

**1992 KENTUCKY
REPORT TO CONGRESS
ON WATER QUALITY**



**Natural Resources and
Environmental Protection Cabinet
Division of Water**

1992

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REPORT TO CONGRESS
ON
WATER QUALITY**

**COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND
ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION**

DIVISION OF WATER

APRIL 1, 1992

ERRATA: In the second paragraph on page viii change 10,671 miles to 10,659 miles.

On Figure VI page xvi change pie diagram reflecting size by acres as follows: white slice should be oligotrophic, 63,513 acres and hatched slice should be mesotrophic, 42,444 acres

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This report was prepared to fulfill requirements of Section 305(b) of the Federal Water Pollution Control Act of 1972 (P.L. 82-500) as subsequently amended and commonly known as the Clean Water Act. Section 305(b) requires that states submit a report to the U.S. Environmental Protection Agency (EPA) on a biennial basis which assesses current water quality conditions. This report presents an assessment of Kentucky's water quality for the period 1990 through 1991. Topics that are discussed in the report are groundwater quality, the status of the state water pollution control program, water quality conditions and use support of streams, rivers and lakes, a discussion on wetlands, and recommendations on additional actions necessary to achieve the objectives and goals of the Clean Water Act.

Water Quality Assessment

The water quality assessment of rivers and streams in Kentucky's 1992 report is based on those waters depicted on U.S. Geological Survey 1:100,000 scale topographic maps of the state. The maps contain about 55,300 miles of streams, of which approximately 10,671 miles (19%) were assessed. This is a decrease in terms of percentage assessed because the base map used in the last report was larger in scale (1:500,000) and had fewer streams. The change to a smaller scale map was requested of states by EPA in order to establish national consistency on waters to be assessed.

The main assessment is based on an analysis of the support of classified uses in state waters excluding the Ohio and Mississippi rivers. Aquatic life and swimming uses were most commonly assessed. Full support of uses occurred in 6656 miles (68%) of the assessed waters and uses were not supported in 2083 miles (21%). Partial use impairment was found in 996 miles (10%) of the assessed waters. Swimming use was impaired to a far greater extent than aquatic life use (Figure I). The major causes of use nonsupport were fecal coliform contamination (pathogen indicators), which affected swimming use, and siltation and organic enrichment, which impaired aquatic life use (Figure II). The major sources of the fecal coliform contamination were municipal wastewater treatment plant discharges and agricultural nonpoint sources. Municipal point sources were responsible for the organic enrichment, while surface mining and agricultural nonpoint sources were the major sources of siltation. Municipal discharges were the primary point source contributor to nonsupport of uses and agricultural activities and resource extraction were the major contributors to nonsupport from nonpoint sources (Figure III).

There were some notable improvements in water quality. Blaine Creek, the South Fork of the Kentucky River, the Kentucky River from Heidelberg to Camp Nelson, and the Licking River near Salyersville exhibited a decrease in chloride concentrations. The domestic water supply use in the Licking River near Salyersville and aquatic life use in Blaine Creek were fully supported, whereas these uses were not supported in the last

Figure I
SUMMARY OF INDIVIDUAL USE SUPPORT
RIVERS AND STREAMS



Figure II
CAUSES OF USE NONSUPPORT
RIVERS AND STREAMS

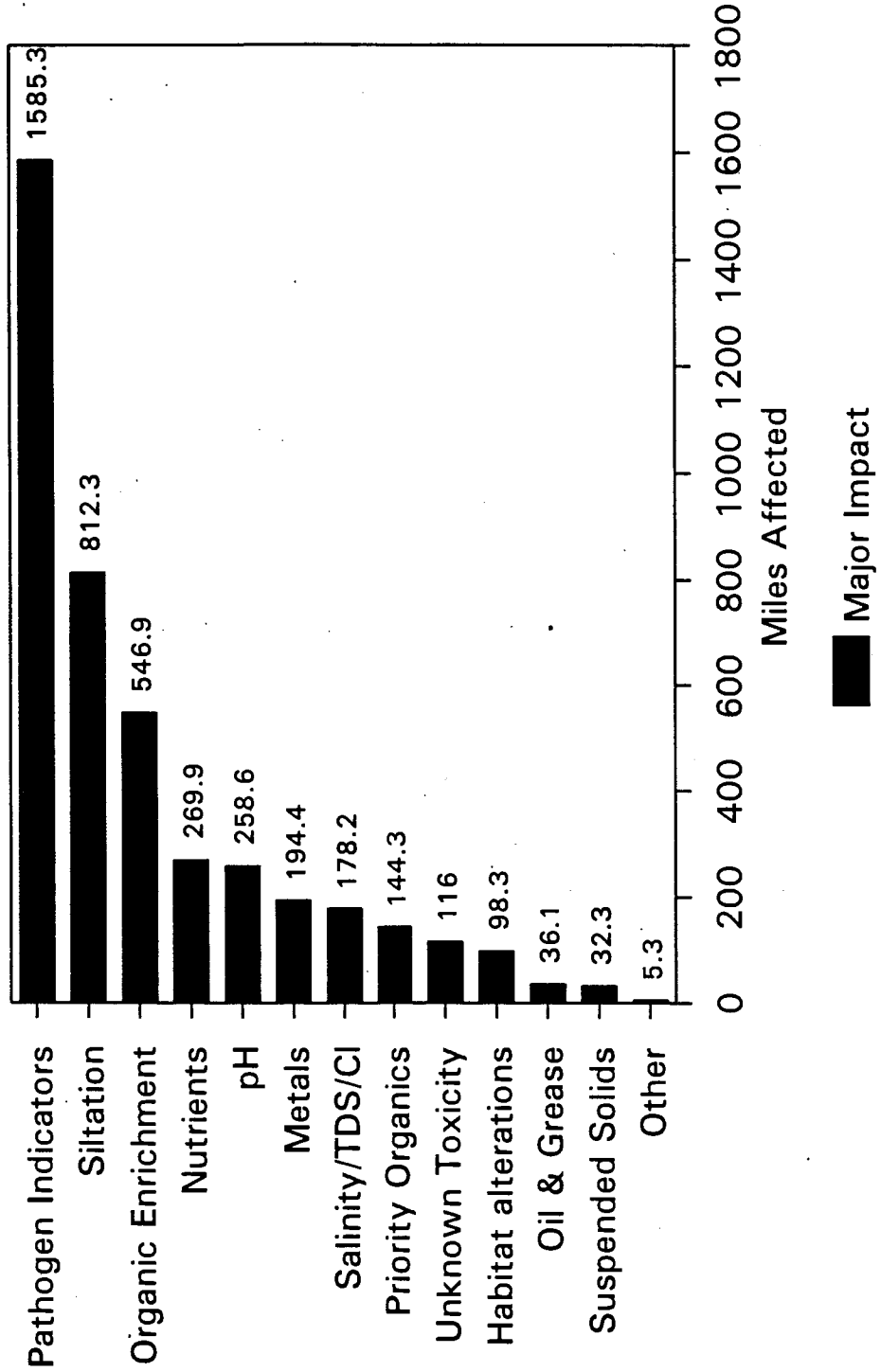
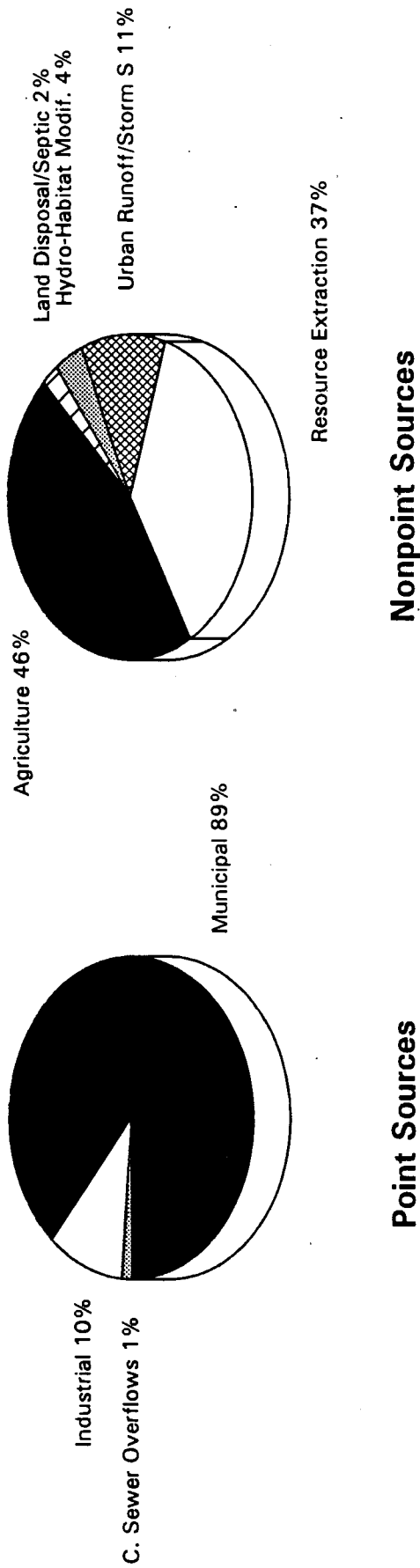


Figure III
SOURCES OF USE NONSUPPORT
RIVERS AND STREAMS



reporting period. The decrease in chlorides is attributed to enforcement of KPDES permit limits on oil and gas production facilities, possible decreases in production, and differing stream flow regimes.

The swimming use in the Kentucky River was supported in areas where the use had previously not been fully supported. Bacteriological surveys at Lake Cumberland indicated that the swimming use was supported in the main lake and around major marinas and houseboat docking areas. The closure of the beach on the Kentucky River at Boonesboro was the only beach closed by the Parks Department during this reporting period. Fecal coliform contamination caused swimming advisories to be posted for the North Fork of the Kentucky River above Jackson, and for the Licking River and some tributary streams near Covington.

Degradation due to priority pollutants has occurred in some of the state's streams. Fish consumption warnings remain posted for the Mud River and Town Branch in Logan, Butler, and Muhlenberg counties because of contamination from PCBs. A fish consumption advisory remains in effect for the West Fork of Drakes Creek in Simpson and Warren counties, and Little Bayou Creek in McCracken County because of contamination from PCBs. The Ohio River remains posted with advisories because of PCB and chlordane contamination. The Ohio River advisories are specifically for the consumption of channel catfish, carp, white bass, paddlefish, and paddlefish eggs.

Thirty-three fish kills totalling 134,208 fish were reported during 1990-1991, affecting over 56 miles of streams and 26 lake acres. The number of fish kills reported and the number of waterbodies affected were fewer than those reported over the last four years, as were the number of miles affected and the number of fish killed. Fish kills were most commonly attributed to sewage discharges and to unknown causes.

The water quality assessment of lakes included more than 90 percent of the publicly-owned lake acreage in Kentucky. Sixty-four of 102 lakes (63 percent) fully supported their uses, 29 (28 percent) partially supported uses, and nine (9 percent) did not support one or more uses. On an acreage basis, 91 percent (195,293 acres) of the 214,962 assessed acres fully supported uses, while 6 percent partially supported uses, and 3 percent did not support one or more uses (Figure IV).

Nutrients were the greatest cause of the uses not being fully supported and affected the largest number of lakes. Agricultural runoff and municipal discharges were the principal sources of the nutrients. Iron and manganese were the second greatest cause of use nonsupport, and affected the domestic water supply use. Natural release of these metals from bottom sediments into the water column causes water treatment problems. Suspended solids from surface mining activities impaired the secondary contact recreation use in several eastern Kentucky reservoirs. Figure V shows causes and sources of use nonsupport in lakes.

Figure IV
SUMMARY OF LAKE USE SUPPORT

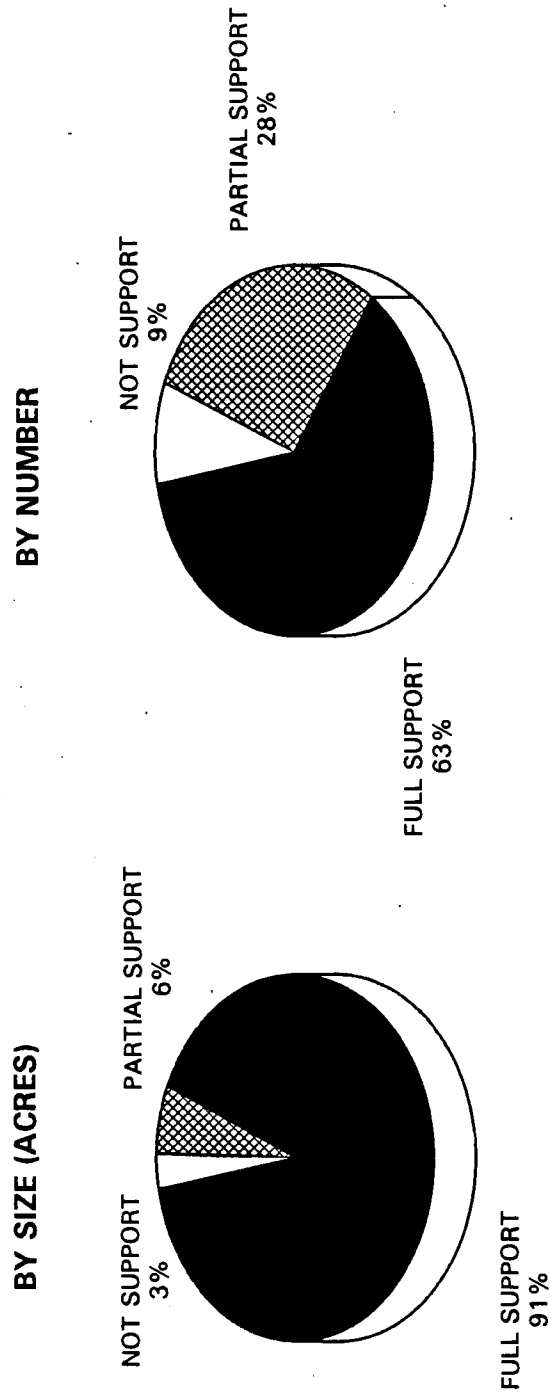
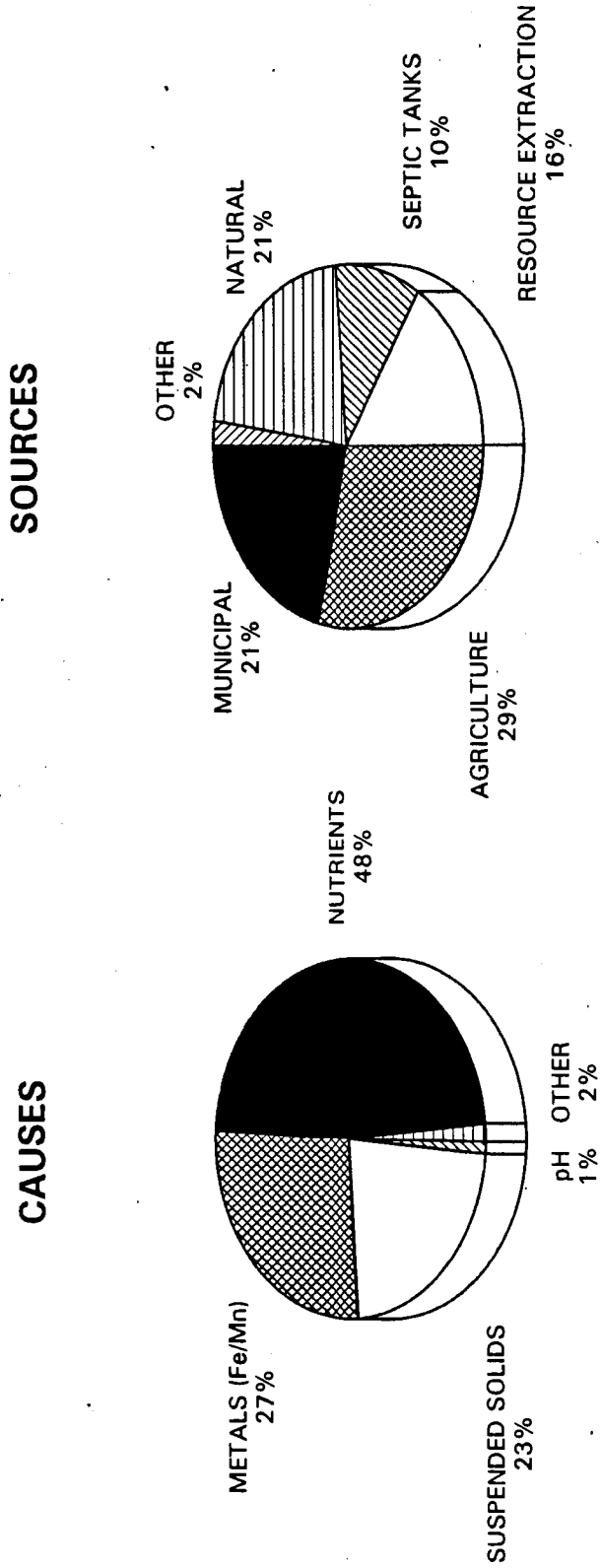


Figure V
USE NONSUPPORT IN LAKES
BY SIZE (ACRES)



An analysis of lake trophic status indicated that of the 102 lakes assessed, 61 were eutrophic, 30 were mesotrophic, and 11 were oligotrophic. About half of the total lake acres were eutrophic. Of the rest, 30 percent were mesotrophic and 20 percent were oligotrophic (Figure VI). Green River and Nolin lakes became less eutrophic. Spurlington, Sympton, Campbellsville City, Jericho, Shelby (in Shelby County), Metcalfe County and Doe Run lakes became more eutrophic than previously reported. Briggs, Mauzy, and Herrington lakes were added to the list of lakes that did not support their uses. Reformatory Lake was removed from the list because water quality had improved to the point that it now partially supports the aquatic life use.

The envelope on the back inside cover of this report contains color coded maps of the degree of use support by major river basins for many streams and lakes in the state. Not all of the streams or lakes assessed are on the maps because of the limitation of the scale used.

Underground storage tanks, septic tanks, abandoned hazardous waste sites, agricultural activities, and landfills are estimated to be the top five sources of groundwater contamination in Kentucky. Improper well construction is no longer one of the top five priorities because new programs instituted by the Division ensure safe well construction standards. The major pollutant of groundwater was bacteria.

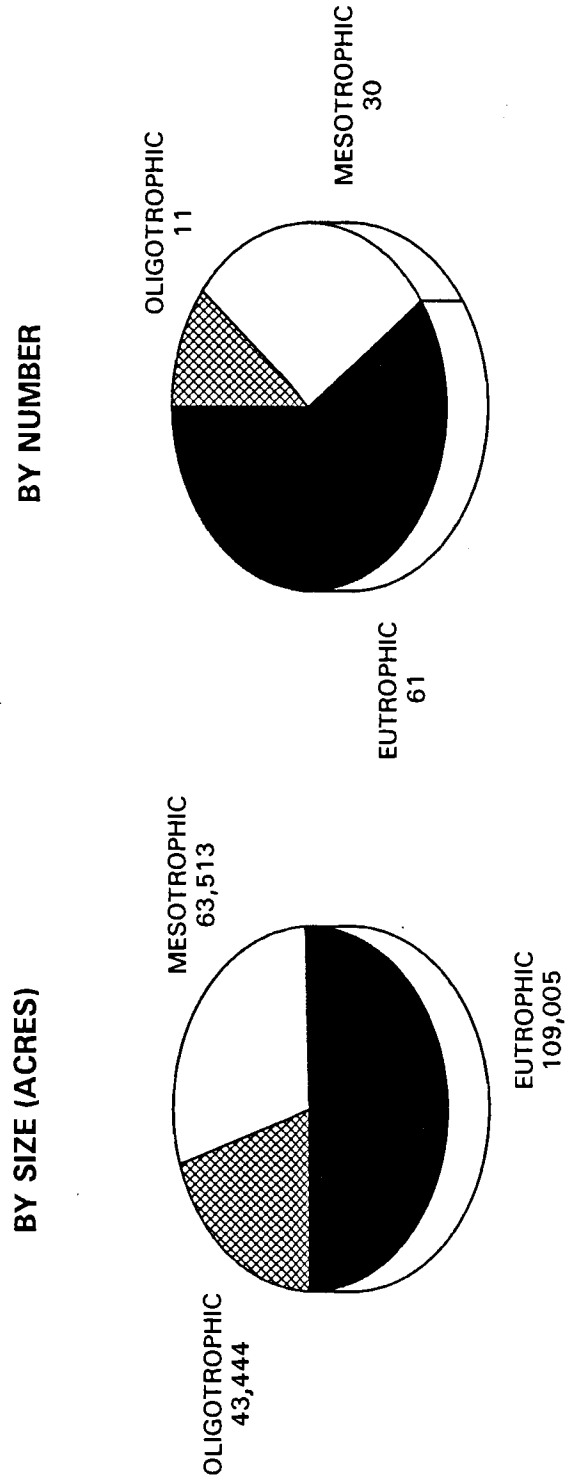
Lack of groundwater data, particularly on quality, quantity and availability and the potential for pesticides to pollute groundwater in karst regions, are two of the areas of special concern in the groundwater program.

Water Pollution Control Programs

Kentucky's water pollution control programs continued expanding to develop new approaches for controlling pollution. By the end of 1991, 77 municipal and 35 industrial wastewater treatment facilities had KPDES permit requirements for whole effluent toxicity testing. The Division of Water conducted acute and chronic toxicity tests on 68 point source discharges in 1990 and 1991. A total of 1,212 tests were conducted by permitted facilities. Approximately one-third of the facilities with biomonitoring permit conditions are conducting toxicity reduction evaluations to reduce the toxicity of their effluents. Pretreatment programs have been approved in 69 cities to better treat industrial wastes. The cities of Louisville, Bardstown, Richmond, Leitchfield and Corbin won national awards in recognition of their effective and innovative pretreatment programs. A state revolving fund program was initiated to meet the needs of new wastewater treatment plant construction.

Forty-five primary ambient monitoring stations characterizing approximately 1,400 stream miles within the state, were in operation during the reporting period. Biological monitoring occurred at 18 of these stations during 1990 and 1991. In addition, six lakes were sampled for eutrophication trends and three lakes for acid

Figure VI
SUMMARY OF LAKE TROPHIC STATE



precipitation trends. Impacts from acid precipitation have not been detected. An expanded lake assessment project, funded by the federal Clean Lakes Program, allowed 50 additional lakes to be sampled for eutrophication trends. Five intensive surveys were conducted on 436 miles of streams for the evaluation of municipal point source and nonpoint agricultural pollution, to determine baseline water quality, and to evaluate the status of water quality in streams previously assessed. Results revealed that high nutrient concentrations impaired aquatic life use in South Elkhorn Creek near Lexington. Little Pitman Creek, near Campbellsville, had improved water quality, but was still impacted in the reach receiving municipal wastewater discharges.

WATER WATCH, a citizen's education program, expanded its membership and increased the number of waters "adopted" by local groups. Since its beginning, 345 groups have been established and 300 streams, 35 lakes, 30 wetlands, and nine karst or underground systems have been adopted. A water quality monitoring project produced data on stream water quality at 135 sites in seven of the twelve river basins in the state.

The nonpoint source control program is involved in monitoring projects in the Mammoth Cave area (Turnhole Spring Groundwater Basin), the upper Salt River/Taylorville Lake watershed, and is participating with Tennessee agencies on an acid mine drainage project in the Bear Creek watershed, which originates in Tennessee, and drains into the Big South Fork of the Cumberland River in Kentucky. A new project is being initiated in the Fleming Creek watershed. These are long term studies to determine nonpoint source impacts and demonstrate water quality improvements from best management practices.

Education efforts in the program produced several noteworthy achievements. A slide/video program on pollution problems from nonpoint sources in Kentucky was produced under contract with Western Kentucky University. Funding was awarded to the Warren County Conservation District and the Gateway Region Environment-Education Network to develop nonpoint source education activities on ways to combat pollution from construction, urban runoff, agriculture, and septic systems.

An update of the Nonpoint Source Pollution Assessment Report was produced for this report. Streams, rivers, lakes, wetlands, and groundwater impacted by nonpoint sources of pollution are listed in an Appendix, along with current information regarding sources and parameters of concern.

BACKGROUND

BACKGROUND

This report was prepared to fulfill the requirements of Section 305(b) of the Federal Water Pollution Control Act of 1972 (P.L. 92-500) as amended by the Clean Water Act of 1987 (P.L. 100-4). Section 305(b) requires that states submit a report to the U.S. Environmental Protection Agency (EPA) every two years that addresses current water quality conditions. This report generally assesses data collected in 1990 and 1991. Items to be addressed in the report include an assessment of the degree to which nonpoint sources of pollutants affect water quality, an assessment of state groundwater quality, an assessment of the extent to which the state's rivers, streams, and lakes meet their designated uses, and recommendations on additional actions that are necessary to achieve the water quality objectives of the Act. Specific data on lake water quality, and information on state programs is also required and addressed in the report. EPA uses the reports from the states to apprise Congress of the current water quality of the nation's waters and to recommend actions which are necessary to achieve improved water quality. States use the reports to provide information on water quality conditions to the general public and other interested parties, and to help set agency pollution control directions.

This report follows the guidance document that EPA provided to the states for the 1992 reporting period. The stream water quality in this report is based on those streams shown on the U.S. Geological Survey's (USGS) Hydrologic Unit Map of Kentucky (scale 1:500,000). The assessments were based on 1,467 streams and rivers composing over 18,000 stream miles (excluding the Ohio and Mississippi Rivers). Stream miles were determined by chord lengths to the 0.1 mile, on USGS 7.5 minute quadrangle maps (scale 1:24,000). These maps are the official river mile index maps maintained by the Division of Water. Stream miles not measured by this method were determined by using map wheels. The EPA has estimated river miles for states based on USGS 1:100,000 scale maps. This scale is recommended to be incorporated by states for 305(b) reporting purposes. Kentucky has followed this recommendation and now uses the EPA estimates and will eventually incorporate these streams and mileages into the assessment base. These estimates greatly expand the number and miles of streams and rivers used in 305(b) assessments. Previously, the total state miles in the assessment base were reported as 18,774. This is now increased to 55,306 miles. As a result, the miles assessed compared to the miles not assessed will be considerably less in this report (19 percent) than reported in 1990 (55 percent). The 55,306 miles contain 37,434 miles of perennial streams, 16,986 miles of intermittent streams and 886 miles of ditches and canals. According to these estimates, Kentucky ranks fourteenth in the nation in miles of perennial streams.

Kentucky is divided into 42 cataloging units, which comprise the 12 river basins assessed in this report. These drainage basins from east to west are the Big Sandy, Little Sandy, Tygarts, Licking, Kentucky, Upper Cumberland, Salt, Green, Tradewater, Lower Cumberland, Tennessee, and Mississippi. The Division of Water has subdivided the cataloging units into smaller, discrete, hydrologic units called waterbodies. The smaller

units are useful for assessment and management purposes. There are 759 waterbodies which include both rivers and lakes. Water quality assessment information on these waterbodies is stored by the Division in a computer software package created by EPA called the Waterbody System (WBS).

The assessment of lake conditions is based on data collected by the Division of Water in 1981-1983 and updated in 1989, 1990 and 1991 through a lake assessment project funded under the federal Clean Lakes Program. The 102 lakes that were assessed have a total area of 214,962 acres and comprise over 90 percent of the publicly owned lakes in the state. This includes the Kentucky portions of Barkley, Kentucky, and Dale Hollow lakes which are border lakes with Tennessee. The total lake acres is more than that estimated by EPA for Kentucky in their 1991 draft document Total State Waters: Estimating River Miles and Lake Acreages for the 1992 Water Quality Assessments (305(b) Reports). The estimates made by the Division are considered to be more accurate because they were taken from engineering drawings of impoundments in the Division's dam inventory files, which are made at a smaller scale, and are thus more accurate than the acreages on 7.5 minute quadrangle maps that were used by EPA. Estimates of major reservoirs were taken from U.S. Army Corps of Engineers reports and were based on acres at certain pool elevations which are also considered to be more accurate. An estimate of the number of lakes in the state was included in the above EPA document. It is based on those lakes shown on the 1:100,000 scale base map and separates lakes into three groups by size. According to those estimates, Kentucky has 2,374 lakes. Of the total, 1,678 are less than ten acres, 672 are between 10 and 500 acres, and 24 are greater than 500 acres. Total wetland acreage in Kentucky has not been accurately determined. The Division of Water, in collaboration with the Kentucky Department of Fish and Wildlife Resources (KDFWR), has contracted with the U.S. Fish and Wildlife Service to map wetlands in the Commonwealth. Estimates from this project are not yet available. The Kentucky State Nature Preserves Commission, in its 1986 report, Wetland Protection Strategies for Kentucky, estimated that 637,000 acres of wetlands remained in Kentucky as of 1978.

Kentucky's population, according to the 1990 census, is 3,685,296. The state has an approximate area of 40,598 square miles. It is estimated that there are approximately 89,431 miles of streams within the borders of Kentucky. That figure was determined from the Kentucky Natural Resources Information System, which has a computerized geographic database. All of the blue line streams on the 7.5 minute USGS topographic maps were digitized to produce the figure. Main channel and tributary river miles in reservoirs are included. A project is underway to subtract those miles, which will produce a more accurate river and stream mile total. Kentucky has 849 miles of border rivers. The northern boundary of Kentucky is formed by the low water mark of the northern shore of the Ohio River and extends along the river from Catlettsburg, Kentucky in the east, to the Ohio's confluence with the Mississippi River near Wickliffe in the west (a length of 664 miles). The southern boundary is formed by an extension of the Virginia-North Carolina 1780 Walker Line which extends due west to the

Tennessee River. Following the acquisition of the Jackson Purchase in 1818, the 36°30' parallel was accepted as the southern boundary from the Tennessee River to the Mississippi River.

Kentucky's eastern boundary begins at the confluence of the Big Sandy River with the Ohio River at Catlettsburg and follows the main stem of the Big Sandy and Tug Fork southeasterly to Pine Mountain, for a combined length of 121 miles, then follows the ridge of the Pine and Cumberland mountains southwest to the Tennessee line. The western boundary follows the middle of the Mississippi River for a length of 64 miles and includes several of the islands in the Mississippi channel. A listing of the above information is provided below.

Atlas

State population (1990 census)	3,685,296
State surface area (square miles)	40,598
Number of major river basins	12
Number of total river miles*	89,431
Number of river miles in assessment base	55,306
Number of miles assessed	10,659
Number of river border miles (subset)	849
Number of lakes/reservoirs	2,374
Number assessed	102
Total acres of lakes/reservoirs	Unknown
Acres assessed	214,962
Wetland acres	637,000

*includes reservoir main channel and tributary channel miles

The climate of Kentucky is classified as continental temperate humid. Summers are warm and humid with an average temperature of 76°F, while winters are moderately cold with an average temperature of 34°F. Annual precipitation averages about 45 inches, but varies between 40 to 50 inches across the state. Maximum precipitation occurs during winter and spring with minimum precipitation occurring in late summer and fall.

Summary of Classified Uses

Kentucky lists waterbodies according to specific uses in its water quality standards regulations. These uses are Warmwater Aquatic Habitat, Coldwater Aquatic Habitat, Domestic Water Supply, Primary Contact Recreation, Secondary Contact Recreation and Outstanding Resource Waters. Those waters not specifically listed are classified (by default) for use as warmwater aquatic habitat, primary and secondary contact recreation, and domestic water supply. The domestic water supply use is applicable at points of

public and semipublic water supply withdrawals. The Division of Water adds waterbodies to the regulation list as an ongoing process in its revision of water quality standards. Intensive survey data and data from other studies, when applicable, are used to determine appropriate uses. Currently, 4,252.7 stream miles are listed as warmwater aquatic habitat, 400.8 miles as coldwater aquatic habitat, 427.9 miles as outstanding resource waters and 5,081.3 miles as primary and secondary contact recreation. By default, over 84,000 miles are classified for the uses of warmwater aquatic habitat, primary and secondary contact recreation and domestic water supply (if applicable). There are approximately 104 points where domestic water supply is withdrawn in streams, and 54 lakes are used for domestic water supply purposes. Twenty-eight lakes have been classified for specific uses in the water quality standards regulations.

CHAPTER 1

WATER QUALITY ASSESSMENT OF RIVERS AND STREAMS

WATER QUALITY ASSESSMENT OF RIVERS AND STREAMS

Status

Water quality conditions for rivers and streams in Kentucky are summarized by use support status in Table 1. The table indicates that of the 10,659 miles assessed, approximately 36 percent experienced some degree of use impairment, while 64 percent fully supported uses. These figures are similar to those reported in 1990. Approximately 19 percent of the 55,300 river miles in the new stream assessment base were assessed. The total miles in Table 1 reflect the streams and mileages in the old database and are mainly those streams found on USGS 1:500,000 scale maps. The total miles assessed were similar to those reported in the 1990 305(b) report. Corrections on stream lengths account for some of the differences and some new streams were added to the assessment.

Table 1
Designated Use Support by River Basin

Basin	Total Miles	Miles Assessed	Miles Fully Supporting Uses	Miles Partially Supporting Uses	Miles Not Supporting Uses
Big Sandy	1117.6	544.1	281.2	13.5	249.4
Little Sandy	364.0	197.0	102.6	31.8	62.6
Tygarts Creek	194.9	194.9	194.9	0.0	0.0
Licking	2009.3	1030.4	751.6	62.2	216.6
Kentucky	3438.4	1857.9	1192.9	179.9	485.1
Upper Cumberland	2188.7	1030.4	776.2	132.6	92.6
Salt	1577.7	1075.5	568.6	83.1	423.8
Green	3585.3	2172.8	1678.9	153.8	340.1
Tradewater	518.1	389.4	173.0	125.3	91.1
Lower Cumberland	658.7	446.7	325.5	100.2	21.0
Tennessee	386.4	128.1	87.2	21.5	19.4
Mississippi	560.9	190.5	106.0	82.1	2.4
Ohio (Minor Tribs.)	1423.7	766.2	611.8	73.8	80.6
Ohio (Mainstem)*	663.9	663.9	0.0	324.6	339.3
State Total	18,687.6	10,658.8	6850.4	1384.4	2424.0

*Assessment provided in ORSANCO 1992 305(b) report.

Methods of Assessment

Water quality data collected by the Kentucky Division of Water (DOW), Kentucky Division of Waste Management, Ohio River Valley Water Sanitation Commission (ORSANCO), U.S. Army Corps of Engineers, and the U.S. Geological Survey (USGS) were used to determine stream use support status. Other sources of information used in this determination include biological studies at fixed stations,

intensive surveys, and data supplied by the Kentucky Department of Fish and Wildlife Resources. The data were categorized as "monitored" or "evaluated." Monitored data were derived from site specific ambient surveys and were generally no more than five years old. In some instances where watershed conditions remained unchanged, monitored data over five years were still considered valid and were categorized as monitored. Evaluated data were from other sources or from ambient surveys that were conducted more than five years ago. The criteria for assessing this data to determine use support follow.

Water Quality Data

Chemical data collected by the DOW, ORSANCO, and the USGS at fixed stations were evaluated according to U.S. EPA guidelines for the preparation of this report. Water quality data were compared with their corresponding criteria as noted in Table 2. All of the criteria in the table, except fecal coliform, were used to assess warmwater aquatic habitat (WAH) use support. If none of the criteria for dissolved oxygen, un-ionized ammonia, temperature, or pH, collected during the period of October 1989 through September 1991, were exceeded in 10 percent or less of the measurements, the segment fully supported its use for WAH. Partial support was indicated if any one criterion for these parameters was exceeded 11-25 percent of the time. The segment was not supporting if any one of these criteria was exceeded greater than 25 percent of the time.

Data for mercury, cadmium, copper, lead, and zinc were analyzed for violations of acute criteria listed in state water quality standards using three years of data (from October 1988 through September 1991). The segment fully supported its use if no criteria were exceeded at stations with quarterly or less frequent sampling, or if only one violation occurred at stations with monthly sampling. The segment was not supporting if one or more exceedences were measured at quarterly or less frequently sampled stations, or two or more exceedences occurred at stations sampled monthly. These assessment criteria are different from the past 305(b) reports. They are more closely linked to the way state water quality criteria were developed. Acute criteria are meant to protect aquatic life if the criteria concentration is not exceeded more than once every three years on the average. The new measures of use support were developed by a joint USGS, state and EPA workgroup. It reviewed the previously used measures and felt that these changes were appropriate because they were more closely linked to the frequency and duration assumptions inherent in water quality criteria.

Fecal coliform data were used to indicate degree of support for primary contact recreation (swimming) use. Primary contact recreation was fully supported if the criterion was exceeded in 10 percent or less of the measurements, partially supported if the criterion was exceeded in 11-25 percent of the measurements, and not supported if the criterion was exceeded greater than 25 percent of the time. In addition, streams with pH below 6.0 units caused by acid mine drainage were judged to not support this use.

Domestic water supply use was not assessed because the use is applicable at points of withdrawal only and could not be quantified in the format required by the guidelines. In areas where both chemical and biological data were available, the biological data were generally the determinate factor for establishing warmwater aquatic habitat use support status. This is especially true when copper, lead and zinc criteria were contradicted by biological criteria. The Division made this decision in recognition of the natural ability of surface waters to sequester metals and make them less bioavailable and therefore less toxic.

Table 2
Physical and Chemical Parameters and Criteria
Used to Determine Use Support Status
at Fixed Stations

Parameter	Criterion	Source
Dissolved oxygen	< 4.0 mg/l	KWQS ¹
Temperature	30°C	KWQS
pH	6 to 9 units	KWQS
Un-ionized ammonia	0.05 mg/l	KWQS
Mercury	2.4 ug/l	KWQS
Cadmium	Based on hardness ²	KWQS
Copper	Based on hardness ³	KWQS
Lead	Based on hardness ⁴	KWQS
Zinc	Based on hardness ⁵	KWQS
Fecal coliform	(May 1 thru Oct. 31) 400 colonies/100 ml	KWQS

1) Kentucky Water Quality Standards

2) Criterion = $e^{(1.128 \ln x - 3.828)}$ x = hardness in mg/l as CaCO₃

3) Criterion = $e^{(.9422 \ln x - 1.464)}$ x = hardness in mg/l as CaCO₃

4) Criterion = $e^{(1.273 \ln x - 1.460)}$ x = hardness in mg/l as CaCO₃

5) Criterion = $e^{(.8473 \ln x + .8604)}$ x = hardness in mg/l as CaCO₃

Fixed-Station Biological Data

Biological data for 1990-1991 were collected from 18 fixed monitoring network stations in nine drainage basins throughout the state. Algae, macroinvertebrates, and fish were collected, and several community structure and function metrics were analyzed for each group of organisms. These metrics were used to determine biotic integrity, water quality, and designated use support for each reach monitored. Expectations for metric

values are dependent upon stream size, ecological region, and habitat quality and were applied accordingly. Criteria for bioassessment of warmwater aquatic habitat (WAH) use support (Table 3) were based on these expectations. Bioassessments integrated data from each group of organisms, habitat data, known physical and chemical parameters, and professional judgement of aquatic biologists.

Algae. Algal samples were collected from each biological monitoring station using both artificial substrates (for biomass estimates) and natural substrates (for algal identification and relative abundance). The condition of the algal community was determined by a periphyton biotic index (PBI) which includes the following metrics: total number of diatom species, diversity, pollution tolerance index, relative abundance of sensitive species, relative abundance of non-diatom algae, and biomass (chlorophyll α and ash-free dry-weight). The PBI is used to rank algal communities as excellent or good (supporting WAH uses), fair (partially supporting), or poor (not supporting).

Macroinvertebrates. Macroinvertebrates were collected using both artificial substrates and qualitative collections from all available natural substrate habitats. For the macroinvertebrate evaluations, stream reaches were considered to fully support the WAH use if information reflected no alterations in community structure or functional compositions for the available habitats, and if habitat conditions were relatively undisturbed. A reach was considered partially supporting uses when information revealed that community structure was slightly altered, that functional feeding components were noticeably influenced, or if available habitats reflected some alterations and/or reductions. Reaches were considered not supporting uses if information reflected sustained alterations or deletions in community structure, taxa richness and functional feeding types, or if available habitats were severely reduced or eliminated.

Fish. Fish were collected for community structure evaluation at the biological monitoring sites listed in Table 45. The condition of the fish community was determined by analysis of species richness, relative abundance, species composition, and with the Index of Biotic Integrity (IBI). The IBI was used to assess biotic integrity directly by evaluation of twelve attributes, or metrics, of fish communities in streams. These community metrics include measurement of species richness and composition, trophic structure, and fish abundance and condition. The IBI was used to assign one of the following categories to a fish community: excellent, good, fair, poor, very poor, or no fish. Reaches with an IBI of excellent or good were considered to fully support uses. Reaches were evaluated as partially supporting uses if they had an IBI of fair, while reaches were considered not supporting uses when the IBI category was poor, very poor, or no fish.

Table 3
Biological Criteria for Assessment of
Warmwater Aquatic Habitat (WAH) Use Support

	Fully Supporting	Partially Supporting	Not Supporting
Algae	Taxa richness (TR) high, intolerant taxa present, community similarity to reference site $\geq 50\%$, biomass similar to reference/control or STORET mean.	Reduced number or Relative Abundance (RA) of intolerant taxa, community similarity to reference site lower than 50%, increased RA of pollution tolerant taxa, increased biomass (if nutrient enriched) of filamentous green algae.	Low TR, loss of sensitive species, pollution tolerant taxa dominant, low community similarity to reference sites, biomass very low (toxicity) or high (organic enrichment).
Macroinvertebrate	Taxa richness, functional grouping and EPT* index high, community similarity to reference site $> 50\%$, sensitive species present.	Taxa richness and/or EPT lower than expected in relation to available habitat. Community similarity to reference site $< 50\%$, increased RA or numbers of facultative taxa. Reduction in RA of sensitive taxa. Some alterations of functional groups evident.	Taxa richness and EPT low, community similarity low, facultative or pollution tolerant taxa dominant, TNI* of tolerant taxa very high. Most functional groups missing from community.
Fish	Index of Biotic Integrity (IBI) excellent or good, presence of rare, endangered or species of special concern.	IBI fair	IBI poor, very poor, or no fish.

*EPT - Ephemeroptera, Plecoptera, Trichoptera, TNI - Total Number of Individuals

Intensive Survey Data

In the 1990-1991 biennium, five intensive surveys were conducted to determine if target streams were supporting their designated uses. Data were also evaluated for 45 additional surveys conducted between 1982 and 1989. Streams intensively surveyed more than five years ago are considered as "evaluated waters," whereas streams surveyed more recently are "monitored waters."

The streams were assessed by evaluating the biological communities (refer to Table 3), physicochemical, toxicity, and habitat data, as well as known watershed activities in concert with direct observation and professional judgement. Stream mileages were grouped as supporting, partially supporting, or nonsupporting designated uses. Streams are considered to support designated uses if no impacts, or only minor impacts to the biotic integrity, physical habitat, and water quality are observed. Streams are determined to be partially supporting when the data indicate either stressed biotic communities, minor violations of water quality criteria, or some physical impairment to aquatic habitats. Nonsupporting streams are those showing severe stress, such as sustained species deletions, trophic imbalances in the biotic communities, chronic violations of water quality criteria, and severely impaired aquatic habitats.

Kentucky Department of Fish and Wildlife Resources Data

The Division of Water extended its analysis of stream use support for the 1990 305(b) report by developing questionnaires on unmonitored streams and sending them to Conservation Officers of the Kentucky Department of Fish and Wildlife Resources (KDFWR). The responses were classified as evaluated assessments. Each questionnaire was divided into two sections. A habitat evaluation section included questions on major land uses in the stream basin, flow, bottom type, sedimentation, and water quality. A fisheries support section was evaluated through questions regarding stream fishery characterization, reproduction (as indicated by presence or absence of both young-of-year (y-o-y) and adult sport fishes), fishery success, and trend of the fishery over the last 10 years. If the fishery was felt to be poor, the respondent was asked to indicate why.

In this assessment of use support, only those questionnaire responses indicating definite support or nonsupport were used. Partial support was not assessed. A stream was considered to fully support WAH use if:

- (1) the stream supported a good fishery,
- (2) both y-o-y and adult sport fishes were present, or if only y-o-y were present, the stream was a tributary to a stream supporting the WAH use, and
- (3) water quality was judged good.

A stream did not support the WAH use if:

- (1) the stream supported a poor fishery,
- (2) few or no fish were present in the stream, and
- (3) water quality was judged poor and/or repeated fish kills were known to occur.

Another source of data for the evaluated category was a list of streams recommended by the KDFWR as candidates for State Outstanding Resource Waters. They were recommended because of their outstanding value as sport fishing streams. These streams were assessed as fully supporting warmwater aquatic habitat use if there was no data which conflicted with the assessment. The above evaluations were utilized again in this report.

Other Data Sources

The classification of streams as coldwater aquatic habitats (CAH) in Kentucky's water quality standards regulations are established from data provided by the KDFWR. Their field surveys indicate which streams can support a sustainable year-round trout fishery. These streams were considered to fully support their CAH use and were considered as monitored waters in the assessment.

The USGS and the Louisville and Jefferson County Metropolitan Sewer District have a monitoring program for several streams in Jefferson County. Twenty-six stations are monitored for 44 parameters including fecal coliform bacteria. Macroinvertebrate and fish collections are also made. The Division used the chemical and bacteriological data from 1989 and 1990 for this report and considered it as monitored data in the assessments.

Field work conducted for the U.S. Fish and Wildlife Service identified streams in Kentucky that harbored the blackside dace, a federally threatened species of fish. This work was considered as monitored data. These streams are automatically classified as State Outstanding Resource Waters and were judged to fully support the WAH use.

Streams surveyed by the Kentucky State Nature Preserves Commission for a special project to obtain background aquatic biota and water quality data in the oil shale region of the state were utilized as monitored information in this report. The information was published in a 1984 report entitled Aquatic Biota and Water Quality and Quantity Survey of the Kentucky Oil Shale Region.

The Blaine Creek watershed has been monitored by the U.S. Army Corps of Engineers - Huntington District for several years in conjunction with the Yatesville Lake project. Their macroinvertebrate and chemical data were utilized as monitored information for this report.

Fish Consumption Use Support

Fish consumption is a new category of use which replaces the assessment of waters meeting the fishable goal of the Clean Water Act. States were not consistent in assessing the fishable goal in previous reports. Some reported that the fishable goal was met if the fish community was healthy even though there was a fish consumption advisory in effect. Other states reported the opposite. Separating fish consumption and aquatic life use gives a clearer picture of actual water quality conditions.

The following criteria were used to assess support for the fish consumption use.

- o Fully Supporting: No fish advisories or bans in effect.
- o Partially Supporting: "Restricted consumption" fish advisory or ban in effect for general population or a subpopulation that could be at potentially greater risk (e.g., pregnant women, children). Restricted consumption is defined as limits on the number of meals consumed per unit time for one or more fish species.
- o Not Supporting: "No consumption" fish advisory or ban in effect for general population, or a subpopulation that could be at potentially greater risk, for one or more fish species; commercial fishing ban in effect.

Use Support Summary

Table 4 shows the results of the evaluated and monitored use assessments from DOW data. Table 1 has more total assessed miles and more miles in the partial support category because it included conclusions from ORSANCO's assessment of the mainstem of the Ohio River and Missouri's assessment of the Mississippi River. Both tables follow EPA guidelines which define fully supporting as meaning that all uses that were assessed, had to be fully supporting before a segment could be listed under that title. If a segment supported one use, but did not support another, it was listed as not supporting. For instance, if a segment supported a warmwater aquatic habitat use, but not a primary contact recreation use, it was listed as not supporting. A segment is listed as partially supporting if any assessed use fell into that category even if another use was fully supported. Many streams were assessed for only one use because data were not available to assess other uses. Table 5 is a summary of individual use support.

The threatened category refers to stream miles that were judged to be in danger of use impairment from anticipated land use changes or development of trends indicating possible impairment. The aquatic life use of four streams was judged to be threatened by siltation from silvicultural activities (Rockcastle River, Horselick Creek, Raccoon

Creek, and White Oak Creek). Illwill Creek's aquatic life use is threatened by petroleum activities and the aquatic life use in the Salt River above Taylorsville Lake is threatened by nutrients from feedlots.

Sixty-eight percent of the assessed waters fully supported their uses. Twenty-one percent (2085 miles) did not support either aquatic life uses and/or swimming uses. Ten percent of the assessed rivers and streams partially supported these uses. The use most impaired was swimming. Close to half of the waters assessed for swimming did not support that use (1589 miles). In contrast, aquatic life use was fully supported in 79 percent (7192 miles) of the waters assessed for that use. Twelve percent were partially supported (1129 miles) and the use was not supported in nine percent (780 miles) of the assessed waters.

Table 4
Summary of Assessed* Use Support

Degree of Use Support	Assessment Basis		Total Assessed
	Evaluated	Monitored	
Miles Fully Supporting	4024.0	2562.7	6586.7
Miles Fully Supporting but Threatened	0.0	68.8	68.8
Miles Partially Supporting	225.6	770.2	995.8
Miles Not Supporting	319.1	1765.6	2084.7
TOTAL	4568.7	5167.3	9736.0

*Excludes mainstems of Ohio and Mississippi rivers; refer to ORSANCO and Missouri 305(b) reports for assessments.

Table 5
**Summary of Individual Use Support
for Rivers and Streams (in miles)**

	Fish	Aquatic Life	Swimming
	Consumption		
Total Assessed	9173.6	9173.6	3397.4
Supporting	9048.7	7192.1	1543.0
Threatened	0.0	72.3	0.0
Partially Supporting	0.0	1128.9	265.4
Not Supporting	124.9	780.3	1589.0

Causes of Use Nonsupport

Table 6 indicates the relative causes of use nonsupport. Stream segment lengths that either did not support or partially supported uses were combined to indicate the miles that were affected. Fecal coliform bacteria (pathogen indicators) were the greatest cause of use impairment and affected swimming use in 1585 miles of streams and rivers. Siltation was the second greatest cause of use impairment, impairing aquatic life use in 812 miles of streams and rivers and moderately impacting an additional 108 miles. Siltation affects the use by covering available habitat, preventing aquatic organisms from inhabiting streams that could normally support them. Organic enrichment was the third leading cause of use impairment. Organic enrichment lowers dissolved oxygen in streams, which causes stress on aquatic life. Aquatic life use was impaired in 547 miles of streams because of organic enrichment effects.

Sources of Use Nonsupport

Sources of use nonsupport were assessed under point and nonpoint categories and are listed in Table 7. Results were similar to the findings in the 1990 305(b) report. Nonpoint sources as a whole affected about twice as many miles of streams as point sources.

Municipal point sources and agricultural nonpoint sources were the leading sources of use nonsupport, each affecting over 1000 miles of streams. Swimming was the major use impaired by municipal sources and was caused by fecal coliform pollution. Nutrients from municipal sources also impaired aquatic life use.

Agriculture affected warmwater aquatic habitat use because of siltation and nutrients and primary contact recreation use because of fecal coliform contamination. Resource extraction activities relating to coal mining and petroleum production were the third leading source of use impairment. Siltation from coal mining and chlorides from petroleum sources impaired aquatic life uses.

Rivers and Streams Not Supporting Uses

Table 8 lists streams and rivers which did not support warmwater aquatic habitat (denoted as aquatic life) and swimming uses. Stream miles affected and causes and sources of nonsupport are also listed. The table differs from a similar table in the 1990 305(b) report by not including streams and rivers in the partial support category. The waters in Table 8 are the most impaired rivers and streams in the state.

