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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: Beaver Valley Power Station, Unit No. 1 and No. 2
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
Beaver Valley Power Station Annual Environmental Report, Non-Radiological

The 2002 Annual Environmental Report, Non-Radiological for Beaver Valley Power Station Units 1 and 2 is being forwarded, as required by Appendix B of our Unit 2 Operating License Section 5.4.1.

There are no regulatory commitments identified in this document. If there are any questions concerning this report, please contact Mr. Larry R. Freeland, Manager, Regulatory Affairs/Performance Improvement at 724-682-5284.

Sincerely,

Mark B. Bezilla

Enclosure

c: Mr. T. G. Colburn, NRR Senior Project Manager
Mr. D. M. Kern, NRC Sr. Resident Inspector
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FirstEnergy Nuclear Operating Company

2002 ANNUAL ENVIRONMENTAL OPERATING REPORT

NON-RADIOLOGICAL

BEAVER VALLEY POWER STATION

UNITS NO. 1 AND 2

LICENSES DPR-66 AND NPF-73

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6.1 Attachment 1: Environmental Permits & Certificates

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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 FirstEnergy Corporation, FENOC, and BVPS, have 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). 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. Attachment 1 contains a listing of permits and registrations for environmental compliance.

The BVPS programs and procedures include 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 Process Improvement Program with a Condition Report. Condition Reports include investigations, cause determinations, and corrective actions to fix and prevent recurrence.

During 2002 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.

A site Plant Community Characterization Study was also performed to evaluate current conditions relative to those described in the Final Environmental Statements-Operating License Stage (FES-OL).

1.2 SUMMARY AND CONCLUSIONS

There were no significant environmental events during 2002. Three spills occurred that, though regulatory reportable, caused no measurable impact to the environment, and are detailed in Section 4.0 of this report. Corrective actions were identified for each through the FENOC Process Improvement Program.

During 2002, 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 2002, no significant changes to were made at BVPS to cause significant negative affect on the environment.

1.4 AQUATIC MONITORING PROGRAM

The 2002 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 27th year of operational environmental monitoring for Unit 1 and the 16th 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 2002 benthic macroinvertebrate surveys conducted in May and September did not indicate an abnormal community structure in the Ohio River either upstream or downstream of the BVPS. These benthic surveys are also a continuation of a Fate and Effects Study conducted from 1990 through 1992 for PA DEP to assess the ecosystem impacts of the molluscicides Betz Clamtrol CT-1, CT-2, and Powerline 3627 that are used to control biofouling organisms at BVPS. To date the results of the benthic studies have not indicated 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. Soft muck-type substrate along the shoreline found in 2002 and previous years was conducive to segmented worm (oligochaete) and midge (chironomid) proliferation. In 2002, 53 macroinvertebrate taxa were identified. ***Eight new taxa were added to the cumulative list of benthic macroinvertebrates collected near BVPS.*** Oligochaetes were the most frequently collected groups in both sampling months at the control and non-control stations. 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 in the vicinity of the BVPS was sampled in May, July, September and November of 2002 with night electrofishing and daytime seining. Results from the 2002 fish surveys indicated that a normal community structure for the Ohio River existed near BVPS based on species composition and relative abundance. Since monitoring began in the early 1970's, the number of identified fish taxa has increased from 43 to 77 for the New Cumberland Pool.

During the survey, forage species were collected in the highest numbers, principally gizzard shad and emerald shiner. This indicated a healthy fish community, since game species rely on the availability of abundant forage for survival. Young sauger were also commonly collected in 2002. Variations in the annual catch were probably attributable to normal fluctuations in the population size of the forage species and the predator populations that depend on them. Forage species, such as gizzard shad and emerald shiners, which have high reproductive potential, frequently respond to changes in the environment with large fluctuations in population size. This in turn influences the population of predator species.

In 2002, species composition remained comparable among control and non-control stations. Common taxa collected included gizzard shad, emerald shiner, sauger, and golden redhorse sucker. The catch per unit effort (number of fish per minute) for electrofishing sampling in 2002 was 1.98 fish. This compared favorably with results of the previous year when electrofishing resulted in 1.23 fish collected per minute. These differences may have been the result of population changes, differences in sampling schedule, or caused by environmental conditions (e.g. turbidity, waves, water temperature, flow) on specific electrofishing sampling dates that affected fish distribution or collection gear efficiency.

Little difference in the species composition of the catch was observed between the control (Station 1) and non-control (Stations 2A, 2B and 3) collections. Habitat preference and availability were probably the most important factors affecting where and when fish were collected. ***In 2002, there again 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 intake during 2002 indicated that *Corbicula* were entering and colonizing the reservoirs. ***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.***

Since 1991, zebra mussels have progressively moved upstream in the Ohio River. In 1993, zebra mussels were identified 50 miles downstream of BVPS. 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. Densities were generally low. During 1997, zebra mussel veligers, juveniles and adults were observed for the first time in sample collections. Densities of zebra mussels in samples increased significantly in 1998 and 1999.

Overall, both the number of observations of settled mussels and the densities of veligers at BVPS in 2002 were similar to that found in 2001. If trends continue and the number of zebra mussels in the Ohio River remain high in 2003, BVPS should maintain their diligent zebra mussel monitoring and control program.

1.5 PLANT COMMUNITY CHARACTERIZATION STUDY

BVPS conducted a Plant Community Characterization Study in 2002 (Attachment 2). The study included a Pennsylvania Natural Diversity Index search for potential threatened and endangered species. The observations and descriptions in the 2002 study were consistent with the descriptions of the FES-OL indicating that there is no evidence of negative impact to the plant communities from the operation of BVPS.

As in previous years, results of the BVPS environmental programs did not indicate any adverse environmental impacts from station operation.

2.0 ENVIRONMENTAL PROTECTION PLAN NON-COMPLIANCES

There were no Environmental Protection Plan non-compliances identified in 2002.

3.0 CHANGES INVOLVING UNREVIEWED ENVIRONMENTAL QUESTIONS

No Unreviewed Environmental Questions were identified in 2002. Therefore, there were no changes involving an Unreviewed Environmental Question.

4.0 NONROUTINE ENVIRONMENTAL REPORTS

4.1 SUMMARY

During 2002, BVPS made three non-routine environmental reports to the Pennsylvania Department of Environmental Protection (PA DEP) for two oil, and one sewage spill incidents. Copies of these reports were submitted to the NRC.

NOTE: Routine reporting requirements under the NPDES Permit monthly Discharge Monitoring Reporting program are not included in this section.

4.1.1 January 30, 2002 Oil Spill: Approximately 100 gallons of diesel fuel was released from the fuel tank of a vehicle delivering materials to the Unit 2 Cooling Tower. The truck was backed up over a stand that ripped the tank causing the spill. The oil flowed into the stormwater system, followed by Peggs Run, then the Ohio River. Some oil was observable on Peggs Run and the Ohio River. Booms were placed on both water bodies to collect as much oil as possible. The event was reportable.

4.1.1.1 Probable Cause: Human Performance- inattention to detail.

4.1.1.2 Corrective Action: Booms were placed on Peggs Run and the Ohio River. Condition Report 02-00782 was written to investigate the incident, and identify actions to prevent recurrence.

4.1.1.3 Actions Taken to Prevent Recurrence: The BVPS spill prevention and response procedure (1/2-ADM-0602) was revised to require attendant personnel to ask delivery drivers to, Get Out And Look" (GOAL) prior to backing up.

4.1.1.4 Agencies Notified: Agencies notified included the Pennsylvania Department of Environmental Protection, Midland, PA and East Liverpool Ohio municipal water companies, the National Response Center, the Beaver County Emergency Services Agency, and the Three Rivers Pollution Response Council (mutual aide organization), in accordance with site procedures.

4.1.2 September 27, 2002 Sewage Hold Tank Overflow: Approximately 200 gallons of sewage was released from a hold tank due to loss of power from a short in a list pump. The material flowed into the stormwater system that leads to Peggs Run. The event was reportable.

4.1.2.1 Probable Cause: A short in a lift pump caused multiple failures.

4.1.2.2 Corrective Action: Booms and drain-blockers were placed over stormwater drains. Material was cleaned up. Condition Report 02-08413 was written to investigate the incident, and identify actions to prevent recurrence.

4.1.2.3 Actions Taken to Prevent Recurrence: Repairs were made to equipment identified in the Condition Report.

4.1.2.4 Agency Notified: The Pennsylvania Department of Environmental Protection was notified.

4.1.3 October 30, 2002 Oil Spill: Approximately 75 gallons of oil was spilled during filling the Unit 2 Emergency Diesel Generator 2-2 tank. An undetermined quantity entered the stormwater system. No oil was observed on the Ohio River, and the stormwater system was pumped out shortly after the spill. The event was reportable.

4.1.3.1 Probable Cause: Human Performance- The delivery vehicle was hooked up to a full tank causing the spill.

4.1.3.2 Corrective Action: Booms and drain-blockers were placed over stormwater drains. Material was cleaned up from surfaces, and oil was pumped from the stormwater system. Condition Report 02-09734 was written to investigate the incident, and identify actions to prevent recurrence.

4.1.3.3 Actions Taken to Prevent Recurrence: Reviews and verifications of filling procedures were performed. A number of changes were implemented to prevent recurrence via the Process Improvement Program identified in the Condition Report.

4.1.3.4 Agency Notified: The Pennsylvania Department of Environmental Protection was notified.

5.0 AQUATIC MONITORING PROGRAM

5.1 INTRODUCTION

This report summarizes the Non-Radiological Environmental Program conducted by the Beaver Valley Power Station 1 (BVPS) 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's 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.

5.1.1 Objectives of the Program

The objectives of the 2002 environmental program were:

(1) To monitor for any possible environmental impact of BVPS operation on the benthic macroinvertebrate and fish communities in the Ohio River;

(2) To provide a minimal sampling program to continue an uninterrupted environmental database for the Ohio River near BVPS, pre-operational to present; and

(3) To evaluate the presence, growth, and reproduction of macrofouling *Corbicula* (Asiatic clam) and zebra mussels (*Dreissena* spp.) at BVPS.

5.1.2 Scope of Services

Stantec Consulting Inc. (Stantec), formerly Beak Consultants Incorporated, was contracted to perform the 2002 Aquatic Monitoring Program as specified in BVBP-ENV-001 - Aquatic Monitoring (procedural guide). The BVPS 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 below.

5.1.3 Benthic Macroinvertebrate Monitoring

The benthic macroinvertebrate monitoring program consisted of benthic 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 the samples, replacing the standard Ponar dredge used in prior studies. This sampling was conducted in May and September 2002. For each 2002 field effort, 18 benthic samples were collected and processed in the laboratory.

5.1.4 Fish Monitoring

The fish monitoring program consisted of seasonal sampling (May, July, September, and November) using boat electrofishing and seining techniques. Boat electrofishing was conducted at night along both shorelines at Stations 1, 2A, 2B, and 3 (Figure 5.3). Seining occurred at Stations 1 and 2B during the day and generally was performed in late afternoon or early evening. All field procedures and data analysis were conducted in accordance with the procedural guide.

5.1.5 Larval Cages/Zebra Mussel Scraper/Bridal Veil Samplers/Pump/Biobox Sampling

Larval cages (two long term and two short term) were set in the project intake structure to sample for *Corbicula* beginning in 1996. The cages continued to be used to monitor for *Corbicula* through August 1997. Results from a study conducted from April through June 1997 to compare short-term larval cage and petite Ponar sample results indicated that Ponar sampling provided comparable results to short-term larval cages for monthly sampling. In August 1997, Ponar sampling replaced short-term larval cage sampling. Long-term cages were used until May 1998 when all larval cages were removed.

Wall scraping samples were collected monthly from the Unit 1 cooling tower, the Unit 2 cooling tower, the barge slip, and the intake wall in 1996 and 1997. Wall scrapings were taken with a D-frame scraper, with five scrapes of approximately 2 ft each made per sample at the sampling locations. In 1998, two additional locations were added; the emergency outfall (June through November) and the emergency outfall impact basin (August through November). In 1999 through 2002, these added sites were sampled from March through November.

The intake sampling and wall scraping sampling was historically conducted once per month, yearlong. Beginning in December 1997, it was decided to forego sampling in December and January of each year, since buildup of the target organisms, *Corbicula* and zebra mussels, does not occur in these cold water months. Monthly sampling has been maintained throughout the balance of the year.

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 tower of Unit 1 and Unit 2 in October 1998. At the request of BVPS, sampling was extended through November in 1998. In 2002, these additional locations were sampled from April through November.

In April 1998, a biobox was set up at the emergency outfall basin to monitor for settling zebra

mussels. The biobox was checked each month, and four substrate plates were removed and analyzed in November 1998. In 2001, the biobox set up at the emergency outfall basin was replaced with two more efficient aquarium style bioboxes. These bioboxes continued to be used at this location for much of 2002. The bioboxes were also used to determine the efficacy of the periodic treatments to control zebra mussel and Corbicula in the facility.

5.1.6 Corbicula/Zebra Mussel Density Determinations

During the scheduled shutdown period for each unit, each cooling tower reservoir bottom was sampled by petite Ponar at standardized locations within the reservoir. Counts of live and dead clams and determination of density were made.

During all *Corbicula*/zebra mussel sampling activities, observations were made of the shoreline and other adjoining hard substrates for the presence of macrofouling species.

5.1.7 Monthly Activity Reports

Each month activity reports that summarized the activities that took place the previous month were prepared. The 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.

5.1.8 Site Description

BVPS is located on an approximately 501-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 5.4 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 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.

The station is situated on the Ohio River at River Mile 34.8 (Latitude: 40°, 36', 18"; Longitude: 80°, 26', 02" at a location on the New Cumberland Pool that is 3.3 river miles (5.3 km) downstream from Montgomery Lock and Dam and 19.4 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.

Ohio River water temperatures generally vary from 32°F to 84°F (0°C to 29°C). Minimum and maximum temperatures generally occur in January and July/August, respectively.

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 is considered to be 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 AQUATIC MONITORING PROGRAM

The environmental study area, established to assess potential impacts, 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 mile (0.5 km) upstream of BVPS and is the control station. Station 2A is located approximately 0.5 mile (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 mile 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.

Sampling dates for each of the program elements are presented in Table 5.1.

The following sections summarize the findings for each of the program elements.

5.2.1 Benthic Macroinvertebrate Monitoring Program

5.2.1.1 Objectives: The objectives of the benthic surveys were to characterize the benthic macroinvertebrates of the Ohio River near BVPS and to determine the impacts, if any, of BVPS operations.

5.2.1.2 Methods: Benthic surveys were scheduled and performed in May and September 2002. Benthic samples were collected at Stations 1, 2A, 2B, and 3 (Figure 5.2), using a petite Ponar grab sampler. 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).

The contents of each grab 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 densities (number/m2) for each taxon were 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.

5.2.1.3 Habitats: Substrate type is an important factor in determining the composition of the benthic community. Two distinct benthic habitats exist in the Ohio River near BVPS. These habitats are the result of damming, channelization, and river traffic. During sampling, shoreline habitats were generally soft muck substrates composed of sand, silt, and detritus. An exception occurred along the north shoreline of Phillis Island at Station 2A where clay and sand 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 is probably the result of channelization and scouring by river currents.

5.2.1.4 Results: Fifty-three (53) macroinvertebrate taxa were identified during the 2002 monitoring program (Tables 5.2, 5.3A and 5.3B). A mean number of 1,290 macroinvertebrates/m2 was collected in May and 6,104/m2 in September (Table 5.4). As in previous years, the macroinvertebrate assemblage during 2002 was dominated by burrowing organisms typical of soft unconsolidated substrates. Oligochaetes (segmented worms) and chironomid (midge fly) larvae were abundant (Table 5.4).

Twenty-seven (27) taxa were present in the May samples, and forty-four (44) taxa in the September samples (Table 5.3A and 5.3B). Nineteen (19) of the 53 taxa were present in both May and September.

The Asiatic clam (Corbicula sp.) 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 1997-2002 sampling program (see Sections 5.1.4 and 5.1.5, Zebra Mussel Monitoring Program). Adults were collected in the September 2002 benthic samples.

In 2002, eight taxa, (four oligochaetes, two mollusks, and two) others 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 2002.

5.2.1.5 Community Structure and Spatial Distribution: Oligochaetes accounted for the highest mean density of macroinvertebrates (Table 5.4) in May and September 2002 (638/m2 and 2,593/m2, respectively). Organisms other then Oligochaetes, chironomid and mollusca had the second highest mean density in May 2002 (265/m2) while mollusca had the second highest mean density in September 2002 (1648/m2).

In May, highest density of macroinvertebrates with a total of 1,935 organisms/m2 occurred at Station 3. In September, the highest density of macroinvertebrates occurred at Station 1 (8,632/ m2). Station 2A had the lowest mean density of organisms in May (86/m2), while the lowest density of macroinvertebrates in September occurred at Station 2B2 (2,752/m2).

5.2.1.6 Comparison of Control and Non-Control Stations: For this analysis, Station 1 was designated the control station since it was always out of the influence of the BVPS discharge and Station 2B (mean density of Station 2B1, 2B2, and 2B3) the non-control station, since it was the station subjected most 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.

Species composition between the control and non-control sample stations was comparable in May (Table 5.5). The density of macroinvertebrates found at the non-control station (1390/ m2) was comparable to the control station (1,548/ m2). The density of oligochaetes was about two times higher at the control station (1,118/m2) than at the non-control station (559/m3). Oligochaetes were the dominant group at both locations although they contributed to 72 percent of the macroinvertebrates collected at the control station, and only 40 percent at the non-control station. Mollusks were present at higher densities at the non-control station (315/m2) than at the control station (129/m2), however, these minor differences probably reflected 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 was about two times higher at the control (8,632/ m2) than at the non-control station (4,372/m2). Oligochaetes and chironomids occurred at about double the densities at the control than the non-control stations. Also, higher densities of mollusks were present at the control station than the non-control. 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 were calculated to describe the relative diversity, evenness, and richness of the macroinvertebrate population structure among stations and between control and non-control sites. The Shannon-Weiner diversity indices in May 2002 collections ranged from 0.57 at Station 2A to 1.67 at Station 3, a non-control station (Table 5.6). The diversity index at the control station (Station 1) was 1.60. Except for Station 2A, the indices for all of the non-control locations were similar to that found at the control station. A higher 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 one the more even the community. Evenness ranged from 0.41 at Station 1 to 0.56 at Station 2B3. The community richness, another estimate of the quality of the macroinvertebrate community, was greatest at control Station 1(3.38) and lowest at Station 2A (0.91). The low diversity and richness at Station 2A was influenced by two low numbers of organisms (three individuals) collected at this location.

In September, the diversity was generally higher than in May. Diversity ranged from 2.02 at Station 2B1 to 2.34 at Station 1. Evenness ranged from 0.46 at Station 2A to 0.51 at non-control Station 2B3 and Station 3. Richness was greatest at Station 1 (3.95) and lowest at Station 2B2 (2.24). No impacts of the BVPS on the benthic community, as measured by differences, were evident in either May or September.

5.2.1.7 Seasonal Comparison: The density of benthic organisms observed was slightly lower in May 2002 as compared to September 2002 (Table 5.3A and 5.3B). Twenty-seven taxa were identified in May, and forty-four (44) in September. The greater number of taxa found in fall is common in temperate fresh waters and is due to maturation of immature oligochaetes and seasonal patterns of chironomid life cycles. Oligochaetes were the most commonly collected macroinvertebrates but chironomids and mollusks were also common in both the May and September samples.

5.2.1.8 Discussion: 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 existed along the shoreline are conducive to oligochaete, chironomid, and mollusk proliferation and limit species of macroinvertebrates that require a more stable bottom.

The density of macroinvertebrates in May and September 2002 fell well within the range of densities of macroinvertebrate collected at BVPS in previous years. The introduction of zebra mussels and Corbicula into the Ohio River may impact the benthic community structure. ***However, 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 (Table 5.7).***

5.3 FISH

5.3.1 Objectives

Fish sampling was conducted 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.

5.3.2 Methods

Adult fish surveys were scheduled and performed in May, July, September, and November 2002. 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 boom electroshocker and floodlights mounted to the bow of the boat. A Coffelt variable voltage, pulsed-DC electrofishing unit powered by a 3.5-kW generator was used. The voltage selected depended on water conductivity and was adjusted based on the amperage of the current passing 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 species 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 2002 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). 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 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 Results

Fish population surveys have been conducted in the Ohio River near BVPS annually from 1970 through 2002. These surveys have resulted in the collection of 72 fish species and five different hybrids (Table 5.8).

In 2002, 504 fishes representing 26 taxa were collected (i.e., handled) during BVPS surveys by electrofishing and seining (Tables 5.9 and 5.10). An estimated additional 51 individuals were observed but not handled during electrofishing surveys (Table 5.15). In addition large schools of gizzard shad and emerald shiners were observed during the July and November sampling runs, respectively. The most common species in the 2002 BVPS surveys, collected by electrofishing and seining combined, were gizzard shad (26.2 percent of the total catch), bluegill (12.9 percent), white bass (11.1 percent), and golden redhorse (8.7 percent). The remaining 27 species combined accounted for 41.1 percent of the total handled catch. The most frequently observed (handled and not handled combined) fish in 2002 were gizzard shad (Tables 5.9, 5.10, and 5.15). Game fishes collected during 2002 included channel catfish, flathead catfish, white bass, bluegill, largemouth bass, smallmouth bass, rock bass, sauger, walleye, black crappie and spotted bass. Game fishes represented 35.1 percent of the total handled catch with 13.5 percent being bluegill.

A total of 321 fish, representing 26 taxa, was collected by electrofishing in 2002 (Table 5.9). Gizzard shad and white bass accounted for the largest percentage (20.2 percent and 17.1 percent of the total catch respectively) of the electrofishing catch in 2002 followed by golden redhorse sucker (13.7 percent). None of the other species collected contributed to greater than six (6)

percent of the total catch.

A total of 183 fishes representing 10 taxa was collected by seining in 2002 (Table 5.10). Fish taxa collected included gizzard shad (36.6 percent of the total catch), bluegill (35.5 percent), emerald shiner (14.2 percent), and spotfin shiner (5.5 percent). Bluegill, pumpkinseed, smallmouth bass, and white bass were the game species collected during seining.

A total of 82 fish representing 16 species was captured during the May 2002 sample event (Table 5.11). A total of 82 fish was collected during electrofishing. Seine netting could not be safely done during May 2002, because of high river water conditions. Freshwater drum (17.1 percent of the total catch) was the most common species collected during electrofishing efforts in May.

