A POST-IMPOUNDMENT INVESTIGATION OF THE BEECH FORK DRAINAGE BASIN, TWELVEPOLE CREEK, WAYNE AND CABELL COUNTIES, WEST VIRGINIA

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Donald Borda

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Adviser Donald Carter
Department of Biological Sciences

Paul L. Stewart
Dean of Graduate School

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ABSTRACT

Fish populations were collected at six stations by means of electrofishing to determine the composition after impoundment. A total of 748 fishes weighing about 9 pounds (4 kg) were collected. Seven families representing 31 species were collected and categorized as game, forage and rough fishes. Game fishes made up 9.1 percent of the total number and 22.3 percent of the total weight; forage fishes 83.0 percent by number and 29.7 percent by weight. The average standing crop was 15 pounds per acre.

Benthic invertebrates were collected at six stations by means of a bottom dredge. A total of 1535 specimens were collected representing 12 orders, 26 families and about 35 species. The sample consisted mostly of Trichoptera (48%), Ephemeroptera (28%) and Diptera (17%).

The riparian vegetation included American sycamore, silver maple, river birch and boxelder while the forested slopes were dominated by white and red oaks, American beech and sugar maple.

The general attitude of the area residents tended to be favorable towards the project and the majority felt that the area had not been environmentally harmed or degraded.

Chapter I

INTRODUCTION

Beech Fork Lake, a United States Army Corps of Engineers reservoir project, was authorized by the Flood Control Act of 1962 (Public Law 87-874). Construction of the dam began in February, 1973 and was completed in November, 1976 with filling procedures beginning in the spring of 1977. The project is located approximately 6.5 air miles (10.5 km) south of Huntington, West Virginia, on the Beech Fork of Twelvepole Creek, a tributary of the Ohio River. Seasonal (summer) pool is maintained at elevation 592.0 feet (msl) from April to October while winter pool elevation is maintained at elevation 583.5 feet (msl). The dam is a random rock filled structure with a flood control elevation of 614.5 feet (msl) with an uncontrolled spillway located on the left abutment.

The impoundment of a reservoir such as Beech Fork provides flood control for the area as well as recreation. Additionally, impoundments should be investigated to survey the environmental impact on the drainage basin as well as the sociological impact on the people living in the immediate area. Pre-impoundment investigations have been made in conjunction with the Beech Fork Lake project (Olson, 1971) and environmental impact statements have been prepared by the United States Army Corps of Engineers, Huntington District,

prior to impoundment (1974). The purpose of this post-impoundment investigation was to examine existing conditions and document the findings while also comparing parameters with pre-impoundment studies. The parameters compared include water quality, coliform bacteria counts, fish populations, benthic invertebrate populations, riparian vegetation, forested-slope vegetation, stomach analysis of selected fishes and a sociological impact survey of Beech Fork area residents by means of a questionnaire method. A conscious and deliberate effort was made to duplicate the collection stations, survey sites and methods and materials used by Olson (1971).

Chapter II

REVIEW OF THE LITERATURE

The Twelvepole Creek drainage basin has become part of a continuing study dealing with the impact of impoundments on the southwestern West Virginia watershed.

East Lynn and Beech Fork Lakes have been extensively studied in investigations pertaining to pre-impoundments of both basins as well as other population studies conducted by students and faculty at Marshall University.

A pre-impoundment investigation of the Beech Fork basin was conducted at ten stations between February 1970 and March 1971 (Olson, 1971). This study revealed 35 species of fishes, 60 species of benthic invertebrates as well as water quality parameters, vegetational analysis and a socio-economic survey.

The East Fork of Twelvepole Creek was investigated prior to impoundment in the summer of 1970 (Tarter, 1972). This study revealed 38 fish species and 36 benthic invertebrate species plus a water quality analysis involving seven parameters.

A post-impoundment, limnological study was conducted on the East Lynn tailwaters from June 1973 through August 1974 (Goodno, 1975). Plankton (38 genera), benthic invertebrates (10 genera), fishes (28 species), and 15 physio-chemical parameters were investigated.

The West Fork of Twelvepole Creek has been surveyed for fishes (with game fishes occupying only 5.6% of the population), benthos (with mayfly nymphs making up 54.3% of the total collected) and water quality parameters (Hardman et. al., 1979).

Population studies conducted by students and faculty at Marshall University and pertaining to the Twelvepole Creek basin include the age and growth of the Troutperch (Watkins, 1973), sex ratios in the Least brook lamprey (Holbrook, 1975) and food of the black basses, East Lynn Lake (Bohn, 1975). Other studies include the reproductive biology of the Troutperch (Muth and Tarter, 1975), life history of the Grass pickerel (Evans and Tarter, 1976) and the reproductive biology of the Logperch in East Lynn Lake (Nance, 1978).

The effects of hypolimnion releases from reservoirs were studied in relationship to fish distribution and species diversity (Edwards, 1978). Major changes were noticed including water temperatures, decreases in nutrient availability (especially nitrates and phosphates) and lower down-stream primary production. Because of such factors, reservoirs were labeled as nutrient traps.

Upstream changes in fish populations following the impoundment of Sagehen Creek, California, were studied by Erman (1973). It was found that suckers increased nearly 62 percent while redsides and daces decreased almost 38 percent. The later phenomenon was thought to be due to the migration of these species into the lake. It was also

determined that there had been no deterioration in water quality over the 12 years spanning pre- and post-impoundments.

The effects of storage and mainstream reservoirs on the benthic macroinvertebrates in the Tennessee Valley was studied by Isom (1971). The pre- and post-impoundment conditions of Norris Dam (Clinch River), Watts Bar and Cherokee Reservoirs were compared as was their effects upon the benthic invertebrate fauna. The studies showed that the organisms were affected by siltation, hypolimnetic oxygen deficiencies, water level fluctuations and seasonally low oxygen tensions downstream of the reservoirs.

Summer benthos in newly flooded areas of Beaver Reservoir, Arkansas, were studied during their second and third years of filling (Aggus, 1971). The results clearly showed a high correlation between certain benthic invertebrates, especially chironomids, and the transfer of energy in the food chain from decaying vegetation to fishes, especially young Largemouth bass.

The effects of water flow manipulation below a hydroelectric dam on the bottom fauna of the Upper Kennebee River, Maine, was studied by Trotzky and Gregory (1974). Their findings indicated that the biota of standing waters contrasted to that of flowing waters and that flows were the limiting factor in the Kennebee River. Forty-two genera were identified with insect populations generally increasing further distances downstream from the dam.

Impacts of construction activities on wetlands of the United States have been studied by Darnell (1976). The results show that over one third of the nation's wetlands have been destroyed through different construction activities while over one-half of the remaining wetlands are in jeopardy. Included in these losses are many aquatic insect species and their habitats.

Last, but by no means least, the intricately complex ecology of running waters has been studied in depth by Hynes (1970). A critical and comprehensive view is given on the ecology and limnology of rivers and streams, including important findings from some 1500 papers and texts.

Chapter III

DESCRIPTION OF THE STUDY AREA

General

Beech Fork Lake is a United States Army Corps of Engineers (Huntington District) project located in Wayne and Cabell Counties, West Virginia, on the Beech Fork of Twelvepole Creek, a tributary of the Ohio River. The project was made possible by the Flood Control Act of 1962 (Public Law 87-874) and provides flood control for the Beech Fork drainage basin of the Twelvepole Creek water-shed as well as recreation for the public and the enhancement of fish and wildlife for the region.

The dam is located approximately 3.7 miles (6.0 km) above the mouth of Beech Fork, approximately 19.6 miles (31.6 km) above the mouth of Twelvepole Creek, two miles southeast of Lavalette, West Virginia. The earth-fill random rock structure rises 86 feet (26.2 m) above the old streambed elevation (640 feet, msl) and spans 1080 feet (329.2 m) along the crest. The spillway is an uncontrolled-type, concrete flume 80 feet in width at an elevation of 614.5 feet (msl). The dam and associated structures aid in the regulation of runoff for the 78 square mile (202 sq. km) drainage basin (17% of the Twelvepole Creek watershed).

The lake itself is maintained at summer pool (592.0 feet, msl) from April through October. This seasonal pool covers an area of 720 acres (291.4 hectares). The winter

pool is maintained at elevation 583.5 feet (msl) from November through March. The pool of record occurred on December 12, 1978 when the pool reached an elevation of 602.94 feet (msl). The lake has a flood control capacity area of 1830 acres (740.6 hectares). The mean depth is 12.75 (3.9 m) feet while the mean breadth is 713.0 feet (217.3 m). Total length of the lake is approximately 8.33 miles (13.4 km) with 31 miles (49.9 km) of shoreline.

Beech Fork originates 14 miles (22.5 km) east-southeast of Wayne, West Virginia, near the town of Nestlow. The creek extends 28.5 miles (45.8 km) with a total fall of 585 feet (178.3 m) (20.5 feet/mile) (3.9 m/km). These figures are somewhat deceiving due to the fact that the first two miles (3.2 km) have an mean fall of 172.5 feet/mile (32.9 m/km) (Krebs and Teets, 1913). As a result of impoundment, the towns of Bowen, Winslow and Booten have been abandoned and their residents relocated. Miller's Fork of Beech Fork is a major tributary, 8.6 miles (13.8 km) in length with an mean fall of 38.4 feet/mile (8.2 m/km).

Geology

Carved by erosion, the Beech Fork drainage basin is characteristically dendritic in nature and lies in the Kanawha section of the Appalachian Plateau physiographic province. The terrain of Beech Fork reservoir is steep, maximum relief of approximately 460 feet (104.2 m), with most level land found in the stream valley. Alluvium and colluvium materials overlay bedrock in these valleys. Alluvial

materials, consisting of silty clays, sandy silts and silty sands with a little gravel or rock fragments, make up the valley floor with thicknesses of up to 55 feet (16.8 m). The colluvial materials, silty to sandy clays with gravel to boulder-size rock fragments, make up the valley slopes with a detritic overburden of weathered indurated clay, siltstone and sandstone.

Stratgraphically, the Beech Fork Basin formation is characterized by the Monogahela and Conemaugh Series. The Conemaugh Series, which includes mostly redbeds, sandstones, siltstones and shale with some limestone and coal, consists of deposits left by repeated marine encroachments. The elevation ranges from 472 to 923 feet (143.9-281.3 m). The Monongahela Series, which consists of sandstones, siltstones and shale with limestone and coal, has an elevation range above 851 feet (259.4 m).

Mineral resources surveys reveal that the Pittsburgh coal seam of the Monongahela Series and a deeper No. 5 block coal seam of the Allegheny Series are the two largest coal seams in the Beech Fork Basin but neither is thought to be a commercially mineable. Natural gas is the only other mineral resource in the area with a projected production life of approximately 30 years.

Climate

The Beech Fork Basin lies in a temperate climatic zone. Mean temperatures range from 36 to 75 F., January and July, respectively. The average growing season runs from mid-April

through mid-October. The mean annual precipitation is 42 inches (1.07 m). The largest recorded flood for the basin, prior to the construction of the dam, occurred on February 4, 1939, at a stage of 31 feet (9.4 m) or 15 feet (4.8 m) above flood stage. Winds in the general area prevail from the southwest.

