



BIOLOGICAL AND WATER QUALITY  
SURVEY OF THE KOKOSING RIVER  
AT GAMBIER, KNOX COUNTY, OHIO

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## INTRODUCTION

The following report documents the biological and water quality characteristics of the Kokosing River and immediate environs in the vicinity of Laymon Road bridge (College Township Road 259) in Knox County, Ohio. This site, approximately one-half mile southwest of Gambier, has been selected for bridge replacement. In October, 1978, a field survey was conducted to obtain the data necessary for this documentation and for an assessment of the potential impacts of bridge construction.

## PROCEDURES

### Ecosystem Description

The general features of the ecosystem in the vicinity of the site were documented. This included basic geologic information such as bedrock, surface materials, topography, and stream characteristics. The various habitats and biological communities present at the sites were described. A search of the scientific literature was conducted to obtain additional information on the site or nearby areas. This information was integrated with data from the proposed survey to present a comprehensive report on the biological status of the site.

### Aquatic Life

Plankton. Phytoplankton and zooplankton were sampled from three stations on the Kokosing River (one 200 feet above the proposed construction area, one 200 feet below, and one in the center. Station nos. 1, 3, and 2, respectively). One tow with a Wisconsin plankton net (12 cm mouth, 0.080 mm mesh) was made at each station. Samples were preserved with five percent formalin and returned to the laboratory for identification. Analysis was accomplished in a Sedgewick Rafter Cell with a compound microscope. Species lists and relative abundances are presented. Standard texts, which are listed in the "Reference" section of this report were used to confirm plankton identification. All samples will be maintained until completion of construction.

Rooted Aquatic Plants. A thorough visual search of both banks of the stream, its associated wetlands, and north/south mid-line of the proposed construction area was conducted to locate and identify the resident species of higher aquatic plants. Species lists and relative abundance are presented. Standard texts and manuals (see "Reference" section) are used to verify identifications.

Benthic Macroinvertebrates. Three samples (same as plankton sample locations) were taken with a six-inch-by-six-inch Ekman dredge and hand picking techniques in the stream bed. Each sample was sieved through a standard United States number 40 soil sieve, preserved in ten percent formalin, and returned to the laboratory for identification. Standard texts and manuals (see "Reference" section) were used to verify identifications. Species lists and the relative abundance of each are presented. All samples will be maintained until completion of construction.

Fish. Seines of varying lengths were used to thoroughly sample and describe the fishery communities of the stream. In addition to the classical fishery techniques described above, a literature survey was conducted in an effort to determine historical populations from the stream. The stream was visually inspected for spawning habitats. Standard texts (see "Reference" section) were 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 then ranked both by biomass and numerical abundance. The mean length and weight of each species are also presented. A voucher collection of each species will be maintained until completion of construction.

### Terrestrial Life

Flora. Trees, shrubs, and herbaceous vegetation were enumerated along the mid-line transect of the length of the study area. The results of this enumeration are presented as a list of species present along with the relative abundance of each species. Identifications of the species encountered were confirmed with the use of standard reference texts.

Fauna. Using classical field techniques, investigators conducted a visual survey of the mid-line transect of the study area, along with the margins of the stream of interest. Actual visual sightings and other evidence of local occurrence, e.g. scats, were recorded. The results of this survey are presented as a list of the species of mammals, birds, reptiles, and amphibians sited within the study area or believed occurring in the study area based on physical evidence encountered. Identification of species encountered were confirmed with the use of standard field guides and/or manuals.

### Water Quality

Water quality determination for 15 parameters were made at three locations on the streams (200 feet above, 200 feet below, and centerline of the construction area. Station nos. 1, 3, and 2, respectively). Time dependent determinations (such as dissolved oxygen and pH) were made in the field. Water samples were collected for laboratory analysis for the other parameters. All tests used techniques prescribed in Standard Methods for Water Analysis (APHA, 1975) or approved by the United States Environmental Protection Agency.

### Wetland Assessment

An assessment was made of all wetlands present in the vicinity of the proposed project. This assessment included 1) description of the nature of the wetland, 2) determination of the areal extent of the wetland, 3) inventory of the resident flora and fauna, and 4) evaluation of the wetland quality and benefits to the local ecosystem.

### Impact Assessment

The information from the biological survey, along with the information from previous studies, were utilized to assess the possible impacts of the proposed project on the ecosystem. Possible adverse effects of the new construction on the area biota are discussed.

## GENERAL DESCRIPTION OF ECOSYSTEM

### Geological Setting

Knox County lies mostly within the Till Plains section of the Central Lowland province except for the northeast part of the county which is in the Unglaciated Allegheny Plateau section of the Appalachian Plateaus province (Fenneman 1938). The highest point in Knox County (1420 feet above sea level) occurs in Liberty Township at the western edge of the county and the lowest place has an elevation of 840 feet in Butler Township where the Kokosing River enters Coshocton County. Most of the county is underlain by Mississippian sandstones and shales. Throughout most of the county, materials of glacial origin overlies the bedrock. This material consists of till (glacial clay and pebbles), sand, and gravel (Root, et al 1961).

Bedrock and Surface Materials. The bedrock in the vicinity of the Kokosing River at Laymon Road (Township Road 259) consists of sandstone of the Cuyahoga Formation overlain by sandstones and siltstones of the Logan Formation (Mississippian). No bedrock was exposed in the stream banks but an excellent exposure of sandstone was noted in a highway cut several hundred feet north of the study area. Root, et al (1961) indicated that the bedrock in the Kokosing River valley is buried by approximately 100 feet of stream alluvium and glacial deposits at this site.

Topography. The elevation of the Kokosing River at the site is approximately 940 feet above sea level. The floodplain is narrow north of the stream channel (less than 500 feet) but extends over 1500 feet to the south. The uplands area adjacent to the floodplain rise to an elevation of 1100 feet to the north at Gambier and 1160 feet to the south of the site, yielding a local relief of about 220 feet. The hills adjacent to the valley are composed of sandstone capped with glacial ground moraine (Illinoian age) while the floodplain is underlain by stream alluvium near the river and glacial outwash terraces at the base of the hills.

Stream Characteristics. At the site, the stream channel gently curves from east to south in its downstream direction. The channel is entrenched approximately 15-20 feet into the floodplain. On October 29, 1978, the Kokosing River was flowing at a moderate rate but the depth was great enough that no riffles were formed. The average water depth for the three stations was 3-5 feet. The water was moderately turbid with a transparency of only 3-4 feet. The bottom material consisted of sand and gravel with some large submerged, sandstone boulders.

