

# **ALABAMA POWER COMPANY**

## **COOSA AND WARRIOR RIVER PROJECTS**

### ***E11 – Impingement, Entrainment, and Turbine Mortality Study Progress Report II***

*July, 2002*

*Prepared by:*

**KLEINSCHMIDT ASSOCIATES**  
**Energy and Water Resource Consultants**

**ALABAMA POWER COMPANY**

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E11 - IMPINGEMENT, ENTRAINMENT, AND TURBINE MORTALITY STUDY  
PROGRESS REPORT II

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PROGRESS REPORT II**

***1.0 INTRODUCTION***

Stakeholders of the Coosa and Warrior Relicensing Teams have identified fish impingement, entrainment, and turbine mortality as an issue to address during relicensing of the Coosa (FERC No. 2146 – Weiss, Neely Henry, Logan Martin, Lay, and Bouldin), Mitchell (FERC No. 82) and Jordan (FERC No. 618) Projects (Coosa River Projects), and the Warrior Project (FERC No. 2165 – Smith and Bankhead). Therefore, the E11 Issue Action Group (IAG) was formed to identify methods to address this issue.

The IAG met on January 30, 2002 to discuss potential methods to address the issue and agreed to evaluate the potential magnitude of fish impingement, entrainment, and turbine mortality using a combination of existing entrainment and turbine mortality literature and site-specific information. On March 7, 2002, APC distributed the Draft E11 Entrainment Study Plan (Study Plan). The IAG met on March 12, 2002 to discuss the proposed methodology outlined in the draft Study Plan. The IAG members indicated that, after some minor changes, the Study Plan is acceptable.

On May 15, 2002, APC distributed the “E11 – Impingement, Entrainment, and Turbine Mortality Study Progress Report” (May Progress Report) to IAG members. The IAG met on May 22, 2002 to review the May Progress Report to discuss how to execute the study plan to the satisfaction of IAG members.

This report is a summary of the study progress since the issuance of the May Progress Report.

## 2.0 *STUDY PROGRESS*

### 2.1 Impingement

Analysis of potential impingement at the projects will require several inputs: trash rack spacing, intake velocity, and species-size composition. Trash rack spacing and intake velocities have been provided by APC. Fish species and size composition estimates are currently being developed based on comments from IAG members.

Once all of these inputs are developed, intake velocities and trash rack spacing will be compared with the swimming speeds and body widths of fish species at the projects to determine which species and sizes of fish, if any, are susceptible to impingement. This qualitative analysis may be supplemented by plant operator observations, as stated in the Study Plan.

### 2.1 Entrainment

#### 2.2.1 Entrainment Database

At the May 22, 2002 meeting, IAG members agreed that the average annual and seasonal entrainment rates from the 9-study database should be used to estimate the number of fish entrained at the Projects.

#### 2.2.3 Calculation of the Entrainment Estimate

##### Step 1 – Total number of fish entrained by month

The estimated total number of fish entrained monthly by each project was calculated by multiplying the appropriate seasonal fish entrainment rate from the 9-study database (Table 1) by the volume of water passed through the turbines monthly during average generation years (Table 2). The

estimated total number of fish potentially entrained monthly and annually by each project is presented in Table 3.

Step 2 – Total number of fish entrained by season

The estimated total number of fish entrained by each project for each season is presented in Table 4. According to the Study Plan, months were divided into seasons as follows:

Winter = December, January, February  
Spring = March, April, May  
Summer = June, July, August  
Fall = September, October, November

Step 3 – Number of entrained fish within each family/genus-group by Season

*This step will be discussed in greater detail at the July 16, 2002 meeting.*

Step 4 – Number of entrained fish within each 25mm (1-inch) length-group  
for each family/genus-group by season

*This step will be discussed in greater detail at the July 16, 2002 meeting.*

The Study Plan originally recommended that species and size composition percentages for each family/genus-group and length-group be based on ADCNR fish collection data, species and size composition from the entrainment database, and IAG recommendations.

At the May 22, 2002 meeting, IAG members indicated that species and size composition data from the 9-study database may be acceptable for estimating the composition of entrained species at the Projects. However, some members requested more detailed information about the composition of entrained species in the 9-study database. Specifically, members suggested a species-level summary of entrainment data, rather than a family/genus-level

summary. As requested by the IAG, species-level summaries are provided in Appendix A, Tables A1 – A12.

### 2.3 Turbine Mortality

Although a complete turbine mortality analysis will not be performed until the entrainment estimates are completed, additional information on identified turbine mortality studies in the database was provided to IAG members in tabular format in the May Progress Report. Additional information on mortality studies in the database will be gathered as the study progresses.

**Table 1. Entrainment rate information from the 9-study database**

<b>Site Name</b>	<b>JAN</b>	<b>FEB</b>	<b>MAR</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JUL</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>	<b>AVG.</b>
Ninety-nine Islands	2.8	5.6	0.8	2.1	4.5	4.5	4.5	4.5	2.7	5.5	3.3	0	3.4
Gaston Shoals	1.3	1.4	0.6	5	1.5	8.8	9	8.3	3.6	2.3	0.4	0.5	3.6
Neals Shoals	nd	nd	6.7	nd	9.5	7.7	nd	4.6	nd	4.0	nd	0.9	5.6
Hollidays Bridge	2.2	0.8	6.5	3.7	11.6	7.1	7.1	7.1	2.9	3.1	1.2	3.3	4.7
Saluda Hydro.	2.2	5.4	nd	nd	nd	10.1	8.1	5.8	5.5	12.6	4.8	5.4	6.7
Richard B. Russell	6.8	33.6	1.0	1.2	0.5	0.3	0.5	1.3	0.6	0.4	2.6	1.1	4.1
King Mill	nd	nd	7.3	4.0	5.2	3.1	3.4	3.6	nd	8.2	4.7	nd	4.9
Moore's Park	0.2	0.8	3.5	7.6	2.9	3.2	5.7	15.6	6.4	3.8	0.2	0.6	4.2
Kleber	nd	0.82	0.44	51.6	2.89	2.31	3.04	5.38	11.03	14.74	5.16	1.38	9.0
<b>Average</b>	<b>2.6</b>	<b>6.9</b>	<b>3.4</b>	<b>10.7</b>	<b>4.8</b>	<b>5.2</b>	<b>5.2</b>	<b>6.2</b>	<b>4.7</b>	<b>6.1</b>	<b>2.8</b>	<b>1.7</b>	<b>5.02</b>