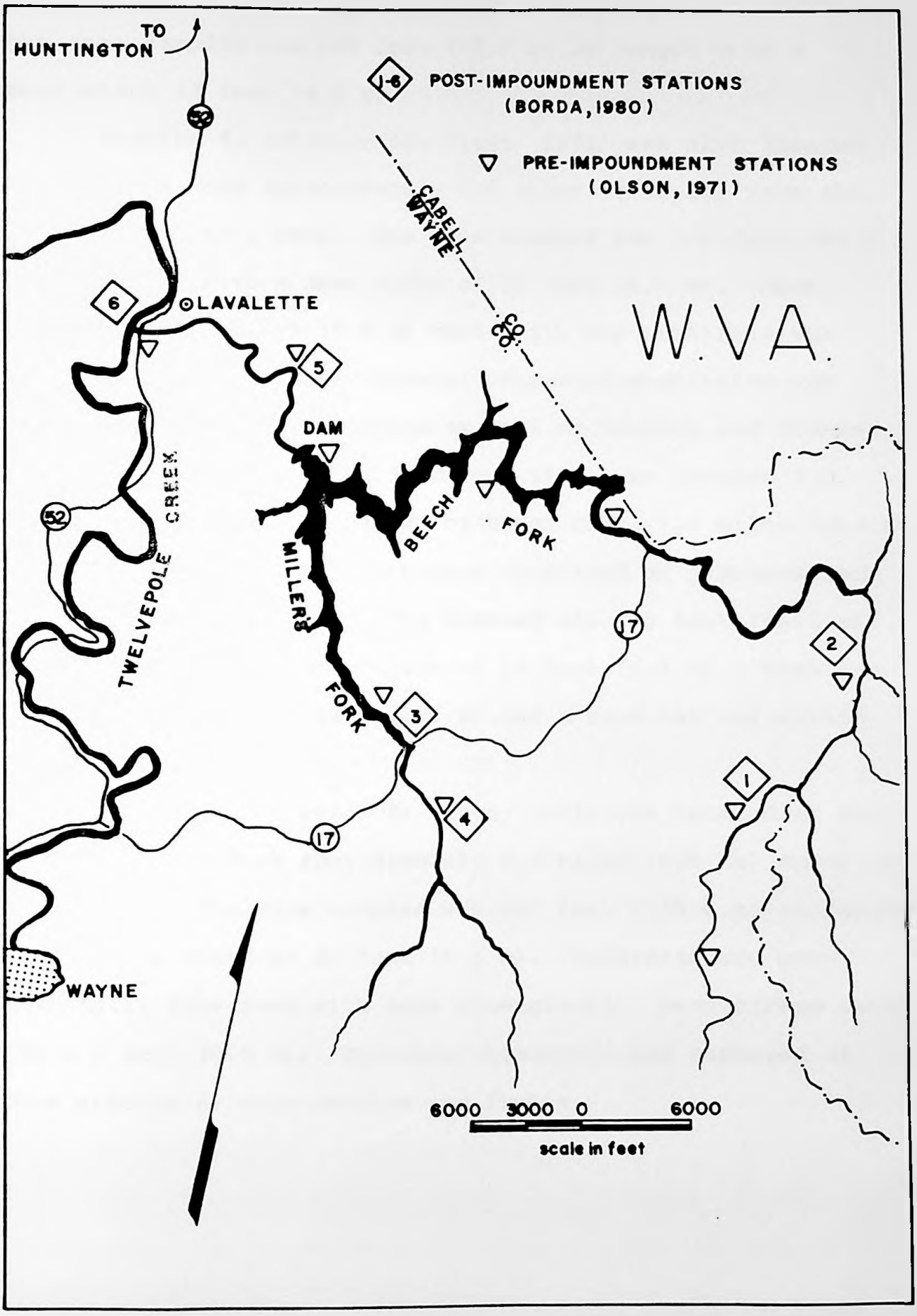
Collection Stations

Station 1, (Station 2; Olson 1971) located approximately 19 miles (30.6 km) from the mouth of Beech Fork and 15.7 miles (22.3 km) upstream of the dam, was sampled for benthic invertebrates and fishes (Figure 1). The substrate was sand and gravel with some sandstone rocks. Depth of the water was approximately 18 to 24 inches (0.5 to 0.6 m) deep while the area sampled was roughly 200 feet (61.0 m) long with a mean width of 14 feet (4.3 m). Samples were collected in the fall and leaf litter was abundant in the stream at that time.

Station 2, (Station 3; Olson 1971) was located approximately 16 miles (25.8 km) from the mouth of Beech Fork and 12.7 miles (20.4 km) upstream of the dam. Benthos and fishes were sampled in an area of 300 feet (91.5 m) in length and a mean width of 17 feet (5.2 m). Substrate was mostly sand, gravel and pebble-sized rocks. Leaf litter was again abundant.

Station 3, (Station 6A; Olson, 1971) was located on Miller's Fork of Beech Fork, approximately 3.2 miles (5.2 km) from the mouth of Miller's Fork. Substrate was primarily fine gravel and sand while leaf litter was minimal. Stream depth varied from 3 feet (0.9 m) to six inches (0.2 m) and

Figure 1. Map of Beech Fork drainage basin, Wayne and Cabell Counties, West Virginia, showing the locations of collection stations for the post-impoundment study in comparison to pre-impoundment stations (Olson, 1971).


TO
HUNTINGTON
1-6 POST-IMPOUNDMENT STATIONS
(BORDA, 1980)
PRE-IMPOUNDMENT STATIONS
(OLSON, 1971)
CABELL
WAYNE
W.VA.
LAVALETTE
DAM
TWELVEPOLE CREEK
MILLER'S FORK
BEECH FORK
WAYNE
6000 3000 0 6000
scale in feet

the area sampled was 200 feet (61.0 m) in length with a mean width 13 feet (4.0 m).

Station 4, (Station 6B; Olson, 1971) was also located on Miller's Fork approximately 6.6 miles (10.6 km) from the mouth of Miller's Fork. The area sampled was 315 feet (96.1 m) in length with a mean width of 16 feet (4.9 m). Mean stream depth was 2.5 (0.8 m) feet while the substrate was sand, mud and some fine gravels. Riparian vegetation was also surveyed at this station as well as benthos and fishes.

Station 5, (Station 7; Olson, 1971) was located 2.3 miles (3.7 km) from the mouth of Beech Fork, 1.4 miles (2.3 km) downstream of the dam. Substrate consisted of pebble-sized rocks, gravel and sand. Area sampled was 3.5 feet (96.1 m) in length and had a mean width of 28 feet (8.5 m). Mean stream depth was 1.5 feet (0.5 m) and a sand bar was within the sample area.

Station 6, (Station 8; Olson, 1971) was located at the mouth of Beech Fork approximately 3.7 miles (6.0 km) downstream of the dam. The area sampled was 390 feet (119.0 m) in length with a mean width of 20 feet (6.1 m). Substrate was predominantly fine sand with some fine gravel. Mean stream depth was 2.5 feet (0.8 m). Riparian vegetation was surveyed at this station as were benthos and fishes.

Chapter IV

METHODS AND MATERIALS

The collection, identification and analysis of samples and data from Beech Fork and Miller's Fork of Twelvepole Creek, Cabell and Wayne Counties, West Virginia was conducted between October, 1978 and June, 1980.

Collection of Fishes. Electrofishing was considered the easiest and most efficient method for the collection of fishes. Collections were made in October, 1978. Conditions were favorable for electrofishing in that the streams were shallow, relatively narrow and fairly clear. A battery-powered, variable voltage backpack electrofisher with pulsed direct current was operated by one member of the collection team while three other members netted the immobilized fishes. This method seemed to work best when the third collector trailed downstream of the operator and other two collectors to net the fishes that were missed. Fishes were sampled at all six collection stations and immediately preserved in 10 percent formalin until they were identified and weighed. At that time they were washed and preserved in 70 percent ethanol. Collections are now being stored in the N. Bayard Green Zoology Museum, Marshall University.

Collection of Benthic Invertebrates. Benthic invertebrates were sampled by means of a five-minute time sample. Benthos were collected in October, 1978. This method was

chosen based on its successful record of obtaining representative samples in this area (Olson, 1971; Tarter, 1972). A bottom dredge with a fine mesh net (60 threads per inch) was held downstream of the collection site to catch any materials or organisms dislodged by the disruption of the substrate with the foot. This method has the advantage of obtaining greater numbers of benthos, as opposed to the Surber Sampler (1 sq. foot), but also has the disadvantage of having a greater proportion of damaged and dismembered samples. The benthic invertebrates were then separated from all other materials (rocks, sand, leaves, etc.) by hand using a white enamel pan and forceps or by elutrification (the bubbling of air through water and the collected sample causing the lighter weight benthos to float to the top of the elutrification chamber and into a series of graduated sieves). Benthos were sampled at all six collection stations and immediately fixed in 10 percent formalin until they were identified and weighed to the nearest 0.0001 gram. Then they were washed and preserved in 70 percent ethanol. Collections are now being stored in the N. Bayard Green Zoology Museum, Marshall University.

Stomach Analysis of Fishes. Stomachs were removed from all representative species of fishes (a maximum of four stomachs per species) from collection Station 3. The contents were then identified to genus (and species when possible) or as plant, animal, mineral detritus or algae using a dissecting and/or compound microscope. Percentages were then

determined for each species by means of the stomach analysis data.

Water Chemistry and Temperature. All water chemistry and temperature analysis were done in the field using a Hach "Direct-Reading" Portable Water Engineer's Laboratory, Model AL-36-WR. All readings were taken in October, 1978. All six collection stations were monitored for pH, dissolved oxygen (mg/l), alkalinity (mg/l) $CaCO_3$ and total hardness (mg/l) $CaCO_3$. Temperature was read in degrees Fahrenheit by placing the thermometer in the water and taking the reading while the bulb was still submerged.

Coliform Bacteria. Tests for the presence of human coliform bacteria, especially Escherichia coli, were performed at all six collection stations. Samples were collected and inoculated in November, 1978. Lactose broth fermentation tubes were inoculated from samples collected in sterile containers. Portable "coli-counters" were also used for coliform analysis to provide confirming data.

A positive lactose broth fermentation test is indicated by a change in color from red to yellow (due to acid production during fermentation) and accululation of gas in the inverted Durham tube. The lactose fermentation test is considered the presumptive test, because if positive it indicates a probability that Escherichia coli is present. The conformed test follows, and a positive confirmed test is indicated by metallic green colonies on Eosin Methylene Blue Agar. The completed test is carried out to make certain that the

metallic green colonies are Escherichia coli. It is performed by inoculating a SIM tube (sulfide, indole, motility) and a citrate slant. A positive completed test consists of an indole positive, citrate negative reaction.

Quantitative determination of bacterial numbers was performed on water samples, using the viable plate count method.

Riparian Vegetation. Woody vegetation was observed on the stream bank at Stations 4 and 6. Station 3 was surveyed for a distance of 300 feet (91.5 m) on the west bank while both east and west banks of Station 6 were surveyed for a distance of 100 feet (30.5 m). All species were identified and listed.

Forested Slopes. Continuous line transects were taken on three forested slopes facing north, south and east. The first transect ran north 20^{o} west and had a 34 percent slope. Three 100 feet by 4 meter plots were surveyed with trees of one inch in diameter or greater being measured and identified. The second transect ran south 35^{o} east and had a 25 percent slope. Again three 100 feet by 4 meter plots were surveyed. The third transect ran north 90^{o} east and had a slope of 29 percent. All trees that met the minimum diameter requirements were measured with a calibrated tape used to exclusively give diameter readings. Each tree was measured at the designated 4.5 feet breast height (dbh) if the tree was within two meters of either side of the continuous transect line. The trees were identified to genus and species and grouped in diameter classes by rounding off the diameters to the lowest whole inch (for example, a tree with a diameter

of 4.7 inches would be in the 4 inch diameter class).

Sociological Impact Questionnaire. A ten question sociological impact survey was personally delivered to 75 Beech Fork area residents with a cover letter and a self-addressed, stamped envelope for the convenience of the participant. Persons were chosen on the basis of their location to the dam itself or to the Bowen Recreation and Camping Area. Participants were asked to reflect upon the effects of the lake and camping area whether their opinions were pr or con. Anonymity was encouraged in hopes of greater participation and the residents were requested to elaborate on any of the questions that they felt were necessary.