Table 6
Causes of Use Nonsupport in Rivers and Streams

Cause Category	Miles Affected	
	Major Impact	Moderate/Minor Impact
Pathogen indicators	1585.3	4.8
Siltation	812.3	108.5
Organic enrichment/D.O.	546.9	56.4
Nutrients	269.9	91.5
pH	258.6	15.1
Metals	194.4	18.1
Salinity/TDS/Chlorides	178.2	20.1
Priority organics	144.3	24.3
Unknown toxicity	116.0	0.0
Habitat alterations	98.3	24.3
Oil and grease	36.1	0.0
Suspended solids	32.3	4.2
Other	5.3	0.0

Table 7
Sources of Use Nonsupport in Rivers and Streams

Source Category	Miles Affected	
	Major Impact	Moderate/Minor Impact
Point Sources		
Municipal	1583.5	165.0
Industrial	180.5	25.4
Combined sewer overflows	23.6	0.0
TOTAL	1787.6	190.4
Nonpoint Sources		
Agriculture	1330.5	476.9
Resource extraction	1078.0	51.2
Urban Runoff/Storm sewers	325.0	73.3
Hydro-Habitat modification	110.1	68.6
Land disposal/septic tanks	64.6	126.7
Construction	2.5	0.0
Silviculture	0.0	34.3
TOTAL	2910.7	831.0
Unknown	333.9	18.1

Table 8
List of Streams Not Supporting Uses by River Basin

Uses Not Supported						
Stream (Waterbody (I.D.))	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
<u>Big Sandy River Basin</u>						
Tug Fork (KY5070201-001) (KY5070201-004)				57.9	Pathogens	Municipal/ Agriculture
Big Creek (KY5070201-005)	19.7	Siltation	Agriculture/ Mining			
Knox Creek (KY5070201-010)				7.6	Pathogens	Agriculture
Levisa Fork (KY5070202-001) (KY5070203-010) (KY5070203-016) (KY5070203-021)				49.5	Pathogens	Municipal/ Agriculture
Shelby Creek (KY5070202-002)				10.0	Pathogens	Municipal
Russell Fork (KY5070202-004)				16.0	Pathogens	Municipal/ Agriculture
Elkhorn Creek (KY5070202-005)				27.4	Pathogens	Municipal
Paint Creek (KY5070203-005)				1.0	Pathogens	Urban Runoff/ Storm Sewers
Left Fork Middle Creek (KY5070203-014)	9.5	pH	Mining	9.5	pH	Mining
Beaver Creek (KY5070203-018)				7.0	Pathogens	Municipal
Mud Creek (KY5070203-022)	17.0	Siltation/Organic Enrichment	Agriculture/ Mining			
Big Sandy (KY5070204-001)	26.8	Metals	Unknown	26.8	Pathogens	Municipal/ Agriculture

Table 8 (Continued)

Uses Not Supported						
Stream (Waterbody (I.D.))	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
<u>Little Sandy River Basin</u>						
Little Sandy River (KY5090104-004)				39.3	Pathogens	Municipal/ Agriculture/ Septic tanks
East Fork Little Sandy River (KY5090104-003)	6.0	Organic Enrichment	Municipal			
Shope Creek (KY5090104-003)	5.4	Organic Enrichment	Municipal			
Newcombe Creek (KY5090104-009)	11.9	Chlorides	Petroleum Activities			
<u>Licking River Basin</u>						
Licking River (KY5100101-001) (KY5100101-004) (KY5100101-034)	6.3	Metals	Unknown	56.4	Pathogens	Municipal/ Agriculture/ Combined Sewer Overflows
North Fork Licking River (KY5100101-012)				19.5	Pathogens	Agriculture
Banklick Creek (KY5100101-002)				19.0	Pathogens	Combined Sewer Overflows
Three-Mile Creek (KY5100101-003)				4.7	Pathogens	Urban Runoff/ Storm Sewers
Lick Creek (KY5100101-037)	9.2	Chlorides	Petroleum Activities			
Raccoon Creek (KY5100101-037)	5.2	Chlorides	Petroleum Activities			

Table 8 (Continued)

Stream (Waterbody (I.D.))		Aquatic Life (miles)			Uses Not Supported			Swimming (miles)		Cause		Source	
Stream	(Waterbody (I.D.))	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source	Swimming (miles)	Cause	Source	Swimming (miles)	Cause	Source
Licking River Basin (Continued)													
Burning Fork	(KY5100101-038)	7.5	Chlorides	Petroleum Activities									
State Road Fork	(KY5100101-038)	5.1	Chlorides	Petroleum Activities									
Rockhouse Fork	(KY5100101-038)	5.0	Chlorides	Petroleum Activities									
Indian Creek	(KY5100102-009)				0.6	Pathogens	Municipal						
Stoner Creek	(KY5100102-012)				9.6	Pathogens	Municipal/Agriculture						
Houston Creek	(KY5100102-013)				14.0	Pathogens	Agriculture						
Hancock Creek	(KY5100102-017)				7.6	Pathogens	Agriculture						
Strodes Creek	(KY5100102-017)				26.5	Pathogens	Municipal/Agriculture/Urban Runoff/Storm Sewers						
Brushy Fork	(KY5100102-020)	5.0	Nutrients/Chlorides	Industrial									
U.T. to Brushy Fork	(KY5100102-020)	0.2	Nutrients/Chlorides	Industrial									
Hinkston Creek	(KY5100102-024)				19.8	Pathogens	Municipal/Agriculture						

Table 8 (Continued)

Uses Not Supported						
Stream (Waterbody (I.D.))	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
<u>Kentucky River Basin</u>						
North Fork Kentucky River (KY5100201-002) (KY5100201-005) (KY5100201-008)				55.1	Pathogens	Municipal/ Urban Runoff/ Storm Sewers
Quicksand Creek (KY5100201-007)				20.8	Pathogens	Agriculture
South Fork Quicksand Creek (KY5100201-007)				13.8	Pathogens	Agriculture
Spring Fork Quicksand Creek (KY5100201-007)	15.0	Siltation	Mining			
Lost Creek (KY5100201-009)	18.5	Siltation	Mining			
Troublesome Creek (KY5100201-009)				49.5	Pathogens	Municipal/Land Disposal
Rockhouse Creek (KY5100201-021)	24.3	Siltation	Mining			
Cutshin Creek (KY5100202-006)	28.8	Oil and Grease/ Siltation	Petroleum Activities/Mining			
Raccoon Creek (KY5100202-006)	7.3	Oil and Grease/ Siltation	Petroleum Activities/Mining			
Billiey Fork (KY5100204-009)	8.1	Chlorides	Petroleum Activities			
Millers Creek (KY5100204-009)	6.4	Chlorides	Petroleum Activities			
Big Sinking Creek (KY5100204-009)	14.1	Chlorides	Petroleum Activities			
Red River (KY5100204-013)	10.0	Metals	Unknown	10.0	Pathogens	Municipal

Table 8 (Continued)

Stream (Waterbody (I.D.))		Aquatic Life (miles)		Swimming (miles)		Uses Not Supported	
Stream (Waterbody (I.D.))	Source	Cause	Source	Cause	Source	Cause	Source
<u>Kentucky River Basin (Continued)</u>							
South Fork Red River	(KY5100204-018)	Chlorides	Petroleum Activities	10.1	38.8	Pathogens	Source Unknown
Sand Lick Creek	(KY5100204-018)	Chlorides	Petroleum Activities	5.0	40.9	Pathogens	Source Unknown
Cat Creek	(KY5100204-017)	Organic Enrichment/ Metals	Source Unknown	7.7	32.7	Pathogens	Source Unknown
Eagle Creek	(KY5100205-003) (KY5100205-005)						
Kentucky River - Lockport	(KY5100205-011)						
Kentucky River - Boonesboro	(KY5100205-047)						
Elkhorn Creek	(KY5100205-018)				17.8	Pathogens	Source Unknown
North Elkhorn Creek	(KY5100205-022)	Organic Enrichment/ Chlorine	Municipal	2.0			
Dry Run	(KY5100205-023)				7.5	Pathogens	Municipal/ Agriculture
U.T. to North Elkhorn Creek	(KY5100205-025)				10.8	Pathogens	Agriculture
South Elkhorn Creek	(KY5100205-026)				17.6	Pathogens	Urban Runoff/ Storm Sewers
Lee Branch	(KY5100205-027)	Organic Enrichment	Municipal	1.0			

Table 8 (Continued)

Stream (Waterbody (I.D.))		Uses Not Supported			Swimming (miles)	Source	Cause
		Aquatic Life (miles)	Cause	Source		Cause	Source
<u>Kentucky River Basin (Continued)</u>							
Town Branch	(KY5100205-028)	11.3	Organic Enrichment/ Metals/ Nutrients	Municipal			
Clarks Run	(KY5100205-039)	8.0	pH/Organic Enrichment	Municipal			
Silver Creek	(KY5100205-052)	2.0	Organic Enrichment/ Nutrients	Municipal			
Brushy Fork	(KY5100205-052)	0.2	Nutrients	Municipal			
<u>Green River Basin</u>							
Nolin River	(KY5110001-010)				49.2	Pathogens	Municipal
Valley Creek	(KY5110001-012)	17.5	Organic Enrichment/ Chlorides	Municipal/ Urban Runoff/ Storm Sewers			
Doty Creek	(KY5110002-012)				4.0	Pathogens	Pasture Land/ Feedlots/ Animal Holding/ Mgt. Areas
Patoka Creek	(KY5110002-018)				4.3	Pathogens	Pasture Land/ Feedlots/ Animal Holding/ Mgt. Areas
Pond Creek	(KY5110003-003)	23.8	pH/Metals	Mining	23.8	pH	Minning

Table 8 (Continued)

Stream (Waterbody (I.D.))		Aquatic Life (miles)			Uses Not Supported			Swimming (miles)		
		Cause	Source	Cause	Source	Cause	Source	Cause	Source	
<u>Green River Basin (Continued)</u>										
Mud River	(KY5110003-005) (KY5110003-008)	64.8	Priority Organics/ Organic Enrichment	Industrial/ Unknown	55.1	Pathogens	Agriculture/ Urban Runoff/ Storm Sewers			
Green River	(KY5110005-001) (KY5110005-003) (KY5110005-011)									
Cypress Creek	(KY5110006-002)	33.3	pH	Mining	33.3	pH	Mining			
Harris Branch	(KY5110006-002)	2.6	pH	Mining	2.6	pH	Mining			
Flat Creek	(KY5110006-005)	10.6	pH	Mining	10.6	pH	Mining			
Drakes Creek	(KY5110006-006)	21.3	pH	Mining	21.3	pH	Mining			
<u>Upper Cumberland River Basin</u>										
Cumberland River	(KY5130101-025) (KY5130101-032)				41.1	Pathogens	Municipal/ Land Disposal			
Yellow Creek	(KY5130101-031)				9.5	Pathogens	Municipal			
Cranks Creek	(KY5130101-038)	15.1	Siltation/pH	Mining						
Big Lily Creek	(KY5130103-011)	2.6	Chlorides	Industrial						
Elk Spring Creek	(KY5130103-018)	1.5	Organic Enrichment	Municipal						
Rock Creek	(KY5130104-007)	4.0	Metals/pH	Mining	4.0	pH	Mining			
Roaring Paunch Creek	(KY5130104-008)	15.6	pH	Subsurface Mining/Surface Mining						

Table 8 (Continued)

Uses Not Supported

Stream (Waterbody (I.D.))	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
<u>Upper Cumberland River Basin (Continued)</u>						
Bear Creek (KY5130104-009)	3.2	pH	Subsurface Mining/Surface Mining	3.2	pH	Surface Mining/ Subsurface Mining
<u>Lower Cumberland River Basin</u>						
North Fork Little River (inc. Upper Branch) (KY5130205-009)				18.1	Pathogens	Municipal/ Agriculture
Elk Fork (KY5130206-002)	7.0	Organic Enrichment	Municipal/ Agriculture			
<u>Salt River Basin</u>						
Pond Creek (KY5140102-002)	17.0	Unknown Toxicity/ Organic Enrichment/ Metals	Municipal	17.0	Pathogens	Municipal
Northern Ditch Pond Creek (inc. Fern Creek) (KY5140102-002)	10.1	Unknown Toxicity/ Organic Enrichment/ Metals	Municipal	10.1	Pathogens	Municipal
Southern Ditch Pond Creek (KY5140102-002)	7.1	Unknown Toxicity/ Organic Enrichment/ Metals	Municipal	7.1	Pathogens	Municipal

Table 8 (Continued)

Stream (Waterbody (I.D.))		Aquatic Life (miles)		Uses Not Supported		Swimming (miles)		Cause		Source	
Stream (Waterbody (I.D.))		Aquatic Life (miles)		Cause	Source	Swimming (miles)		Cause	Source		
<u>Salt River Basin (Continued)</u>											
Spring Ditch	(KY5140102-002)	2.0		Unknown Toxicity/ Organic Enrichment/ Metals	Municipal	2.0		Pathogens	Municipal		
Fishpool Creek	(KY5140102-002)	5.4		Unknown Toxicity/ Organic Enrichment	Municipal	5.4		Pathogens	Municipal		
Knob Creek	(KY5140102-002)	15.3		Unknown Toxicity/ Organic Enrichment	Municipal						
Briar Creek	(KY5140102-002)	5.7		Unknown Toxicity/ Organic Enrichment	Municipal						
Mill Creek	(KY5140102-003)					13.5		Pathogens	Municipal		
Salt River	(KY5140102-005) (KY5140102-029) (KY5140102-031)					57.5		Pathogens	Septic Tanks/ Urban Runoff/ Storm Sewers/ Municipal/ Pasture Land/ Feedlots/ Animal Holding/ Mgt. Areas		

Table 8 (Continued)

Stream (Waterbody (I.D.))		Uses Not Supported			Swimming (miles)	Source	Cause	Source
		Aquatic Life (miles)	Cause	Source				
<u>Salt River Basin (Continued)</u>								
Town Creek	(KY5140102-033)				3.2		Pathogens	Municipal/ Pasture Lands/ Feedlots/ Animal Holding/ Mgt. Areas
Floyds Fork	(KY5140102-007) (KY5140102-011) (KY5140102-014)	13.0	Organic Enrichment	Municipal/ Urban Runoff/ Storm Sewers/ Flow Regulation	61.6		Pathogens	Municipal
Cedar Creek	(KY5140102-008)	15.2	Organic Enrichment	Municipal	15.2		Pathogens	Municipal
Pennsylvania Run	(KY5140102-008)				5.5		Pathogens	Municipal
Brooks Run	(KY5140102-009)	6.0	Organic Enrichment	Municipal	6.0		Pathogens	Municipal
Chenoweth Run	(KY5140102-010)	9.1	Organic Enrichment	Municipal	9.1		Pathogens	Municipal
Pope Lick Creek	(KY5140102-012)				5.0		Pathogens	Municipal/ Urban Runoff/ Storm Sewers
Long Run	(KY5140102-012)				9.5		Pathogens	Municipal/ Agriculture

Table 8 (Continued)

Uses Not Supported						
Stream (Waterbody (I.D.))	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
<u>Salt River Basin (Continued)</u>						
Beech Creek (KY5140102-026)				30.1	Pathogens	Pasture Lands/ Feedlots/ Manure Lagoons/ Animal Holding/ Mgt. Areas/ Septic Tanks
Crooked Creek (KY5140102-027)				13.9	Pathogens	Pasture Land/ Feedlots/ Septic Tanks/ Animal Holding/ Mgt. Areas
Ashes Creek (KY5140102-028)				10.3	Pathogens	Pasture Land/ Feedlots/ Animal Holding/ Mgt. Areas
Jacks Creek (KY5140102-028)				8.0	Pathogens	Pasture Land/ Feedlots/ Manure Lagoons/ Animals Holding/ Mgt. Areas

Table 8 (Continued)

Uses Not Supported

Stream (Waterbody (I.D.))	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
<u>Salt River Basin (Continued)</u>						
Timber Creek (KY5140102-028)				4.8	Pathogens	Pasture Land/ Feedlots/ Manure Lagoons/ Animals Holding/ Mgt. Areas
Rolling Fork (KY5140103-001) (KY5140103-005)				107.4	Pathogens	Municipal/ Agriculture
<u>Tradewater River Basin</u>						
Crab Orchard Creek (KY5140205-003)	22.6	pH/Siltation	Mining/ Agriculture	22.6	pH	Mining
Vaughn Ditch (KY5140205-003)	3.2	pH/Siltation	Mining/ Agriculture	3.2	pH	Mining
Clear Creek (KY5140205-008)	28.1	pH/Siltation	Mining/ Agriculture	28.1	pH	Mining
Lick Creek (KY5140205-008)	18.1	pH/Siltation	Mining/ Agriculture	18.1	pH	Mining
Caney Creek (KY5140205-015)	11.3	pH/Siltation	Mining/ Agriculture	11.3	pH	Mining
Buffalo Creek (KY5140205-016)	7.8	pH/Siltation	Mining/ Agriculture	7.8	pH	Mining

Table 8 (Continued)

Stream (Waterbody (I.D.))		Uses Not Supported	Aquatic Life (miles)	Swimming (miles)	Source	Cause	Source
<u>Tennessee River Basin</u>							
Cypress Creek	(KY6040006-013)	19.4	Unknown Toxicity/ Priority Organics	Industrial			
<u>Mississippi River Basin</u>							
Mayfield Creek	(KY8010201-004)	2.4	Organic Enrichment	Municipal			
<u>Ohio River Tributaries</u>							
Muddy Fork Beargrass Creek	(KY5140101-002)	6.9		Pathogens			Municipal/Urban Runoff/ Storm Sewers
South Fork Beargrass Creek	(KY5140101-002)	14.6		Pathogens			Municipal/Urban Runoff/ Storm Sewers
Middle Fork Beargrass Creek	(KY5140101-002)	15.2		Pathogens			Municipal/Urban Runoff/ Storm Sewers
Goose Creek	(KY5140101-003)	12.2		Pathogens			Municipal
Little Goose Creek	(KY5140101-003)	8.7		Pathogens			Municipal
Little Bayou Creek	(KY5140206-002)	6.5	Priority Organics	Hazardous Waste			
Mill Creek	(KY5140101-001)	16.5	Metals	Urban Runoff/ Storm Sewers			Urban Runoff/ Storm Sewers

Changes in Use Support: 1990 to 1992

Several waterbodies showed an improvement in water quality since the last report. Consequently, their use support status has changed. The streams listed in Table 9 as fully supporting a use had previously been assessed as either not supporting or partially supporting aquatic life or swimming uses.

Table 9 also lists waterbodies that have poorer water quality than that reported in 1990. Their use has either changed from full support or partial support to not support.

Blaine Creek water quality has improved because of the shut-down of oil and gas production in its watershed. The changes to full support of aquatic life in the Green River at Sebree and the Barren River near Bowling Green, and not support in the Big Sandy near Louisa, Licking River near Covington, and Red River near Clay City is a reflection of the change in the criteria used in the assessments and not a change in water quality. The changes in swimming use support are probably most related to differing rainfall patterns between the years as fecal coliform contamination has been positively linked to rain events.

Trends in Water Quality

A statistical trend analysis was not performed in this reporting period. A trend analysis is reported every four years. However, a noteworthy change in water quality was detected at monitoring stations on the Kentucky and Licking Rivers and will be discussed. Brine pollution of streams and rivers from oil and gas production operations has been a concern in Kentucky for several years. Steps were taken in 1985 to add chloride to Kentucky's water quality criteria to protect aquatic life. That enabled the Division to limit chlorides on permits for oil and gas production facilities. Since that time monitoring of water quality in the affected areas of the Kentucky River, Blaine Creek, and Licking River basins has shown a decrease in chloride concentrations, particularly in 1989, 1990, and 1991. Figure 1 illustrates the decrease noted in the Kentucky River at the Heidelberg monitoring station. The decrease has also been noted farther down river at Camp Nelson and in the South Fork of the Kentucky River.

Blaine Creek water quality has improved as noted in the previous section. The Right and Left forks of Blaine Creek have improved water quality, but still show some signs of chloride impacts on macroinvertebrate communities and only partially support aquatic life.

The Licking River near Salyersville has also shown a marked decrease in chloride concentrations (see Figure 1). Data from the DOW monitoring site have shown a decrease in the median chloride values beginning in 1989. The median was 227 mg/l in 1986, 140 mg/l in 1987, and 177 mg/l in 1988. In 1989 the median was 33 mg/l and in 1990 it was 27 mg/l. Maximum values had been above the domestic water supply

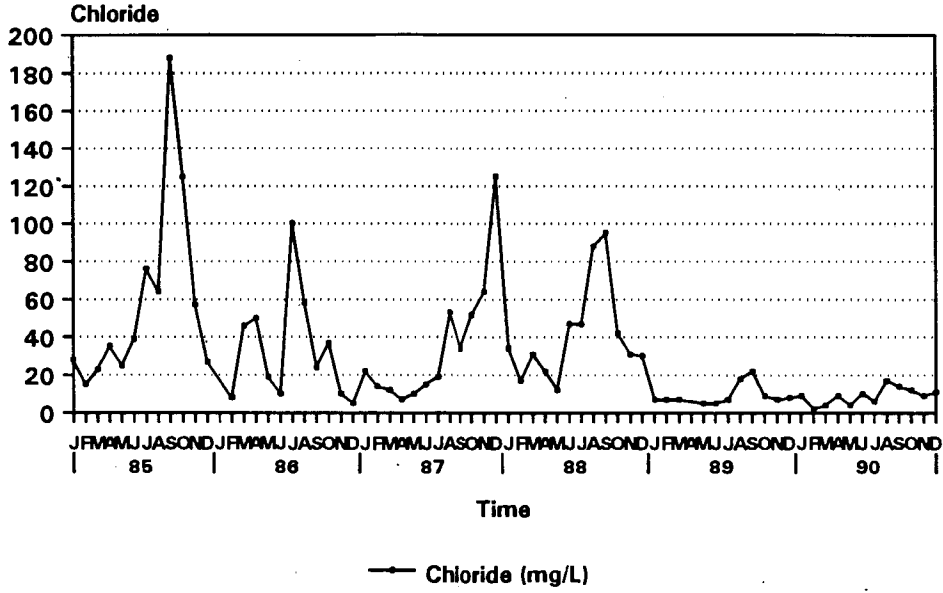
Table 9
Changes in Use Support
1990 to 1992

Waterbody	Full Support		Not Support	
	Aquatic Life	Swimming	Aquatic Life	Swimming
Big Sandy River near Louisa			X	X
Blaine Creek	X			
Tygart Creek		X		
Licking River near Covington			X	X
Cat Creek			X	
Middle Fork Kentucky River		X		
Red River near Clay City			X	
Kentucky River near:				
Heidelberg		X		
Boonesboro				X
Frankfort		X		
Lockport				X
Eagle Creek				X
Elkhorn Creek				X
Cumberland River near:				
Cumberland Falls				
Burkesville		X		
Rolling Fork near New Haven		X		X
Floyds Fork			X	
Long Run	X			
Green River near:				
Munfordsville		X		
Morgantown		X		
Sebree	X			
Barren River near:				
Bowling Green	X			
Bacon Creek				X
Little River near Cadiz		X		
East Fork Clarks River		X		
Mayfield Creek near:				
Blandville		X		
Mayfield			X	
Bayou de Chien		X		

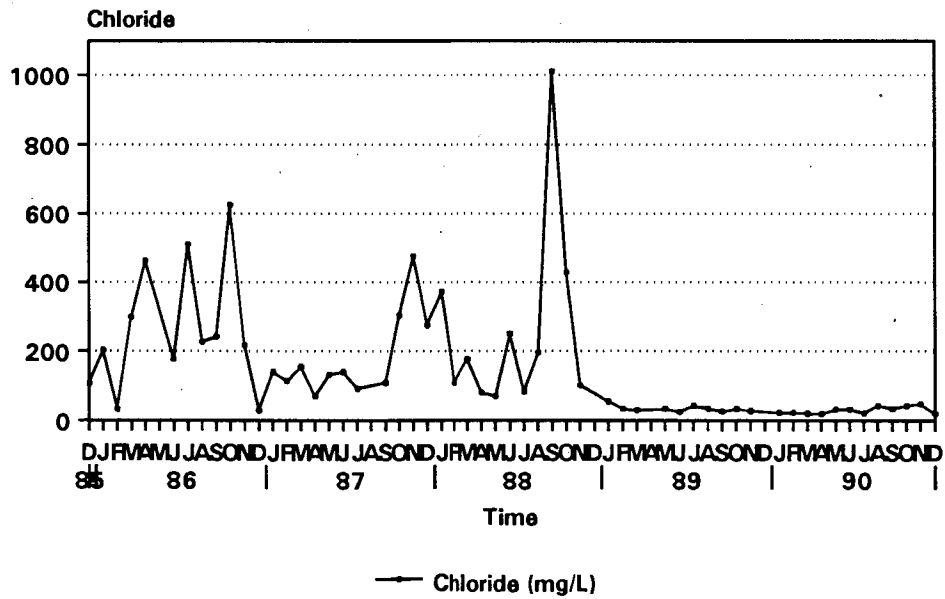
X - Denotes change in status from 1990

Figure 1

Kentucky River at Heidelberg Chloride vs. Time



Licking River at Salyersville Chloride vs. Time



criterion of 250 mg/l for several years and interfered with this use for the city of Salyersville. For instance, the maximum concentrations were 625 mg/l, 474 mg/l, and 1010 mg/l in 1986, 1987, and 1988 respectively. The maximum concentrations were 54 mg/l in 1989 and 47 mg/l in 1990.

The decrease in chloride concentrations in the Kentucky River and Licking River in the areas discussed above may be attributed to enforcement of the chloride limits on permits, decreases in oil production, and flow variations in the receiving streams.

Public Health/Aquatic Life Impacts: Toxics

Although the biological monitoring program focuses on the protection of aquatic life from toxics and conventional pollutants, an underlying theme of aquatic life protection is subsequent public health protection. The DOW has played an increasing role in public health protection through assessing the need for fish consumption advisories based on the concentrations of contaminants in fish tissue samples. Additionally, the Division coordinated a study to determine the extent of chlordane and PCB contamination in paddlefish fillets and eggs collected from the Ohio River. Data provided by the University of Louisville, concern regarding the commercial marketing of paddlefish fillets, and the use of paddlefish roe as domestic caviar prompted this investigation.

Fish Consumption Advisories

Four individual fish consumption advisories are currently in effect within the Commonwealth of Kentucky. All of these were discussed in the 1990 305(b) report and are still in place. They are briefly summarized in Table 10, and are discussed in detail below.

All of the advisories are based on contaminant residues exceeding the respective Federal Food and Drug Administration (FDA) action levels in edible portions (fillets). For each advisory, PCBs are a contaminant of concern. Chlordane is also of concern in the Ohio River advisory. All advisories were jointly agreed upon and issued by the Kentucky Natural Resources and Environmental Protection Cabinet (KNREPC), the Kentucky Department of Fish and Wildlife Resources (KDFWR), and the Cabinet for Human Resources (CHR). Operational protocols established in 1990 outline the roles of each agency in issuing fish consumption advisories. Additionally, ORSANCO and other Ohio River states were involved in issuing the advisory on the Ohio River.

Town Branch/Mud River. Fish samples representing nine species were collected from four locations on Town Branch during March 1990. All fish were analyzed as wholebody samples and indicated that PCBs are still of concern within this system.

Table 10
Fish Consumption Advisory Summary

Stream	Pollutants	Source	Miles Covered	Date Established	Comments
Town Branch/Mud River (Logan, Butler and Muhlenberg counties)	PCBs	Dye-casting plant	71.5	October 1985	Cleanup in progress; monitoring continues. All species covered.
West Fork Drakes Creek (Simpson and Warren counties)	PCBs	Adhesive plant	46.9	April 1985	Monitoring continues; levels in fish appear to be declining. All species covered.
Little Bayou Creek (McCracken County)	PCBs	Gaseous diffusion plant	6.5	April 1989	On-site clean-up in progress; monitoring continues; contamination appears limited to Little Bayou Creek. All species covered.
Ohio River	PCBs Chlordane	Urban runoff; no known point source discharge	663.9	June 1989	(Channel catfish, carp, White bass, Paddlefish). Monitoring continues, advisory re-issued 1992.

Samples of five fish species (carp, channel catfish, bluegill, largemouth bass, spotted bass) were collected from the lower portion of Mud River during September 1990. Analyses conducted included eleven metals, nine PCB Aroclors, nine chlordane isomers, and 28 other parameters. Results for chlordane, PCBs, and percent lipids are summarized in Table 11. Chlordane was not detected in any of the samples and PCBs were well below the FDA action level. Additional sampling is scheduled for Town Branch and the middle portion of Mud River during 1992.

Clean-up activities have been conducted on-site and at several off-site locations. Groundwater monitoring has continued and a dye tracing study was recently completed. A groundwater collection system design has been selected and plans for the placement are being finalized. Also, deep aquifer extraction wells have been put into place. Sampling and analysis of Town Branch floodplain soils has been conducted. This information will be used to help determine necessary remediation activities for the Town Branch floodplain area. Sediment clean-up in Town Branch is scheduled to begin in 1992.

West Fork Drakes Creek. Fish-tissue samples were collected in August 1990. Six species (stoneroller, silver shiner, white sucker, bluegill, longear sunfish, spotted bass) were collected and analyzed for 58 parameters. Chlordane, and percent lipid results are summarized in Table 11. Chlordane concentrations were well below the FDA action level. Although PCB levels did not exceed the FDA action level for edible portions, the wholebody samples indicated that PCBs are still of concern in this system, and the stream is scheduled to be sampled by DOW during 1992. The University of Kentucky collected fish samples during late 1991 and early 1992. Upon completion of DOW sampling and analysis, and after reviewing the UK results, this advisory will be re-evaluated.

Little Bayou Creek. This stream was placed under a fish consumption advisory in 1989 after the DOW received and reviewed fish-tissue data from the Paducah Gaseous Diffusion Plant (PGDP). During 1987-1989, approximately 53 percent of the fish samples exceeded the FDA action level for PCBs (2.0 ppm). While the advisory covers all species, green and longear sunfish were the predominate species that were collected and analyzed. The plant is conducting on-site clean-up activities, monitoring effluent quality, and performing groundwater studies. Chemical, ecological, and fish-tissue evaluations were conducted in Big and Little Bayou Creeks by the University of Kentucky during 1987-1991.

About 240 fish have been collected from Big Bayou Creek and analyzed for PCBs. Of these, only 4 percent have exceeded the FDA action level for PCBs. Fish samples collected from nearby ponds on the West Kentucky Wildlife Management Area and from Metropolis Lake during 1989 generally did not indicate PCB contamination. Additional monitoring at the PGDP is scheduled during 1992.

Table 11
1990 Fish Tissue Data for Two Fish Consumption Advisory Areas*

Stream/ Species	Chlordane	PCBs	Aroclor Detected	Percent Lipids
<u>Mud River</u>				
Carp (3)-F**	-	0.18	1254	2.6
Channel catfish (3)-F	-	0.17	1260	2.6
Bluegill (8)-WB	-	-	-	1.3
Largemouth bass (2)-F	-	-	-	0.6
Spotted bass (2)-F	-	0.63	1248, 1254	1.0
<u>West Fork Drakes Creek</u>				
Stoneroller (12)-WB	0.074	1.16	1248	10.0
Silver shiner (12)-WB	0.116	2.19	1248, 1254	14.6
White sucker (1)-WB	-	0.65	1248	4.7
Bluegill (3)-WB	0.008	0.45	1248, 1254	2.2
Longear sunfish (7)-WB	0.042	0.72	1248, 1254	2.5
Spotted bass (1)-F	0.079	1.27	1248, 1254	3.1
Spotted bass (2)-WB	0.127	2.15	1248, 1254	3.8

*Chlordane and PCB results are ppm

**F denotes fillet sample

WB denotes wholebody sample

Number in parenthesis denotes number of fish in composite sample

- Not detected

Ohio River. Fish tissue samples were collected and analyzed through the cooperative efforts of KNREPC, KDFWR, CHR, FDA and ORSANCO. Fish samples were obtained during lockchamber studies and related electrofishing activities and by special sampling efforts aimed specifically at paddlefish.

The current advisory, based on the 1990 and 1991 fish-tissue results (Appendix A(1)) still covers that portion of the Ohio River bordering Kentucky. The four species covered in the 1992 advisory are: channel catfish, carp, white bass, and paddlefish. Paddlefish eggs are also included in the 1992 advisory because of their use in domestic caviar and the presence of chlordane levels exceeding the 0.3 ppm FDA action level (Appendix A(1)).

Additional sampling activities planned for 1992 include lockchamber studies and related electrofishing activities. Upon completion of sample collection and analysis, the fish consumption will be re-evaluated.

National Bioaccumulation Study Follow-up

Eleven locations in Kentucky have been previously sampled as part of the National Dioxin Study and the National Bioaccumulation Study conducted by the EPA. The Division of Water participated in these studies by providing information on sampling locations and by collecting fish samples for analysis by EPA/Region IV. Chlordane, dioxin, and PCB results were included in the 1990 305(b) report.

Only one sample collected by Kentucky during these studies approached the FDA Level of Concern for dioxin (25 ppt). A 1989 composite fillet sample taken from two striped bass collected in the Big Sandy River near Catlettsburg, Kentucky, was analyzed by EPA/Region IV and found to contain 22.8 parts per trillion (ppt) dioxin. As a result of joint efforts by the U.S. Army Corps of Engineers-Huntington District, the Division of Water, and the West Virginia Division of Natural Resources, follow-up fish and sediment sampling were conducted during 1990. Fish were collected at five locations on the Big Sandy River during July and August 1990.

Twelve fillet samples representing seven species were submitted for analysis. Dioxin, furan, and lipid results are summarized in Appendix A(2). No dioxin concentrations exceeded the 25 ppt Level of Concern established by FDA. The highest dioxin concentration observed was 17.0 ppt in a channel catfish composite sample (Appendix A(2)). Dioxin and furan were not detected in sediment samples collected by the Huntington District Corps of Engineers. Currently, no fish consumption advisory has been issued.

Public Health/Aquatic Life Impacts: Non-toxics

Non-toxics are conventional pollutants such as chlorine, un-ionized ammonia, oxygen demanding substances, and pathogenic organisms such as bacteria and viruses. These pollutants are a cause of concern because they are often responsible for fish kills, or like bacteria and viruses, can pose a threat to human health. Reports on fish kills, bacteriological evaluations of water quality, and beach closures are discussed below.

Fish Kill Incidents

Thirty-three fish-kill reports were received by KDFWR between January 1, 1990, and December 31, 1991. These involved slightly more than 56 stream miles and 26 surface acres on 35 different waterbodies. Seven major causes were identified, with organic enrichment by wastewater treatment plants (WWTPs) or animal wastes being predominant (45%). Nine fish kills were caused by unknown sources and ranged from 20 to over 22,000 fish killed. Over 134,000 fish valued at approximately \$33,000 were estimated to have been killed. The two largest fish kills during this period accounted for almost half (45%) of the total fish killed. A chemical spill to Russell Fork during 1990 killed the greatest number of fish (38,576) during this period. Almost half (16) of the fish kills investigated occurred in July, August, and September. Table 12 summarizes the severity, causes, and locations of fish kills during 1990-91. Appendix A(3) shows a more detailed list of the fish kills that were investigated.

A 12-year synopsis (1980-91) of fish kill records is shown in Table 13. During this period, the number of major (greater than 1000 fish) fish kills occurring each year has remained fairly low (ten or less). For the current 305(b) reporting period (1990-91), the number of major fish kills recorded (12) and the number of waterbodies affected were lower than those for previous two 305(b) reporting periods. The number of stream miles affected and the number of fish killed (134,208) were also lower than in the previous four years.

Bacteriological Evaluations of Swimming Use

Fecal coliform bacteria are measured in water samples as indicators of other disease-causing bacteria. The most common illnesses experienced from swimming in fecally contaminated waters are gastroenteritis, ear infections, and skin infections (swimmers itch). During the 1990-1991 recreation seasons, bacteriological surveys were conducted in the areas listed below.

- o Upper Salt River and tributaries to Taylorsville Lake
- o North Fork Kentucky River
- o Three-mile Creek/Lower Licking River
- o Embayment/Dock Areas at Lake Cumberland

Table 12
Fish Kill Summary

		1990	1991	Total
Severity:	Light (< 100)	1	2	3
	Moderate (100-1,000)	8	7	15
	Major (> 1,000)	5	7	12
	Unknown	2	1	3
	Total	16	17	33
Cause:	Sewage (WWTP)	4	5	9
	Agricultural operation	3	3	6
	Mining or oil operation	0	2	2
	Oil or chemical spill	2	1	3
	Natural (low D.O., etc.)	1	2	3
	Herbicides	0	1	1
	Unknown	6	3	9
	Total	16	17	33
River Basin:	Big Sandy	4	3	7
	Licking	4	4	8
	Kentucky	3	3	6
	Salt	1	1	2
	Green	4	2	6
	Upper Cumberland	0	2	2
	Lower Cumberland	0	0	0
	Tennessee	0	0	0
	Ohio tributaries	0	2	2
Total	16	17	33	
Approximate number of stream miles		19.4	36.93	56.33
Approximate acres of lakes		1.1	25.0	26.1
Estimated number of fish killed		74,170	60,038	134,208

**Table 13
Fish Kill Synopsis, 1980-1991**

Year	Number of Incidents	Number of Water-bodies	Stream Miles Affected	Surface Acres Affected	Number Fish Killed	Number Major Fish Kills*	Known Causes
1980	24	25	53.2	-	224,136	10	10
1981	26	30	74.3	-	81,266	7	10
1982	26	28	52.0	72.0	98,436	5	12
1983	36	41	51.3	7.0	76,187	8	19
1984	33	35	67.3	47.5	106,514	7	18
1985	29	27	86.9	4.5	59,499	5	9
1986	23	20	23.3	47.0	129,560	8	9
1987	30	32	58.3	200.0	229,583	10	14
1988	19	16	105.6	-	319,212	10	10
1989	23	23	47.8	9.0	222,330	9	11
1990	16	17	19.4	1.10	74,170	5	5
1991	17	18	36.9	25.0	60,038	7	7

*>1000 fish killed

The upper Salt River, its tributaries, and tributaries to Taylorsville Lake were monitored for fecal coliform as part of a DOW study on point and nonpoint source impacts to Taylorsville Lake. The samples were collected twice in August 1990. The North Fork of the Kentucky River was monitored as a follow-up to its nonsupport of swimming use which was reported in the 1990 305(b) report. Sampling over weekly intervals in the 1990 recreation season resulted in a posting of a nonswimming advisory by the Division in 1990 and 1991. That advisory is still in effect and monitoring is continuing in-stream and at point sources in order to determine if the advisory can be cancelled. The Division has worked with municipalities in the area to improve wastewater treatment plant operations and reduce fecal coliform pollution.

Three-mile Creek discharges to the Licking River near Covington, Kentucky. The Division sampled this creek, Bank Lick Creek, the lower Licking River, and creeks near the town of Melbourne in 1991 and found they were polluted by fecal coliform bacteria. Advisories were sent to residents, creeks were posted, and notices were published in local newspapers about the risk of bodily contact in these waters. The Division plans to continue monitoring these areas in the 1992 recreation season to determine if the advisories need to be continued and to identify pollution sources.

Houseboat slip and dock areas on Lake Cumberland have been monitored for fecal coliform levels on a monthly basis, during the recreation season, since 1988. Areas around the Burnside, Jamestown, Alligator, and Grider Hill docks have shown no evidence of fecal coliform pollution. Five areas in the main lake outside of marina and dock influences are also monitored and have shown no evidence of fecal coliform pollution. The lake is considered to be safe for swimming.

Beach Closures

During the 1990 and 1991 recreation season beaches were closed at only one of 11 state parks. The beach on the Kentucky River at Fort Boonesboro State Park was closed on July 6, 1990. The Department of Parks is building a swimming pool at the park that will replace the beach as a swimming area. The Department of Parks monitored the following state park beaches:

Barren River Lake	Rough River Lake
Lake Barkley	Green River Lake
Kenlake	Buckhorn Lake
J.J. Audubon (Scenic Lake)	Lake Malone
Fort Boonesboro	Greenbo Lake
(Kentucky River)	Pennyrile Lake

Wetland Information

The loss of valuable wetland resources, and adverse impacts to remaining areas, are of special concern to Kentucky. Over half of the original wetland acreage has been destroyed. Nearly all of the areas that remain have been degraded by pollutants, such as pesticides, acid mine drainage, siltation, brine water, and/or domestic and industrial sewage. However, Kentucky still does not have an active wetland monitoring program. There continues to be a poor understanding of what once occurred, what is left, and current impacts and rates of loss.

According to the most recent (1979) USFWS classification system, the majority of Kentucky's wetlands fall in the Palustrine System. Areas lying shoreward of rivers and lakes, including floodplains, oxbows, ponds, marshes, and swamps, are members of the Palustrine System. The broad alluvial floodplains of the Ohio and Mississippi Rivers and their tributaries in western Kentucky comprise the vast

majority of Kentucky's wetlands. The class type within these floodplain areas is mostly bottomland hardwood forests with inclusion of scrub-shrub and emergent types of vegetation. Small ponds are common throughout the state and their area is difficult to assess. However, ponds have important value as ecological epicenters.

In 1985, the DOW provided funding to the Kentucky State Nature Preserves Commission to determine the status of Kentucky's wetlands. Recommendations for protection of remaining wetland areas were included in their 1986 report Wetland Protection Strategies for Kentucky. Among their findings was an estimate that, as of 1978, 637,000 acres remain of the original 1,566,000 acres of wetlands in Kentucky, see Table 14. Further, it was estimated that only 20 percent of Kentucky's wetland soils remain forested, which reflects a dramatic decline in bottomland hardwood wetlands. The Kentucky Department of Fish and Wildlife Resources estimates Kentucky's annual rate of wetland loss at 3,600 acres. This information provides only a rough estimate of Kentucky's wetland trends.

Table 14
Extent of Wetlands, By Type

Wetland Type	Historical Extent (acres) ¹	1990 305(b) Acreage ²	Most Recent Acreage
Palustrine-All Types	1,566,000	637,000	637,000

Source of Information:

¹Kentucky Soil and Water Conservation Commission. 1982. Kentucky Soil and Water Conservation Program. Part 1.

²Kentucky Nature Preserves Commission. 1986. Wetland Protection Strategies for Kentucky.

Water Quality Standards for Wetlands

Kentucky water quality standards include wetlands as waters of the state, but do not provide specific wetlands criteria. As waters of the state, wetlands are designated for the uses of warmwater aquatic habitat and contact recreation. Additionally, three of Kentucky's wetlands have been designated as outstanding resource waters.

In 1991, the DOW received a grant under Section 104(b)(3) of the Clean Water Act to address deficiencies in the water quality standards regarding wetlands protection. Under this grant selected wetlands were added to the reference reach monitoring program. Representative wetlands were selected within physiographic regions for monitoring to characterize chemical water quality, sediment quality, fish

tissue residue, habitat condition, and general biotic conditions. From this information, decisions will be made regarding: designation of appropriate stream use classifications, modifications to numerical chemical criteria, and development of narrative or numerical biocriteria. This information will not be available for use during Kentucky's next triennial review, scheduled for 1992.

401 Certification

Any applicant for a federal permit for an activity that could result in any discharge of a pollutant into a regulated state wetland is required to obtain a Section 401 water quality certification from DOW. The state is to certify that the materials to be discharged into a wetland will comply with the applicable effluent limitations, water quality standards, and any other applicable conditions of state law. Section 401 requirements pertain to any activity that requires a federal permit and that may result in a discharge to state water. Discharges may include but are not limited to dredged spoil, solid waste, garbage, rock, and soil. The state certification process is typically triggered through a Section 404 permit application and the associated Corps of Engineers Public Notice.

The Corps of Engineers public notice includes a request for 401 certification. Upon receipt, DOW initiates review for potential adverse impacts to designated uses of wetlands. Review focuses on possible violations of state regulations designed to protect water quality and aquatic life. Additional information, such as wetland mitigation plans, may be requested during the review process. The certification decision is submitted to the applicant and the Corps of Engineers.

Sufficient information to process a 401 certification is normally provided through the federal permit application and public notice process. If additional information is required, the applicant is so notified by the DOW. The Corps has the authority to issue general permits for certain categories of activities, which provide blanket authorization on a nationwide, state, or regional level, provided there are minimal adverse impacts on the environment. Such proposed activities do not require individual permits as long as the project complies with the conditions in the general permit. However, the proposed activity requires a Section 401 water quality certification in Kentucky if the action involves discharges into one acre or more of wetland.

Consistent with Section 401 and Kentucky water quality standards, wetlands impacts should be avoided or minimized wherever possible. When unavoidable impacts occur, appropriate compensation is required to replace the lost functions. Unavoidable wetland losses, incurred as a result of the permitting process or as a result of an illegal fill and subject to enforcement, require mitigation (restoration, creation, and/or enhancement) to compensate for wetlands unavoidably lost.

Attainment of functional equivalency should be the goal of all mitigation activities. The choice of restoration, creation, or enhancement mitigation for any project depends upon the site specific characteristics of available locations. The choice should be based upon analysis of factors that limit the ecological functioning of the watershed, ecosystem or region. Ideally, mitigation should be in the form of restoration of "prior converted" wetlands as defined by the Corps of Engineers. Mitigation should be initiated either before or at the same time that the proposed project work is being undertaken. The mitigation plan must be made part of the project application. Where an activity does not result in a permanent loss, on-site restoration in addition to compensatory mitigation should occur.

The principal deficiencies in the federal Section 404 permitting program and the state water quality certification program are the lack of effective compliance assurance and enforcement elements. The Corps of Engineers and DOW need to significantly increase surveillance and enforcement activities in order to ensure permitted and/or unpermitted activities are not degrading or eliminating wetland resources.

CHAPTER 2

WATER QUALITY ASSESSMENT OF LAKES

WATER QUALITY ASSESSMENT OF LAKES

Section 314 of the Clean Water Act of 1987 requires that states submit a lake water quality assessment as part of their biennial 305(b) report. Six areas are to be included in the assessment. These are:

- (1) An identification and classification according to eutrophic condition, of all publicly-owned lakes in a state.
- (2) A general description of the state's procedures, processes, and methods (including land use requirements) for controlling lake pollution.
- (3) A general discussion of the state's plans to restore the quality of degraded lakes.
- (4) Methods and procedures to mitigate the harmful effects of high acidity and remove or control toxics mobilized by high acidity.
- (5) A list and description of publicly-owned lakes for which uses are known to be impaired, including those lakes that do not meet water quality standards or that require implementation of control programs to maintain compliance with applicable standards, and those lakes in which water quality has deteriorated as a result of high acidity that may reasonably be due to acid deposition.
- (6) An assessment of the status and trends of water quality in lakes including the nature and extent of pollution loading from point and nonpoint sources and the extent of impairment from these sources, particularly with regard to toxic pollution.

The U.S. Environmental Protection Agency (EPA) has developed a guidance document Guidelines for the Preparation of the 1992 State Water Quality Assessments (305(b) Reports (August 1991), which includes a section on lake assessment reports. Kentucky's report generally complies with the guidelines suggested by the EPA.

Lake Identification

Appendix B lists publicly-owned lakes for which data were available to assess trophic status. Much of this information came from recent lake surveys (1989-1991) conducted by the Division of Water and Murray State University as part of a cooperative agreement funded under Section 314 of the Clean Water Act. The surveys were conducted on lakes which had originally been sampled by the Division of Water in 1981-1983 and on 11 lakes which had not previously been surveyed. Not all of the significant publicly-owned lakes in Kentucky are included in the table because data have not been collected from all such lakes. For purposes of this report, publicly-owned lakes are those lakes that are owned or managed by a public entity such as a city, county, state, or federal agency where the public has free access for use. A nominal fee

for boat launching charged by concessionaires may occur on some of these lakes. Lakes that are publicly-owned, but restrict public access because they are used solely as a source of domestic water supply, are not included. These lakes do not qualify for federal restoration funds under the Clean Lakes Program and were not monitored in the lake classification survey. In addition, Lewisburg Lake has been removed from the list of significant lakes because public access has been restricted. EPA guidance suggests that all significant lakes be included in state surveys. The term "significant" is to be defined by the state so that all lakes that have substantial public interest and use would be included. For this purpose, Kentucky considers all of the publicly-owned lakes it has surveyed and listed in Appendix B and also those which have not yet been surveyed, but qualify as publicly-owned lakes, as significant. All of these lakes have substantial local or regional public interest and use.

Trophic Status

Lake trophic state was assessed by using the Carlson Trophic State Index (TSI) for chlorophyll α . This method is convenient because it allows lakes to be ranked numerically according to increasing eutrophy and also provides for a distinction (according to TSI value) between oligotrophic, mesotrophic and eutrophic lakes. The growing season average TSI (chlorophyll α) value was used to rank each lake. Growing season was defined as the April through October period. A distinction was made for those lakes which exhibited trophic gradients. If lakes exhibited trophic gradients or embayment differences, those areas were often analyzed separately.

While there are several other methods of evaluating lake trophic state, the accuracy and precision of the chlorophyll α analytical procedure (determined from Division of Water quality control data) and proven ability of the chlorophyll α TSI to detect changes, made it the index of choice for classifying lakes in Kentucky's program.

Chlorophyll α concentration data from the ambient monitoring program, and the most current chlorophyll α data collected during the spring through fall seasons (a minimum of 3 samples) by the U.S. Army Corps of Engineers (COE) on several reservoirs which they manage, were used to update the trophic classifications for this report. Other data were obtained from a report on a study of Lake Barkley conducted by Dr. Joe M. King of Murray State University. Data averaged from water column depths of up to 20 feet were used in calculating TSI values. Table 15 contains the trophic state rankings of lakes of 5,000 acres or more in size and Table 16 lists and ranks the trophic state of lakes less than 5,000 acres in size. Lakes that have updated classifications are in bold face type. A "+" or "-" symbol is used to indicate a trend of increasing or decreasing trophicity. Trends were defined as a change of ten units from a previous TSI score. This represents a doubling or halving of Secchi disk depth and was chosen because it is a noticeable indication of change.

A summary of Tables 15 and 16 indicates that of the 102 classified lakes, 61 (60%) were eutrophic (3 being hypereutrophic), 30 (29%) were mesotrophic, and 11 (11%) were oligotrophic. This is based on the status of the major areas of lakes and does not account for the trophic gradient that exists in some reservoirs nor the trophic status of the embayments of others. The dynamic nature of these reservoirs makes it more difficult to assign them a single trophic state because their water residence times, the nature of major inflows, and their morphology can result in different trophic states in separate areas. The tables indicate that trophic gradients exist in Barren River and Laurel River lakes and that certain embayments of Lake Cumberland are eutrophic, while the main lake area is oligotrophic.

The 102 assessed lakes have a total area of 214,962 acres. Only those portions of lakes Barkley, Kentucky, and Dale Hollow lying within Kentucky were included in the total. Tennessee reports on those portions within its borders. Of the total, 51 percent (109,005 acres) were eutrophic while 29 percent (63,513 acres) were oligotrophic and 20 percent (43,444 acres) were mesotrophic. The decrease in eutrophic acres from the 1990 305(b) report is largely because Green River and Nolin River lakes were reclassified as mesotrophic based on more current lake data.