<b>Spring</b>	<b>6.11</b>
<b>Summer</b>	<b>5.56</b>
<b>Winter</b>	<b>4.57</b>
<b>Fall</b>	<b>3.67</b>

**Table 2a. Average monthly turbine flow in million cubic feet (mcf)**

<b>Site (period of record)</b>	<b>JAN</b>	<b>FEB</b>	<b>MAR</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JUL</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>
Weiss (1964 - 2000)	35,299	32,688	39,024	32,612	24,286	15,158	13,611	11,857	10,824	13,876	17,945	26,344
N. Henry (1966 - 2000)	40,084	35,637	41,593	33,463	25,365	16,488	14,891	12,749	11,613	14,391	20,280	28,877
Logan Martin (1964 - 2000)	47,519	44,227	52,776	40,927	29,683	18,508	16,148	13,432	12,318	17,161	22,640	33,784
Lay (1964 - 2000)	48,881	45,551	53,517	43,023	31,144	20,621	17,889	14,740	13,556	18,143	23,359	34,749
Mitchell (1964 - 2000)	43,898	43,203	49,856	37,981	30,397	22,432	19,883	16,156	14,931	19,342	24,690	33,710
Jordan (1964 - 2000)	26,463	24,184	27,983	21,923	18,334	10,634	8,989	7,812	6,897	9,187	10,441	17,812
Bouldin (1967 - 1975, 1980 - 2000)	43,301	43,964	48,470	37,857	25,500	18,367	16,493	12,959	11,778	14,526	21,397	33,252
Smith (1961 - 2000)	5,343	5,919	7,320	6,775	4,690	3,685	3,560	3,606	2,921	1,649	1,897	3,997
Bankhead (1963 - 2000)	19,552	18,634	20,527	16,537	10,953	6,983	6,432	5,218	4,487	3,167	5,889	13,663

[Source: APC 2002, unpublished data, as modified by Kleinschmidt]

**Table 3. Monthly Estimated Total Number of Fish Entrained for the Warrior and Coosa River Projects**

<b>Site</b>	<b>JAN</b>	<b>FEB</b>	<b>MAR</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JUL</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>	<b>TOTAL</b>
Weiss	161,318	149,382	238,438	199,257	148,386	84,279	75,674	65,927	39,722	50,924	65,858	120,391	1,399,555
N. Henry	183,185	162,863	254,131	204,461	154,981	91,674	82,793	70,884	42,621	52,816	74,428	131,967	1,506,805
Logan Martin	217,162	202,118	322,464	250,065	181,364	102,905	89,783	74,679	45,206	62,980	83,087	154,394	1,786,209
Lay	223,386	208,170	326,987	262,870	190,288	114,654	99,465	81,957	49,749	66,586	85,729	158,805	1,868,646
Mitchell	200,613	197,439	304,619	232,067	185,727	124,719	110,550	89,829	54,798	70,986	90,613	154,054	1,816,014
Jordan	120,935	110,522	170,973	133,948	112,019	59,127	49,978	43,437	25,311	33,717	38,319	81,402	979,688
Bouldin	197,886	200,917	296,154	231,304	155,802	102,118	91,704	72,054	43,226	53,311	78,527	151,963	1,674,964
Smith	24,417	27,051	44,724	41,398	28,656	20,486	19,794	20,048	10,721	6,051	6,962	18,268	268,576
Bankhead	89,354	85,158	125,419	101,043	66,921	38,826	35,760	29,013	16,468	11,622	21,613	62,441	683,638

**Table 4. Seasonal Estimated Total Number of Fish Entrained at the Warrior and Coosa River Projects**

<b>Site</b>	<b>WINTER</b>	<b>SPRING</b>	<b>SUMMER</b>	<b>FALL</b>
Weiss	431,090	586,081	225,880	156,504
N. Henry	478,015	613,573	245,351	169,865
Logan Martin	573,674	753,893	267,368	191,273
Lay	590,361	780,146	296,076	202,064
Mitchell	552,106	722,413	325,099	216,397
Jordan	312,860	416,940	152,542	97,346
Bouldin	550,766	683,259	265,875	175,064
Smith	69,736	114,778	60,328	23,734
Bankhead	236,952	293,383	103,599	49,703

**APPENDIX A**

**Fish Species and Size Composition from the 9-study Entrainment Database**

Table A1	Richard B. Russell Fish Entrainment Species Composition
Table A2	Saluda Fish Entrainment Species composition
Table A3	99 Islands Fish Entrainment Species Composition
Table A4	Neal Shoals Fish Entrainment Species Composition
Table A5	Gaston Shoals Fish Entrainment Species Composition
Table A6	Hollidays Bridge Fish Entrainment Species Composition
Table A7	King Mill Fish Entrainment Species Composition
Table A8	Kleber Fish Entrainment Species Composition
Table A9	Moore's Park Entrainment Species Composition
Table A10	Seasonal Fish Entrainment Species Composition from the 9-study Database
Table A11	Monthly Fish Entrainment Species Composition from the 9-study Database
Table A12	Average Size Composition of Entrained Fish from the 9-study Database
Table A13	Winter Size Composition of Entrained Fish from the 9-study Database
Table A14	Spring Size Composition of Entrained Fish from the 9-study Database
Table A15	Summer Size Composition of Entrained Fish from the 9-study Database
Table A16	Fall Size Composition of Entrained Fish from the 9-study Database

