N.C. Division of Water Resources (DWR) Fourth Round of Dan River Fish Tissue Metals Analysis Following the Eden Coal Ash Spill (15-Month Post-Spill Assessment)

July 27, 2016

Water Resources
ENVIRONMENTAL QUALITY

N.C. DIVISION OF WATER RESOURCES (DWR) FOURTH ROUND OF DAN RIVER FISH TISSUE METALS ANALYSIS FOLLOWING THE EDEN COAL ASH SPILL (FIFTEEN-MONTH POST-SPILL ASSESSMENT), July 27, 2016

Key Findings

- Results for DWR's fourth round of fish tissue metals analysis from the Dan River (fifteen-month post-spill assessment in late April/early May 2015, Table 1) are similar to its first three assessments following the February 2014 coal ash spill, and also to historical DWR fish tissue data from two Dan River sites in 2005. Collectively, all of the DWR Dan River fish tissue data reported to present show similar levels of heavy metals among alike species with very infrequent exceedances of North Carolina's Division of Public Health (DPH) fish consumption advisory action levels and screening values.
- Approximately 15 months following the coal ash spill in Eden, N.C., DWR has found very little evidence of heavy metals being incorporated into fish tissues in the North Carolina portions of the Dan River downstream of the coal ash spill site. There have been a few statistically significant changes measured in fish tissue metals over the course of the four DWR post-spill assessments. However, none of these changes represent fish tissue metals with exceedances of the various DPH action levels and screening values.
- Mercury was reported above the laboratory practical quantitation limit (PQL) (0.02 mg/kg) in all 99 (100%) samples in the fourth-round fish tissue assessment. Three of the 11 Striped Bass from the Milton site (F1) showed fillet-mercury concentrations (0.43, 0.44 and 0.50 mg/kg, respectively) exceeding the 0.4 mg/kg N.C. mercury action level. All other fish-mercury observations in round four were below the action level. *North Carolina's statewide mercury advisory for Largemouth Bass has been in place since 2001. The state of Virginia has also issued fish consumption advisories for mercury and PCBs in the Dan River.* Almost all (97 of 99) of the round-four mercury observations were either within or above the generic wildlife reference screening value range of 0.03 to 0.1 mg/kg.
- Arsenic was reported above the laboratory PQL (0.10 mg/kg) in 28 of 99 (28%) fish-tissue samples collected and processed during the fourth-round assessment. Fish-arsenic data ranged from 0.11 to 0.31 mg/kg, with the three highest concentrations observed in Striped Bass from Milton (F1), which either met or exceeded the DPH fillet screening value of 0.27 mg/kg. None (0%) of the round four fish tissue samples reached the generic wildlife screening value for arsenic (1.3 mg/kg).
- Selenium was detected in all (100%) round-four fish-tissue samples, but all were well below the DPH advisory action level of 10.0 mg/kg. Values ranged from 0.21 to 0.93 mg/kg and were similar to data from rounds one, two, and three, with no clear differences between species or trophic guilds. Twelve of the round four selenium concentrations (12%) were at or above the generic wildlife screening value of 0.6 mg/kg, most of which occurred in Redbreast Sunfish.
- Much like the first three DWR Dan River fish-tissue assessments, the highest concentrations of heavy metals in round-four were often observed in whole-body samples. However, the number of whole-body samples was low in comparison to fillet samples (11% and 89%, respectively). *DPH uses only fillet concentrations to determine if fish advisories will be recommended.*

Introduction

In late April and early May 2015, DWR collected its fourth round of fish-tissue samples from the Dan River for a 15-month post-spill assessment of heavy metals following the February 2014 coal ash spill in Eden, N.C. The objectives of this fourth round of sampling were 1) to continue providing Dan River fish-tissue data to DPH for human risk assessments and 2) to evaluate any potential changes in concentrations of fish-tissue metals that may be associated with the February 2014 coal ash spill.

Methods

The four sampling stations from upstream of the Dan River Steam Station to the lower North Carolina portion of Kerr Reservoir at Satterwhite Point State Park Recreation Area (approximately 115 river miles) were sampled from April 28 to May 6, 2015 using 7.5 and 2.5 generator powered pulsator (GPP) boat-mounted electrofishers (see map in Appendix 1). Fish tissue samples were then processed and analyzed at the DWR Water Sciences Section (WSS) laboratories in Raleigh, NC according to the DWR fish tissue contaminant standard operating procedure https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/intensive-survey-branch) and according to the United States Environmental Protection Agency (EPA) analytical methods 245.6 (CVAA), 200.7 (ICP) and 200.8 (ICPMS). Eighty-eight of the 99 round-four samples were processed as fillets for use in DPH risk assessments and 11 samples were processed as whole-body types for comparison to generic wildlife screening values.

Two previously assessed sites located in Virginia (Danville, and Kerr Reservoir headwaters near Staunton River State Park) were dropped from the second, third, and fourth rounds of fish collections in order to eliminate duplicate sampling efforts between DWR and the Virginia Department of Environmental Quality (VADEQ). A total of 15 previously sampled species were collected during the fourth-round assessment, including five species of suckers (four redhorse species), three catfish species, two sunfish species, and three top predators. The suite of 16 metals tested for in the 99 processed fish tissue samples included aluminum (Al), arsenic (As), barium (Ba), cadmium (Cd), chromium (Cr), copper (Cu), iron (Fe), lead (Pb), magnesium (Mg), manganese (Mn), mercury (Hg), nickel (Ni), selenium (Se), silver (Ag), thallium (Tl), and zinc (Zn). DWR has analyzed a total of 289 samples from the N.C. portions of the Dan River since the February 2014 coal ash spill, resulting in a total of 4,624 discrete data points.

Screening Values

There are currently two North Carolina fish consumption action levels established by DPH for the protection of individuals who consume fish; mercury (0.4 mg/kg, wet weight) and selenium (10.0 mg/kg, wet weight). Fish tissue screening values have also been developed by DPH for 18 other metals since the Dan River coal ash spill (Appendix 2). Generic wildlife screening values are also available for mercury, selenium, and arsenic for comparison to these data (Appendix 3). However, concentrations of metals in fish fillets or whole-body samples may not be representative of the specific diets of predatory fish and aquatic-dependent wildlife, and therefore may not be ideal for wildlife risk assessments. The values in Appendix 3 are provided for a general wildlife screen of fish tissue metals data, but have not been formally adopted by DWR or any other agency.

General Observations and Results

Approximately 15 months after the Duke Energy coal ash spill at Eden, N.C., there are no clear signs of coal-ash-related heavy metals being incorporated into fish tissues in the Dan River. Striped Bass collected at Milton (F1) is the only species that showed any elevated levels of heavy metals during the fourth-round assessment (Hg and As, three observations each).

Monitoring results for each of the 16 heavy metals measured in DWR's fourth-round fish-tissue assessment of the Dan River are discussed here:

Aluminum (Al) – Twenty-seven concentrations of aluminum (27%) were equal to or above the laboratory PQL of 1.0 mg/kg. Values ranged from 1.0 to 170 mg/kg, with the highest two observations occurring in whole-body Redhorse samples from the Milton (F1) and Eden (J1) sites. Similar to results from the baseline assessments (rounds one and two) and from the ten-month assessment (round three), all concentrations of aluminum were well below the DPH screening value of 410 mg/kg.

Arsenic (As) – Twenty-eight observations of total arsenic (28%) were reported above the laboratory PQL (0.10 mg/kg) with concentrations ranging from 0.11 to 0.31 mg/kg. In comparison, total arsenic measurements in the first three monitoring rounds were reported above the lab PQL at 0.02%, 37%, and 2%, respectively. In total, three of the 11 Striped Bass collected during round four at the Milton site (F1) were equal to or just exceeding the DPH screening value of 0.27 mg/kg. In comparison, nine of the 12 Striped Bass collected during their 2014 spawning run (round two data) exceeded the 0.27 mg/kg NCDPH screening value. All observations of total arsenic were well below the generic wildlife reference screening value of 1.3 mg/kg.