## Biological Habitats

Aquatic. The aquatic habitat of the Kokosing River in Knox County, Ohio at the Laymon Road bridge can be described as a slow flow riffle/pool habitat with low riffle density and frequency of occurrence. At this point the Kokosing is a turbid, sluffish stream with a muck bottom near the banks. Ample cover is provided at many locations along both banks by log snags and overhanging shrubs.

Terrestrial. The terrestrial habitat is a fringe of hardwoods over 40 years old lining both banks of the stream. Were it not for man's activities (road construction, farming, etc.) this would be a typical climax forest. However, the section of trees lining the banks is seldom more than 20-50 feet wide which has allowed a significant growth of undercover beneath the canopy. The banks are approximately 10 feet above the stream and quite steep.

## AQUATIC LIFE

### Plankton

Phytoplankton. Twenty-three genera of algae were identified from plankton samples obtained at the three stations (Table 1). Diatoms were the most abundant group of algae found in the water, with Navicula, Melosira and Fagilaria being the most numerous genera. Green algae was the next most common, followed by blue-green algae and desmids. Except for the three named diatom genera, the population density was relatively low (less than 0.5 individual per millilitre). The total density of the phytoplankton population at the site average 1.9 cells/ml. The environmental significance of the major genera found in the Kokosing River is outlined in Table 2. An inspection of this table reveals that all of the taxa found are common to streams and that most of them are associated with some degree of eutrophication (nutrient enrichment). Only two taxa are indicators of freshwater pollution, while four taxa are indicators of clean water. In general the composition and density of the phytoplankton population indicates a relatively clean water environment with a moderate amount of nutrient enrichment.

Zooplankton. Eleven genera of planktonic animals were identified from samples collected at the three stations (Table 1). Protozoans were the most abundant group, with Diffflugia being the most common. Rotifers were the second group in abundance, with Keratella and Polyarthra being most numerous. Other groups included copopods, tardigrades and midge larvae. The zooplankton population were moderate in size, being equal to 12% of the algae population. No taxa associated with degraded water quality were detected.

### Rooted Aquatic Plants

Suitable habitat for vascular aquatic plants did not occur within the limits of the study area. Careful inspection did not reveal any study specimens.



## Benthic Macroinvertebrates

A search of recent literature produced no published reports of the benthic macroinvertebrate fauna from the Kokosing River in Knox County. However, the fauna as observed in this study must be considered typical of slow moving, good water quality, sand-bottomed streams in Ohio. The fauna was dominated by midges of the family Chironomidae. Four genera were found within the study area (Table 3). Chironomus sp. dominated followed, in order of abundance, by Polypedilum sp., Cryptochironomus sp. and Procladius sp. No large heavy bodied individuals were encountered as all were very small as is typical of a flowing habitat.

A small population of oligochaetes was found immediately under the bridge at Station 2 (Table 3). This station had less sand and more mud than the bordering stations undoubtedly due to the drainage ditch from the corn field at the northwest corner of the Laymon Rd./Kokosing River intersection.

Other inhabitants of this reach of the stream included the dragonfly nymph Macromia sp. and the snail Goniobasis sp. Only one individual of each genera was recorded.

## Fish

Trautman (1957) lists 46 species as occurring in the Knox County portion of the Kokosing River (Table 4). Sampling efforts, utilizing seines, during the present study yielded 8 species and one hybrid, a cross between a green sunfish and an orange-spotted sunfish (Table 5). One of these species, the largemouth bass, was not previously reported by Trautman. Bluntnose minnows were the dominant species representing 50 percent of the catch followed by striped shiners, 16 percent and rock bass, 11 percent (Table 6). Schools of young-of-the-year striped shiners and bluntnose minnows were observed near the banks but were difficult to catch with seines due to snags near shore. Fish densities were greatest in this cover near the banks.

Most of the Kokosing River in Knox County can be classified as classic riffle/pool habitat. However, the frequency and size of the riffles near Laymon Road were greatly reduced. A small riffle was located approximately 300 feet below the study area, but no riffle was present in the 400 foot study area. The 3-5 foot deep sand bottomed stream with large portions of knee-deep muck near the banks which also showed several gravel outcroppings and overhanging trees and shrubs is an ideal habitat for bass and sunfish. Furthermore, this type habitat all but precludes the presence of resident populations of darters, stonerollers and other riffle species.

This stretch of the Kokosing probably serves as a year-round habitat for the 8 species collected. Gravel outcroppings are probably used for spawning while the cover afforded by the snags and overhanging shrubs is probably used as a nursery ground for fish larvae in addition to spawning.

## TERRESTRIAL LIFE

### Terrestrial Flora

The south bank of the study area was characterized by a 20 foot to 50 foot zone of trees with little herbaceous vegetation evident. The tree zone was bordered by agricultural crop land. The south bank is dominated by black willow (Salix nigra), hackberry (Celtis occidentalis) and red maple (Acer rubrum). The north shore of the river is composed of a wetland area to the northwest and a steep bank to the northeast of the existing bridge. Both the bank portion and the wetland portion are dominated by black willow and silver maple (Acer saccharinum). The dominant herbaceous plants in the bank portion are joe-pye-weed (Eupatorium purpurceum), goldenrod (Solidago sp.) and false foxglove (Gerardia sp.). The dominant herbaceous plants in the wetland portion are ground ivy (Glechoma hederacea) and crowfoot (Ranunculus sp.). Vegetation in the study area is listed in Table 7.

### Terrestrial Fauna

A green frog (Rana clamitans) was collected within the study area. The wetland portion of the area provides adequate habitat for other species of frogs (Rana spp., Hyla sp.). Although none were observed, the study area provides suitable habitat for banded water snakes (Natrix sipedon). Careful inspection of the study area revealed little evidence of mammalian life other than the siting of an eastern chipmunk (Tamias striatus). Habitat within the study area is suitable for a variety of mammalian species.

The only bird sited within the study area was a yellow shafted flicker (Colaptes auratus). Inspection of the girders of the existing bridge revealed a phoebe nest (Sayornis phoebe). Other nesting habitat was sufficiently diverse to support a variety of species. Inspection of the area was conducted too late in the season to evaluate breeding birds. A breeding bird census is best conducted during the first two weeks of June.