**Table A1. Richard B. Russell Fish Entrainment Species Composition (by percent)**

<b>Name</b>	<b>JAN</b>	<b>FEB</b>	<b>MAR</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JUL</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>
Black Bullhead	0.0000	0.0000	0.0160	0.0963	0.0000	0.2065	0.0000	0.2615	0.0000	0.0000	0.0000	0.0000
Black Crappie	0.0244	0.0023	0.1062	0.3718	5.2876	17.4898	1.8707	0.7093	0.0000	0.0000	0.0635	0.0400
Blackbanded Darter	0.0000	0.0018	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Blueback Herring	10.0929	3.5211	21.2217	29.5016	41.1762	30.8363	8.5071	24.1845	5.2183	24.1518	0.7930	1.0700
Bluegill	0.0739	0.0090	0.4791	4.3537	1.7257	2.9677	3.4140	3.1195	2.3575	1.5961	0.1220	0.3200
Brown Bullhead	0.0000	0.0000	0.0160	0.0000	0.1289	0.0813	2.3746	0.0000	5.8122	0.9271	0.0319	6.1400
Carp	0.0000	0.0000	0.0000	0.0619	0.0303	0.2377	0.9427	0.0494	0.0861	1.7073	0.0000	0.0300
Channel Catfish	0.0138	0.0015	0.0000	0.0262	0.5256	0.0813	0.0751	0.2293	0.2066	0.0970	0.8373	0.1100
Coosa Bass	0.0000	0.0000	0.0000	0.0000	0.0148	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Flathead Catfish	0.0000	0.0000	0.0000	0.0114	0.0000	0.0000	0.0000	0.0000	0.0000	0.0970	0.0915	0.0500
Gizzard Shad	0.0078	0.0009	0.0583	0.0420	0.0000	0.0665	0.4962	0.0701	0.1628	0.3686	0.0225	0.0400
Golden Shiner	0.0034	0.0000	0.0000	0.0436	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Green Sunfish	0.0000	0.0000	0.0000	0.0149	0.0210	0.1062	0.0564	0.0000	0.0000	0.0000	0.0000	0.0000
Hybrid Bass	0.0033	0.0000	0.1070	0.0808	0.1328	0.0000	0.0000	0.0000	0.0000	0.0000	0.0150	0.0000
Largemouth Bass	0.0023	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0215	0.0970	0.0000	0.0000
Longnose Gar	0.0023	0.0000	0.0000	0.0000	0.0000	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Northern Hogsucker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0726	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rainbow Trout	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0706	0.0000	0.0000	0.0000	0.0000	0.0000
Redbreast Sunfish	0.0000	0.0000	0.0000	0.0232	0.0000	0.0000	0.0000	0.0322	0.0000	0.0000	0.0000	0.0000
Silver Redhorse	0.0000	0.0000	0.0000	0.0047	0.0739	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0200
Smallmouth Bass	0.0000	0.0000	0.0000	0.0216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Snail Bullhead	0.0000	0.0000	0.0000	0.0000	0.0000	0.0707	0.0000	0.0000	0.0000	0.0000	0.0000	0.0500
Spottail Shiner	0.0572	0.0060	0.5785	0.4113	0.3082	0.1868	0.0000	0.0000	0.0000	0.0000	0.0000	0.2300
Spotted Bass	0.0000	0.0000	0.0000	0.0000	0.0000	0.0693	0.0000	0.0801	0.0000	0.0000	0.0086	0.0000
Striped Bass	0.0000	0.0000	0.0301	0.0346	0.0271	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tesselated Darter	0.0000	0.0000	0.0000	0.0000	0.1059	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Threadfin Shad	86.7983	95.5201	17.0483	17.0313	1.6977	15.1388	64.4096	66.4364	78.3285	28.0236	94.9874	83.7000
Walleye	0.0000	0.0009	0.0000	0.0117	0.0000	0.0000	0.1691	0.0000	0.0000	0.0000	0.0000	0.0000
Warmouth	0.0080	0.0000	0.0000	0.1334	0.1171	0.0000	0.0000	0.0395	0.0612	0.0000	0.0000	0.0300
White Bass	0.0000	0.0000	0.0151	0.0058	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
White Catfish	0.1101	0.0246	0.4023	0.2249	0.7180	1.0050	1.1070	1.4991	5.0192	39.8065	2.6459	3.8000
White Crappie	0.0000	0.0000	0.0000	1.1535	0.0708	1.6104	0.0564	0.1290	0.0000	0.0000	0.0000	0.0000
White Perch	0.0000	0.0090	0.8298	4.7006	9.1373	0.9421	0.0706	0.0000	0.0441	0.0000	0.0391	0.0000
Whitefin Shiner	0.0000	0.0000	0.0000	0.0080	0.0000	0.0000	0.0606	0.0000	0.0000	0.0000	0.0000	0.0000
Yellow Bullhead	0.0244	0.0000	0.0000	0.0000	0.0000	0.0000	0.6421	0.0000	0.0000	0.0000	0.0000	0.0000
Yellow Perch	2.7780	0.9028	59.0916	41.4511	38.7012	28.7646	15.6773	3.1601	2.6820	3.1278	0.3424	4.3600