Chapter V

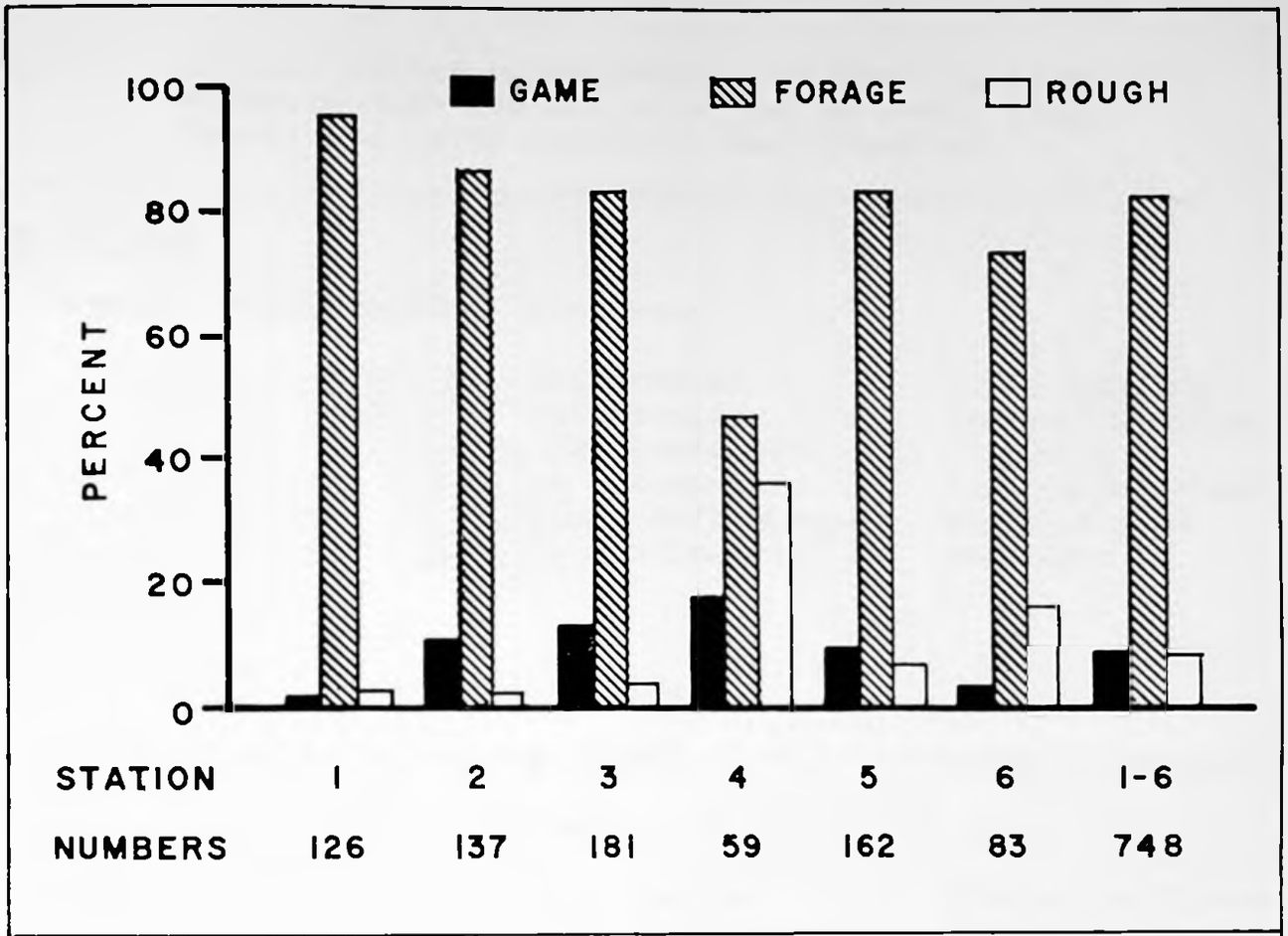
RESULTS

Fishes. A total of 748 fishes were collected by means of electroshocking. The total weight of the population sample was 4.12 kg (9.08 lbs) (Figures 2A and 2B). Thirty-one species representing seven families were identified from the collection (Tables 1-4).

All game fishes were identified to the family Centrarchidae (Sunfishes) which represented 9.09 percent of the total population in number and 22.31 percent in weight (Table 2). Game fishes reached their highest numerical frequency (16.95%) at Station 4, while their highest frequency in weight (61.22%) was at Station 2. The Green sunfish, Lepomis cyanellus (Rafinesque), comprised almost half of the game fish population (47%) and was also the only game fish collected at all six stations. The spotted bass, Micropterus punctulatus (Rafinesque), although only making up less than 15 percent of the game fishes in number, was responsible for over 41 percent of the weight and was sampled at five of the collection stations. Although no grass pickerel, Esox americanus vermiculatus (Lesueur), were sampled during the study; their presence in the drainage basin has been documented by other workers (Olson, 1971; Evans and Tarter, 1976).

Figure 2A. Percentage frequency of the total number of game, forage and rough fishes collected at six stations in Beech Fork and Miller's Fork of Twelvepole Creek, Wayne and Cabell Counties, West Virginia.

Figure 2B. Percentage frequency of the total weight of game, forage and rough fishes collected at six stations in Beech Fork and Miller's Fork of Twelvepole Creek, Wayne and Cabell Counties, West Virginia. Weights are listed in kilograms.


GAME
FORAGE
ROUGH
PERCENT
100
80
60
40
20
0
STATION 1 2 3 4 5 6 1-6
NUMBERS 126 137 181 59 162 83 748

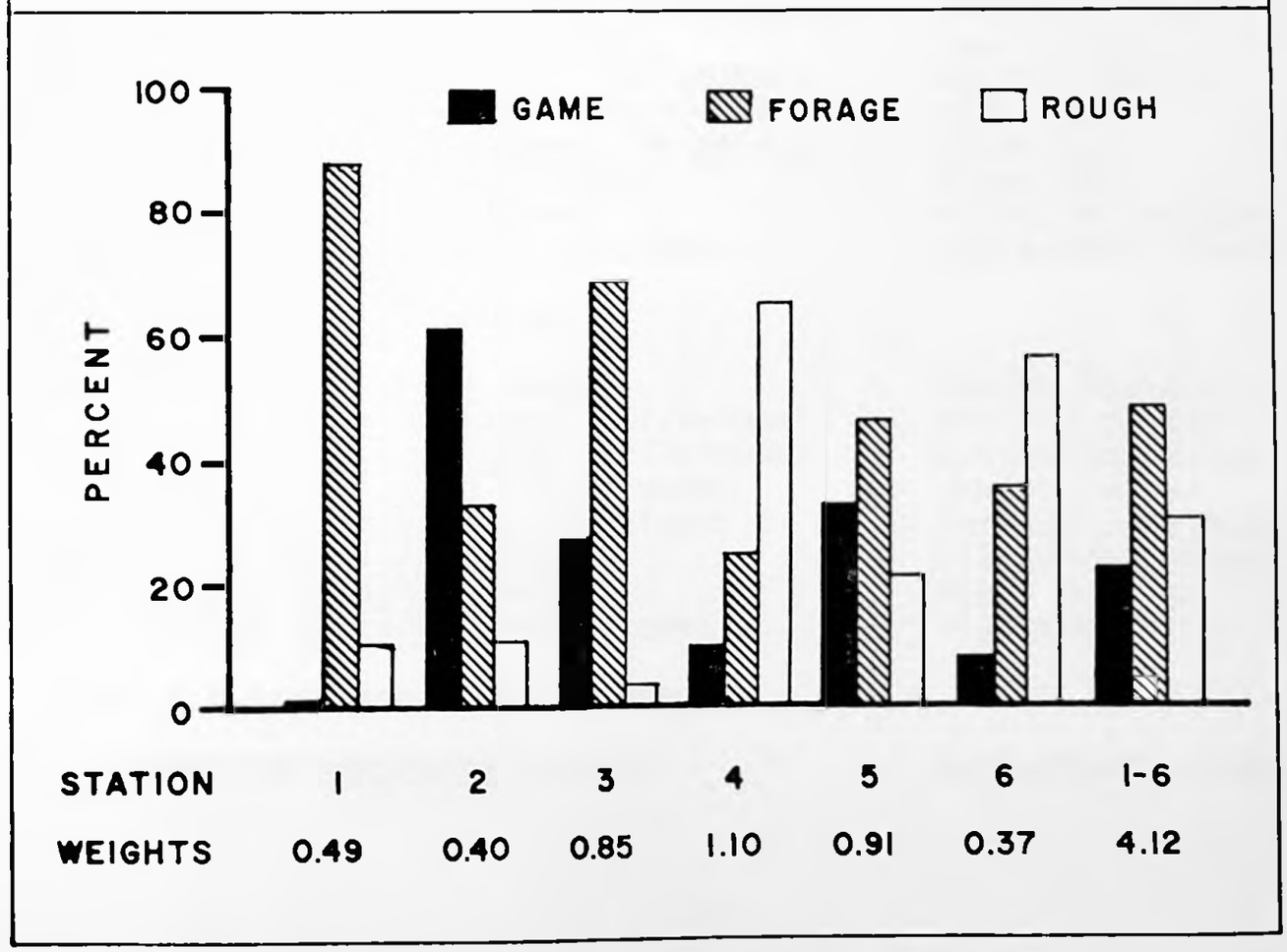

GAME
FORAGE
ROUGH
PERCENT
100
80
60
40
20
0
STATION 1 2 3 4 5 6 1-6
WEIGHTS 0.49 0.40 0.85 1.10 0.91 0.37 4.12

Table 1. List of fishes collected at six sampling stations on Beech Fork and Miller's Fork of Beech Fork, Cabell and Wayne Counties, West Virginia.

GAME FISHES	
Family Centrarchidae (Sunfishes)	
Lepomis cyanellus (Rafinesque)	Green Sunfish
Lepomis megalotis (Rafinesque)	Longear Sunfish
Lepomis macrochirus (Rafinesque)	Bluegill
Micropterus salmoides (Lacepede)	Largemouth Bass
Micropterus punctulatus (Rafinesque)	Spotted Bass
Ambloplites rupestris (Rafinesque)	Rockbass
FORAGE FISHES	
Family Atherinidae (Silversides)	
Labidesthes sicculus (Cope)	Brook Silverside
Family Cyprinidae (Minnows)	
Pimephales notatus (Rafinesque)	Bluntnose Minnow
Notropis chrysocephalus (Rafinesque)	Striped Shiner
Notropis stramineus (Cope)	Sand Shiner
Notropis atherinoides (Rafinesque)	Emerald Shiner
Campostoma anomalum (Rafinesque)	Stoneroller
Semotilus atromaculatus (Mitchell)	Creek Chub
Hybopsis micropogon (Cope)	River Chub
Ericymba buccata (Cope)	Silverjaw Minnow
Phenacobius mirabilis (Girard)	Suckermouth Minnow
Family Percidae (Perches)	
Etheostoma zonale (Cope)	Banded Darter
Etheostoma flabellare (Rafinesque)	Fantail Darter
Etheostoma blennoides (Rafinesque)	Greenside Darter
Etheostoma nigrum (Rafinesque)	Johnny Darter
Etheostoma variatum (Kirtland)	Variegate Darter
Perina maculata (Girard)	Glackside Darter
Percina sciera (Swain)	Dusky Darter
Percina caprodes (Rafinesque)	Logperch
Family Petromyzontidae (Lampreys)	
Lampetra aepyptera (Abbott)	Least Brook Lamprey

Table 1. (Concluded)

ROUGH FISHES

Family Catostomidae (Suckers)

Hypentelium nigricans (Lesueur)	Northern Hogsucker
Catostomus commersoni (Lacepede)	Common White Sucker
Moxostoma erythrurum (Rafinesque)	Golden Redhorse
Mosostoma anisurum (Rafinesque)	Silver Redhorse

Family Ictaluridae (Freshwater Catfishes)

Ictalurus melas (Rafinesque)	Black Bullhead
Noturus miurus (Jordan)	Brindled Madtom

Table 2. Percentage frequency distributions of game, forage and rough fishes by total numbers and by weight (in grams). All fishes collected from Beech Fork and Miller's Fork of Beech Fork, Cabell and Wayne Counties, West Virginia.

Station	Percentage Frequency (Numbers)			Percentage Frequency (Weight-kg.)		
	Game	Forage	Rough	Game	Forage	Rough
1	1.59	96.03	2.38	1.28	88.24	10.48
2	10.95	86.13	2.92	61.22	32.48	6.30
3	12.71	83.98	3.31	27.42	68.94	3.64
4	16.95	47.46	35.59	9.80	24.94	65.26
5	9.26	83.95	6.79	32.61	46.48	20.91
6	3.61	79.52	16.87	7.89	35.51	56.60
Total	9.09	83.02	7.89	22.31	47.99	29.70

Total Number 738 Total Weight 4.13 kg.

Table 3. Estimated standing crop of fishes in pounds per acre for six collection stations of Miller's Fork and Beech Fork, Cabell and Wayne Counties, West Virginia.

