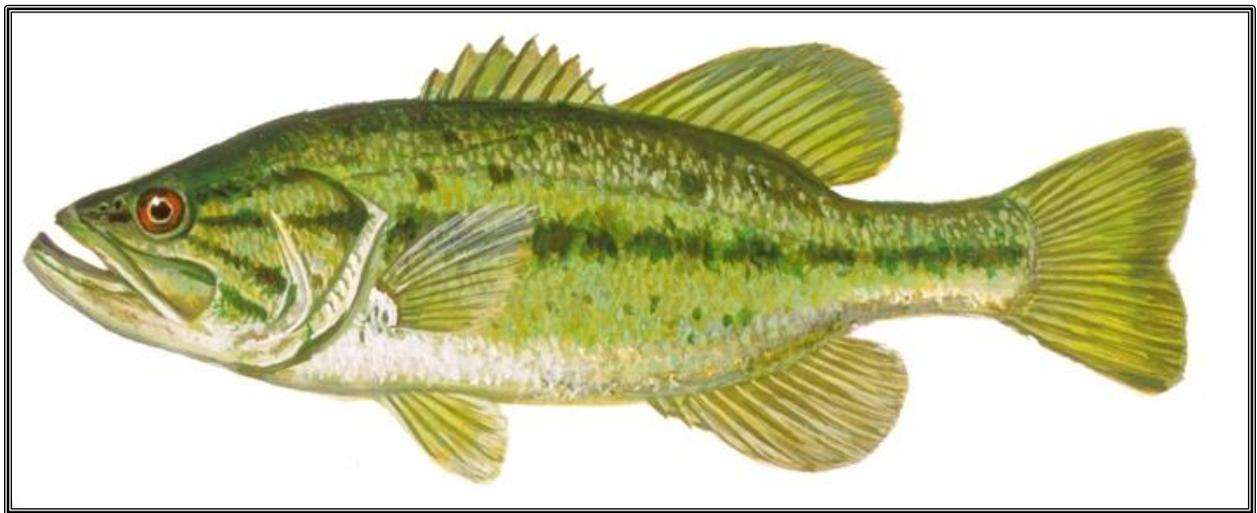


Selenium-Induced Developmental Effects Among Fishes in Select West Virginia Waters



West Virginia Department of Environmental Protection

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Summary

In respect to the USEPA's draft whole fish tissue body burden criterion for selenium—7.91 mg/kg dry weight (USEPA, 2004), potentially revised to 11.1 mg/kg dry weight (USEPA, 2008)—the West Virginia Department of Environmental Protection (WVDEP) has studied selenium bioaccumulation among fishes residing in the State's lakes and streams since 2005. Additionally, due to concern regarding fish population health at locations subjected to elevated selenium inputs, particularly during the more sensitive developmental life stages of fishes (e.g. yolk-sac larvae), the WVDEP has collected and examined bluegill sunfish, *Lepomis macrochirus*, larvae (ichthyoplankton) from selected waterbodies since 2007. Also, in 2009, WVDEP began acquiring data about selenium concentrations within fish eggs, which is often used as a predictor of larval deformity rates (Lemly, 1997; Holm *et al.*, 2005; Muscatello *et al.*, 2006). Certain developmental deformities may also be observed among individuals surviving to later life stages (Nagano *et al.*, 2007); consequently, WVDEP has conducted deformity surveys of adult fishes in selenium enriched waters as well as at reference locations since 2008.

Larval deformity rates were variable throughout the study duration but were nonetheless associated with waterborne selenium exposure. Reference locations produced age-based larval bluegill subsamples (24-168 hours) with deformity rates between 0% and 1.27%; whereas, locations with elevated seleniferous inputs exhibited bluegill ichthyoplankton deformity rates ranging from 0% to 47.56% in certain developmental stages (10-312 hours). However, these evaluations were not indicative of overall reproductive success or population sustainability, which must be determined via more detailed studies. Independent confirmation of selenium-induced larval deformities among bluegill populations sampled in 2008 was sought via collaboration with Dr. Diana Papoulias, Fish Research Biologist, United States Geological Survey (USGS), Columbia, MO, who verified the presence of developmental deformities. Maximum deformity rates among certain aged bluegill subsamples as determined through these evaluations were 19.28%, representing specimens collected from selenium-enriched waters. Concentrations of selenium within fish eggs also varied according to study location and ranged from <0.8 mg/kg dry weight among bluegill eggs at the control site to 64.62 mg/kg dry weight among largemouth bass, *Micropterus salmoides*, eggs collected from selenium-enriched waters. Searches for more mature, yet developmentally-deformed fishes revealed increased deformity rates (14%) among largemouth bass residing in the Upper Mud River Reservoir (UMRR), Lincoln County, West Virginia, as compared to deformity rates among largemouth bass found in the reference location (0%), Plum Orchard Lake (POL), Fayette County, West Virginia.

Background

Among oviparous vertebrates, the teleost fish egg and embryo contained within represents a life stage which is susceptible to the effects of bioaccumulative toxicants through the processes of maternal transfer (Russell *et al.*, 1999). Specifically, potentially detrimental substances like selenium are accrued via maternal diet and stored in the liver. During oogenesis, or egg formation, these substances are transferred from the maternal liver, through the circulatory system, into the oocyte (egg cell) as yolk (Evans & Claiborne [eds.], 2006). Developmental deformities may then be incurred as a result of natural

growth phenomena with the embryo utilizing contaminants (e.g. elevated selenium concentrations) instead of typical organic and inorganic constituents (Rolland, 2000; Strmac *et al.*, 2002; Zambonino *et al.*, 2005). Selenium, being a chemical analog of sulfur, is especially detrimental when substituting sulfur in protein synthesis as the structural confirmation is compromised. Selenium-induced developmental deformities can be manifest in several ways, but most often result in embryonic spinal curvatures, anomalous yolk-sac absorption, and malformed craniofacial features (Lemly, 1997; Holm *et al.*, 2005). Such teratogenic conditions may be inherently lethal, or may cause a reduction in the overall fitness of the organism, resulting in delayed mortality (Gillespie & Baumann, 1986; Pyron & Beitinger, 1989).

The USEPA's draft whole fish tissue body burden criterion for selenium is based primarily on experimentally observed impacts to sunfish—specifically, bluegill sunfish (USEPA, 2004; USEPA, 2008). Therefore, the reproductive activities of bluegill sunfish were the focus of this study. More specifically, a comparison of reproductive success, measured through developmental deformities observed among yolk-sac larvae, of bluegill sunfish populations inhabiting selenium-enriched waters versus those residing in reference locations was the major objective of this investigation. However, important contributions from the scientific literature have recently been made via correlations between selenium concentrations in maternal eggs and subsequent deformity rates among developing larvae (Lemly, 1997; Holm *et al.*, 2005; Muscatello *et al.*, 2006). Accordingly, collections of fish eggs from gravid females of various species, inhabiting environs with diverse selenium inputs, were made by WVDEP personnel. Subsequent analyses of the selenium tissue concentrations within these eggs allowed for comparisons to egg tissue concentration thresholds for selenium suggested in the literature, albeit among different fish species, and were also an experimental objective. Furthermore, it was surmised that establishing such selenium egg tissue concentrations among certain species would provide valuable information regarding poorly understood bioaccumulation mechanisms (e.g. selenium accrual by stream fishes in fluvial environs). Lastly, developmental deformities persisting among more mature individuals are often observed at locales experiencing selenium-induced toxicity to the fish community (Lemly, 1993; Hamilton *et al.*, 2005_b). In May, 2007, WVDEP and United States Fish and Wildlife Service (USFWS) biologists first observed a potentially developmentally-deformed largemouth bass at a selenium-enriched impoundment—the Upper Mud River Reservoir. Since that time, several deformity surveys have been conducted at this location and at reference sites in order to determine the persistence of such developmental deformities among the resident mature fish populations.

Study Locations

The primary study locations, which correspond to potential anthropogenic selenium inputs (Appendix A), were located within similar coal-bearing geologic strata and are warmwater fisheries managed by the West Virginia Division of Natural Resources—the Upper Mud River Reservoir and Plum Orchard Lake (Figure 1). These locations were sites of both fertilized bluegill egg collection and stripped (maternal) egg collection for selenium tissue concentration determination. The Upper Mud River Reservoir is a 306-acre impoundment located in Lincoln County, WV, which is formed by the dammed confluence of the main forks of the Mud River. It was first inundated in 1995. Upstream of this reservoir, significant

Experimental Methods

ICHTHYOPLANKTON

The spawning activities of bluegill sunfish populations at the Upper Mud River Reservoir and Plum Orchard Lake were monitored throughout the spring seasons of the study years, 2007-2009. Observations of water temperature, male nest-building activities, and female staging were made while nest site locations were identified and geo-referenced. Once initiated, spawning phenomena were observed and photographed as well as restricted from extraneous human disturbance (e.g. at the Upper Mud River Reservoir swimming beach). Materials used by male bluegills to line nest depressions were inspected periodically until affixed eggs were found. Relict Asian clam, *Corbicula fluminea*, shells were primarily used by bluegills as nesting substrate in the Upper Mud River Reservoir; whereas, small cobblestones, twigs, and pine cones lined bluegill nests in Plum Orchard Lake.

Fertilized eggs, affixed to nesting substrate, were collected by hand and immediately transferred into 48-quart coolers filled with water from the spawning areas. The coolers were mechanically aerated by two battery-powered aerators and standard aquarium air stones. After securing the inundated eggs/nest substrate along the aerated cooler bottom, the specimens were transported to WVDEP headquarters, where 10-gallon aquaria were prearranged to accept the substrate-affixed eggs and collected water. Eggs and nest substrate were carefully and evenly distributed by hand along the aquarium floors, following the addition of the aerated water. Three 10-gallon aerated aquariums were used to contain the egg specimens from each study location, totaling six aquariums for entire ichthyoplankton rearing experiment (Figure 2). Eggs and nest materials not placed in the experimental aquaria were retained in the aerated coolers throughout the remainder of the study. Physicochemical parameters and other water quality constituents (e.g. dissolved metals and nutrients) were measured in the incubation medium (aquarium water) periodically throughout the study to assure habitat stability. Additionally, aquarium waters during the 2009 study year were treated with dilute (0.05%) bleach, sodium hypochlorite, and formaldehyde (1%) in order to curtail growth of the egg fungus, *Saprolegnia sp.*

Developing bluegill larvae were removed from the aquaria beginning 10-24 hours after reaching a post-hatch tail-free life stage. Larvae were extracted in fractions of the total number observed at 2-day intervals. Removal of the larvae was accomplished through a large diameter bulb pipette and larvae were transferred, along with a small volume of aquarium water, into sterile 250 ml plastic beakers. Photographs and video images of extant (living) larvae in the beakers were made via Bodelin ProScope HR at 50x magnification and an ocular lens microscope camera at various magnifications. Following photography, the larvae, in the beakers, were placed into a -80°C freezer for approximately 20 minutes in order to induce a state of torpor. The beakers were then removed and the surficial chilled water was extracted with the bulb pipette, leaving the torpid larvae and a small volume of water at the bottom. Formaldehyde, buffered and diluted to 10%, was subsequently added to the beakers, totaling a volume of 200 ml, which instantly preserved the anesthetized larvae. The fixed larvae were retained in these vessels throughout the remainder of the study, being removed via bulb pipette only for deformity screening.

Figure 2. Typical aquarium layout, note *Corbicula fluminea* relict shells along bottom.



Screening of the preserved bluegill larvae for developmental deformities was accomplished via light microscopy using VWR VistaVision dissecting microscopes. Anomalous larvae were grouped into four categories: craniofacial, spinal, yolk-sac, and other deformities. Reference literature regarding ichthyoplankton identification and selenium-induced developmental deformities included Lemly's (1997) "A Teratogenic Deformity Index for Evaluating Impacts of Selenium on Fish Populations," and Lipson and Moran's (1974) Manual for Identification of Early Developmental Stages of Fishes of the Potomac River Estuary, as well as other related publications (Holm, 2002; Janz & Muscatello, 2008). Confirmation of larval deformities among 2008-collected specimens was performed by Dr. Diana Papoulias, Fish Research Biologist, USGS, Columbia, MO. Dr. Papoulias evaluated 60.5% of 10-hour larvae, 89.2% of 120-hour larvae, and 40.6% of 192-hour larvae that WVDEP reared and examined in 2008. Histological assessments of these bluegill ichthyoplankton were made via standard light and specialized microscopy (Papoulias, pers. comm., 2009).

EGG TISSUE

Gravid female stream and lake fishes were collected by standard electrofishing techniques (USEPA, 2000). Individuals were live-kept in ambient water until dissection, when the gonads were removed from the body cavity. Ovaries were further dissected and the eggs within were removed via small laboratory spatula. Once extracted, eggs were placed in individual sterile beakers, or were composited with the eggs of other individuals of the same species to achieve a minimum analytical mass. Specimens were kept at 0°C until chemical analyses were performed in accordance to USEPA's Laboratory Analysis Method 200.3, which is the basis for derivation of whole-body selenium concentrations in fish tissue (USEPA, 1991).

Results and Conclusions

2007 ICHTHYOPLANKTON

Deformity rates among 2007 bluegill ichthyoplankton were as high as 12.0% of the sampled population; although, the total number of specimens evaluated was relatively small at 569 individuals (Table 1; Figure 3). These deformity rates could not be compared to those from a reference population in the Left Fork/Mud River portion of the Upper Mud River Reservoir as it was later found to be influenced by the selenium-enriched part of the impoundment. However, a small number of bluegill larvae, 72 individuals, were collected from another reference location, Plum Orchard Lake. Upon evaluation of these reference specimens for anomalies, none were found to be deformed—0% (Table 1; Figure 3). Of the deformities among specimens from selenium-enriched locations, most were categorized as spinal anomalies; however, each of the deformity categories was represented in the population (Appendix C).

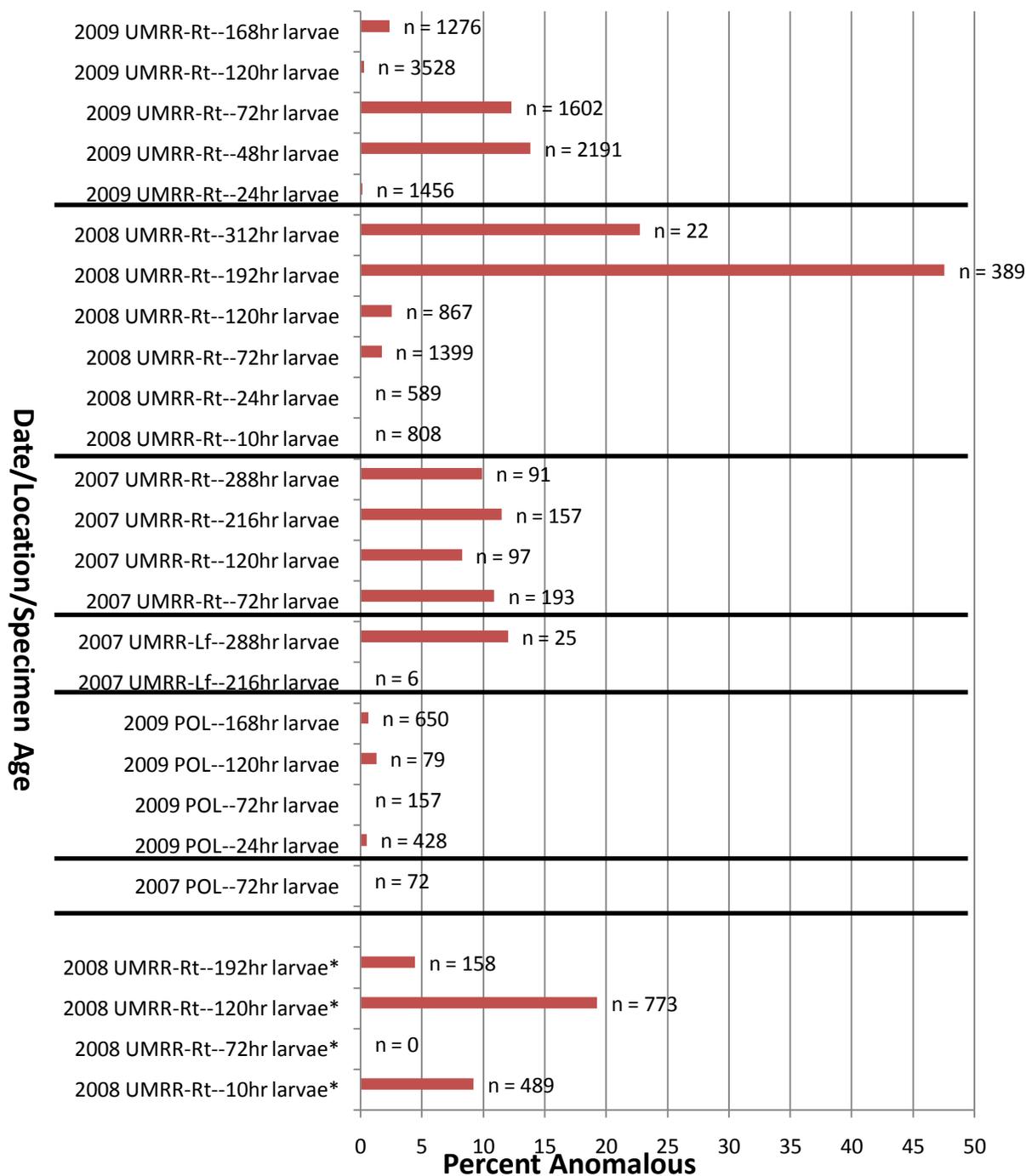
2008 ICHTHYOPLANKTON

During the 2008 study year, the location of a productive reference (non-impacted) spawning bluegill sunfish population was of paramount importance; a point of comparison to the presumably selenium-impacted ichthyoplankton was an experimental necessity. Consequently, Plum Orchard Lake, Fayette County, WV, was targeted as such a reference location due to its geography/geology as well as its low anthropogenic selenium input. However, attempts to locate bluegill nests within the impoundment were unsuccessful as the prolific growth of fragrant waterlilies, *Nymphaea odorata*, covered the surface water and shaded the lake's bottom from visible observation.

Bluegill ichthyoplankton were collected from the selenium-influenced population in the Upper Mud River Reservoir. The age-based deformity rate among these specimens ranged from 0 to 47.56% (Table 1). The total number of specimens evaluated by WVDEP in 2008 was 4,074. Dr. Diana Papoulias, USGS, Columbia, MO, confirmed the presence of selenium-induced developmental deformities among a subset (1420 individuals) of the 2008 Upper Mud River Reservoir bluegill ichthyoplankton. Dr. Papoulias' observed age-based deformity rate ranged from 2.54% to 19.28% (Table 1; Figure 3; Appendix C). Dr. Papoulias' maximum observed deformity rate of 19.28% corresponds to WVDEP's larval deformity rate

evaluation of 2.54%, considering 89.2% of the same specimens. WVDEP's evaluation of 192-hour larvae revealed a deformity rate of 47.56% as compared to 4.43% by Dr. Papoulias, who examined only 40.6% of the total specimens. Consideration must be given to Dr. Papoulias' use of higher resolution microscopy and that these confirmations are not based on evaluations of identical subsamples.

Figure 3. Larval bluegill sunfish, *Lepomis macrochirus*, deformity rates at study locations, 2007-2009.



*Observations made by Dr. Diana Papoulias, USGS (see Appendix C for details)

During the 2008 study year, the prevalence of the egg fungus, *Saprolegnia sp.*, in all experimental aquaria necessitated the removal of entrapped larvae from the fungal mass, or mycelium. Since it was documented that developmentally deformed individuals were not able to swim normally (Gillespie & Baumann, 1986), these specimens were carefully extracted from fungal hyphae and were included in the deformity evaluations in the same manner as individuals freely captured. Many of larvae removed from the fungal mycelium were found to be developmentally deformed.

Table 1. Deformity evaluations of bluegill sunfish, *Lepomis macrochirus*, ichthyoplankton 2007-2009.

Site	Date Preserved	# Specimens Evaluated	Observed Anomalies	% Anomalous
UMRR-Rt	6/1/07	193	21	10.88
UMRR-Rt	6/4/07	97	8	8.25
POL	6/6/07	72	0	0.00
UMRR-Rt	6/8/07	157	18	11.46
UMRR-Lf	6/8/07	6	0	0.00
UMRR-Lf	6/11/07	25	3	12.00
UMRR-Rt	6/11/07	91	9	9.89
UMRR-Rt	6/4/2008	808	0	0.00
UMRR-Rt*	6/4/2008	180	6	3.33
UMRR-Rt*	6/4/2008	158	30	18.99
UMRR-Rt*	6/4/2008	151	9	5.96
UMRR-Rt	6/5/2008	589	0	0.00
UMRR-Rt	6/7/2008	1399	24	1.72
UMRR-Rt*	6/7/2008	698	damaged	damaged
UMRR-Rt*	6/7/2008	216	damaged	damaged
UMRR-Rt*	6/7/2008	147	damaged	damaged
UMRR-Rt	6/9/2008	867	22	2.54
UMRR-Rt*	6/9/2008	46	25	54.35
UMRR-Rt*	6/9/2008	585	112	19.15
UMRR-Rt*	6/9/2008	102	6	5.88
UMRR-Rt*	6/9/2008	40	6	15.00
UMRR-Rt	6/12/2008	389	185	47.56
UMRR-Rt*	6/12/2008	158	7	4.43
UMRR-Rt*	6/12/2008	150	damaged	damaged
UMRR-Rt	6/19/2008	22	5	22.73
UMRR-Rt	6/13/2009	1456	2	0.14
UMRR-Rt	6/16/2009	2191	303	13.83
UMRR-Rt	6/18/2009	1602	197	12.30
UMRR-Rt	6/20/2009	3528	9	0.26
UMRR-Rt	6/22/2009	1276	30	2.35
POL	6/16/2009	428	2	0.47
POL	6/18/2009	157	0	0.00
POL	6/20/2009	79	1	1.27
POL	6/22/2009	650	4	0.62

*Determinations made by Dr. Diana Papoulias, USGS.

2009 ICHTHYOPLANKTON

Attempts to collect a reference population of bluegill ichthyoplankton in 2009 were successful as 1,314 specimens were preserved from Plum Orchard Lake (Table 1; Figures 3 & 7). Among these individuals, a maximum deformity rate of 1.27% was observed, and most anomalies were considered slight. In contrast, larval deformity rates were as high as 13.83% among bluegill ichthyoplankton collected from the Upper Mud River Reservoir (Table 1), and many individuals were impacted by yolk-sac edema (Figures 4, 5, & 6). A total of 10,053 individuals were examined from the selenium-influenced population. Observations of larval viability in the aquaria also revealed the phenomenon of delayed mortality, where certain impacted individuals did not survive beyond defined life stages (e.g. 72-hour larvae afflicted by yolk-sac edema eventually died due to their deformities). Such delayed mortalities, particularly related to yolk-sac edema, were likely a result of congestive heart failure caused by increased fluid in the pericardial region (Figure 5) and/or feeding disruption caused by the ventral extension, or gape, of the mandible (Figure 6).

Figure 4. Multiple edematous bluegill larvae, *Lepomis macrochirus*, of similar age from UMRR.

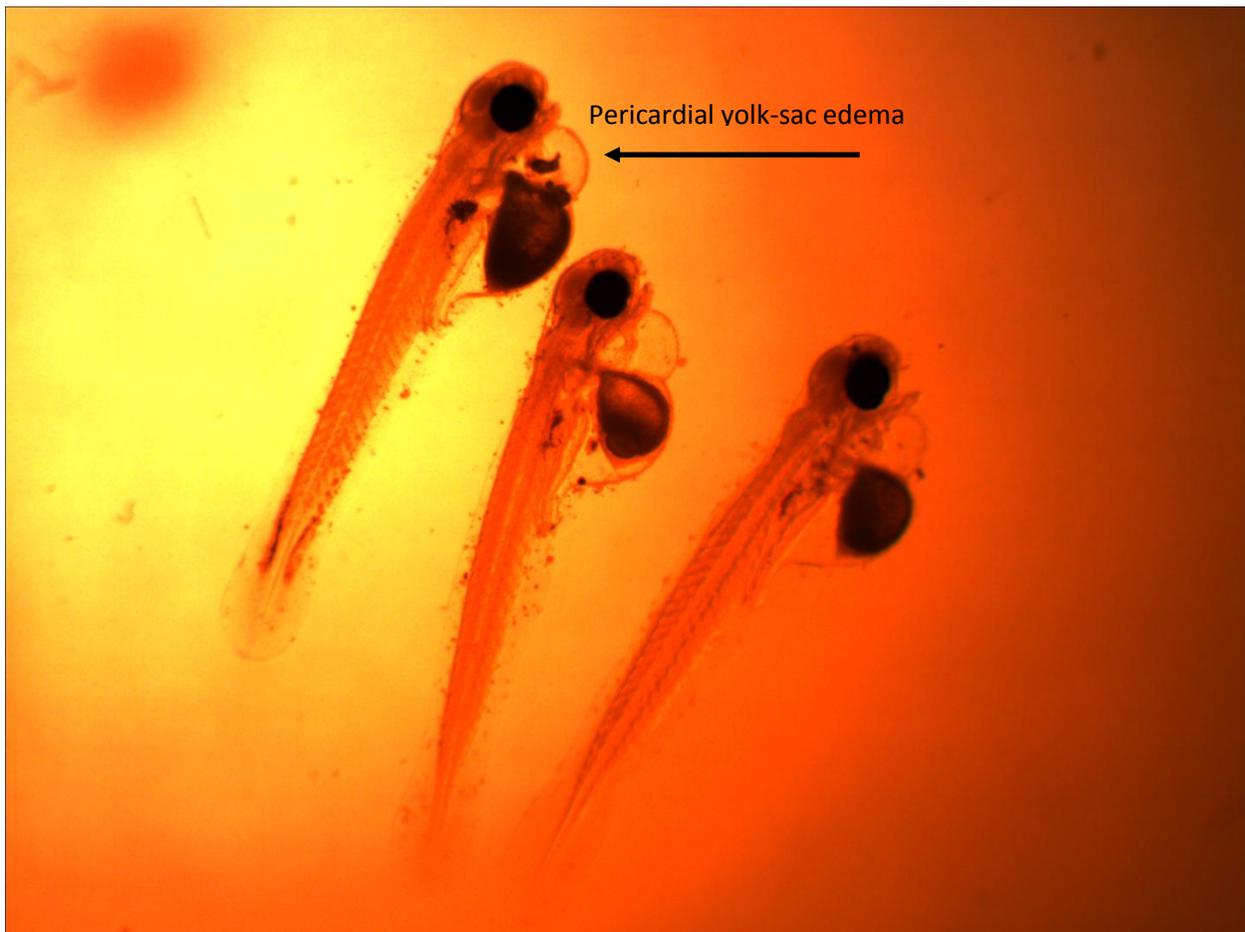


Figure 5 (Left) & Figure 6 (Right). Bluegill larvae with pericardial yolk-sac edema and gaped mandibles.

