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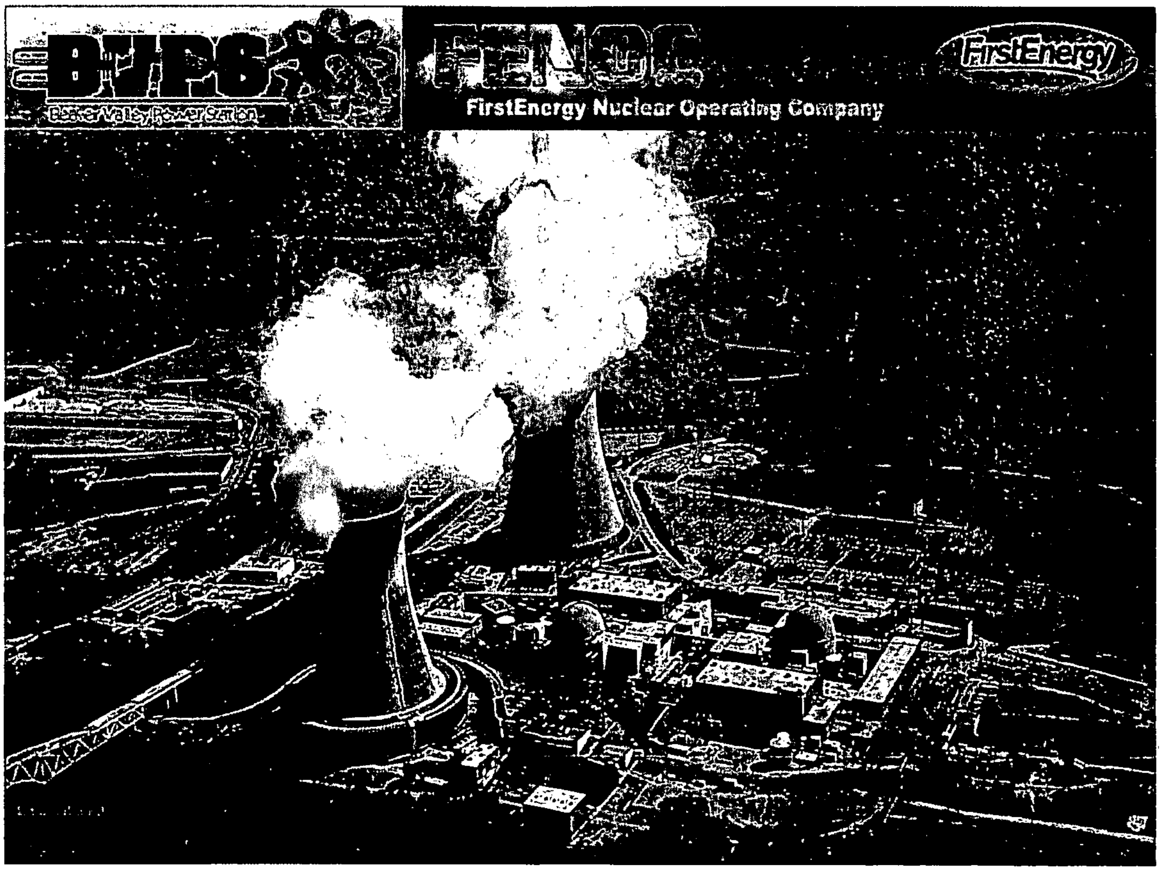
BEAVER VALLEY POWER STATION



2008 ANNUAL ENVIRONMENTAL OPERATING REPORT

NON-RADIOLOGICAL

UNITS NO. 1 AND 2

LICENSES DPR-66 AND NPF-73

BEAVER VALLEY POWER STATION
ENVIRONMENTAL & CHEMISTRY SECTION

Technical Report Approval

2008 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

(Non-Radiological)

UNITS NO. 1 AND 2

LICENSES DPR-66 AND NPF-73

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1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

This report is submitted in accordance with Section 5.4.1 of Appendix B: To Facility Operating License No. NPF-73, Beaver Valley Power Station Unit 2, Environmental Protection Plan (Non-Radiological). Beaver Valley Power Station (BVPS) is operated by FirstEnergy Nuclear Operating Company (FENOC). The Objectives of the Environmental Protection Plan (EPP) are:

- Verify that the facility is operated in an environmentally acceptable manner, as established by the Final Environmental Statement-Operating License Stage (FES-OL) and other NRC environmental impact assessments.

- Coordinate NRC requirements and maintain consistency with other Federal, State, and local requirements for environmental protection.

- Keep NRC informed of the environmental effects of facility construction and operation and of actions taken to control those effects.

To achieve the objectives of the EPP, FENOC and BVPS have developed written programs and procedures to comply with the EPP, protect the environment, and comply with governmental requirements primarily including the US Environmental Protection Agency (EPA) and the Pennsylvania Department of Environmental Protection (PA DEP) requirements. Water quality matters identified in the Final Environmental Statements-Operating License Stage (FES-OL) are regulated under the National Pollutants Discharge Elimination System (NPDES) Permit No. PA0025615. Waste is regulated under EPA Identification No. PAR000040485. Air quality is regulated under PA DEP State Only Air Operating Permit No. OP-04-00086. Attachment 10.1 contains a listing of permits and certificates for environmental compliance.

The BVPS programs and procedures address pre-work and pre-project environmental evaluations, operating procedures, pollution prevention and response programs procedures and plans, process improvement and corrective action programs, and human performance programs. Technical and managerial monitoring of tasks, operations, and other activities are performed. Any identified challenges, concerns, or questions are captured in the FENOC Problem Identification and Resolution Program with a Condition Report. Condition Reports include investigations, cause determinations, and corrective actions.

During 2008 BVPS continued an Aquatic Monitoring Program to evaluate its potential impact on the New Cumberland Pool of the Ohio River, and to provide information on potential impacts to BVPS operation from macrofoulers such as Asian clams and zebra mussels.

1.2 SUMMARY AND CONCLUSIONS

There were no significant environmental events during 2008. During 2008, no significant changes to operations that could affect the environment were made at Beaver Valley Power Station. ***As in previous years, results of the BVPS environmental programs did not indicate any adverse environmental impacts from station operation.***

1.3 ANALYSIS OF SIGNIFICANT ENVIRONMENTAL CHANGE

During 2008, no significant changes were made at BVPS to cause significant negative affect on the environment.

1.4 AQUATIC MONITORING PROGRAM

The 2008 Beaver Valley Power Station (BVPS) Units 1 and 2 Non-Radiological Monitoring Program consisted of an Aquatic Program that included surveillance and field sampling of the Ohio River's aquatic life in the vicinity of the station. The Aquatic Program is an annual program conducted to provide baseline aquatic resources data, to assess the impact of the operation of BVPS on the aquatic ecosystem of the Ohio River, and to monitor for potential impacts of biofouling organisms (*Corbicula* and zebra mussels) on BVPS operations. This is the 33rd year of operational environmental monitoring for Unit 1 and the 22nd year for Unit 2. ***As in previous years, the results of the program did not indicate any adverse environmental impact to the aquatic life in the Ohio River associated with the operation of BVPS.***

The results of the 2008 benthic macroinvertebrate survey conducted in May and September indicated a normal community structure exists in the Ohio River both upstream and downstream of the BVPS. These benthic surveys are a continuation of a Fate and Effects Study conducted from 1990 through 1992 for the PA DEP to assess the ecosystem impacts of the molluscicides (e.g., NALCO H-150M) used to control biofouling organisms at BVPS. To date the results of the benthic studies have not identified any impacts of operation at the BVPS including the use these biocides on the benthic community below the BVPS discharge.

Substrate was probably the most important factor influencing the distribution and abundance of the benthic macroinvertebrates in the Ohio River near BVPS. The generally soft muck-type substrate along the shoreline found in 2008 and previous years was conducive to segmented worm (oligochaete) and midge (chironomid) proliferation. Forty-six (46) macroinvertebrate taxa were identified during the 2008 monitoring program. No new taxa were added to the cumulative taxa list of macroinvertebrates collected near BVPS. No state or Federal threatened or endangered macroinvertebrate species were collected during 2008. In May and September, oligochaetes were the most frequently collected group of macroinvertebrate. ***There were no major differences in the community structure between control and non-control stations that could be attributed to operation of BVPS. The overall community structure has changed little since pre-operational years, and program results did not indicate that BVPS operations were affecting the benthic community of the Ohio River.***

The fish community of the Ohio River near the BVPS was sampled in May, July, September and November of 2008 with nighttime electrofishing and daytime seining. Since monitoring began in the early 1970's, the number of identified fish taxa has increased from 43 to 78 for the New Cumberland Pool.

Benthivores (bottom feeders including suckers and buffalo) and forage species (e.g. gizzard shad and emerald shiners) were generally collected in the highest numbers in 2008. The number of forage fish was appreciably greater than in 2007. Variations in annual catch were probably attributable to normal fluctuations in the population size of the forage species and the predator populations that rely on them. Forage species, such as gizzard shad and emerald shiner with high reproductive potentials, frequently respond to changes in natural environmental factors (competition, food availability, cover, and water quality) with large fluctuations in population size. This, in turn, influences their appearance in the sample populations during annual surveys. Spawning/rearing success due to abiotic factors is usually the determining factor of the size and composition of a fish community.

In 2008 the annual catch rate was 1.98 fish per minute. The greatest catch rate in 2008 occurred in spring (May) when the catch rate was 4.54 fish per minute. Sauger, shorthead redhorse sucker, golden redhorse sucker and smallmouth bass contributed to the majority of this total. The lowest catch rate occurred in summer (July) with a rate of 0.68 fish per electrofishing minute. The annual catch rates were consistent over the four years ranging from a high of 1.98 fish per minute in 2008 to 1.16 in 2005.

Little difference in the species composition of the catch was observed between the control (Station 1) and non-control (Stations 2A, 2B and 3) stations. Habitat preference and availability were probably the most important factors affecting where and when fish were collected. ***Results from the 2008 fish surveys indicated that a normal community structure for the Ohio River exists near BVPS based on species composition and relative abundance. In 2008, there was no indication of negative impact to the fish community in the Ohio River from the operation of BVPS.***

The monthly reservoir ponar samples collected in Units 1 and 2 cooling towers and the four samples collected at the intake during 2008 indicated that *Corbicula* were entering and colonizing the station. ***Overall, the numbers of Corbicula collected in the samples were comparatively low, which continued the trend over the past few years of fewer Corbicula and reflected a water-body-wide trend observed in the Ohio River.***

In 1995, live zebra mussels were collected for the first time by divers in the BVPS main intake and auxiliary intake structures during scheduled cleanings. Overall, both the number of observations and densities of settled mussels were similar in 2003-present although somewhat higher in 2008. The density of veligers in 2008 was much higher than in 2007, but was comparable to 2006. ***Although densities of settled mussels in the vicinity of BVPS are low compared to other populations such as in the Lower Great Lakes, densities comparable to those in the Ohio River are sufficient to cause problems in the operation of untreated cooling water intake systems.***

2.0 ENVIRONMENTAL PROTECTION PLAN NON-COMPLIANCES

There were no Environmental Protection Plan EPP non-compliances identified in 2008.

3.0 CHANGES INVOLVING UNREVIEWED ENVIRONMENTAL QUESTIONS

No Unreviewed Environmental Questions (UEQ)were identified in 2008. Therefore, there were no changes involving an UEQ.

4.0 NON-ROUTINE ENVIRONMENTAL REPORT

There were no non-routine environmental reports in 2008 (e.g., reportable spill). Routine reports were prepared, in accordance with regulations and the applicable permits, for air, waste, and water.

5.0 AQUATIC MONITORING PROGRAM

This section of the report summarizes the Non-Radiological Environmental Program conducted for the BVPS 1 Units 1 and 2 Operating License Numbers DPR-66 and NPF-73. This is a non-mandatory program, because on February 26, 1980, the Nuclear Regulatory Commission (NRC) granted BVPS' request to delete all of the Aquatic Monitoring Program, with the exception of the fish impingement program (Amendment No. 25), from the Environmental Technical Specifications (ETS). In 1983, BVPS was permitted to also delete the fish impingement studies from the ETS program of required sampling along with non-radiological water quality requirements. However, in the interest of providing an uninterrupted database, BVPS has continued the Aquatic Monitoring Program.

The objectives of the 2008 Aquatic Environmental Program were:

- To monitor for any possible environmental impact of BVPS operation on the benthic macroinvertebrate and fish communities in the Ohio River;
- To provide a low level sampling program to continue an uninterrupted environmental database for the Ohio River near BVPS, pre-operational to present; and
- To discover and evaluate potential impacts to BVPS operations from the aquatic environment (Ref. SOER-07-002). This includes the presence, growth, and reproduction of macrofouling *Corbicula* (Asiatic clam) and zebra mussels (*Dreissena* spp.) in the Ohio River.

5.1 SITE DESCRIPTION

BVPS is located on an approximately 453-acre tract of land on the south bank of the Ohio River in the Borough of Shippingport, Beaver County, Pennsylvania. The Shippingport Atomic Power Station once shared the site with BVPS before being decommissioned. Figure 5.1 is a plan view of BVPS. The site is approximately 1 mile (1.6 km) from Midland, Pennsylvania; 5 miles (8 km) from East Liverpool, Ohio; and 25 miles (40 km) from Pittsburgh, Pennsylvania. The population within a 5-mile (8 km) radius of the plant is approximately 18,000. The Borough of Midland, Pennsylvania has a population of approximately 3,500.

The station is situated at Ohio River Mile 34.8 (Latitude: 40° 36' 18"; Longitude: 80° 26' 02") at a location on the New Cumberland Pool that is 3.1 river miles (5.3 km) downstream from Montgomery Lock and Dam and 19.6 miles (31.2 km) upstream from New Cumberland Lock and Dam. The Pennsylvania-Ohio-West Virginia border is 5.2 river miles (8.4 km) downstream from the site. The river flow is regulated by a series of dams and reservoirs on the Beaver, Allegheny, Monongahela, and Ohio Rivers and their tributaries.

The study site lies along the Ohio River in a valley, which has a gradual slope that extends from the river (Elevation 665 ft (203 m) above mean sea level) to an elevation of 1,160 ft (354 m) along a ridge south of BVPS. The plant entrance elevation at the station is approximately 735 ft

(224 m) above mean sea level.

BVPS Units 1 and 2 have a thermal rating of 2,660 megawatts (MW). Units 1 & 2 have a design electrical rating of 835 MW and 836 MW, respectively. The circulating water systems for each unit are considered a closed cycle system with continuous overflow, using a cooling tower to minimize heat released to the Ohio River. Commercial operation of BVPS Unit 1 began in 1976 and Unit 2 began operation in 1987.

5.2 STUDY AREA

The environmental study area was established to assess potential impacts and consists of four sampling stations, each having a north and south shore (Figure 5.1). Station 1 is located at River Mile (RM) 34.5, approximately 0.3 miles (0.5 km) upstream of BVPS and is the control station. Station 2A is located approximately 0.5 miles (0.8 km) downstream of the BVPS discharge structure in the main channel. Station 2B is located in the back channel of Phillis Island, also 0.5 miles downstream of the BVPS discharge structure. Station 2B is the principal non-control station because the majority of discharges from BVPS Units 1 and 2 are released to this back channel. Station 3 is located approximately two miles (3.2 km) downstream of BVPS and only rarely is influenced by the BVPS discharge.

5.3 METHODS

Shaw Environmental, Inc. (Shaw) was contracted to perform the 2008 Aquatic Monitoring Program as specified in BVBP-ENV-001-Aquatic Monitoring (procedural guide). This procedural guide references and describes in detail the field and laboratory procedures used in the various monitoring programs, as well as the data analysis and reporting requirements. These procedures are summarized according to task in the following subsections. Sampling was conducted according to the schedule presented in Table 5.1.

5.3.1 Benthic Macroinvertebrate Monitoring

The benthic macroinvertebrate monitoring program consisted of river bottom sampling using a Ponar grab sampler at four stations on the Ohio River. Prior to 1996, duplicate sampling occurred at Stations 1, 2A, and 3, while triplicate sampling occurred at Station 2B (i.e., one sample at each shoreline and mid-channel) (Figures 5.1 and 5.2). In 1996, a review of the sampling design indicated that sampling should be performed in triplicate at each station to conform to standardized U.S. Environmental Protection Agency (USEPA) procedures. Therefore, starting in 1996, triplicate samples were taken at Stations 1, 2A, and 3, as in 1995, with triplicate samples also collected at each shore and mid-channel location at Station 2B. A petite Ponar dredge was used to collect these samples, replacing the standard Ponar dredge used in prior studies. This sampling was conducted in May and September 2008. For each 2008 field effort, 18 benthic samples were collected and processed in the laboratory. All field procedures and data analyses were conducted in accordance with the procedural guide.

