Allen Steam Station

NPDES Permit No. NC0004979

Monitoring of Arsenic, Selenium and Mercury in Fish Muscle Tissue from Upper Lake Wylie, NC

Duke Energy
2014

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1.0 Introduction

Duke Energy owns and operates the Allen Steam Station located on upper Lake Wylie in Gaston County, Belmont, NC. The Allen Station's National Pollutant Discharge Elimination System (NPDES) Permit (No. NC0004977 Section A 16) requires monitoring of trace elements (arsenic, selenium and mercury) in fish tissues near the discharge once per permit cycle. Fish were collected according to the submitted study plan (dated December 4, 2013). The resulting data are submitted in this report.

2.0 Study Site Description and Sampling Locations

Fish were collected from three locations in upper Lake Wylie (Figure 1). These locations were adjacent to the Allen Station discharge (DI), 6.2 kilometers upstream (UP) and 10.9 kilometers downstream of the discharge (DN).

3.0 Target Species

The target species of fish were largemouth bass and redear sunfish. As recommended by the US Environmental Protection Agency (EPA), an attempt was made to limit the smallest fish to 75% of the largest fish total length by species depending on availability (US EPA 2000).

4.0 Field Sampling Methods

Fish were collected using electrofishing according to our Biology Program Procedures Manual (Procedure NR-00080, Rev. 1), which is approved by the NC Division of Water Resources under the Company's NC Biological Laboratory Certification (# 006), located at New Hill, NC. Only live fish that showed little or no signs of deterioration were retained for analysis. Retained fish were individually tagged (Floy tags), identified to species, measured for total length (mm), weight (g), placed on ice until frozen and transferred to a freezer within 24 hours of collection.

Water quality data consisting of temperature, pH, dissolved oxygen, specific conductance and turbidity were recorded daily at the surface at each sampling location. Other noteworthy environmental conditions including river flow conditions and weather conditions were noted and are available upon request.

5.0 Laboratory Processing and Arsenic, Selenium and Mercury Analysis

All fish samples were processed in the New Hill trace element laboratory according to procedure NR-00107 (Rev. 4) Trace Element Monitoring Laboratory Procedure. The processed samples (lyophilized left axial muscle; right muscle occasionally included when needed) were analyzed for arsenic, selenium and mercury by x-ray spectrophotometry. Quality control was achieved by analytical standards, replicates and certified reference materials. The remaining fish carcasses were archived and will be kept at least two years in the event that re-analysis is needed.

6.0 Data Analysis and Reporting

Arsenic, selenium and mercury concentrations (converted to µg/g fresh weight) in the fish muscle tissue collected during 2014 are shown in Table 1. In addition to the length and weight of each fish, the dry-to-fresh weight ratios are presented to convert the arsenic, selenium and mercury concentrations fresh weight values back to dry weight values as desired. All fish collected during 2014 were below the US EPA Screening Values for Recreational Fishermen of 1.2 µg/g (fresh weight) for arsenic (US EPA 2000). All fish collected during 2014 were below the NC human consumption advisory level of 10 µg/g (fresh weight) for selenium. All fish collected during 2014 had mercury concentrations below the NC Health Directors Action Advisory Level of 0.4 µg/g fresh weight (NCDHHS 2006).

References

NCDHHS. 2006. Health effects of methylmercury and North Carolina's advice on eating fish. North Carolina Occupational and Environmental Epidemiology Branch, Raleigh, NC.

US EPA. 2000. Guidance for assessing chemical contaminant data for use in fish advisories. Vol. 1. Fish sampling and analysis. Third edition. EPA 823-B-00-007. United States Environmental Protection Agency, Office of Water, Washington, DC.

Table 1. Arsenic, selenium and mercury concentrations (fresh weight) in axial muscle of fish from upper Lake Wylie during April 2014.