A total of 55 fish representing 16 species was captured during the July 2002 sample event (Table 5.12). This was the lowest total catch during any sampling month. A total of 43 fish was collected during electrofishing and 12 during seining. Golden redhorse (34.9 percent of the total catch) was the most common species boated during the electrofishing effort. Spotfin shiner (75 percent of the total catch) was the most frequently collected species during the seining efforts. No fish were collected by seining at Station S-1.

During the September sample event, 262 fish representing 17 taxa were collected (Table 5.13). A total of 47 fish was collected during electrofishing and 215 during seining. Gizzard shad (27.7 percent of the total catch) and black buffalo (12.8 percent) were the most common species boated during the electrofishing effort. Gizzard shad (89.3 percent of the seine catch) was the most frequently collected species during the seining efforts in September. More fish were collected in September than in any other sampling month in 2002.

During the November sample event, 246 fish representing 16 taxa were captured (Table 5.14). A total of 149 fish were collected during electrofishing and 97 during seining. Gizzard shad (29.5 percent of the total catch) and golden redhorse (14.8 percent) were the most common species boated during the electrofishing effort. Bluegill (67.0 percent of the seine catch) was the most frequently collected species during the seining efforts in November.

At the request of the Pennsylvania Fish and Boat Commission (PFBC), electrofishing catch rates were calculated as fish per minute (i.e., power on time) of sampling for 2000 through 2002. Electrofishing catch rates are presented in Tables 5.16, 5.17, and 5.18 for fish that were boated and handled during the 2000 through 2002 surveys by season. Note that because of security concerns after September 11, 2001 fisheries efforts were not completed in September and November 2001.

In 2002, the annual catch rate was 1.98 fish per minute. The greatest catch rate in 2002 occurred in November (winter)(3.63 fish/ electrofishing minute). This was the highest seasonal catch rate of the three years that were compared. A large number of Gizzard Shad contributed to this total. The lowest catch rate occurred in July (summer) with a rate of 1.08 fish/ electrofishing minute.

In 2001, the annual catch rate was 1.28 fish per electrofishing minute, however, this is not directly culpable to 2002 catch rates, since September and November were not sampled.. The

greatest electrofishing catch rate was in May (1.70 fish/electrofishing minute). The lowest catch rate was observed in July (0.85 fish/electrofishing minute).

In 2000 the annual catch rate was 2.31 fish per electrofishing minute. This was the highest annual catch rate of the three years that were compared. The greatest electrofishing catch rate was in May (2.52 fish/electrofishing minute). The lowest catch rate was observed in September (1.48 fish/electrofishing minute).

5.3.4 Comparison of Control and Non-Control Stations

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).

The seine data for 2002 (Table 5.10) indicated no major differences in species composition between control and non-control stations. The total number of fish captured at the control station was larger than at the non-control station.

5.3.5 Discussion

The results of the 2002 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. Forage species were collected in the highest numbers. 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 large numbers of emerald shiners and gizzard shad observed in 2002. 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.

Also, 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 decrease the collection efficiency of this gear.

In 2002, species composition remained comparable among stations. Common taxa collected in the 2002 surveys by all methods included gizzard shad, emerald shiner, redhorse sucker species, sauger, quillback, and smallmouth bass. 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.

5.4 CORBICULA MONITORING PROGRAM

5.4.1 Introduction

The introduced Asiatic clam (*Corbicula fluminea*) was first detected in the United States in 1938 in the Columbia River near Knappton, Washington (Burch 1944). It has since spread throughout most of the country, inhabiting any suitable freshwater habitat. Information from prior aquatic surveys has demonstrated the presence of *Corbicula* in the Ohio River in the vicinity of the BVPS, and the plant is listed in NUREG/CR-4233 (Counts 1985).

One adult Asiatic clam is capable of producing many thousands of young called early juveniles. These early juveniles are very small (approximately 0.2 mm) and will easily pass through the water passages of a power plant. Once the juveniles settle on the substrate, rapid growth occurs. If *Corbicula* develop within a power plant's water passages, they can impede the flow of water through the plant, especially through blockage of condenser tubes and small service water piping. Reduction of flow may be so severe that a plant shutdown is necessary. *Corbicula* are of particular concern when they develop undetected in emergency systems where the flow of water is not constant (NRC, IE Bulletin 81-03).

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 2002.

5.4.2 Monitoring

5.4.2.1 Objectives: 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 also used to monitor for the presence of macrofouling zebra mussels (see Sections 5.15 and 5.1.6).

5.4.2.2 Methods: Cooling Towers - Monthly Reservoir Sampling

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 side-walls and sediments. The sampler used on the side-walls 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.

In 2002, each month (April through November), a single petite ponar grab sample was scheduled to be taken in the reservoir of each cooling tower to obtain density and growth information on any *Corbicula* in the bottom sediment. Due to security concerns, no samples were collected from Unit 1 or Unit 2 in February and March. 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 16.0 mm to 0.6 mm. Live and dead clams on 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.

Cooling Towers - *Corbicula* Density Determination

Population surveys of both BVPS cooling tower reservoirs have been conducted during scheduled outages (1986 through 2001) in order to estimate the number of *Corbicula* present in these structures. In 2002 neither cooling tower was sampled to estimate the *Corbicula* population.. The Unit 2 Cooling Tower did not contain enough silt (very clean) to sample. Unit 1 did not require sampling because it did not have an outage and was not drained during the year.

5.4.2.3 Results:

Unit 1 Cooling Tower - Monthly Reservoir Sampling

In 2002, a total of 66 *Corbicula* (15.2 percent alive) was collected from the Unit 1 cooling tower basin during monthly reservoir sampling. The largest live *Corbicula* collected measured 15.0 mm in length (Table 5.19 and Figure 5.7). The greatest numbers of *Corbicula* were collected in August (29 individuals). *Corbicula* were collected in lower numbers in the other months sampled. Scheduled collections were not made in February and March because of security concerns.

Unit 2 Cooling Tower - Monthly Reservoir Sampling

In 2002, 30 *Corbicula* (33 percent alive) were collected from the Unit 2 cooling tower reservoir during monthly sampling. The largest *Corbicula* collected was dead and measured 2.1 mm in length (Table 5.20 and Figure 2.7). Individuals were collected from April through November. No collections were made in February and March because of security concerns.

In 2002, BVPS continued its *Corbicula* control program (year 13), which included the use of a molluscicide (CT-1) to prevent the proliferation of *Corbicula* within BVPS. BVPS was granted permission by the Pennsylvania Department of Environmental Protection to use CT-1 to target the Unit 1 river water system and the Unit 2 service water system.

In 1990 through 1993, the molluscicide applications (CT-1) 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 CT-1 applications targeted the internal water systems; therefore the CT-1 concentrations in the cooling towers were reduced during CT-1 applications. Consequently, adult and juvenile *Corbicula* in the cooling towers often survived the CT-1 applications. Reservoir sediment samples taken after CT-1 applications represent mortality of *Corbicula* in the cooling tower only and do not reflect mortality in BVPS internal water systems. CT-1 applications occurred during February 2002 for Unit 2, no samples were available for density estimations.

Cooling Towers - *Corbicula* Density Determination

Population surveys of both BVPS cooling tower reservoirs as scheduled to be conducted during scheduled outages (1986 through 2002) to estimate the number of *Corbicula* present in these structures. In 2002 neither Unit 1 or Unit 2 was sampled since no outages were scheduled.

5.4.2.4 Discussion: The monthly reservoir sediment samples collected in Units 1 and 2 cooling towers during 2002 demonstrated that *Corbicula* were entering and colonizing the reservoirs. Overall densities in Units 1 and 2 were less than in 2000 and 2001. The maximum monthly density of *Corbicula* in Unit 1 was 1,221/m^2, which occurred in August. The maximum density of clams in Unit 2 was 430/m^2, which occurred in August. The lower density of *Corbicula* in Unit 2 compared to Unit 1 was consistent with previous years results. 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.

5.4.2.5 Corbicula Juvenile Study:

(1) Objective

The *Corbicula* juvenile study was designed to collect data on *Corbicula* spawning activities and growth of individuals entering the intake from the Ohio River.

(2) Methods

Specially constructed clam cages were initially utilized for this study. Each cage was constructed of a 1 ft durable plastic frame with fiberglass screening (1 mm mesh) secured to cover all open areas. Each cage contained approximately 10 lbs of industrial glass beads (3/8-inch diameter) to provide ballast and a uniform substrate for the clams. The clam cage mesh size permitted only very small clams to enter and colonize the cage.

In 1988 through 1994, the cages were left in place for five months following initial placement. Changes in procedure were made to better define the time period when *Corbicula* were spawning in the Ohio River and releasing larvae that could enter BVPS through the intake structure.

Larval cages were maintained in the BVPS intake structure in 1995 according to the following procedure. Each month, two empty clam cages were placed in the intake structure bays. Each cage was left in place for two months, after which time it was removed and examined for clams. Four clam cages were maintained in the intake structure bays each month throughout 1995-1996.

In February 1996, it was decided to modify the sampling regime so that two of the four cages in the forebay were long-term samplers and the other two were monthly short-term samplers. Each month, the two long-term samplers were pulled; the fine sediment was carefully washed from the cage and any *Corbicula* present were measured. The cages were immediately redeployed along with any identified *Corbicula*. The two short-term cages were pulled monthly and the contents removed for laboratory analyses. New short-term cages were then deployed.

Each short-term clam cage removed after the one or two-month colonization period was returned to the laboratory where it was processed to determine the number of clams that had colonized the cage. *Corbicula* obtained from each cage were rinsed through a series of stacked U.S. Standard sieves ranging in mesh size from 9.5 mm to 0.6 mm. Live and dead clams on each sieve were counted and the numbers were recorded. The largest and smallest clams were measured to establish a length range for the sample. The size distribution data obtained using the sieves reflected clam width, rather than length.

Observational-based concerns that the clam cages could quickly clog with sediment during high sediment periods and, as a result, not sample effectively, 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.

During the 1998 sampling season, at the request of BVPS personnel, all clam cages were removed after the May 18, 1998 collection. Monthly petite ponar grabs from the forebay in the intake building continued thereafter.

In 2002, the sampling with petite ponar was moved to the Ohio River basin directly in front of the Intake Structure Building. Collections were made in conjunction with the fisheries sampling (May, July, September, and November). During each sampling month two ponar grabs were taken approximately 20 feet off shore of the intake building. These grab samples were processed in the same manner as when they were collected from within the Intake Structure Building.

(3) Results

Figure 5.7 presents the abundance and size distribution data for samples collected in the Ohio River near the intake structure by petite ponar in 2002. *Corbicula* were collected during all four collections (May, July, September, and November). The presence of small individuals (1.00-1.99 and 2.00-3.34) of *Corbicula* indicated that successful spawning had occurred. The number of individuals collected was comparable to 2001 (14 in 2001 vs. 25 in 2002.

(4) Discussion

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 late-April (Figure 5.7). The settled clams generally increase in size throughout the year. ***The overall low numbers of Corbicula collected in the intake and cooling towers in 2002 towers, compared to levels in the 1980's, likely reflects a natural decrease in the density of Corbicula in the Ohio River near BVPS.***

5.5 ZEBRA MUSSEL MONITORING PROGRAM

5.5.1 Introduction

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 in recent years.

Adult zebra mussels can live up to five years and grow to 2 inches in length. North American research suggests that each female may be capable of producing over one million microscopic (veliger larvae) offspring per year, which can easily pass through water intake screens. They use strong adhesive byssal threads, collectively referred to as the byssus, to attach themselves to any hard surfaces (e.g., boat hulls, intake pipes and other mussels). Transport of these organisms between water bodies is accomplished in part by boats that have adult mussels attached to their hulls or larvae in their live wells and/or bilges. In anticipation of zebra mussel infestation and responding to NRC Notice No. 89-76 (Biofouling Agent-Zebra Mussel, November 21, 1989), BVPS instituted a Zebra Mussel Monitoring Program in January 1990.

The Zebra Mussel Monitoring Program included the Ohio River and the circulating river water system of the BVPS (intake structure and cooling towers). This section describes this Monitoring Program and the results obtained during Ohio River and BVPS surveys conducted through 2000.

5.5.2 Monitoring

5.5.2.1 Objectives: 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 for these mussels to reach the size and density that could impact the plant.

5.5.2.2 Methods:

5.5.2.2.1 Intake Structure and Barge Slip: The surveillance techniques used on site were:

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

- Pump sample collections from the barge slip and outside the intake structure, to detect the planktonic early life forms (March through November); and

- Sampling of substrate plates used for detection of settled stages in the impact basin below the Emergency outfall (April through November).

- Sampling of one artificial substrate (bridal veil material) suspended in the Ohio River from the Barge Slip (May through November).

5.5.2.2.2 Cooling Towers: The techniques used in the Unit 1 and Unit 2 cooling tower locations were:

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

- Pump samples in March through November to detect planktonic life forms.

5.5.2.2.3 Emergency Outfall:

- Monthly scraper sample collections in the emergency outfall impact basin (February through November); and

- Pump samples in March through November to detect planktonic life forms.

5.5.2.2.4 Splash Pool:

- Monthly scraper sample collections in the Splash Pool (February through November); and

- Pump samples in March through November to detect planktonic life forms.

5.5.3 Results

Zebra mussels were detected in both pump samples (Figures 5.9 and 5.10) and substrate samples (Figure 5.11 and 5.12) in 2002.

Zebra mussel veligers were present in pump samples collected from June through September (Figures 5.9 and 5.10). Densities of veligers generally peaked in July and August. The greatest density of veligers was present in the sample collected at the Barge Slip in August (10,693/m^3). Veligers were present in all samples collected in June through August in 2002. Overall, veliger densities were lower in 2002 than in 2001. In 2001, the greatest density collected was 117,900/m^3. Whether this was due to an overall reduction in numbers of veligers in the Ohio River or due to the limited number of samples and the propensity of veligers to be non-uniformly distributed in the water is uncertain.

In 2002, attached zebra mussels were collected in scrape samples taken from the Barge Slip and the outside wall of the Intake Structure (Figures 5.11 and 5.12). None were collected at either

cooling tower, the Splash Pool, or the Emergency Outfall Impact Basin. Attached zebra mussels were collected at the Barge Slip in June and August. The highest density collected from the Barge Slip was 27/m^2 in August. Zebra mussels were collected from scraping samples from the Intake Structure beginning in June; mussels were also collected in July and August. The same density was collected in each month (2/m^2.) The mussels collected at the intake and Barge Slip were adult mussels capable of reproducing with the largest being 19 mm. Compared with 2000 and 2001 collection of adult zebra mussels was similar to 2001 and lower than 2002. Densities however remained high compared to past years.

5.5.4 Discussion

From 1991 through 1993, based on reports, zebra mussels moved progressively upstream from the lower to upper Ohio River. In 1994, there were confirmed zebra mussel sightings at locations both upstream and downstream from BVPS, including the Allegheny River. The July 1995 sighting of zebra mussels at Maxwell Locks and Dam on the Monongahela River established the presence of these organisms within the Allegheny, Monongahela and Ohio Rivers in Western Pennsylvania.

In 1995, live zebra mussels were found by divers in the BVPS main intake structure and auxiliary intake structure during scheduled cleaning operations. The 1996 Zebra Mussel Monitoring Program at BVPS did not collect any live zebra mussels at BVPS. During the first quarter 1996 (January and February) intake bay cleaning, divers observed an undetermined number of zebra mussels in the intake bays. During the second quarter 1996 cleaning, no mussels were reported. During the third and fourth quarter 1996 intake bay cleanings, about one dozen mussels were observed each time in Bay C only. None were collected by the divers for confirmation.

During 1997, zebra mussel veligers were observed in June. Juvenile zebra mussels appeared in the clam cage and ponar dredge samples. In November 1997, adult zebra mussels were found in the intake ponar dredge samples.

During the 1998 Zebra Mussel Monitoring Program at BVPS, zebra mussel veligers, juveniles, and an adult were observed in sample collections. A moderate density of zebra mussel veligers was observed during the August through November 1998 samples, indicating that spawning occurred sometime during the late summer. Juvenile zebra mussels appeared during March sampling. These mussels were 3.5, 3.5, and 4.5 mm in length, which indicates that they were probably young-of-the-year in 1997. Young-of-the-year zebra mussels appeared in September through November. This observation confirms successful zebra mussel spawning in the area around BVPS.

During 1998, zebra mussels were also found on the walls of the main intake structure during each of the quarterly inspections that took place. During the first quarter, greater than 100 zebra mussels/ft^2 were present in Bay B, although fewer were present in the other bays. Less than 5 mussels/ft^2 were observed during the second quarter inspection that took place in April. Only Bays A and B were inspected, however. A few small zebra mussels were observed during the third quarter inspection; however, any recently settled mussels would be easily missed during a

visual inspection. Few (>10/ft^2) mussels were also observed during the fourth quarter inspection. *Corbicula* were also present in the main intake structure during each quarterly inspection. Zebra mussels were also observed in the alternate intake structure during the last three quarters of 1998, however, densities were low.

In 1999, the number of both veligers and settled zebra mussel increased significantly in the Ohio River near the BVPS. For the first time, the settled zebra mussels were collected in groups rather than as individuals. The density of veligers exceeded 1000/m^3 on many occasions for the first time in 1999.

Overall both the number of observations of settled mussels and the densities of veligers were less in 2001 and 2002 than in 2000.Densities, however, remain high compared to past years. Zebra mussels densities in other water systems display significant annual variations due to environmental variables including water temperature and flow conditions. ***Whether the population of zebra mussels in this reach of the Ohio River is plateauing 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 conduced.***

5.5.5 Zebra Mussel and Corbicula Control Activities

In 2002, BVPS continued its *Corbicula* and zebra mussel control program (Twelfth year), which included the use of a molluscicide (CT-1) to prevent the proliferation of *Corbicula* within BVPS. BVPS was granted permission by the Pennsylvania Department of Environmental Protection to use CT-1 to target the Unit 1 river water system and the Unit 2 service water system.

In 1990 through 1993, the molluscicide applications (CT-1) focused on reducing the *Corbicula* population throughout the entire river water system of each BVPS plant (Units 1 and 2). In 1994 through 2002, the CT-1 or 2 applications targeted zebra mussels and *Corbicula* in the internal water systems; therefore the molluscicide concentrations in the cooling towers were reduced during CT-1 or 2 applications. Consequently, adult and juvenile *Corbicula* in the cooling towers often survived the applications. Reservoir sediment samples taken after CT-1 or 2 applications represented mortality of *Corbicula* in the cooling tower only and do not reflect mortality in BVPS internal water systems.

In 2002, control treatments occurred in April, July, and October. In addition to clamicide treatments, proactive 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.

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TABLES

TABLE 5.1

BEAVER VALLEY POWER STATION (BVPS)
SAMPLING DATES FOR 2002

Study	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Benthic Macroinvertebrate					20				25			
Fish					20-21		16		25		13	
Corbicula and Zebra Mussel				17	20	25	16	20	25	22	13	
Corbicula CT Density				17	20	25	16	20	25	22	13	
Zebra Mussel Veliger				17	20	25	16	20	25	22	13	

TABLE 5.2

SYSTEMATIC LIST OF MACROINVERTEBRATES COLLECTED FROM 1973 THROUGH 2002 IN THE OHIO RIVER NEAR BVPS

Taxa	Collected in Previous Years	Collected in 2002	New in 2002
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	X	
Entoprocta			
Urnatella gracilis	X		
Ectoprocta			
Fredericella sp.	X		
Paludicella articulata	X		
Pectinatella sp.	X		
Plumatella sp.	X		
Annelida			
Oligochaeta	X	X	
Aeolosomatidae	X		
Tubificida	X		
Enchytraeidae	X	X	
Naididae		X	
Allonais pectinata	X		
Amphichaeta leydigi	X		
Amphichaeta sp.	X		
Arcteonais lomondi	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		
N. pardalis	X	X	

TABLE 5.2 (Cont'd)

Taxa	Collected in Previous Years	Collected in 2002	New in 2002
N. pseudobtusa	X		
N. simplex	X		
N. variabilis	X	X	
Nais sp.	X	X	
Ophidonais serpentina	X		
Paranais frici	X		
Paranais litoralis		X	X
Paranais sp.	X		
Piguetiella michiganensis	X		
Pristina idrensis	X		
Pristina longisoma	X		
Pristina longiseta	X		
P. osborni	X	X	
P. sima	X	X	
Pristina sp.	X	X	
Pristinella sp.		X	X
Pristinella jenkinae	X	X	
Pristinella idrensis		X	X
Pristinella osborni		X	X
Ripistes parasita	X		
Slavina appendiculata	X		
Specaria josinae			
Stephensoniana trivandrana	X		
Stylaria fossularis	X		
S. lacustris	X		
Uncinais uncinata	X		
Vejdovskyella comata	X		
Vejdovskyella intermedia	X		
Vejdovskyella sp.	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		
L. spiralis	X		
L. udekemianus	X		
Limnodrilus sp.	X		
Peloscolex multisetosus longidentus	X		
P. m. multisetosus	X		
Potamothrix moldaviensis	X		
Potamothrix sp.		X	X
P. vejdovskyi	X	X	
Psammoryctides curvisetosus	X		
Tubifex tubifex	X		
Unidentified immature forms:	X		

TABLE 5.2 (Cont'd)

Taxa	Collected in Previous Years	Collected in 2002	New in 2002
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	X	
Lumbricidae	X		
Arthropoda			
Acarina	X		
Ostracoda	X		
Isopoda			
Asellus sp.	X		
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			
Heptageniidae	X		
Stenacron sp.	X		
Stenonema sp.	X		
Ephemeridae			
Ephemera sp.	X		
Hexagenia sp.	X	X	
Ephron sp.	X		
Baetidae	X		
Baetis sp.			
Caenidae			
Caenis sp.	X	X	
Serattella sp.	X		
Potamanthidae			
Potamanthus sp.			
Tricorythidae			
Tricorythodes sp.	X		
Megaloptera			
Sialis sp.	X	X	

TABLE 5.2 (Cont'd)

