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A Preliminary Ecological Study of Areas to be Impounded in the Salt River Basin of Kentucky

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Louis A. Krumholz
University of Louisville

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A PRELIMINARY ECOLOGICAL STUDY OF AREAS TO BE IMPOUNDED IN THE SALT RIVER BASIN OF KENTUCKY

Dr. Louis A. Krumholz
Principal Investigator

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University of Louisville Water Resources Laboratory
Louisville, Kentucky 40208

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ABSTRACT

This report covers work that is an extension of Project No. A-019-KY. A series of 25 sampling stations was established in the mainstream and tributaries of the Salt River that extend from the source of the stream in Boyle County to a few miles below the site of Taylorsville Dam in Spencer County. Sampling for water chemistry and biota was carried out semimonthly. Data on temperature, oxygen, depth, and discharge, along with analyses for cations (Ca, Mg, Fe, Mn) and anions (PO_4, NO_3, NO_2, CO_3, HCO_3) have been accumulated and analyzed. Bottom fauna, fishes, and plants have been sampled at each station and relative abundance and species composition of the biota have been made.

Physical and chemical data, along with flora and fauna taken from the stream present the characteristics of a relatively healthy ecosystem. Water temperatures reflect air temperatures closely and dissolved oxygen values are near saturation. Turbidity increased with runoff, the stream flow increasing rapidly during rainy periods and falling to a minimum during dry periods. Total alkalinities ranged from 135 to 210 mg/l as $CaCO_3$ with ranges in pH from 6.3 to 8.2. Nitrate nitrogen ranged from 2.0 to 11.3 mg/l and orthophosphate from 0.25 to 2.78 mg/l. Iron and manganese ranged from 0.07 to 0.46 and 0.09 to 0.39 mg/l, respectively.

A total of 74 species of algae referable to 35 families were collected and identified. Green algae (Chlorophyta) were represented by 38 species, reflecting the contention that the Salt River is a relatively clean, oligosaprobic stream. More than 200 species of vascular plants referable to 50 families have been collected from the riparian vegetation. Bottom fauna includes 98 species of insects representing 8 orders and 42 families. Prominent

among these are the 23 species of chironomids that have been identified to date. The most common crustaceans are Orconectes rusticus and Lirceus lineatus along with several species of Gammarus. Molluscs include gastropods, fingernail clams, and unionids. More than 50 species of fishes have been collected and will provide data for a preliminary report to be published in the open literature.

Plans include a further inventory of the fish population and continued study of the physiochemical and biological aspects of the stream ecosystem. The study of economic aspects of the area will continue at an accelerated pace.

KEYWORDS: Ecology, Water Quality, Environmental effects, Limnology, Planning, Preimpoundments, Aquatic Habitats, Eutrophication, Evaluation

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INTRODUCTION

This report covers work that is an extension of Project No. A-019-KY, entitled "A preliminary reconnaissance of areas to be impounded in the Salt River Basin of Kentucky," for the period from 1 July 1968 through 30 June 1969. The Salt River Basin has an area of 2920 square miles and lies in the most heavily populated area of Kentucky. The Salt River consists of three principal streams (Fig. 1), the Salt River proper, the Beech Fork, and the Rolling Fork.

This study is concerned solely with the mainstem of the Salt River from its source in Boyle County, near Danville, to a few miles below Taylorsville in Spencer County, a distance of about 100 miles of stream. The preliminary objectives of the study were: 1) to collect and catalogue specimens of all kinds of algae in the stream, 2) to collect and catalogue specimens of all kinds of vascular plants in the riparian area, 3) to select sites to serve as permanent sampling stations for all segments of the aquatic organisms as well as for the physical and chemical aspects of the water, and 4) to arrange for a comprehensive study of the changes that take place in the human population, the economics, and the agriculture of the area.

DESCRIPTION OF THE STUDY AREA

The mainstem of the Salt River, also known as the North Fork of the Salt River, rises as three separate sources just south of Kentucky Highway 300 near the town of Parksville in south central Boyle County. It flows in a northerly direction for about 50 miles through Boyle, Mercer, and Anderson counties to about 3 miles south of Lawrenceburg, where it makes a 90-degree turn to the west. It then flows in a westerly direction through Anderson, Spencer, and Bullitt counties, then forms the boundary between Bullitt and

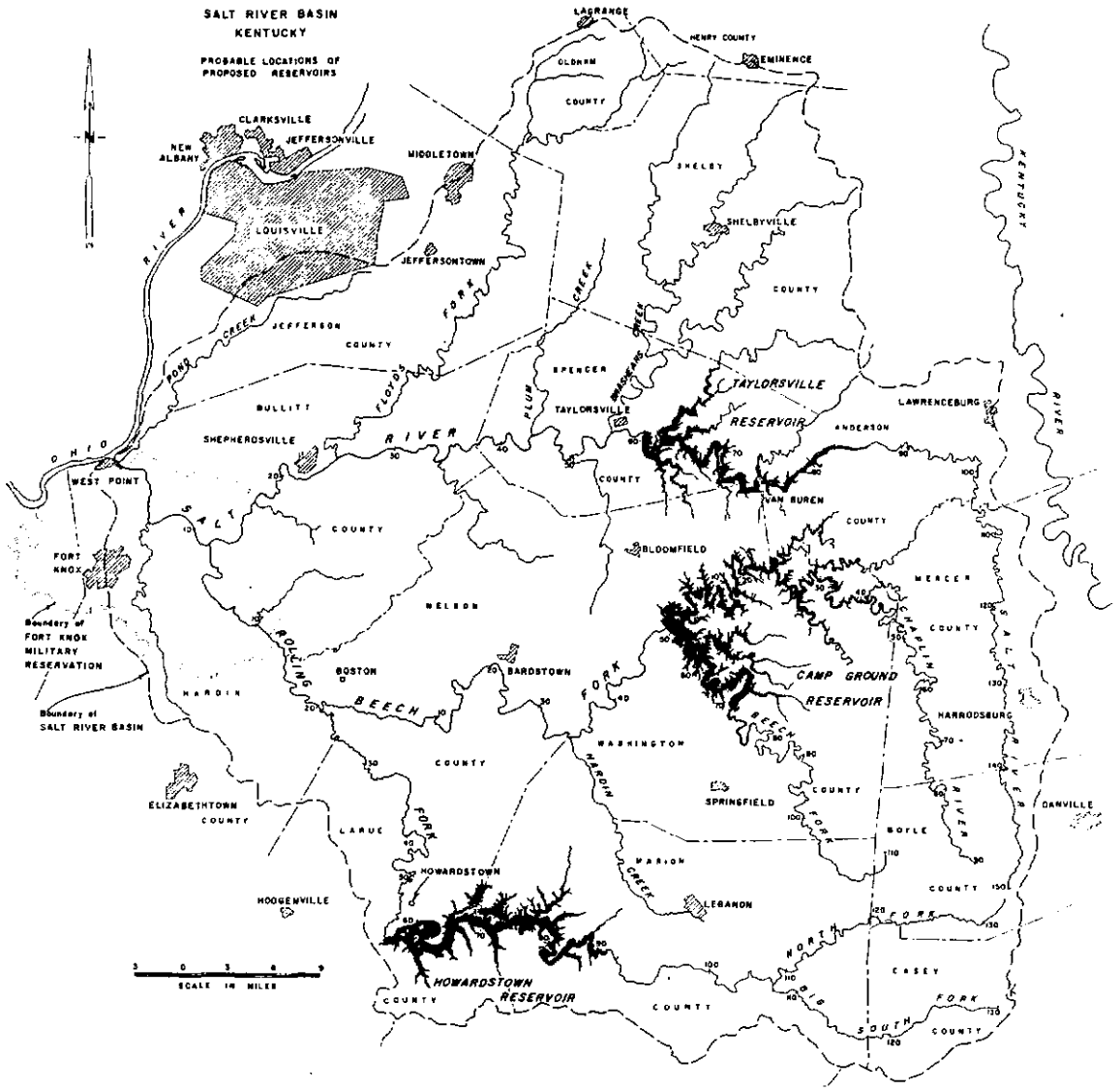

Figure 1. The Salt River Basin showing the Salt River and its principal tributaries, together with the sites for the proposed reservoirs.

Hardin counties before emptying into the Ohio River at West Point at Ohio River Mile 629.9 (Fig. 1). Thus, the mainstem of the Salt River drains the northern and extreme eastern part of the basin. In its upper reaches, the Salt River flows through gently rolling hills over rock bottoms with loose rocks and gravel in the beds. As it becomes larger, much of the bottom is solid rock, mostly limestone and siltstones. In its western part, the stream flows through areas of carboniferous shales and sandstones. In the pooled areas there are accumulations of sand and gravel, and silt has been deposited in eddies.

