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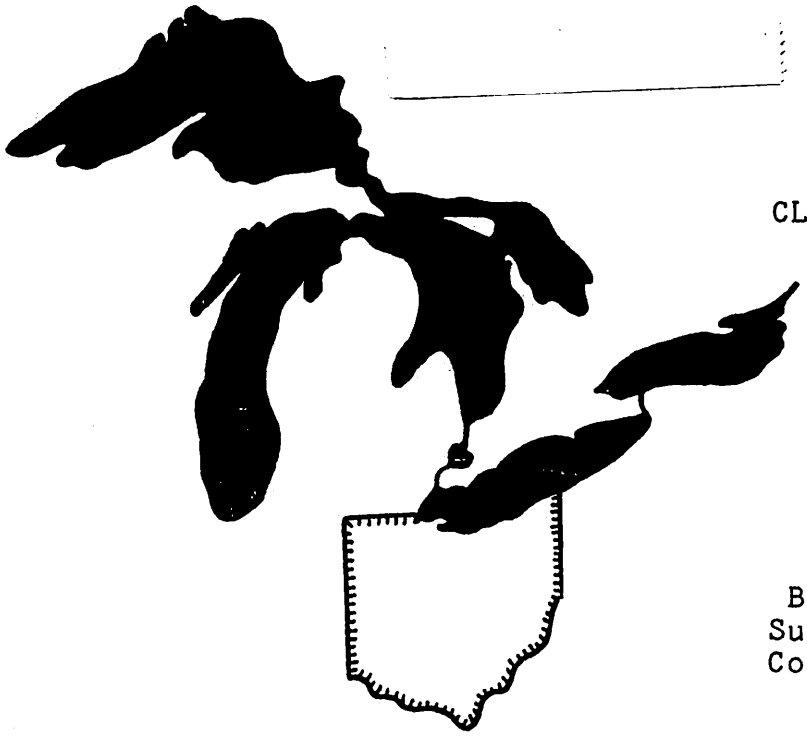

CLEAR TECHNICAL REPORT NO.302

Biological and Water Quality Survey of Big Beaver Creek at County Road 58 in Pike County

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May 1986

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INTRODUCTION

A biological/water quality survey of Big Beaver Creek in Pike County, Ohio at the intersection of County Road 58 was conducted on March 6 and 8, 1986 by Drs. C. Lawrence Cooper and Jeffrey M. Reutter. This survey was done to determine the potential environmental impact of the replacement and relocation (approximately 125 feet downstream) of the County Road 58 bridge. The survey included biological, physical, aquatic and terrestrial components.

PROCEDURES

Ecosystem Description

The general features of the ecosystem in the vicinity of the site were documented through field reconnaissance surveys and review of pertinent literature. This included basic geological information such as bedrock, surface materials, topography and stream characteristics. The various habitats and biological communities present at the site were described and mapped. A literature search was conducted to obtain additional information on the site or nearby areas with similar characteristics. This information was integrated with data obtained from the present survey to present a comprehensive statement of the ecological status of the site.

Water Quality

Water quality determinations were made for 14 parameters at several locations above and below the existing County Road 58 bridge and the scour hole immediately downstream of the bridge. Temperature, conductivity, transparency, current speed, and dissolved oxygen were measured in the field. Water samples were collected for laboratory analysis of the remaining parameters. All tests were performed using techniques prescribed in Standard Methods for Water Analysis (APHA, 1975) or approved by the U.S. Environmental Protection Agency.

Aquatic Life

Benthic macroinvertebrates. Benthic macroinvertebrates within a 300 foot corridor (150 feet above and below the existing County Road 58 bridge were thoroughly, qualitatively sampled by hand-picking overturned rocks and collecting grab samples with a 6 in. x 6 in. Ekman Dredge. The hand picking was most effective in the rocky riffles, while the Ekman Dredge was used most effectively in the sand and gravel at the downstream side of the scour hole and in the vicinity of the proposed new bridge. All samples were preserved in 10% formalin and returned to the laboratory for identification. Identification was to the lowest taxonomic unit practicable.