Taxa	Collected in Previous Years	Collected in 2002	New in 2002
Odonata			
Gomphidae			
Argia sp.	X		
Dromogomphus spoliatus	X		
Dromogomphus sp.	X		
Gomphus sp.	X		
Libellulidae			
Libellula sp.	X		
Trichoptera	X	X	
Hydropsychidae	X		
Cheumatopsyche sp.	X		
Hydropsyche sp.	X		
Parapsyche sp.	X		
Psychomyiidae			
Psychomyia sp.			
Hydroptilidae			
Hydroptila sp.	X		
Orthotrichia sp.			
Oxyethira sp.	X		
Leptoceridae		X	
Ceraclea sp.	X		
Leptocerus sp.	X		
Oecetis sp.	X		
Polycentropodidae			
Cyrnellus sp.	X		
Polycentropus sp.	X		
Coleoptera	X		
Hydrophilidae	X		
Elmidae			
Ancyronyx variegatus	X		
Dubiraphia sp.	X		
Helichus sp.	X		
Stenelmis sp.	X		
Psephenidae	X		
Diptera		X	
Unidentified Diptera	X		
Probezzia	X	X	
Psychodidae	X		
Pericoma sp.	X		
Psychoda sp.	X		
Telmatoscopus sp.	X		
Unidentified Psychodidae pupae	X		
Chaoboridae			
Chaoborus sp.	X	X	
Simuliidae			
Similium sp.	X		
Chironomidae	X		
Chironominae	X		
Tanytarsini pupa	X		
Chironominae pupa	X		
Axarus sp.	X		

TABLE 5.2 (Cont'd)

Taxa	Collected in Previous Years	Collected in 2002	New in 2002
Chironomus sp.	X	X	
Cladopelma sp.	X		
Cladotanytarsus sp.			
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		
Paracladopelma sp.	X		
Paratanytarsus sp.	X		
Paratendipes albimanus	X		
Phaenopsectra sp.	X		
Polypedilum (s.s.) *convictum* type	X		
P. (s.s.) *simulans* type	X		
Polypedilum sp.	X	X	
Rheotanytarsus 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	X	
Clinotanypus sp.	X		
Coelotanypus scapularis	X		
Coelotanypus sp.	X	X	
Djalmabatista pulcher	X		
Djalmabatista sp.	X		
Procladius sp.	X	X	
Tanypus sp.	X	X	
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		
Eukiefferiella sp.	X		
Hydrobaenus sp.	X		
Limnophyes sp.	X		
Nanocladius (s.s.) *distinctus*	X		
Nanocladius sp.	X		
Orthocladius sp.	X		
Parametriocnemus sp.	X		
Paraphaenocladius sp.	X		

TABLE 5.2 (Cont'd)

Taxa	Collected in Previous Years	Collected in 2002	New in 2002
Psectrocladius sp.	X		
Psectrotanypus sp.			
Pseudorthocladius sp.	X		
Pseudosmittia sp.	X		
Smittia sp.	X		
Theinemannimyia sp.	X		
Diamesinae			
Diamesa sp.	X		
Potthastia sp.	X		
Ceratopogonidae	X	X	
Bezzia sp.	X		
Culicoides sp.	X		
Dolichopodidae	X		
Empididae	X		
Clinocera sp.	X		
Wiedemannia sp.	X		
Ephydridae	X		
Muscidae	X		
Limnphora sp.		X	X
Rhagionidae	X		
Tipulidae	X		
Stratiomyidae	X		
Syrphidae	X		
Lepidoptera	X		
Hydrachnidia	X		
Mollusca			
Gastropoda	X		
Hydrobiidae	X	X	
Amnicolinae			
Amnicola sp.	X	X	
Amnicola limosa	X	X	
Physacea	X		
Physidae	X		
Physa sp.	X		
Physa ancillaria		X	X
Ancylidae	X		
Ferrissia sp.	X		
Planorbidae	X		
Valvatidae	X		
Valvata perdepressa	X		
Valvata piscinalis	X		
Valvata sincera sincera	X	X	
Valvata sp.		X	X
Pelecypoda	X		
Sphaeriacea	X		
Corbiculidae			
Corbicula fluminea	X	X	
Corbicula sp.	X	X	
Sphaeriidae	X		
Pisidium ventricosum	X		

TABLE 5.3.1

BENTHIC MACROINVERTEBRATE COUNTS FOR TRIPLICATE SAMPLES
TAKEN AT EACH SAMPLE STATION FOR MAY 2002

Scientific name	May Location						May Total
	1	2A	2B1	2B2	2B3	3	
Brachionus sp							0
Nematoda	1						1
Potamothix sp							0
Oligochaeta							0
Enchytraeidae	1						1
Naididae						1	1
N. pardalis							0
N variabilis							0
Nais sp		1					1
Paranais litoralis							0
Pristina idrensis	2						2
P. osborni							0
P. sima							0
Pristinella sp.							0
Pristinella jenkinae							0
Pristinella osborni							0
Branchiura sowerbyi							0
L. hoffmeisteri	3		3			4	10
L. maumeensis	7		1			1	9
P vejdovskyi	3		1		1		5
without hair chaetae	9		14	4	14	19	60
Lumbriculidae	1						1
Lumbricina			1				1
Gammarus sp			3		1		4
Hexagenia sp				16		13	29
Caenis sp							0
Sialis sp				1			1
Trichoptera							0
Leptoceridae							0
Diptera					1		1
Probezzia							0
Chaoborus sp							0
Chironomus sp							0
Cryptochironomus sp	1				1		2
Dicrotendipes sp							0
Polypedilum sp	2		9	2		1	14
Tanytarsus sp.				1			1
Ablabesmyia sp.				1		2	3
Coelotanypus sp			1			2	3
Procladius sp	2						2
Ceratopogonidae	2						2
Muscidae							0
Limnphora sp	1						1
Hydrobiidae							0
Amnicola sp.							0
Amnicola limosa			1				1
Physa sp							0
Valvata sincera sincera							0
Corbicula fluminea	1			1	7		9
Corbicula sp		2					2
Pisidium sp.	1			4	10	3	18
Dreissena polymorpha							0
Tanypus sp							0
Monthly Total	37	3	34	30	35	46	185

TABLE 5.3.2

BENTHIC MACROINVERTEBRATE COUNTS FOR TRIPLICATE SAMPLES
TAKEN AT EACH SAMPLE STATION FOR SEPTEMBER 2002

Scientific name	September Location						September	2002
	1	2A	2B1	2B2	2B3	3	Total	Total
Brachionus sp.			1				1	1
Nematoda					1		1	2
Potamothix sp				2			2	2
Oligochaeta		1	1	1			3	3
Enchytraeidae							0	1
Naididae							0	1
N pardalis						1	1	1
N. variabilis	4		2				6	6
Nais sp							0	1
Paranais litoralis						1	1	1
Pristina idrensis							0	2
P. osborni	1	1		1			3	3
P. sima	2					1	3	3
Pristinella sp						1	1	1
Pristinella jenkinae	3						3	3
Pristinella osborni	2	1				2	5	5
Branchiura sowerbyi	3				2	2	7	7
L. hoffmeisteri	12	18	7	10	8	6	61	71
L. maumeensis	4		1	1	1		7	16
P. vejdovskyi	13	17	4	4	13	7	58	63
without hair chaetae	69	42	19	75	23	48	276	336
Lumbriculidae							0	1
Lumbricina		1					1	2
Gammarus sp.	1	1		1		2	5	9
Hexagenia sp		10	1	3	10		24	53
Caenis sp.	2	7			1	4	14	14
Sialis sp							0	1
Trichoptera	1		1	1			3	3
Leptoceridae	1				2	6	9	9
Diptera	1						1	2
Probezzia					4		4	4
Chaoborus sp.				2			2	2
Chironomus sp.	4	8	2		1		15	15
Cryptochironomus sp	6	1	3	1	3	9	23	25
Dicrotendipes sp.						1	1	1
Polypedilum sp.	11	8	2		1		22	36
Tanytarsus sp	36	8	1		2	2	49	50
Ablabesmyia sp		6		2	4		12	15
Coelotanypus sp	1	30	6	39	40	1	117	120
Procladius sp		1	5	5	1		12	14
Ceratopogonidae					3		3	5
Muscidae							0	1
Limnphora sp.							0	1
Hydrobiidae	1						1	1
Amnicola sp		1					1	1
Amnicola limosa	2	1	14	8	1	6	32	33
Physa sp.						1	1	1
Valvata sincera sincera				1			1	1
Corbicula fluminea							0	9
Corbicula sp.	26	26	23	16	46	72	209	211
Pisidium sp	9	7	6	2	3	1	28	46
Dreissena polymorpha			2				2	2
Tanypus sp.				1			1	1
Monthly Total	215	196	101	176	170	174	1031	1217

TABLE 5.4

MEAN NUMBER OF MACROINVERTEBRATES (NUMBER/M^2) AND PERCENT COMPOSITION OF OLIGOCHAETA, CHIRONOMIDAE, MOLLUSCA, AND OTHER ORGANISMS, 2002 BVPS

May 20	Station											
	1 (Control)		2A		2B1 (Non-control)		2B2 (Non-control)		2B3 (Non-control)		3	
	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%
Oligochaeta	1118	72	0	0	860	61	172	13	645	44	1032	53
Chironomidae	215	14	0	0	430	30	172	13	43	3	215	11
Mollusca	86	6	86	100	0	0	215	17	731	50	129	7
Others	129	8	0	0	129	9	731	57	43	3	559	29
Total	1548	100	86	100	1419	100	1290	100	1462	100	1935	100

September 25	Station											
	1 (Control)		2A		2B1 (Non-control)		2B2 (Non-control)		2B3 (Non-control)		3	
	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%
Oligochaeta	4117	48	3397	41	1462	40	1978	71	1935	29	2666	40
Chironomidae	2494	29	2666	32	817	23	602	22	2236	33	516	8
Mollusca	1806	21	1462	18	1247	35	129	5	2107	31	3139	48
Others	215	2	774	9	86	2	43	2	473	7	258	4
Total	8632	100	8299	100	3612	100	2752	100	6751	100	6579	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), 2002 BVPS

May 20

	Control Station (Mean)		Non-Control Station (Mean)	
	#/m^2	%	#/m^2	%
Oligochaeta	1118	72	559	40
Chironomidae	215	14	215	15
Mollusca	86	6	315	23
Others	129	8	301	22
TOTAL	1548	100	1390	100

September 25

	Control Station (Mean)		Non-Control Station (Mean)	
	#/m^2	%	#/m^2	%
Oligochaeta	4117	48	1792	41
Chironomidae	2494	29	1218	28
Mollusca	1806	21	1161	27
Others	215	2	201	5
TOTAL	8632	100	4372	100

TABLE 5.6

SHANNON-WEINER DIVERSITY, EVENNESS AND RICHNESS INDICES FOR BENTHIC MACROINVERTEBRATES COLLECTED IN THE OHIO RIVER, 2002

	Station					
	1	2A	2B1	2B2	2B3	3
Date: May 20						
No. of Taxa	15	2	9	8	7	9
Shannon-Weiner Index	1.60	0.57	1.55	1.50	1.56	1.67
Evenness	0.41	0.57	0.49	0.50	0.56	0.53
Richness	3.38	0.91	2.27	2.06	1.69	2.09

	Station					
	1.00	2A	2B1	2B2	2B3	3.00
Date: September 25						
No. of Taxa	25	21	19	20	21	21
Shannon-Weiner Index	2.34	2.04	2.02	2.25	2.24	2.25
Evenness	0.50	0.46	0.48	0.52	0.51	0.51
Richness	3.95	3.35	3.39	3.24	3.43	3.41

TABLE 5.7

BENTHIC MACROINVERTEBRATE DENSITIES (NUMBER/M^2) FOR STATION 1 (CONTROL) AND STATION 2B (NON-CONTROL) DURING PREOPERATIONAL AND OPERATIONAL YEARS THROUGH 2002
BVPS

Month	Preoperational Years						Operational Years					
	1973		1974		1975		1976		1977		1978	
	1	2B	1	2B	1	2B	1	2B	1	2B	1	2B
May	248	508	1,116	2,197			927	3,660	674	848	351	126
August	99	244	143	541	1,017	1,124	851	785	591	3,474	601	1,896
Mean	173	376	630	1,369	1,017	1,124	889	2,223	633	2,161	476	1,011

Month	Operational Years											
	1979		1980		1981		1982		1983		1984	
	1	2B	1	2B	1	2B	1	2B	1	2B	1	2B
May	1,004	840	1,041	747	209	456	3,490	3,026	3,590	1,314	2,741	621
August	1,185	588										
September			1,523	448	2,185	912	2,958	3,364	4,172	4,213	1,341	828
Mean	1,095	714	1,282	598	1,197	684	3,223	3,195	3,881	2,764	2,041	725

TABLE 5.7 (Cont'd)

BENTHIC MACROINVERTEBRATE DENSITIES (NUMBER/M^2) FOR STATION 1 (CONTROL) AND STATION 2B (NON-CONTROL) DURING PREOPERATIONAL AND OPERATIONAL YEARS THROUGH 2002 BVPS

Month	Operational Years											
	1985		1986		1987		1988		1989		1990	
	1	2B	1	2B	1	2B	1	1	1	2B	1	2B
May	2,256	867	601	969	1,971	2,649	1,1804	1,775	3,459	2,335	15,135	5,796
September	1,024	913	849	943	2,910	2,780	1,420	1,514	1,560	4,707	5,550	1,118
Mean	1,640	890	725	956	2,440	2,714	1,612	1,645	2,510	3,274	10,343	3,457

Month	Operational Years											
	1991		1992		1993		1994		1995		1996	
	1	2B	1	2B	1	2B	1	2B	1	2B	1	2B
May	7,760	6,355	7,314	10,560	8,435	2,152	6,980	2,349	8,083	9,283	1,987	1,333
September	3,855	2,605	2,723	4,707	4,693	2,143	1,371	2,930	1,669	3,873	1,649	2,413
Mean	5,808	4,480	5,019	7,634	6,564	2,148	4,176	2,640	4,876	6,578	1,814	3,7746

*Mean of 2B1, 2B2, 2B3

TABLE 5.7 (Cont'd)

BENTHIC MACROINVERTEBRATE DENSITIES (NUMBER/M^2) FOR STATION 1 (CONTROL) AND STATION 2B (NON-CONTROL) DURING PREOPERATIONAL AND OPERATIONAL YEARS THROUGH 2002 BVPS

Month	Operational Years											
	1997		1998		1999		2000		2001		2002	
1	1	2B*	1	2B	1	2B*	1	2B*	1	2B*	1	2B*
May	1,411	2,520	6,980	2,349	879	1,002	2,987	2,881	3,139	5,232	1,548	2,795
September	1,944	2,774	1,371	2,930	302	402	3,092	2,742			8,632	14,663
Mean	1,678	2,647	4,176	2,640	591	702	3,040	2,812	3,139	5,232	5,090	8,729

Mean of 2B1, 2B2, 2B3

TABLE 5.8

SCIENTIFIC AND COMMON NAME[1] OF FISH COLLECTED IN THE NEW CUMBERLAND POOL OF THE OHIO RIVER, 1970 THROUGH 2002 BVPS

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
Cyprinella spiloptera	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 commersoni	White sucker
Hypentelium nigricans	Northern hogsucker
Ictiobus bubalus	Smallmouth buffalo
I. niger	Black buffalo
Minytrema melanops	Spotted sucker

TABLE 5.8
(Continued)

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. 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

TABLE 5.8
(Continued)

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
Stizostedion canadense	Sauger
S. vitreum	Walleye
S. canadense x S. vitreum	Saugeye
Sciaenidae (drums)	
Aplodinotus grunniens	Freshwater drum

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

TABLE 5.9

COMPARISON OF CONTROL VS. NON-CONTROL ELECTROFISHING CATCHES DURING THE BVPS 2002 FISHERIES SURVEY

Common Name	Scientific Name	Control	%	Non-control	%	Total fish	%
Black buffalo	*Ictiobus niger*	3	3.4	12	5.2	15	4.7
Black crappie	*Pomoxis nigromaculatus*	1	1.1	1	0.4	2	0.6
Bluegill	*Lepomis macrochirus*			3	1.3	3	0.9
Channel catfish	*Ictalurus punctatus*	1	1.1	7	3.0	8	2.5
Common carp	*Cyprinus carpio*	4	4.5	1	0.4	5	1.6
Emerald shiner	*Notropis atheriniodes*	3	3.4	2	0.9	5	1.6
Flathead catfish	*Pylodictus olivaris*			3	1.3	3	0.9
Freshwater drum	*Aplodinotus grunniens*	5	5.7	12	5.2	17	5.3
Gizzard shad	*Dorosoma cepedianum*	28	31.8	37	15.9	65	20.2
Golden redhorse	*Moxostoma erythrurum*	12	13.6	32	13.7	44	13.7
Highfin carpsucker	*Carpoides velifer*			11	4.7	11	3.4
Northern hog sucker	*Hypentelium nigricans*	1	1.1			1	0.3
Longnose gar	*Lepisosteus osseus*			1	0.4	1	0.3
Mooneye	*Hiodon tergius*			4	1.7	4	1.2
Pumpkinseed	*Lepomis gibbosus*			3	1.3	3	0.9
Quillback	*Carpoides cyprinus*	2	2.3	12	5.2	14	4.4
River Redhorse	*Moxostoma carinatum*	1	1.1	2	0.9	3	0.9
Sauger	*Stizostedion canadense*	2	2.3	9	3.9	11	3.4
Shorthead redhorse sucker	*Moxostoma macrolepidotum*	1	1.1	14	6.0	15	4.7
Silver redhorse	*Moxostoma anisurum*	2	2.3	10	4.3	12	3.7
Smallmouth bass	*Micropterus dolomeiu*	3	3.4	3	1.3	6	1.9
Spottail shiner	*Notropis hudsonius*	4	4.5			4	1.2
Spotted bass	*Micropterus punctulatus*	3	3.4	5	2.1	8	2.5
Walleye	*Stizostedion vitreum*	2	2.3	3	1.3	5	1.6
White bass	*Morone chrysops*	9	10.2	46	19.7	55	17.1
White catfish	*Ameriurus catus*	1	1.1			1	0.3
Electrofishing	Gear Total:	88	100	233	100	321	100

TABLE 5.10

COMPARISON OF CONTROL VS. NON-CONTROL SEINE CATCHES DURING THE BVPS 2002 FISHERIES SURVEY

Common Name	*Scientific Name*	*Control*	*%*	*Non-control*	*%*	*Total fish*	*%*
Black buffalo	*Ictiobus niger*		0.0	5	7.8	5	2.7
Bluegill	*Lepomis macrochirus*	50	42.0	15	23.4	65	35.5
Bluntnose minnow	*Pimephales notatus*	3	2.5	2	3.1	5	2.7
Emerald shiner	*Notropis atherinoides*	24	20.2	2	3.1	26	14.2
Gizzard shad	*Dorosoma cepedianum*	38	31.9	29	45.3	67	36.6
Pumpkinseed	*Lepomis gibbosus*		0.0	1	1.6	1	0.5
Smallmouth bass	*Micropterus dolomieui*	1	0.8		0.0	1	0.5
Spotfin shiner	*Cyprinella spilopterus*	3	2.5	7	10.9	10	5.5
Spottail shiner	*Notropis hudsonius*		0.0	2	3.1	2	1.1
White bass	*Morone chrysops*		0.0	1	1.6	1	0.5
Seine	Gear Total:	119	100	64	100	183	100

Seine and Electrofishing	Year Total	207	-------	297	-------	504	-------

TABLE 5.11

FISH SPECIES COLLECTED DURING THE MAY 2002 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

Common Name	Scientific Name	Sample locations *						Seine		Electrofishing	
		S-1**	S-2**	E-1	E-2A	E-2B	E-3	Total	%	Total	%
Channel catfish	*Ictalurus punctatus*				3	1	2			6	7.3
Common carp	*Cyprinus carpio*			1						1	1.2
Flathead catfish	*Pylodictis olivaris*					1				1	1.2
Freshwater drum	*Aplodinotus grunniens*			5	1	1	7			14	17.1
Gizzard shad	*Dorosoma cepedianum*			2			2			4	4.9
Golden redhorse	*Moxostoma erythrurum*					4				4	4.9
Highfin carpsucker	*Carpiodes velifer*					1	10			11	13.4
Longnose gar	*Lepisosteus osseus*					1				1	1.2
Mooneye	*Hiodon tergius*					1	1			2	2.4
Quillback	*Carpoides cyprinus*						6			6	7.3
River redhorse	*Moxostoma carinatum*			1		2				3	3.7
Sauger	*Stizostedion canadense*			2		1				3	3.7
Shorthead redhorse sucker	*Moxostoma*			1	1	5				7	8.5
Silver redhorse	*Moxostoma anisurum*			2		9				11	13.4
Walleye	*Stizostedion vitreum*			2						2	2.4
White bass	*Morone chrysops*					5	1			6	7.3
Total		0	0	16	5	32	29	0	0	82	100

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

** Seine netting could not be safely done because of high river water conditions

TABLE 5.12

FISH SPECIES COLLECTED DURING THE JULY 2002 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

Common Name	Scientific Name	Sample locations *						Seine		Electrofishing	
		S-1	S-2	E-1	E-2A	E-2B	E-3	Total	%	Total	%
Black buffalo	*Ictiobus niger*						1			1	2.3
Common carp	*Cyprinus carpio*			1		1				2	4.7
Freshwater drum	*Aplodinotus grunniens*				1					1	2.3
Gizzard shad	*Dorosoma cepedianum*			1	1	2				4	9.3
Golden redhorse	*Moxostoma erythrurum*			8	5		2			15	34.9
Pumpkinseed	*Lepomis gibbosus*		1				1	1	8.3	1	2.3
Quillback	*Carpoides velifer*						2			2	4.7
Sauger	*Stizostedion canadense*						1			1	2.3
Shorthead redhorse sucker	*Moxostoma macrolepidotum*				1					1	2.3
Silver redhorse	*Moxostoma anisurum*				1					1	2.3
Smallmouth bass	*Micropterus dolomeiui*		2					2	16.7		
Spotfin shiner	*Cyprinella spilopterus*		9					9	75.0		
Spottail shiner	*Notropis hudsonius*			4						4	9.3
Spotted bass	*Micropterus punctulatus*					4				4	9.3
Walleye	*Stizostedion vitreum*				1	2				3	7.0
White bass	*Morone chyrsops*				1	1	1			3	7.0
Total		0	12	14	11	10	8	12	100	43	100