The contents of each Ponar grab sample were gently washed through a U.S. Standard No. 30 sieve and the retained contents were placed in a labeled bottle and preserved in ethanol. In the laboratory, rose bengal stain was added to aid in sorting and identifying the benthic organisms. Macroinvertebrates were sorted from each sample, identified to the lowest taxon practical and counted. Mean density (number/m^2) for each taxon was calculated for each replicate. Four indices used to describe the benthic community were calculated: Shannon-Weiner diversity index, evenness (Pielou, 1969), species richness, and the number of taxa. These estimates provide an indication of the relative quality of the macroinvertebrate community.

5.3.2 Fish Monitoring

Fish sampling was conducted in 2008 to provide a continuous baseline of data and to detect possible changes that may have occurred in the fish populations in the Ohio River near BVPS. Fish population surveys have been conducted in the Ohio River near BVPS annually from 1970 through 2008. These surveys have resulted in the collection of 73 fish species and five different hybrids.

Adult fish surveys were scheduled and performed in May, July, September, and November 2008. During each survey, fish were sampled by standardized electrofishing techniques at four stations (Stations 1, 2A, 2B and 3) (Figure 5.3). Seining was performed at Station 1 (north shore) and Station 2B (south shore of Phillis Island) to sample species that are generally under-represented in electrofishing catches (e.g., young-of-the-year fish and small cyprinids).

Night electrofishing was conducted using a boat-mounted electroshocker with floodlights attached to the bow. A Smith-Root Type VI A variable voltage, pulsed-DC electrofishing unit powered by a 5-kW generator was used. The voltage selected depended on water conductivity and was adjusted to provide constant amperage (4-6 amps) of the current through the water. The north and south shoreline areas at each station were shocked for at least 10 minutes of unit "on" time (approximately five minutes along each shore) during each survey.

When large schools of fish of a single non-game species such as gizzard shad and shiners were encountered during electrofishing efforts, all of the stunned fish were not netted and retrieved onboard the boat. A few fish were netted for verification of identity, and the number of observed stunned fish remaining in the water was estimated. The size range of the individual fish in the school was also estimated and recorded. This was done in an effort to expedite sample processing and cover a larger area during the timed electrofishing run. Regardless of the number of individuals, all game fish were boated when observed.

Fish seining was performed at Station 1 (control) and Station 2B (non-control) during each scheduled 2008 BVPS fishery survey. A 30-ft long bag seine made of 1/4-inch nylon mesh netting was used to collect fish located close to shore in 1 to 4 ft of water. Three seine hauls were performed at both Station 1 (north shore) and Station 2B (south shore of Phillis Island) during each survey.

Fish collected during electrofishing and seining efforts were processed according to standardized procedures. All captured game fishes were identified, counted, measured for total length (nearest 1 mm), and weighed (nearest 1 g for fish less than or equal to 1000 g and the nearest 5 g for all other fish). Non-game fishes were counted, and a random subsample of lengths was taken. Live fish were returned to the river immediately after processing was completed. All fish that were unidentifiable or of questionable identification and were obviously not on the endangered or threatened species list were placed in plastic sample bottles, preserved, labeled and returned to the laboratory for identification. Any species of fish that had not previously been collected at BVPS was retained for the voucher collection. Any threatened or endangered species (if collected) would be photographed and released.

5.3.3 *Corbicula* Density Determinations for Cooling Tower Reservoirs

The *Corbicula* Monitoring Program at BVPS includes sampling the circulating river water and the service water systems of the BVPS (intake structure and cooling towers). This report describes this Monitoring Program and the results of the field and plant surveys conducted in 2008.

The objectives of the ongoing Monitoring Program are to evaluate the presence of *Corbicula* at BVPS, and to evaluate the potential for and timing of infestation of the BVPS. This program is conducted in conjunction with a program to monitor for the presence of macrofouling zebra mussels (see Section 5.3.5).

Corbicula enter the BVPS from the Ohio River by passing through the water intakes, and eventually settle in low flow areas including the lower reservoirs of the Units 1 and 2 cooling towers. The density and growth of these *Corbicula* were monitored by collecting monthly samples from the lower reservoir sidewalls and sediments. The sampler used on the sidewalls consisted of a D-frame net attached behind a 24-inch long metal scraping edge. This device was connected to a pole long enough to allow the sampler to extend down into the reservoir area from the outside wall of the cooling tower. Sediments were sampled with a petite Ponar dredge.

Cooling tower reservoir sampling was historically conducted once per month. Beginning in December 1997, it was decided to forego sampling in cold water months since buildup of *Corbicula* does not occur then. Monthly sampling has been maintained throughout the warmer water months of the year. In 2008 sampling began in March and ended in early November.

In 2008, once each month (March through November), a single petite Ponar grab sample was taken in the reservoir of each cooling tower to obtain density and growth information on *Corbicula* present in the bottom sediment. The samples collected from each cooling tower were returned to the laboratory and processed. Samples were individually washed, and any *Corbicula* removed and rinsed through a series of stacked U.S. Standard sieves that ranged in mesh size from 1.00 mm to 9.49 mm. Live and dead clams retained in each sieve were counted and the numbers were recorded. The size distribution data obtained using the sieves reflected clam width, rather than length. Samples containing a small number of *Corbicula* were not sieved; individuals were measured and placed in their respective size categories. A scraping sample of about 12 square feet was also collected at each cooling tower during each monthly sampling effort. This sample was processed in a manner consistent with the petit Ponar samples.

Population surveys of both BVPS cooling tower reservoirs have been conducted during scheduled outages (1986 to present) to estimate the number of *Corbicula* present in these structures. During the scheduled shutdown period for each unit, each cooling tower reservoir bottom is sampled by petite Ponar at standardized locations within the reservoir. Counts of live and dead clams and determination of density were made. There were no scheduled outages during 2008 when samples were collected.

5.3.4 *Corbicula* Juvenile Monitoring

The *Corbicula* juvenile study was designed to collect data on *Corbicula* spawning activities and growth of individuals entering the intake from the Ohio River. From 1988 through 1998, clam cages were deployed in the intake forebay to monitor for *Corbicula* that entered the BVPS.

Observational-based concerns that the clam cages would quickly clog with sediment during high sediment periods and, as a result, would not effectively sample for *Corbicula*, led to an evaluation of an alternate sampling technique. From April through June 1997, a study was conducted to compare the results of the clam cage samplers to a petite Ponar dredge technique to determine *Corbicula* presence and density in the BVPS intake bays. It was hypothesized that using a Ponar sampler to collect bottom sediments and analysis of those sediments would provide a more representative sample of *Corbicula* settlement and growth rates, and had the added benefit of not requiring confined space entry to conduct the sampling. Results of the study confirmed this hypothesis.

During the 1998 sampling season, at the request of BVPS personnel, all clam cages were removed after the May 18th collection. Monthly petite Ponar grabs from the forebay in the intake building continued thereafter. Samples were processed in the same manner as Cooling Tower Samples (Section 5.3.3).

From 2002 to present, because of site access restrictions, sampling with the petite Ponar has been moved to the Ohio River directly in front of the Intake Structure Building. Collections are presently made in conjunction with the fisheries sampling (May, July, September, and November). During each sampling month two Ponar grabs are taken approximately 20 feet off shore of the intake building. These grab samples are processed in the same manner as when they were collected from within the Intake Structure Building.

5.3.5 Zebra Mussel Monitoring

The Zebra Mussel Monitoring Program includes sampling the Ohio River and the circulating river water system of the BVPS.

The objectives of the Monitoring Program were:

(1) To identify if zebra mussels were in the Ohio River adjacent to BVPS and provide early warning to operations personnel as to their possible infestation;

(2) To provide data as to when the larvae were mobile in the Ohio River and insights as to their vulnerability to potential treatments; and

(3) To provide data on their overall density and growth rates under different water temperatures and provide estimates on the time it requires these mussels to reach the size and density that could impact the plant.

The zebra mussel sampling for settled adults was historically conducted once per month, yearlong. Beginning in December 1997, it was decided to forego sampling in the colder water months of each year, since buildup of zebra mussels, does not occur then. Monthly sampling has been maintained throughout the balance of the year. In 2008 sampling occurred from March through November.

A pump sample for zebra mussel veligers was collected at the barge slip location monthly from April through October in 1996 and 1997. The scope of the sampling was expanded in 1998 to also include the intake structure. In June 1998, the Emergency Outfall and Emergency Outfall Impact Basin locations were also added. Additional pump samples were collected from the cooling towers of Unit 1 and Unit 2 in October 1998. In 2008 veliger sampling began in April and was conducted monthly through October.

At the Intake Structure and Barge Slip the following surveillance techniques were used:

- Wall scraper sample collections on a monthly basis (March through November) from the barge slip and the riprap near the intake structure to detect attached adults; and

- Pump sample collections from the barge slip and outside the intake structure, to detect the planktonic early life forms (April through October).

At each of the cooling towers the following techniques were used:

- Monthly reservoir scraper sample collections in each cooling tower (March through November); and

- Pump samples in April through October to detect planktonic life forms.

At the Emergency Outfall and the Splash Pool the following techniques were used:

- Monthly scraper sample collections in each (March through November); and
- Pump samples in each from April through October to detect planktonic life forms.

5.3.6 Reports

Each month, activity reports that summarized the activities that took place the previous month were prepared and submitted. These reports included the results of the monthly *Corbicula*/zebra mussel monitoring including any trends observed and any preliminary results available from the benthic and fisheries programs. The reports addressed progress made on each task, and reported any observed biological activity of interest.

5.4 RESULTS OF THE AQUATIC MONITORING PROGRAM

The following sections summarize the findings for each of the program elements. Sampling dates for each of the program elements are presented in Table 5.1.

5.4.1 Benthic Macroinvertebrate Monitoring Program

Benthic surveys were scheduled and performed in May and in September 2008. Benthic samples were collected using a petite Ponar grab sampler at Stations 1, 2A, 2B, and 3 (Figure 5.2). Triplicate samples were taken off the south shore at Stations 1, 2A, and 3. Sampling at Station 2B, in the back channel of Phillis Island, consisted of triplicate petite Ponar grabs at the south side, middle, and north side of the channel (i.e., Sample Stations 2B1, 2B2, and 2B3, respectively).

Substrate type is an important factor in determining the composition of the benthic community. The habitats in the vicinity of BVPS are the result of damming, channelization, and river traffic. Shoreline habitats at the majority of sampling locations were generally in depositional areas that consisted of soft muck substrates composed of mixes of sand, silt, and detritus. One exception was along the north shoreline of Phillis Island at Station 2A where hard pan clay dominated. The other distinct habitat, hard substrate (gravel and cobble), was located in mid-channel of the back channel of Phillis Island. The hard substrate was probably the result of channelization and scouring by river currents.

Forty-six (46) macroinvertebrate taxa were identified during the 2008 monitoring program (Tables 5.2 and 5.3), which was four more than in 2007. A mean density of 770 macroinvertebrates/m^2 was collected in May and 1,796/m^2 in September (Table 5.4). As in previous years, the macroinvertebrate assemblage during 2008 was dominated by burrowing organisms typical of soft unconsolidated substrates. Oligochaetes (segmented worms), mollusks (clams and snails) and chironomid (midge fly) larvae were abundant (Table 5.4). Also as in 2007, the total mean density of organism was higher in September than in May.

Twenty-eight (28) taxa were present in the May samples, and thirty-three (33) taxa in the September samples (Table 5.3.1 and 5.3.2). Fifteen (15) of the 42 taxa were present in both May and September. Numerically, immature tubificid worms were the most abundant organism in both May and September.

The Asiatic clam (*Corbicula*) has been observed in the Ohio River near BVPS from 1974 to present. Zebra mussels were first collected in the BVPS benthic samples in 1998. Adult zebra mussels, however, were detected in 1995 and 1996 by divers in the BVPS main and auxiliary intake structures during scheduled cleaning operations. Zebra mussel veligers, adults and juveniles were collected during the 1997-2008 sampling programs (see Sections 5.4.5 Zebra Mussel Monitoring Program). Both live *Corbicula* and zebra mussels were collected in benthic macroinvertebrate samples in 2008.

In 2008, no new taxa were added to the cumulative taxa list of macroinvertebrates collected near BVPS (Table 5.2). No state or Federal threatened or endangered macroinvertebrate species were collected during 2008.

In the May 2008 samples, oligochaetes accounted for the highest mean density of macroinvertebrates and chironomids had the second highest (624/m^2 or 81 percent of the total density and 96/m^2 or 12 percent, respectively) (Table 5.4). Mollusks and had a mean density of only 24/m^2. Organisms other then oligochaetes, chironomids and mollusks were present at a density of 26/m^2 in May.

In September 2008 samples, oligochaetes accounted for the highest mean density of macroinvertebrates and mollusks had the second highest (1,046/m^2 or 58 percent of the total density and 506/m^2 or 28 percent, respectively) (Table 5.4). Chironomids had the third highest mean density in September 2008 (220/m^2 or 12 percent) while the "others" category had the fourth highest mean density (26/m^2 or 1 percent).

In May, the highest density of macroinvertebrates (3,167 organisms/m^2) occurred at Station 2B3. In September, the highest density of macroinvertebrates also occurred at Station 2B3 (3,783/m^2). In May the lowest mean density of organisms occurred at Station 2B1 (43/m^2). In September, the lowest mean density of organisms occurred at Station 1 (1,161/m^2).

For a comparison of the control to non-control stations, Station 1 was designated the control station, because it is always out of the influence of the BVPS discharge and Station 2B (mean density of Station 2B1, 2B2, and 2B3) was designated as the non-control station, since it is the station most regularly subjected to BVPS's discharge. Stations 3 and 2A may be under the influence of the plume under certain conditions, but it is unlikely that they are regularly influenced by BVPS.

The mean density of macroinvertebrates in the non-control station was 7.9 times higher ($1,252/m^2$) than that of the control station ($158/m^2$) in May (Table 5.5). The high density of oligochaetes in the non-control samples ($1,046/m^2$) accounted for the majority of this difference. Overall the differences probably reflect the natural differences in substrate and natural heterogeneous distributions of these organisms between the stations rather than project-related impacts.

In September, the density of macroinvertebrates present at the non-control ($2,150/m^2$) was about 1.9 times greater than at the control station ($1,161/m^2$). The density of oligochaetes was about 6.8 times higher at the non-control than the control stations, which contributed to the majority to the density difference between stations. This was partially offset by the density of mollusks that was about 4.4 times higher in the control station ($774/m^2$) than in the non-control ($177/m^2$). As in May, the differences observed between Station 1 (control) and Station 2B (non-control) were probably related to observed differences in habitat at each station. Differences were within the expected range of variation for natural populations of macroinvertebrates.

Indices that describe the relative diversity, evenness, and richness of the macroinvertebrate population structure among stations and between control and non-control sites were calculated. A higher Shannon-Weiner diversity index indicates a relatively better structured assemblage of organisms, while a lower index generally indicates a low quality or stressed community. Evenness is an index that estimates the relative contribution of each taxon to the community assemblage, the closer to 1.00, the healthier the community. The community richness is another estimate of the quality of the macroinvertebrate community with a higher richness number indicating a healthier community.

The Shannon-Weiner diversity indices in May 2008 collections ranged from 0.28 at Station 2B1 to 0.93 at Station 2B3 (Table 5.6). In May evenness ranged from 0.47 at Station 2B3 to 0.89 at Stations 3 and 2B2. Richness was greatest at Station 2A (2.83) and lowest at Station 1 (0.83). The overall low indices at Stations 1 and 2B1 are attributed to the relatively few species collected; three at Station 1 and 2 at Station 2B1. These low numbers of organisms likely are due to natural variation in the Ohio River rather than due to BVPS operations. In fact Station 1 is the control station and Station 2B1 is a non-control station. The range in diversity of the macroinvertebrate community in September was generally higher than in May. The overall increase in the number of taxa present in September likely contributed to the relatively higher indices. Relatively high numbers of taxa are frequently present in early fall due to the increased numbers of aquatic stages of insects, especially chironomids, as well as the ability to separate the many of the tubificids that are lumped together when immature. Diversity ranged from 0.52 at Station 2B3 to 0.91 at Station 1. Evenness was also comparable in September to May and ranged from 0.42 at Station 2B3 to 0.81 at Station 1. Richness was greatest at Station 2A (3.77) and lowest at Station 2B2 (1.98).

In May, the number of taxa, diversity, evenness and richness indices were appreciably lower in the control station (Station 1) than in the non-control stations (2B1, 2B2, 2B3) (Table 5.6). In September the indices between the control and non-control stations were comparable. Differences were also apparent in the previous study year and were likely due to natural annual variations in the local populations at these locations. No impacts of the BVPS on the benthic community, as measured by differences between control and non-control zones, were evident in either May or September.