Lake Pollution Control Procedures

Kentucky utilizes several approaches to control pollution in its publicly owned lakes. The approach chosen is dependent upon the pollutant source and the characteristics of each lake. Point sources of potential pollution are more controllable than nonpoint sources. The following procedures are routinely used to control point sources of pollution.

Permitting Program

A lake discharge guidance procedure is in effect and is applied to any new construction permit for a facility that proposes to discharge into a lake, or for any application for a lake discharge permit under the Kentucky Pollutant Discharge Elimination System (KPDES). An applicant is required to evaluate all other feasible means of routing the discharge or to explore alternate treatment methods that would result in no discharge to a lake. As a last resort, a lake discharge may be permitted. Permits for domestic wastes require secondary treatment and a discharge into the hypolimnion in the main body of the lake. More stringent treatment may be required depending upon lake characteristics. Surface discharges are not allowed. A permit may also be denied to a prospective discharger if the discharge point is within five miles of a domestic water supply intake.

Table 15
Trophic State Rankings for Lakes
5,000 Acres or Greater in Area
(by Carlson TSI (Chl α) Values)

Lake	TSI (Chl α)*	Acres
<u>Eutrophic</u>		
Barkley	61	45,600
Kentucky	54	48,100
<u>Mesotrophic</u>		
Barren River	50	7,205
Beaver Creek Arm	57 (Eutrophic)	1,565
Skaggs Creek Arm	50	1,230
Green River	48	8,210
Rough River	48	5,100
Cave Run	45	8,270
Nolin	43	5,790
<u>Oligotrophic</u>		
Cumberland	38	49,364
Lily Creek Embayment	61 (Eutrophic)	144
Beaver Creek Embayment	57 (Eutrophic)	742
Laurel River	34	4,990
Midlake-Laurel River Arm	47 (Mesotrophic)	754
Headwaters-Laurel River Arm	58 (Eutrophic)	316
Dale Hollow	33	4,300

*Scale: 0-40 Oligotrophic (nutrient poor, low algal biomass)
 41-50 Mesotrophic (slightly nutrient rich, moderate amount of algal biomass)
 51-69 Eutrophic (nutrient rich, high algal biomass)
 70-100 Hypereutrophic (very high nutrient concentrations and algal biomass)

Bold Type = Updated Classifications,

Table 16
Trophic State Rankings for Lakes
Less Than 5,000 Acres in Area
(by Carlson TSI (Chl α) Values)

Lake	TSI (Chl α)*	Acres
	<u>Hypereutrophic</u>	
Beaver Dam	86	50
Mitchell	85	58
Happy Hollow	75	20
	<u>Eutrophic</u>	
Swan	69	193
Arrowhead	68	37
Fish	68	27
Spurlington	68+	36
Campbellsville City	67+	63
Jericho	67+	137
Marion County	67	21
McNeely	67	51
Reformatory	67	54
Taylorsville	67	3,050
Guist Creek	65	317
Wilgreen	65	169
Shelby (Shelby County)	64+	17
Buck	64	19
Metcalf County	64+	22
Willisburg	64	126
Briggs	63	18
Kingfisher	63	30
Metropolis	63	36
Flat	62	38
Greenbriar**	62	66
Carpenter	61	64
Doe Run	61+	51
Sympson	61+	184
Burnt Pond	60	10
Long Pond	60	56
Moffit	60	49

Table 16 (Continued)

Lake	TSI (Chl α)*	Acres
Shelby (Ballard County)	60	24
Turner	60	61
Carnico	59	114
Scenic	59	18
A.J. Jolly	58	204
Energy	58	370
Corinth	57	96
Freeman	57	160
Sand Lick	57	74
Beaver	56	158
Bullock Pen	56	134
Elmer Davis	56	149
Kincaid	56	183
Malone	56	826
Mauzy	56	84
Spa	56	240
Washburn	56	26
Boltz	55	92
General Butler	55	29
George	55	53
Fishpond	54	32
Herrington	54	2,940
Salem	54	99
Shanty Hollow**	54	135
Carr Fork	53	710
Pennyrile	53	47
Williamstown**	53	300
Caneyville	52	75
Bert Combs	51	36
<u>Mesotrophic</u>		
Chenoa	50	37
Corbin	50	139
Dewey	50+	1,100
Liberty	50	79
Long Run	50	27

Table 16 (Continued)

Lake	TSI (Chl α)*	Acres
Morris	50	170
Beshear	49	760
Hematite	49	90
Honker	49-	190
Laurel Creek	49	42
Linville	49	273
Pan Bowl	49	98
PeeWee	49	360
Greenbo	48	181
Luzerne	48	55
Mill Creek (Monroe County)	48	109
Smokey Valley	47	36
Tyner	46	87
Wood Creek	46	672
Blythe	45	89
Campton	45	26
Mill Creek (Powell County)	43	41
Paintsville	43	1,139
Providence City	42	35
Grapevine	41-	50
<u>Oligotrophic</u>		
Grayson	39	1,512
Buckhorn	38	1,230
Loch Mary	38	135
Fishtrap	37	1,143
Martins Fork	37	334
Stanford	36	43
Cannon Creek**	33	243
Cranks Creek	32	219

*Scale: 0-40 Oligotrophic 51-69 Eutrophic
41-50 Mesotrophic 70-100 Hypereutrophic
Bold Type = Updated Classifications, ** = 2 samples only,
+/- = upward (more eutrophic) or downward (less eutrophic) trend

Water Quality Standards Regulations

Kentucky has not adopted specific criteria to protect lake uses. Warmwater aquatic habitat, domestic water supply (if the lake is used for this purpose), and primary and secondary contact recreation criteria are generally applicable to lakes. In specific cases, a provision in the water quality standards regulation can be utilized to designate a waterbody as nutrient limited if eutrophication is a problem. Point source dischargers to the lake and its tributaries can then have nutrient limits included in their permits.

Lakes that support trout are further protected by another provision that requires dissolved oxygen in waters below the epilimnion to be kept consistent with natural water quality.

Kentucky is not planning to adopt statewide criteria specifically for lakes. A site-specific approach to lake pollution control is more realistic and feasible.

Specific Lake Legislation and Local Initiatives

The Kentucky General Assembly has the prerogative to pass legislation to protect lakes. This action has been taken for Taylorsville Lake. House Joint Resolution No. 4 prohibits issuing any discharge permits that allow effluents to be directly discharged into the lake. It also prohibits issuing any permits that allow inadequately treated effluents to be discharged into contributing tributaries that drain the immediate watershed of the lake. In addition, wastewater permit applications in the basin above the lake must be evaluated to ensure that discharges will not adversely affect the lake or its uses. Other provisions provide for stringent on-site wastewater treatment requirements, promotion of nonpoint source controls, and proper management of sanitary landfills in the watershed.

Lake protection associations are not formally organized in Kentucky. This is one mechanism that has proven to be successful in preventing lake pollution in other states. Local ordinances can be passed that restrict land use activities and on-site treatment systems and lead to pollution abatement. Local grass roots opposition to activities which may degrade lakes can lead to state agency action. An example is the petition process in the state's surface mining regulations which can lead to lands being declared unsuitable for mining. Such a petition has been successfully made to protect the water quality of Cannon Creek Lake in Bell County. The lake is used as a water supply for the City of Pineville and is also used for fishing and recreation.

Lake Monitoring

Monitoring water quality in lakes is a part of Kentucky's ambient monitoring program and is described in Chapter 4. The objectives of the monitoring program are flexible so that lakes can be monitored for several purposes. These include:

- o detection of trends in trophic state
- o impacts of permit decisions
- o ambient water quality characterization
- o nonpoint source impacts
- o long-term acid precipitation impacts
- o pollution incidences such as fish kills and nuisance algal blooms
- o new initiatives such as fish tissue analysis for toxics and fecal coliform surveys in swimming areas.

Lake Restoration Plan

Kentucky has not developed a formal state Clean Lakes Program. Several states have adopted a program modeled after the federal Clean Lakes Program and have had state funds appropriated to aid in lake restoration projects. The impetus for developing these programs has been the historical importance of lakes as recreational and aesthetic resources in these states. Pollution or the potential for pollution has prompted support for state development of these programs. Pollution of lakes in Kentucky has not reached a point where there is a recognized need to develop a state program of this nature.

The Division of Water does participate in the federal Clean Lakes Program. The Natural Resources and Environmental Protection Cabinet is the state agency designated by the Governor to receive federal assistance under this program. Kentucky has received three assistance awards. Two helped to fund projects which classified lakes in the state according to trophic state and assessed their need for restoration. The other award helped to fund a diagnostic/feasibility study of McNeely Lake in Jefferson County.

The Division of Water cooperated with local and federal agencies in all of these projects and prepared a grant for implementation of the restoration plan for McNeely Lake. The grant was not awarded because it was technically not eligible for assistance under federal guidelines. However, Jefferson County passed a bond issue to finance the implementation of the plan. It was completed in December of 1988. The Division is monitoring the lake as part of its ambient program to document water quality improvements.

The Division of Water is ready to cooperate with local agencies and other interested groups to participate in the federal Clean Lakes Program. The preparation of the lake assessment chapter in the 305(b) report is a requirement for future participation in that program.

Toxic Substance Control/Acid Mitigation Activities

Kentucky does not have publicly-owned lakes that have high acidity caused by acid precipitation; consequently, this requirement does not apply and will not be addressed.

Identification of Impaired and Threatened Lakes

Table 17 summarizes information on overall use support for Kentucky lakes. This information was gathered from published annual reports produced by the COE on reservoirs which they manage, from research reports by other investigators, and from Division of Water data bases. The total acres assessed are equal to the acres monitored. The analysis is based on chemical data relating to iron, manganese, and dissolved oxygen problems, biological data relating to algal biomass (blooms), algae causing taste and odor problems, macrophyte infestations, and fish kill reports. Criteria were also developed based on other indicators of lake use support (see Table 18). One of the criteria for support of aquatic life indicates that a use was not being fully supported if the average dissolved oxygen concentration within the epilimnion was less than 5 mg/l. This criterion and pH are related to aquatic life standards.

**Table 17
Summary of Lake Use Support**

Degree of Use Support	Assessment Basis (Monitored)	Total Assessed
Acres Fully Supporting	100,454	100,454
Acres Threatened	94,839	94,839
Acres Partially Supporting	12,931	12,931
Acres Not Supporting	6,738	6,738

Acres Assessed - 214,962
Total Kentucky Lake Acreage - 228,385

The total acres reported in Table 17 is based on the Division of Water's Dam Inventory Files and the acres inventoried in the lake classification program. The assessed acres represent over 90 percent of the publicly-owned lake acreage in the state. The U.S. EPA published a draft document in December, 1991 entitled Total State Waters: Estimating River Miles and Lake Acreages for the 1992 Water Quality Assessments (305(b) Reports), which lists total lake acreage in Kentucky as 182,169 acres. The acreages are computer derived from USGS 1:24,000 scale maps for lakes shown on the USGS 1:100,000 scale map series. This total is less than the estimate in this report. The Division of Water derived its estimate of lake acreages from engineering drawings in its Dam Inventory Files, from reported acres (at certain elevations) in U.S. Army Corps of Engineers project reports of its major reservoirs in the state, and by planimetry USGS 1:24,000 scale map series for lakes with no reported acres. These are

Table 18
Criteria for Lake Use Support Classification

Category	Warmwater Aquatic Habitat	Secondary Contact Water Recreation	Domestic Water Supply
Not Supporting:	At least two of the following:	At least one of the following:	At least one of the following:
	1. Fish kills caused by poor water quality	1. Widespread excess macrophyte/macrosopic algal growth	1. Chronic taste and odor complaints caused by algae
	2. Severe hypolimnetic oxygen depletion	2. Chronic nuisance algal blooms	2. Chronic treatment problems caused by poor water quality
	3. Dissolved oxygen average less than 5 mg/l in the epilimnion		
Partially Supporting: (At least one of the listed criteria).	1. Dissolved oxygen average less than 5 mg/l in the epilimnion	1. Localized or seasonally excessive macrophyte/macrosopic algal growth	1. Occasional taste and odor complaints caused by algae
	2. Severe hypolimnetic oxygen depletion	2. Occasional nuisance algal blooms	2. Occasional treatment problems caused by poor water quality
	3. Other specific cause (i.e. low pH)	3. High suspended sediment concentrations during the recreation season	
		4. Other specific cause (i.e. low pH).	
Fully Supporting:	1. None of the above	1. None of the above	1. None of the above

considered to be more accurate estimates than those reported by U.S. EPA. Many lakes have been classified by use in Kentucky and are listed in Kentucky's water quality standards. Waters not specifically listed by use in water quality regulations are generally classified for the uses of warmwater aquatic habitat, primary and secondary contact recreation, and domestic water supply at points of withdrawal. Lake use support is based on these uses. Primary contact recreation was not assessed because the primary indicator of use support (fecal coliform bacteria) was not measured as part of agency monitoring programs.

Detailed information on formerly assessed lakes can be found in the report on the lake classification program entitled Trophic State and Restoration Assessments of Kentucky Lakes, which was published in 1984 by the Division of Water. Detailed information on newly assessed lakes will be included in the final report of the lake assessment project. Appendix B lists summary information on all of the lakes assessed.

Table 19 and Table 20 list lakes according to whether their uses are not supported or are partially supported. The tables indicate which criteria from Table 18 were used to determine nonsupport or partial support and the probable causes and sources for the support not being achieved. Table 21 lists those lakes which fully support their uses.

Ninety-one percent of the total acres assessed supported uses while nine percent did not fully support uses. Nine of the ten lakes over 5,000 acres in size fully supported uses. Rough River Lake is the exception. The domestic water supply use of this lake is partially supported because of occasional treatment problems caused by natural sources of manganese. More than half of the small lakes fully supported their designated uses (55 of 92) or 60 percent. Twenty-eight of these lakes (30%) partially supported a particular use. Nine lakes did not support one or more uses. Briggs, Herrington and Mauzy lakes are new additions to this category. Reformatory Lake was removed from the list and placed in the partial support category because of improved water quality. In total, of the 102 lakes assessed, 64 fully supported their uses (63%), 29 lakes partially supported uses (28%) and nine lakes did not support one or more uses (9%).

Hazards to human health through consumption of fish or swimming in waters contaminated by bacteria were not considered as problems in any of the listed lakes. Table 22 summarizes use support information for lakes based on acres and number of lakes.

EPA guidance asks for a list of threatened lakes. These are defined as lakes that fully support uses now, but may not in the future because of anticipated sources or adverse trends of pollution. Table 17 indicates the total acres classified as threatened. Table 23 lists the lakes and indicates what uses are threatened and the causes and sources of the threats.

Table 19
Lakes Not Supporting Uses

Lake	Use Not Supported*	Criteria**	Cause	Source
Briggs	WAH	2,3	Nutrients	Lake fertilization
Corbin	DWS	1	Nutrients	Municipal point sources and Agricultural nonpoint sources
Herrington	WAH	1,3	Nutrients	Municipal point sources and Agricultural nonpoint sources, septic tanks
Jericho	WAH	2,3	Nutrients	Agricultural nonpoint sources
Loch Mary	DWS	2	Metals (Mn) and other inorganics (noncarbonate hardness)	Surface mining (abandoned lands)
Mauzy	WAH	2,3	Nutrients	Lake fertilization
McNeely	WAH	2,3	Nutrients	In-place contaminants (sediments)
Sympson	DWS	1	Nutrients	Agricultural nonpoint sources
Taylorville	WAH	2,3	Nutrients	Municipal point sources and Agricultural nonpoint sources

*WAH - Warmwater Aquatic Habitat, SCR - Secondary Contact Recreation,
DWS - Domestic Water Supply

**Refer to Table 18

Table 20
Lakes Partially Supporting Uses

Lake	Use*	Criteria**	Cause	Source
Beshear	WAH	1	Nutrients	Natural
Buckhorn	SCR	3	Suspended solids	Surface mining
Campbellsville	WAH	1	Nutrients	Agricultural nonpoint sources
Caneyville	DWS	1	Nutrients	Natural
	SCR	1	Nutrients	Natural
Carpenter	SCR	1	Shallow lake basin	Natural
	WAH	1	Nutrients	In-place contaminants (sediments)
Carr Fork	SCR	3	Suspended solids	Surface mining
Cranks Creek	WAH	3	pH	Mining (abandoned lands)
	SCR	3	pH	Mining (abandoned lands)
Dewey	SCR	3	Suspended solids	Surface mining
Fishtrap	SCR	3	Suspended solids	Surface mining
George	WAH	1	Nutrients	Agricultural nonpoint sources
Guist Creek	DWS	1	Nutrients	Agricultural nonpoint sources
	WAH	1	Nutrients	Agricultural nonpoint sources
Honker	WAH	1	Nutrients	Natural
Kincaid	WAH	1	Nutrients	Unknown
Laurel Creek	DWS	1	Nutrients	Natural
Laurel River (Headwaters)	SCR	1	Nutrients	Municipal point sources and Agricultural nonpoint sources
Liberty	DWS	2	Metals (Fe and Mn)	Natural
Martins Fork	SCR	3	Suspended Solids	Surface mining
Marion County	SCR	2	Nutrients	Lake fertilization
Metcalfe County	SCR	1	Shallow lake basin	Natural
	WAH	2	Nutrients	Agricultural nonpoint sources

Table 20 (Continued)

Lake	Use*	Criteria**	Cause	Source
Morris	DWS	1	Nutrients	Agricultural nonpoint sources
Reformatory	WAH	2	Nutrients	Agricultural nonpoint sources
Rough River	DWS	2	Metals (Mn)	Natural
Salem	SCR	1	Shallow lake basin	Natural
Sand Lick Creek	WAH	1	Nutrients	Agricultural nonpoint sources
Scenic	WAH	1	Nutrients	In-place contaminants (sediments)
Shelby (Shelby Co.)	WAH	1	Nutrients	Agricultural nonpoint sources/In-place contaminants (sediments)
Spa	WAH	1	Nutrients	Agricultural nonpoint sources
Stanford	DWS	1	Nutrients	Natural
Wilgreen	WAH	2	Nutrients	Septic tanks
	SCR	2	Nutrients	Septic tanks
Washburn	WAH	2	Nutrients	Unknown

*WAH - Warmwater aquatic habitat, SCR - Secondary contact recreation, DWS - Domestic water supply

**Refer to Table 18

Table 21
Lakes Fully Supporting Uses

Size		
5000 Acres or Larger	Less than 5000 Acres	
Barkley	A.J. Jolly	Linville
Barren	Arrowhead	Long Pond
Cave Run	Beaver	Long Run
Cumberland	Beaver Dam	Luzerne
Dale Hollow	Bert Combs	Malone
Green	Blythe	Metropolis
Kentucky	Boltz	Mill Creek
Laurel River (except for headwaters)	Buck	Mill Creek (Monroe Co.)
Nolin	Bullock Pen	Mill Creek (Powell Co.)
	Burnt Pond	Mitchell
	Campton	Moffit
	Cannon Creek	Paintsville
	Carnico	Pan Bowl
	Chenoa	Peewee
	Corinth	Pennyrile
	Doe Run	Providence City
	Elmer Davis	Shanty Hollow
	Energy	Shelby (Ballard Co.)
	Fish	Smokey Valley
	Fish Pond	Spurlington
	Flat	Swan Pond
	Freeman	Turner
	General Butler	Tyner
	Grapevine	Williamstown
	Grayson	Willisburg
	Greenbo	Wood Creek
	Greenbriar	
	Happy Hollow	
	Hematite	
	Kingfisher	

Table 22
Use Support Summary for Lakes

(by Acres)

Use	Supporting	Supporting But Threatened	Partially Supporting	Not Supporting
Fish Consumption	214,962	0	0	0
Aquatic Life	156,974	49,239	2,469	6,280
Swimming	214,743	0	219	0
Secondary Contact	116,203	93,700	5,059	0
Drinking Water*	80,623*	0	5,826	458

Total Assessed Acres = 214,962

*Total Assessed Acres for Domestic Water Supply = 86,449

(by Number)

Use	Supporting	Supporting But Threatened	Partially Supporting	Not Supporting
Fish Consumption	102	0	0	0
Aquatic Life	78	2	16	6
Swimming	101	0	1	0
Secondary Contact	87	2	13	0
Drinking Water*	30	0	7	3

Total Assessed Lakes = 102

*Total Assessed for Domestic Water Supply = 40

**Table 23
Threatened Lakes**

Lake	Use* Threatened	Cause	Source
Kentucky	SCR	Macrophyte infestations	Natural or introduced exotic species
	WAH	Low dissolved oxygen	Unspecified nonpoint sources
Paintsville	WAH	Salinity/brine	Petroleum activities
Barkley	SCR	Suspended solids	Unspecified nonpoint sources

*SCR - Secondary Contact Recreation, WAH - Warmwater Aquatic Habitat

Table 24 indicates the causes responsible for nonsupport of lake uses. As noted in previous 305(b) reports, nutrients cause the greatest percentage of nonsupport and affect the largest number of lakes. Nutrients can stimulate a proliferation of algae, which may cause taste and odor problems in lakes used for domestic water supplies. Dissolved oxygen can also be lowered in surface waters by very productive algal populations that stimulate microbial respiration and may result in fish kills or a decrease in oxygen to levels that are not conducive to the support of healthy populations of fish. Metals are the second largest contributor to nonsupport of uses. The nonsupport is attributable to iron and manganese effects on lakes used for domestic water supplies. These metals are solubilized from lake sediments under anoxic conditions and cause water treatment problems. Suspended solids (the next largest contributor to nonsupport of uses) cause several reservoirs in eastern Kentucky to not fully support secondary contact recreational uses. Priority pollutants (toxics) did not cause any of the lake use impairments.

Table 25 indicates the sources responsible for nonsupport of lake uses. Agricultural sources are the single source responsible for the highest percentage of use nonsupport (29%). Nonpoint sources including agriculture account for the highest percentage of lake uses not being supported (57%). More detailed studies in watersheds of the lakes in the agriculture category are necessary before contributing sources of nonpoint pollution can be distinguished. Surface mining for coal (resource extraction) is the next greatest nonpoint source contributor to lake uses not being fully supported. Lake recreational uses are impaired because waters become turbid after receiving runoff water, laden with sediment from lands disturbed by surface mining activities. This reduces the incentive for secondary contact uses. Municipal point sources were responsible for 21 percent of the use nonsupport, as were natural causes.

Table 24
Causes of Use Nonsupport* In Lakes

Major Impact**	Number of Lakes Affected	Acres	% Contribution (by Acres)
Nutrients	29	9,520	48
Metals (Fe/Mn)	3	5,314	27
Suspended solids	5	4,517	23
pH	1	219	1
Other (Shallow lake basin)	3	185	1
Other inorganics (noncarbonate hardness)	1	135	< 1

*Nonsupport is a collective term for lakes either not supporting or partially supporting uses

**No moderate or minor impacts were noted

Table 25
Sources of Use Nonsupport* in Lakes

Source	Major Impact (Acres)	Moderate/Minor Impact (Acres)
Point Sources		
Municipal	6,445	455
Nonpoint Sources		
Agriculture	8,727	
Resource Extraction	4,871	
Septic tanks	3,109	
Other		
Natural	6,474	
Lake fertilization	123	
In-place contaminants	334	
Unknown	209	

*Nonsupport is a collective term for lakes either not supporting or partially supporting uses

Water Quality Trend Assessment

Trophic Trends

One of the objectives of the ambient monitoring program is to assess eutrophication of Kentucky lakes. The monitoring strategy is to obtain at least two years of data during the growing season on each lake. After the data is assessed, a decision is made either to continue monitoring or to assess another lake.

A review of current lake data from the ambient monitoring program, data retrieved through STORET on COE managed lakes, data from the lake assessment program, and other reports resulted in an assessment of trophic trends at several lakes. As mentioned earlier, a change in the chlorophyll TSI value (averaged over the April - October growing season) of 10 units was used to indicate a trophic change. A discussion of trends from the above databases follows.

Lakes in the Assessment Program. TSI values were compared for those lakes assessed in 1981-1983 that had been resurveyed in 1989, 1990, and 1991. Comparisons of two data sets does not provide a strong trend analysis because the intervening years were not sampled. They do, however, indicate a change. The comparisons, as noted in Table 16 show that Spurlington, Campbellsville City, Jericho, Shelby (Shelby County), Metcalfe County, and Doe Run lakes were more eutrophic. Lake Jericho's change resulted in its warmwater aquatic habitat use not being supported. Wood Creek Lake changed from an oligotrophic to a mesotrophic state. No uses were impaired. Sympson Lake changed from a mesotrophic to a eutrophic state. Honker and Grapevine lakes changed from eutrophic to mesotrophic states.

Lakes in the Ambient Monitoring Program. The following is a discussion on individual lakes which have been monitored over several years by the Division of Water, the COE, and other researchers. Analyses are based on the combined databases. Trophic trends are indicated by a change in TSI values of 10 units or greater. The extent of these databases gives the trend assessments a high level of confidence.

Green River Lake. COE data from 1981 indicated that this lake might be changing from a mesotrophic to a eutrophic state. Subsequent sampling in 1985 and 1986 by the DOW showed the main body of the lake to be mesotrophic. The 1989 COE data indicated that the lake was eutrophic. The TSI value changed from 44 (mesotrophic) to 55 (eutrophic). Monitoring by the COE will indicate if this eutrophic trend continues. The Division monitored the lake in 1990 and 1991. The data showed that the lake was less eutrophic in 1990 and that it had returned to a mesotrophic state in 1991.

Nolin River Lake. The 1988 305(b) report indicated that this lake was changing from a mesotrophic to a eutrophic state. The period of record showed the lake to be mesotrophic from 1975 through 1983 (TSI average was 44). Data from 1982 through

1987 showed a eutrophic trend. The TSI value was 55 in 1987. The DOW monitored the lake in 1988 and verified that the lake was eutrophic (TSI was 52). COE data from 1990 showed the lake was mesotrophic (TSI was 43). The lake appears to have stabilized at a low eutrophic/high mesotrophic state. Its changes in trophic state are probably related to annual variations in nutrient loading which are driven by meteorological conditions.

Reformatory Lake. The Division of Water classified this lake as hypereutrophic in the 1984 305(b) report. Its aquatic life use was not supported because of severe hypolimnetic oxygen depletion and dissolved oxygen of less than 5 mg/l in the epilimnion. Subsequent investigations indicated that livestock operations in the watershed were the major source of nutrients which caused the degraded lake conditions.

Best management practices were implemented to reduce nutrient loading to the lake from these livestock operations with the help of the University of Kentucky Agricultural Extension Service. Monitoring of the lake in 1985 and 1986 showed that these practices brought about water quality improvements. Algal biomass had decreased, water clarity improved, and dissolved oxygen remained above 5 mg/l in the epilimnion, and there was less severe oxygen depletion in the hypolimnion. Total phosphorus, the nutrient of concern, had decreased.

Subsequent monitoring from 1987 through 1990 showed that there was a reversal in water quality. The lake was hypereutrophic in 1989 and again did not support aquatic life use. Site visits in the watershed in 1990 revealed that the best management practices had not been maintained and that nutrients from current livestock operations increased the phosphorus loading to the lake.

Livestock operations ceased in late 1990 due to economic factors. Monitoring in 1991 indicated an improvement in water quality. Dissolved oxygen in the epilimnion did not go below 5.0 mg/l. The lake was less eutrophic. Hypolimnetic oxygen depletion was still severe with dissolved oxygen less than 1 mg/l. The lake was moved from the not supporting category to partially supporting in this report because of the improved water quality. The Division is continuing to monitor the lake to document water quality conditions.

McNeely Lake. The Division is monitoring this lake to document changes in water quality as a result of the diversion of effluent from package treatment plants in the watershed to a pipeline that discharges at a location below the lake's dam. Three years of monitoring after this diversion (which began in December of 1988) have shown some improvement in water quality. The lake is no longer hypereutrophic as it was in 1987 and 1988. TSI values for 1989, 1990, and 1991 were 65, 64, and 66 respectively, which places it in the eutrophic category. Spring total phosphorus values in surface waters were 79 percent less after diversion. The average spring epilimnetic concentration dropped from 420 ug/l to 87 ug/l. This is still enough phosphorus to support eutrophic

conditions. The lake experienced dissolved oxygen concentrations of less than 5 mg/l in the epilimnion and had severe hypolimnetic oxygen depletion in 1991. These factors caused the lake to be categorized as not supporting aquatic life. The Division is continuing to monitor the lake to determine the nature of water quality improvements. Evidence from studies on sediment cores indicate that the lake was eutrophic before development occurred in the watershed. Some lower level of eutrophy may be all that can be expected of a lake of this nature.

Lake Jericho. Lake Jericho is a 137 acre lake in Henry County formed by a dam on the Little Kentucky River. It was first monitored by the Division in 1983. At that time the lake was eutrophic and had a mean TSI of 57. Its aquatic life use was fully supported. The lake was monitored again in 1989. Its TSI was 64, indicating it was eutrophic. It experienced dissolved oxygen problems in September when epilimnetic concentrations dropped below 3.0 mg/l and the hypolimnion had less than 1 mg/l. These low dissolved oxygen values caused the lake to be categorized as not supporting an aquatic life use. The Division has monitored the lake yearly since 1989 in order to document any worsening water quality conditions. In September of 1990 and 1991, similar low dissolved oxygen concentrations developed as in 1989. The lake was therefore categorized as continuing to not support aquatic life. The land use in the lake's watershed is largely agriculture (80%) and this activity is suspected to be the source of nutrients that cause the lake to be eutrophic and not support the aquatic life use.

Other Trends in Water Quality

Lake Acidification. The Division began monitoring three lakes in 1985 on an annual basis to document changes in water quality that could be attributed to acid precipitation. These lakes (Tyner, Bert Combs, and Cannon Creek) were the least buffered of any of the lakes sampled by the Division, which made them candidates for monitoring impacts from acid precipitation. Lakes with an acid neutralizing capacity (ANC) of 41 to 200 uequiv/l (2.5 to 10 mg/l total alkalinity) can be classified as moderately sensitive to acidification. The ANC averages for Tyner, Bert Combs and Cannon Creek lakes were 333, 188 and 160 uequiv/l respectively. These lakes have shown no detectible acidification trends. The monitoring program was discontinued in 1991. A baseline of water quality has been established in these lakes that can be compared to future studies.

CHAPTER 3

WATER QUALITY ASSESSMENT OF GROUNDWATER

WATER QUALITY ASSESSMENT OF GROUNDWATER

Introduction

An overall program of information dissemination, research in the three basic groundwater regions of Kentucky, and regulation of groundwater use constitute the major elements of Kentucky's groundwater protection program. In addition, collection of data for a groundwater data base has continued at a steady pace. Major studies in Kentucky groundwater are shown in Table 26. The studies are being performed throughout the state by various state and federal agencies and universities.

Two projects mentioned in the table deserve more attention because of their scope and similarity:

- (1) In 1990, the University of Kentucky College of Agriculture was mandated by the General Assembly of the Commonwealth to assess the influence of agricultural practices upon groundwater. In cooperation with the Division of Water, ten areas have been selected for detailed studies. These areas include regions of intensive and diverse farming on all the types of bedrock/soil available in Kentucky (including karst drainage in the Bluegrass Region, karst drainage in the Western Pennyroyal Region, and unconsolidated sediments in the Jackson Purchase Region). Data for the first year have been analyzed and preliminary conclusions are being formulated. In 1991, the project was expanded from 2 to 5 farms. Also, experiments with various agricultural techniques, such as pesticide pollution in relation to type of tillage used, are being conducted.
- (2) In 1990, the Nonpoint Source Section of the Division of Water awarded its first grant, under Section 319 of the Clean Water Act of 1987, to study nonpoint source pollution in Kentucky. Since that time, several agencies have received money through the Division for the study of nonpoint pollution as it pertains to groundwater (see Table 26 for those studies with 319 in parentheses). Each study monitors groundwater levels and collects samples for analysis of various pesticides and nitrates, and/or other constituents, that may have been introduced by current agricultural practices, or the study monitors the changes brought about by switching from current agricultural practices to best management practices (BMPs).

Most of the groundwater work in the state is being conducted by agencies receiving money from the University of Kentucky College of Agriculture or the Division of Water. The studies will contribute significant water quality data for several critical areas of Kentucky when completed.

Table 26
Major Studies in Groundwater

Agency	Hydrologic System	Description	Status
Division of Water (319)		Groundwater Exhibit to be displayed in the American Museum of Caves, Horse Cave, Kentucky	Starting
Division of Water (319)	Mammoth Cave	Monitor surface water in karst and cave area in relation to agricultural activities	In Progress
Division of Water (Groundwater Branch)	Aquifers	Conduct technical reviews of all geological and hydrologic plans and activities related to the Paducah Gaseous Diffusion Plant	In Progress
Division of Water (Groundwater Branch) (319)	Spring Systems	Monitor 3 spring systems for pesticides as a result of agricultural activity	In Progress
Kentucky Geological Survey	Aquifers	Study effects of abandoned mine lands on water quality	In Progress
Kentucky Geological Survey	Aquifers	Study effects of deep coal mines on hydrogeology, Eastern Kentucky Coal Field	Starting
Kentucky Geological Survey	Aquifers	Study groundwater geochemistry and its relationship to groundwater flow in Eastern Kentucky Coal Field	Starting
Kentucky Geological Survey (UK College of Agriculture)	Spring System	Study hydrogeology of Garretts' Spring (Sinking Creek) Drainage Basin	In Progress

Table 26 Continued

Agency	Hydrologic System	Description	Status
Kentucky Geological Survey (UK College of Agriculture)	Drainage Basin	Study hydrology of a drainage basin in relation to agricultural practices in Hickman County	In Progress
Kentucky Geological Survey	Kentucky River Basin	Reconnaissance of groundwater resources within the Kentucky River Basin	Completed
Kentucky Geological Survey		Kentucky Aquifer Research Database (KARD)	In Progress
Kentucky Geological Survey	Knox Group	Study production of fresh water from the Knox Group	In Progress
Kentucky Geological Survey (319)	Spring System	Monitor Pleasant Grove Spring drainage basin for nonpoint source pollution	In Progress
Kentucky Geological Survey		Study riparian vegetation effects on water quality using models and experiments	Starting
Kentucky Geological Survey	Surface mine spoil	STARFIRE: Monitor mine spoil to determine water quality	In Progress
Kentucky Geological Survey	Groundwater Basin	Monitor Robinson Forest groundwater basin before and during coal mining activities	Starting
Kentucky State University	Groundwater Basin	Describe and assess impacts and processes associated with agricultural practices	In Progress

Table 26 (Continued)

Agency	Hydrologic System	Description	Status
University of Kentucky (College of Agriculture)	Groundwater Basins	Study agricultural chemical use impacts on groundwater resources in selected sites in Kentucky	In Progress
University of Kentucky (Geological Sciences)	Groundwater Basin	Study effects of land-use on water quality at 4 watersheds in Elizabethtown, Kentucky	In Progress
United States Geological Survey (UK College of Agriculture)	Groundwater Basins	Study effects of land-use on water quality of 4 watersheds in Elizabethtown, Kentucky	In Progress
United States Geological Survey	Spring Systems	Monitor water quality and low flow characteristics of 3 public water supply springs, Elizabethtown, Kentucky	In Progress
United States Geological Survey	Vadose zone	Study hydrogeology of the vadose zone and define the fate and transport of agricultural chemicals	In Progress
Warren County Conservation District (319)	Spring systems	Monitor Harris Spring groundwater basin for agricultural practices and storm runoff sedimentation	In Progress

Groundwater Issues

Two issues in Kentucky groundwater must be addressed to effectively manage groundwater resources. The issues, information systems/resource management and increased pesticide usage, are receiving most of the attention of Kentucky agencies at the present.

Information Systems and Resource Management

Kentucky's need for potable groundwater in the future will necessitate management of the groundwater resource. As growth occurs, both in population and industry, more demands are being made on Kentucky's water systems. Recent droughts have prompted interest in groundwater as a more stable, and cleaner, water supply than surface water. Water quality, quantity, and availability must be determined now to intelligently, and safely, use groundwater for large volume users of the future. Information needed for decisions must be in a form that can be readily accessed and integrated with other blocks of information.

In 1990, the Kentucky Legislature mandated that the Kentucky Geological Survey develop a groundwater data repository for data collected by all state agencies (KRS 151:035). Although no funds were allocated, KGS has hired a data base programmer who has begun the development of a relational data base and has developed plans for computer hardware and software to operate the system. The Groundwater Advisory Council is acting as the focal point for discussion of issues related to the creation and operation of the data repository.

The Division of Water has standardized the data acquisition forms for well and spring inspections to ensure data is acquired in the same form throughout the agency. This information will be entered into the database and forwarded to the Kentucky Geological Survey for inclusion in the mandated repository.

These steps toward universality of data information will assist in the technology transfer necessary to make informed decisions. Emphasis must be placed on groundwater resource data acquisition for the information system.

Increased Use of Pesticides In Kentucky

Much of Kentucky's income is from agricultural pursuits. Pesticides and fertilizers used to grow healthy crops may end up in groundwater. Much of the farming occurs in karst areas which may allow surface water access to underground streams before the water can rid itself of the harmful products it carries. The actual extent of pollution from these sources is not known. Studies have been instituted from several aspects to try to understand what happens and how to control and/or reduce pollution from these sources.

Progress in Groundwater Protection Programs

Kentucky has implemented (or is in the process of implementing) several programs that are aimed at protecting groundwater resources within the state. Each addresses a different aspect of pollution potential for the state.

Wellhead Protection Program

The large percentage of the state's population that relies on groundwater resources necessitates that the Commonwealth establish a comprehensive wellhead protection program. Also, in accordance with the 1986 Safe Drinking Water Act Amendments, the Department for Environmental Protection has designated the Groundwater Branch of the Division of Water to be the lead agency for coordinating all wellhead protection efforts for the state. Approximately 31 percent of public and domestic water supplies in Kentucky comes from groundwater sources. There are 211 community, and 311 non-community water suppliers who serve approximately 450,000 persons across the state.

The main goal of Kentucky's Wellhead Protection Program (WHP) is to delineate hydrogeologically sound wellhead protection areas that can be effectively managed by individual communities. Additional program goals are protection, education, and best management practices of groundwater resources in order to ensure a potable drinking water supply in the future. New public water system wells and springs under the WHP should be initially delineated and have a potential source inventory prior to drilling or pumping.

Participation in the WHP applies to all public water systems. The expected completion time for systems to be delineated is 1997. Delineation will be approached in two phases. Each phase is based upon population at risk and aquifer vulnerability.

Groundwater Permitting

The Permit Section of the Groundwater Branch was established on October 16, 1990. The Section was created to develop and administer a regulatory program that implements the groundwater protection goal recommended in the Kentucky Groundwater Protection Strategy. The Permit Section has written and distributed a Groundwater Regulations Issues paper and accepted public comments on the paper. Regulations to classify groundwater and establish groundwater protection standards have been drafted. Groundwater permitting regulations will be drafted in the future.

Water-well Drillers Certification

The program has certified 185 drillers and 190 rig operators to date. Since January 1990, 5,000 well records have been submitted to make a total of 13,000 records on file. Along with monitoring-well drillers certification, which was implemented in July 1991, a requirement for continuing education was added; any driller wishing to renew certification will be required to submit documentation of three hours of education or training.

Monitoring-well Drillers Certification

Regulations requiring the certification of monitoring-well drillers became effective July 1, 1991. Drillers with two or more years of experience were given one year from that date to become "grandfathered" into the program without examination. After July 1, 1992, examination will be required. In addition, monitoring-well construction standards were also adopted effective July 1, 1991. These requirements in Section 13 of 401 KAR 6:310 are:

- 1) Monitoring wells shall be installed by certified drillers.
- 2) Monitoring wells shall be constructed in such a manner as to prevent groundwater contamination.
- 3) Materials used in construction shall be appropriate for the purpose of the well.
- 4) The annular space above the sampling depth shall be properly sealed.
- 5) The well shall be completed at least 4 inches above grade or installed with a water-proof flush mount device.
- 6) A locking cap shall be installed.
- 7) A record of the well shall be filed with the DOW.
- 8) If unused, monitoring wells shall be properly abandoned.

This program will improve the quality of monitoring-well construction in Kentucky, help prevent the pollution of groundwater, and will add to the groundwater database. The program has approximately 100 well records received to date, and has certified approximately 60 drillers and rig operators.

A continuing education requirement is also included in the new regulations. Any driller wishing to renew certification will be required to submit documentation of three hours of education or training. Acceptable training includes the Annual Kentucky Water Well Association/Division Of Water Workshop, National Water Well Association classes, in-house training, such as Layne's Well Rehabilitation and Pump Seminar, vendor training and college classes.

Groundwater Education and Well Water Testing Program

A Groundwater Education and Well Water Testing program was instituted in 1990. The Kentucky Division of Conservation, in cooperation with the Kentucky Farm Bureau Federation, the Kentucky Association of Conservation Districts, and the Kentucky Cooperative Extension Service, is implementing the program. The primary goals of this voluntary program are to educate the public on how farming operations and other land activities may cause pollution of surface and groundwater resources, to promote the understanding that pollution prevention through use of best management practices (BMPs) is more cost effective than clean up after damage has occurred, and to increase the knowledge of private well water users. A secondary goal of the program is to provide water well users the opportunity to have their water tested for selected contaminants on a voluntary basis.

The program disseminates information in the form of exhibits, speakers, printed material, and other media at local agricultural groundwater education meetings in most of Kentucky's 120 counties (the program is available to all counties, but a few have declined to participate). The information includes: groundwater concerns; agricultural, forestry, and construction nonpoint source pollution aspects; collection and care of water samples to be analyzed; and a list of laboratories to be used for testing analysis.

The well water testing program cannot be considered a scientific study; however, results from individual well tests can be used to indicate areas in Kentucky that may be particularly susceptible to groundwater and well contamination. Meetings in 82 counties have been conducted to date, with over 4,000 people attending. Water-well samples were collected by residents and submitted for analysis. Of the 4,409 samples tested for nitrates, 4.3 percent contained nitrate levels that exceeded drinking water standards. Analysis of 1,384 samples for atrazine indicated that 0.3 percent exceeded drinking water standards. One percent of the 474 samples tested for alachlor exceeded the drinking water standards.

Groundwater Quality Contamination from Mining and Drilling Activities

For the last ten years, the Kentucky Cooperative Extension Service has conducted training sessions on protecting groundwater contamination by surface mining and oil and gas well operations. Emphasis has been on the processes that lead

to groundwater degradation and how such processes can be predicted and controlled. In 1991, a training manual was compiled from existing information and materials accumulated so that training sessions could be standardized. With one manual, more and better training sessions can occur, thus reaching more people in the state.

Environmental Issues Survey

The Kentucky Environmental Quality Commission (EQC) conducted a survey of county and city officials to determine environmental issues and priorities. EQC's survey provided an opportunity for local officials to identify issues of specific concern to their communities, as well as to rate in order of importance their views on statewide environmental issues. The questionnaire encouraged mayors, county judge/executives, and area development districts to showcase local initiatives with regard to natural resources, recycling, and other environmental issues.

EQC questionnaires were first mailed November 1990, with a follow-up mailing conducted in January 1991. Eleven of fifteen area development districts, 60 of 120 counties, and 87 cities throughout Kentucky responded to the survey.

Groundwater pollution was ranked as the third most significant statewide environmental issue by responding local officials. An estimated one-third of all Kentuckians and 90 percent of the state's rural population rely on groundwater for a source of drinking water. More than 90 percent of the local officials responding expressed an interest in becoming more active in protecting their natural and environmental resources given adequate technical assistance and resources. Seventy-nine percent of all respondents considered pollution of underground sources of water to have high importance.

Underground Storage Tanks

Although the Underground Storage Tank Regulation Program has been in effect since 1984, no information other than the ranking of leakage from tanks has appeared previously in this report. Since the program began, approximately 30,000 tanks have been registered. In the first years of the program, all tanks in service, or taken out of service after 1 January 1974, were required to be registered. Beginning in December 1988, however, older tanks have come under an upgrade schedule for release detection, spill and overfill protection, and corrosion protection requirements. All tanks installed after December 1988 must meet all new requirements in an effort to minimize groundwater contamination. All "old" tanks must meet the standards for new tanks by December 1998.

Assessment of Groundwater Quality

The sources of groundwater pollution are varied and range from waste deposited in landfills, to septic tanks, to industrial sources such as underground storage tanks, and agricultural sources such as land application of fertilizers and pesticides. The major sources of contamination in Kentucky are shown in Table 27. The five highest priority sources have been ranked (one being the most serious). Improper well construction is no longer one of the top five priorities. The introduction of well construction regulations and well driller certification are ensuring that all wells drilled in Kentucky meet safe well construction standards. The major contaminating substances in Kentucky from the sources listed in Table 27 are shown in Table 28. Some pollutants (arsenic, fluorides, and radioactives), though hazardous, affect small or isolated areas and are not presently considered to be major pollutants. By far, the major pollutant in Kentucky is bacteria.

Table 27
Major Sources of Groundwater Contamination

Source	Relative Priority
Septic tanks	2
On-site industrial landfills (excludes pits, lagoons, surface impoundments)	
Other landfills	5
Surface impoundments (excluding oil and gas brine pits)	
Oil and gas brine pits	
Underground storage tanks	1
Injection wells	
Abandoned hazardous waste sites	3
Regulated hazardous waste sites	
Salt water intrusion	
Land application/treatment	
Agricultural activities	4
Road salting	
Improper Well Construction	

Table 28
Substances Contaminating Groundwater

Organic chemicals:	Metals
Volatile	Radioactive material
Synthetic	Pesticides
Inorganic chemicals:	Other agricultural chemicals
Nitrates	Petroleum products
Fluorides	Other (Bacteria)
Arsenic	
Brine/salinity	

Groundwater Indicators

The U.S. EPA in conjunction with a State Task Force has developed a set of indicators to be utilized to track progress and trends in groundwater protection efforts for 305(b) reporting purposes. The indicators are listed below and will be discussed separately.

Source of Data	Indicator
1. Public groundwater supplies	<ul style="list-style-type: none"> ● Compliance with MCLs (maximum contaminant levels) and population at risk ● Compliance with MCLs by contaminant
2. Point sources of contamination	<ul style="list-style-type: none"> ● Population at risk from Resource Conservation and Recovery Act (RCRA) Subtitle C and D facilities ● Population at risk from the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund) sites ● Detection of volatile organic compounds (VOCs) in groundwater

- 3. Nonpoint sources of contamination
 - Nitrates in groundwater
 - Leachable pesticide usage

Public Groundwater Supplies

Although many pollutants can be found in Kentucky, only a few currently are known to pollute public water supplies (PWS) in the state (Table 29). There are 522 PWS with a service population of approximately 450,000 that use groundwater in Kentucky. The 22,883 people at risk from MCL violations in 1991 is 5 percent of the total population using groundwater. No PWS were repeat offenders. That is, there were no PWS with violations in both 1990 and 1991. Also, although more violations occurred in 1991, fewer people were at risk from those violations. PWS suffered from bacterial contamination five times more often than from all other contaminants in 1991.

Table 29
Number of Groundwater-Supported Public Water Supplies (PWS)
with MCL* Violations

MCL Parameter	Number PWS with MCL Violations	
	1990	1991
Turbidity	0	3
Barium	1	1
Fluoride	0	0
Nitrate	0	0
Selenium	0	0
Trihalomethanes	0	0
Bacteria	17	19
Population at Risk	34,654	22,883

*MCL = Maximum Contaminant Level

Point Sources of Contamination

RCRA Subtitle C and D Facilities. Contaminants reported from Subtitle C facilities are listed in Table 30. It should be noted that the numbers are considered conservative since they do not include some sites where there is known soil

contamination, nor do they include sites where groundwater contamination is suspected. Many such sites either have no groundwater monitoring or samples have not yet been obtained. The off-site contamination numbers also could be considered conservative, although in some cases "off-site" would represent recharge into a river or stream. There are currently approximately 153 RCRA sites in Kentucky, approximately 45 of which have groundwater monitoring systems.

The information in Table 31 on RCRA Subtitle D facilities represents the findings in a total of 50 permitted solid waste landfill sites in Kentucky. An additional 80 permitted sites have not submitted reports to the Division of Waste Management. These data reflect only wells on-site because, unless specifically requested by a landowner, wells off-site are not monitored by the Division of Waste Management.

CERCLA Sites. Information is available on CERCLA sites in Kentucky for the first time for this report (Table 32). All the sites with off-site contamination also have on-site contamination. Note that some public water supplies have been affected by these sites.

Table 30
RCRA Subtitle C Hazardous Waste Site Groundwater Contaminants
(1991)

Contaminant Group ¹	Number of Sites with On-Site Contamination ²	Number of Sites with Of Site Contamination ³
Metals	21	4
Volatile Organics	28	6
Semi-volatile Organics	4	1
PCBs	1	1
Pesticides	2	0

¹Most sites are impacted by more than one contaminant group.

²Total Number of sites with on-site contamination = 28.

³Total Number of sites with off-site contamination = 10.

Table 31
RCRA Subtitle D Solid Waste Site Groundwater Contamination
(1991)

Contaminant Group	Number of Sites, 1990	Number of Sites, 1991
Metals	12	16
Organics	13	17
Pesticides	Those landfills that ran this analysis did not show contamination above MCLs	
PCBs	No PCBs from these sites have been reported in Kentucky	

Table 32
CERCLA Site Groundwater Contamination

Sites With Contamination:	1990	1991
On-Site	63	72
Off-Site	13	14
Affecting Public Water Supplies	3	1

Detection of VOCs in Groundwater. Volatile Organic Compounds (VOCs) were detected in 19 PWS in 1990 and in 16 PWS in 1991 (Table 33). Five PWS had detections in both 1990 and 1991. Also, five PWS had VOCs above MCLs in 1991. Two PWS were closed due to VOC contamination in 1990. Both, however, are working on remediation of their problem.

Table 33
Groundwater Supported Public Water Supplies (PWS)
with Volatile Organic Chemical Contamination

Volatile Organic Compound	Number of PWS with VOC Detections	
	1990	1991
1,1,1-trichloroethane	7	3
trichloroethylene	4	2
benzene	3	1
carbon tetrachloride	1	2
vinyl chloride	1	
dichloromethane	1	
1,4-dichlorobenzene	4	
1,2-dichloroethane	1	
p-dichlorobenzene		3
Population at Risk	39,439	19,545

Nonpoint Sources of Contamination

Nitrates. Nitrate contamination information was not available for this report.

Pesticides. Pesticide information was gathered by the Department of Agriculture, Division of Pesticides and is presented in Table 34. The data used are the amount of pesticides sold in a county per year. Eighty-six counties reported data, 34 did not. Data for previous years were not available.

Table 34
Pesticides in Kentucky
(1991)

Pesticide Use Intensity (lbs/sq. mile)	Number of Counties (1991)
0-400	76
401-1,000	9
1,001-1,430	1

CHAPTER 4

WATER POLLUTION CONTROL PROGRAMS

POINT SOURCE CONTROL PROGRAM

Wastewater Treatment Facility Permitting

Point source pollution refers to any discharge from municipal or industrial facilities that can be identified as emanating from a discrete source such as a conduit or ditch. Kentucky has a total of 3,023 active permits covered by the Kentucky Pollutant Discharge Elimination System (KPDES) program. Over 4,000 additional coal mining-related discharges are covered under the KPDES Coal General Permit. New federal mandates require expansion of the point source program to include stormwater runoff and combined sewer overflows. Kentucky has been issuing stormwater permits for more than five years to major industrial discharges with process wastewater (such as power plants, refineries, and chemical plants) and others with a significant potential for water quality problems from their runoff (petroleum bulk plants and concrete mix plants). A permitting strategy is being developed to cover industries that have not been previously permitted that are subject to the new regulations.

