Commonwealth of Pennsylvania
Department of Environmental Protection
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SUBJECT: Fisheries Survey
Curwensville Reservoir
File #18668
Pike Township, Clearfield County

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Summary

On July 2, 2008, I conducted a night electrofishing survey with assistance from John Ryder and Jared Dressler on Curwensville Reservoir located in Pike Township, Clearfield County. The purpose of the survey was to document the fish community for aquatic life and recreational uses and to collect a fish tissue sample to determine human health criteria. This survey completes the evaluation of all lake use categories (aquatic life, recreation, water supply, and public health) for the reservoir.

We collected fish following the DEP fish sampling protocol with the exception of weighing individuals. We also collected gamefish at three reaches that were previously surveyed by PA Fish and Boat Commission (PFBC) in 1998, and collected a largemouth bass and yellow perch sample for fish tissue analysis.

We processed 434 fish during the survey. Largemouth bass were the dominant gamefish species collected (N=18) and low numbers of smallmouth bass, chain pickerel, and walleye (N=7) were also collected. Yellow perch were the dominant species collected (N = 251) and accounted for 61% of the total catch. The abundance of all species was poor when compared with other reservoirs in the region. The low abundance of fish was related to the reservoir's short retention time and subsequent low productivity and was not associated with poor water quality.

Although fish abundance was low, the catch per unit effort of largemouth bass increased over the 1998 survey from 2.2 fish per hour to 9.6 fish per hour in 2008. In addition, the catch of preferred length largemouth bass (300 mm; 12 inches) increased from 1.8 fish per hour in 1998 to 4.3 fish per hour in 2008.

Yellow perch and bluegill were the only two species that had an adequate sample to evaluate size structure. Low values for proportional stock density (PSD) and relative stock density of preferred (RSD-P) length yellow perch and bluegill both indicated that few fish were large enough to meet angler preference and subsequent harvest.

The Curwensville Reservoir production is limited by the short residence time, of the water in the reservoir, and the response of the fish community reflects the reduced productivity. The fish community in the reservoir did not show indications that there were actual water quality problems that required correction. Therefore, Curwensville Reservoir meets aquatic life and recreational use requirements and should be placed on List 2 of the Pennsylvania Integrated Water Quality Assessment Report.

Results of heavy metals analyses indicated that the largemouth bass sample had elevated mercury levels above the statewide consumption advisory of one meal per week. However, a second test is required before any advisories are posted. We plan to collect another largemouth bass sample in 2009 to confirm mercury levels before any decisions about an advisory are made. The reservoir will be placed on List 5 of the Pennsylvania Integrated Water Quality Assessment Report as an impairment of public health use, if the 2009 mercury levels are similar.

Introduction

Curwensville Reservoir is a 316-hectare (790 acre) impoundment located on the West Branch Susquehanna River in Pike Township, Clearfield County. The reservoir is one of four impoundments that are part of the West Branch flood control system. The reservoir's primary purpose is for flood control, with secondary objectives for recreation and improvement of downstream water quality.

Curwensville Reservoir is classified as warmwater fishes (WWF) in the Chapter 93 Water Quality Standards and is also managed as a warmwater fishery by the PA Fish and Boat Commission. Streams in much of the reservoir's contributory drainage area are listed in the 305b report as attained, but the West Branch of the Susquehanna River from it's source downstream to Burnside, and a significant number of tributaries are impaired from abandoned mine drainage (AMD). Numerous mine drainage abatement projects are being implemented in the watershed and improved water quality is anticipated. The Department conducted a trophic status index survey in 2006 and the last fisheries survey was conducted by PFBC in 1998.

The purpose of the study was to conduct a fisheries survey to document the fish community composition of the reservoir, the size structure and condition of the sport fish community, and measure contaminant levels in tissue of select species.

Methods

Fish were sampled on July 2, 2008, using a pulsed-DC (200-250 V, 3-6 A) nighttime electrofishing boat at ten stations. Starting points were randomly selected within three major sections of the reservoir (upper, middle, and lower) where previous water quality sampling stations were located. A standard sampling effort of 4 minutes was expended at seven stations and we sampled three additional reaches (EL 2, 3, and 4) that were previously sampled by PFBC (1998; Figure 1). Two netters attempted to capture all fish that were encountered, except common carp which were visually counted. Sample collections at the PFBC stations only targeted gamefish species and any new species that were not collected at other stations. All fish were processed at the end of each station and any unidentified species were preserved for later identification. We measured the exact total length (TL, mm) of all gamefish and recorded other species in 25-millimeter (mm) length groups.