Fish. Seines of varying lengths were used to sample and describe the fishery community of the stream. In addition to this classical fishery technique, a literature survey was conducted in an effort to determine the historical populations of the stream. The stream was also visually inspected for spawning habitats. The Fishes of Ohio by Trautman (1981) was used to confirm identifications.

In addition to identifying the fish and qualitatively defining the populations with species lists, all fish captured were weighed, measured, and enumerated. The species were ranked both by biomass and numerical abundance. The mean length and weight of each species was determined. A voucher collection of each species will be maintained until completion of construction.

Terrestrial Life

Flora. Trees, shrubs and dominant herbaceous vegetation within 200 feet of the existing bridge site as well as the area along the length of the right-of-way for the new highway and bridge were mapped and enumerated. The results of this inventory are presented as a list of species along with a discussion of the relative abundance of the dominant forms. Identifications of the species encountered were confirmed with the use of standard texts and manuals and through comparison with know herbarium specimens.

Fauna. Using classical field techniques, investigators conducted a visual survey of the study area. Actual visual sightings and other evidence of local occurrence (scats, tracks, burrows) were recorded. The results of this survey are presented as a list of avian species and a discussion of the species of mammals, birds, reptiles and amphibians sited within or near the study area or believed occurring in the study area based on the physical evidence encountered. Identification of species encountered were confirmed with the use of standard field guides and/or manuals.

GENERAL DESCRIPTION OF ECOSYSTEM

Geological Setting

Bedrock and Surface Materials. Pike County, Ohio is underlain by rocks of Devonian and Mississippian Age, largely marine sediments which have been lithified into shales and sandstones. The resistant sandstones are found outcropping in ravines. Sandstone cobbles form the stream bed and the existing bridge site at Beaver Creek.

Big Beaver Creek valley is relatively narrow in the vicinity of the study site, approximately 2,000 feet. The study site lies at an elevation between 570 feet and 580 feet. At this point,

the stream lies immediately adjacent to the steep side of a knob which rises to an elevation slightly in excess of 800 feet. The knob is capped by resistant Vinton sandstone (Melvin, 1933). The valley is located in the unglaciated Appalachian Highlands and, as a result, is free of glacial modification with only secondary modifications of glaciation evident.

Big Beaver Creek enters the Scioto River flood plain about three-fourths mile south of the Village of Piketon. This area is also beyond the glacial drift border located in the northern portion of the county. The Scioto valley at this point is deeply filled, 80-140 feet, with outwash sand, gravel and silt (Stout, et al., 1944).

Silty loams are the predominant soils in the area. These are residual sandstone and shale soils with an average depth of development ranging from 18 to 44 inches and with a moderate moisture holding capacity (Ohio Department of Natural Resources, 1958). A lengthy area adjacent to Beaver Creek, including the study site, is comprised of Pope-Philo soils (Ohio Department of Natural Resources, 1963)).

The U.S. Geological Survey maintains a ground water recording station one mile west of Piketon on the site of the Goodyear Atomic Corporation plant (No. 390359083015100). During the 16 year period of record (1969-1984), the water level has fluctuated from a maximum daily low of 27.46 feet below surface elevation datum (Feb. 15, 1977) of 550 feet to a minimum daily low of 10.06 feet below datum (recorded on March 1, 1979) (U.S.G.S., 1985).

Stream Characteristics. Big Beaver Creek is a free-flowing stream located within the Scioto River Basin of south central Ohio. The headwaters of the stream rise in eastern Pike County near the Jackson County border. Beaver Creek flows westerly for most of its 23.2 mile length, finally emptying into the Scioto River three-fourths mile south of Piketon. The creek and its tributaries drain an area of approximately 69.9 square miles, almost entirely within Pike County. From an elevation of 860 feet at the source, the stream falls an average of 14.2 feet per mile to an elevation of 531 feet at its mouth (Ohio Department of Natural Resources, 1960).