Barium (Ba) – Twenty-eight of 99 barium concentrations (28%) in round four were reported above the laboratory PQL of 0.20 mg/kg. Values ranged from 0.21 to 23.0 mg/kg, with the highest occurring in an individual Bull Chub whole-body sample from the Berry Hill site (D1). Similar to the results from rounds one, two, and three, all concentrations were well below the DPH screening value of 82.0 mg/kg. All round-four barium data were flagged with the J2 qualifier because they failed to meet the established quality control criteria; there is no available standard method reference material for barium in fish tissues.

Cadmium (Cd) – Similar to the results for the second- and third-round assessments, none (0%) of the round-four observations of cadmium in Dan River fish tissues were reported above the laboratory PQL of 0.10 mg/kg. The DPH screening value for cadmium in fish tissues is 0.41 mg/kg.

Chromium (Cr) – Chromium was reported above the laboratory PQL in five (5%) of the round-four samples, with concentrations ranging from 0.21 to 0.49 mg/kg. The highest value was observed in a whole-body Notchlip Redhorse sample collected from the Milton site (F1). None (0%) of the chromium concentrations collected by DWR since the coal ash spill have either met or exceeded the DPH screening value of 1.2 mg/kg.

Copper (Cu) – All observations of copper (100%) in round four were detected above the laboratory PQL of 0.10 mg/kg, with a range of 0.13 to 1.3 mg/kg. The highest concentration of copper was observed in a Bull Chub whole-body sample from the Milton site (F1). All (100%) concentrations of copper in Dan River fish tissues continued to be well below the NCDPH screening value of 16.0 mg/kg.

Iron (Fe) – Iron concentrations were reported above the laboratory PQL of 1.0 mg/kg in all (100%) of the round-four samples, with a range of 1.3 to 150.0 mg/kg. Consistent with DWR's baseline (rounds one and two) and ten-month (round three) observations, the highest iron concentrations were observed in whole-body sample types; the highest two occurring in whole-body Redhorse samples from Milton (F1) and Eden (J1). All observations (100%) were well below the DPH screening value of 290 mg/kg.

Lead (Pb) – Lead was reported above the laboratory PQL (0.10 mg/kg) in only one Blue Catfish fillet sample (1%, 0.11 mg/kg) during the round-four assessment. By comparison, lead concentrations in the first three DWR assessments were reported above the laboratory PQL in 8%, 1%, and 0% of samples, respectively. There is no human health screening value available for the evaluation of lead in fish tissues in North Carolina.

Magnesium (Mg) – Much like DWR's first three Dan River fish tissue assessments, 100% of magnesium concentrations were reported well above the laboratory PQL of 2.0 mg/kg. Values ranged from 250 to 500 mg/kg, with the highest concentrations observed in whole-body sample types of suckers, sunfish, and minnows. No screening value is available in N.C. for the comparison of magnesium in fish tissues.

Manganese (Mn) – Seventy-three of the 99 manganese concentrations (73%) were reported at or above the laboratory PQL of 0.20 mg/kg during the round four assessment. Values were similar to baseline (rounds one and two) and ten-month (round three) results, ranging from 0.21 to 25.0 mg/kg. The highest value was observed in a whole-body Snail Bullhead sample from the Berry Hill site (D1). All concentrations (100%) continue to be well below the DPH screening value of 58.0 mg/kg.

Mercury (Hg) – All observations (100%) of total mercury in the fourth-round post-spill assessment were reported above the 0.02 mg/kg laboratory PQL. Concentrations ranged from 0.02 mg/kg to 0.50 mg/kg, with the highest observed in a 23-inch Striped Bass collected at the Milton site (F1). A total of three Striped Bass collected in round four, all in the 23- to 24-inch range, exceeded the DPH fish consumption action level of 0.4 mg/kg. Ninety-seven of the 99 round-four mercury observations were also within or greater than the generic wildlife reference screening value range of 0.03 to 0.1 mg/kg.

Nickel (Ni) – Seven concentrations of nickel (7%) were reported above the laboratory PQL of 0.10 mg/kg, most of which were observed in whole-body sample types. Similar to the results from the first three DWR assessments, nickel concentrations ranged from 0.13 to 0.54 mg/kg with all (100%) well below the DPH screening value of 8.2 mg/kg.

Selenium (Se) – All measurements (100%) of selenium in the round-four assessment were reported above the laboratory PQL of 0.10 mg/kg, with concentrations ranging from 0.21 to 0.93 mg/kg. The highest selenium concentration occurred in a Redbreast Sunfish whole-body composite sample from the control site at Eden (J1). All values were well below the 10.0 mg/kg DPH action level, but 14 of 99 (14%) were

equal to or greater than the generic wildlife reference screening value of 0.6 mg/kg. Similar to the selenium data collected during the baseline efforts (rounds one and two) and at 10 months (round three), almost half (43%) were issued J2 qualifiers because they failed to meet established quality control criteria. Standard selenium reference material recoveries were higher than the allowable range.

Silver (Ag) – No (0%) round four concentrations of silver in fish tissues from the Dan River were reported above the laboratory PQL of 0.10 mg/kg. To date, no observations of silver in Dan River fish collected since the Eden coal ash spill have been reported above the laboratory PQL. The DPH screening value for silver in fish tissue is 2.1 mg/kg.

Thallium (Tl) – Consistent with the first three assessments, no concentrations of thallium (0%) were reported above the laboratory PQL of 0.10 mg/kg. All thallium data were flagged with the J2 qualifier because they failed to meet the established quality control criteria. There is no available standard method reference material for thallium in fish tissues. The DPH screening value for thallium in fish tissue is 0.00412 mg/kg.

Zinc (Zn) – Concentrations of zinc were reported above the laboratory PQL (0.20 mg/kg) in all 99 (100%) of the round-four Dan River fish samples, with a range of 3.0 to 26.0 mg/kg. Much like the zinc results in the first three rounds of Dan River monitoring, the highest zinc concentrations were observed in whole-body fish samples of sunfish, minnows, and suckers. All concentrations were well below the DPH screening value of 120 mg/kg.

Summary of Fish Tissue Metals Concentrations and NC Screening Value Exceedances at N.C. Sites Since the Coal Ash Spill

A summary of analytes measured during DWR's four rounds of Dan River fish-tissue monitoring (including reporting ranges, percentages at or above laboratory PQLs, and exceedances of established N.C. human health risk assessment criteria in fillets) is presented in Table 2. Only the four sites sampled in N.C. are presented in Table 2 (*i.e.,* round one data from Danville, VA, and Kerr Reservoir headwaters in VA are excluded). Exceedances of N.C.'s risk assessment criteria during all four assessment rounds were limited to four of the 16 heavy metals analyzed in Dan River fish samples (mercury, arsenic, cadmium, and thallium) among five species [Largemouth Bass (mercury=6, cadmium=1), Striped Bass (mercury=5, arsenic=12), Walleye (mercury=1), Golden Redhorse (mercury=1), and Redbreast Sunfish (thallium=1)]. Overall, 27 exceedances of N.C.'s risk assessment criteria have been observed in the N.C. portions of the Dan River since the coal ash spill, representing nine percent of the two hundred and eighty-nine fish samples. Mercury and arsenic represented the majority of these 27 DPH exceedances, with four percent of the 289 samples each. All selenium-fillet values (100%) have remained well below the state's DPH selenium advisory action level (10.0 mg/kg) throughout the four Dan River post-spill assessments.

The majority of the data incorporated in DWR's historic statewide fish tissue contaminant program is represented by total mercury alone. The other 15 heavy metals included in the Dan River assessments are not routinely analyzed by DWR. When comparing the historic statewide fish-mercury data to those observed in the four post-spill Dan River assessments, average mercury concentrations are similar. This is typical of DWR's historic fish-mercury assessments across North Carolina. Eleven of the 13 mercury

exceedances observed in the four Dan River assessments were observed in top predator species [Striped Bass (n=5), and Largemouth Bass (n=6)]. Results for Arsenic are similar to mercury results with a total of twelve exceedances, all observed in Striped Bass, representing four percent of the two hundred and eighty-nine samples.