**Table A2. Saluda Fish Entrainment Species composition (by percent)**

<b>Name</b>	<b>JAN</b>	<b>FEB</b>	<b>MAR</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JUL</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>
gizzard shad	83.87	83.87	-	-	-	0.00	0.00	0.00	0.00	2.07	60.01	83.87
spottail shiner	3.22	3.23	-	-	-	0.00	1.08	2.99	0.00	2.07	0.00	3.22
fieryblack shiner	0.00	0.00	-	-	-	0.00	0.00	0.00	3.17	2.07	0.00	0.00
sandbar shiner	0.00	0.00	-	-	-	0.00	0.00	0.00	52.38	0.00	0.00	0.00
white sucker	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00	0.00	3.63	0.00
snail bullhead	3.22	3.23	-	-	-	0.00	1.08	2.99	0.00	2.07	0.00	3.22
white catfish	0.00	0.00	-	-	-	3.45	3.23	2.99	3.17	2.07	0.00	0.00
flat bullhead	0.00	0.00	-	-	-	0.00	0.00	0.00	6.35	0.00	0.00	0.00
channel catfish	0.00	0.00	-	-	-	1.72	4.30	7.46	0.00	0.00	0.00	0.00
white perch	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00	3.45	10.91	0.00
white bass	6.45	6.45	-	-	-	0.00	0.00	0.00	0.00	3.45	0.00	6.46
redbreast sunfish	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00	2.07	0.00	0.00
bluegill	0.00	0.00	-	-	-	87.94	70.95	43.28	31.75	71.03	7.28	0.00
redeer sunfish	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00	7.59	0.00	0.00
redevye bass	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00	2.07	0.00	0.00
largemouth bass	0.00	0.00	-	-	-	3.45	2.15	0.00	0.00	0.00	0.00	0.00
black crappie	0.00	0.00	-	-	-	1.72	1.08	0.00	3.17	0.00	10.91	0.00
yellow perch	6.45	6.45	-	-	-	1.72	1.08	0.00	0.00	0.00	7.28	6.46



**Table A4. Neal Shoals Fish Entrainment Species Composition (by percent)**

<b>Name</b>	<b>JAN</b>	<b>FEB</b>	<b>MAR</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JUL</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>
black bullhead	-	-	0.00	-	0.00	-	-	1.80	-	-	-	-
black crappie	-	-	0.00	-	4.65	-	-	0.00	-	-	-	-
black redhorse	-	-	52.48	-	6.40	-	-	9.01	-	-	-	-
blackbanded darter	-	-	0.00	-	0.58	-	-	0.00	-	-	-	-
blueback herring	-	-	0.00	-	9.88	-	-	2.70	-	-	-	-
bluegill	-	-	0.99	-	13.37	-	-	6.31	-	-	-	-
brown bullhead	-	-	0.99	-	5.23	-	-	5.41	-	-	-	-
carp	-	-	2.97	-	5.81	-	-	6.31	-	-	-	-
channel catfish	-	-	0.99	-	31.98	-	-	18.92	-	-	-	-
dollar sunfish	-	-	0.99	-	0.00	-	-	0.00	-	-	-	-
flier	-	-	0.00	-	0.58	-	-	0.00	-	-	-	-
gizzard shad	-	-	1.98	-	0.58	-	-	5.41	-	-	-	-
largemouth bass	-	-	0.99	-	2.91	-	-	2.70	-	-	-	-
nothern hog sucker	-	-	0.99	-	0.00	-	-	0.00	-	-	-	-
quillback	-	-	0.99	-	0.00	-	-	0.00	-	-	-	-
redbreast sunfish	-	-	11.88	-	4.65	-	-	0.90	-	-	-	-
redeer sunfish	-	-	0.99	-	9.88	-	-	3.60	-	-	-	-
rosyface chub	-	-	0.00	-	1.16	-	-	0.00	-	-	-	-
shorthead redhorse	-	-	11.88	-	0.00	-	-	0.00	-	-	-	-
spottail shiner	-	-	5.94	-	0.00	-	-	12.61	-	-	-	-
striped jumprock	-	-	0.00	-	1.74	-	-	0.90	-	-	-	-
tessellated darter	-	-	1.98	-	0.00	-	-	0.00	-	-	-	-
threadfin shad	-	-	2.97	-	0.00	-	-	15.32	-	-	-	-
white catfish	-	-	0.00	-	0.00	-	-	5.41	-	-	-	-
whitefin shiner	-	-	0.00	-	0.00	-	-	2.70	-	-	-	-
yellow perch	-	-	0.00	-	0.58	-	-	0.00	-	-	-	-