The U.S. Geological Survey does not maintain a hydrologic station on Beaver Creek nor one on the Scioto River main stem within Pike County. No long term water quality or stream characteristic records for Big Beaver Creek were encountered during this study.

Biological Habitats

Aquatic. The aquatic habitat of this small tributary of the Scioto River is an excellent example of classic riffle/pool habitat. Most pools were less than four feet deep, although the

large scour hole below the existing bridge is a very unique feature and approximately 14 feet deep. The banks, which show signs of much higher water and occasional floods, are lined with trees and eroding causing some of the trees to hang out over the water or fall in. These trees provide a great deal of cover for fish. No classical wetlands were observed within the study area.

Terrestrial. The forest ecosystem located within the study area is a hydric forest which occupies a very small portion of the flood plain and is not subject to protracted periods of overflow. The width of this greenbelt varies. It is limited by adjoining agricultural land and the existing roadbed. The original vegetation at the time of the earliest land surveys was oak-sugar maple forest (Gordon, 1966). However, the original hydric forest along streams in south central Ohio undoubtedly included sycamore, silver maple, box elder and black willow along with black walnut, Juglans nigra in greater abundance than presently found.

RESULTS

Water Quality

Table 1 contains the results of water quality determinations for samples collected from Big Beaver Creek on 6 March 1986. No U.S. Geological Survey water quality records are available for the study site. Therefore, no comparisons can be made with earlier water quality determinations. However, it is possible to make several generalizations by comparing Big Beaver Creek to other Ohio streams. The dissolved oxygen level was very good (high) and could easily support even the least tolerant species. Although nitrogen levels could be considered typical of many Ohio streams, several other parameters provided strong indications that Big Beaver Creek could be below average on biological productivity. As examples, phosphorus, alkalinity and hardness were all low indicating a soft, nutrient poor stream.

Aquatic Life

Rooted Aquatic Plants. Vascular aquatic plants in the study area were confined to several small (less than 10 square meters each) beds of smartweed (Polygonum sp.) growing in shallow riffle zones upstream from the existing bridge site.

Benthic Macroinvertebrates. Bandy (1976) has summarized the existing literature regarding benthic macroinvertebrates within the Scioto River drainage system. Stansbery (1965, 1966) depicted the molluscan communities of the upper Scioto River as a fauna with fewer riffle species than previously known due to losses in species diversity caused by water quality problems. Within the study area, living bivalve mollusca (Spharrium sp.) and shells (Lampsilus radiata) were recovered from the stream bed.

Big Beaver Creek harbored insects characteristic of relatively clean water with helgrammites (dobsonfly larvae, Corydalus sp.), stoneflies (common stonefly larvae, Order Plecoptera) and caddisflies (caddisfly larvae, Order Tricoptera). Immature crayfish (Orconectes sp.) were common among the cobbles upstream from the existing bridge site.

Fish. Trautman (1981) lists 47 species as occurring or having occurred at or near this location on Big Beaver Creek (Table 3). However, one of these species was found only before 1901, and 23 others have not been recorded since 1955. Only the southern redbelly dace has entered the area since 1955, while the remaining 22 species have been captured in the area for many years. None of these species in on the United States list of endangered species, and only one, the sand darter is on the Ohio list of endangered species. However, the sand darter has not been observed in the area during the last 30 years.

Sampling during the current study yielded five species, all of which had been previously reported by Trautman (1981) (Table 4). Spawning habitat for all five species was evident indicating that they could be year-round residents. The green sunfish was collected under overhanging vegetation in a quiet, deep area along the bank. The fantail darters were abundant in every riffle. The bluntnose minnows, sand shiners, and striped shiners were common in the pools. It is highly unlikely that the proposed construction will significantly impact any of these populations because of the abundance of similar habitat above and below the construction corridor.