Station	Surface Area Sampled (in acres)	Pounds Per Acre
1	0.064	16.94
2	0.117	7.57
3	0.060	31.08
4	0.116	20.91
5	0.202	9.98
6	0.079	4.50
	Average	15.16

Table 4. Composition, number and collection stations of fishes from Beech Fork and Miller's Fork, Cabell and Wayne Counties, West Virginia.

GAME FISHES - 68

Family Centrarchidae (Sunfishes)

Green Sunfish (32) 1, 2, 3, 4, 5, 6.
Longear Sunfish (3) 2, 3, 5.
Bluegill (17) 2, 5.
Largemouth Bass (4) 3.
Spotted Bass (10) 2, 3, 4, 5, 6.
Rockbass (2) 2.

FORAGE FISHES - 621

Family Atherinidae (Silversides)

Brook Silversides (1) 1.

Family Cyprinidae (Minnows)

Bluntnose Minnow (233) 1, 2, 3, 4, 5, 6.
Striped Shiner (99) 1, 2, 3, 4, 5, 6.
Sand Shiner (53) 1, 2, 3, 6.
Emerald Shiner (7) 6.
Stoneroller (70) 1, 3, 5.
Creek Chub (22) 1, 3, 4, 5.
River Chub (45) 5, 6.
Silverjaw Minnow (10) 5, 6.
Suckermouth Minnow (1) 5.

Family Percidae (Perches)

Banded Darter (18) 1, 2, 3, 5, 6.
Fantail Darter (10) 3, 5, 6.
Greenside Darter (10) 2, 5.
Johnny Darter (16) 5, 6.
Variegate Darter (5) 5.
Blackside Darter (5) 1, 2, 3, 6.
Dusky Darter (3) 5, 6.
Logperch (6) 2, 3, 4, 5.

Family Petromyzontidae (Lampreys)

Least Brook Lamprey (7) 3, 4, 5, 6.

Table 4. (Concluded)

ROUGH FISHES - 59

Family Catostomidae (Suckers)

Northern Hogsucker (26) 1, 2, 3, 5, 6.
Common White Sucker (9) 3, 4.
Golden Redhorse (17) 4, 6.
Silver Redhorse (2) 3, 5.

Family Ictaluridae (Freshwater Catfishes)

Black Bullhead (1) 3.
Brindled Madtom (4) 2, 6.

The forage fishes made up the largest frequencies in both number and weight with 83.02 and 47.99 percent, respectively. Four families, comprising 19 species, made up the group with the bluntnose minnow, Pimephales notatus (Rafinesque), accounting for over 37 percent in number. The striped shiner, Notropis chrysocephalus (Rafinesque), and creek chub, Semotilus atromaculatus (Mitchell), represented 29 and 23.4 percent of the weight, respectively. The forage fishes at Station 1 contained the largest percentage frequency in both weight (88%) and number (96%). Only the Bluntnose minnow and the Striped shiner were found at all six collection stations. The families Cyprinidae and Percidae were represented by 9 and 8 species, respectively.

The rough fishes made up only 7.89 percent of the entire collection in number but contained 29.70 percent of the total weight. The Northern hogsucker, Hypentelium nigricans (Lesueur), had both the greatest frequencies in number and weight with 44 and 36.4 percent, respectively. The Common white sucker, Catostomus commersoni (Lacepede), and the Golden redhorse, Moxostoma erythrurum (Rafinesque), composed 31.5 and 29.3 percent, respectively, of the weight. The rough fishes at Station 4 had the largest percentage frequency in both number (35.59%) and weight (65.26%).

An estimate of the standing crop for fishes was determined at all six stations (Table 3). A mean of 15.16 pounds per acre was calculated. Stations 3 and 6 showed

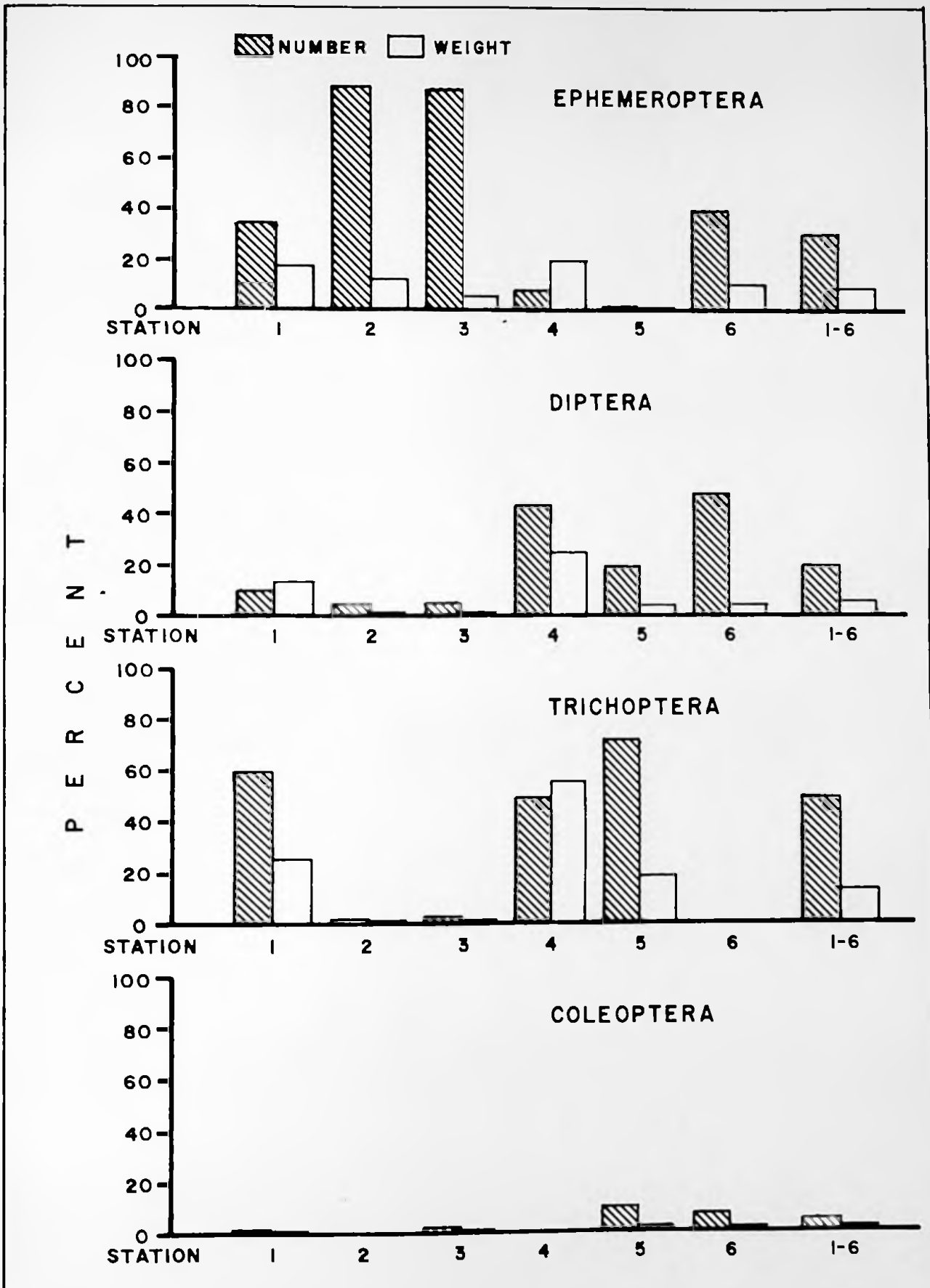
the largest and lowest standing crops, with 31.08 and 4.50 pounds per acre, respectively.

Benthic Invertebrates. The benthic macroinvertebrates, numbering 1535 and weighing 20.3564 grams, (Figures 3 and 4), were collected at all six stations. Twelve orders were represented including 26 families, 31 genera and about 35 species. Taxonomic groupings identified in the investigation included Ephemeroptera, Diptera, Coleoptera, Trichoptera, Plecoptera, Megaloptera, Odonata, Decapoda, Oligochaeta, Pelecypoda, Hemiptera and Isopoda. Complete listings of all taxa as well as percent frequencies of number and weight can be found in Tables 5 and 6.

Ephemeropterans (mayflies) showed the highest species diversity and consisted of seven families with about eleven species. The order comprised 27.88 percent of the total benthic invertebrate population by number and 6.54 percent by weight. The mayfly Isonychia contained the greatest frequency (25.7%) followed by Stenonema vicarium (Walker) (24.3%) and S. tripunctatum (Banks) (23.4%). The greatest number of ephemeropterans occurred at Station 1 (210). The mayflies at Station 4 had the greatest frequency by weight (17.86%) while Station 2 had the greatest frequency by number (85.88%).

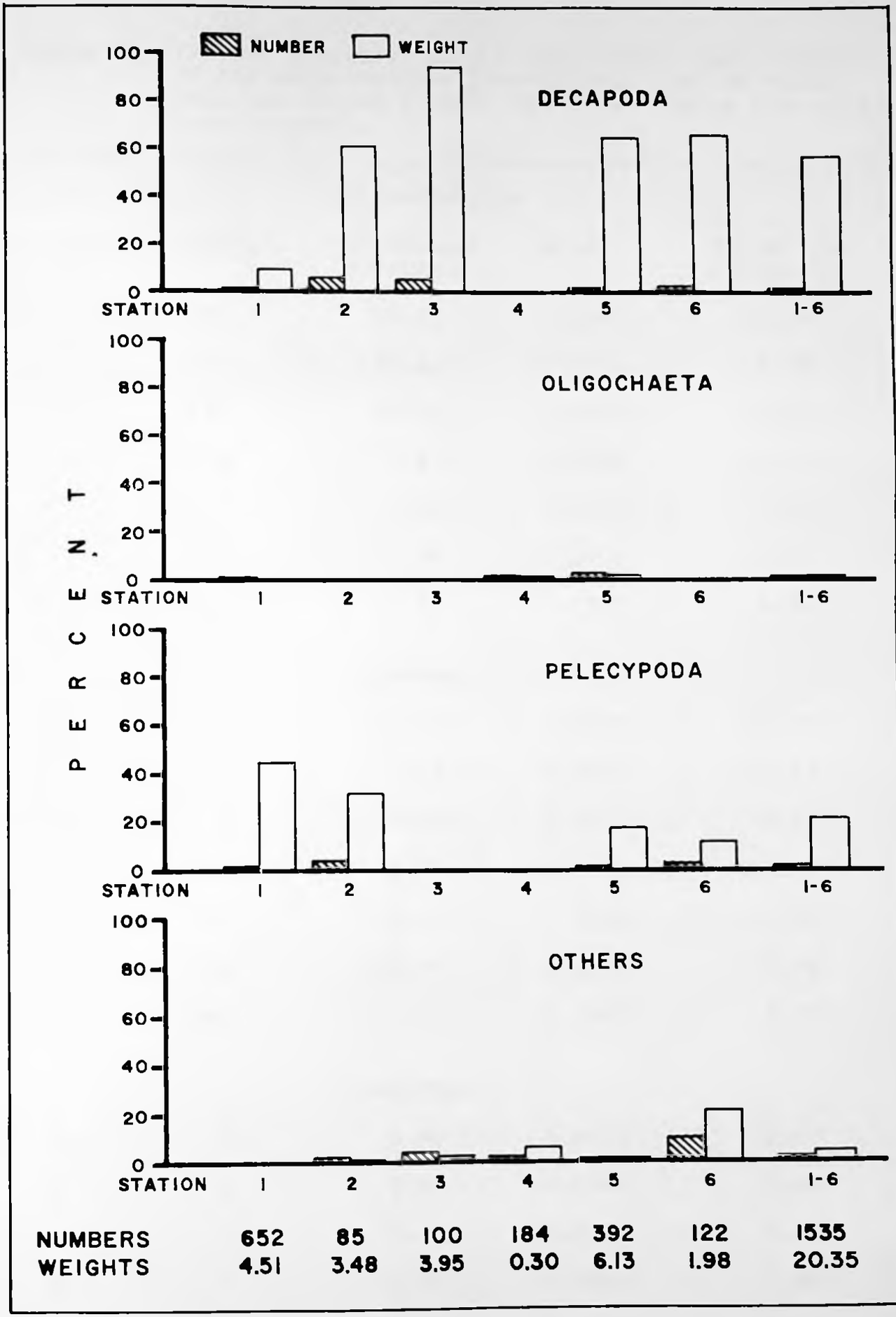
Dipterans (true flies) were represented by four families and about five species. They contained the largest numerical frequency at Station 6 (45.90). At Station 4 they accounted for 22.50 percent by weight. The genera Chironomus (155) and Tipula (94) showed the greatest numbers. Of the total benthic invertebrate population, dipterans comprised 17.33

Figure 3. Percentage frequency of the total number and weight of Trichoptera, Ephemeroptera, Diptera and Coleoptera (by stations) in Beech Fork and Miller's Fork of Twelvepole Creek, Wayne and Cabell Counties, West Virginia.