Leverett (1929:8) reported that at one time the Salt River formed the headwaters of the Ohio River, and that all of the Ohio River east of the mouth of the present Salt River drained in a more or less northerly direction into the area now occupied by the Great Lakes or into some stream that emptied into the Wabash River drainage. Also, Leverett (1929:8) pointed out that "The north-flowing headwater part of the North Fork of the Salt River in Boyle and Mercer counties, is connected with the Kentucky River by a shallow valley carrying fluvial material, which was the former line of discharge of this stream into the Kentucky. But Salt River, probably because of a more direct course to the part of the Ohio River where it discharges, and one through weaker strata, has diverted this stream away from the Kentucky." This is the area about 3 miles south of Lawrenceburg where the Salt River makes its abrupt turn to the west.

During the study period, 45 sites were selected as likely stations for collecting samples of the biota and water for analyses in the laboratory (Fig. 2). Although 45 sites were selected, only 25 were used during this phase of the study. Brief descriptions of each of those 25 stations as they appeared in the summer of 1968 follows. The miles indicate the stream miles

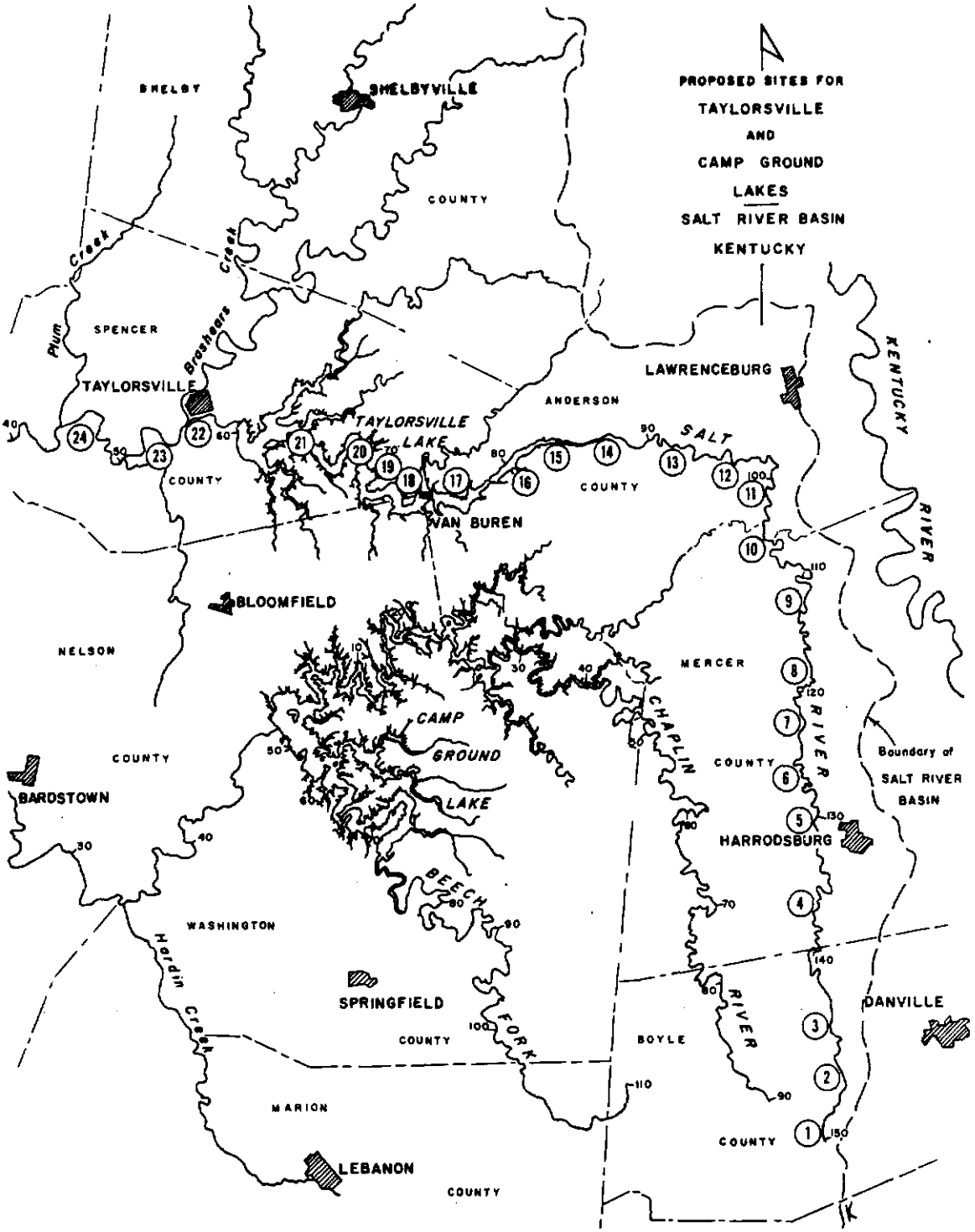

Figure 2. The Salt River, the Beech Fork, and the Chaplin River showing the locations of the permanent sites for the collection of water samples and bottom fauna.

below the first station.

Station 1. In central Boyle County at the upper end of Salt River Road about 1 mile south of Kentucky Highway 34 and approximately 0.1 mile northeast of Wilsonville. This is considered the source of the Salt River for purposes of this study and is designated as Mile 0.0. The stream is formed by two tributaries and is about 1.5 m wide just below the confluence. The bottom is mixed sand, gravel, and rubble.

Station 2. In Boyle County about 0.5 miles northeast of Wilsonville at the intersection of Tarkington Road and Caldwell Church Road. This station is 1.9 stream miles below the source. The stream is about 4 m wide and the bottom is bedrock limestone with small gravelly or sandy riffle areas. The elevation is 932 feet above mean sea level. This station is known as Coggin's Bluff.

Station 3. The Atoka station is in northern central Boyle County 1.1 miles north of the U. S. Highway 150 bridge at Atoka. The station is 4.9 miles from the source and the bottom is characterized by shallow pools and gravel riffles interspersed with exposed bedrock limestone. The stream is 4-6 m wide.

Station 4. In south central Mercer County at the confluence of Dry Branch and the Salt River approximately 0.2 mile from the Mud Meetinghouse Church, whence the name of the station. This station is 13.7 miles from the source and includes a long pool grading into a long (100 m) rocky riffle area. The average depth of the pool is little more than 1 m with a sandy mud bottom. The bottom of the riffle consists of rocks from the size of a marble to that of a dinner plate. Here the stream is 4-5 m wide.

Station 5. The Harrodsburg station is in south central Mercer County, 1.1 m west of the center of Harrodsburg at the bridge over Kentucky Highway 152.

This station is 17.5 miles from the source. Here the river is characterized as a long pool with sandy mud bottom about 5-6 m wide. The average depth of the pool is less than 1 m.

Station 6. In central Mercer County to the left of Kentucky Highway 390, 4.75 miles northwest of Harrodsburg at the site of an old grist mill. All that remains of the mill is a rock wall. This station is 23.0 miles downstream from the source and is characterized by an extremely rubbly bottom in a large riffle area about 75 m long. The stream at the Grist Mill station is about 6 m wide and less than 1 m deep.

Station 7. This is the Jackson Road station in central Mercer County at the bridge on Jackson Road just east of Keonon Road. This station is 26.2 miles downstream from the source and is characterized by mud banks and a sluggish current.

Station 8. In central Mercer County, 1.2 miles west of Talmage on Highway 1160. This station is called the Talmage-Mayo station and the reference point is the highway bridge. It is 30.1 miles from the source.

Station 9. The Salvisa Junction station is in northern Mercer County, 1.1 miles west of Salvisa Junction at the bridge on Highway 1987. Here the stream is characterized by a riffle well over 100 m long with gravel- to cobble-sized stones interspersed with sand and gravel. This station is 38.2 miles from the source.

Station 10. In northwestern Mercer County at the bridge crossing the Salt River on Locto Road, 1.5 miles northwest of Bondville. This stream is 43.5 miles downstream from the source.

Station 11. In southeastern Anderson County, 0.8 mile west of McBrayer, at the junction of Rice Road, Highway 749, and Highway 513. This is the McBrayer Distillery station and the reference point is the bridge crossing the river.