A list of species was recorded and compared with previous studies of the reservoir (Hollender and Kristine 1999). The catch-per-unit-effort (CPUE), proportional stock density (PSD: Anderson and Neumann 1996), and relative stock density (RSD-P: Anderson and Neumann 1996) of individual sportfish species were calculated when there was an adequate sample size. The CPUE was defined as the number of fish collected per hour of electrofishing. The PSD and RSD-P for all sportfish species were calculated when at least 20 stock-length fish were collected. The PSD in this study was expressed as:

$$\frac{\text{Number of fish} \geq \text{minimum quality length}}{\text{Number fish} \geq \text{minimum stock length}} \times 100$$

The RSD-P in this study was expressed as:

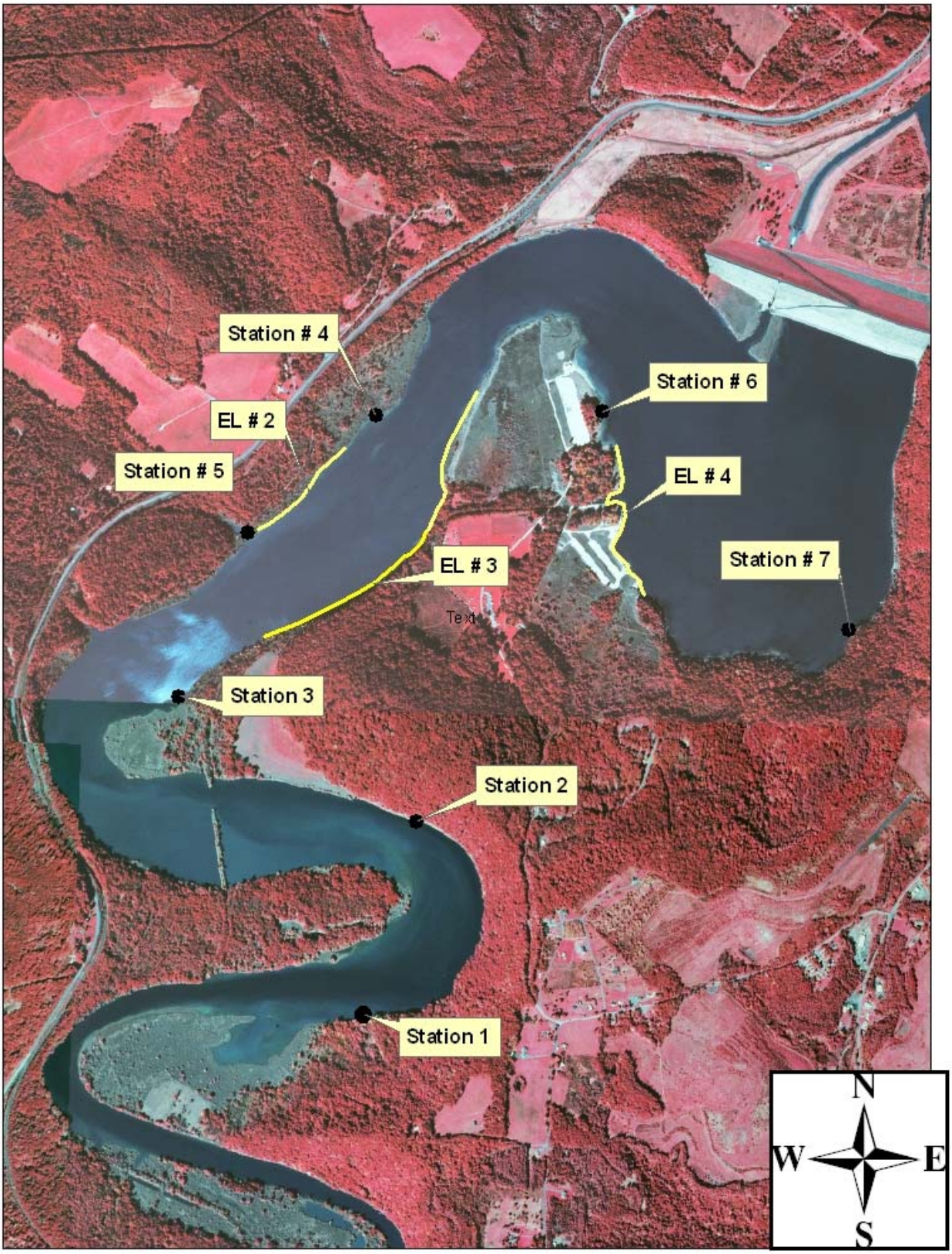
$$\frac{\text{Number of fish} \geq \text{minimum preferred length}}{\text{Number fish} \geq \text{minimum stock length}} \times 100$$