Substrate was probably the most important factor controlling the distribution and abundance of the benthic macroinvertebrates in the Ohio River near BVPS. Soft, mucky substrates that generally existed along the shoreline are conducive to oligochaete, chironomid, and mollusk habitation and limit species of macroinvertebrates that require a more stable bottom.

The density of macroinvertebrates in May and September 2008 fell within the range of densities of macroinvertebrates collected at BVPS in previous years (Table 5.7). ***The community structure has changed little since pre-operational years, and the available evidence does not indicate that BVPS operations have affected the benthic community of the Ohio River.***

5.4.2 Fish Sampling Program

In 2008, 396 fishes representing 24 taxa were collected (i.e., handled) during BVPS surveys by electrofishing and seining (Table 5.8). All taxa collected in 2008 were previously encountered at BVPS. The most common species in the 2008 BVPS surveys, which were collected by electrofishing and seining combined, were shorthead redhorse sucker (17.7% of the total catch), followed by sauger (16.4 %), emerald shiner (10.1%), smallmouth bass (9.6%), golden redhorse sucker (8.1%), gizzard shad (6.1%) and spotted bass (5.8%). None of the remaining 17 species contributed to more than 5 percent of the total handled catch. The most frequently observed but not handled fish in 2008 were gizzard shad (Table 5.15). Game fishes collected during 2008 included channel catfish, flathead catfish, white bass, bluegill, largemouth bass, smallmouth bass, sauger, walleye, rock bass and spotted bass. Game fishes represented 45.7 % of the total handled catch, 26.0% of which were smallmouth bass and sauger.

A total of 322 fish, representing 21 taxa, was collected by electrofishing in 2008 (Table 5.9). Sauger and shorthead redhorse suckers accounted for the greatest portion of the 2008 electrofishing catch (20.2% and 19.9%, respectively) followed by smallmouth bass (10.9%), golden redhorse sucker (9.3%), gizzard shad (7.5%) and smallmouth buffalo (5.0%). No other species collected contributed to greater than five percent of the total catch. Fish observed and not collected in the 2008 electrofishing study are presented in Table 5.15.

A total of 74 fish representing 10 taxa was collected by seining in 2008 (Table 5.10). The most abundant taxa collected was emerald shiner (54.1% of the total catch) followed by spotted bass (17.6%) and shorthead redhorse sucker (8.1%). Bluegill, smallmouth bass and spotted bass were the only game species collected by seining. The game species were only collected as juveniles.

A total of 187 fish representing 14 species was captured during the May 2008 sampling event (Table 5.11). All but three of the fish were collected during electrofishing. Sauger (27.7% of the total catch), shorthead redhorse sucker (21.7%), smallmouth bass (9.8%) and golden redhorse sucker (9.8%) were the most common species boated during the electrofishing effort. Bluegill, channel catfish, rock bass, sauger, smallmouth bass, spotted bass, and walleye were the game species collected in May. Three juvenile shorthead redhorse suckers were the only fish collected by seine netting in May.

A total of 32 fish representing 12 species was captured during the July 2008 sampling event (Table 5.12). A total of 28 fish representing 11 species was collected during electrofishing efforts. Smallmouth buffalo (17.9% of the total catch), and freshwater drum, gizzard shad and smallmouth bass (each contributing to 14.3 percent of the total catch) were the most common species boated during the electrofishing effort. Bluegill, flathead catfish, sauger, smallmouth bass, and spotted bass were the only game species collected during the July electrofishing study (Table 5.12). A total of four fish representing three species was collected by the seines. Two golden redhorse sucker, one smallmouth buffalo and one gizzard shad were the only fish collected in the seine nets.

During the September sampling event, 78 fish representing 16 taxa were collected during fish sampling efforts (Table 5.13). A total of 52 fish representing 14 species was collected during electrofishing in September. Gizzard shad (32.7% of the total catch) and smallmouth bass (17.3%) were the most abundant species. Shorthead redhorse sucker (13.5% of the total electrofishing catch), quillback (7.7%) and golden redhorse sucker (5.8%) were also relatively abundant. White bass, channel catfish, sauger, smallmouth bass and spotted bass were the only game species collected during electrofishing efforts in September. Hundreds of juvenile gizzard shad that were too small to be collected in the electrofishing nets were observed but not boated (Table 5.15). A total of 26 fish, representing five taxa were collected during seine netting efforts in September. Fifty percent of the fish that were seine netted were juvenile spotted bass. The only other game fish collected in seine nets were three juvenile smallmouth bass.

During the November sampling event, 99 fish representing 16 taxa were captured (Table 5.14). A total of 58 fish representing 14 species were collected during electrofishing. Shorthead redhorse sucker were the most abundant species collected by electrofishing and contributed to 25.9% of the total. Other relatively abundant species were sauger (17.2% of the total), golden redhorse sucker (15.5%), spotted bass (6.9%), and smallmouth bass (6.9%). Game species collected by electrofishing included white bass, smallmouth bass, bluegill, sauger, largemouth bass, and spotted bass. Fish observed and not collected in the November electrofishing study are presented in Table 5.15. A total of 41 species representing species were collected by seines in November. Of these 82.9% were emerald shiners. Mimic shiners and juvenile bluegills were also collected by seines.

Electrofishing catch rates are presented in Tables 5.16, 5.17, 5.18, and 5.19 for fish that were boated and handled during the 2005 through 2008 surveys by season (FENOC 2006, 2007 and 2008). In 2008 the annual catch rate was 1.98 fish per minute. The greatest catch rate in 2008 occurred in spring (May) when the catch rate was 4.54 fish per minute. Sauger, shorthead redhorse sucker, golden redhorse sucker and smallmouth bass contributed to the majority of this total. The lowest catch rate occurred in summer (July) with a rate of 0.68 fish per electrofishing minute. The annual catch rates were consistent over the four years ranging from a high of 1.98 fish per minute in 2008 to 1.16 in 2005. Over the four years, the highest seasonal catch rates occurred in May 2008(4.54 fish per minute) and in May 2006 (2.85 fish per minute). The lowest seasonal catch rates occurred in July 2008 (0.68 fish per electrofishing minute) and July 2006 (0.70 fish per minute).

The results of the electrofishing sampling effort (Table 5.9) did not indicate any major differences in species composition between the control station (1) and the non-control Stations 2A, 2B, and 3. A greater number of fish representing more species was captured at non-control stations than control stations. This was most likely due to the extra effort expended at non-control stations versus control stations (i.e., there are three non-control stations and only one control station). In 2008, fewer individuals and species were collected by seines at both control and non-control stations than during electrofishing effort (Table 5.10). Species composition was comparable in seine collections taken in control and non-control stations.

In 2008, species composition remained comparable among stations. Common taxa collected in the 2008 surveys by all methods included gizzard shad, redhorse sucker species, smallmouth buffalo, sauger, smallmouth bass, and emerald shiner. Little difference in the species composition of the catch was observed between the control (1) and non-control stations (2A, 2B and 3). Habitat preference and availability were probably the most important factors affecting where and when different species of fish are collected.

The results of the 2008 fish surveys indicated that there is a normal community structure in the Ohio River in the vicinity of BVPS based on species composition and relative abundance of fish observed during the surveys. Benthivores (bottom feeders including suckers and buffalo) and forage species (e.g. gizzard shad, emerald shiners) were collected in the highest numbers. The numbers of forage species were greater than in 2007. Variations in annual catch were probably attributable to normal fluctuations in the population size of the forage species and the predator populations that rely on them. Forage species, such as gizzard shad and emerald shiner with high reproductive potentials, frequently respond to changes in natural environmental factors (competition, food availability, cover, and water quality) with large fluctuations in population size, which could be the reason for the lower numbers of these species observed in 2007. This, in turn, influences their appearance in the sample populations during annual surveys. Spawning/rearing success due to abiotic factors is usually the determining factor of the size and composition of a fish community. In addition, differences in electrofishing catch rate can be attributed to environmental conditions that prevail during sampling efforts. High water, increased turbidity, and swift currents that occur during electrofishing efforts in some years can affect the collection efficiency of this year.

5.4.3 Corbicula Monitoring Program

In 2008, six *Corbicula* (50.0 percent alive) were collected from the Unit 1 cooling tower basin during monthly reservoir sampling. No *Corbicula* were collected in the scraping samples. The largest *Corbicula* collected was retained in a sieve with a 6.30-9.49 mm length size range (Table 5.20 and Figure 5.5). The greatest numbers of *Corbicula* were collected in March (four individuals). Individuals were collected only in March. T he mean density of total *Corbicula* (live and dead) in Unit 1 in 2008 was $28/m^2$. *Corbicula* were collected only in March and August.

In 2008, six *Corbicula* (66.7 percent alive) were collected from the Unit 2 cooling tower reservoir during monthly sampling. The largest *Corbicula* collected was in the greater than 9.5 mm length size range (Table 5.21 and Figure 5.6). Individuals were collected in March, May and August. The mean density of *Corbicula* in Unit 2 in 2008 was $33/m^2$. The greatest numbers of *Corbicula* (four individuals) were collected in March. No sampling was conducted in April because the Unit 2 Cooling Tower could not be accessed due to unit shutdown.

In 2008, BVPS continued its *Corbicula* control program (Year 16), which included the use of a molluscicide (HM-150M) to prevent the proliferation of *Corbicula* within BVPS. BVPS was granted permission by the Pennsylvania Department of Environmental Protection to use HM-150M to target the Unit 1 river water system and the Unit 2 service water system.

In 1990 through 1993, the molluscicide applications (HM-150M) focused on reducing the *Corbicula* population throughout the entire river water system of each BVPS plant (Units 1 and 2). In 1994 and 1995, the HM-150M applications targeted the internal water systems; therefore, the HM-150M concentrations in the cooling towers were reduced during HM-150M applications. Consequently, adult and juvenile *Corbicula* in the cooling towers often survived the HM-150M applications. Reservoir sediment samples taken after HM-150M applications represent mortality of *Corbicula* in the cooling tower only and do not reflect mortality in BVPS internal water systems.

The monthly reservoir sediment samples collected in Units 1 and 2 Cooling Towers during 2008 demonstrated that *Corbicula* were entering and colonizing the reservoirs. Overall, densities in Units 1 and 2 were somewhat less than those in 2007. The recent decrease of *Corbicula* at the BVPS returns densities to levels more consistent with densities in the Ohio River in the mid-1990's, but well below those present during the 1980's.

5.4.4 *Corbicula* Juvenile Monitoring Program

Figure 5.7 presents the abundance and size distribution data for samples collected in the Ohio River near the intake structure by petite ponar dredge in 2008. Ten live individuals were collected during May, two in July, six in September and five November for a total of 23 individuals. They ranged in size from the 0.01-0.99mm size range that were spawned in 2008 to greater than 9.50mm that were spawned in prior years. The number of individuals collected in 2008 was somewhat higher than in 2007 (14 individuals), 2006 (three individuals) and 2005 (17 individuals).

A spring/early-summer spawning period typically occurs in the Ohio River near BVPS each year when preferred spawning temperatures (60-65° F) are reached (Figure 5.8). The offspring from this spawning event generally begin appearing in the sample collections in May. The settled clams generally increase in size throughout the year. ***The overall low numbers of live Corbicula collected in the sample collected outside the intake and cooling towers in 2008, compared to levels in the 1980's, likely reflects a natural decrease in the density of Corbicula in the Ohio River near BVPS.***

5.4.5 Zebra Mussel Monitoring Program

Zebra mussels (*Dreissena polymorpha*) are exotic freshwater mollusks that have ventrally flattened shells generally marked with alternating dark and lighter bands. They are believed to have been introduced into North America through the ballast water of ocean-going cargo vessels probably from Eastern Europe. They were first identified in Lake St. Clair in 1988 and rapidly spread to other Great Lakes and the Mississippi River drainage system, becoming increasingly abundant in the lower, middle, and upper Ohio River. They use strong adhesive byssal threads, collectively referred to as the byssus, to attach themselves to any hard surfaces (e.g., intake pipes, cooling water intake systems, and other mussels). Responding to NRC Notice No. 89-76 (Biofouling Agent-Zebra Mussel, November 21, 1989), BVPS instituted a Zebra Mussel Monitoring Program in January 1990. Studies have been conducted each year since then.

Zebra mussels were detected in both pump samples (Figures 5.9 and 5.10) and substrate samples (Figure 5.11 and 5.12) in 2008. Zebra mussel veliger pump samples were collected from April through October (Figures 5.9 and 5.10). Veligers were collected at all of the six sites that were sampled in 2008. Densities of veligers generally increased through the year, peaked in July and August and then were less for the balance of the sampling year. This seasonal pattern is typical for zebra mussels in the northeastern United States. Spawning begins as water temperature reach approximately 14 degrees C and peak at water temperatures of 21 degrees C. Veligers densities usually peak about two weeks after the optimum water temperature for spawning is reached. Veliger densities then fall off as veligers mature and settle. The greatest density of veligers was present in the sample collected from the Emergency Outfall Facility in August (95,220/m^3). Veligers were not present in until June. From June through the end of veliger sampling in October, veligers were present in every sample collected at all locations. Overall, veliger densities were much higher than in 2007 but comparable in magnitude to 2006. This is likely due to annual variability in numbers of veligers in the Ohio River.

In 2008, settled zebra mussels were collected in scrape samples at the barge slip, and the intake structure (Figures 5.11 and 5.12). The highest density of mussels was present in the sample collected at the barge slip (76 mussels/m^2) in July. The mussels collected at each of the sites included individuals that were capable of reproducing. The density of collected adult zebra mussels was somewhat higher than in past years.

Overall, both the number of observations and densities of settled mussels were similar in 2003-present although somewhat higher in 2008. The density of veligers in 2008 was much higher than in 2007, but was comparable to 2006. Although densities of settled mussels are low compared to other populations such as the Lower Great Lakes, densities comparable to those in the Ohio River are sufficient to cause problems in the operation of untreated cooling water intake systems. ***Whether the population of zebra mussels in this reach of the Ohio River is resurging or only yearly fluctuations are present cannot be determined. In any case, the densities of mussels that presently exist are more than sufficient to impact the BVPS if continued prudent monitoring and control activities are not conducted.***

6.0 ZEBRA MUSSEL AND *CORBICULA* CONTROL ACTIVITIES

In 2008, BVPS continued its *Corbicula* and zebra mussel control program (15th year), which included the use of a molluscicide (HM-150M) to prevent the proliferation of *Corbicula* within BVPS. BVPS was granted permission by the Pennsylvania Department of Environmental Protection to use HM-150M to target the Unit 1 river water system and the Unit 2 service water system.

In 1990 through 1993, the molluscicide applications (HM-150M) focused on reducing the *Corbicula* population throughout the entire river water system of each BVPS plant (Units 1 and 2). In 1994 through 2008, the HM-150M or 2 applications targeted zebra mussels and *Corbicula* in the internal water systems; therefore the molluscicide concentrations in the cooling towers were reduced during HM-150M or 2 applications. Consequently, adult and juvenile *Corbicula* in the cooling towers often survived the applications. Reservoir sediment samples taken after HM-150M or 2 applications represented mortality of *Corbicula* in the cooling tower only and do not reflect mortality in BVPS internal water systems.

In addition to clamicide treatments, preventive measures were taken that included quarterly cleaning of the Intake Bays. The bay cleanings are intended to minimize the accumulation and growth of mussels within the bays. This practice prevents creating an uncontrolled internal colonization habitat. Timely bay cleaning ensure the mussels don't have time to grow to a size more likely to impact BVPS.