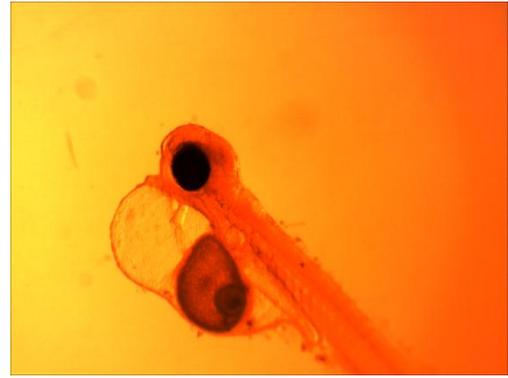
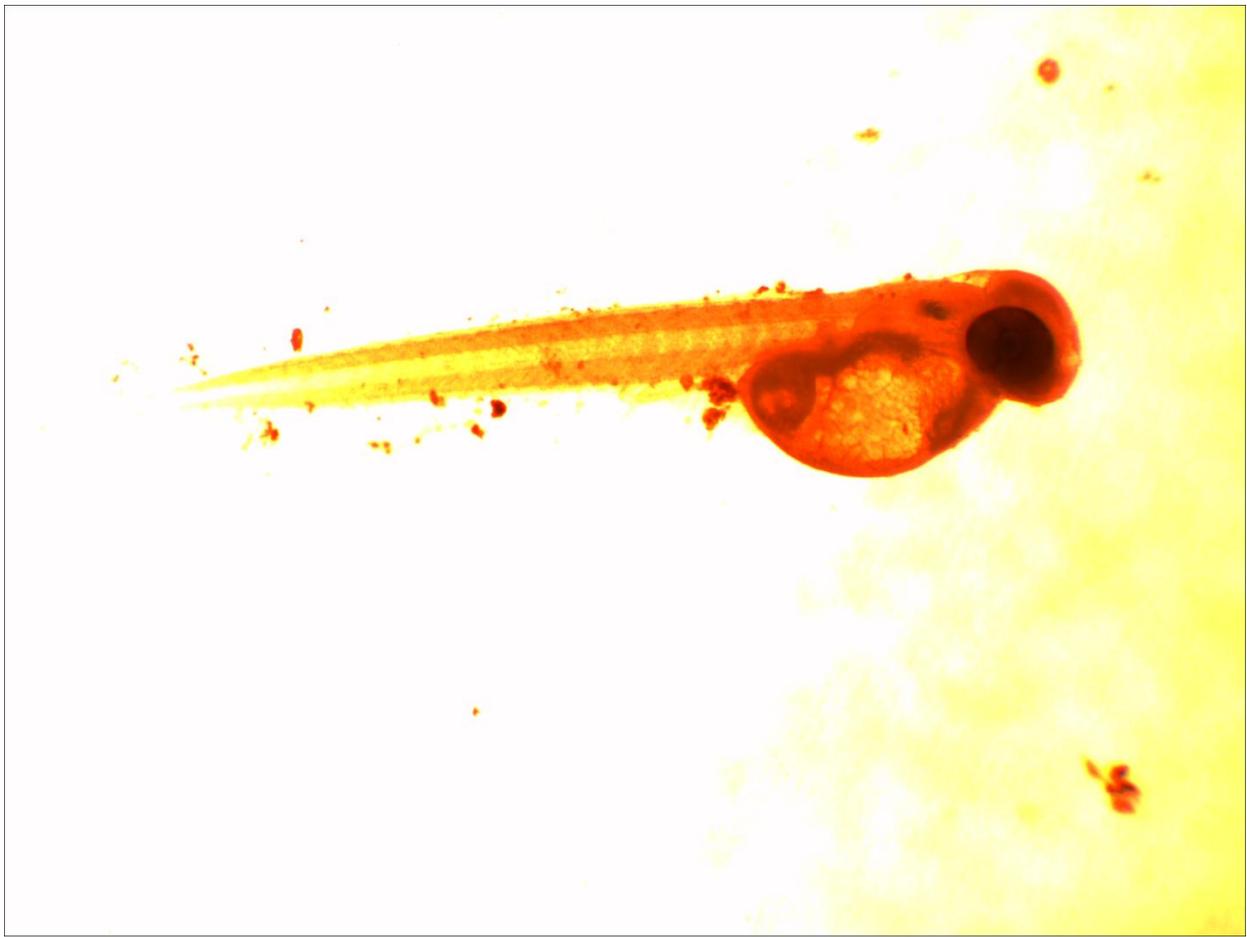


Figure 7. Developmentally typical POL bluegill larva in yolk-sac life stage.



EGG TISSUE SELENIUM CONCENTRATIONS

In comparison to published values (thresholds) associated with elevated larval deformity rates, fish eggs from various species were collected during the 2009 study year and analyzed for selenium concentration (mg/kg dry weight). At stream locations, minnow (family Cyprinidae) and sucker (family Catostomidae) females were collected and stripped of their eggs. Seng Creek, a selenium-enriched stream, contained creek chubs, *Semotilus atromaculatus*, with egg tissue selenium concentrations as high as 23.75 and 21.85 mg/kg dry weight, respectively (Figure 8; Appendix B). In contrast, a creek chub collected from a reference location, Ash Fork, exhibited an egg tissue selenium concentration of 6.5 mg/kg dry weight, and at Mud River, which is also selenium enriched, creek chub eggs had accrued 17.7 mg/kg dry weight selenium. Among the suckers, Davis Creek populations of white suckers, *Catostomus commersoni*, representing a reference location, had accrued egg tissue selenium concentrations of 5.1 and 3.9 mg/kg dry weight, respectively. These egg concentrations were less than those representing selenium-enriched locations (e.g. Mud River) where white suckers exhibited egg tissue selenium concentrations of 14.7 mg/kg dry weight.

The sunfishes (family Centrarchidae) are purported to be among the most sensitive fishes in regard to potential selenium-induced reproductive impacts (USEPA, 2004). Therefore, collection of sunfish eggs for selenium tissue concentration analyses was an important study objective. At impounded reference and selenium-enriched locations, both bluegill sunfish and largemouth bass gravid females were targeted for this purpose. Plum Orchard Lake, the reference location, contained bluegill and largemouth bass females with egg tissue selenium concentrations of <0.8 mg/kg dry weight and 8.7 mg/kg dry weight, respectively. Whereas, sunfish eggs collected from the Upper Mud River Reservoir, a selenium-enriched environ, contained comparatively more selenium: bluegill eggs had 9.8 mg/kg dry weight and largemouth bass eggs had accrued selenium concentrations as high as 64.6 mg/kg dry weight.

ADULT DEFORMITY SEARCH

Searches for developmentally-deformed individuals, which have survived to maturity, were conducted at Plum Orchard Lake and the Upper Mud River Reservoir in October, 2007 and 2008, focusing again on the sunfishes—bluegills and largemouth bass. These searches were initiated after observations of deformed adult fishes were made by WVDEP and USFWS personnel in May, 2007, (Figure 9) and following literature reviews revealing the occurrence of this phenomenon in other selenium-impacted fish populations (Lemly, 1993; Hamilton *et al.*, 2005_b). In 2007, 50% of adult largemouth bass examined in the Upper Mud River Reservoir were considered to have some degree of craniofacial deformity, with approximately 50 individuals evaluated. In 2008, 12% of adult largemouth bass were craniofacially deformed from the Upper Mud River Reservoir population, with 117 individuals evaluated. In contrast, a 2008 survey of the Plum Orchard Lake adult largemouth bass population revealed 0 deformities, with 35 individuals evaluated (Appendix E).

Figure 8. Egg tissue selenium concentrations from fishes collected at study locations.

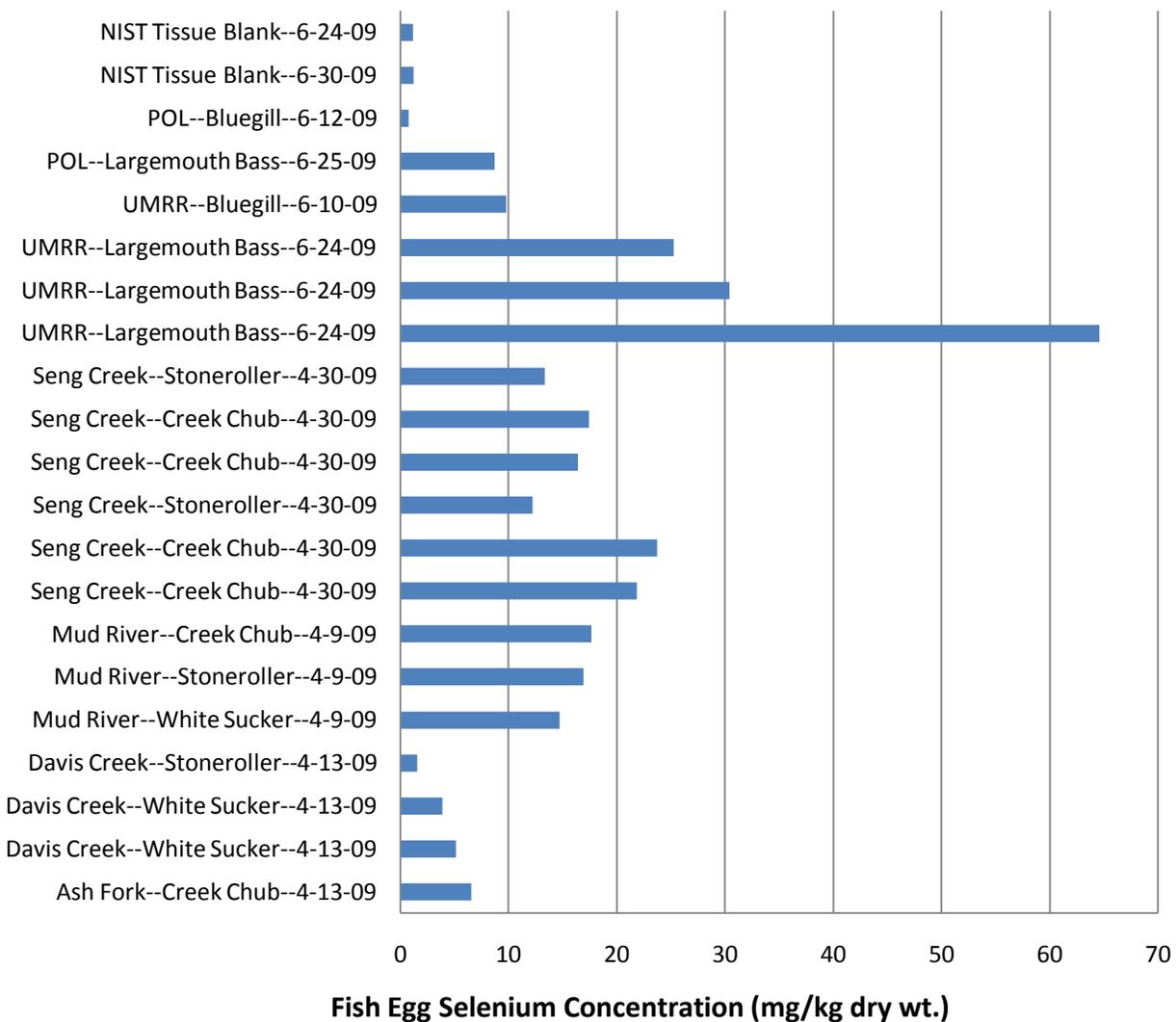


Figure 9. Adult largemouth bass, *Micropterus salmoides*, from UMRR with deformed facial features.



LITERATURE COMPARISONS & IMPLICATIONS

In regard to published studies which have similarly examined selenium-induced deformity rates among developing ichthyoplankton and suggested threshold rates for the sustenance of population health, the available information is concise—20% deformed larvae, above background or reference conditions, compromises the population (Lemly, 1997; USEPA, 2004; Muscatello *et al.*, 2006). In this study, 2009 reference population deformity rates among bluegill larvae collected from Plum Orchard Lake were documented maximally at 1.27%. At the selenium-enriched location, the Upper Mud River Reservoir, maximum bluegill larval deformity rates were also below 20% in 2007 and 2009 sample populations (12.3% and 13.83%, respectively); however, in 2008, deformity rates were nearly 50% of the sampled population. Although this information suggests that the bluegill sunfish ichthyoplankton in the Upper Mud River Reservoir is potentially impacted due to the elevated occurrences of selenium-induced larval deformities documented in this study, more detailed evaluations of larval hatchability and survivability are needed to verify population-level effects.

Unlike the literature regarding selenium-induced larval deformity rates and subsequent fishery health, many published studies provide information regarding egg tissue concentrations of selenium which are predictive of toxicity. Muscatello *et al.* (2006) found that when concentrations of selenium reached 33.55 mg/kg dry weight among the eggs of northern pike, *Esox lucius*, 20% of the developing larvae exhibited deformities above background populations. Lemly (2002) suggests a selenium egg tissue concentration of 10 mg/kg dry weight as a threshold, above which selenium egg concentrations are predictive of a rapid increase in teratogenic deformities among developing larvae. Additionally, increased selenium egg tissue concentrations were correlated to an increase in deformities among razorback suckers, *Xyrauchen texanus*, as well as were indicative of smaller egg diameters and hatchability (Hamilton *et al.*, 2005_a). In comparison, most of the selenium egg tissue concentrations of the fishes examined in this study were less than 30 mg/kg dry weight; however, all except one sample of fish eggs collected from selenium enriched locations exceeded 10 mg/kg dry weight (Figure 8; Appendix B). Of particular interest was selenium concentrations in the eggs of fishes collected from fluvial environs, to which fewer comparable published studies exist, and the amount of selenium accrual by the eggs of largemouth bass inhabiting the Upper Mud River Reservoir. In regard to the latter, a single female containing eggs with a selenium concentration of 64.62 mg/kg dry weight was documented; this value is considerably high in comparison to selenium egg concentrations of other fishes described in the literature (Gillespie & Baumann, 1986; Holm *et al.*, 2005).

Since some developmental deformities among ichthyoplankton may persist into more mature fishes, particularly in regard to less severe anomalies, extensive population surveys of fishes residing in waters experiencing larval teratogenesis were necessary to determine the extent of surviving deformed adults. In general, craniofacial deformities, particularly those related to the lower jaw (mandibular) malformations, are among the most common anomalies observed in pollutant-impacted fish populations (Rolland, 2000; Al-Harbi, 2001; Strmac *et al.*, 2002; Nagano *et al.*, 2007). Such anomalous adult fishes have been observed in this study (Figure 9) among individuals collected at selenium-enriched locations (e.g. the Upper Mud River Reservoir). Although there are no clear thresholds suggested in the literature regarding percentages of impacted populations that are predictive of impending deleterious conditions, a few published studies have documented population collapses of fish

communities when observed anomalous adults have exceeded 20-50% of the sampled individuals (Lemly, 1997; Hamilton, 2005_b). Therefore, according to these guidelines, the number (percentage) of deformed adults observed among largemouth bass populations at the Upper Mud River Reservoir is within the range considered to be impacted by selenium toxicity.

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Appendix A
Water Quality

STREAM_NAME	ANCODE	MILE	DATE	ANALYTE	Q	Se (ppm)
Davis Creek	WVK-39	2.6	05-Sep-02	Se Total	<	0.005
Davis Creek	WVK-39	3.3	20-Sep-07	Se Total	<	0.001
Davis Creek	WVK-39	13.7	04-Jun-02	Se Total	<	0.005
Plum Orchard Lake	WVK-65-Z-(L1)		23-Jul-07	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		29-May-08	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	25-Apr-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	25-Apr-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	25-Apr-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	24-May-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	24-May-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	24-May-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	22-Jun-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	22-Jun-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	22-Jun-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	15-Aug-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	15-Aug-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	27-Sep-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	27-Sep-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	27-Sep-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	11-Dec-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	11-Dec-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	11-Dec-06	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	09-May-07	Se Total	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)	0.04	29-Oct-08	Se Total	<	0.001
Seng Creek	WVKC-42	0	16-Jul-02	Se Total		0.007
Seng Creek	WVKC-42	0	16-Jul-02	Se Total		0.008
Seng Creek	WVKC-42	0	05-Sep-02	Se Total		0.006
Seng Creek	WVKC-42	0	05-Sep-02	Se Total		0.006
Seng Creek	WVKC-42	0	16-Oct-02	Se Total	<	0.005
Seng Creek	WVKC-42	0	29-Oct-02	Se Total	<	0.005
Seng Creek	WVKC-42	0	14-Nov-02	Se Total		0.006
Seng Creek	WVKC-42	0	14-Nov-02	Se Total		0.006
Seng Creek	WVKC-42	0	09-Dec-02	Se Total		0.009
Seng Creek	WVKC-42	0	28-Jan-03	Se Total		0.009
Seng Creek	WVKC-42	0	24-Feb-03	Se Total	<	0.005
Seng Creek	WVKC-42	0	20-Mar-03	Se Total		0.009
Seng Creek	WVKC-42	0	14-Apr-03	Se Total	<	0.005
Seng Creek	WVKC-42	0	14-May-03	Se Total		0.006
Seng Creek	WVKC-42	2.5	15-Nov-05	Se Total		0.04
Seng Creek	WVKC-42	2.5	13-Dec-05	Se Total		0.042
Seng Creek	WVKC-42	2.5	04-Jan-06	Se Total		0.023
Seng Creek	WVKC-42	2.5	08-Feb-06	Se Total		0.031
Seng Creek	WVKC-42	2.5	13-Mar-06	Se Total		0.026

STREAM_NAME	ANCODE	MILE	DATE	ANALYTE	Q	Se (ppm)
Seng Creek	WVKC-42	2.5	13-Apr-06	Se Total		0.015
Seng Creek	WVKC-42	2.5	13-Apr-06	Se Total		0.015
Seng Creek	WVKC-42	2.5	02-May-06	Se Total		0.023
Seng Creek	WVKC-42	2.5	13-Jun-06	Se Total		0.025
Seng Creek	WVKC-42	2.5	12-Jul-06	Se Total		0.041
Seng Creek	WVKC-42	2.5	24-Aug-06	Se Total		0.03
Seng Creek	WVKC-42	2.5	17-Oct-06	Se Total		0.023
Seng Creek	WVKC-42	2.5	19-Apr-07	Se Total		0.024
Seng Creek	WVKC-42	3.9	16-Jul-02	Se Total		0.018
Seng Creek	WVKC-42	3.9	05-Sep-02	Se Total		0.0089
Seng Creek	WVKC-42	3.9	16-Oct-02	Se Total		0.008
Seng Creek	WVKC-42	3.9	29-Oct-02	Se Total		0.01
Seng Creek	WVKC-42	3.9	14-Nov-02	Se Total		0.012
Seng Creek	WVKC-42	3.9	09-Dec-02	Se Total		0.014
Seng Creek	WVKC-42	3.9	28-Jan-03	Se Total		0.01
Seng Creek	WVKC-42	3.9	24-Feb-03	Se Total		0.009
Seng Creek	WVKC-42	3.9	20-Mar-03	Se Total		0.045
Seng Creek	WVKC-42	3.9	14-Apr-03	Se Total		0.03
Seng Creek	WVKC-42	3.9	14-May-03	Se Total		0.009
Ash Fork	WVKG-5-H	0.1	09-Nov-05	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.1	19-Dec-05	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.1	04-Jan-06	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.1	09-Feb-06	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.1	13-Mar-06	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.1	13-Mar-06	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.1	03-Apr-06	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.1	02-May-06	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.1	12-Jun-06	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.1	11-Jul-06	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.1	21-Aug-06	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.1	05-Oct-06	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.1	05-Oct-06	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.1	16-Oct-06	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.25	04-Jan-06	Se Total	<	0.001
Ash Fork	WVKG-5-H	0.3	05-Jun-08	Se Total	<	0.001
Mud River	WVOGM	2.5	24-Sep-08	Se Total	<	0.001
Mud River	WVOGM	25.4	22-Sep-08	Se Total	<	0.001
Mud River	WVOGM	52.8	18-Sep-08	Se Total		0.003
Mud River	WVOGM	52.8	18-Sep-08	Se Total		0.004
Mud River	WVOGM	57.4	17-Sep-08	Se Total		0.004
Mud River	WVOGM	61.7	18-Sep-08	Se Total		0.006
Mud River	WVOGM	61.7	10-Nov-08	Se Total		0.004
Mud River	WVOGM	67.4	21-Dec-06	Se Total		0.008
Mud River	WVOGM	74.1	05-Mar-09	Se Total		0.0096
Mud River	WVOGM	74.1	07-Apr-09	Se Total		0.0071
Mud River	WVOGM	74.1	12-May-09	Se Total		0.0121

STREAM_NAME	ANCODE	MILE	DATE	ANALYTE	Q	Se (ppm)
Mud River	WVOGM	74.1	22-Jun-09	Se Total		0.0216
Mud River	WVOGM	74.3	21-Dec-06	Se Total		0.01
Mud River	WVOGM	75.6	30-Nov-05	Se Total		0.0084
Mud River	WVOGM	75.6	13-Dec-05	Se Total		0.007
Mud River	WVOGM	75.6	05-Jan-06	Se Total		0.005
Mud River	WVOGM	75.6	05-Jan-06	Se Total		0.005
Mud River	WVOGM	75.6	08-Feb-06	Se Total		0.0087
Mud River	WVOGM	75.6	15-Mar-06	Se Total		0.004
Mud River	WVOGM	75.6	05-Apr-06	Se Total		0.005
Mud River	WVOGM	75.6	03-May-06	Se Total		0.007
Mud River	WVOGM	75.6	13-Jun-06	Se Total		0.005
Mud River	WVOGM	75.6	21-Aug-06	Se Total		0.008
Mud River	WVOGM	75.6	20-Sep-06	Se Total		0.014
Mud River	WVOGM	75.6	03-Nov-06	Se Total		0.008
Mud River	WVOGM	75.6	06-Jun-07	Se Total		0.022
Mud River	WVOGM	75.6	10-Nov-08	Se Total		0.015
Mud River	WVOGM	77.1	27-Jul-05	Se Total		0.007
Mud River	WVOGM	77.1	16-Sep-08	Se Total		0.009
Upper Mud River Reservoir	WVOGM-(L1)		16-May-07	Se Total		0.003
Upper Mud River Reservoir	WVOGM-(L1)		24-Jul-07	Se Total		0.005
Upper Mud River Reservoir	WVOGM-(L1)		25-Jul-07	Se Total		0.003
Upper Mud River Reservoir	WVOGM-(L1)		04-Oct-07	Se Total		0.005
Upper Mud River Reservoir	WVOGM-(L1)		04-Oct-07	Se Total		0.005
Upper Mud River Reservoir	WVOGM-(L1)		19-Mar-08	Se Total		0.004
Upper Mud River Reservoir	WVOGM-(L1)		20-Mar-08	Se Total	<	0.001
Upper Mud River Reservoir	WVOGM-(L1)		05-Nov-08	Se Total		0.005
Upper Mud River Reservoir	WVOGM-(L1)	0.05	04-Oct-07	Se Total		0.005
Upper Mud River Reservoir	WVOGM-(L1)	1.4	03-Nov-05	Se Total		0.006
Upper Mud River Reservoir	WVOGM-(L1)	1.4	12-Jan-06	Se Total		0.002
Upper Mud River Reservoir	WVOGM-(L1)	1.4	12-Jan-06	Se Total		0.004
Upper Mud River Reservoir	WVOGM-(L1)	1.4	12-Jan-06	Se Total		0.004
Upper Mud River Reservoir	WVOGM-(L1)	1.4	12-Jan-06	Se Total		0.005
Upper Mud River Reservoir	WVOGM-(L1)	1.4	12-Jan-06	Se Total		0.004
Upper Mud River Reservoir	WVOGM-(L1)	1.4	12-Jan-06	Se Total		0.003
Upper Mud River Reservoir	WVOGM-(L1)	1.4	27-Feb-06	Se Total		0.003
Upper Mud River Reservoir	WVOGM-(L1)	1.4	27-Feb-06	Se Total		0.005
Upper Mud River Reservoir	WVOGM-(L1)	1.4	27-Feb-06	Se Total		0.003
Upper Mud River Reservoir	WVOGM-(L1)	1.4	04-Apr-06	Se Total		0.0036
Upper Mud River Reservoir	WVOGM-(L1)	1.4	04-Apr-06	Se Total		0.003
Upper Mud River Reservoir	WVOGM-(L1)	1.4	04-Apr-06	Se Total		0.002
Upper Mud River Reservoir	WVOGM-(L1)	1.4	17-Apr-06	Se Total		0.002
Upper Mud River Reservoir	WVOGM-(L1)	1.4	17-Apr-06	Se Total		0.001
Upper Mud River Reservoir	WVOGM-(L1)	1.4	17-Apr-06	Se Total		0.002
Upper Mud River Reservoir	WVOGM-(L1)	1.4	24-May-06	Se Total		0.002
Upper Mud River Reservoir	WVOGM-(L1)	1.4	24-May-06	Se Total		0.001
Upper Mud River Reservoir	WVOGM-(L1)	1.4	24-May-06	Se Total		0.004

