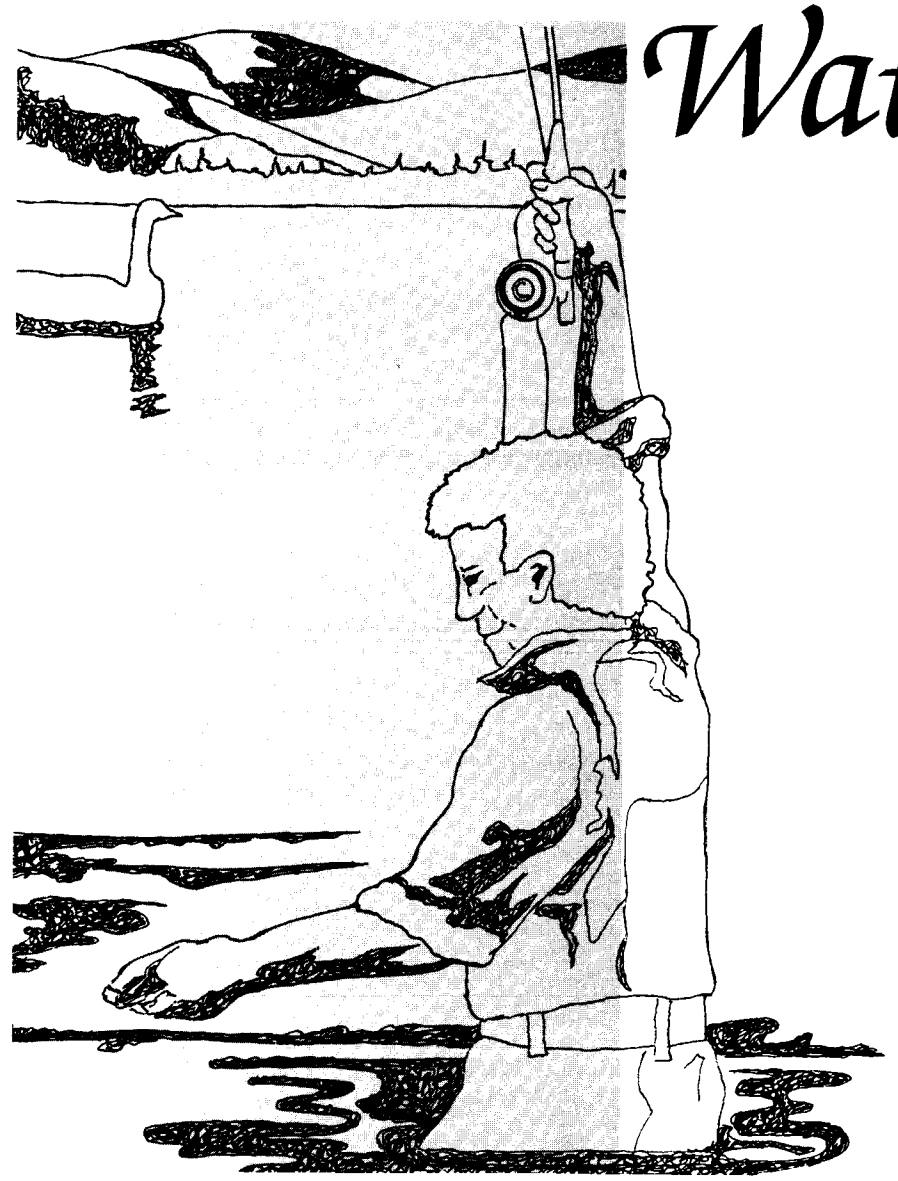