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

TABLE 5.13

FISH SPECIES COLLECTED DURING THE SEPTEMBER 2002 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

Common Name	Scientific Name	Sample locations *						Seine		Electrofishing	
		S-1	S-2	E-1	E-2A	E-2B	E-3	Total	%	Total	%
Black buffalo	*Ictiobus niger*		5		6			5	2.3	6	12.8
Black crappie	*Pomoxis nigromaculatus*					1				1	2.1
Channel catfish	*Ictalurus punctatus*			1			1			2	4.3
Common carp	*Cyprinus carpio*			2						2	4.3
Emerald shiner	*Notropis atheriniodes*	10	1					11	5.1		
Flathead catfish	*Pylodictus olivaris*					2				2	4.3
Gizzard shad	*Dorosoma cepedianum*	38	154	6	3	4		192	89.3	13	27.7
Golden redhorse	*Moxostoma erythrurum*						3			3	6.4
Northern hog sucker	*Hypentelium nigricans*			1						1	2.1
Pumpkinseed	*Lepomis gibbosus*		1		1		1	1	0.5	2	4.3
Quillback	*Carpoides cyprinus*			2						2	4.3
Smallmouth bass	*Micropterus dolomeiui*	1		1	2	1		1	0.5	4	8.5
Spotfin shiner	*Cyprinella spilopterus*	1	3					4	1.9		
Spottail shiner	*Notropis hudsonius*		1					1	0 5		
Spotted bass	*Micropterus punctulatus*			3	1					4	8.5
White bass	*Morone chrysops*			1	1		2			4	8.5
White catfish	*Ameriurus catus*			1						1	2.1
Total		50	165	18	14	8	7	215	100	47	100

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

TABLE 5.14

FISH SPECIES COLLECTED DURING THE NOVEMBER 2002 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

Common Name	Scientific Name	Sample locations *						Seine		Electrofishing	
		S-1	S-2	E-1	E-2A	E-2B	E-3	Total	%	Total	%
Black buffalo	*Ictiobus niger*			3	4	1				8	5.4
Black crappie	*Pomoxis nigromaculatus*			1						1	0.7
Bluegill	*Lepomis macrochirus*	50	15		1	1	1	65	67.0	3	2.0
Bluntnose minnow	*Pimephales notatus*	3	2					5	5.2		
Emerald shiner	*Notropis atheriniodes*	14	1	3		2		15	15.5	5	3.4
Freshwater drum	*Aplodinotus grunniens*						1			1	0.7
Gizzard shad	*Dorosoma cepedianum*		4	19	13	8	4	4	4.1	44	29.5
Golden redhorse	*Moxostoma erythrurum*			4	3	6	9			22	14.8
Mooneye	*Hiodon tergius*				1	1				2	1.3
Quillback	*Carpoides cyprinus*				1	2	1			4	2.7
Sauger	*Stizostedion canadense*				4	3				7	4.7
Shorthead redhorse sucker	*Moxostoma macrolepidotum*				1	2	5			8	5.4
Smallmouth bass	*Micropterus dolomeiui*			2	2	4	4			12	8.1
Spotfin shiner	*Cyprinella spilopterus*	2	4					6	6.2		
Spottail shiner	*Notropis hudsonius*		1					1	1.0		
White bass	*Morone chrysops*		1	8	2	6	16	1	1.0	32	21.5
Total		69	28	40	32	36	41	97	100	149	100

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

TABLE 5.15

ESTIMATED NUMBER OF FISH OBSERVED * DURING ELECTROFISHING OPERATIONS

Common Name	Scientific Name	May	July	Sept	Nov	Total
Emerald shiner	*Notropis atheriniodes*				1000's	
Gizzard shad	*Dorosoma cepedianum*		1000's	51		51
Total			1000"s	51	1000's	51

* = Not boated or handled

Table 5.16

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2000 FISHERIES SURVEY

Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Spring	40	Buffalo sp.	4	0.1000
		Bullheads/Catfishes	2	0.0500
		Channel catfish	11	0.2750
		Common carp	3	0.0750
		Flathead catfish	2	0.0500
		Freshwater drum	1	0.0250
		Gizzard shad	22	0.5500
		Golden redhorse	12	0.3000
		Quillback	8	0.2000
		River redhorse	4	0.1000
		Rock bass	1	0.0250
		Sauger	26	0.6500
		Shorthead redhorse sucker	8	0.2000
		Silver redhorse	9	0.2250
		Smallmouth bass	3	0.0750
		Striped bass	12	0.3000
		Walleye	13	0.3250
		Season Total	141	2.5250
Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Summer	40	Black buffalo	1	0.0250
		Channel catfish	1	0.0250
		Common carp	4	0.1000
		Emerald shiner	5	0.1250
		Flathead catfish	2	0.0500
		Gizzard shad	22	0.5500
		Golden redhorse	12	0.3000
		Highfin carpsucker	1	0.0250
		Largemouth bass	2	0.0500
		Quillback	4	0.1000
		River redhorse	3	0.0750
		Sauger	18	0.4500
		Shorthead redhorse sucker	5	0.1250
		Silver redhorse	5	0.1250
		Smallmouth bass	3	0.0750
		Smallmouth buffalo	3	0 0750
		Spotted bass	2	0.0500
		White bass	3	0.0750
		Season Total	96	2.4000

Table 5.16 (Cont'd)

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2000 FISHERIES SURVEY

Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Fall	40	Bluegill	3	0.0750
		Channel catfish	3	0.0750
		Common carp	1	0.0250
		Freshwater drum	3	0.0750
		Gizzard shad	10	0.2500
		Golden redhorse	8	0.2000
		Longnose gar	5	0.1250
		Northern hogsucker	1	0.0250
		Quillback	1	0.0250
		Sauger	8	0.2000
		Shorthead redhorse sucker	1	0.0250
		Silver redhorse	2	0.0500
		Smallmouth bass	5	0.1250
		Walleye	2	0 0500
		White bass	6	0.1500
		Season Total	59	1.4750
Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Winter	40	Bluegill	4	0.1000
		Channel catfish	1	0.0250
		Emerald shiner	1	0.0250
		Freshwater drum	2	0.0500
		Gizzard shad	19	0.4750
		Golden redhorse	10	0.2500
		Sauger	21	0.5250
		Shorthead redhorse sucker	1	0.0250
		Silver redhorse	2	0.0500
		Smallmouth bass	3	0.0750
		Smallmouth buffalo	6	0.1500
		Spotted bass	1	0.0250
		Walleye	1	0.0250
		White bass	2	0.0500
		Season Total	74	1.8500
Year	160		370	2.3125

Table 5.17

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2002 FISHERIES SURVEY

Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Spring	40	Channel catfish	2	0.050
		Freshwater drum	2	0.050
		Gizzard shad	14	0.350
		Golden redhorse	17	0 425
		Quillback	1	0.025
		River carp sucker	3	0.075
		Sauger	2	0.050
		Shorthead redhorse sucker	10	0.250
		Silver redhorse	7	0.175
		Smallmouth bass	5	0.125
		Smallmouth buffalo	4	0.100
		Walleye	1	0.025
		Season Total	68	1.700
Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Summer	40	Black buffalo	2	0.0500
		Bluegill	2	0.0500
		Common carp	1	0.0250
		Emerald shiner	2	0.0500
		Flathead catfish	2	0.0500
		Freshwater drum	2	0.0500
		Golden redhorse	6	0.1500
		Sauger	8	0.2000
		Shorthead redhorse sucker	2	0.0500
		Silver redhorse	3	0.0750
		Smallmouth bass	3	0.0750
		Spotted bass	1	0.0250
		Season Total	34	0.8500
Year	80		102	1.2750

Table 5.18

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2002 FISHERIES SURVEY

Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Spring	40 06	Channel catfish	6	0 1498
		Common carp	1	0 0250
		Flathead catfish	1	0 0250
		Freshwater drum	15	0.3744
		Gizzard shad	4	0 0999
		Golden redhorse	4	0 0999
		High fin carpsucker	11	0.2746
		Longnose gar	1	0 0250
		Quillback	6	0.1498
		Mooneye	2	0.0499
		River redhorse	3	0 0749
		Sauger	3	0 0749
		Shorthead redhorse	6	0 1498
		Silver redhorse	11	0.2746
		Walleye	2	0 0499
		White bass	6	0.1498
		Season Total	82	2.0469

Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Summer	40	Black buffalo	1	0 0250
		Common carp	2	0.0500
		Freshwater drum	1	0.0250
		Gizzard shad	4	0.1000
		Golden redhorse	15	0.3750
		Quillback	2	0 0500
		Pumpkinseed	1	0 0250
		Sauger	1	0.0250
		Shorthead redhorse	1	0.0250
		Silver redhorse	1	0 0250
		Spottail shiner	4	0.1000
		Spotted bass	4	0.1000
		Walleye	3	0 0750
		White bass	3	0.0750
		Season Total	43	1 0750

Table 5.18 (Cont'd)

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2002 FISHERIES SURVEY

Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Fall	41.1	Black buffalo	5	0.1217
		Black crappie	1	0.0243
		Channel catfish	2	0.0487
		Common Carp	2	0.0487
		Flathead catfish	2	0.0487
		Gizzard shad	14	0.3406
		Golden redhorse	3	0.0730
		Northern Hog sucker	1	0.0243
		Pumpkinseed	2	0.0487
		Quillback	2	0.0487
		Smallmouth bass	4	0.0973
		Spotted bass	4	0.0973
		White bass	4	0.0973
		White catfish	1	0 0243
		Season Total	47	1.1436
Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Winter	41	Black buffalo	8	0.1951
		Black crappie	1	0.0250
		Bluegill	3	0.0749
		Emerald shiner	5	0.1248
		Freshwater drum	1	0 0250
		Gizzard shad	44	1.0984
		Golden redhorse	22	0.5492
		Quillback	4	0.0999
		Mooneye	2	0.0499
		Sauger	7	0.1747
		Shorthead redhorse	8	0.1997
		Smallmouth bass	12	0.2996
		White bass	32	0.7988
		Season Total	149	3 6341
Year	162 16		321	1.9795

TABLE 5.19

UNIT 1 COOLING RESERVOIR MONTHLY SAMPLING
CORBICULA DENSITY DATA FOR
2002 FROM BVPS

Collection Date	Area sampled (sq ft)	Live or Dead	Count	Mean Length (mm)	Maximum Length (mm)	Minimum Length (mm)	Estimated number (per sq m)
4/17/02	0.25	Dead	1	3.80			43
		Live	1	1.10			43
5/20/02	0.25	Dead	3	3.03	5.0	1 0	129
		Live	0				0
6/25/02	0.25	Dead	0				0
		Live	0				0
7/16/02	0.25	Dead	5	3.46	3.8	2.8	210
		Live	3	4.80	6.2	2.2	129
8/20/02	0.25	Dead	26	3.88	10.0	1.5	1092
		Live	3	8.00	15.0	4.5	129
9/25/02	0.25	Dead	3	2.67	3.0	2.0	129
		Live	0				0
10/22/02	0.25	Dead	9	6.33	11.0	3.0	278
		Live	3	8.00	10 0	6 0	129
11/13/02	0.25	Dead	9	7.00	10.0	2 0	278
		Live	0				0
Unit summary		Dead	56				2159
		Live	10				430

TABLE 5.20

UNIT 2 COOLING RESERVOIR MONTHLY SAMPLING
CORBICULA DENSITY DATA FOR
2002 FROM BVPS

Collection Date	Area sampled (sq ft)	Live or Dead	Count	Mean Length (mm)	Maximum Length (mm)	Minimum length (mm)	Estimated number (per sq m)
4/17/02	0.25	Dead	0				0
		Live	0				0
5/20/02	0.25	Dead	0				0
		Live	0				0
6/25/02	0.25	Dead	0				0
		Live	0				0
7/16/02	0.25	Dead	0				0
		Live	1	1.20			43
8/20/02	0.25	Dead	9	1.67	2.1	1.0	387
		Live	1	2.00			43
9/25/02	0.25	Dead	11	1.18	1.4	0.6	11
		Live	8	1.08	1.2	1.1	8
10/22/02	0.25	Dead	0				0
		Live	0				0
11/13/02	0.25	Dead	0				0
		Live	0				0
Unit summary		Dead	20				398
		Live	10				94

TABLE 5.21

ZEBRA MUSSEL SUBSTRATE SETTLEMENT RESULTS FROM BVPS, 2002

Tile location	Date set	Date retrieved	Number/m^2
EOB Biobox AS1-Substrate	April 17	May 20	0
EOB Biobox AS2-Substrate	April 17	May 20	0
EOB Biobox BS1-Substrate	April 17	May 20	0
EOB Biobox BS2-Substrate	April 17	May 20	0
EOB Biobox AS1-Substrate	May 20	June 25	0
EOB Biobox AS2-Substrate	May 20	June 25	0
EOB Biobox BS1-Substrate	May 20	June 25	0
EOB Biobox BS2-Substrate	May 20	June 25	0
Barge Slip-Briadal Veil	April 17	June 25	
EOB Biobox AS1-Substrate	June 25	July 16	0
EOB Biobox BS1-Substrate	June 25	July 16	0
Barge Slip-Briadal Veil	June 25	July 16	294
EOB Biobox AS3-Substrate	July 16	August 20	0
EOB Biobox AS4-Substrate	July 16	August 20	0
Barge Slip-Briadal Veil	July 16	August 20	84
Barge Slip-Briadal Veil	August 20	September 25	42
Barge Slip-Briadal Veil	September 25	October 22	0
Barge Slip-Briadal Veil	October 22	November 13	0

FIGURES

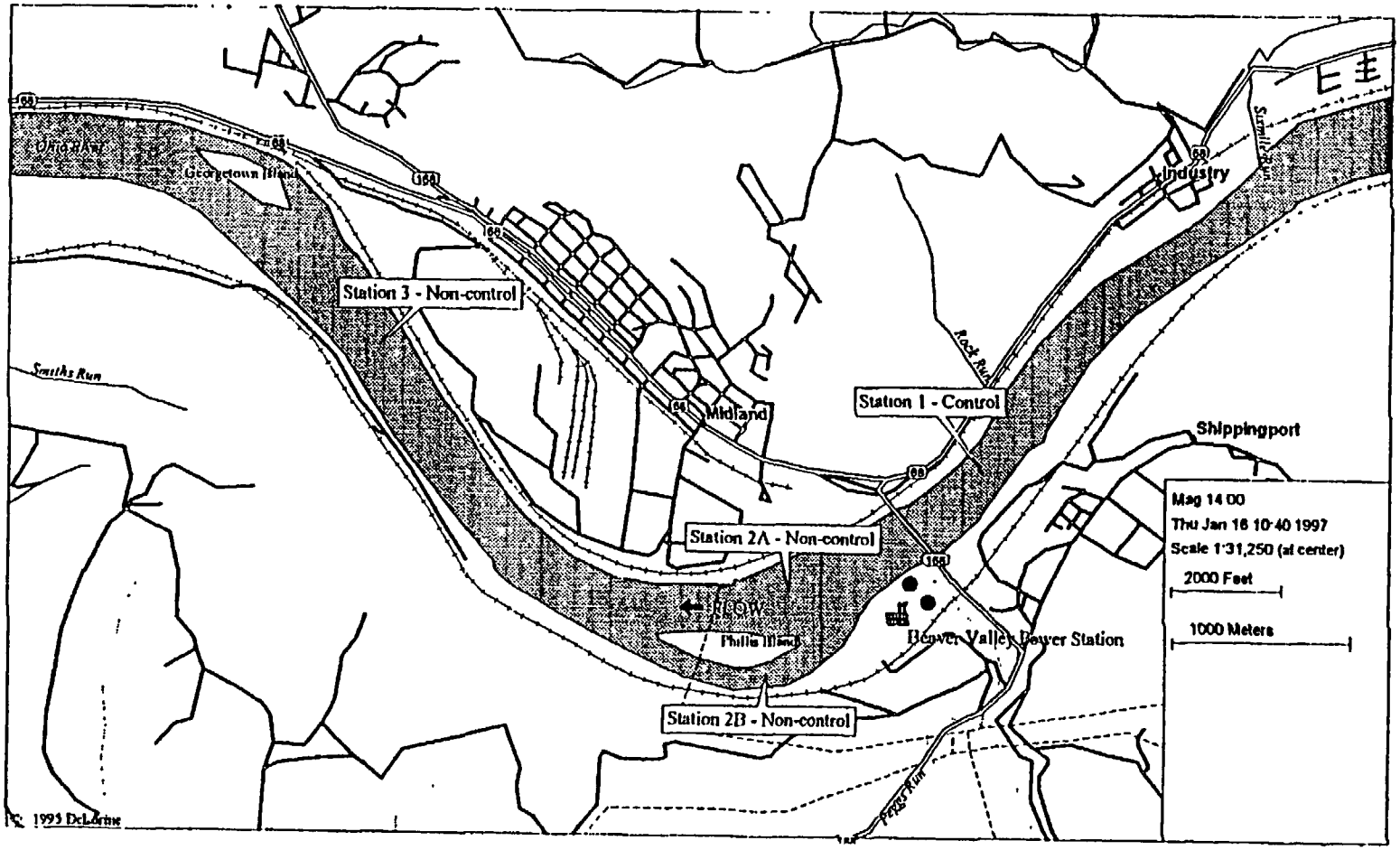

Figure 5.1: Location Map for the Beaver Valley Power Station Aquatic Monitoring Program Control and Non-Control Sampling Locations

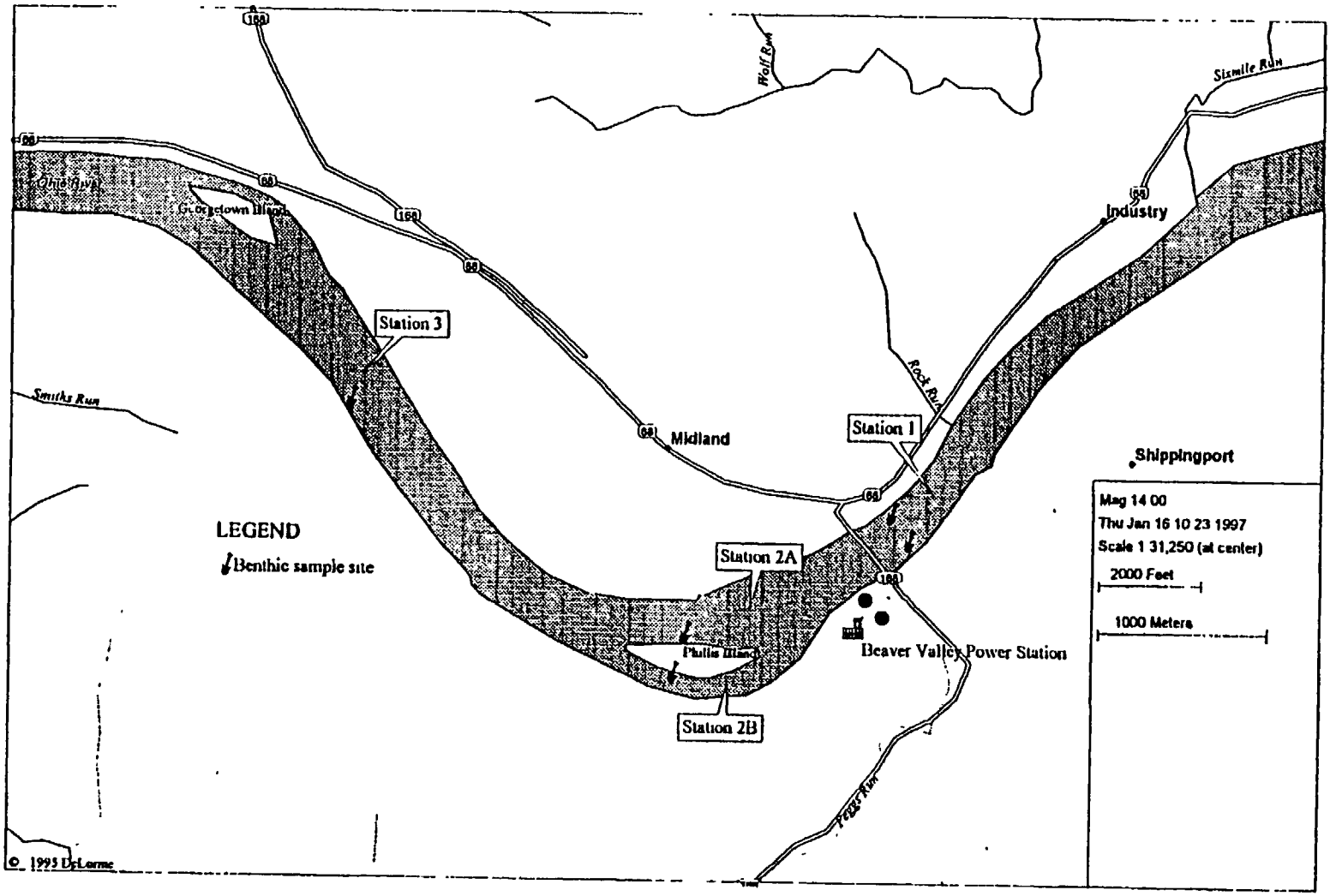

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Figure 5.2: Location Map for the Beaver Valley Power Station Benthic Organism Sampling Sites