**Table A5. Gaston Shoals Fish Entrainment Species Composition (by percent)**

<b>Name</b>	<b>JAN</b>	<b>FEB</b>	<b>MAR</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JUL</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>
Gizzard shad	6.90	12.13	28.59	0.87	0.00	0.00	0.00	0.00	0.00	1.78	20.00	0.00
Threadfin shad	0.00	0.00	7.13	0.00	0.00	0.00	0.00	0.00	3.33	3.57	0.00	0.00
Central stoneroller	3.45	3.03	0.00	0.00	2.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Common carp	0.00	0.00	0.00	0.00	2.94	0.00	0.00	0.00	1.11	1.78	0.00	0.00
Thicklip carp	0.00	0.00	7.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bluehead chub	3.45	3.03	0.00	0.87	2.94	1.43	1.44	1.44	0.00	0.00	0.00	0.00
Golden shiner	0.00	0.00	0.00	3.46	0.00	2.87	2.87	2.87	3.33	3.57	0.00	0.00
Spottail shiner	0.00	0.00	0.00	0.00	2.94	0.96	0.96	0.96	0.00	0.00	0.00	0.00
Whitefin shiner	0.00	0.00	0.00	0.87	0.00	0.00	0.00	0.00	1.11	1.78	0.00	0.00
Fieryblack shiner	0.00	0.00	0.00	0.00	2.94	1.91	1.91	1.91	0.00	0.00	0.00	0.00
Fathead minnow	0.00	0.00	0.00	0.00	0.00	0.96	0.96	0.96	0.00	0.00	0.00	0.00
Creek chub	0.00	0.00	0.00	0.00	2.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Quillback	0.00	0.00	0.00	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
White sucker	3.45	3.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Northern hog sucker	0.00	0.00	0.00	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silver redhorse	0.00	0.00	0.00	0.87	2.94	0.96	0.96	0.96	0.00	1.78	20.00	0.00
Smallfin redhorse	10.34	0.00	0.00	0.00	2.94	0.96	0.96	0.96	0.00	0.00	0.00	38.47
Striped jumprock	3.45	3.03	0.00	25.12	11.77	1.91	1.91	1.91	1.11	3.57	20.00	0.00
Snail bullhead	6.90	3.03	0.00	7.80	2.94	37.32	37.32	37.32	10.00	8.93	0.00	15.38
White catfish	6.90	9.10	0.00	3.46	8.83	7.66	7.66	7.66	1.11	1.78	0.00	0.00
Brown bullhead	0.00	0.00	0.00	11.26	0.00	2.87	2.87	2.87	0.00	0.00	0.00	0.00
Flat bullhead	0.00	0.00	0.00	2.60	0.00	0.96	0.96	0.96	0.00	0.00	0.00	0.00
Channel catfish	10.34	9.10	0.00	0.87	8.83	11.96	11.96	11.96	36.67	32.16	20.00	15.38
Margined madtom	0.00	0.00	0.00	2.60	2.94	0.48	0.48	0.48	0.00	0.00	0.00	0.00
Sunfish hybrid	6.90	9.10	0.00	13.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Redbreast sunfish	3.45	3.03	35.72	7.80	11.77	15.31	15.31	15.31	5.56	5.36	0.00	0.00
Warmouth	0.00	0.00	0.00	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bluegill	20.70	36.36	21.43	7.80	14.71	8.61	8.61	8.61	34.44	28.58	0.00	0.00
Redear sunfish	3.45	3.03	0.00	6.93	11.77	1.91	1.91	1.91	0.00	0.00	0.00	0.00
Smallmouth bass	0.00	0.00	0.00	0.00	2.94	0.96	0.96	0.96	0.00	0.00	0.00	0.00
Largemouth bass	3.45	3.03	0.00	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
White crappie	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.11	3.57	20.00	0.00
Tesselated darter	3.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.38
Piedmont darter	3.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.11	1.78	0.00	15.38

**Table A6. Hollidays Bridge Fish Entrainment Species Composition (by percent)**

<b>Name</b>	<b>JAN</b>	<b>FEB</b>	<b>MAR</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JUL</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>
Gizzard shad	60.51	71.45	-	-	-	-	-	-	0.00	0.00	42.85	64.28
Golden shiner	2.63	7.14	-	-	-	-	-	-	0.00	0.00	0.00	0.00
Whitefin shiner	0.00	0.00	-	-	-	-	-	-	12.25	20.76	0.00	0.00
Fieryblack shiner	0.00	0.00	-	-	-	-	-	-	0.00	7.55	0.00	0.00
Sandbar shiner	2.63	7.14	-	-	-	-	-	-	0.00	0.00	0.00	0.00
Northern hog sucker	2.63	7.14	-	-	-	-	-	-	0.00	0.00	0.00	0.00
Snail bullhead	2.63	0.00	-	-	-	-	-	-	0.00	0.00	0.00	3.58
White catfish	0.00	0.00	-	-	-	-	-	-	20.42	3.77	0.00	0.00
Flat bullhead	0.00	0.00	-	-	-	-	-	-	0.00	3.77	0.00	0.00
Channel catfish	0.00	0.00	-	-	-	-	-	-	34.70	3.77	10.73	0.00
Redbreast sunfish	0.00	0.00	-	-	-	-	-	-	4.07	3.77	0.00	0.00
Bluegill	10.53	0.00	-	-	-	-	-	-	20.42	45.30	21.43	14.28
Redear sunfish	0.00	0.00	-	-	-	-	-	-	4.07	7.55	0.00	0.00
Black crappie	7.90	0.00	-	-	-	-	-	-	4.07	3.77	10.73	8.94
Seagreen darter	2.63	7.14	-	-	-	-	-	-	0.00	0.00	0.00	0.00
Yellow perch	5.26	0.00	-	-	-	-	-	-	0.00	0.00	7.13	5.36
Piedmont darter	2.63	0.00	-	-	-	-	-	-	0.00	0.00	7.13	3.58

Table A7. King Mill Fish Entrainment Species Composition (by percent)