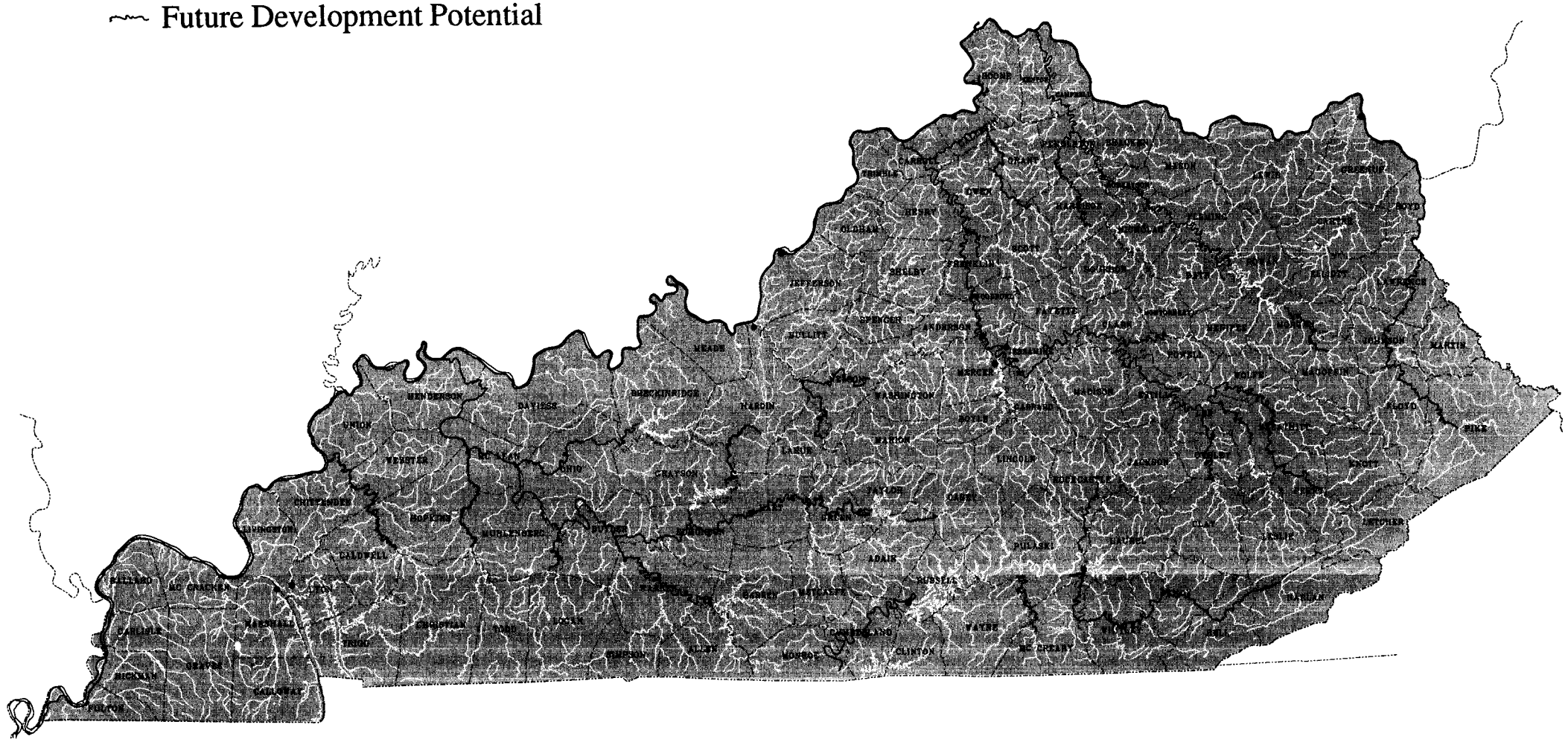
Water Resources