The bottom is sand, gravel, and mud with boulder-sized stones scattered over the area. At the northern end, a larger sandbar splits the course of the stream. Extensive beds of *Dianthera* grow at the southern end. The stream is 6-7 m wide and averages less than 0.3 m deep. This station is 48.4 miles from the source.

Station 12. In southeastern Anderson County, approximately 2.5 miles northwest of McBrayer at the ford on Rice Road. The bottom consists of gravel to rubble. The stream is 6-7 m wide and the station is 52.2 miles from the source.

Station 13. In south central Anderson County, 0.6 mile northwest of Fox Creek. The reference point is the highway bridge of U. S. Highway 62. The site is characterized by 2 long pools on either side of a riffle about 4-5 m long. The riffle consists of cobble- to boulder-sized rocks with some sand and gravel. The stream is 8-10 m wide and 0.1-0.5 m deep. The station is 56.8 miles from the source.

Station 14. In central Anderson County, 0.5 mile south of the junction of Anderson city road with Kentucky Highway 44, between the bridge spanning Indian Creek and the bridge spanning the Salt River. This station is 63.4 miles from the source and the stream in this area is broken by many small islands and extensive beds of *Dianthera*. There is a riffle more than 100 m long between 2 pools. The bed of the riffle is composed of small gravel to cobble-sized stones with some sand and silt in evidence. The stream is 8-10 m wide and from a few centimeters to more than a meter deep.

Station 15. In west central Anderson County, 0.15 mile south of the junction of Highways 53 and 54 at Glensboro. The reference point is the old iron bridge spanning the river 65.8 miles downstream from the source. The course of the stream has a braided appearance with many small islands and beds of

Dianthera. The stream flows over large expanses of bedrock limestone and into a long, shallow pool, the bottom of which is covered with rocks ranging in size from that of a baseball to that of a washtub. The stream is 8-10 m wide and from a few centimeters to 1 m deep.

Station 15A. Also at Glensboro but 200 m downstream from Station 15 at the mouth of Leech Creek. Leech Creek is a very intermittent stream, more like a drain. It is very rocky and steep with a high flow shortly after a rain. The stream flows through woods in its upper reaches and through pastureland lower down. Very little fauna. Water chemistry indicated that the bed is mostly limestone and scree.

Station 16. In northwestern Anderson County about 2.8 miles west of Glensboro on the road to Van Buren. This station is 68.7 miles from the source at a ford across the Salt River. There is a short riffle about 3 m long between 2 pools, each of which is more than 100 m long. The bottom consists of gravel and rubble and there are beds of *Dianthera* northeast of the station. The stream is 8-10 m wide and from a few centimeters to more than a meter deep.

Station 17. At Goodnight Bridge in western Anderson County at the junction of Highway 248 with the road from Glensboro to Van Buren. The bridge is 71.3 miles from the source and the stream is characterized by a small riffle area about 2-3 m long at the western end of a pool about 100 m long. The riffle is composed of pea- to basketball-sized rocks, whereas the pool bottom ranges from exposed bedrock limestone with rocks that range in size from baseballs to dinner plates and interspersed with sand and mud. Beds of *Dianthera* grow at either end of the stream course. The stream at this station is 8-12 m wide and from a few centimeters to more than a meter deep.

Station 18. In western Anderson County, at the bridge over the Salt River 0.1 mile south of the junction of Watts Run Road with Highway 248 in Van

Buren. Here, the stream is characterized by a pool about 100 m long, 8-12 m wide, and from 0.3 to 1.3 m deep. Numerous beds of *Dianthera* are scattered throughout the area and literally choke the stream at the western end of the station. This station is 73.5 miles from the source.

Station 19. In eastern Spencer County, 3.8 miles west of Van Buren at the confluence of Timber Creek with Salt River. This station is 77.4 miles from the source and the stream is 8-12 m wide and about 1 m deep.

Station 20. In eastern Spencer County about 100 m northwest of the confluence of Candy Branch with Salt River. The station is 80.0 miles downstream from the source and is characterized as a riffle about 100 m long at the northwestern end of a pool about 100 m long. The riffle contains stones from the size of a baseball to that of a washtub with some sand, gravel, and mud present. There is a large sandbar and extensive beds of *Dianthera* at the southwestern end of the riffle. The stream is 8-10 m wide and from a few centimeters to 0.5 m deep.

Station 21. In east central Spencer County, 0.8 mile south of the confluence of Little Beech Creek with Salt River. Station 21 is 85.1 miles from the source.

Station 22. At the Highway 55 bridge that spans Salt River in central Spencer County, 2.5 miles southeast of the junction of Highways 55 and 44 at Taylorsville. This station, 92.7 miles from the source, is characterized as a pool about 200 m long with a 4 to 5-m riffle at the western end. The bottom of the pool is sandy mud but there are rocks ranging from the size of a dinner plate to a washtub in the riffle. There are several beds of *Dianthera* in the northwestern end of the pool. Here, the stream is about 12 m wide and the depth ranges from a few centimeters in the riffles to 1.5 m in the pool.

Station 23. In south central Spencer County, 1.3 miles south of Highway 55 bridge on an unnumbered gravel road. The bridge is on the Taylorsville-Bloomfield Road. At this station, there is a riffle about 10 m long between 2 pools. Numerous beds of *Dianthera* grow in the stream course giving the channel a braided appearance. The riffle is covered with rocks ranging in size from that of a pea to a dinner plate with sand and mud present. The stream is 10-12 m wide and from 150 to 500 cm deep. The station is 94.0 miles from the source.

Station 24. In western Spencer County, approximately 1.0 mile south of the junction of Highway 623 with Highway 44, east of Waterford at the bridge on Highway 623 over Salt River. This station is about 102 miles below the source.

Station 25. Near Shepherdsville in central Bullitt County about 127 miles downstream from the source of Salt River. The station is 0.5 mile south of the junction of Highways 61 and 44 at Shepherdsville at the bridge over Salt River.

Descriptions of other stations will appear in a subsequent report.

METHODS

Temperature data were obtained using calibrated mercury stem thermometers or the thermistor element of a Yellow Springs Model 54 Oxygen Meter. Readings for dissolved oxygen were taken with the same meter and checked against data following the Alsterberg modification of the Winkler method as outlined in the 12th edition of Standard Methods for Examination of Water and Wastewater. Total hardness and alkalinities were determined following procedures outlined in Standard Methods. Alkalinities were also determined potentiometrically with a Corning Model 10 pH meter. Major anions and cations were determined by accepted procedures using colorimetric

analyses with a Bausch and Lomb Spectronic 20 spectrophotometer.

Bottom samples were collected with nets, dredges, and Surber samplers in an effort to obtain qualitative as well as quantitative estimates of the fauna. Fish were collected with an electroshocking apparatus, nets, seines, and chemicals. Samples of water, bottom fauna, streamside vegetation, and aquatic vertebrates were taken at each of the described stations at least once during the study period. Data from these collections are appended to this report and include a list of algae, a list of higher plants, a list of bottom fauna, and a list of fishes.

PHYSICAL AND CHEMICAL DATA

Although physical and chemical data for Salt River were collected at each of the 25 stations listed, principal effort was expended in the approximately 30 miles of stream to be impounded by Taylorsville Reservoir (Stations 14-23; Miles 63.4-94.0). From its source to a few miles downstream from Taylorsville, Salt River is a series of riffles and pools, the water flowing over bedrock limestone with sand, silt, gravel, and rubble accumulated in the stream bed. Water temperatures at all stations paralleled ambient temperatures and ranged from 3 C in March to 27-30 C in June and July (Table 1). Also, there is a marked inverse correlation between water temperatures and dissolved oxygen. So far as percentage saturation of dissolved oxygen in the water is concerned the ranges are from about 60% in July to about 120% in February. Even with the high temperatures of midsummer, the water at most stations remains at about 80% saturation. The effects of sanitary sewage effluents on the stream are localized below the outfalls from Harrodsburg and Lawrenceburg and do not have an extensive effect on the mainstream of Salt River.

Table 1. Physical and chemical data from seven stations within the proposed flood pool of Taylorsville Reservoir. These data are preliminary and are intended only to indicate the general characteristics of Salt River, Kentucky.