### Terrestrial Ecosystem

The terrestrial ecosystem located on the south bank of the Kokosing River is a narrow zone of mature hardwood canopy trees with little apparent herbaceous ground cover. The adjacent ecosystems, cropland to the south and the Kokosing River to the north, provide very distinct boundaries. Two ecosystems are located within the study area on the north bank, a narrow wetland bordered by cropland and the river and a small old-field type ecosystem bordered by Ohio Route 229 and the river. Were it not for man's activity, the hardwood forest ecosystem would be more extensive in the flood plain.

## WATER QUALITY

Table 8 contains the results of water quality determinations for samples collected at three stations on 29 October 1978. For comparison, determinations made by the U.S. Geological Survey (1978) at Mount Vernon, Ohio on 23 March 1978 and 5 July 1978 are presented in Table 9. The results for all three dates agree well and indicate a relatively consistent quality of the water. The Kokosing River has been designated as a warm water habitat stream by the Ohio Environmental Protection Agency. The water quality standards for such a stream are listed in Table 10. The quality of the Kokosing River did not exceed any of the maximum permissible concentrations established by Ohio EPA on the dates sampled. However, nutrient enrichment (nitrogen and phosphorus) is evident.

## WETLANDS ANALYSIS

### Summary

It is proposed to construct a bridge to replace the existing structure crossing Township Road 259 (Laymon Road) over Kokosing River at Gambier, Ohio. The proposed action will affect a wetland. In accordance with Presidential Executive order 11990, Protection of Wetlands, an evaluation was made to determine the extent and quality of the wetland as well as the impact of the proposed action.

The site encompasses approximately 14,000 square feet of wetland within the proposed 200 foot right-of-way northeast of the existing structure. The wetland lies on the floodplain adjacent to the shoreline of the Kokosing River and extends further along the northeast shoreline beyond the proposed 200 foot right-of-way. If mitigation measures are not adopted a total of 14,000 square feet of wetland may be taken. Impact on the wetland beyond the 200 foot right-of-way is judged negligible.

Field investigation of the area and consultation with the Ohio Natural Heritage Program of the Ohio Department of Natural Resources indicates the wetland supports no threatened or endangered species of state or national significance. The wetland is considered of marginal significance to wildlife.

The wetland has not been previously studied by the scientific community nor has it been identified as having natural area qualities. Likewise, no wetlands outside of the area of proposed activity but in the region of the project have been identified as Ohio natural areas. The overall evaluation concludes the wetland area within the boundaries of the proposed activity site is of little significance (Table 12).

## Description of Proposed Action and Purpose of Wetlands Survey

Proposed Action. The proposed action is the construction of a new bridge structure at the site of the existing bridge structure crossing Township Road No. 259 (Laymon Road) over the Kokosing River at Mt. Vernon, Knox County, Ohio.

Purpose of Wetlands Survey. Presidential Executive order 11990, Protection of Wetlands (FR 42[101]: 26961) requires that federal agencies "shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds that: there is no practicable alternative to such construction, and the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use."

In carrying out the intent of the Executive Order, the agency is to consider several factors which are pertinent to a proposed action's effect on the quality of the wetland. Public health, safety and welfare factors include effects on water supply, pollution, flood and storm hazards, and sediment and erosion. Maintenance of natural systems is a factor which includes conservation and long term productivity of existing flora and fauna, as well as species and habitat diversity. Other factors in the public interest include recreation, scientific and cultural uses.

A wetland survey in the area of proposed action was conducted to determine the extent, type and location of the wetland within the project region, the significance of the wetland affected by the proposed action and the environmental impacts of the proposed action on the wetland affected.

Wetland Definition and Survey Approach. For the purposes of this survey, wetlands are defined (E.O. 11990) as "Those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetation or aquatic life that requires saturated or seasonably saturated soil conditions for growth and reproduction."

The U.S. Fish and Wildlife Service (Cowardin, 1977) new interim classification system, Classification of Wetlands and Deep-Water Habitats of The United States, was used to describe the wetland. Data collected consisted of evaluating recreational use, surrounding land use, signs of disturbance and pollution degradation, physical dimensions, wildlife using the wetland, dominant vegetation and presence of threatened or endangered species. The results are stated below.

A breeding bird census is not included. The survey period was late October. Birds and other wildlife use are discussed on the basis of existing literature, published or unpublished, and field experience. A detailed quantitative vegetation survey was not performed. Dominant vegetation and any unusual plant species were noted.

## Evaluation of Wetland Affected by the Proposed Action

The discussion contains the results of the field investigation conducted October 29, 1978 to determine the significance of the wetland located along the shoreline in the immediate vicinity (200 ft) of the existing bridge structure. The factors considered and significance determined are presented in Table 12. In making a determination, a wetland may have different levels of significance. It is recognized that all wetlands are important as habitat for fish and wildlife. Within the context of Executive Order 11990, additional factors must be considered before any decision to alter a wetland is made.

Wetland size is important. Large wetlands support a diversity of life. Diversity of life tends to support a more stable ecosystem. Major changes have been observed in low diversity ecosystems following natural events. Larger wetland ecosystems are altered less by seasonal natural events than smaller ones. Therefore, very small wetlands are often considered of less significance than large ones due to the vulnerability of their inhabitants to devastation by unusual but not uncommon natural events such as storms, freezes, droughts, etc. The regional context of a wetland is important if the wetland ecosystem is unique in the region even though it may not harbor floral or faunal elements recognized as threatened or endangered on the state or national level.

In terms of health and welfare, wetlands are commonly described as areas which hold water during peak runoff periods, thereby reducing flooding downstream. Runoff water frequently carries considerable dissolved and suspended solids. Wetlands are considered sinks in which solids and inorganic nutrients are filtered from the water, thereby releasing relatively clear, clean water following passage through the wetland.

Surrounding Land Use. The wetland is located northwest of the existing bridge structure. Immediately to the east of the wetland is agricultural land currently used for corn production. A 3 to 5 foot deep drainage ditch passes from the corn field, through the wetland to the Kokosing River. Were it not for the drainage provided, the adjacent agricultural land would currently be wetland habitat. Both areas occupy low-lying floodplain adjacent to the stream. The Kokosing River serves as the western border of the wetland area.

Physical Features. Wetland within the project area border, 200 feet northwest of the existing bridge, covers approximately 14,000 square feet. The wetland extends further alongside the Kokosing River. Even in the fall, this low-lying floodplain area was damp. Surface water is probably seasonal with periodic flooding in the late winter and spring. The area may be driest in late summer.