Kentucky's rivers are important for domestic, municipal, industrial and agricultural uses, power generation, navigation, and commerce. Rivers and streams frequently dictate the patterns of future growth, and the management of water resources becomes increasingly important as communities expand. Conflicts often arise between existing river uses and water resource projects that require significant alteration of the river environment. As communities develop, it becomes important to identify potential water-use conflicts between resource conservation and development to strike a balance among such conflicting resource allocations.

Water Resource Study Rivers

- Hydropower Development
- Future Development Potential



EVALUATION METHODOLOGY

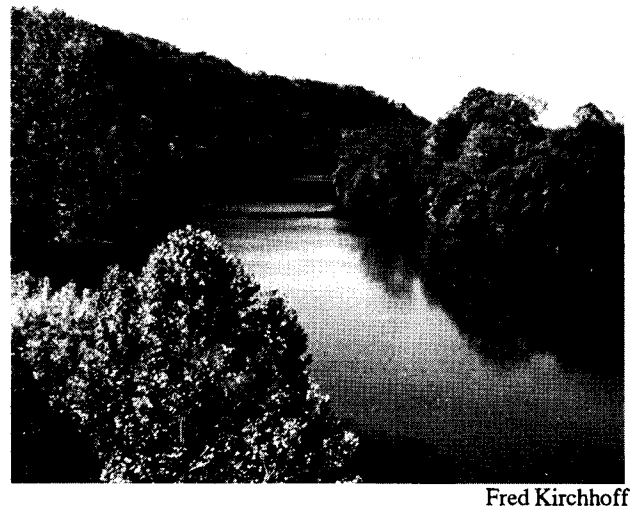
Rivers and streams with potential to provide water supplies for municipal and industrial uses, hydropower generation or navigation were evaluated to determine those areas most significant for resource development. Each study river included within the water resources category met one of the following **minimum standards:**

- potential for future development as a water supply (lowest average monthly flow greater than or equal to 75 cubic feet per second or approximately 50 million gallons per day)
- occurrence of developed hydropower sites or undeveloped sites with identified potential for hydropower
- commercially navigable rivers

FUTURE DEVELOPMENT POTENTIAL

The ability of a river or stream to provide for future development in terms of water resources was evaluated on the basis of three criteria consisting of water quantity, basic water quality parameters, and safety. Each river meeting the minimum standard for future development was assigned a value class based on an evaluation process. A point system was used for determining the relative value of each criterion. Scores for each study segment were then totaled and assigned to a value class ranking.

Kentucky River



Fred Kirchhoff

A total of 120 points was allocated to the three criteria; 60 points for water quantity, 48 points for water quality, and 12 points for safety. As the presence of a reliable source of water is a critical limiting factor for development, water quantity was based on the lowest average monthly flow as measured at U.S. Geological Survey stream gaging stations. The consideration of water quality was limited in this evaluation to those basic factors related to developmental considerations. Water quality parameters consisted of temperature, biochemical oxygen demand (BOD), dissolved oxygen, and dissolved solids. Safety was evaluated in terms of the number of roadway, rail, or oil or gas pipeline crossings on a study segment and, therefore, the relative risk of an accidental spill or leak.

The following is a detailed listing of scores used to evaluate each of the study segments for future development potential.

Water Quantity (points based on lowest average monthly flow)

unknown	0 points
0 to 75 cubic feet per second	20 points
76 to 750 cubic feet per second	40 points
greater than 750 cubic feet per second	60 points

Water Quality -- average water temperature

unknown	0 points
greater than 19° centigrade	2 points
16° to 19° centigrade	4 points
less than 16° centigrade	6 points

Water Quality -- maximum water temperature

unknown	0 points
greater than 32° centigrade	2 points
29° to 32° centigrade	4 points
less than 29° centigrade	6 points

Water Quality -- average biochemical oxygen demand (BOD)

unknown	0 points
greater than 2.8 milligrams per liter	2 points
2.2 to 2.8 milligrams per liter	4 points
less than 2.2 milligrams per liter	6 points

Water Quality -- maximum biochemical oxygen demand

unknown	0 points
greater than 12 milligrams per liter	2 points
6 to 12 milligrams per liter	4 points
less than 6 milligrams per liter	6 points

Water Quality -- average dissolved oxygen

unknown	0 points
less than 7 milligrams per liter	2 points
7 to 9 milligrams per liter	4 points
greater than 9 milligrams per liter	6 points

Water Quality -- minimum dissolved oxygen

unknown	0 points
less than 7 milligrams per liter	2 points
7 to 9 milligrams per liter	4 points
greater than 9 milligrams per liter	6 points

Water Quality -- average dissolved solids

unknown	0 points
greater than 750	4 points
250 to 750	8 points
less than 250	12 points

Safety (based on number of transmission crossings above the downstream end of study segment and the lowest average monthly flow)

no crossings	12 points
one or more crossings and lowest average flow greater than 750 cubic feet per second	12 points
one or more crossings and lowest average monthly flow between 750 and 75 cubic feet per second	8 points
one or more crossings and lowest average monthly flow less than 75 cubic feet per second	4 points
unknown	0 points

An overall score was computed for each of the rivers evaluated for future development of water resources and ranked according to the following value classes.