	Station Number						
	14	15	16	17	18	20	23
Miles from source	63.4	65.8	68.7	71.3	73.5	80.0	94.0
Temperature °C, air/water							
February	-/5.2	-/5.5	-/5.6	-/4.1	-/-	-/4.9	-/5.2
March	16/8.5	15/8.8	-/3	-/3	-/3	16/10	14/7.5
April	23/14	22/14	23/13	27/14.7	25/16	28/16	20/13.3
May	24/21	20/20	27/19	21/20	22/19	23/19	22/20
June	29/23	28/23	29/23	29/23	28/23	30/23	28/23
July	31/26	31/27	29/26	30/26	31/26	29/28	29/27
Dissolved oxygen, ppm							
February	13.6	12.4	13.2	13.1	--	12.6	13.0
March	13.5	13.9	--	12.3	14.0	11.6	10.9
April	13.6	12.8	12.4	10.4	7.6	7.6	10.5
May	10.1	7.2	10.8	10.9	5.2	9.4	8.6
June	9.6	9.0	8.6	8.4	8.8	8.1	6.7
July	7.6	6.9	8.5	7.7	8.2	5.6	4.8
pH							
February	7.5	7.3	7.6	7.4	--	7.3	7.4
March	6.3	6.8	7.2	6.9	7.2	7.2	6.4
April	7.1	7.1	7.0	6.9	6.9	6.6	6.9
May	6.9	7.0	6.6	6.8	6.9	6.5	6.7
June	6.9	6.9	6.9	6.9	7.0	6.9	7.0
July	6.8	6.8	6.8	6.7	6.9	6.8	6.8
Alkalinity (HCO_3), ppm							
February	164	176	141	177	--	176	163
March	178	185	198	154	190	202	182
April	204	206	195	183	137	185	168
May	171	148	196	186	128	167	154
June	138	166	148	131	181	170	185
July	148	170	162	156	154	142	141

Table 1. (continued)

Calcium, mg/l							
February	91.7	83.7	88.4	81.4	--	85.3	76.7
March	71.0	74.5	89.0	87.4	97.0	89.0	80.5
April	87.4	92.2	90.2	80.3	64.1	72.9	73.7
May	64.9	63.4	--	--	59.3	--	--
June	60.7	68.4	67.4	68.4	74.1	71.3	54.9
July	64.1	72.2	70.5	66.2	54.5	60.1	61.3
Manganese, ppm							
February	0.26	0.16	0.35	0.28	--	0.28	0.41
March	0.10	0.10	0.10	0.40	0.20	0.25	0.10
April	0.20	0.13	0.11	0.20	0.58	0.31	0.19
May	0.32	0.51	0.09	0.13	0.80	0.07	0.09
June	0.25	0.24	0.13	0.15	0.23	0.09	0.16
July	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Iron, ppm							
February	0.36	0.37	0.20	0.28	--	0.34	0.49
March	0.12	0.10	0.06	0.20	0.08	0.17	0.11
April	0.12	0.12	0.11	0.27	0.85	0.32	0.24
May	0.32	0.60	0.08	0.12	1.46	0.09	0.10
June	--	0.06	--	0.19	0.16	0.28	0.16
July	0.08	0.29	0.08	0.09	0.35	0.15	0.05

Table 1. (continued)

Calcium, mg/l							
February	91.7	83.7	88.4	81.4	--	85.3	76.7
March	71.0	74.5	89.0	87.4	97.0	89.0	80.5
April	87.4	92.2	90.2	80.3	64.1	72.9	73.7
May	64.9	63.4	--	--	59.3	--	--
June	60.7	68.4	67.4	68.4	74.1	71.3	54.9
July	64.1	72.2	70.5	66.2	54.5	60.1	61.3
Manganese, ppm							
February	0.26	0.16	0.35	0.28	--	0.28	0.41
March	0.10	0.10	0.10	0.40	0.20	0.25	0.10
April	0.20	0.13	0.11	0.20	0.58	0.31	0.19
May	0.32	0.51	0.09	0.13	0.80	0.07	0.09
June	0.25	0.24	0.13	0.15	0.23	0.09	0.16
July	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Iron, ppm							
February	0.36	0.37	0.20	0.28	--	0.34	0.49
March	0.12	0.10	0.06	0.20	0.08	0.17	0.11
April	0.12	0.12	0.11	0.27	0.85	0.32	0.24
May	0.32	0.60	0.08	0.12	1.46	0.09	0.10
June	--	0.06	--	0.19	0.16	0.28	0.16
July	0.08	0.29	0.08	0.09	0.35	0.15	0.05

The depth of the river increases rapidly following rainfall largely because of the impermeable limestones and shales that underlie the basin. Water levels at most stations fluctuate dramatically following a storm (see Hendrickson and Krieger, 1964) and those fluctuations appear to have a major effect on the distribution of the bottom fauna. The turbidity of the water increases quickly as flow and runoff increase. Turbidity, as measured with a Hellige Turbidimeter ranged from 5.0 to 650.0 (ppm SiO_2); the latter reading occurred immediately following a 3-inch rainfall.

In the fall (November), rainfall tends to increase the levels of nitrate nitrogen and orthophosphate following leaching of agricultural fertilizers and degradation of riparian leaves. Concentrations of cations tend to be lower and reflect evident dilution. In the spring (April), nutrient levels and cation concentrations decrease with increased runoff.

Average monthly hydrogen ion concentrations (pH) ranged from 6.3 to 7.5 (Table 1) and total alkalinities (HCO_3) from 128 to 204 ppm. Such a range of pH with the concomitant alkalinities indicates that the bicarbonate ion (HCO_3) largely accounts for the alkalinities with about 25% of the carbon dioxide available as "free CO_2." These data permit us to make a preliminary characterization of Salt River water as medium hard. In a limnetic situation, these values would be indicative of potentially productive waters. Total dissolved solids ranged from 40 to 160 mg/l and conductivity (specific conductance) from 100 to 350 micromhos (x 10^6). Increased runoff with consequent increased discharge affect alkalinity, conductivity, and total dissolved solids. However, it is not always a matter of dilution; increased runoff may bring additional electrolytes into the stream and cause an increase in conductivity. Thus there exists a complex relationship among dissolved solids, conductivity, and stream volume. One thing does seem clear; Salt River is not appropriately named since no

brackish or saline waters have been encountered so far.

Although not included in the data in Table 1, chemical analyses show that nitrate nitrogen ranges from 0.1 to 9.9 mg/l and orthophosphate (PO_4) from 0.2 to 2.9 mg/l. High values for nitrates occurred near fields under cultivation, and presumably treated with fertilizers, whereas the high values for phosphates occurred in the fall presumably from the decomposition of large quantities of leaves from riparian vegetation.

Iron and manganese are present in small quantities (Table 1) and apparently have little effect on the environment. However, it is possible that these cations, acting in concert in a limnetic situation, could cause adverse effects in areas of low oxygen concentration in waters near the bottom (Ruttner, 1963:83). Mackenthum (1969) has pointed out that such conditions may develop following impoundment and could affect water quality by causing stains and producting objectionable tastes and odors.

FLORA AND FAUNA

Algae were collected and identifiifed by Dr. Takashi Sawa, University of Toronto, Toronto, Canada, during the summer of 1968 from the upper reaches of Salt River. The appended list includes 74 species referable to 35 families in 5 divisions. In some instances, the algae were classified only to genus because zygotes necessary for specific identification were lacking. Certainly, this preliminary list is incomplete and further collections will be made. Still the diversity of the flora is indicative of an oligosaprobic stream (Kolkwitz and Marsson, 1909) that is capable of assimilating perturbing effluents rather well.

Higher plants were collected and identified by Harry H. Woodward under the supervision of Professor William S. Davis. Specimens of all plants

are in the P. A. Davies Herbarium of the University of Louisville. The collections were confined to Anderson, Nelson, and Spencer counties, but there is little doubt that many species occur throughout the basin. Although more than 350 species of higher plants, referable to 80 families, were collected and identified, all species were not collected from each county. In all probability, further collections will reveal that the floras of the three counties, as well as those from Mercer and Boyle counties at the extreme upper end of Salt River, are quite similar. Still, such a list from preliminary collections indicates a widely varied and abundant flora.

Over much of the Salt River, there are extensive stands of water willow *Dianthera (=Justicia) americana* which, especially in the shallow areas literally choke the streambed and give the river a braided appearance. These beds are extensive and are such an essential part of the environment that the contribution of this species should be studied in detail. An effort will be made to undertake such a study in the future. Along with the water willow, black willow, *Salix nigra*, is a common emergent form. As with most streams in central Kentucky, sycamores, *Platanus occidentalis*, and oaks, *Quercus* spp., are common riparian trees.