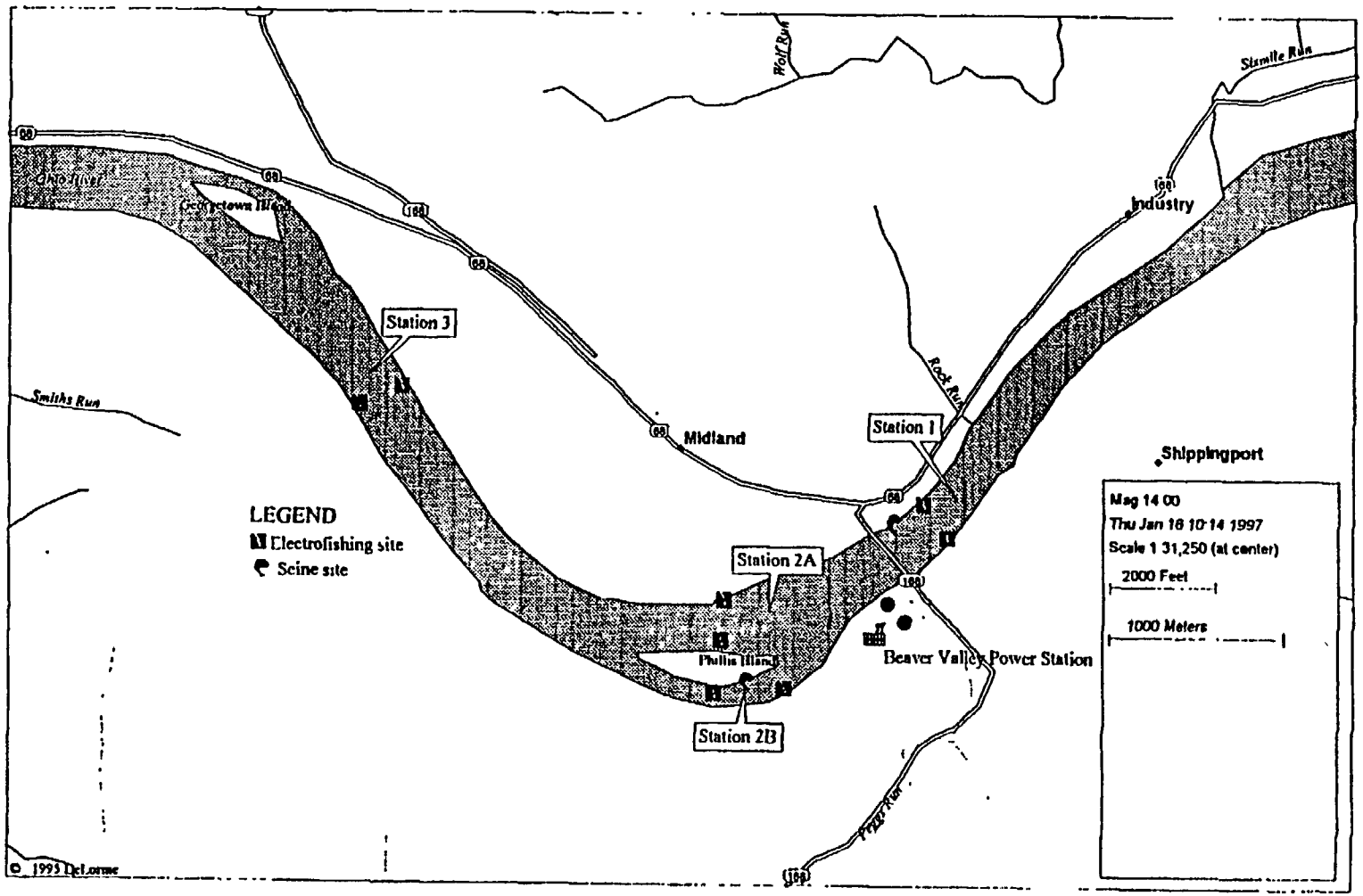


Figure 5.3: Location Map for the Beaver Valley Power Station Fish Population Sampling Sites

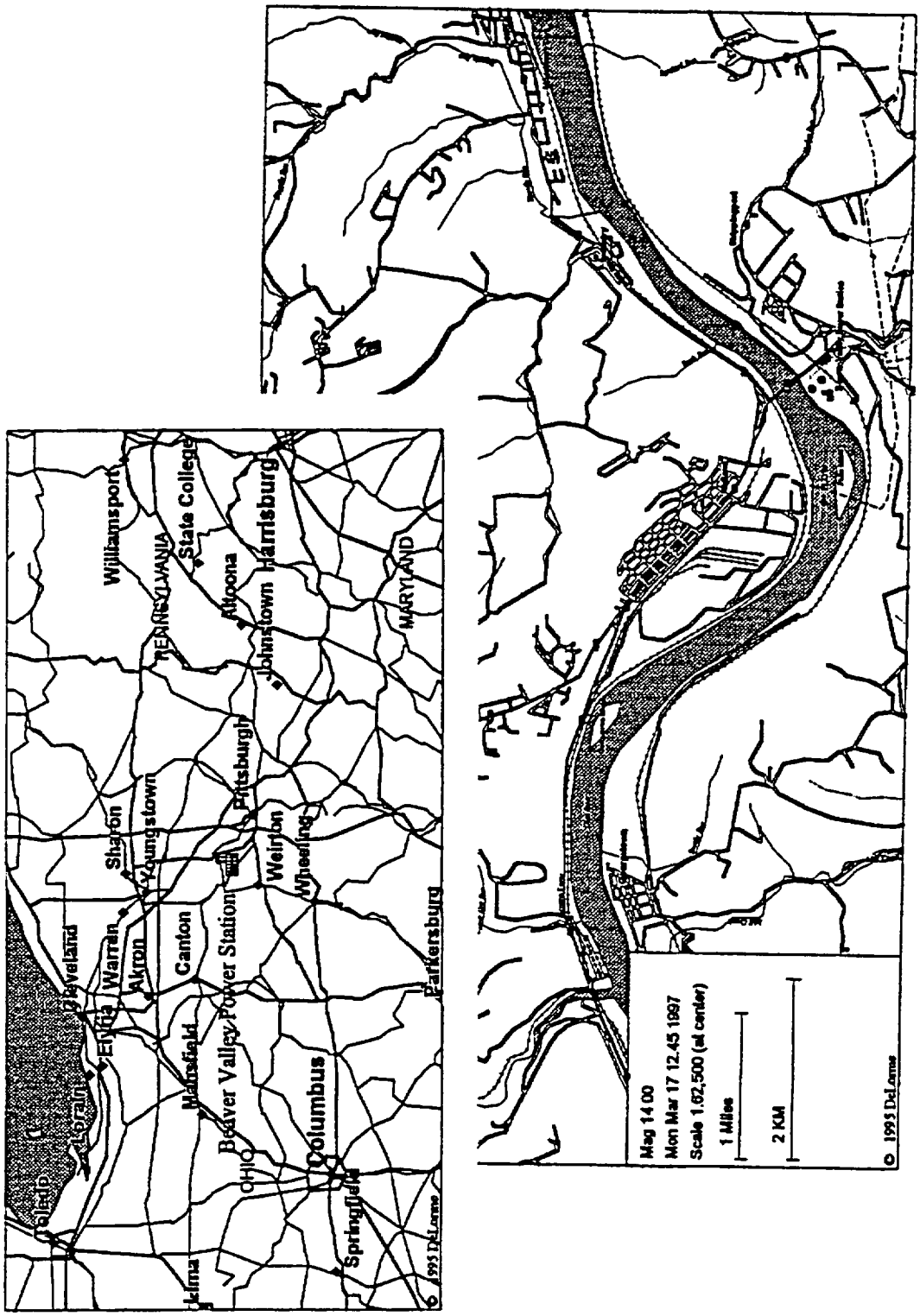
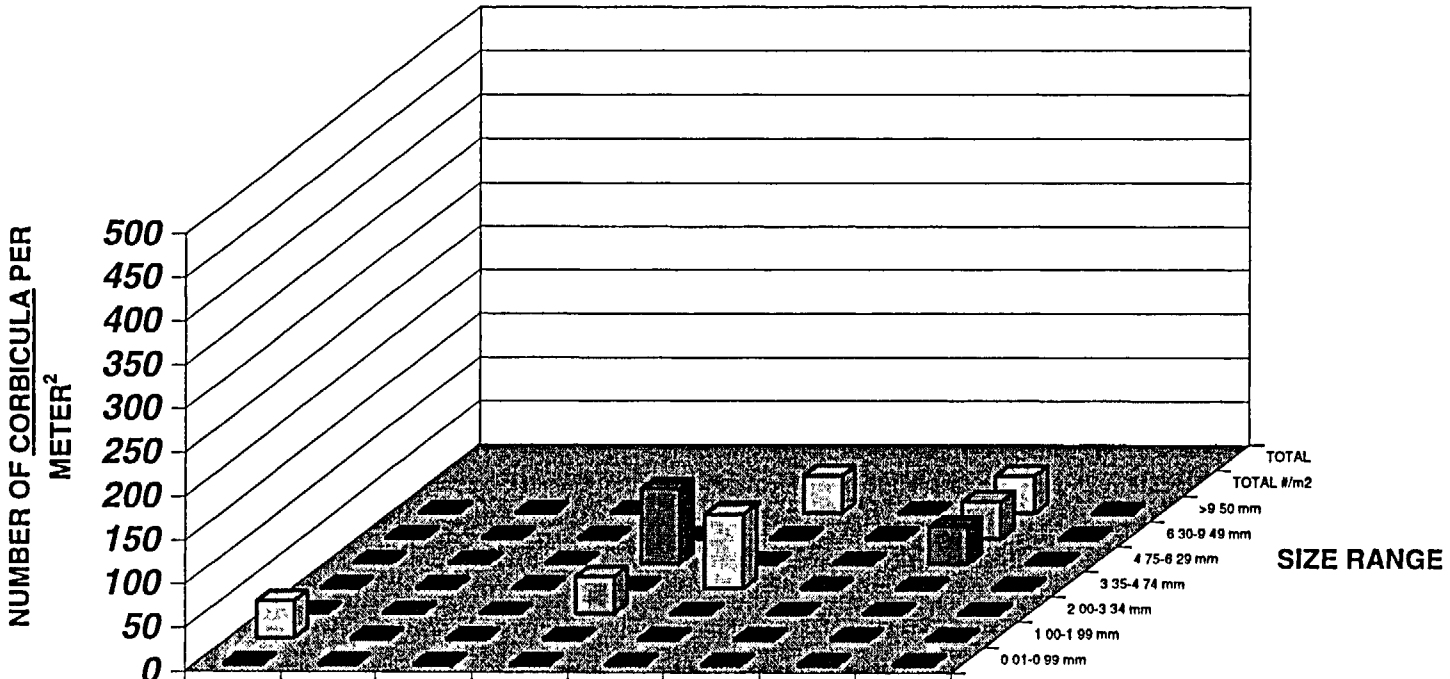
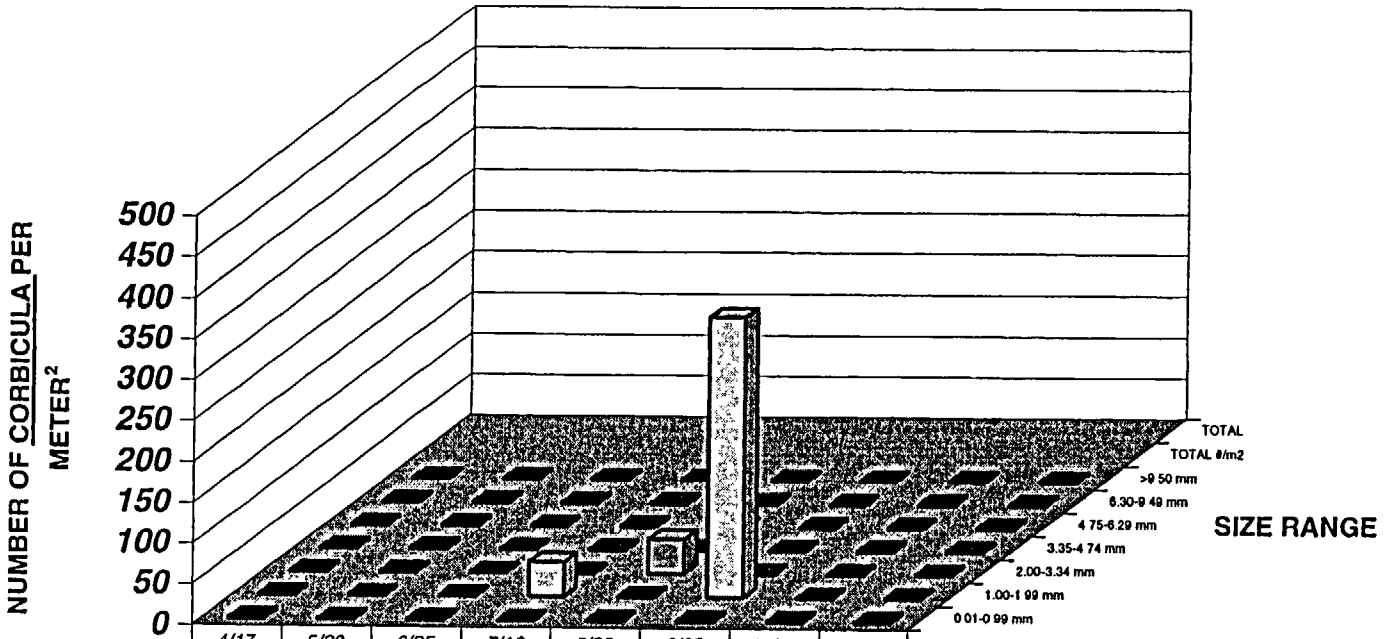


Figure 5.4: Study Area Location, Beaver Valley Power Station, Shippingport, PA



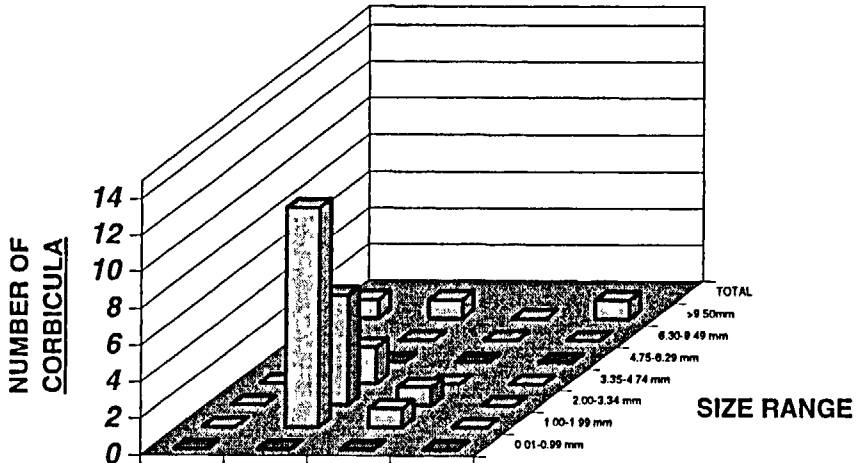
	4/17	5/20	6/25	7/16	8/20	9/25	10/22	11/13
0 01-0.99 mm	0	0	0	0	0	0	0	0
1.00-1.99 mm	43	0	0	0	0	0	0	0
2 00-3 34 mm	0	0	0	43	0	0	0	0
3 35-4 74 mm	0	0	0	0	86	0	0	0
4 75-6 29 mm	0	0	0	86	0	0	43	0
6 30-9 49 mm	0	0	0	0	0	0	43	0
>9 50 mm	0	0	0	0	43	0	43	0
TOTAL #/m2	43	0	0	129	129	0	129	0
TOTAL	628	0	0	1883	1883	0	1883	0

Figure 5.5 Comparison of Live *Corbicula* Clam Density Estimates Among BVPS Unit 1 Cooling Tower Reservoir Sample Events, for Various Clam Shell Size Groups, 2002.



	4/17	5/20	6/25	7/16	8/20	9/25	10/22	11/13
0 01-0 99 mm	0	0	0	0	0	0	0	0
1 00-1.99 mm	0	0	0	43	0	344	0	0
2.00-3 34 mm	0	0	0	0	43	0	0	0
3 35-4 74 mm	0	0	0	0	0	0	0	0
4 75-6 29 mm	0	0	0	0	0	0	0	0
6 30-9 49 mm	0	0	0	0	0	0	0	0
>9 50 mm	0	0	0	0	0	0	0	0
TOTAL #/m2	0	0	0	43	43	344	0	0
TOTAL	0	0	0	550	550	4403	0	0

Figure 5.6 Comparison of Live *Corbicula* Clam Density Estimates Among Unit 2 Cooling Tower Reservoir Sample Events, for Various Shell Size Groups, 2002.



	5/20	7/16	9/25	11/13
0.01-0.99 mm	0	0	0	0
1.00-1.99 mm	0	12	1	0
2.00-3.34 mm	0	6	1	0
3.35-4.74 mm	0	2	0	0
4.75-6.29 mm	0	0	0	0
6.30-9.49 mm	0	0	0	0
>9.50mm	1	1	0	1
TOTAL	1	21	2	1

Intake structure bottom samples are being collected from the Ohio River at the Intake Building because of security concerns.

Figure 5.7 Comparison of Live *Corbicula* Clam Density Estimates Among Intake Structure Sample Events, for Various Clam Shell Size Groups, 2002.

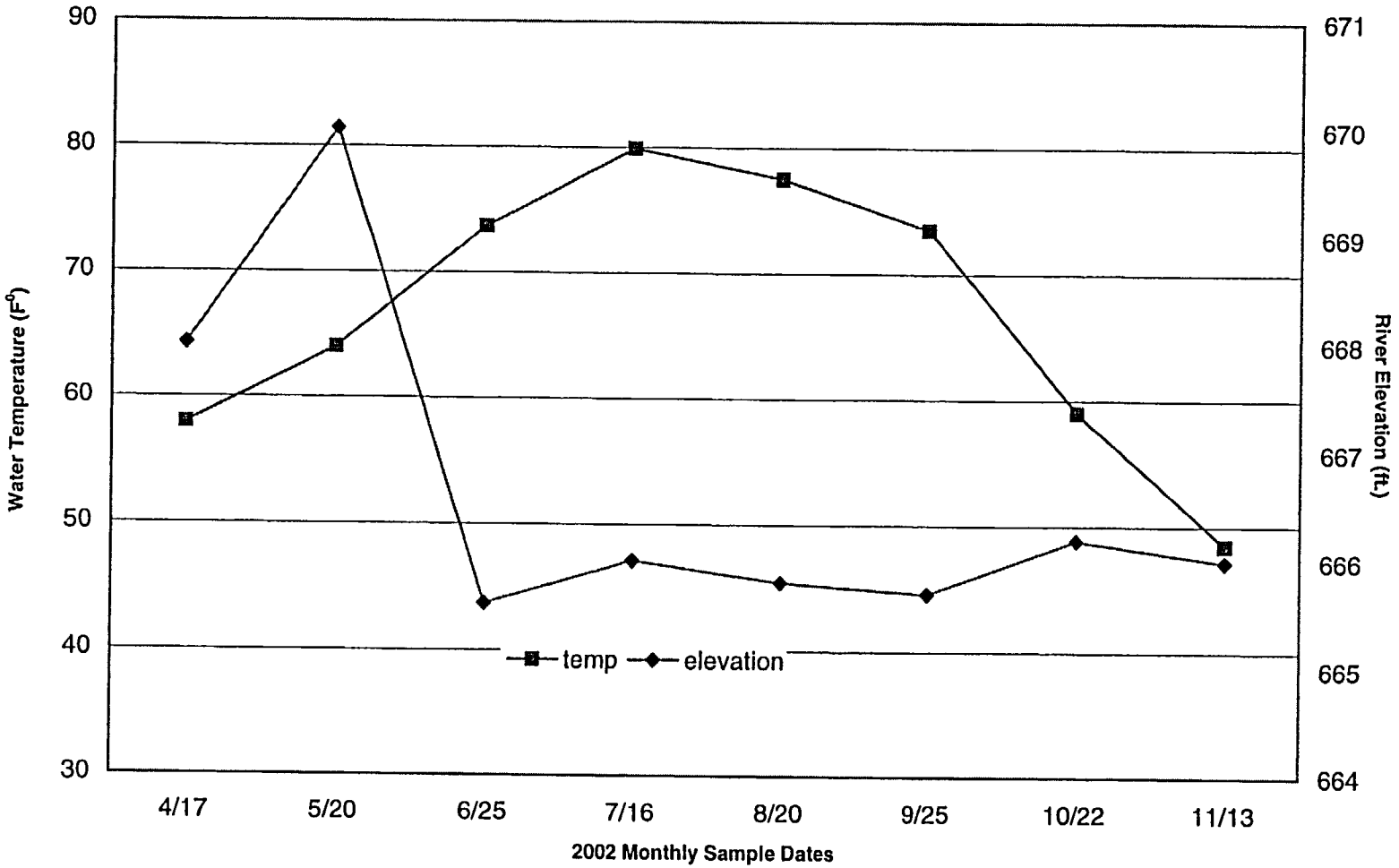
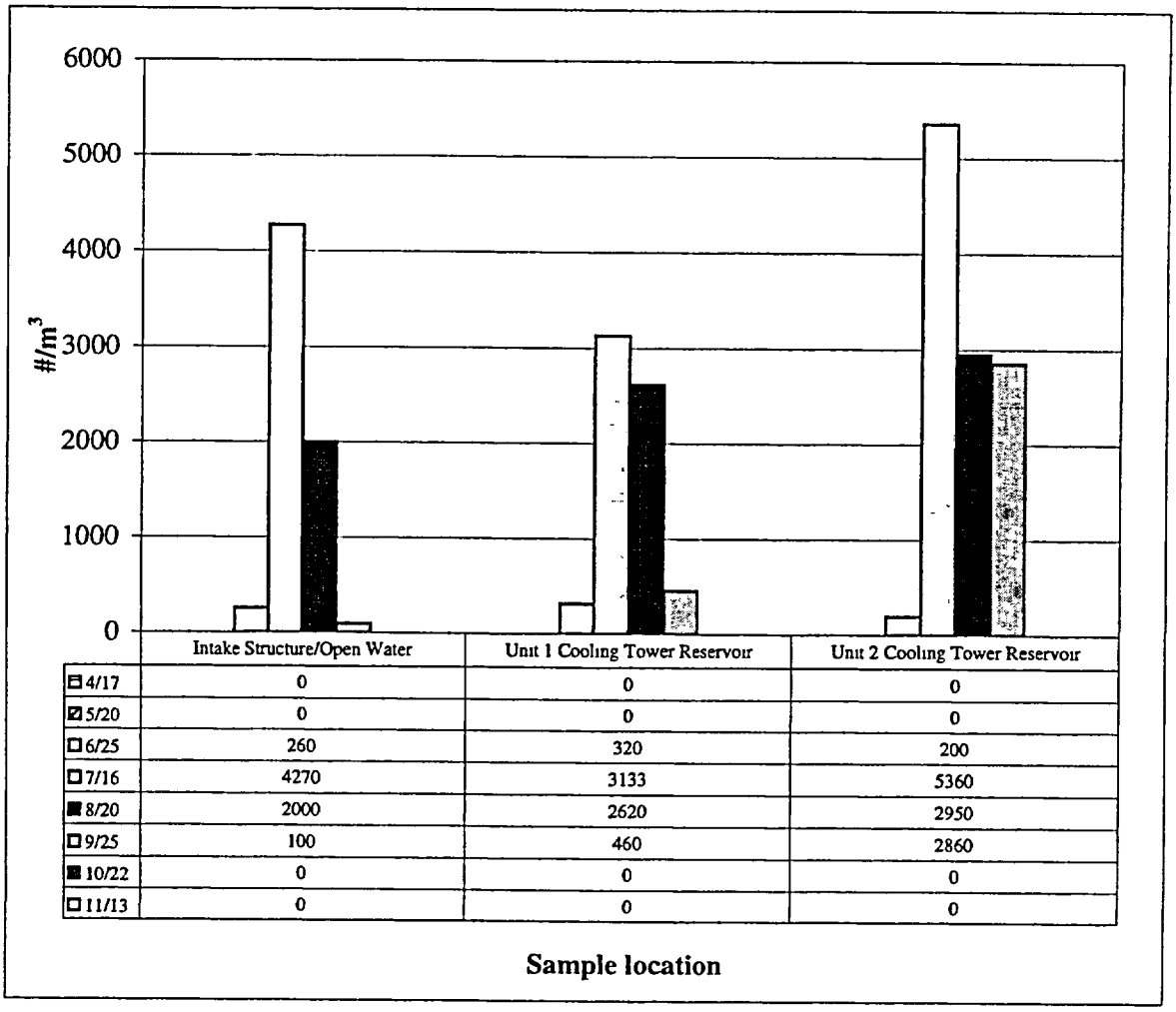


Figure 5.8 Water Temperature and River Elevation Recorded at the Ohio River at BVPS Intake Structure During the 2002 Monthly Sampling Dates.