NUMBERS	652	85	100	184	392	122	1535
WEIGHTS	4.51	3.48	3.95	0.30	6.13	1.98	20.35

Figure 4. Percentage frequency of the total number and weight of Decapoda, Oligochaeta, Pelecypoda and Others (Plecoptera, Megaloptera, Odonata, Isopoda and Hemiptera) in Beech Fork and Miller's Fork of Twelvepole Creek, Wayne and Cabell Counties, West Virginia. Weights are listed in grams.



NUMBERS	652	85	100	184	392	122	1535
WEIGHTS	4.51	3.48	3.95	0.30	6.13	1.98	20.35

Table 5. Percent frequency of the total number and weight of the major benthic invertebrate taxa in Beech Fork and Miller's Fork, Cabell and Wayne Counties, West Virginia.

Station	Number	Percentage Frequency	Weight	Percentage Frequency
		EPHEMEROPTERA		
1	210	32.21	0.6146	13.63
2	73	85.88	0.3262	9.38
3	85	85.00	0.1660	4.20
4	14	7.61	0.0542	17.86
5	1	0.26	0.0044	0.07
6	45	36.89	0.1653	8.34
Total (1-6)	428	27.88	1.3307	6.54
		DIPTERA		
1	59	9.05	0.5075	11.25
2	3	3.53	0.0039	0.11
3	4	4.00	0.0071	0.18
4	78	42.39	0.0683	22.50
5	66	16.84	0.1492	2.43
6	56	45.90	0.0487	2.46
Total (1-6)	266	17.33	0.7847	3.85
		COLEOPTERA		
1	3	0.46	0.0024	0.05
2	0	0.00	0.0000	0.00
3	2	2.00	0.0017	0.04
4	0	0.00	0.0000	0.00
5	31	7.91	0.0263	0.43
6	7	5.74	0.0053	0.27
Total (1-6)	43	2.80	0.0357	0.18

Table 5. (Continued)

Station	Number	Percentage Frequency	Weight	Percentage Frequency
		TRICHOPTERA		
1	370	56.75	1.0764	23.86
2	1	1.18	0.0039	0.11
3	2	2.00	0.0005	0.01
4	89	48.37	0.1655	54.53
5	276	70.41	0.9596	15.65
6	0	0.00	0.0000	0.00
Total (1-6)	738	48.08	2.2059	10.84
		PLECOPTERA		
1	0	0.00	0.0000	0.00
2	0	0.00	0.0000	0.00
3	0	0.00	0.0000	0.00
4	0	0.00	0.0000	0.00
5	0	0.00	0.0000	0.00
6	1	0.82	0.0184	0.93
Total (1-6)	1	0.07	0.0184	0.09
		MEGALOPTERA		
1	0	0.00	0.0000	0.00
2	0	0.00	0.0000	0.00
3	0	0.00	0.0000	0.00
4	1	0.54	0.0009	0.30
5	1	0.26	0.0181	0.30
6	3	2.46	0.0152	0.77
Total (1-6)	5	0.33	0.0342	0.17

Table 5. (Continued)

Station	Number	Percentage Frequency	Weight	Percentage Frequency
		ODONATA		
1	0	0.00	0.0000	0.00
2	1	1.18	0.0000	0.10
3	2	2.00	0.0807	2.04
4	1	0.54	0.0136	4.48
5	0	0.00	0.0000	0.00
6	5	4.10	0.3564	17.98
Total (1-6)	9	0.59	0.4543	2.23
		DECAPODA		
1	1	0.15	0.3355	7.44
2	4	4.71	2.0907	60.15
3	4	4.00	3.6887	93.34
4	0	0.00	0.0000	0.00
5	4	1.02	3.9316	64.11
6	2	1.64	1.2782	64.49
Total (1-6)	15	0.98	11.3247	55.63
		ISOPODA		
1	0	0.00	0.0000	0.00
2	0	0.00	0.0000	0.00
3	0	0.00	0.0000	0.00
4	0	0.00	0.0000	0.00
5	0	0.00	0.0000	0.00
6	1	0.82	0.0006	0.03
Total (1-6)	1	0.07	0.0006	0.00

Table 5. (Concluded)

Station	Number	Percentage Frequency	Weight	Percentage Frequency
		OLIGOCHAETA		
1	1	0.15	0.0003	0.00
2	0	0.00	0.0000	0.00
3	0	0.00	0.0000	0.00
4	1	0.54	0.0010	0.33
5	9	2.30	0.0500	0.82
6	0	0.00	0.0000	0.00
Total (1-6)	11	0.07	0.0513	0.25
		PELECYPODA		
1	8	1.23	1.9864	44.04
2	3	3.53	1.0475	30.17
3	0	0.00	0.0000	0.00
4	0	0.00	0.0000	0.00
5	4	1.02	0.9932	16.20
6	2	1.64	0.1940	9.79
Total (1-6)	17	1.11	4.2211	20.74
		HEMIPTERA		
1	0	0.00	0.0000	0.00
2	0	0.00	0.0000	0.00
3	1	1.00	0.0072	0.18
4	0	0.00	0.0000	0.00
5	0	0.00	0.0000	0.00
6	0	0.00	0.0000	0.00
Total (1-6)	1	0.07	0.0072	0.04

Table 6. Composition, total number collected (in parenthesis), and collection stations of the benthic invertebrates of Beech Fork and Miller's Fork, Wayne and Cabell Counties, West Virginia.

Ephemeroptera - 428

Family Baetiscidae

Baetisca bajkovi Neave (12) 1, 2, 3, 6.

Family Caenidae

Caenis sp. (6) 3, 2.

Family Ephemerellidae

Ephemerella sp. (3) 3, 2.

Family Ephemeridae

Ephemera sp. (31) 2, 3, 6.

Family Heptageniidae

Stenonema tripunctatum (Banks) (100) 2, 3, 4, 6.
S. vicarium (Walker) (104) 1, 2, 3, 4, 5, 6.
S. interpunctatum (Say) (27) 1, 2.
S. fuscum (Clemens) (5) 1.
Stenonema sp. (2) 1, 3.

Family Leptophlebiidae

Paraleptophlebia sp. (28) 1, 2.

Family Siphlonuridae

Isonychia sp. (110) 1, 4.

Diptera - 266

Family Simuliidae

Simulium sp. (10) 4.

Family Chironomidae

Chironomus sp. (155) 1, 2, 3, 4, 5, 6.

Family Tipulidae

Tipula sp. (94) 1, 2, 4, 5, 6.
Limnophila sp. (6) 1, 3, 5.

Table 6. (Continued)

Family Tabanidae

Tabanus sp. (1) 6.

Coleoptera - 43

Family Haliplidae

Heliplus sp. (1) 3.

Family Psephenidae

Psephenus herricki (DeKay) (3) 3, 6.

Family Elmidae

Stenelmis sp. (39) 1, 5, 6.

Trichoptera - 738

Family Hydropsychidae

Hydropsyche sp. (71) 4, 5.
Cheumatopsyche sp. (600) 1, 2, 4, 5.

Family Philopotamidae

Chimarra sp. (62) 1, 5.

Family Limnophilidae

Pycnopsyche sp. (5) 1, 3, 4.

Plecoptera - 1

Family Perlidae

Acroneuria perplexa Frison (1) 6.

Megaloptera - 5

Family Sialidae

Sialis sp. (4) 4, 6.

Family Corydalidae

Corydalus cornutus Linnaeus (1) 5.

Odonata - 9

Family Aeschnidae

Aeschna sp. (1) 3.

Table 6. (Concluded)

Family Gomphidae

Gomphus sp. (3) 3, 6.

Family Macromiidae

Macromia sp. (2) 6.

Family Agrionidae

Agria sp. (3) 2, 4, 6.

Decapoda - 15

Family Astacidae

Orconectes sanborni sanborni (Fraxon) (15) 1, 2, 3, 5, 6.

Oligochaeta - 11

sp. (11) 1, 4, 5.

Pelecypoda - 17

Musculium sp. (17) 1, 2, 5, 6.

Hemiptera - 1

Family Notonectidae

Notonecta sp. (1) 3.

Isopoda - 1

Asellus sp. (1) 6.

percent by number and 3.85 percent by weight.

Coleopterans (beetles) contained three families and about four species. At Station 5, they had the greatest frequency in both number (7.91%) and weight (0.43%). The genus Stenelmis made up 91 percent of the beetles.

Trichoptera, the largest order in the study, contained 738 specimens and comprised 48 percent of the total invertebrate investigation. Caddisflies at Station 1 had the largest number of larvae (370) while Stations 4 and 5 had the greatest frequency by number and weight with 70.41 and 54.53 percent, respectively. The genus Cheumatopsyche contained 600 specimens and was the most abundant benthic invertebrate in the entire study.

Although the order Decapoda made up less than one percent of the benthic invertebrates, crayfishes comprised 55.63 percent of the total weight. All individuals were of the same species, Orconectes sanborni sanborni (Fraxon).

The order Pelecypoda (clams) also had a small frequency (1.11%), but made up 20.74 percent of the total weight. The genus Musculium made up the total population of clams.

The order Odonata (dragonflies and damselflies) was represented by four families with at least four species. Only at station 6 was the frequency by weight considerable (17.98%). The total frequencies by number and weight were 0.59 and 2.23 percent, respectively.

The orders Plecoptera (stoneflies), Megaloptera (megalopterans), Isopoda (isopods), Oligochaeta (annelid worms) and Hemiptera (true bugs) were all relatively small

in both number and weight and were combined into one group entitled 'Others' in Figure 4. Their total frequencies by number and weight were 0.61 and 0.55 percent, respectively (Tables 5 and 6).

Stomach Analysis of Fishes. Stomach analysis of the game fishes revealed that the Largemouth bass was primarily psicivorous while the Green sunfish, Longear sunfish and the Spotted bass were omnivorous in their diet. Of the forage fishes the Bluntnose minnow, Stoneroller, Striped shiner and Least brook lamprey were herbivorous while the Creek chub, Banded darter, Fantail darter, Blackside darter and the Logperch were omnivorous. All of the rough fishes, including the Northern hogsucker, Common white sucker and Black bullhead, were omnivorous while both of the suckers were scavengers. A complete list of stomach analysis contents can be found in Table 7.

Water Chemistry and Temperature. Water chemistry analysis showed a mean pH of 7.8 and a mean dissolved oxygen content of 7.2 mg/l. Alkalinity and total hardness both showed a mean of 99.8 mg/l $CaCO_3$. The mean temperature was 62.3 F (16.8 C). Results of the water chemistry and temperature analysis can be found in Table 8.

Coliform Bacteria. All six stations gave a positive result for the presumptive, lactose broth fermentation test. These data indicate that there was a possibility that Escherichia coli were present. The confirmed test was also positive which indicated that coliform bacteria were present due to the presence of metallic green colonies. A completed test was

Table 7. Stomach content analysis of all fishes from Station 3, Miller's Fork of Beech Fork, Cabell and Wayne Counties, West Virginia.

GAME FISHES

Green Sunfish - *Stenonema tripunctatum* (57.8%)
Crayfish (38.2%)
Plant material (3.9%)
Microcrustaceans (trace)

Longear Sunfish - *Caenis* sp. (34.4%)
Stenonema sp. (62.1%)
Isonychia sp. (3.5%)

Largemouth Bass - fish (unidentifiable) (98.3%)
insect material (1.7%)
plant material (trace)

Spotted Bass - Digested mass including plant algae, water beetle larvae, diptera and odonate larvae

FORAGE FISHES

Bluntnose Minnow - Algae (filamentous) and bottom ooze.

Stoneroller - Algae (filamentous) and bottom ooze.

