number of fillet samples of each species collected in the round 2 baseline that exceed the human health screening level

[c] There is a N.C. statewide fish consumption advisory in North Carolina 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

Table 6. N.C. DENR round 2 baseline fish fillet tissue metals data for the Dan River summarized by collection location and species. Round 2 baseline fish collected April 9 - 24, 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. Screening levels and fish tissue data in mg/kg wet weight.

	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	0.02	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.10	1.00	0.10	1.00	2.00	0.20	0.20	0.10
Species								**Eden N.C. Location (DENR Site "J1")**									
Golden Redhorse	No. of fillet samples	2															
	No. of detects	2	0	0	0	2	0	0	2	2	0	0	2	2	2	2	0
	Low detect value	0.17	NA	NA	NA	0.38	NA	NA	4.90	0.37	NA	NA	3.60	280	<0.20*	0.83	NA
	High detect value	0.21	NA	NA	NA	0.55	NA	NA	5.50	0.42	NA	NA	3.70	300	0.21*	1.00	NA
	Mean detected value	0.19	NA	NA	NA	0.47	NA	NA	5.20	0.40	NA	NA	3.65	290	0.16	0.92	NA
	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	2															
	No. of detects	2	0	0	0	2	0	0	2	2	0	0	2	2	0	2	0
	Low detect value	0.15	NA	NA	NA	0.26	NA	NA	4.00	0.43	NA	NA	3.20	260.00	NA	0.80	NA
	High detect value	0.18	NA	NA	NA	0.39	NA	NA	4.70	0.56	NA	NA	4.10	260.00	NA	1.00	NA
	Mean detected value	0.17	NA	NA	NA	0.33	NA	NA	4.35	0.50	NA	NA	3.65	260.00	NA	0.90	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	2															
	No. of detects	2	0	0	0	2	0	0	2	2	0	0	2	2	0	0	0
	Low detect value	0.21	NA	NA	NA	0.18	NA	NA	3.70	0.42	NA	NA	1.20	280.00	NA	NA	NA
	High detect value	0.23	NA	NA	NA	0.20	NA	NA	3.90	0.46	NA	NA	1.30	280.00	NA	NA	NA
	Mean detected value	0.22	NA	NA	NA	0.19	NA	NA	3.80	0.44	NA	NA	1.25	280.00	NA	NA	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	2															
	No. of detects	2	1	0	0	2	1	0	2	2	0	0	2	2	0	2	0
	Low detect value	0.05	0.10	NA	NA	0.20	0.13	NA	4.60	0.53	NA	NA	1.40	290.00	NA	0.25	NA
	High detect value	0.08	0.10	NA	NA	0.36	0.13	NA	5.80	0.63	NA	NA	2.10	290.00	NA	0.27	NA
	Mean detected value	0.07	0.10	NA	NA	0.28	0.13	NA	5.20	0.58	NA	NA	1.75	290.00	NA	0.26	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	1															
	No. of detects	1	0	0	0	1	0	0	1	0	1	0	1	1	0	1	0
	Detected value	0.03	<0.10	<0.10	<0.200	0.52	<0.10	<0.10	6.20	0.15*	3.30	<0.10*	4.70	250.00	<0.20*	0.30	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6 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	0.02	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.10	1.00	0.10	1.00	2.00	0.20	0.20	0.10
Species		Berry Hill N.C. Location (DENR Site "D1")															
Channel Catfish	No. of fillet samples	6															
	No. of detects	6	0	0	0	6	0	0	6	6	5	0	6	6	0	3	0
	Low detect value	0.10	NA	NA	NA	0.27	NA	NA	3.30	0.18	1.50	NA	1.90	240.00	NA	0.20	NA
	High detect value	0.14	NA	NA	NA	0.54	NA	NA	4.40	0.34	3.40	NA	3.00	280.00	NA	0.34	NA
	Mean detected value	0.12	0	0	0	0.38	0	0	3.73	0.25	2.04	0	2.50	268.33	0	0.25	0
	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	2															
	No. of detects	2	0	0	0	2	0	0	2	2	2	0	2	2	0	2	0
	Low detect value	0.19	NA	NA	NA	0.56	NA	NA	5.80	0.41	1.00	NA	4.40	290.00	NA	1.30	NA
	High detect value	0.21	NA	NA	NA	0.61	NA	NA	6.80	0.44	2.30	NA	4.90	300.00	NA	1.50	NA
	Mean detected value	0.20	0	0	0	0.59	0	0	6.30	0.43	1.65	0	4.65	295.00	0	1.40	0
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quillback	No. of fillet samples	2															
	No. of detects	2	0	0	0	2	0	0	2	2	2	0	2	2	0	2	0
	Low detect value	0.33	NA	NA	NA	0.58	NA	NA	4.40	0.43	3.40	NA	7.80	220.00	NA	0.97	NA
	High detect value	0.37	NA	NA	NA	0.80	NA	NA	6.10	0.86	68.00	NA	12.00	240.00	NA	1.40	NA
	Mean detected value	0.35	0	0	0	0.69	0	0	5.25	0.65	35.70	0	9.90	230.00	0	1.19	0