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8.0

TABLES

TABLE 5.1
BEAVER VALLEY POWER STATION (BVPS)
SAMPLING DATES FOR 2008

Study	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Benthic Macroinvertebrate					14				16		6	
Fish					14		29		16		6	
Corbicula and Zebra Mussel			25	22	14	25	29	21	16	16	6	
Corbicula CT Density												
Zebra Mussel Veliger				22	14	25	29	21	16	16		

Table 5.2

Systematic List of Macroinvertebrates Collected From 1973 Through 2008 in The Ohio River Near BVPS

Phylum	Class	Family / Sub-Family	Genus and Species	Previous Collections	Collected in 2008	New in 2008
Porifera						
			Spongilla fragilis	X		
Cnidaria						
	Hydrozoa					
		Clavidae				
			Cordylophora lacustris	X		
		Hydridae				
			Craspedacusta sowerbii	X		
			Hydra sp.	X		
Platyhelminthes						
	Tricladida			X		
	Rhabdocoela			X		
Nemertea				X		
Nematoda				X		
Entoprocta						
			Urnatella gracilis	X		
Ectoprocta						
			Fredericella sp.	X		
			Paludicella articulata	X		
			Pectinatella sp.	X		
			Plumatella sp.	X		
Annelida						
	Oligochaeta			X	X	
		Aeolosomatidae		X		
		Enchytraeidae		X		
		Naididae		X		
			Allonais pectinata	X		
			Amphichaeta leydigi	X		
			Amphichaeta sp.	X		
			Arcteonais lomondi	X	X	
			Aulophorus sp.	X		
			Chaetogaster diaphanus	X		
			C. diastrophus	X		
			Dero digitata	X		
			Dero flabelliger	X		
			D. nivea	X		
			Dero sp.	X		
			Nais barbata	X		
			N. behningi	X		
			N. bretscheri	X		
			N. communis	X		
			N. elinguis	X	X	
			N. pardalis	X	X	
			N. pseudobtusa	X		
			N. simplex	X		
			N. variabilis	X	X	
			Nais sp.	X		
			Ophidonais serpentina	X		
			Paranais frici	X	X	
			Paranais litoralis	X		
			Paranais sp.	X		
			Piguetiella michiganensis	X		
			Pristina idrensis	X		
			Pristina longisoma	X		
			Pristina longiseta	X		
			P. osborni	X	X	
			P. sima	X		
			Pristina sp.	X		
			Pristinella sp.	X		

Table 5.2 (continued)

Systematic List of Macroinvertebrates Collected From 1973 Through 2008 in The Ohio River Near BVPS

Phylum	Class	Family Sub-Family	Genus and Species	Previous Collections	Collected in 2008	New in 2008
Annelida	**Oligochaeta**	Naididae	*Pristinella jenkinae*	X	X	
			Pristinella idrensis	X		
			Pristinella osborni	X		
			Ripistes parasita	X		
			Slavina appendiculata	X		
			Specaria josinae	X	X	
			Stephensoniana trivandrana	X		
			Stylaria fossularis	X		
			S. lacustris	X	X	
			Uncinais uncinata	X		
			Vejdovskyella comata	X		
			Vejdovskyella intermedia	X		
			Vejdovskyella sp.	X		
	Tubificida			X		
		Tubificidae		X		
			Aulodrilus limnobius	X		
			A. pigueti	X		
			A. pluriseta	X		
			Aulodrilus sp.	X		
			Bothrioneurum vejdovskyanum	X		
			Branchiura sowerbyi	X	X	
			Ilyodrilus templetoni	X		
			Limnodrilus cervix	X		
			L. cervix (variant)	X		
			L. claparedianus	X		
			L. hoffmeisteri	X	X	
			L. maumeensis	X	X	
			L. profundicla	X	X	
			L. spiralis	X		
			L. udekemianus	X		
			Limnodrilus sp.	X		
			Peloscolex multisetosus longidentus	X		
			P. m. multisetosus	X		
			Potamothrix moldaviensis	X		
			Potamothrix sp.	X		
			P. vejdovskyi	X	X	
			Psammoryctides curvisetosus	X		
			Tubifex tubifex	X		
			Unidentified immature forms:			
			with hair chaetae	X		
			without hair chaetae	X	X	
		Lumbriculidae		X	X	
		Hirudinae		X		
		Glossiphoniidae		X		
			Helobdella elongata	X		
			H. stagnalis	X		
			Helobdella sp.	X		
		Erpobdellidae				
			Erpobdella sp.	X		
			Mooreobdella microstoma	X		
		Haplotaxidae				
			Stylodrilus heringianus	X		
	Lumbricina			X		
		Lumbricidae		X		

Table 5.2 (continued)

Systematic List of Macroinvertebrates Collected From 1973 Through 2008 in The Ohio River Near BVPS

Phylum	Class	Family / Sub-Family	Genus and Species	Previous Collections	Collected in 2008	New in 2008
Arthropoda						
	Acarina			X		
	Ostracoda			X		
	Isopoda					
			Asellus sp.	X		
Arthropoda						
	Amphipoda					
		Talitridae				
			Hyalella azteca	X		
		Gammaridae				
			Crangonyx pseudogracilis	X		
			Crangonyx sp.	X		
			Gammarus fasciatus	X		
			Gammarus sp.	X	X	
		Pontoporeiidae				
			Monoporeia affinis	X		
Decapoda				X		
Collembola				X		
Ephemeroptera				X		
		Heptageniidae		X		
			Stenacron sp.	X		
			Stenonema sp.	X		
		Ephemeridae				
			Ephemera sp.	X		
			Hexagenia sp.	X	X	
			Ephron sp.	X		
		Baetidae				
			Baetis sp.	X		
		Caenidae				
			Caenis sp.	X	X	
			Serattella sp.	X		
		Tricorythidae				
			Tricorythodes sp.	X		
Megaloptera						
			Sialis sp.	X		
Odonata						
		Gomphidae				
			Argia sp.	X		
			Dromogomphus spoliatus	X		
			Dromogomphus sp.	X		
			Gomphus sp.	X	X	
		Libellulidae				
			Libellula sp.	X		
Plecoptera				X		
Trichoptera				X		
		Hydropsychidae				
			Cheumatopsyche sp.	X		
			Hydropsyche sp.	X		
			Parapsyche sp.	X		
		Hydroptilidae				
			Hydroptila sp.			
			Orthotrichia sp.			
			Oxyethira sp.			
		Leptoceridae				
			Ceraclea sp.	X		
			Oecetis sp.	X	X	
		Polycentropodidae				
			Cyrnellus sp	X		
Trichoptera		Polycentropodidae	*Polycentropus sp.*	X		

Table 5.2 (continued)

Systematic List of Macroinvertebrates Collected From 1973 Through 2008 in The Ohio River Near BVPS

Phylum	Class	Family / Sub-Family	Genus and Species	Previous Collections	Collected in 2008	New in 2008
Coleoptera						
		Hydrophilidae		X		
Coleoptera		Elmidae	*Ancyronyx variegatus*	X		
			Dubiraphia sp.	X		
			Helichus sp.	X		
			Optioserus sp.	X		
			Stenelmis sp.	X		
		Psephenidae		X		
Diptera						
			Unidentified Diptera	X		
		Psychodidae		X		
			Pericoma sp.	X		
			Psychoda sp.	X		
			Telmatoscopus sp.	X		
			Unidentified Psychodidae pupae	X		
		Chaoboridae				
			Chaoborus sp.	X		
		Simuliidae				
			Similium sp.	X		
		Chironomidae		X		
		Chironominae		X		
			Tanytarsini pupa	X		
			Chironominae pupa	X		
			Axarus sp.	X		
			Chironomus sp.	X	X	
			Cladopelma sp.	X		
			Cladotanytarsus sp.	X	X	
			Cryptochironomus sp.	X	X	
			Dicrotendipes nervosus	X		
			Dicrotendipes sp.	X	X	
			Glyptotendipes sp.	X		
			Harnischia sp.	X		
			Microchironomus sp.	X		
			Micropsectra sp.	X		
			Microtendipes sp.	X		
			Parachironomus sp.	X	X	
			Paracladopelma sp.	X		
			Paratanytarsus sp.	X		
			Paratendipes sp.	X	X	
			Phaenopsectra sp.	X		
			Polypedilum (s.s.) convictum type	X		
			P. (s.s.) simulans type	X		
			Polypedilum sp.	X	X	
			Rheotanytarsus sp.	X		
			Stempelina sp	X		
			Stenochironomus sp.	X		
			Stictochironomus sp.	X		
			Tanytarsus coffmani	X		
			Tanytarsus sp.	X	X	
			Tribelos sp.	X		
			Xenochironomus sp.	X		
		Tanypodinae		X		
			***Tanypodinae* pupae**	X		
			Ablabesmyia sp.	X		
			Clinotanypus sp.	X		
			Coelotanypus scapularis	X		
			Coelotanypus sp.	X	X	
			Djalmabatista pulcher	X		
			Djalmabatista sp.	X		
			Procladius sp.	X	X	
			Tanypus sp.	X		

Table 5.2 (continued)

Systematic List of Macroinvertebrates Collected From 1973 Through 2008 in The Ohio River Near BVPS

Phylum	Class	Family / Sub-Family	Genus and Species	Previous Collections	Collected in 2008	New in 2008
Diptera		Tanypodinae	*Thienemannimyia group*	X		
			Zavrelimyia sp.	X		
		Orthocladiinae		X		
			***Orthocladiinae* pupae**	X		
			Cricotopus bicinctus	X		
			C. (s.s.) trifascia	X		
			Cricotopus (Isocladius)-sylvestris Group	X		
			C. (Isocladius) sp.	X		
			Cricotopus (s.s.) sp.	X	X	
			Eukiefferiella sp.	X		
			Hydrobaenus sp.	X		
			Limnophyes sp.	X		
			Nanocladius (s.s.) distinctus	X		
			Nanocladius sp.	X		
			Orthocladius sp.	X	X	
			Parametriocnemus sp.	X		
			Paraphaenocladius sp.	X		
			Psectrocladius sp.	X		
			Pseudorthocladius sp.	X		
			Pseudosmittia sp.	X		
			Smittia sp.	X		
			Theinemannimyia sp.	X		
		Diamesinae				
			Diamesa sp.	X		
			Potthastia sp.	X		
		Ceratopogonidae		X		
			Probezzia sp.	X	X	
			Bezzia sp.	X	X	
			Culicoides sp.	X	X	
		Dolichopodidae		X		
		Empididae		X		
			Clinocera sp.	X		
			Wiedemannia sp.	X		
		Ephydridae		X		
		Muscidae		X		
		Rhagionidae		X		
		Tipulidae		X		
		Stratiomyidae		X		
		Syrphidae		X		
Lepidoptera				X		
Hydrachnidia				X		
Mollusca						
	Gastropoda			X		
		Hydrobiidae		X		
		Amnicolinae				
			Amnicola sp.	X	X	
			Aminicola binneyana	X		
			Amnicola limosa	X		
			Stagnicola elodes	X		
	Physacea			X		
		Pleuroceridae				
			Pleurocera acuta	X		
			Goniobasis sp	X	X	
		Physidae		X		
			Physa sp.	X		
			Physa ancillaria	X		
			Physa integm	X		

Table 5.2 (continued)

Systematic List of Macroinvertebrates Collected From 1973 Through 2008 in The Ohio River Near BVPS

Phylum	Class	Family / Sub-Family	Genus and Species	Previous Collections	Collected in 2008	New in 2008
Mollusca	**Physacea**	Ancylidae		X	X	
			Ferrissia sp.	X		
		Planorbidae				
			Gillia atilis	X		
		Valvatidae		X		
			Valvata perdepressa	X		
			Valvata piscinalis	X	X	
			Valvata sincera sincera	X		
			Valvata sp.	X		
Pelecypoda				X		
	Sphaeriacea			X		
		Corbiculidae				
			Corbicula fluminea	X	X	
			Corbicula sp.	X		
		Sphaeriidae		X		
			Pisidium ventricosum	X		
			Pisidium sp.	X	X	
			Sphaerium sp.	X	X	
			Unidentified immature Sphaeriidae	X		
		Dreissenidae				
			Dreissena polymorpha	X	X	
		Unionidae		X		
			Anodonta grandis	X		
			Anodonta (immature)	X		
			Elliptio sp.	X		
			Quadrula pustulosa	X		
			Unidentified immature Unionidae	X		

TABLE 5.3

BENTHIC MACROINVERTEBRATE COUNTS FOR TRIPLICATE SAMPLES TAKEN AT EACH SAMPLE STATION FOR MAY AND SEPTEMBER 2008

Scientific name	May							Sept							
	Location						May Total	Location						Sept Total	2008 Total
	1	2A	2B1	2B2	2B3	3		1	2A	2B1	2B2	2B3	3		
Amnicola sp.	0	0	0	0	0	0	0	0	0	3	2	0	3	8	8
Ancylidae	0	0	0	0	0	0	0	9	3	0	0	0	4	16	16
Arcteonais lomondi	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1
Bezzia sp.	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Branchiura sowerbyi	2	1	0	0	1	0	4	1	7	0	0	2	1	11	15
Caenis sp.	0	0	0	2	0	0	2	0	0	1	0	0	0	1	3
Chironomid pupae	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1
Chironomus sp.	0	7	0	0	2	0	9	0	0	0	0	1	0	1	10
Cladotanytarsus sp	0	2	0	1	0	0	3	0	0	0	0	0	0	0	3
Coelotanypus sp.	0	0	0	0	0	0	0	0	0	0	7	2	2	11	11
Corbicula fluminea	0	0	0	0	0	0	0	0	5	7	3	4	4	23	23
Cricotopus (s.s.) sp.	0	0	0	0	0	0	0	1	1	0	0	0	0	2	2
Cryptochironomus sp.	0	0	0	0	0	0	0	2	5	9	0	1	1	18	18
Culicoides sp.	0	0	0	0	5	0	5	0	0	0	0	0	0	0	5
Dicrotendipides sp	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Dreissena polymorpha	0	0	0	7	0	0	7	28	4	0	4	0	44	80	87
Gammarus sp.	0	0	0	7	0	0	7	0	1	0	0	0	1	2	9
Gomphus sp.	0	1	0	0	0	0	1	0	1	0	0	0	0	1	2
Goniobasis sp.	0	0	0	0	0	0	0	5	5	0	0	0	4	14	14
Hexagenia sp.	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2
Immature tubificid without	8	5	1	5	148	5	172	11	33	38	61	195	25	363	535
Limnodrilus hoffmeisteri	0	1	0	0	20	5	26	2	1	10	3	11	0	27	53
Limnodrilus maumeensis	0	0	0	0	33	1	34	0	0	0	0	10	0	10	44
Limnodrilus profundicola	0	0	0	0	2	0	2	0	0	0	0	0	0	0	2
Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Nais elinguis	0	0	0	0	0	6	6	0	0	0	0	0	0	0	6
Nais pardalis	0	0	0	0	0	3	3	0	0	0	0	0	0	0	3
Nais variabilis	0	0	0	0	0	0	0	0	0	0	0	3	0	3	3
Oecetis sp.	0	0	0	1	0	0	1	0	1	0	1	0	1	3	4
Oligochaeta	0	0	0	0	0	0	0	3	1	0	0	2	0	6	6
Orthocladius sp.	0	1	2	7	0	0	10	0	0	0	0	0	0	0	10
Parachironomus sp.	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1
Paranais frici	0	0	0	0	0	0	0	3	1	0	0	0	0	4	4
Paratendipes sp.	0	1	0	0	0	1	2	0	0	0	0	0	0	0	2
Pisidium sp.	0	0	0	0	1	1	2	0	0	0	0	0	0	0	2
Polypedilum sp.	0	0	0	0	5	2	7	4	4	12	0	3	7	30	37
Potamothrix vejdovskyi	0	0	0	0	1	0	1	0	0	1	3	7	0	11	12
Pristina osborni	0	0	0	0	1	0	1	0	2	1	1	0	0	4	5
Pristinella jenkinae	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Probezzia sp.	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Procladius sp.	0	0	0	0	0	0	0	0	0	5	3	16	0	24	24
Specaria josinae	1	0	0	4	2	0	7	0	0	0	0	0	0	0	7
Sphaerium sp.	0	0	0	0	0	1	1	10	41	4	6	4	3	68	69
Stylaria lacustris	0	4	0	0	0	0	4	0	0	0	0	0	0	0	4
Tanytarsus sp.	0	0	0	2	0	0	2	0	0	0	0	1	0	1	3
Valvata piscinalis	0	0	0	0	0	0	0	2	1	0	0	0	0	3	3
Monthly Total	11	24	3	38	221	25	322	81	118	92	94	264	103	752	1074

TABLE 5.4

MEAN NUMBER OF MACROINVERTEBRATES (NUMBER/M^2) AND PERCENT COMPOSITION OF OLIGOCHAETA, CHIRONOMIDAE, MOLLUSCA, AND OTHER ORGANISMS, 2008 BVPS

May	Station													
	1 (Control)		2A		2B1 (Non-control)		2B2 (Non-control)		2B3 (Non-control)		3		Total Mean	
	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%
Oligochaeta	0	0	158	46	14	33	143	26	2981	94	287	80	624	81
Chironomidae	158	100	172	50	29	67	158	29	100	3	43	12	96	12
Mollusca	0	0	0	0	0	0	100	18	14	0	29	8	24	3
Others	0	0	14	4	0	0	143	26	72	2	0	0	26	3
Total	158	100	344	100	43	100	544	100	3167	100	359	100	770	100

September	Station													
	1 (Control)		2A		2B1 (Non-control)		2B2 (Non-control)		2B3 (Non-control)		3		Total Mean	
	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%
Oligochaeta	244	21	631	37	731	55	975	72	3311	88	387	26	1046	58
Chironomidae	143	12	172	10	373	28	143	11	344	9	143	10	220	12
Mollusca	774	67	846	50	201	15	215	16	114	3	889	60	506	28
Others	0	0	43	3	14	1	14	1	14	0	57	4	24	1
Total	1161	100	1692	100	1319	100	1347	100	3783	100	1476	100	1796	100

TABLE 5.5

MEAN NUMBER OF MACROINVERTEBRATES (NUMBER/M^2) AND PERCENT COMPOSITION OF OLIGOCHAETA, CHIRONOMIDAE, MOLLUSCA, AND OTHER ORGANISMS FOR THE CONTROL STATION (1) AND THE AVERAGE FOR NON-CONTROL STATIONS (2B1, 2B2, AND 2B3), 2008 BVPS

May	Control Station (Mean)		Non-Control Station (Mean)	
	#/m^2	%	#/m^2	%
Oligochaeta	0	0	1046	84
Chironomidae	158	100	96	8
Mollusca	0	0	38	3
Others	0	0	72	6
TOTAL	158	100	1252	100

September	Control Station (Mean)		Non-Control Station (Mean)	
	#/m^2	%	#/m^2	%
Oligochaeta	244	21	1672	78
Chironomidae	143	12	287	13
Mollusca	774	67	177	8
Others	0	0	14	1
TOTAL	1161	100	2150	100

TABLE 5.6

SHANNON-WEINER DIVERSITY, EVENNESS AND RICHNESS INDICES
FOR BENTHIC MACROINVERTEBRATES COLLECTED IN THE OHIO RIVER, 2008

	Station					
May	1	2A	2B1	2B2	2B3	3
No. of Taxa	3	10	2	11	12	9
Shannon-Weiner Index	0.33	0.86	0.28	0.93	0.51	0.85
Evenness	0.69	0.86	0.92	0.89	0.47	0.89
Richness	0.83	2.83	0.91	2.75	2.04	2.49

	Station					
September	1	2A	2B1	2B2	2B3	3
No. of Taxa	13	19	12	10	17	15
Shannon-Weiner Index	0.91	0.89	0.82	0.61	0.52	0.80
Evenness	0.81	0.70	0.76	0.61	0.42	0.68
Richness	2.73	3.77	2.43	1.98	2.87	3.02

Table 5.7. Benthic Macroinvertebrate Densities for Stations 1 (Control) and 2B (Noncontrol), BVPS, 1973-2008.