The overflow from combined sanitary and stormwater sewers in excess of the interceptor sewer or regulatory capacity, that is discharged into a receiving water without going to a publicly owned treatment works (POTW), is considered a combined sewer overflow (CSO). The number of CSO points statewide currently consists of 231 from a total of 21 separate systems. Most of these are located on larger streams such as the Ohio River and Kentucky River. The state began to include permit language addressing CSOs in the summer of 1991 as permits expired and were reissued. Currently, three permittees have permits reissued with CSO language included, and these three permits cover 168 of the identified CSO points.

In conjunction with a Northern Kentucky permitted facility, which had the largest number of CSO points for a single permittee, a Section 104(b)(3) grant has been awarded to the Division. Water quality data specifically related to CSO events will be collected to determine the role of CSOs on the water quality problems in the study area. This information will be valuable in developing a statewide database for tracking CSO trends and should facilitate future permitting and implementation strategies.

Wastewater permit limits in Kentucky have been water quality-based since National Pollutant Discharge Elimination System (NPDES) program delegation on September 30, 1983. Generally, there are two approaches for establishing water quality-based limits for toxic pollutants: chemical-specific limits, which are individual chemical criteria for determining discharge limits for all known toxic or suspected toxic pollutants in an effluent; or whole effluent toxicity testing, which sets limits on an effluent's total toxicity as measured by acute and/or chronic bioassays on appropriate aquatic organisms.

Both approaches have advantages and drawbacks, but when both are integrated into a toxics control strategy, they provide a flexible and effective control for the discharge of toxic pollutants.

Toxicity data are available for only a limited number of compounds. Single parameter protection criteria, therefore, often do not provide adequate protection of aquatic life if the toxicity of the components in the effluent is unknown, there are synergistic (greater than predicted) or antagonistic (less than predicted) effects between toxic substances in complex effluents, and/or a complete chemical characterization of the effluent has not been carried out. Since it is not economically feasible to determine the toxicity of each of the thousands of potentially toxic substances in complex effluents or to conduct exhaustive chemical analyses of effluents, the most direct and cost-effective approach to measuring the toxicity of effluents is to conduct effluent toxicity tests with aquatic organisms.

Effluent Toxicity Testing

In 1988 the Commonwealth of Kentucky adopted an integrated strategy to control toxic discharges into surface waters. This toxics control strategy was implemented by including both chemical-specific limits and whole effluent toxicity (WET) limits in KPDES permits issued to industrial and publicly-owned treatment works (POTWs). These limits were applied to most major and selected minor industrial dischargers, major municipal dischargers, and minor municipal dischargers with an approved pretreatment program. The WET limitations were developed for both acute and chronic levels based on a case-by-case evaluation of the discharge type and volume, and the size of the receiving stream. To date, the Division of Water has issued 112 permits with WET limitations. Of the 112 permits, 35 are industrial and 77 are municipal.

During 1990 and 1991, WET tests were conducted on point source dischargers throughout the state. The Division of Water tested 68 facilities. A total of 1,212 tests were conducted by 112 facilities in compliance with KPDES biomonitoring permit requirements. All the Division of Water tests were 96-hour static-renewal bioassays using Ceriodaphnia dubia and Pimephales promelas as the test organisms. Results of the Division of Water's toxicity tests are summarized in Table 35.

Biomonitoring test results are submitted with a facility's discharge monitoring reports (DMRs) on a monthly basis for the first year of biomonitoring, after which tests are performed quarterly. Test species are Ceriodaphnia dubia and Pimephales promelas. Acute tests are 48-hour static exposures and chronic tests are the 7-day P. promelas growth test and 7-day C. dubia reproduction test. Two consecutive failures of a single concentration "screen" test, using the permitted concentration, results in a facility's entering a toxicity reduction evaluation (TRE). Screen test failures are summarized in Table 36.

Approximately one-third of all facilities currently with biomonitoring permit limits are conducting TREs. A summary of facilities in TRE status by the end of 1991 is shown in Table 37.

Table 35
Division of Water Effluent Toxicity Testing
1990-1991

Facility Type	Prechlorinated Effluent			Final Effluent		
	Number Toxic	Total Tests	Percent Toxic	Number Toxic	Total Tests	Percent Toxic
<u>1990 Results</u>						
Municipal						
Major	8	11	73	7	15	47
Minor with pretreatment	1	1	100	1	6	17
Minor	7	9	78	11	11	100
Total Municipal	16	21	76	19	32	59
Industrial	0	0	NA	0	1	0
<u>1991 Results</u>						
Municipal						
Major	2	2	100	2	7	29
Minor with pretreatment	0	0	NA	1	2	50
Minor	1	1	100	7	14	50
Total Municipal	3	3	100	10	23	43
Industrial	0	0	NA	4	9	44

Table 36
KPDES Permittee Effluent Toxicity Testing
1990-1991

Facility Type	Total Screening Tests	Number Failed	Percent Failure
<u>1990 Results</u>			
Municipal			
Major	292	121	41
Minor	50	22	44
Total	342	143	42
Industrial			
Major	138	27	20
Minor	34	14	41
Total	172	41	24
<u>1991 Results</u>			
Municipal			
Major	403	209	52
Minor	101	31	31
Total	504	240	48
Industrial			
Major	124	50	40
Minor	70	34	49
Total	194	84	43
Total Both Years	1,212	508	42

Table 37
Summary of Toxicity Reduction Evaluations (TREs)
1991

Facility Type	Number with Biomonitoring	Number in TREs	Percent TREs
Municipal			
Major	59	24	41
Minor	18	4	22
Total	77	28	36
Industrial			
Major	26	6	23
Minor	9	5	56
Total	35	11	31
Grand Total	112	39	35

By the end of 1991, three facilities had completed their TREs and another 13 could be finished by the end of 1992. The reduction of toxic discharges is being achieved as summarized below (by number of facilities):

<u>Methods</u>	<u>Number</u>
New treatment plant construction	4
Plant improvements	5
Plant operation changes	5
Treatment options identified	6
Toxic sources identified	2

Toxicity identification evaluations (TIEs) have been performed on a number of facilities with varying success. The most commonly found groups of toxicants are metals and pesticides. The following is a list of the number of facilities identifying different groups of toxicants in their effluent. Most of those identified have yet to be confirmed as the cause of toxicity because of the variability in municipal wastewater composition.

<u>Toxicants</u>	<u>Number</u>
Metals	7
Pesticides	4
Surfactants	2
Polymers	2
Ammonia	2
Others	4

A closer examination of the facilities in TREs has revealed that treatment type can play a significant role in the degree of toxic discharge. Facilities with rotating biological contactors (RBCs) have the greatest frequency of entering a TRE. Seventy-nine percent (11 of 14) of all facilities with biomonitoring permit limits and RBCs were in a TRE, compared with an overall rate of 35 percent. This high rate of TREs among RBC facilities accounts for nearly half of all major municipal facilities that are in TRE status. Another observation is that older RBC facilities have a greater frequency of entering a TRE, which is an apparent reflection of RBC's poor performance record. More research is needed in the area of treatment plant design to reduce toxic discharges. The facility design review and funding process has been changed to prevent further construction of RBC facilities. EPA needs to develop a mechanism to accelerate their replacement.

Pretreatment Program

The quality of Kentucky's surface waters continues to face a threat from improperly treated industrial waste discharged into municipal sewage treatment systems. Such waste often contains pollutants that are either not removed by the municipal treatment process or, if removed, result in the generation of contaminated sludge. In an effort to control this problem, Kentucky has approved pretreatment programs in 69 cities and has screened several others to determine their need for a pretreatment program. A list of communities with approved pretreatment programs and the estimated costs to administer the local program is presented in Table 38. The facilities needing programs are all on schedule for obtaining approval. Once approved, each program is inspected annually and must submit semi-annual status reports to the Division of Water for review. These reports are incorporated into the computer files known as the Permit Compliance System (PCS) and Pretreatment Permits and Enforcement Tracking System (PPETS).

The National Pretreatment Excellence Awards recognize those publicly owned wastewater treatment plants that have developed and implemented effective and innovative pretreatment programs. EPA's award program is divided into four categories based on flow of the POTW: 0 to 2.0 MGD, 2.01 to 5.0 MGD, 5.01 to 20.0 MGD, and greater than 20 MGD.

Table 38
Total Estimated Level of Annual Funding
Required to Implement the
POTW Pretreatment Program

No.	POTW	\$/Year
1	Adairville	\$15,000
2	Ashland	85,163
3	Auburn	108,000
4	Bardstown	25,000
5	Beaver Dam	5,000
6	Berea	7,000
7	Bowling Green	52,200
8	Cadiz	12,000
9	Calhoun	In-Active
10	Calvert City	2,500
11	Campbellsville	46,410
12	Campbell/Kenton SD#1	132,000
13	Caveland Sanitation	14,880
14	Corbin	68,046
15	Cynthiana	12,000
16	Danville	13,000
17	Edmonton	2,000
18	Elizabethtown	350,000
19	Elkton	1,000
20	Eminence	22,500
21	Flemingsburg	9,000
22	Frankfort	85,000
23	Franklin	40,550
24	Fulton	18,000
25	Georgetown	12,000
26	Glasgow	22,600
27	Guthrie	7,000
28	Harrodsburg	13,000
29	Hartford	6,260
30	Henderson	60,300

Table 38 (Continued)

No.	POTW	\$/Year
31	Hopkinsville	151,000
32	Jamestown	23,000
33	Lancaster	1,000
34	Lawrenceburg	22,500
35	Lebanon	10,000
36	Leitchfield	35,895
37	Lexington	331,200
38	Livermore	5,506
39	London	15,000
40	Louisville	1,397,900
41	Madisonville	32,000
42	Marion	13,500
43	Mayfield	12,500
44	Maysville	9,000
45	Middlesboro	12,000
46	Monticello	8,000
47	Morganfield	In-Active
48	Morgantown	25,929
49	Mt. Sterling	13,500
50	Murray	20,000
51	Nicholasville	47,000
52	Owensboro	61,000
53	Owingsville	1,000
54	Paducah	78,000
55	Paris	20,000
56	Princeton	13,500
57	Richmond	16,562
58	Russellville	21,500
59	Scottsville	1,400
60	Shelbyville	19,180
61	Somerset	60,000
62	Springfield	6,000
63	Stanford	2,000
64	Tompkinsville	5,000
65	Versailles	1,000
66	Williamsburg	9,000
67	Williamstown	4,350
68	Winchester	64,000
69	Wurtland	7,000
	Total	\$3,824,331

In the three years that local programs have been recognized, Kentucky POTWs have faired well each year, with a total of five programs receiving the awards:

<u>Year</u>	<u>POTW</u>	<u>Category</u>
1989	Louisville MSD	(20 + MGD)
1990	Bardstown	(0 - 2.0 MGD)
	Richmond	(2.01 - 5.0 MGD)
1991	Leitchfield	(0 - 2.0 MGD)
	Corbin	(2.01 - 5.0 MGD)

Municipal Facilities

Construction grants, state revolving loan fund monies, and other funding programs have resulted in the construction of over \$116 million in wastewater projects which came on line during 1990-1991 as indicated in Table 39. Thirty municipal wastewater projects were completed during this two year period. An additional 20 to 25 projects are in various stages of construction.

Although significant improvements in water quality have been realized through the construction of new wastewater treatment facilities, there are numerous needs that remain to be addressed. The 1990 Needs Survey, conducted by the Division of Water as part of its planning process, indicated that municipal discharges continue to impair water quality and pose potential human health problems. State and federal minimum treatment requirements are not being met in every instance. The 1990 Needs Survey identified a capital investment need of \$1.133 billion to construct and rehabilitate wastewater treatment facilities and components for Kentucky, based on the 1990 population. Backlog needs of \$1.133 billion, coupled with long-range needs for publicly-owned treatment facilities, reveal a projected total need of over \$1.485 billion through the year 2010. A detailed breakdown of investment needs is presented in Table 40.

The 1986 305(b) Report to Congress described Kentucky's Water Infrastructure Report and concluded that a revolving loan fund concept was the most feasible option for Kentucky in meeting its water infrastructure needs. Because the federal law was not in place at that time, Kentucky was unable to pass appropriate legislation during the 1986 Kentucky General Assembly.

When the 100th Congress of the United States passed HR 1, the final step toward elimination of grants and establishment of state revolving funds was initiated. States were given the option of using a portion of the allotment for grants through FY 90.

Table 39
Wastewater Treatment Facilities That Came on Line
During Calendar Years 1990-1991

Type of Funding/City	Date on Line	Design Flow (mgd)	Treatment Cost	Interceptors
Grant				
Beaver Dam	8/90	0.711	\$1,460,000	\$25,000
Berea*	5/91	2.100	231,000	0
Cave City	5/91	0.600	2,320,348	1,334,998
Central City	9/90	0.973	2,858,940	883,970
Elkton*	5/91	0.272	303,675	0
Horse Cave	5/91	0.280	2,320,348	1,334,998
Inex	9/90	0.260	1,447,769	4,044,888
Irvington	11/90	0.144	818,000	1,778,728
Lexington - Town Branch	11/90	30.000	48,807,025	0
Louisville - West Co.	5/90	15.000	19,759,312	8,543,754
Manchester	11/90	0.581	1,505,566	615,243
Middlesboro	7/91	-	0	606,915
Millersburg	3/91	0.200	582,644	0
Oak Grove	12/91	0.500	-	372,459
Sacramento	9/90	0.062	465,786	1,218,553
Shelby Co. Sanitation Dist.	9/90	-	0	2,163,282
Whitesburg	1/91	0.500	<u>768,525</u>	0
Total			\$83,648,938	\$22,922,788
Loan				
Jackson	8/91	0.750	\$3,241,350	
Jenkins	5/91	0.750	2,624,166	
Manchester	11/90	0.581	1,938,084	264,284
Mt. Washington	3/91	0.900	1,217,000	
Perryville	2/91	0.100	<u>715,871</u>	
Total			\$9,736,471	\$264,284
Auburn	8/90	0.350		
Brodhead	7/91	0.150		
Henderson	8/91	7.500		
McKee	3/90	0.170		
Oak Grove	12/91	0.500		
Wurtland	7/91	1.100		
Versailles	8/91	3.000		
Totals for EPA Funded Projects			\$93,385,409	\$23,187,072

*Modification or Replacement

Table 40
Investment Needs for Wastewater Treatment
Facilities in Kentucky 1990-2010
(In millions of January 1990 dollars)

Facility	For Current 1990 Population	Projected Needs 2010 Population
Secondary treatment	\$134	\$181
Advanced secondary treatment	47	57
Infiltration/Inflow	81	81
Major rehabilitation of sewers	12	12
New collector sewers	562	693
New interceptor sewers	273	437
Correction of combined sewer overflows	<u>24</u>	<u>24</u>
Total	\$1,133	\$1,485

Kentucky made the decision to place all federal dollars in the revolving fund to the extent possible beginning in FY 88. A few large segmented grant projects required continuation of some grant funding through FY 90. An early transition from grants to loans assured more available dollars in the revolving loan fund over the long term.

Kentucky state legislation was passed March 14, 1988. Kentucky has received four capitalization grants from EPA. These grants of FY 88 through FY 91 federal funds total \$88.2 million. Provisions have been made in the state biennial budget for the 20 percent match, and it is estimated that approximately \$156 million will be available in federal and state funding through 1994 when federal funding is to cease. This should be a first step toward funding the \$431 million of requests contained in the state's priority list, as well as other wastewater needs that have not yet been placed on the priority list.

The funding formula, which distributes capitalization grant money to the states, currently provides Kentucky with only 1.2872 percent of the amount authorized nationally for each fiscal year. In comparison with total national wastewater facility needs, this figure falls short of the 1.64 percent that exists in Kentucky. Also, if compared with population based on 1990 census figures, the allotment percentage falls short of the 1.47 percent of population in Kentucky. A funding allotment percentage for Kentucky of approximately 1.55 percent would be more in line with needs and population figures. The estimated annual difference in available state revolving fund money would translate into two or three additional wastewater projects for Kentucky communities.

The law originally provided an authorization of appropriations beginning at \$2.4 billion and tapering to \$.6 billion for fiscal year 1994. To date, actual appropriations have fallen short of the authorized figures. Consideration should be given to maintaining a higher funding level and extending the funding beyond 1994 at least to the point of allotting the total amount originally planned. This higher level of funding and extension beyond 1994 are necessary to assure that states establish a financially healthy, perpetual revolving fund.

Wastewater Regionalization

Over the last two years, the Division of Water has used funds from Section 205(j) of the Clean Water Act to assist it and regional planning organizations to develop regionalization approaches to treat wastewater. The objective of this initiative is to discourage the proliferation of small privately-owned package treatment plants in the state. Contracts with four area development districts, one regional health organization, and the Council of State Governments have provided information for the development of regionalization strategies at the state and local level and have provided technical assistance at the plants to enhance water quality.

Some of the results of this initiative have been the elimination of a number of existing package treatment plants, prevention of package treatment plant construction by connection to municipal systems, inclusion of siting restrictions on package treatment plants in local master plans, and planning and zoning ordinances. The improvement in operations at some package plants has also occurred because of the takeover by a responsible public entity.

NONPOINT SOURCE POLLUTION CONTROL PROGRAM

The Kentucky Nonpoint Source Management Program document provides a comprehensive description of Kentucky's strategy for controlling nonpoint source (NPS) pollution. It was prepared by the Division of Water (DOW) in response to the requirements of the Water Quality Act of 1987 and received full approval from the U.S. Environmental Protection Agency (EPA) in November 1989. It describes those control measures, or best management practices (BMPs), that Kentucky will use to control pollution resulting from each NPS category (agriculture, construction, etc.) identified in the Kentucky NPS Assessment Report and in this report, the programs to achieve implementation of those BMPs, and a schedule for implementing those programs.

Because NPS pollution arises from a wide spectrum of diffuse sources throughout the Commonwealth, a variety of programs exists in a number of agencies which address NPS pollution control. The DOW serves as the lead oversight agency for these programs. Agencies and institutions cooperating in the implementation of Kentucky's NPS Management Program include the Kentucky Division of Conservation (DOC), Division of Forestry, Division of Waste Management, Division of Pesticides, Department for Surface Mining Reclamation and Enforcement, Kentucky Conservation Districts, Kentucky Geological Survey, U.S. Soil Conservation Service (SCS), U.S. Agriculture Stabilization and Conservation Service (ASCS), U.S. Forest Service, U.S. Geological Survey, U.S. Army Corps of Engineers, Tennessee Valley Authority, University of Kentucky Water Resources Research Institute, and University of Kentucky College of Agriculture.

Kentucky's NPS program has received \$1,504,335 from EPA through Section 319 and 205(j)(5) grants for fiscal years 1990 and 1991. Currently, for fiscal year 1992, Kentucky has requested \$389,000 for baseline funding and has submitted 14 project proposals for competitive funding.

Monitoring

Nonpoint source pollution problems in the waters of the Commonwealth originate from land-based activities. The direct interrelationship between land activities and water quality necessitates that both the terrestrial and the aquatic environments be monitored and evaluated. To this end, the NPS Pollution Control Program has formed two on-site planning field teams. Each team consists of a DOW field team leader with an aquatic ecology background and a DOC field team member with an agronomy/agriculture background.

The actual collection, assessment, evaluation, and interpretation of both water quality and land-based data is the responsibility of the field teams. Physical characteristics of the waterbody, water chemistry, aquatic biological community structure, and land-based activities are different aspects of the waterbody's ecosystem that

may be monitored. A multifaceted approach is necessary for NPS monitoring because of the mobility of NPS pollutants, the varying degrees of pollutant toxicity, the close interrelationship of land-based activities and NPS pollution, and the spatial and temporal variabilities that exist in natural, dynamic ecosystems. Nonpoint source standard operating procedures (SOPs) will provide instruction and guidance in, and will ensure standardization of, study plan development, station location selection, water quality monitoring, land use/treatment monitoring, and weather monitoring.

Water quality monitoring is an important aspect of the NPS program, especially if monitored water quality data is lacking, existing NPS pollution problems need to be quantified, and documentation is needed to show changes in water quality where alterations in land use practices have occurred. Monitoring will be conducted as part of NPS demonstration projects.

Demonstration Project: Mammoth Cave

Increasing public awareness of water quality problems at Mammoth Cave National Park has resulted in the development of the Mammoth Cave Karst Area Water Quality Oversight Committee. Its purpose is to achieve coordination among citizens, land users, and government agencies to monitor and improve the quality of waters in the karst area in south-central Kentucky.

A multi-agency technical committee consisting of representatives from local and state SCS offices, the ASCS, U.S. National Park Service, DOC, DOW, Kentucky Geological Survey, U.S. Geological Survey, Tennessee Valley Authority, University of Kentucky-College of Agriculture, Western Kentucky University-Department of Agriculture, and Western Kentucky University-Center for Cave and Karst Studies was established to work with the Mammoth Cave Karst Area Water Quality Oversight Committee in developing a nonpoint source water quality project for the Mammoth Cave area.

Local SCS and ASCS representatives prioritized farms within the Mammoth Cave vicinity for possible demonstration projects. Based on land resource needs, accessible water monitoring areas, and farmer cooperation, five farms were chosen as demonstration farms. Best management practices have been or will be implemented in a holistic, systems approach at two farms, and animal waste treatment facilities are being installed at three other farms. Multi-agency monitoring efforts will be used to document agricultural impacts on the quality of surface waters, groundwaters, and wetlands, and to address cross-media interactions. DOW has developed study plans for monitoring activities for each of the demonstration farms, has coordinated monitoring activities with other involved agencies, is implementing water quality monitoring, and will interpret and document changes in water quality that relate to the implementation of BMPs. These demonstration farms are being used for agricultural education purposes.

In order to execute project monitoring objectives, different sampling techniques are being employed at the various demonstration farms. For the most part, monitoring focuses on stormwater runoff. Automatic samplers were installed at two farms and will be used to evaluate agricultural BMPs. Animal waste lagoons are also being evaluated at these two farms.

The other three demonstration sites pertain only to feedlot operations. One of these operations drains into a second-order stream. An upstream - downstream biological/bacteriological/physicochemical monitoring approach is being employed there. Several sets of data have been collected at this location.

An animal waste lagoon has already been installed at one of the demonstration farms. Two sets of pre-BMP data were collected. These consisted of physicochemical and bacteriological analyses of grab samples. Because this is a no-discharge design system, post-BMP samples will probably not be collected.

The other demonstration farm was recently selected for the installation of an animal waste lagoon. Construction is planned for spring 1992. Some pre-BMP data have been collected for this site consisting of physicochemical and bacteriological analyses of grab samples.

Demonstration Project: Upper Salt River/Taylorsville Reservoir Watershed

Fishery problems in Taylorsville Reservoir, including fish kills and reduced fish reproduction, have prompted multi-agency concern over the water quality in the Upper Salt River watershed. The U.S. Army Corps of Engineers, Kentucky Department of Fish and Wildlife Resources, and DOW are investigating the water quality and fishery problems in the watershed. The basin is being impacted from excessive nutrient and sediment loading from agricultural activities, municipal wastes, faulty septic systems, and other land use activities. A comprehensive study plan, developed by NPS field team leaders, describes the objectives and activities of agencies involved in water quality monitoring in the upper Salt River/Taylorsville Reservoir (USR/TR) watershed.

The NPS program is conducting a study to determine the contribution of nonpoint source pollution from agricultural activities on the water quality of the upper Salt River and to document any changes in water quality that result from BMP implementation. The NPS field teams have obtained and compiled various land use/cover/treatment data including, but not limited to, geology, pesticide usage, number of failing septic systems, number of dairies, and animal waste facilities in the watershed. A U.S. Department of Agriculture (USDA) hydrologic unit area water quality (HUAWQ) project has been funded for this watershed. The overall goal of the USDA HUAWQ project is to abate

or prevent water quality degradation in both surface and groundwater sources of the USR/TR watershed over a five year period. To achieve this goal, the identified sources of contamination will be addressed by the use of best management practices.

An additional monitoring activity in the watershed relates to the development of Total Maximum Daily Loads (TMDLs). To develop a watershed-wide strategy for addressing both point and nonpoint source pollution in the USR/TR watershed, the DOW is developing TMDLs for the Upper Salt River. Total phosphorous is the primary pollutant parameter of concern for the TMDL. Targeted phosphorous values for point sources (waste load allocation) and nonpoint sources (load allocation) are being developed for the Upper Salt River. Total phosphorous TMDLs will be correlated with target chlorophyll α values in Taylorsville Reservoir.

Demonstration Project: Big South Fork/Bear Creek Interstate Watershed

The Big South Fork/Bear Creek demonstration project is located in an interstate watershed that lies in both Tennessee and Kentucky. Bear Creek flows north from Tennessee into Kentucky where it joins with the Big South Fork of the Cumberland River. A large portion of the Big South Fork watershed is classified and operated as a National River and Recreation Area by the National Park Service. Nonpoint source pollution impacts to Bear Creek begin outside the Big South Fork National River and Recreation Area (BSFNRA) in Tennessee. The lower portion of Bear Creek lies in Kentucky, mostly within the BSFNRA.

The Bear Creek drainage is affected by unreclaimed strip mines, numerous uncased, unmapped and abandoned oil and gas wells, agricultural activities, and suspected illegal industrial dump sites. An abandoned surface coal mine of approximately 70 acres, characterized by heavily eroding spoil banks and acid mine drainage, is one of several nonpoint source pollution problems in the upper reaches of the Bear Creek watershed.

The Tennessee Department of Health and Environment (TDHE), Nonpoint Source Program in cooperation with the Tennessee Department of Conservation (TDOC), Land Reclamation Program, has developed a rehabilitation plan for the Bear Creek watershed. The rehabilitation plan calls for surface mine reclamation and water quality monitoring. The TDOC Land Reclamation Program has studied the abandoned mine land sites and has implemented resource management BMPs. The BMPs include drainage control structures, subsurface limestone drains (anoxic alkaline trenches), aeration, and artificial wetlands through which to route acid mine drainage. The TDOC has implemented reclamation action and BMP implementation along Bear Creek.

In order to document changes in water quality associated with BMP implementation, the TDHE-NPS monitoring team is monitoring water quality before and after BMP implementation in the Tennessee portion of Bear Creek. To complete the watershed monitoring plan for this project, the Kentucky NPS monitoring team is conducting water quality monitoring in the Kentucky portion of Bear Creek. The team is supplementing Tennessee's activities by monitoring a station at the mouth of Bear Creek. In order to address possible temporal variability in water quality at Bear Creek, Rock Creek, a Kentucky Outstanding Resource Water, has been selected as an appropriate reference stream. An automatic water sampler has been installed at the Bear Creek station to collect rain event water samples. Quarterly biological monitoring is being conducted at both the impacted and reference stations in order to document recovery of the stream biota. Further, to ensure that biological data from Tennessee and Kentucky are comparable, Tennessee Standard Operating Procedures are being used by Kentucky for this particular project.

Demonstration Project: Fleming Creek

A project proposal for BMP monies for the Fleming Creek watershed was submitted to the USDA during the fourth quarter of 1991 by the SCS, Cynthiana, Kentucky, office with assistance from the DOW. This project was approved for funding in February 1992. Fleming Creek is a priority watershed; therefore, the Division will conduct water quality monitoring on this waterbody for the next several years.

Fleming Creek flows generally east to west and meets with the Licking River at mile 106.9. Fleming Creek's mainstem is 39 miles long draining an area of 61,670 acres. Further, this stream and its tributaries are contained almost entirely within Fleming County in northeastern Kentucky.

Fleming County ranks third statewide in number of dairy cattle. Eighty-five feedlot operations occur in this watershed, and the total cow population in the county exceeds 10,000 head. Moreover, an estimated 1,700,000 cubic feet of animal waste is washed into local streams annually. Because of this pollution source, water quality degradation has resulted.

Some data pertinent to this project have already been collected. In May 1990, officials from the Soil Conservation Service and DOW sampled several stations within the watershed in an effort to gather background information. Biological data and field water quality analyses were obtained for these stations.

A draft study plan has been developed for this project. Under the plan, the monitoring program will consist of three phases and will commence in the spring of 1992.

First, a watershed-wide bacteria and nutrient survey will be conducted. The purpose of this phase will be to examine the entire watershed with respect to point and nonpoint pollution sources in an effort to target those areas most affected by animal wastes. Data from this phase will also be used to locate a relatively unimpacted stream within the watershed for the purpose of a reference/control site.

Second, from these initial stations, several sites will be retained for long-term monitoring, including the reference/control station. The purpose of this second phase will be to measure water quality changes as a result of BMP installation in a holistic manner. Water quality data will center on nutrient concentrations for this phase.

Third, biological, physicochemical, and possibly bacteriological data will be collected at two of the more impacted (from animal waste) tributaries within the watershed and at the reference/control site. Preference will be given to the impacted subwatersheds for BMP installation. The purpose of this third phase is to evaluate water quality changes within "targeted" subwatersheds.

Data Collection/Data Management

A necessary and important function of the NPS program is the collection and management of NPS-related information. The cooperative, multi-agency nature of the program prescribes the reliance upon, and utilization of, existing data such as land use classification statistics, baseline water quality values, and best management practice evaluations. To this end, an NPS document library has been developed. All NPS-related documents are cataloged, and pertinent data are entered on computer for future retrieval. In addition, a computer literature search service has been identified and utilized for accessing other scientific and technical information pertinent to the program. Further, several statewide databases have been identified and utilized, including county-specific fertilizer and pesticide databases.

Education

To a large extent, the implementation of BMPs to control NPS pollution relies upon voluntary adoption by those who manage the use of Kentucky's land resources. Therefore, education plays a vital role in Kentucky's NPS Management Program. NPS education programs inform land users and other Kentucky citizens about the causes, consequences, and solutions (BMP use) for the various types and sources of NPS pollution.

The DOW NPS program supports and coordinates with a wide spectrum of NPS educational activities and programs. These programs are conducted by a number of cooperating agencies and institutions including the DOW, DOC, Division of Forestry, Division of Pesticides, local Conservation Districts, SCS, and the Kentucky Cooperative Extension Service. The DOW has provided program speakers for school classrooms, civic groups, trade organizations, and agency meetings. Additionally, exhibits and other educational materials have been provided for use in conferences, fairs, field days, and clean-up days.

Several NPS education projects are being conducted under the oversight of the DOW NPS program since they receive funding authorized by Section 319 of the Water Quality Act of 1987:

- o The slide/video program and accompanying brochure, "Every Time It Rains," a general introduction to NPS pollution problems in Kentucky targeted to the general public, was produced by the Center for Math, Science, and Environmental Education at Western Kentucky University (WKU).
- o WKU is also producing a video program on abandoned minelands and water quality, targeted to general audiences in Kentucky and Tennessee. It centers on the Bear Creek/Big South Fork demonstration project as an example of how these problems can be solved.
- o The Gateway Region Environment-Education Network (GRE-EN), based in the Gateway District Health Department, is conducting a multi-faceted education program in the five-county Gateway region that targets agriculture, septic systems, and illegal dumps.
- o The Warren County Conservation District has been conducting a number of educational activities that present NPS pollution problems and solutions arising from construction and urban runoff in karst regions, including contractor field days and the construction of a high-quality portable exhibit.
- o The American Cave Conservation Association is building an exhibit in its American Museum of Caves and Karstlands, located in Horse Cave, which illustrates the many types of human activity that can pollute groundwater.

The WATER WATCH program (described in another section of this report) has proven to be a particularly valuable channel for educating citizens about NPS water quality problems and solutions. The WATER WATCH and NPS program staff are working to further expand WATER WATCH educational materials and programs to

include more information on BMPs and NPS pollution control, train participants to identify land use activities that are contributing to NPS pollution of their adopted waterbody, and collect data about water quality, aquatic life, and aquatic habitat conditions, including supplemental monitoring for NPS demonstration projects.

Update of the Nonpoint Source Pollution Assessment Report

Section 319 of the Water Quality Act of 1987 required all states to complete and submit a statewide Nonpoint Source (NPS) Pollution Assessment Report to EPA. The NPS Assessment Report was an attempt to identify all waters contaminated by NPS pollution and the NPS categories contributing to the problem. Kentucky's report was completed and approved by EPA in January 1989. EPA requires each state to update the report every year. The update of the NPS Assessment Report is a part of the 305(b) reporting process. The assessment update will identify navigable waters impacted by NPS pollution, detail changes that have occurred since the publication of the assessment in the 1990 305(b) report, and discuss NPS pollution in Kentucky's waters.

The NPS Pollution Assessment Report fulfills four requirements of Section 319 which are briefly summarized as follows:

1. Identify navigable waters that cannot attain or maintain applicable water quality standards or goals and requirements of the Water Quality Act of 1987 without additional action to control NPS pollution.
2. Identify categories and subcategories of NPS pollution that affect waters identified in Item 1.
3. Describe the process for identifying Best Management Practices (BMPs) and other measures to control NPS and to reduce such pollution to the "maximum extent practicable."
4. Identify and describe state and local programs for NPS control.

The discussion that follows relates to items 1 and 2. An example of the format used in Appendix C to identify NPS impacted waters is presented in Figure 2. Information contained in the appendix includes the waterbody code, waterbody name, NPS categories, parameters of concern, data sources, method of assessment, and designated uses not fully supported.

Figure 2. Data Table Organization for Nonpoint Source Impacted Waters

WATERBODY CODE	STREAM NAME	NPS CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
05100202-011	ROCKHOUSE CREEK	32	88	21	55	51	SED,MET,SO ₄ ,Cl	305(b), 1988	MONITORED	WAH

Waterbody Name and Code

The identification of waters impacted by NPS pollution consists of the name of the principal stream, lake, wetland, or groundwater site. The code further delineates the water being assessed and has been indexed in a computer storage and retrieval system for easy access to information compiled for the waterbody.

NPS Category

The categories and subcategories of NPS pollution sources for each of the listed waters and their codes were established in EPA's guidance document for the preparation of the 1992 305(b) report. Refer to Appendix C for a listing of the codes and sources.

Additionally, the NPS categories were prioritized based on the severity of the NPS impact. Prioritized categories appear in numbered columns, indicating the relative severity of NPS impacts for a specific waterbody. Column one identifies the NPS impact of greatest concern.

Parameters of Concern

This information indicates the parameters which significantly contribute to the NPS impacts. These parameters include sediment, nutrients, bacteria, chemicals, pesticides, metals, etc. See Appendix C for a list of the parameters and their abbreviations.

Data Sources: Evaluated/Monitored

Information for Kentucky's NPS Assessment Report was gathered from many different sources. Both evaluated and monitored data were obtained and used to assess the NPS impacts to streams and lakes, wetlands, and groundwaters. Two levels of assessment were used to determine the impact of NPS pollution: monitored or evaluated. "Monitored" waters are those that have been assessed based on current site-specific water quality data. Waters were labeled as being "evaluated" if they were judged to be

impacted by NPS pollution based on field observations, citizen complaints, fish kill reports, land use data, etc. Additionally, specific water quality data more than five years old were labeled as evaluated. A bibliography listing data sources used for assessing nonpoint source impacts is provided in Appendix C.

Uses Not Fully Supported

Kentucky water quality regulations classify streams based on identifiable uses. The stream use classifications are: Warmwater Aquatic Habitat (WAH), Coldwater Aquatic Habitat (CAH), Domestic Water Supply (DWS), Primary Contact Recreation (PCR), Secondary Contact Recreation (SCR), and Outstanding Resource Waters (ORW). Uses in several waterbodies have been designated as threatened due to land-based activities in the area. Threatened use means that while a use or uses are fully supported in these waterbodies, NPS pollution arising from current land use activities in those watersheds could potentially make these waterbodies not support a use. The use classifications help protect public health and welfare and protect and enhance the quality of water for aquatic life. Partial and nonsupport are not differentiated in the tables, but these support categories are reported separately in the streams and rivers and lake assessment chapters in this report.

Surface and Groundwaters Impacted by Nonpoint Source Pollution

Rivers, Streams, and Lakes

Nonpoint source pollution of Kentucky's rivers, streams, and lakes is widespread, occurring in virtually every county of the state. Agricultural activities are the major sources of NPS pollution in Kentucky, both in terms of statewide distribution and the severity of pollution within a given area or watershed. Siltation from disturbed land is the primary agricultural pollutant and is the most common nonpoint source pollutant in Kentucky. It can cause navigational and flooding problems, threaten aquatic life, and transport large amounts of other pollutant materials. For example, nutrients and pesticides, two additional agricultural NPS pollutants, bind to, and are transported along with, sediment particles to streams and lakes.

Crop production is the primary agricultural land use activity affecting water quality. Because of its widespread occurrence, pastureland, especially where poorly maintained, is the second most common source of agricultural NPS pollution. Nutrient loading and bacterial contamination from feedlots, animal holding, and other livestock management areas are commonly occurring and often critical NPS problems throughout the Commonwealth. Other sources of agricultural NPS pollution include streambank erosion from unrestrained livestock, irrigated crop production, and specialty crop production (truck farming).

Surface coal mining activities are the most extensive and critical sources of NPS pollution that impact the streams and lakes of the Eastern and Western Kentucky Coalfields. Underground coal mine activities are a common secondary source of NPS pollution in these regions. Other mining-related nonpoint pollution sources in the state include runoff from limestone quarries and abandoned fluorspar mines.

Sediment, acid mine drainage, and elevated iron and sulfate concentrations are the principal pollutants associated with surface and underground coal mining activities. Sedimentation arises from stripping operations, haul roads, spoil banks on unreclaimed abandoned mine areas, deforested areas, sediment retention structures which have failed or do not operate properly, and sometimes surface disturbances associated with areas permitted for deep mining. Abandoned mines, which include underground mines and surface mines abandoned illegally or before mining regulations took effect, generally contribute the most severe acid water problems. Impacts from limestone quarries generally involve slight downstream increases in siltation and alkalinity.

Petroleum extraction activities occur in several regions of the Commonwealth. Improper brine discharges from oil and gas drilling operations result in high chloride levels, which in some areas are severe enough to eliminate aquatic fauna and adversely affect downstream public water supplies. Sedimentation from improperly constructed and maintained oil and gas facility service roads is also of concern.

Siltation of streams and lakes frequently results from silvicultural activities, or activities related to use of forest lands. Erosion can result from logging operations, saw mill runoff, reforestation, residue management, forest fires, haul road construction and maintenance, and woodland grazing of livestock. NPS pollution from silvicultural operations is widespread in Kentucky and is of special concern in steeply sloping areas.

Sediment is the major pollutant arising from several other source categories of NPS pollution. Construction activities (residential, commercial, or highway) can expose bare soil, resulting in severe erosion and sedimentation. Hydrologic habitat modification activities such as dredging, channelization, and flow regulation/modification, can alter the stream flow, disturb adjacent land area, and cause streambank erosion. Streambank erosion can also be caused by unrestrained access for livestock and increased runoff from impervious surfaces in urban areas.

Nonpoint source pollutants other than sediment are carried by runoff from several different categories of sources into Kentucky's streams and lakes. Stormwater runoff from urban areas washes nutrients, pesticides, bacteria, petroleum products, and a broad spectrum of other toxic substances into streams and lakes. On-site wastewater system runoff, especially from malfunctioning septic tanks, carries bacteria and nutrients to waterbodies. Solid waste and sewage is another frequently occurring NPS pollution category. While garbage, refuse, and debris primarily clog watercourses and create

aesthetic eyesores, they can also be a water quality problem because of pollutant residues remaining in the discarded containers and packaging. Finally, herbicides and other toxic substances that are used in highway and railroad right-of-way maintenance, discarded in landfills, or used in industrial land treatment, have been reported to pollute Kentucky's streams and lakes.

Appendix C presents an updated, comprehensive listing of Kentucky rivers, streams, and lakes impacted by NPS pollution. Both monitored and evaluated data were used to update the 1989 version of the Kentucky Nonpoint Source Pollution Assessment Report. In many cases, analysis of the updated information has resulted in changes to designated use-support determinations. Compared to earlier determinations, a greater number of rivers, streams, and lakes are now reported to not fully support their designated uses because of nonpoint sources of pollution. This is because additional available data have enabled use-support determinations to be made for more of the Commonwealth's waters.

The appendix consists of tables organized by the eight major Kentucky river basins and minor tributaries of the Ohio River. Impacted waters are identified by Waterbody System number. When comparing this updated report to earlier versions of the Kentucky Nonpoint Source Pollution Assessment Report, it is important to note that the earlier reports identified impacted waters by P.L.-566 watershed number, and that there is not a one-to-one correspondence between the Waterbody and P.L.-566 cataloging systems.

Wetlands

Kentucky possesses a diversity and abundance of wetland resources. The major wetlands are identified as riverine, palustrine, and lacustrine. Human activities which adversely impact wetlands include resource exploration and extraction, agriculture, hydrologic/habitat modification, silviculture, and construction. Resource extraction activities of some type probably affect more acres of wetlands in Kentucky than any other category. Nonpoint source pollutants such as acid mine drainage and sedimentation have adversely impacted the water quality, soil saturation time, and vegetation of these wetlands. Another resource extraction activity, petroleum exploration and extraction, also has a detrimental effect on wetlands. Oil well drilling often results in modifications to the existing drainage patterns, with subsequent changes in adjacent wetland ecosystems. Additionally, oil spillage and brine discharges from active oil wells adversely impact wetlands.

Historically, the conversion of wetlands for agriculture has resulted in substantial losses of wetland resources in the Commonwealth. In addition to direct wetland loss through conversion, agricultural nonpoint source runoff containing high concentrations of sediments, nutrients, and pesticides can potentially degrade wetland areas.

Riparian wetlands are impacted by hydrologic/habitat modifications such as channelization and flood control activities. Straightening channels for flood control can prevent the natural flooding of wetlands and subsequently reduce their mineral and organic nourishment. Constructed levees can cut off wetlands from floodplains or increase water levels, both of which alter the natural soil saturation period and can cause an adverse change in wetland functions.

Another threat to wetland resources is silvicultural activities. Timber harvesting is periodically desired on wetland areas with large stands of timber. However, logging operations typically result in soil compaction and sedimentation, resulting in wetland alteration and degradation.

Wetlands in Kentucky are also affected by construction activities. Land development, highway construction, and other construction related activities can result in both wetland conversion and nonpoint source pollutant loading to adjacent wetlands.

Groundwater

One of the most valuable resources in Kentucky is the state's extensive groundwater system. Groundwater is susceptible to nonpoint source (NPS) contamination. Karst regions, which comprise about 50 percent of the Commonwealth, are especially vulnerable. Approximately 48 of Kentucky's 120 counties are considered at high to moderate risk for groundwater contamination. The variety of geologic settings within Kentucky provide for significant local differences in the transport, accumulation, and breakdown of pollutants in the subsurface environment. The spatial variability of land uses also affects the distribution of pollutants in groundwater. Activities that can lead to groundwater contamination include agriculture, on-site sewage systems, waste disposal, resource exploration, development and/or extraction, improper well construction and operation, urban development, construction, underground injection of liquids, underground storage tank leakage, and spills.

Agricultural activities have a major impact on Kentucky's groundwater resources. Sedimentation is a common contaminant resulting from agricultural activities, especially in karst areas where sediment-laden streams sink into subterranean caverns. Other identified contaminants from agricultural activities are pesticides, nutrients, and bacteria. Some types of pesticides are soluble in water and are transported to aquifers by percolation of precipitation or by runoff from cropland. Excessive amounts of nitrates, nitrites, and bacteria can potentially render an aquifer useless. These contaminants may reach groundwater sources via percolation of precipitation through contaminated soil or runoff from animal feedlots, animal waste storage facilities, animal waste spreading operations, and sewage disposal systems.

Another major NPS impact to Kentucky's groundwater is improperly constructed or maintained on-site sewage disposal systems. Bacteria, nutrients, and potentially hazardous chemicals are the major parameters of concern. Leakage from these systems percolates through the soil into groundwater sources. Contamination of well water by on-site sewage systems can pose serious health problems to well users.

Contaminants such as PCBs, metals, bacteria, and hazardous chemicals are major parameters of concern in leachate and runoff from inadequately constructed or maintained solid or hazardous waste disposal facilities. In karst areas, the relatively rapid rate of contaminant transport through the soil into the aquifer results in the decreased ability of the soil to filter contaminants from the water. Where a leak occurs in a facility's liner, contamination could be swift and extensive. Runoff from such areas can potentially cause serious degradation problems in groundwater systems. Illegal dumping of wastes into sinkholes, along roadsides, or in secluded areas may also impact groundwater resources.

Resource exploration, development, and/or extraction activities can cause regional NPS groundwater contamination problems. Petroleum extraction activities, such as the construction and operation of oil and gas wells, can cause groundwater contamination. Elevated concentrations of chlorides and total dissolved solids in groundwater are associated with brine contamination from oil and gas well drilling activities. Brine can enter the groundwater system directly during the well drilling process via improper underground reinjection or as a result of waterflooding techniques commonly used for secondary petroleum recovery. Other parameters of concern from petroleum activities include metals and sulfates. Groundwater systems in Kentucky's coal regions are particularly vulnerable to NPS pollution impacts as well. The major parameters of concern regarding coal mining activities are elevated concentrations of metals and acid mine drainage. To a varying degree, groundwater quality near abandoned mines can be impacted by NPS contaminants. The Division of Abandoned Lands has had a significant number of requests from local governments for assistance in developing public water supplies where existing groundwater sources have been adversely impacted.

Urban areas and construction activities have been identified as sources of NPS contaminants of groundwater. In urban karst areas, groundwater is vulnerable to contamination by metals, bacteria, pesticides, and oil and grease from street runoff. Highly contaminated stormwater runoff can directly recharge groundwater through sinkholes used as auxiliary stormwater disposal facilities and sinking streams. Sediment is usually the major contaminant from construction activities.

Underground injection of liquid wastes, underground storage tanks, and spills are other NPS pollutants of groundwater. Underground injection of liquid wastes will severely impact an aquifer if the substance is injected directly into the aquifer. The parameters of concern are dependent upon the identity of the injected liquid. Leaking underground storage tanks can also cause localized groundwater damage. Petroleum

products can readily percolate into underlying aquifers. Spills of toxic materials can reach groundwater systems by percolation or surface water recharge. Contamination from a spill can cause major degradation of a groundwater source.

Not only does nonpoint source pollution affect the quality of groundwater used for drinking, it also threatens aquatic organisms. Subterranean river basins and aquifers provide a unique habitat for certain endangered and rare species. Three rare animal species, Amblyopsis spelaea (Northern cavefish), Typhlichthys subterraneus (Southern cavefish), and Palaemonias ganteri (Kentucky cave shrimp) are known to inhabit subterranean waters in Kentucky. Survival of these species is directly related to suitable groundwater quality in the Mammoth Cave region. The only known population of Palaemonias ganteri is found in the Mammoth Cave region. It is listed as a federally endangered species by the U.S. Fish and Wildlife Service because it "is in danger of extinction throughout all or a significant portion of its range." Both A. spelaea and T. subterraneus are candidates for federal listing.

Oil and gas drilling presently occurs in several groundwater basins that supply Mammoth Cave. Brine from such activities commonly reaches aquifers potentially creating physicochemical changes in groundwater quality. Finally, agricultural activities resulting in sedimentation, excessive nutrients, and the introduction of pesticides into the groundwater can potentially impact rare cave species.

Appendix C identifies groundwater basins that are known to be impacted by nonpoint source pollution. They were assessed using both evaluated and monitored data. Evaluated data were based on non-monitored water quality information provided by DOW groundwater staff and the U.S. Geological Survey. More baseline data are needed to effectively evaluate the extent of contamination present in Kentucky's groundwater.

SURFACE WATER MONITORING PROGRAM

An effective water monitoring program is essential for making sound pollution control decisions and for tracking water quality improvements. Specifically, Kentucky's ambient monitoring program provides monitoring data to identify priority waterbodies upon which to concentrate agency activities, to revise state water quality standards, to aid in the development of wasteload allocations, and to determine water quality trends in Kentucky surface waters. As outlined in the Kentucky Ambient Surface Water Monitoring Strategy, the major objectives associated with the Ambient Monitoring Program are:

1. To operate a fixed-station monitoring network meeting chemical, physical, and biological data requirements of the state program and EPA's Basic Water Monitoring Program (BWMP).
2. To conduct intensive surveys on priority waterbodies in support of stream use designations, wasteload allocation model calibration/verification, and other agency needs.
3. To store data in EPA's STORET system, a computerized water quality data base.
4. To coordinate ambient monitoring activities with other agencies (EPA, Ohio River Valley Water Sanitation Commission, U.S. Geological Survey, U.S. Army Corps of Engineers, etc.).

Following is a discussion of components of the monitoring program (fixed-station monitoring, biological monitoring, intensive surveys, and reference reaches). Elements of the toxicity testing program relating to surface waters, and a citizen education program called WATER WATCH, which includes a monitoring element, are also discussed.

Fixed-Station Monitoring Network

For the reporting period (1990-1991) the Division of Water's physicochemical network consisted of a balance of 45 stream stations located in ten river basins. In this period some stations were deleted, others relocated, and some new stations were established, based on a review of monitoring objectives. Table 41 lists stations sampled and Figure 3 depicts station locations. Samples were collected monthly at each station for the variables listed in Table 42. Excluding the mainstem of the Ohio River, water quality information generated by the fixed-station network was used to characterize 1,432 stream miles within the state.