Biological Features. Dominant vegetation is black willow, cottonwood and silver maple. Other vegetation at the site is listed in Table 11. No aquatic vascular plants were noted. No characteristic vegetation zonation was apparent. No reptiles or mammals were observed. A green frog was observed near the base of the bridge. The area may be utilized to a limited

extent by cottontail rabbit (Sylvilagus floridanus) and raccoon (Procyon lotor). No birds were observed in the wetland area during the period of the survey. The wetland area could provide adequate habitat for red-winged blackbirds (Agelaius phoeniceus). Waterfowl would not be expected to use the area for nesting or migration.

Wetland Classification and Significance Determination. This area is classified as a freshwater broad-leaved deciduous scrub/shrub wetland. The field investigation and wetland evaluation indicate this area cannot be considered significant due to its small size and limited biological diversity (Table 12). The area within the proposed right-of-way will probably be lost as a result of the proposed action. The impact of this loss is minimal due to the continuance of the existing wetland beyond the limits of the proposed right-of-way and due to the existence of similar areas along the shoreline of the Kokosing River in the region.

## IMPACT ASSESSMENT

In an attempt to determine the degree of environmental disturbance associated with the proposed bridge replacement, an inspection trip was made to a recently completed bridge replacement over the Kokosing River at Howard, Ohio (8 miles east of Mt. Vernon). a similar type of construction is planned for the present study site. It appears environmental impacts will be localized and temporary. All of the vegetation and benthic organisms in the right-of-way will be eliminated. The natural vegetation will be replaced by slope-stabilizing ground cover. The stream bottom will probably be recolonized by benthic fauna within a year. During the construction period, increased turbidity can be expected downstream of the crossing. Some fish spawning habitat will be lost, but this is not considered significant in terms of the river ecosystem. In summary, environmental losses due to this project are considered minimal, primarily because of the availability of extensive habitats of a similar nature in adjacent areas. No endangered species were observed at the study site.

TABLES

TABLE 1

PLANKTON ANALYSES FOR KOKOSING RIVER SAMPLES COLLECTED  
IN THE VICINITY OF TWP. RD. 259, KNOX COUNTY-OCTOBER 29, 1978.

| ORGANISMS                     | INDIVIDUALS PER ML |           |           |
|-------------------------------|--------------------|-----------|-----------|
|                               | STATION 1          | STATION 2 | STATION 3 |
| PHYTOPLANKTON                 |                    |           |           |
| Bacillariophyceae (Diatoms)   |                    |           |           |
| <u>Synedra</u> sp.            | 0.04               | 0.02      | 0.07      |
| <u>Cymbella</u> sp.           | -                  | <0.02     | 0.02      |
| <u>Melosira</u> sp.           | 0.33               | 0.47      | 0.60      |
| <u>Navicula</u> sp.           | 0.73               | 0.33      | 0.47      |
| <u>Tabellaria</u> sp.         | <0.02              | 0.44      | 0.53      |
| <u>Fragilaria</u> sp.         | <0.02              | <0.02     | <0.02     |
| <u>Nitzschia</u> sp.          | 0.20               | 0.35      | 0.16      |
| <u>Pinnularia</u> sp.         | -                  | 0.02      | -         |
| <u>Cyclotella</u> sp.         | -                  | 0.02      | 0.02      |
| <u>Surirella</u> sp.          | 0.18               | 0.27      | 0.29      |
| <u>Gyrosigma</u> sp.          | 0.02               | -         | -         |
| <u>Asterionella</u> sp.       | <0.02              | <0.02     | -         |
| <u>Centronella</u> sp.        | <0.02              | 0.04      | <0.02     |
| Chlorophyta (Green Algae)     |                    |           |           |
| <u>Mougeotia</u> sp.          | -                  | -         | -         |
| <u>Ankistrodesmus</u> sp.     | 0.04               | <0.02     | -         |
| <u>Cladophora</u> sp.         | 0.02               | <0.02     | <0.02     |
| <u>Scenedesmus</u> sp.        | -                  | 0.07      | 0.02      |
| <u>Pediastrum</u> sp.         | 0.04               | <0.02     | <0.02     |
| Desmidiaceae (Desmids)        |                    |           |           |
| <u>Closterium</u> sp.         | <0.02              | <0.02     | <0.02     |
| <u>Cosmarium</u> sp.          | -                  | <0.02     | -         |
| <u>Staurastrum</u> sp.        | -                  | <0.02     | <0.02     |
| Cyanophyta (Blue-Green Algae) |                    |           |           |
| <u>Oscillatoria</u> sp.       | <0.02              | <0.02     | 0.02      |
| <u>Oocystis</u> sp.           | -                  | -         | -         |
| <u>Merismopedia</u> sp.       | -                  | -         | -         |
| ZOOPLANKTON                   |                    |           |           |
| Protozoa                      |                    |           |           |
| <u>Synura</u> sp.             | <0.02              | <0.02     | <0.02     |
| <u>Mallomonas</u> sp.         | -                  | -         | -         |
| <u>Diffflugia</u> sp.         | 0.20               | 0.11      | 0.18      |
| <u>Acanthocystis</u> sp.      | 0.02               | 0.02      | -         |
| <u>Dinobryon</u> sp.          | -                  | -         | -         |
| <u>Peridinium</u> sp.         | -                  | -         | -         |



TABLE 1 (CON'T.)