STREAM_NAME	ANCODE	MILE	DATE	ANALYTE	Q	Se (ppm)
Upper Mud River Reservoir	WVOGM-(L1)	1.4	22-Jun-06	Se Total		0.003
Upper Mud River Reservoir	WVOGM-(L1)	1.4	22-Jun-06	Se Total		0.004
Upper Mud River Reservoir	WVOGM-(L1)	1.4	22-Jun-06	Se Total		0.002
Upper Mud River Reservoir	WVOGM-(L1)	1.4	17-Aug-06	Se Total		0.002
Upper Mud River Reservoir	WVOGM-(L1)	1.4	17-Aug-06	Se Total		0.006
Upper Mud River Reservoir	WVOGM-(L1)	1.4	27-Sep-06	Se Total		0.005
Upper Mud River Reservoir	WVOGM-(L1)	1.4	27-Sep-06	Se Total		0.005
Upper Mud River Reservoir	WVOGM-(L1)	1.4	27-Sep-06	Se Total		0.004
Upper Mud River Reservoir	WVOGM-(L1)	1.4	28-Nov-06	Se Total		0.004
Upper Mud River Reservoir	WVOGM-(L1)	1.4	28-Nov-06	Se Total		0.002
Upper Mud River Reservoir	WVOGM-(L1)	1.4	28-Nov-06	Se Total		0.004
Upper Mud River Reservoir	WVOGM-(L1)	1.4	21-Dec-06	Se Total		0.004
Upper Mud River Reservoir	WVOGM-(L1)	1.4	11-May-07	Se Total		0.007
Upper Mud River Reservoir	WVOGM-(L1)	1.4	11-May-07	Se Total		0.006
Upper Mud River Reservoir	WVOGM-(L1)	1.4	30-May-08	Se Total		0.003
Upper Mud River Reservoir	WVOGM-(L1)	4.19	04-Oct-07	Se Total		0.005

Appendix B
Fish Egg Selenium Concentrations

Stream Name	Mile	Date	Species	Portion	Q	Se (ppm dry wt.)
Ash Fork	0.4	13-Apr-09	Creek Chub	Fish Eggs		6.549
Davis Creek	10.6	13-Apr-09	White Sucker	Fish Eggs		5.13
Davis Creek	10.6	13-Apr-09	White Sucker	Fish Eggs		3.92
Davis Creek	10.6	13-Apr-09	Stoneroller	Fish Eggs		1.56
Mud River	74.6	09-Apr-09	White Sucker	Eggs-Composite		14.735
Mud River	74.6	09-Apr-09	Stoneroller	Eggs-Composite		16.923
Mud River	74.6	09-Apr-09	Creek Chub	Eggs-Composite		17.674
Seng Creek	3.6	30-Apr-09	Creek Chub	Fish Eggs		21.851
Seng Creek	3.6	30-Apr-09	Creek Chub	Fish Eggs		23.75
Seng Creek	3.6	30-Apr-09	Stoneroller	Eggs-Composite		12.269
Seng Creek	3.6	30-Apr-09	Creek Chub	Fish Eggs		16.416
Seng Creek	3.6	30-Apr-09	Creek Chub	Fish Eggs		17.478
Seng Creek	3.6	30-Apr-09	Stoneroller	Eggs-Composite		13.4
Upper Mud River Reservoir		24-Jun-09	Largemouth Bass	Fish Eggs		64.615
Upper Mud River Reservoir		29-Jun-09	Largemouth Bass	Fish Eggs		30.462
Upper Mud River Reservoir		29-Jun-09	Largemouth Bass	Fish Eggs		25.261
Upper Mud River Reservoir		10-Jun-09	Bluegill	Fish Eggs		9.783
Plum Orchard Lake		25-Jun-09	Largemouth Bass	Fish Eggs		8.722
Plum Orchard Lake		12-Jun-09	Bluegill	Fish Eggs	<	0.8
None-Standard Reference Material		30-Jun-09	NIST-1947 Lake Michigan Fish Tissue	Tissue Blank		1.25
None-Standard Reference Material		24-Jun-09	NIST-1947 Lake Michigan Fish Tissue	Tissue Blank		1.199

Appendix C
Larval Fish Evaluations

Sample Location	Aquarium	Date	Vial	# larvae	% deformed
UMRR	6	6/9/2008	10	46	54
UMRR	cooler	6/9/2008	11	585	19
UMRR	4	6/9/2008	13	102	6
UMRR	5	6/9/2008	14	40	15
UMRR	4	6/12/2008	19	158	4
UMRR	6A	6/4/2008	21	180	3
UMRR	4B	6/4/2008	24	158	19
UMRR	6B	6/4/2008	25	151	6
UMRR	cooler	6/12/2008	17	150	not examined
UMRR	6	6/7/2008	31	698	not examined
UMRR	5	6/7/2008	33	216	not examined
UMRR	cooler	6/7/2008	34	147	not examined

Dr. Diana Papoulias' 2008 bluegill evaluations

Larvae Origin	Date Preserved	Evaluation Date	Species Identified	# Specimens Evaluated	Specimen Quality ^b	Developmental Stage (≈age) ^c	# Anomalous Spinal/Skeletal Features	# Anomalous Craniofacial Features	# Anomalous Fins	# Anomalous Yolk Sac Sorption	# All Other Anomalies
Left Fork/UMRR	6/11/07	08/09/07	<i>Lepomis macrochirus</i>	25	N/A	12 days post-hatch	25	0	22	3	0
Right Fork/UMRR	6/11/07	08/09/07	<i>Lepomis macrochirus</i>	67	N/A	12 days post-hatch	65	2	64	3	1
Right Fork/UMRR	6/8/07	08/09/07	<i>Lepomis macrochirus</i>	116	N/A	9 days post-hatch	115	1	116	0	0
Left Fork/UMRR	6/8/07	08/09/07	<i>Lepomis macrochirus</i>	6	N/A	9 days post-hatch	6	0	6	0	0
Right Fork/UMRR	6/8/07	08/09/07	<i>Lepomis macrochirus</i>	41	N/A	9 days post-hatch	24	17	41	0	0
Right Fork/UMRR	6/4/07	08/09/07	<i>Lepomis macrochirus</i>	97	N/A	5 days post-hatch	92	5	94	3	0
Right Fork/UMRR	6/1/07	08/09/07	<i>Lepomis macrochirus</i>	193	N/A	3 days post-hatch	186	7	186	7	7
Right Fork/UMRR	6/11/07	08/09/07	<i>Lepomis macrochirus</i>	24	N/A	12 days post-hatch	23	1	23	1	1
Right Fork/UMRR	5/31/07	08/09/07	<i>Lepomis macrochirus</i>	274	N/A	1 day post-hatch	—	—	—	—	—
UMRR	6/7/08	7/23/08	<i>Lepomis macrochirus</i>	12	#1=11 #3=1	~ 72 hour YSL	0	0	0	0	0
UMRR	6/7/08	7/23/08	<i>Lepomis macrochirus</i>	80	#3	~48 hour YSL	0	0	0	0	0
UMRR	6/7/08	7/23/08	<i>Lepomis macrochirus</i>	133	#1* (#2)	~72 hour YSL	0	0	0	0	0
UMRR	6/7/08	7/23/08	<i>Lepomis macrochirus</i>	3	1	~72 hour YSL	2*	0	0	1^	0
UMRR	6/7/08	7/24/08	<i>Lepomis macrochirus</i>	231	Mostly 1/some 2*	variable ~72 hour YSL	0	0	0	0	0

Larvae Origin	Date Preserved	Evaluation Date	Species Identified	# Specimens Evaluated	Specimen Quality ^b	Developmental Stage (≈age) ^c	# Anomalous Spinal/Skeletal Features	# Anomalous Craniofacial Features	# Anomalous Fins	# Anomalous Yolk Sac Sorption	# All Other Anomalies
UMRR	6/7/08	7/24/08	<i>Lepomis macrochirus</i>	393	2	~72 hour YSL Some 24 hour larvae	0	0	0	0	0
UMRR	6/7/08	7/24/08	<i>Lepomis macrochirus</i>	57	3 & 4 (~10)	~24 hour YSL, variable	0	0	0	0	0
UMRR	6/7/08	7/24/08	<i>Lepomis macrochirus</i>	15	1	~72 hour YSL	13 ^A	0	0	2 ^B	1 ^C
UMRR	6/7/08	7/28/08	<i>Lepomis macrochirus</i>	21	1	72 hour YSL	0	0	0	0	0
UMRR	6/4/08	8/4/08	<i>Lepomis macrochirus</i>	56	1	Tail-bud stage (in egg capsule)	0	0	0	0	0
UMRR	6/4/08	8/4/08	<i>Lepomis macrochirus</i>	78	1	Tail-free stage (out of capsule)	0	0	0	0	0
UMRR	6/4/08	8/4/08	<i>Lepomis macrochirus</i>	13	3	Early Embryo with decay	0	0	0	0	0
UMRR	6/4/08	8/6/08	<i>Lepomis macrochirus</i>	180	1	Tail-free stage (out of capsule)	0	0	0	0	0
UMRR	6/4/08	8/6/08	<i>Lepomis macrochirus</i>	38	Mostly 1 & 2 some 3	Tail-free, ~10 hour post hatch	0	0	0	0	0
UMRR	6/4/08	8/6/08	<i>Lepomis macrochirus</i>	151	1	Tail-free, ~10 hour post hatch	0	0	0	0	0

Larvae Origin	Date Preserved	Evaluation Date	Species Identified	# Specimens Evaluated	Specimen Quality ^b	Developmental Stage (\approx age) ^c	# Anomalous Spinal/Skeletal Features	# Anomalous Craniofacial Features	# Anomalous Fins	# Anomalous Yolk Sac Sorption	# All Other Anomalies
UMRR	6/4/08	8/6/08	<i>Lepomis macrochirus</i>	158	1	Tail-free, ~10 hour post hatch	0	0	0	0	0
UMRR	6/4/08	8/6/08	<i>Lepomis macrochirus</i>	41	1	Tail-free, ~10 hour post hatch	0	0	0	0	0
UMRR	6/4/08	8/6/08	<i>Lepomis macrochirus</i>	27	1	Tail-free, ~10 hour post hatch	0	0	0	0	0
UMRR	6/4/08	8/4/08	<i>Lepomis macrochirus</i>	51	1	Tail-free, ~10 hour post hatch	0	0	0	0	0
UMRR	6/4/08	8/4/08	<i>Lepomis macrochirus</i>	15	1	Tail-free, ~10 hour post hatch	0	0	0	0	0
UMRR	6/9/08	8/4/08	<i>Lepomis macrochirus</i>	5	1	<96 hour, YSL	0	5	0	0	0
UMRR	6/9/08	8/4/08	<i>Lepomis macrochirus</i>	3	1,3	1<96 hour, YSL 1>24 hour, YSL 1<24 hour, YSL	0	1 ^A	0	0	0
UMRR	6/9/08	8/4/08	<i>Lepomis macrochirus</i>	3	1	48 hour, YSL	0	1 ^A	0	1 ^B	0
UMRR	6/9/08	8/4/08	<i>Lepomis macrochirus</i>	8	1	>72 hour, YSL	1 ^A	0	0	6 ^B	1 ^C

Larvae Origin	Date Preserved	Evaluation Date	Species Identified	# Specimens Evaluated	Specimen Quality ^b	Developmental Stage (\approx age) ^c	# Anomalous Spinal/Skeletal Features	# Anomalous Craniofacial Features	# Anomalous Fins	# Anomalous Yolk Sac Sorption	# All Other Anomalies
UMRR	6/9/08	8/4/08	<i>Lepomis macrochirus</i>	24	3	<72 hour, YSL	0	0	0	0	0
UMRR	6/9/08	8/4/08	<i>Lepomis macrochirus</i>	70	1	>72 hour, YSL	0	0	0	0	0
UMRR	6/9/08	7/29/08	<i>Lepomis macrochirus</i>	52	1	>72 hour, YSL	0	0	0	0	0
UMRR	6/9/08	7/29/08	<i>Lepomis macrochirus</i>	16	3	72 hour, YSL	0	0	0	0	0
UMRR	6/9/08	7/29/08	<i>Lepomis macrochirus</i>	1	1*	72 hour, YSL	1	0	0	0	0
UMRR	6/9/08	7/29/08	<i>Lepomis macrochirus</i>	3	1	>72 hour, YSL	0	0	0	0	0
UMRR	6/9/08	7/29/08	<i>Lepomis macrochirus</i>	563	3*	>72 hour, YSL	0	0	0	0	0
UMRR	6/9/08	7/29/08	<i>Lepomis macrochirus</i>	79	3	72 hour, YSL	0	0	0	0	0
UMRR	6/9/08	7/29/08	<i>Lepomis macrochirus</i>	5	1 & 3*	72 hour, YSL	4 ^A	0	0	2 ^B	2 ^C
UMRR	6/9/08	8/14/08	<i>Lepomis macrochirus</i>	32	1	<96 hour larvae	0	0	0	0	0
UMRR	6/9/08	8/14/08	<i>Lepomis macrochirus</i>	3	3	72 hour larvae	0	0	0	0	0
UMRR	6/7/08	7/28/08	<i>Lepomis macrochirus</i>	147	1-98% 2-2%	~72 hour larvae	5 ^A	0	0	0	0
UMRR	6/7/08	7/28/08	<i>Lepomis macrochirus</i>	12	1	~72 hour*, YSL	0	0	0	0	0
UMRR	6/7/08	7/28/08	<i>Lepomis macrochirus</i>	58	1	~20% 72 hour YSL ~80% < 72 hour YSL	0	0	0	0	0

Larvae Origin	Date Preserved	Evaluation Date	Species Identified	# Specimens Evaluated	Specimen Quality ^b	Developmental Stage (≈age) ^c	# Anomalous Spinal/Skeletal Features	# Anomalous Craniofacial Features	# Anomalous Fins	# Anomalous Yolk Sac Sorption	# All Other Anomalies
UMRR	6/7/08	7/28/08	<i>Lepomis macrochirus</i>	96	1	72 hour, YSL	0	0	0	0	0
UMRR	6/7/08	7/28/08	<i>Lepomis macrochirus</i>	121	3	<72 hour, YSL	0	0	0	0	0
UMRR	6/7/08	7/28/08	<i>Lepomis macrochirus</i>	18	1 and 2	72 hour YSL	0	0	0	0	0
UMRR	6/7/08	7/28/08	<i>Lepomis macrochirus</i>	2	3	72 hour YSL	0	0	0	0	0
UMRR	6/5/08	8/12/08	<i>Lepomis macrochirus</i>	52	3	>24 hour YSL	0	0	0	0	0
UMRR	6/5/08	8/12/08	No larvae observed	0	0	0	0	0	0	0	0
UMRR	6/5/08	8/12/08	<i>Lepomis macrochirus</i>	13	3	~10 hour, YSL	0	0	0	0	0
UMRR	6/5/08	8/12/08	No larvae observed	0	0	0	0	0	0	0	0
UMRR	6/5/08	8/12/08	<i>Lepomis macrochirus</i>	49	3	>24 hour YSL	0	0	0	0	0
UMRR	6/5/08	8/12/08	<i>Lepomis macrochirus</i>	138	3 and 4	<24 hour, YSL	0	0	0	0	0
UMRR	6/5/08	8/12/08	<i>Lepomis macrochirus</i>	5	3	<24 hour, YSL	0	0	0	0	0
UMRR	6/5/08	8/12/08	<i>Lepomis macrochirus</i>	227	3	~24 hour YSL,	0	0	0	0	0
UMRR	6/5/08	8/12/08	<i>Lepomis macrochirus</i>	105	3	~24 hour YSL,	0	0	0	0	0
UMRR	6/19/08	12/8/08	<i>Lepomis macrochirus</i>	22	3	+120 hour	3 ^A	2	0	0	0

Larvae Origin	Date Preserved	Evaluation Date	Species Identified	# Specimens Evaluated	Specimen Quality ^b	Developmental Stage (\approx age) ^c	# Anomalous Spinal/Skeletal Features	# Anomalous Craniofacial Features	# Anomalous Fins	# Anomalous Yolk Sac Sorption	# All Other Anomalies
UMRR	6/19/08	12/8/08	<i>Lepomis macrochirus</i>	88	3	+96 hour	0	0	0	0	0
UMRR	6/19/08	12/8/08	<i>Lepomis macrochirus</i>	62	3	+96 hour	62	0	0	0	0
UMRR	6/19/08	12/11/08	<i>Lepomis macrochirus</i>	17	3	+96 hour	0	0	0	0	0
UMRR	6/19/08	12/11/08	<i>Lepomis macrochirus</i>	36	3	+96 hour	36 ^A	0	0	1	0
UMRR	6/19/08	12/11/08	<i>Lepomis macrochirus</i>	82	3	+96 hour	82	0	0	0	0
UMRR	6/19/08	12/11/08	<i>Lepomis macrochirus</i>	76	3	+96 hour	0	0	0	0	0
UMRR	6/19/08	12/12/08	<i>Lepomis macrochirus</i>	24	3	+96 hour	0	0	0	0	0
UMRR	6/19/08	12/12/08	<i>Lepomis macrochirus</i>	4	3	+96 hour	4	0	0	0	0
UMRR	6/13/09	7/20/09	<i>Lepomis macrochirus</i>	583	1	24hr	0	0	0	0*	0
UMRR	6/13/09	7/20/09	<i>Lepomis macrochirus</i>	4	3	24hr	0	0	0	0*	0
UMRR	6/13/09	7/20/09	<i>Lepomis macrochirus</i>	1	1	\approx 12hr	0	0	0	0*	1
UMRR	6/13/09	7/20/09	<i>Lepomis macrochirus</i>	1	1	24hr	0	0	0	1	0
UMRR	6/13/09	7/22/09	<i>Lepomis macrochirus</i>	262	1	24hr tail-free	0	0	0	0	0
UMRR	6/13/09	7/22/09	<i>Lepomis macrochirus</i>	225	1*	\approx 18hr	0	0	0	0	0
UMRR	6/13/09	7/22/09	<i>Lepomis macrochirus</i>	3	2	\approx 12hr	0	0	0	0	0
UMRR	6/13/09	7/22/09	<i>Lepomis macrochirus</i>	377	1	\approx 18hr	0	0	0	0	0

Larvae Origin	Date Preserved	Evaluation Date	Species Identified	# Specimens Evaluated	Specimen Quality ^b	Developmental Stage (\approx age) ^c	# Anomalous Spinal/Skeletal Features	# Anomalous Craniofacial Features	# Anomalous Fins	# Anomalous Yolk Sac Sorption	# All Other Anomalies
UMRR	6/16/09	7/23/09	<i>Lepomis macrochirus</i>	543	1	\approx 48hr	0	0	0	0	0
UMRR	6/16/09	7/23/09	<i>Lepomis macrochirus</i>	65	1	\approx 48hr	0	0	0	65	0
UMRR	6/16/09	7/23/09	<i>Lepomis macrochirus</i>	1	3	\approx 30hr	0	0	0	0	0
UMRR	6/16/09	8/27/09	<i>Lepomis macrochirus</i>	150	1	\approx 48hr	0	0	0	22	0
UMRR	6/16/09	8/27/09	<i>Lepomis macrochirus</i>	417	1	\approx 48hr	0	0	0	0	0
UMRR	6/16/09	9/8/09	<i>Lepomis macrochirus</i>	4	1	\approx 48hr	0	0	0	0	4
UMRR	6/16/09	9/10/09	<i>Lepomis macrochirus</i>	314	1	\approx 48hr	0	0	0	210	2*
UMRR	6/16/09	9/10/09	<i>Lepomis macrochirus</i>	697	1	\approx 48hr	0	0	0	0	0
POL	6/16/09	9/10/09	<i>Lepomis macrochirus</i>	146	1	\approx 24hr	0	0	0	0	0
POL	6/16/09	9/10/09	<i>Lepomis macrochirus</i>	1	1	\approx 24hr	0	0	0	1	0
POL	6/16/09	9/10/09	<i>Lepomis macrochirus</i>	2	2	\approx 24hr	0	0	0	0	0
POL	6/16/09	9/10/09	<i>Lepomis macrochirus</i>	94	2	\approx 24hr	0	0	0	0	0
POL	6/16/09	9/10/09	<i>Lepomis macrochirus</i>	1	1	\approx 24hr	1	0	0	0	0
POL	6/16/09	9/10/09	<i>Lepomis macrochirus</i>	2	2	\approx 24hr	0	0	0	0	0
POL	6/16/09	9/11/09	<i>Lepomis macrochirus</i>	182	1	\approx 24hr	0	0	0	0	0

Larvae Origin	Date Preserved	Evaluation Date	Species Identified	# Specimens Evaluated	Specimen Quality ^b	Developmental Stage (\approx age) ^c	# Anomalous Spinal/Skeletal Features	# Anomalous Craniofacial Features	# Anomalous Fins	# Anomalous Yolk Sac Sorption	# All Other Anomalies
POL	6/18/09	9/11/09	<i>Lepomis macrochirus</i>	86	1	\approx 48hr	0	0	0	0	0
POL	6/18/09	9/14/09	<i>Lepomis macrochirus</i>	26	1	\approx 48hr	0	0	0	0	0
POL	6/18/09	9/14/09	<i>Lepomis macrochirus</i>	1	2	\approx 48hr	0	0	0	0	0
POL	6/18/09	9/15/09	<i>Lepomis macrochirus</i>	41	1	\approx 48hr	0	0	0	0	0
POL	6/18/09	9/15/09	<i>Lepomis macrochirus</i>	3	2	\approx 48hr	0	0	0	0	0
POL	6/20/09	9/15/09	<i>Lepomis macrochirus</i>	4	1	\approx 72hr	0	0	0	0	0
POL	6/20/09	9/15/09	<i>Lepomis macrochirus</i>	1	1	\approx 72hr	0	1	0	0	0
POL	6/20/09	9/15/09	<i>Lepomis macrochirus</i>	15	1	\approx 72hr	0	0	0	0	0
POL	6/20/09	9/16/09	<i>Lepomis macrochirus</i>	58	1	\approx 72hr	0	0	0	0	0
POL	6/20/09	9/16/09	<i>Lepomis macrochirus</i>	1	2	\approx 72hr	0	0	0	0	0
UMRR	6/18/09	9/14/09	<i>Lepomis macrochirus</i>	108	1*	\approx 72hr	0	0	0	108	0
UMRR	6/18/09	9/14/09	<i>Lepomis macrochirus</i>	573	1*	\approx 72hr	0	0	0	0	0
UMRR	6/18/09	9/18/09	<i>Lepomis macrochirus</i>	291	1	\approx 72hr	0	0	0	0	0
UMRR	6/18/09	9/18/09	<i>Lepomis macrochirus</i>	89	1	\approx 72hr	0	0	0	89	0
UMRR	6/20/09	9/18/09	<i>Lepomis macrochirus</i>	889	1	\approx 96hr	0	0	0	0	0
UMRR	6/20/09	9/18/09	<i>Lepomis macrochirus</i>	6	1/3	\approx 96hr	6	0	0	0	0

Larvae Origin	Date Preserved	Evaluation Date	Species Identified	# Specimens Evaluated	Specimen Quality ^b	Developmental Stage (\approx age) ^c	# Anomalous Spinal/Skeletal Features	# Anomalous Craniofacial Features	# Anomalous Fins	# Anomalous Yolk Sac Sorption	# All Other Anomalies
UMRR	6/22/09	9/30/09	<i>Lepomis macrochirus</i>	431	1	\approx 120hr	0	0	0	0	0
UMRR	6/22/09	9/30/09	<i>Lepomis macrochirus</i>	12	1	\approx 120hr	2*	10	0	0	0
POL	6/22/09	9/17/09	<i>Lepomis macrochirus</i>	312	1	\approx 96hr	0	0	0	0	0
POL	6/22/09	9/17/09	<i>Lepomis macrochirus</i>	3	1	\approx 96hr	2	1	0	0	0
POL	6/22/09	9/17/09	<i>Lepomis macrochirus</i>	181	1	\approx 96hr	0	0	0	0	0
POL	6/22/09	9/17/09	<i>Lepomis macrochirus</i>	152	1	\approx 96hr	0	0	0	0	0
POL	6/22/09	9/17/09	<i>Lepomis macrochirus</i>	1	2	\approx 96hr	0	0	0	0	0
POL	6/22/09	9/17/09	<i>Lepomis macrochirus</i>	1	1	\approx 96hr	1	0	0	0	0
UMRR	6/18/09	9/18/09	<i>Lepomis macrochirus</i>	481	1	\approx 48hr	0	0	0	0	0
UMRR	6/18/09	9/18/09	<i>Lepomis macrochirus</i>	2	1	\approx 48hr	0	0	0	0	0
UMRR	6/18/09	9/18/09	<i>Lepomis macrochirus</i>	58	1	\approx 48hr	0	0	0	0	0
UMRR	6/20/09	9/22/09	<i>Lepomis macrochirus</i>	122 7	1	\approx 72hr	0	0	0	0	0
UMRR	6/20/09	9/22/09	<i>Lepomis macrochirus</i>	1	2	\approx 72hr	0	0	0	0	0
UMRR	6/20/09	9/22/09	<i>Lepomis macrochirus</i>	2	1	\approx 72hr	1	0	0	1	0
UMRR	6/20/09	9/29/09	<i>Lepomis macrochirus</i>	140 2	1	\approx 72hr	0	0	0	0	0
UMRR	6/20/09	9/29/09	<i>Lepomis macrochirus</i>	1	1	\approx 72hr	0	0	0	1	0

