FINAL PERFORMANCE REPORT

Federal Aid Grant No. F17AF01107 (T-100-R-1)

Targeted Surveys for the Peppered Shiner in the Kiamichi, Little, Glover and Mountain Fork Rivers

Oklahoma Department of Wildlife Conservation

Report Period: January 1, 2018 - June 30, 2020

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Project Title: Targeted Surveys for the Peppered Shiner in the Kiamichi, Little, Glover and Mountain Fork Rivers

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Principal Investigator:
Daniel C. Allen, PhD
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Department of Biology
University of Oklahoma

Co-Principal Investigator:
William J. Matthews, PhD
Professor Emeritus
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University of Oklahoma

Objective:
To estimate the distribution and abundance of the Peppered Shiner, *Notropis perpallidus*, in the Kiamichi, Little, Glover, and Mountain Fork Rivers by field surveys using seines. The locations and numbers of *N. perpallidus* and all other fishes of greatest conservation need captured during the project and communities in which they occur will be provided in each Performance Report. Physical habitat characteristics will be quantified to assess *N. perpallidus* habitat requirements.

Summary of Progress:
Year 1. We developed two different seining protocols for the project and implemented them at study sites in 100 sites in the Kiamichi, Little, Glover, and Mountain Fork River drainages. In all cases we used 10-foot long, 4-foot deep, 3/16" mesh seines.

Year 2. We sampled 63 sites in the Kiamichi, Little, Glover, and Mountain Fork Rivers. In year 1 we sampled 100 sites, bringing our project total to 163 sites. In our proposal, we proposed to sample a total of 100 sites across both years, so we greatly exceeded our own expectations.

We developed two different seining protocols for the project. In all cases we used 10-foot long, 4-foot deep, 3/16" mesh seines.

Targeted Sampling Method:
The goal of this methodology was to focus on sampling the *Notropis perpallidus* habitats. Previous records and publications indicate that the *N. perpallidus* has been collected in moderate-sized sized rivers, primarily in the slow to moderate currents of pools 0.6-1.2 m in depth associated with beds of water willow, *Justicia americana*. Here we would target these areas with 10 seine hauls. After each seine haul, we inspect the collected fishes to look specifically for *N. perpallidus.* If *N. perpallidus* was found in the seine haul, we would voucher all the fish collected in that seine haul so that we could identify which fishes *N. perpallidus* may

be associated with. If more than one *N. perpallidus* was collected, we would only voucher the best specimen for identification confirmation in the lab. If there was no *N. perpallidus* present in the seine haul, we would return all collected fish back into the river without identifying or enumerating them.

Full Community Sampling Method:
The goal of this methodology was to sample the entire fish community at a given site, sampling all habitats present (riffles, runs, pools, etc.). Here we would distribute seine hauls representatively across the range of habitats present for approximately one-hour, at least 60 minutes but if conditions made collecting difficult, we would sample for up to 90 minutes (times for each site are provided in Table 1). All fish, with the exception of any federally threatened Leopard Darter (*Percina pantherina*) or state threatened Blackside Darter (*Percina maculata*), are collected and vouchered for identification in the lab.

Physical habitat data:
We collected physical habitat data for 91 sites, including all of the sites where a full community sample was collected and a handful of the targeted sampling method only sites. We recorded the following variables: water temperature (degrees Celsius), pH and conductivity (µS/m) measured with a handheld probe; water depth (m) and flow velocity (m/s) measured with a wading rod and flowmeter; bankfull and wetted channel widths (m) measured with a measuring tape or rangefinder; visual estimates of substrate composition (percent clay, silt, sand, gravel, cobble, boulder, and bedrock); visual estimates of mesohabitat composition (percent riffle, percent pool, percent leaf litter cover in pools and percent aquatic macrophyte cover in riffles), visual estimates of riparian zone vegetation (percent cover) and canopy cover over the stream measured by a spherical densiometer.

Sites Sampled:
Across the two years of the project, we sampled 163 sites across the Kiamichi, Little, Glover, and Mountain Fork Rivers (Figure 1). Of these sites, 77 were sampled using the Targeted sampling method, 40 were sampled using the Full Community method, and 46 were sampled using both methods (Table 1).