Terrestrial Life

Flora. The existing bridge site and the proposed bridge site pass through a narrow greenbelt of hydric forest which borders Big Beaver Creek. Vegetation within the limits of the study area is listed in Table 5. The streamside greenbelt of trees consists primarily of sycamore, Platanus occidentalis; box elder, Acer negundo; cottonwood, Populus deltoides; willow, Salix sp.; and silver maple, Acer saccharinum. The remaining tree species listed in Table 5 comprise less than 10% of the total number present.

The embankment of the existing roadbed was covered with a thicket of shrubby and herbaceous vegetation consisting primarily of honeysuckle, Lonicera sp.; greenbrier, Smilax sp.; raspberry, Rubus sp.; and teasel, Dipsacus sylvestris. The herbaceous understory vegetation was primary persistent remains of late summer annuals such as joe-pye weed, Eupatorium maculatum and ironweed, Vernonia missourica. Lianas growing about the trunks and branches of the trees were primarily wild grape, Vitis sp., and poison ivy, Toxicodendron radicans.

The one treeless area, downstream from the existing and proposed bridge sites, is a periodically inundated streamside zone covered with grasses, primarily a canary grass, Phalaris sp., and reed grass, Phagmites communis. Hummocky spots in this streamside zone harbor multiple, small sandbar willows, Salix interior. While periodically inundated by high water, this area does not appear to ever be persistently inundated.

Fauna. Thorough inspection of the area indicates that it is frequently visited by domestic dogs. The only mammal evident was a cottontail rabbit, Sylvilagus floridanus. Trapping apparently occurs in the area. The latter conclusion is prompted by the finding of a muskrat, Ondatra zibethica, leg in the stream shallows downstream from the study site. While signs of other mammals were not evident, the study site provides habitat for occasional use by Virginia oppossum, Didelphis virginiana; raccoon, Procyom lotor; and whitetail deer, Odocoileus virginians.

Birds present within or flying within the study site are listed in Table 6. Examination of the study area produced no evidence of amphibians or reptiles. It is likely that the study area is frequented by limited numbers of frogs, turtles and snakes during the late spring and summer seasons.

IMPACT ASSESSMENT

Big Beaver Creek at the Pike County Road 58 (Shyville Rd.) crossing is a typical warmwater Ohio stream. Personal observations by the biological review team indicate that current bridge replacement is badly needed and that the proposed site is the most obvious.

Although it appears that no rare or endangered species will be adversely impacted by the effort, there is some obvious concern over the loss of the scour hole. No other biological or ecological features are so unique in the area as to raise a concern over their destruction during bridge replacement. The stream appears to be dotted with small riffles and pools above and below the existing bridge, and although there will be some obvious destruction of benthic and spawning habitat, recolonization following construction should be rapid and complete. Turbidity associated with the construction process should also be temporary and localized and of no lasting effect. No wetland areas will be impacted.

The scour hole represents an area of some concern as will be discussed below. It is the largest hole of its type on any stream we have observed in Ohio. Its great depth can make it a refuge during droughts. However, it should be noted that the hole itself is not natural, as it was obviously caused by the stream constriction at the present bridge. As a result, the disposition of the existing bridge foundation is of interest. If

left standing, the constriction will continue to provide the forces necessary to prevent sedimentation. If removed, it is likely that sedimentation in the scour hole would be rapid.

Having considered the above information our conclusion is this: because it is not likely from a review of the literature that the fish species which inhabit this hole could not inhabit the smaller nearby pools, we do not feel that bridge replacement should be prevented to preserve the pool. We do, however, recommend that the bridge be moved downstream as much as possible and that every consideration be given to allow as much of the hole as possible to remain.