Table 41
Fixed-Station Monitoring Network

Map No.	Station Name	RMI	Road Location
1	Tug Fork at Kermit	35.1	KY 40
2	Levisa Fork near Louisa	29.6	KY 644
3	Levisa Fork near Pikeville	114.6	KY 1426
4	Little Sandy River near Argillite	13.2	KY 1
5	Tygart's Creek near Load	28.1	KY 7
6	Kinniconick Creek near Tannery	10.4	KY 1149
7	Licking River at Claysville	78.2	US 62
8	N. Fork Licking River at Milford	6.9	KY 19
9	S. Fork Licking River at Morgan	11.7	KY 1054
10	Licking River at West Liberty	226.4	US 460
11	Kentucky River at Frankfort	66.4	St. Clair St. Bridge
12	Kentucky River at Camp Nelson	135.1	Old US 27
13	Eagle Creek at Glencoe	21.5	US 127
14	South Elkhorn Creek near Midway	25.3	Lundy Farm Rd Bridge
15	Dix River near Danville	34.6	KY 52
16	Red River at Clay City	21.6	KY 11/15
17	Red River near Hazel Green	68.5	KY 746
18	Kentucky River at L&D 11	201.0	L&D 11
19	N. Fork Kentucky River at Jackson	304.5	Old KY 30
20	M. Fork Kentucky River at Tallega	8.3	KY 708
21	S. Fork Kentucky River at Booneville	12.1	KY 28
22	Salt River at Shepherdsville	22.9	KY 61
23	Salt River at Glensboro	82.5	KY 53
24	Rolling Fork near Lebanon Junction	12.3	KY 434
25	Beech Fork near Maud	48.1	KY 55
26	Pond Creek near Louisville	15.5	Manslick Rd. Bridge
27	Green River near Island	74.4	KY 85
28	Pond River near Sacramento	12.4	KY 85
29	Rough River near Dundee	62.5	Barrets Ford Bridge
30	Mud River near Gus	17.4	KY 949
31	Barren River at Bowling Green	37.5	College St. Bridge
32	Green River at Munfordville	225.9	US 31W
33	Nolin River at White Mills	80.9	White Mills Bridge
34	Bacon Creek near Priceville	7.2	C. Avery Rd. Bridge
35	Tradewater River near Sullivan	15.1	US 60/641
36	Little River near Cadiz	24.4	KY 272
37	Cumberland River at Burkesville	422.6	Boat ramp
38	S. Fork Cumberland River at Blue Heron	44.7	Old Rail Bridge
39	Rockcastle River at Billows	24.4	Old KY 80
40	Horse Lick Creek near Lamero	7.5	Daugherty Rd. Ford
41	Cumberland River at Cumberland Falls	562.3	KY 90
42	Cumberland River at Pineville	654.4	Pine St. Bridge
43	Clarks River at Almo	53.5	Almo-Shiloh Rd. Bridge
44	Mayfield Creek near Blandville	10.8	KY 121
45	Bayou de Chien near Clinton	15.1	US 51

Figure 3

Fixed-Station Monitoring Network Stream Station Locations

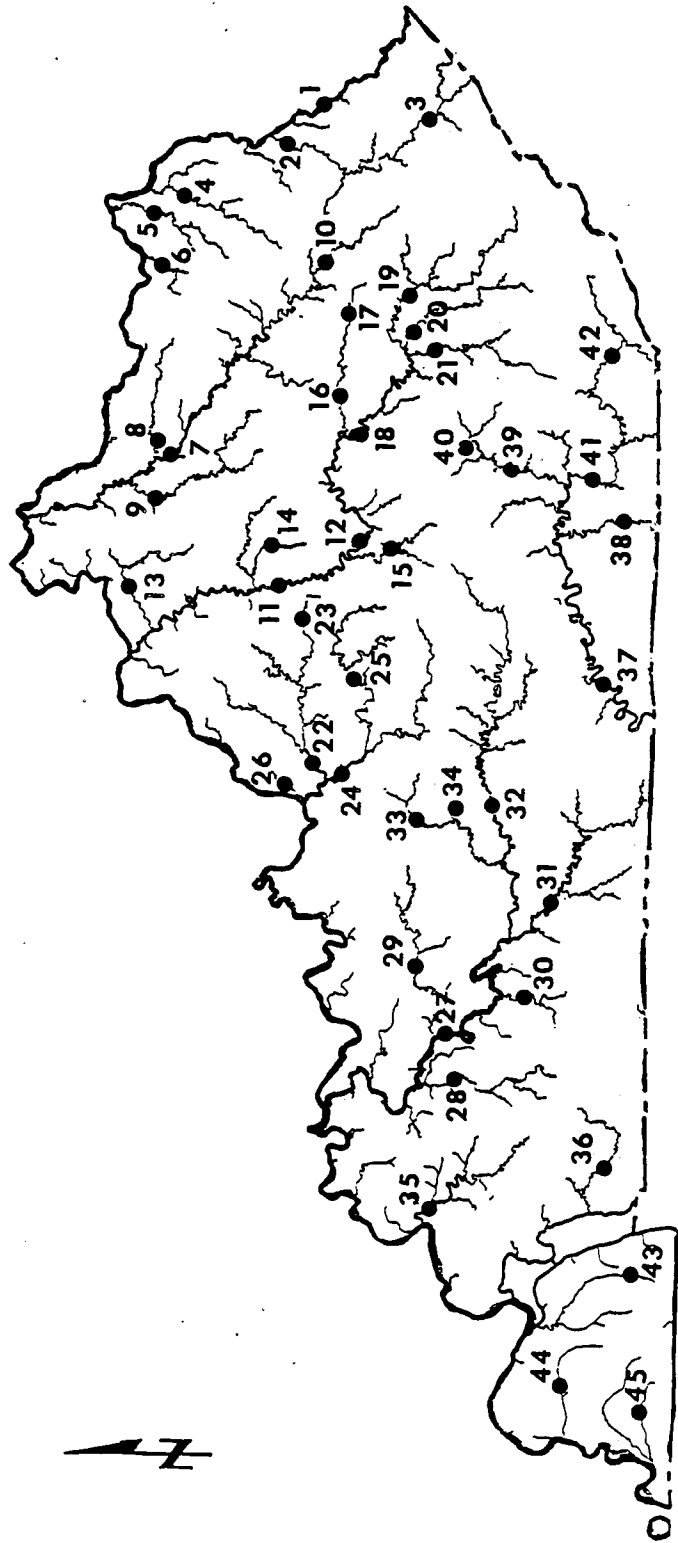


Table 42
Stream Fixed-Station Variable Coverage

<u>Variables</u>	<u>Variables</u>
<u>Field Data</u>	<u>Laboratory Data</u>
Weather code (47501)	Acidity, mg/l (00435)
Air temp, °C (00020)	Alkalinity, mg/l (00410)
Water temp, °C (00010)	BOD, 5-day, mg/l (00310)
Specific conductance uS/cm @ 25C (00094)	Chloride, mg/l (00940)
D.O., mg/l (00299)	Sulfate, dissolved mg/l (00946)
pH, S.U. (00400)	Suspended solids, mg/l (00530)
Turbidity, N.T.U. (82078)	TOC, mg/l (00680)
Flow, cfs (00060)	
<u>Minerals, Total*</u>	
Calcium, mg/l (00916)	
Magnesium, mg/l (00927)	<u>Metals, Total*</u>
Potassium, mg/l (00937)	Aluminum, ug/l (01105)
Sodium, mg/l (00929)	Arsenic, ug/l (01002)
Hardness, mg/l (00900)	Barium, ug/l (01007)
	Cadmium, ug/l (01027)
<u>Bacteria</u>	Chromium, ug/l (01034)
Fecal coliform, colonies per 100 ml (31616)	Copper, ug/l (01042)
	Iron, ug/l (01045)
<u>Nutrients</u>	Lead, ug/l (01051)
NH ₃ -N, mg/l (00610)	Manganese, ug/l (01055)
NO ₂ + NO ₃ -N, mg/l (00630)	Mercury, ug/l (071900)
TKN, mg/l (00625)	Zinc, ug/l (01092)
Total phosphorus, mg/l (00665)	

*Total as Total Recoverable, Note: STORET codes are in parentheses

In addition to water quality information generated by the state's fixed-station network, the Division supports and uses information collected by the Ohio River Valley Water Sanitation Commission (ORSANCO) at five major tributary stations. These stations include: Cumberland River below Lake Barkley Dam, Tennessee River at Paducah, Green River near Sebree, Licking River at Covington, and Big Sandy River near Louisa. The Division also uses information from stations maintained as part of the U.S. Geological Survey's current monitoring programs.

Lake monitoring under the ambient monitoring program addressed three objectives in 1990 and 1991. First, several lakes were sampled to evaluate problems of accelerated eutrophication. Second, three lakes were sampled to evaluate trends relating to potential acid precipitation impacts. This part of the program was discontinued in 1991 because no trends were detected in five years of monitoring. Third, Dewey Lake was also monitored to quantify and describe impacts on water clarity and use impairment caused by suspended solids entering the lake from surface mining activities. Lakes in the ambient monitoring program are listed in Table 43, and the parameters measured are in Table 44.

Biological Monitoring

Kentucky's biological monitoring program (BMP) currently consists of a network of 42 stations located in 12 river basins. Data collected from these stations are used to ensure that existing water quality is maintained, provide background values against which future water quality conditions can be compared, and recognize emerging problems in the areas of toxic chemicals, bacteriological contamination, and nuisance biological growth. Program emphasis is directed at evaluating warmwater aquatic habitat (WAH) use support, determining presence and concentration of contaminant residues in fish tissue and sediments, and evaluating municipal and industrial effluents for toxic conditions. The information from these monitoring efforts also defines existing aquatic life, helps determine necessary protective measures for aquatic life, and is used in developing the 305(b) report. For this report, biological data from 18 sites sampled from 1990-1991 were used to assess 492.3 miles of streams for WAH use. Biological monitoring station locations and parameter coverage are outlined in Table 45.

The WAH use was supported in 376.3 miles, supported but threatened in 43.3 miles, and partially supported in 70.0 miles. Causes of threat or impairment were siltation, organic enrichment, or nutrients, and sources were silviculture, nonpoint source agricultural runoff, municipal point sources, and habitat modification. No BMP sites showed non-support of the WAH use during the 1990-1991 period.

Intensive Surveys

Kentucky uses the intensive survey to evaluate site-specific water quality problems. Information developed from intensive surveys is essential in providing information to:

- o Document the attainment/impairment of designated water uses
- o Verify and justify construction grants decisions
- o Address issues raised in petitions for water quality standards variances, or use redesignations

Table 43

Lake Ambient Monitoring Network

Lake	Station Location
Monitored for Eutrophication Trends	
Reformatory	Dam
McNeely	Dam
Jericho	Dam
Cumberland	Big Lily Creek Embayment Beaver Creek Embayment (1990 only)
Dewey (1991 only)	Dam Mid-lake Area Dicks Creek Area
Green River	Dam Robinson Creek Area Corbin Bend Area Below State Rd. 551
Monitored for Acid Precipitation Trends (1990 only)	
Tyner	Dam
Cannon Creek	Dam
Bert Combs	Dam

Table 44
Lake Ambient Monitoring Parameters

Parameters	EUT ¹	ACP
Dissolved oxygen	X	
Temperature	X	
pH	X	X
Specific conductance	X	X
Depth of euphotic zone	X	
Acidity		X
Acid neutralizing capacity (Alkalinity)	X	X
T. ² aluminum		X
Extractable aluminum		X
D. ³ Calcium		X
D. chloride		X
T. fluoride		X
D. fluoride		X
D. inorganic carbon		X
D. organic carbon		X
D. iron		X
D. magnesium		X
D. potassium		X
D. silica		X
D. sodium		X
D. sulfate		X
T. phosphorus	X	
T. soluble phosphorus	X	
Orthophosphate	X	
Ammonia-N	X	X
Nitrite & nitrate-N	X	
T. Kjeldahl-N	X	
Chlorophyll a	X	
Color		X

¹EUT - lake eutrophication evaluation
²ACP - lake acid precipitation evaluation
²Total
³Dissolved

Table 45
Biological Monitoring Station Locations
and Sampling Coverage (1990-1991)

Station	Station Number	Algae	Macro-invertebrate	Fish	Fish Tissue	Sediments	Miles Assessed
Big Sandy River Basin Tug Fork Levisa Fork	002					X	*
	006					X	*
	049	X	X	X		X	39.3 S
Little Sandy River Basin Little Sandy River	063	X	X	X		X	24.5 S
	048	X	X	X		X	45.7 S
	028	X	X	X		X	19.5 S
Ohio River Tributaries Kinniconick Creek Tygarts Creek	036	X		X		X	*
	060	X	X	X		X	31.8 S
	031				X	X	*
Licking River Basin North Fork Licking River South Fork Licking River North Fork Licking River	033					X	*
	026	X	X	X		X	29.0 S
	027	X	X	X		X	34.3 PS
	034	X	X	X		X	17.6 PS
	022	X	X	X		X	38.8 S
	045	X	X	X		X	3.0 S
	009	X	X	X		X	37.0 S
	010	X	X	X		X	32.8 ST
Kentucky River Basin North Fork Kentucky River South Fork Kentucky River Kentucky River, Lock 14 Red River South Elkhorn Creek Eagle Creek Dix River	051	X	X	X		X	*
	050	X	X	X		X	20.8 S
	009	X	X	X		X	37.0 S
Upper Cumberland River Basin Cumberland River Rockcastle River Horse Lick Creek Buck Creek	010	X	X	X		X	32.8 ST
	051	X	X	X		X	*
	050	X	X	X		X	20.8 S

Table 45 (Continued)

Station	Station Number	Algae	Macro-invertebrate	Fish	Fish Tissue	Sediments	Miles Assessed
Green River Basin							
Nolin River	021					X	*
Bacon Creek	020					X	*
Green River	018					X	*
Green River	016	X	X		X	X	40.9 S
Barren River	017	X	X		X	X	14.2 S
Mud River	015				X	X	*
Salt River Basin							
Salt River	052			X		X	10.5 ST
Beech Fork	041	X	X			X	*
Rolling Fork	057					X	*
Tradewater River Basin							
Tradewater River	039					X	*
Tennessee River Basin							
Clarks River	038					X	*
Mississippi River Basin							
Bayou de Chien	037	X	X		X	X	18.1 PS
Mayfield Creek	042	X	X		X	X	31.8 S
Lower Cumberland River Basin							
Little River - Cadiz	043					X	*
Total		18	18	16	7	33	492.3

S = Supports WAH Use, ST = Supports WAH, but threatened, PS = Partially Supports WAH

*Sediment only - not included in bioassessment

- o Document water quality improvements and progress resulting from water pollution control efforts.
- o Establish base-line biological data required for permit requirements and establishment of standards.

In 1990-1991, five intensive surveys were conducted on 435.5 miles of streams. The locations, purposes, and conclusions of these surveys are summarized in Table 46. Using primarily the physicochemical data, 361.4 stream miles were determined to be supporting designated uses, 5.9 stream miles were partially supporting designated uses, and 68.2 miles of stream were not supporting designated uses. These assessments were pooled with other existing information to arrive at the final use-support decisions discussed in Chapter 1.

Reference Reach Program

The Division began a program to gather physical, chemical, and biological data from unimpacted or least impacted streams and wetlands in 1991. The program looks at candidate waters as representative of geographical regions of the state known as ecoregions. This information allows a comparison with other stream data and defines the physical, chemical, and biological potentials for the streams of a particular ecoregion. These reference reach sites provide the information needed to document water quality in unimpacted streams, which can determine the potential legitimate uses of other streams in the same region. The data from this program will provide the basis for the development of narrative and numerical biocriteria for the various ecoregions of the Commonwealth. As a part of the Division's reference reach program, 45 reference streams will be selected. At these sites, conditions for chemical water quality, sediment quality, fish tissue residue, habitat condition, and biotic conditions will be determined.

Five streams in the Central Appalachian Ecoregion were sampled in 1991. The data from these streams were used to make use-support assessments in this report. All of the streams fully supported aquatic life use.

Citizens Water Watch Program

The Kentucky WATER WATCH program is administered by the Division of Water. Initiated in 1985, WATER WATCH promotes individual responsibility for a common resource, educates Kentuckians about the wise use and protection of local water resources, provides a recreational opportunity through group activities, and gives citizens more access to their government. Objectives include: promoting individual responsibility for a common resource by fostering a public role in drawing attention to specific problem

Table 46
List of Intensive Surveys Conducted During FY 1990 - 1991

Waterbody Number/ Stream Name	Survey Purpose	Year Surveyed	Total Miles Assessed	Miles Supporting Use	Miles Not Supporting Uses	Conclusions
Little Sandy River Basin						
KY5090104-003 East Fork Little Sandy River	To determine the baseline water quality of selected streams in the Little Sandy River system	1991	45.9	45.9		Physicochemical data from selected streams in the Little Sandy River system indicate that the water quality is supporting designated uses.
KY5090104-004- Mainstem of Little Sandy River (MP 11.7-51.0)		1991	39.3	39.3		
KY5090104-006 Big Sinking Creek		1991	19.0	19.0		
KY5090104-009 Big Caney Creek		1991	15.0	15.0		
KY5090104-010 Little Sandy River (MP 70.8-78.8) and Laurel Creek		1991	24.4	24.4		

Table 46 (Continued)

Waterbody Number/ Stream Name	Survey Purpose	Year Surveyed	Total Miles Assessed	Miles Supporting Use	Miles Not Supporting Uses	Conclusions
Kentucky River Basin						
<u>Eagle Creek System</u>						
KY5100205-003 Eagle Creek (MP 0.0-27.3)	To determine baseline water quality and the impact of nonpoint source pollution to selected streams in the Eagle Creek basin.	1990	27.3	27.3		Physicochemical data from selected streams within the Eagle Creek watershed indicate that the water quality is supporting designated uses. High nutrient concentrations observed throughout the basin could degrade the water quality in the future.
KY5100205-004 Ten Mile Creek (MP 0.0-3.0)		1990	3.0	3.0		
KY5100205-005 Eagle Creek (MP 27.3-72.3)		1990	45.0	45.0		
KY5100205-006 Clarks Creek Basin		1990	21.5	21.5		
KY5100205-007 Stevens Creek Basin		1990	24.0	24.0		
KY5100205-010 Eagle Creek (MP 72.3 to headwater)		1990	61.0	61.0		

Table 46 (Continued)

Waterbody Number/ Stream Name	Survey Purpose	Year Surveyed	Total Miles Assessed	Miles Supporting Use	Miles Not Supporting Uses	Conclusions
<u>South Elkhorn Creek System</u> KY5100205-026 (MP 0.0 - 34.0)	To determine if the water quality of the South Elkhorn Creek drainage has improved since the 1982 study.	1990	34.0		34.0	The physicochemical data indicate that the water quality of waterbodies KY5100205-026 and 028 are not supporting designated uses because of elevated nutrient concentrations and organic enrichment. These inputs are apparently arising from both point and nonpoint sources. Waterbody KY500205-026 also had elevated zinc concentrations from an unknown source. Even though the water chemistry in waterbody KY5100205-029 is supporting designated uses, high nutrient concentrations are degrading water quality.

Table 46 (Continued)

Waterbody Number/ Stream Name	Survey Purpose	Year Surveyed	Total Miles Assessed	Miles Supporting Use	Miles Not Supporting Uses	Conclusions
KY5100205-028 Town Branch		1990	11.3		11.3	
KY5100205-029 South Elkhorn Creek (MP 34.0-57.2)		1990	17.2	17.2		
Green River Basin						
KY5110001-006 Little Pitman Creek	To determine if the water quality of Little Pitman Creek had improved since the 1984 intensive survey.	1991	13.8	3.8	4.1	The biological and physicochemical data indicate that the water quality of Little Pitman Creek has improved since 1984, particularly in the lower reaches. The mid- reach is still degraded by organic enrichment arriving from an upstream wastewater treatment plant.

Table 46 (Continued)

Waterbody Number/ Stream Name	Survey Purpose	Year Surveyed	Total Miles Assessed	Miles Supporting Use	Miles Not Supporting Uses	Conclusions
Cumberland River Basin						
KY5130104-006 Big South Fork Cumberland River (MP 40.3 - 35.2)	To determine the baseline water quality of the Wild River segment of the Big South Fork and selected tributary streams.	1991	14.9	14.9		Physicochemical data indicate that the Big South Fork water quality is sufficient to support designated uses. However, the stream reach from Bear Creek down stream is degraded by acid mine waste entering from tributary streams. Acid mine drainage in Bear Creek and Roaring Paunch have severely reduced or altered the biological communities resulting in these tributary streams not supporting designated uses.
KY5130104-008 Roaring Paunch Creek System		1991	15.6		15.6	
KY5130104-009 Bear Creek		1991	3.2		3.2	

situations; enhancing citizen understanding and support through a strong program of public education; and communicating the value of environmental quality in attracting industry and tourism to the state. The Division of Water promotes the program by encouraging citizens to form groups that "adopt" waterbodies of local interest.

After a group is formed, members identify the stream, lake or wetland they want to adopt and submit an "adoption" form for approval to the Division of Water. After the adoption is approved, the WATER WATCH group then promotes community awareness and protection of its adopted water resource through stream monitoring, school based programs, and stream rehabilitation projects.

Each group receives training from the Division's program coordinator as well as educational resources. The latter include a WATER WATCH Program Manual and two field guides (A Field Guide to Kentucky's Lakes and Wetlands and A Field Guide to Kentucky's Rivers and Streams).

Since its beginning, more than 345 groups have been established with more than 1,680 volunteers statewide, and approximately 24,000 people have received a two-hour training program on basic stream monitoring. More than 300 streams, 35 lakes, 30 wetlands, and nine karst or underground systems have been adopted. Advanced training workshops for volunteers are also offered from time to time.

Volunteer Stream Sampling Project

The WATER WATCH Program initiated a Volunteer Stream Sampling Project in 1987. The objectives were to assist local groups in developing information concerning the quality of water resources close to them, to gather information about stream segments not covered by the existing Kentucky Ambient Water Quality Monitoring Network, and to educate the public about the condition and importance of Kentucky's water resources.

To date, the project has recruited more than 135 volunteer teams consisting of more than 300 volunteers to conduct regular water quality tests on streams in their communities. Although the information obtained cannot be used in enforcement action, citizen monitoring can and has provided useful "flagging" of water quality problems. Remedial action has occurred as a result of these efforts.

The teams are equipped with commercial water testing kits for measuring dissolved oxygen, pH, temperature, nitrate-nitrogen, total settleable solids, iron, and chloride. Volunteers are trained in testing and reporting procedures, quality control, and interpretation of results. Training also involves discussing ways the information can be shared through various organizations and media outlets.

Recruited groups have agreed to perform monthly tests on at least two designated sites in their community for one year. The volunteers submit the results to the Division, usually within one week after the tests are performed. The results are tabulated, summarized, and reported back to the groups.

The project is producing site data from 135 stations on streams in seven of Kentucky's 12 major river basins. The program is administered on a continuing basis by the WATER WATCH Program Coordinator at the Division of Water as a part of the overall WATER WATCH Program. New sites are being added continuously. Local groups, civic organizations, schools, and businesses contribute to the project.

RECOMMENDATIONS

LIST OF RECOMMENDATIONS

The actions listed below are recommended to achieve further progress in meeting the goals and objectives of the Clean Water Act.

- o The EPA should take the lead in developing a comprehensive framework for coordinating federal programs that have a groundwater element. To foster this, EPA should include appropriate portions of the Kentucky Comprehensive State Groundwater Protection Program as conditions in grants awarded to agencies in the state that have groundwater protection responsibilities.
- o Guidance on stormwater and combined sewer overflow permitting is needed in regard to: appropriate governing stream flows for water quality based permits, the need to apply human-health based criteria for carcinogens, appropriate sampling techniques, and what treatment procedures are available and appropriate.
- o Kentucky has benefitted from Clean Lakes Program funding, yet EPA removes the funding from its budget, relying on Congress to appropriate money through lobbying efforts of states and concerned citizens and lake supporters. States would be helped better if EPA backed this program by leaving it in its budget.
- o State nonpoint source and groundwater programs need to be funded at least at current levels. Reductions in 1993 funding would be a significant set-back to the progress being made.
- o The federal consistency provision of Section 319 needs to be enforced so that federal agencies in the state are aware that their programs are to be consistent with the Nonpoint Source Management Program. Kentucky's NPS program has been hampered because it is unable to require best management practices on federally funded projects.
- o Research at the federal level is needed to identify and determine ways to eliminate chronically toxic components of effluents.
- o EPA should increase technical and financial support for state efforts on Section 401 activities. Regional guidance is needed on wetlands program applications regarding antidegradation and chemical, physical, and biological criteria development for use classifications.

- o The Division supports the use of the 1989 Wetland Delineation Manual. The 1991 manual is not technically sound, and its use would jeopardize what little remains of Kentucky's wetlands.
- o Section 404 permit conditions need to be actively enforced through a joint Corps of Engineers and EPA compliance assurance program.

APPENDIX A(1)

**OHIO RIVER FISH TISSUE RESULTS,
1989-1991**

Appendix A(1)
Ohio River Fish Tissue Results, 1989 - 1991 (ppm)

Site	Species	PCBs			Chlordane		
		1989	1990	1991	1989	1990	1991
Ohio River RM 341.0 Greenup L&D	Carp	-	1.86	-	-	0.25	-
	Freshwater Drum	-	0.8	-	-	0.2	-
	Smallmouth Buffalo	-	0.32	-	-	<0.10	-
	Channel Catfish 36-42 cm	-	0.89	-	-	<0.10	-
	Channel Catfish 43-48 cm	-	1.96	-	-	0.42*	-
	Channel Catfish 54-57 cm	-	2.51*	-	-	0.43*	-
	Paddlefish Fillets	-	-	-	-	-	-
	#1	-	-	-	-	-	0.11
	#2	-	-	-	-	-	0.19
	#3	-	-	-	-	-	0.20
Paddlefish eggs	-	-	1.2	-	-	0.45*	

Appendix A(1)
Ohio River Fish Tissue Results, 1989 - 1991 (ppm)

Site	Species	PCBs			Chlordane		
		1989	1990	1991	1989	1990	1991
Ohio River RM 436.2 Meldahl L&D	Carp	-	-	0.02	-	-	ND
	Smallmouth Buffalo	0.31	-	-	<0.10	-	-
	White Bass	-	-	0.82	-	-	0.09
	Channel Catfish 47 cm	-	-	1.86	-	-	0.24
	Channel Catfish 52 cm	-	-	1.42	-	-	0.17
	Channel Catfish 60 cm	-	-	1.85	-	-	0.20
	Paddlefish Fillets	-	-	-	-	-	-
	#1	-	0.28	-	-	0.22	-
	#2	-	0.36	-	-	0.29	-
	#3	-	0.61	-	-	0.55*	-
#4	-	0.86	-	-	0.83*	-	
#5	-	0.54	-	-	0.22	-	
#6	-	1.2	-	-	0.88*	-	
#7	-	0.52	-	-	0.36*	-	
#8	-	0.42	-	-	0.68*	-	
#9	-	1.36	-	-	1.0*	-	
#10	-	1.3	-	-	0.97*	-	

Appendix A(1)
Ohio River Fish Tissue Results, 1989 - 1991 (ppm)

Site	Species	PCBs			Chlordane		
		1989	1990	1991	1989	1990	1991
	Paddlefish Eggs						
	#1	-	0.49	-	-	0.29	-
	#2	-	0.54	-	-	0.32*	-
	#3	-	0.13	-	-	0.54*	-
	#4	-	0.52	-	-	0.94*	-
	#5	-	0.66	-	-	0.47*	-
	#6	-	0.2	-	-	0.61*	-
	#7	-	0.66	-	-	0.50*	-
	#8	-	0.50	-	-	0.78*	-
	#9	-	0.41	-	-	1.08*	-
	#10	-	0.53	-	-	0.98*	-
Ohio River RM 472.8 Cincinnati, OH	Carp	-	1.16	-	-	0.14	-
Ohio River RM 483.9 Cincinnati, OH	Channel Catfish 50 cm	-	-	0.81	-	-	0.16
	Channel Catfish 60 cm	-	-	1.70	-	-	0.25

Appendix A(1)
Ohio River Fish Tissue Results, 1989 - 1991 (ppm)

Site	Species	PCBs			Chlordane		
		1989	1990	1991	1989	1990	1991
Ohio River Markland L&D RM 531.5	Carp	-	1.35	-	-	0.23	-
	Paddlefish	-	1.32	-	-	0.39*	-
	Freshwater Drum	-	0.91	-	-	0.13	-
	Smallmouth Buffalo	-	0.61	-	-	<0.10	-
	Channel Catfish 48-52 cm	-	4.02*	-	-	0.48*	-
	Channel Catfish 53-59 cm	-	2.86*	-	-	0.32*	-
	Channel Catfish 60-65 cm	-	6.12*	-	-	0.71*	-
	Paddlefish Fillets	-	-	-	-	-	-
	#1	-	-	0.42	-	-	0.31*
	#2	-	-	0.65	-	-	0.36*
	#3	-	-	0.17	-	-	0.16
	#4	-	-	0.17	-	-	0.13
	#5	-	-	0.25	-	-	0.13
#6	-	-	0.37	-	-	0.32*	
#7	-	-	0.24	-	-	0.33*	
#8	-	-	0.40	-	-	0.21	
Paddlefish eggs	#1	-	-	1.6	-	-	0.65*
	#3	-	-	1.14	-	-	0.49*
	#6	-	-	0.15	-	-	0.08
	Ohio River RM 606.5	2.68*	1.14	0.82	0.43*	0.13	0.09
	McAlpine L&D	<0.10	-	2.80*	-	-	ND
	White Crappie	0.66	0.87	-	-	-	0.38*
Ohio River RM 606.5 McAlpine L&D	Channel Catfish 36 cm	-	-	-	-	-	-
	Channel Catfish 48 cm	-	-	-	-	-	-
	Channel Catfish 65 cm	-	-	-	-	-	-
Freshwater Drum	0.33	-	-	<0.10	0.14	-	
Smallmouth Buffalo	-	-	-	<0.10	<0.10	-	
White Bass	-	0.35	-	<0.10	<0.10	-	

Appendix A(1)
Ohio River Fish Tissue Results, 1989 - 1991 (ppm)

Site	Species	PCBs				Chlordane			
		1989	1990	1991	1989	1990	1991	1991	
Ohio River RM 625.9 West Point, KY	Paddlefish Fillets	-	-	-	-	-	-	-	-
	#1	-	0.4	-	-	0.26	-	-	
	#2	-	0.24	-	-	0.11	-	-	
	#3	-	0.37	-	-	0.27	-	-	
	#4	-	0.25	-	-	0.14	-	-	
	Paddlefish Eggs	-	Tr	-	-	0.11	-	-	
	#1	-	Tr	-	-	0.42*	-	-	
	#2	-	1.5	-	-	0.6*	-	-	
#3	-	0.23	-	-	0.27	-	-		
#4	-	-	-	-	-	-	-		
Ohio River RM 665.3	White Bass	-	0.26	-	-	<0.10	-	-	
	Black Bass	-	-	-	-	-	-	-	
	Smallmouth Buffalo	-	<0.10	-	-	<0.10	-	-	
	Spotted Bass	-	<0.10	-	-	<0.10	-	-	
Ohio River RM 665.3	Channel Catfish 45 cm	-	-	1.00	-	-	0.09	-	
	Channel Catfish 53 cm	-	-	2.29*	-	-	0.25	-	

Appendix A(1)
Ohio River Fish Tissue Results, 1989 - 1991 (ppm)

Site	Species	PCBs			Chlordane		
		1989	1990	1991	1989	1990	1991
Ohio River RM 720.7 Cannelton L&D	Carp	0.19	0.27	-	<0.10	<0.10	-
	Channel Catfish	1.65	-	-	0.21	-	-
	Walleye/Sauger	-	-	-	-	-	-
	White Crappie	<0.10	-	-	<0.10	-	-
	Channel Catfish 32-36 cm	-	0.29	-	-	<0.10	-
	Channel Catfish 50-52 cm	-	3.3*	-	-	0.46*	-
	Freshwater Drum	-	0.64	-	-	0.15	-
	Smallmouth Buffalo	-	0.91	-	-	<0.10	-
	Paddlefish (Composite)	-	-	-	-	-	-
	Fillet	-	0.23	-	-	0.22	-
	Eggs	-	0.73	-	-	0.51*	-
	Paddlefish Fillets	-	-	-	-	-	-
	#1	-	-	-	-	-	0.18
	#2	-	-	0.47	-	-	0.24
	#7	-	-	0.53	-	-	0.12
	Paddlefish eggs	-	-	-	-	-	-
	#1	-	-	-	-	-	0.06
#2	-	-	0.48	-	-	0.30*	

Appendix A(1)
Ohio River Fish Tissue Results, 1989 - 1991 (ppm)

Site	Species	PCBs			Chlordane		
		1989	1990	1991	1989	1990	1991
Ohio River RM 778.0 Newburgh L&D	Carp	-	-	0.34	-	-	0.06
	Channel Catfish 36 cm	1.69	0.32	0.35	0.32*	<0.10	0.06
	Channel Catfish 49 cm	-	-	1.13	-	-	0.14
	Crappie	0.28	-	-	<0.10	-	-
	White Bass	0.65	-	0.41	<0.10	-	0.06
	Smallmouth Buffalo	-	0.22	-	-	<0.10	-
	Flathead Catfish	-	0.24	-	-	<0.10	-
	Sauger	-	-	0.20	-	-	0.02
	Paddlefish (Composite)	-	-	-	-	-	-
	Fillet	-	0.12	-	-	0.11	-
	Eggs	-	0.56	-	-	0.03	-
	Paddlefish Fillets	-	-	-	-	-	-
	#1	-	-	-	-	-	0.063
	#2	-	-	-	-	-	0.033
	#3	-	-	-	-	-	0.028
#4	-	-	-	-	-	0.16	
Paddlefish eggs	-	-	0.91	-	-	-	
#5	-	-	-	-	-	0.54*	
Ohio River RM 806.9 Henderson	Carp	-	-	0.24	-	-	0.06
	Channel Catfish 44 cm	-	-	0.32	-	-	0.05

Appendix A(1)
Ohio River Fish Tissue Results, 1989 - 1991 (ppm)

Site	Species	PCBs		Chlordane	
		1989	1990	1989	1990
Ohio River RM 846.0 Uniontown L&D	Smallmouth Buffalo	-	0.26	-	<0.10
	Freshwater Drum	-	0.3	-	<0.10
	Carp	-	0.24	-	<0.10
	Flathead Catfish	-	0.31	-	<0.10
	Channel Catfish 42-46 cm	-	1.06	-	0.2
	Channel Catfish 48-54 cm	-	1.88	-	0.47*
Ohio River RM 918.5 Smithland L&D	Carp	1.71	-	0.48	<0.10
	Channel Catfish 36 cm	-	-	0.37	-
	Channel Catfish 43 cm	-	-	0.77	-
	Channel Catfish 53 cm	0.5	-	1.18	<0.10
	Largemouth Bass	-	-	0.05	-
	Sauger	-	-	0.22	-
	Striped Bass	<0.10	-	-	0.10
	Blue Catfish	<0.10	-	0.71	<0.10
	Bigmouth Buffalo	0.38	-	-	<0.10
	Paddlefish (Composite)	-	-	-	-
Paddlefish Fillet Eggs Paddlefish Fillet #1 #2 #3 #4 #5 #6 #7 #8 #9 #10	Fillet	-	0.17	-	0.17
	Eggs	-	Tr	-	Tr
	Paddlefish Fillet	-	-	-	-
	#1	-	-	0.48	-
	#2	-	-	0.40	-
	#3	-	-	0.51	-
	#4	-	-	0.12	-
	#5	-	-	0.51	-
	#6	-	-	0.83	-
	#7	-	-	0.58	-
#8	-	-	0.67	-	
#9	-	-	0.60	-	
#10	-	-	0.47	-	

**Appendix A(1)
Ohio River Fish Tissue Results, 1989 - 1991 (ppm)**

Site	Species	PCBs			Chlordane		
		1989	1990	1991	1989	1990	1991
Ohio River RM 927.85	Sauger	-	-	0.20	-	-	0.02

*Exceeds FDA action level of 2.0 ppm for PCBs or 0.30 ppm for chlordane
 ND = Not Detected

APPENDIX A(2)

**SUMMARY OF ANALYTICAL RESULTS
FOR FISH SAMPLES
(FILLET) COLLECTED FROM
BIG SANDY RIVER 1990**

Appendix A(2)
Summary of Analytical Results for Fish Samples (Filletts) Collected
from Big Sandy River, 1990

Collection Date	Fish Species	Location	2,3,7,8 Dioxin (ppt)	2,3,7,8 Furan (ppt)	% Lipid
July 19, 1990	Channel catfish (3)	Big Sandy River RMI 2.1	17.0 ⁽¹⁾	1.0 ⁽²⁾	3.6
July 19, 1990	Hybrid striped bass (4)	Big Sandy River RMI 7.1	0.72 ⁽¹⁾	0.67 ⁽²⁾	1.2
July 24, 1990	Channel catfish (3)	Big Sandy River Ft. Gay, WV (RMI 26.7)	0.80 ⁽¹⁾	2.3 ⁽²⁾	1.7
August 1, 1990	Carp (1)	Between Whites Creek and Sharps Branch*	ND	ND	1.7
August 1, 1990	Bigmouth Buffalo(1)	Between Whites Creek and Sharps Branch*	ND	ND	3.3
August 1, 1990	Drum (1)	Between Whites Creek and Sharps Branch*	ND	ND	0.1
August 1, 1990	Bigmouth Buffalo(3)	Above Tennessee Gas pumping station**	ND	ND	2.8
August 1, 1990	Carp (1)	Above Tennessee Gas pumping station**	2.2	4.5 (e)	2.2
August 1, 1990	Sauger(1)	Above Tennessee Gas pumping station**	1.4	3.3 (e)	2.1
August 1, 1990	Redhorse(2)	Above Tennessee Gas pumping station**	1.3	0.27	1.7
August 1, 1990	Bigmouth Buffalo(1)	Hwy. 60 Bridge***	ND	ND	0.2

Appendix A(2) (Continued)

Collection Date	Fish Species	Location	2,3,7,8 Dioxin (ppt)	2,3,7,8 Furan (ppt)	% Lipid
August 1, 1990	Sauger(1)	Hwy. 60 Bridge***	ND	0.43	0.6

ND - Not Detected.
 (e) - Denotes estimated maximum concentration.
 *MP 7.9 to 8.3
 **MP 11.3 to 12.0
 ***MP 0.7 to 1.1
 (1) Reported as total TCDD
 (2) Reported as total TCDF

APPENDIX A(3)

FISH KILL INVESTIGATIONS SUMMARY

Appendix A(3)
Fish Kill Investigations Summary (1990)

County	Waterbody	Date	Miles Affected	Pollutant	Number of Fish
Barren	Barren River Lake	09-14-90	0.10*	Unknown	20
Breckinridge	Hardins Creek	09-10-90	0.25	Municipal Sewage	2,616
Breckinridge	Tules Creek	04-29-90	1.0*	Unknown	250
Carter	Tygarts Creek	08-22-90	0.50	Municipal Sewage	533
Fayette	West Hickman Creek	03-05-90	3.00	Unknown	-
Fayette	East Hickman Creek	07-16-90	1.00	Unknown	-
Fleming	Fleming Creek	08-05-90	0.50	Animal Waste (Dairy Farm)	3,740
Franklin	S. Fork Elkhorn Cr.	04-25-90	1.00	Unknown	200
Grayson	Caney Creek	06-18-90	1.17	Animal Waste (Hog Farm)	2,060
Grayson	Beaverdam Creek	04-22-90	0.50	Municipal Sewage	272
Green	Little Pitman Creek	01-03-90	3.83	Municipal Sewage	23,171
Harrison	Trib. to Twin Cr. & S. Fork Licking River	04-26-90	1.40	Unknown	700
Jefferson	Wetland	02-07-90	Unknown	Natural (Low D.O.)	1,000
Magoffin	Boardtree Creek	08-17-90	1.00	Petroleum (Diesel Fuel)	932
Montgomery	Somerset Creek	07-28-90	0.25	Animal Waste (Cattle)	100
Pike	Russell Fork	09-08-90	5.00	Chemical (Nalco 99-87)	38,576
Subtotal (1990)	17	-	19.40 mi 1.10 acres	-	74,170

Fish Kill Investigation Summary (1991)

County	Waterbody	Date	Miles Affected	Pollutant	Number of Fish
Bath	McDole Branch	6-10-91	0.10	Pesticides (Atrazine and Gramoxone)	25
Bath	Slate Creek	11-04-91	13.50	Low B.O.D. (Leaf litter and low flow)	1,000
Boyle	Herrington Lake	5-14-91	25*	Natural (Oxygen depletion)	5,000
Boyle	Clarks Runs	2-5-91	-	Municipal Sewage (chlorine)	500
Butler	Indian Camp Creek	5-30-91	3.50	Animal Waste (Hog manure)	12,237
Carter	Tygarts Creek	8-30-91	0.10	Municipal Sewage	200
Carter	Tygarts Creek	8-11-91	0.08	Municipal Sewage	146
Fleming	Johnson Creek	7-29-91	0.17	Manure/Feedlot	235
Harlan	Clover Fork and Seagraves Creek	7-22-91	2.20	Coal Mining (Blackwater)	9,776
Jefferson	Big Run Creek	4-3-91	0.10	Unknown	20
Leslie	Cane Branch and Wooten Creek	1-13-91	0.50	Unknown	-
Oldham	Lick Creek	5-16-91	2.25	Animal Waste (Hog manure)	1,000
Pike	Caney Fork of John's Creek	8-29-91	1.00	Gas/Oil Well	2,278
Rowan	Christy Creek	11-21-91	0.50	Sealmaster Coal Tar Road Sealer	836
Russell	Lily Creek	8-6-91	0.18	Municipal Sewage	1,335

Fish Kill Investigation Summary (1991)

County	Waterbody	Date	Miles Affected	Pollutant	Number of Fish
Spencer	Salt River	9-24-91	1.25	Municipal Sewage	22,502
Taylor	Little Pitman Creek	9-24-91	1.25	Municipal Sewage	2,948
Subtotal (1991)				36.93 mi.	60,038
Total (1990-91)				56.33 mi 25.0 acres	134,208

* = Acres Affected

26.1 acres

APPENDIX B

**LAKE INFORMATION AND
EXPLANATORY CODES**

Appendix B
Lake Information and Explanatory Codes

COLUMN HEADER	DEFINITION
LAKE NAME	the name of the waterbody as shown on USGS topographic map
TOTAL ACREAGE	size of lake at summer pool or normal seasonal levels
USGS QUADRANGLE	quadrangle where the dam or waterbody is located
LATTITUDE\LONGITUDE	location of the dam by degrees, minutes, and seconds
WATERBODY SYSTEM NUMBER	a stream identification number assigned by the Division of Water
COUNTY NAME	the name of the county where the dam or lake is located
RIVER BASIN	the name of the major river basin in which the waterbody is located
SUBBASIN	the name of the waterbody that receives the discharge from the lake or reservoir

LAKE NAME	TOTAL ACRES	USGS QUADRANGLE	LATI-TUDE	LONGI-TUDE	WATERBODY SYSTEM NUMBER	COUNTY NAME	RIVER BASIN	SUBBASIN
A.J JOLLY LAKE	204	ALEXANDRIA	38-52-59	84-22-27	KY5100101-006L01	CAMPBELL	LICKING	PHILLIPS CREEK
ARROWHEAD LAKE	37	CAIRO, ILL-KY	37-01-50	89-07-20	KY8010100-002L02	BALLARD	MISSISSIPPI	CYPRESS SLOUGH
BARREN RIVER LAKE	10000	LUCAS	36-55-34	86-02-28	KY5110002-013L01	BARRENVALLLEN	GREEN	BARREN RIVER
BEAVER LAKE	158	ASHBROOK	37-57-45	85-01-20	KY5140103-021L01	ANDERSON	SALT	BEAVER CREEK
BEAVER DAM LAKE	50	OLMSTEAD ILL-KY	37-09-04	89-02-32	KY8010100-001L06	BALLARD	OHIO	HUMPHREY CREEK
BERT COMBS LAKE	36	BARCREEK	37-10-00	83-42-27	KY5100203-008L01	CLAY	KENTUCKY	BEECH CREEK
BOLTZ LAKE	92	WILLIAMSTOWN	38-42-12	84-36-45	KY5100205-004L02	GRANT	KENTUCKY	ARNOLDS CREEK
BRIGGS LAKE	18	HOMER	36-53-21	86-49-49	KY5110003-008L01	LOGAN	GREEN	MUD RIVER
BUCK LAKE	19	BARLOW, KY-ILL	37-02-26	89-05-22	KY8010100-001L03	BALLARD	MISSISSIPPI	SHAWNEE CREEK
BUCKHORN LAKE	1230	BUCKHORN	37-18-16	83-26-54	KY5100202-003L01	PERRYVALESLE	KENTUCKY	MIDDLE FK. KENTUCKY RIV
BULLOCK PEN LAKE	134	VERONA	38-47-36	84-38-41	KY5100205-004L01	GRANT	KENTUCKY	BULLOCK PEN CREEK
BURNT POND	10	BARLOW, KY-ILL	37-02-40	89-07-02	KY8010100-002L03	BALLARD	MISSISSIPPI	DEEP SLOUGH
CAMPBELLSVILLE CITY RES.	63	CAMPBELLSVILLE	37-21-31	85-20-17	KY5110001-026L01	TAYLOR	GREEN	TRACE FK, L. PITMAN CK
CAMPTON LAKE	26	CAMPTON	37-44-42	83-32-37	KY5100204-022L01	WOLFE	KENTUCKY	HIRAM BR, SWIFT CAMP CK
CANEYVILLE CITY RESERVOIR	75	CANEYVILLE	37-26-34	86-27-42	KY5110004-008L01	GRAYSON	GREEN	NF CANEY CREEK
CANNON CREEK LAKE	243	MIDDLESBORO NORTH	36-40-51	83-42-08	KY5130101-031L01	BELL	UPPER CUMBERLAND	CANNON CREEK
CARPENTER LAKE	64	MACEO	37-50-51	86-58-51	KY5140201-001L01	DAVIES	OHIO	UT TO PUP CREEK
CARR FORK LAKE	710	VICCO	37-14-04	83-00-03	KY5100201-015L01	KNOTT/PERRY	KENTUCKY	CARR FORK, KENTUCKY RIV
CAVE RUN LAKE	8270	SALT LICK	38-03-03	83-29-42	KY5100101-028L01	ROWAN/BATH	LICKING	N/A
CHENOA LAKE	37	KAYJAY	36-40-33	83-51-07	KY5130101-029L01	BELL	UPPER CUMBERLAND	CLEAR CREEK
CORBIN CITY RESERVOIR	139	CORBIN	36-59-23	87-07-07	KY5130101-006L01	LAUREL	UPPER CUMBERLAND	LAUREL RIVER
CORINTH LAKE	96	MASON	38-30-00	84-34-56	KY5100205-008L01	GRANT	KENTUCKY	THREE FORKS CREEK
CRANKS CREEK LAKE	219	HUBBARD SPRINGS, VA	36-44-23	83-13-12	KY5130101-038L02	HARLAN	UPPER CUMBERLAND	CRANKS CREEK
DALE HOLLOW LAKE	4300	DALE HOLLOW DAM, TN	36-36-31	85-19-29	KY5130105-001L01	CUMBERLAND/CLINTON	UPPER CUMBERLAND	OBEY RIVER
DEWEY LAKE	1100	DEWEY LAKE	37-41-39	82-42-22	KY5070203-012L01	FLOYD	BIG SANDY	LEVISA FORK
DOE RUN LAKE	51	INDEPENDENCE	38-59-19	84-33-07	KY5100101-002L01	KENTON	LICKING	BULLOCK PEN CREEK
ELMER DAVIS LAKE	149	GRATZ	38-29-51	84-52-40	KY5100205-015L01	OWEN	KENTUCKY	NORTH SEVERN CREEK
ENERGY LAKE	370	MONT	36-51-30	88-01-26	KY5130205-016L01	TRIGG	LOWER CUMBERLAND	CROOKED CREEK
FISH LAKE	27	BARLOW, KY-ILL	37-03-00	89-05-30	KY8010100-001L02	BALLARD	MISSISSIPPI	SHAWNEE CREEK
FISHPOND LAKE	32	JENKINS WEST	37-09-42	83-40-38	KY5100201-022L01	LETCHER	KENTUCKY	FISHPOND BRANCH

LAKE NAME	TOTAL ACRES	USGS QUADRANGLE	LATITUDE	LONGITUDE	WATERBODY SYSTEM NUMBER	COUNTY NAME	RIVER BASIN	SUBBASIN
FISHTRAP LAKE	1143	MILLARD	37-25-39	82-22-12	KY5070202-008L01	PIKE	BIG SANDY	LEVISA FORK
FLAT LAKE	38	BARLOW, KY-ILL	37-02-30	89-05-57	KY8010100-001L01	BALLARD	MISSISSIPPI	UT TO SHAWNEE CREEK
FREEMAN LAKE	160	ELIZABETH TOWN	37-43-15	85-52-17	KY5110001-012L01	HARDIN	GREEN	FREEMAN CREEK
GENERAL BUTLER ST. PK. LAKE	29	CARROLLTON	38-40-04	85-08-54	KY5100205-002L01	CARROLL	KENTUCKY	UT TO KENTUCKY RIVER
GRAPEVINE LAKE	50	MADISONVILLE EAST	37-18-16	87-28-40	KY5110006-005L01	HOPKINS	GREEN	UT TO FLAT CREEK
GRAYSON LAKE	1512	GRAYSON	38-11-48	83-02-36	KY5090104-008L01	CARTER/ELLIOTT	LITTLE SANDY	N/A
GREENBRIAR LAKE	66	PRESTON	38-01-11	83-51-34	KY5100101-022L01	MONTGOMERY	LICKING	GREENBRIAR CREEK
GREENBO LAKE	181	ARGILLITE	38-29-19	85-52-04	KY5090104-007L01	GREENUP	LITTLE SANDY	CLAYLICK CREEK
GREEN RIVER LAKE	8210	CANE VALLEY	37-14-59	85-20-02	KY5110001-033L01	ADAIR/TAYLOR	GREEN	N/A
GUJST CREEK LAKE	317	SHELBYVILLE	38-12-28	85-08-31	KY5140102-021L01	SHELBY	SALT	GUJST CREEK
HAPPY HOLLOW LAKE	20	OLMSTEAD ILL-KY	37-00-28	89-01-48	KY8010100-001L05	BALLARD	OHIO	HUMPHREY CREEK
HEMATITE LAKE	90	MONT	36-53-44	88-02-53	KY5130205-016L03	TRIGG	LOWER CUMBERLAND	LONG CREEK
HERRINGTON LAKE	2940	WILMORE	37-44-45	84-42-14	KY5100205-038L01	MERCER/GARRARD	KENTUCKY	DIX RIVER
HONKER LAKE	190	MONT	36-54-22	88-01-47	KY5130205-016L02	TRIGG	LOWER CUMBERLAND	LONG CREEK
KENTUCKY LAKE	48100	GRAND RIVERS	36-29-52	88-02-42	KY6040005-001L01	MARSHALL/LIVINGSTON	TENNESSEE	N/A
KINCAID LAKE	183	FALMOUTH	38-42-57	84-16-36	KY5100101-008L01	PENDELTON	LICKING	KINCAID CREEK
KINGFISHER LAKE	30	MACEO	37-50-42	86-58-35	KY5140201-001L02	DAVIES	OHIO	PUP CREEK
LAKE BARKLEY	45600	GRAND RIVERS	36-44-12	87-57-58	KY5130205-006L01	LIVINGSTON/LYON	LOWER CUMBERLAND	N/A
LAKE BESHEAR	760	DAWSON SPRINGS	37-08-28	87-40-57	KY5140205-014L01	CALDWELL/CHRISTIAN	TRADEWATER	PINEY CREEK
LAKE BLYTHE	89	KELLY	36-55-32	87-30-00	KY5130205-009L01	CHRISTIAN	LOWER CUMBERLAND	WHITE CREEK
LAKE CARNICO	114	CARLISLE	38-20-48	84-02-30	KY5100102-020L01	NICHOLAS	LICKING	BRUSHY CREEK
LAKE CUMBERLAND	50250	WOLF CREEK DAM	36-54-47	84-58-43	KY5130103-010L01	RUSSELL/CLINTON	UPPER CUMBERLAND	N/A
LAKE GEORGE	53	MARION	37-17-49	88-05-25	KY5140203-004L01	CRITTENDEN	OHIO	UT TO CROOKED CREEK
LAKE JERICHO	137	SMITHFIELD	38-27-07	85-16-56	KY5140101-006L01	HENRY	LITTLE KENTUCKY	N/A
LAKE LINVILLE	273	WILDIE	37-23-20	84-20-40	KY5130102-007L01	ROCKCASTLE	UPPER CUMBERLAND	RENFRO CREEK
LAKE MALONE	826	ROSEWOOD	37-04-19	87-02-20	KY5110003-006L01	MUHLBERG	GREEN	ROCKY CREEK
LAKE MORRIS	170	KELLY	36-55-44	87-27-18	KY5130205-009L02	CHRISTIAN	LOWER CUMBERLAND	UPPER BRANCH, LITTLE RIV
LAKE PEWEE	360	MADISONVILLE WEST	37-21-09	87-31-40	KY5140205-008L01	HOPKINS	TRADEWATER	GREASY CREEK
LAKE WASHBURN	26	DUNDEE	37-31-05	86-50-56	KY5110004-007L01	OHIO	GREEN	LICK BRANCH
LAUREL CREEK LAKE	42	WHITLEY CITY	36-41-18	84-26-35	KY5130101-011L01	MCCREARY	UPPER CUMBERLAND	LAUREL CREEK