Results:
In our 123 Targeted Sample sites, we collected only one fish that may be a *Notropis perpallidus* at site 98 in 2018. This specimen is a juvenile and not a full-grown adult, and we did not collect any other *N. perpallidus* at this site. Although it shares the peppered markings that are distinctive of *N. perpallidus*, we are hesitant to identify this fish as anything other than a "potential *N. perpallidus.*" We preserved this fish in formalin, so unfortunately we cannot use DNA barcoding methods to identify it. This site is in the Little River, downstream of Pine Creek Lake and immediately below a low-head dam that seemed to be part of some type of water intake infrastructure on the west bank. In this seine haul, we also collected 7 Blacktail Shiner (*Cyprinella venusta*), 2 Steelcolor Shiner (*C. whipplei*), one Rocky Shiner (*N. suttkusi*), and one juvenile largemouth bass (*Micropterus salmoides*). This fish was collected just downstream of a water willow island, below a riffle, in water about 0.5-1 foot deep. The sediment composition of the riverbed was approximately 80% cobble, 10% gravel, and 10% sand. We made another collection at this site in 2019 but did not find any fish that appeared to be a *N. perpallidus*.

In our 86 Full Community Sample sites, we did not collect any *Notropis perpallidus*. We did collect 3849 individuals of 55 other species, which are summarized in Table 2. We collected 6 Species of Greatest Conservation Need, including Scaly Sand Darter, Redspot Darter, Orangebelly Darter, Ouachita Mountain Shiner, Kiamichi Shiner, and Mountain Madtom. We list the count of each species collected at each site in Table 3.

No federally threatened Leopard Darter (*Percina pantherina*) or state threatened Blackside Darter (*Percina maculata*) were collected at any point in 2018 or 2019.

Results from the physical habitat measurements are provided in Table 4.

Summary:
We proposed to sample 100 sites over a two-year period, and instead we sampled 163 sites, exceeding the number of sites we proposed. However, in all of our sampling we only found one individual fish that may be a *Notropis perpallidus* in 2018. We are unable to confirm the ID of this fish as it is a juvenile, in spite of attempts by co-PI Dr. William J. Matthews, a renowned expert of Oklahoma fishes. We revisited this site in 2019 to sample it again, but we did not collect any fishes that resembled *N. perpallidus*. In summary, the results from our project lead us to believe that *N. perpallidus* may still be present in Oklahoma, but it is exceedingly rare and very difficult to detect. Accordingly, we believe this fish should be given the highest conservation priority possible.

Monthly Reports:
January 2018:
In January 2018 we reviewed historical records for known Peppered Shiner records to plan a scouting, and fish sampling trip training with the PI Allen, Co-PI Matthews, and two graduate students. This trip is currently planned for mid- February 2018.

February 2018:
We had planned a scouting, and fish sampling trip training with the PI Allen, Co-PI Matthews, and two graduate students over President's Day weekend (Feb 17-19), but we had to cancel the trip at the last minute to a storm system that brought 5-7 inches of rain into the region. We rescheduled this initial trip for the third weekend in April, weather permitting. In lieu of going out into the field PI Allen and Co-PI Matthews met and began to identifying research permits and field supplies needed for the project, and where and how to procure them, so that we can get prepared for the summer field season.

March 2018:
PI Allen began to purchase research supplies needed for the project and began working on research permits. PI Allen and Co-PI Matthews have plans to go into the field to train graduate students in sampling methods on the weekend of April 28th.

April 2018:
PI Allen continued to purchase research supplies needed for the project and submitted scientific collection permit applications to ODWC and began drafting the IACUC protocols for the project.

PI Allen and Co-PI Matthews were unable to go into the field to train graduate students in sampling methods on the weekend of April 28th due to rains, but will reschedule at a later date.

May 2018:
PI Allen continued to purchase research supplies needed for the project. Allen received the scientific collection permit from ODWC and submitted the IACUC protocols for the project to the OU IACUC committee.

June 2018:
PI Allen and co-PI Matthews worked to develop a sampling protocol for the project. Co-PI Matthews worked with the two graduate students (Steve Bittner and Michelle Busch) that will work on the project (who are in PI Allen's lab) to train them for in-the-field identification of Peppered Shiner and Leopard Darter. Finally, PI Allen and co-PI Matthews completed the first field trip for May 31 - June 1 where PI Allen and co-PI Matthews trained the graduate students Bittner and Busch in the field protocol for the project while sampling the first field sites for the project. We made 7 collections in the Little, Kiamichi, and Glover Rivers. Co-PI Matthews spent an additional day in the lab training PI Allen and the two graduate students on fish identification of the collected fishes.

July 2018:
PI Allen graduate students Bittner and Busch sampled sites for Peppered Shiner. In July, we sampled approximately 9 sites on the Kiamichi River, 29 on the Little River, 15 on the Glover River, and 8 on the Mountain Fork River.