Bottom organisms were collected from selected sites in the upper Salt River. Although these preliminary collections were not extensive, the variety of organisms indicates that Salt River is a relatively clean and healthy stream. The presence of freshwater sponges of the genus *Spongilla*, several species of stoneflies, mayflies, caddisflies, and midges, and the abundance of other forms lend credence to the well being of the stream. In only two locations, below Harrodsburg and Lawrenceburg where sewage effluent entered the stream, was there a marked deterioration of the fauna. Within another year, when many more bottom samples will be collected and analyzed,

we will be able to provide a much more accurate picture of the relative abundance and distribution of the benthic fauna.

Fishes were collected during the spring and early summer of 1969 with seines, electrofishing apparatus, and/or chemicals. The fishes were preserved in 10% formalin in the field and brought to the laboratory for identification. After deformalization, the fish were identified to species, preserved in ethyl alcohol, and placed in the Fish Collection of the University of Louisville. The species taken in these collections are listed in the report, and an annotated version of this list was published in the Transactions of the Kentucky Academy of Science, Volume 31 (1970), Numbers 3-4, pages 51-63. Copies of that publication are included with this report. The list of fishes includes 52 species and 3 hybrid sunfishes referable to 11 families. Such a species composition of fishes from a stream the size of Salt River indicates the maintenance of a well-balanced population with adequate numbers of forage, predator, and game species. However, it is believed that further sampling will add other species to the list.

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APPENDIX

ALGAE COLLECTED FROM UPPER SALT RIVER, SUMMER 1968

CHLOROPHYTA

Chlamydomonadaceae	*Chlamydomonas* sp.
Phacotaceae	*Phacotus lenticularis* *Dysmorphococcus variabilis*
Volvocaceae	*Pandorina morum*
Palmellaceae	*Sphaerocystis Schroeteri*
Tetrasporaceae	*Tetraspora gelatinosa*
Ulotrichaceae	*Ulothrix rorida*
Microsporaceae	*Microspora tumidula*
Chaetophoraceae	*Protoderma viride*
Trentepohliaceae	*Gongrosira lacustris*
Cladophoraceae	*Cladophora glomerata* *Cladophora* sp. *Rhizoclonium hookeri*
Chlorococcaceae	*Chlorococcum* sp.
Hydrodictyaceae	*Hydrodictyon reticulatum* *Pediastrum tetras* *Pediastrum biradiatum* *Pediastrum boryanum* *Sorastrum americanum*
Coelastraceae	*Coelastrum microporum*
Oocystaceae	*Chlorella* sp. *Oocystis* sp. *Tetraedron trigonum*
Scenedesmaceae	*Scenedesmus longus* *Scenedesmus abundans* *Scenedesmus brasiliensis*
Zygnemataceae	*Spirogyra* sp. (Sp. 1) *Spirogyra* sp. (Sp. 2) *Spirogyra* sp. (Sp. 3)

Mesotaeniaceae	*Netrium digitus*
Desmidiaceae	*Closterium dianae* *Closterium lanceolatum* *Cosmarium formosulum* *Cosmarium supraspeciosum* *Cosmarium constrictum* *Staurastrum margaritaceum* *Staurastrum polymorphum*
Oedogoniaceae	*Oedogonium* sp.
EUGLENOPHYTA	
Euglenaceae	*Euglena ehrenbergii* *Euglena minuta* *Trachelomonas* sp.
CHRYSOPHYTA	
Tribonemataceae	*Bumilleria sicula*
Synuraceae	*Synura Adamsii*
Coscinodiscaceae	*Melosira varians*
Meridionaceae	*Meridion circulata*
Diatomaceae	*Diatoma vulgare*
Fragilariaceae	*Synedra ulna*
Achnanthaceae	*Cocconeis pediculus* *Achanthes lanceolata* *Rhoicosphenia curvata*
Naviculaceae	*Navicula mutica* *Navicula gracilis* *Navicula rhynocephala* *Pinnularia interrupta* *Stauroneis smithii* *Gyrosigma scalproides*
Gomphonemataceae	*Gomphonema sphaerophorum*
Cymbellaceae	*Cymbella tumida*
Nitzschiaceae	*Nitzschia linearis*
RHODOPHYTA	
Chantransiaceae	*Audouinella violacea*

CYANOPHYTA

Chroococcaceae	*Chroococcus* sp.
	Polycystis sp.
	Synechococcus aeruginosus
	Merismopedia tenuissima
	Coelosphaerium collinsii
Pleurocapsaceae	*Pleurocapsa minor*
Oscillatoriaceae	*Spirulina* sp.
	Oscillatoria amoena
	Oscillatoria lacustris
	Oscillatoria geminata
	Oscillatoria formosa
	Lyngbya sp.
	Phormidium tenue
	Phormidium retzii

PLANTS COLLECTED IN THE SALT RIVER BASIN, 1968-1969

PTERIDOPHYTA

EQUISETACEAE

Equisetum arvense L.	Common Horsetail

POLYPODIACEAE

Adiantum pedatum L.	Maidenhair Fern
Polystichum acrostichoides (Michx.)	Schott Christmas Fern

SPERMATOPHYTA

CUPRESSACEAE

Juniperus virginiana L.	Red Cedar

MONOCOTYLEDONEAE

GRAMINEAE

Agrostis alba L.	Redtop
Bromus japonicus Thunb.	Japanese Brome Grass
Bromus tectorum L.	Downy Chess
Dactylis glomerata L.	Orchard Grass
Digitaria sanguinalis (L.) Scop.	Crab Grass
Elymus virginicus L.	Wild Rye
Festuca elatior L.	Meadow Fescue
Festuca obtusa Biehler	Nodding Fescue
Glycera striata (Lam.) Hitchc.	Fowl Meadow Grass
Hordeum pusillum Nutt	Little Barley
Hordeum vulgare L.	Barley
Hystrix patula Moench.	Bottlebrush Grass
Leptochloa filiformis (Lam.) Beauv.	Feather Grass
Melica mutica Walt.	Melic Grass
Panicum boscii Poir.	Panic Grass
Panicum flexile (Gatt.) Scribn.	Panic Grass
Paspalum laeve Michx.	Paspalum
Phleum pratense L.	Timothy
Poa compressa L.	Canada Blue Grass
Poa pratensis L.	Kentucky Blue Grass
Poa sylvestris A. Gray	Sylvan Blue Grass
Secale cereale L.	Rye
Setaria faberii Herrm.	Nodding Foxtail
Setaria geniculata (Lam.) Beauv.	Prairie Foxtail
Sorghum vulgare Pers.	Sorghum
Sphenopholis intermedia Rydb.	Wedge Grass
Tridens flavus (L.) Hitchc.	Purpletop

CYPERACEAE

Carex gravida Bailey	Sedge
Carex sparganioides Muhl.	Sedge
Cyperus strigosus L.	Sedge
Scirpus atrovirens Willd.	Common Bulrush

LEMNACEAE	
Lemna minor L.	Duckweed
COMMELINACEAE	
Commelina communis L.	Day Flower
Tradescantia subaspera Ker.	Spiderwort
Tradescantia virginiana L.	Spiderwort
LILIACEAE	
Allium vineale L.	Field Garlic
Camassia scilloides (Raf.) Cory	Wild Hyacinth
Erythronium umbellatum L.	White Dog-tooth Violet
Hemerocallis fulva L.	Day-lily
Ornithogalium umbellatum L.	Star-of-Bethlehem
Polygonatum biflorum (Walt.) Ell.	Solomon's Seal
Smilacina racemosa (L.) Desf.	False Solomon's Seal
Smilax bona-nox L.	Bullbrier
Smilax hispida Muhl.	Bristly Greenbrier
Uvularia grandiflora Sm.	Bellwort
DIOSCOREACEAE	
Dioscorea quaternata (Walt.) J.F. Gmel.	Wild Yam
IRIDACEAE	
Sisyrinchium arenicola Bickn.	Blue-eyed Grass
Sisyrinchium graminoides Bickn.	Blue-eyed Grass
DICOTYLEDONEAE	
SAURURACEAE	
Saururus cernuus L.	Water-Dragon
SALICACEAE	
Salix fragilis L.	Crack-willow
Salix nigra Marsh	Black Willow
Salix rigida Muhl.	Heart-leaved Willow
JUGLANDACEAE	
Carya cordiformis (Wang.) K. Koch	Pignut Hickory
Carya illinoensis (Wang.) K. Koch	Pecan
Carya laciniosa (Michx.) Loud.	Kingnut Hickory
Carya ovata (Mill.) K. Koch	Shagbark Hickory
Carya tomentosa Nutt	Mockernut Hickory
Juglans nigra L.	Walnut
CORYLACEAE	
Carpinus caroliniana Walt.	Blue Beech
Ostrya virginiana (Mill.) K. Koch	Hop Hornbeam
FAGACEAE	
Quercus alba L.	White Oak