LAKE NAME	TOTAL ACRES	USGS QUADRANGLE	LATI-TUDE	LONGI-TUDE	WATERBODY SYSTEM NUMBER	COUNTY NAME	RIVER BASIN	SUBBASIN
LAUREL RIVER LAKE	6060	SAWYER	36-58-21	84-15-31	KY5130101-003L01	LAUREL\WHITLEY	UPPER CUMBERLAND	LAUREL RIVER
LEWISBURG LAKE	51	LEWISBURG	36-58-14	86-55-36	KY5110003-008L01	LOGAN	GREEN	AUSTIN CREEK
LIBERTY LAKE	79	LIBERTY	37-19-03	84-54-26	KY5110001-042L01	CASEY	GREEN	HICKMAN CREEK
LOCH MARY	135	MADISONVILLE WEST	37-16-06	87-31-22	KY5140205-008L02	HOPKINS	TRADEWATER	UT TO CLEAR CREEK
LONG POND	56	CAIRO, ILL-KY	37-01-15	89-07-40	KY8010100-002L01	BALLARD	MISSISSIPPI	CYPRESS SLOUGH
LONG RUN PARK LAKE	27	CRESTWOOD	38-16-01	85-25-05	KY5140102-012L01	JEFFERSON	SALT	LONG RUN
LUZERNE LAKE	55	GREENVILLE	37-12-42	87-11-54	KY5110003-003L01	MUHLBERG	GREEN	UT TO CANEY CREEK
MARION COUNTY LAKE	21	LEBANON EAST	37-30-54	85-14-45	KY5140103-007L01	MARKON	SALT	UT TO ROLLING FORK
MARTIN'S FORK LAKE	334	ROSE HILL, VA-KY	36-44-36	83-15-58	KY5130101-038L01	HARLAN	UPPER CUMBERLAND	MARTINS FORK
MAUZY LAKE	84	BORDLEY	37-37-08	87-51-26	KY5140202-004L01	UNION	OHIO	CASEY CREEK
MCNEELY LAKE	51	BROOKS	38-06-09	85-38-07	KY5140102-008L01	JEFFERSON	SALT	PENNSYLVANIA RUN
METCALFE COUNTY LAKE	22	EAST FORK	37-02-30	85-36-32	KY5110001-022L01	METCALFE	GREEN	SULPHUR CREEK
METROPOLIS LAKE	36	JOPPA, ILL-KY	37-08-52	88-46-00	KY5140206-006L01	MCCRACKEN	OHIO	FLOOD PLAIN LAKE
MILL CREEK L. (MONROE CO)	109	TOMPKINSVILLE	36-40-44	85-41-45	KY5110002-022L01	MONROE	GREEN	MILL CREEK
MILL CREEK L. (POWELL CO)	41	SLADE	37-46-07	83-40-06	KY5100204-018L01	POWELL	KENTUCKY	MILL CREEK
MITCHELL LAKE	58	OLMSTEAD ILL-KY	37-06-24	89-02-43	KY8010100-001L07	BALLARD	OHIO	HUMPHREY CREEK
MOFFIT LAKE	49	BORDLEY	37-34-41	87-51-10	KY5140205-002L01	UNION	TRADEWATER	DYSON CREEK
NOLIN RIVER LAKE	5790	NOLIN LAKE	37-20-10	86-10-55	KY5110001-007L01	EDMONSON	GREEN	NOLIN RIVER
PAINTSVILLE LAKE	1139	OIL SPRINGS	37-50-28	82-52-38	KY5050203-008L01	JOHNSON	BIG SANDY	LEVISA FORK
PANBOWL LAKE	98	JACKSON, QUICKSAND	37-34-30	82-22-31	KY5100201-005L01	BREATHITT	KENTUCKY	NF KENTUCKY RIVER
PENNYRILE LAKE	47	DAWSON SPRINGS SW	37-04-06	87-39-50	KY5140205-014L02	HOPKINS	TRADEWATER	CLIFTY CREEK
PROVIDENCE CITY LAKE (NEW)	35	PROVIDENCE	37-22-30	87-47-49	KY5140205-007L01	WEBSTER	TRADEWATER	OWENS CREEK
REFORMATORY LAKE	54	LAGRANGE	38-23-52	85-26-16	KY5140101-004L01	OLDHAM	OHIO	CEDAR CREEK
ROUGH RIVER LAKE	5100	MCDANIELS	37-36-40	86-29-00	KY5110004-013L01	GRAYSON\BRCKINRDGE	GREEN	ROUGH RIVER
SALEM LAKE	99	HODGENVILLE	37-35-29	85-42-41	KY5110001-016L01	LARUE	GREEN	SALEM CREEK
SANDLICK CREEK LAKE	74	BURTONVILLE	38-23-23	83-36-41	KY5100101-021L01	FLEMING	LICKING	SAND LICK CREEK
SCENIC LAKE	18	EVANSVILLE S, ILL-KY	37-52-42	87-33-37	KY5140202-006L01	HENDERSON	OHIO	UT TO OHIO RIVER
SHANTY HOLLOW LAKE	135	REEDYVILLE	37-09-02	86-23-13	KY5110001-005L01	WARREN	GREEN	CLAY LICK CREEK
SHELBY LAKE (SHELBY CO)	17	SHELBYVILLE	38-13-59	85-13-02	KY5140102-022L01	SHELBY	SALT RIVER	CLEAR CREEK
SHELBY LAKE (BALLARD CO)	24	OLMSTEAD ILL-KY	37-11-01	89-01-52	KY8010100-001L08	BALLARD	OHIO	GAR CREEK

LAKE NAME	TOTAL ACRES	USGS QUADRANGLE	LATITUDE	LONGITUDE	WATERBODY SYSTEM NUMBER	COUNTY NAME	RIVER BASIN	SUBBASIN
SMOKEY VALLEY LAKE	36	GRAHN	38-21-59	83-07-41	KY5090103-007L01	CARTER	TYGARTS CREEK	SMOKEY CREEK
SPA LAKE (MUD RIVER MPS 6A)	240	SHARON GROVE	36-56-04	87-01-25	KY5110003-007L01	LOGAN	GREEN	WOLF LICK CREEK
SPURLINGTON LAKE	36	SPURLINGTON	37-23-18	83-15-12	KY5110001-034L01	TAYLOR	GREEN	BRUSHY FK, ROBINSON CK
STANFORD CITY RESERVOIR	43	HALLS GAP	37-29-12	84-40-48	KY5100205-044L01	LINCOLN	KENTUCKY	NEALS CREEK
SYMPSON LAKE	184	CRAVENS	37-48-27	85-30-17	KY5140103-011L01	NELSON	SALT	BUFFALO CREEK
SWAN POND	193	BARLOW,KY-ILL	37-15-50	89-07-05	KY8010100-001L04	BALLARD	MISSISSIPPI	MINOR SLOUGH
TAYLORSVILLE LAKE	3050	TAYLORSVILLE	38-00-05	85-13-12	KY5140102-025L01	SPENCER	SALT	N/A
TURNER LAKE	61	OLMSTEAD,ILL-KY	37-10-22	89-02-30	KY5140206-001L01	BALLARD	OHIO	HUMPHREY CREEK
TYNER LAKE	87	MCKEE	37-22-09	83-54-47	KY5130102-010L01	JACKSON	UPPER CUMBERLAND	FLAT LICK CREEK
WILGREEN LAKE	169	RICHMOND SOUTH	37-42-44	84-20-43	KY5100205-052L01	MADISON	KENTUCKY	TRACE FORK,SILVER CK
WILLIAMSTOWN LAKE	300	WILLIAMSTOWN	38-40-38	84-31-15	KY5100101-007L01	GRANT	LACKING	SF GRASSY CREEK
WILLISBURG LAKE	126	BRUSH GROVE	37-49-32	85-09-24	KY5140103-017L01	WASHINGTON	SALT	LICK CREEK
WOOD CREEK LAKE	672	BERNSTADT	37-11-24	84-10-48	KY5130102-005L01	LAUREL	UPPER CUMBERLAND	WOOD CREEK

COLUMN HEADER

DEFINITION

ASSESSMENT:

DATE

year of the most recent assessment

CAT

CATEGORY = the type of assessment made in determining the water quality condition of the waterbody

M (monitored) assessments were based on current (< 10 yrs. old) site-specific data

E (evaluated) assessments were based on information other than site specific criteria

TYPE

one digit code representing the type of water quality assessment made on the waterbody:

1 = assessment based on growing season sampling regime (three times per year)

2 = assessment based on data collected over time at fixed monitoring stations

3 = assessment based on Division of Water collections

4 = assessment based on U.S. Corps of Engineers collections

5 = assessment based on Tennessee Valley Authority collections

TROPHIC STATUS

the trophic state of the waterbody at the most recent assessment

TOX

Toxics Monitoring?

MON?

an indication of the existence of information (Y = yes; N = no) indicating the presence or absence of toxics in the waterbody

TOXIC CODES

the type of toxics monitoring information gathered at the waterbody

1 = Organics in the water column

5 = Metals in the water column

2 = Organics in fish tissue

6 = Metals in the sediment

3 = Pesticides in water column

7 = Metals in fish tissue

4 = Pesticides in fish tissue

8 = Toxics testing of discharge

FISH CONSUMPTION:

SUPP

no fish/shellfish advisories or bans in effect

PART

a fish/shellfish advisory or ban in effect for "restricted consumption" which limits the number of meals or amount consumed per unit time

NOT

a fish/shellfish advisory or ban with a commercial fishing/shellfishing ban in effect for "no consumption" for one or more fish species

COLUMN HEADER	DEFINITION
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SWIMMABLE:

SUPP the number of acres which support water-based recreational activities
PART the number of acres which partially support water-based recreational activities
NOT the number of acres which do not support water-based recreational activities

USE SUPPORT:

FULL Use Support Status
all uses are supported(based on data)
PART one or more uses are partially supported and the remaining uses are fully supported
NOT one or more uses are not being supported

- 1) WAH = warmwater aquatic habitat
- 2) CAH = coldwater aquatic habitat
- 3) PCR = primary contact recreation
- 4) SCR = secondary contact recreation
- 5) DWS = domestic water supply

CAUSE\SOURCE:

a code which refers to the cause and source of the impact that caused the waterbody to either not or partially support the use

1 = metals	A = natural
2 = nutrients	B = lake fertilization
3 = suspended solids	C = municipal (package treatment plants)
4 = shallow lake basin	D = septic tanks
5 = pH	E = unspecified nonpoint source
6 = other inorganics	F = surface mining/deep mining/abandoned lands
	G = agricultural nonpoint source
	H = animal holding and management areas
	I = in-place contaminants (sediments)

LAKE NAME	ASSESSMENT:			TROPIC STATUS	TOX MON	TOXIC CODES	FISH CONSUMPTION:			SWIM-MABLE:			USE FULLY SUPPORTED	USE PART SUPPORTED	USE NOT SUPPORTED	CAUSE/SOURCE
	DATE	CAT	TYPE				S	PS	NS	S	PS	NS				
A.J.JOLLY LAKE	1989	M	1,3	EUTROPHIC	N		204			204			WAH,PCR,SCR,DWS			
ARROWHEAD LAKE	1989	M	1,3	EUTROPHIC	N		37			37			WAH,PCR,SCR			
BARREN RIVER LAKE	1987	M	2,4	MESOTROPHIC	N		10000			10000			WAH,PCR,SCR,DWS			
BEAVER CREEK ARM	1987	M	2,4	EUTROPHIC	N								WAH,PCR,SCR			
SKAGGS CREEK ARM	1987	M	2,4	MESOTROPHIC	N								WAH,PCR,SCR			
BEAVER LAKE	1989	M	1,3	EUTROPHIC	N		158			158			WAH,PCR,SCR			
BEAVER DAM LAKE	1991	M	1,3	HYPER-EUTROPHIC	N		50			50			WAH,PCR,SCR			
BERT COMBS LAKE	1990	M	1,3	EUTROPHIC	N		36			36			WAH,PCR,SCR			
BOLTZ LAKE	1989	M	1,3	EUTROPHIC	N		92			92			WAH,PCR,SCR,DWS			
BRIGGS LAKE	1990	M	1,3	EUTROPHIC	N		18			18			PCR,SCR	WAH		2,B
BUCK LAKE	1989	M	1,3	EUTROPHIC	N		19			19			WAH,PCR,SCR			
BUCKHORN LAKE	1989	M	2,4	OLIGOTROPHIC	Y	1,3,5,6	1230			1230			WAH,PCR,DWS	SCR		3,F
BULLOCK PEN LAKE	1989	M	1,3	EUTROPHIC	N		134			134			WAH,PCR,SCR,DWS			
BURNT POND	1989	M	1,3	EUTROPHIC	N		10			10			WAH,PCR,SCR			
CAMPBELLSVILLE CITY RES.	1989	M	1,3	EUTROPHIC	N		63			63			PCR,SCR,DWS	WAH		2,G
CAMPTON LAKE	1990	M	1,3	MESOTROPHIC	N		26			26			WAH,PCR,SCR,DWS			
CANEYVILLE CITY RESERVOIR	1990	M	1,3	EUTROPHIC	N		75			75			WAH,PCR	DWS,SCR		2,A
CANNON CREEK LAKE	1990	M	1,3	OLIGOTROPHIC	N		243			243			WAH,PCR,SCR,DWS			
CARPENTER LAKE	1990	M	1,3	EUTROPHIC	N		64			64			PCR	WAH,SCR		2,4,A,I
CARR FORK LAKE	1989	M	2,4	EUTROPHIC	Y	1,3,5,6	710			710			WAH,PCR	SCR		3,F
CAVE RUN LAKE	1989	M	2,4	MESOTROPHIC	Y	1,3,5,6	8270			8270			WAH,PCR,SCR,DWS			
CHENOA LAKE	1990	M	1,3	MESOTROPHIC	N		37			37			WAH,PCR,SCR			
CORBIN CITY RESERVOIR	1990	M	1,3	MESOTROPHIC	N		139			139			WAH,PCR,			2,C,G
CORINTH LAKE	1989	M	1,3	EUTROPHIC	N		96			96			WAH,PCR,SCR			
CRANKS CREEK LAKE	1990	M	1,3	OLIGOTROPHIC	N		219			219				WAH,PCR,SCR		5,F
DALE HOLLOW LAKE	1979	M	2,4	OLIGOTROPHIC	N		4300			4300			WAH,PCR,SCR			
DEWEY LAKE	1990	M	2,4	MESOTROPHIC	Y	1,3,5,6	1100			1100			WAH,PCR	SCR		3,F
DOE RUN LAKE	1989	M	1,3	EUTROPHIC	N		51			51			WAH,PCR,SCR			
ELMER DAVIS LAKE	1989	M	1,3	EUTROPHIC	N		149			149			WAH,PCR,SCR			
ENERGY LAKE	1989	M	1,3	EUTROPHIC	N		370			370			WAH,PCR,SCR			

LAKE NAME	ASSESSMENT:			TROPIC STATUS	TOX MON?	TOXIC CODES	FISH CONSUMPTION:			SWIM-MABLE:			USE FULLY SUPPORTED	USE PART SUPPORTED	USE NOT SUPPORTED	CAUSE/SOURCE
	DATE	CAT	TYPE				S	PS	NS	S	PS	NS				
FISH LAKE	1989	M	1,3	EUTROPHIC	N		27			227			WAH,PCR,SCR			
FISHPOND LAKE	1990	M	1,3	EUTROPHIC	N		32			32			WAH,PCR,SCR			3,F
FISHTRAP LAKE	1989	M	2,4	OLIGOTROPHIC	Y	1,3,5,6	1143			1143			WAH,PCR	SCR		
FLAT LAKE	1989	M	1,3	EUTROPHIC	N		38			38			WAH,PCR,SCR			
FREEMAN LAKE	1990	M	1,3	EUTROPHIC	N		160			160			WAH,PCR,SCR,DWS			
GENERAL BUTLER ST.PK. LAKE	1989	M	1,3	EUTROPHIC	N		29			29			WAH,PCR,SCR			
GRAPEVINE LAKE	1990	M	1,3	MESOTROPHIC	N		50			50			WAH,PCR,SCR,DWS			
GRAYSON LAKE	1989	M	2,4	OLIGOTROPHIC	Y	1,3,5,6	1512			1512			WAH,PCR,SCR,DWS			
GREENBRIAR LAKE	1990	M	1,3	EUTROPHIC	N		66			66			WAH,PCR,SCR,DWS			
GREENBO LAKE	1989	M	1,3	MESOTROPHIC	N		181			181			WAH,PCR,SCR			
GREEN RIVER LAKE	1990	M	2,4	MESOTROPHIC	Y	1,2,3,5,6	8210			8210			WAH,PCR,SCR,DWS			2,G
GUIST CREEK LAKE	1989	M	1,3	EUTROPHIC	N		317			317			PCR,SCR	WAH,DWS		
HAPPY HOLLOW LAKE	1991	M	1,3	HYPER-EUTROPHIC	N		20			20			WAH,PCR,SCR			
HEMATITE LAKE	1989	M	1,3	MESOTROPHIC	N		90			90			WAH,PCR,SCR			2,C,G,D
HERRINGTON LAKE	1989	M	1,3	EUTROPHIC	N		2940			2940			PCR,SCR,DWS			2,A
HONKER LAKE	1989	M	1,3	MESOTROPHIC	N		190			190			PCR,SCR	WAH		
HONKER LAKE	1989	M	1,3	MESOTROPHIC	N		49100			49100			WAH,PCR,SCR,DWS			
KENTUCKY LAKE	1991	M	2,4	EUTROPHIC	Y	1,2,3,4,5,6,7	183			183			PCR,SCR	WAH		2,B
KINCAID LAKE	1990	M	1,3	EUTROPHIC	N		30			30			WAH,PCR	SCR		2,B
KINGFISHER LAKE	1990	M	1,3	EUTROPHIC	N		45600			45600			WAH,PCR,SCR,DWS			
LAKE BARKLEY	1984	M	5	EUTROPHIC	N		760			760			PCR,SCR,DWS	WAH		2,A
LAKE BESHEAR	1990	M	1,3	MESOTROPHIC	N		89			89			WAH,PCR,SCR			
LAKE BLYTHE	1990	M	1,3	MESOTROPHIC	N		114			114			WAH,PCR,SCR			
LAKE CARNICO	1990	M	1,3	EUTROPHIC	N		50250			50250			WAH,PCR,SCR,DWS			
LAKE CUMBERLAND	1982	M	2,4	OLIGOTROPHIC	N								WAH,PCR,SCR			
LILY CREEK ARM	1991	M	1,3	EUTROPHIC	N								WAH,PCR,SCR			
BEAVER CREEK ARM	1990	M	1,3	EUTROPHIC	N								WAH,PCR,SCR			
LAKE GEORGE	1990	M	1,3	EUTROPHIC	N		53			53			PCR,SCR,DWS	WAH		2,G
LAKE JERICHO	1991	M	1,3	EUTROPHIC	N		137			137			PCR,SCR			2,G
LAKE LINVILLE	1990	M	1,3	MESOTROPHIC	N		273			273			WAH,PCR,SCR,DWS			
LAKE MALONE	1990	M	1,3	EUTROPHIC	N		826			826			WAH,PCR,SCR			

LAKE NAME	ASSESSMENT:			TROPIC STATUS	TOX MON?	TOXIC CODES	FISH CONSUMPTION:			SWIM-MABLE:			USE FULLY SUPPORTED	USE PART SUPPORTED	USE NOT SUPPORTED	CAUSE/SOURCE
	DATE	CAT	TYPE				S	PS	NS	S	PS	NS				
LAKE MORRIS	1990	M	1,3	MESOTROPHIC	N		170			170			WAH,PCR,SCR	DWS		2,G
LAKE PEWEE	1990	M	1,3	MESOTROPHIC	N		360			360			WAH,PCR,SCR,DWS			
LAKE WASHBURN	1990	M	1,3	EUTROPHIC	N		26			26			PCR,SCR	WAH		2,E
LAUREL CREEK LAKE	1990	M	1,3	MESOTROPHIC	N		42			42			WAH,PCR,SCR	DWS		2,A
LAUREL RIVER LAKE	1979	M	2,4	OLIGOTROPHIC	N		6060			6060			WAH,PCR,SCR,DWS			2,C,E
MIDLAKE-LAUREL R. ARM	1979	M	2,4	MESOTROPHIC	N								WAH,PCR,SCR,DWS			
HEADWTRS-LAUREL R. ARM	1979	M	2,4	EUTROPHIC	N								WAH,PCR	SCR		2,C,G
LIBERTY LAKE	1989	M	1,3	MESOTROPHIC	N		79			79			WAH,PCR,SCR	DWS		1,A
LOCH MARY	1990	M	1,3	OLIGOTROPHIC	N		135			135			WAH,PCR,SCR		DWS	1,6,F
LONG POND	1989	M	1,3	EUTROPHIC	N		56			56			WAH,PCR,SCR			
LONG RUN PARK LAKE	1989	M	1,3	MESOTROPHIC	N		27			27			WAH,PCR,SCR			
LUZERNE LAKE	1990	M	1,3	MESOTROPHIC	N		55			55			WAH,PCR,SCR,DWS			
MARION COUNTY LAKE	1989	M	1,3	EUTROPHIC	N		21			21			WAH,PCR	SCR		2,B
MARTIN'S FORK LAKE	1982	M	2,4	OLIGOTROPHIC	N		334			334			WAH,PCR	SCR		3,F
MAUZY LAKE	1990	M	1,3	EUTROPHIC	N		84			84			PCR,SCR	WAH		2,B
MCNEELY LAKE	1991	M	1,3	EUTROPHIC	N		51			51			PCR,SCR	WAH		2,C
METCALFE COUNTY LAKE	1990	M	1,3	EUTROPHIC	N		22			22			PCR	WAH,SCR		1,4,A,G
METROPOLIS LAKE	1989	M	1,3	EUTROPHIC	N		36			36			WAH,PCR,SCR			
MILL CREEK L. (MONROE CO.)	1990	M	1,3	MESOTROPHIC	N		109			109			WAH,PCR,SCR			
MILL CREEK L. (POWELL CO.)	1990	M	1,3	MESOTROPHIC	N		41			41			WAH,PCR,SCR,DWS			
MITCHELL LAKE	1991	M	1,3	HYPER-EUTROPHIC	N		58			58			WAH,PCR,SCR			
MOFFIT LAKE	1990	M	1,3	EUTROPHIC	N		49			49			WAH,PCR,SCR			
NOLIN RIVER LAKE	1989	M	2,4	MESOTROPHIC	Y	1,3,5,6	5790			5790			WAH,PCR,SCR			
PAINTSVILLE LAKE	1989	M	2,4	MESOTROPHIC	Y	1,3,5,6	1139			1139			WAH,PCR,SCR			
PANBOWL LAKE	1990	M	1,3	MESOTROPHIC	N		98			98			WAH,PCR,SCR			
PENNYRILE LAKE	1991	M	1,3	EUTROPHIC	N		47			47			WAH,PCR,SCR			
PROVIDENCE CITY LAKE (NEW)	1990	M	1,3	MESOTROPHIC	N		35			35			WAH,PCR,SCR,DWS			
REFORMATORY LAKE	1991	M	1,3	EUTROPHIC	N		54			54			PCR,SCR	WAH		2,I
ROUGH RIVER LAKE	1989	M	2,4	MESOTROPHIC	Y	1,3,5,6	5100			5100			WAH,PCR,SCR	DWS		1,A
SALEM LAKE	1990	M	1,3	EUTROPHIC	N		99			99			WAH,PCR,DWS	SCR		4,A

LAKE NAME	ASSESSMENT:			TOXIC CODES	FISH CONSUMPTION:			SWIM-MABLE:			USE FULLY SUPPORTED	USE PART SUPPORTED	USE NOT SUPPORTED	CAUSE/SOURCE
	DATE	CAT	TYPE		S	PS	NS	S	PS	NS				
SANDLICK CREEK LAKE	1989	M	1,3		74		74		74	PCR,SCR	WAH		2,G	
SCENIC LAKE	1990	M	1,3		18		18		18	PCR,SCR	WAH		2,I	
SHANTY HOLLOW LAKE	1991	M	1,3		135		135		135	WAH,PCR,SCR	WAH		2,G,I	
SHELBY LAKE (SHELBY CO.)	1990	M	1,3		17		17		17	PCR,SCR	WAH		2,G,I	
SHELBY LAKE (BALLARD CO.)	1991	M	1,3		24		24		24	WAH,PCR,SCR	WAH		2,G	
SMOKEY VALLEY LAKE	1989	M	1,3		36		36		36	WAH,PCR,SCR	WAH		2,G	
SPA LAKE (MUD RIV. MPS 6A)	1990	M	1,3		240		240		240	PCR,SCR,DWS	WAH		2,G	
SPURLINGTON LAKE	1989	M	1,3		36		36		36	WAH,PCR,SCR	DWS		2,A	
STANFORD CITY RESERVOIR	1989	M	1,3		43		43		43	WAH,PCR,SCR	DWS		2,G	
SYMPSON LAKE	1990	M	1,3		184		184		184	WAH,PCR,SCR	DWS		2,C,G	
SWAN POND	1989	M	1,3		193		193		193	PCR,SCR	WAH		2,D	
TAYLORSVILLE LAKE	1989	M	2,4		3050	1,3,5,6	3050		3050	WAH,PCR,SCR	WAH		2,D	
TURNER LAKE	1989	M	1,3		61		61		61	WAH,PCR,SCR,DWS	WAH,SCR		2,D	
TYNER LAKE	1990	M	1,3		87		87		87	PCR	WAH,SCR		2,D	
WILGREEN LAKE	1990	M	1,3		169		169		169	WAH,PCR,SCR,DWS	WAH,SCR		2,D	
WILLIAMSTOWN LAKE	1990	M	1,3		300		300		300	WAH,PCR,SCR,DWS	WAH,SCR		2,D	
WILLISBURG LAKE	1989	M	1,3		126		126		126	WAH,PCR,SCR,DWS	WAH,SCR		2,D	
WOOD CREEK LAKE	1989	M	1,3		672		672		672	WAH,PCR,SCR,DWS	WAH,SCR		2,D	

APPENDIX C

NONPOINT SOURCE IMPACTED WATERBODIES

Big Sandy River Basin -- Nonpoint Source Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED*
		1	2	3	4	5				
BIG SANDY RIVER BASIN										
KY05070201-001	TUG FORK	65	10	50	51	52	BACT, SED, DO, TSS, SO,	KNPS, 1987; KDOW-BIO, 1987; KDOW-AMB, 1990	MONITORED	WAH-P, PCR
KY05070201-002	ROCKCASTLE CREEK	51	52	55	32	80	SED, BACT, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05070201-003	WOLF CREEK	51	21	52	32	65	SED, BACT, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05070201-004	EMILY CREEK	51	65	21	52	32	SED, BACT, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05070201-004	TUG FORK	65	10	51	52	55	BACT, SED, SO,	KNPS, 1987; KDOW-BACT, 1988	MONITORED	PCR
KY05070201-004	TURKEY CREEK	51	62	32	14	80	SED, BACT, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05070201-005	BIG CREEK	50	10	51	52	65	SED, BACT, SO,	KNPS, 1987; KDOW, 1988b; DFWR, 1988	MONITORED	WAH
KY05070201-006	POND CREEK	51	52	65	80	32	SED, BACT, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05070201-007	TUG FORK	51	52	55	40	65	SED, BACT, MET, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05070201-008	BLACKBERRY CREEK	51	52	65	80	32	SED, BACT, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05070201-009	PETER CREEK	51	52	65	80	32	SED, BACT, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05070201-010	KNOX CREEK	65	51	52	80		BACT, SED, SO,	KNPS, 1987; KDOW-BACT, 1988	MONITORED	PCR
KY05070202-001	LEVISA FORK	65	10	51	40	80	BACT, SED, SO, MET	KNPS, 1987; KDOW-BACT, 1988; KDOW-BIO, 1990-91	MONITORED	PCR, WAH-P
KY05070202-002	SHELBY CREEK	51	52	65	80	32	SO, SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05070202-004	RUSSELL FORK	65	10				BACT	KDOW-BACT, 1988	MONITORED	PCR
KY05070202-005	ELKHORN CREEK	80	51	52	21	65	SED, BACT, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05070202-009	GRAPEVINE CREEK	52	65	80	32	83	SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05070202-010	FEDS CREEK	51	52	65	80	32	SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05070203-001	LEVISA FORK	51	52	40	65	83	SED, BACT, SO, MET, NUT	KNPS SURVEY, 1987	EVALUATED	
KY05070203-002	GEORGES CREEK	51	83	32	65	21	MET, SED, SO, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05070203-003	TOMS CREEK	51	52	61	65	62	SED, BACT, SO, MET, NUT	KNPS SURVEY, 1987	EVALUATED	
KY05070203-004	GREASY CREEK	51	21	83	65	20	SED, BACT, SO, MET, NUT	KNPS SURVEY, 1987	EVALUATED	
KY05070203-004	GRIFFITH CREEK	51	32	65	80	83	MET, SED, SO, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05070203-004	WILEY CREEK	51	21	65	80		SED, BACT, SO, MET	KNPS SURVEY, 1987	EVALUATED	
KY05070203-005	BARNETTS CREEK	32	83	65	20	80	SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05070203-005	PAINT CREEK	40					BACT	KDOW-BACT, 1988	MONITORED	PCR
KY05070203-006	JENNYNS CREEK	51	55	83	80	32	SED, CI, BACT, SO, MET	KNPS SURVEY, 1987	EVALUATED	
KY05070203-007	MUDLICK CREEK	51	52	83	80	31	SED, CI, BACT, SO, MET	KNPS SURVEY, 1987	EVALUATED	
KY05070203-009	LITTLE PAINT CREEK	80	65	32			SO, SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05070203-010	LEVISA FORK	50	10				SED	KDOW-AMB, 1990-91	MONITORED	WAH-P

Big Sandy River Basin -- Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KY05070203-011	DANIEL CREEK	83	51	75	71	52	BACT, SED	KNPS SURVEY, 1987	EVALUATED	
KY05070203-011	JOHNS CREEK	51	80	65	32	52	SED, BACT, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05070203-013	BRUSHY CREEK	51	52	65	80	32	SED, BACT, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05070203-013	BUFFALO CREEK	51	80	65	32	83	SED, BACT, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05070203-013	RACCOON CREEK	51	52	65	80	61	SED, BACT, SO ₄ , MET	KNPS,1987;KDFWR,1987;KDOW,1988b	EVALUATED	WAH, PCR
KY05070203-014	MIDDLE CREEK, LF. FORK	51	65	80	32		SED, SO ₄ , BACT, MET	KNPS SURVEY, 1987	EVALUATED	
KY05070203-014	MIDDLE CREEK, RT. FORK	80	65	32			SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05070203-015	ABBOTT CREEK	80	65	32			SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05070203-015	MILLER CREEK	63	51	52	65	62	SED, BACT, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05070203-016	LEVISA FORK	40	70	10			TSS, SED, BACT	KDOW-AMB/BIO, 1988-89	MONITORED	PCR, WAH-P
KY05070203-017	BULL CREEK	51	57	80	65	32	SED, BACT, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05070203-017	COW CREEK	80	65	32	51		SED, BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05070203-018	BEAVER CREEK	51	65	40	80	32	pH, Fe, SO ₄ , COND	KNPS, 1987; USGS, 1980	EVALUATED	
KY05070203-019	CANEY FORK	51	31	80	65	32	SED, SO ₄ , MET, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05070203-020	BEAVER CREEK, LF. FORK	50	40	65	80	32	pH, NUTR, BACT, SED	KNPS SURVEY, 1987	EVALUATED	
KY05070203-021	LEVISA FORK	65	10	51	40	70	BACT, TSS, SED, DO	KDOW-BIO,1988-89;KDOW-AMB,1990-91	MONITORED	PCR, WAH-P
KY05070203-022	MUD CREEK	51	60	10	80	32	SED, DO, BACT, SO ₄ , MET	KNPS,1987;KDOW,1988b;KDFWR,1987	EVALUATED	
KY05070203-023	ISLAND CREEK	51	52	65	80	61	SO ₄ , SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05070204-001	BIG SANDY RIVER	90	10	65	50		MET, BACT	ORSANCO, 1988-91	MONITORED	WAH, PCR
KY05070204-002	FIVE FORKS CREEK	51	84	52	31	73	SED, BACT, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05070204-006	BLAINE CREEK	55	51	31	32	21	Cl,TDS,SED,BACT,SO ₄ ,MET	KNPS SURVEY, 1987	EVALUATED	
KY05070204-006	BLAINE CREEK, LEFT FK	55					Cl, TDS	KDOW-IS, 1990	MONITORED	WAH-P
KY05070204-006	BLAINE CREEK, RIGHT FK	55					Cl, TDS	KDOW-IS, 1990	MONITORED	WAH-P
KY05070204-006	FRANKS CREEK	55	51	61	80	83	SED, BACT, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05070204-006	HOOD CREEK	55	51	11	83	80	SED, BACT, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05070204-006	LAUREL CREEK, LOWER	55	51	61	83	14	SED, BACT, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05070204-006	LAUREL CREEK, UPPER	55	51	61	83	14	SED, BACT, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	

LITTLE SANDY RIVER BASIN

KY05090104-001	LITTLE SANDY RIVER	65	10				BACT	KDOW-AMB/BIO, 1988-89	MONITORED	PCR
KY05090104-002	RACCOON & ALLCORN CREEKS	65	11	18	80		BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05090104-003	BIG RUN	51					INORGANICS	KDOW-IS, 1991	EVALUATED	WAH-P

Big Sandy River Basin -- Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KY05090104-003	E. FORK LITTLE SANDY RIVER	51	10	80	65	SED, SO ₄ , MET, CI, NUT	KNPS, 1987; KDOW-IS, 1991	MONITORED	WAH-P	
KY05090104-004	LITTLE SANDY RIVER	65	10	60	11 18	BACT, SED, NUTR	KNPS, 1987; KDOW-BIO, 1988-89; KDOW-AMB, 1990-91	MONITORED	PCR	
KY05090104-005	LITTLE FORK	51	80	65	21 70	SED, BACT, MET	KNPS SURVEY, 1987	EVALUATED		
KY05090104-007	BARNETT CREEK	65	18	80		BACT, NUTR	KNPS SURVEY, 1987	EVALUATED		
KY05090104-007	CANE CREEK	65	11	18	80	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED		
KY05090104-007	LOST CREEK	80	21	65	11 18	SED, BACT, NUTR	KNPS SURVEY, 1987	EVALUATED		
KY05090104-007	OLDTOWN CREEK	65	11	18	80	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED		
KY05090104-007	STINSON CREEK	65	80	20	51	BACT, SED	KNPS SURVEY, 1987	EVALUATED		
KY05090104-009	BIG GIMLET CREEK	11	80	65	21	SED, BACT	KNPS SURVEY, 1987	EVALUATED		
KY05090104-009	NEWCOMBE CREEK	55	51	80	65 50	CI, TDS, SED, BACT, SO ₄ , MET	KNPS, 1987; KDOW-IS, 1990-91	MONITORED	WAH	
KY05090104-010	LITTLE SANDY RIVER	51	55	80	65	BACT, SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED		
KY05090104-010	LITTLE SANDY R., RT. & MID. FK	51	65	80	21	SED, BACT, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED		

TYGARTS CREEK BASIN

KY05090103-002	SCHULTZ CREEK	65	11	18	80	SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090103-003	WHITE OAK CREEK	65	11	18	80	SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090103-004	BEECHY CREEK	65	11	18	80	SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090103-004	LEATHERWOOD BRANCH	65	11	18	80	SED	KNPS SURVEY, 1987	EVALUATED	
KY05090103-004	THREE PRONG BRANCH	65	11	18	80	BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05090103-004	WHITE OAK CREEK	65	11	18	80	SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090103-005	BUFFALO & GRASSY CREEKS	14	20	65		SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090103-006	TYGARTS CREEK	14	20	65		SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090103-007	SMOKEY CREEK	14	20	65		SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090103-008	UPPER TYGARTS & FLAT CREEK	80	65	21	18 20	SED, BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	

LAKES

KY05070202-005	JENKINS RESERVOIR	51	30			SEDIMENT	KDOW, 1991a	EVALUATED	
KY05070202-008L01	FISHTRAP LAKE	50				SEDIMENT, TSS	KDOW, 1988b; USACOE/KDOW, 1989	MONITORED	SCR-P
KY05070203-012L01	DEWEY LAKE	51	31	32	65	SED, TSS, BACT	KDOW, 1988b; KDOW-LAKE, 1991	MONITORED	SCR-P

Licking River Basin -- Nonpoint Source Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
LICKING RIVER BASIN										
KY05100101-001	LICKING RIVER	40	90				BACT, MET	ORSANCO, 1990-91; KDOW-BACT, 1987	MONITORED	PCR, WAH
KY05100101-002	BANKLICK CREEK	40	30	10	60		BACT, NUTR, MET, SED	KNPS SURVEY, 1987; KDOW-BACT, 1987	MONITORED	PCR
KY05100101-003	DECOURSEY CREEK	40	30	60	10		NUTR, MET, SED	KNPS SURVEY, 1987	EVALUATED	
KY05100101-003	THREE-MILE CREEK	40					BACTERIA	KDOW-BACT, 1990-91	MONITORED	PCR
KY05100101-004	LICKING RIVER	10	11	80	14	20	BACT, SED, NUTR	KNPS, 1987; USGS, 1990-91	MONITORED	PCR
KY05100101-005	CRUISES CREEK	10	60	30			NUTR, MET, SED	KNPS SURVEY, 1987	MONITORED	PCR
KY05100101-006	PHILLIPS CREEK	60	30	10	40		NUTR, MET, SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100101-007	GRASSY CREEK	11	10	65	20	63	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100101-008	KINCAID CREEK	11	65	20	14	15	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100101-009	BOWMAN CREEK	10	30	60			NUTR, MET, SED	KNPS SURVEY, 1987	EVALUATED	
KY05100101-010	LICKING RIVER	11	14	16	80	20	SED, BACT, NUTR	KNPS SURVEY, 1987	MONITORED	PCR
KY05100101-012	NORTH FORK LICKING RIVER	10					BACTERIA	KDOW-BIO, 1986; KDOW-AMB, 1990-91	EVALUATED	
KY05100101-013	STONE LICK BRANCH	11	13	14	16	20	SED, NUTR, BACT	KNPS SURVEY, 1987	MONITORED	PCR-P
KY05100101-015	LICKING RIVER	10	80	21	11	65	BACT, SED, NUTR	KNPS, 1987; KDOW-AMB, 1990-91	EVALUATED	
KY05100101-017	JOHNSON CREEK	11	16	13	14	20	SED, NUTR	KNPS SURVEY, 1987	MONITORED	PCR-P
KY05100101-018	FLEMING CREEK	40	16	11	80		BACT, SED, NUTR, MET	KNPS SURVEY, 1987	EVALUATED	
KY05100101-019	FLAT CREEK	11	80	18	14	65	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100101-020	HILLSBORO BRANCH	11	16				BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100101-021	FOX CREEK	21	80	11	73	66	SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05100101-022	SLATE CREEK	16	11	18	14	65	SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05100101-023	SALT LICK CREEK	11	80	21			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100101-024	TRIPLETT CREEK	10	65	80	40	51	PEST, BACT, SED	KNPS SURVEY, 1987	EVALUATED	
KY05100101-025	NORTH FORK TRIPLETT CREEK	65	80	20	14		BACTERIA	KNPS SURVEY, 1987	EVALUATED	
KY05100101-027	LICKING RIVER	80	21	11	65		SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100101-029	BEAVER CREEK	11	80	40	21		NUTR, SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100101-030	CRANEY CREEK	80	55	11	65	21	NUTR, SED, CI	KNPS SURVEY, 1987	EVALUATED	
KY05100101-030	NORTH FORK LICKING RIVER	80	65	51			SED, MET, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100101-031	BLACKWATER CREEK	11	80	65			SEDIMENT	KNPS SURVEY, 1987	EVALUATED	

Licking River Basin - Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KY05100101-032	GRASSY CREEK	80	65	11			SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100101-034	LICKING RIVER	55	51	65	80	11	Cl, TDS, BACT, MET, COND, SED, O/G	KNPS, 1987; KDOW, 1988b; KDOW-AMB, 1990-91	MONITORED	WAH-P
KY05100101-035	CANEY CREEK	80	65				BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100101-036	ELK FORK	80	65	21	51		SED, MET, SO, BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100101-036	WILLIAMS BRANCH	80	51	65	21		SED, MET, SO, BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100101-037	COW CREEK	80					SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05100101-037	LF. & RT. FORKS MIDDLE CK.	51	80	21	32		SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05100101-037	LICK CREEK	55	80	32	11		Cl, TDS, SED	KNPS, 1987; KDOW-IS, 1986	MONITORED	WAH
KY05100101-037	RACCOON CREEK	55					Cl, TDS	KDOW-IS, 1986	MONITORED	WAH
KY05100101-037	WHITE OAK CREEK	51	80	32	11		SED, MET, SO, BACT, NUTR	KNPS SURVEY, 1987	MONITORED	WAH
KY05100101-038	BURNING FORK	55					Cl, TDS	KDOW-IS, 1986	MONITORED	WAH
KY05100101-038	STATE ROAD FORK	55					Cl, TDS	KDOW-IS, 1986	MONITORED	WAH
KY05100101-039	LICKING RIVER	55	50	51	80	11	Cl, TDS, COND, DO, SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100102-001	SOUTH FORK LICKING RIVER	11	12	14	18	10	NUTR, PEST, SED, MET, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100102-002	COOPERSTOWN CREEK	80	10	65			NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100102-005	TWIN CREEK	11	14	20	32	16	SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05100102-006	MILL CREEK	11	14	20	32	80	SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05100102-008	SOUTH FORK LICKING RIVER	40	10	11	12	14	SED, NUTR, BACT, PEST, MET	KNPS SURVEY, 1987	EVALUATED	
KY05100102-010	SOUTH FORK LICKING RIVER	40	10	11	12	14	SED, NUTR, BACT, PEST, MET	KNPS, 1987; KDOW-BIO, 1986; KDOW-AMB, 1990-91	MONITORED	PCR-P, WAH-P
KY05100102-012	STONER CREEK	10	11	16	14	51	BACT, MET, NUTR, SED	KNPS, 1987; KDOW-BACT, 1987	MONITORED	PCR
KY05100102-013	HOUSTON CREEK	10					BACTERIA	KDOW-BACT, 1987	MONITORED	PCR
KY05100102-015	STONER CREEK	10	11	16	14	51	BACT, MET, NUTR, SED	KNPS SURVEY, 1987	EVALUATED	
KY05100102-016	KENNEDY CREEK	11	16	14	51	18	MET, NUTR, SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100102-017	HANCOCK CREEK	10	40				BACTERIA	KDOW-BACT, 1987	MONITORED	PCR
KY05100102-017	STRODES CREEK	10	40	11	14	16	BACT, SED, PEST	KNPS, 1987; KDOW-BACT, 1987	MONITORED	PCR
KY05100102-018	CABIN CREEK	11	16	14	51	18	MET, NUTR, SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100102-018	STONER CREEK	10	11	16	14	51	BACT, MET, NUTR, SED	KNPS SURVEY, 1987	EVALUATED	
KY05100102-020	BIG BRUSHY CREEK	10	11	62	80	32	NUTR, SED, BACT	KNPS, 1987; KDOW-IS, 1986	MONITORED	WAH
KY05100102-022	SOMERSET CREEK	11	80	18	40	14	BACT, NUTR, SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05100102-024	HINKSTON CREEK	10	80	11	12	40	BACT, NUTR, SED, MET	KNPS, 1987; KDOW-BACT, 1987	MONITORED	PCR

Licking River Basin -- Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
LAKES										
KY05100101-008L01	KINCAID LAKE			90			NUTRIENTS	KDOW-LAKE, 1990-91	MONITORED	WAH-P
KY05100101-021L01	SAND LICK CREEK LAKE			10			NUTRIENTS	KDOW-LAKE, 1990-91	MONITORED	WAH-P
OHIO RIVER MINOR TRIBUTARIES										
KY05090201-001	TWELVE MILE CREEK	10	30	60			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090201-002	LOCUST CREEK	11	14	15	21	22	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090201-003	BRACKEN CREEK	11	14	15	21	22	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090201-004	LEE CREEK	11	12	13	14	16	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090201-005	LAWRENCE CREEK	11	13	14	16	20	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090201-006	CABIN CREEK	65	20	80	18	11	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090201-006	EAST FORK CABIN CREEK	11	65	13	14	20	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090201-008	QUICKS RUN	14	21				SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05090201-009	SALT LICK CREEK	23	21	20	65	11	SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090201-010	KINNICONNICK CREEK	23	21	80	65	18	SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090201-014	BEASLEY CREEK	11	12	13	14	16	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090201-014	BULL FORK CREEK	65	55	11	14	20	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090201-014	FOUR MILE CREEK	60	10	30	40		SED, NUTR, BACT, MET	KNPS SURVEY, 1987	EVALUATED	
KY05090201-014	INDIAN CREEK	11	14	13	12	15	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090201-014	SNAG CREEK	11	14	15	21	22	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090201-014	TURTLE CREEK	11	14	15	21	22	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	

Kentucky River Basin -- Nonpoint Source Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KENTUCKY RIVER BASIN										
KY05100201-002	NORTH FORK KENTUCKY RIVER	40	80	51	55	21	BACT, SED, SO ₄ , MET	KNPS, 1987; KDOW-AMB, 1990-91; USGS, 1990-91	MONITORED	PCR
KY05100201-003	DEVIL CREEK	50	51	55	20	SED, MET, SO ₄ , Cl, pH, Fe		KNPS SURVEY, 1987	EVALUATED	
KY05100201-003	WALKERS CREEK	55	21	23		SED, Cl		KNPS SURVEY, 1987	EVALUATED	
KY05100201-004	BOONE FORK FROZEN CREEK	80	11			SED		KNPS SURVEY, 1987	EVALUATED	
KY05100201-004	FROZEN CREEK	80	11			SED		KNPS SURVEY, 1987	EVALUATED	
KY05100201-005	NORTH FORK KENTUCKY RIVER	40	50	10	80	51	BACT, SED, SO ₄ , MET	KNPS, 1987; KDOW-BIO, 1986; KDOW-AMB, 1990-91; USGS, 1990-91	MONITORED	PCR, WAH-P
KY05100201-006	CANEY CREEK	80				SED		KNPS SURVEY, 1987	EVALUATED	
KY05100201-007	QUICKSAND CREEK	10	51	55	65	80	BACT, NUTR, SO ₄ , SED, Cl	KNPS, 1987; KDOW-BACT, 1988	MONITORED	PCR
KY05100201-007	SOUTH FORK QUICKSAND CR.	10	51	80			BACT, SED	KNPS, 1987; KDOW-BACT, 1988	MONITORED	PCR
KY05100201-007	SPRING FORK	50					SED	KDFWR, 1987	EVALUATED	WAH
KY05100201-008	NORTH FORK KENTUCKY RIVER	40	51	55	10	20	BACT, SED, SO ₄ , MET	KNPS, 1987; KDOW-AMB, 1990-91; USGS, 1990-91	MONITORED	PCR, WAH-P
KY05100201-009	BALLS FORK	65	80	51	32		SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100201-009	BUCKHORN CREEK	51	65				SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100201-009	LOST CREEK	50	80				SED, NUTR, BACT	KNPS, 1987; KDFWR, 1987	MONITORED	WAH
KY05100201-009	TROUBLESOME CREEK	60	40	51	52	55	BACT, SO ₄ , MET, SED	KNPS, 1987; KDOW-BACT, 1988	MONITORED	PCR
KY05100201-010	NORTH FORK KENTUCKY RIVER	51	52	80	55	21	SED, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05100201-011	BIG CREEK	51	52	55	32	23	SED, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05100201-011	GRAPEVINE CREEK	51	52	80	32		SED, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05100201-012	NORTH FORK KENTUCKY RIVER	51	52	80	55	32	SED, MET, AS, Cl, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05100201-013	LOTTS CREEK	51	52	65	80	32	SED, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05100201-016	CARR FORK CREEK	51	52	80	57		SED, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05100201-017	NORTH FORK KENTUCKY RIVER	51	80	11	52	32	SED, AS, MET, Cl	KNPS SURVEY, 1987	EVALUATED	
KY05100201-018	LEATHERWOOD CREEK	51	52	80	57	55	SO ₄ , SED, MET, Cl	KNPS SURVEY, 1987	EVALUATED	
KY05100201-019	TURKEY CREEK	51	80	21	55		SO ₄ , SED, MET, Cl	KNPS SURVEY, 1987	EVALUATED	
KY05100201-020	MACES CREEK	51	52	55	23	80	SO ₄ , SED, MET, Cl	KNPS SURVEY, 1987	EVALUATED	
KY05100201-021	ROCKHOUSE CREEK	50	51	57	80	21	SED, MET, SO ₄	KNPS SURVEY, 1987; KDOW, 1988b	EVALUATED	WAH
KY05100201-022	MILLSTONE CREEK	51	80	63	21		SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05100202-002	LONG CREEK	51	52	80	23	21	SED	KNPS SURVEY, 1987	EVALUATED	

Kentucky River Basin -- Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KY05100202-002	TURKEY CREEK	11					SED, CI, MET	KNPS SURVEY, 1987	EVALUATED	
KY05100202-006	CUTSHIN CREEK	55	50	51	80	52	OIL-GREASE, SED, MET, SO ₄ , CI	KNPS, 1987; KDFWR, 1987	EVALUATED	WAH
KY05100202-006	RACCOON CREEK	55	50				OIL-GREASE, SED	KDFWR, 1987	EVALUATED	WAH
KY05100202-007	MIDDLE FORK KENTUCKY RIV.	51	57	52	21	80	SED, MET, SO ₄ , CI, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100202-008	ROCKHOUSE CREEK	32	80	21	55	51	SED, MET, SO ₄ , CI	KNPS SURVEY, 1987	EVALUATED	
KY05100202-009	GREASY CREEK	51	52	80	14	32	SED, MET, SO ₄ , CI	KNPS SURVEY, 1987	EVALUATED	
KY05100202-010	BEECH FORK	51	52	80	55	32	SED, MET, SO ₄ , CI	KNPS SURVEY, 1987	EVALUATED	
KY05100202-010	MIDDLE FORK KENTUCKY RIV.	51	57	52	21	80	SED, MET, SO ₄ , CI, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100203-002	SEXTON CREEK	57	51	85	11	20	SED, MET, SO ₄ , CI, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100203-003	UPPER BUFFALO CREEK	51					SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05100203-004	BULLSKIN CREEK	20	51	52	80	55	SED, MET, SO ₄ , CI, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100203-005	BUCK CREEK	80	51	11			SED	KNPS SURVEY, 1987	EVALUATED	
KY05100203-005	COW CREEK	51	11				SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05100203-005	INDIAN CREEK	51	11				SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05100203-005	ISLAND CREEK	51	11				SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05100203-005	JONES FORK	80	65	51	32		SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100203-005	MEADOW CREEK	80	32				SED	KNPS SURVEY, 1987	EVALUATED	
KY05100203-005	RIGHT FORK OF BEAVER CREEK	51	65	80	32		SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100203-006	GOOSE CREEK	51	20	14	11	77	SED, MET, SO ₄ , CI, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100203-010	GOOSE CREEK	51	20	14	11	77	SED, MET, SO ₄ , CI, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100203-011	REDBIRD RIVER	20	51	14	11	62	SO ₄ , SED, MET, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100204-001	CAMPBELL CREEK	22	55	80			SED, CI	KNPS SURVEY, 1987	EVALUATED	
KY05100204-001	KENTUCKY RIVER	11	22	55	80	51	CI, SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100204-002	DROWNING CREEK	11	65	32	14	22	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100204-004	RED LICK CREEK	11	65	22	55	80	CI, SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100204-006	SOUTH FK STATION CAMP CR.	55	18	85	80	22	CI, SED, MET, NUTR, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05100204-008	COW CREEK	55	80				CI, SED	KNPS SURVEY, 1987	EVALUATED	
KY05100204-008	KENTUCKY RIVER	11	22	55	80	51	SED, MET, NUTR, SO ₄ , CI, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100204-009	BIG SINKING CREEK	55					CI, TDS	KDOW-IS, 1989	EVALUATED	WAH
KY05100204-009	BILLEY FORK	55					CI, TDS	KDOW-IS, 1989	MONITORED	WAH