August 2018:
PI Allen graduate students Bittner and Busch sampled sites for Peppered Shiner. In August we finished sampling for the year, with a total of 60 sites with a focus on the Little and Glover Rivers. We will focus on sampling the Kiamichi and Mountain Fork Rivers next summer. We will start to process the fish we have collected in the field in the lab with PI Matthews to identify any Peppered Shiner that we collected.

September 2018:
We began to process the fish we have collected in the field in the lab with PI Matthews to identify any Peppered Shiner that we collected. We started working on a presentation for the ODWC Research Update Meeting on October 3, 2018.

October 2018:
We presented preliminary results from this project at the ODWC Research Update Meeting on October 3, 2018. We continued to process the fish we have collected in the field in the lab with PI Matthews to identify any Peppered Shiner that we collected.

November 2018:
We continued to process the fish we have collected in the field in the lab with PI Matthews to identify any Peppered Shiner that we collected.

December 2018:

We continued to process the fish we have collected in the field in the lab with PI Matthews to identify any Peppered Shiner that we collected.

January/February 2019:
We continued to process the fish we have collected in the field in the lab with PI Matthews to identify any Peppered Shiner that we collected.

March 2019:
We continued to process the fish we have collected in the field in the lab with PI Matthews to identify any Peppered Shiner that we collected. We began to plan for summer 2019 field work, including preparing equipment and field site selection.

April 2019:
We continued to process the fish we have collected in the field in the lab with PI Matthews to identify any Peppered Shiner that we collected.

We began to plan for summer 2019 field work, including preparing equipment and field site selection. We anticipate that field work will begin after July 1, as we have already expended travel funds budget for the current fiscal year.

May 2019:
We continued to process the fish we have collected in the field in the lab with PI Matthews to identify any Peppered Shiner that we collected.

We began to plan for summer 2019 field work, including preparing equipment lists and field site selection. Purchasing of field equipment and repairs of existing field equipment has begun. We anticipate that field work will begin after July 1, as we have already expended travel funds budget for the current fiscal year.

June 2019:
We continued to process the fish we have collected in the field in the lab with PI Matthews to identify any Peppered Shiner that we collected.

We finalized plans for summer 2019 field work. We anticipate that field work will begin after July 1, as we have already expended travel funds budget for the current fiscal year.

July 2019:
Two graduate students conducted sampling trips for Peppered Shiner in the Mountain Fork, Kiamichi, and lower Little Rivers.

August 2019:
Two graduate students continued sampling trips for Peppered Shiner in the Mountain Fork, Kiamichi, and lower Little Rivers in August of 2019.

September 2019:

Though we have finished most of the surveys for the project, we have a few sites we would like to return to and a few more new sites we wish to survey. We were unable to complete these additional surveys in September but are planning on doing so in the following month.

October 2019:
We conducted 3 more surveys. We will now begin to compile our data and finish processing fish samples.

November 2019:
We continued to compile our data and finish processing fish samples from the study sites.

December 2019:
We continued to compile our data and finish processing fish samples from the study sites.

January 2020:
We continued to compile our data and finish processing fish samples from the study sites.

February 2020:
We finished processing fish samples from the study sites with co-PI Matthews, and are beginning to prepare our data for the final report.

March 2020:
We began to prepare our data for the final report.

April 2020:
OU campus closed for research operations on March 16 due to the coronavirus pandemic and has not yet reopened. However, we have finished processing all our field work and processing lab samples so the campus closure will not affect our progress on this project.

May 2020:
OU campus has remained closed to research operations since March 16 due to the coronavirus pandemic. However, we have finished processing all our field work and processing lab samples so the campus closure will not affect our progress on this project.

June 2020:
OU campus is ramping up research operations in different phases on campus. We are resuming our work in organizing our data from this project.

Significant Deviations:
There have been no significant deviations from the proposed work.

Equipment:
No equipment exceeding $5,000 in cost was purchased.