	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	1															
	No. of detects	1	1	0	0	1	0	0	1	1	0	0	1	1	0	1	0
	Detected value	0.03	0.12	<0.10	<0.200	0.66	<0.10	<0.10	5.20	0.35	<1.00	<0.10*	8.40	280.00	0.59*	2.20	<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	2															
	No. of detects	2	0	0	0	2	0	0	2	2	1	0	2	2	0	1	0
	Low detect value	0.07	NA	NA	NA	0.31	NA	NA	5.50	0.43	29.00	NA	2.20	260	NA	0.59	NA
	High detect value	0.14	NA	NA	NA	0.49	NA	NA	7.10	0.54	29.00	NA	2.50	290	NA	0.59	NA
	Mean detected value	0.11	0	0	0	0.40	0	0	6.30	0.49	29.00	0	2.35	275	0	0.59	0
	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	2															
	No. of detects	2	0	0	0	2	0	0	2	2	0	0	2	2	0	2	0
	Low detect value	0.11	NA	NA	NA	0.34	NA	NA	4.40	0.75	NA	NA	2.20	280	NA	0.94	NA
	High detect value	0.13	NA	NA	NA	0.36	NA	NA	4.60	0.79	NA	NA	2.20	310	NA	1.00	NA
	Mean detected value	0.12	0	0	0	0.35	0	0	4.50	0.77	0	0	2.20	295	0	0.97	0
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6 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	0.02	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.10	1.00	0.10	1.00	2.00	0.20	0.20	0.10
		Milton N.C. (DENR Site "F1")															
Notchlip Redhorse	No. of fillet samples	2															
	No. of detects	2	0	0	0	2	0	0	2	0	1	0	2	2	0	2	0
	Low detect value	0.13	NA	NA	NA	0.42	NA	NA	4.40	NA	2.40	NA	4.20	280	NA	0.77	NA
	High detect value	0.14	NA	NA	NA	0.51	NA	NA	6.20	NA	2.40	NA	4.50	300	NA	0.85	NA
	Mean detected value	0.14	0	0	0	0.47	0	0	5.30	0	2.40	0	4.35	290.00	0	0.81	0
	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	0	1	0	1	1	0	1	0
	Detected value	0.08	<0.10	<0.10	<0.200	0.44	<0.10	<0.10	4.30	0.68*	2.30	<0.10*	3.50	280.00	<0.20*	0.89	<0.10
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Bass	No. of fillet samples	5															
	No. of detects	5	5	0	0	5	0	0	5	0	4	0	5	5	0	0	0
	Low detect value	0.13	0.14	NA	NA	0.24	NA	NA	3.50	NA	2.50	NA	1.90	240	NA	NA	NA
	High detect value	0.26	0.25	NA	NA	0.50	NA	NA	5.10	NA	4.90	NA	3.00	270	NA	NA	NA
	Mean detected value	0.19	0.19	0	0	0.32	0	0	4.04	0	3.58	0	2.38	256	0	0	0
	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	6															
	No. of detects	6	0	0	0	6	0	0	6	0	4	0	6	6	0	1	0
	Low detect value	0.06	NA	NA	NA	0.22	NA	NA	3.50	NA	1.10	NA	1.90	220	NA	0.21	NA
	High detect value	0.11	NA	NA	NA	0.35	NA	NA	4.60	NA	19.00	NA	3.50	260	NA	0.21	NA
	Mean detected value	0.08	0	0	0	0.27	0	0	4.05	0	7.25	0	2.33	245	0	0.21	0
	No. detects > SL	0	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	0	0	1	1	0	1	0
	Detected value	0.10	<0.10	<0.10	<0.200	0.38	<0.10	<0.10	3.00	0.30	<1.00	<0.10*	5.30	280.00	<0.20*	0.29	<0.10*
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walleye	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	**0.47**	<0.10	<0.10	<0.200	0.32	<0.10	<0.10	3.20	0.37	<1.00	<0.10*	3.80	280.00	<0.20*	<0.20	<0.10*
	No. detects > SL	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blue Catfish	No. of fillet samples	3															
	No. of detects	3	0	0	0	3	0	0	3	3	0	0	3	3	0	2	0
	Low detect value	0.12	NA	NA	NA	0.19	NA	NA	2.80	0.26	NA	NA	1.70	240	NA	0.21	NA
	High detect value	0.26	NA	NA	NA	0.23	NA	NA	3.60	0.26	NA	NA	4.90	250	NA	0.25	NA
	Mean detected value	0.18	0	0	0	0.20	0	0	3.27	0.26	0	0	2.90	247	0	0.23	0
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striped Bass	No. of fillet samples	12															
	No. of detects	12	12	0	0	12	0	0	12	12	3	0	12	12	0	2	0
	Low detect value	0.21	0.18	NA	NA	0.28	NA	NA	2.70	0.44	1.10	NA	3.60	220	NA	0.22	NA
	High detect value	**0.43**	**0.84**	NA	NA	0.52	NA	NA	3.50	0.55	7.50	NA	8.50	260	NA	0.46	NA
	Mean detected value	0.34	**0.47**	NA	NA	0.37	NA	NA	2.92	0.48	3.73	NA	5.35	238	NA	0.34	NA
	No. detects > SL	2	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mean of > SL values	**0.42**	**0.56**														