Statistical Analysis of 16 Fish Tissue Metals in Four Rounds of Monitoring since the Coal Ash Spill

DWR has sampled three of its Dan River fish tissue monitoring sites [Eden (J1), Berry Hill (D1), and Milton (F1), see Appendix 1] on four occasions since the February 2014 coal ash spill. The following seven fish species have been collected at these three repeat sampling locations during either or both of the DWR baseline assessments (rounds one and two, February through April 2014), and also during rounds three or four (10 and 15 months, respectively). These seven fish species have been evaluated using bivariate regressions with JMP statistical software for changes in concentrations of heavy metals in fillet tissues over the four DWR fish tissue assessments:

- Golden Redhorse (Eden and Berry Hill)
- Redbreast Sunfish (Eden and Berry Hill)
- V-lip Redhorse (Eden)
- Notchlip Redhorse (Milton)
- Blue Catfish (Milton)
- Channel Catfish (Milton)
- Striped Bass (Milton)

Results of regression analyses of the 16 metals in fillets of recurring species are summarized in Table 3 for evaluation of their potential incorporation into fish tissues at the approximate 15-month post-spill interval. It is important to note that these bivariate regressions are based on a total number of ten or more samples for the seven recurring species at repeat sites. No statistics were performed for tissue samples with less than ten observations of the 16 heavy metals and no calculations of statistical power were performed in this study. DWR will evaluate all subsequent rounds of fish tissue metals data from the Dan River using this statistical method.

At the 15-month post-spill interval, there are no clear signs of heavy metal bioaccumulation into fish tissues in the N.C. portions of the river downstream of the Dan River Steam Station. Only three metals (Mg, Zn, and Se) showed increasing trends (at the 95% confidence level) at stations downstream of the spill location (Table 3). Moreover, the Eden control site located upstream of the low-head dam at Duke Energy's Dan River Steam Station also showed three metals with increasing trends at the $p<0.05$ level (Mg, As, and Mn) (Table 3). However, these increasing trends are in no way an indication of elevated concentrations of heavy metals in the tissues of these seven fish species. On the contrary, all of the metals that showed increasing trends over the four DWR fish tissue assessments showed concentrations low enough that none of them met or exceeded any of the established DPH action levels or screening values.

Magnesium represented a majority of increasing trends over the 15-month period at all three repeat stations, regardless of upstream or downstream proximity to the spill site (Table 3). Magnesium is a naturally occurring metal that is essential to cellular function in all known living organisms. Seasonal variation is thought to be the likely cause of the increasing trends in magnesium and other metals in Dan River fish tissues over the 15-month period since the spill. There is no available screening value in North Carolina for the evaluation of magnesium in fish tissues.

Future Assessments

DWR is planning its fifth (and likely final) round of fish tissue sampling on the Dan River in the spring of 2016. Although it is expected that concentrations of fish tissue metals in round five will remain similar to previous results which indicate a lack of bioaccumulation, DWR is committed to providing a robust and conclusive data set to DPH for human risk assessment relative to the consumption of Dan River fish. No further fish tissue monitoring efforts will be planned beyond spring 2016 unless the data indicates a need to further evaluate the potential bioaccumulation of coal ash-related heavy metals.

Table 1. NCDWR Fourth Round Dan River Fish Tissue Metals Analysis, 15 Months Following Eden, NC Coal Ash Spill (February, 2014).

Analyte (mg/kg wet weight).

Bold data indicates detection above the laboratory practical quantitation limit (PQL) and does not represent concentrations above NCDPH action levels or screening values or wildlife screening levels.

Site Location	Date Coll.	DWR # [1]	Species	Sample Type [2]	TL (mm)	Wt (g)	Hg	As	Cd	Crt	Cu	Ni	Pb	Zn	Se	Al	Tl	Fe	Mg	Ba	Mn	Ag
J1	4/29/15	15-23	Golden Redhorse	F	364	583	**0.28**	<0.10	<0.10	<0.20	**0.47**	<0.10	<0.10	**5.20**	**0.50**	<1.00	<0.10*	**5.30**	**330.00**	<0.20*	**1.20**	<0.10*
Eden	4/29/15	15-24	Golden Redhorse	F	351	519	**0.24**	<0.10	<0.10	<0.20	**0.50**	<0.10	<0.10	**5.40**	**0.41**	<1.00	<0.10*	**5.40**	**310.00**	**0.25***	**1.00**	<0.10*
NC	4/29/15	15-25	Golden Redhorse	F	353	531	**0.26**	<0.10	<0.10	<0.20	**0.48**	<0.10	<0.10	**4.90**	**0.37**	<1.00	<0.10*	**4.40**	**300.00**	<0.20*	**1.20**	<0.10*
	4/29/15	15-26	Golden Redhorse	F	337	446	**0.26**	<0.10	<0.10	<0.20	**0.53**	<0.10	<0.10	**4.90**	**0.38**	**2.80**	<0.10*	**4.90**	**290.00**	<0.20*	**0.88**	<0.10*
	4/29/15	15-27	Golden Redhorse	F	345	460	**0.30**	<0.10	<0.10	<0.20	**0.46**	<0.10	<0.10	**6.00**	**0.34**	<1.00	<0.10*	**4.60**	**320.00**	**0.22***	**1.30**	<0.10*
	4/29/15	15-28	Golden Redhorse	F	341	391	**0.12**	<0.10	<0.10	<0.20	**0.44**	<0.10	<0.10	**5.60**	**0.27**	<1.00	<0.10*	**3.00**	**330.00**	<0.20*	**0.99**	<0.10*
	4/29/15	15-29	Golden Redhorse	F	329	382	**0.18**	**0.11**	<0.10	<0.20	**0.29**	<0.10	<0.10	**5.60**	**0.34**	<1.00	<0.10*	**3.10**	**330.00**	**0.23***	**0.59**	<0.10*
	4/29/15	15-30	Golden Redhorse	WC-3	306	329	**0.08**	**0.12**	<0.10	**0.32**	**0.73**	**0.41**	<0.10	**13.00**	**0.48**	**120.00**	<0.10*	**130.00**	**470.00**	**3.70***	**21.00**	<0.10*
	4/29/15	15-31	V-lip Redhorse	F	282	216	**0.14**	**0.12**	<0.10	<0.20	**0.38**	<0.10	<0.10	**4.60**	**0.58**	<1.00	<0.10*	**1.90**	**330.00**	<0.20*	**0.48**	<0.10*
	4/29/15	15-32	V-lip Redhorse	F	316	245	**0.13**	**0.11**	<0.10	<0.20	**0.41**	<0.10	<0.10	**6.10**	**0.41**	<1.00	<0.10*	**3.30**	**280.00**	**0.35***	**0.96**	<0.10*
	4/29/15	15-34	V-lip Redhorse	F	283	233	**0.18**	**0.14**	<0.10	<0.20	**0.26**	<0.10	<0.10	**5.20**	**0.54**	**1.10**	<0.10*	**3.00**	**320.00**	**0.30***	**0.91**	<0.10*
	4/29/15	15-35	V-lip Redhorse	F	365	189	**0.27**	<0.10	<0.10	<0.20	**0.26**	<0.10	<0.10	**4.50**	**0.52**	<1.00	<0.10*	**2.20**	**330.00**	**0.26***	**0.90**	<0.10*
	4/29/15	15-36	V-lip Redhorse	F	254	150	**0.12**	<0.10	<0.10	<0.20	**0.26**	<0.10	<0.10	**4.90**	**0.60**	<1.00	<0.10*	**2.60**	**320.00**	**0.24***	**0.51**	<0.10*
	4/29/15	15-37	Bull Chub	W	243	172	**0.05**	<0.10	<0.10	**0.22**	**0.72**	**0.49**	<0.10	**26.00**	**0.36**	**39.00**	<0.10*	**43.00**	**480.00**	**15.0***	**10.00**	<0.10*
	4/29/15	15-38	Bull Chub	W	206	113	**0.05**	**0.11**	<0.10	<0.20	**1.30**	**0.15**	<0.10	**19.00**	**0.33**	**10.00**	<0.10*	**31.00**	**320.00**	**8.90***	**6.30**	<0.10*
	4/29/15	15-39	Redbreast Sunfish	F	153	78	**0.16**	**0.17**	<0.10	<0.20	**0.31**	<0.10	<0.10	**5.00**	**0.65**	<1.00	<0.10*	**1.80**	**320.00**	<0.20*	**0.22**	<0.10*
	4/29/15	15-40	Redbreast Sunfish	F	158	76	**0.05**	**0.13**	<0.10	**0.36**	**0.33**	<0.10	<0.10	**5.90**	**0.60**	<1.00	<0.10*	**3.50**	**310.00**	<0.20*	**0.27**	<0.10*
	4/29/15	15-41	Redbreast Sunfish	F	156	75	**0.04**	**0.19**	<0.10	<0.20	**0.18**	<0.10	<0.10	**5.50**	**0.42**	<1.00	<0.10*	**2.00**	**280.00**	<0.20*	<0.20	<0.10*
	4/29/15	15-42	Redbreast Sunfish	F	158	72	**0.05**	**0.20**	<0.10	<0.20	**0.20**	<0.10	<0.10	**5.20**	**0.36**	<1.00	<0.10*	**1.50**	**300.00**	<0.20*	**0.34**	<0.10*
	4/29/15	15-43	Redbreast Sunfish	F	184	123	**0.04**	<0.10	<0.10	<0.20	**0.24**	<0.20	<0.10	**5.50**	**0.52**	<1.00	<0.10*	**2.40**	**310.00**	<0.20*	**0.21**	<0.10
	4/29/15	15-45	Redbreast Sunfish	FC-4	149	61	**0.08**	<0.10	<0.10	<0.20	**0.21**	<0.20	<0.10	**5.80**	**0.56**	<1.00	<0.10*	**1.80**	**320.00**	<0.20*	**0.24**	<0.10
	4/29/15	15-46	Redbreast Sunfish	FC-3	141	54	**0.07**	<0.10	<0.10	<0.20	**0.20**	<0.20	<0.10	**5.90**	**0.62**	<1.00	<0.10*	**1.80**	**310.00**	<0.20*	**0.27**	<0.10
	4/29/15	15-47	Redbreast Sunfish	WC-4	123	38	**0.08**	<0.10	<0.10	<0.20	**0.52**	<0.20	<0.10	**19.00**	**0.93**	**31.00**	<0.10*	**66.00**	**470.00**	**1.70***	**8.30**	<0.10
	4/29/15	15-48	Redbreast Sunfish	WC-4	128	41	**0.04**	<0.10	<0.10	<0.20	**0.40**	<0.20	<0.10	**18.00**	**0.75**	**23.00**	<0.10*	**38.00**	**490.00**	**1.50***	**5.60**	<0.10