Prepared by:

Principal Investigator: Daniel C. Allen, PhD, Assistant Professor, Department of Biology, University of Oklahoma

Co-Principal Investigator: William J. Matthews, PhD, Professor Emeritus, Department of Biology, University of Oklahoma

Date prepared: October 1, 2020

Approved by: Ken Cunningham, Assistant Chief of Fisheries
Oklahoma Department of Wildlife Conservation

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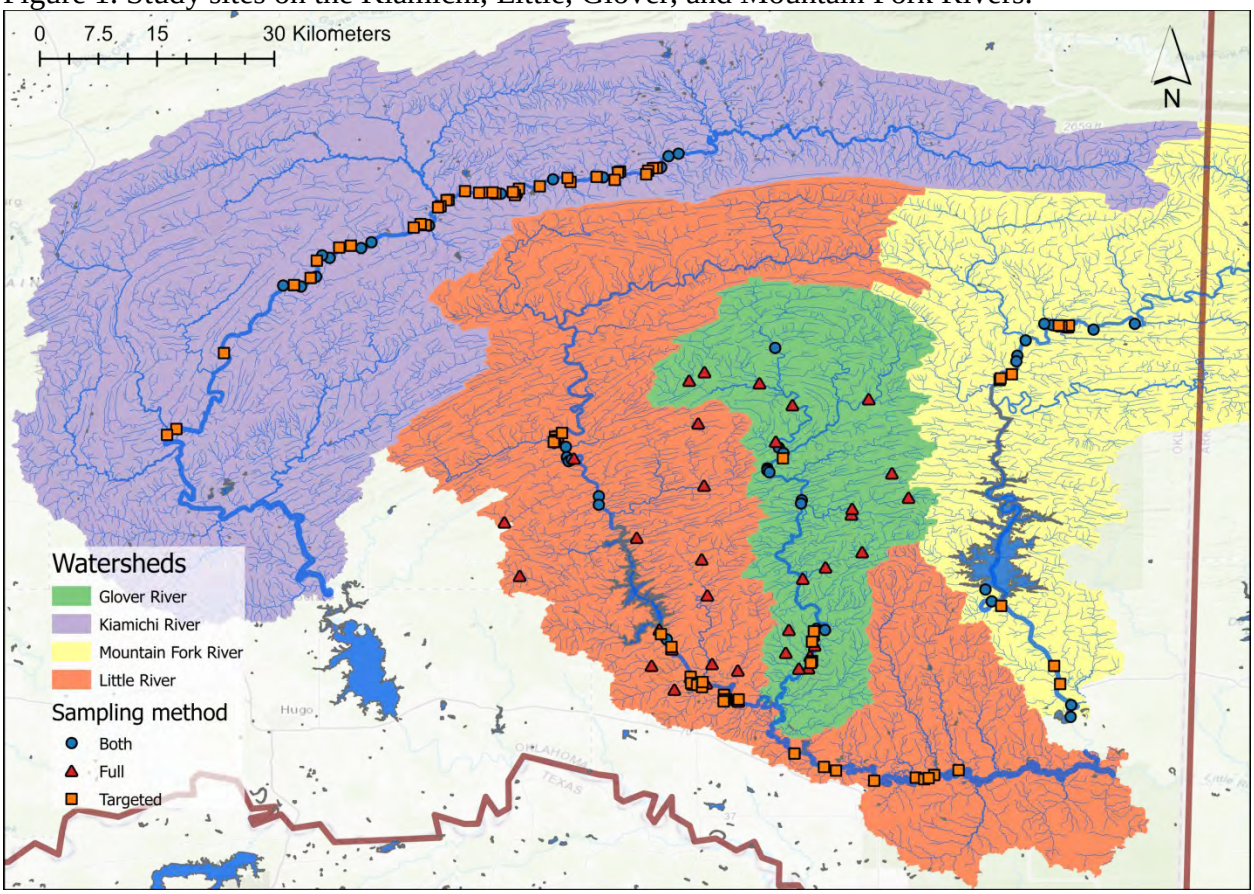
Figures:

Figure 1. Study sites on the Kiamichi, Little, Glover, and Mountain Fork Rivers.



Tables:

Table 1. List of sites sampled, and method used, during the project.