Class 1 .....90 - 120 points

Class 2 .....70 -89 points

Class 3 .....40 - 69 points

HYDROPOWER DEVELOPMENT STATUS

A number of Kentucky rivers and streams provide water for hydroelectric generation, while numerous other sites have been identified as having the potential to provide for power generation. More than 35 of these potential sites are permitted, licensed, or under consideration by the Federal Energy Regulatory Commission (FERC). A complete listing and description of FERC sites is contained in Appendix D. Those sites fully developed for hydropower generation were evaluated on the basis of generating capacity.

The sites were then ranked according to the following values:

Class 1.....greater than 100,000 kilowatts

Class 2.....10,000 - 100,000 kilowatts

Class 3.....less than 10,000 kilowatts

NAVIGABLE RIVERS

Kentucky's major rivers provide commercially navigable waterways for various bulk commodities - coal, petroleum products, sand, gravel, and crushed rock. The Ohio River serves communities along the entire northern border of the state. The Tennessee, Cumberland, Green and Mississippi rivers are accessible to Western Kentucky while the Kentucky River provides transportation for Central Kentucky.

Rivers were evaluated on the basis of channel depth:

Class 1.....Nine-foot minimum channel depth

Class 2.....Six-foot minimum channel depth

FINDINGS

A total of 66 river segments (4.8% of the total rivers studied in the assessment) covering 3,866 miles (10% of the total miles) were evaluated in the Water Resources Category. Segments ranged in length from 4.4 miles (Dix River) to 664 miles (Ohio River). Water resource rivers are distributed across the state.

The major rivers in the future development subcategory are the Cumberland River (Tennessee State Line to Wolf Creek Dam), the Kentucky River (Elkhorn Creek confluence to Lock and Dam, number 4), and Green River (Nolin River confluence to Little Barren River confluence). The Cumberland River at Wolf Creek Dam is the highest ranking river in the hydropower subcategory, and the Ohio River is the highest ranking river in the navigation subcategory. Four of the rivers are of national significance--the Mississippi and Ohio rivers for navigation and the Cumberland and Tennessee rivers for hydropower generation.

Future Development Potential

Thirty-six rivers covering 2,236.1 miles were identified as Class 1 future development rivers. Class 1 rivers range in length from 4.4 to 154.1 miles, averaging 62.1 miles. The majority are located in the central and western portions of the state.

Nine rivers covering 424.7 miles were identified as Class 2 future development rivers. Class 2 rivers ranged in length from 20.5 to 91.8 miles, averaging 47.2 miles. They are located throughout the state.

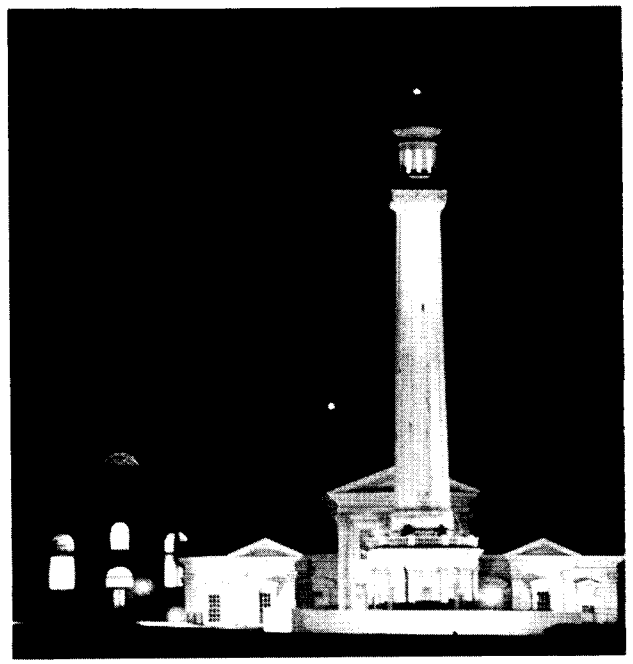
Five rivers covering 227.9 miles were identified as Class 3 future development rivers. Class 3 rivers ranged in length from 17.8 to 74.5