Table 1 continued.

Analyte (mg/kg wet weight).

Bold data indicates detection above the laboratory practical quantitation limit (PQL) and does not represent concentrations above NCDPH action levels or screening values or wildlife screening levels.

Site Location	Date Coll.	DWR # [1]	Species	Sample Type [2]	TL (mm)	Wt (g)	Hg	As	Cd	Crt	Cu	Ni	Pb	Zn	Se	Al	Tl	Fe	Mg	Ba	Mn	Ag
D1	5/6/15	15-49	Golden Redhorse	F	367	595	**0.23**	<0.10	<0.10	<0.20	**0.38**	<0.20	<0.10	**7.40**	**0.38**	<1.00	<0.10*	**3.40**	**300.00**	**0.28***	**1.00**	<0.10
Berry	5/6/15	15-50	Golden Redhorse	F	365	584	**0.26**	<0.10	<0.10	<0.20	**0.50**	<0.20	<0.10	**9.40**	**0.36**	<1.00	<0.10*	**4.20**	**320.00**	<0.20*	**0.86**	<0.10
Hill	5/6/15	15-51	Golden Redhorse	F	355	462	**0.13**	<0.10	<0.10	<0.20	**0.36**	<0.20	<0.10	**5.90**	**0.37**	<1.00	<0.10*	**3.20**	**320.00**	<0.20*	**0.63**	<0.10
NC	5/6/15	15-52	Golden Redhorse	F	340	458	**0.15**	<0.10	<0.10	<0.20	**0.48**	<0.20	<0.10	**6.80**	**0.41**	<1.00	<0.10*	**4.30**	**310.00**	<0.20*	**1.00**	<0.10
	5/6/15	15-53	Golden Redhorse	F	350	503	**0.14**	<0.10	<0.10	<0.20	**0.44**	<0.20	<0.10	**5.90**	**0.40**	<1.00	<0.10*	**3.30**	**320.00**	<0.20*	**0.58**	<0.10
	5/6/15	15-54	Golden Redhorse	FC-3	330	396	**0.13**	<0.10	<0.10	<0.20	**0.33**	<0.20	<0.10	**6.80**	**0.38**	<1.00	<0.10*	**3.20**	**330.00**	**0.25***	**1.10**	<0.10
	5/6/15	15-56	Golden Redhorse	WC-3	309	312	**0.06**	<0.10	<0.10	<0.20	**0.66**	<0.20	<0.10	**16.00**	**0.44**	**36.00**	<0.10*	**43.00**	**490.00**	**3.40***	**18.00**	<0.10
	5/6/15	15-57	Golden Redhorse	WC-3	276	233	**0.07**	<0.10	<0.10	<0.20	**0.73**	<0.20	<0.10	**16.00**	**0.52**	**50.00**	<0.10*	**51.00**	**500.00**	**3.10***	**19.00**	<0.10
	5/6/15	15-58	V-lip Redhorse	F	336	442	**0.12**	<0.10	<0.10	<0.20	**0.38**	<0.20	<0.10	**6.50**	**0.66**	<1.00	<0.10*	**2.30**	**320.00**	**0.22***	**0.83**	<0.10
	5/6/15	15-59	Channel Catfish	F	425	800	**0.13**	<0.10	<0.10	<0.20	**0.27**	<0.20	<0.10	**4.90**	**0.21**	<1.00	<0.10*	**2.20**	**280.00**	<0.20*	**0.22**	<0.10
	5/6/15	15-60	Channel Catfish	F	418	668	**0.12**	<0.10	<0.10	<0.20	**0.23**	<0.10	<0.10	**4.40**	**0.26**	**1.10**	<0.10*	**2.10**	**270.00**	<0.20*	<0.2	<0.10
	5/6/15	15-61	Snail Bullhead	W	195	86	**0.02**	<0.10	<0.10	<0.20	**0.56**	<0.20	<0.10	**13.00**	**0.25**	**21.00**	<0.10*	**31.00**	**330.00**	**1.40***	**25.00**	<0.10
	5/6/15	15-62	Redbreast Sunfish	F	150	73	**0.05**	<0.10	<0.10	<0.20	**0.23**	<0.20	<0.10	**5.90**	**0.66**	<1.00	<0.10*	**2.00**	**300.00**	<0.20*	**0.24**	<0.10
	5/6/15	15-63	Redbreast Sunfish	F	145	54	**0.12**	<0.10	<0.10	<0.20	**0.23**	<0.10	<0.10	**5.90**	**0.63***	<1.00	<0.10*	**1.90**	**300.00**	<0.20*	<0.2	<0.10
	5/6/15	15-64	Redbreast Sunfish	WC-5	104	21	**0.04**	<0.10	<0.10	**0.21**	**0.48**	**0.54**	<0.10	**21.00**	**0.65***	**29.00**	<0.10*	**39.00**	**460.00**	**2.60***	**7.30**	<0.10
	5/6/15	15-65	Gizzard Shad	F	351	431	**0.03**	<0.10	<0.10	<0.20	**0.50**	<0.10	<0.10	**5.20**	**0.30***	**1.10**	<0.10*	**9.00**	**280.00**	**0.59***	**2.70**	<0.10
	5/6/15	15-67	Bull Chub	W	168	56	**0.03**	<0.10	<0.10	<0.20	**0.72**	**0.51**	<0.10	**19.00**	**0.38***	**7.40**	<0.10*	**21.00**	**380.00**	**23.00***	**7.30**	<0.10

Table 1 continued.