PLANKTON ANALYSES FOR KOKOSING RIVER SAMPLES COLLECTED  
IN THE VICINITY OF TWP. RD. 259, KNOX COUNTY-OCTOBER 29, 1978.

| ORGANISMS              | INDIVIDUALS PER ML |           |           |
|------------------------|--------------------|-----------|-----------|
|                        | STATION 1          | STATION 2 | STATION 3 |
| ZOOPLANKTON            |                    |           |           |
| Rotifera               |                    |           |           |
| <u>Lepadella</u> sp.   | -                  | -         | -         |
| <u>Kellecottia</u> sp. | -                  | -         | -         |
| <u>Keratella</u> sp.   | <0.02              | <0.02     | 0.02      |
| <u>Monostyla</u> sp.   | -                  | <0.02     | <0.02     |
| <u>Lecane</u> sp.      | -                  | -         | <0.02     |
| <u>Rotaria</u> sp.     | -                  | -         | -         |
| <u>Polyarthra</u> sp.  | <0.02              | <0.02     | -         |
| Copepoda               |                    |           |           |
| <u>Cyclops</u> spp.    | 0.02               | <0.02     | 0.02      |
| Nauplius larvae        | <0.02              | 0.04      | 0.04      |
| Tardigrada             |                    |           |           |
| <u>Macrobiotus</u> sp. | -                  | <0.02     | -         |
| Diptera                |                    |           |           |
| <u>Chironomus</u> sp.  | -                  | -         | <0.02     |
| Total Phytoplankton    | 1.60               | 2.03      | 2.20      |
| Total Zooplankton      | >0.24              | >0.17     | >0.26     |
| TOTAL PLANKTON         | 1.84               | 2.20      | 2.46      |

TABLE 2

ENVIRONMENTAL SIGNIFICANCE OF ALGAE FOUND  
IN THE KOKOSING RIVER

| PHYTOPLANKTON<br>GENERA       | Attached<br>Algae | Clean water<br>Algae | Eutrophication<br>Indicator | Freshwater<br>Pollution<br>Indicator | Stream<br>Algae | Taste and Oder<br>Algae | Filter Clogging<br>Algae |
|-------------------------------|-------------------|----------------------|-----------------------------|--------------------------------------|-----------------|-------------------------|--------------------------|
| Bacillariophyceae (Diatoms)   |                   |                      |                             |                                      |                 |                         |                          |
| <u>Synedra</u> sp.            |                   |                      | X                           | X                                    | X               | X                       |                          |
| <u>Cymbella</u> sp.           |                   | X                    | X                           |                                      | X               |                         |                          |
| <u>Melosira</u> sp.           |                   |                      | X                           |                                      | X               |                         |                          |
| <u>Navicula</u> sp.           |                   |                      | X                           |                                      | X               | X                       | X                        |
| <u>Tabellaria</u> sp.         |                   |                      | X                           |                                      | X               |                         |                          |
| <u>Fragilaria</u> sp.         |                   |                      | X                           |                                      | X               |                         |                          |
| <u>Nitzschia</u> sp.          |                   |                      | X                           |                                      | X               |                         |                          |
| <u>Pinnularia</u> sp.         |                   | X                    |                             |                                      | X               |                         |                          |
| <u>Cyclotella</u> sp.         |                   | X                    |                             |                                      | X               |                         |                          |
| <u>Surirella</u> sp.          |                   |                      | X                           |                                      | X               |                         |                          |
| <u>Gyrosigma</u> sp.          |                   |                      | X                           |                                      | X               |                         |                          |
| <u>Asterionella</u> sp.       |                   |                      | X                           |                                      | X               |                         |                          |
| Chlorophyta (Green Algae)     |                   |                      |                             |                                      |                 |                         |                          |
| <u>Mougeotia</u> sp.          | X                 |                      | X                           |                                      | X               |                         |                          |
| <u>Ankistrodesmus</u> sp.     |                   |                      | X                           |                                      | X               |                         |                          |
| <u>Cladophora</u> sp.         | X                 |                      | X                           |                                      | X               |                         |                          |
| <u>Scenedesmus</u> sp.        |                   |                      | X                           | X                                    | X               |                         |                          |
| <u>Pediastrum</u> sp.         |                   |                      | X                           |                                      | X               |                         |                          |
| Desmidiaceae (Desmids)        |                   |                      |                             |                                      |                 |                         |                          |
| <u>Closterium</u> sp.         |                   |                      | X                           |                                      | X               |                         |                          |
| <u>Cosmarium</u> sp.          |                   |                      | X                           |                                      | X               |                         |                          |
| <u>Staurastrum</u> sp.        |                   | X                    | X                           |                                      | X               |                         |                          |
| Cyanophyta (Blue-Green Algae) |                   |                      |                             |                                      |                 |                         |                          |
| <u>Oscillatoria</u> sp.       |                   |                      | X                           | X                                    | X               |                         |                          |
| <u>Docystis</u> sp.           |                   |                      | X                           |                                      | X               |                         |                          |
| <u>Merismopedia</u> sp.       |                   |                      | X                           | X                                    | X               |                         |                          |

Data Source: Palmer (1977)

TABLE 3  
 BENTHIC MACROINVERTEBRATE POPULATIONS\*  
 29 OCTOBER 1978

| TAXA                        | STATION | 1      | 2      | 3      | MEAN   |
|-----------------------------|---------|--------|--------|--------|--------|
| ANNELIDA                    |         |        |        |        |        |
| Oligochaeta                 |         | 0.0    | 86.1   | 0.0    | 28.7   |
| Hair setae                  |         | 0.0    | 645.9  | 0.0    | 215.3  |
| No hair setae               |         |        |        |        |        |
| ARTHROPODA                  |         |        |        |        |        |
| Chironomidae                |         | 86.1   | 0.0    | 0.0    | 28.7   |
| Chironomus sp.              |         | 301.4  | 1550.2 | 904.3  | 918.6  |
| <u>Cryptochironomus</u> sp. |         | 473.7  | 43.1   | 86.1   | 201.0  |
| <u>Polypedilum</u> sp.      |         | 1119.6 | 43.1   | 86.1   | 416.3  |
| <u>Procladius</u> sp.       |         | 0.0    | 43.1   | 0.0    | 14.4   |
| Odonata                     |         |        |        |        |        |
| Libellulidae                |         |        |        |        |        |
| <u>Macromia</u> sp.         |         | 0.0    | 43.1   | 0.0    | 14.4   |
| MOLLUSCA                    |         |        |        |        |        |
| Gastropoda                  |         |        |        |        |        |
| <u>Goniobasis</u> sp.       |         | 0.0    | 43.1   | 0.0    | 14.4   |
| TOTAL                       |         | 1980.8 | 2454.6 | 1076.5 | 1837.3 |

\* Collected with a 6 inch x 6 inch ekmen dredge in the Kokosing River in Knox Co., Ohio at the Laymon Road bridge (Station 2) and 200 feet upstream (Station 1) and downstream (Station 3). Data presented as no. of organisms m<sup>2</sup>.