Kentucky River Basin -- Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KY05100204-009	FURNACE FORK	55					Cl, TDS	KDOW-AMB, 1990-91; USGS, 1990-91	MONITORED	WAH-P
KY05100204-009	MILLERS CREEK	55 22 11 80					Cl, TDS, SED, MET, NUTR, SO ₄	KNPS, 1987; KDOW, 1988; KDOW-IS, 1989; KDOW-AMB, 1990-91	MONITORED	WAH
KY05100204-011	STURGEON CREEK	57 85 80 51					SED, MET, NUTR, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05100204-013	RED RIVER	90 55 22 65 11					MET, Cl, NUTR, SO ₄ , BACT	KNPS, 1987; KDOW-AMB, 1990-91	MONITORED	WAH,
KY05100204-014	LULBGRUD CREEK	11 14 21 23 31					SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100204-015	HARDWICK CREEK	10 20					SED	KNPS SURVEY, 1987	EVALUATED	
KY05100204-016	CANE CREEK	11 21 80					SED	KNPS SURVEY, 1987	EVALUATED	
KY05100204-017	CAT CREEK	90					DO, MET	USGS, 1990-91	MONITORED	WAH
KY05100204-018	SAND LICK FORK	55					Cl, TDS	KDOW-IS, 1985	EVALUATED	WAH
KY05100204-018	SOUTH FORK RED RIVER	55					Cl, TDS	KDOW-IS, 1985	EVALUATED	WAH
KY05100204-019	RED RIVER	76 77 90 50 21					SED, BACT, MET	KNPS, 1987; KDOW-BIO, 1987; KDOW-AMB, 1990-91	MONITORED	WAH-P, PCR-P
KY05100204-023	STILLWATER CREEK	10 60 65 20					SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100204-025	GILLMORE CREEK	10 20 51 40					SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100204-025	LACY CREEK	10 20 51					SED	KNPS SURVEY, 1987	EVALUATED	
KY05100204-025	RED RIVER	90 76 77 50 10					BACT, SED, MET, Fe, Mn	KNPS, 1987; KDOW-BIO, 1987; KDOW-AMB, 1990-91	MONITORED	WAH-P, PCR-P
KY05100205-001	KENTUCKY RIVER	11 18 32 40					SED, NUTR, MET	KNPS SURVEY, 1987	EVALUATED	
KY05100205-002	MILL CREEK	11 18 14 32 40					SED, NUTR, MET	KNPS SURVEY, 1987	EVALUATED	
KY05100205-002	WHITES RUN CREEK	11 18 32 40					SED, NUTR, MET	KNPS SURVEY, 1987	EVALUATED	
KY05100205-003	EAGLE CREEK	90 80 65 10 11					BACT, SED, NUTR, MET	KNPS, 1987; KDOW-AMB, 1990-91	MONITORED	PCR
KY05100205-004	TEN MILE CREEK	80 10 65					SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-005	EAGLE CREEK	90 80 65 10					BACT, SED, NUTR, MET	KNPS, 1987; KDOW-AMB, 1990-91	MONITORED	PCR
KY05100205-006	CLARKS CREEK	80 10 65					SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-008	BRUSH CREEK	80 65 10					SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-008	GRASSY RUN	80 10 65					SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-010	EAGLE CREEK	11 12 14 22 20					SED, OIL-GREASE, BACT, MET	KNPS SURVEY, 1987	EVALUATED	
KY05100205-011	KENTUCKY RIVER	90					BACT	KNPS, 1987; USGS, 1990-91	MONITORED	PCR
KY05100205-012	BIG TWIN CREEK	80 65 10					SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-013	CAINES RUN	11 14					SED	KNPS SURVEY, 1987	EVALUATED	
KY05100205-013	DRENNON CREEK	11 14					SED	KNPS SURVEY, 1987	EVALUATED	

Kentucky River Basin -- Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KY05100205-013	SULPHUR CREEK	11	14				SED	KNPS SURVEY, 1987	EVALUATED	
KY05100205-014	SIX MILE CREEK	11	14				SED	KNPS SURVEY, 1987	EVALUATED	
KY05100205-015	SEVERN CREEK	80	65	10			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-016	CEDAR CREEK	80	65	10			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-016	SAWRIDGE CREEK	80	65	10			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-017	FLAT CREEK	11	14				SED	KNPS SURVEY, 1987	EVALUATED	
KY05100205-017	MILL CREEK	80	65	10			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-018	ELKHORN CREEK	90	46				BACT, MET, SED, NUTR	KNPS, 1987; USGS, 1990-91	MONITORED	PCR
KY05100205-019	NORTH ELKHORN CREEK	10	11	12	13	14	NUTR, MET, SED, BACT	KNPS, 1987; KDOW-IS, 1986-88	MONITORED	WAH-P
KY05100205-021	CANE RUN CREEK	90	11	12	14	32	SED, MET, NUTR, BACT	KNPS, 1987; KDOW-IS, 1990	MONITORED	WAH-P
KY05100205-022	NORTH ELKHORN CREEK	10	11	12	13	14	NUTR, MET, SED, BACT	KNPS, 1987; KDOW-IS, 1986-88	MONITORED	WAH-P
KY05100205-023	DRY RUN	10					NUTR, BACT	KDOW-IS, 1986-87	MONITORED	PCR, WAH-P
KY05100205-023	LANES RUN	10					NUTR	KDOW-IS, 1986-87	MONITORED	WAH-P
KY05100205-024	NORTH ELKHORN CREEK	10	40				NUTR	KDOW-IS, 1986-88	MONITORED	WAH-P
KY05100205-025	UNNAMED TRIB/N ELKHORN CK	10					BACT	KDOW-IS, 1986-88	MONITORED	WAH-P
KY05100205-026	SOUTH ELKHORN CREEK	40	14	11	80	32	DO, BACT, MET, LINDANE, SED	KNPS, 1987; KDOW-IS, 1986; KDOW-AMB, 1990-91	MONITORED	WAH-P, PCR
KY05100205-029	SOUTH ELKHORN CREEK	11	80	32	40		SED, LINDANE, MET, CI, DDT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-031	STONEY CREEK	11	14				SED	KNPS SURVEY, 1987	EVALUATED	PCR
KY05100205-032	NORTH & SOUTH BENSON CRKS	11	12	14	65		SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-034	GLENNS CREEK	11	40	80	14		SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05100205-035	CLEAR CREEK	11	80	14	20		SED	KNPS SURVEY, 1987	EVALUATED	
KY05100205-036	CRAIG CREEK	11	80	14	20		SED	KNPS SURVEY, 1987	EVALUATED	
KY05100205-036	SHAKER CREEK	11	14				SED	KNPS SURVEY, 1987	EVALUATED	
KY05100205-037	DIX RIVER	11	16	65	32		SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-039	CLARKS RUN	62	65	32	14		SED, BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100205-040	SPEARS CREEK	14	32				SED, BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100205-041	DIX RIVER	11	16	65	32		SED	KNPS SURVEY, 1987	EVALUATED	
KY05100205-042	HANGING FORK	11	80	18	65		SED, BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100205-042	HARRIS CREEK	11	12	14	13		SED	KNPS SURVEY, 1987	EVALUATED	
KY05100205-043	DIX RIVER	11	80	18	65	61	SED, NUTR, BACT, SO., MET	KNPS SURVEY, 1987	EVALUATED	

Kentucky River Basin -- Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KY05100205-044	LOGAN CREEK	11	18	80	32		SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-047	KENTUCKY RIVER	90	11	40	14	32	BACT, SED, NUTR	KNPS, 1987; KDOW-BIO/AMB, 1990-91; USGS, '90-91	MONITORED	PCR
KY05100205-048	JESSAMINE CREEK	40	30	65			SED, NUTR, BACT, MET	KNPS SURVEY, 1987	EVALUATED	
KY05100205-049	HICKMAN CREEK	32	40	64			SED, NUTR, BACT, MET	KNPS SURVEY, 1987	EVALUATED	
KY05100205-050	SUGAR CREEK	11	18	22			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-051	PAINT LICK CREEK	11	16	18	32		SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-052	SILVER CREEK	32	65	11	40		PEST, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100205-053	TATE CREEK	32	65	40	11		SED	KNPS SURVEY, 1987	EVALUATED	
KY05100205-054	BOONE CREEK	80	14	11	32		SED	KNPS SURVEY, 1987	EVALUATED	
KY05100205-055	OTTER CREEK	32	65	40	11		PEST, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05100205-056	FOUR MILE CREEK	70					SED	KNPS SURVEY, 1987	EVALUATED	
KY05100205-057	UPPER HOWARD CREEK	70	10				SED	KNPS SURVEY, 1987	EVALUATED	
KY05100205-058	MUDDY CREEK	32	65	66	63		SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-059	CANOE CREEK	11	18	22			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05100205-059	LOWER HOWARD CREEK	80					SED	KNPS SURVEY, 1987	EVALUATED	
LAKES										
KY05100201-015L01	CARR FORK LAKE	51	52	65	32		SED, TSS, BACT	KNPS, 1987; KDOW, 1988b; USACOE, 1990	MONITORED	SCR-P
KY05100202-003L01	BUCKHORN LAKE	51	52	21	55		SED, TSS	KNPS, 1987; KDOW, 1988b; USACOE, 1990	MONITORED	SCR-P
KY05100205-038L01	HERRINGTON LAKE	10	65	16	11	32	NUTR, SED, BACT	KNPS, 1987; KDOW-LAKE, 1990-91	MONITORED	WAH
KY05100205-052L01	WILGREEN LAKE	65					NUTR	KDOW, 1988b; KDOW-LAKE, 1990-91	MONITORED	WAH-P, SCR-P
OHIO RIVER MINOR TRIBUTARIES										
KY05090203-001	MUD LICK CREEK	40	30	10	60	80	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090203-002	GUNPOWDER CREEK	40	30	10	80	20	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090203-003	WOOLPER CREEK	40	30	10	80	20	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05090203-004	AGNIELS & BLACKROCK CREEK	11	18	32	40		SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05090203-004	McCOOLS CREEK	11	18	32	40		SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05090203-004	STEPHENS CREEK	11	18	32	40		SED, MET	KNPS, 1987; KDOW, 1986c	EVALUATED	

Upper Cumberland River Basin -- Nonpoint Source Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
UPPER CUMBERLAND RIVER BASIN										
KY05130101-004	SPRUCE CREEK			51	57	55	SO ₄ , SED, MET, CI	KNPS SURVEY, 1987	EVALUATED	
KY05130101-005	LYNN CAMP CREEK			62	63	40	SED, MET, SO ₄ , NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130101-010	INDIAN CREEK			30	40		SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05130101-011	LAUREL CREEK			50	30	40	SED, MET	KNPS SURVEY, 1987	MONITORED	CAH-P
KY05130101-011	MARSH CREEK			50	51	55	SED, MET, SO ₄ , CI	KNPS SURVEY, 1987; KDFWR, 1986-87	EVALUATED	
KY05130101-012	JELLICO CREEK			51	52	57	SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05130101-013	WATTS CREEK			11	13	14 16 18	SO ₄ , SED, MET, NUTR, BACT, CI	KNPS SURVEY, 1987	EVALUATED	
KY05130101-014	BUNCHES CREEK			51	52	57 22	SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05130101-016	CANE CREEK			52	57		SO ₄ , SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05130101-017	LAUREL FORK			51	52	57 80 65	SO ₄ , SED, MET, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05130101-019	CUMBERLAND RIVER			51	80	40	SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05130101-020	POPLAR CREEK			51	52	57	SO ₄ , SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05130101-021	MEADOW CREEK			11	13	14 16 51	SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05130101-022	INDIAN CREEK			51	80		SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05130101-023	RICHLAND CREEK			51	80		SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05130101-024	LITTLE POPLAR CREEK			51	52	21	SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05130101-024	PATTERSON CREEK			51	52	57	SO ₄ , SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05130101-025	CUMBERLAND RIVER			60	51	80 40	BACT, SED, MET, SO ₄	KNPS, 1987; KDOW-AMB, 1990-91	MONITORED	PCR
KY05130101-026	BRUSH CREEK			51	80	21	SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05130101-027	STINKING CREEK			51	80	21	SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05130101-028	GREASY CREEK			51	21	80	SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05130101-029	LITTLE CLEAR CREEK			51	80		SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05130101-030	STRAIGHT CREEK			21	51	65 80	NUTR, BACT, SED	KNPS SURVEY, 1987	EVALUATED	
KY05130101-031	BENNETTS FORK			40	50	70	SEDIMENT	KDOW-IS, 1989	MONITORED	WAH-P
KY05130101-031	CLEAR FORK			50	51	80	SEDIMENT	KNPS, 1987; KDOW, 1988b; KDOW-IS, 1989	MONITORED	WAH-P
KY05130101-031	LITTLE YELLOW CREEK			30			SEDIMENT	KDOW-IS, 1989	MONITORED	WAH-P
KY05130101-031	STONY FORK			50	51	21	SED, MET, SO ₄	KNPS, 1987; KDOW-IS, 1989	MONITORED	WAH-P
KY05130101-031	YELLOW CREEK			40	70	51 23 31	ORG, DO, SED, MET, SO ₄ , NUT, BACT	KNPS, 1987; KDOW, 1988b; KDOW-IS, 1989	MONITORED	WAH-P
KY05130101-032	CUMBERLAND RIVER			60			BACTERIA	KDOW-AMB, 1990-91	MONITORED	PCR

Upper Cumberland River Basin -- Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	S T R E A M N A M E	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KY05130101-033	BROWNIES CREEK	51	21	80	65		SED, MET, SO, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05130101-034	PUCKETT CREEK	80	51	52			SED, MET, SO, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05130101-035	WALLINS CREEK	52	51	80			SED, MET, SO,	KNPS SURVEY, 1987	EVALUATED	WAH-P
KY05130101-036	POOR FORK	50	52	51	80	21	SED, MET, NUTR, SO, BACT, CI	KNPS, 1987; KDFWR, 1987	EVALUATED	
KY05130101-037	CLOVER FORK	52	51	80	21		SED, MET, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05130101-038	CATRONS CREEK	52	51	80	21		SED, MET, SO,	KNPS SURVEY, 1987	EVALUATED	WAH
KY05130101-038	CRANKS CREEK	51	52	80			SED, pH, MET, SO,	KNPS, 1987; KDFWR, 1987	EVALUATED	
KY05130101-038	MARTINS FORK	52	51	80			SED, MET, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05130101-038	SLATERS CREEK	57	51	52			SED, MET, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05130102-001	ROCKCASTLE RIVER	20	50	11	65	80	SED, BACT, MET	KNPS, 1987; KDOW-AMB, 1990-91	MONITORED	WAH-T
KY05130102-002	CANE CREEK	22					SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05130102-003	SINKING CREEK	51	22				MET, BACT, SED	KNPS SURVEY, 1987	EVALUATED	
KY05130102-004	SKEGGS CREEK	51	80	65	11		MET, BACT, SED	KNPS SURVEY, 1987	EVALUATED	
KY05130102-005	WOOD CREEK	32	14	51	18		SED, BACT, NUTR, MET, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05130102-007	CROOKED CREEK	50					SEDIMENT	KDFWR, 1981	EVALUATED	WAH-P
KY05130102-007	ROUNDSTONE CREEK	11	51	65	80		BACT, SED, NUTR, MET, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05130102-009	HORSE LICK CREEK	20	70	57	80	18	SED, BACT, NUTR, MET, SO,	KNPS, 1987; KDOW-AMB, 1990-91	MONITORED	WAH-T
KY05130102-010	MIDDLE FORK ROCKCASTLE R.	80	18	22			BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130102-011	MOORES CREEK	18	85	80	22		SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05130102-011	POND CREEK	18	85	80	22		SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130102-011	RACCOON CREEK	14	51	63	77	22	SED, BACT, NUTR, MET, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05130102-011	SOUTH FORK ROCKCASTLE RIV.	51	20	14	11	13	BACT, NUTR, SED, MET, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05130103-001	KETTLE CREEK	11	21	55			SED, CI	KNPS SURVEY, 1987	EVALUATED	
KY05130103-003	SULPHER CREEK	10	20				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05130103-004	MESHACH CREEK	10	20				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05130103-005	MARROWBONE CREEK	11	21	14	18	80	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130103-006	BIG RENOX CREEK	11	14	21	55		PEST, SED, BACT, SOLID WASTE, CI	KNPS SURVEY, 1987	EVALUATED	
KY05130103-007	BEAR CREEK	55	11				SED, CI	KNPS SURVEY, 1987	EVALUATED	
KY05130103-008	CROCUS CREEK	11	14	13	18	21	PEST, SED, BACT, SOLID WASTE	KNPS SURVEY, 1987	EVALUATED	
KY05130103-009	McFARLAND CREEK	10	20				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05130103-009	MUDCAMP CREEK	55	21	14			SED, CI	KNPS SURVEY, 1987	EVALUATED	

Upper Cumberland River Basin - Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	S T R E A M N A M E	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KY05130103-012	WOLF CREEK	18	11	14	21	20	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130103-013	SPUTTER BRANCH	11	80	18	83		NUTR, SED	KNPS SURVEY, 1987	EVALUATED	
KY05130103-014	BIG CLIFTY CREEK	11	83	18			NUTR, SED	KNPS SURVEY, 1987	EVALUATED	
KY05130103-014	COLD WEATHER CREEK	11	80	32	18		BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130103-014	FISHING CREEK	11	13	80	65	16	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130103-014	ROCK LICK CREEK	11	13	80	16		BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130103-015	PITMAN CREEK (LOWER)	32	40	83	51		SED, MET, SO, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05130103-015	PITMAN CREEK (UPPER)	11	40	32	18		SED, MET, SO, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05130103-016	CANEY CREEK	11	80	83	18		BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130103-017	OTTER CREEK	11	18	65	85	55	SED, CI, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130103-018	BEAVER CREEK	40	65	32			SED, NUTR, MET, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05130103-020	MEADOW CREEK	11	51	65	85		NUTR, SED	KNPS SURVEY, 1987	EVALUATED	
KY05130104-001	BIG SOUTH FORK	51	52	57	83		SO, SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05130104-002	CEDAR SINKING CREEK	11	23	51	55	65	NUTR, BACT, SED, CI	KNPS SURVEY, 1987	EVALUATED	
KY05130104-003	SINKING CREEK	11	23	51	55	65	NUTR, BACT, SED, CI	KNPS SURVEY, 1987	EVALUATED	
KY05130104-004	LITTLE SOUTH FORK	50	11	23	51	55	SED, CI, TDS, NUTR, BACT	KNPS, 1987; KDOW-IS, 1988-89	MONITORED	WAH-P
KY05130104-005	WOLF CREEK	51	52	57			SO, SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05130104-007	ROCK CREEK	50	51	52	57		pH, MET, SO, SED	KNPS, 1987; KDOW-IS, 1988-89	MONITORED	WAH, PCR
KY05130104-008	ROARING PAUNCH CREEK	51	52	57			pH, CI, TDS, SED, SO, MET	KNPS, 1987; KDOW-IS, 1991	MONITORED	WAH
KY05130104-009	BEAR CREEK	51	52				pH	KDOW-IS/NPS, 1991	MONITORED	WAH,PCR
KY05130105-002	SMITH CREEK	14	11	12	13	18	NUTR, BACT, SED, CI	KNPS SURVEY, 1987	EVALUATED	
KY05130105-002	SPRING CREEK	14	11	18	13	12	NUTR, BACT, SED	KNPS, 1987; KDOW, 1986c	EVALUATED	
KY05130105-003	ILLWILL CREEK	55	21	14	11	13	CI, TDS, NUTR, BACT, SED	KNPS, 1987; TN TECH, 1989	MONITORED	WAH-T

LAKES

KY05130101-003L01	LAUREL RIVER LAKE (HEADWTRS)	10	22	32			NUTR, SED	KNPS, 1987; KDOW, 1988b; USACOE, 1988-89	MONITORED	SCR-P
KY05130101-006L02	CORBIN RESERVOIR	10					NUTRIENTS	KDOW, 1988b; KDOW-LAKE, 1990-91	MONITORED	DWS
KY05130101-038L01	MARTINS FORK LAKE	52	51				SEDIMENT	KNPS, 1987; KDOW, 1988b; USACOE, 1982	EVALUATED	SCR-P
KY05130101-038L02	CRANKS CREEK LAKE	50					pH	KDOW-LAKE, 1990-91	MONITORED	WAH-P, SCR-P

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WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
SALT RIVER BASIN										
KY05140102-005	SALT RIVER	10	40	32			BACT,DO,NUTR,SED	KNPS,1987;KDOW-AMB,1990-91;KDOW-IS,1988-89	MONITORED	PCR, WAH-P
KY05140102-006	LONG LICK CREEK	21	32				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-011	FLOYDS FORK	40	74	65	32	14	DO,MET,SED,BACT,NUT	KNPS SURVEY, 1987; USGS,1991	MONITORED	WAH
KY05140102-012	CANE RUN	10	40				BACTERIA	KDOW, 1990a	EVALUATED	WAH-P
KY05140102-012	LONG RUN	10	40				BACTERIA	USGS, 1991	MONITORED	PCR
KY05140102-012	POPE LICK CREEK	40	10				BACTERIA	USGS, 1991	MONITORED	PCR
KY05140102-014	FLOYDS FORK	10	65	32	18	14	MET, SED, BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140102-015	SALT RIVER	10	11	18	32		SED, NUTR, DO, BACT	KNPS, 1987; KDOW,1990b	EVALUATED	WAH-P
KY05140102-016	COXS CREEK, EAST FORK	11	14	18	65		SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-016	COXS CREEK, WEST FORK	11	14	18			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-016	KIMBLY RUN	11	14	18			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-017	PLUM CREEK	11	18	32			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-018	EAST FK SIMPSON CREEK	11	14	18	40		MET, NUTR, SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-019	DUTCHMAN CREEK	11	18	32			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-019	ELK CREEK	11	18	32			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-019	GOOSE CREEK	11	18	32			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-020	BRASHEARS CREEK	11	18	23	32		SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-020	BUCK CREEK	11	18				SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-021	GUIST CREEK	11	18				SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-022	CLEAR CREEK	11	18	32	40		SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-023	BULLSKIN CREEK	11	18				SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-023	FOX RUN	11	18				SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-024	SALT RIVER	10					SED, NUTR, DO	KDOW, 1988-89	EVALUATED	WAH-P
KY05140102-026	BEECH CREEK	16	18	14	19	65	BACT, SED, NUTR	KNPS, 1987; KDOW-NPS,1990	MONITORED	PCR
KY05140102-027	CROOKED CREEK	65	16	18	14		BACTERIA	KDOW-NPS,1990	MONITORED	PCR
KY05140102-027	E. PRONG CREEK	11	18	32	14		SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140102-028	ASHES CREEK	16	18	14			BACTERIA	KDOW-NPS,1990	MONITORED	PCR
KY05140102-028	JACKS CREEK	16	18	14	19		BACT, SED, NUTR, MET	KNPS, 1987; KDOW-NPS,1990	MONITORED	PCR
KY05140102-028	TIMBER CREEK	16	18	14	19		BACTERIA	KNPS, 1987; KDOW, 1988b; KDOW-NPS, 1990	MONITORED	PCR

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WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KY05140102-029	SALT RIVER	16	18	14	65		BACT, NUTR, SED	KDOW-NFS/AMB, 1990-91	MONITORED	PCR, WAH-T
KY05140102-030	HAMMOND CREEK	16	18	11	14	32	SED, NUTRIENTS	KNPS SURVEY, 1987	EVALUATED	
KY05140102-031	SALT RIVER	16	18	14	65	32	BACT, SED, MET	KNPS, 1987; KDOW-NFS, 1990	MONITORED	PCR
KY05140102-033	SALT RIVER	16	18	40			BACT, SED, MET	KNPS, 1987; KDOW-NFS, 1990	MONITORED	PCR
KY05140103-001	ROLLING FORK	10	16	18	14	11	BACT, SED, NUTR	KNPS, 1987; USGS, 1990-91	MONITORED	PCR
KY05140103-005	ROLLING FORK	10	16	18	14	11	BACT, SED, NUTR	KNPS, 1987; KDOW-AMB, 1990-91	MONITORED	PCR
KY05140103-006	POTTINGER CREEK	11	14	18			SED, BACT, NUTR	KNPS SURVEY, 1987	MONITORED	PCR
KY05140103-007	CLEAR CREEK	11	14	18	62	80	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140103-007	OTTER CREEK	11	90				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140103-007	PANTHER CREEK	11	14	22	20	80	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140103-007	SALT LICK CREEK	11	90	22	20	80	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140103-007	THOMPSONS CREEK	11	90				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140103-011	LICK CREEK	11	12	18	14	65	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140103-012	BEECH FORK	10					BACTERIA	KNPS, 1987; KDOW-AMB, 1990-91	MONITORED	PCR-P
KY05140103-014	CARTWRIGHT CREEK	11	14	16	22	20	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140103-017	LONG LICK CREEK	10	20				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140103-019	CHAPLIN RIVER	11	14	18	20		SED, BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140103-020	GLENS CREEK	10	20				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140103-021	BEAVER CREEK	14	32	20			SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140103-023	DRY FORK OF CHAPLIN RIVER	11	14	12			SEDIMENT	KNPS SURVEY, 1987	EVALUATED	

LAKES

KY05140101-004L01	REFORMATORY LAKE	10	16	18			NUTRIENTS, DO	KDOW, 1988b; KDOW-LAKE, 1990-91	MONITORED	WAH-P
KY05140101-006L01	LAKE JERICHO	10					NUTRIENTS	KDOW-LAKE, 1990-91	MONITORED	WAH
KY05140102-021L01	GUIST CREEK LAKE	10	65				NUTRIENTS	KDOW, 1986c; KDOW-LAKE, 1990-91	MONITORED	DWS-P, WAH-P
KY05140102-022L01	SHELBY LAKE	10					NUTRIENTS	KDOW, 1988b; KDOW-LAKE, 1990-91	MONITORED	WAH-P
KY05140102-025L01	TAYLORSVILLE LAKE	16	18	14	32	65	NUTR, SED, BACT,	KNPS, 1987; USACOE, 1992	MONITORED	WAH
KY05140103-011L01	SYMPSON LAKE	16	11	14	18	65	NUTRIENTS	KDOW, 1988b; KDOW-LAKE, 1990-91	MONITORED	DWS

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WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
OHIO RIVER MINOR TRIBUTARIES										
KY05140101-001	BIG RUN CREEK	10	30				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140101-001	MILL CREEK	40	30	60	10		MET, BACT, SED	KNPS, 1987; USGS, 1991	MONITORED	PCR, WAH
KY05140101-002	BEARGRASS CREEK	40	60				SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05140101-002	M. FK BEARGRASS CREEK	40					BACT, DO	USGS, 1991	MONITORED	PCR, WAH
KY05140101-002	S. FK BEARGRASS CREEK	40					BACT, DO	USGS, 1991	MONITORED	PCR, WAH-P
KY05140101-002	MUDDY FK BEARGRASS CK	40					BACT, DO	USGS, 1991	MONITORED	PCR
KY05140101-004	HARRODS CREEK	11	14	30			SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140101-005	PRYOR BRANCH	11	14				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140101-005	CORN CREEK	11					SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140101-006	LITTLE KENTUCKY RIVER	11	14	18	32	40	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140101-006	WHITE SULPHUR FORK	11	14				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140101-007	LOCUST CREEK	11	18	32	40	14	NUTR, SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05140101-007	CAMP CREEK	11					SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140101-007	GILMORE CREEK	11	18	32	40		SED, NUTR, BACT, MET	KNPS SURVEY, 1987	EVALUATED	
KY05140101-007	SPRING CREEK	11					SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140101-007	BARB BONE CREEK	11					SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140101-007	PATTONS CREEK	11	14				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140101-007	MIDDLE CREEK	11	14				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140101-007	EIGHTEEN MILE CREEK	10					SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140101-007	POND, TAYLOR & BULL CREEKS	10					SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140104-001	SINKING CREEK	11	14	16	21		SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140104-004	OTTER CREEK	11	14	16	31	32	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140104-005	TIOGA CREEK	11	14	16	31	32	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140104-005	FRENCH CREEK	11	14	16	31	32	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140104-005	WOLF CREEK	11	14	16	31	32	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140104-005	SPRING CREEK	11	14	16	21	31	SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140104-005	YELLOW BANK CREEK	11	14	16	31	32	SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140104-005	LICK RUN	11	14	16	21		SEDIMENT	KNPS SURVEY, 1987	EVALUATED	

Green River Basin -- Nonpoint Source Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
GREEN RIVER BASIN										
KY05110001-001	GREEN RIVER	11	14				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-002	LITTLE REEDY CREEK	51	70	11	14	22	MET, SO., BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110001-003	BIG REEDY CREEK	11	16	14	51	77	MET, SO., BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110001-004	BEAR CREEK	11	16	14	51	13	SO., SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05110001-005	ALEXANDER CREEK	11	14				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-005	BEAVER DAM CREEK	11	14				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-005	BIG BULL CREEK	51	11	14	22	20	MET, SO., BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110001-005	CLAY LICK CREEK	10					SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-005	LITTLE BEAVER DAM CREEK	11	14				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-005	LITTLE BULL CREEK	51	11	14	22	20	MET, SO., BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110001-005	LOST CREEK	10					SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-009	BACON CREEK	10	11	18			BACT, SED, NUTR	KNPS, 1987; KDOW-AMB, 1990-91	MONITORED	PCR-P
KY05110001-010	NOLIN RIVER	11	18	32	21	16	NUTR, SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-012	VALLEY CREEK	40	11	15	18	32	DO, CI, TDS, NUT, SED, BACT	KNPS, 1987; KDOW-BIO, 1988	MONITORED	WAH
KY05110001-013	NOLIN RIVER	11	18	32	21	16	NUTR, SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-014	MIDDLE CREEK	11	15	18	32	90	NUTR, SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-016	McDOUGAL CREEK	11	90				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-017	WALTERS CREEK	11	90				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-019	LYNN CAMP CREEK	11	18	16	14	21	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110001-020	LITTLE BARREN RIVER	11	21	18	32	14	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110001-021	GREASY CREEK	11	14	16	18	21	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110001-021	TRAMMEL CREEK	11	14	16	18	65	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110001-024	GREEN RIVER	11	14	16	18	80	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-025	BRUSH CREEK	11	14	16	18	21	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110001-026	LITTLE PITMAN CREEK	10	62	11	64	65	CI, TDS, BACT, SED	KNPS, 1987; KDOW-IS, 1991	MONITORED	WAH-P
KY05110001-026	PITMAN CREEK	62	11	64	65	18	BACT, SED	KNPS SURVEY, 1987	EVALUATED	
KY05110001-027	RUSSELL CREEK	11	14	16	18	13	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-028	CANEY FORK	14	16	18	65	76	SED, NUTR, BACT, MET	KNPS SURVEY, 1987	EVALUATED	
KY05110001-030	RUSSELL CREEK	11	14	16	18	13	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	

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		1	2	3	4	5				
KY05110001-031	LITTLE RUSSELL CREEK	11	14	16	18	65	SED, NUTR, BACT, MET	KNPS SURVEY, 1987	EVALUATED	
KY05110001-032	GREEN RIVER	11	14	16	18	80	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-032	MEADOW CREEK	11	18	16	14	65	SED, NUTR, BACT, MET	KNPS SURVEY, 1987	EVALUATED	
KY05110001-034	ROBINSON TALLOW CREEK	11	18	14			SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110001-035	CASEY CREEK	11	13	80	16		SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110001-037	GREEN RIVER	11	13	18	14	21	SED, NUTR, MET, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05110002-001	BARREN RIVER	11	18	14			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05110002-002	LITTLE MUDDY CREEK	11	70	14	22	20	SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110002-003	GASPER RIVER	11	14	22	20	16	SED, SOLID WASTE, BACT, MET	KNPS SURVEY, 1987	EVALUATED	
KY05110002-007	WEST FORK DRAKES CREEK	11					SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110002-008	MIDDLE FORK DRAKES CREEK	11	62	55	14		SED, BACT	KNPS, 1987; ASCS, 1987; HLTH DEPT, 1987	EVALUATED	
KY05110002-008	SULPHUR FORK	11	14	80			SED, PEST	KNPS, 1987; ASCS, 1987	EVALUATED	
KY05110002-010	BARREN RIVER	11	18	14			SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05110002-011	BAYS FORK	11	56				pH, SED	KNPS SURVEY, 1987	EVALUATED	PCR
KY05110002-012	DOTY CREEK	16	14	18			BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110002-014	BEAVER CREEK	11	18	32	40		Cl, SED, MET	KDOW-NPS, 1990-91	MONITORED	PCR
KY05110002-015	SKAGGS CREEK	11	14	16	18	55	Cl, SED, MET	KNPS SURVEY, 1987	EVALUATED	
KY05110002-016	PETERS CREEK	11	18				SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110002-018	PATOKA CREEK	16	14	18			BACT, NUTR	KDOW-NPS, 1990-91	MONITORED	PCR
KY05110002-019	BARREN RIVER	11	14	22	20		SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110002-019	HUNGRY CREEK	10	80				SEDIMENT	KNPS, 1987; ASCS, 1987	EVALUATED	
KY05110002-019	PINCHGUT CREEK	11	14				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110002-019	PUNCHBON CREEK	10	80				SEDIMENT	KNPS, 1987; ASCS, 1987	EVALUATED	
KY05110002-022	EAST FORK BARREN RIVER	11	16				SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110002-022	MILL CREEK	14	23	32	11		SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110003-001	GREEN RIVER	51	11	80			SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05110003-002	LEWIS CREEK	51	10				SED, MET, pH, SO ₄ , Fe	KNPS SURVEY, 1987	EVALUATED	
KY05110003-003	CANEY CREEK	50					pH, METALS	KDOW-IS, 1981	EVALUATED	WAH-P, PCR-P
KY05110003-003	FOND CREEK	51	57	52	11	40	pH, MET, SED, SO ₄ , Fe	KNPS, 1987; KDOW-IS, 1981	EVALUATED	WAH, PCR
KY05110003-005	MUD RIVER	11	14	51	18	66	SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05110003-008	MUD RIVER	90	11	14	51	18	SED, MET, SO ₄ , ORG	KNPS, 1987; KDOW-AMB, 1990-91	MONITORED	WAH

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WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KY05110003-010	MUDDY CREEK	11	70	14	51	22	SED, pH, SO ₄ , Fe	KNPS SURVEY, 1987	EVALUATED	
KY05110003-011	INDIAN CAMP CREEK	70	11	51	14	22	SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05110003-012	WELCH CREEK	51	11	70	14	22	SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05110003-013	PANTHER CREEK	51	11	14	22	20	SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05110004-001	ROUGH RIVER	11	51				SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05110004-002	BARNETT CREEK	11	14				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110004-004	MUDDY CREEK	11	14	51			SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05110004-006	ADAMS FORK	11	14	22			SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110004-007	HALLS CREEK	11					SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110004-008	CANEY CREEK	11	16	71			BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110004-010	SHORT CREEK	11	16	71			BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110004-011	ROCK LICK CREEK	11	14	16	21		SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110004-014	FIDDLERS CREEK	11	14	16	21		SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110004-015	CLIFTY CREEK	11	16				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110004-016	MEETING CREEK	11	16	15	18	21	SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110004-017	LITTLE CLIFTY CREEK	11	16				SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110004-017	MUDDY PRONG	11	14	16	21		SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05110004-018	ROUGH CREEK	11	15	21	55		COND, SED, pH, Cl	KNPS SURVEY, 1987	EVALUATED	
KY05110005-001	GREEN RIVER	10	40	55	11		BACT, MET, SED, Cl	KNPS, 1987; ORSANCO, 1990-91	MONITORED	PCR
KY05110005-003	GREEN RIVER	10	40	55	11		BACT, MET, SED, Cl	KNPS, 1987; ORSANCO, 1990-91	MONITORED	PCR
KY05110005-004	LICK CREEK	51	11				SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05110005-006	PANTHER CREEK	10	70	11	80	14	SEDIMENT	KNPS, 1987; KDFWR, 1987	EVALUATED	WAH-P
KY05110005-007	W. FORK KNOBLICK CREEK	11	51	14			SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05110005-008	RHODES CREEK	11	80				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110005-009	NORTH FORK PANTHER CREEK	10	70	11	80	14	SEDIMENT	KNPS, 1987; KDFWR, 1987	EVALUATED	WAH-P
KY05110005-010	SOUTH FORK PANTHER CREEK	10	70	11	80	14	SEDIMENT	KNPS, 1987; KDFWR, 1987	EVALUATED	WAH
KY05110005-010	TWO MILE CREEK	11	14	80			SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110005-011	GREEN RIVER	10	40	55	11	80	BACT, MET, SED, NUTR, Cl, SO ₄	KNPS, 1987; ORSANCO, 1990-91	MONITORED	PCR
KY05110005-012	DEER CREEK	11	80	55	16	74	SED, NUTR, Cl	KNPS SURVEY, 1987	EVALUATED	
KY05110005-013	CASH CREEK	51	11				SED, SO ₄ , MET	KNPS SURVEY, 1987	EVALUATED	
KY05110005-013	DELAWARE CREEK	11	51	14			SEDIMENT	KNPS SURVEY, 1987	EVALUATED	

Green River Basin -- Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KY05110005-015	LONG FALLS CREEK	11	13	14	16	80	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05110005-016	BUCK CREEK	11	13	14	16	51	PEST, SED, BACT	KNPS, 1987; HLTH DEPT, 1987; ASCS, 1987	EVALUATED	
KY05110006-001	POND RIVER	51	10	71	11	90	BACT, SED, NUTR, pH, MET, SQ, Fe	KNPS, 1987; KDOW, 1981; KDOW-AMB, 1990-91	MONITORED	WAH-P, PCR-P
KY05110006-002	CYPRESS CREEK	50	51	13	14	16	pH, SED, NUTR, SQ, BACT, MET	KNPS, 1987; KDOW-IS, 1982	EVALUATED	WAH, PCR
KY05110006-002	HARRIS BRANCH	50					pH	KDOW-IS, 1982	EVALUATED	WAH, PCR
KY05110006-003	OTTER CREEK	80	74	11			SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110006-004	ELK CREEK	80	74	11			SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05110006-005	FLAT CREEK	50	51	57	11		pH, SED, MET, SO ₄	KNPS, 1987; KDOW-IS, 1982	EVALUATED	WAH, PCR
KY05110006-006	DRAKES CREEK	50	11	51	80	74	pH, SED, SO ₄ , Fe	KNPS, 1987; KDOW-IS, 1982	EVALUATED	WAH, PCR
KY05110006-008	WEST FORK POND RIVER	11	80	74	51		SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05110006-009	POND RIVER	90					METALS	KDOW-AMB, 1989	MONITORED	WAH-P
KY05110006-013	EAST FORK POND RIVER	11	21	80	83	55	SED, Cl	KNPS SURVEY, 1987	EVALUATED	

LAKES

KY05110001-022L01	METCALFE COUNTY LAKE	10	86				NUTRIENTS	KDOW-LAKE, 1990-91	MONITORED	WAH-P, SCR-P
KY05110001-026L01	CAMPBELLSVILLE RESERVOIR	10					NUTRIENTS	KDOW, 1988b; KDOW-LAKE, 1990-91	MONITORED	WAH-P
KY05110003-007L01	SPA LAKE	10					NUTRIENTS	KDOW-LAKE, 1990-91	MONITORED	WAH-P
KY05110004-007L01	LAKE WASHBURN	90					NUTRIENTS	KDOW-LAKE, 1990-91	MONITORED	WAH-P

OHIO RIVER MINOR TRIBUTARIES

KY05140201-001	PUP CREEK	11	51	14			SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05140201-002	BLACKFORD CREEK	51	11	14	22	16	SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05140201-003	LEAD CREEK	11	14	22			SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140201-004	CLOVER CREEK	11	14	22	16	21	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140201-004	INDIAN CREEK	11	14	22	16	21	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140201-005	FULKERSON & HORSEMAN DITCH	11	40	32	80		SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140201-005	PANTHER CREEK	11	14	22			SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140201-005	TOWN CREEK	11	14	16	21		SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140201-005	YELLOW CREEK	40	11	65			SED, BACT	KNPS SURVEY, 1987	EVALUATED	

Lower Cumberland and Tradewater River Basins -- Nonpoint Source Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
LOWER CUMBERLAND RIVER BASIN										
KY05130205-002	SANDY CREEK	14	11	30			SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05130205-003	CLAY LICK CREEK	11	14	57	30		BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130205-004	LIVINGSTON CREEK	11	14	16	21	20	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130205-005	HICKORY CREEK	11	14	21			SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05130205-005	RICHLAND CREEK	14	11				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05130205-005	SUGAR CREEK	51	11	14			SED, PH, SO ₄ , Fe	KNPS SURVEY, 1987	EVALUATED	
KY05130205-007	DRY FORK CREEK	11	16	18	14	21	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05130205-008	LITTLE RIVER	10	11	14	16	21	SED, NUTR, BACT, MET	KNPS, 1987; KDOW-IS, 1988; KDOW-AMB, 1990-91	MONITORED	WAH-P
KY05130205-009	NORTH FORK LITTLE R.	10	11	31	32	80	BACT, SED, NUTR	KNPS, 1987; KDOW-IS, 1988	MONITORED	PCR, WAH-P
KY05130205-010	SOUTH FORK LITTLE R.	10	11	31	32	80	SED, NUTR	KNPS, 1987; KDOW-IS, 1988	MONITORED	WAH-P
KY05130205-011	SINKING FORK	10	11	14	16	21	SED, NUTR, BACT	KNPS, 1987; KDOW-IS, 1988	MONITORED	WAH-P
KY05130205-014	MUDDY FORK	11	14	16	21	20	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05130205-016	SALINE CREEK	11	14	16	21	20	SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05130206-001	MONTGOMERY CREEK	11	14	16	21	20	SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130206-002	ELK FORK	11	31	32	80	21	MET, BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130206-003	RED RIVER	10	11	14	40	80	DO, BACT, SED, NUT, MET	KNPS, 1987; KDOW-IS, 1982	MONITORED	WAH
KY05130206-004	WHIPPOORWILL CREEK	11	16	18			SED, BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130206-005	SOUTH FORK RED R.	11	16	21	80		SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130206-006	PLEASANT RUN	11	16				SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05130206-008	SPRING CREEK	11	80	18	21		MET, BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
LAKES										
KY05130205-009L02	MORRIS LAKE	10					NUTRIENTS	KDOW, 1988b; KDOW-LAKE, 1990-91	MONITORED	DWS-P
KY05140203-004L01	LAKE GEORGE	10					NUTRIENTS	KDOW-LAKE, 1990-91	MONITORED	WAH-P
KY05140205-008L02	LOCH MARY LAKE	50					MET, INORGANICS	KDOW-LAKE, 1990-91	MONITORED	DWS
TRADEWATER RIVER BASIN										
KY05140205-001	TRADEWATER RIVER	50	10	11	30	51	DO, SED, MET, PH, SO ₄ , COND	KNPS, 1987; KDOW-IS, 1981	EVALUATED	WAH-P
KY05140205-002	CYPRESS CREEK	50	10				PH, SEDIMENT	KDOW-IS, 1981	EVALUATED	WAH-P, PCR-P
KY05140205-002	SMITH DITCH	50	10	11	14	51	PH, SED, NUT, MET, SO ₄	KNPS, 1987; KDOW-IS, 1981	EVALUATED	WAH-P, PCR-P

Lower Cumberland and Tradewater River Basins -- Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
KY05140205-003	CRAB ORCHARD CREEK	50	10	11	51	52	pH, MET, SED, SO ₄	KNPS, 1987; KDOW-IS, 1981	EVALUATED	WAH
KY05140205-003	VAUGHN DITCH	50	10				pH, MET, SED, SO ₄	KDOW-IS, 1981	EVALUATED	WAH
KY05140205-005	TRADEWATER RIVER	50	10	11	74	21	DO, SED, MET, SO ₄	KNPS, 1987; KDOW-IS, 1981	EVALUATED	WAH-P
KY05140205-006	BUTLER CREEK	10	30				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140205-008	CLEAR CREEK	50	10	51	11	55	pH, SED, SO ₄ , COND	KNPS, 1987; KDOW-IS, 1981	MONITORED	WAH, PCR
KY05140205-008	LICK CREEK	50	10				pH, SEDIMENT	KDOW-IS, 1981	EVALUATED	WAH, PCR
KY05140205-008	WEIRS CREEK	50	10				pH, SEDIMENT	KDOW-IS, 1981	EVALUATED	WAH-P, PCR-P
KY05140205-009	TRADEWATER RIVER	50	10	11	74	21	DO, SED, MET, SO ₄	KNPS, 1987; KDOW-IS, 1981; KDOW-AMB, 1990-91	MONITORED	WAH-P
KY05140205-010	DONALDSON CREEK	11	21				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140205-011	WARD CREEK	11	21				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140205-012	TRADEWATER RIVER	50	10	11	74	21	DO, SED, MET, SO ₄	KNPS, 1987; KDOW-AMB/BIO, 1990-91	MONITORED	WAH-P
KY05140205-013	MONTGOMERY CREEK	11	21				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140205-015	CANEY CREEK	51	10	80	74	11	pH, SED, SO ₄ , COND	KNPS, 1987; KDOW-IS, 1981	EVALUATED	PCR, WAH
KY05140205-016	BUFFALO CREEK	50	10	51	80	74	pH, SED, SO ₄ , COND	KNPS, 1987; KDOW-IS, 1981	EVALUATED	WAH, PCR
KY05140205-017	SANDLICK CREEK	11					SEDIMENT	KNPS SURVEY, 1987	EVALUATED	

OHIO RIVER MINOR TRIBUTARIES

KY05140202-001	LOST CREEK	11	14	55			SEDIMENT, CI	KNPS SURVEY, 1987	EVALUATED	
KY05140202-001	SIBLEY CREEK	77	55				SEDIMENT, CI	KNPS SURVEY, 1987	EVALUATED	
KY05140202-002	HIGHLAND CREEK	11	55	16	14	80	SEDIMENT, CI	KNPS SURVEY, 1987	EVALUATED	
KY05140202-006	CANOE CREEK	10	70	40	11	55	SEDIMENT, CI	KNPS, 1987; KDFWR, 1987	EVALUATED	WAH-P
KY05140203-001	SUGARCAMP CREEK	11	14				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140203-002	DEER CREEK	11	14	57	30		SED, MET, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05140203-003	CANEY FORK	10	30				SED, pH, Fe, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05140203-003	HURRICANE CREEK	10	30				SED, pH, Fe, SO ₄	KNPS SURVEY, 1987	EVALUATED	
KY05140203-004	CROOKED CREEK	10	30	40	63		SED, METALS	KNPS SURVEY, 1987	EVALUATED	
KY05140203-005	EAGLE CREEK	11	14	16			NUTR, SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140203-006	GOOSE POND DITCH	11	14	72			SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140203-007	BUCK CREEK	14	11				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140203-007	CAMP CREEK	10	30				SEDIMENT	KNPS, 1987; KDOW, 1986c	EVALUATED	
KY05140203-007	CANEY CREEK	11	14				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	
KY05140203-007	LONG BRANCH	11	14				SEDIMENT	KNPS SURVEY, 1987	EVALUATED	

Tennessee and Mississippi River Basins -- Nonpoint Source Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
TENNESSEE RIVER BASIN										
KY06040005-004	CLEAR CREEK	11	14	16	18	21	SED, BACT, NUTR, MET	KNPS SURVEY, 1987	EVALUATED	
KY06040005-004	WILDCAT CREEK	11	14	16	18	21	SED, BACT, NUTR, MET	KNPS SURVEY, 1987	EVALUATED	
KY06040006-002	ISLAND CREEK	11	14	31	32		SED, MET, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY06040006-006	CLARKS RIVER	10					NUTR, SED	KDOW-AMB, 1990-91	MONITORED	WAH-P
KY06040006-009	EAST FORK CLARKS RIVER	11	14	16	18	21	SED, MET, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY06040006-011	WEST FORK CLARKS RIVER	11	14	16	18	21	SED, MET, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY06040006-013	JOHNS CREEK	11					SED	KNPS SURVEY, 1987	EVALUATED	
KY06040006-013	CYPRESS CREEK	40					PCB	KDOW-IS, 1987	MONITORED	WAH
MISSISSIPPI RIVER BASIN										
KY08010100-001	HAZEL CREEK	11	14	16	80		SED	KNPS SURVEY, 1987	EVALUATED	
KY08010100-001	SHAWNEE CREEK	11	14	16	20	40	BACT, SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY08010201-002	BACK SLOUGH CREEK	11					SED	KNPS SURVEY, 1987	EVALUATED	
KY08010201-002	TRUMAN CREEK	11					SED	KNPS SURVEY, 1987	EVALUATED	
KY08010201-003	WEST FORK MAYFIELD CREEK	11	51	18			SED, NUTR, MET	KNPS SURVEY, 1987	EVALUATED	
KY08010201-010	OBION CREEK	11	30	18			SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY08010201-015	KNOBB CREEK	11	18				SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY08010201-016	OBION CREEK	11	30	18			SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY08010201-017	BRUSH CREEK	11	18				SED, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY08010201-018	BAYOU DE CHIEN	11	70	18	90		NUT, SED, MET, BACT, ORG	KNPS, 1987; KDOW-BIO, 1987; KDOW-AMB, 1990-91	MONITORED	WAH-P
KY08010201-018	RUSH CREEK	11					SED	KNPS SURVEY, 1987	EVALUATED	
KY08010201-019	LITTLE MUD CREEK	11	80	71	72	74	SED	KNPS SURVEY, 1987	EVALUATED	
KY08010201-019	MUD CREEK	11	80	71	72	74	SED, BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY08010201-020	LITTLE BAYOU DE CHIEN	11	80				SED	KNPS SURVEY, 1987	EVALUATED	
KY08010201-021	CANE CREEK	11	18	80	30		NUTR, SED, BACT	KNPS SURVEY, 1987	EVALUATED	
KY08010202-003	TERRAPIN CREEK	11	14	16	18	21	SED, MET, BACT, NUTR	KNPS SURVEY, 1987	EVALUATED	

Tennessee and Mississippi River Basins -- Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
		1	2	3	4	5				
OHIO RIVER MINOR TRIBUTARIES										
KY05140206-001	CLAYTON CREEK	11	14	16	20	32	SED, BACT, NUTR, MET, SO,	KNPS SURVEY, 1987	EVALUATED	
KY05140206-001	HUMPHREY BRANCH	90	10				SED	KDOW-IS, 1984	EVALUATED	WAH-P
KY05140206-001	HUMPHREY CREEK	10	70				SED	KDOW-IS, 1984	EVALUATED	WAH-P
KY05140206-002	BAYOU CREEK	60	11	14	32	40	ORG, SED, MET, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140206-002	LITTLE BAYOU CREEK	66	11	14	32	40	ORG, PCB, SED, MET, NUTR, BACT	KNPS SURVEY, 1987; UK, 1989	MONITORED	WAH
KY05140206-003	MASSAC CREEK	11	14	16	32	40	SED, MET, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140206-004	PERKINS CREEK	11	14	31	32		SED, MET, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	
KY05140206-005	NEWTONS CREEK	11	14	16	80		SED, NUTR	KNPS SURVEY, 1987	EVALUATED	
KY05140206-005	REDSTONE CREEK	11	14	16	20	31	SED, MET, NUTR, BACT	KNPS SURVEY, 1987	EVALUATED	

* - P = partial support, - T = threatened

Nonpoint Source Impacted Groundwaters

HYDROLOGIC SYSTEM	COUNTY OR REGION	NPS CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED OR EVALUATED
ALLUVIAL AQUIFER NEAR CALVERT CITY	MARSHALL	11 62 63 64 65	MET, VOC, PEST	KDOW, 1988a	MONITORED
ALLUVIAL AQUIFER NEAR LOUISVILLE	JEFFERSON	90	ORGANICS	DAVIS & MTHWS, 1983	EVALUATED
ALLUVIAL G'WATER SYSTEMS OVERLYING PENN- SYLVANIAN SHALE, LIMESTONE, & SANDSTONE	DAVISS, HOPKINS	10 11 12 18 19	PEST, NUTR, NO ₃ , TSS, BACT	UK, 1991	MONITORED
ANVIL AQUIFER	UNION	52 86	Fe, SO ₄ , TDS, TSS	FICKLE, 1991	EVALUATED
AQUIFER NEAR RUSSELLVILLE	LOGAN	64 66 61	PCB, METALS	HAZTECH, 1986	EVALUATED
BIG SINKING OIL FIELD AQUIFERS	ESTILL, POWELL, LEE, WOLFE	55	pH, COND, TDS, Cl, Br, SO ₄ , Na, Ca, TOC	SMC MARTIN, 1983	EVALUATED
CENTRAL KENTUCKY KARST REGION	CENTRAL KY KARST REGION	65	BACTERIA	QUINLAN & ROWE, 1977	EVALUATED
CHLOE CREEK GROUNDWATER BASIN	PIKE	52	ACID	KDOW, 1986d	EVALUATED
DOUBLE SINK GROUNDWATER BASIN	EDMONSON	10 20	SED, PEST	LEITHEUSER, 1988	EVALUATED
DRAKES CREEK KARSTIC AQUIFER	SIMPSON	60	PCB	CRAWFORD, 1985	EVALUATED
GARRETT SPRING	JESSAMINE, WOODFORD	11 12 13 14 20	TSS, COND, Ca, Mg, Cl, NO ₃ , SO ₄ , BACT	UK WRRI, 1990	MONITORED
GARRETT SPRING GROUNDWATER BASIN	JESSAMINE, WOODFORD	32 68	TSS, SED, BACT	UK, 1991	MONITORED
GATEWAY A.D.D. AQUIFER	ROWAN, MONT., BATH, MEN., MORGAN	11 65	BACTERIA	KDOW - KGS, 1988	MONITORED
G'WATER IN LOESS OVERLYING COASTAL PLAIN DEPOSITS-PURCHASE PHYSIOGRAPHIC REGION	HICKMAN	10 11 12 18 19	PEST, NUTR, NO ₃ , BACT	UK, 1991	MONITORED
HARRIS SPRINGS GROUNDWATER BASIN	WARREN	30 40	SED, TDS, TSS	WARREN CO. CD., 1991	EVALUATED
HIDDEN RIV. G'WATER BASIN NEAR HORSE CAVE	HART	64 65	CYANIDE, METALS	KDOW, 1986d	EVALUATED
INNER BLUEGRASS KARST AQUIFERS	AND., BOYLE, BOUR., CLARK, FAY., FRAN GAR., JESS., MAD., MER., SCOTT, WOOD.	10 40	BACT, NITRATES	SCANLON, 1985	EVALUATED
LOST RIVER	WARREN	32 40 61 62 63	ORG, VOC, FUEL	CRAWFORD, 1982 & 1986	EVALUATED
LOUISVILLE AQUIFER	JEFFERSON	65	BACTERIA	USEPA, 1981 - 1982	EVALUATED
MAMMOTH CAVE REGION GROUNDWATER BASIN	EDM., HART, BARREN, WARR, GRAYSON	16 18 19 11 14	NUT, SED, PEST, BACT, NO ₃ , Cl	USEPA, 1981; KDOW- NFS, 1991a; NFS, 1991	EVALUATED
McCOY BLUE SPRING GROUNDWATER BASIN	HART, BARREN, EDMONSON	10 20 55	SED, PEST, Cl	LEITHEUSER, 1988	EVALUATED
MILL CREEK GROUNDWATER BASIN	JEFFERSON	65	BACTERIA	USEPA, 1982	EVALUATED

Nonpoint Source Impacted Groundwaters (Cont'd.)