Site ID	Year	Sampling Method	Sampling Time	Latitude (°)	Longitude (°)
1	2018	full	60	34.10986503	-95.0781
2	2018	both	60	34.09878499	-95.0695
3	2018	full	90	34.05498	-95.0424
4	2018	both	60	34.04788203	-95.039
5	2018	full	80	34.08724302	-95.0637
6	2018	full	60	34.04797699	-95.0243
7	2018	full	60	34.03411098	-95.0009
8	2018	full	60	34.02724503	-94.9873
9	2018	full	60	34.103202	-94.9007
10	2018	both	60	34.110882	-94.8973
11	2018	both	60	34.10942003	-94.8877
12	2018	full	60	34.09161997	-94.8995
13	2018	full	60	34.079315	-94.9048
14	2018	full	60	34.073117	-94.9032
15	2018	full	60	34.06540699	-94.9066
16	2018	full	60	34.06504196	-94.9177
17	2018	both	60	34.32470502	-95.1992
18	2018	both	60	34.32012599	-95.1856
19	2018	both	60	34.30821103	-95.1844
20	2018	both	60	34.303503	-95.1823
21	2018	both	60	34.30533897	-95.1789
22	2018	full	90	34.30649802	-95.1762
23	2018	both	60	34.26325603	-95.1477
24	2018	both	60	34.25353001	-95.1478
25	2018	both	60	34.31905604	-94.9407
26	2018	both	60	34.31268403	-94.9355
27	2018	targeted	n/a	34.30685	-94.936
28	2018	both	60	34.29503401	-94.9538
29	2018	both	60	34.29292898	-94.954
30	2018	both	60	34.29082403	-94.9517
31	2018	both	60	34.258806	-94.9142
32	2018	both	60	34.25501897	-94.9152
33	2018	both	60	34.46010101	-94.6267
34	2018	both	60	34.461293	-94.6357
35	2019	both	60	34.44230497	-94.657
36	2019	both	60	34.42458001	-94.6664
37	2019	both	60	34.418332	-94.6678
38	2019	targeted	n/a	34.40348703	-94.6728
39	2019	both	60	34.46156097	-94.5316
40	2019	both	60	34.45487397	-94.5787
41	2019	both	60	34.609376	-95.242
42	2019	both	60	34.61097602	-95.26
43	2019	both	60	34.65388	-95.0676
44	2019	both	60	34.65688898	-95.0559
45	2019	both	60	34.64121801	-95.0759
46	2019	both	60	34.63615802	-95.0919

47	2019	both	60	34.62962701	-95.1427
48	2019	both	60	34.62726901	-95.2003
49	2019	both	60	34.156159	-94.7033
50	2019	both	60	34.14259904	-94.696
51	2019	targeted	n/a	34.13730897	-94.685
52	2019	targeted	n/a	34.06830101	-94.6242
53	2019	targeted	n/a	34.047604	-94.6173
54	2019	both	60	34.02330897	-94.6047
55	2019	both	60	34.00988703	-94.6051
56	2019	both	60	34.57414501	-95.3428
57	2019	both	60	34.55509203	-95.409
58	2019	both	60	34.54833998	-95.4209
59	2019	both	60	34.53724201	-95.4569
60	2019	both	60	34.54007098	-95.4658
61	2019	both	60	34.51562701	-95.4728
62	2019	both	60	34.50424396	-95.4899
63	2019	both	60	34.50552296	-95.5107
64	2018	both	60	34.43363	-94.9449
65	2018	full	80	34.36784	-94.9251
66	2018	full	90	34.32587	-94.9443
67	2018	full	80	34.19891	-94.845
68	2018	full	60	34.24217	-94.8573
69	2018	full	60	34.24863	-94.8564
70	2018	full	60	34.18137	-94.887
71	2018	full	90	34.16838	-94.9132
72	2018	full	50	34.10961	-94.9291
73	2018	full	60	34.08329	-94.9328
74	2018	full	60	34.40571	-95.0262
75	2018	full	60	34.39591	-95.0438
76	2018	full	60	34.39292	-94.963
77	2018	full	60	34.37466	-94.8373
78	2018	full	60	34.28948	-94.8107
79	2018	full	60	34.26146	-94.7916
80	2018	full	60	34.04687	-95.0397
81	2018	full	80	34.0409	-95.0608
82	2018	full	60	34.068339	-95.087
83	2018	full	60	34.34679	-95.0335
84	2018	full	70	34.17161	-95.2386
85	2018	full	60	34.23308	-95.2562
86	2018	full	60	34.21544	-95.1041
87	2018	full	90	34.14922	-95.0229
88	2018	full	60	34.27539	-95.0267
89	2018	full	60	34.19057	-95.0294
90	2018	full	70	34.07042	-95.0175
91	2018	full	60	34.06289	-94.9879
92	2018	targeted	n/a	34.07276404	-94.9038
93	2018	targeted	n/a	33.94297698	-94.7621
94	2018	targeted	n/a	33.94854398	-94.7341
95	2018	targeted	n/a	34.42779799	-95.5786