TABLE 4  
 HISTORICAL REVIEW\* OF FISH SPECIES  
 INHABITING THE KOKOSING RIVER IN KNOX COUNTY, OHIO

| COMMON NAME            | SCIENTIFIC NAME <span style="float: right;">**</span> |
|------------------------|---|
| Grass Pickereel        | <u>Esox americanus verniculatus</u>                   |
| Quillback              | <u>Carpiodes cyprinus</u>                             |
| Silver Redhorse        | <u>Moxostoma anisurum</u>                             |
| Black Redhorse         | <u>M. duquesnei</u>                                   |
| Golden Redhorse        | <u>M. erythrurum</u>                                  |
| Shorthead Redhorse     | <u>M. macrolepidotum</u>                              |
| Northern Hog Sucker    | <u>Hypentelium nigricans</u>                          |
| White Sucker           | <u>Catostomus commersoni</u>                          |
| Carp                   | <u>Cyprinus carpio</u>                                |
| Goldenshiner           | <u>Notemigonus crysoleucas</u>                        |
| Hornyhead Chub         | <u>Hybopsis biguttata (1925-1938)</u>                 |
| River Chub             | <u>H. micropogon (1925-1938)</u>                      |
| Bigeye Chub            | <u>H. amblops (1925-1938)</u>                         |
| Blacknose Dace         | <u>Rhinichthys atratulus</u>                          |
| Creek Chub             | <u>Semotilus atromaculatus</u>                        |
| Southern Redbelly Dace | <u>Phoxinus erythrogaster</u>                         |
| Redside Dace           | <u>Clinostomus elongatus</u>                          |
| Silver Shiner          | <u>Notropis photogenis</u>                            |
| Rosyface Shiner        | <u>N. rubellus</u>                                    |
| Striped Shiner         | <u>N. chrysocephalus</u>                              |
| Spotfin Shiner         | <u>N. spilopterus</u>                                 |
| Sand Shiner            | <u>N. stramineus</u>                                  |
| Mimic Shiner           | <u>N. volucellus</u>                                  |
| Silverjaw Minnow       | <u>Ericymba buccata</u>                               |
| Fathead Minnow         | <u>Pimephales promelas</u>                            |
| Bluntnose Minnow       | <u>P. notatus</u>                                     |
| Stoneroller            | <u>Campostoma anomalum</u>                            |
| Channel Catfish        | <u>Ictalurus punctatus</u>                            |

TABLE 4 (Con't.)  
 HISTORICAL REVIEW\* OF FISH SPECIES  
 INHABITING THE KOKOSING RIVER IN KNOX COUNTY, OHIO

| COMMON NAME           | SCIENTIFIC NAME**                     |
|-----------------------|---------------------------------------|
| Black Bullhead        | <u>I. melas</u> (prior to 1901)       |
| Stonecat Madtom       | <u>Noturus flavus</u> (prior to 1901) |
| Trout-perch           | <u>Percopsis omiscomaycus</u>         |
| Rock Bass             | <u>Ambloplites rupestris</u>          |
| Smallmouth Bass       | <u>Micropterus dolomieu</u>           |
| Green Sunfish         | <u>Lepomis cyanellus</u>              |
| Bluegill              | <u>L. macrochirus</u>                 |
| Walleye               | <u>Stizostedion v. vitreum</u>        |
| Blackside Darter      | <u>Percina maculata</u>               |
| Logperch              | <u>P. caprodes</u>                    |
| Central Johnny Darter | <u>Etheostoma nigrum</u>              |
| Greenside Darter      | <u>E. blennioides</u>                 |
| Banded Darter         | <u>E. zonale</u>                      |
| Variegated Darter     | <u>E. variatum</u>                    |
| Rainbow Darter        | <u>E. caeruleum</u>                   |
| Fantail Darter        | <u>E. flabellare</u>                  |
| Mottled Sculpin       | <u>Cottus bairdi</u>                  |
| Brook Stickleback     | <u>Culaea inconstans</u>              |

\* From Trautman (1957).

\*\* Bailey et al. (1970).

TABLE 5

SCIENTIFIC AND COMMON NAMES<sup>1</sup> OF FISH SPECIES COLLECTED<sup>2</sup>  
 FROM THE KOKOSING RIVER AT THE LAYMON ROAD BRIDGE,  
 KNOX COUNTY, OHIO - 29 OCTOBER 1978

| COMMON NAME           | SCIENTIFIC NAME                |
|-----------------------|--------------------------------|
| Bluntnose Minnow      | <u>Pimephales notatus</u>      |
| Creek Chub            | <u>Semotilus atromaculatus</u> |
| Green Sunfish         | <u>Lepomis cyanellus</u>       |
| X                     | X                              |
| Orangespotted Sunfish | <u>Lepomis humilis</u>         |
| Johnny Darter         | <u>Etheostoma nigrum</u>       |
| Largemouth Bass       | <u>Micropterus salmoides</u>   |
| Northern Hog Sucker   | <u>Hypentelium nigricans</u>   |
| Rock Bass             | <u>Ambloplites rupestris</u>   |
| Smallmouth Bass       | <u>Micropterus dolomieu</u>    |
| Striped Shiner        | <u>Notropis chrysocephalus</u> |

<sup>1</sup> From Bailey et al. (1970)

<sup>2</sup> Collected using shore seines varying from 1.5 - 9m in length.

TABLE 6

SUMMARY OF SHORE SEINE CATCH FROM THE KOKOSING RIVER NEAR THE  
LAYMON ROAD BRIDGE, KNOX COUNTY, OHIO - 29 OCTOBER 1978

| Species               | Number Captured | % of Tot. by # | Length (mm) |        | Weight (g) |       | % of Tot. by wt. |
|-----------------------|-----------------|----------------|-------------|--------|------------|-------|------------------|
|                       |                 |                | Mean        | Range  | Mean       | Total |                  |
| Bluntnose Minnow      | 19              | 50.0           | 31          | 23-37  | 0.5        | 9.5   | 12.9             |
| Creek Chub            | 2               | 5.3            | 77          | 53-100 | 6.0        | 12.0  | 16.3             |
| Green Sunfish         | 1               | 2.6            | 63          |        | 5.0        | 5.0   | 6.8              |
| X                     |                 |                |             |        |            |       |                  |
| Orangespotted Sunfish | 1               | 2.6            | 44          |        | 1.0        | 1.0   | 1.4              |
| Johnny Darter         | 1               | 2.6            | 77          |        | 5.0        | 5.0   | 6.8              |
| Largemouth Bass       | 1               | 2.6            | 110         |        | 18.0       | 18.0  | 24.5             |
| Northern Hog Sucker   | 4               | 10.6           | 51          | 33-89  | 16.0       | 4.0   | 5.4              |
| Rock Bass             | 3               | 7.9            | 64          | 55-83  | 4.3        | 13.0  | 17.7             |
| Smallmouth Bass       | 6               | 15.8           | 50          | 46-55  | 1.0        | 6.0   | 8.2              |
| Striped Shiner        |                 |                |             |        |            |       |                  |
| TOTAL                 | 38              | 100.0          |             |        |            | 73.5  | 100.0            |