Table 6 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	0.02	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.10	1.00	0.10	1.00	2.00	0.20	0.20	0.10
Species	**Kerr Reservoir nr Satterwhite Pt. Recreation Area, N.C. Location (DENR Site "Kerr Res.")**																
Largemouth Bass	No. of fillet samples	11															
	No. of detects	11	10	0	0	11	0	0	11	11	1	0	10	11	0	0	0
	Low detect value	0.16	0.11	NA	NA	0.19	NA	NA	4.00	0.34	1.00	NA	1.50	250	NA	NA	NA
	High detect value	**0.58**	0.26	NA	NA	0.50	NA	NA	7.00	0.47	1.00	NA	3.00	300	NA	NA	NA
	Mean detected value	0.36	0.18	NA	NA	0.30	NA	NA	5.17	0.38	1.00	NA	2.10	282	NA	NA	NA
	No. detects > SL	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mean of > SL values	**0.52**															
Redear Sunfish	No. of fillet samples	2															
	No. of detects	2	1	0	0	2	0	0	2	2	1	0	2	2	0	0	0
	Low detect value	0.06	0.19	NA	NA	0.12	NA	NA	5.50	0.38	1.70	NA	1.00	230	NA	NA	NA
	High detect value	0.13	0.19	NA	NA	0.14	NA	NA	6.40	0.38	1.70	NA	2.80	280	NA	NA	NA
	Mean detected value	0.10	0.19	NA	NA	0.13	NA	NA	5.95	0.38	1.70	NA	1.90	255	NA	NA	NA
	No. detects > SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow Perch	No. of fillet samples	7															
	No. of detects	7	0	0	1	7	2	1	7	7	7	0	7	7	0	5	0
	Low detect value	0.05	NA	NA	0.33	0.18	0.13	0.12	4.50	0.28	1.80	NA	1.20	190	NA	0.24	NA
	High detect value	0.16	NA	NA	0.33	0.48	0.46	0.12	21.0	0.40	62.00	NA	56.0	550	NA	11.00	NA
	Mean detected value	0.11	NA	NA	0.33	0.26	0.30	0.12	7.41	0.32	11.26	NA	10.1	287	NA	2.53	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

* indicates J2 Qualifier - estimated value - failed to meet established quality control criteria.

No. = number

SL = screening level

DENR = Department of Environment and Natural Resources

DPH = Division of Public Health, Department of Health and Human Services

mg/kg wet weight = milligrams metal per kilogram wet weight fish tissue

NA = not applicable

N.C. = North Carolina