96	2018	targeted	n/a	34.10489003	-95.0762
97	2018	targeted	n/a	34.09014802	-95.0642
98	2018	targeted	n/a	34.05583603	-95.0421
99	2018	targeted	n/a	34.048582	-95.0415
100	2018	targeted	n/a	34.09625399	-94.9026
101	2018	targeted	n/a	34.33222996	-95.1946
102	2018	targeted	n/a	34.33156	-95.198
103	2018	targeted	n/a	34.32794102	-95.198
104	2018	targeted	n/a	34.32572803	-95.1994
105	2018	targeted	n/a	34.612281	-95.2748
106	2018	targeted	n/a	34.611937	-95.2852
107	2018	targeted	n/a	34.61382	-95.3015
108	2018	targeted	n/a	34.60386196	-95.3203
109	2018	targeted	n/a	34.60346801	-95.3227
110	2018	targeted	n/a	34.596462	-95.3297
111	2018	targeted	n/a	34.59522299	-95.3324
112	2018	targeted	n/a	34.45735401	-94.6082
113	2018	targeted	n/a	34.45952903	-94.6071
114	2018	targeted	n/a	34.45845497	-94.6159
115	2018	targeted	n/a	34.45945501	-94.6189
116	2018	targeted	n/a	34.39677699	-94.6868
117	2018	targeted	n/a	34.39872301	-94.6858
118	2018	targeted	n/a	34.34057599	-95.6333
119	2018	targeted	n/a	34.046497	-95.0348
120	2018	targeted	n/a	34.04405803	-95.029
121	2018	targeted	n/a	34.04973904	-95.0284
122	2018	targeted	n/a	34.03511496	-95.0038
123	2018	targeted	n/a	34.02997099	-95.0011
124	2018	targeted	n/a	34.02999496	-95.0026
125	2018	targeted	n/a	34.027615	-95.0042
126	2018	targeted	n/a	34.10812503	-94.9004
127	2018	targeted	n/a	34.07392996	-94.9025
128	2018	targeted	n/a	34.07178503	-94.9039
129	2019	targeted	n/a	34.61659298	-95.2394
130	2019	targeted	n/a	34.609334	-95.2442
131	2019	targeted	n/a	34.61282398	-95.2465
132	2019	targeted	n/a	34.61106797	-95.2665
133	2019	targeted	n/a	34.61238904	-95.2698
134	2019	targeted	n/a	34.64049004	-95.0811
135	2019	targeted	n/a	34.64019701	-95.0854
136	2019	targeted	n/a	34.63735202	-95.091
137	2019	targeted	n/a	34.63324497	-95.0932
138	2019	targeted	n/a	34.636413	-95.1233
139	2019	targeted	n/a	34.63537197	-95.1256
140	2019	targeted	n/a	34.62681798	-95.1294
141	2019	targeted	n/a	34.63028398	-95.1502
142	2019	targeted	n/a	34.62439301	-95.1803
143	2019	targeted	n/a	34.62904698	-95.1836
144	2019	targeted	n/a	34.61939002	-95.2155

145	2019	targeted	n/a	35.19799297	-97.4531
146	2019	targeted	n/a	34.33379302	-95.644
147	2019	targeted	n/a	34.57479201	-95.3467
148	2019	targeted	n/a	34.33600198	-95.19
149	2019	targeted	n/a	34.57599297	-95.3524
150	2019	targeted	n/a	34.57196999	-95.3605
151	2019	targeted	n/a	34.55115798	-95.4327
152	2019	targeted	n/a	34.54906703	-95.4461
153	2019	targeted	n/a	34.53401498	-95.4719
154	2019	targeted	n/a	34.51407501	-95.479
155	2019	targeted	n/a	34.50590601	-95.4981
156	2019	targeted	n/a	33.93995102	-94.7833
157	2019	targeted	n/a	33.93818596	-94.7736
158	2019	targeted	n/a	33.93950301	-94.7685
159	2019	targeted	n/a	34.02981299	-94.9869
160	2019	targeted	n/a	33.96760996	-94.9228
161	2019	targeted	n/a	33.95224996	-94.8888
162	2019	targeted	n/a	33.9481	-94.8749
163	2019	targeted	n/a	33.93641998	-94.8311

Table 2. Summary of fish species collected across all 86 full fish community samples.