Analyte (mg/kg wet weight).

Bold data indicates detection above the laboratory practical quantitation limit (PQL) and does not represent concentrations above NCDPH action levels or screening values or wildlife screening levels.

Site Location	Date Coll.	DWR # [1]	Species	Sample Type [2]	TL (mm)	Wt (g)	Hg	As	Cd	Crt	Cu	Ni	Pb	Zn	Se	Al	Tl	Fe	Mg	Ba	Mn	Ag
F1	4/28/15	15-68	Striped Bass	F	566	1933	**0.23**	**0.16**	<0.10	<0.20	**0.31**	<0.10	<0.10	**3.80**	**0.51***	<1.00	<0.10*	**3.80**	**280.00**	<0.20*	<0.20	<0.10
Milton	4/28/15	15-69	Striped Bass	F	656	3444	**0.15**	**0.23**	<0.10	<0.20	**0.42**	<0.10	<0.10	**4.70**	**0.42***	<1.00	<0.10*	**5.30**	**250.00**	<0.20*	<0.20	<0.10
NC	4/28/15	15-70	Striped Bass	F	552	2436	**0.06**	**0.30**	<0.10	<0.20	**0.41**	<0.10	<0.10	**4.30**	**0.49***	<1.00	<0.10*	**5.90**	**250.00**	<0.20*	<0.20	<0.10
	4/28/15	15-71	Striped Bass	F	589	2290	**0.50**	**0.23**	<0.10	<0.20	**0.53**	<0.10	<0.10	**4.70**	**0.43***	<1.00	<0.10*	**7.90**	**280.00**	<0.20*	<0.20	<0.10
	4/28/15	15-72	Striped Bass	F	646	3850	**0.37**	**0.20**	<0.10	<0.20	**0.44**	<0.10	<0.10	**5.20**	**0.59***	<1.00	<0.10*	**6.90**	**260.00**	<0.20*	<0.20	<0.10
	4/28/15	15-73	Striped Bass	F	605	2699	**0.33**	**0.31**	<0.10	<0.20	**0.47**	<0.10	<0.10	**4.20**	**0.52***	<1.00	<0.10*	**5.80**	**250.00**	<0.20*	<0.20	<0.10
	4/28/15	15-74	Striped Bass	F	606	2752	**0.39**	**0.27**	<0.10	<0.20	**0.40**	<0.10	<0.10	**3.80**	**0.51***	<1.00	<0.10*	**5.40**	**250.00**	<0.20*	<0.20	<0.10
	4/28/15	15-75	Striped Bass	F	622	3050	**0.43**	**0.24**	<0.10	<0.20	**0.37**	**0.13**	<0.10	**4.20**	**0.46***	<1.00	<0.10*	**5.50**	**250.00**	<0.20*	**0.35**	<0.10
	4/28/15	15-76	Striped Bass	F	603	2738	**0.44**	**0.14**	<0.10	<0.20	**0.26**	<0.10	<0.10	**3.60**	**0.44***	<1.00	<0.10*	**4.20**	**290.00**	<0.20*	**0.28**	<0.10
	4/28/15	15-77	Striped Bass	F	433	1022	**0.15**	**0.18**	<0.10	<0.20	**0.33**	<0.10	<0.10	**4.00**	**0.40***	<1.00	<0.10*	**2.50**	**270.00**	<0.20*	**0.90**	<0.10
	4/28/15	15-78	Striped Bass	F	388	662	**0.18**	**0.23**	<0.10	<0.20	**0.35**	<0.10	<0.10	**4.10**	**0.51***	<1.00	<0.10*	**3.40**	**290.00**	<0.20*	**0.47**	<0.10
	4/28/15	15-79	Shorthead Redhorse	F	356	480	**0.09**	<0.10	<0.10	<0.20	**0.44**	<0.10	<0.10	**5.10**	**0.41***	<1.00	<0.10*	**4.50**	**300.00**	**0.37***	**0.93**	<0.10
	4/28/15	15-81	Shorthead Redhorse	F	410	730	**0.24**	<0.10	<0.10	<0.20	**0.38**	<0.10	<0.10	**6.70**	**0.38***	<1.00	<0.10*	**5.50**	**320.00**	**0.32***	**2.60**	<0.10
	4/28/15	15-82	Shorthead Redhorse	F	442	966	**0.20**	<0.10	<0.10	<0.20	**0.27**	<0.10	<0.10	**4.40**	**0.37***	<1.00	<0.10*	**3.60**	**300.00**	<0.20*	**0.58**	<0.10
	4/28/15	15-83	Shorthead Redhorse	F	459	1185	**0.17**	<0.10	<0.10	<0.20	**0.34**	<0.10	<0.10	**5.10**	**0.28**	**1.20**	<0.10*	**4.00**	**310.00**	**0.21***	**1.10**	<0.10
	4/28/15	15-84	Shorthead Redhorse	F	454	1273	**0.10**	<0.10	<0.10	<0.20	**0.35**	<0.10	<0.10	**4.50**	**0.38**	<1.00	<0.10*	**5.80**	**290.00**	<0.20*	**0.52**	<0.10
	4/28/15	15-85	Quillback	F	404	865	**0.23**	<0.10	<0.10	<0.20	**0.57**	<0.10	<0.10	**5.40**	**0.86**	**1.00**	<0.10*	**6.40**	**310.00**	**0.26***	**0.89**	<0.10
	4/28/15	15-86	Quillback	F	465	1434	**0.17**	<0.10	<0.10	<0.20	**0.31**	<0.10	<0.10	**4.00**	**0.34**	<1.00	<0.10*	**3.20**	**270.00**	<0.20*	**0.63**	<0.10
	4/28/15	15-87	Quillback	F	506	1759	**0.16**	<0.10	<0.10	<0.20	**0.46**	<0.10	<0.10	**4.40**	**0.52**	**1.10**	<0.10*	**5.40**	**290.00**	<0.20*	**0.35**	<0.10
	4/28/15	15-88	Notchlip Redhorse	F	485	1154	**0.16**	<0.10	<0.10	<0.20	**0.36**	<0.10	<0.10	**5.20**	**0.36**	**2.00**	<0.10*	**3.40**	**300.00**	<0.20*	**0.80**	<0.10
	4/28/15	15-89	Notchlip Redhorse	F	496	1257	**0.13**	<0.10	<0.10	<0.20	**0.40**	<0.10	<0.10	**5.10**	**0.56**	<1.00	<0.10*	**4.00**	**280.00**	<0.20*	**1.00**	<0.10
	4/28/15	15-90	Notchlip Redhorse	F	503	1379	**0.14**	<0.10	<0.10	<0.20	**0.34**	<0.10	<0.10	**5.20**	**0.55**	<1.00	<0.10*	**4.30**	**300.00**	**0.26***	**1.50**	<0.10
	4/28/15	15-92	Notchlip Redhorse	W	402	712	**0.08**	<0.10	<0.10	**0.49**	**0.87**	**0.41**	<0.10	**13.00**	**0.57**	**170.00**	<0.10*	**150.00**	**490.00**	**4.40***	**19.00**	<0.10
	4/28/15	15-93	V-lip Redhorse	F	329	392	**0.07**	<0.10	<0.10	<0.20	**0.36**	<0.10	<0.10	**5.20**	**0.61**	<1.00	<0.10*	**2.00**	**330.00**	<0.20*	**0.66**	<0.10
	4/28/15	15-94	Redbreast Sunfish	F	158	100	**0.05**	<0.10	<0.10	<0.20	**0.49**	<0.10	<0.10	**6.00**	**0.56**	<1.00	<0.10*	**2.40**	**280.00**	<0.20*	**0.33**	<0.10
	4/28/15	15-95	Channel Catfish	F	473	798	**0.12**	<0.10	<0.10	<0.20	**0.16**	<0.10	<0.10	**3.00**	**0.41**	**1.10**	<0.10*	**1.50**	**230.00**	<0.20*	<0.20	<0.10
	4/28/15	15-96	Channel Catfish	F	510	1157	**0.06**	<0.10	<0.10	<0.20	**0.27**	<0.10	<0.10	**4.40**	**0.33**	**1.00**	<0.10*	**3.00**	**250.00**	<0.20*	<0.20	<0.10
	4/28/15	15-97	Channel Catfish	F	380	457	**0.08**	<0.10	<0.10	<0.20	**0.18**	<0.10	<0.10	**3.70**	**0.22**	**1.20**	<0.10*	**1.30**	**260.00**	<0.20*	<0.20	<0.10
	4/28/15	15-98	Channel Catfish	FC-3	317	293	**0.02**	<0.10	<0.10	<0.20	**0.29**	<0.10	<0.10	**4.90**	**0.23**	**1.70**	<0.10*	**2.10**	**270.00**	<0.20*	**0.23**	<0.10
	4/28/15	15-99	Blue Catfish	F	677	3724	**0.06**	<0.10	<0.10	<0.20	**0.23**	<0.10	<0.10	**4.30**	**0.26**	<1.00	<0.10*	**1.50**	**260.00**	<0.20*	**0.24**	<0.10
	4/28/15	15-100	Blue Catfish	F	582	1827	**0.14**	<0.10	<0.10	<0.20	**0.15**	<0.10	<0.10	**3.80**	**0.29**	<1.00	<0.10*	**1.90**	**240.00**	<0.20*	**0.24**	<0.10
	4/28/15	15-101	Blue Catfish	F	646	2951	**0.09**	<0.10	<0.10	<0.20	**0.25**	<0.10	<0.10	**5.20**	**0.22**	**1.20**	<0.10*	**2.30**	**250.00**	<0.20*	**0.26**	<0.10