miles,averaging 45.6 miles. All are located in Central and Western Kentucky

Hydropower Development Status

Eight rivers were evaluated as hydropower rivers--three were Class 1, four were Class 2, and one was Class 3. Mileage was not assigned to hydropower rivers because hydroelectric dams occupy single sites on rivers.

Louisville Water Tower



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Navigable Rivers

Seven rivers covering 912.8 miles were identified as Class 1 navigation rivers. Class 1 rivers ranged in length from seven miles to 664 miles, averaging 130.4 miles. A 64.3-mile segment of the Kentucky River was identified as a Class 2 navigation river.

Table 26. Summary of Water Resource Evaluations

	Class 1	Class 2	Class 3	Total
	Number of Segments			
Future Development	36	9	5	50
Hydropower	3	4	1	8
Navigation	7	1	0	8
	River Miles			
Future Development	2236.1	424.7	227.9	2888.7
Hydropower	0.0	0.0	0.0	0.0
Navigation	912.8	64.3	0.0	977.1

SOURCES OF INFORMATION

Karan, P.P. and Cotton Mather, eds. *Atlas of Kentucky*, University of Kentucky Press, Lexington, Kentucky, 1977.

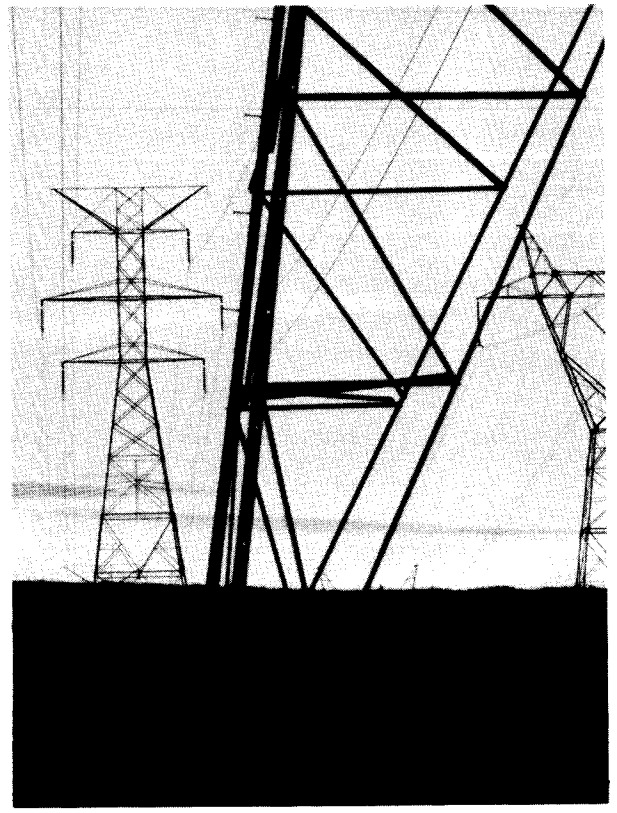
Kentucky Department of Economic Development, *Gas Transmission in Kentucky*. Map 1984.

U.S. Department of Interior, *Stream Flow and Basin Characteristics at Selected Sites in Kentucky*, Report 84-764, U.S. Geological Survey, 1984.

U.S. Department of Interior, *Streams of Kentucky*, map, U.S. Geological Survey, 1958.

U.S. Environmental Protection Agency, STORET Computer Database.