Scientific Name	Common Name	Count Cumulative	SGCN Tier
Ameiurus melas	Black Bullhead	1	
Ameiurus natalis	Yellow Bullhead	1	
Ammocrypta vivax	Scaly Sand Darter	1	3
Aphredoderus sayanus	Pirate Perch	1	
Aplodinotus grunniens	Freshwater Drum	2	
Campostoma anomalum	Central Stoneroller	177	
Centrarchus macropterus	Flier	2	
Cyprinella venusta	Blacktail Shiner	73	
Cyprinella whipplei	Steelcolor Shiner	185	
Dorosoma cepedianum	Gizzard Shad	3	
Erimyzon claviformis	Creek Chubsucker	2	
Esox americanus americanus	Redfin Pickerel	2	
Esox americanus vermiculatus	Grass Pickerel	1	
Etheostoma artesiae	Redspot Darter	3	3
Etheostoma asprigene	Mud Darter	8	
Etheostoma collettei	Creole Darter	3	2
Etheostoma gracile	Slough Darter	1	
Etheostoma radiosum	Orangebelly Darter	36	2
Etheostoma spectabile	Orangethroat Darter	7	
Fundulus blairae	Western Starhead Topminnow	1	
Fundulus notatus	Blackstripe Topminnow	25	
Fundulus olivaceus	Blackspotted Topminnow	217	
Gambusia affinis	Western Mosquitofish	122	
Hybognathus nuchalis	Mississippi Silvery Minnow	3	
Labidesthes sicculus	Brook Silverside	214	
Lepisosteus spp.	Gar spp.	1	
Lepomis cyanellus	Green Sunfish	33	
Lepomis humilis	Orangespotted Sunfish	4	
Lepomis macrochirus	Bluegill Sunfish	82	
Lepomis megalotis	Longear Sunfish	220	
Lepomis microlophus	Redear Sunfish	1	
Lepomis miniatus	Redspotted Sunfish	1	
Lepomis spp.		13	
Luxilus chrysocephalus	Striped Shiner	24	
Lythrurus snelsnoni	Ouachita Mountain Shiner	4	2
Lythrurus umbratilis	Redfin Shiner	113	
Micropterus dolomieu	Smallmouth Bass	5	
Micropterus punctulatus	Spotted Bass	51	
Micropterus salmoides	Largemouth Bass	10	
Micropterus spp.		1	
Moxostoma carinatum	River Redhorse	1	
Moxostoma duquesni	Black Redhorse	6	
Moxostoma erythurum	Golden Redhorse	2	
Notropis athernoides	Emerald Shiner	11	
Notropis atrocaudalis	Blackspot Shiner	5	1
Notropis boops	Bigeye Shiner	1759	
Notropis buchanani	Ghost Shiner	1	

Notropis ortenburgeri	Kiamichi Shiner	161	2
Notropis spp.		38	
Noturus eleutherus	Mountain Madtom	11	3
Percina caprodes	Logperch	1	
Percina copelandi	Channel Darter	1	
Percina phoxocephala	Slenderhead Darter	1	
Percina sciera	Dusky Darter	7	
Pimephales notatus	Bluntnose Minnow	48	
Unidentified (juvenile etc.)		140	

Table 3. Fish species data for each of the 86 full community samples collected over the course of the project.

Site ID	Scientific Name	Common Name	Count
1	Fundulus olivaceus	Blackspotted Topminnow	2
1	Lepomis macrochirus	Bluegill Sunfish	2
1	Micropterus punctulatus	Spotted Bass	11
1	Percina caprodes	Logperch	1
1	Unidentified		2
2	Fundulus notatus	Blackstripe Topminnow	1
2	Labidesthes sicculus	Brook Silverside	1
3	Cyprinella venusta	Blacktail Shiner	11
3	Fundulus olivaceus	Blackspotted Topminnow	10
3	Gambusia affinis	Western Mosquitofish	3
3	Lepisosteus spp.	Gar spp.	1
3	Lepomis spp.		1
3	Lythrurus umbratilis	Redfin Shiner	9
3	Micropterus punctulatus	Spotted Bass	3
3	Notropis boops	Big Eye Shiner	17
3	Pimephales notatus	Bluntnose Minnow	1
4	Ammocrypta vivax	Scaly Sand Darter	1
4	Cyprinella venusta	Blacktail Shiner	3
4	Cyprinella whipplei	Steelcolor Shiner	1
4	Fundulus olivaceus	Blackspotted Topminnow	5
4	Micropterus dolomieu	Smallmouth Bass	1
4	Unidentified		10
5	Campostoma anomalum	Central Stoneroller	2
5	Fundulus olivaceus	Blackspotted Topminnow	16
5	Labidesthes sicculus	Brook Silverside	7
5	Lythrurus umbratilis	Redfin Shiner	6
5	Notropis boops	Bigeye Shiner	1
5	Unidentified		9
6	Campostoma anomalum	Central Stoneroller	1
6	Cyprinella venusta	Blacktail Shiner	11
6	Fundulus olivaceus	Blackspotted Topminnow	55
6	Labidesthes sicculus	Brook Silverside	27
6	Lepomis megalotis	Longear Sunfish	2
6	Micropterus punctulatus	Spotted Bass	5
6	Notropis ortenburgeri	Kiamichi Shiner	8
6	Percina sciera	Dusky Darter	1
7	Campostoma anomalum	Central Stoneroller	1
7	Cyprinella venusta	Blacktail Shiner	26
7	Etheostoma radiosum	Orangebelly Darter	1
7	Etheostoma spectabile	Orangethroat Darter	1
7	Fundulus olivaceus	Blackspotted Topminnow	49
7	Gambusia affinis	Western Mosquitofish	2
7	Labidesthes sicculus	Brook Silverside	12
7	Lepomis spp.		2
7	Micropterus punctulatus	Spotted Bass	4
7	Notropis ortenburgeri	Kiamichi Shiner	30
7	Percina phoxocephala	Slenderhead Darter	1
8	Campostoma anomalum	Central stoneroller	1
8	Cyprinella venusta	Blacktail Shiner	19
8	Cyprinella whipplei	Steelcolor Shiner	1