HYDROLOGIC SYSTEM	COUNTY OR REGION	NPS CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED OR EVALUATED
		1	2	3	4	5			
MILL HOLE SUBBASIN OF TURNHOLE SPR. BASIN	BARREN, EDMONSON	55	10	20			SO ₄ , Cl, COND, TSS	QUINLAN & ROWE, 1978; KDOW-NPS, 1991a	EVALUATED
MISSISSIPPIAN KARST G'WATER SYSTEMS OF THE WESTERN PENNYROYAL PHYSIOG. REGION	LOGAN, TODD	10	11	12	18	19	PEST, NUTR, NO ₃ , TSS, BACT	UK, 1991	MONITORED
MISSISSIPPIAN LIMESTONE G'WATER SYSTEMS OF THE EASTERN PENNYROYAL PHYSIOG. REGION	RUSSELL	10	11	12	18	19	PEST, NUTR, NO ₃ , TSS, BACT	UK, 1991	MONITORED
NORTH FORK KENTUCKY RIVER GWATER BASIN	LEE, BREATHTITT, PERRY	51					METALS, ACID	DYER, 1983	EVALUATED
OHIO R. ALLUVIAL AQUIFER; PIRITH SPR. & HEAD OF ROUGH SPR. G'WATER BASINS	HARDIN	10	30	60			TSS, Cl, SO ₄ , OIL-GREASE, COND, Na, Ca, Fi, FUEL, ALK	USGS, 1990	EVALUATED
OHIO VALLEY ALLUVIAL AQUIFER	HANCOCK	60					FI, CYANIDE	ENV. RES. MGT, 1980	EVALUATED
ORDOVICIAN KARST GROUNDWATER SYSTEMS OF THE INNER BLUEGRASS PHYSIOGRAPHIC REGION	BOURBON, JESSAMINE, WOODFORD	10	11	12	18	19	PEST, NUTR, NO ₃ , TSS, BACT	UK, 1991	MONITORED
ORDOVICIAN KARST GROUNDWATER SYSTEMS OF THE OUTER BLUEGRASS PHYSIOGRAPHIC REGION	FLEMING, SHELBY	10	11	12	18	19	PEST, NUTR, NO ₃ , TSS, BACT	UK, 1991	MONITORED
PIKE SPRING GROUNDWATER BASIN	HART, BARREN, EDMONSON	10	20				SED, PEST	LEITHEUSER, 1988	EVALUATED
PLEASANT GROVE SPRING BASIN	LOGAN	10	11	12	18	19	NUTR, SED, PEST, BACT, NO ₃	UK, 1991	EVALUATED
ROYAL SPRING AQUIFER	SCOTT	11	14	16	18	61	BACTERIA	ROSS, et al., 1978	EVALUATED
SLOANE VALLEY KARSTIC AQUIFER	PULASKI	61	63	51			METALS	FERRY, 1984	EVALUATED
SUDS SPRING GROUNDWATER BASIN	HART, BARREN, EDMONSON	10	20	55			SED, PEST, Cl	LEITHEUSER, 1988	EVALUATED
TURNHOLE SPRING GROUNDWATER BASIN	EDMONSON, BARREN	10	20				SED, PEST	LEITHEUSER, 1988; KDOW-NPS, 1991a	EVALUATED
UNNAMED AQUIFER	LIVINGSTON, MARSHALL, McCRACKEN	10	65				BACT, NITRATES	KDOW, 1988a	MONITORED
UNNAMED GROUNDWATER BASIN	JOHNSON & MARTIN	52					METALS, ACID	MULL, ET AL., 1981	EVALUATED
UNNAMED GROUNDWATER BASIN	CHRISTIAN	90					BACTERIA	MUENDEL, 1980	EVALUATED
UNNAMED GROUNDWATER BASIN	JEFFERSON	65					BACTERIA	USEPA, 1983	EVALUATED
UNNAMED GROUNDWATER BASINS	FLOYD, HARLAN, PIKE, WHITLEY	51					TSS, TDS, SO ₄ , pH, Fe, ALK, COND	KGS, 1991	MONITORED
UNNAMED G/W BASIN NEAR BOWLING GREEN	WARREN	90					ORGANICS	KDOW, 1986d	EVALUATED
UNNAMED G'WATER BASIN NEAR PRINCETON	CALDWELL	90					INORGANICS	PLEBUCH, 1976	EVALUATED
UNNAMED GROUNDWATER SITE	MAGOFFIN	90						PEAK AND THIET	EVALUATED

Nonpoint Source Impacted Groundwaters (Cont'd.)

HYDROLOGIC SYSTEM	COUNTY OR REGION	NPS CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED OR EVALUATED
		1	2	3	4	5			
UNNAMED GROUNDWATER SITE	MONTGOMERY	90					OIL-GREASE	KDOW, 1986d	EVALUATED
UNNAMED G'W SITE NEAR BRUSHY ELEM SCH.	PIKE	90					FUEL	DOW, 1986d	EVALUATED
UNNAMED GWATER SITE NEAR CAMPBELLSVILLE	TAYLOR	90					FUEL	KDOW, 1986d	EVALUATED
UNNAMED G'WATER SITE NEAR ELIZABETHTOWN	HARDIN	84					INORGANICS	LAMBERT, 1979	EVALUATED
UNNAMED G'WATER SITE NEAR ELIZABETHTOWN	HARDIN	90					ORGANICS	MULL & LYVERSE, 1984	EVALUATED
UNNAMED G'WATER SITE NEAR ELIZABETHTOWN	HARDIN	10					NUTRIENTS	DOW, 1986d	EVALUATED
UNNAMED G'WATER SITE NEAR FORT KNOX	HARDIN	90					FUEL	DOW, 1986d	EVALUATED
UNNAMED G'WATER SITE NEAR FRANKFORT	FRANKLIN	90					FUEL	DOW, 1986d	EVALUATED
UNNAMED GROUNDWATER SITE NEAR I-65	HART	82					OIL-GREASE	DOW, 1986d	EVALUATED
UNNAMED G'WATER SITE NEAR LEXINGTON	FAYETTE	90					FUEL	DOW, 1986d	EVALUATED
UNNAMED G'WATER SITE NEAR LEXINGTON	FAYETTE	90					ORGANICS	FAUST, 1980	EVALUATED
UNNAMED GROUNDWATER SITE NEAR LIGON	FLOYD	90						KY FAIR TAX COALITION, 1983	EVALUATED
UNNAMED G'WATER SITE NEAR LOUISVILLE	JEFFERSON	90					FUEL	DOW, 1986d	EVALUATED
UNNAMED-IN DOUBLE SPRINGS DRAINAGE BASIN	WARREN	65					BACTERIA	SCHINDEL, 1984	EVALUATED
UNNAMED KARST AQUIFERS	BOUR., CLARK, FAY., JESS., SCOTT, WOOD	10					TSS, PEST, COND, NO ₃ , SO ₄ , CI	USGS, 1977	EVALUATED
UNNAMED KARST AQUIFERS	WARR, HARDIN, HART, PUL., EDMONSON	40					ORGANICS	CRAWFORD & GRAVE, 1984	EVALUATED
UNNAMED SPRING GROUNDWATER BASIN	HART, BARREN, EDMONSON	10 20 55					SED, PEST, CI	LEITHEUSER, 1988	EVALUATED

* COUNTY ABBREVIATIONS *

AND. = ANDERSON
BOUR. = BOURBON

EDM. = EDMONSON
FAY. = FAYETTE
FRAN. = FRANKLIN
GAR. = GARRARD

JESS = JESSAMINE
MAD. = MADISON
MEN. = MENIFEE
MER. = MERCER

MONT. = MONTGOMERY
PUL. = PULASKI
WARR. = WARREN
WOOD. = WOODFORD

Nonpoint Source Impacted Wetlands

HYDRO-LOGIC CODE	WETLANDS NAME (RIVER BASIN)	COUNTY	NPS CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED
			1	2	3	4	5			
05070201	BEAR CREEK (BIG SANDY)	PIKE	51					SED, pH, MET, COND, SO ₄ , Na	KNPC, 1979	EVALUATED
05070202	ELKHORN CREEK (BIG SANDY)	PIKE	51					SED, COND, SO ₄ , MET, Na	KNPC, 1979	EVALUATED
05070203	JENNY CREEK (BIG SANDY)	JOHNSON	51	52				COND, SO ₄ , MET, Na, SED	KNPC, 1979	EVALUATED
05070203	LEVISA FORK (BIG SANDY)	JOHNSON	51	52				SED, COND, SO ₄ , MET, ALK	KNPC, 1979	EVALUATED
05070203	RIGHT FK BEAVER CK (BIG SANDY)	FLOYD	51					COND, SO ₄ , Na, METALS	KNPC, 1979	EVALUATED
05070203	ROCKCASTLE CREEK (BIG SANDY)	MARTIN	51	52				SED, MET, SP COND, SO ₄ , Na	KNPC, 1979	EVALUATED
05070203	SPURLOCK CREEK (BIG SANDY)	FLOYD	51	52	50			SO ₄ , METALS, Na, pH, SED	KNPC, 1979	EVALUATED
05070204	BLAINE CREEK (BIG SANDY)	LAWRENCE	55	51	71			COND, METALS, Cl, Na	KNPC, 1979	EVALUATED
05090103	SCHULTZ CREEK (OHIO)	GREENUP	31					SEDIMENT	KDOW, 1991a	EVALUATED
05090104	EAST FORK LITTLE SANDY RIVER	BOYD	51					SP COND, SO ₄ , Na, MET	KNPC, 1979	EVALUATED
05100101	LICKING RIVER	MAGOFFIN	51	10	16	71		SED, NUT, SO ₄ , MET, COND	KNPC, 1979	EVALUATED
05100201	BUCHHORN CREEK (KENTUCKY)	BREATHITT	51					METALS, SO ₄ , SP COND	KNPC, 1979	EVALUATED
05100201	CARR FORK (KENTUCKY)	KNOTT	51	52				SED, MET, SO ₄ , Na, SP COND	KNPC, 1979	EVALUATED
05100201	SQUABBLE CREEK (KENTUCKY)	PERRY	51	71	62			SED, SO ₄ , MET, Na, COND, BACT, NUT	KNPC, 1979	EVALUATED
05100201	TROUBLESOME CREEK (KENTUCKY)	PERRY	51					SP COND, SO ₄ , MET, Na	KNPC, 1979	EVALUATED
05100203	BUCK CREEK (KENTUCKY)	OWSLEY	51	10				SEDIMENT, SO ₄ , METALS	KNPC, 1979	EVALUATED
05100203	GOOSE CREEK (KENTUCKY)	CLAY	51					SEDIMENT	KNPC, 1979	EVALUATED
05100204	STURGEON CREEK (KENTUCKY)	LEE	51	10				SEDIMENT	KNPC, 1979	EVALUATED
05110003	BEECH CREEK (GREEN)	MUHLBERG	51	71	76	78		SED, pH, SP COND, SO ₄ , DO	USEPA, 1990	MONITORED
05110003	BIG MUDDY CREEK (GREEN)	BUTLER	11	70				SEDIMENT	KDOW, 1991a	EVALUATED
05110003	BULL RUN (GREEN)	OHIO	11	70				SED, TSS	USEPA, 1990	EVALUATED
05110003	DOOLIN LAKE SWAMP	BUTLER	20					SEDIMENT	KNPC, 1980b	EVALUATED
05110003	GREEN RIVER	MUHL., BUTLER, OHIO	11	78				TSS, SED	USEPA, 1990	EVALUATED
05110003	LEWIS CREEK (GREEN)	OHIO, MUHLBERG	51					TSS, SO ₄ , MET, COND, pH	USEPA, 1990; MITSCH, et al., 1983	MONITORED
05110003	LITTLE MUDDY CREEK SWAMP	BUTLER	20					SEDIMENT	KNPC, 1980b	EVALUATED
05110003	MUD RIVER (GREEN)	BUTLER, LOGAN	14	55				Cl, SED	USEPA, 1990; KNPC, 1981	EVALUATED
05110003	POND CREEK (GREEN)	OHIO, MUHLBERG	51	71	76	78	21	SED, COND, pH, SO ₄ , DO, MET, Fe, ACID	USEPA, 1990; MITSCH, et al., 1983; KNPC, 1980b & 1981	MONITORED
05110003	ROCKY CREEK (GREEN)	MUHLBERG	51					SO ₄	USEPA, 1990; KNPC, 1981	MONITORED
05110004	MUDDY CREEK (GREEN)	OHIO, BUTLER	21	71	65	51	10	SED, BACT, SO ₄ , PEST, Cl,	USEPA, 1990; KNPC, 1981 & 1980b	MONITORED
05110004	ROCK HOUSE SLOUGH (GREEN)	OHIO	10	74				SEDIMENT	KNPC, 1980b	EVALUATED
05110004	UNNAMED WETLAND-E OF DUNDEE	OHIO	20	74				SEDIMENT	KNPC, 1980b	EVALUATED
05110004	UNNAMED WETLAND-SW OF DUNDEE	OHIO	70	74	20	51	55	SEDIMENT	KNPC, 1980b	EVALUATED
05110005	ABE CREEK WETLANDS	McLEAN	20	74	71			SEDIMENT	KNPC, 1980b	EVALUATED
05110005	BUCK CREEK SWAMP	McLEAN	10					SEDIMENT	KNPC, 1980b	EVALUATED

Nonpoint Source Impacted Wetlands (Cont'd.)

HYDRO-LOGIC CODE	WETLANDS NAME (RIVER BASIN)	COUNTY	NPS CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED
			1	2	3	4	5			
05110005	LONG FALLS CREEK (GREEN)	McLEAN	51	55	10	71	SP COND, CI, SO ₄ , SED	KNPC, 1980b	EVALUATED	
05110005	MOSLEYVILLE SLOUGH	DAVISS	51	71	10		COND, SO ₄ , Fe, Mn	KDOW, 1981	EVALUATED	
05110005	PANTHER CREEK WETLANDS (GREEN)	DAVISS, OHIO	20	23	10	51	SEDIMENT	KNPC, 1980b; USEPA, 1990	EVALUATED	
05110005	RICHMOND SLOUGH	DAVISS, HENDERSON	55	11	14		SEDIMENT, CI	KNPS SURVEY, 1987	EVALUATED	
05110005	UNNAMED SLOUGH-ALONG KY 136	HENDERSON	55				SPECIFIC CONDUCTANCE, CI	KNPC, 1981	EVALUATED	
05110005	UNNAMED WETLANDS-W OF RACE CK	HENDERSON	11	14			SEDIMENT	KNPC, 1980b	EVALUATED	
05110006	CYPRESS CREEK (GREEN)	McLEAN, MUHL	51	71	73	11 77	TSS, SO ₄ , pH, COND, Mn, Fe, ACID, SED	MITSCH, 1982 & 1985; BOSSERMAN, 1985; USEPA, 1990	MONITORED	
05110006	DEER CREEK (GREEN)	WEBSTER	10	55	71	80	METALS, SOLID WASTE	KDOW, 1981; KNPC, 1980b	EVALUATED	
05110006	DRAKES CREEK (GREEN)	HOPKINS, CHRISTIAN	51				pH, SP COND, SED, SO ₄	MITSCH, et al., 1983; USEPA, 1990	MONITORED	
05110006	FLAT CREEK WETLANDS	HOPKINS	50				SP COND, SO ₄ , BACT	USEPA, 1990; KNPC, 1980b	MONITORED	
05110006	FLAT CREEK (GREEN)	HOPKINS	51	52	57		SO ₄ , SP COND, pH	MITSCH, et al., 1983; KNPC, 1981	EVALUATED	
05110006	ISAACS & IRWIN CREEKS (GREEN)	MUHLBERG	51	70			SED, pH, COND, SO ₄	USEPA, 1990	EVALUATED	
05110006	JARRELLS CREEK (GREEN)	MUHLBERG	20	11			SEDIMENT	USEPA, 1990	EVALUATED	
05110006	LITTLE CYPRESS CREEK	OHIO	51	52	57		SP COND, SO ₄ , Fe, Mn	MITSCH, et al., 1983	EVALUATED	
05110006	LOG CREEK (GREEN)	MUHLBERG	11	70			SEDIMENT	USEPA, 1990	EVALUATED	
05110006	LONG CREEK (GREEN)	MUHLBERG	51	71	10		SEDIMENT	USEPA, 1990	EVALUATED	
05110006	LONG POND (GREEN)	CHRIS., MUHL, HOPK	51	52	57	11 76	SED, SP COND, MET	MITSCH, et al., 1983; KNPC, 1980 & 1981; KDOW, 1989	EVALUATED	
05110006	OTTER CREEK (GREEN)	HOPKINS	11	51	71		SEDIMENT, TSS	USEPA, 1990	EVALUATED	
05110006	PLEASANT RUN (GREEN)	HOPKINS	51				pH, COND, SED, SO ₄	USEPA, 1990	MONITORED	
05110006	POND RIVER WETLANDS	CHRIS, McLEAN, MUHL	10	20	55		SEDIMENT	KNPC, 1980b	EVALUATED	
05110006	ROUGH RIVER (GREEN)	OHIO	51				SO ₄	KNPC, 1981	EVALUATED	
05110006	THOMPSON CREEK (GREEN)	MUHLBERG	51	57	71		SED, pH, TSS, SP COND, SO ₄	USEPA, 1990; MITSCH, et al., 1983	EVALUATED	
05110006	WEST FORK POND RIVER (GREEN)	CHRISTIAN	51	57	74	20	COND, SO ₄ , ALKALINITY, SED	MITSCH, et al., 1983; KNPC, 1980b & 1981	EVALUATED	
05130101	BIG INDIAN CREEK (UPP. CUMBER)	KNOX	51	10	16		SED, SO ₄ , MET, Na, COND, NUT	KNPC, 1979	EVALUATED	
05130101	CLEAR FORK (UPPER CUMBERLAND)	BELL	51	10			SED, SO ₄ , MET, SP COND	KNPC, 1979	EVALUATED	
05130101	COLLIERS CREEK (UP. CUMBER.)	LETCHER	52				SED, MET, SP COND, ALK, Na	KNPC, 1979; KNPC, 1980a	EVALUATED	
05130101	CRANKS CREEK (UP. CUMBERL.)	HARLAN	51				pH, COND, MET, SO ₄ , TURB	KNPC, 1979	EVALUATED	
05130101	LAUREL RIVER (UPP. CUMBERLAND)	LAUREL	50				SP COND, SO ₄ , METALS	KNPC, 1980a	EVALUATED	
05130101	MARSH CREEK (UPPER CUMBERLAND)	McCREARY	51	52	10		pH, METALS, SEDIMENT	KNPC, 1980a	EVALUATED	
05130101	ROAD FORK CREEK (UPP. CUMBER.)	KNOX	10	16	51		NUTRIENTS, SEDIMENT	KNPC, 1979	EVALUATED	
05130104	BIG SOUTH FORK (UP. CUMBERLAND)	McCREARY	51				SEDIMENT, pH, SO ₄	KNPC, 1980a	EVALUATED	
05130104	KENNEDY CREEK (UP. CUMBERLAND)	WAYNE	55				CI, Na	KNPC, 1980a	EVALUATED	
05130104	LITTLE SOUTH FORK (UP. CUMBER.)	WAYNE	55				TDS, SPECIFIC CONDUCTANCE, CI	KNPC, 1980a	EVALUATED	

Nonpoint Source Impacted Wetlands (Cont'd.)

HYDRO-LOGIC CODE	WETLANDS NAME (RIVER BASIN)	COUNTY	NPS CATEGORIES					PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED
			1	2	3	4	5			
05130205	CANEY CREEK (LOWER CUMBERL.)	TRIGG	31					SEDIMENT	KDOW, 1991a	EVALUATED
05140101	NORTHERN DITCH (OHIO)	JEFFERSON	32 63 70					SEDIMENT	KDOW, 1991a	EVALUATED
05140202	GRASSY POND WETLANDS	HENDERSON	77 72 55					SEDIMENT, CI	KNPS SURVEY, 1987	EVALUATED
05140202	HENDERSON SLOUGHS	HENDERSON, UNION	11 55					SEDIMENT, SP COND	BOSSERMAN, 1985; MITSCH, 1982; KNPC, 1980b	EVALUATED
05140202	LITTLE CYPRESS SLOUGH	HENDERSON	77 72 55					SEDIMENT, CI	KNPS SURVEY, 1987	EVALUATED
05140202	OHIO RIVER WETLANDS	UNION	11					SEDIMENT	KNPC, 1980b	EVALUATED
05140202	UNNAMED SLOUGH - OHIO RIVER	HENDERSON	55					SPECIFIC CONDUCTANCE	KNPC, 1980b	EVALUATED
05140205	BROOKS CREEK (TRADEWATER)	CALD.HOPK,CRIT,WEB	51 52 57					SO ₄ , SP COND, SED	MITTSCH, et al., 1983	EVALUATED
05140205	CANY CREEK (TRADEWATER)	HOPKINS	51 52 57					ACIDITY, SO ₄ , METALS	MITTSCH, et al., 1983	EVALUATED
05140205	CLEAR CREEK (TRADEWATER)	HOPKINS	51 70 21 74					SED, TSS, pH, SO ₄ , COND, Fe, Mn	MITTSCH, 1982 & 1985; BOSSERMAN, 1985; USEPA, 1990	MONITORED
05140205	COPPERAS CREEK (TRADEWATER)	HOPKINS	51					SEDIMENT, pH, COND	KDOW, 1991a	EVALUATED
05140205	FLOODPLAIN WETLANDS (T ^W WATER)	CRITTENDEN	11					SEDIMENT	KNPC, 1980b	EVALUATED
05140205	LAND BRANCH WETLANDS	CALDWELL	50 20 74					SEDIMENT	KNPC, 1980b	EVALUATED
05140205	LICK CREEK (TRADEWATER)	CALD.HOPK,CRIT,WEB	51 52 57 21 23					pH, SO ₄ , Fe, SEDIMENT	MITTSCH, et al., 1983; KNPC, 1980b	EVALUATED
05140205	MONTGOMERY CREEK (TRADEWATER)	HOPK.,CALD.,CHRIS.	65 10 50					SEDIMENT	MITTSCH, et al., 1983; KNPC, 1981	EVALUATED
05140205	OLNEY (TRADEWATER)	CALDWELL, HOPKINS	51 52 57					SEDIMENT, pH, METALS	MITTSCH, et al., 1983; KNPC, 1981	EVALUATED
05140205	PROVIDENCE (TRADEWATER)	WEB., CRIT., HOPK	51 52 57					SED, Mn, SO ₄ , Al, COND	MITTSCH, et al., 1983	EVALUATED
05140205	SLOVER CREEK (TRADEWATER)	WEBSTER	51 70					SEDIMENT, TSS	USEPA, 1990	EVALUATED
05140205	UNNAMED (HURRICANE/T ^W WATER)	HOPK., CALD., CHRIS.	51					pH, DO, Fe	MITTSCH, et al., 1983	EVALUATED
05140205	WEIRS CREEK (TRADEWATER)	HOPKINS	51 70 52 57 74					SED,TSS,pH,SO ₄ ,COND,Fe,ACID	MITTSCH, et al., 1983; KNPC, 1980b & 1981; USEPA, 1990	MONITORED
08010100	BURNT SLOUGH CREEK (MISS.)	BALLARD	11					SEDIMENT	KDOW, 1989	EVALUATED
08010201	BAYOU DE CHEIN WETLANDS (MISS.)	FULTON,HICK.,GRAV.	11 18					SEDIMENT, NUTRIENTS, BACT	KDOW, 1989	EVALUATED
08010201	LITTLE BAYOU DE CHEIN WETLANDS	FULTON	11					SEDIMENT	KDOW, 1989	EVALUATED
08010201	MAYFIELD CREEK WETLANDS (MISS.)	CALLOWAY, GRAVES	11 14 16 18 20					SEDIMENT, BACT, METALS	KDOW, 1989; KDOW, 1991b	EVALUATED
08010201	OBION CREEK WETLANDS (MISS.)	CARLISLE,HICK.,GRAV	11 30 18					SEDIMENT, NUTRIENTS	KDOW, 1989	EVALUATED
08010201	WEST PK MAYFIELD CK WETLANDS	GRAVES	11 51 18					SED, NUTRIENTS, METALS	KDOW, 1989	EVALUATED
08010202	OWENS SLOUGH (MISS.)	FULTON	11 14 22					SEDIMENT	KNPS SURVEY, 1987	EVALUATED
08010202	RUNNING SLOUGH (MISS.)	FULTON	11					SEDIMENT, NUTRIENTS	USFW, 1988	EVALUATED

* COUNTY ABBREVIATIONS *

CALD. = CALDWELL
CHRIS. = CHRISTIAN

CRIT. = CRITTENDEN
GRAV. = GRAVES

HICK. = HICKMAN
HOPK. = HOPKINS

MUHL. = MUHLENBERG
WEB. = WEBSTER

Abbreviations Used in Data Source Table

Agricultural Stabilization and Conservation Service	ASCS
Kentucky Department for Health Services	HLTH DEPT
Kentucky Division of Water	KDOW
Ambient Monitoring Program	KDOW-AMB
Bacteriological Monitoring	KDOW-BACT
Bioassay Monitoring/Toxicity Testing Program	KDOW-BIO
Intensive Survey Monitoring Program	KDOW-IS
Lakes Monitoring Program	KDOW-LAKE
Nonpoint Source Program	KDOW-NPS
Kentucky Nonpoint Source Survey	KNPS
Kentucky Geological Survey	KGS
Kentucky Nature Preserves Commission	KNPC
Kentucky Department of Fish and Wildlife Resources	KDFWR
National Park Service	NPS
Ohio River Valley Water Sanitation Commission	ORSANCO
Tennessee Technological University	TN-TECH
University of Kentucky	UK
United States Army Corps of Engineers	USACOE
United States Department of Agriculture	USDA
United States Environmental Protection Agency	USEPA
United States Fish and Wildlife Service	USFW
United States Geological Survey	USGS

Parameter Abbreviations

Parameters	Abbreviations or Notation
<u>Agriculture</u>	
Total Suspended Solids	SUSPENDED, SOLIDS
Sediment	TSS
Pesticides	SED, SEDIMENT
Lindane	PEST
Dichloro-diphenyl-trichloroethane	LINDANE
Nutrients (ammonia, phosphorus)	DDT
Bacteria	NUTR, NUT
Dissolved oxygen	BACT
Nitrates	DO
	NITRATES, NO ₃
<u>Mining</u>	
Acidity	ACID
Manganese	Mn
Sulfates	SO ₄
Aluminum	Al
Metals	MET
Iron	IRON, Fe
pH	pH
Alkalinity	ALKALINITY, ALK
Specific Conductance	SP COND, COND
<u>Petroleum</u>	
Chlorides	Cl
Total organic carbon	TOC
<u>Urban</u>	
Oil-grease	OIL-GREASE, O/G
Arsenic	As
Solid waste	SOLID WASTE
Polychlorinated-biphenyls	PCB
Total dissolved solids	TDS
Bromide	Br
Sodium	Na
Calcium	Ca
Volatile organic compounds	VOC
Organics	ORGANICS, ORG
Fluorides	FLUORIDES, FI
Cyanide	CYANIDE
Fuel (Gasoline, Diesel)	FUEL
Inorganics	INORGANICS, INORG

Nonpoint Source Category Codes

<p>10 <u>Agriculture</u></p> <p>11 Non-irrigated crop production</p> <p>12 Irrigated crop production</p> <p>13 Specialty crop production (e.g., truck farming and orchards)</p> <p>14 Pasture land</p> <p>15 Range land</p> <p>16 Feedlot - all types</p> <p>17 Aquaculture</p> <p>18 Animal management areas</p> <p>19 Manure lagoons</p>	<p>60 <u>Land Disposal</u></p> <p>61 Sludge</p> <p>62 Wastewater</p> <p>63 Landfills</p> <p>64 Industrial land treatment</p> <p>65 Onsite wastewater systems (septic tanks, etc.)</p> <p>66 Hazardous waste</p> <p>67 Septage disposal</p>
<p>20 <u>Silviculture</u></p> <p>21 Harvesting-reforestation</p> <p>22 Forest management</p> <p>23 Logging road construction/maintenance</p>	<p>70 <u>Hydrologic - Habitat Modification</u></p> <p>71 Channelization</p> <p>72 Dredging</p> <p>73 Dam construction</p> <p>74 Flow regulation</p>
<p>30 <u>Construction</u></p> <p>31 Highway - road - bridge</p> <p>32 Land development</p>	<p>75 Bridge construction</p> <p>76 Vegetation removal</p> <p>77 Streambank modification - destabilization</p> <p>78 Draining - filling of wetlands</p>
<p>40 <u>Runoff/Storm Sewers</u> (Includes runoff from residential, commercial, industrial, and park-land areas not covered under other source categories)</p>	<p>80 <u>Other</u></p> <p>81 Atmospheric deposition</p> <p>82 Waste storage - storage tank leaks</p> <p>83 Highway maintenance & runoff</p> <p>84 Spills</p> <p>85 In-place contaminants</p> <p>86 Natural</p> <p>87 Recreational activities</p> <p>88 Upstream impoundments</p> <p>89 Salt storage sites</p>
<p>50 <u>Resource Extraction</u></p> <p>51 Surface mining</p> <p>52 Subsurface mining</p> <p>53 Placer mining</p> <p>54 Dredge mining</p> <p>55 Petroleum activities</p> <p>56 Mill tailings</p> <p>57 Mine tailings</p>	<p>90 <u>Unknown</u></p>

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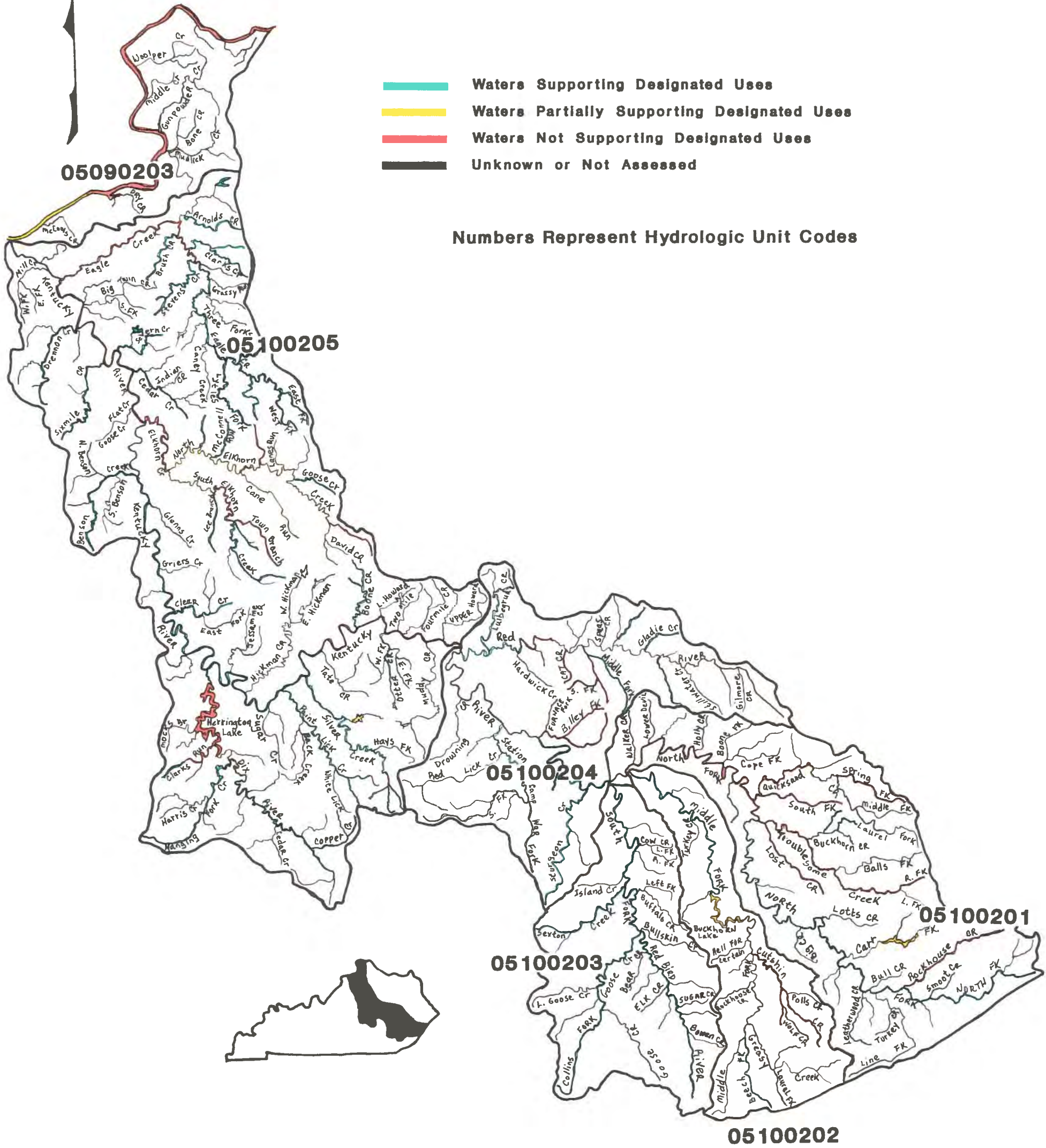
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KENTUCKY RIVER BASIN

N



- Waters Supporting Designated Uses
- Waters Partially Supporting Designated Uses
- Waters Not Supporting Designated Uses
- Unknown or Not Assessed

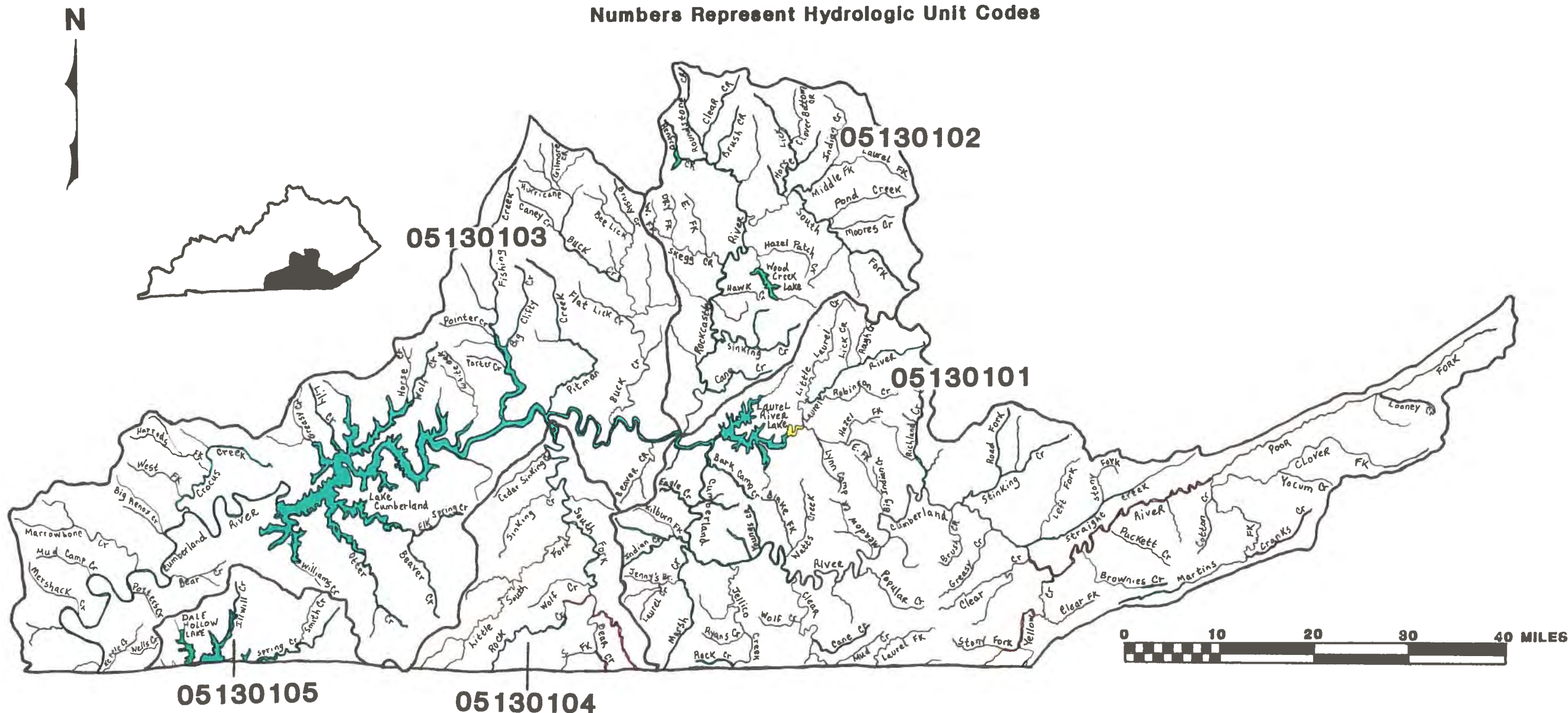
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UPPER CUMBERLAND RIVER BASIN

- █ Waters Supporting Designated Uses
- █ Waters Partially Supporting Designated Uses
- █ Waters Not Supporting Designated Uses
- █ Unknown or Not Assessed

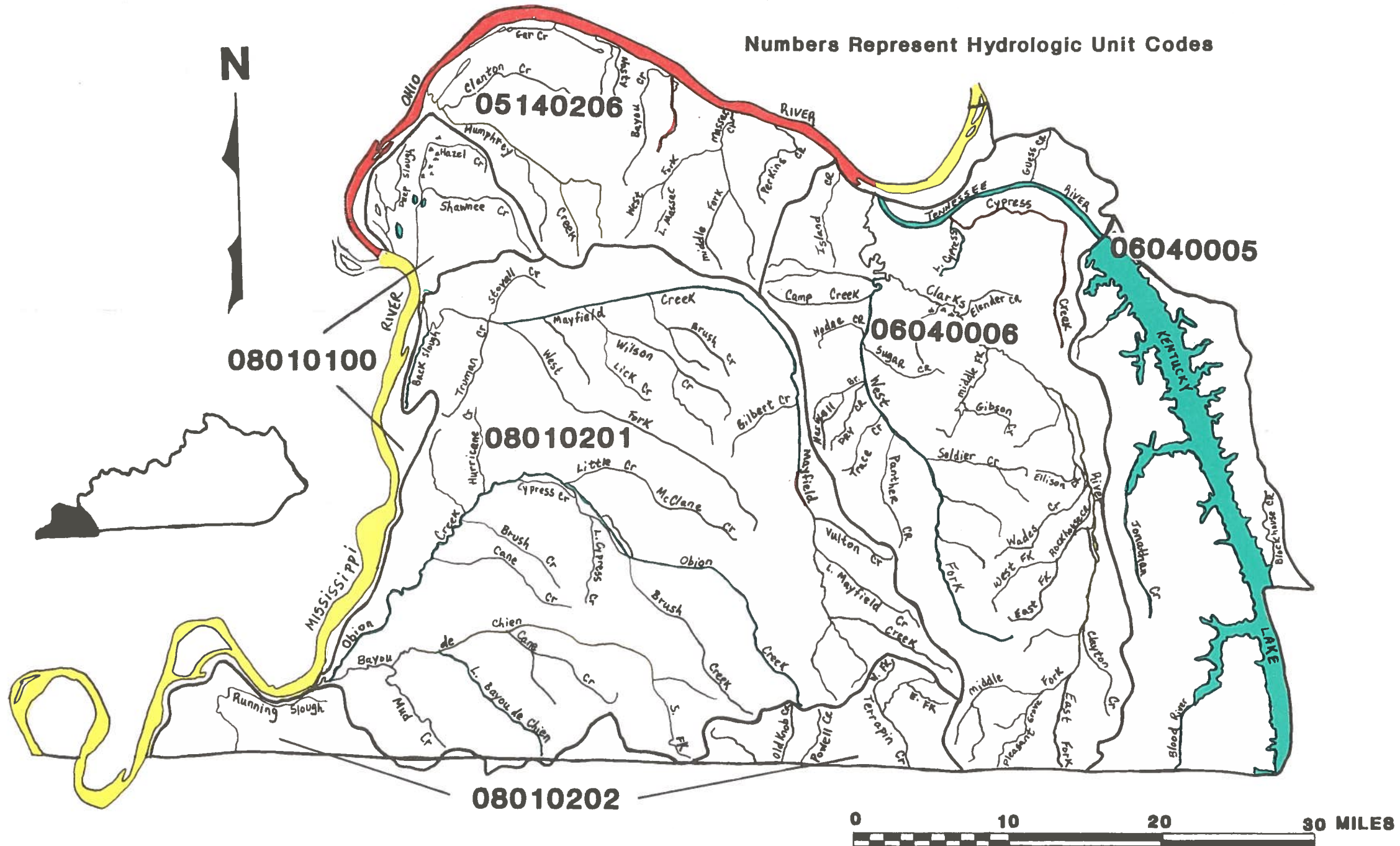
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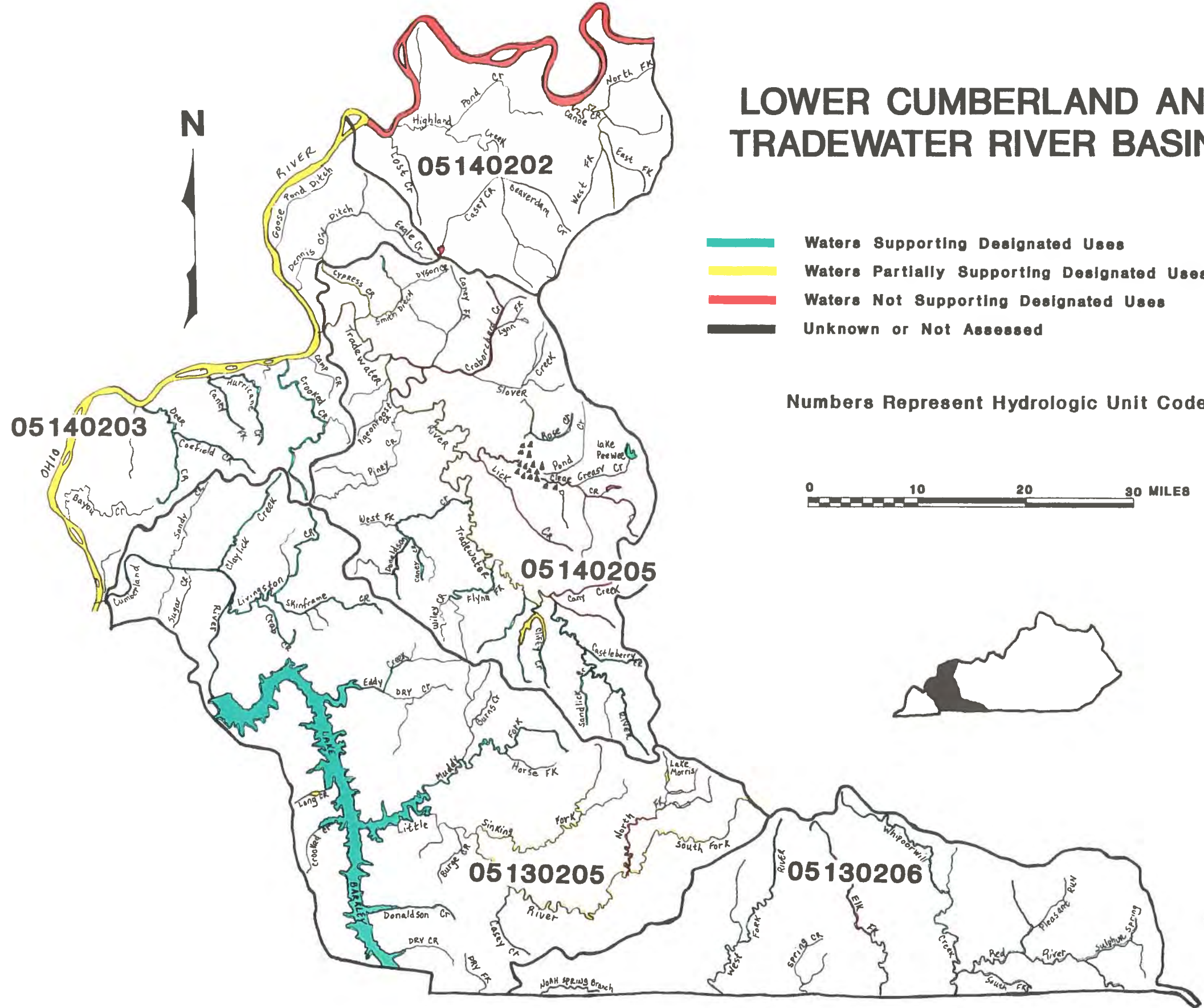
TENNESSEE AND MISSISSIPPI RIVER BASINS

- █ Waters Supporting Designated Uses
- █ Waters Partially Supporting Designated Uses
- █ Waters Not Supporting Designated Uses
- █ Unknown or Not Assessed

Numbers Represent Hydrologic Unit Codes



LOWER CUMBERLAND AND TRADEWATER RIVER BASINS



- Waters Supporting Designated Uses
- Waters Partially Supporting Designated Uses
- Waters Not Supporting Designated Uses
- Unknown or Not Assessed

Numbers Represent Hydrologic Unit Codes



BIG SANDY RIVER BASIN

Includes Little Sandy River and Tygarts Creek



- Waters Supporting Designated Uses
- Waters Partially Supporting Designated Uses
- Waters Not Supporting Designated Uses
- Unknown or Not Assessed

Numbers Represent Hydrologic Unit Codes



GREEN RIVER BASIN

N

- █ Waters Supporting Designated Uses
- █ Waters Partially Supporting Designated Uses
- █ Waters Not Supporting Designated Uses
- █ Unknown or Not Assessed

Numbers Represent Hydrologic Unit Codes