	Intake Structure/Open Water	Unit 1 Cooling Tower Reservoir	Unit 2 Cooling Tower Reservoir
4/17	0	0	0
5/20	0	0	0
6/25	260	320	200
7/16	4270	3133	5360
8/20	2000	2620	2950
9/25	100	460	2860
10/22	0	0	0
11/13	0	0	0

Figure 5.9 Density of zebra mussels veligers (#/m^3) collected at Beaver Valley Power Station Intake Structure, Unit 1 Cooling Tower Reservoir and Unit 2 Cooling Tower Reservoir.

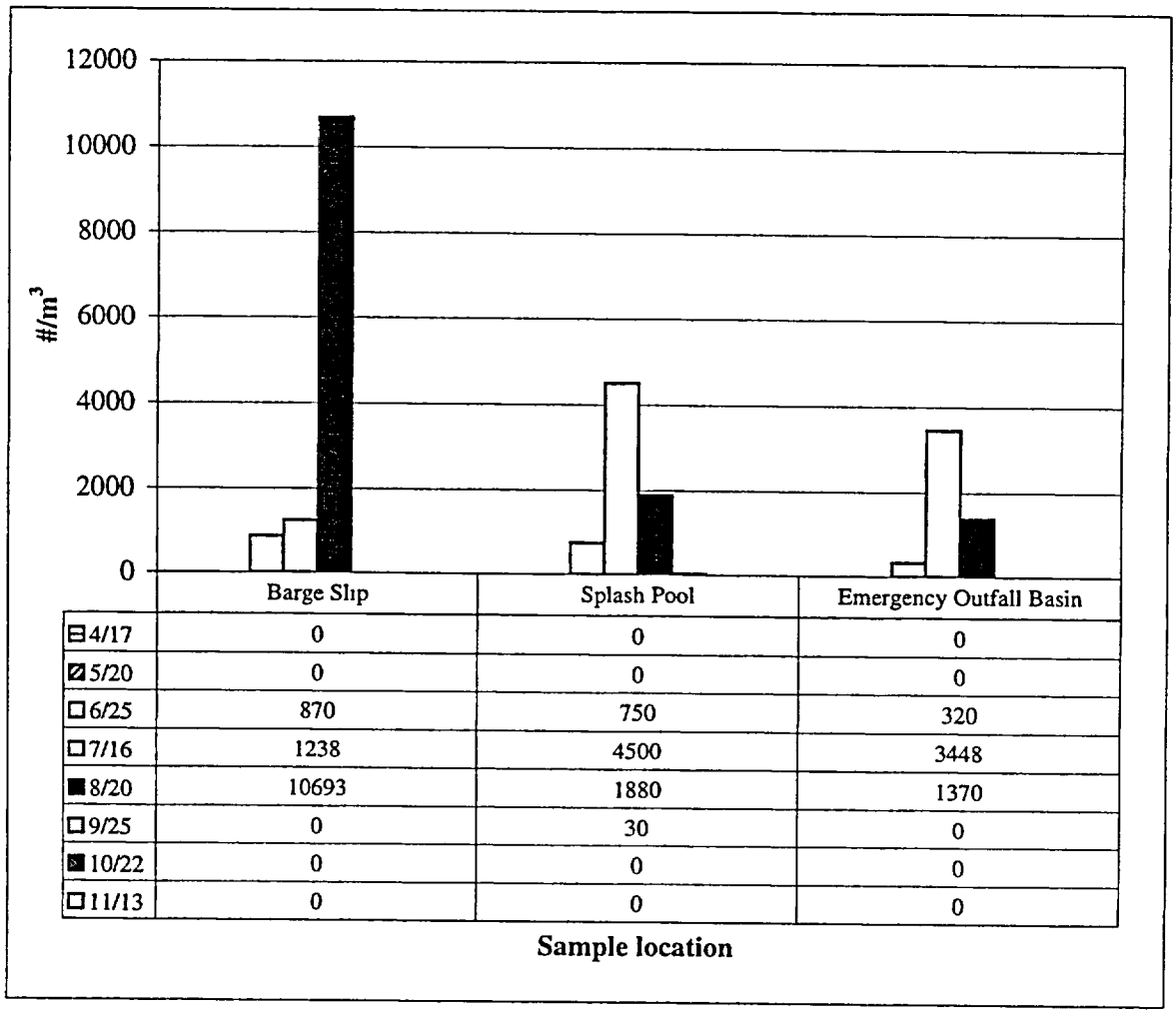
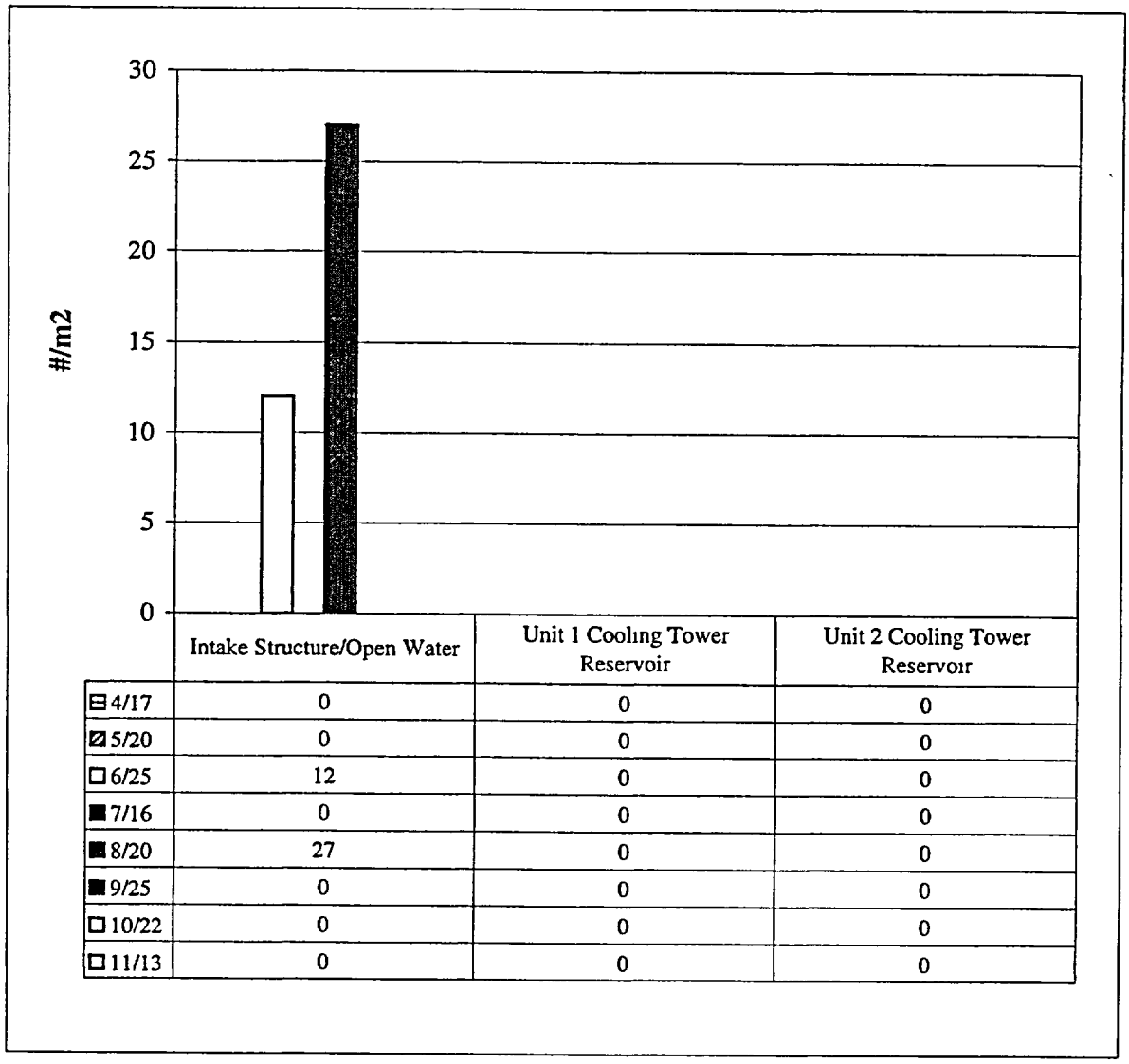
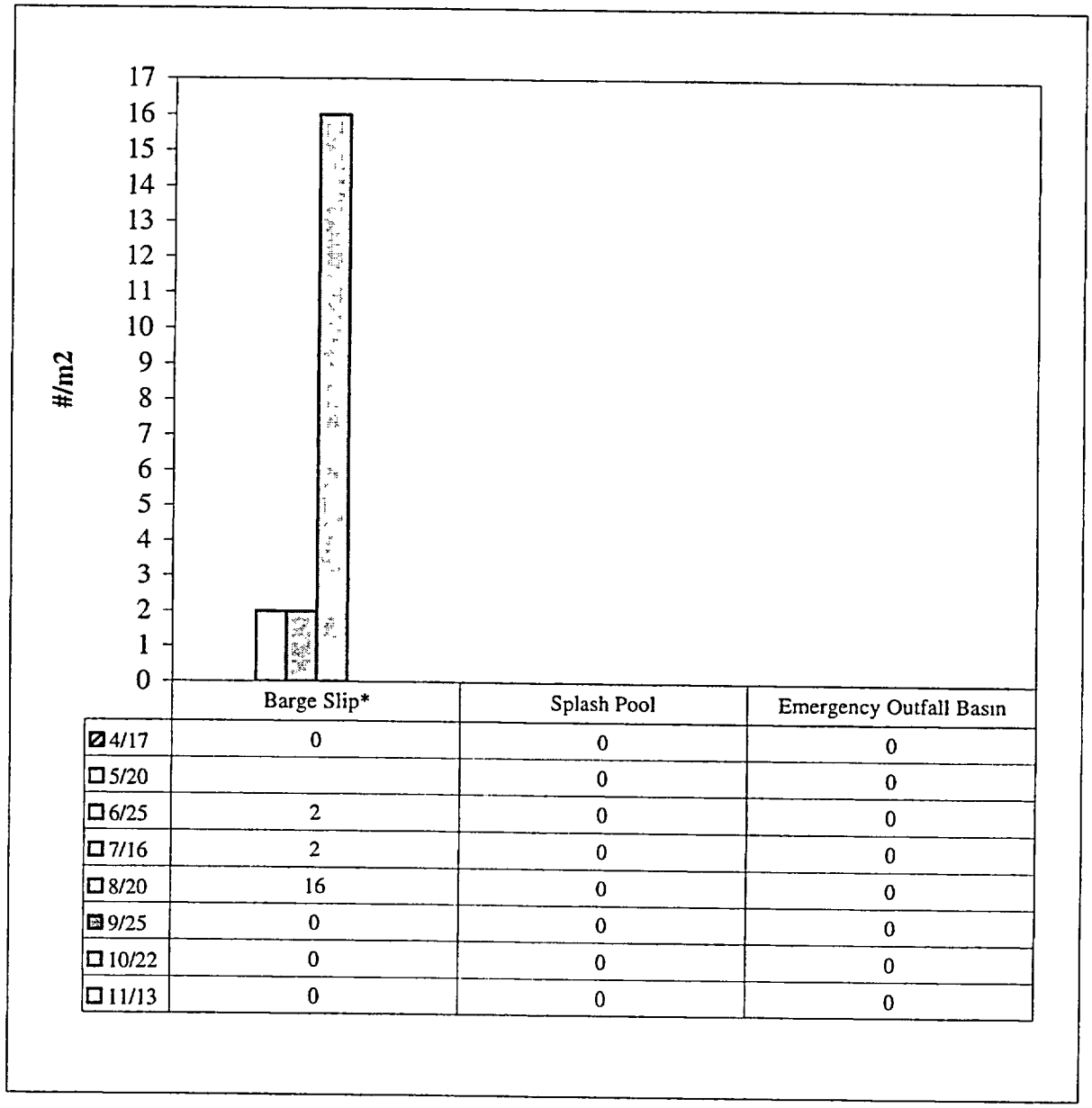


Figure 5.10 Density of zebra mussels veligers (#/m^3) collected at Beaver Valley Power Station Barge Slip, Slpash Pool and Emergency Outfall Basin, 2002.



	Intake Structure/Open Water	Unit 1 Cooling Tower Reservoir	Unit 2 Cooling Tower Reservoir
4/17	0	0	0
5/20	0	0	0
6/25	12	0	0
7/16	0	0	0
8/20	27	0	0
9/25	0	0	0
10/22	0	0	0
11/13	0	0	0

Figure 5.11 Density (#/$m^{2)}$ of settled zebra mussels at Beaver Valley Power Station Intake Structure, Unit 1 Cooling Tower Reservoir and Unit 2 Cooling Tower Reservoir, 2002



	Barge Slip*	Splash Pool	Emergency Outfall Basin
4/17	0	0	0
5/20		0	0
6/25	2	0	0
7/16	2	0	0
8/20	16	0	0
9/25	0	0	0
10/22	0	0	0
11/13	0	0	0

Figure 5.12 Density (#/m^2) of settled zebra mussels at Beaver Valley Power Station Barge Slip, Splash Pool and Emergency Outfall Basin, 2002.

*Samples could not be collected from the Barge Slip because of high river water conditions.

ATTACHMENTS

ATTACHMENT 1: ENVIRONMENTAL PERMITS & CERTIFICATES

Registration Number	Regulator/Description	Expiration
PAR000040485	BVPS EPA RCRA Identification number for regulated waste activity. Also used by PA DEP to monitor regulated waste activity.	Indefinite
04-02474	BVPS EPA Facility Identification Number for CERCLA/EPCRA/SARA. Used for SARA Tier II reporting and emergency planning.	Indefinite
04-02475	BVPS Offsite 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 PA DEP and US EPA.	12/27/2006
04-13281	BVPS Unit 1 PA DEP Facility Identification number for regulated storage tanks.	Indefinite
04-13361	BVPS Unit 2 PA DEP Facility Identification number for regulated storage tanks.	Indefinite
04-302-055, 04-309-004, 04-399-006 04-399-005A OP-04-00086	PA DEP Air operating permits currently under application for state-only permit for emergency diesel generators and auxiliary boilers.	Indefinite
200100242	US Army Permit for maintenance dredging	12/31/2011
N/A	PA DEP Open Burning Permit for operation of the BVPS Fire School- annual application and renewal	12/31/2003
061301003010J	US Department of Transportation Hazardous Materials Registration renewed annually	06/30/2003

ATTACHMENT 2

PLANT COMMUNITY CHARACTERIZATION STUDY

for the

BEAVER VALLEY POWER STATION SITE SHIPPINGPORT, PENNSYLVANIA

October 2002

First Energy Nuclear Operating Company

Shippingport, Pennsylvania

Prepared by:
Beak Consultants Incorporated
140 Rotech Drive
Lancaster, New York 14086-9755
Tel: (716) 759-1200
Fax: (716) 759-1489

1.0 INTRODUCTION

First Energy Nuclear Operating Company (FENOC) retained Beak Consultants Incorporated (Beak) to complete a Plant Community Characterization Study of the Beaver Valley Power Station (BVPS) Site in Shippingport, Pennsylvania. The field investigation was completed on July 16 & 17, 2002. The objectives of the study were to define and characterize the natural communities present within the BVPS Site and immediately downstream of the Site along the Ohio River (see Figure 1, Appendix A). In general, the aquatic and riparian communities associated with the Ohio River were defined and characterized in greater detail than communities located further away from the Ohio River.

Beak completed this study by reviewing Section 2.2 of the 1983 Environmental Report for the BVPS Site (Ohsson et al. 1984), examining the Pennsylvania Natural Diversity Index (PNDI) database search results for potentially significant ecological resources (including threatened and endangered species) that may be associated with the BVPS Site, conducting a field survey of the natural communities present within and adjacent to the Site, and updating existing information about natural communities and wildlife, as presented in the 1983 Environmental Report. The field survey covered most of the BVPS Site, as well as an off-site area adjacent to the Ohio River (including Phillis Island). The survey area is shown in Figure 1.

This report describes Beak's methods for completing the Plant Community Characterization Study, describes the natural communities that are present within the BVPS Site, and identifies wildlife that may occur within the Site.

2.0 METHODS

The Plant Community Characterization Study was conducted to update existing information available for natural communities and wildlife associated with the BVPS Site (i.e., data from Section 2.2 of the 1983 Environmental Report). It also included a more detailed examination of the aquatic and riparian communities associated with the Ohio River, including areas outside the FENOC property that were not evaluated in the 1983 Environmental Report.

Beak's field survey of the BVPS Site was conducted on July 16 & 17, 2002. The Site was visited to define and characterize the natural communities present on the property. Plant community boundaries were identified and drawn on September 18, 1990 color infrared aerial photos of the Site. Representative areas within each community were traversed to qualitatively characterize the community. Distinguishing characteristics included plant species composition, successional stage, edaphic conditions, and land use.

Wildlife occurrence within each community was noted during the field surveys. Wildlife occurrence was determined by direct observations, as well as vocalizations, tracks, and other evidence (e.g., nests, burrows, scat). Wildlife observations were compared against species lists presented in Tables 2.2-6, 2.2-10, 2.2-15, and 2.2-16 of the 1983 Environmental Report. Those lists were developed using geographic ranges and habitat requirements, as well as fairly extensive field surveys.

Beak carefully inventoried dry woodland communities within the BVPS Site to determine presence/absence of tall tick-trefoil (*Desmodium glabellum*), a state-listed plant that was identified by the PNDI as potentially occurring within the Site (see Appendix B). Tall tick-trefoil is listed by the Pennsylvania Department of Conservation and Natural Resources (PDCNR) as "Tentatively Undetermined" (TU), which is defined as "a classification of plant species believed to be in danger of population decline, but which cannot presently be included within another classification due to taxonomic uncertainties, limited evidence within historical records, or insufficient data (PDCNR 2002)."

3.0 RESULTS

The BVPS Site is a 500± acre property that consists primarily of undeveloped land (approximately two-thirds of the Site). Most of the undeveloped land supports upland forest communities. The remainder of the Site is heavily developed with buildings and paved surfaces associated with the power plant (Figure 1). The following sections describe the natural communities present within the BVPS Site and the species of wildlife that may occur within the Site.

3.1 Natural Communities

Beak identified 13 communities within the BVPS Site. The distribution of these communities is shown in Figure 1. Plant species lists for the communities are provided in Table 1 (Appendix C). Dominant plant species are identified with asterisks. General descriptions of the communities are presented below.

Aquatic Communities

Three aquatic communities are present within or adjacent to the BVPS Site: Ohio River (Community No. 1), Open Water Lagoon (Community No. 8), and Peggs Run (Community No. 12). The Ohio River borders the BVPS Facility to the north, providing a large expanse of open water habitat. The river is approximately 1,000 ft. wide in this area. The riparian habitats bordering the river vary from heavily developed to undisturbed forest.

The Open Water Lagoon community encompasses two small coves located at the downstream end of the developed portion of the Site. These lagoons have permanent connections with the Ohio River and are therefore inundated on a long-term basis and are influenced directly by river water levels.

Peggs Run consists of a 15± ft. wide concrete sluice through most of the developed portion of the BVPS Site. It is a shallow (3-4 inches of water at the time of the field survey), slow-flowing stream which discharges directly into the Ohio River, just downstream of the Route 168 Bridge (Figure 1). Very few trees or shrubs occur along the banks of Peggs Run in this area. A segment of Peggs Run, located just above its confluence with the Ohio River, may be influenced by Ohio River water levels due to the low gradient in this section. It is important to note, however, that this study was not

intended to determine the zone of influence.

Above the developed portion of the Site, Peggs Run is a natural channel that consists of a series of shallow pool, riffle, and run habitats. The substrate is predominantly cobble intermixed with boulders, gravel, and sand. Upland forest communities border Peggs Run in this area, providing shoreline habitat and overhanging vegetation. The invert elevation of this segment of Peggs Run is high enough above the surface water elevation of the Ohio River that this segment is uninfluenced by water levels in the river.

Terrestrial Communities Influenced by Ohio River Water Levels

Three communities within or adjacent to the BVPS Site are influenced, at least occasionally, by water levels in the Ohio River. These include the following: Beach and Embankment (Community No. 3), Willow Scrub (Community No. 6), and Silver Maple Floodplain Forest (Community No. 7). The Beach and Embankment community is located along the northern shore of Phillis Island (Figure 1). It consists primarily of an un-vegetated shoreline that is alternately flooded and exposed, depending on the Ohio River water levels. A narrow and steep embankment is present above some portions of the beach.

Willow Scrub (Community No. 6) and Silver Maple Floodplain Forest (Community No. 7) border the Ohio River and appear to be flooded on an intermittent basis (i.e., during flood events). The primary distinction between the two communities is the stage of succession, with the former consisting mostly of shrubs, saplings, and small trees and the latter being dominated by larger and older trees and exhibiting a mostly closed tree canopy. Otherwise, the plant species composition of the two communities is similar (see Table 1).

Terrestrial Communities Uninfluenced by Ohio River Water Levels

The remaining seven communities are located above the influence of water levels in the Ohio River. These include two communities on Phillis Island that appear to be rarely, if ever, flooded by the Ohio River: Black Locust - Hardwood Forest (Community No. 4) and Knotweed Stand (Community No. 5) (Figure 1). The Black Locust - Hardwood Forest (Community No. 4) supports a fair diversity of trees consisting mostly of early successional species (Table 1). This community also occurs as a

narrow riparian corridor bordering the southern shore of the Ohio River, downstream of the BVPS Site (Figure 1). The Knotweed Stand (Community No. 5) consists of a very dense growth of Japanese knotweed (*Polygonum cuspidatum*), limited to the eastern end of Phillis Island (Figure 1).