Five largemouth bass and five yellow perch were collected for fish tissue analysis. All fish were processed according to DEP protocol (2005) and were scaled with the skin attached. Tissue samples were analyzed for heavy metals, pesticides, and PCB's and results were compared with fish consumption advisory criteria.

Results

We identified 19 species of fish compared to 15 that were previously collected in 1998. However, increases in species composition could have been attributed to the type of gear and collection methods used in the study. Seven new taxa were identified since the 1998 PFBC survey and included chain pickerel (*Esox niger*), tessellated darter (*Etheostoma olmstedi*), green sunfish (*Lepomis cyanellus)*, common shiner (*Luxilus cornutus*), bluntnose minnow (*Pimephales notatus*), walleye (*Sander vitreus)*, and creek chub (*Semotilus atromaculatus*). Several of the new taxa that were collected are typically associated with streams and may have been incidentally collected near the mouths of tributaries entering the reservoir. Walleye have also

Figure 1 – Fish sampling stations in Curwensville Reservoir located in Pike Township, Clearfield County. Stations with EL are PA Fish and Boat Commission electrofishing stations that were sampled.



been stocked in the reservoir by a local sporting group since the last survey was conducted. Three species captured in the 1998 survey were not found in 2008 (Table 1).

Table 1 – Comparison of the fish species collected in Curwensville Reservoir by the PA Fish and Boat Commission in 1998 (Hollender and Kristine 1999) and nighttime electrofishing conducted in 2008.

Common Name	***Scientific Name***	**Abbreviation**	**1998**	**2008**
Rock bass	*Ambloplites rupestris*	RB	*	*
Yellow bullhead	*Ameiurus natalis*	YB	*	*
Brown bullhead	*Ameiurus nebulosis*	BB	*	
White sucker	*Catostomus commersoni*	WS	*	*
Common carp	*Cyprinus carpio*	CC	*	*
Muskellunge-tiger	*Esox masquinongy*	MK	*	
Chain pickerel	*Esox niger*	CP		*
Tesselated darter	*Etheostoma olmstedi*	TD		*
Green sunfish	*Lepomis cyanellus*	GSF		*
Pumpkinseed	*Lepomis gibbosus*	PS	*	*
Bluegill	*Lepomis macrochirus*	BG	*	*
Common shiner	*Luxilus cornutus*	CS		*
Smallmouth bass	*Micropterus dolomieu*	SMB	*	*
Largemouth bass	*Micropterus salmoides*	LMB	*	*
Shorthead redhorse	*Moxostoma macrolepidotum*	SHR	*	*
Golden shiner	*Notemigonus chrysoleucas*	GS	*	*
Spottail shiner	*Notropis hudsonius*	STS	*	
Yellow perch	*Perca flavescens*	YP	*	*
Bluntnose minnow	*Pimephales notatus*	BNM		*
White crappie	*Pomoxis annularis*	WC	*	*
Walleye	*Sander vitreus*	WE		*
Creek Chub	*Semotilus atromaculatus*	CRK		*

We did not observe high numbers of fish when compared to other lakes and reservoirs in the region. The total CPUE of all fish was 889.1 (N = 7 stations), and the total CPUE of gamefish (N = 10 stations) was 13.8. Largemouth bass accounted for 69% of the gamefish catch, but total catch was low (CPUE = 9.6). Yellow perch were the most abundant fish species collected (CPUE = 541.3) and accounted for 61% of all fish collected. The bluegill catch was second in abundance (CPUE = 143.5), but catch rates were nearly 4 times less than yellow perch (Table 2).

We did not collect a minimum sample (n = 20) of stock size fish to calculate a valid PSD and RSD-P for gamefish. Nonetheless, largemouth bass (n = 14) had a PSD and RSD-P value of 57 and 36. We collected an adequate panfish sample to calculate PSD and RSD-P for yellow perch and bluegill. The PSD and RSD-P values for yellow perch (n = 45 stock length fish) were 17 and 2 and the PSD and RSD-P values for bluegill (n = 44 stock length fish) were 18 and 0. Low

Table 2 – A list of Curwensville fish species collected on July 2, 2008 with the number of individuals collected at each station and the catch per unit effort (CPUE) for each species and station.