Quercus coccinea Muenchb.	Scarlet Oak
Quercus macrocarpa Michx.	Bur Oak
Quercus prinoides Willd.	Chestnut Oak
Quercus rubra L.	Red Oak
Quercus shumardii Buckl.	Shumard Oak
Quercus velutina Lam.	Black Oak
ULMACEAE	
Celtis laevigata Willd.	Sugarberry
Celtis occidentalis L.	Hackberry
Ulmus americana L.	American Elm
Ulmus rubra Muhl.	Slippery Elm
MORACEAE	
Maclura pomifera (Raf.) Schneid.	Osage Orange
Morus alba L.	White Mulberry
URTICACEAE	
Laportea canadensis (L.) Gand.	Wood Nettle
Pilea pumila (L.) Gray	Clearweed
LORANTHACEAE	
Phoradendron flavescens (Pursh) Mett.	Mistletoe
ARISTOLOCHIACEAE	
Asarum canadense L.	Wild Ginger
POLYGONACEAE	
Polygonum erectum L.	Knotweed
Polygonum hydropiper L.	Water Pepper
Polygonum hydropiperoides Michx.	Wild Water Pepper
Polygonum pensylvanicum L.	Pink Weed
Polygonum persicaria L.	Lady's Thumb
Polygonum punctatum Ell.	Water Smartweed
Polygonum scandens L.	False Buckweed
Polygonum virginianum L.	Virginia Knotweed
Rumex altissimus Wood.	Pale Dock
Rumex crispus L.	Sour Dock
Rumex mexicanus Meisn.	Dock
Rumex obtusifolius L.	Bitter Dock
CHENOPODIACEAE	
Chenopodium album L.	Pigweed
AMARANTHACEAE	
Amaranthus hydridus L.	Green Amaranth
PHYTOLACCACEAE	
Phytolacca americana L.	Pokeweed
CARYOPHYLLACEAE	
Dianthus armeria L.	Deptford Pink
Saponaria officinalis L.	Bouncing Bet
Silene stallata (L.) Ait. f.	Starry Campion

Silene virginica L.	Fire Pink
Stellaria media (L.) Cyrillo	Common Chickweed
Stellaria pubera Michx.	Great Chickweed

RANUNCULACEAE

Actaea pachypoda Ell.	White Baneberry
Anemone virginiana L.	Thimbleweed
Anemonella thalictroides(L.) Spach.	Rue Anemone
Aquilegia canadensis L.	Columbine
Clematis versicolor Sm.	Leather Flower
Clematis viorna L.	Leather Flower
Delphinium tricorne Michx.	Dwarf Larkspur
Ranunculus abortivus L.	Small-flowered Crowfoot
Ranunculus bulbosa L.	Bulbous Buttercup
Ranunculus recurvatus Poir.	Hooked Crowfoot
Ranunculus septentrionalis Poir.	Swamp Buttercup
Thalictrum dioicum L.	Early Meadow Rue

BERBERIDACEAE

Jeffersonia diphylla (L.) Pers.	Twin-leaf
Podophyllum peltatum L.	Mayapple

MENISPERMACEAE

Menispermum canadensis L.	Moonseed

MAGNOLIACEAE

Liriodendron tulipifera L.	Yellow Poplar

ANNONACEAE

Asimina triloba (L.) Dunal	Pawpaw

LAURACEAE

Lindera benzoin (L.) Blume	Spice Bush
Sassafras albidum (Nutt.) Nees	Sassafras

PAPAVERACEAE

Sanguinaria canadensis L.	Bloodroot

FUMARIACEAE

Corydalis flavula (Raf.) DC.	Pale Corydalis

CRUCIFERAE

Barbarea vulgaris R. Br.	Winter Cress
Capsella bursa-pastoris (L.) Medic.	Shepherd's Purse
Cardamine douglassi (Torr.) Britt.	Purple Cress
Cardamine hirsuta L.	Bitter Cress
Dentaria laciniata Muhl.	Toothwort
Erucastrum gallicum (Willd.) O.E. Schulz	
Iodanthus pinnatifidus (Michx.) Steud.	Purple Rocket
Lepidium campestre (L.) R. Br.	Field Cress
Lepidium virginicum L.	Pepper Grass
Thlaspi arvense L.	Field Penny Cress
Thlaspi perfoliatum L.	Perfoliate Penny Cress

CRASSULACEAE	
Penthorum sedoides L.	Ditch Stonecrop
Sedum ternatum Michx.	Stonecrop
SAXIFRAGACEAE	
Heuchera americana L.	Alum Root
Hydrangea arborescens L.	Wild Hydrangea
PLATANACEAE	
Platanus occidentalis L.	Sycamore
ROSACEAE	
Agrimonia pubescens Wallr.	Agrimony
Agrimonia rostellata Wallr.	Agrimony
Geum canadense Jacq.	White Avens
Geum vernum (Raf.) T. & G.	Early Water Avens
Potentilla recta L.	Rough-fruited Cinquefoil
Potentilla simplex Michx.	Five-finger
Prunus persica (L.) Batsch	Peach
Prunus serotina Ehrh.	Black Cherry
Rosa canina L.	Dog Rose
Rosa carolina L.	Pasture Rose
Rosa foliolasa Nutt.	Rose
Rosa setigera Michx.	Prairie Rose
Rubus allegheniensis Porter	High-bush Blackberry
Rubus occidentalis L.	Black Raspberry
Rubus orarius Blanchard	High-bush Blackberry
LEGUMINOSAE	
Amphicarpa bracteata (L.) Fern.	Hog Peanut
Cassia marilandica L.	Wild Senna
Cercis canadensis L.	Redbud
Desmodium cuspidatum (Muhl.) Loud.	Tick Trefoil
Desmodium dillenii Darl.	Tick Trefoil
Desmodium glutinosum(Muhl.) Wood.	Tick Trefoil
Desmodium paniculatum (L.) DC.	Tick Trefoil
Gleditsia triacanthos L.	Honey Locust
Lathyrus latifolius L.	Everlasting Pea
Lespedeza bicolor Turcz	Bush Clover
Lespedeza stipulacea Maxim.	Korean Clover
Medicago lupulina L.	Black Medic
Medicago sativa L.	Alfalfa
Melilotus albus Desr.	White Sweet Clover
Melilotus officinalis (L.) Lam.	Yellow Sweet Clover
Phaseolus polystachios (L.) BSP.	Wild Bean
Trifolium campestre L.	Large Hop Clover
Trifolium pratense L.	Red Clover
Trifolium repens L.	White Clover
Vicia caroliniana Walt.	Wood Vetch
Vicia desycarpa Ten.	Vetch
OXALIDACEAE	
Oxalis grandis Sm.	Sheep-sorrel
Oxalis stricta L.	Yellow Wood Sorrel

GERANIACEAE	
Geranium maculatum L.	Wild Geranium
RUTACEAE	
Ptelea trifoliata L.	Hop Tree
POLYGALACEAE	
Polygala senega L.	Seneca Snakeroot
EUPHORBIACEAE	
Acalypha ostryaefolia Riddell.	Three-seeded Mercury
Acalypha rhomboidea Raf.	Three-seeded Mercury
Croton monanthogynus Michx.	Croton
Euphorbia corollata L.	Flowering Spurge
Euphorbia dentata Michx.	Spurge
Euphorbia maculata L.	Nodding Spurge
CELASTRACEAE	
Celastrus scandens L.	American Bittersweet
Euonymus atropurpureus Jacq.	Wahoo
Euonymus obovatus Nutt.	Running Strawberry Bush
ANACARDIACEAE	
Rhus glabra L.	Smooth Sumac
Rhus radicans L.	Poison Ivy
STAPHYLEACEAE	
Staphylea trifolia L.	American Bladder-nut
ACERACEAE	
Acer negundo L.	Box Elder
Acer nigrum Michx. f.	Black Maple
Acer saccharinum L.	Silver Maple
Acer saccharum Marsh.	Sugar Maple
HIPPOCASTANACEAE	
Aesculus glabra Willd.	Ohio Buckeye
BALSAMINACEAE	
Impatiens capensis Meerb.	Spotted Touch-me-not
Impatiens pallida Nutt.	Pale Touch-me-not
VITACEAE	
Ampelopsis cordata Michx.	Racoon Grape
Parthenocissus quinquefolia (L.)	Virginia Creeper
Vitis vulpina L.	Winter Grape
TILIACEAE	
Tilia americana L.	Basswood
Tilia heterophylla Vent.	White Basswood
MALVACEAE	
Sida spinosa L.	Prickly Mallow

