Evaluation of Heavy Metal Concentrations in Fish from the Dan River in 2014, 2015, 2016, and 2017

Dan River

DANVILLE, VIRGINIA

Letter Health Consultation

May 10, 2019

Virginia Department of Health
Division of Environmental Epidemiology
109 Governor Street
Richmond, Virginia 23219

COMMONWEALTH of VIRGINIA

Department of Health – Office of Epidemiology

NORMAN OLIVER MD, MA
STATE HEALTH COMMISSIONER

PO BOX 2448
RICHMOND, VA 23218

TTY 7-1-1 OR
1-800-828-1120

May 10, 2019

Gabriel Darkwah
Lab Data Coordinator
Virginia Department of Environmental Quality
629 E. Main Street
Richmond, VA 23219

Dear Mr. Darkwah,

Thank you for providing the analysis results for metal contaminants in fish tissue from fish collected along the Dan River, Virginia in 2014, 2015, 2016, and 2017. The Virginia Department of Health (VDH) has finished reviewing the results for public health implications, as requested. VDH concludes that current fish consumption advisories should remain in effect for the Dan River and its tributaries, and that no additional fish consumption advisories are needed.

BACKGROUND

In 2014, 2015, 2016, and 2017, the Virginia Department of Environmental Quality (DEQ) collected fish along the length of the Dan River, from the Virginia/North Carolina border to the Clarksville Marina (**Figure 1**). Sampling was done to evaluate whether the 2014 coal ash release at Duke Energy in North Carolina has resulted in changes in heavy metal concentrations in fish tissue from the Dan River upstream of Danville. Fish collection, laboratory analysis, and how screening values (SVs) were derived are not discussed in this health consultation.

DISCUSSION

In 2014, 160 fish samples were collected from nine different sites[1] along the Dan River and were analyzed for 17 different metal analytes including: aluminum (Al), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), manganese (Mn), nickel (Ni), selenium (Se), silver (Ag), thallium (Tl), vanadium (V), zinc (Zn), and

[1] Figure 1 shows a map of collection sites

mercury (Hg). There were **160** fish samples collected from eight of the original sites in both 2015 and 2016, which were analyzed for the same metals as in 2014. In all of the samples tested, Al, As, Ba, Cr, Cu, Mn, Hg, Se, Ag, and Zn were detected at measurable levels. For those samples in which the analytes were detected at measurable levels, all except for mercury were below the VDH SVs,. Therefore, only mercury will be discussed in this document. A summary of fish tissue samples that exceeded VDH's lower level of concern for mercury (0.5 parts per million (ppm)) collected in all four sampling years is located in **Table 1**. Of all samples, 13 samples in 2014, 2 samples in 2015, 9 samples in 2016, and 8 samples in 2017 contained concentrations of mercury above VDH's lower level of concern.

In 2014 and 2017, several fish collected upstream of Danville had mercury concentrations that exceeded VDH's lower level of concern for mercury. At collection **Site 1,**[2] two out of three largemouth bass collected in 2017 exceeded VDH's lower level of concern for mercury, with an average concentration of 0.49 ppm and a range of 0.29-0.66 ppm. At collection **Site 2**, two out of five largemouth bass sampled in 2017 exceeded VDH's lower level of concern for mercury, with an average concentration of 0.48 ppm and a range of 0.39-0.61 ppm mercury for all largemouth bass sampled. None of the fish sampled from collection **Site 3** exceeded VDH's lower level of concern for mercury in 2017.

Mercury bioaccumulation discussion

The rate of bioaccumulation of mercury in biota after a single contamination event is not well understood and can be influenced by a variety of environmental factors including water chemistry and temperature. There are several steps involved with the methylation of inorganic mercury in the sediment of the river, and then the methylmercury must make its way up the food chain where it is biomagnified in the predator species of the aquatic system. It is expected that there may be a delay in seeing any noticeable changes in the concentration of mercury in edible fish tissues.