Table 1 continued.

							Analyte (mg/kg wet weight). *Bold data indicates detection above the laboratory practical quantitation limit (PQL) and does not represent concentrations above NCDPH action levels or screening values or wildlife screening levels.*														
Site Location	**Date Coll.**	**DWR # [1]**	**Species**	**Sample Type [2]**	**TL (mm)**	**Wt (g)**	**Hg**	**As**	**Cd**	**Crt**	**Cu**	**Ni**	**Pb**	**Zn**	**Se**	**Al**	**Tl**	**Fe**	**Mg**	**Ba**	**Mn**	**Ag**
F1	4/28/15	15-103	Blue Catfish	F	527	1402	**0.13**	<0.10	<0.10	<0.20	**0.24**	<0.10	<0.10	**5.60**	**0.28***	**1.60**	<0.10*	**3.40**	**260.00**	<0.20*	**0.29**	<0.10*
Milton	4/28/15	15-104	Blue Catfish	F	579	1613	**0.15**	<0.10	<0.10	<0.20	**0.17**	<0.10	<0.10	**3.90**	**0.36***	<1.00	<0.10*	**1.80**	**260.00**	<0.20*	**0.21**	<0.10
NC	4/28/15	15-105	Blue Catfish	F	680	3080	**0.10**	<0.10	<0.10	<0.20	**0.27**	<0.10	**0.11**	**5.10**	**0.57***	**34.00**	<0.10*	**2.50**	**250.00**	<0.20*	<0.20	<0.10
(cont)	4/28/15	15-106	Blue Catfish	F	556	2132	**0.11**	<0.10	<0.10	<0.20	**0.24**	<0.10	<0.10	**4.50**	**0.26***	<1.00	<0.10*	**1.90**	**250.00**	<0.20*	**0.25**	<0.10
	4/28/15	15-107	Blue Catfish	F	681	3553	**0.08**	<0.10	<0.10	<0.20	**0.25**	<0.10	<0.10	**4.70**	**0.24***	<1.00	<0.10*	**2.30**	**250.00**	<0.20*	**0.26**	<0.10
	4/28/15	15-108	Blue Catfish	F	683	3153	**0.20**	<0.10	<0.10	<0.20	**0.38**	<0.10	<0.10	**6.80**	**0.34***	<1.00	<0.10*	**4.30**	**230.00**	<0.20*	**0.29**	<0.10
	4/28/15	15-109	Blue Catfish	F	490	1044	**0.11**	<0.10	<0.10	<0.20	**0.27**	<0.10	<0.10	**4.00**	**0.23***	<1.00	<0.10*	**2.10**	**260.00**	<0.20*	**0.30**	<0.10
	4/28/15	15-110	Blue Catfish	F	556	1685	**0.03**	<0.10	<0.10	<0.20	**0.22**	<0.10	<0.10	**4.30**	**0.23***	<1.00	<0.10*	**2.10**	**240.00**	<0.20*	**0.32**	<0.10

Table 1 continued.

Analyte (mg/kg wet weight).

Bold data indicates detection above the laboratory practical quantitation limit (PQL) and does not represent concentrations above NCDPH action levels or screening values or wildlife screening levels.