	Preoperational					
	1973		1974		1975	
	1	2B	1	2B	1	2B
May	248	508	1116	2197		
August	99	244	143	541	1017	1124
Mean	**173**	**376**	**630**	**1369**	**1017**	**1124**

	Operational					
	1976		1977		1978	
	1	2B	1	2B	1	2B
May	927	3660	674	848	351	126
August	851	785	591	3474	601	1896
Mean	**889**	**2223**	**633**	**2161**	**476**	**1011**

	Operational					
	1979		1980		1981	
	1	2B	1	2B	1	2B
May	1004	840	1041	747	209	456
Aug/Sept	1185	588	1523	448	2185	912
Mean	**1095**	**714**	**1282**	**598**	**1197**	**684**

	Operational					
	1982		1983		1984	
	1	2B	1	2B	1	2B
May	3490	3026	3590	1314	2741	621
September	2958	3364	4172	4213	1341	828
Mean	**3223**	**3195**	**3881**	**2764**	**2041**	**725**

	Operational					
	1985		1986		1987	
	1	2B	1	2B	1	2B
May	2256	867	601	969	1971	2649
September	1024	913	849	943	2910	2780
Mean	**1640**	**890**	**725**	**956**	**2440**	**2714**

Table 5.7. Benthic Macroinvertebrate Densities for Stations 1 (Control) and 2B (Noncontrol), BVPS, 1973-2008 (Continued).

	Operational					
	1988		1989		1990	
	1	2B	1	2B	1	2B
May	1804	1775	3459	2335	15135	5796
September	1420	1514	1560	4707	5550	1118
Mean	**1612**	**1645**	**2510**	**3274**	**10343**	**3457**

	Operational					
	1991		1992		1993	
	1	2B	1	2B	1	2B
May	7760	6355	7314	10560	8435	2152
September	3588	2605	2723	4707	4693	2143
Mean	**5808**	**4480**	**5019**	**7634**	**6564**	**2148**

	Operational					
	1994		1995		1996	
	1	2B	1	2B	1	2B
May	6980	2349	8083	9283	1987	1333
September	1371	2930	1669	3873	1649	2413
Mean	**4176**	**2640**	**4876**	**6578**	**1814**	**1873**

	Operational					
	1997		1998		1999	
	1	2B	1	2B	1	2B
May	1411	2520	6980	2349	879	1002
September	1944	2774	1371	2930	302	402
Mean	**1678**	**2647**	**4176**	**2640**	**591**	**702**

	Operational					
	2000		2001		2002	
	1	2B	1	2B	1	2B
May	2987	2881	3139	5232	1548	2795
September	3092	2742			8632	14663
Mean	**3040**	**2812**	**3139**	**5232**	**5090**	**8729**

Table 5.7. Benthic Macroinvertebrate Densities for Stations 1 (Control) and 2B (Noncontrol), BVPS, 1973-2008 (Continued).

	Operational					
	2003		2004		2005	
	1	2B	1	2B	1	2B
May	7095	10750	2752	4558	516	1146
September	2193	6464	10062	7604	4773	6435
Mean	**4644**	**8607**	**6407**	**6121**	**2645**	**3791**

	Operational					
	2006		2007		2008	
	1	2B	1	2B	1	2B
May	143	1242	559	912	158	1252
September	229	2199	560	3794	1161	2150
Mean	**186**	**1721**	**560**	**2353**	**660**	**1701**

TABLE 5.8

TOTAL FISH CATCH; ELECTROFISHING AND SEINE NET COMBINED DURING THE BVPS 2008 FISHERIES SURVEY

Common Name	Scientific Name	Number	Percent
Smallmouth buffalo	*Ictiobus bubalus*	17	4.29
Bluegill	*Lepomis macrochirus*	9	2.27
Carp	*Cyprinus carpio*	2	0.51
Channel catfish	*Ictalurus punctatus*	12	3.03
Emerald shiner	*Notropis atherinoides*	40	10.10
Flathead catfish	*Pylodictis olivaris*	1	0.25
Freshwater drum	*Aplodinotus grunniens*	8	2.02
Gizzard shad	*Dorosoma cepedianum*	24	6.06
Golden redhorse sucker	*Moxostoma erythrurum*	32	8.08
Largemouth bass	*Micropterus salmoides*	1	0.25
Longnose gar	*Lepisosteus osseus*	5	1.26
Mimic shiner	*Notropis volucellus*	2	0.51
Mooneye	*Hiodon tergisus*	1	0.25
Northern hog sucker	*Hypentelium nigricans*	1	0.25
Quillback	*Carpiodes cyprinus*	16	4.04
River carpsucker	*Carpiodes carpio*	1	0.25
Rock bass	*Ambloplites rupestris*	1	0.25
Sauger	*Sander canadense*	65	16.41
Shorthead redhorse sucker	*Moxostoma macrolepidotum*	70	17.68
Silver redhorse	*Moxostoma anisurum*	13	3.28
Smallmouth bass	*Micropterus dolomieu*	38	9.60
Spotted bass	*Micropterus punctulatus*	23	5.81
Walleye	*Sander vitreum*	12	3.03
White bass	*Morone chrysops*	2	0.51
Total Fish Collected in 2008		**396**	**100.00**

TABLE 5.9

COMPARISON OF CONTROL VS. NON-CONTROL ELECTROFISHING CATCHES DURING THE BVPS 2008 FISHERIES SURVEY

Common Name	Control	%	Non-control	%	Total fish	%
Smallmouth buffalo	5	5.05	11	4.9	16	4.97
Bluegill	1	1.01	3	1.3	4	1.24
Carp			2	0.9	2	0.62
Channel catfish	1	1.01	11	4.9	12	3.73
Flathead catfish			1	0.4	1	0.31
Freshwater drum			7	3.1	7	2.17
Gizzard shad	8	8.08	16	7.2	24	7.45
Golden redhorse sucker	10	10.10	20	9.0	30	9.32
Largemouth bass	1	1.01			1	0.31
Longnose gar			5	2.2	5	1.55
Mooneye	1	1.01			1	0.31
Quillback	3	3.03	13	5.8	16	4.97
River carpsucker			1	0.4	1	0.31
Rock bass			1	0.4	1	0.31
Sauger	24	24.24	41	18.4	65	20.19
Shorthead redhorse sucker	22	22.22	42	18.8	64	19.88
Silver redhorse	2	2.02	11	4.9	13	4.04
Smallmouth bass	12	12.12	23	10.3	35	10.87
Spotted bass	2	2.02	8	3.6	10	3.11
Walleye	6	6.06	6	2.7	12	3.73
White bass	1	1.01	1	0.4	2	0.62
Electrofishing Totals	**99**	**100.00**	**223**	**100**	**322**	**100.00**

TABLE 5.10

COMPARISON OF CONTROL VS. NON-CONTROL SEINE CATCHES DURING THE BVPS 2008 FISHERIES SURVEY

Common Name	Control	%	Non-control	%	Total fish	%
Smallmouth buffalo	0	0.00	1	2.33	1	1.35
Bluegill	1	3.23	4	9.30	5	6.76
Emerald shiner	20	64.52	20	46.51	40	54.05
Freshwater drum	0	0.00	1	2.33	1	1.35
Golden redhorse sucker	2	6.45	0	0.00	2	2.70
Mimic shiner	1	3.23	1	2.33	2	2.70
Northern hogsucker	1	3.23	0	0.00	1	1.35
Shorthead redhorse sucker	3	9.68	3	6.98	6	8.11
Smallmouth bass	1	3.23	2	4.65	3	4.05
Spotted bass	2	6.45	11	25.58	13	17.57
Seine Totals	**31**	**100.00**	**43**	**100.00**	**74**	**100.00**

TABLE 5.11

FISH SPECIES COLLECTED DURING THE MAY 2008 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

Common Name	Sample locations*						Seine		Electrofishing	
	S-1	S-2	E-1	E-2A	E-2B	E-3	Total	%	Total	%
Smallmouth buffalo	-	-	2	-	-	4	0	0.00	6	3.26
Bluegill	-	-	-	-	1	-	0	0.00	1	0.54
Carp	-	-	-	1	-	-	0	0.00	1	0.54
Channel catfish	-	-	1	2	3	4	0	0.00	10	5.43
Emerald shiner	-	-	-	-	-	-	0	0.00	0	0.00
Flathead catfish	-	-	-	-	-	-	0	0.00	0	0.00
Freshwater drum	-	-	-	-	-	2	0	0.00	2	1.09
Gizzard shad	-	-	-	-	-		0	0.00	0	0.00
Golden redhorse sucker	-	-	6	5	1	6	0	0.00	18	9.78
Largemouth bass	-	-	-	-	-	-	0	0.00	0	0.00
Longnose gar	-	-	-	-	-	-	0	0.00	0	0.00
Mimic shiner	-	-	-	-	-	-	0	0.00	0	0.00
Mooneye	-	-	-	-	-	-	0	0.00	0	0.00
Northern hog sucker	-	-	-	-	-	-	0	0.00	0	0.00
Quillback	-	-	1	-	-	8	0	0.00	9	4.89
River carpsucker	-	-	-	-	-	-	0	0.00	0	0.00
Rock bass	-	-	-	1	-	-	0	0.00	1	0.54
Sauger	-	-	18	16	8	9	0	0.00	51	27.72
Shorthead redhorse sucker	-	3	13	11	3	13	3	100.00	40	21.74
Silver redhorse	-	-	2	1	1	7	0	0.00	11	5.98
Smallmouth bass	-	-	6	10	2	-	0	0.00	18	9.78
Spotted bass	-	-	1	1	2	-	0	0.00	4	2.17
Walleye	-	-	6	1	2	3	0	0.00	12	6.52
White bass	-	-	-	-	-	-	0	0.00	0	0.00
Total	**0**	**3**	**56**	**49**	**23**	**56**	**3**	**100.00**	**184**	**100.00**

* Gear = (E) Fish captured by electrofishing; (S) captured by seining

TABLE 5.12

FISH SPECIES COLLECTED DURING THE JULY 2008 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

Common Name	Sample locations *						Seine		Electrofishing	
	S-1	S-2	E-1	E-2A	E-2B	E-3	Total	%	Total	%
Smallmouth buffalo	-	1	1	1	2	1	1	25.00	5	17.86
Bluegill	-	-	1	-	-	-	0	0.00	1	3.57
Carp	-	-	-	-	-	-	0	0.00	0	0.00
Channel catfish	-	-	-	-	-	-	0	0.00	0	0.00
Emerald shiner	-	-	-	-	-	-	0	0.00	0	0.00
Flathead catfish	-	-	-	-	-	1	0	0.00	1	3.57
Freshwater drum	-	1	-	-	1	3	1	25.00	4	14.29
Gizzard shad	-	-	1	-	3	-	0	0.00	4	14.29
Golden redhorse sucker	2	-	-	-	-	-	2	50.00	0	0.00
Largemouth bass	-	-	-	-	-	-	0	0.00	0	0.00
Longnose gar	-	-	-	1	2	-	0	0.00	3	10.71
Mimic Shiner	-	-	-	-	-	-	0	0.00	0	0.00
Mooneye	-	-	-	-	-	-	0	0.00	0	0.00
Northern hog sucker	-	-	-	-	-	-	0	0.00	0	0.00
Quillback	-	-	-	1	-	-	0	0.00	1	3.57
River carpsucker	-	-	-	-	-	-	0	0.00	0	0.00
Rock bass	-	-	-	-	-	-	0	0.00	0	0.00
Sauger	-	-	2	-	-	-	0	0.00	2	7.14
Shorthead redhorse sucker	-	-	1	-	1	-	0	0.00	2	7.14
Silver redhorse	-	-	-	-	-	-	0	0.00	0	0.00
Smallmouth bass	-	-	2	1	1		0	0.00	4	14.29
Spotted bass	-	-	1	-	-	-	0	0.00	1	3.57
Walleye	-	-	-	-	-	-	0	0.00	0	0.00
White bass	-	-	-	-	-	-	0	0.00	0	0.00
Total	**2**	**2**	**9**	**4**	**10**	**5**	**4**	**100.00**	**28**	**100.00**

* Gear = (E) Fish captured by electrofishing; (S) captured by seining

TABLE 5.13

FISH SPECIES COLLECTED DURING THE SEPTEMBER 2008 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

Common Name	Sample locations*						Seine		Electrofishing	
	S-1	S-2	E-1	E-2A	E-2B	E-3	Total	%	Total	%
Smallmouth buffalo	-	-	1	1	-	-	0	0.00	2	3.85
Bluegill	-	-	-	-	-	-	0	0.00	0	0.00
Carp	-	-	-	-	-	1	0	0.00	1	1.92
Channel catfish	-	-	-	-	1	1	0	0.00	2	3.85
Emerald shiner	6	-	-	-	-	-	6	23.08	0	0.00
Flathead catfish	-	-	-	-	-	-	0	0.00	0	0.00
Freshwater drum	-	-	-	-	-	1	0	0.00	1	1.92
Gizzard shad	-	-	7	5	3	2	0	0.00	17	32.69
Golden redhorse sucker	-	-	-	2	1	-	0	0.00	3	5.77
Largemouth bass	-	-	-	-	-	-	0	0.00	0	0.00
Longnose gar	-	-	-	-	-	-	0	0.00	0	0.00
Mimic shiner	-	-	-	-	-	-	0	0.00	0	0.00
Mooneye	-	-	1	-	-	-	0	0.00	1	1.92
Northern hog sucker	1	-	-	-	-	-	1	3.85	0	0.00
Quillback	-	-	1	2	-	1	0	0.00	4	7.69
River carpsucker	-	-	-	-	-	-	0	0.00	0	0.00
Rock bass	-	-	-	-	-	-	0	0.00	0	0.00
Sauger	-	-	2	-	-	-	0	0.00	2	3.85
Shorthead redhorse sucker	3	-	1	1	2	3	3	11.54	7	13.46
Silver redhorse	-	-	-	-	1	-	0	0.00	1	1.92
Smallmouth bass	1	2	3	4	2	-	3	11.54	9	17.31
Spotted bass	2	11	-	-	1	-	13	50.00	1	1.92
Walleye	-	-	-	-	-	-	0	0.00	0	0.00
White bass	-	-	-	-	1	-	0	0.00	1	1.92
Total	**13**	**13**	**16**	**15**	**12**	**9**	**26**	**100.00**	**52**	**100.00**