Black Locust - Knotweed Scrub (Community No. 2) consists of a series of narrow strips of upland vegetation that separate developed portions of the Site from the Ohio River (Figure 1). These areas were recently cleared and treated with herbicide, killing most of the black locust (*Robinia pseudoacacia*) trees and saplings and some of the Japanese knotweed. Successional Old Field (Community No. 9) occurs in two small areas outside the transmission corridors that are in an early stage of succession as a result of site disturbance. These areas are vegetated mostly by grasses and herbs, with scattered saplings and shrubs.

The 1983 Environmental Report for the BVPS Site (Ohsson et al. 1984) defined and mapped several distinct forest communities within the undeveloped portion of the Site. Beak chose to consolidate most of those communities into one forest cover type, Upland Mixed Hardwoods Forest (Community No. 10). Beak did so because species composition varies considerably across the forested portion of the Site, based primarily on aspect and steepness of slope, thus forming a complex patchwork of upland forest communities that would have been very labor intensive to accurately map and characterize.

Numerous transmission line corridors crisscross the BVPS Site. The maintained corridors that cut through wooded portions of the Site were identified as Community No. 11 (Figure 1). These corridors support a very dense growth of shrubs, saplings, woody vines, and herbs. The dominant species are tolerant of frequent disturbance.

Developed Land (Community No. 13) identifies the heavily developed area located in the northeastern third of the Site. This area supports numerous buildings and paved surfaces associated with the power plant (Figure 1). Very little plant growth occurs within this area, other than occasional landscape plantings.

3.2 Wildlife Associated with the BVPS Site

Beak recorded species of wildlife observed during the July 16 & 17, 2002 field investigation and compared those species against comprehensive species lists presented in Tables 2.2-6, 2.2-10, 2.2-15, and 2.2-16 of the 1983 Environmental Report (see Appendix D). No additional species were noted during Beak's field investigation. It is important to note that the 1983 lists were developed based on geographic ranges and habitat requirements, as well as fairly extensive field surveys.

3.3 Threatened & Endangered Species

Beak searched dry woodland communities (i.e., Communities 4, 10, and 11) for tall tick-trefoil, a species listed as "Tentatively Undetermined" by the PDCNR. No specimens of tall tick-trefoil were observed.

4.0 REFERENCES

Ohsson, Karl E., Arthur E. Robb, Jr., Robert L. Shema, Alan J. Hosmer, William R. Cody, J.W. McIntire, and C.J. Touhill. 1984. 1983 Annual Environmental Report, Non-Radiological. Duquesne Light Company. Beaver Valley Power Station, Unit 2. Volume 1 Environmental Report, Operating License Stage. Docket #50-334. Amendment 6, May 1984.

Pennsylvania Department of Conservation and Natural Resources. 2002. Element Ranking List - Pennsylvania Natural Diversity Inventory. State Rank Codes and Definitions. http://www.dcnr.state.pa.us/forestry/pndi/rank.htm.

Appendix A

Figure 1

(Plant Community Map)

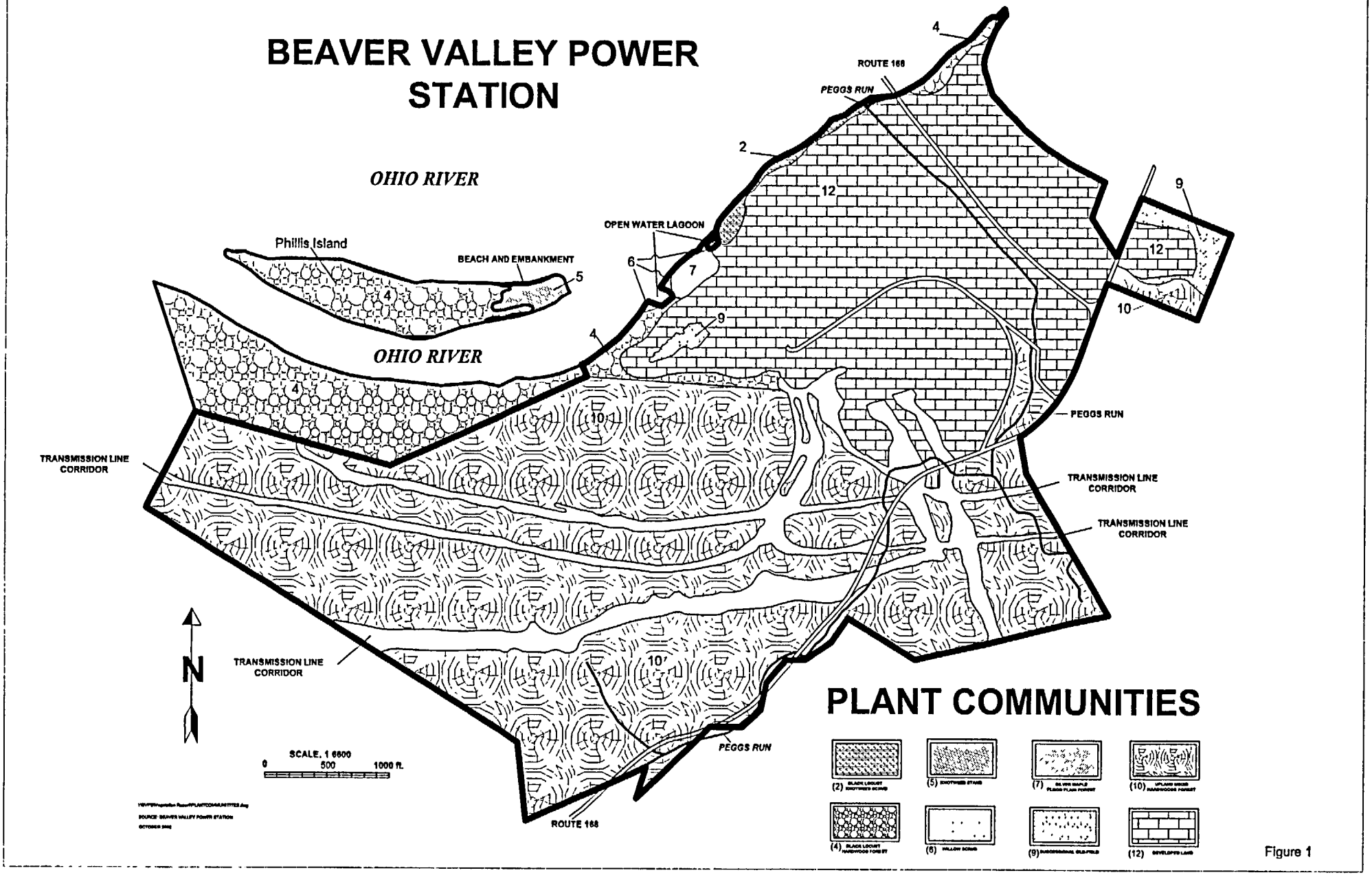

BEAVER VALLEY POWER STATION
OHIO RIVER
Phillis Island
BEACH AND EMBANKMENT
OHIO RIVER
OPEN WATER LAGOON
ROUTE 168
PEGGS RUN
PEGGS RUN
TRANSMISSION LINE CORRIDOR
TRANSMISSION LINE CORRIDOR
TRANSMISSION LINE CORRIDOR
TRANSMISSION LINE CORRIDOR
PEGGS RUN
ROUTE 168
N
SCALE, 1 6600
0 500 1000 ft.
PLANT COMMUNITIES
(2)
(5)
(7)
(10)
(4)
(6)
(9)
(12)

Figure 1

Appendix B

Agency Correspondence

(PNDI Database Search Results)

PNDI Internet Database Search Results

PNDI Search Number: N100082
Search Results For scherfel@co.beaver.pa.us
Search Performed By: john paul scherfel On 5/31/02 2:15:22 PM
Agency/Organization: Beaver County Conservation District
Phone Number: 724-774-7090
Search Parameters: Quad - 408054; North Offset - 22.5; West Offset - 8; Acres - 100
Project location center (Latitude): 40.62353
Project location center (Longitude): 80.43260
Project Type: Utility Projects/Work on Existing Infrastructure

Print this page using your Internet browser's print function and keep it as a record of your search.

Instructions for DCNR Bureau of Forestry personnel only:
When instructed below to contact the PA Fish and Boat Commission, the US Fish and Wildlife Service or the PA Game Commission, Bureau of Forestry personnel should instead contact Merlin Benner, who will coordinate resolution with those agencies.
When instructed to contact Jeanne Harris, they should do so.

DEP and Conservation Districts should follow the instructions below when potential conflicts are indicated.

When details are displayed as part of the search result, the element's Scientific Name, Common Name, State Status, Proposed State Status and Number of Occurrences within the Search Area are listed.

Due to the sensitive nature of certain endangered species, species names are not displayed for species under the jurisdiction of the Pennsylvania Fish & Boat Commission and the U.S. Fish & Wildlife Service.

PNDI records indicate the following potential conflicts with ecological resources of special concern within the specified search area:

9 potential conflicts

The Applicant should FAX a cover letter including a project narrative; acreage to be impacted, how construction/maintenance activity is to be accomplished, township/municipality where project resides, USGS 7.5 minute quadrangle with project boundary marked, and quad name on the map to:

Non-Game and Endangered Species Unit
PA Fish and Boat Commission
450 Robinson Lane
Bellefonte, PA 16823
FAX number: (814) 359-5153

---

1 potential Plant conflicts:

DESMODIUM GLABELLUM - TALL TICK-TREFOIL - TU - TU (1)

The person conducting this search should FAX this Receipt, Supplement #1 (if applicable), USGS Topo, and **project narrative** to:

Jeanne Harris
Department of Conservation and Natural Resources
Bureau of Forestry
P.O. Box 8552
Harrisburg, PA 17105-8552
FAX number: (717) 772-0271

PNDI is a site specific information system, which describes significant natural resources of Pennsylvania. This system includes data descriptive of plant and animal species of special concern, exemplary natural communities and unique geological features. PNDI is a cooperative project of the Department of Conservation and Natural Resources, The Nature Conservancy and the Western Pennsylvania Conservancy. This response represents the most up-to-date summary of the PNDI data files and is valid for 1 year. An absence of recorded information does not necessarily imply actual conditions on-site. A field site survey may reveal previously unreported populations.

Legal authority for Pennsylvania's biological resources resides with three administrative agencies. The handout entitled Pennsylvania Biological Resource Management Agencies, outlines which species groups are managed by these agencies. Feel free to contact our office if you have questions concerning this response or the PNDI system, and please refer to the PNDI Search Number at the top of this page in future correspondence concerning this project.

New Search using inches on a Quad

New Search using Latitude and Longitude | PNDI Search Home

PNDI Search Welcome

FENOC
FirstEnergy Nuclear Operating Company

Beaver Valley Power Station
Route 168
P.O. Box 4
Shippingport, PA 15077-0004

May 30, 2002
ND1LRE:0001

Beaver County Conservation District
1000 Third Street
Beaver, PA 15009 – 2026

Pennsylvania Natural Diversity Search WBS 12.3.8

To Whom It May Concern:

In accordance with Pennsylvania Department of Environmental Protection (PA DEP) guidelines, please find the enclosed Pennsylvania Natural Diversity Inventory Search Form. FirstEnergy Nuclear Operating Company (FENOC) is hereby requesting a screening for species of special concern listed in the Pennsylvania Natural Diversity Inventory (PNDI) for Beaver Valley Power Station (BVPS).

BVPS is situated on approximately 520 acres on the south bank of the Ohio River, at mile mark 34.5, in Shippingport Boro, Beaver County. The plant itself sits at the northern edge of the Hookstown, PA United States Geological Survey (USGS) quadrangle, and at the southern edge of the Midland, PA quadrangle. Attached to the PNDI form is a photcopy of the USGS maps areas-of-interest in accordance with the form's instructions. The area also includes Phillis Island.

If you have any questions or need more information, please feel free to contact me at 724-682-5874.

Michael D. Banko III
Senior Nuclear Technologist

MDB/tar

Enclosure

WBS# 12.3.8

2930-PM-WM0041 2/2001

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED MANAGEMENT
BUREAU OF WATERWAYS ENGINEERING

FOR OFFICIAL USE ONLY

PNDI Screening
Reviewer Michael D. Yeck
Date 5-31-02
Phone No. 724-774-7090

SUPPLEMENT NO. 1
PENNSYLVANIA NATURAL DIVERSITY INVENTORY SEARCH FORM

This form provides site information necessary to perform a computer screening for species of special concern listed unde the Endangered Species Act of 1973, the Wild Resource Conservation Act, the Pennsylvania Fish and Boat Code or the PA Game and Wildlife Code. Records regarding species of special concern are maintained by PA DCNR in a computer data base called the "Pennsylvania Natural Diversity Inventory" (PNDI). Results from this search are not intended to be a conclusive compilation of all potential special concern resources located within a proposed project site. On-site biologica surveys may be recommended to provide a definitive statement on the presence or absence, or degree of natural integrity of any project site. Results of this PNDI search are valid for one year.

Please complete the information below, attach an 8½" x 11" photocopy (DO NOT REDUCE) of the portion of the U.S.G.S. Quadrangle Map that identifies the project location and outlines the approximate boundaries of the project and mail to the appropriate DEP regional office or delegated County Conservation District prior to completing a Chapter 105 environmental assessment or any other DEP permit application. (SEE REVERSE SIDE FOR LIST OF OFFICES AND ADDRESSES).

NAME: FirstEnergy Nuclear Operating Company (Attn: M. Banko)

ADDRESS: Beaver Valley Power Station

SEB-2, P.O. Box 4, Route 168

Shippingport, PA 15077

PHONE: (724) -6825874

COUNTY: Beaver

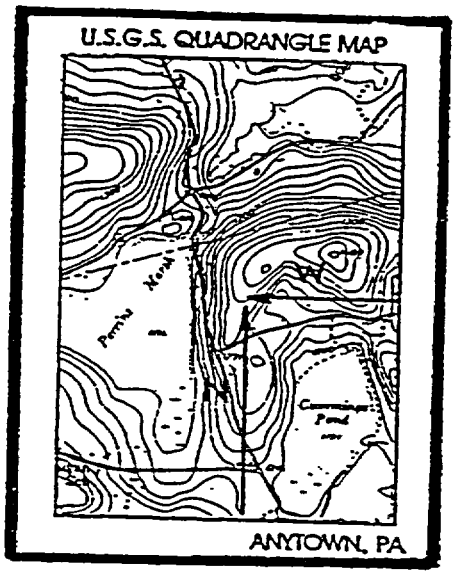
TWP./MUNICIPALITY: Shippingport Boro

U.S.G.S. 7½ Minute Quadrangle

Hookstown, PA & Midland, PA

PROJECT DESCRIPTION AND SIZE (Briefly describe entire area relevant to your project, including acreage.)

Project is Beaver Valley Power Station. Total owned property is approximately 520 acres on the south bank of the Ohio River at ~ mile 34.5 in Shippingport, PA. Include review for Phyllis Island. NOTE: The plant is located at the NORTHERN EDGE of the HOOKSTOWN QUADRANGLE, and the SOUTHERN EDGE of the MIDLAND QUADRANGLE.



North (Up) 22 5" (Hookstown) inches

West (to the left) 8" (Hookstown) inches

INDICATE PROJECT LOCATION TO THE NEAREST ONE TENTH INCH MEASURING FROM THE EDGE OF THE MAP IMAGE FROM THE LOWER RIGHT CORNER.

FOR OFFICIAL USE ONLY

SCREENING RESULTS - Follow the directions of the checked block.

☐ No potential conflicts were encountered during the PNDI inquiry. Include this form and the PNDI receipt with your Chapter 105 environmental assessment or other DEP permit application submissions.

☑ Potential conflicts must be resolved by contacting the natural resource agencies listed on the PNDI receipt. Please provide a copy of this form and the PNDI receipt along with a brief description of your project to the listed agency for consultation and recommendations. Include this form, the printed PNDI search results and the natural resource agency's written recommendation with your Chapter 105 environmental assessment or other DEP permit application submissions.

Appendix C

Plant Community List

Table 1. Plant Communities Present Within the Beaver Valley Power Station Study Area.

Cover Type No.	Cover Type Name	Dominant & Sub-dominant Plants		Stratum	Vegetation Density	Comments
		Common Name	Latin Name			
1	Ohio River	N/A	*N/A*	N/A	N/A	Permanently flooded open water community.
2	Black Locust - Knotweed Scrub	* black locust	*Robinia pseudoacacia*	sapling/shrub	moderate	Scrub area recently cleared and treated with herbicide.
		* Japanese knotweed	*Polygonum cuspidatum*	herb	dense	
3	Beach & Embankment	N/A	*N/A*	N/A	N/A	Unvegetated shoreline that is alternately flooded & exposed from fluctuating water levels.
4	Black Locust - Hardwood Forest	* silver maple	*Acer saccharinum*	tree	dense	Upland forest community covering most of Phillis Island.
		Ohio buckeye	*Aesculus glabra*			
		tree-of-heaven	*Ailanthus altissima*			
		butternut	*Juglans cinerea*			
		black walnut	*Juglans nigra*			
		* sycamore	*Platanus occidentalis*			
		eastern cottonwood	*Populus deltoides*			
		black cherry	*Prunus serotina*			
		* black locust	*Robinia pseudoacacia*			
		spicebush	*Lindera benzoin*	sapling/shrub	moderate	
		black locust	*Robinia pseudoacacia*			
		sassafras	*Sassafras albidum*			
		multiflora rose	*Rosa multiflora*	woody vine	scattered	
		riverbank grape	*Vitis riparia*			

Cover Type No.	Cover Type Name	Dominant & Sub-dominant Plants Common Name	Latin Name	Stratum	Vegetation Density	Comments
		garlic mustard	*Alliaria petiolata*	herb	moderate	
		Indian hemp	*Apocynum cannabinum*			
		* false nettle	*Boehmeria cylindrica*			
		* woodland sedge	*Carex blanda*			
		Joe Pye weed	*Eupatorium purpureum*			
		Dame's rocket	*Hesperis matronalis*			
		American germander	*Teucrium canadense*			
		* tall ironweed	*Vernonia altissima*			
5	Knotweed Stand	* Japanese knotweed	*Polygonum cuspidatum*	herb	dense	Dense growth of knotweed at eastern end of Phillis Island.
6	Willow Scrub	silver maple	*Acer saccharinum*	tree	moderate	Intermittently flooded - bordering Ohio River
		sycamore	*Platanus occidentalis*			
		* black willow	*Salix nigra*			
		box-elder	*Acer negundo*	sapling/shrub		
		* black willow	*Salix nigra*			
		* false nettle	*Boehmeria cylindrica*	herb	dense	
		enchanter's nightshade	*Circaea lutetiana*			
		Japanese knotweed	*Polygonum cuspidatum*			
		stinging nettle	*Urtica dioica*			
		white vervain	*Verbena urticifolia*			
7	Silver Maple Floodplain Forest	* silver maple	*Acer saccharinum*	tree	moderate	Intermittently flooded - bordering the Ohio River
		black willow	*Salix nigra*			

Cover Type No.	Cover Type Name	Dominant & Sub-dominant Plants Common Name	Latin Name	Stratum	Vegetation Density	Comments
		box-elder	*Acer negundo*	sapling/shrub	scattered	
		buttonbush	*Cephalanthus occidentalis*			
		swamp milkweed	*Asclepias incarnata*	herb	moderate	
		* false nettle	*Boehmeria cylindrica*			
		sensitive fern	*Onoclea sensibilis*			
		Japanese knotweed	*Polygonum cuspidatum*			
		smartweed	*Polygonum sp.*			
		* American germander	*Teucrium canadense*			
		* white vervain	*Verbena urticifolia*			
8	Open Water Lagoon	N/A	*N/A*	N/A	N/A	Permanently flooded open water community connected to Ohio River
9	Successional Old Field	box-elder	*Acer negundo*	sapling/shrub	scattered	Disturbed areas dominated by herbs & shrubs (outside the transmission corridors)
		staghorn sumac	*Rhus typhina*			
		nodding wild onion	*Allium cernuum*			
		common burdock	*Arctium minus*			
		common mugwort	*Artemisia vulgaris*			
		* smooth brome grass	*Bromus inermis*			
		crown vetch	*Coronilla varia*			
		* orchard grass	*Dactylis glomerata*			
		* Queen Anne's lace	*Daucus carota*			
		teasel	*Dipsacus sylvestris*			
		English plantain	*Plantago lanceolata*			
		tall goldenrod	*Solidago altissima*			

Dominant & Sub-dominant Plants

Cover Type No.	Cover Type Name	Common Name	Latin Name	Stratum	Vegetation Density	Comments
10	Upland Mixed Hardwoods Forest	* sugar maple	*Acer saccharum*	tree	dense	Species composition varies based on aspect and steepness of slope
		black birch	*Betula nigra*			
		bitternut hickory	*Carya cordiformis*			
		American beech	*Fagus grandifolia*			
		white ash	*Fraxinus americana*			
		tulip poplar	*Liriodendron tulipifera*			
		* black cherry	*Prunus serotina*			
		chestnut oak	*Quercus prinus*			
		* northern red oak	*Quercus rubra*			
		black oak	*Quercus velutina*			
		American basswood	*Tilia americana*			
		* sugar maple	*Acer saccharum*	sapling/shrub	moderate	
		witch hazel	*Hamamelis virginiana*			
		* spicebush	*Lindera benzoin*			
		eastern hophornbeam	*Ostrya virginiana*			
		sassafras	*Sassafras albidum*			
		poison ivy	*Toxicodendron radicans*	woody vine	scattered	
		riverbank grape	*Vitis riparia*			
		garlic mustard	*Alliaria petiolata*	herb	moderate	
		wild ginger	*Asarum canadense*			
		spinulose wood fern	*Dryopteris carthusiana*			
		marginal wood fern	*Dryopteris marginalis*			
		white snakeroot	*Eupatorium rugosum*			
		broad-leaved waterleaf	*Hydrophyllum canadense*			
		* pale jewelweed	*Impatiens pallida*			
		* May apple	*Podophyllum peltatum*			
		jumpseed	*Polygonum virginianum*			
		* Christmas fern	*Polystichum acrostichoides*			

Cover Type No.	Cover Type Name	Dominant & Sub-dominant Plants		Stratum	Vegetation Density	Comments
		Common Name	Latin Name			
11	Transmission Line Corridor	red maple	*Acer rubrum*	sapling/shrub	dense	Dominated by shrubs, saplings, woody vines & herbs due to ROW maintenance.
		* black cherry	*Prunus serotina*			
		* staghorn sumac	*Rhus typhina*			
		black locust	*Robinia pseudoacacia*			
		* blackberry	*Rubus allegheniensis*	woody vine	dense	
		black raspberry	*Rubus occidentalis*			
		poison ivy	*Toxicodendron radicans*			
		redtop	*Agrostis alba*	herb	moderate	
		* marginal wood fern	*Dryopteris marginalis*			
		* white snakeroot	*Eupatorium rugosum*			
		flat-top goldenrod	*Euthamia graminifolia*			
		* pale jewelweed	*Impatiens pallida*			
		pokeweed	*Phytolacca americana*			
		May apple	*Podophyllum peltatum*			
		* tall goldenrod	*Solidago altissima*			
12	Peggs Run	N/A	*N/A*	N/A	N/A	Perrenial stream with natural channel and concrete sluice segments.
13	Developed Land	N/A	*N/A*	N/A	N/A	Mostly unvegetated area surrounding power station.