Larvae Origin	Date Preserved	Evaluation Date	Species Identified	# Specimens Evaluated	Specimen Quality ^b	Developmental Stage (\approx age) ^c	# Anomalous Spinal/Skeletal Features	# Anomalous Craniofacial Features	# Anomalous Fins	# Anomalous Yolk Sac Sorption	# All Other Anomalies
UMRR	6/22/09	10/1/09	<i>Lepomis macrochirus</i>	522	1	\approx 120hr	0	0	0	0	0
UMRR	6/22/09	10/1/09	<i>Lepomis macrochirus</i>	8	1	\approx 120hr	0	8	0	0	0
UMRR	6/22/09	10/1/09	<i>Lepomis macrochirus</i>	291	1	\approx 96hr	0	0	0	0	0
UMRR	6/22/09	10/1/09	<i>Lepomis macrochirus</i>	2	2	\approx 96hr	0	0	0	0	0
UMRR	6/22/09	10/1/09	<i>Lepomis macrochirus</i>	10	1	\approx 96hr	1	8	0	0	1

^a Quick Cooled, H₂O decanted, Innundated in Preservative

^b 1. Typical, Normal Development

2. Mechanically Damaged by Handling

3. Evidence of Fungal Infestation

4. Evidence of Parasitism

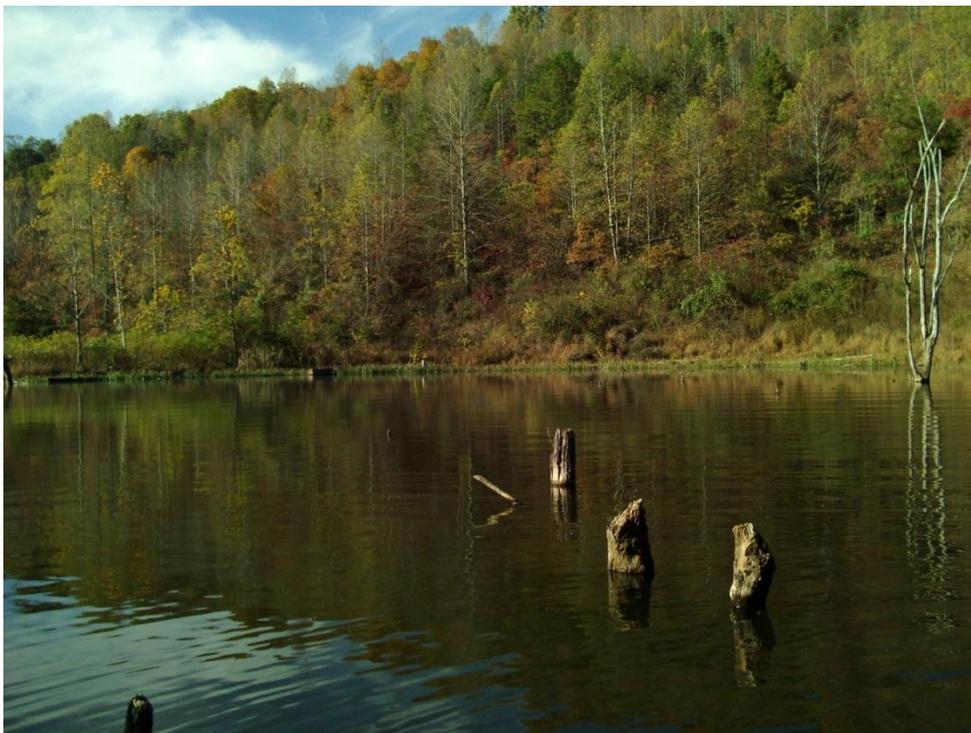
^c YSL = Yolk Sac Larva

*Determination of edemic yolk sac not practical due to early stage of larvae (i.e. very little sorption has taken place)

Appendix D
Selected Study Photos

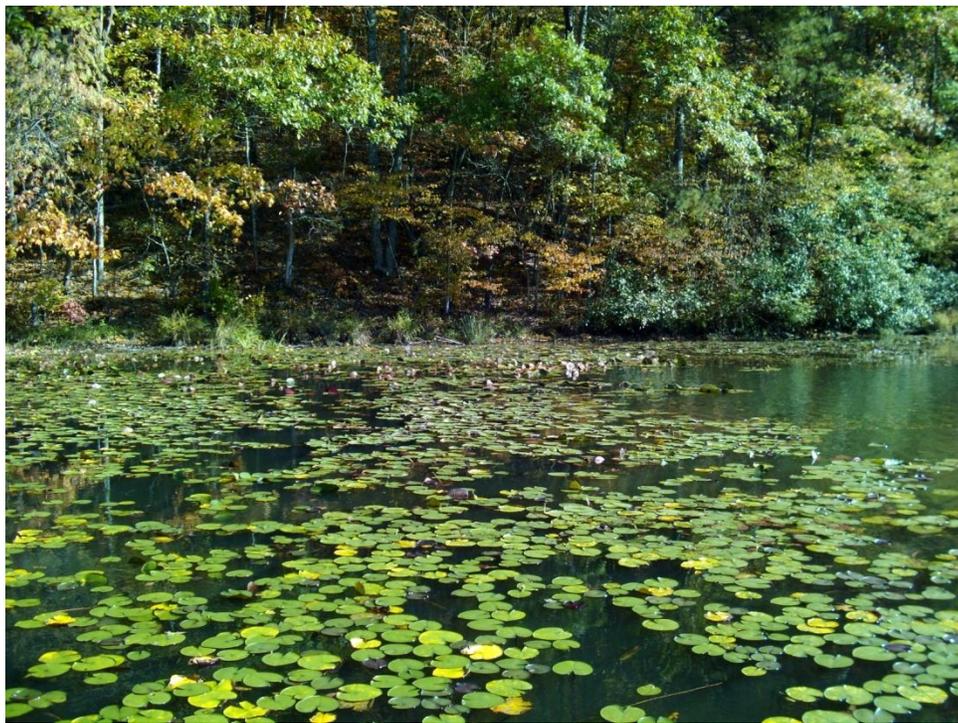


Upper Mud River Reservoir, Lincoln County, WV, 2008



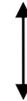


Plum Orchard Lake, Fayette County, WV, 2008





Largemouth Bass, *Micropterus salmoides*, from UMRR with slight facial deformities, 2008





Typical Largemouth Bass, *Micropterus salmoides*, from Plum Orchard Lake, 2008





Fish Egg Collection, UMRR, 2008





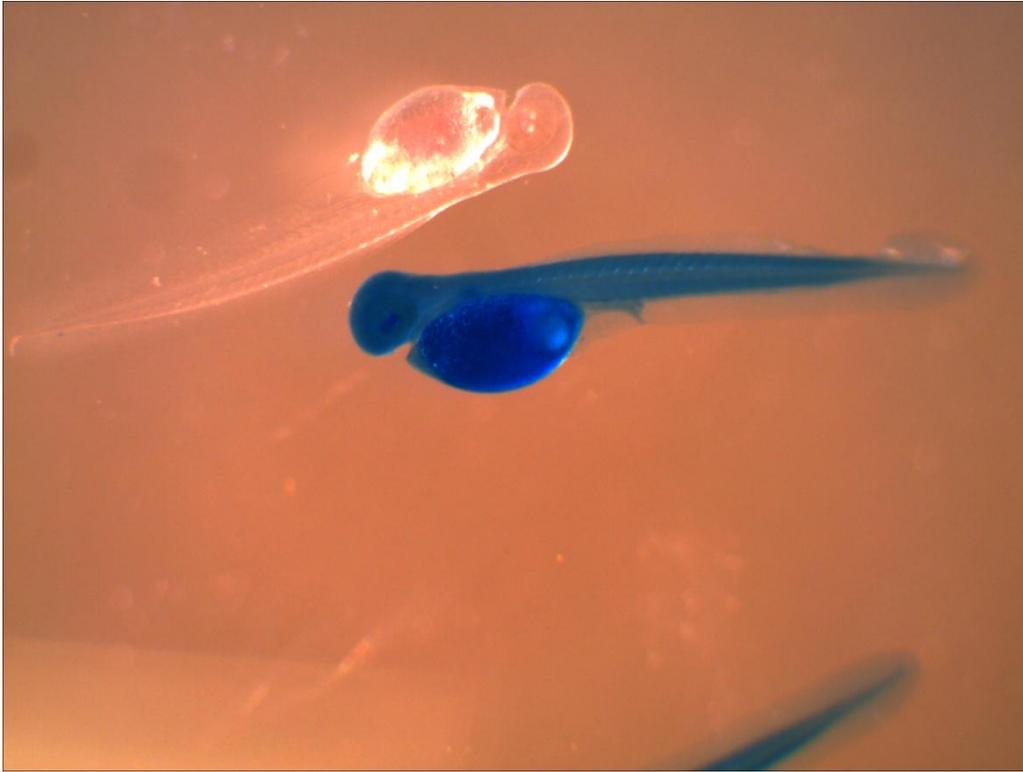
Ichthyoplankton Rearing Laboratory Design, 2008





Developmentally-Deformed Bluegill, *Lepomis macrochirus*, Larvae from UMRR,
2009





Typical Bluegill, *Lepomis macrochirus*, Larvae from POL, 2009 (top specimens color-enhanced by stain) \updownarrow



Appendix E

Related Documents Regarding Selenium and Fisheries Health

e-mail correspondence from Ben Lowman to Pat Campbell, 2-18-09

Observations on Deformed Fishes in the Upper Mud River Reservoir

In May, 2007, West Virginia Department of Environmental Protection biologists Ben Lowman, Jason Morgan, and Robert Row were conducting a birds' eggs collection survey at the Upper Mud River Reservoir, Lincoln County, West Virginia. Assisted by US Fish and Wildlife ornithologist Joe Skorupa, the group located a spawning beach being used by bluegill sunfishes, *Lepomis macrochirus*. The shallow water area included nest depressions lined with relict shells from Asian clams, *Corbicula fluminea*, as well as nest guarding males and schooling prenuptial females (Figures 1 and 2). Occasionally, a mature largemouth bass, *Micropterus salmoides*, would raid the nesting area in apparent attempt to predate bluegill eggs; however, the determined male bluegills successfully defended their nests, often driving the largemouth bass into the extreme shallows. It was on such an escape run that the biologists, photographing the spawning event, noticed a facial deformity on the nest-raiding largemouth bass. The bass appeared to have a protrusive lower jaw, one incapable of occlusion with the upper maxillae; yet, careful observation revealed a truncation of the maxillae, or upper jaw. The biologists discussed the rarity of such a deformation given the number of fishes that each has closely inspected during their respective careers.

Two days later, Jason Morgan and Robert Row, electroshocking fish in the same impoundment, collected another largemouth bass that exhibited severe facial deformity, also having an extremely truncated maxillae (Figure 3). This individual was of similar size to the nest-raiding bass. Again, biologists noted the scarcity of such individuals occurring in natural populations as such mal-fitness is usually a detriment to survival. Later, a discussion ensued regarding the likelihood of angling injuries or attempted predation leading to the observed deformities. It was agreed by all that uniqueness of the abnormalities combined with an apparent manifestation in certain aged fishes was evidence of mutation. Since selenium, the chemical analog of sulfur, is known to cause developmental deformities among vertebrates, and the inhabited environment of the fish was exposed to elevated selenium loads, the potential of selenium-induced deformities was raised.

Later in the summer, on August 3, 2007, the wildlife manager at the Upper Mud River Reservoir, Karen McClure, called WVDEP headquarters to discuss a deformed bluegill sunfish that had been turned in by an angler at the impoundment. The angler noted that the specimen was the second bluegill that he had caught that day with such deformities; consequently, he saved this second specimen for scientific study. DEP biologists collected the individual (Figure 4) and examined it for potential spinal kyphosis, a ventral bending of the cervical spine. Upon inspection, the biologists observed complete and symmetrical scaling overlying the spinal bend as well as a well pigmented integument (Figure 5). It was not conclusively determined if the anomaly was of developmental origin or injury related; however, the fish was retained for further analysis. Since then, biologists have continued electroshocking surveys of the fishes inhabiting the Upper Mud River Reservoir; and, in November, 2008, collected several individuals (largemouth bass) exhibiting various degrees of maxillae truncation (Figures 6). Anomalous fishes have not been observed at other, reference, impoundments (i.e. Plum Orchard Lake and Elk Fork Lake). Furthermore, developmental deformities among larval bluegill sunfishes are believed to be present,

some having crainiofacial anomalies similar to those exhibited by the deformed adult largemouth basses (Figure 7). Independent verification of the larval fish assessments is currently being pursued.

It is now believed that a selenium-induced teratogenic developmental event has led to the deformities among largemouth basses in the Upper Mud River Reservoir. In support, a 12% (14 of 117 individuals examined) deformity rate among adult largemouth basses was revealed in recent (October 29, 2008, and November 5, 2008) electroshocking surveys of the impoundment. Contrastingly, a 0% (0 of 35 individuals examined) deformity rate of adult largemouth basses was observed in fishes collected from Plum Orchard Lake (October 29, 2008).

In summary, the Upper Mud River Reservoir continues to be the focus of selenium bioaccumulation studies undertaken by WVDEP biologists. Although the extent to which the wildlife populations inhabiting and residing around the impoundment can accrue bodily selenium and remain unaffected is still not fully known, it is likely that the first observations of selenium toxicity to the fish community have been made.



Figure 1. Bluegill sunfishes, *Lepomis macrochirus*, during spawning activities (photo taken 6/1/08).



Figure 2. Nest guarding male bluegill sunfish (photo taken 6/1/08).



Figure 3. Crainofacially deformed largemouth bass, *Micropterus salmoides* (photo taken 5/24/07).



Figure 4. Bluegill sunfish, *Lepomis macrochirus*, with spinal anomaly (photo taken 8/6/07).

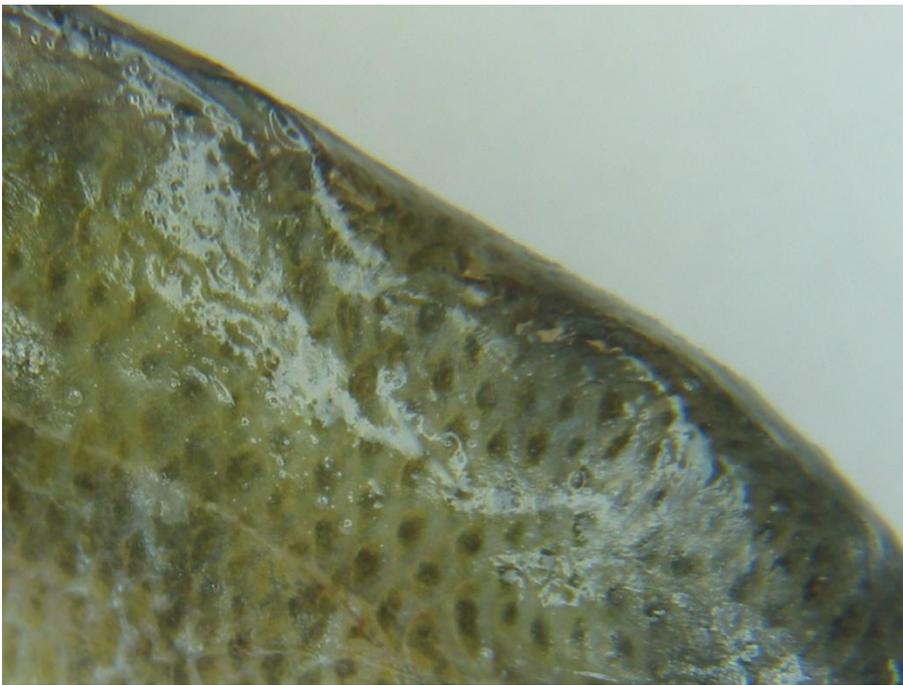


Figure 5. Scales overlying spinal bend in bluegill sunfish, *Lepomis macrochirus* (photo taken 8/6/07).



Figure 6. Largemouth bass, *Micropterus salmoides*, with truncated maxillae (photo taken 11/5/08).



Figure 7. Larval bluegill sunfish, *Lepomis macrochirus*, with gaping jaw (photo taken 8/4/08).

MEMORANDUM

To: Patrick Campbell
From: Jeffrey Ginger
Date: December 10, 2009
Subject: Juvenile Black Bass Survey

Recent observations at the Upper Mud River Reservoir regarding selenium-induced deformities in adult black bass (*Micropterus spp.*) prompted a visual assessment survey throughout the impoundment. Typically, the right fork of Upper Mud River Reservoir has exhibited higher concentrations of selenium and poorer habitat. Selenium toxicity in the water body could potentially threaten fecundity and recruitment in fishes. The study concentrated on documenting the presence/absence of juveniles and multiple size classes of the bass to assess recruitment success. Anomalous and diseased fish were also documented as a measure of overall health. The study focused on game fish; therefore, other species were excluded from collection.

On November 12 and 16, 2009, DEP personnel conducted fish surveys at 10 sites in the Upper Mud River Reservoir in Lincoln County, West Virginia. Five sites from each fork, having similar habitats were sampled. Boat electro-fishing for 1,000 seconds at each site was employed to collect the fish, which were evaluated, measured, and returned to the reservoir, with very few retained as vouchers.

In general, habitat differed in each fork of the reservoir. The left fork contained more submerged vegetation; whereas, the right fork had more visible large woody debris. Overall, more fish were collected from the right fork (151 individuals) versus the left fork (137 individuals) and a larger number of juvenile black bass were collected in the right fork as well (Table 1). The majority of juveniles collected were spotted bass (*Micropterus punctalatus*) while the majority of the adult fish collected were largemouth bass (*Micropterus salmoides*). Hybridization between the two species was also evident. Most size/age classes of bass were represented in Upper Mud River Reservoir with more younger fish collected in the right fork. No young-of-the-year fish were collected. Approximately 5.2% of the fish collected were anomalous. The maxillary and spinoskeletal anomalies observed during the last sampling event were observed once again. Approximately 2.8% of the fish collected were diseased in some way.

At the present time, the population of black bass in the Upper Mud River Reservoir seems to exhibit stability based on the presence of juvenile fish and multiple size/age classes. Black bass anomalies occurring in this reservoir do, however, warrant further study with concentration on effects of selenium on the egg, larvae, and fry stages.

Respectfully,

Jeff Ginger

Table 1. Results of a Black Bass Survey on Selected Sites on the Upper Mud River Reservoir 11/12/09 & 11/16/09.

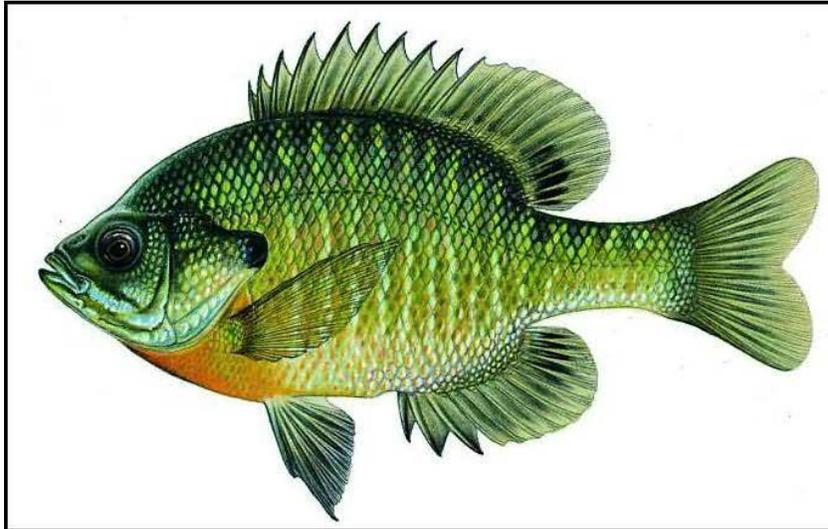
Site ID	Site Description	Latitude	Longitude	Fish Species	Size Class (mm)	# of Fish Collected	# Anomalous	# Diseased
#1	Left Fork	38 09 13.9	82 02 20.2	Largemouth Bass (LMB)	100-149	2	0	0
#1	Left Fork	38 09 13.9	82 02 20.2	LMB	150-199	4	0	1
#1	Left Fork	38 09 13.9	82 02 20.2	LMB	200-249	4	0	1
#1	Left Fork	38 09 13.9	82 02 20.2	LMB	300-349	3	0	2
#1	Left Fork	38 09 13.9	82 02 20.2	LMB	350-400	1	0	0
#1	Left Fork	38 09 13.9	82 02 20.2	Spotted Bass (SB)	200-249	1	0	0
#1	Left Fork	38 09 13.9	82 02 20.2	<i>Lepomis sp.</i>	100-149	8	0	0
#2	Left Fork	38 09 21.4	82 02 26.2	LMB	150-199	3	1	0
#2	Left Fork	38 09 21.4	82 02 26.2	LMB	200-249	1	0	0
#2	Left Fork	38 09 21.4	82 02 26.2	LMB	250-299	1	0	0
#2	Left Fork	38 09 21.4	82 02 26.2	LMB	350-400	3	0	0
#2	Left Fork	38 09 21.4	82 02 26.2	SB	250-299	1	0	0
#2	Left Fork	38 09 21.4	82 02 26.2	<i>Lepomis sp.</i>	100-149	5	0	0
#3	Left Fork	38 09 29.7	82 02 26.9	LMB	150-199	9	0	0
#3	Left Fork	38 09 29.7	82 02 26.9	LMB	200-249	3	0	0
#3	Left Fork	38 09 29.7	82 02 26.9	LMB	250-299	4	0	0
#3	Left Fork	38 09 29.7	82 02 26.9	LMB	300-349	3	0	0
#3	Left Fork	38 09 29.7	82 02 26.9	LMB	350-399	1	0	0
#3	Left Fork	38 09 29.7	82 02 26.9	LMB	450-499	1	0	0
#3	Left Fork	38 09 29.7	82 02 26.9	<i>Lepomis sp.</i>	100-149	3	0	0
#4	Left Fork	38 09 30.9	82 02 39.5	LMB	50-99	1	0	0
#4	Left Fork	38 09 30.9	82 02 39.5	LMB	100-149	1	0	0
#4	Left Fork	38 09 30.9	82 02 39.5	LMB	150-199	17	0	1
#4	Left Fork	38 09 30.9	82 02 39.5	LMB	200-	12	0	1

Site ID	Site Description	Latitude	Longitude	Fish Species	Size Class (mm)	# of Fish Collected	# Anomalous	# Diseased
					249			
#4	Left Fork	38 09 30.9	82 02 39.5	LMB	250-299	4	0	0
#4	Left Fork	38 09 30.9	82 02 39.5	LMB	300-349	4	1	0
#4	Left Fork	38 09 30.9	82 02 39.5	LMB	350-400	4	0	2
#4	Left Fork	38 09 30.9	82 02 39.5	<i>Lepomis sp.</i>	150-199	6	0	0
#5	Left Fork	38 09 36.7	82 02 46.6	LMB	50-99	1	0	0
#5	Left Fork	38 09 36.7	82 02 46.6	LMB	150-199	3	0	0
#5	Left Fork	38 09 36.7	82 02 46.6	LMB	200-249	6	0	0
#5	Left Fork	38 09 36.7	82 02 46.6	LMB	250-299	4	0	0
#5	Left Fork	38 09 36.7	82 02 46.6	LMB	300-349	4	1	0
#5	Left Fork	38 09 36.7	82 02 46.6	LMB	350-400	2	0	0
#5	Left Fork	38 09 36.7	82 02 46.6	LMB	400-449	1	0	0
#5	Left Fork	38 09 36.7	82 02 46.6	<i>Lepomis sp.</i>	150-199	5	0	0
#5	Left Fork	38 09 36.7	82 02 46.6	SB	50-99	1	0	0
#6	Right Fork	38 08 26.6	82 02 42.7	LMB	300-349	3	1	0
#6	Right Fork	38 08 26.6	82 02 42.7	LMB	350-400	1	1	0
#6	Right Fork	38 08 26.6	82 02 42.7	LMB	450-499	2	0	0
#6	Right Fork	38 08 26.6	82 02 42.7	<i>Lepomis sp.</i>	150-199	5	0	0
#7	Right Fork	38 08 31.8	82 02 54.0	LMB	100-149	1	0	0
#7	Right Fork	38 08 31.8	82 02 54.0	LMB	150-199	4	0	0
#7	Right Fork	38 08 31.8	82 02 54.0	LMB	200-249	1	0	0
#7	Right Fork	38 08 31.8	82 02 54.0	LMB	300-349	1	0	0
#7	Right Fork	38 08 31.8	82 02 54.0	<i>Lepomis sp.</i>	100-149	1	0	0
#7	Right Fork	38 08 31.8	82 02 54.0	SB	50-99	9	0	0
#8	Right Fork	38 08 39.4	82 03 2.0	LMB	100-149	1	0	0
#8	Right Fork	38 08 39.4	82 03 2.0	LMB	150-199	4	1	0
#8	Right Fork	38 08 39.4	82 03 2.0	LMB	200-	5	0	0

Site ID	Site Description	Latitude	Longitude	Fish Species	Size Class (mm)	# of Fish Collected	# Anomalous	# Diseased
					249			
#8	Right Fork	38 08 39.4	82 03 2.0	LMB	250-299	1	0	0
#8	Right Fork	38 08 39.4	82 03 2.0	LMB	300-349	2	1	0
#8	Right Fork	38 08 39.4	82 03 2.0	LMB	450-499	1	0	0
#8	Right Fork	38 08 39.4	82 03 2.0	<i>Lepomis sp.</i>	150-199	3	0	0
#8	Right Fork	38 08 39.4	82 03 2.0	<i>Micropterus spp.</i> (juveniles)	50-99	4	0	0
#9	Right Fork	38 08 42.9	82 03 22.5	LMB	50-99	9	0	0
#9	Right Fork	38 08 42.9	82 03 22.5	LMB	100-149	3	0	0
#9	Right Fork	38 08 42.9	82 03 22.5	LMB	150-199	1	0	0
#9	Right Fork	38 08 42.9	82 03 22.5	LMB	200-249	8	0	0
#9	Right Fork	38 08 42.9	82 03 22.5	LMB	250-299	15	3	0
#9	Right Fork	38 08 42.9	82 03 22.5	LMB	300-349	8	1	0
#9	Right Fork	38 08 42.9	82 03 22.5	LMB	350-399	4	0	0
#9	Right Fork	38 08 42.9	82 03 22.5	LMB	400-449	3	2	0
#9	Right Fork	38 08 42.9	82 03 22.5	<i>Lepomis sp.</i>	≈150	3	0	0
#9	Right Fork	38 08 42.9	82 03 22.5	SB(juveniles)	0-49	1	0	0
#9	Right Fork	38 08 42.9	82 03 22.5	SB(juveniles)	50-99	21	0	0
#9	Right Fork	38 08 42.9	82 03 22.5	<i>Micropterus spp.</i> (juveniles)	100-149	2	0	0
#9	Right Fork	38 08 42.9	82 03 22.5	<i>Micropterus spp.</i>	150-199	1	0	0
#9	Right Fork	38 08 42.9	82 03 22.5	<i>Micropterus spp.</i>	300-349	1	0	0
#10	Right Fork	38 08 54.3	82 03 28.8	LMB	100-149	3	0	0
#10	Right Fork	38 08 54.3	82 03 28.8	LMB	150-199	1	0	0
#10	Right Fork	38 08 54.3	82 03 28.8	LMB	200-249	4	0	0
#10	Right Fork	38 08 54.3	82 03 28.8	LMB	250-299	2	0	0
#10	Right Fork	38 08 54.3	82 03 28.8	LMB	300-349	1	2	0
#10	Right Fork	38 08 54.3	82 03 28.8	LMB	350-399	5	0	0
#10	Right Fork	38 08 54.3	82 03 28.8	<i>Lepomis sp.</i>	170	1	0	0
#10	Right Fork	38 08 54.3	82 03 28.8	SB	184	1	0	0

Site ID	Site Description	Latitude	Longitude	Fish Species	Size Class (mm)	# of Fish Collected	# Anomalous	# Diseased
#10	Right Fork	38 08 54.3	82 03 28.8	SB(juveniles)	50-99	4	0	0

SELENIUM BIOACCUMULATION AMONG SELECT STREAM AND LAKE FISHES IN WEST VIRGINIA



PREPARED BY:



west virginia department of environmental protection

FEBRUARY 2009

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STUDY OVERVIEW

Due to the USEPA's publication of a draft national recommended whole-body tissue criterion for selenium, it was determined that a study designed to elucidate the factors and impacts of selenium bioaccumulation among select fish species, including bluegill sunfishes, found in the surface waters of West Virginia was warranted. This research emphasized the correlation of observed whole-body tissue concentrations of selenium in fishes to in-stream selenium quantities in both lotic and lentic environments, and comparison of those tissue concentrations to EPA's proposed whole-body chronic exposure tissue criterion of 7.91 $\mu\text{g/g}$ (dry weight selenium). Particular attention was given to the more susceptible sunfishes (family Centrarchidae) in regard to bioaccumulation; however, the bioaccumulation rates of many other species found in potentially impacted and reference aquatic systems were also researched. Site-specific water quality information, whole fish tissue concentrations, and bioaccumulation factors for selenium among select species of stream and lake fishes were derived from 18 locations (Fig. 1), beginning 1 November, 2005, and continuing to 20 July, 2007.