Fish Species	Station 1	Station 2	Station 3	EL #3	Station 4	EL# 2	Station 5	EL #4	Station 6	Station 7	CPUE
Shorthead Redhorse	1	1	7		1		7		2	2	45.7
Yellow Perch	19	2	58		72		18		47	33	541.3
Golden Shiner	3	1	2		3						19.6
Rock Bass	1	1					1			1	8.7
White Sucker	2	1	1		2		4		4	1	32.6
Largemouth Bass	1	1		11		3		2			9.6
Yellow Bullhead	3						1				8.7
Bluegill	1	9	18		3		16		2	17	143.5
Common Carp	3										6.5
Pumpkinseed		1	7		3		1		1	1	30.4
Walleye				2							1.1
Smallmouth Bass				5							2.7
White Crappie				1							0.0
Common Shiner					1						0.0
Chain Pickerel						1					0.5
Tesselated Darter							1		3	2	13.0
Bluntnose Minnow							3		8	2	28.3
Creek Chub							1				2.2
Green Sunfish										1	2.2
Total	34	17	93	19	85	4	53	2	67	60	434
Time (minutes)	4	4	4	45.86	4	17	4	22.5	4	4	
Total Catch (CPUE)	515.2	257.6	1409.1	*	1287.9	*	803.0	*	1015.2	909.1	896.4
Gamefish (CPUE)	15.2	15.2	0.0	23.7	0.0	14.3	0.0	5.3	0.0	0	13.8

PSD and RSD-P values for yellow perch and bluegill indicated there was a low percentage of fish that are preferred and targeted by anglers.

The length distribution of largemouth bass did not display any meaningful patterns because the sample size was small. However, the size distribution represented different age classes (Figure 2). Only 18% of the yellow perch catch and 15% of the bluegill catch were $\geq$ 125 mm (4.8 inches) indicating most of the sample had small individuals (Figure 3).

Figure 2 - The length frequency distribution of largemouth bass collected from Curwensville Reservoir on July 2, 2008.

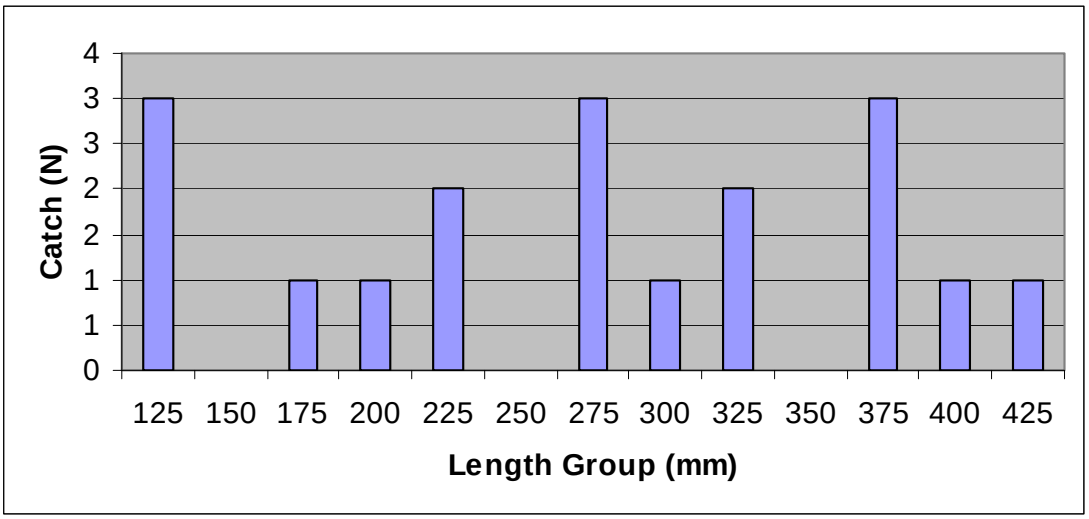
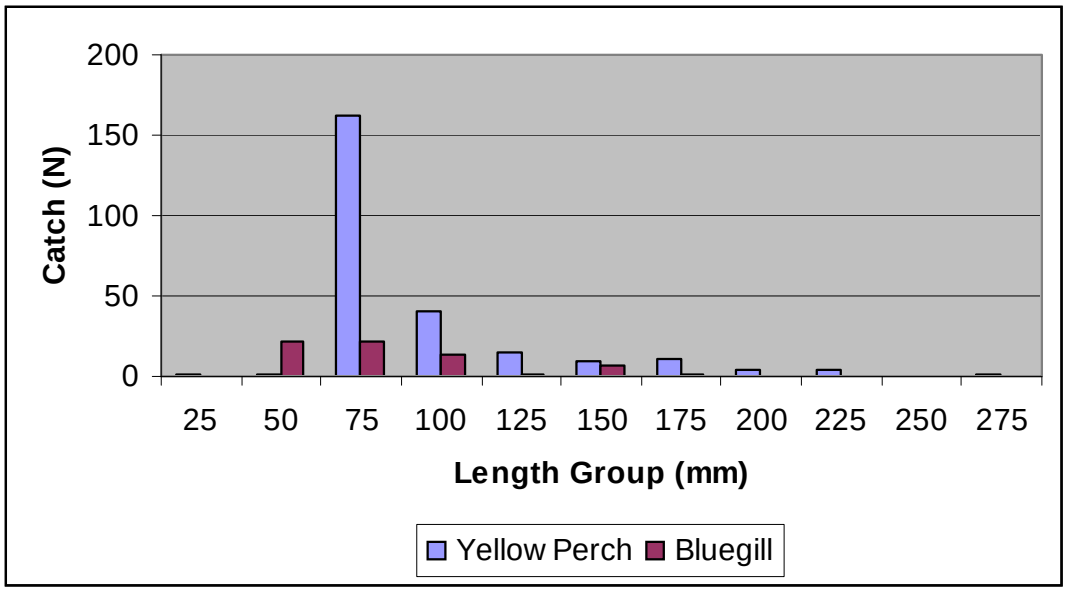