Assessing the need for advisory upstream of Danville

When assessing the fish tissue mercury concentrations upstream of Danville, VDH considers the abundance of the fish species in the waterway, their size, and the average concentration of contaminant in at least 12 fish of edible size before issuing a fish consumption advisory. VDH also seeks input from DEQ and the Department of Game and Inland Fisheries (DGIF). VDH met with DEQ to discuss the mercury concentration in fish collected upstream of Danville in March 2019. Data from future sampling events may support adding an advisory upstream of Danville, but at this time there is insufficient data to support the change in the current fish consumption advisories. The current fish consumption advisory for the Dan River is attached (**Figure 2**).

[2] See Figure 1 for collection site locations

Table 1: 2014, 2015, 2016, 2017 summary of fish tissue samples that exceed VDH's lower level of concern for mercury.*

Collection Site	Fish Species	Year	Hg Conc. (ppm)	Mass of Fish (g)
1	Largemouth Bass	2017	0.52	880
1	Largemouth Bass	2017	0.66	1140
1	Largemouth Bass	2014	0.53	760
2	Largemouth Bass	2017	0.61	2180
2	Largemouth Bass	2017	0.53	1405
2	Largemouth Bass	2014	0.54	946
4	Striped Bass	2017	0.56	2375
4	Flathead Catfish	2016	0.84	-
4	Flathead Catfish	2016	0.64	-
4	Striped Bass	2016	0.74	-
4	Striped Bass	2016	0.62	-
4	Walleye	2014	0.65	1366.5
5	Blue Catfish	2017	0.7	11,200
5	Blue Catfish	2015	0.56	-
5	Flathead Catfish	2014	1.23	17,000
5	Flathead Catfish	2014	0.96	14,400
5	Flathead Catfish	2014	0.82	14,200
5	Flathead Catfish	2014	0.65	11,200
5	Flathead Catfish	2014	0.63	5700
6	Largemouth Bass	2016	0.55	-
7	Flathead Catfish	2016	0.69	-
7	Flathead Catfish	2014	0.83	14,200
8	Striped Bass	2017	0.62	2637
8	Striped Bass	2017	0.58	1939
8	Flathead Catfish	2016	0.59	-
8	Walleye	2016	0.90	-
8	Walleye	2016	0.54	-
8	Spotted Bass	2015	0.70	-
8	Flathead Catfish	2014	0.56	6500
8	Smallmouth Bass	2014	0.71	1581
8	Walleye	2014	0.51	1434
8	White Bass	2014	1.25	428

*Sites 1 and 2 are upstream of Danville. Note: only 8 fish out of 160 collected in 2017 exceeded VDH's lower level of concern. ppm – parts per million. g – grams. Hg – mercury.

CONCLUSION

VDH concludes that the existing fish consumption advisory for the Dan River is protective of health.

RECOMMENDATION

VDH recommends that the current fish consumption advisories remain in effect for the Dan River.

Please let us know if you have any questions about our analysis or wish to discuss these data further.

Sincerely,

Rachel Ellick, M.S.
Health Assessor
Virginia Department of Health
Richmond, VA 23219

Caroline “Carrie” Holsinger, DrPH, CPH
Director, Division of Surveillance and Investigation
Virginia Department of Health
Richmond, VA 23219

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Figure 1. Map of fish collection sites.