Name	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
longnose gar	-	-	0.00	0.00	0.00	0.00	1.32	0.00	-	0.00	0.00	-
American eel	-	-	0.00	0.80	1.12	1.59	0.66	1.28	-	0.00	0.00	-
Clupeid sp.	-	-	0.00	0.00	0.56	0.79	6.62	1.28	-	0.00	0.00	-
Alosa sp.	-	-	0.00	0.00	0.00	0.00	0.00	2.56	-	0.00	0.00	-
blueback herring	-	-	11.08	0.80	0.00	0.00	37.75	6.41	-	3.31	4.24	-
American shad	-	-	0.00	0.00	0.00	0.00	0.00	53.85	-	0.00	0.00	-
gizzard shad	-	-	3.77	8.00	12.92	13.49	2.65	6.41	-	0.83	1.69	-
threadfin shad	-	-	35.61	17.60	24.16	15.87	13.91	0.00	-	67.40	61.86	-
redfin pickerel	-	-	0.00	0.00	0.00	0.79	0.66	1.28	-	0.00	0.00	-
chain pickerel	-	-	0.24	0.00	0.56	3.97	0.00	1.28	-	0.28	1.69	-
bluehead chub	-	-	0.00	0.00	0.56	0.00	0.00	0.00	-	0.00	0.00	-
Cyprinid sp.	-	-	0.00	0.00	0.00	0.79	0.00	0.00	-	0.00	0.00	-
golden shiner	-	-	0.00	3.20	6.74	1.59	0.00	1.28	-	0.55	0.00	-
Notropis sp.	-	-	0.00	0.00	1.12	1.59	0.00	0.00	-	0.00	0.00	-
dusky shiner	-	-	0.00	0.00	0.00	0.00	0.66	1.28	-	0.00	0.00	-
spottail shiner	-	-	30.66	26.40	6.18	11.11	6.62	0.00	-	0.00	0.85	-
sailfin shiner	-	-	0.00	0.80	0.00	0.00	0.00	0.00	-	0.00	0.00	-
yellowfin shiner	-	-	0.00	0.80	1.12	0.79	0.66	0.00	-	0.00	0.00	-
coastal shiner	-	-	0.24	3.20	0.56	0.00	0.66	0.00	-	0.00	1.69	-
white catfish	-	-	0.00	0.00	0.00	0.00	0.66	0.00	-	0.28	2.54	-
yellow bullhead	-	-	0.00	0.80	0.00	0.00	0.00	0.00	-	0.00	0.00	-
brown bullhead	-	-	0.00	0.00	0.00	0.79	0.00	1.28	-	0.00	0.00	-
flat bullhead	-	-	0.00	0.00	0.56	0.79	0.66	1.28	-	0.00	0.85	-
tadpole madtom	-	-	0.00	0.00	1.12	0.00	0.66	0.00	-	0.28	0.85	-
margined madtom	-	-	0.00	3.20	2.81	3.17	2.65	6.41	-	0.28	3.39	-
speckled madtom	-	-	0.00	0.80	1.12	0.79	1.32	0.00	-	0.00	0.00	-
pirate perch	-	-	0.47	1.60	1.12	3.97	1.32	1.28	-	16.57	3.39	-
mosquitofish	-	-	0.00	0.00	0.56	0.79	0.00	0.00	-	0.28	0.00	-
brook silverside	-	-	4.72	4.00	1.12	3.17	3.31	0.00	-	0.00	0.85	-
white X striped bass	-	-	0.00	0.00	0.00	0.00	1.99	1.28	-	0.00	0.00	-
white bass	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	0.28	0.00	-
striped bass	-	-	0.00	0.00	0.00	0.00	0.66	0.00	-	0.00	0.00	-
blackbanded sunfish	-	-	0.24	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	-
bluespotted sunfish	-	-	0.94	4.80	1.69	0.79	0.00	2.56	-	3.59	0.85	-
redbreast sunfish	-	-	0.24	4.00	2.25	2.38	1.99	0.00	-	1.66	0.85	-
pumpkinseed	-	-	0.00	1.60	0.56	0.00	0.00	0.00	-	0.00	0.85	-
warmouth	-	-	0.00	1.60	1.12	0.00	0.00	0.00	-	0.00	0.00	-
bluegill	-	-	4.48	10.40	20.22	15.08	6.62	1.28	-	3.87	11.86	-
redecor sunfish	-	-	0.00	0.00	1.69	0.00	0.00	0.00	-	0.28	0.00	-
largemouth bass	-	-	0.00	0.80	3.93	13.49	0.66	6.41	-	0.00	0.00	-
black crappie	-	-	0.71	0.00	0.00	0.00	0.66	0.00	-	0.00	0.00	-
Christmas darter	-	-	0.47	0.80	0.00	0.00	0.00	0.00	-	0.00	0.00	-
tessellated darter	-	-	0.47	0.00	0.00	0.00	3.31	0.00	-	0.00	0.00	-
yellow perch	-	-	5.19	4.00	3.93	1.59	0.66	1.28	-	0.28	1.69	-
blackbanded darter	-	-	0.47	0.00	0.56	0.79	0.66	0.00	-	0.00	0.00	-

**Table A8. Kleber Fish Entrainment Species  
Composition (by percent)\***

<b>Species</b>	<b>Percent</b>
black crappie	0.19
blacknose dace	0.02
bluegill	28.45
bluntnose minnow	0.02
bowfin	0.04
brook stickleback	0.02
brook trout	0.15
brown bullhead	1.68
burbot	0.37
central mudminnow	0.08
chestnut lamprey	0.97
common shiner	0.17
creek chub	0.29
fathead minnow	0.79
golden shiner	0.02
hybrid sunfish	0.02
johnny darter	0.02
largemouth bass	0.15
logperch	0.02
longear sunfish	0.19
mottled sculpin	0.02
northern pike	0.04
northern redbelly dace	0.14
pumpkinseed	3.33
rock bass	24.93
rosyface shiner	0.04
smallmouth bass	0.04
trout-perch	0.02
walleye	0.02
white sucker	5.18
yellow perch	32.59

*\*monthly species-data not available for this study*

**Table A9. Moore's Park Entrainment Species  
Composition (by percent)\***

<b>Species</b>	<b>Percent</b>
black crappie	1.59
blackside darter	1.06
bluegill	39.05
channel catfish	6.67
chestnut lamprey	3.70
common shiner	2.22
hybrid sunfish	12.91
largemouth bass	2.65
pumpkinseed	21.48
shorthead redhorse	1.69
smallmouth bass	4.87
walleye	0.95
warmouth	1.16

*\*monthly species data unavailable for this study*

Table A10. Seasonal Fish Entrainment Species Composition from the 9-study Database\*