* Gear = (E) Fish captured by electrofishing; (S) captured by seining

TABLE 5.14

FISH SPECIES COLLECTED DURING THE NOVEMBER 2008 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

Common Name	Sample locations *						Seine		Electrofishing	
	S-1	S-2	E-1	E-2A	E-2B	E-3	Total	%	Total	%
Smallmouth buffalo	-	-	1	1	1	-	0	0.00	3	5.17
Bluegill	1	4	-	1	1	-	5	12.20	2	3.45
Carp	-	-	-	-	-	-	0	0.00	0	0.00
Channel catfish	-	-	-	-	-	-	0	0.00	0	0.00
Emerald shiner	14	20	-	-	-	-	34	82.93	0	0.00
Flathead catfish	-	-	-	-	-	-	0	0.00	0	0.00
Freshwater drum	-	-	-	-	-	-	0	0.00	0	0.00
Gizzard shad	-	-	-	-	3	-	0	0.00	3	5.17
Golden redhorse sucker	-	-	4	2	1	2	0	0.00	9	15.52
Largemouth bass	-	-	1	-	-	-	0	0.00	1	1.72
Longnose gar	-	-	-	-	2	-	0	0.00	2	3.45
Mimic shiner	1	1	-	-	-	-	2	4.88	0	0.00
Mooneye	-	-	-	-	-	-	0	0.00	0	0.00
Northern hog sucker	-	-	-	-	-	-	0	0.00	0	0.00
Quillback	-	-	1	-	1	-	0	0.00	2	3.45
River carpsucker	-	-	-	-	1	-	0	0.00	1	1.72
Rock bass	-	-	-	-	-	-	0	0.00	0	0.00
Sauger	-	-	2	4	2	2	0	0.00	10	17.24
Shorthead redhorse sucker	-	-	7	3	2	3	0	0.00	15	25.86
Silver redhorse	-	-	-	-	1	-	0	0.00	1	1.72
Smallmouth bass	-	-	1	-	3	-	0	0.00	4	6.90
Spotted bass	-	-	-	1	3	-	0	0.00	4	6.90
Walleye	-	-	-	-	-	-	0	0.00	0	0.00
White bass	-	-	1	-	-	-	0	0.00	1	1.72
Total	**16**	**25**	**18**	**12**	**21**	**7**	**41**	**100.00**	**58**	**100.00**

* Gear = (E) Fish captured by electrofishing; (S) captured by seining

TABLE 5.15

ESTIMATED NUMBER OF FISH OBSERVED * DURING ELECTROFISHING OPERATIONS, 2008

Common Name	May	July	Sept	Nov	Total
Unidentified redhorse suckers	32	2		2	**36**
Walleye/Sauger	16				**16**
Longnose gar	2	1		2	**5**
Carp	3			1	**4**
Smallmouth buffalo		3			**3**
Gizzard shad		5	100s		**100s**
Unidentified sunfish				2	**2**
Total	53	11	100s	7	

* = Not boated or handled

Table 5.16

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2005 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Spring	41	Smallmouth buffalo	5	0.1220
		Black crappie	1	0.0244
		Bluegill	1	0.0244
		Gizzard shad	3	0.0732
		Golden redhorse sucker	16	0.3902
		Longnose gar	1	0.0244
		Northern hog sucker	1	0.0244
		Rock bass	1	0.0244
		Sauger	6	0.1463
		Shorthead redhorse sucker	7	0.1707
		Silver redhorse	3	0.0732
		Smallmouth bass	2	0.0488
		Spotted bass	2	0.0488
		White bass	1	0.0244
		Season Total	50	1.2195
Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Summer	41	Smallmouth buffalo	5	0.1220
		Carp	5	0.1220
		Flathead catfish	1	0.0244
		Gizzard shad	12	0.2927
		Mooneye	1	0.0244
		Quillback	1	0.0244
		Sauger	1	0.0244
		Shorthead redhorse sucker	3	0.0732
		Silver redhorse	1	0.0244
		Smallmouth bass	4	0.0976
		Spotted bass	2	0.0488
		Walleye	1	0.0244
		Season Total	37	0.9024

Table 5.16 (continued)

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2005 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Fall	40	Smallmouth buffalo	7	0.1750
		Bluegill	1	0.0250
		Channel catfish	2	0.0500
		Flathead catfish	1	0.0250
		Freshwater drum	2	0.0500
		Gizzard shad	1	0.0250
		Golden redhorse sucker	1	0.0250
		Log perch	1	0.0250
		Longnose gar	5	0.1250
		Sauger	2	0.0500
		Shorthead redhorse sucker	3	0.0750
		Silver redhorse	1	0.0250
		Smallmouth bass	7	0.1750
		White bass	1	0.0250
		Season Total	35	0.8750
Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Winter	41	Smallmouth buffalo	6	0.1463
		Bluegill	1	0.0244
		Carp	1	0.0244
		Gizzard shad	2	0.0488
		Golden redhorse sucker	4	0.0976
		Longnose gar	1	0.0244
		Mooneye	1	0.0244
		Quillback	1	0.0244
		River carpsucker	1	0.0244
		Sauger	13	0.3171
		Shorthead redhorse sucker	12	0.2927
		Smallmouth bass	13	0.3171
		Spotted bass	7	0.1707
		Walleye	2	0.0488
		White bass	2	0.0488
		Season Total	67	1.6341
	163		189	1.1595

Table 5.17

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2006 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Spring	41	Black buffalo	10	0.2439
		Black crappie	1	0.0244
		Gizzard shad	9	0.2195
		Golden redhorse sucker	19	0.4634
		Quillback	2	0.0488
		Sauger	17	0.4146
		Shorthead redhorse sucker	16	0.3902
		Skipjack herring	1	0.0244
		Smallmouth bass	11	0.2683
		Spotted bass	5	0.1220
		Striped bass x White bass	1	0.0244
		Walleye	10	0.2439
		White bass	15	0.3659
		Season Total	117	2.8537
Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Summer	40	Black buffalo	2	0.0500
		Black crappie	1	0.0250
		Gizzard shad	3	0.0750
		Golden redhorse sucker	4	0.1000
		Longnose gar	2	0.0500
		Shorthead redhorse sucker	12	0.3000
		Silver redhorse	1	0.0250
		Smallmouth bass	3	0.0750
		Season Total	28	0.7000

Table 5.17 (continued)

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2006 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Fall	40	Black buffalo	3	0.0732
		Bluegill	1	0.0244
		Carp	3	0.0732
		Gizzard shad	5	0.1220
		Golden redhorse sucker	2	0.0488
		Longnose gar	4	0.0976
		Mooneye	1	0.0244
		Quillback	2	0.0488
		Sauger	5	0.1220
		Shorthead redhorse sucker	14	0.3415
		Silver redhorse	1	0.0244
		Smallmouth bass	2	0.0488
		Spotted bass	1	0.0244
		White bass	1	0.0244
		Season Total	45	1.1250
Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Winter	40	Black buffalo	18	0.4500
		Carp	1	0.0250
		Channel catfish	1	0.0250
		Flathead catfish	1	0.0250
		Freshwater drum	4	0.1000
		Gizzard shad	18	0.4500
		Golden redhorse sucker	2	0.0500
		Mooneye	3	0.0750
		Quillback	6	0.1500
		River carpsucker	1	0.0250
		Shorthead redhorse sucker	11	0.2750
		Walleye	1	0.0250
		White bass	1	0.0250
		Season Total	68	1.7000
	161		258	1.6025

Table 5.18

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2007 FISHERIES SURVEY

Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Spring	41	Smallmouth buffalo	5	0.122
		Black crappie	1	0.024
		Bluegill	1	0.024
		Gizzard shad	3	0.073
		Golden redhorse sucker	16	0.390
		Longnose gar	1	0.024
		Northern hog sucker	1	0.024
		Rock bass	1	0.024
		Sauger	6	0.146
		Shorthead redhorse sucker	7	0.171
		Silver redhorse	3	0.073
		Smallmouth bass	2	0.049
		Spotted bass	2	0.049
		White bass	1	0.024
		Season Total	50	1.220
Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Summer	41	Smallmouth buffalo	5	0.1220
		Carp	5	0.1220
		Flathead catfish	1	0.0244
		Gizzard shad	12	0.2927
		Mooneye	1	0.0244
		Quillback	1	0.0244
		Sauger	1	0.0244
		Shorthead redhorse sucker	3	0.0732
		Silver redhorse	1	0.0244
		Smallmouth bass	4	0.0976
		Spotted bass	2	0.0488
		Walleye	1	0.0244
		Season Total	37	0.9024

Table 5.18 (Cont'd)
CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE)
BY SEASON DURING THE BVPS 2007 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Fall	40.00	Smallmouth buffalo	7	0.1707
		Bluegill	1	0.0244
		Channel catfish	2	0.0488
		Flathead catfish	1	0.0244
		Freshwater drum	2	0.0488
		Gizzard shad	1	0.0244
		Golden redhorse sucker	1	0.0244
		Log perch	1	0.0244
		Longnose gar	5	0.1220
		Sauger	2	0.0488
		Shorthead redhorse sucker	3	0.0732
		Silver redhorse	1	0.0244
		Smallmouth bass	7	0.1707
		White bass	1	0.0244
		Season Total	35	0.8537
Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Winter	40.00	Smallmouth buffalo	6	0.1463
		Bluegill	1	0.0244
		Carp	1	0.0244
		Gizzard shad	2	0.0488
		Golden redhorse sucker	4	0.0976
		Longnose gar	1	0.0244
		Mooneye	1	0.0244
		Quillback	1	0.0244
		River carpsucker	1	0.0244
		Sauger	13	0.3171
		Shorthead redhorse sucker	12	0.2927
		Smallmouth bass	13	0.3171
		Spotted bass	7	0.1707
		Walleye	2	0.0488
		White bass	2	0.0488
		Season Total	67	1.6341
	162.00		189	1.1667

Table 5.19

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2008 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Spring	40.5	Smallmouth buffalo	6	0.1481
		Bluegill	1	0.0247
		Carp	1	0.0247
		Channel catfish	10	0.2469
		Freshwater drum	2	0.0494
		Golden redhorse sucker	18	0.4444
		Quillback	9	0.2222
		Rock bass	1	0.0247
		Sauger	51	1.2593
		Shorthead redhorse sucker	40	0.9877
		Silver redhorse	11	0.2716
		Smallmouth bass	18	0.4444
		Spotted bass	4	0.0988
		Walleye	12	0.2963
		Season Total	184	4.5432
Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Summer	41	Smallmouth buffalo	5	0.1220
		Bluegill	1	0.0244
		Flathead catfish	1	0.0244
		Freshwater drum	4	0.0976
		Gizzard shad	4	0.0976
		Longnose gar	3	0.0732
		Quillback	1	0.0244
		Sauger	2	0.0488
		Shorthead redhorse sucker	2	0.0488
		Smallmouth bass	4	0.0976
		Spotted bass	1	0.0244
		Season Total	28	0.6829

Table 5.19 (continued)

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2008 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Fall	41	Smallmouth buffalo	2	0.0488
		Carp	1	0.0244
		Channel catfish	2	0.0488
		Freshwater drum	1	0.0244
		Gizzard shad	17	0.4146
		Golden redhorse sucker	3	0.0732
		Mooneye	1	0.0244
		Northern hog sucker	0	0.0000
		Quillback	4	0.0976
		Sauger	2	0.0488
		Shorthead redhorse sucker	7	0.1707
		Silver redhorse	1	0.0244
		Smallmouth bass	9	0.2195
		Spotted bass	1	0.0244
		White bass	1	0.0244
		Season Total	52	1.2683
Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Winter	40.4	Smallmouth buffalo	3	0.0743
		Bluegill	2	0.0495
		Carp	0	0.0000
		Gizzard shad	3	0.0743
		Golden redhorse sucker	9	0.2228
		Largemouth bass	1	0.0248
		Longnose gar	2	0.0495
		Quillback	2	0.0495
		River carpsucker	1	0.0248
		Sauger	10	0.2475
		Shorthead redhorse sucker	15	0.3713
		Silver redhorse	1	0.0248
		Smallmouth bass	4	0.0990
		Spotted bass	4	0.0990
		White bass	1	0.0248
		Season Total	58	1.4356
	163		322	1.9767

TABLE 5.20

UNIT 1 COOLING RESERVOIR MONTHLY SAMPLING
CORBICULA DENSITY DATA FOR
2008 FROM BVPS

Collection Date	Area sampled (sq ft)	Live or Dead	Count	Maximum Length Range (mm)	Minimum length Range(mm)	Estimated number (per sq m)
3/25/2008	0.25	Dead	0	-	-	0
		Live	0	-	-	0
4/22/2008	0.25	Dead	1	0.001-0.99	0.001-0.99	43
		Live	3	2.00-3.34	1.00-1.99	129
5/14/2008	0.25	Dead	0	-	-	0
		Live	0	-	-	0
6/25/2008	0.25	Dead	0	-	-	0
		Live	0	-	-	0
7/29/2008	0.25	Dead	0	-	-	0
		Live	0	-	-	0
8/21/2008	0.25	Dead	2	6.30-9.49	4.75-6.29	86
		Live	0	-	-	0
9/16/2008	0.25	Dead	0	-	-	0
		Live	0	-	-	0
10/16/2008	0.25	Dead	0	-	-	0
		Live	0	-	-	0
11/6/2008	0.25	Dead	0	-	-	0
		Live	0	-	-	0
Unit summary		Dead	3	6.30-9.49	0.001-0.99	14
		Live	3	2.00-3.34	1.00-1.99	14

TABLE 5.21

UNIT 2 COOLING RESERVOIR MONTHLY SAMPLING
CORBICULA DENSITY DATA FOR
2008 FROM BVPS

Collection Date	Area sampled (sq ft)	Live or Dead	Count	Maximum Length Range (mm)	Minimum length Range(mm)	Estimated number (per sq m)
3/25/2008	0.25	Dead	1	1.00-1.99	1.00-1.99	43
		Live	3	1.00-1.99	1.00-1.99	129
4/22/2008*	0.25	Dead	---	---	---	---
		Live	---	---	---	---
5/14/2008	0.25	Dead	0	---	---	0
		Live	1	>9.5	>9.5	43
6/25/2008	0.25	Dead	0	---	---	0
		Live	0	---	---	0
7/29/2008	0.25	Dead	0	---	---	0
		Live	0	---	---	0
8/21/2008	0.25	Dead	1	3.35-4.74	3.35-4.74	43
		Live	0	---	---	0
9/16/2008	0.25	Dead	0	---	---	0
		Live	0	---	---	0
10/16/2008	0.25	Dead	0	---	---	0
		Live	0	---	---	0
11/6/2008	0.25	Dead	0	---	---	0
		Live	0	---	---	0
Unit summary		Dead	2	3.35-4.74	1.00-1.99	11
		Live	4	>9.5	1.00-1.99	22

*Not sampled due to Unit 2 shutdown

9.0

FIGURES

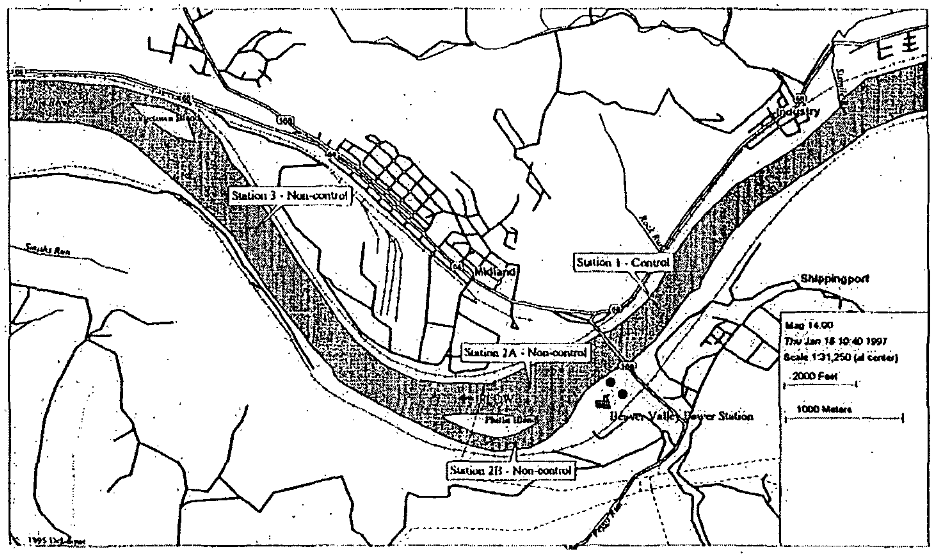


Figure 5.1 2008 Beaver Valley Power Station Aquatic Monitoring Program Sampling Control and Non-Control Sampling Stations