Power Transmission Towers in Jessamine County



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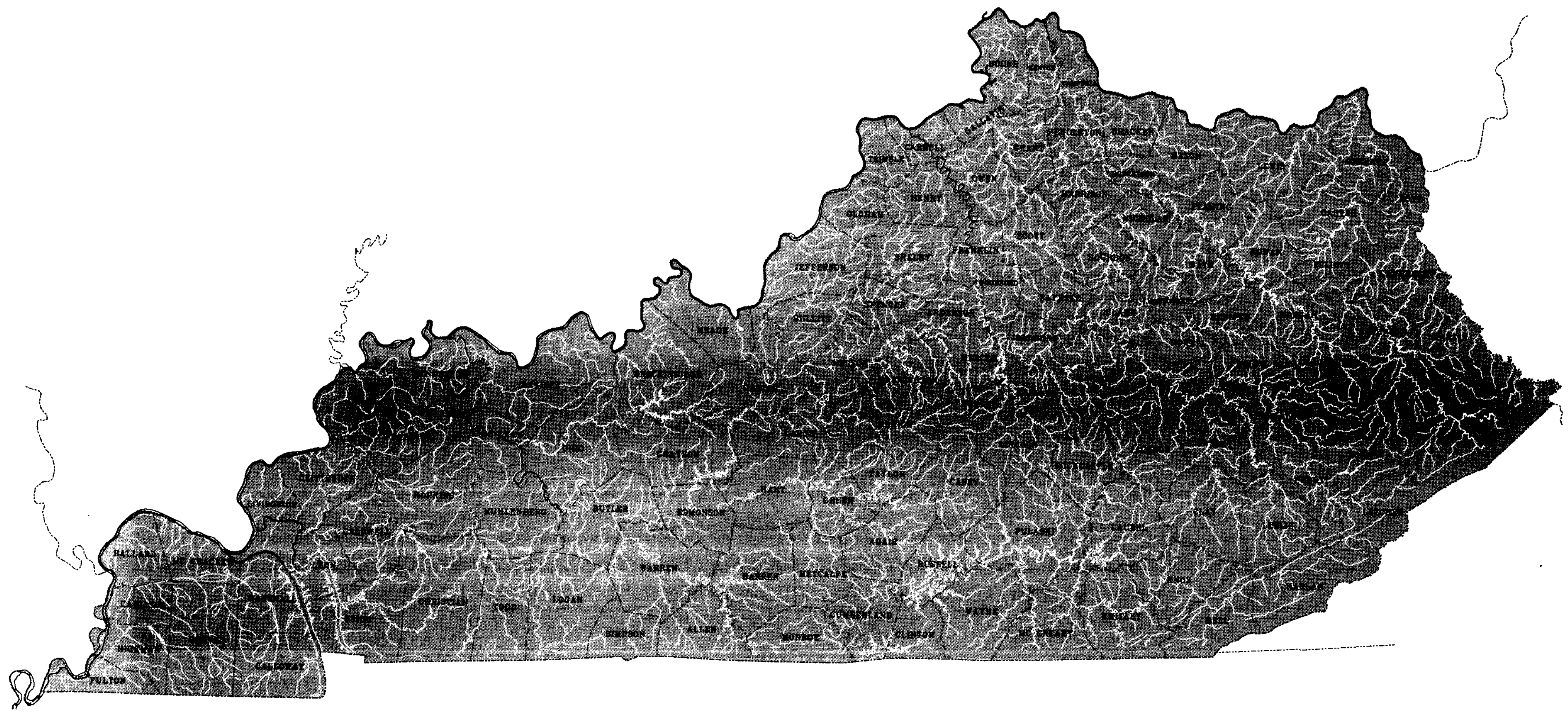
Navigable Study Rivers