Fish species	Location	Month	Length (mm)	Weight (g)	As (µg/g)	Se (µg/g)	Hg (µg/g)	Dry-to-fresh weight ratio*
Largemouth bass	UP	April	377	630	0.21	0.37	<0.05	0.193
Largemouth bass	UP	April	411	878	0.08	0.40	<0.05	0.190
Largemouth bass	UP	April	408	822	0.14	0.45	<0.06	0.205
Largemouth bass	UP	April	316	381	0.18	0.47	<0.05	0.195
Largemouth bass	UP	April	338	550	0.08	0.35	<0.06	0.205
Largemouth bass	UP	April	422	952	<0.03	0.27	<0.03	0.127
Redear sunfish	UP	April	235	263	<0.04	0.70	<0.06	0.211
Redear sunfish	UP	April	224	195	0.04	0.79	<0.05	0.202
Redear sunfish	UP	April	218	162	0.04	0.52	<0.05	0.192
Redear sunfish	UP	April	261	283	0.06	0.52	<0.05	0.187
Redear sunfish	UP	April	214	161	<0.04	0.52	<0.05	0.200
Redear sunfish	UP	April	206	154	0.06	0.68	<0.05	0.200
Largemouth bass	DI	April	332	427	0.18	0.36	<0.05	0.198
Largemouth bass	DI	April	325	450	0.19	0.46	<0.06	0.209
Largemouth bass	DI	April	371	635	0.23	0.42	<0.06	0.209
Largemouth bass	DI	April	348	514	0.23	0.41	<0.06	0.206
Largemouth bass	DI	April	321	354	0.15	0.53	<0.05	0.190
Largemouth bass	DI	April	374	671	0.14	0.65	<0.05	0.198
Redear sunfish	DI	April	228	193	0.16	0.81	<0.05	0.203
Redear sunfish	DI	April	240	233	0.14	0.62	<0.05	0.194
Redear sunfish	DI	April	209	132	0.06	0.64	<0.06	0.207
Redear sunfish	DI	April	260	284	0.15	0.65	<0.05	0.191
Redear sunfish	DI	April	219	162	0.11	0.63	<0.05	0.185
Redear sunfish	DI	April	223	166	0.04	0.52	<0.05	0.186
Largemouth bass	DN	April	344	491	0.29	0.35	<0.05	0.196
Largemouth bass	DN	April	361	558	0.26	0.32	<0.06	0.214
Largemouth bass	DN	April	365	559	0.21	0.38	<0.06	0.213
Largemouth bass	DN	April	355	610	0.20	0.36	<0.05	0.197
Largemouth bass	DN	April	362	580	0.18	0.44	<0.05	0.198
Largemouth bass	DN	April	349	551	0.24	0.40	<0.05	0.200
Redear sunfish	DN	April	219	150	0.09	0.44	<0.05	0.185
Redear sunfish	DN	April	246	253	0.10	0.51	<0.05	0.198
Redear sunfish	DN	April	215	172	0.04	0.43	<0.05	0.195
Redear sunfish	DN	April	210	150	<0.04	0.46	<0.05	0.201
Redear sunfish	DN	April	203	146	0.04	0.49	<0.05	0.197
Redear sunfish	DN	April	209	155	0.04	0.53	0.05	0.203

***** To convert to a dry weight, divide the fresh weight concentrations by the dry-to-fresh weight ratio.

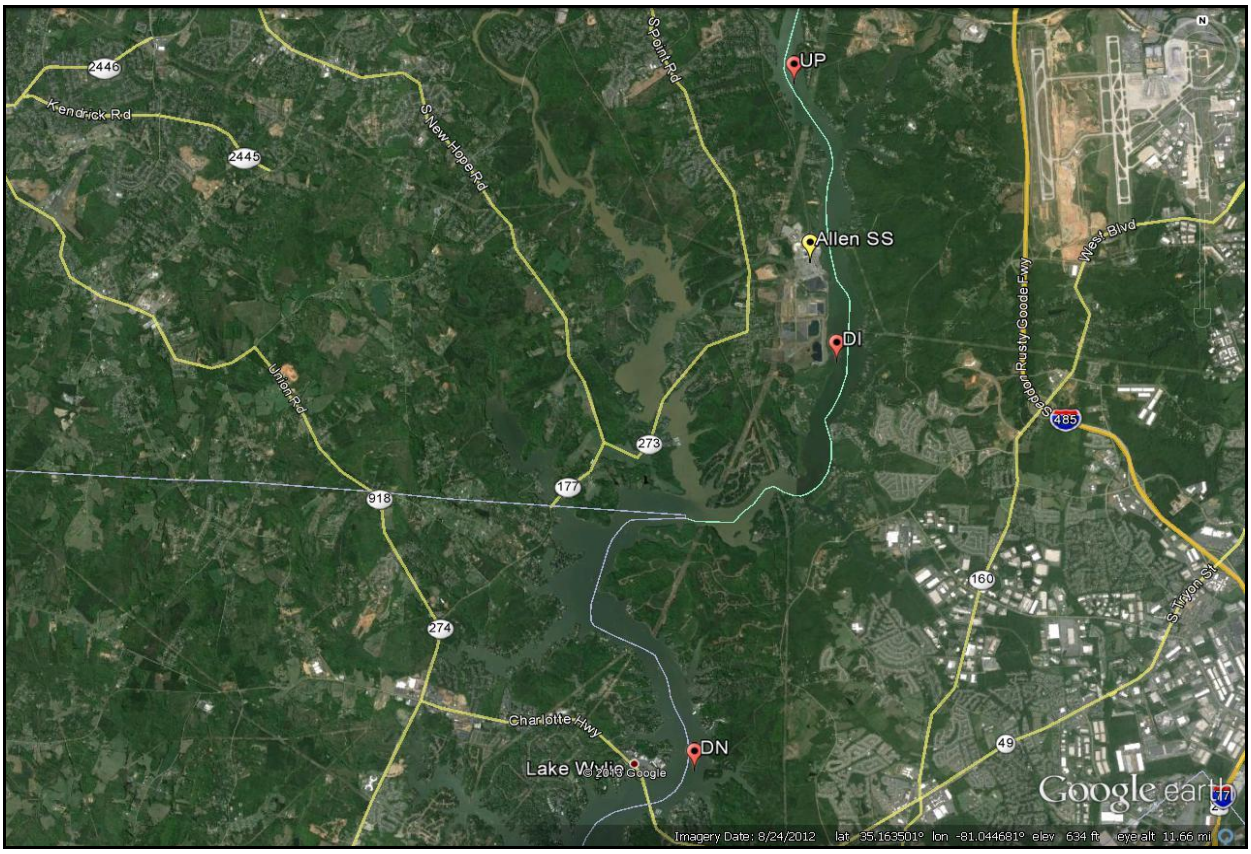

Figure 1. Upper Lake Wylie arsenic, selenium and mercury monitoring locations.