EXPERIMENTAL

WATER CHEMISTRY

Water chemistry monitoring occurred at 18 sites with known or suspected elevated levels of selenium, as well as reference locations (Fig. 1). Monitoring sites were identified after researching information contained in the Total Maximum Daily Load (TMDL), Watershed Assessment, Mining and Industrial Permitting Section databases. Generally, selected stream and lake monitoring locations were downstream of surface mining/valley fill areas and fly ash disposal sites, with the exception of the uninfluenced control sites. Waterborne selenium concentrations were monitored monthly at these locations for one year, and were analyzed at minimum detection limits of ≤ 1 ppb ($\mu\text{g/L}$). Physicochemical information regarding dissolved oxygen, pH, temperature, and specific conductance were also obtained for each monitoring event. Chemical analyses for other water quality constituents (copper, mercury, lead, zinc, cadmium, arsenic, and sulfates) were performed quarterly to elucidate potential antagonistic relationships in selenium bioaccumulation. At lotic sites, stream flow was measured during each sampling event in cubic feet per second (cfs). At lentic stations, depth stratified water samples were

periodically collected to identify any layering of waterborne constituents within the water column. All study information regarding water chemistry analyses of selenium are located in Appendix A; comprehensive water quality data are also provided in the attached CD.

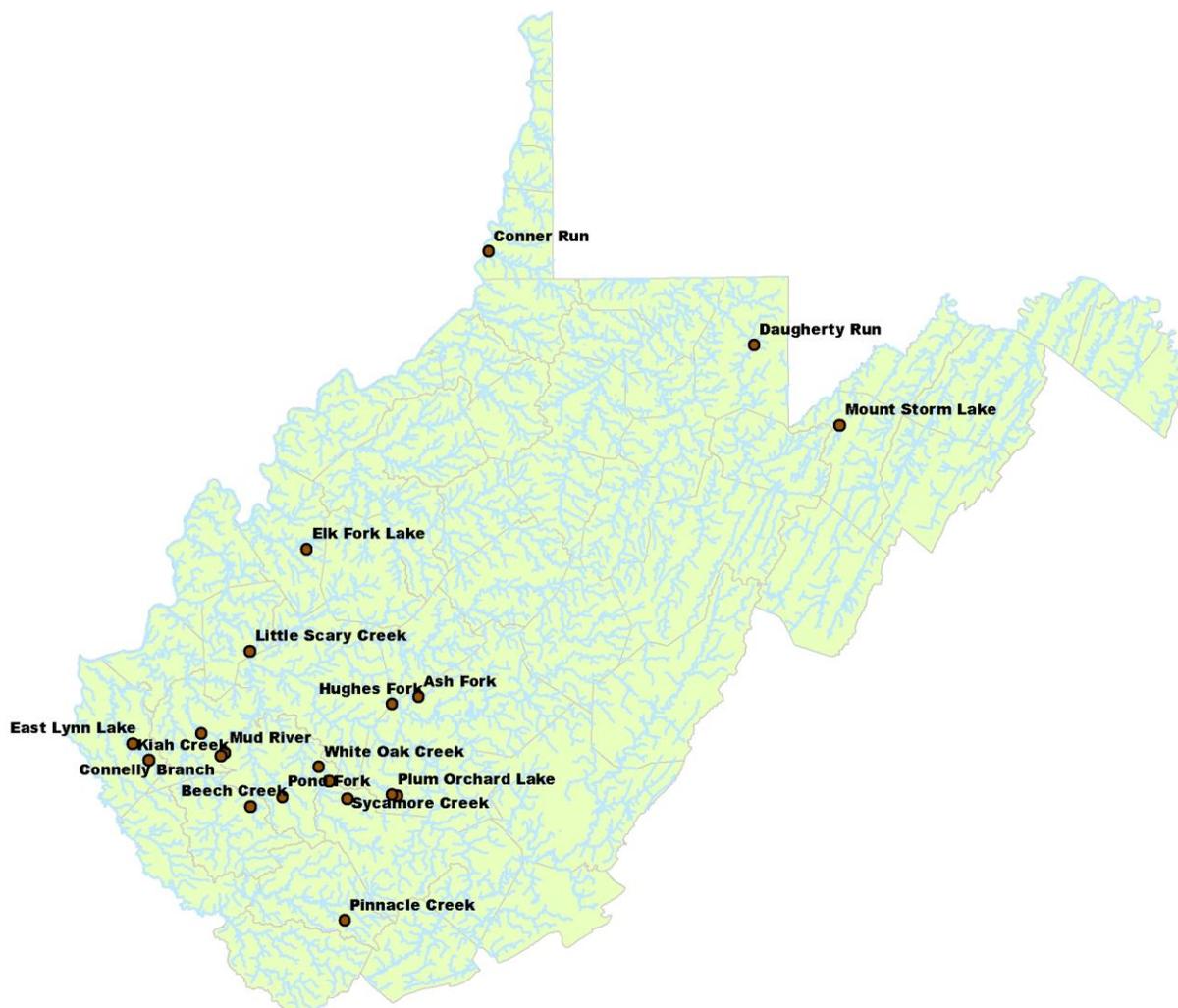


Figure 1. Streams and lakes selected for selenium water quality and/or fish tissue (bioaccumulation) monitoring.

FISH TISSUE

Stream fishes at study locations were collected by backpack electroshocking efforts; whereas, lake fishes were collected by both hook and line and electroshocking methods. Several species, including bluegill, green sunfish, creek chub, central stoneroller, rockbass, and white sucker, were selected for whole-body tissue analysis of selenium, and provide a means for bioaccumulation comparisons among organisms and sites. Fish collections occurred once in each of two seasonal groups (summer/fall and winter/early spring) at study locations. Collected specimens were individually labeled (tagged), double bagged, and iced to 4°C in transit to storage; specimens were stored at <0° C in preparation for laboratory tissue analysis. Tissue analysis to determine whole-body concentrations of (dry weight) selenium (µg/g, or micrograms of selenium per gram of fish tissue), was prescribed for all specimens, facilitating comparison to EPA's draft whole-body chronic exposure tissue criterion of 7.91 µg/g (dry weight selenium) for bluegill sunfish (USEPA, 2004). Individual fish were analyzed for whole tissue selenium concentrations as well as composite samples of smaller species, representing as many as seven fish per collection event, in order to achieve a desired minimum sample weight of 5 g. A thorough inspection of all fishes for anomalies/disease was completed, with particular attention given to overall fitness and the symptoms of Winter Stress Syndrome (Lemly, 1993). Other species were preserved (frozen as whole specimens) during the collection efforts for potential future analyses.

WATERBORNE SELENIUM SPECIATION

In August, 2006, eight sample locations were selected for analysis of waterborne selenium in regard to the proportion of selenite, selenium in the IV (Se⁺⁴) valence state, to selenate, selenium in the VI (Se+6) valence state. Bioaccumulative differences between these selenium species are reported from the literature (USEPA, 2004) along with their potential to occur as a result of certain seleniferous inputs. Frontier GeoSciences, Inc., Seattle, WA, was selected to perform the speciation analysis of the waterborne selenium obtained from the study locations. An additional seven locations were analyzed for waterborne selenium species in June, 2008; the result of those analyses are located in Table 2 (see Results).

BIOACCUMULATION FACTORS

Upon collection, analysis and performance of appropriate final quality assurance/quality control measures, the data were used in a series of bioaccumulation rate calculations following EPA protocols (USEPA, 1987). Independent calculations were used to derive the bioaccumulation rates of each fish, collected from streams or lakes. The following equation was used to calculate bioaccumulation factors for the collected fish:

$$\text{BAF} = \text{Tissue Concentration} / \text{Water Column Concentration}$$

Combinations of site-specific bioaccumulation factors and tissue concentrations of selenium were also calculated; the results of those groupings were examined for potential similarities and are reported in Table 3 (see Results).

RESULTS

WATER QUALITY

Measured waterborne concentrations of selenium at the 18 study locations were variable and representative of potential seleniferous inputs (Table 1 and Appendix A). Average water column concentrations of selenium in streams ranged from <1.0 ppb¹ ($\mu\text{g/L}$) at the reference site, Ash Fork (Fig. 1), to 49.7 ppb at Conner Run, which is influenced by upstream fly ash deposition. Among lentic environs, average waterborne selenium concentrations ranged from <1.0 ppb at reference locations to 3.4 ppb at the Upper Mud River Reservoir, which is influenced by upstream mining activities. Among streams influenced by mining activities, Seng Creek had the highest average concentration of waterborne selenium at 27.2 ppb; whereas, similarly grouped Kiah Creek averaged a waterborne selenium concentration of 1.6 ppb. Neither lentic nor lotic sites categorized as reference averaged more than 1.0 ppb, waterborne selenium concentration.²

SPECIATION ANALYSIS

From 28 August, 2006, through 30 August, 2006, samples from eight study locations were collected for analysis of waterborne selenium species, or determination of the valence state of the selenium present in waterborne concentrations. An additional seven samples were analyzed for waterborne selenium species in June, 2008. These values are included in Table 2. Of significance, the two stream locations representing influence by fly ash deposition, Conner Run and Little Scary Creek, exhibited valence state selenium almost exclusively in the selenite (Se^{+4} , IV) form, which is reported to be more bioaccumulative (USEPA, 2004). Whereas, other stream locations impacted by upstream mining activities, were shown to contain waterborne selenium predominantly in the selenate (Se^{+6} , VI) form. Analysis of water collected from another stream, Sycamore Creek, revealed total inorganic selenium concentrations of 0.123 ppb, comprised of selenate selenium at concentrations of 0.073 ppb and selenite selenium at concentrations of <0.05 ppb, below the laboratory's minimum detection limit.

¹ This value represents the analytical laboratory's minimum detection limit for selenium. In calculations involving bioaccumulation rates, 1.0 ppb was used when values of <1.0 ppb were reported from the laboratory.

² The dataset representing water chemistry, fish tissue, and bioaccumulation factors from Sycamore Creek were not incorporated into similarly categorized locations in derivation of average values. See Excluded Data for additional information.

Table 1. Average water chemistry, whole fish tissue concentrations, and bioaccumulation factors for selenium at study locations.

Site	Stream Code	Avg. Water Column Conc. (ppb)	Avg. Fish Tissue Conc. (ppm)	Avg. Sunfish Tissue Conc. (ppm)	Avg. Minnow Tissue Conc. (ppm)	Avg. BAF (L/kg)
Fly Ash Influenced Streams		39.65	33.21	15.83	41.23	914
*Daugherty Run	WVMC-19	1.00	1.48	1.56	1.49	1476
Little Scary Creek	WVK-31	31.50	40.43	6.20	54.69	1283
Conner Run	WVO-77-A	47.80	25.99	25.46	27.76	544
Fly Ash Influenced Impoundments		1.30	3.80	3.80	NA	2915
Mount Storm Lake	WVPNB-17-(L1)	1.30	3.80	3.80	NA	2915
Mining Influenced Streams		9.39	6.21	6.07	5.74	1179
Beech Creek	WVKC-10-T-15	12.30	7.55	7.34	7.64	613
Pond Fork	WVKC-10-U	2.40	3.64	4.03	2.76	1515
White Oak Creek	WVKC-35	15.80	6.77	7.12	6.42	428
Seng Creek	WVKC-42	27.20	8.16	NA	8.16	300
Hughes Fork	WVKG-5-B-4	5.30	7.97	NA	7.97	1503
Pinnacle Creek	WVOG-124	2.50	6.02	6.78	5.11	2520
Kiah Creek	WVO-2-Q-18	1.60	2.70	2.73	2.68	1690
Mud River	WVOGM	8.00	6.89	8.43	5.20	862
*Sycamore Creek	WVKC-47-E	1.00	4.00	NA	4.00	4448
Mining Influenced Impoundments		2.25	13.04	13.04	NA	4783
Upper Mud River Reservoir	WVOGM-(L1)	3.50	23.11	23.11	NA	6601
East Lynn Lake	WVO-2-Q-(L1)	1.00	2.96	2.96	NA	2965
Reference Stream		0.94	2.50	NA	2.50	2500
Ash Fork	WVKG-5-H	0.94	2.50	NA	2.50	2500
Reference Impoundments		1.00	1.36	1.36	NA	1364
Elk Fork Lake	WVO-32-M-(L1)	1.00	1.03	1.03	NA	1033
Plum Orchard Lake	WVK-65-Z-(L1)	1.00	1.69	1.69	NA	1694

*Not used in derivation of averages

Table 2. Analytical Results of Selenium Speciation Study.

Site	Total Inorganic Selenium (ppb)	Se ⁺⁴ (ppb)	Se ⁺⁶ (ppb)	% Selenite, Se ⁺⁴	% Selenate, Se ⁺⁶
Sycamore Creek	0.123**	0.05*	0.073	NA	NA
Seng Creek	21.898	0.858	21.040	3.9	96.1
White Oak Creek	13.602	0.752	12.850	5.5	94.5
Beech Creek	13.505	0.485	13.020	3.6	96.4
Little Scary Creek	32.600	30.600	2.000	93.9	6.1
Mud River	4.852	0.242	4.610	5.0	95.0
Hughes Fork	2.451	0.331	2.120	13.5	86.5
Conner Run	60.300	59.800	0.500	99.2	0.8
Toe Pond at Connelly Branch	16.910	0.410	16.500	2.4	97.6
Right Fork of Upper Mud River Reservoir	8.852	0.352	8.500	4.0	96.0
Left Fork of Upper Mud River Reservoir	0.384**	0.192*	0.192*	NA	NA
Tailwaters of Upper Mud River Reservoir	3.245	0.285	2.960	8.8	91.2
Beech Bottom Creek of POL	0.384**	0.192*	0.192*	NA	NA
Plum Orchard Lake (POL)	0.384**	0.192*	0.192*	NA	NA
Tailwaters of POL	0.384**	0.192*	0.192*	NA	NA

*Represents datum at analytical minimum detection limit

**Derived from calculation of one or more values at analytical minimum detection limit

FISH TISSUE

Average whole fish tissue concentrations of selenium in fishes collected from study locations ranged from 1.03 ppm (mg/L) at Elk Fork Lake, a reference impoundment, to 40.43 ppm at Little Scary Creek, which is influenced by upstream fly ash deposition (Table 1 and Appendix B). Among categorized locations, streams influenced by fly ash disposal contained fishes with the highest average whole body selenium concentrations, 39.65 ppm; whereas, the reference stream contained fishes that averaged 2.50 ppm, tissue selenium concentration. Locations categorized as reference impoundments had fishes with the lowest average whole tissue selenium concentrations, 1.36 ppm, while fishes residing in impoundments influenced by upstream mining activities averaged whole tissue selenium concentrations of 13.04 ppm. Fishes collected from the study impoundment influenced by fly ash deposition contained, on average, 3.80 ppm, whole

tissue selenium concentration. In examination of selenium accrual among like groups of fishes, sunfishes (family Centrarchidae) exhibited the highest average whole tissue selenium concentrations at Conner Run, 25.46 ppm, followed by the Upper Mud River Reservoir, 23.11 ppm, and the Mud River, 8.43 ppm. Minnows (family Cyprinidae) contained the highest average concentrations of whole tissue selenium in Little Scary Creek, 54.69 ppm, followed by Conner Run, 27.76 ppm, and Seng Creek, 8.16 ppm. All values representing whole tissue selenium concentrations for individual fish are found in Appendix B, and comprehensive tissue data, including potential selenium-antagonist tissue concentrations, are located in the provided CD.

BIOACCUMULATION

Bioaccumulation factors (rates) were calculated for all fishes collected and analyzed for tissue selenium concentrations during the study. Average water chemistry concentrations of selenium were used to represent study locations sampled multiple times.³ Analytical results of whole tissue selenium concentrations were then divided by the corresponding average water chemistry value. The resulting rates, representing bioaccumulation of selenium in whole fish tissues, are reported in liters per kilogram (L/kg), Table 1. The study location with the highest degree of whole tissue selenium bioaccumulation was the Upper Mud River Reservoir, where fishes accrued selenium at 6601 (L/kg), on average. In comparison, fishes collected from Plum Orchard Lake, on average, accrued whole tissue selenium at a rate of 1694 (L/kg). Among categorized locations, mining influenced impoundments contained fishes that exhibited the highest levels of bioaccumulated selenium and, on average, accrued whole tissue selenium at a rate of 4783 (L/kg).

EXCLUDED DATA

Water quality data from Sycamore Creek, initially representing a reference location, was not included in average values derived for waterborne selenium concentrations for reference streams due to upstream mining activities that may have influenced fish tissue selenium concentrations. Fishes collected from the Sycamore Creek study location exhibited elevated tissue selenium concentrations above expected background levels; fishes collected on 19 April, 20007, averaged 13.37 ppm, whole tissue selenium concentration. This overall increase in selenium body burden may be attributed to selenium deposition via historic, pre-law mining in the watershed as well as some current mining activities; although, increased waterborne selenium concentrations were not detected through water chemistry monitoring.

Water quality data from Daugherty Run, initially representing a fly ash influenced stream, was not included in average values derived for waterborne selenium

³ In bioaccumulation rate calculations involving water quality data reported at <1.0 ppb, the minimum laboratory detection limit of 1.0 ppb was used; although, actual waterborne exposure may be inferred as <1.0 ppb.

concentrations for fly ash influenced streams due to upstream measures that have prevented selenium exposure to erosion processes. Fly ash deposition in this drainage was not influencing (elevating) waterborne selenium concentrations or whole fish tissue selenium concentrations because of dry landfilling deposition; therefore, both water chemistry and fish tissue selenium concentrations measured at Daugherty Run were not included among other data representing fly ash influenced streams in determination of average values for these constituents among the group.

Analytical data regarding whole fish tissue concentrations of selenium performed by the WVU-NRCCE laboratory are reported in Appendix B; however, the values are not included in the dataset used to calculate bioaccumulation factors for individual fish at study locations. The WVU-NRCCE data was excluded due to discrepancies among results as compared to values derived by other analytical laboratories, quality assurance concerns, and analytical methods less resolute than required in the study. The fishes analyzed by the WVU-NRCCE laboratory represent an early spring sample event, from 21 March, 2006, through 26 April, 2006. A replacement collection of early spring fishes was conducted 19 April, 2007, through 3 June, 2007.

Analytical results derived from certain ICP (inductively coupled plasma) methods were excluded from the dataset used to calculate bioaccumulation factors for individual fish at study locations, but are reported in Appendix B. Upon comparison of ICP versus graphite furnace analytical methods, January, 2007, BioChem Testing, Inc., recommended the use of graphite furnace techniques, without HCl addition, over ICP methods in the analysis of whole fish tissue for selenium concentrations. The recommendations were issued in order to maintain appropriate detection limits, required in the study, as well as achieve the most accurate results for all tissues analyzed; however, it was noted that ICP methods should yield reliable data for the analysis of fish tissue. ICP methods used by REI Consultants in the derivation of whole fish tissue concentrations of selenium and are included in the dataset of bioaccumulation calculations.⁴

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⁴ The exclusion of one datum, representing a whole fish tissue selenium concentration for a bluegill collected from Plum Orchard Lake, 17 April, 2007, was deemed necessary after comparison of analytical results with other values representing individual fishes at that location revealed large discrepancies.

Appendix A. Water chemistry results for waterborne selenium concentrations at study locations.