Site Location	Date Coll.	DWR # [1]	Species	Sample Type [2]	TL (mm)	Wt (g)	Hg	As	Cd	Crt	Cu	Ni	Pb	Zn	Se	Al	Tl	Fe	Mg	Ba	Mn	Ag
Kerr Res.	4/30/15	15-111	Largemouth Bass	F	426	1184	**0.22**	**0.11**	<0.10	<0.20	**0.20**	<0.10	<0.10	**4.30**	**0.44***	<1.00	<0.10*	**1.60**	**310.00**	<0.20*	<0.20	<0.10
Satterwhite	4/30/15	15-112	Largemouth Bass	F	379	630	**0.25**	**0.11**	<0.10	<0.20	**0.28**	<0.10	<0.10	**7.80**	**0.42***	<1.00	<0.10*	**2.90**	**300.00**	<0.20*	<0.20	<0.10
Point	4/30/15	15-114	Largemouth Bass	F	420	959	**0.23**	**0.11**	<0.10	<0.20	**0.19**	<0.10	<0.10	**5.00**	**0.34***	<1.00	<0.10*	**2.40**	**280.00**	<0.20*	<0.20	<0.10
State	4/30/15	15-115	Largemouth Bass	F	418	1052	**0.35**	<0.10	<0.10	<0.20	**0.19**	<0.10	<0.10	**3.30**	**0.54***	<1.00	<0.10*	**1.80**	**310.00**	<0.20*	<0.20	<0.10
Rec.	4/30/15	15-116	Largemouth Bass	F	452	1278	**0.35**	<0.10	<0.10	<0.20	**0.13**	<0.10	<0.10	**3.40**	**0.44***	<1.00	<0.10*	**1.30**	**300.00**	<0.20*	<0.20	<0.10
Area	4/30/15	15-117	Largemouth Bass	F	395	972	**0.22**	**0.12**	<0.10	<0.20	**0.25**	<0.10	<0.10	**5.20**	**0.42**	<1.00	<0.10*	**1.90**	**300.00**	<0.20*	<0.20	<0.10
NC	4/30/15	15-118	Largemouth Bass	F	399	825	**0.28**	**0.12**	<0.10	<0.20	**0.17**	<0.10	<0.10	**5.40**	**0.35***	<1.00	<0.10*	**1.30**	**310.00**	<0.20*	<0.20	<0.10
	4/30/15	15-119	Largemouth Bass	F	377	660	**0.32**	**0.11**	<0.10	<0.20	**0.18**	<0.10	<0.10	**6.20**	**0.37***	<1.00	<0.10*	**1.70**	**290.00**	<0.20*	<0.20	<0.10
	4/30/15	15-120	Largemouth Bass	F	318	410	**0.09**	**0.13**	<0.10	<0.20	**0.21**	<0.10	<0.10	**6.20**	**0.35***	<1.00	<0.10*	**2.50**	**300.00**	<0.20*	<0.20	<0.10
	4/30/15	15-121	Redear Sunfish	F	213	165	**0.13**	<0.10	<0.10	<0.20	**0.16**	<0.10	<0.10	**6.40**	**0.52***	<1.00	<0.10*	**1.50**	**320.00**	<0.20*	<0.20	<0.10
	4/30/15	15-122	Redear Sunfish	F	170	73	**0.05**	<0.10	<0.10	<0.20	**0.19**	<0.10	<0.10	**6.30**	**0.62***	<1.00	<0.10*	**1.60**	**300.00**	<0.20*	<0.20	<0.10
	4/30/15	15-123	Redear Sunfish	F	221	186	**0.05**	<0.10	<0.10	<0.20	**0.22**	<0.10	<0.10	**6.80**	**0.49***	<1.00	<0.10*	**1.60**	**320.00**	<0.20*	<0.20	<0.10
	4/30/15	15-125	Yellow Perch	F	204	87	**0.08**	<0.10	<0.10	<0.20	**0.21**	<0.10	<0.10	**5.50**	**0.51***	**1.00**	<0.10*	**1.50**	**280.00**	<0.20*	**0.38**	<0.10
	4/30/15	15-126	Yellow Perch	F	185	67	**0.08**	<0.10	<0.10	<0.20	**0.17**	<0.10	<0.10	**5.30**	**0.52***	<1.00	<0.10*	**1.80**	**280.00**	<0.20*	**0.29**	<0.10
	4/30/15	15-127	Yellow Perch	F	186	72	**0.09**	<0.10	<0.10	<0.20	**0.19**	<0.10	<0.10	**5.00**	**0.65***	<1.00	<0.10*	**1.30**	**270.00**	<0.20*	**0.24**	<0.10
	4/30/15	15-128	Yellow Perch	F	209	101	**0.09**	<0.10	<0.10	<0.20	**0.17**	<0.10	<0.10	**5.50**	**0.54***	<1.00	<0.10*	**1.70**	**260.00**	<0.20*	**0.28**	<0.10
	4/30/15	15-129	Yellow Perch	F	186	73	**0.08**	<0.10	<0.10	<0.20	**0.18**	<0.10	<0.10	**4.90**	**0.55***	<1.00	<0.10*	**1.40**	**270.00**	<0.20*	**0.40**	<0.10
	4/30/15	15-130	Yellow Perch	F	172	65	**0.11**	<0.10	<0.10	<0.20	**0.19**	<0.10	<0.10	**5.80**	**0.52***	<1.00	<0.10*	**1.90**	**290.00**	<0.20*	**0.39**	<0.10

[1] DWR # - The following blind duplicate samples intended for laboratory quality control were removed (15-33, 15-44, 15-55, 15-66, 15-80, 15-91, 15-102, 15-113 and 15-124).

[2] Sample Type - F = individual fillet, FC2 = fillet composite of 2, FC3 = fillet composite of 3, W = individual whole body, WC2 = whole body composite of 2, etc.

Bold data indicates analyte detection above the laboratory practical quantitation limit (PQL).

< indicates that the analyte was not detected above the reported PQL.

*** indicates J2 Qualifier - estimated value - failed to meet established quality control criteria (there is no standard reference material for Tl or Ba, and some Se reference material recoveries were higher than the allowable range).**

PQL's for analytes with all detections above the laboratory PQL

Cu = 0.10

Zn = 0.20

Se = 0.10

Mg = 2.00

Method Reference

U.S. EPA - 245.6 - Hg

U.S. EPA - 200.3 - sample prep. for spectrochemical determination of total recoverable elements in biological tissues (precedes 200.7 and 200.8).

U.S. EPA - 200.7 - Al, Ba, Cr, Fe, Mg, Mn, Zn

U.S. EPA - 200.8 - Ag, As, Cd, Cu, Pb, Ni, Se, Tl

Table 2. DWR Dan River Fish Tissue Metals Summary (% of Observations At or Above Laboratory PQL, Data Ranges, and Exceedances of DPH Action Levels and Screening Values).

	% at or above laboratory PQL (range in mg/kg by wet weight)						
Analyte	Round 1 (N=53)*	Round 2 (N=82)	Round 3 (N=55)	Round 4 (N=99)	DPH FCA or SV (mg/kg)**	No. of DPH Exceedances (% of total)	Species with DPH Exceedances (N)***
Hg	100% (0.02-0.43)	100% (0.03-0.58)	82% (0.02-0.76)	100% (0.02-0.50)	**0.4**	13 (4%)	GRH(1), WE(1), LMB(6), STB(5)
As	0.02% (0-0.10)	37% (0.10-0.84)	2% (0.11)	28% (0.11-0.31)	0.27	12 (4%)	STB(12)
Cd	6% (0.20-0.93)	0%	0%	0%	0.41	1 (<<1%)	LMB(1)
Crt	9% (0.20-0.87)	5% (0.21-0.42)	7% (0.23-0.28)	5% (0.21-0.49)	1.2	0	n/a
Cu	100% (0.15-1.30)	100% (0.12-1.5)	100% (0.13-0.80)	100% (0.13-1.3)	16	0	n/a
Ni	28% (0.16-0.75)	12% (0.13-0.48)	24% (0.11-0.49)	7% (0.13-0.54)	8.2	0	n/a
Pb	8% (0.30-16.0)	1% (0.12)	0%	1% (0.11)	n/a	0	n/a
Zn	100% (3.2-70.0)	100% (2.7-36.0)	100% (3.0-30.0)	100% (3.0-26.0)	120	0	n/a
Se	100 (0.17-0.79)	100% (0.15-0.86)	100% (0.28-1.2)	100% (0.21-0.93)	**10**	0	n/a
Al	40% (1.0-62.0)	49% (1.0-120.0)	53% (1.0-54.0)	27% (1.0-170.0)	410	0	n/a
Tl	0.02% (0.13)	0%	0%	0%	0.00412	1 (<<1%)	RBS(1)
Fe	100% (1.30-80.0)	99% (1.0-160.0)	98% (1.0-53.0)	100% (1.3-150.0)	290	0	n/a
Mg	100% (170.0-580.0)	100% (190.0-550.0)	100% (220.0-530.0)	100% (250.0-500.0)	n/a	0	n/a
Ba	57% (0.20-7.7)	27% (0.21-6.6)	33% (0.21-7.7)	28% (0.21-23.0)	82	0	n/a
Mn	77% (0.25-30.0)	48% (0.20-24.0)	67% (0.24-34.0)	73% (0.21-25.0)	58	0	n/a
Ag	0%	0%	0%	0%	2.1	0	n/a

* Round 1 fish tissue data from Virginia not included.

** FCA = NC fish consumption advisory action level (bolded), SV = NC screening value. Two action levels exist for Hg and Se; all others are screening values.