WATER RESOURCES (Future Development)--CLASS 1 RIVERS

River Name	Downstream Endpoint	River Mile	Upstream Endpoint	River Mile	Downstream County	Upstream County	Study Length
Barren River	Green River	0.0	Drakes Creek	43.6	Butler	Warren	43.6
Barren River	Drakes Creek	43.6	Little Difficult Creek	63.3	Warren	Allen	19.7
Beech Fork	Rolling Fork	0.0	Cartwright Creek	39.1	Nelson	Nelson	39.1
Big South Fork Cumberland R.	Lake Cumberland	16.5	Ky 92	40.3	McCreary	McCreary	23.8
Cumberland River	Tennessee State Line	385.5	Wolf Creek Dam	460.9	Monroe	Russell	75.4
Cumberland River	Rockcastle River	546.5	Poor Fork	694.2	Laurel	Harlan	147.7
Dix River	Kentucky River	0.0	Dix Dam	3.0	Garrard	Garrard	3.0
Eagle Creek	Tenmile Creek	27.3	Sadieville, Ky	86.4	Grant	Scott	59.1
Green River	Ohio River	0.0	Mud River	108.6	Henderson	Ohio	108.6
Green River	Mud River	108.6	Nolin River	183.5	Ohio	Edmonson	74.9
Green River	Nolin River	183.5	Little Barren River	250.2	Edmonson	Green	66.7
Green River	Little Barren River	250.2	Goose Creek	342.2	Green	Casey	92.0
Kentucky River	Ohio River	0.0	Elkhorn Creek	51.9	Carroll	Franklin	51.9
Kentucky River	Elkhorn Creek	51.9	Lock #4	64.9	Franklin	Franklin	13.0
Kentucky River	Lock #4	64.9	Dix River	118.2	Franklin	Mercer	53.3
Kentucky River	Lock & Dam No. 10	176.4	Red River	190.8	Clark	Clark	14.4
Kentucky River	Red River	190.8	Heidelberg, Ky	248.2	Clark	Lee	57.4
Licking River	North Fork Licking River	71.4	Cave Run Lake Dam	173.6	Bracken	Bath	102.2
Middle Fork Kentucky River	North Fork Kentucky River	0.0	Freeman Fork	36.5	Lee	Breathitt	36.5
Mississippi River	Tennessee State Line	882.6	Ohio River	953.8	Fulton	Ballard	71.2
Nolin River	Green River	0.0	Nolin Lake Dam	8.1	Edmonson	Edmonson	8.1
Nolin River	Nolin Lake	64.3	Cox Run	98.8	Grayson	Hardin	34.5
North Fork Kentucky River	South Fork Kentucky River	254.8	Carr Fork	367.8	Lee	Perry	113.0
Ohio River	Mississippi River	0.0	Tennessee River	48.8	Ballard	Livingston	48.8
Ohio River	Tennessee River	48.8	Tradewater River	108.0	Livingston	Union	59.2
Ohio River	Tradewater River	108.0	Green River	197.4	Union	Henderson	89.4
Ohio River	Green River	197.4	Salt River	351.5	Henderson	Hardin	154.1
Ohio River	Salt River	351.5	Kentucky River	435.6	Hardin	Carroll	84.1
Ohio River	Kentucky River	435.6	Licking River	511.2	Carroll	Kenton	75.6
Ohio River	Licking River	511.2	Big Sandy River	664.0	Campbell	Boyd	152.8
Red River	Kentucky River	0.0	Hatcher Creek	33.2	Clark	Powell	33.2

River Name	Downstream Endpoint	River Mile	Upstream Endpoint	River Mile	Downstream County	Upstream County	Study Length
Rockcastle River	Lake Cumberland	8.5	Roundstone Creek	41.3	Laurel	Rockcastle	32.8
Rolling Fork	Salt River	0.0	Beech Fork	20.2	Bullitt	Nelson	20.2
Rolling Fork	Beech Fork	20.2	Otter Creek	62.5	Nelson	Larue	42.3
Rough River	Green River	0.0	Rough River Lake Dam	89.4	Ohio	Breckinridge	89.4
South Fork Kentucky River	Kentucky River	0.0	Red Bird River	45.1	Lee	Clay	45.1