Name	WINTER	SPRING	SUMMER	FALL	ANNUAL
threadfin shad	50.69	12.23	9.05	21.78	23.44
bluegill	2.52	12.13	25.93	27.40	16.99
gizzard shad	19.85	12.78	6.39	9.59	12.15
snail bullhead	1.52	6.15	19.36	3.01	7.51
channel catfish	9.01	2.30	6.82	9.73	6.97
redbreast sunfish	0.09	4.57	9.20	4.01	4.47
yellow perch	2.78	12.04	1.04	0.94	4.20
blueback herring	2.86	10.20	1.98	0.75	3.95
striped jumprock	0.09	7.15	1.45	4.56	3.31
white catfish	3.19	1.38	4.25	2.71	2.88
smallfin redhorse	1.51	3.89	0.46	0.36	1.55
spottail shiner	0.04	1.67	3.84	0.19	1.43
black crappie	0.94	1.10	0.46	2.26	1.19
brown bullhead	0.75	2.05	1.43	0.30	1.13
redeer sunfish	0.09	2.04	0.92	1.46	1.13
whitefin shiner	0.00	0.81	1.33	2.13	1.07
golden shiner	0.08	0.80	1.38	0.83	0.77
sandbar shiner	0.08	0.00	0.00	2.51	0.65
flat bullhead	0.00	0.42	0.46	1.40	0.57
fieryblack shiner	0.00	0.39	0.92	0.58	0.47
silver redhorse	0.00	0.97	0.46	0.25	0.42
pedmont darter	0.95	0.22	0.00	0.30	0.37
white perch	0.00	0.68	0.01	0.73	0.36
white bass	0.95	0.00	0.00	0.31	0.32
shorthead redhorse	0.18	0.02	0.53	0.43	0.29
carp	0.00	0.86	0.03	0.21	0.28
bluehead chub	0.09	0.31	0.69	0.00	0.27
smallmouth bass	0.00	0.40	0.46	0.00	0.21
marginated madtom	0.00	0.60	0.24	0.00	0.21
largemouth bass	0.09	0.15	0.33	0.15	0.18
northern hog sucker	0.26	0.14	0.00	0.30	0.18
tesselated darter	0.59	0.01	0.00	0.00	0.15
white crappie	0.00	0.07	0.03	0.42	0.13
dollar sunfish	0.11	0.18	0.09	0.13	0.13
fathead minnow	0.00	0.00	0.46	0.00	0.11
white sucker	0.27	0.00	0.00	0.14	0.10
thicklip chub	0.00	0.38	0.00	0.00	0.10
quillback	0.00	0.36	0.00	0.00	0.09
redeye bass	0.00	0.00	0.00	0.19	0.05
creek chubsucker	0.18	0.00	0.00	0.00	0.04
Eastern silvery minnow	0.18	0.00	0.00	0.00	0.04
creek chub	0.00	0.17	0.00	0.00	0.04
warmouth	0.01	0.15	0.00	0.00	0.04
black redhorse	0.00	0.10	0.01	0.00	0.03
seagreen darter	0.08	0.00	0.00	0.00	0.02
brook silverside	0.00	0.04	0.00	0.00	0.01
pirate perch	0.00	0.01	0.00	0.03	0.01
hybrid bass	0.00	0.02	0.00	0.00	0.01
black bullhead	0.00	0.01	0.02	0.00	0.01
flathead catfish	0.01	0.00	0.00	0.02	0.01
bluespotted sunfish	0.00	0.01	0.00	0.01	0.01
yellow bullhead	0.00	0.00	0.01	0.00	0.00
striped bass	0.00	0.01	0.00	0.00	0.00
chain pickerel	0.00	0.00	0.00	0.00	0.00
coastal shiner	0.00	0.01	0.00	0.00	0.00
spotted bass	0.00	0.00	0.01	0.00	0.00
blackbanded darter	0.00	0.01	0.00	0.00	0.00
walleye	0.00	0.00	0.00	0.00	0.00
American eel	0.00	0.00	0.00	0.00	0.00
Christmas darter	0.00	0.00	0.00	0.00	0.00
green sunfish	0.00	0.00	0.00	0.00	0.00
speckled madtom	0.00	0.00	0.00	0.00	0.00
tadpole madtom	0.00	0.00	0.00	0.00	0.00
yellowfin shiner	0.00	0.00	0.00	0.00	0.00
pumpkinseed	0.00	0.00	0.00	0.00	0.00
longnose gar	0.00	0.00	0.00	0.00	0.00
mosquitofish	0.00	0.00	0.00	0.00	0.00
blackbanded sunfish	0.00	0.00	0.00	0.00	0.00
redfin pickerel	0.00	0.00	0.00	0.00	0.00
rosyface chub	0.00	0.00	0.00	0.00	0.00
rainbow trout	0.00	0.00	0.00	0.00	0.00
dusky shiner	0.00	0.00	0.00	0.00	0.00
flier	0.00	0.00	0.00	0.00	0.00
sailfin shiner	0.00	0.00	0.00	0.00	0.00
Coosa bass	0.00	0.00	0.00	0.00	0.00

\*Percentage values less than 0.005 percent appear as 0.00

Table A11. Monthly Fish Entrainment Species Composition from the 9-study Database (by percent)\*