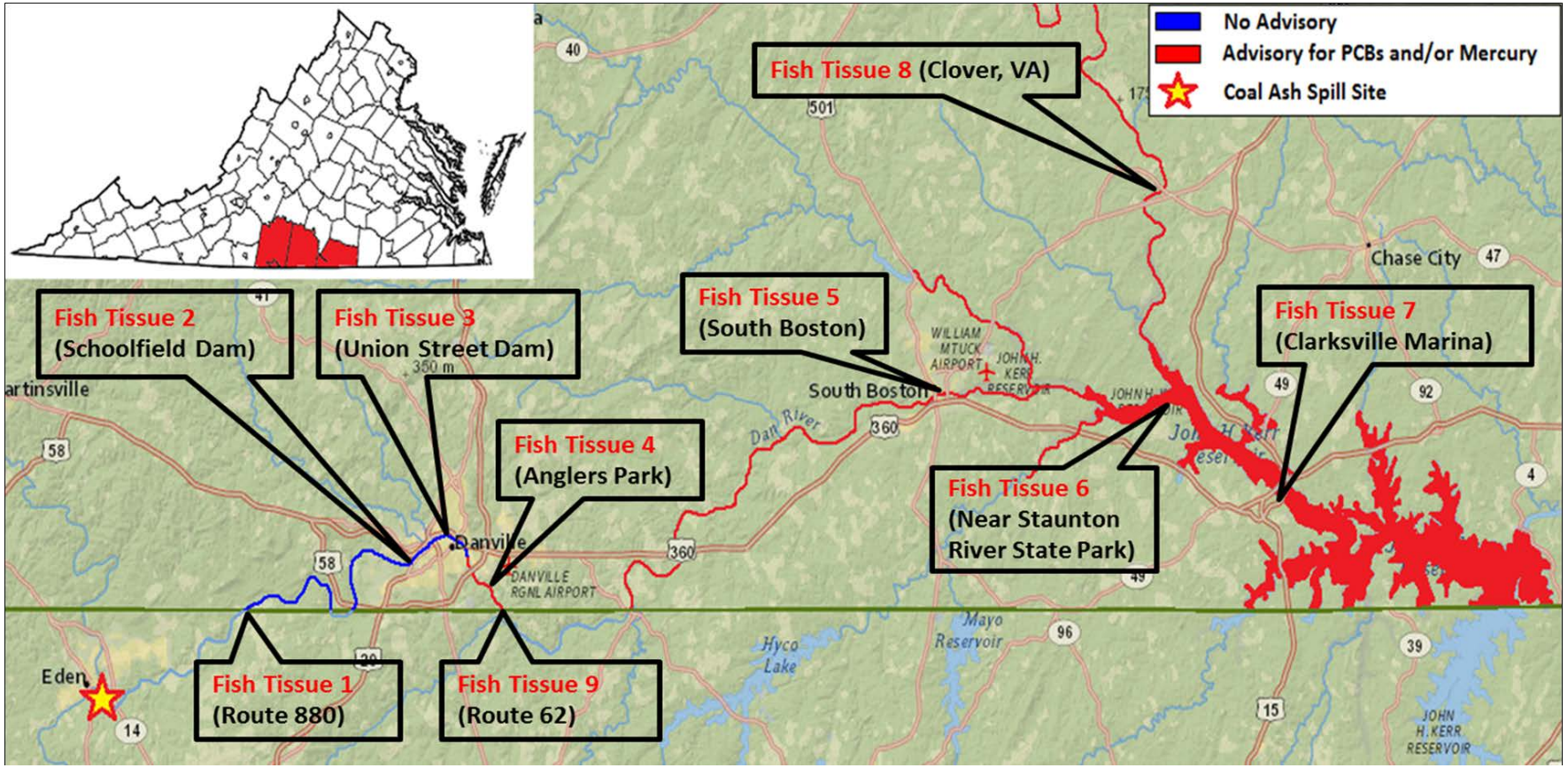

Figure 2. Current fish consumption advisories for the Dan River.

WATERBODY AND AFFECTED BOUNDARIES	AFFECTED LOCALITIES	CONTAMINANT	SPECIES	ADVISORIES/RESTRICTIONS
Dan River (within the state of Virginia from the Brantley Steam Plant Dam in Danville downstream to the confluence with Roanoke River on John. H. Kerr Reservoir, including its tributaries Hyco River up to Rt. 738 bridge and Banister River up to the Banister Dam. These river segments comprise ~67 miles).	Danville City, Pittsylvania Co., Halifax Co., Mecklenburg Co.	PCBs, Mercury	Flathead Catfish ≥ 32 inches 	**DO NOT EAT**
		PCBs, Mercury	Flathead Catfish < 32 inches 	No more than two meals/ month
		PCBs	Carp 	
		PCBs	Redhorse Sucker 	
		PCBs	Channel Catfish 	
		PCBs, Mercury	Striped Bass 	
		PCBs, Mercury	White Bass 	
		PCBs	White Perch 	
		PCBs, Mercury	Blue Catfish 	
		PCBs	Walleye 	
		PCBs, Mercury	Longnose Gar 	
		Mercury	Largemouth Bass