Figure 3 – The length frequency distribution of yellow perch and bluegill collected from Curwensville Reservoir on July 2, 2008.



the fish tissue results indicated elevated mercury concentrations for largemouth bass (0.23 ppm) and low concentrations for yellow perch (0.056 ppm). Copper, chromium, lead, and selenium levels were also reported, but cadmium was below the detection limit. Results for PCB's and pesticides were not completed and will be reviewed for public health criteria when they are reported. The mercury concentration measured in largemouth bass was just above the action level of one meal per week (0.2 – 1.0 ppm), but the mercury concentration in yellow perch was not a concern (Table 3).

Table 3 – Results of largemouth bass and yellow perch fish tissue samples analyzed for heavy metals. The sample was from scaled fillets with the skin attached. All values are reported in parts per million (ppm). Values for mercury that are between 0.2-1.0 ppm indicate an action level for consumption of one meal per month**.**

Variable	Largemouth Bass	Yellow Perch
Cadmium (Cd)	< 0.005	< 0.005
Chromium (Cr)	0.245	0.282
Copper (Cu)	1.13	0.381
Mercury (Hg)	0.231	0.056
Lead (Pb)	0.092	< .025
Selenium (Se)	1.552	1.322

Discussion

We sampled the reservoir in July when the water surface temperature was 22.5 ^{0}C (72.5 ^{0}F). This was not the normal index period or the preferred sampling temperature, but it was the earliest date that could be scheduled and water temperatures were relatively similar to the June 1998 PFBC electrofishing survey.

It is difficult to determine how much water temperature influenced our catch rates and species composition, but the survey was adequate to document fish community composition and measure contaminant levels. Hollender and Kristine (1998) concluded that the fish community in Curwensville Reservoir was limited by a short retention time, poor habitat, and poor water quality associated with abandoned mine drainage (AMD). Means (2008) documented major declines in nutrients over Hughey (1988) and attributed improved water quality from mine drainage treatment in the contributing drainage as the reason for reductions in nutrient loading. However, declines in nutrients did not correspond to declines in lake production because nutrients were flushed through the reservoir before they could be utilized by plankton. Therefore, the limiting factor for production in the reservoir is driven by the short retention time.

Our observations of the fish community and water quality conditions (Means 2008) both indicated improvement in the last 10 years. Although abundance was very low compared with other reservoirs, we found largemouth bass lengths were distributed over a range of size groups which indicated different age classes and successful recruitment. In addition, the total catch of largemouth bass had increased from 2.2 per hour in 1998 to 9.6 in 2008, and the catch of

preferred length largemouth bass (300mm; 12 inch) had increased from 1.8 in 1998 to 4.3 in 2008.