TABLE 7

## LIST OF VASCULAR FLORA

Twp. Rd. No. 259 - 29 October 1978

| Common Name     | Scientific Name              |
|-----------------|------------------------------|
| Vegetation:     |                              |
| Black walnut    | <u>Juglans nigra</u>         |
| Black willow    | <u>Salix nigra</u>           |
| Common milkweed | <u>Asclepias syriaca</u>     |
| Cottonwood      | <u>Populus deltoides</u>     |
| Crowfoot        | <u>Ranunculus</u> sp.        |
| False foxglove  | <u>Gerardia</u> sp.          |
| Goldenrod       | <u>Solidago</u> sp.          |
| Ground ivy      | <u>Glechoma hederacea</u>    |
| Hackberry       | <u>Celtis occidentalis</u>   |
| Joe-pye-weed    | <u>Eupatorium purpureum</u>  |
| Poison ivy      | <u>Rhus radicans</u>         |
| Red Maple       | <u>Acer rubrum</u>           |
| Riverbank grape | <u>Vitus riparia</u>         |
| Silver maple    | <u>Acer saccharinum</u>      |
| Sycamore        | <u>Platanus occidentalis</u> |



TABLE 8

WATER QUALITY MEASUREMENTS FOR KOKOSING  
RIVER SAMPLES IN THE VICINITY OF TWP. RD. 259,  
KNOX COUNTY, OHIO-OCTOBER 29, 1978

| PARAMETER                    | UNITS    | STATION 1 | STATION 2 | STATION 3 |
|------------------------------|----------|-----------|-----------|-----------|
| Time                         | Hrs.     | 1500      | 1515      | 1530      |
| Depth                        | M        | 0.8       | 1.7       | 1.0       |
| Temperature                  | °C       | 8.9       | 9.4       | 9.8       |
| Dissolved Oxygen             | mg/l     | 10.1      | 9.8       | 9.8       |
| Conductivity                 | µmhos/cm | 405       | 405       | 410       |
| Turbidity                    | NTU      | 2.8       | 4.2       | 5.1       |
| pH                           | units    | 8.0       | 7.5       | 7.8       |
| Acidity (CaCO <sub>3</sub> ) |          |           |           |           |
| Free                         | mg/l     | 0.0       | 0.0       | 0.0       |
| Total                        | mg/l     | 0.0       | 15.0      | 0.0       |
| Total Hardness               | mg/l     | 280       | 280       | 280       |
| Total Phosphorus (P)         | µg/l     | 714.0     | 679.5     | 690.0     |
| Soluble Phosphorus (P)       | µg/l     | 291.0     | 273.0     | 278.5     |
| Ammonia Nitrogen             | µg/l     | 38        | 36        | 51        |
| Nitrate/Nitrite Nitrogen     | mg/l     | 8.6       | 7.9       | 7.3       |
| Chloride (Cl)                | mg/l     | 22.5      | 24.0      | 25.0      |
| Total Iron (Fe)              | µg/l     | 133       | 141       | 61        |
| Sulfate (SO <sub>4</sub> )   | mg/l     | 62        | 59        | 64        |
| Alkalinity                   | mg/l     | 202       | 201       | 201       |

TABLE 9

WATER QUALITY DATA FOR THE KOKOSING RIVER  
AT MOUNT VERNON, OHIO  
MARCH AND JULY 1978

| Date                                       | March 23 | July 5 |
|--|----------|--------|
| Time                                       | 0945     | 1415   |
| Discharge (CFS)                            | 622      | 450    |
| Conductivity (umhos/cm)                    | 380      | 425    |
| pH   | 8.0      | 7.9    |
| Temperature (°C)                           | 4        | 24     |
| Dissolved oxygen (mg/l)                    | 11.3     | 7.5    |
| DO Saturation (%)                          | 86       | 88     |
| BOD - 5 day (mg/l)                         | 1.1      | 2.8    |
| Hardness (ca, Mg, mg/l)                    | 180      | 180    |
| Dissolved Calcium (Ca, mg/l)               | 48       | 50     |
| Dissolved Magnesium (Mg, mg/l)             | 15       | 14     |
| Dissolved Sodium (Na, mg/l)                | 8.8      | 8.3    |
| Dissolved Potassium (K, mg/l)              | 2.8      | 2.8    |
| Bicarbonate (HCO <sub>3</sub> , mg/l)      | 150      | 166    |
| Carbon Dioxide (CO <sub>2</sub> , mg/l)    | 2.4      | 3.3    |
| Dissolved Sulfate (SO <sub>4</sub> , mg/l) | 40       | 36     |
| Dissolved Chloride (Cl, mg/l)              | 21       | 18     |
| Dissolved Fluoride (F, mg/l)               | 0.1      | 0.1    |
| Dissolved Silica (SiO <sub>2</sub> , mg/l) | 6.1      | 5.5    |
| Dissolved Solids (mg/l)                    | 216      | 217    |
| Total Nitrate (N, mg/l)                    | 2.5      | 2.3    |
| Total Nitrite (N, mg/l)                    | 0.02     | 0.05   |
| Total Ammonia Nitrogen (N, mg/l)           | 0.06     | 0.06   |
| Total Phosphorus (P, mg/l)                 | 0.05     | 0.19   |
| Total Arsenic (As, µg/l)                   | 1        | 3      |
| Total Chromium (Cr, µg/l)                  | 10       | <10    |
| Total Copper (Cu, µg/l)                    | 0        | 11     |
| Dissolved Iron (Fe, µg/l)                  | 30       | 20     |
| Total Lead (Pb, µg/l)                      | 5        | 19     |
| Dissolved Manganese (Mn, µg/l)             | 20       | 10     |
| Total Mercury (Hg, µg/l)                   | 0.0      | 0.0    |
| Total Zinc (Zn, µg/l)                      | 0.0      | 40     |
| Total Organic Carbon (C, mg/l)             | 4.2      | 8.0    |