Striped Shiner - Algae (filamentous) and bottom ooze.

Sand Shiner - Algae (filamentous) and bottom ooze.

Creek Chub - Gomphidae sp. (78.4%)
Plant material (21.4%)

Banded Darter - Traces of Oligochaeta, Caddisfly larvae, microcrustaceans, Coleoptera larvae and *Stenonema* sp.

Fantail Darter - *Caenis* (98%)
microcrustaceans (trace)

Blackside Darter - *Stenonema* sp. (99%)
microcrustaceans (trace)

Table 7. (Concluded)

Logperch	Trace of caddisfly larvae.
Least Brook Lamprey	detritus and bottom ooze.
ROUGH FISHES	
Northern Hogsucker	Microcrustaceans and bottom ooze.
Common White Sucker	Microcrustaceans and chironomids (trace)
Black Bullhead	Microcrustaceans, plant material and filamentous algae.

Table 8. Water Analysis of Beech Fork and Miller's Fork of Beech Fork Creek, Cabell and Wayne Counties, West Virginia.

Station	Temp. (F)	Temp. (C)	pH	Dissolved Oxygen (mg/l)	Alkalinity (mg/l $CaCO_3$)	Hardness (mg/l $CaCO_3$)
1	55	(12.8)	7.8	7	102.6	102.6
2	54	(12.2)	7.5	6	102.6	102.6
3	67	(19.4)	8.8	9	136.8	136.8
4	65	(18.3)	7.8	7	68.4	85.5
5	67	(19.4)	7.3	5	102.6	85.5
6	66	(18.9)	7.7	9	85.5	85.5
Average	62.3	(16.8)	7.8	7.2	99.8	99.8

performed which indicated that Stations 1, 2, 3, 4, and 6 did not contain human fecal Escherichia coli. The results at Station 5 gave a positive test but, by using the viable plate count method, indicated only trace amounts. All six stations did contain other forms of coliform bacteria which made the water non-potable but, other than Station 5, these coliforms were not from human, fecal sources.

Riparian Vegetation. The riparian vegetation was observed noted from the stream banks adjacent to Stations 4 and 6. A total of 25 species were listed (Table 9), most of which were characteristically tolerant to saturated soils and occasional flooding. Representative tree species observed at both stations included American sycamore, silver maple, river birch, slippery elm, yellow buckeye, flowering dogwood, black walnut and boxelder. Riparian shrubs were observed at Station 4 with Virginia creeper, poison ivy and greenbriar growing in abundance.

Forested Slopes. Trees from three forested slopes were identified. The diameters of more than one inch at breast height (4.5 feet) were recorded and their total basal areas determined for each individual species. Listings of the individual species, including their diameters and basal areas, can be found in Tables 10-13.

The first continuous line transect (situated north 20° west, 0.0904 acres) revealed the red oak, Quercus rubra as the dominant species representing 61.56 square feet per acre.

Table 9. Riparian vegetation surveyed from collection stations 4 (Miller's Fork) and 6 (Beech Fork), Cabell and Wayne Counties, West Virginia.

Station 4	
Platanus occidentalis	American Sycamore
Acer saccharinum	Silver Maple
Betula nigra	River Birch
Ulmus fulva	Slippery Elm
Aesculus octandra	Yellow Buckeye
Prunus serotina	Black Cherry
Acer negundo	Boxelder
Salix nigra	Black Willow
Acer saccharum	Sugar Maple
Acer saccharinum	Silver Maple
Asimina triloba	Pawpaw
Juglans nigra	Black Walnut
Cornus florida	Flowering Dogwood
Liriodendron tulipifera	Tulip Poplar
Lindera benzoin	Spicebush
Ostrya virginiana	Ironwood
Ostrya virginiana	Ironwood
Vitis riparia	Wild Grape
Rhus radicans	Poison Ivy
Parthenocissus quinquefolia	Virginia Creeper
Fraxinus pennsylvanica	Green Ash
Smilax sp.	Green Briar
Rubus sp. (Subgenera *Eubatus*)	Blackberry
Rubus sp.	Elderberry
Station 6	
Populus deltoides	Eastern Cottonwood
Juglans nigra	Black Walnut
Acer negundo	Boxelder
Fagus grandifolia	American Beech
Cornus florida	Flowering Dogwood
Aesculus octandra	Yellow Buckeye
Ulmus fulva	Slippery Elm
Betula nigra	River Birch
Acer saccharinum	Silver Maple
Platanus occidentalis	American Sycamore

Table 10. Forested slope vegetation in diameter classes (by plot) with total basal areas (sq in) of a 300 foot continuous line transect with a 34 percent slope descending north 20° west between Stower's Branch and Miller's Fork of Beech Fork Lake, Cabell and Wayne Counties, West Virginia.

Plot I (100 feet X 13.12 feet)	
Carya ovata 6	33.18
Acer saccharum 1, 1, 1, 2, 2, 2, 2, 5	49.71
Quercus rubra 8, 8, 12, 13	379.30
Fraxinus americana 4	15.91
Quercus alba 6, 7, 8, 11, 13	381.11
Betula nigra 1, 1, 1	5.31
Pinus echinata 3, 5	33.38
Nyssa sylvatica 1, 1	3.54
TOTAL	900.44
Plot II (100 feet X 13.12 feet)	
Juniperus virginiana 1	1.77
Cercis canadensis 1, 1, 2, 2, 4	29.27
Liriodendron tulipifera 1, 2, 4	22.59
Acer saccharum 1, 1	3.54
Sassafras albidum 1	1.77
Cornus florida 1, 1	3.54
Robinia pseudo-accacia 7	44.18
Carya laciniosa 1	1.77
Quercus rubra 7, 7	88.36
Betula nigra 1	1.77
Fagus grandifolia 1, 1, 1	5.31
TOTAL	203.87
Plot III (100 feet X 13.12 feet)	
Fagus grandifolia 23	433.70
Quercus rubra 1, 1, 20	333.64
Acer saccharum 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 3, 4	84.68
Carya laciniosa 1	1.77
Fraxinus americana 2, 3	14.53
Cercis canadensis 2, 3	14.53
Betula nigra 1	1.77
Liriodendron tulipifera 9	70.88
Carya tomentosa 1	1.77
Cornus florida 1	1.77
TOTAL	959.04
TOTAL PLOTS I-III	2063.35

Total Area Sampled 0.0904 Acres

Table 11. Forested slope vegetation in diameter classes (by plot) with total basal areas (sq in) of a 300 foot continuous line transect with a 29 percent slope descending north 90° east between Stower's Branch and Miller's Fork of Beech Fork Lake, Cabell and Wayne Counties, West Virginia.

Plot I (100 feet X 13.12 feet)	
Acer saccharum 1, 1, 1, 1, 1, 1, 1, 2, 2, 6, 11, 13	302.39
Ulmus fulva 3	9.62
Quercus rubra 3, 5, 9	104.26
Quercus alba 3, 12, 20	462.42
Carya laciniosa 1, 5	25.53
Fagus grandifolia 3	9.62
TOTAL	913.84
Plot II (100 feet X 13.12 feet)	
Acer rubrum 1, 1, 1, 1, 1, 1, 1, 3, 3, 5, 5, 13	222.25
Cornus florida 1	1.77
Quercus rubra 8	56.75
Carya ovata 8	56.75
Carya laciniosa 1	1.77
Acer saccharum 1, 1, 1, 3	14.93
Quercus alba 2, 2, 3, 8, 9	147.07
Prunus serotina 1	1.77
TOTAL	503.06
Plot III (100 feet X 13.12 feet)	
Cornus florida 2	4.91
Carya laciniosa 3	9.62
Quercus alba 4, 8, 24	544.06
Acer rubrum 1, 1	3.54
Quercus bicolor 1	1.77
Sassafras albidum 1	1.77
Prunus serotina 2, 2	9.82
Quercus rubra 2	4.91
Fagus grandifolia 3, 14, 16, 17, 21, 34	1926.92
Acer saccharum 4, 4, 12, 14	312.94
TOTAL	2820.26
TOTAL PLOTS I-III	4237.16
Total Area Sampled 0.0904 Acres	

Table 12. Forested slope vegetation in diameter classes (by plot) with total basal areas (sq in) of a 300 foot continuous line transect with a 25 percent slope descending south 35° east between Stower's Branch and Miller's Fork of Beech Fork Lake, Cabell and Wayne Counties, West Virginia.

Plot I (100 feet X 13.12 feet)	
Quercus alba 13, 16, 17, 18	866.20
Acer saccharum 1, 1, 1, 1, 1, 2, 2, 3	28.29
Betula nigra 1	1.77
Nyssa sylvatica 2, 2	9.82
Carya ovata 2, 5, 8	85.42
Quercus rubra 3, 4	25.53
Prunus serotina 1, 1	3.54
Cornus florida 1, 1, 1, 1, 3	16.70
Carya tomentosa 1, 7, 7, 12	212.83
Quercus bicolor 1, 2	6.68
TOTAL	1256.78
Plot II (100 feet X 13.12 feet)	
Quercus alba 6, 18, 19	600.58
Nyssa sylvatica 1	1.77
Betula nigra 1, 2	6.68
Acer saccharum 1, 1, 2, 2, 3, 3	32.60
Carya tomentosa 1, 5, 6, 11, 14	327.71
Quercus velutina 3, 18	278.42
Sassafras albidum 4, 7	60.09
Acer rubrum 1, 1	3.54
Fraxinus americana 1, 1	3.54
Quercus rubra 12	122.70
Fagus grandifolia 1, 2	6.68
TOTAL	1444.31
Plot III (100 feet X 13.12 feet)	
Quercus velutina 8, 13, 21, 24	1034.35
Nyssa sylvatica 1, 2, 6	39.86
Ulmus fulva 1	1.77
Prunus serotina 1, 2	6.68
Acer saccharum 1, 1, 1, 2, 3	19.84
Carya tomentosa 4	15.91
Sassafras albidum 4, 7	60.09
Quercus alba 5, 7, 10	154.53
Acer rubrum 6, 11	137.08
Quercus palustris 22	397.60
Carya laciniosa 4, 7, 11	163.99
Pinus echinata 13	143.10

Table 12. (Concluded)

Quercus rubra 9	70.88
Carya ovata 4, 5	39.67
Populus deltoides 4	15.91
Cornus florida 2, 3, 3	24.16
TOTAL	2325.41
TOTAL PLOTS I-III	5026.50

Total Area Sampled 0.0904 Acres

Table 13. Forested slope vegetation with total basal areas (sq ft/ acre) of three continuous line transects between Stower's Branch and Miller's Fork, Cabell and Wayne Counties, West Virginia.

Plot Location: north 20° west Area Sampled: 0.0904 acres	Total Basal Area (sq ft/ acre)
Quercus rubra	61.56
Fagus grandifolia	33.72
Quercus alba	29.28
Acer saccharum	10.52
Liriodendron tulipifera	7.18
Robinia pseudo-acacia	3.39
Cercis canadensis	3.36
Pinus echinata	2.56
Carya ovata	2.55
Fraxinus americana	2.34
Betula nigra	0.68
Cornus florida	0.41
Nyssa sylvatica	0.27
Carya laciniosa	0.27
Juniperus virginiana	0.14
Sassafras albidum	0.14
Carya tomentosa	0.14
Total	158.51

Plot Location: north 90° east Area Sampled: 0.0904 acres	Total Basal Area (sq ft/ acre)
Fagus grandifolia	148.76
Quercus alba	88.61
Acer saccharum	48.42
Acer rubrum	17.34
Quercus rubra	12.75
Carya ovata	4.36
Carya laciciosa	2.84
Prunus serotina	0.89
Ulmus fulva	0.74
Cornus florida	0.51
Quercus bicolor	0.14
Sassafras albidum	0.14
Total	325.50

Plot Location: south 35° east Area Sampled: 0.0904 acres	
Quercus alba	124.55
Quercus velutina	100.85

Table 13. (Concluded)

Plot Location: south 35° east (cont.)	Total Basal Area (sq ft/ acre)
Carya tomentosa	42.75
Quercus palustris	30.54
Quercus rubra	16.83
Carya laciniosa	12.60
Pinus echinata	10.99
Acer rubrum	10.80
Carya ovata	9.61
Sassafras albidum	9.23
Acer saccharum	6.20
Nyssa sylvatica	3.95
Cornus florida	3.14
Populus deltoides	1.22
Prunus serotina	0.79
Betula nigra	0.65
Quercus bicolor	0.51
Fagus grandifolia	0.51
Fraxinus americana	0.27
Ulmus fulva	0.14
Total	385.13

White oak, Quercus alba, and American beech, Fagus grandifolia, were also noted as important species with 33.72 and 29.28 square feet per acre, respectively. Total square feet per acre for all species was 158.51.