Waterbody Name	Code	Mile	Date	Q	Total Se (mg/L)
Beech Creek	WVKC-10-T-15	1.4	11/30/2005		0.007
Beech Creek	WVKC-10-T-15	1.4	12/13/2005		0.012
Beech Creek	WVKC-10-T-15	1.4	1/4/2006		0.007
Beech Creek	WVKC-10-T-15	1.4	2/8/2006		0.018
Beech Creek	WVKC-10-T-15	1.4	3/15/2006		0.007
Beech Creek	WVKC-10-T-15	1.4	4/13/2006		0.01
Beech Creek	WVKC-10-T-15	1.4	5/3/2006		0.016
Beech Creek	WVKC-10-T-15	1.4	6/13/2006		0.008
Beech Creek	WVKC-10-T-15	1.4	7/12/2006		0.022
Beech Creek	WVKC-10-T-15	1.4	8/23/2006		0.018
Beech Creek	WVKC-10-T-15	1.4	9/20/2006		0.009
Beech Creek	WVKC-10-T-15	1.4	8/28/2006		0.0135
Beech Creek	WVKC-10-T-15	1.4	10/17/2006		0.006
Beech Creek	WVKC-10-T-15	1.4	4/26/2007		0.019
Pond Fork	WVKC-10-U	15.8	11/29/2005		0.0014
Pond Fork	WVKC-10-U	15.8	12/13/2005		0.0015
Pond Fork	WVKC-10-U	15.8	1/4/2006		0.0014
Pond Fork	WVKC-10-U	15.8	2/8/2006		0.003
Pond Fork	WVKC-10-U	15.8	3/15/2006		0.0016
Pond Fork	WVKC-10-U	15.8	4/13/2006		0.002
Pond Fork	WVKC-10-U	15.8	5/3/2006		0.003
Pond Fork	WVKC-10-U	15.8	5/3/2006		0.003
Pond Fork	WVKC-10-U	15.8	6/13/2006		0.002
Pond Fork	WVKC-10-U	15.8	7/12/2006		0.003
Pond Fork	WVKC-10-U	15.8	8/23/2006		0.003
Pond Fork	WVKC-10-U	15.8	9/20/2006		0.002
Pond Fork	WVKC-10-U	15.8	10/17/2006		0.002
Pond Fork	WVKC-10-U	15.8	4/25/2007		0.005
White Oak Creek	WVKC-35	2.7	11/15/2005		0.016
White Oak Creek	WVKC-35	2.7	12/13/2005		0.016
White Oak Creek	WVKC-35	2.7	1/4/2006		0.008
White Oak Creek	WVKC-35	2.7	2/8/2006		0.019
White Oak Creek	WVKC-35	2.7	2/8/2006		0.0177
White Oak Creek	WVKC-35	2.7	3/15/2006		0.013
White Oak Creek	WVKC-35	2.7	4/12/2006		0.008
White Oak Creek	WVKC-35	2.7	5/2/2006		0.014
White Oak Creek	WVKC-35	2.7	6/12/2006		0.019
White Oak Creek	WVKC-35	2.7	7/12/2006		0.024
White Oak Creek	WVKC-35	2.7	8/23/2006		0.017
White Oak Creek	WVKC-35	2.7	9/18/2006		0.014
White Oak Creek	WVKC-35	2.7	8/28/2006		0.0136
White Oak Creek	WVKC-35	2.7	10/16/2006		0.01
White Oak Creek	WVKC-35	2.7	4/26/2007		0.027
Seng Creek	WVKC-42	2.5	11/15/2005		0.04

Waterbody Name	Code	Mile	Date	Q	Total Se (mg/L)
Seng Creek	WVKC-42	2.5	12/13/2005		0.042
Seng Creek	WVKC-42	2.5	1/4/2006		0.023
Seng Creek	WVKC-42	2.5	2/8/2006		0.031
Seng Creek	WVKC-42	2.5	3/13/2006		0.026
Seng Creek	WVKC-42	2.5	4/13/2006		0.015
Seng Creek	WVKC-42	2.5	4/13/2006		0.015
Seng Creek	WVKC-42	2.5	5/2/2006		0.023
Seng Creek	WVKC-42	2.5	6/13/2006		0.025
Seng Creek	WVKC-42	2.5	7/12/2006		0.041
Seng Creek	WVKC-42	2.5	8/24/2006		0.03
Seng Creek	WVKC-42	2.5	9/19/2006		0.028
Seng Creek	WVKC-42	2.5	8/28/2006		0.0219
Seng Creek	WVKC-42	2.5	10/17/2006		0.023
Seng Creek	WVKC-42	2.5	4/19/2007		0.024
Sycamore Creek	WVKC-47-E	1.6	11/14/2005	<	0.001
Sycamore Creek	WVKC-47-E	1.6	12/13/2005	<	0.001
Sycamore Creek	WVKC-47-E	1.6	1/4/2006	<	0.001
Sycamore Creek	WVKC-47-E	1.6	2/8/2006		0.001
Sycamore Creek	WVKC-47-E	1.6	3/13/2006	<	0.001
Sycamore Creek	WVKC-47-E	1.6	4/12/2006	<	0.001
Sycamore Creek	WVKC-47-E	1.6	5/2/2006	<	0.001
Sycamore Creek	WVKC-47-E	1.6	6/12/2006	<	0.001
Sycamore Creek	WVKC-47-E	1.6	7/12/2006	<	0.001
Sycamore Creek	WVKC-47-E	1.6	8/23/2006	<	0.001
Sycamore Creek	WVKC-47-E	1.6	9/19/2006	<	0.001
Sycamore Creek	WVKC-47-E	1.6	8/28/2006		0.000123
Sycamore Creek	WVKC-47-E	1.6	10/17/2006	<	0.001
Sycamore Creek	WVKC-47-E	1.6	4/19/2007	<	0.001
Upper Mud River Reservoir	WVOGM-(L1)		11/3/2005		0.006
Upper Mud River Reservoir	WVOGM-(L1)		1/12/2006		0.004
Upper Mud River Reservoir	WVOGM-(L1)		1/12/2006		0.005
Upper Mud River Reservoir	WVOGM-(L1)		1/12/2006		0.004
Upper Mud River Reservoir	WVOGM-(L1)		1/12/2006		0.004
Upper Mud River Reservoir	WVOGM-(L1)		1/12/2006		0.003
Upper Mud River Reservoir	WVOGM-(L1)		1/12/2006		0.002
Upper Mud River Reservoir	WVOGM-(L1)		2/27/2006		0.003
Upper Mud River Reservoir	WVOGM-(L1)		2/27/2006		0.005
Upper Mud River Reservoir	WVOGM-(L1)		2/27/2006		0.003
Upper Mud River Reservoir	WVOGM-(L1)		4/4/2006		0.003
Upper Mud River Reservoir	WVOGM-(L1)		4/4/2006		0.0036
Upper Mud River Reservoir	WVOGM-(L1)		4/4/2006		0.002
Upper Mud River Reservoir	WVOGM-(L1)		4/17/2006		0.002
Upper Mud River Reservoir	WVOGM-(L1)		4/17/2006		0.002
Upper Mud River Reservoir	WVOGM-(L1)		4/17/2006		0.001
Upper Mud River Reservoir	WVOGM-(L1)		5/24/2006		0.002
Upper Mud River Reservoir	WVOGM-(L1)		5/24/2006		0.004
Upper Mud River Reservoir	WVOGM-(L1)		5/24/2006		0.001

Waterbody Name	Code	Mile	Date	Q	Total Se (mg/L)
Upper Mud River Reservoir	WVOGM-(L1)		6/22/2006		0.003
Upper Mud River Reservoir	WVOGM-(L1)		6/22/2006		0.004
Upper Mud River Reservoir	WVOGM-(L1)		6/22/2006		0.002
Upper Mud River Reservoir	WVOGM-(L1)		8/17/2006		0.006
Upper Mud River Reservoir	WVOGM-(L1)		8/17/2006		0.002
Upper Mud River Reservoir	WVOGM-(L1)		9/27/2006		0.005
Upper Mud River Reservoir	WVOGM-(L1)		9/27/2006		0.005
Upper Mud River Reservoir	WVOGM-(L1)		9/27/2006		0.004
Upper Mud River Reservoir	WVOGM-(L1)		11/28/2006		0.004
Upper Mud River Reservoir	WVOGM-(L1)		11/28/2006		0.004
Upper Mud River Reservoir	WVOGM-(L1)		11/28/2006		0.002
Upper Mud River Reservoir	WVOGM-(L1)		12/21/2006		0.004
Upper Mud River Reservoir	WVOGM-(L1)		5/11/2007		0.006
Upper Mud River Reservoir	WVOGM-(L1)		5/11/2007		0.007
Upper Mud River Reservoir	WVOGM-(L1)		5/16/2007		0.003
Hughes Fork	WVKG-5-B-4	0.0	11/9/2005		0.004
Hughes Fork	WVKG-5-B-4	0.0	12/19/2005		0.0046
Hughes Fork	WVKG-5-B-4	0.0	1/19/2006		0.004
Hughes Fork	WVKG-5-B-4	0.0	2/9/2006		0.0096
Hughes Fork	WVKG-5-B-4	0.0	3/13/2006		0.009
Hughes Fork	WVKG-5-B-4	0.0	4/18/2006		0.0032
Hughes Fork	WVKG-5-B-4	0.0	5/2/2006		0.008
Hughes Fork	WVKG-5-B-4	0.0	6/12/2006		0.002
Hughes Fork	WVKG-5-B-4	0.0	8/21/2006		0.002
Hughes Fork	WVKG-5-B-4	0.0	8/29/2006		0.00245
Hughes Fork	WVKG-5-B-4	0.0	10/16/2006		0.005
Hughes Fork	WVKG-5-B-4	0.0	5/1/2007		0.01
Ash Fork	WVKG-5-H	0.0	11/9/2005	<	0.001
Ash Fork	WVKG-5-H	0.0	12/19/2005	<	0.001
Ash Fork	WVKG-5-H	0.0	1/4/2006	<	0.001
Ash Fork	WVKG-5-H	0.0	2/9/2006	<	0.001
Ash Fork	WVKG-5-H	0.0	3/13/2006	<	0.001
Ash Fork	WVKG-5-H	0.0	3/13/2006	<	0.001
Ash Fork	WVKG-5-H	0.0	4/3/2006	<	0.001
Ash Fork	WVKG-5-H	0.0	5/1/2006	<	0.001
Ash Fork	WVKG-5-H	0.0	6/12/2006	<	0.001
Ash Fork	WVKG-5-H	0.0	7/11/2006	<	0.001
Ash Fork	WVKG-5-H	0.0	8/21/2006	<	0.001
Ash Fork	WVKG-5-H	0.0	10/5/2006	<	0.001
Ash Fork	WVKG-5-H	0.0	10/5/2006	<	0.001
Ash Fork	WVKG-5-H	0.0	10/16/2006	<	0.001
Daugherty Run	WVMC-19	0.0	12/19/2005	<	0.001
Daugherty Run	WVMC-19	0.0	11/2/2005	<	0.001
Daugherty Run	WVMC-19	0.0	1/17/2006	<	0.001
Daugherty Run	WVMC-19	0.0	2/15/2006	<	0.001
Daugherty Run	WVMC-19	0.0	3/21/2006	<	0.001
Daugherty Run	WVMC-19	0.0	9/7/2006	<	0.001

Waterbody Name	Code	Mile	Date	Q	Total Se (mg/L)
East Lynn Lake	WVO-2-Q-(L1)		11/3/2005		0.001
East Lynn Lake	WVO-2-Q-(L1)		12/22/2005		0.001
East Lynn Lake	WVO-2-Q-(L1)		1/11/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		1/11/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		1/11/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		1/11/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		1/11/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		1/11/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		2/27/2006		0.001
East Lynn Lake	WVO-2-Q-(L1)		2/27/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		2/27/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		4/6/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		4/6/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		4/6/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		5/25/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		5/25/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		5/25/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		6/20/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		6/20/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		6/20/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		8/17/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		8/17/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		8/17/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		8/17/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		9/26/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		9/26/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		9/26/2006		0.001
East Lynn Lake	WVO-2-Q-(L1)		11/28/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		11/28/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		11/28/2006	<	0.001
East Lynn Lake	WVO-2-Q-(L1)		5/2/2007	<	0.001
Kiah Creek	WVO-2-Q-18	1.2	11/10/2005		0.002
Kiah Creek	WVO-2-Q-18	1.2	12/14/2005		0.002
Kiah Creek	WVO-2-Q-18	1.2	12/14/2005		0.002
Kiah Creek	WVO-2-Q-18	1.2	1/5/2006		0.001
Kiah Creek	WVO-2-Q-18	1.2	2/9/2006		0.003
Kiah Creek	WVO-2-Q-18	1.2	3/15/2006	<	0.001
Kiah Creek	WVO-2-Q-18	1.2	3/31/2006	<	0.001
Kiah Creek	WVO-2-Q-18	1.2	5/3/2006		0.001
Kiah Creek	WVO-2-Q-18	1.2	6/13/2006		0.001
Kiah Creek	WVO-2-Q-18	1.2	7/12/2006		0.002
Kiah Creek	WVO-2-Q-18	1.2	8/22/2006		0.001
Kiah Creek	WVO-2-Q-18	1.2	9/21/2006		0.001
Kiah Creek	WVO-2-Q-18	1.2	11/3/2006		0.002
Kiah Creek	WVO-2-Q-18	1.2	11/3/2006		0.002
Kiah Creek	WVO-2-Q-18	1.2	5/3/2007		0.002
Conner Run	WVO-77-A	0.2	11/8/2005		0.009

Waterbody Name	Code	Mile	Date	Q	Total Se (mg/L)
Conner Run	WVO-77-A	0.2	12/6/2005		0.004
Conner Run	WVO-77-A	0.2	1/24/2006		0.023
Conner Run	WVO-77-A	0.2	2/7/2006		0.027
Conner Run	WVO-77-A	0.2	3/7/2006		0.0615
Conner Run	WVO-77-A	0.2	4/10/2006		0.043
Conner Run	WVO-77-A	0.2	5/23/2006		0.061
Conner Run	WVO-77-A	0.2	6/14/2006		0.052
Conner Run	WVO-77-A	0.2	8/22/2006		0.09
Conner Run	WVO-77-A	0.2	8/22/2006		0.088
Conner Run	WVO-77-A	0.2	8/30/2006		0.079
Conner Run	WVO-77-A	0.2	8/30/2006		0.0603
Conner Run	WVO-77-A	0.2	10/25/2006		0.036
Conner Run	WVO-77-A	0.2	4/23/2007		0.035
Mud River	WVOGM	77.5	11/30/2005		0.0084
Mud River	WVOGM	77.5	12/13/2005		0.007
Mud River	WVOGM	77.5	1/5/2006		0.005
Mud River	WVOGM	77.5	1/5/2006		0.005
Mud River	WVOGM	77.5	2/8/2006		0.0087
Mud River	WVOGM	77.5	3/15/2006		0.004
Mud River	WVOGM	77.5	4/5/2006		0.005
Mud River	WVOGM	77.5	5/3/2006		0.007
Mud River	WVOGM	77.5	6/13/2006		0.005
Mud River	WVOGM	77.5	8/21/2006		0.008
Mud River	WVOGM	77.5	9/20/2006		0.014
Mud River	WVOGM	77.5	8/29/2006		0.00485
Mud River	WVOGM	77.5	11/3/2006		0.008
Mud River	WVOGM	77.5	6/6/2007		0.022
Mount Storm Lake	WVPNB-17-(L1)		11/1/2005		0.001
Mount Storm Lake	WVPNB-17-(L1)		12/20/2005		0.001
Mount Storm Lake	WVPNB-17-(L1)		1/24/2006		0.002
Mount Storm Lake	WVPNB-17-(L1)		1/24/2006		0.002
Mount Storm Lake	WVPNB-17-(L1)		1/24/2006		0.0015
Mount Storm Lake	WVPNB-17-(L1)		1/24/2006		0.0014
Mount Storm Lake	WVPNB-17-(L1)		2/15/2006		0.002
Mount Storm Lake	WVPNB-17-(L1)		2/15/2006		0.002
Mount Storm Lake	WVPNB-17-(L1)		2/15/2006		0.001
Mount Storm Lake	WVPNB-17-(L1)		2/15/2006		0.002
Mount Storm Lake	WVPNB-17-(L1)		4/11/2006	<	0.001
Mount Storm Lake	WVPNB-17-(L1)		4/11/2006		0.001
Mount Storm Lake	WVPNB-17-(L1)		4/11/2006		0.002
Mount Storm Lake	WVPNB-17-(L1)		5/23/2006		0.001
Mount Storm Lake	WVPNB-17-(L1)		5/23/2006		0.001
Mount Storm Lake	WVPNB-17-(L1)		5/23/2006	<	0.001
Mount Storm Lake	WVPNB-17-(L1)		6/19/2006	<	0.001
Mount Storm Lake	WVPNB-17-(L1)		6/19/2006	<	0.001
Mount Storm Lake	WVPNB-17-(L1)		6/19/2006	<	0.001

Waterbody Name	Code	Mile	Date	Q	Total Se (mg/L)
Mount Storm Lake	WVPNB-17-(L1)		8/15/2006		0.002
Mount Storm Lake	WVPNB-17-(L1)		8/15/2006		0.001
Mount Storm Lake	WVPNB-17-(L1)		9/6/2006		0.001
Mount Storm Lake	WVPNB-17-(L1)		9/6/2006		0.001
Mount Storm Lake	WVPNB-17-(L1)		9/6/2006		0.001
Mount Storm Lake	WVPNB-17-(L1)		11/29/2006	<	0.001
Mount Storm Lake	WVPNB-17-(L1)		11/29/2006	<	0.001
Mount Storm Lake	WVPNB-17-(L1)		11/29/2006	<	0.001
Mount Storm Lake	WVPNB-17-(L1)		4/24/2007	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		4/26/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		4/26/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		4/26/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		5/22/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		5/22/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		5/22/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		6/26/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		6/26/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		6/26/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		8/16/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		8/16/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		9/28/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		9/28/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		12/5/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		12/5/2006	<	0.001
Elk Fork Lake	WVO-32-M-(L1)		4/25/2007	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		4/25/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		4/25/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		4/25/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		5/24/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		5/24/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		5/24/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		6/22/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		6/22/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		6/22/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		8/15/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		8/15/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		9/27/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		9/27/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		9/27/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		12/11/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		12/11/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		12/11/2006	<	0.001
Plum Orchard Lake	WVK-65-Z-(L1)		5/9/2007	<	0.001
Little Scary Creek	WVK-31	0.1	4/18/2006		0.027
Little Scary Creek	WVK-31	0.1	5/4/2006		0.027
Little Scary Creek	WVK-31	0.1	6/20/2006		0.042
Little Scary Creek	WVK-31	0.1	8/22/2006		0.042

Waterbody Name	Code	Mile	Date	Q	Total Se (mg/L)
Little Scary Creek	WVK-31	0.1	9/20/2006		0.032
Little Scary Creek	WVK-31	0.1	8/29/2006		0.0326
Little Scary Creek	WVK-31	0.1	12/15/2006		0.026
Little Scary Creek	WVK-31	0.1	4/20/2007		0.023
Pinnacle Creek	WVOG-124	3.6	7/9/2007		0.003
Pinnacle Creek	WVOG-124	11.1	7/10/2007		0.002

Appendix B. Whole tissue selenium concentrations from fishes collected at study locations, including excluded data (see Excluded Data).

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Green Sunfish		11.2
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Green Sunfish		10.7
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Green Sunfish		7.7
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Green Sunfish		7.2
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Green Sunfish		12.8
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Creek Chub		13.8
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Creek Chub		17.2
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Creek Chub		11.4
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Creek Chub		12.6
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Creek Chub		11.4
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Stoneroller		3.3
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Stoneroller		22.8
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Stoneroller		6.6
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Stoneroller		8.0
Beech Creek	WVKC-10-T-15	11/20/2005	BioChem Testing	Stoneroller		3.8
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Green Sunfish		4.3
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Green Sunfish		8.0
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Green Sunfish		9.8
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Green Sunfish		51.7
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Green Sunfish		4.3
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Stoneroller		5.1
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Stoneroller		10.9
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Stoneroller		3.9
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Stoneroller		5.9
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Stoneroller		4.5
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Creek Chub		4.2
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Creek Chub		4.7
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Creek Chub		5.1
Beech Creek	WVKC-10-T-15	4/13/2006	WVU-NRCCE	Creek Chub		4.9
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Green Sunfish		4.7
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Green Sunfish		4.4
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Green Sunfish		4.7
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Green Sunfish		5.8
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Green Sunfish		3.5
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Stoneroller		2.8
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Stoneroller		2.5
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Stoneroller		2.2
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Stoneroller		2.2
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Stoneroller		2.1
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Creek Chub		5.0
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Creek Chub		5.6

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Creek Chub		7.4
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Creek Chub		3.3
Beech Creek	WVKC-10-T-15	9/20/2006	BioChem Testing	Creek Chub		6.0
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Stoneroller		4.6
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Green Sunfish		6.1
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Green Sunfish		6.1
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Stoneroller		3.4
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Green Sunfish		6.9
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Green Sunfish		5.6
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Green Sunfish		11.0
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Green Sunfish		12.2
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Creek Chub		12.6
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Stoneroller		6.1
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Creek Chub		8.1
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Stoneroller		4.4
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Creek Chub		7.3
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Green Sunfish		4.1
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Creek Chub		11.0
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Creek Chub		6.6
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Creek Chub		10.3
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Creek Chub		10.4
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Creek Chub		11.9
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Creek Chub		7.6
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Creek Chub		9.9
Beech Creek	WVKC-10-T-15	4/26/2007	BioChem Testing	Stoneroller		3.6
Pond Fork	WVKC-10-U	11/29/2005	BioChem Testing	Green Sunfish		3.5
Pond Fork	WVKC-10-U	11/29/2005	BioChem Testing	Green Sunfish		3.6
Pond Fork	WVKC-10-U	11/29/2005	BioChem Testing	Green Sunfish	<	1.0
Pond Fork	WVKC-10-U	11/29/2005	BioChem Testing	Green Sunfish		3.4
Pond Fork	WVKC-10-U	11/29/2005	BioChem Testing	Green Sunfish		7.7
Pond Fork	WVKC-10-U	11/29/2005	BioChem Testing	Stoneroller		3.9
Pond Fork	WVKC-10-U	11/29/2005	BioChem Testing	Stoneroller		3.8
Pond Fork	WVKC-10-U	11/29/2005	BioChem Testing	Stoneroller		3.6
Pond Fork	WVKC-10-U	11/29/2005	BioChem Testing	Stoneroller		3.6
Pond Fork	WVKC-10-U	4/13/2006	WVU-NRCCE	Green Sunfish		4.7
Pond Fork	WVKC-10-U	4/13/2006	WVU-NRCCE	Green Sunfish		5.6
Pond Fork	WVKC-10-U	4/13/2006	WVU-NRCCE	Green Sunfish		4.8
Pond Fork	WVKC-10-U	4/13/2006	WVU-NRCCE	Green Sunfish		10.0
Pond Fork	WVKC-10-U	4/13/2006	WVU-NRCCE	Green Sunfish		4.5
Pond Fork	WVKC-10-U	4/13/2006	WVU-NRCCE	Stoneroller		5.5
Pond Fork	WVKC-10-U	4/13/2006	WVU-NRCCE	Stoneroller		6.5
Pond Fork	WVKC-10-U	4/13/2006	WVU-NRCCE	Stoneroller		3.7
Pond Fork	WVKC-10-U	9/19/2006	BioChem Testing	Stoneroller		2.0
Pond Fork	WVKC-10-U	9/19/2006	BioChem Testing	Stoneroller		2.1

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Pond Fork	WVKC-10-U	9/19/2006	BioChem Testing	Stoneroller		1.5
Pond Fork	WVKC-10-U	9/19/2006	BioChem Testing	Stoneroller		2.1
Pond Fork	WVKC-10-U	9/19/2006	BioChem Testing	Stoneroller		2.3
Pond Fork	WVKC-10-U	9/19/2006	BioChem Testing	Green Sunfish		2.2
Pond Fork	WVKC-10-U	9/19/2006	BioChem Testing	Green Sunfish		1.9
Pond Fork	WVKC-10-U	9/19/2006	BioChem Testing	Green Sunfish		3.7
Pond Fork	WVKC-10-U	9/19/2006	BioChem Testing	Green Sunfish		3.2
Pond Fork	WVKC-10-U	9/19/2006	BioChem Testing	Green Sunfish		4.4
Pond Fork	WVKC-10-U	4/25/2007	BioChem Testing	Green Sunfish		9.8
Pond Fork	WVKC-10-U	4/25/2007	BioChem Testing	Green Sunfish		2.8
Pond Fork	WVKC-10-U	4/25/2007	BioChem Testing	Green Sunfish		4.8
Pond Fork	WVKC-10-U	4/25/2007	BioChem Testing	Green Sunfish		4.7
Pond Fork	WVKC-10-U	4/25/2007	BioChem Testing	Green Sunfish		3.2
Pond Fork	WVKC-10-U	4/25/2007	BioChem Testing	Green Sunfish		4.1
Pond Fork	WVKC-10-U	4/25/2007	BioChem Testing	Green Sunfish		4.7
Pond Fork	WVKC-10-U	4/25/2007	BioChem Testing	Green Sunfish		3.4
Pond Fork	WVKC-10-U	4/25/2007	BioChem Testing	Green Sunfish		5.1
Pond Fork	WVKC-10-U	4/25/2007	BioChem Testing	Green Sunfish		3.4
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Bluegill	<	1.0
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Green Sunfish	<	1.0
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Green Sunfish		4.3
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Green Sunfish		3.9
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Green Sunfish		8.2
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Green Sunfish		8.6
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Creek Chub	<	1.0
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Creek Chub	<	1.0
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Creek Chub	<	1.0
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Creek Chub		4.2
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Creek Chub		9.4
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Stoneroller		12.8

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Stoneroller		7.2
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Stoneroller		8.6
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Stoneroller		11.8
White Oak Creek	WVKC-35	11/15/2005	BioChem Testing	Stoneroller		7.6
White Oak Creek	WVKC-35	4/12/2006	WVU-NRCCE	Green Sunfish		22.8
White Oak Creek	WVKC-35	4/12/2006	WVU-NRCCE	Green Sunfish		17.2
White Oak Creek	WVKC-35	4/12/2006	WVU-NRCCE	Green Sunfish		10.5
White Oak Creek	WVKC-35	4/12/2006	WVU-NRCCE	Green Sunfish		27.0
White Oak Creek	WVKC-35	4/12/2006	WVU-NRCCE	Green Sunfish		21.8
White Oak Creek	WVKC-35	4/12/2006	WVU-NRCCE	Stoneroller		4.8
White Oak Creek	WVKC-35	4/12/2006	WVU-NRCCE	Stoneroller		6.1
White Oak Creek	WVKC-35	4/12/2006	WVU-NRCCE	Stoneroller		5.0
White Oak Creek	WVKC-35	4/12/2006	WVU-NRCCE	Stoneroller		6.6
White Oak Creek	WVKC-35	4/12/2006	WVU-NRCCE	Stoneroller		19.9
White Oak Creek	WVKC-35	4/12/2006	WVU-NRCCE	Creek Chub		34.4
White Oak Creek	WVKC-35	4/12/2006	WVU-NRCCE	Creek Chub		24.0
White Oak Creek	WVKC-35	9/18/2006	BioChem Testing	Green Sunfish		3.2
White Oak Creek	WVKC-35	9/18/2006	BioChem Testing	Green Sunfish		10.0
White Oak Creek	WVKC-35	9/18/2006	BioChem Testing	Green Sunfish		23.7
White Oak Creek	WVKC-35	9/18/2006	BioChem Testing	Green Sunfish		11.8
White Oak Creek	WVKC-35	9/18/2006	BioChem Testing	Green Sunfish		7.2