WATER RESOURCES (Future Development)--CLASS 2 RIVERS

River Name	Downstream Endpoint	River Mile	Upstream Endpoint	River Mile	Downstream County	Upstream County	Study Length
Big Sandy River	Ohio River	0.0	Levisa Fork	26.8	Boyd	Lawrence	26.8
Eagle Creek	Kentucky River	0.0	Tenmile Creek (near Glencoe,Ky)	27.3	Carroll	Grant	27.3
Levisa Fork	Big Sandy River	0.0	Beaver Creek	91.8	Lawrence	Floyd	91.8
Levisa Fork	Beaver Creek	91.8	Russell Fork	123.6	Floyd	Pike	31.8
Licking River	Ohio River	0.0	North Fork Licking River	71.4	Kenton	Bracken	71.4
Mud River	Green River	0.0	Wolf Lick Creek	30.5	Butler	Logan	30.5
Salt River	Ohio River	0.0	Taylorsville Lake Dam	59.5	Bullitt	Spencer	59.5
South Fork Licking River	Licking River	0.0	Stoner Creek	65.1	Pendleton	Bourbon	65.1
Tradewater River	Ohio River	0.0	Craborchard Creek	20.5	Crittenden	Crittenden	20.5

WATER RESOURCES (Future Development)--CLASS 3 RIVERS

River Name	Downstream Endpoint	River Mile	Upstream Endpoint	River Mile	Downstream County	Upstream County	Study Length
Elkhorn Creek	Kentucky River	0.0	Forks of Elkhorn	17.8	Franklin	Franklin	17.8
Licking River	North Fork	197.4	Salyersville, Ky	269.0	Rowan	Magoffin	71.6
Pond River	Green River	0.0	Flat Creek	31.1	Hopkins	Hopkins	31.1
Pond River	Flat Creek	31.1	Coal Creek	64.0	Hopkins	Christian	32.9
Tradewater River	Craborchard Creek	20.5	Caney Creek	95.0	Crittenden	Hopkins	74.5

WATER RESOURCES (Hydropower)--CLASS 1 RIVERS

River Name	Downstream Endpoint	River Mile	Upstream Endpoint	River Mile	Downstream County	Upstream County	Study Length
Cumberland River	Lake Barkley Dam	30.6		30.6	Livingston		0.0
Cumberland River	Wolf Creek Dam	460.9		460.9	Russell		0.0
Tennessee River	Kentucky Lake Dam	22.4		22.4	Marshall		0.0

WATER RESOURCES (Hydropower)--CLASS 2 RIVERS

River Name	Downstream Endpoint	River Mile	Upstream Endpoint	River Mile	Downstream County	Upstream County	Study Length
Dix River	Dix Dam	3.0		3.0	Garrard		0.0
Laurel River	Laurel River Lake Dam	2.1		2.1	Laurel		0.0
Ohio River	McAlpin Dam	375.5		375.5	Jefferson		0.0
Ohio River	Greenup Lock & Dam	640.4		640.4	Greenup		0.0

WATER RESOURCES (Hydropower)--CLASS 3 RIVERS

River Name	Downstream Endpoint	River Mile	Upstream Endpoint	River Mile	Downstream County	Upstream County	Study Length
Kentucky River	Lock & Dam No. 7	117.0		117.0	Jessamine		0.0

WATER RESOURCES (Navigability)--CLASS 1 RIVERS

River Name	Downstream Endpoint	River Mile	Upstream Endpoint	River Mile	Downstream County	Upstream County	Study Length
Big Sandy River	Ohio River	0.0	8.6 mile upstream	8.6	Boyd	Boyd	8.6
Cumberland River	Ohio River	0.0	Lake Barkley Dam	30.6	Livingston	Livingston	30.6
Green River	Ohio River	0.0	109 mile upstream	109.0	Henderson	Butler	109.0
Licking River	Ohio River	0.0	Seven miles upstream	7.0	Campbell	Campbell	17.0
Mississippi River	Tennessee State Line	882.6	Ohio River	953.8	Fulton	Ballard	71.2
Ohio River	Mississippi	0.0	Big Sandy River	664.0	Ballard	Boyd	664.0
Tennessee River	Ohio River	0.0	Kentucky Lake Dam	22.4	McCracken	Livingston	22.4

WATER RESOURCES (Navigability)--CLASS 2 RIVERS

River Name	Downstream Endpoint	River Mile	Upstream Endpoint	River Mile	Downstream County	Upstream County	Study Length
Kentucky River	Ohio River	0.0	Frankfort	64.3	Caroll	Franklin	64.3