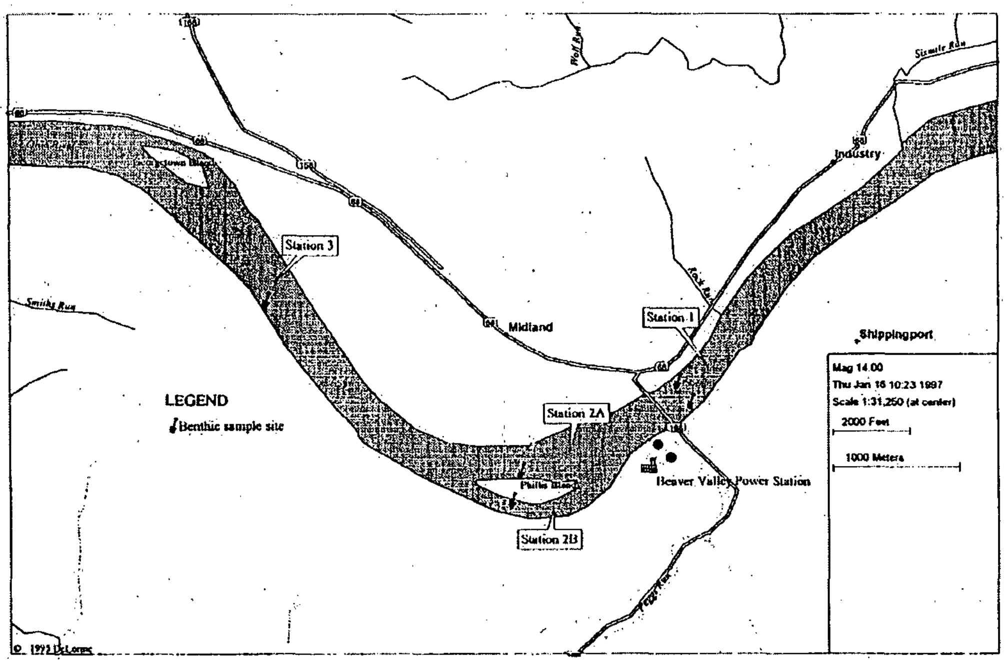


Figure 5.2 Location Map for Beaver Valley Power Station Benthic Organism Survey Sampling Sites for the 2008 Study

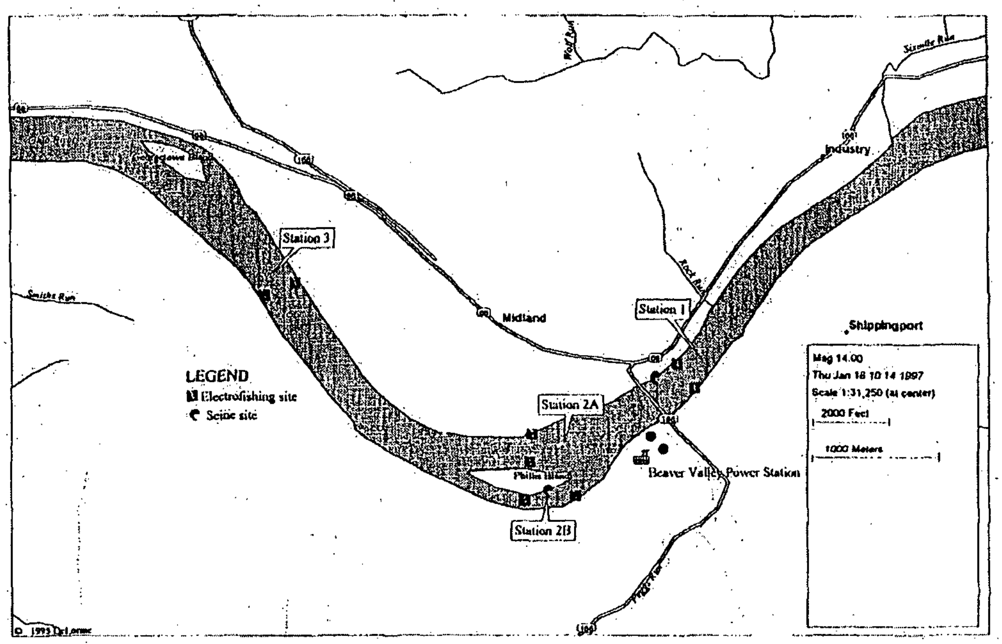


Figure 5.3 Location Map for Beaver Valley Power Station Fish Population Survey Fish Sampling Sites for the 2008 Study

ANNUAL ENVIRONMENTAL REPORT

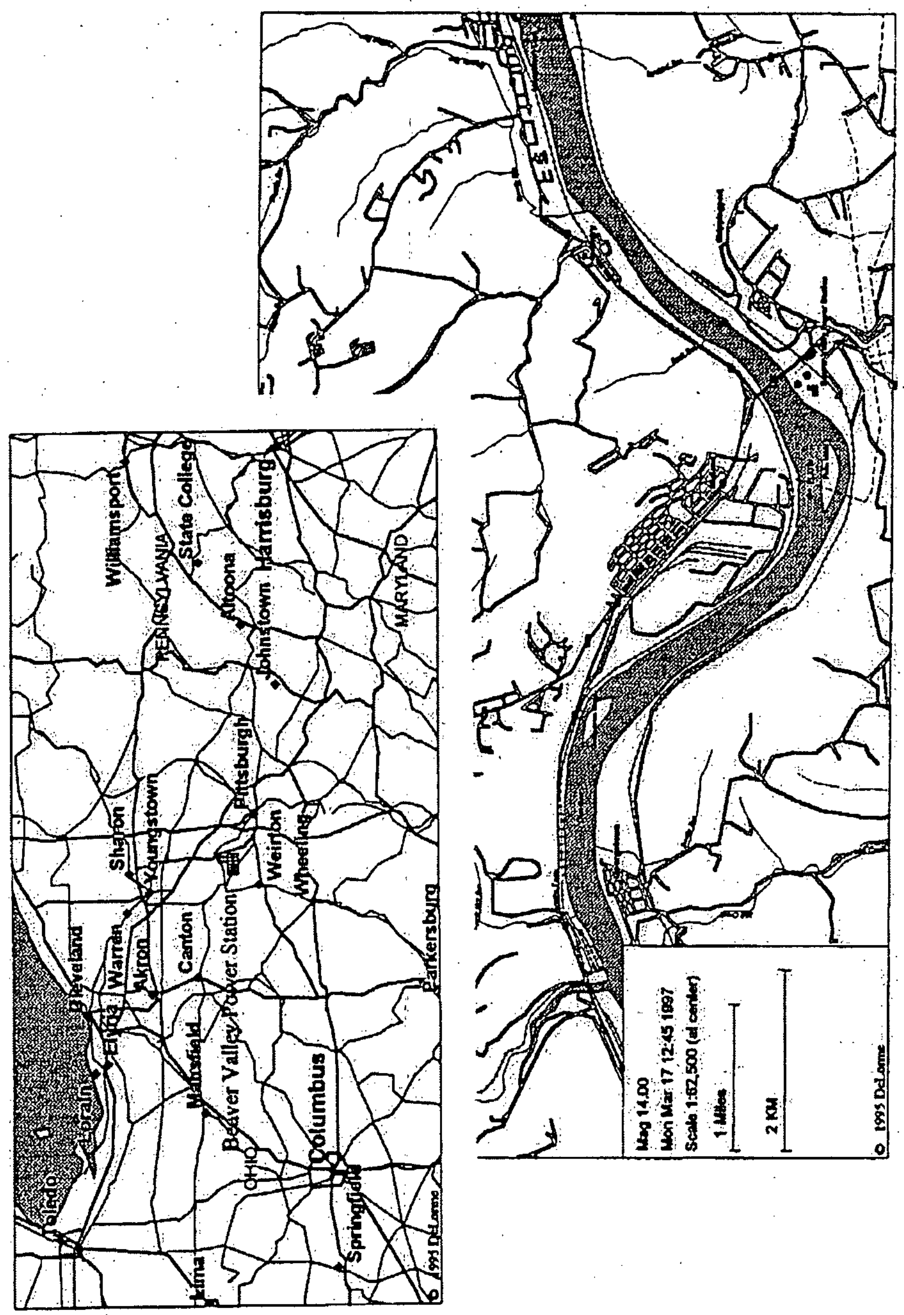
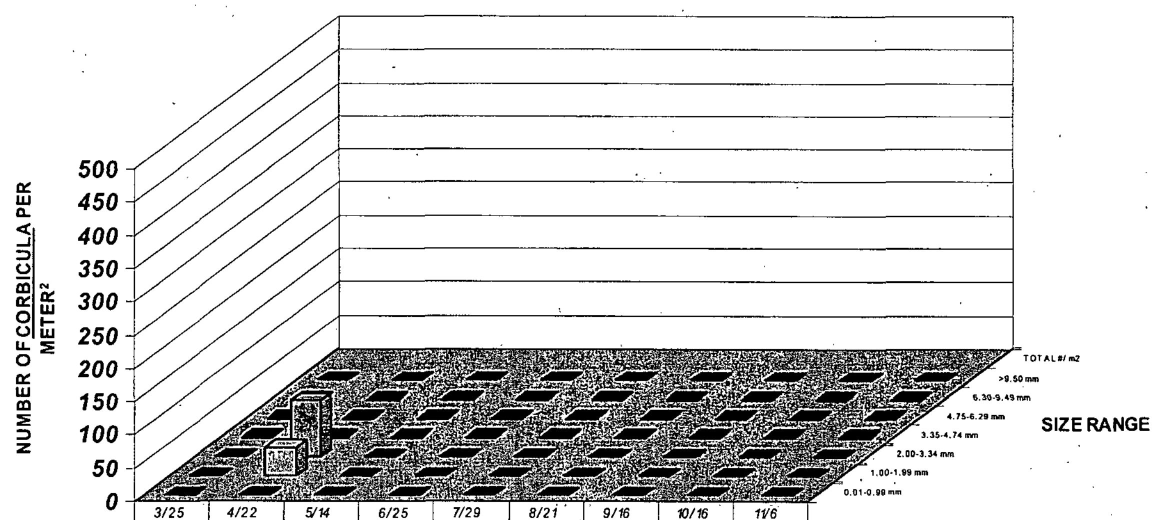


Figure 5.4 Location of Study Area, Beaver Valley Power Station Shippingport, Pennsylvania BVPS

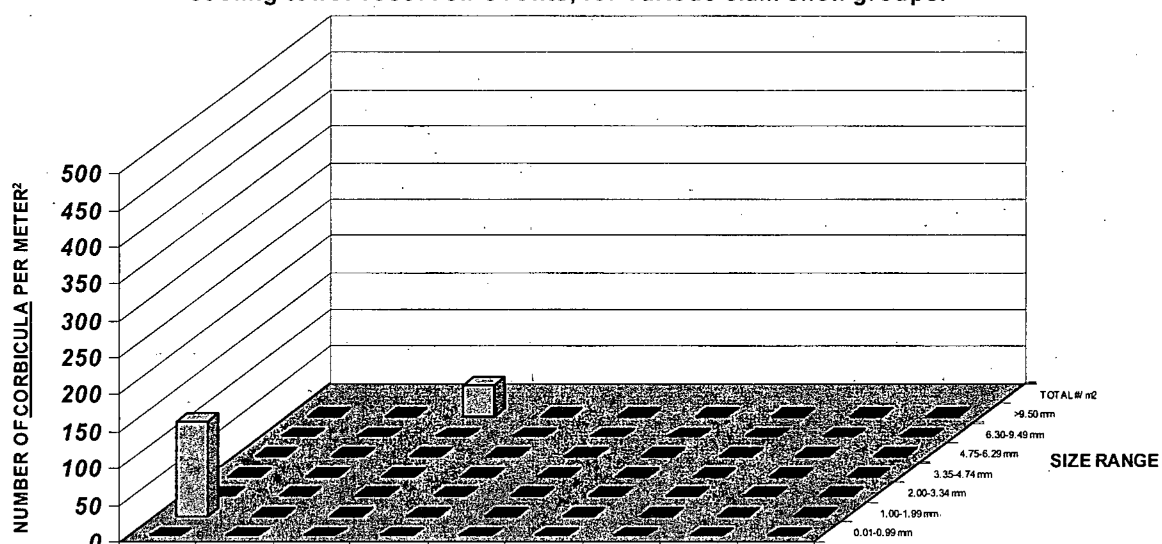
Comparison of live Corbicula clam density estimates among 2008 BVPS Unit 1 cooling tower reservoir events, for various clam shell groups.



	3/25	4/22	5/14	6/25	7/29	8/21	9/16	10/16	11/6
0.01-0.99 mm	0	0	0	0	0	0	0	0	0
1.00-1.99 mm	0	43	0	0	0	0	0	0	0
2.00-3.34 mm	0	86	0	0	0	0	0	0	0
3.35-4.74 mm	0	0	0	0	0	0	0	0	0
4.75-6.29 mm	0	0	0	0	0	0	0	0	0
6.30-9.49 mm	0	0	0	0	0	0	0	0	0
>9.50 mm	0	0	0	0	0	0	0	0	0
TOTAL #/m2	0	129	0	0	0	0	0	0	0

Figure 5.5

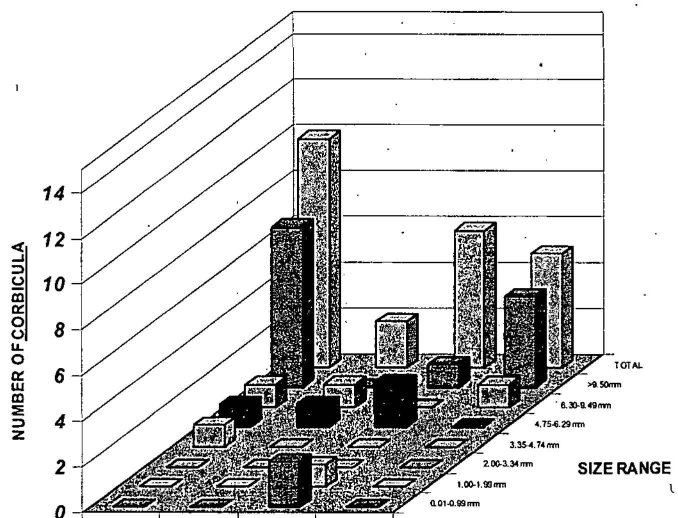
Comparison of live Corbicula clam density estimates among 2008 BVPS Unit 2 cooling tower reservoir events, for various clam shell groups.



	3/25	4/22*	5/14	6/25	7/29	8/21	9/16	10/16	11/6
0.01-0.99 mm	0	0	0	0	0	0	0	0	0
1.00-1.99 mm	129	0	0	0	0	0	0	0	0
2.00-3.34 mm	0	0	0	0	0	0	0	0	0
3.35-4.74 mm	0	0	0	0	0	0	0	0	0
4.75-6.29 mm	0	0	0	0	0	0	0	0	0
6.30-9.49 mm	0	0	0	0	0	0	0	0	0
>9.50 mm	0	0	43	0	0	0	0	0	0
TOTAL #/m2	129	0	43	0	0	0	0	0	0

Figure 5.6

Comparison of live Corbicula clam density estimates among 2008 BVPS Intake Structure sample events, for various clam shell groups.



	5/14	7/29	9/16	11/6
0.01-0.99 mm	0	0	2	0
1.00-1.99 mm	0	0	1	0
2.00-3.34 mm	0	0	0	0
3.35-4.74 mm	1	0	0	0
4.75-6.29 mm	1	1	2	0
6.30-9.49 mm	1	1	0	1
>9.50mm	7	0	1	4
TOTAL	10	2	6	5

Intake structure bottom samples are collected from the Ohio River at the Intake Building.

Figure 5.7

Water Temperature and River Elevation Recorded at the Ohio River at BVPS Intake Structure During 2008 on Monthly Sample Dates.