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
White Oak Creek	WVKC-35	9/18/2006	BioChem Testing	Creek Chub		3.6
White Oak Creek	WVKC-35	9/18/2006	BioChem Testing	Creek Chub		2.8
White Oak Creek	WVKC-35	9/18/2006	BioChem Testing	Stoneroller		5.0
White Oak Creek	WVKC-35	9/18/2006	BioChem Testing	Stoneroller		4.2
White Oak Creek	WVKC-35	9/18/2006	BioChem Testing	Stoneroller		2.5
White Oak Creek	WVKC-35	9/18/2006	BioChem Testing	Stoneroller		3.9
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Creek Chub		4.2
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Green Sunfish		6.2
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Green Sunfish		6.5
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Green Sunfish		11.4
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Green Sunfish		4.7
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Green Sunfish		5.7
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Creek Chub		12.8
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Green Sunfish		7.3
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Green Sunfish		10.9
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Creek Chub		10.9
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Creek Chub		10.8
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Creek Chub		9.8
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Green Sunfish		3.7
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Green Sunfish		4.3
White Oak Creek	WVKC-35	4/26/2007	BioChem Testing	Green Sunfish		6.1
Seng Creek	WVKC-42	11/15/2005	BioChem Testing	Creek Chub		7.2

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Seng Creek	WVKC-42	11/15/2005	BioChem Testing	Creek Chub		8.4
Seng Creek	WVKC-42	11/15/2005	BioChem Testing	Creek Chub		8.1
Seng Creek	WVKC-42	11/15/2005	BioChem Testing	Creek Chub		11.9
Seng Creek	WVKC-42	11/15/2005	BioChem Testing	Creek Chub		7.5
Seng Creek	WVKC-42	4/13/2006	WVU-NRCCE	Creek Chub		28.2
Seng Creek	WVKC-42	4/13/2006	WVU-NRCCE	Creek Chub		14.8
Seng Creek	WVKC-42	4/13/2006	WVU-NRCCE	Creek Chub		4.7
Seng Creek	WVKC-42	4/13/2006	WVU-NRCCE	Creek Chub		36.3
Seng Creek	WVKC-42	4/13/2006	WVU-NRCCE	Creek Chub		17.6
Seng Creek	WVKC-42	9/19/2006	BioChem Testing	Creek Chub		9.1
Seng Creek	WVKC-42	9/19/2006	BioChem Testing	Creek Chub		14.2
Seng Creek	WVKC-42	9/19/2006	BioChem Testing	Creek Chub		7.7
Seng Creek	WVKC-42	9/19/2006	BioChem Testing	Creek Chub		4.9
Seng Creek	WVKC-42	9/19/2006	BioChem Testing	Creek Chub		14.7
Seng Creek	WVKC-42	4/19/2007	BioChem Testing	Creek Chub		5.7
Seng Creek	WVKC-42	4/19/2007	BioChem Testing	Creek Chub		4.8
Seng Creek	WVKC-42	4/19/2007	BioChem Testing	Creek Chub		7.2
Seng Creek	WVKC-42	4/19/2007	BioChem Testing	Creek Chub		5.7
Seng Creek	WVKC-42	4/19/2007	BioChem Testing	Creek Chub		5.2
Sycamore Creek	WVKC-47-E	11/14/2005	BioChem Testing	Creek Chub	<	1.0
Sycamore Creek	WVKC-47-E	11/14/2005	BioChem Testing	Creek Chub	<	1.0
Sycamore Creek	WVKC-47-E	11/14/2005	BioChem Testing	Creek Chub	<	1.0
Sycamore Creek	WVKC-47-E	11/14/2005	BioChem Testing	Creek Chub	<	1.0
Sycamore Creek	WVKC-47-E	11/14/2005	BioChem Testing	Creek Chub	<	1.0
Sycamore Creek	WVKC-47-E	11/14/2005	BioChem Testing	Stoneroller	<	1.0
Sycamore Creek	WVKC-47-E	11/14/2005	BioChem Testing	Stoneroller	<	1.0
Sycamore Creek	WVKC-47-E	11/14/2005	BioChem Testing	Stoneroller	<	1.0
Sycamore Creek	WVKC-47-E	11/14/2005	BioChem Testing	Stoneroller	<	1.0
Sycamore Creek	WVKC-47-E	11/14/2005	BioChem Testing	Stoneroller	<	1.0
Sycamore Creek	WVKC-47-E	4/12/2006	WVU-NRCCE	Creek Chub		9.9
Sycamore Creek	WVKC-47-E	4/12/2006	WVU-NRCCE	Creek Chub		10.7
Sycamore Creek	WVKC-47-E	4/12/2006	WVU-NRCCE	Creek Chub		11.1

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Sycamore Creek	WVKC-47-E	4/12/2006	WVU-NRCCE	Creek Chub		5.9
Sycamore Creek	WVKC-47-E	4/12/2006	WVU-NRCCE	Creek Chub		4.8
Sycamore Creek	WVKC-47-E	9/19/2006	BioChem Testing	Creek Chub		2.5
Sycamore Creek	WVKC-47-E	9/19/2006	BioChem Testing	Creek Chub		1.8
Sycamore Creek	WVKC-47-E	9/19/2006	BioChem Testing	Creek Chub		1.7
Sycamore Creek	WVKC-47-E	9/19/2006	BioChem Testing	Creek Chub		1.7
Sycamore Creek	WVKC-47-E	9/19/2006	BioChem Testing	Creek Chub		2.7
Sycamore Creek	WVKC-47-E	9/19/2006	BioChem Testing	Stoneroller		0.7
Sycamore Creek	WVKC-47-E	9/19/2006	BioChem Testing	Stoneroller		1.9
Sycamore Creek	WVKC-47-E	9/19/2006	BioChem Testing	Stoneroller		2.1
Sycamore Creek	WVKC-47-E	4/19/2007	BioChem Testing	Creek Chub		10.7
Sycamore Creek	WVKC-47-E	4/19/2007	BioChem Testing	Creek Chub		11.8
Sycamore Creek	WVKC-47-E	4/19/2007	BioChem Testing	Creek Chub		11.5
Sycamore Creek	WVKC-47-E	4/19/2007	BioChem Testing	Creek Chub		10.2
Sycamore Creek	WVKC-47-E	4/19/2007	BioChem Testing	Creek Chub		22.7
Upper Mud River Reservoir	WVOGM-(L1)	11/3/2005	BioChem Testing	Bluegill		32.0
Upper Mud River Reservoir	WVOGM-(L1)	11/3/2005	BioChem Testing	Bluegill		27.0
Upper Mud River Reservoir	WVOGM-(L1)	11/3/2005	BioChem Testing	Bluegill		27.0
Upper Mud River Reservoir	WVOGM-(L1)	11/3/2005	BioChem Testing	Bluegill		60.0
Upper Mud River Reservoir	WVOGM-(L1)	11/3/2005	BioChem Testing	Bluegill		41.0

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Upper Mud River Reservoir	WVOGM-(L1)	11/3/2005	BioChem Testing	Green Sunfish		22.0
Upper Mud River Reservoir	WVOGM-(L1)	11/3/2005	BioChem Testing	Green Sunfish		30.0
Upper Mud River Reservoir	WVOGM-(L1)	11/3/2005	BioChem Testing	Green Sunfish		27.0
Upper Mud River Reservoir	WVOGM-(L1)	11/3/2005	BioChem Testing	Green Sunfish		26.0
Upper Mud River Reservoir	WVOGM-(L1)	11/3/2005	BioChem Testing	Green Sunfish		47.0
Upper Mud River Reservoir	WVOGM-(L1)	4/4/2006	WVU-NRCCE	Green Sunfish		23.2
Upper Mud River Reservoir	WVOGM-(L1)	4/4/2006	WVU-NRCCE	Green Sunfish		27.5
Upper Mud River Reservoir	WVOGM-(L1)	4/4/2006	WVU-NRCCE	Green Sunfish		16.9
Upper Mud River Reservoir	WVOGM-(L1)	4/4/2006	WVU-NRCCE	Green Sunfish		26.7
Upper Mud River Reservoir	WVOGM-(L1)	4/4/2006	WVU-NRCCE	Green Sunfish		31.6
Upper Mud River Reservoir	WVOGM-(L1)	9/27/2006	BioChem Testing	Green Sunfish		8.1
Upper Mud River Reservoir	WVOGM-(L1)	9/27/2006	BioChem Testing	Green Sunfish		7.6
Upper Mud River Reservoir	WVOGM-(L1)	9/27/2006	BioChem Testing	Green Sunfish		24.4
Upper Mud River Reservoir	WVOGM-(L1)	9/27/2006	BioChem Testing	Green Sunfish		23.3
Upper Mud River Reservoir	WVOGM-(L1)	9/27/2006	BioChem Testing	Green Sunfish		6.2
Upper Mud River Reservoir	WVOGM-(L1)	9/27/2006	BioChem Testing	Bluegill		38.0

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Upper Mud River Reservoir	WVOGM-(L1)	9/27/2006	BioChem Testing	Bluegill		24.5
Upper Mud River Reservoir	WVOGM-(L1)	9/27/2006	BioChem Testing	Bluegill		23.3
Upper Mud River Reservoir	WVOGM-(L1)	9/27/2006	BioChem Testing	Bluegill		16.4
Upper Mud River Reservoir	WVOGM-(L1)	9/27/2006	BioChem Testing	Bluegill		9.8
Upper Mud River Reservoir	WVOGM-(L1)	12/21/2006	BioChem Testing	Bluegill		50.9
Upper Mud River Reservoir	WVOGM-(L1)	12/21/2006	BioChem Testing	Bluegill		60.1
Upper Mud River Reservoir	WVOGM-(L1)	12/21/2006	BioChem Testing	Bluegill		41.7
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	BioChem Testing	Green Sunfish		9.5
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	BioChem Testing	Bluegill		14.9
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	BioChem Testing	Bluegill		22.7
Upper Mud River Reservoir	WVOGM-(L1)	5/17/2007	BioChem Testing	Largemouth Bass		23.7
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	BioChem Testing	Crappie		20.5
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	BioChem Testing	Green Sunfish		21.4
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	BioChem Testing	Green Sunfish		31.7
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	BioChem Testing	Green Sunfish		22.0
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	BioChem Testing	Green Sunfish		39.6

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	REIC	Bluegill		13.3
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	BioChem Testing	Green Sunfish		22.9
Upper Mud River Reservoir	WVOGM-(L1)	5/17/2007	BioChem Testing	Largemouth Bass		21.0
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	REIC	Bluegill		13.9
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	BioChem Testing	Bluegill		37.5
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	BioChem Testing	Bluegill		18.1
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	BioChem Testing	Bluegill		34.9
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	REIC	Bluegill		3.9
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	BioChem Testing	Bluegill		32.2
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	REIC	Green Sunfish		16.0
Upper Mud River Reservoir	WVOGM-(L1)	5/11/2007	REIC	Bluegill		9.0
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	BioChem Testing	Green Sunfish		19.9
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	BioChem Testing	Green Sunfish		12.9
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	REIC	Green Sunfish		12.7
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	BioChem Testing	Green Sunfish		14.6
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	BioChem Testing	Bluegill		19.8

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	BioChem Testing	Bluegill		18.1
Upper Mud River Reservoir	WVOGM-(L1)	5/17/2007	BioChem Testing	Largemouth Bass		29.3
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	BioChem Testing	Bluegill		17.8
Upper Mud River Reservoir	WVOGM-(L1)	5/17/2007	BioChem Testing	Largemouth Bass		27.0
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	BioChem Testing	Bluegill		19.3
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	REIC	Bluegill		11.0
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	BioChem Testing	Bluegill		11.2
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	BioChem Testing	Bluegill		8.9
Upper Mud River Reservoir	WVOGM-(L1)	5/17/2007	BioChem Testing	Bluegill		27.1
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	BioChem Testing	Green Sunfish		3.2
Upper Mud River Reservoir	WVOGM-(L1)	5/16/2007	BioChem Testing	Green Sunfish		8.7
Hughes Fork	WVKG-5-B-4	11/9/2005	BioChem Testing	Creek Chub		4.1
Hughes Fork	WVKG-5-B-4	11/9/2005	BioChem Testing	Creek Chub		7.2
Hughes Fork	WVKG-5-B-4	11/9/2005	BioChem Testing	Creek Chub		7.7
Hughes Fork	WVKG-5-B-4	11/9/2005	BioChem Testing	Creek Chub		10.9
Hughes Fork	WVKG-5-B-4	11/9/2005	BioChem Testing	Creek Chub		8.9
Hughes Fork	WVKG-5-B-4	11/9/2005	BioChem Testing	Stoneroller	<	1.0
Hughes Fork	WVKG-5-B-4	11/9/2005	BioChem Testing	Stoneroller		34.5
Hughes Fork	WVKG-5-B-4	11/9/2005	BioChem Testing	Stoneroller		4.0
Hughes Fork	WVKG-5-B-4	11/9/2005	BioChem Testing	Stoneroller		14.9
Hughes Fork	WVKG-5-B-4	11/9/2005	BioChem Testing	Stoneroller		8.1
Hughes Fork	WVKG-5-B-4	4/18/2006	WVU-NRCCE	Bluegill		4.7
Hughes Fork	WVKG-5-B-4	4/18/2006	WVU-NRCCE	Creek Chub		5.6
Hughes Fork	WVKG-5-B-4	4/18/2006	WVU-NRCCE	Creek Chub		5.3
Hughes Fork	WVKG-5-B-4	4/18/2006	WVU-NRCCE	Creek Chub		4.3
Hughes Fork	WVKG-5-B-4	4/18/2006	WVU-NRCCE	Creek Chub		4.5

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Hughes Fork	WVKG-5-B-4	4/18/2006	WVU-NRCCE	Creek Chub		4.9
Hughes Fork	WVKG-5-B-4	4/18/2006	WVU-NRCCE	Stoneroller		10.2
Hughes Fork	WVKG-5-B-4	4/18/2006	WVU-NRCCE	Stoneroller		3.7
Hughes Fork	WVKG-5-B-4	4/18/2006	WVU-NRCCE	Stoneroller		3.7
Hughes Fork	WVKG-5-B-4	4/18/2006	WVU-NRCCE	Stoneroller		4.2
Hughes Fork	WVKG-5-B-4	10/16/2006	BioChem Testing	Stoneroller		5.6
Hughes Fork	WVKG-5-B-4	10/16/2006	BioChem Testing	Stoneroller		6.3
Hughes Fork	WVKG-5-B-4	10/16/2006	BioChem Testing	Stoneroller		7.1
Hughes Fork	WVKG-5-B-4	10/16/2006	BioChem Testing	Stoneroller		7.3
Hughes Fork	WVKG-5-B-4	10/16/2006	BioChem Testing	Stoneroller		5.8
Hughes Fork	WVKG-5-B-4	10/16/2006	BioChem Testing	Creek Chub		4.3
Hughes Fork	WVKG-5-B-4	10/16/2006	BioChem Testing	Creek Chub		5.7
Hughes Fork	WVKG-5-B-4	10/16/2006	BioChem Testing	Creek Chub		6.0
Hughes Fork	WVKG-5-B-4	10/16/2006	BioChem Testing	Creek Chub		4.4
Hughes Fork	WVKG-5-B-4	10/16/2006	BioChem Testing	Creek Chub		6.4
Hughes Fork	WVKG-5-B-4	5/1/2007	BioChem Testing	Creek Chub		6.1
Hughes Fork	WVKG-5-B-4	5/1/2007	BioChem Testing	Creek Chub		9.1
Hughes Fork	WVKG-5-B-4	5/1/2007	BioChem Testing	Creek Chub		2.7
Hughes Fork	WVKG-5-B-4	5/1/2007	BioChem Testing	Creek Chub		6.6
Hughes Fork	WVKG-5-B-4	5/1/2007	BioChem Testing	Creek Chub		7.4
Hughes Fork	WVKG-5-B-4	5/1/2007	BioChem Testing	Creek Chub		12.9
Hughes Fork	WVKG-5-B-4	5/1/2007	BioChem Testing	Creek Chub		11.5
Hughes Fork	WVKG-5-B-4	5/1/2007	BioChem Testing	Creek Chub		7.5
Hughes Fork	WVKG-5-B-4	5/1/2007	BioChem Testing	Creek Chub		6.9
Ash Fork	WVKG-5-H	11/9/2005	BioChem Testing	Stoneroller	<	1.0
Ash Fork	WVKG-5-H	11/9/2005	BioChem Testing	Stoneroller		3.2
Ash Fork	WVKG-5-H	11/9/2005	BioChem Testing	Stoneroller	<	1.0
Ash Fork	WVKG-5-H	11/9/2005	BioChem Testing	Stoneroller		3.3
Ash Fork	WVKG-5-H	11/9/2005	BioChem Testing	Stoneroller		3.4
Ash Fork	WVKG-5-H	11/9/2005	BioChem Testing	Creek Chub	<	1.0
Ash Fork	WVKG-5-H	11/9/2005	BioChem Testing	Creek Chub	<	1.0
Ash Fork	WVKG-5-H	11/9/2005	BioChem Testing	Creek Chub	<	1.0
Ash Fork	WVKG-5-H	11/9/2005	BioChem Testing	Creek Chub	<	1.0
Ash Fork	WVKG-5-H	11/9/2005	BioChem Testing	Creek Chub	<	1.0
Ash Fork	WVKG-5-H	4/3/2006	WVU-NRCCE	Creek Chub		13.9
Ash Fork	WVKG-5-H	4/3/2006	WVU-NRCCE	Creek Chub		10.2
Ash Fork	WVKG-5-H	4/3/2006	WVU-NRCCE	Creek Chub		7.3
Ash Fork	WVKG-5-H	4/3/2006	WVU-NRCCE	Creek Chub		4.4
Ash Fork	WVKG-5-H	4/3/2006	WVU-NRCCE	Creek Chub		4.2
Ash Fork	WVKG-5-H	4/3/2006	WVU-NRCCE	Stoneroller		10.2
Ash Fork	WVKG-5-H	4/3/2006	WVU-NRCCE	Stoneroller		15.9
Ash Fork	WVKG-5-H	4/3/2006	WVU-NRCCE	Stoneroller		5.4
Ash Fork	WVKG-5-H	4/3/2006	WVU-NRCCE	Stoneroller		5.1
Ash Fork	WVKG-5-H	10/5/2006	BioChem Testing	Creek Chub		2.1

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Ash Fork	WVKG-5-H	10/5/2006	BioChem Testing	Creek Chub		4.6
Ash Fork	WVKG-5-H	10/5/2006	BioChem Testing	Creek Chub		3.0
Ash Fork	WVKG-5-H	10/5/2006	BioChem Testing	Creek Chub		2.8
Ash Fork	WVKG-5-H	10/5/2006	BioChem Testing	Creek Chub		4.5
Ash Fork	WVKG-5-H	10/5/2006	BioChem Testing	Stoneroller		3.0
Ash Fork	WVKG-5-H	10/5/2006	BioChem Testing	Stoneroller		4.9
Ash Fork	WVKG-5-H	10/5/2006	BioChem Testing	Stoneroller		2.5
Ash Fork	WVKG-5-H	10/5/2006	BioChem Testing	Stoneroller		6.0
Ash Fork	WVKG-5-H	5/1/2007	BioChem Testing	Creek Chub		1.7
Ash Fork	WVKG-5-H	5/1/2007	BioChem Testing	Creek Chub		2.3
Ash Fork	WVKG-5-H	5/1/2007	BioChem Testing	Creek Chub		2.5
Ash Fork	WVKG-5-H	5/1/2007	BioChem Testing	Creek Chub		2.2
Ash Fork	WVKG-5-H	5/1/2007	BioChem Testing	Creek Chub		2.5
Ash Fork	WVKG-5-H	5/1/2007	BioChem Testing	Creek Chub		1.7
Ash Fork	WVKG-5-H	5/1/2007	BioChem Testing	Creek Chub		2.6
Ash Fork	WVKG-5-H	5/1/2007	BioChem Testing	Creek Chub		2.3
Ash Fork	WVKG-5-H	5/1/2007	BioChem Testing	Creek Chub		1.8
Daugherty Run	WVMC-19	11/2/2005	BioChem Testing	Rock Bass	<	1.0
Daugherty Run	WVMC-19	11/2/2005	BioChem Testing	Rock Bass	<	1.0
Daugherty Run	WVMC-19	11/2/2005	BioChem Testing	Green Sunfish	<	1.0
Daugherty Run	WVMC-19	11/2/2005	BioChem Testing	Green Sunfish	<	1.0
Daugherty Run	WVMC-19	11/2/2005	BioChem Testing	Green Sunfish		4.0
Daugherty Run	WVMC-19	11/2/2005	BioChem Testing	Creek Chub	<	1.0
Daugherty Run	WVMC-19	11/2/2005	BioChem Testing	Creek Chub	<	1.0
Daugherty Run	WVMC-19	11/2/2005	BioChem Testing	Creek Chub	<	1.0
Daugherty Run	WVMC-19	3/21/2006	WVU-NRCCE	Brook Trout	<	5.3
Daugherty Run	WVMC-19	3/21/2006	WVU-NRCCE	Brook Trout		6.1
Daugherty Run	WVMC-19	3/21/2006	WVU-NRCCE	Brook Trout		16.3
Daugherty Run	WVMC-19	3/21/2006	WVU-NRCCE	Brook Trout		12.0
Daugherty Run	WVMC-19	3/21/2006	WVU-NRCCE	Brook Trout	<	5.5
Daugherty Run	WVMC-19	9/7/2006	BioChem Testing	Brook Trout		0.8
Daugherty Run	WVMC-19	9/7/2006	BioChem Testing	Brook Trout		1.6
Daugherty Run	WVMC-19	9/7/2006	BioChem Testing	Rock Bass		1.1
Daugherty Run	WVMC-19	9/7/2006	BioChem Testing	Green Sunfish		1.8
Daugherty Run	WVMC-19	9/7/2006	BioChem Testing	Stoneroller		3.0
East Lynn Lake	WVO-2-Q-(L1)	11/3/2005	BioChem Testing	Hybrid Sunfish	<	1.0
East Lynn Lake	WVO-2-Q-(L1)	11/3/2005	BioChem Testing	Hybrid Sunfish	<	1.0
East Lynn Lake	WVO-2-Q-(L1)	11/3/2005	BioChem Testing	Hybrid Sunfish	<	1.0
East Lynn Lake	WVO-2-Q-(L1)	11/3/2005	BioChem Testing	Hybrid Sunfish	<	1.0
East Lynn Lake	WVO-2-Q-(L1)	11/3/2005	BioChem Testing	Hybrid Sunfish		4.0
East Lynn Lake	WVO-2-Q-(L1)	11/3/2005	BioChem Testing	Bluegill		9.0
East Lynn Lake	WVO-2-Q-(L1)	11/3/2005	BioChem Testing	Bluegill		4.0
East Lynn Lake	WVO-2-Q-(L1)	11/3/2005	BioChem Testing	Bluegill		4.0
East Lynn Lake	WVO-2-Q-(L1)	11/3/2005	BioChem Testing	Bluegill		4.0

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
East Lynn Lake	WVO-2-Q-(L1)	11/3/2005	BioChem Testing	Bluegill	<	1.0
East Lynn Lake	WVO-2-Q-(L1)-LC	9/26/2006	BioChem Testing	Green Sunfish		3.3
East Lynn Lake	WVO-2-Q-(L1)-LC	9/26/2006	BioChem Testing	Green Sunfish		3.5
East Lynn Lake	WVO-2-Q-(L1)-LC	9/26/2006	BioChem Testing	Green Sunfish		4.7
East Lynn Lake	WVO-2-Q-(L1)-LC	9/26/2006	BioChem Testing	Green Sunfish		4.3
East Lynn Lake	WVO-2-Q-(L1)-LC	9/26/2006	BioChem Testing	Bluegill		2.8
East Lynn Lake	WVO-2-Q-(L1)-LC	9/26/2006	BioChem Testing	Bluegill		2.0
East Lynn Lake	WVO-2-Q-(L1)-LC	9/26/2006	BioChem Testing	Bluegill		2.8
East Lynn Lake	WVO-2-Q-(L1)-LC	9/26/2006	BioChem Testing	Bluegill		2.6
East Lynn Lake	WVO-2-Q-(L1)-LC	9/26/2006	BioChem Testing	Bluegill		2.2
East Lynn Lake	WVO-2-Q-(L1)-EF	9/26/2006	BioChem Testing	Bluegill		6.1
East Lynn Lake	WVO-2-Q-(L1)-EF	9/26/2006	BioChem Testing	Bluegill		2.6
East Lynn Lake	WVO-2-Q-(L1)-EF	9/26/2006	BioChem Testing	Bluegill		3.9
East Lynn Lake	WVO-2-Q-(L1)-EF	9/26/2006	BioChem Testing	Bluegill		5.2
East Lynn Lake	WVO-2-Q-(L1)-EF	9/26/2006	BioChem Testing	Bluegill		3.6
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		1.9
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		3.0
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		3.6
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		3.6
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		3.1
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		0.8
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		2.0
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Green Sunfish		2.5
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		2.0
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Green Sunfish		2.6
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		4.0
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		3.7
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		1.3
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		2.3
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		2.0
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		2.1
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		2.5
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		2.2
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		3.4
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Green Sunfish		2.7
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Green Sunfish		3.7
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		3.9
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Bluegill		2.1
East Lynn Lake	WVO-2-Q-(L1)	5/2/2007	BioChem Testing	Green Sunfish		2.1
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Bluegill	<	1.0
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Bluegill	<	1.0
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Bluegill		4.0
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Bluegill		4.2
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Bluegill		4.1