Data Source: U.S. Geological Survey (1978)

TABLE 1.0  
OHIO EPA WATER QUALITY STANDARDS 1978 \*

| Parameter                 | Maximum Permissible Concentration |
|---------------------------|-----------------------------------|
| Ammonia                   | 13 mg/l                           |
| Beryllium                 | 1.100 mg/l                        |
| Cadmium                   | 0.012 mg/l                        |
| Chlorine (total residual) | 0.002 mg/l                        |
| Chromium                  | 0.100 mg/l                        |
| Cyanide                   | 0.025                             |
| Dissolved Oxygen          | 5.0 mg/l                          |
| Dissolved Solids          | 1500 mg/l.                        |
| Conductivity              | 2400 $\mu$ mhos/cm                |
| Iron                      | 1.000 mg/l                        |
| Lead                      | 0.030 mg/l                        |
| MBAS (Foaming Agents)     | 0.500 mg/l                        |
| Mercury                   | 0.0002 mg/l                       |
| Oil and Grease            | 5 mg/l                            |
| pH                        | 6.5 - 9.0                         |
| Phenolic Compounds        | 0.010 mg/l                        |
| Phthalate Esters          | 0.003 mg/l                        |
| BCB's                     | 0.000001 mg/l                     |

\*Warm water habitat

TABLE 11

## LISTING OF FLORA AND FAUNA OF THE WETLAND AREA

Twp. Rd. No. 259 - 29 October 1978

| Common Name   | Scientific Name            |
|---|----------------------------|
| Vegetation:   |                            |
| Black willow  | <u>Salix nigra</u>         |
| Cottonwood  | <u>Populus deltoides</u>   |
| Crowfoot  | <u>Ranunculus</u> sp.      |
| Ground ivy  | <u>Glechoma hederacea</u>  |
| Hackberry   | <u>Celtis occidentalis</u> |
| River bank grape  | <u>Vitus riparia</u>       |
| Silver maple  | <u>Acer saccharinum</u>    |
| Reptiles and Amphibians:                                |                            |
| Green frog  | <u>Rana clamitans</u>      |
| Avifauna:   |                            |
| None observed   |                            |
| Mammalian Fauna:  |                            |
| None observed   |                            |
| Macrobenthic invertebrate and fish fauna not applicable |                            |

TABLE 12  
SUMMARY OF WETLAND SIGNIFICANCE

| Significance Factors                    | Wetland Evaluation |
|---|--------------------|
| Identified Scientific Importance        | 0                  |
| Unusual, Threatened, Endangered Species | 0                  |
| Pollution Degradation and Disturbance   | 0                  |
| Wetland Wildlife Importance             | 0                  |
| Health and Welfare                      | 1                  |
| Wetland Size                            | 0                  |
| Regional Context                        | 0                  |
| Identified Natural Area                 | 0                  |
| Recreation                              | 0                  |
| Natural Area Qualities                  | 0                  |

- 0 - not significant
- 1 - marginally significant
- 2 - significant
- x - significance not determined

## REFERENCES

- American Public Health Association. 1975. Standard Methods for the Examination of Water and Wastewater. 14th ed. APHA, New York. 1193 p.
- Bailey, R.M., J.E. Fitch, E.S. Herald, E.A. Lachner, C.C. Lindsey, R.C. Robins, and W.B. Scott. 1970. A list of common and scientific names of fishes from the United States and Canada. Third Ed. Amer. Fish. Soc. Spec. Pub. No. 6. 150 p.
- Chengalath, R., C.H. Fernanda, and B.G. George. 1971. The planktonic Rotifera of Ontario with keys to genera and species. Univ. Waterloo Biology Series, Ont. No. 2. 40 p.
- Collins, G.B., and R.O. Kalinsky. 1972. The diatoms of the Scioto River basin. The Ohio State Univ., Columbus, Ohio. The Dept. of Botany. Unnumbered mineo. 18 p.
- Cowardin, L.M. 1977. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service. 48 p.
- Eddy, S., and A.C. Hodson. 1964. Taxonomic keys to the common animals of the north central states. Burgess Publishing Company, Minneapolis, Minnesota. 162 p.
- Fassett, N.C. 1957. An manual of aquatic plants. Univ. of Wisconsin Press, Madison, Wisconsin. 405 p.
- Fennemen, N.M. 1938. Physiography of eastern United States. McGraw-Hill, New York. 691 p.
- Klemm, D.J. 1972. Biota of freshwater ecosystems identification manual No. 8, Freshwater leeches (Annelida: Hirundinea) of North America. U.S. EPA. 53 p.
- Mason, W.T. 1973. An introduction to the identification of chironomid larvae. Fed. Water Poll. Contr. Admin. 89 p.
- Palmer, C.M. 1977. Algae and water pollution. U.S. Environmental Protection Agency, EPA-600/9-77-036. 124 p.
- Pennak, R.W. 1978. Fresh-water Invertebrates of the United States. 2nd Edition. John Wiley & Sons, New York. 803 p.
- Root, S.I., J. Rodriguez and J.L. Forsyth. 1961. Geology of Knox County. Ohio Geol. Survey Bull. 59. 232 p.
- Stein, C.B. 1962. Key to the fresh-water mussels (Family Unionidae) of western Lake Erie. Ohio State Univ. Museum of Zool. Mimeo. 7 p.

- Taft, C.E. and C.W. Taft. 1971. The algae of western Lake Erie. Bull. Ohio Biol. Survey, New Series 4:1-185.
- Torke, B.G. 1974. An illustrated guide to the identification of the planktonic crustacea of Lake Michigan with notes on their ecology. Center for Great Lakes Studies, The Univ. of Wisconsin-Milwaukee, Special Report No. 17. 42 p.
- Trautman, M.B. 1957. The fishes of Ohio. The Ohio State Univ. Press, Columbus, Ohio 683 p.
- U.S. Geological Survey. 1978. Water resources data for Ohio: water year 1977. Vol. 1. Ohio River Basin. U.S. Geol. Sur. Water Data Rept. OH-77-1. 518 p.
- Usinger, R.L. 1956. Aquatic insects of California. Univ. Calif. Press, Berkeley. 508 p.
- Ward, H.G. and G.C. Whipple. 1959. Fresh-water Biology. 2nd ed., W.T. Edmondson, ed. John Wiley and Sons, New York. 1248 p.