HYPERICACEAE	
Hypericum densiflorum Pursh	Saint John's-wort
Hypericum perforatum L.	Common Saint John's-wort
Hypericum punctatum L.	Spotted Saint John's-wort
VIOLACEAE	
Hybanthus concolor (T.F. Forst.) Spreng.	Green Violet
Viola papilionacea Pursh	Common Violet
Viola pensylvanica Michx.	Smooth Yellow Violet
Viola striata Ait.	Pale Violet
PASSIFLORACEAE	
Passiflora lutea L.	Passionflower
THYMELAEACEAE	
Dirca palustris L.	Leatherwood
ONAGRACEAE	
Gaura biennis L.	Biennial Gaura
Oenothera biennis L.	Evening Primrose
UMBELLIFERAE	
Chaerophyllum procumbens (L.) Crantz.	Wild Chervil
Chaerophyllum tainturieri Hook.	Wild Chervil
Conium maculatum L.	Poison Hemlock
Cryptotaenia canadensis (L) DC.	Honewort
Daucus carota L.	Wild Carrot
Erigenia bulbosa (Michx.) Nutt.	Harbinger of Spring
Pastinaca sativa L.	Parsnip
Sanicula gregaria Bickn.	Black Snakeroot
Taenidia integerrima (L.) Drude	Yellow Pimpernel
Thaspium barbinode (Michx.) Nutt.	Meadow Parsnip
Thaspium trifoliatum (L.) Gray	Meadow Parsnip
Torilis japonica (Houtt.) DC.	Hedge Parsley
CORNACEAE	
Cornus drummondi Meyer	Rough-leaved Dogwood
Cornus florida L.	Flowering Dogwood
PRIMULACEAE	
Dodecatheon meadia L.	Shooting Star
Lysimachia ciliata L.	Fringed Loosestrife
EBENACEAE	
Diospyros virginiana L.	Persimmon
OLEACEAE	
Fraxinus americana L.	White Ash
Fraxinus quadrangulata Michx.	Blue Ash
GENTIANACEAE	
Swertia caroliniensis (Walt.) Kuntze	American Columbo

APOCYNACEAE	
Apocynum cannabinum L.	Indian Hemp
ASCLEPIADACEAE	
Asclepias incarnata L.	Swamp Milkweed
Asclepias quadrifolia Jacq.	Milkweed
Asclepias syriaca L.	Common Milkweed
Asclepias tuberosa L.	Butterfly Weed
Matelea baldwyniana (Sweet) Woodson	Climbing Milkweed
CONVOLVULACEAE	
Convolvulus sepium L.	Hedge Bindweed
Cuscuta cuspidata Engelm.	Dodder
Cuscuta pentagona Engelm.	Dodder
Ipomoea hederacea (L.) Jacq.	Blue Morning Glory
Ipomoea lacunosa L.	Small White Morning Glory
Ipomoea pandurata (L.) G.F.W. Mey.	Wild Potato Vine
POLEOMONIACEAE	
Phlox amplifolia Britt.	Broadleaf Phlox
Phlox divaricata L.	Wild Sweet William
Phlox paniculata L.	Garden Phlox
Polemonium reptans L.	Jacob's Ladder
HYDROPHYLLACEAE	
Hydrophyllum appendiculatum Michx.	Woolen Breeches
Hydrophyllum macrophyllum Nutt.	Waterleaf
Phacelia purshii Buckl.	Miami Mist
BORAGINACEAE	
Cynoglossum virginianum L.	Giant Forget-me-not
Hackelia virginiana (L.) I.M. Johnston	Beggar's Lice
Myosotis macrosperma Engelm.	Scorpion Grass
VERBENACEAE	
Lippia lanceolata Michx.	Fog Fruit
Verbena urticifolia L.	White Vervain
LABIATAE	
Blephilia ciliata (L.) Benth.	Ohio Horse Mint
Glechoma hederacea L.	Ground Ivy
Lamium amplexicaule L.	Henbit
Lamium purpureum	Dead Nettle
Leonurus cardiaca L.	Motherwort
Mentha piperita L.	Peppermint
Mentha spicata L.	Spearmint
Perilla frutescens L.	Beef-steak Plant
Physostegia virginiana (L.) Britt.	False Dragonhead
Prunella vulgaris L.	Self-heal
Salvia lyrata L.	Cancer Weed
Scutellaria incana Riehler	Skullcap
Scutellaria nervosa Pursh	Skullcap
Scutellaria ovata Hill	Skullcap

SOLANACEAE	
Datura stramonium L.	Jimson Weed
Nicotiana tobacum L.	Tobacco
Physalis longifolia Nutt.	Ground Cherry
Physalis virginiana Mill.	Ground Cherry
Solanum americanum Mill.	Black Nightshade
Solanum carolinense L.	Bull Nettle
SCROPHULARIACEAE	
Aureolaria virginica (L.) Pennell.	False Foxglove
Mimulus alatus Ait.	Monkey Flower
Pedicularis canadensis L.	Wood Betony
Penstemon alluviorum Pennell.	Beard-tongue
Penstemon pallidus Sm.	Beard-tongue
Scrophularia marilandica L.	Figwort
Verbascum blattaria L.	Moth Mullein
Verbascum thapsus L.	Mullein
Veronica arvensis L.	Corn Speedwell
BIGNONIACEAE	
Bignonia capreolata L.	Cross Vine
Campsis radicans (L.) Seem.	Trumpet Vine
Catalpa bignonioides Walt.	Catalpa
ACANTHACEAE	
Dianthera americana L.	Waterwillow
Ruellia strepens L.	Wild Petunia
PLANTAGINACEAE	
Plantago lanceolata L.	English Plantain
Plantago rugellii Dcne.	Rugel Plantain
Plantago virginica L.	Hoary Plantain
RUBIACEAE	
Galium aparine L.	Goose Grass
Galium circaezans Michx.	Wild Licorice
Galium concinnum T. & G.	Bedstraw
Galium pedemontanum All.	Bedstraw
Galium triflorum Michx.	Sweet-scented Bedstraw
Houstonia purpurea L.	Mountain Houstonia
CAPRIFOLIACEAE	
Lonicera japonica Thunb.	Japanese Honeysuckle
Sambucus canadensis L.	Common Elderberry
Symphoricarpos orbiculatus Moench.	Coral Berry
Triosteum angustifolium L.	Yellow-flowered Horse Gentain
Viburnum rufidulum Raf.	Southern Black Haw
VALERIANACEAE	
Valerianella radiata (L.) Dufr.	Corn Salad
DIPSACACEAE	
Dipsacus sylvestris Huds.	Teasel

CUCURBITACEAE

Lagenaria siceraria (Molina) Standl.	Bottle Gourd
Sicyos angulatus L.	Bur Cucumbler

CAMPANULACEAE

Campanula americana L.	Tall Bellflower
Lobelia inflata L.	Indian Tobacco
Lobelia siphilitica L.	Blue Cardinal Flower

COMPOSITAE

Achillea millefolium L.	Common Milfoil
Ambrosia artemisiifolia L.	Common Ragweed
Ambrosia trifida L.	Giant Ragweed
Artemisia annua L.	Sweet Wormwood
Aster novae-angliae L.	New England Aster
Aster pilosus Willd.	White Heath Aster
Aster sagittifolius Willd.	Aster
Aster shortii Lindl.	Aster
Astranthium integrifolium (Michx.) Nutt	Western Daisy
Bidens bipinnata L.	Spanish Needles
Bidens frondosa L.	Sticktight
Bidens polylepis Blake.	Tickseed Sunflower
Chrysanthemum leucanthemum L.	Ox-eye Daisy
Cichorium intybus L.	Common Chicory
Cirsium discolor (Muhl.) Spreng.	Field Thistle
Crepis pulchra L.	Hawk's Beard
Erigeron annuus (L.) Pers.	Daisy Fleabane
Erigeron philadelphicus L.	Philadelphia Fleabane
Eupatorium coelestinum L.	Mist-flower
Eupatorium rugosum Houtt.	White Snakeroot
Eupatorium serotinum Michx.	Late Boneset
Helenium autumnale L.	Sneezeweed
Helianthus strumosus L.	Sunflower
Helianthus tuberosus L.	Jerusalem Artichoke
Heliopsis helianthoides (L.) Sweet	Ox-eye
Lactuca canadensis L.	Wild Lettuce
Lactuca floridana (L.) Gaertn.	Wild Lettuce
Lactuca serriola L.	Prickly Lettuce
Polymnia canadensis L.	Small-flowered Leaf-cup
Polymnia uvedalia L.	Yellow-flowered Leaf-cup
Rudbeckia hirta L.	Black-eyed Susan
Rudbeckia triloba L.	Brown-eyed Susan
Senecio aureus L.	Golden Ragwort
Senecio obovatus Muhl.	Squaw-weed
Silphium perfoliatum L.	Cup Plant
Solidago altissima L.	Tall Goldenrod
Solidago flexicaulis L.	Broadleaf Goldenrod
Solidago ulmifolia (L.) Britt.	Elm-leaf Goldenrod
Taraxacum officinalis Wiggers.	Common Dandelion
Verbesina alternifolia (L.) Britt.	Yellow Ironweed
Vernonia altissima Nutt.	Ironweed
Xanthium chinense Mill.	Cocklebur