*** GRH = Golden Redhorse, WE = Walleye, LMB = Largemouth Bass, STB = Striped Bass and RBS = Redbreast Sunfish.

Table 3. Regression Analysis Summary for 16 Heavy Metals in Fish Fillets from Three Repeat Dan River Stations.*

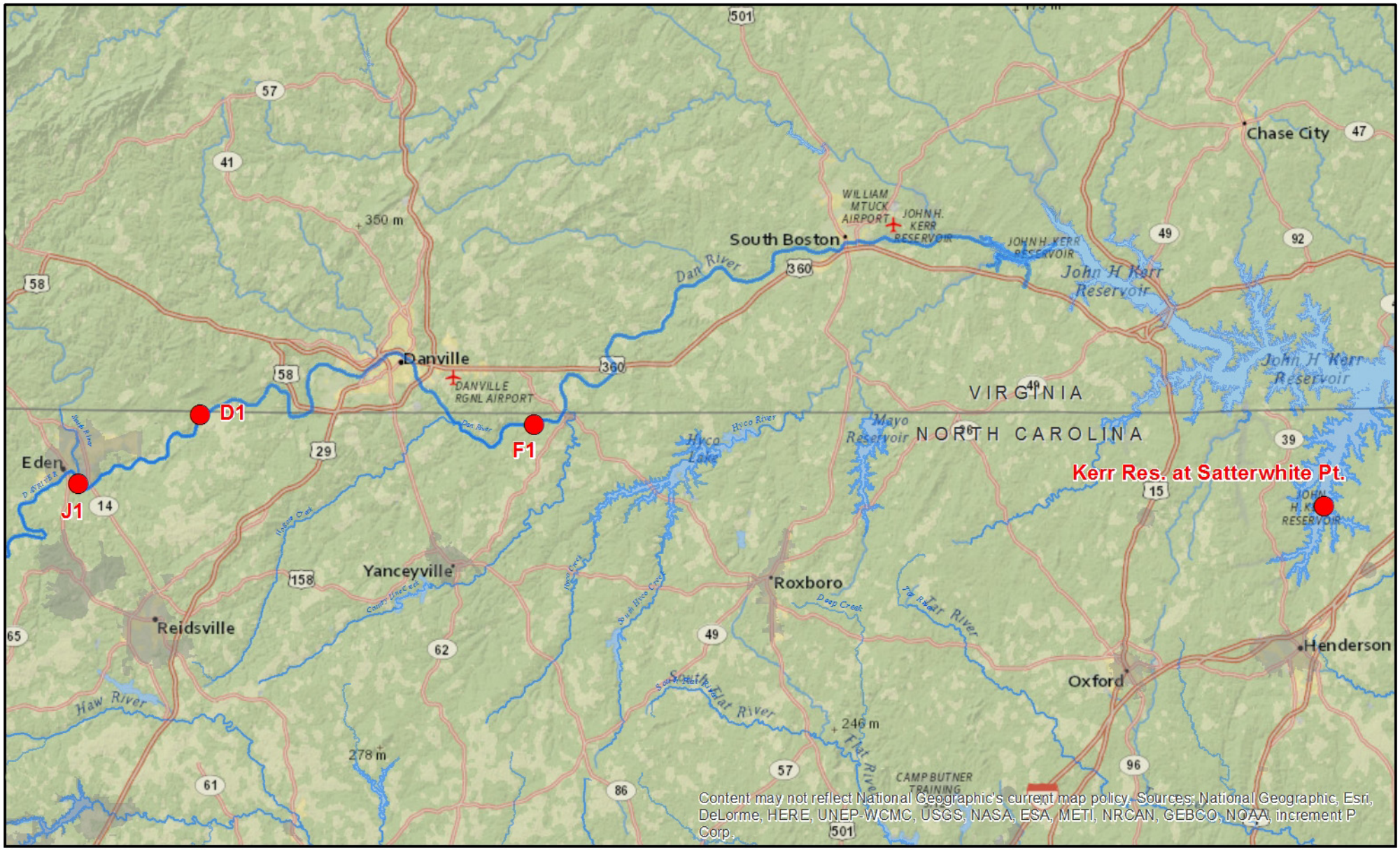
Station	Species	Significant Increase (p<0.05)	Non-significant Upward Trend (p>0.05)	Significant Decrease (p<0.05)	Non-significant Downward Trend (p>0.05)	Total N**	N per Round (1,2,3,4)
Eden (control)	Golden Redhorse	Mg	Zn	none	none	21	6,2,6,7
Eden (control)	Redbreast Sunfish	As, Mg, Mn	none	Cu, Zn	none	18	6,2,3,7
Eden (control)	V-lip Redhorse	Mg	As, Zn	none	Ba	10	0,2,3,5
Berry Hill	Golden Redhorse	Mg	Se	Ba, Mn	Cd, Pb, Al, Fe	15	3,2,4,6
Berry Hill	Redbreast Sunfish	none	none	none	none	11	1,2,6,2
Milton	Blue Catfish	Zn	Mn	none	Hg	14	0,3,0,11
Milton	Channel Catfish	none	none	none	none	10	0,6,0,4
Milton	Notchlip Redhorse	Se, Mg	Mn	Ba	Fe	12	6,2,1,3
Milton	Striped Bass	Zn, Mg	none	As	Al	23	0,12,0,11

* Stats available upon request.

** Minimum Total N = 10.

Appendix 1.

Duke Power Eden Coal Ash Spill - Fish Tissue Monitoring Locations for Dan River, NC



Fish Tissue Monitoring Stations

0 2.5 5 10 15 20 Miles

N

DWR
Division of Water Resources

Appendix 2. NCDPH Fish Tissue Screening Values

North Carolina Division of Public Health Fish Tissue Screening Values for Human Ingestion Exposures for the Dan River Coal Ash Spill		
Metal	**Screening Values (µg/kg)**	**Screening Values (mg/kg)**
Aluminum	410,000	410
Antimony	160	0.16
Arsenic (as inorganic As)	27	0.027
Arsenic (as total As)	270	0.27
Barium	82,000	82
Beryllium	1,600	1.6
Boron	82,000	82
Cadmium	410	0.41
Calcium	Not Available	Not Available
Chromium (VI)	1,200	1.2
Cobalt	120	0.12
Copper	16,000	16
Iron	290,000	290
Lead	Not Available	Not Available
Lithium	820	0.82
Magnesium	Not Available	Not Available
Manganese	58,000	58
Nickel	8,200	8.2
Silver	2,100	2.1
Sodium	Not Available	Not Available
Thallium	4.1	0.00412
Vanadium	2,100	2.1
Zinc	120,000	120

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

Notes:

1. Screening Values based on fish ingestion rate of 170g/day, Acceptable Cancer Risk Level of 1E-04, a 70 kg adult, and daily life-time exposure.

2. All values as wet weight fillet tissue.

prepared September 16, 2014

Appendix 3. Generic Wildlife Screening Values

Mercury – 0.03 to 0.1 mg/kg wet weight (EPA 1997, Shore et al. 2011)[1,2]

Selenium – 3.0 mg/kg dry weight – (about 0.6 mg/kg wet weight) (Ohlendorf and Heinze, 2011)[3]

Arsenic – 1.3 mg/kg wet weight (muscle tissue) (from Table 28.7 in Eisler 2000)[4]

[1] U.S. Environmental Protection Agency. 1997. Mercury report to Congress. Volume VII: Characterization of human health and wildlife risks from mercury exposure in the United States. Office of Air Quality Planning and Standards and Office of Research and Development. EPA-452-R-97-009.

[2] Shore RF, Pereira MG, Woshner V, Thompson DR. 2011. Mercury in Nonmarine Birds and Mammals. Pages 609-624 In: WN Beyer, JP Meador (Eds). Environmental Contaminants in Biota: Interpreting Tissue Concentrations, Second Edition. CRC Press, Boca Raton, FL.

[3] Ohlendorf HM, Heinz GH. 2011. Selenium in Birds. Pages 669-701 In: WN Beyer, JP Meador (Eds). Environmental Contaminants in Biota: Interpreting Tissue Concentrations, Second Edition. CRC Press, Boca Raton, FL.

[4] Eisler R. 2000. Handbook of Chemical Risk Assessment: Health Hazards to Humans, Plants, and Animals, Vol. 3. Lewis Publishers, Boca Raton, FL.