We only collected two walleye, but missed several others while sampling. We were aware that a local sporting group had been stocking walleyes for several years in the reservoir, but their presence had not been documented. Our observation and collection of walleye indicated that some of these fish are surviving. However, we would not expect natural reproduction of walleye in the reservoir and limits in lake production and subsequent plankton production would be a major obstacle for a successful fry or fingerling stocking program.

This survey demonstrated that a diverse fish community was present and that some level of recreation was available. It also suggested that species diversity increased in the reservoir since 1998, but it could not be determined whether increases were associated with water quality improvements or if they were associated with stocking and collection methods. The low CPUE indicated reduced abundance compared to other lakes, and it was primarily due to limited productivity in the reservoir. A short retention time and subsequent effects on lake production limit the ability of the reservoir to support a higher biomass.

There is a potential for elevated mercury levels in fish because high metals concentrations were measured previously in water samples (Means 2008). However, the pH and alkalinity concentrations measured in the reservoir did not indicate declines in pH where heavy metals could readily disassociate and be available for uptake into the food chain. Mercury accumulation is a common problem in top predators, especially in older individuals due to longer opportunity for exposure and accumulation. Low concentrations of mercury in yellow perch and concentrations 4 times higher in largemouth bass suggested mercury is magnified at different levels of the food chain. The mercury levels measured in largemouth bass were slightly above the statewide advisory and will require a resample to confirm the result before any fish consumption advisories are posted.

The West Branch Susquehanna River watershed upstream of Curwensville Reservoir is affected by abandoned mine drainage, but these water quality issues do not appear to adversely affect the fish community in the reservoir. Instead, the fish community seems to be influenced more by dam operations and the associated decline in productivity, but not to the point that it interferes with recreational opportunities or the ability of the reservoir to sustain a healthy fish community. Therefore, the aquatic life and recreational use of Curwensville Reservoir is attaining the designated use and should be placed on List 2 of the Pennsylvania Integrated Water Quality Assessment Report as attained. Additional collections of largemouth bass are needed in 2009 before it can be determined if mercury levels will require a fish consumption advisory. The reservoir will be placed on List 5 of the Pennsylvania Integrated Water Quality Assessment Report as an impairment for public health if mercury levels are confirmed above the action level of 0.2 ppm.

References

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Appendix

Appendix A - Length and weights of largemouth bass and yellow perch analyzed for heavy metals.

	Total Length (inches)	Weight (lbs. Oz.)
Largemouth Bass	11.9	12.1 oz.
	12.4	1 lb. 1 oz.
	12.7	1 lb. 1.5 oz.
	15.5	1 lb. 11 oz.
	16.0	1 lb. 12 oz.
Yellow Perch	7.7	3.2 oz.
	9.1	5.6 oz.
	9.3	6.3 oz.
	9.4	6.7 oz.
	9.5	5.6 oz.

Appendix B - Length frequency distribution of all fish measured in the study.

Name Curwensville Reservoir Station # All
Date : 7/2/2008 Time: 1.88 hrs
Water Temperature 22.5 ^{0}C

	SRH	YP	BG	GDS	RB	WS	LMB	WE	CP	YB	PSS	SMB	GS
25 - 49		2											
50 - 74		2	22										
75 - 99		162	21		3						9		
100 - 124		40	14	6							2		1
125 - 149		15	1	3			3				3	1	
150 - 174	3	10	7										
175 - 199		11	1			3	1					2	
200 - 224		4				2	1	2		1			
225 - 249	1	4			1		2			2			
250 - 274	1									1		1	
275 - 299		1					3						
300 - 324						1	1						
325 - 349						3	2						
350 - 374	1					5							
375 - 399	1					1	3						
400 - 424	1						1						
425 - 449	8						1		1				
450 - 474	3												
475-499													
500 - 524	1												
Total	20	251	66	9	4	15	18	2	1	4	14	4	1

SRH = Shorthead Redhorse
YP= Yellow Perch
BG = Bluegill
GDS = Golden Shiner
RB = Rock Bass
WE= Walleye
CP = Chain Pickerel
YB = Yellow Bullhead
PSS = Pumpkinseed Sunfish
SMB = Smallmouth Bass
LMB= Largemouth Bass
WS = White Sucker
GS = Green Sunfish