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TABLE 1

BIG BEAVER CREEK WATER QUALITY

Location:	At County Road 58 in Pike County
Date:	6 March 1986
Time:	11:15 AM Eastern Standard
Temperature:	2.7° C (above and below scour hole)
Conductivity:	220 umhos/cm (above and below scour hole)
Transparency:	0.9 m
Current Speed:	1.3 m/sec at riffle below scour hole. No detectable current in scour hole.
Dissolved Oxygen:	13.8 mg/l (above and below scour hole)
Total Phosphorus:	0.04 mg/l
Soluble Phosphorus:	0.01 mg/l
Ammonia Nitrogen:	0.24 mg/l
Nitrate Nitrogen:	3.7 mg/l
Chloride:	11 mg/l
Total Alkalinity:	25 mg/l
Total Iron:	440 ug/l
Sulfate:	54 mg/l
Total Hardness:	98 mg/l

TABLE 2

LISTING OF BENTHIC MACROINVERTEBRATES FOUND
WITHIN BIG BEAVER CREEK STUDY SITE,
PIKE COUNTY, OHIO

Mollusca
- Class Pelecypoda
  - Family Sphaeriidae
    - *Sphaerium* sp.
  - Family Unionidae
    - *Lampsilus radiata*

Arthropoda
- Class Crustacea
  - Family Cambaridae
    - *Orconectes* sp.
- Class Insecta
  - Order Plecoptera
    - Family Perlidae
      - *Neoperla* sp.
  - Order Neuroptera
    - Family Corydalidae
      - *Corydalus* sp.
  - Order Trichoptera
    - Family Hydro psychidae
      - *Cheumatopsyche* sp.
  - Order Diptera
    - Family Tipulidae

TABLE 3

FISH SPECIES REPORTED FROM THE BIG BEAVER CREEK DRAINAGE BY TRAUTMAN (1981)

Scientific Name	Common Name
Lampetra aepyptera[1]	least brook lamprey
Dorosoma cepedianum[1]	gizzard shad
Esox americanus vermiculatus[2]	grass pickerel
Cyprinus carpio[1]	carp
Notemigonus crysoleucas[1]	golden shiner
Nocomis micropogon[3]	river chub
Hybopsis amblops[1]	bigeye chub
Semotilus atromaculatus[2]	creek chub
Phenacobius mirabilis[2]	suckermouth minnow
Phoxinus erythrogaster[4]	southern redbelly dace
Notropis atherinoides[1]	emerald shiner
N. umbratilis[1]	redfin shiner
N. chrysocephalus[2]	striped shiner
N. whipplei[1]	steelcolor shiner
N. spilopterus[1]	spotfin shiner
N. stramineus[2]	sand shiner
N. volucellus[1]	mimic shiner
Ericymba buccata[2]	silverjaw minnow
Pimephales notatus[1]	bluntnose minnow
Campostoma anomalum[2]	stoneroller minnow
Ictiobus cyprinellus[1]	bigmouth buffalofish
Carpiodes cyprinus[1]	quillback
Moxostoma anisurum[1]	silver redhorse
M. erythrurum[2]	golden redhorse
Hypentelium nigricans[2]	northern hog sucker
Catostomus commersoni[2]	white sucker
Minytrema melanops[2]	spotted sucker
Ictalurus natalis[1]	yellow bullhead
I. melas[1]	black bullhead
Noturus flavus[1]	stonecat
N. miurus[1]	brindled madtom
N. gyrinus[1]	tadpole madtom
Percopsis omiscomaycus[2]	trout-perch
Fundulus notatus[2]	blackside topminnow
Pomoxis annularis[2]	white crappie
Ambloplites rupestris[1]	rockbass
Micropterus dolomieui[1]	smallmouth bass
M. punctulatus[2]	spotted bass
Lepomis cyanellus[1]	green sunfish
L. macrochirus[2]	bluegill
L. megalotis[2]	longear sunfish
Percina maculata[2]	blackside darter
Percina caprodes[2]	logperch
Ammocrypta pellucida[1]	sand darter
Etheostoma nigrum[2]	johnny darter
E. spectabile[2]	orangethroat darter
E. flabellare[2]	fantail darter

1 Found by Trautman (1981) prior to 1955.
2 Found by Trautman (1981) prior to 1955 and between 1955-1980.
3 Recorded before 1901.
4 Found by Trautman (1981) between 1955 and 1983.