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Creek Chub	<	1.0
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Creek Chub	<	1.0
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Creek Chub	<	1.0
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Creek Chub	<	1.0
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Creek Chub	<	1.0
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Stoneroller	<	1.0
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Stoneroller		4.1
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Stoneroller		3.8
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Stoneroller	<	1.0
Kiah Creek	WVO-2-Q-18	11/10/2005	BioChem Testing	Stoneroller	<	1.0
Kiah Creek	WVO-2-Q-18	3/31/2006	WVU-NRCCE	Green Sunfish		4.3
Kiah Creek	WVO-2-Q-18	3/31/2006	WVU-NRCCE	Green Sunfish		4.7
Kiah Creek	WVO-2-Q-18	3/31/2006	WVU-NRCCE	Green Sunfish		6.2
Kiah Creek	WVO-2-Q-18	3/31/2006	WVU-NRCCE	Creek Chub		5.0
Kiah Creek	WVO-2-Q-18	3/31/2006	WVU-NRCCE	Creek Chub		4.7
Kiah Creek	WVO-2-Q-18	3/31/2006	WVU-NRCCE	Creek Chub		4.9
Kiah Creek	WVO-2-Q-18	3/31/2006	WVU-NRCCE	Creek Chub		4.7
Kiah Creek	WVO-2-Q-18	3/31/2006	WVU-NRCCE	Stoneroller		3.9
Kiah Creek	WVO-2-Q-18	3/31/2006	WVU-NRCCE	Stoneroller		3.7
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Green Sunfish		3.1
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Green Sunfish		2.7
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Green Sunfish		3.0
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Green Sunfish		2.4
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Green Sunfish		2.7
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Bluegill		2.5
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Bluegill		2.5
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Bluegill		4.3
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Bluegill		1.7
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Bluegill		1.2
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Stoneroller		3.3
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Stoneroller		2.5
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Stoneroller		2.4
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Stoneroller		3.2
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Stoneroller		2.7
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Creek Chub		1.9
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Creek Chub		3.1
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Creek Chub		2.6
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Creek Chub		2.2
Kiah Creek	WVO-2-Q-18	9/21/2006	BioChem Testing	Creek Chub		2.3
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Bluegill		3.1
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Creek Chub		2.6
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Creek Chub		2.0
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Creek Chub		2.5
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Creek Chub		3.2

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Bluegill		3.2
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Bluegill		2.7
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Creek Chub		4.8
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Creek Chub		3.7
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Creek Chub		5.4
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Creek Chub		4.0
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Creek Chub		4.9
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Bluegill		2.6
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Creek Chub		5.4
Kiah Creek	WVO-2-Q-18	5/3/2007	BioChem Testing	Bluegill		2.7
Conner Run	WVO-77-A	11/8/2005	BioChem Testing	Creek Chub		30.0
Conner Run	WVO-77-A	11/8/2005	BioChem Testing	Creek Chub		23.0
Conner Run	WVO-77-A	11/8/2005	BioChem Testing	Creek Chub		22.0
Conner Run	WVO-77-A	11/8/2005	BioChem Testing	Creek Chub		25.0
Conner Run	WVO-77-A	11/8/2005	BioChem Testing	Creek Chub		26.0
Conner Run	WVO-77-A	11/8/2005	BioChem Testing	White Sucker		20.0
Conner Run	WVO-77-A	11/8/2005	BioChem Testing	White Sucker		23.0
Conner Run	WVO-77-A	11/8/2005	BioChem Testing	Green Sunfish		21.0
Conner Run	WVO-77-A	11/8/2005	BioChem Testing	Green Sunfish		20.0
Conner Run	WVO-77-A	11/8/2005	BioChem Testing	Green Sunfish		27.0
Conner Run	WVO-77-A	11/8/2005	BioChem Testing	Green Sunfish		29.0
Conner Run	WVO-77-A	11/8/2005	BioChem Testing	Green Sunfish		27.0
Conner Run	WVO-77-A	4/10/2006	WVU-NRCCE	Green Sunfish		10.9
Conner Run	WVO-77-A	4/10/2006	WVU-NRCCE	Green Sunfish		15.4
Conner Run	WVO-77-A	4/10/2006	WVU-NRCCE	Green Sunfish		21.9
Conner Run	WVO-77-A	4/10/2006	WVU-NRCCE	Green Sunfish		15.6
Conner Run	WVO-77-A	4/10/2006	WVU-NRCCE	Green Sunfish		18.8
Conner Run	WVO-77-A	4/10/2006	WVU-NRCCE	Creek Chub		12.0
Conner Run	WVO-77-A	4/10/2006	WVU-NRCCE	Creek Chub		10.0
Conner Run	WVO-77-A	4/10/2006	WVU-NRCCE	Creek Chub		4.5
Conner Run	WVO-77-A	4/10/2006	WVU-NRCCE	Creek Chub		12.4
Conner Run	WVO-77-A	4/10/2006	WVU-NRCCE	Creek Chub		14.4
Conner Run	WVO-77-A	8/30/2006	BioChem Testing	Creek Chub		35.0
Conner Run	WVO-77-A	8/30/2006	BioChem Testing	Creek Chub		31.8
Conner Run	WVO-77-A	8/30/2006	BioChem Testing	Creek Chub		26.3
Conner Run	WVO-77-A	8/30/2006	BioChem Testing	Creek Chub		28.0
Conner Run	WVO-77-A	8/30/2006	BioChem Testing	Creek Chub		32.5
Conner Run	WVO-77-A	8/30/2006	BioChem Testing	Green Sunfish		47.7
Conner Run	WVO-77-A	8/30/2006	BioChem Testing	Green Sunfish		32.9
Conner Run	WVO-77-A	8/30/2006	BioChem Testing	Green Sunfish		29.1
Conner Run	WVO-77-A	8/30/2006	BioChem Testing	Green Sunfish		22.2
Conner Run	WVO-77-A	8/30/2006	BioChem Testing	Green Sunfish		29.3
Conner Run	WVO-77-A	4/23/2007	BioChem Testing	Green Sunfish		16.5
Conner Run	WVO-77-A	4/23/2007	BioChem Testing	Green Sunfish		23.9

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Conner Run	WVO-77-A	4/23/2007	BioChem Testing	Creek Chub		25.9
Conner Run	WVO-77-A	4/23/2007	BioChem Testing	Bluegill		25.3
Conner Run	WVO-77-A	4/23/2007	BioChem Testing	Green Sunfish		29.7
Conner Run	WVO-77-A	4/23/2007	BioChem Testing	Green Sunfish		24.7
Conner Run	WVO-77-A	4/23/2007	BioChem Testing	Green Sunfish		18.5
Conner Run	WVO-77-A	4/23/2007	BioChem Testing	Green Sunfish		21.3
Conner Run	WVO-77-A	4/23/2007	BioChem Testing	Green Sunfish		21.4
Conner Run	WVO-77-A	4/23/2007	BioChem Testing	Green Sunfish		21.1
Conner Run	WVO-77-A	4/23/2007	BioChem Testing	Green Sunfish		21.7
Mud River	WVOGM	11/30/2005	BioChem Testing	Green Sunfish		11.7
Mud River	WVOGM	11/30/2005	BioChem Testing	Green Sunfish		19.4
Mud River	WVOGM	11/30/2005	BioChem Testing	Green Sunfish		11.3
Mud River	WVOGM	11/30/2005	BioChem Testing	Green Sunfish		7.4
Mud River	WVOGM	11/30/2005	BioChem Testing	Green Sunfish		12.0
Mud River	WVOGM	11/30/2005	BioChem Testing	Creek Chub		8.7
Mud River	WVOGM	11/30/2005	BioChem Testing	Creek Chub	<	1.0
Mud River	WVOGM	11/30/2005	BioChem Testing	Creek Chub		4.3
Mud River	WVOGM	11/30/2005	BioChem Testing	Creek Chub	<	1.0
Mud River	WVOGM	11/30/2005	BioChem Testing	Creek Chub	<	1.0
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Creek Chub		25.4
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Creek Chub		23.6
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Creek Chub		22.5
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Creek Chub		27.2
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Creek Chub		26.5
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Stoneroller		7.2
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Stoneroller		26.7
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Stoneroller		9.9
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Stoneroller		12.5
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Green Sunfish		13.0
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Green Sunfish		17.4
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Green Sunfish		19.2
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Green Sunfish		16.0
Mud River	WVOGM	4/5/2006	WVU-NRCCE	Green Sunfish		16.3
Mud River	WVOGM	9/20/2006	BioChem Testing	Green Sunfish		12.1
Mud River	WVOGM	9/20/2006	BioChem Testing	Green Sunfish		5.4
Mud River	WVOGM	9/20/2006	BioChem Testing	Green Sunfish		5.2
Mud River	WVOGM	9/20/2006	BioChem Testing	Green Sunfish		6.9
Mud River	WVOGM	9/20/2006	BioChem Testing	Green Sunfish		5.1
Mud River	WVOGM	9/20/2006	BioChem Testing	Stoneroller		4.6
Mud River	WVOGM	9/20/2006	BioChem Testing	Stoneroller		5.0
Mud River	WVOGM	9/20/2006	BioChem Testing	Stoneroller		3.8
Mud River	WVOGM	9/20/2006	BioChem Testing	Stoneroller		4.8
Mud River	WVOGM	9/20/2006	BioChem Testing	Stoneroller		3.3
Mud River	WVOGM	9/20/2006	BioChem Testing	Bluegill		7.8

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Mud River	WVOGM	9/20/2006	BioChem Testing	Bluegill		9.8
Mud River	WVOGM	9/20/2006	BioChem Testing	Bluegill		4.9
Mud River	WVOGM	9/20/2006	BioChem Testing	Creek Chub		10.1
Mud River	WVOGM	9/20/2006	BioChem Testing	Creek Chub		7.3
Mud River	WVOGM	9/20/2006	BioChem Testing	Creek Chub		5.7
Mud River	WVOGM	9/20/2006	BioChem Testing	Creek Chub		2.7
Mud River	WVOGM	9/20/2006	BioChem Testing	Creek Chub		2.2
Mud River	WVOGM	6/6/2007	REIC	Creek Chub		8.2
Mud River	WVOGM	6/6/2007	REIC	Green Sunfish		1.3
Mud River	WVOGM	6/6/2007	REIC	Green Sunfish		1.6
Mud River	WVOGM	6/6/2007	REIC	Green Sunfish		9.7
Mud River	WVOGM	6/6/2007	REIC	Green Sunfish		2.8
Mud River	WVOGM	6/6/2007	REIC	Green Sunfish		8.1
Mud River	WVOGM	6/6/2007	REIC	Green Sunfish		5.9
Mud River	WVOGM	6/6/2007	REIC	Green Sunfish		5.3
Mud River	WVOGM	6/6/2007	REIC	Bluegill		17.3
Mud River	WVOGM	6/6/2007	REIC	Creek Chub		10.0
Mud River	WVOGM	6/6/2007	REIC	Creek Chub		3.7
Mud River	WVOGM	6/6/2007	REIC	Creek Chub		8.5
Mud River	WVOGM	6/6/2007	REIC	Creek Chub		8.3
Mud River	WVOGM	6/6/2007	REIC	Bluegill		14.6
Little Scary Creek	WVK-31	4/18/2006	WVU-NRCCE	Creek Chub		42.9
Little Scary Creek	WVK-31	4/18/2006	WVU-NRCCE	Creek Chub		55.6
Little Scary Creek	WVK-31	4/18/2006	WVU-NRCCE	Creek Chub		36.8
Little Scary Creek	WVK-31	4/18/2006	WVU-NRCCE	Creek Chub		70.6
Little Scary Creek	WVK-31	4/18/2006	WVU-NRCCE	Creek Chub		41.9
Little Scary Creek	WVK-31	4/18/2006	WVU-NRCCE	Creek Chub		38.5
Little Scary Creek	WVK-31	4/18/2006	WVU-NRCCE	Creek Chub		23.0
Little Scary Creek	WVK-31	4/18/2006	WVU-NRCCE	Green Sunfish		39.3
Little Scary Creek	WVK-31	9/20/2006	BioChem Testing	Creek Chub		58.3
Little Scary Creek	WVK-31	9/20/2006	BioChem Testing	Creek Chub		58.1
Little Scary Creek	WVK-31	9/20/2006	BioChem Testing	Creek Chub		55.4
Little Scary Creek	WVK-31	9/20/2006	BioChem Testing	Creek Chub		68.6
Little Scary Creek	WVK-31	9/20/2006	BioChem Testing	Creek Chub		51.3

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Little Scary Creek	WVK-31	9/20/2006	BioChem Testing	Creek Chub		56.3
Little Scary Creek	WVK-31	4/20/2007	BioChem Testing	Green Sunfish		6.9
Little Scary Creek	WVK-31	4/20/2007	BioChem Testing	Creek Chub		67.5
Little Scary Creek	WVK-31	4/20/2007	BioChem Testing	Green Sunfish		3.6
Little Scary Creek	WVK-31	4/20/2007	BioChem Testing	Green Sunfish		11.4
Little Scary Creek	WVK-31	4/20/2007	BioChem Testing	Green Sunfish		5.7
Little Scary Creek	WVK-31	4/20/2007	BioChem Testing	Green Sunfish		3.4
Little Scary Creek	WVK-31	4/20/2007	BioChem Testing	Creek Chub		41.1
Little Scary Creek	WVK-31	4/20/2007	BioChem Testing	Creek Chub		79.6
Little Scary Creek	WVK-31	4/20/2007	BioChem Testing	Creek Chub		72.8
Little Scary Creek	WVK-31	4/20/2007	BioChem Testing	Creek Chub		43.8
Little Scary Creek	WVK-31	4/20/2007	BioChem Testing	Creek Chub		3.5
Plum Orchard Lake	WVK-65-Z-(L1)	4/25/2006	WVU-NRCCE	Bluegill		16.3
Plum Orchard Lake	WVK-65-Z-(L1)	4/25/2006	WVU-NRCCE	Bluegill		8.6
Plum Orchard Lake	WVK-65-Z-(L1)	4/25/2006	WVU-NRCCE	Bluegill		4.9
Plum Orchard Lake	WVK-65-Z-(L1)	4/25/2006	WVU-NRCCE	Bluegill		19.0
Plum Orchard Lake	WVK-65-Z-(L1)	4/25/2006	WVU-NRCCE	Bluegill		4.2
Plum Orchard Lake	WVK-65-Z-(L1)	4/25/2006	WVU-NRCCE	Bluegill		7.5
Plum Orchard Lake	WVK-65-Z-(L1)	4/25/2006	WVU-NRCCE	Bluegill		15.1
Plum Orchard Lake	WVK-65-Z-(L1)	9/27/2006	BioChem Testing	Green Sunfish		1.3
Plum Orchard Lake	WVK-65-Z-(L1)	9/27/2006	BioChem Testing	Bluegill		2.0
Plum Orchard Lake	WVK-65-Z-(L1)	9/27/2006	BioChem Testing	Bluegill	<	1.3
Plum Orchard Lake	WVK-65-Z-(L1)	9/27/2006	BioChem Testing	Bluegill		1.4
Plum Orchard Lake	WVK-65-Z-(L1)	9/27/2006	BioChem Testing	Bluegill		1.3
Plum Orchard Lake	WVK-65-Z-(L1)	9/27/2006	BioChem Testing	Bluegill		1.2

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Plum Orchard Lake	WVK-65-Z-(L1)	4/17/2007	BioChem Testing	Bluegill		1.6
Plum Orchard Lake	WVK-65-Z-(L1)	4/17/2007	BioChem Testing	Bluegill		1.7
Plum Orchard Lake	WVK-65-Z-(L1)	4/17/2007	BioChem Testing	Bluegill		1.4
Plum Orchard Lake	WVK-65-Z-(L1)	4/17/2007	BioChem Testing	Bluegill		1.9
Plum Orchard Lake	WVK-65-Z-(L1)	4/17/2007	BioChem Testing	Green Sunfish		1.3
Plum Orchard Lake	WVK-65-Z-(L1)	4/17/2007	REIC	Bluegill		19.8
Plum Orchard Lake	WVK-65-Z-(L1)	5/9/2007	BioChem Testing	Bluegill		1.1
Plum Orchard Lake	WVK-65-Z-(L1)	5/9/2007	BioChem Testing	Green Sunfish		1.3
Plum Orchard Lake	WVK-65-Z-(L1)	5/9/2007	REIC	Bluegill		3.6
Plum Orchard Lake	WVK-65-Z-(L1)	5/9/2007	BioChem Testing	Bluegill		1.4
Plum Orchard Lake	WVK-65-Z-(L1)	5/9/2007	BioChem Testing	Bluegill		1.2
Plum Orchard Lake	WVK-65-Z-(L1)	5/9/2007	REIC	Bluegill		3.8
Mount Storm Lake	WVPNB-17-(L1)	11/1/2005	BioChem Testing	Bluegill		3.0
Mount Storm Lake	WVPNB-17-(L1)	11/1/2005	BioChem Testing	Bluegill		3.0
Mount Storm Lake	WVPNB-17-(L1)	11/1/2005	BioChem Testing	Bluegill		3.0
Mount Storm Lake	WVPNB-17-(L1)	11/1/2005	BioChem Testing	Bluegill		3.0
Mount Storm Lake	WVPNB-17-(L1)	11/1/2005	BioChem Testing	Bluegill		3.0
Mount Storm Lake	WVPNB-17-(L1)	11/1/2005	BioChem Testing	Bluegill		3.0
Mount Storm Lake	WVPNB-17-(L1)	11/1/2005	BioChem Testing	Bluegill		7.0
Mount Storm Lake	WVPNB-17-(L1)	11/1/2005	BioChem Testing	Bluegill		7.0
Mount Storm Lake	WVPNB-17-(L1)	11/1/2005	BioChem Testing	Bluegill		7.0
Mount Storm Lake	WVPNB-17-(L1)	11/1/2005	BioChem Testing	Bluegill		4.0
Mount Storm Lake	WVPNB-17-(L1)	4/11/2006	WVU-NRCCE	Bluegill		4.3
Mount Storm Lake	WVPNB-17-(L1)	4/11/2006	WVU-NRCCE	Bluegill		5.1
Mount Storm Lake	WVPNB-17-(L1)	4/11/2006	WVU-NRCCE	Bluegill		5.1

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Mount Storm Lake	WVPNB-17-(L1)	4/11/2006	WVU-NRCCE	Bluegill		4.9
Mount Storm Lake	WVPNB-17-(L1)	4/11/2006	WVU-NRCCE	Bluegill		5.1
Mount Storm Lake	WVPNB-17-(L1)	4/11/2006	WVU-NRCCE	Green Sunfish		5.3
Mount Storm Lake	WVPNB-17-(L1)	4/11/2006	WVU-NRCCE	Green Sunfish		21.8
Mount Storm Lake	WVPNB-17-(L1)	4/11/2006	WVU-NRCCE	Green Sunfish		6.6
Mount Storm Lake	WVPNB-17-(L1)	4/11/2006	WVU-NRCCE	Green Sunfish		4.7
Mount Storm Lake	WVPNB-17-(L1)	4/11/2006	WVU-NRCCE	Green Sunfish		11.8
Mount Storm Lake	WVPNB-17-(L1)	9/6/2006	BioChem Testing	Bluegill		2.2
Mount Storm Lake	WVPNB-17-(L1)	9/6/2006	BioChem Testing	Bluegill		4.2
Mount Storm Lake	WVPNB-17-(L1)	9/6/2006	BioChem Testing	Bluegill		1.6
Mount Storm Lake	WVPNB-17-(L1)	9/6/2006	BioChem Testing	Bluegill		2.7
Mount Storm Lake	WVPNB-17-(L1)	9/6/2006	BioChem Testing	Bluegill		4.3
Mount Storm Lake	WVPNB-17-(L1)	9/6/2006	BioChem Testing	Bluegill		2.5
Mount Storm Lake	WVPNB-17-(L1)	9/6/2006	BioChem Testing	Bluegill		2.4
Mount Storm Lake	WVPNB-17-(L1)	9/6/2006	BioChem Testing	Bluegill		2.0
Mount Storm Lake	WVPNB-17-(L1)	9/6/2006	BioChem Testing	Bluegill		2.1
Mount Storm Lake	WVPNB-17-(L1)	9/6/2006	BioChem Testing	Bluegill		2.5
Mount Storm Lake	WVPNB-17-(L1)	4/24/2007	BioChem Testing	Green Sunfish		2.5
Mount Storm Lake	WVPNB-17-(L1)	4/24/2007	BioChem Testing	Bluegill		3.9
Mount Storm Lake	WVPNB-17-(L1)	4/24/2007	BioChem Testing	Bluegill		4.8
Mount Storm Lake	WVPNB-17-(L1)	4/24/2007	BioChem Testing	Bluegill		3.2
Mount Storm Lake	WVPNB-17-(L1)	4/24/2007	BioChem Testing	Bluegill		4.8
Mount Storm Lake	WVPNB-17-(L1)	4/24/2007	BioChem Testing	Bluegill		5.3

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Mount Storm Lake	WVPNB-17-(L1)	4/24/2007	BioChem Testing	Bluegill		7.0
Mount Storm Lake	WVPNB-17-(L1)	4/24/2007	BioChem Testing	Green Sunfish		2.8
Mount Storm Lake	WVPNB-17-(L1)	4/24/2007	BioChem Testing	Bluegill		5.3
Elk Fork Lake	WVO-32-M-(L1)	4/26/2006	WVU-NRCCE	Bluegill		26.1
Elk Fork Lake	WVO-32-M-(L1)	4/26/2006	WVU-NRCCE	Bluegill		16.3
Elk Fork Lake	WVO-32-M-(L1)	4/26/2006	WVU-NRCCE	Bluegill		5.3
Elk Fork Lake	WVO-32-M-(L1)	4/26/2006	WVU-NRCCE	Bluegill		14.0
Elk Fork Lake	WVO-32-M-(L1)	4/26/2006	WVU-NRCCE	Bluegill		5.3
Elk Fork Lake	WVO-32-M-(L1)	4/26/2006	WVU-NRCCE	Green Sunfish		11.0
Elk Fork Lake	WVO-32-M-(L1)	4/26/2006	WVU-NRCCE	Green Sunfish		22.9
Elk Fork Lake	WVO-32-M-(L1)	4/26/2006	WVU-NRCCE	Green Sunfish		5.3
Elk Fork Lake	WVO-32-M-(L1)	10/4/2006	BioChem Testing	Green Sunfish		1.3
Elk Fork Lake	WVO-32-M-(L1)	10/4/2006	BioChem Testing	Green Sunfish		0.9
Elk Fork Lake	WVO-32-M-(L1)	10/4/2006	BioChem Testing	Green Sunfish		1.3
Elk Fork Lake	WVO-32-M-(L1)	10/4/2006	BioChem Testing	Green Sunfish		1.4
Elk Fork Lake	WVO-32-M-(L1)	10/4/2006	BioChem Testing	Green Sunfish		1.4
Elk Fork Lake	WVO-32-M-(L1)	10/4/2006	BioChem Testing	Bluegill		1.1
Elk Fork Lake	WVO-32-M-(L1)	10/4/2006	BioChem Testing	Bluegill		0.7
Elk Fork Lake	WVO-32-M-(L1)	10/4/2006	BioChem Testing	Bluegill		1.2
Elk Fork Lake	WVO-32-M-(L1)	10/4/2006	BioChem Testing	Bluegill		0.8
Elk Fork Lake	WVO-32-M-(L1)	10/4/2006	BioChem Testing	Bluegill		1.1
Elk Fork Lake	WVO-32-M-(L1)	4/25/2007	BioChem Testing	Bluegill		0.8
Elk Fork Lake	WVO-32-M-(L1)	4/25/2007	BioChem Testing	Bluegill		1.1
Elk Fork Lake	WVO-32-M-(L1)	4/25/2007	BioChem Testing	Bluegill		0.7
Elk Fork Lake	WVO-32-M-(L1)	4/25/2007	BioChem Testing	Bluegill		1.1
Elk Fork Lake	WVO-32-M-(L1)	4/25/2007	BioChem Testing	Bluegill		0.8
Elk Fork Lake	WVO-32-M-(L1)	4/25/2007	BioChem Testing	Bluegill		0.8
Elk Fork Lake	WVO-32-M-(L1)	4/25/2007	BioChem Testing	Bluegill		1.1
Elk Fork Lake	WVO-32-M-(L1)	4/25/2007	BioChem Testing	Bluegill		1.1
Pinnacle Creek	WVOG-124	7/9/2007	REIC	Smallmouth Bass		7.4
Pinnacle Creek	WVOG-124	7/9/2007	REIC	Rock Bass		9.0
Pinnacle Creek	WVOG-124	7/9/2007	REIC	Smallmouth Bass		5.0
Pinnacle Creek	WVOG-124	7/9/2007	REIC	Smallmouth Bass		5.6
Pinnacle Creek	WVOG-124	7/9/2007	REIC	Rock Bass		5.4
Pinnacle Creek	WVOG-124	7/9/2007	REIC	Rock Bass		8.2
Pinnacle Creek	WVOG-124	7/9/2007	REIC	Rock Bass		5.3
Pinnacle Creek	WVOG-124	7/9/2007	REIC	Rock Bass		7.6
Pinnacle Creek	WVOG-124	7/9/2007	REIC	Rock Bass		5.7
Pinnacle Creek	WVOG-124	7/10/2007	REIC	Creek Chub		7.8
Pinnacle Creek	WVOG-124	7/11/2007	REIC	Creek Chub		4.7

Waterbody Name	Code	Date Collected	Testing Laboratory	Species	Q	Tissue Se (mg/kg) dry wt
Pinnacle Creek	WVOG-124	7/12/2007	REIC	Creek Chub		4.8
Pinnacle Creek	WVOG-124	7/13/2007	REIC	Creek Chub		5.0
Pinnacle Creek	WVOG-124	7/14/2007	REIC	Creek Chub		4.1
Pinnacle Creek	WVOG-124	7/15/2007	REIC	Creek Chub		4.8
Pinnacle Creek	WVOG-124	7/16/2007	REIC	Creek Chub		4.8
Pinnacle Creek	WVOG-124	7/17/2007	REIC	Creek Chub		5.3
Pinnacle Creek	WVOG-124	7/18/2007	REIC	Rock Bass		8.0
Pinnacle Creek	WVOG-124	7/19/2007	REIC	Creek Chub		4.7
Pinnacle Creek	WVOG-124	7/20/2007	REIC	Rock Bass		7.4