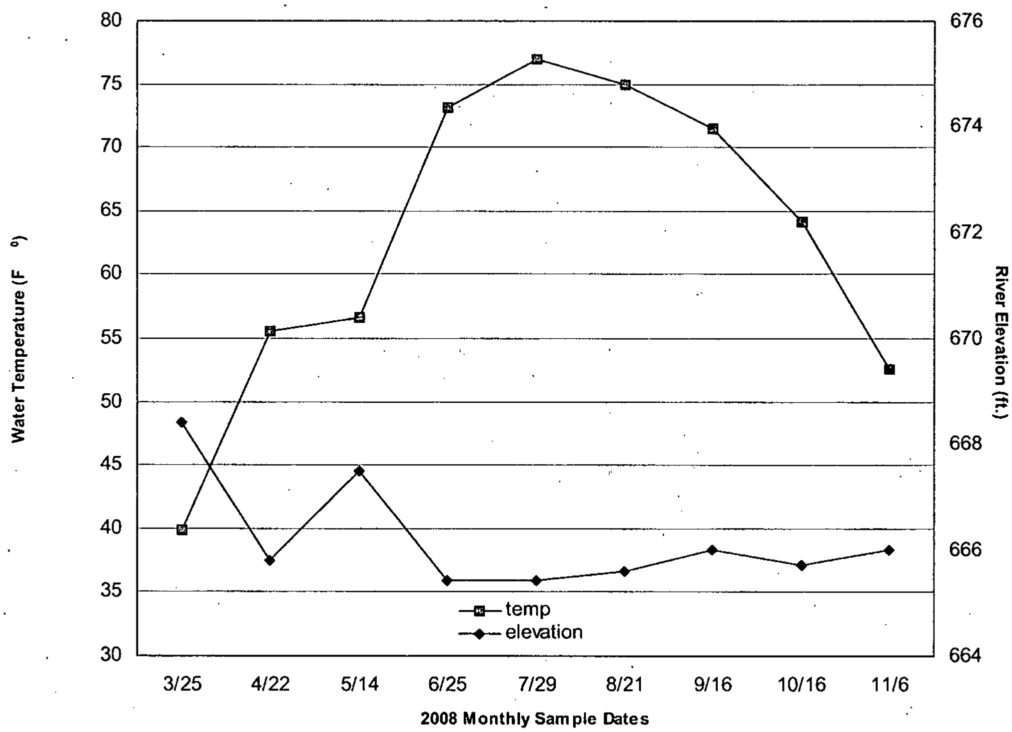
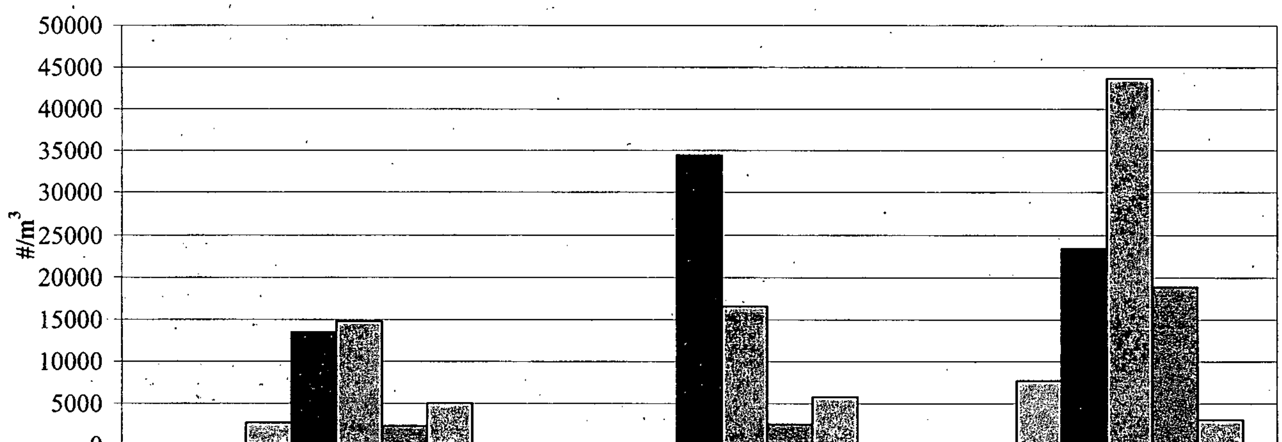


Figure 5.8

Density of zebra mussel veligers collected at Beaver Valley Power Station, 2008.

Note: No sample collected at Cooling Tower 2 in April due to outage.

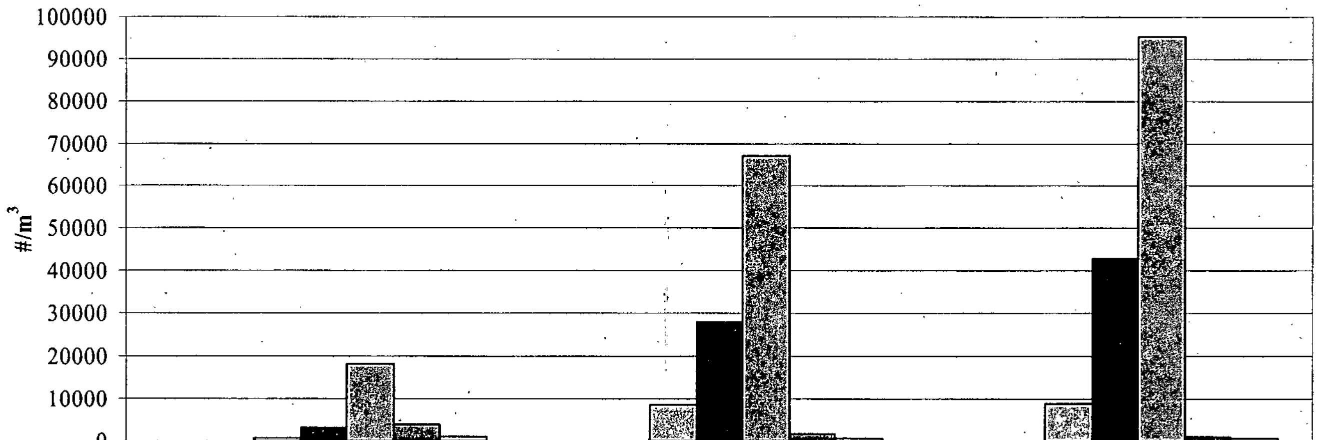


	Intake Structure/Open Water	Unit 1 Cooling Tower Reservoir	Unit 2 Cooling Tower Reservoir*
4/22	0	0	0
5/14	0	0	0
6/25	2767	160	7590
7/29	13380	34390	23300
8/21	14720	16400	43750
9/16	2300	2,410	18720
10/16	4940	5712	3091

Sample location

Figure 5.9

Density of zebra mussel veligers collected at Beaver valley Power Station, 2008



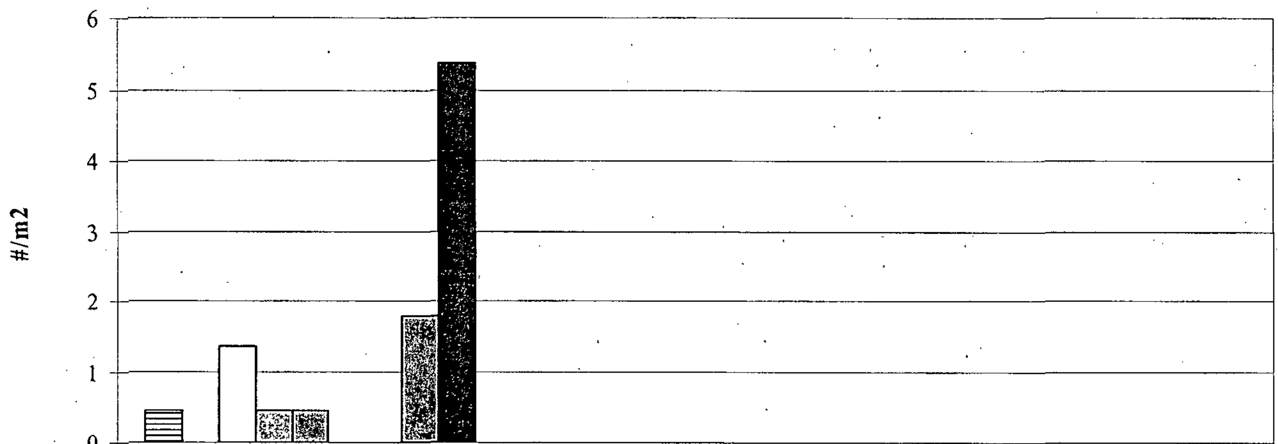
	Barge Slip	Splash Pool	Emergency Outfall Facility
4/22	0	0	0
5/14	0	0	0
6/25	840	8742	8970
7/29	3185	27907	43000
8/21	18135	67000	95220
9/16	4,088	1820	1200
10/16	1060	640	760

Sample location

Figure 5.10

Density of settled zebra mussels at Beaver Valley Power Station, 2008.

Note: No sample collected at Cooling Tower 2 in April due to outage.

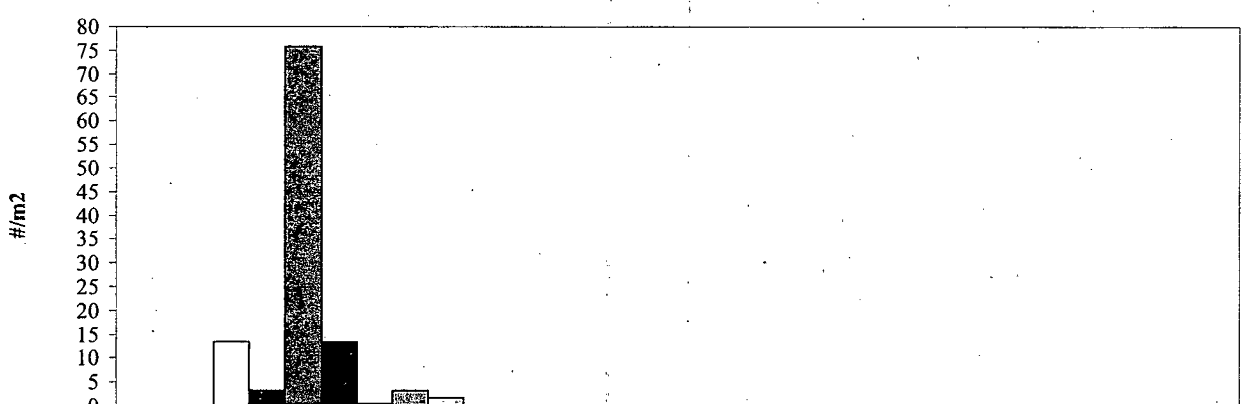


	Intake Structure/Open Water	Unit 1 Cooling Tower Reservoir	Unit 2 Cooling Tower Reservoir*
3/25	0	0	0
4/22	0	0	0
5/15	1	0	0
6/25	0	0	0
7/29	0	0	0
8/21	0	0	0
9/16	0	0	0
10/16	2	0	0
11/6	5	0	0

Figure 5.11

Density of settled zebra mussels at Beaver Valley Power Station, 2008.

Note: Barge Slip not sampled in March due to high water.



	Barge Slip*	Splash Pool	Emergency Outfall Facility
3/25	0	0	0
4/22	0	0	0
5/14	13	0	0
6/25	3	0	0
7/29	76	0	0
8/21	13	0	0
9/16	0	0	0
10/16	3	0	0
11/6	2	0	0

Figure 5.12

10.0

PERMITS

Attachment 10.1: PERMITS & CERTIFICATES FOR ENVIRONMENTAL COMPLIANCE

Registration Number	Regulator/Description	Expiration
PAR000040485	BVPS EPA generator identification Resource Conservation & Recovery Act (RCRA) Identification number for regulated waste activity. Also used by PA DEP to monitor regulated waste activity under the Pennsylvania Solid Waste Management Act (SWMA).	Indefinite
04-02474	BVPS EPA Facility Identification Number for CERCLA/EPCRA/SARA. Used for SARA Tier II reporting and emergency planning.	Indefinite
04-02475	FE Long Term Distribution Center/Warehouse (22) EPA Facility Identification Number for CERCLA/EPCRA/SARA. Used for SARA Tier II reporting and emergency planning.	Indefinite
PA0025615	BVPS NPDES Permit number under US EPA and PA DEP.	12/27/2006 *Continued pending approval of renewal application.*
04-13281	BVPS Unit 1 PA DEP Facility Identification & certificate number for regulated storage tanks.	Indefinite
04-13361	BVPS Unit 2 PA DEP Facility Identification & certificate number for regulated storage tanks.	Indefinite
OP-04-00086	PA DEP State Only Synthetic Minor Permit for emergency auxiliary boilers, emergency diesel generators, paint shop and other miscellaneous sources..	10/12/2012
N/A	PA DEP Open Burning Permit for operation of the BVPS Fire School- annual application and renewal	12/31/2009
060503 4450 004L	US Department of Transportation Hazardous Materials Registration	06/30/2009
200100242	US Army Permit for maintenance dredging (With Encroachment/Submerged Lands Agreement #0477705, this allows maintenance dredging.).	12/31/2011
0477705	Encroachment Permit/Submerged Lands Agreement for construction and maintenance of current barge slip. (With US Army Permit #200100242, this allows maintenance dredging.)	Indefinite
06786A	Encroachment Permit/Submerged Lands Agreement for transmission line over Ohio River @ Mile 34.5	Indefinite
18737	Encroachment Permit/Submerged Lands Agreement for Unit 1 intake and discharge (main combined intake and outfall structures)	Indefinite
0475711	Encroachment Permit/Submerged Lands Agreement for construction and maintenance of Unit 2 auxiliary intake	Indefinite
	- End Table -	

APPENDIX A

SCIENTIFIC AND COMMON NAME[1] OF FISH COLLECTED IN THE NEW CUMBERLAND POOL OF THE OHIO RIVER, 1970 THROUGH 2008 BVPS

[1]Nomenclature follows Robins, et al. (1991)

Family and Scientific Name	Common Name
Lepisosteidae (gars)	
Lepisosteus osseus	Longnose gar
Hiodontidae (mooneyes)	
Hiodon alosoides	Goldeye
H. tergisus	Mooneye
Clupeidae (herrings)	
Alosa chrysochloris	Skipjack herring
A. pseudoharengus	Alewife
Dorosoma cepedianum	Gizzard shad
Cyprinidae (carps and minnows)	
Campostoma anomalum	Central stoneroller
Carassius auratus	Goldfish
Ctenopharyngodon idella	Grass carp
Notropis spilopterus	Spotfin shiner
Cyprinus carpio	Common carp
C. carpio x C. auratus	Carp-goldfish hybrid
Luxilus chrysocephalus	Striped shiner
Macrhybopsis storeriana	Silver chub
Nocomis micropogon	River chub
Notemigonus crysoleucas	Golden shiner
Notropis atherinoides	Emerald shiner
N. buccatus	Silverjaw minnow
N. hudsonius	Spottail shiner
N. rubellus	Rosyface shiner
N. stramineus	Sand shiner
N. volucellus	Mimic shiner
Pimephales notatus	Bluntnose minnow
P. promelas	Fathead minnow
Rhinichthys atratulus	Blacknose dace
Semotilus atromaculatus	Creek chub
Catostomidae (suckers)	
Carpiodes carpio	River carpsucker
C. cyprinus	Quillback
C. velifer	Highfin carpsucker
Catostomus commersonii	White sucker
Hypentelium nigricans	Northern hogsucker
Ictiobus bubalus	Smallmouth buffalo
I. niger	Black buffalo
Minytrema melanops	Spotted sucker

Family and Scientific Name	Common Name
Moxostoma anisurum	Silver redhorse
M. carinatum	River redhorse
M. duquesnei	Black redhorse
M. erythrurum	Golden redhorse
M. macrolepidotum	Shorthead redhorse
Ictaluridae (bullhead catfishes)	
Ameiurus catus	White catfish
A. furcatus	Blue catfish
A. melas	Black bullhead
A. natalis	Yellow bullhead
A. nebulosus	Brown bullhead
Ictalurus punctatus	Channel catfish
Noturus flavus	Stonecat
Pylodictis olivaris	Flathead catfish
Esocidae (pikes)	
Esox lucius	Northern pike
E. masquinongy	Muskellunge
E. lucius x E. masquinongy	Tiger muskellunge
Salmonidae (trouts)	
Oncorhynchus mykiss	Rainbow trout
Percopsidae (trout-perches)	
Percopsis omiscomaycus	Trout-perch
Cyprinodontidae (killifishes)	
Fundulus diaphanus	Banded killifish
Atherinidae (silversides)	
Labidesthes sicculus	Brook silverside
Percichthyidae (temperate basses)	
Morone chrysops	White bass
M. saxatilis	Striped bass
M. saxatilis x M. chrysops	Striped bass hybrid
Centrarchidae (sunfishes)	
Ambloplites rupestris	Rock bass
Lepomis cyanellus	Green sunfish
L. gibbosus	Pumpkinseed
L. macrochirus	Bluegill
L. microlophus	Redear sunfish
L. gibbosus x L. microlophus	Pumpkinseed-redear sunfish hybrid
Micropterus dolomieu	Smallmouth bass
M. punctulatus	Spotted bass
M. salmoides	Largemouth bass
Pomoxis annularis	White crappie
P. nigromaculatus	Black crappie

Family and Scientific Name	**Common Name**
Percidae (perches)	
Etheostoma blennioides	Greenside darter
E. nigrum	Johnny darter
E. zonale	Banded darter
Perca flavescens	Yellow perch
Percina caprodes	Logperch
P. copelandi	Channel darter
Sander canadense	Sauger
S. vitreum	Walleye
S. canadense x S. vitreum	Saugeye
Sciaenidae (drums)	
Aplodinotus grunniens	Freshwater drum