TABLE 4

SUMMARY OF SEINING CATCH FROM BIG BEAVER CREEK
March 8, 1986

Species	No. Captured	% of Total	Length (mm) Mean	Length (mm) Range	Weight (g) Mean	Weight (g) Total	% of Total By Weight
Bluntnose Minnow	5	20.8	62	57-70	1.4	7.0	5.8
Fantail Darter	11	45.8	54	38-67	1.0	10.5	8.7
Green Sunfish	1	4.2	98	-	98.0	98.0	81.3
Sand Shiner	3	12.5	54	51-60	1.0	3.0	2.5
Striped Shiner	4	16.7	45	43-49	0.5	2.0	1.7
Total	24	100.0				120.5	100.0

TABLE 5

LISTING OF VASCULAR FLORA FOUND WITHIN THE STUDY AREA ALONG BIG BEAVER CREEK, PIKE COUNTY, OHIO

Scientific Name	Common Name
Trees	
Salicaceae	Willow family
Salix nigra	black willow
Salix sp	willow
Populus deltoides	cottonwood
Rosaceae	Rose Family
Prunus serotina	black cherry
Aceraceae	Maple Family
Acer saccharinum	silver maple
Acer negundo	box elder
Juglandaceae	Walnut Family
Juglans nigra	black walnut
Platanaceae	Plane Tree Family
Platanus occidentalis	sycamore
Ulmaceae	Elm Family
Celtis occidentalis	hackberry
Fagaceae	Beech Family
Fagus grandifolia	beech
Quercus sp	oak
Betulaceae	Birch Family
Betula nigra	river birch
Carpinus caroliniana	muscle wood
Sapindaceae	Soapberry Family
Aesculus glabra	Ohio buckeye

Table 5 Continued

Shrubs and Lianas

Salicaceae	Willow Family
Salix interior	sandbar willow
Salix discolor	pussy willow
Vitaceae	Grape Family
Vitis sp.	wild grape
Anacardiaceae	Sumac Family
Toxicodendron radicans	poison ivy
Caprifoliaceae	Honeysuckle Family
Sambucus canadensis	common elder
Lonicera sp.	honeysuckle

Herbs

Pteridophytes	Ferns and Fern Allies
Lycopodium sp.	clubmoss
Polystichum acrostichoides	Christmas fern
Gramineae	Grass Family
Phalaris sp.	canary grass
Phagmites communis	reed grass
Smilacaceae	Greenbrier Family
Smilax sp.	greenbrier
Polygonaceae	Buckwheat Family
Polygonum sp.	smartweed
Violaceae	Violet Family
Viola sp.	violet
Rosaceae	Rose Family
Rosa sp.	rose
Rubus sp.	raspberry
Umbelliferae	Parsley Family
Daucus carota	Queen Anne's lace
Dipsacaceae	Teasel Family
Dipsacus sylvestris	teasel
Compositae	Composite Family
Eupatorium maculatum	joe-pye-weed
Solidago sp.	goldenrod
Vernonia missourica	ironweed

TABLE 6

LISTING OF AUIFAUNA OBSERVED WITHIN OR NEAR THE STUDY AREA - MARCH 8, 1986

Scientific Name	Common Name
Vultures and Hawks	
Buteo lagopus	rough-legged hawk
Gallinaceous Birds	
Colinus virginianus	bobwhite
Shorebirds	
Charadrius vociferus	killdeer
Doves and Cuckoos	
Zenaidura macroura	mourning dove
Woodpeckers	
Centurus carolinus	red-bellied woodpecker
Jays and Crows	
Cyanocitta cristata	blue jay
Coruus brachyrhynchos	common crow
Tree Gleaners	
Parus atricapillus	black-capped chickadee
Thrushes	
Turdus migratorius	robin
Finches	
Richmondena cardinalis	cardinal