The second transect (north 90° east, 0.0904 acres) was overwhelmingly dominated by American beech with 148.76 square feet per acre. Again, white oak was common (88.61 sq ft/ acre) followed by sugar maple, Acer saccharum, (48.42 sq ft/ acre). Total square feet per acre for all species was 325.50.

The third transect (south 35° east, 0.0904 acres) was dominated by white oak with 124.55 square feet per acre followed closely by black oak, Quercus velutina, with 100.85 square feet per acre. Mockernut hickory, Carya tomentosa, and pin oak, Quercus palustris, represented 42.75 and 30.54 square feet per acre, respectively. The total composition of all species accounted for 385.13 square feet per acre.

Sociological Impact Questionnaire. Of the seventy-five questionnaires that were distributed, twenty-five (33.3%) were completed and returned (Table 14).

The number of people per household had a mean of three and ranged in number from one to five people. The mean age range of the households was 31-50 years of age (28%) while age groups 11-18 and 19-30 represented 20 percent each. Primary source location for employment was Huntington, West Virginia (55.6%) while 22.2 percent of the sample population

Table 14. Questionnaire results from 75 forms distributed to Beech Fork Area residents with number of responses (in parentheses), percentages of responses and comments made by residents.

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1. Number of persons in your household:
   (25) Average: 3 Range: 1-5

2. How many persons in your household fall into each of these categories of age groups:
   (25)

0 - 10	13.3%
11 - 18	20.0%
19 - 30	20.0%
31 - 50	28.0%
51 - 65	8.0%
66 & over	10.7%

3. Where is your primary source of employment:
   (24)

Huntington	55.6%
Wayne	3.7%
Ashland	3.7%
Ironton	3.7%
Burnaugh, Ky.	3.7%
Bowen Campground	3.7%
Retired	22.2%
Other	3.7%

4. Has Beech Fork Lake and the new communities that have developed in the area, as well as the boating, swimming, fishing, hunting, camping, picnicing and business been worth it all:
   (24)
   YES - 55.6% NO - 33.3% No Comment - 11.1%

5. Did you have to sell any portion of your land for the Beech Fork Lake Project? If so, was it a fair price:
   (24) (3) YES - 16.7% NO - 83.3% Fair - 33.3% Not fair - 66.7%

6. Has housing and property value gone up because of the lake:
   (24) YES - 58.3% NO - 16.7% Don't know - 25.0%

7. Did you favor the Beech Fork Lake Project from the very beginning? Why or why not?
   (19) YES - 52.6% NO - 47.4% (See comments in results)

8. Have you, in the last three years, raised farm crops on your property? If so, what were some of your primary crops?
   (21) YES - 42.9% NO - 57.1% (See comments in results)

9. Do you raise a garden which contributes significantly to your family's food supply:
   (23) YES - 69.6% NO - 30.4%

10. Do you feel that the Beech Fork Lake Project has harmed the environment or degraded the general area in any way:
    (22) YES - 31.8% NO - 68.2% (See comments in results)

was retired. The general feeling towards the Beech Fork Lake project was favorable. Most of the people responding to the questionnaire did not have to sell any of their land for the project (83.3%) and the majority (58.3%) felt that property value had risen due to the reservoir. Farming and gardening were common in the area with 42.9 and 69.6 percent responding affirmatively. Area residents primarily felt that the project had not had any adverse effects upon the environment in the general area (68.2%).

Chapter VI

DISCUSSIONS AND CONCLUSIONS

Fishes. Due to the restrictions now placed on the use of rotenone, the electrofishing method was used. Rotenone sampling would have probably given a more accurate, thorough and representative sample. Due to the necessity of wading in the stream to electrofish and net the immobilized fishes, all collections were made in stream conditions where water levels did not exceed 3.5 feet (1.1 m) in depth.

Although game fish numbers were relatively low, it should be recognized that their percentages are on the upswing from pre-impoundment studies (Olson, 1971) (9.09% numerical frequency as compared to 5.42%) while rough fish populations are tailing off in numerical frequency (10.10% compared to 7.89%). Other recorded accounts of the Twelvepole Creek drainage basin, namely the East Fork, show higher percentages of game fishes (Tarter, 1972) but again rotenone was used and lake environments were included in the sample.

Green sunfish and Bluegill sunfishes were the most abundant game fishes in the post-impoundment investigation and it is felt that this is due to the type of environment sampled (small, shallow and relatively sluggish streams) which favor these species (Clay, 1962). Largemouth bass conversely inhabit larger impoundment areas such as lakes or large pools and prefers still waters. Spotted bass

tend to occupy large pools and streams of moderate current. Rockbass prefer substrates of large boulders and occupy large pools more so than riffles and area or beds of vegetation (Clay, 1962). All of these conditions and preferences were hardly met in all six of the sampling area. The figures that were attained are believed to be representative and expected for the study area. However, it is speculated that other investigation areas (lakes and deeper pools), using different methods (rotenoning), would reveal more favorable game fish data. The Grass pickerel was not encountered in this study but is documented in this drainage basin (Evans, 1976).

Forage fishes remained rather constant in number and in weight frequencies (83% and 84% by number and 48% and 41% by weight, post-impoundment versus pre-impoundment, respectively) (Olson, 1971). Again, the type of area studied favors the forage fishes. Forage fishes are more characteristic of streams and are often more numerous than all other fishes combined (Pflieger, 1975). The Bluntnose minnow was extremely abundant and appeared in all six station samples. The Stoneroller and Striped shiner were also present in large numbers. As expected, the River chub was found only in downstream stations from the dam where it had easy and convenient access from the Ohio River.

Darters were lesser in number than the minnows but they have a tendency to prefer swifter riffles than what was encountered. They also have lost their swim bladders

through evolution and sink to the bottom of the stream when they stop swimming and spend most of their time between rocks and vegetation to block the current (Pflieger, 1975). For these reasons electrofishing is less effective in retrieving them.

The rough fishes were the smallest group encountered by number (7.89%) in the sample although they had a moderately high frequency by weight (29.70%). The pre-impoundment study (Olson, 1971) revealed a greater percentage of rough fishes by weight (38.88) but it is common for rough fishes to attain relatively high weights and exceed the weights of all other fishes combined. The Northern hogsucker was the most abundant rough fish in the study. Few catfishes were sampled, probably due to their nocturnal nature. They normally spend their daylight hours in crevices and natural cavities or in deep pools, again out of electroshocking range.

Estimated standing crop figures of 15.16 pounds per acre for the post-impoundment conditions compare quite consistantly with those found in the pre-impoundment study of 17.21 pounds per acre (Olson, 1971). The ranges observed were also consistant between post- and pre-impoundments with 4.50-31.08 and 5.87-35.09 pounds per acre, respectively (Olson, 1971).

A pre-impoundment study of the East Fork of Twelvepole Creek showed a mean standing crop of 87.89 pounds per acre (Tarter, 1972). It is felt that these figures are considerably

higher due to the use of rotenone which is a highly efficient fish toxicant. This again demonstrates the limited range and effectiveness of electrofishing.

Benthic Invertebrates. Benthic invertebrate populations were predominantly the insect orders Trichoptera, Ephemeroptera and Diptera. Trichopterans were the largest order collected and comprised 48 percent of all benthic macroinvertebrates. The frequency by weight (10.84%) is deceiving due to the fact that crayfishes and mollusks were included in the benthic invertebrate sample and obviously accounted for the largest percentages by weight (combined, almost 76% of the total sample weight). So, if these two orders were removed, the Trichoptera would account for approximately 45 percent of the sample weight. At Station 1, the greatest number of caddisfly larvae were found and this was probably due to the enormous amount of leaf litter found at this site. Trichopterans prefer higher plants as one of their primary food sources (Pennak, 1953). Trichopterans were very abundant in the pre-impoundment investigation (28.71% of the total population) and were second only to the order Ephemeroptera (29.47%) (Olson, 1971). So, in comparison, their present status seems rather secure and their future outlook even more promising. As in the pre-impoundment study, the genus Cheumatopsyche is still the most abundant trichopteran.

Ephemeropteran larvae maintained a high numerical frequency (27.88%) and the population seems to be quite stable in comparison to the pre-impoundment investigation (29.47%

of the total benthic invertebrate population) (Olson, 1971). The mayfly nymphs are also a good indicator of favorable water chemistry implying that the Beech Fork waters are of desirable quality. The free-ranging genus Isonychia and the "clingers", Stenonema vicarium and S. tripunctatum, were abundant in the investigation, as they were in the pre-impoundment study (Olson, 1971). These species also prefer higher plants for their primary food source and, thus, the environmental stream conditions, with dense leaf litter, was desirable for their presence.

In his pre-impoundment study, Olson (1971) feared the possibility of high siltation and eutrophication severely damaging the benthic population, especially the Ephemeroptera (due to their delicate gill structures), and eventually destroying the entire food chain. However, it seems as though this condition has never materialized which is sure to cause speculation amongst all concerned ecologists and environmentalists.

Dipteran larvae were relatively plentiful in the study with the genera Chironomus and Tipula comprising the bulk of the specimens. They made up 93.45 percent of the entire benthic population in a post-impoundment study of the East Lynn tailwaters, a tributary of Twelvepole Creek (Goodno, 1975). The total number of 266 dipterans, with a numerical frequency of 17.33 percent, found in the post-impoundment study was substantially higher than that of pre-impoundment which numbered 145 and represented 6.88 percent of the total benthic invertebrate population (Olson, 1971). This increase

is to be expected due to the fact that dipterans (especially chironomids) can tolerate variations in current and are normally one of the first benthic invertebrates to adapt to post-impoundment conditions (Hynes, 1970; Aggus, 1971). Also, they are normally found in great abundance in areas of flooded herbaceous vegetation (Isom, 1971). For these reasons, aquatic dipteran larvae show greater variability in structure and habitat than any other order of aquatic insect (Pennak, 1953).

The only major difference in the composition of benthic invertebrates between pre- and post-impoundment studies is the lack of the order Plecoptera (stoneflies) in the post-impoundment study. Only one stonefly was found in the post-impoundment investigation (Station 6) compared to 385 in the pre-impoundment survey (Olson, 1971).

Many factors could have contributed to the decline of the stonefly population. Probably the two main controlling factors affecting the stoneflies were the reduction in current, which in turn can lower the dissolved oxygen content, and the increase in siltation which can reduce the efficiency of the gills and suffocate the organism (Hynes, 1970). Both of these factors negatively affect the respiratory functions of the insect which is essential for its survival. For the most part, stonefly nymphs prefer swift currents where an abundance of oxygen is present (Pennak, 1953). The stations surveyed in the post-impoundment study did not exemplify these swift current conditions and the stream environment was noticeably more lentic in nature. Siltation is normally

present in reservoir projects of this type, with Beech Fork being no exception.

Studies have shown that slow currents resulting from low flows are attributing to the decline of certain swift water insects, including the stonefly genera Acroneuria and Paragnetina (Trotzky and Gregory, 1974).

An additional controlling factor could be the temperature. However, its effects upon the stoneflies in this region would seem to be less severe than the ones found in previous studies. In reference to anchor and frazil ice, Dr. J. Hanson of the University of Massachusetts reported that a severe cold spell one year in early winter, before the icing over of the streams, almost eliminated the genus Allocapnia from the area around Amherst (Hynes, 1970). Several severe winters have been experienced in this area since impoundment (1977 and 1978) and it could possibly have had some controlling effect on the stonefly population. Also, very few stoneflies occur in Austrian streams in which the temperature rises to more than 25 C (Hynes, 1970). Again, this is a slim possibility, but still gives an insight into the delicacy of the stonefly's existance.

It could also be possible that the collection methods used might have failed to attain a representative stonefly population. But, in light of the composition of the entire benthic invertebrate collection, this seems doubtful.