BENTHIC ARTHROPODS

TRICHOPTERA	
Rhyacophilidae	*Rhyacophila lobifera*
	Rhyacophila ?ledra
	Glossosoma
Philopotamidae	*Chimarra obscura*
Psychomyiidae	*Polycentropus cinereus*
	Polycentropus sp.
	Tinodes
Hydropsychidae	*Cheumatopsyche analis*
	Cheumatopsyche aphanta
	Cheumatopsyche burksi
	Cheumatopsyche campyla
	Cheumatopsyche oxa
	Cheumatopsyche sordida
	Cheumatopsyche speciosa
	Diplectrona modesta
	Hydropsyche betteni
	Hydropsyche depravata
	Hydropsyche orris
	Hydropsyche simulans
	Macronemum zebratum
	Potamyia flava
Hydroptilidae	*Hydroptila* sp.
	Agraylea
	Oxythira
	Ochrotrichia
Phryganeidae	*Phryganea sayi*
	Ptilostomis ocellifera
Limnephilidae	*Ironoquia punctatissima*
	Neophylax concinnus
	Pycnopsyche guttifer
	Pycnopsyche lepida
	Neophylax nacatus
Leptoceridae	*Athripsodes ancylus*
	Athripsodes angustus
	Athripsodes cancellatus
	Athripsodes resurgens
	Athripsodes tarsi-punctatus
	Athripsodes transversus
	A. n. sp.
	Leptocella exquisita
	Mystacides interjecta
	Oecetis inconspicua

TRICHOPTERA (continued)	
Leptoceridae	*Setodes* sp.
	Triaenodes ?aba
	Triaenodes tarda
	Leptocella sp.
	Leptocerus
Helicopsychidae	*Helicopsyche borealis*
Hydroptilidae	*Tascobia palmata*
	Dibusa sp.
	Oecetis inconspicua
Brachycentridae	*Brachycentrus lateralis*
	B. numerosus
LEPIDOPTERA	
Pyralidae	*Parargyractis* sp.
	Synclita sp.
	Parargyractis fulicalis
DIPTERA	
Tipulidae	*Tipula*
	Antocha saxicola
Rhagionidae	*Atherix*
Empidae	*Roederiodes*
	Hemerodromia ??
Tabanidae ?	*Tabanus*
	Chrysops
Simuliidae	*Simulium* 3 spp.
Ceratopogonidae	*Palypomyia* 5 spp.
Chironomidae	*Pentaneura* 3 or 4 spp.
	Procladius
	Tanypus 2 spp.?
	Clinotanypus
	Diamesa nivor
	Cricotopus
	Cardiocladius
	Corynoneura 2 spp.
	Pseudochironomus richardsoni
	Cryptochironomas digitatus
	Microtendipes pedellus
	Chironomus spp. 3 spp.
	Glyptotendipes lobiferus
	Xenochironomus scopula
	Xenochironomus xenolabris
	Calopsectra
	Tanytarsus

COLEOPTERA	
Hydrophilidae	*Hydrobius* 3 spp.
Haliplidae	*Peltodytes*
Dytiscidae	5 spp.
Gyrinidae	*Dineutes* 3 spp. *Gyrinus*
Elmidae	*Stenelmis* 3 spp.
Psephenidae	*Psephenus*
MEGALOPTERA	
	Sialis infumata *Corydalus cornuata*
NEUROPTERA	*Sisyria vicaria*

COLEOPTERA	
Hydrophilidae	*Hydrobius* 3 spp.
Haliplidae	*Peltodytes*
Dytiscidae	5 spp.
Gyrinidae	*Dineutes* 3 spp. *Gyrinus*
Elmidae	*Stenelmis* 3 spp.
Psephenidae	*Psephenus*
MEGALOPTERA	
	Sialis infumata *Corydalus cornuata*
NEUROPTERA	*Sisyria vicaria*

FISHES COLLECTED FROM UPPER SALT RIVER, 1969

LEPISOSTEIDAE	
Lepisosteus osseus (Linnaeus)	Longear Gar
CLUPEIDAE	
Alosa chrysochloris (Rafinesque)	Skipjack Herring
Dorosoma cepedianum (Lesueur)	Gizzard Shad
CYPRINIDAE	
Campostoma anomalum (Rafinesque)	Stoneroller
Chrosomus erythrogaster (Rafinesque)	Southern Redbelly Dace
Cyprinus carpio Linnaeus	Carp
Ericymba buccata Cope	Silverjaw Minnow
Hybopsis amblops (Rafinesque)	Bigeye Chub
Notemigonus crysoleucas (Mitchill)	Golden Shiner
Notropis ardens (Cope)	Rosefin Shiner
Notropis boops Gilbert	Bigeye Shiner
Notropis cornutus (Mitchill)	Common Shiner
Notropis stramineus (Cope)	Sand Shiner
Notropis spilopterus (Cope)	Spotfin Shiner
Notropis whipplei (Girard)	Steelcolor Shiner
Phenacobius mirabilis (Girard)	Suckermouth Minnow
Pimephales notatus (Rafinesque)	Bluntnose Minnow
Pimephales promelas Rafinesque	Fathead Minnow
Semotilis atromaculatus (Mitchill)	Creek Chub
CATOSTOMIDAE	
Catostomus commersoni (Rafinesque)	White Sucker
Hypentelium nigricans (Lesueur)	Northern Hogsucker
Ictiobus cyprinellus (Valenciennes)	Bigmouth Buffalo
Minytrema melanops (Rafinesque)	Spotted Sucker
Moxostoma erythrurum (Rafinesque)	Golden Redhorse
ICTALURIDAE	
Ictalurus melas (Rafinesque)	Black Bullhead
Ictalurus natalis (Lesueur)	Yellow Bullhead
Ictalurus nebulosus (Lesueur)	Brown Bullhead
Ictalurus punctatus (Rafinesque)	Channel Catfish
Noturus flavus Rafinesque	Stonecat
Noturus miurus Jordan	Brindled madtom
CYPRINODONTIDAE	
Fundulus notatus (Rafinesque)	Blackstripe Topminnow
CENTRARCHIDAE	
Ambloplites rupestris (Rafinesque)	Rock Bass
Lepomis cyanellus Rafinesque	Green Sunfish
Lepomis humilis (Girard)	Orangespotted Sunfish
Lepomis macrochirus Rafinesque	Bluegill
Lepomis megalotis (Rafinesque)	Longear Sunfish
Lepomis microlophus (Günther)	Redear Sunfish

CENTRARCHIDAE (continued)	
Micropterus dolomieui Lacepede	Smallmouth Bass
Micropterus punctulatus (Rafinesque)	Spotted Bass
Micropterus salmoides (Lacepede)	Largemouth Bass
Pomoxis annularis Rafinesque	White Crappie
PERCIDAE	
Etheostoma blennioides Rafinesque	Greenside Darter
Etheostoma caeruleum Storer	Rainbow Darter
Etheostoma flabellare Rafinesque	Fantail Darter
Etheostoma nigrum Rafinesque	Johnny Darter
Etheostoma zonale (Cope)	Banded Darter
Percina caprodes (Rafinesque)	Logperch
Percina maculata (Girard)	Blackside Darter
Stizostedion canadense (Smith)	Sauger
SCIAENIDAE	
Aplodinotus grunniens Rafinesque	Freshwater Drum
COTTIDAE	
Cottus carolinae (Gill)	Banded Sculpin
ATHERINIDAE	
Labidesthes sicculus (Cope)	Brook Silverside
HYBRID CENTRARCHIDS	
Lepomis cyanellus x *megalotis*	
Lepomis macrochirus x *humilis*	
Lepomis cyanellus x *humilis*	