Asterisks denote dominant plant species

Appendix D

Wildlife Species Lists

(Source = 1983 Environmental Report)

BVPS-2 ER-OLS

TABLE 2.2-6

MAMMALS WHOSE GEOGRAPHIC RANGES INCLUDE THE SITE*

Common Name	Scientific Name	Status/ Presence Verified
Virginia opossum	Didelphis virginiana	Tracks
Masked shrew	Sorex cinereus	
Smoky shrew	Sorex fumeus	Captured
Thompson's pygmy shrew	Microsorex thompsoni	
Short-tailed shrew	Blarina brevicauda	Captured
Least shrew	Cryptotis parva	
Hairy-tailed mole	Parascalops breweri	Sign
Star-nosed mole	Condylura cristata	
Little brown myotis	Myotis lucifugus	Captured
Keen's myotis	Myotis keenii	
Indiana myotis	Myotis sodalis	Endangered**,***
Small-footed myotis	Myotis leibii	Endangered***
Silver-haired bat	Lasionycteris noctivagans	
Eastern pipistrelle	Pipistrellus subflavus	Captured
Big brown bat	Eptesicus fuscus	
Red bat	Lasiurus borealis	Captured
Hoary bat	Lasiurus cinereus	
Evening bat	Nycticeius humeralis	
Eastern cottontail	Sylvilagus floridanus	Observed
New England cottontail	Sylvilagus transitionalis	
Eastern chipmunk	Tamias striatus	Captured
Woodchuck	Marmota monax	Observed
Gray squirrel	Sciurus carolinensis	Observed
Fox squirrel	Sciurus niger	Observed
Red squirrel	Tamiasciurus hudsonicus	Observed
Southern flying squirrel	Glaucomys volans	Captured
Beaver	Castor canadensis	Sign
Deer mouse	Peromyscus maniculatus	
White-footed mouse	Peromyscus leucopus	Captured
Eastern woodrat	Neotoma floridana	Endangered***
Meadow vole	Microtus pennsylvanicus	Captured
Woodland vole	Microtus pinetorum	Captured
Muskrat	Ondatra zibethicus	Tracks
Southern bog lemming	Synaptomys cooperi	
Norway rat	Rattus norvegicus	
House mouse	Mus musculus	
Meadow jumping mouse	Zapus hudsonius	Captured
Woodland jumping mouse	Napaeozapus insignis	Captured
Red fox	Vulpes vulpes	Reported
Gray fox	Urocyon cinereoargenteus	Reported
Raccoon	Procyon lotor	Tracks
Weasel	Mustela nivalis	
Long-tailed weasel	Mustela frenata	Captured
Mink	Mustela vison	
Striped skunk	Mephitis mephitis	Tracks

TABLE 2.2-6 (Cont)

Common Name	Scientific Name	Status/ Presence Verified
River otter	Lontra canadensis	
Bobcat	Lynx rufus	
White-tailed deer	Odocoileus virginianus	Observed

NOTES:

*Ranges from Burt, W.H. and Grossenheider 1964. Nomenclature from Jones, J.C. et al 1975.
**US Department of Interior Fish and Wildlife Service 1983.
***Pennsylvania Game Commission 1983.

TABLE 2.2-10

BIRDS WHOSE GEOGRAPHIC RANGES INCLUDE THE SITE [1]

Species [2,3]	Special Status	Periods of Occurrence [4]			Habitat Notes
		Summer	Winter	Fall and Spring	
Common loon	-	NE	RA	OC	River
Horned grebe	-	NE	RA	OC	River
Pied-billed grebe	-	RA	VE	OC	Poor breeding habitat
Double-crested cormorant	-	NE	NE	NE	
Great blue heron	-	RA	RA	VE	Poor breeding habitat
Little blue heron	-	NE	NE	NE	
Great egret	-	NE	NE	OC	River shore
Cattle egret	-	RA	NE	NE	
Green heron	-	RA	NE	OC	Poor breeding habitat
Black-crowned night heron	Declining [5]	NE	NE	RA	Poor quality habitat
American bittern	Threatened [6]	RA	NE	RA	Poor quality habitat
Least bittern	Threatened [6]	RA	NE	RA	Poor quality habitat
Whistling swan	Game	NE	NE	RA	River
Snow goose	-	NE	NE	NE	
Canada goose	Game	NE	NE	RA	River
Brant	-	NE	NE	NE	
Mallard	Game	RA	VE	OC	Poor breeding habitat
Black duck	Game	OC	OC	OC	Poor breeding habitat
Gadwall	Game	NE	NE	RA	River
American wigeon	Game	NE	RA	OC	River
Pintail	Game	NE	RA	OC	River
American green-winged teal	Game	NE	RA	OC	River
Blue-winged teal	Game	RA	NE	OC	Poor breeding habitat
Shoveler	Game	NE	RA	OC	River
Wood duck	Game	RA	RA	OC	River and river shore
Redhead	Game	NE	RA	OC	River
Ring-necked duck	Game	NE	RA	OC	River
Canvasback	Game	NE	RA	OC	River
Lesser scaup	Game	NE	RA	OC	River
Greater scaup	Game	NE	NE	OC	River
Common goldeneye	Game	NE	OC	OC	River
Bufflehead	Game	NE	RA	OC	River
Oldsquaw	Game	NE	NE	OC	River
White-winged scoter	Game	NE	NE	RA	River
Black scoter	Game	NE	NE	RA	River
Ruddy duck	Game	NE	RA	OC	River
Hooded merganser	Game	NE	RA	OC	River
Common merganser	Game	NE	OC	OC	River

TABLE 2.2-10 (Cont)

Species [1,2]	Special Status	Periods of Occurrence [1]			Habitat Notes
		Summer	Winter	Fall and Spring	
Red-breasted merganser	Game	NE	RA	OC	River
Turkey vulture	-	OC	RA	VE	
Black vulture	-	NE	NE	NE	
Goshawk	-	NE	RA	RA	
Sharp-shinned hawk	Declining [3]	OC	OC	OC	
Cooper's hawk	Declining [3]	OC	OC	VE	
Red-tailed hawk	-	VE	VE	VE	
Rough-legged hawk	-	NE	NE	NE	
Red-shouldered hawk	Declining [3]	OC	OC	OC	Poor quality habitat
Broad-winged hawk	-	OC	NE	OC	
Bald eagle	Endangered [2,3]	RA	RA	RA	Poor quality habitat
Golden eagle	-	NE	NE	NE	
Marsh hawk	Declining [3]	OC	OC	OC	Poor quality habitat
Osprey	Declining [3]	NE	NE	RA	River and river edge
Peregrine falcon	Endangered [3]	NE	RA	RA	Poor quality habitat
Merlin	Declining [3]	NE	RA	RA	
American kestrel	Declining [3]	VE	OC	VE	
Turkey	Game	NE	NE	NE	
Ruffed grouse	Game	VE	VE	VE	
Bobwhite	Game	OC	OC	OC	Poor quality habitat
Ringed-necked pheasant	Game	OC	OC	OC	Poor quality habitat
Virginia rail	Game	RA	NE	OC	Poor quality habitat
King rail	Endangered [3]	NE	NE	NE	
Sora rail	Game	RA	NE	OC	Poor quality habitat
Common gallinule	Game	RA	NE	OC	Poor quality habitat
American coot	Game	RA	RA	OC	Poor quality habitat
Semipalmated plover	-	NE	NE	OC	River shore
Killdeer	-	VE	RA	VE	River shore
Black-bellied plover	-	NE	NE	OC	River shore
Ruddy turnstone	-	NE	NE	OC	River shore
American woodcock	Game	OC	RA	OC	
Common snipe	Game	RA	RA	OC	Poor breeding habitat
Spotted sandpiper	-	RA	NE	OC	Poor breeding habitat
Solitary sandpiper	-	NE	NE	OC	River shore
Greater yellowlegs	-	NE	NE	OC	River shore
Lesser yellowlegs	-	NE	NE	OC	River shore
Pectoral sandpiper	-	NE	NE	RA	River shore
Baird's sandpiper	-	NE	NE	OC	River shore
Least sandpiper	-	NE	NE	OC	River shore
Dunlin	-	NE	NE	OC	River shore

TABLE 2.2-10 (Cont)

Species [1,2]	Special Status	Periods of Occurrence [3]			Habitat Notes
		Summer	Winter	Fall and Spring	
Semipalmated sandpiper	-	NE	NE	OC	River shore
Sanderling	-	NE	NE	RA	River shore
Dowitcher short-billed	-	NE	NE	RA	River shore
Herring gull	-	RA	OC	OC	River and shore
Ring-billed gull	-	RA	OC	VE	River and shore
Bonaparte's gull	-	NE	OC	OC	River and shore
Caspian tern	-	NE	NE	NE	River and shore
Common tern	-	RA	NE	OC	River and shore
Black tern	Threatened [4]	RA	NE	OC	Poor breeding habitat
Rock dove	-	RA	VE	VE	
Mourning dove	Game	VE	VE	VE	
Yellow-billed cuckoo	-	VE	NE	VE	
Black-billed cuckoo	-	VE	NE	VE	
Barn owl	Declining [4]	RA	RA	RA	Poor breeding habitat
Screech owl	-	VE	VE	VE	
Great horned owl	-	OC	OC	OC	
Barred owl	-	OC	OC	OC	
Long-eared owl	-	RA	RA	RA	
Short-eared owl	Endangered [4]	RA	RA	RA	Poor quality habitat
Snowy owl	-	NE	NE	NE	
Saw-whet owl	-	RA	RA	RA	Poor quality habitat
Whip-poor-will	-	OC	NE	OC	
Common nighthawk	-	OC	NE	OC	
Chimney swift	-	VE	NE	VE	
Ruby-throated hummingbird	-	VE	NE	VE	
Belted kingfisher	-	VE	VE	VE	River and shore
Common flicker	-	VE	RA	VE	
Pileated woodpecker	-	VE	VE	VE	
Red-bellied woodpecker	-	VE	VE	VE	
Red-headed woodpecker	-	OC	OC	OC	
Yellow-bellied sapsucker	-	OC	RA	OC	
Hairy woodpecker	-	VE	VE	VE	
Downy woodpecker	-	VE	VE	VE	
Eastern kingbird	-	OC	NE	OC	
Acadian flycatcher	-	NE	NE	NE	
Great crested flycatcher	-	VE	NE	VE	
Eastern phoebe	-	VE	NE	VE	
Yellow-bellied flycatcher	-	VE	NE	OC	
American flycatcher	-	VE	NE	VE	
Willow flycatcher	-	VE	NE	OC	

TABLE 2.2-10 (Cont)

Species [1,2]	Special Status	Periods of Occurrence [1] Summer	Winter	Fall and Spring	Habitat Notes
Least flycatcher	-	VE	NE	OC	
Eastern wood pewee	-	VE	NE	VE	
Olive-sided flycatcher	-	NE	NE	VE	
Horned lark	-	OC	NE	OC	Poor quality habitat
Tree swallow	-	OC	NE	OC	River and shore
Bank swallow	-	OC	NE	VE	River and shore
Rough-winged swallow	-	VE	NE	OC	
Barn swallow	-	OC	NE	OC	
Cliff swallow	-	RA	NE	RA	
Purple martin	-	OC	NE	OC	
Blue jay	-	VE	VE	VE	
Northern raven	-	NE	NE	NE	
Common crow	-	VE	VE	VE	
Black-capped chickadee	-	NE	VE	OC	
Carolina chickadee	-	VE	VE	VE	
Tufted titmouse	-	VE	VE	VE	
White-breasted nuthatch	-	VE	VE	VE	
Red-breasted nuthatch	-	NE	RA	OC	
Brown creeper	-	OC	VE	VE	Poor breeding habitat
House wren	-	VE	NE	VE	
Winter wren	-	RA	VE	VE	Poor breeding habitat
Marsh wren	-	RA	NE	NE	
Sedge wren	Threatened [1]	RA	NE	NE	
Bewick's wren	Declining [1] Endangered [1]	RA	RA	RA	Poor quality habitat
Carolina wren	-	VE	VE	VE	
Mockingbird	-	RA	RA	VE	Poor breeding habitat
Gray catbird	-	VE	NE	VE	
Brown thrasher	-	OC	RA	VE	
American robin	-	VE	NE	VE	
Wood thrush	-	VE	NE	VE	
Hermit thrush	-	OC	NE	OC	Poor breeding habitat
Swainson's thrush	-	OC	NE	VE	
Gray-checked thrush	-	NE	NE	VE	
Veery	-	OC	NE	VE	Poor breeding habitat
Eastern bluebird	-	OC	RA	OC	Poor breeding habitat
Blue-gray gnatcatcher	-	VE	NE	VE	
Golden-crowned kinglet	-	NE	VE	NE	
Ruby-crowned kinglet	-	NE	RA	VE	
American (water) pipit	-	NE	NE	OC	Poor quality habitat
Cedar waxwing	-	NE	VE	VE	

TABLE 2.2-10 (Cont).

Species [1,2]	Special Status	Periods of Occurrence [3] Summer	Winter	Fall and Spring	Habitat Notes
Loggerhead shrike	Declining [4]	RA	RA	RA	
Starling	-	VE	VE	VE	
White-eyed vireo	-	RA	NE	RA	
Yellow-throated vireo	-	VE	NE	VE	
Solitary vireo	-	OC	NE	VE	
Red-eyed vireo	-	VE	NE	VE	
Philadelphia vireo	-	NE	NE	VE	
Warbling vireo	-	OC	NE	VE	Poor breeding habitat
Black and white warbler	-	OC	NE	VE	Poor breeding habitat
Worm-eating warbler	-	VE	NE	VE	
Golden-winged warbler	-	OC	NE	OC	
Blue-winged warbler	-	VE	NE	VE	
Tennessee warbler	-	NE	NE	VE	
Nashville warbler	-	NE	NE	VE	
Northern parula	-	OC	NE	VE	Poor breeding habitat
Yellow throated warbler	-	NE	NE	VE	
Yellow warbler	-	VE	NE	VE	
Magnolia warbler	-	OC	NE	VE	Poor breeding habitat
Cape May warbler	-	NE	RA	VE	
Black-throated blue warbler	-	OC	NE	VE	Poor breeding habitat
Yellow-rumped warbler	-	NE	VE	VE	
Black-throated green warbler	-	OC	NE	VE	Poor breeding habitat
Cerulean warbler	-	VE	NE	VE	
Blackburnian warbler	-	OC	NE	VE	Poor breeding habitat
Chestnut-sided warbler	-	OC	NE	VE	Poor breeding habitat
Bay-breasted warbler	-	NE	NE	VE	
Blackpoll warbler	-	NE	NE	VE	
Pine warbler	-	NE	NE	VE	
Prairie warbler	-	OC	NE	NE	Poor quality habitat
Palm warbler	-	NE	NE	OC	
Ovenbird	-	VE	NE	VE	
Northern waterthrush	-	NE	NE	OC	
Louisiana waterthrush	-	OC	NE	VE	
Kentucky warbler	-	VE	NE	VE	
Connecticut warbler	-	NE	NE	VE	
Mourning warbler	-	OC	NE	VE	
Common yellowthroat	-	OC	NE	VE	Poor breeding habitat
Yellow-breasted chat	-	VE	NE	VE	
Hooded warbler	-	VE	NE	VE	
Wilson's warbler	-	NE	NE	VE	

TABLE 2.2-10 (Cont)

Species [1,2]	Special Status	Periods of Occurrence [1] Summer	Winter	Fall and Spring	Habitat Notes
Canada warbler	-	OC	NE	VE	Poor breeding habitat
American redstart	-	VE	NE	VE	
House sparrow	-	OC	VE	OC	
Eastern meadowlark	-	OC	OC	VE	Poor quality habitat
Redwinged blackbird	-	VE	RA	VE	
Orchard oriole	-	RA	NE	RA	
Northern oriole	-	VE	NE	VE	
Rusty blackbird	-	NE	RA	OC	
Common grackle	-	VE	RA	VE	
Brown-headed cowbird	-	VE	RA	VE	
Scarlet tanager	-	VE	NE	VE	
Summer tanager	-	RA	NE	RA	
Cardinal	-	VE	VE	VE	
Rose-breasted grosbeak	-	VE	NE	VE	
Indigo bunting	-	VE	NE	VE	
Evening grosbeak	-	NE	OC	OC	Erratic
Common redpoll	-	NE	RA	NE	
House finch	Spreading	RA	RA	RA	
Purple finch	-	NE	OC	OC	Erratic
Pine siskin	-	NE	OC	OC	Erratic
American goldfinch	-	VE	VE	VE	
Red crossbill	-	NE	OC	OC	Poor quality habitat
White-winged crossbill	-	NE	RA	RA	
Rufous-sided towhee	-	VE	RA	VE	
Savannah sparrow	-	OC	NE	OC	Poor quality habitat
Grasshopper sparrow	Declining [3]	RA	NE	RA	Poor quality habitat
Henslow's sparrow	Declining [3] Threatened [4]	RA	NE	RA	Poor quality habitat
Vesper sparrow	-	OC	NE	OC	Poor quality habitat
Lark sparrow	-	RA	NE	RA	
Dark-eyed junco	-	OC	VE	OC	Poor breeding habitat
Tree sparrow	-	NE	VE	VE	
Chipping sparrow	-	OC	NE	VE	
Field sparrow	-	VE	VE	VE	
White-crowned sparrow	-	NE	RA	RA	
White-throated sparrow	-	RA	VE	VE	Poor breeding habitat
Fox sparrow	-	NE	NE	OC	
Lincoln's sparrow	-	NE	NE	OC	
Swamp sparrow	-	OC	RA	OC	Poor quality habitat
Song sparrow	-	VE	VE	VE	
Snow bunting	-	NE	RA	RA	Poor quality habitat

Table 2.2-10 (Cont)

NOTES:
1. NUS Corporation 1976a.
2. American Ornithologists' Union 1957.
3. American Ornithologists' Union 1973.
4. RA = Rare in regional habitats similar to those on the site;
   NE = Not expected;
   OC = Occurs in regional habitats similar to those on the site; and
   VE = Verified on the site during this study.
5. National Audubon Society 1973.
6. U.S. Department of Interior 1980.
7. Pennsylvania Game Commission 1983.

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TABLE 2.2-15

AMPHIBIAN SPECIES WITH RANGES INCLUDING THE SITE*

Common Name	Scientific Name
Eastern hellbender	Cryptobronchus alleganiensis alleganiensis
Mudpuppy	Necturus maculosus maculosus
Red-spotted newt	Notophthalmus viridescens
Jefferson salamander	Ambystoma jeffersonianum
Silvery salamander	Ambystoma platineum
Spotted salamander	Ambystoma maculatum
Marbled salamander	Ambystoma opacum
Dusky salamander**	Desmognathus fuscus
Mountain salamander	Desmognathus ocrophaeus
Seal salamander	Desmognathus monticola
Red-backed salamander	Plethodon cinereus
Slimy salamander**	Plethodon glutinosus
Wehrle's salamander	Plethodon wehrlei
Ravine salamander	Plethodon richmondi
Spring salamander	Gyrinophilus porphyriticus
Four-toed salamander	Hemidactylium scutatum
Red salamander	Pseudotriton ruber
Long-tailed salamander	Eurycea longicauda
Two-lined salamander**	Eurycea bislineata
American toad**	Bufo americanus
Fowler's toad**	Bufo woodhousei
Spring peeper**	Hyla crucifer
Gray treefrog	Hyla versicolor
Western chorus frog	Pseudacris triseriata
Mountain chorus frog**	Pseudacris brachyphona
Green frog**	Rana clamitans
Pickerel frog	Rana palustris
Leopard frog**	Rana pipiens
Bullfrog	Rana catesbeiana
Woodfrog**	Rana sylvatica

NOTES:

*Ranges and nomenclature from Conant 1958.
**Observed on the BVPS site.

TABLE 2.2-16

REPTILE SPECIES WITH RANGES INCLUDING THE SITE*

Common Name	Scientific Name
Snapping turtle	Chelydra serpentina
Wood turtle	Clemmys insculpta
Spotted turtle	Clemmys guttata
Stinkpot	Sternotherus odoratus
Painted turtle	Chrysemys picta
Eastern box turtle**	Terrapene carolina
Smooth softshell	Trionyx muticus
Spiny softshell	Trionyx spinifer
Map turtle	Graptemys geographica
Fence lizard	Sceloporus undulatus
Five-lined skink	Eumeces fasciatus
Red-bellied snake	Storeria occipitomaculata
Brown snake	Storeria dekayi
Northern water snake	Natrix sipedon
Kirtland's water snake	Natrix kirtlandi
Queen snake	Regina septemvittata
Eastern garter snake**	Thamnophis sirtalis
Eastern ribbon snake	Thamnophis sauritus
Northern ribbon snake***	Thamnophis sauritus septenirionolis
Eastern hognose snake	Heterodon platyrhinos
Ringneck snake**	Diadophis punctatus
Racer	Coluber constrictor
Smooth green snake	Opheodrys vernalis
Rat snake**	Elaphe obsoleta
Northern milk snake	Lampropeltis doliata
Copperhead**	Agkistrodon contortrix
Massasauga	Sistrurus catenatus
Timber rattlesnake	Crotalus horridus

NOTES:

*Ranges and nomenclature from Conant 1958.
**Observed on the BVPS site.
***Ranges and nomenclature from Pennsylvania Game Commission 1983.