An over-view of the entire benthic invertebrate population in present conditions would indicate that there are changes occurring due to the impoundment of the basin and

that future investigations should be employed to monitor any new impacts upon the area.

Stomach Analysis of Fishes. The interrelationships among fishes, benthic invertebrates, bacteria, plant material and detritus can be seen and their dependence recognized (Table 7). The food web does characterize a freshwater stream with an abundance of flora and fauna. Their presence illustrates community dynamics and also confirms the assumption that the water quality of adequate, if not exceptional, quality. As confirmed in the pre-impoundment study by Olson (1971), four food groups represent four trophic levels. Algae and detritus, both plant and animal, are characteristic of the first trophic level while most of the benthic invertebrates and some of the forage fishes (Bluntnose minnow, Stoneroller, Striped and Sand shiners, Least brook lamprey, etc.) represent the herbivore or second trophic level. The third trophic level is occupied by the sunfishes, darters and some of the suckers which would be considered carnivore while the top trophic level is occupied by the Largemouth bass which is piscivorous. This series of trophic levels tend to lead to a favorable energy flow through the ecosystem and indicates that the stream is well on its way towards equilibrium after post-impoundment and implies good fishing potential for the future.

Coliform Bacteria. Presumptive, confirmed and completed tests revealed the presence of some coliform in the stream. However, only Station 5 has displayed human, fecal Escherichia coli, and then only in trace amounts (two colonies

per 100 millimeters). This amount falls extremely below the Environmental Protection Agency standards maximum limit of 200 colonies per 100 millimeters (USEPA, 1976). Olson (1971) documented that all ten of his collection stations displayed the presence of E. coli which was of human fecal sources. In comparing the results with the pre-impoundment study (Olson, 1971), it seems that only the presumptive and confirmed tests were performed. The completed test is required to be absolutely positive that the coliform present is indeed human fecal E. coli. Other types of coliform can be present in water supplies making them non-potable for human consumption, but they should not automatically be labeled and documented as human fecal E. coli without the proper completed test.

Water Chemistry. The parameters tested were pH, dissolved oxygen, alkalinity and total hardness. The mean pH was found to be 7.8 (7.3 to 8.8 range,) which was well within the acceptable 6.5 to 9.0 guidelines for freshwater aquatic life (USEPA, 1976). The dissolved oxygen levels were determined to have mean of 7.2 mg/l (range, 5 to 9 mg/l) which was above the minimum concentration, 5.0 mg/l, needed to maintain a good fish population. Alkalinity showed a mean of 99.8 mg/l $CaCO_3$ which (range, 68.4 to 136.8 mg/l $CaCO_3$) was much higher than the minimum 20 mg/l $CaCO_3$ needed to sustain aquatic life. High alkalinity values demonstrate the stream's ability to buffer low pH levels. Mean total hardness levels were found to be 99.8 mg/l $CaCO_3$ (range,

85.5 to 136.8 mg/l $CaCO_3$) which characterized the water as moderately hard by Environmental Protection Agency standards. Compared to the pre-impoundment study (Olson, 1971), pH levels were slightly higher after post-impoundment while dissolved oxygen levels dropped and alkalinity and total hardness figures rose.

Riparian Vegetation. In comparison to pre-impoundment study (Olson, 1971), the composition of riparian vegetation has seen little change. Only basswood, Tilia americana, and butternut, Juglans cinerea, were not noted at either station in the post-impoundment investigation, although this is not to say that their presence has totally vanished at other stream locations. Due to the fact that the riparian vegetation was simply listed, neither dominance nor density ratios were determined. It is felt, however, that the riparian vegetation adjacent to all collection stations was not seriously affected by the impoundment since the water levels were not raised considerably in these areas. However, conditions closer to the lake where inundation and vegetation removal (prior to impoundment) had occurred, the effects were more than likely far more severe.

Primarily because of the riparian habitat local species of both plant and animal can survive and flourish. It should be noted that the riparian habitat is important in all areas where its high organic production provides the main source of nutrients for stream animals, offers considerable protection against local erosion and downstream

flooding and siltation (Darnell, 1976).

Forested Slopes. It should be noted that a diligent attempt was made to duplicate plot locations identified in Olson (1971). All magnetic-north compass readings were kept constant (north 20° west, north 90° east and south 35° east). Only the slope percentages varied with a mean difference of +0.33 percent.

The comparative results seem to indicate little change over the past eight years. Only the north 20° west slope showed a dominance difference with the red oak, Quercus rubra, exceeding the American beech, Fagus grandifolia, in total basal area, 61.56 sq ft/ acre to 29.28 sq ft/ acre, respectively. This compares to American beech, with 54.42 sq ft/ acre, and red oak, 43.65 sq ft/ acre, in the pre-impoundment study (Olson, 1971). The north 90° east slope showed the American beech to be dominant in both surveys with 165.51 sq ft/ acre in 1971 and 148.76 sq ft/ acre in 1979. The south 35° east transects were also consistant showing the white oak, Quercus alba, to be dominant in both 1971 and 1979 with 47.75 sq ft/ acre and 124.55 sq ft/ acre, respectively. Sugar maple, Acer saccharum, was also very common in both surveys.

Harold E. Ward, Ph.D. (pers. comm.), a life-time resident of the area, stated that logging and clear cutting was commonplace in the 1930's and some residents bought tracts of land hoping to capitalize on the industry in later years. But many residents were forced to sell tracts of their land for the reservoir project while others lost

access to their land due to inundation of old logging trails.

Sociological Impact Questionnaire. Public sentiment appears to be shifting to a more favorable attitude towards the project. Although, it should be understood that the people selected to be surveyed in the previous study prior to impoundment of the lake (Olson, 1971) were about to be relocated because of the project. It is understandable that most opinions were negative due to the fact that the majority of these people were life-long residents of the area with family heritages dating back several generations.

In 1971, 50 percent of the people surveyed did not feel that the recreation and business associated with the lake would be "worth it all" while only 35 percent believed it would. In 1980, almost 56 percent agreed that the project was worthwhile while only 33 percent looked upon it negatively.

The mean age remained to fall into the 31-50 year-old bracket. Huntington, West Virginia, was still the major center for employment in the area (55.6%) while 22 percent of those surveyed were retired. These figures compare to 59 percent and 26 percent, respectively, in the pre-impoundment survey (Olson, 1971).

Many of the residents surveyed in 1979 were newcomers to the area. This factor obviously limits their responses to Questions 4-7 (Table 14).

Seventeen percent of the people had to sell part of their land to the federal government for the project. Of the three people having to sell part of their land, two of

them felt that the price they received was not a fair one. Meanwhile, nearly 60 percent of the people felt that housing and property values had risen due to the project.

Agriculturally, 43 percent of the families raised farm crops on their land as compared to 45 percent in the pre-impoundment survey (Olson, 1971). Nearly seventy percent raised gardens which significantly contributed to the family's food supply while 75 percent did in 1971.

An overwhelming 68 percent of the people did not feel that the project had harmed the environment or degraded the area in any way.

Additional comments were invited while anonymity was encouraged (although some concerned residents did give their names). The responses were quite sincere and the complaints seemed legitimate.

Area resident D. A. Sloane commented, "I would like to know why all of this money is being spent on swimming pools and restaurants at the recreation site and not a penny has been spent on the road leading to the recreation area? I, along with everyone else who lives here, am tired of fighting tourist traffic each weekend on dangerous, substandard roads. I think it is very discouraging for people to have to travel these pig-trails in motor homes and trailers, which cost hundreds and sometimes thousands (of dollars), to risk such an investment on poor road conditions. Each time the Governor comes to visit he is always taken over a route which no one hardly uses so that he can't see the Bowen Ridge route."

Another resident, Mr. Dotson Robinson, stated, "The Beech Fork project will have little value as a flood control project. It seems to me to have been built as a recreation project. I've traveled the Beech Fork road for the past ten years and have (still) seen it flooded many times. I predict that the reservoir will be filled with silt in a very few years therefore negating its recreational value. Roads: A better entrance should be built to the park. Existing roads are too narrow and crooked for recreational vehicle travel. Suggested route would be from the top of Dass Hill along state route 10/3. Other roads should be upgraded and berms built. Water: Water to the campground is being supplied by trucks. I hear it ran out over the Memorial Day weekend. A possible result of the campground will be a water line (installed) by the Salt Rock District that will supply water to the campground as well as residents of the area who must rely on cisterns and wells with low supplies or poor water."

Danny and Rexanna Ross, Beech Fork Road residents, commented, "Your survey interests my husband and I considerably. Yes, Beech Fork Lake has caused a lot of problems. We feel the water table has been raised because of the lake. There is enough damage in this area to warrant a look into environmental damages. This spring there have been numerous landslides in this area. A lot of them are on undisturbed land. Land that has not been dozed or graded. Lands have moved where people have lived with no problems until Beech Fork Dam. The road to the lake is gradually washing away, caused by the constant drainage of the lake, cutting away

the tow hold. There is no way to prove this as a lone individual, but we feel the water table has risen so that proper drainage is impossible. Our house suffered a $12000 loss. We also feel the increased traffic is a problem. Trash being thrown in our yards on the way to the lake and driving at high rates of speed concern us. We felt this area would be good for raising children, but have since changed our minds. If you look, you'll see that just about every other house is for sale. We are not alone in our thoughts. I suppose the only good thing about the lake is the increased property values, but only for those looking for a fast profit - not those looking for a permanent home."

Some anonymous comments included: "I favored the Beech Fork project from the beginning because we needed such a recreation area and we have enjoyed it". "I didn't favor the project at first because I thought it was a joke. After they opened the camping area I really began to enjoy it. It's not far from home and we enjoy getting away for a while." "We have a boat on the lake and love it".

In conclusion, the major grievances of the residents seem to be road conditions, the large amount of traffic along with trash and noise, landslides and the relocation of fellow residents who worked hard and long for their land. Meanwhile on the positive side, area residents have praised the lake for its fishing, boating, picnicing, camping and flood control.

Chapter VII

SUMMARY

1. A total of 748 fishes, which weighed 9.1 pounds, was collected by means of electrofishing. The collection included 31 species and represented seven families.
2. Game fishes were represented by the family Centrarchidae; forage fishes by the families Atherinidae, Cyprinidae, Percidae and Petromyzontidae; and the rough fishes by the families Catostomidae and Ictaluridae.
3. Game, forage and rough fishes comprised 9.1, 83.0 and 7.9 percent of the total population in number, respectively; and 22.3, 40.0 and 29.7 percent of the total weight, respectively.
4. Standing crops for the fishes ranged from 4.5-31.1 pounds per acre; the mean was 15.2 pounds per acre. The limitations of electrofishing should be recognized when comparing this data to other studies using different methods of collection.
5. The most abundant species of fishes was the Bluntnose minnow followed by the Striped shiner and the Stoneroller.
6. Stomach analysis revealed a complex food chain with the largemouth bass being the top carnivore in the group.
7. A total of 1535 benthic invertebrates weighing 20.4 grams was collected representing 12 orders, 26 families and about 35 species.

8. The most abundant order was the Trichoptera (Caddisflies) comprising 48 percent of the total collection in number. The other important orders included Ephemeroptera (Mayflies), Dipterans (True flies) and Coleopterans (Beetles).

9. The order Plecoptera (Stoneflies) was represented by only one member of the genus Acronueria. The decline in this order suggests that more lentic conditions, including decreases in current velocities and increased siltation, are impacting upon the benthic invertebrate fauna.

10. Dipterans (True flies) seem to be thriving which also suggests a trend towards a more lentic environment where dipterans tend to adapt quite well.

11. All water quality parameters examined fell within U. S. Environmental Protection Agency specifications for freshwater streams.

12. Coliform bacteria was tested for and found to be present at all six stations although human fecal coliform bacteria, Escherichia coli, was found only at Station 5.

13. Riparian vegetation included American sycamore, silver maple, river birch, slippery elm, yellow buckeye, flowering dogwood, black walnut and boxelder.

14. Forested slopes were dominated by white oak, American beech, red oak, sugar maple, black oak, mockernut hickory and pin oak.

15. A sociological impact questionnaire revealed that the general attitude towards the Beech Fork project was

favorable and the majority did not feel that the lake had any adverse effect upon the environment. General criticism was focused towards road conditions, traffic flow and litter.

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