Name	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
American eel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
black bullhead	0.00	0.00	0.01	0.02	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00
black crappie	0.55	0.00	0.06	0.72	2.52	1.01	0.27	0.12	0.95	2.17	3.66	2.27
black redhorse	0.00	0.00	0.27	0.00	0.03	0.00	0.00	0.02	0.00	0.00	0.00	0.00
blackbanded darter	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
blackbanded sunfish	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
blueback herring	5.41	2.76	21.48	5.28	3.83	1.19	0.63	4.12	0.77	1.12	0.37	0.39
bluegill	2.71	1.12	3.77	16.32	16.29	32.10	26.20	19.48	27.05	51.28	3.87	3.72
bluehead chub	0.20	0.06	0.00	0.42	0.51	0.70	0.71	0.65	0.00	0.00	0.00	0.00
bluespotted sunfish	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00
brook silverside	0.00	0.00	0.10	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
brown bullhead	0.00	0.00	0.01	6.11	0.03	1.41	1.56	1.32	0.85	0.04	0.01	2.25
carp	0.00	0.00	0.02	0.01	2.55	0.01	0.06	0.02	0.36	0.27	0.00	0.01
chain pickerel	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
channel catfish	15.26	10.18	4.09	0.42	2.39	6.71	7.04	6.72	19.42	7.35	2.41	1.61
Christmas darter	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
coastal shiner	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coosa bass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
creek chub	0.00	0.00	0.00	0.00	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00
creek chubsucker	0.32	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
dollar sunfish	0.06	0.02	0.29	0.11	0.13	0.08	0.10	0.10	0.18	0.08	0.12	0.25
dusky shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eastern silvery minnow	0.32	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
fathead minnow	0.00	0.00	0.00	0.00	0.00	0.47	0.47	0.44	0.00	0.00	0.00	0.00
fieryblack shiner	0.00	0.00	0.00	0.00	1.18	0.94	0.94	0.87	0.46	1.29	0.00	0.00
flat bullhead	0.00	0.00	0.00	1.26	0.00	0.47	0.47	0.44	0.91	1.45	1.83	0.00
flathead catfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.02
flier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gizzard shad	15.23	4.66	23.12	3.07	12.15	6.16	6.80	6.22	1.31	1.85	25.61	39.67
golden shiner	0.18	0.06	0.00	1.69	0.70	1.41	1.41	1.31	1.03	1.46	0.00	0.00
green sunfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
hybrid bass	0.00	0.00	0.05	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00
largemouth bass	0.21	0.06	0.01	0.42	0.03	0.68	0.29	0.01	0.43	0.00	0.00	0.00
longnose gar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
marginated madtom	0.00	0.00	0.00	1.27	0.52	0.24	0.24	0.23	0.00	0.00	0.01	0.00
mosquitofish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
northern hog sucker	0.50	0.28	0.01	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.91	0.00
pedmont darter	0.38	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.34	0.19	0.38	2.47
pirate perch	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.08	0.01	0.00
pumpkinseed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
quillback	0.00	0.00	0.01	1.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
rainbow trout	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
redbreast sunfish	0.20	0.06	5.84	3.79	4.09	9.30	9.51	8.79	2.64	4.38	5.02	0.00
redeer sunfish	0.20	0.06	0.01	4.01	2.10	0.94	0.94	0.88	0.49	3.87	0.00	0.00
redeye bass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.00	0.00
redfin pickerel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
rosyface chub	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sailfin shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sandbar shiner	0.18	0.06	0.00	0.00	0.00	0.00	0.00	0.00	7.53	0.00	0.00	0.00
seagreen darter	0.18	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
shorthead redhorse	0.32	0.22	0.06	0.00	0.00	0.51	0.56	0.52	1.29	0.00	0.00	0.00
silver redhorse	0.00	0.00	0.00	2.39	0.52	0.47	0.47	0.44	0.00	0.19	0.56	0.01
smallfin redhorse	0.61	0.00	0.00	11.14	0.51	0.47	0.47	0.44	0.00	1.08	0.00	3.91
smallmouth bass	0.00	0.00	0.00	0.00	1.18	0.47	0.47	0.44	0.00	0.00	0.00	0.00
snail bullhead	0.97	0.19	4.08	3.78	10.59	19.58	19.92	18.58	4.80	3.30	0.91	3.39
speckled madtom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
spottail shiner	0.03	0.00	0.95	0.79	3.25	1.78	4.08	5.67	0.00	0.56	0.00	0.08
spotted bass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
striped bass	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
striped jumprock	0.20	0.06	0.00	19.38	2.06	1.45	1.51	1.39	0.77	6.87	6.03	0.00
tadpole madtom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
tesselated darter	0.20	0.00	0.02	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	1.56
thicklip chub	0.00	0.00	1.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
threadfin shad	46.56	74.83	9.17	3.75	23.77	4.19	8.03	14.92	20.70	1.99	42.67	30.67
walleye	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
warmouth	0.00	0.00	0.00	0.45	0.02	0.00	0.00	0.01	0.01	0.00	0.00	0.01
white bass	0.78	0.27	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00	1.80
white catfish	4.92	3.24	0.17	2.37	1.60	4.45	4.27	4.03	4.02	2.93	1.19	1.39
white crappie	0.00	0.00	0.00	0.21	0.01	0.06	0.00	0.02	0.34	0.37	0.56	0.00
white perch	0.00	0.01	0.35	0.84	0.84	0.04	0.00	0.00	0.01	0.94	1.25	0.00
white sucker	0.52	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.00
whitefin shiner	0.00	0.00	0.00	0.42	2.02	1.28	1.41	1.30	3.12	3.27	0.00	0.00
yellow bullhead	0.01	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00
yellow perch	2.62	0.97	25.12	7.43	3.58	1.44	1.13	0.54	0.39	0.14	2.27	4.75
yellowfin shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

\*Size composition percentages based on Russell, Saluda, 99 Islands, Gaston Shoals, Hollidays Bridge, and King Mill studies. Size composition information was not available for Neal Shoals, Kleber, and Moore's Park.

NOTE: Percentage values less than 0.005 percent appear as 0.00



