8	Fundulus olivaceus	Blackspotted Topminnow	17
8	Gambusia affinis	Western Mosquitofish	2
8	Labidesthes sicculus	Brook Silverside	2
8	Lepomis megalotis	Longear Sunfish	1
8	Micropterus punctulatus	Spotted Bass	3
8	Notropis boops	Bigeye Shiner	1
8	Notropis ortenburgeri	Kiamichi Shiner	17
8	Noturus eleutherus	Mountain Madtom	2
9	Campostoma anomalum	Central Stoneroller	20
9	Cyprinella whipplei	Steelcolor Shiner	8
9	Etheostoma asprigene	Mud Darter	1
9	Etheostoma gracile	Slough Darter	1
9	Etheostoma radiosum	Orangebelly Darter	1
9	Gambusia affinis	Western Mosquitofish	7
9	Lepomis megalotis	Longear Sunfish	7
9	Micropterus punctulatus	Spotted Bass	2
9	Notropis boops	Bigeye Shiner	27
9	Unidentified		15
10	Campostoma anomalum	Central Stoneroller	1
10	Cyprinella whipplei	Steelcolor Shiner	4
10	Labidesthes sicculus	Brook Silverside	4
10	Lepomis macrochirus	Bluegill Sunfish	2
10	Lepomis megalotis	Longear Sunfish	3
10	Micropterus dolomieu	Smallmouth Bass	1
10	Notropis boops	Bigeye Shiner	92
10	Unidentified		61
11	Campostoma anomalum	Central Stoneroller	1
11	Cyprinella whipplei	Steelcolor Shiner	6
11	Etheostoma radiosum	Orangebelly Darter	1
11	Fundulus olivaceus	Blackspotted Topminnow	1
11	Lepomis megalotis	Longear Sunfish	1
11	Micropterus punctulatus	Spotted Bass	1
11	Notropis boops	Bigeye Shiner	81
12	Campostoma anomalum	Central Stoneroller	4
12	Cyprinella whipplei	Steelcolor Shiner	5
12	Gambusia affinis	Western Mosquitofish	2
12	Labidesthes sicculus	Brook Silverside	2
12	Lepomis megalotis	Longear Sunfish	6
12	Micropterus punctulatus	Spotted Bass	2
12	Notropis boops	Bigeye Shiner	7
12	Pimephales notatus	Bluntnose Minnow	1
13	Campostoma anomalum	Central Stoneroller	2
13	Cyprinella whipplei	Steelcolor Shiner	15
13	Etheostoma radiosum	Orangebelly Darter	1
13	Etheostoma spectabile	Orangethroat Darter	1
13	Fundulus notatus	Blackstripe Topminnow	1
13	Fundulus olivaceus	Blackspotted Topminnow	3
13	Gambusia affinis	Western Mosquitofish	10
13	Labidesthes sicculus	Brook Silverside	4
13	Lepomis cyanellus	Green Sunfish	1
13	Lepomis megalotis	Longear Sunfish	1
13	Micropterus punctulatus	Spotted Bass	1
13	Notropis boops	Bigeye Shiner	66

13	Notropis ortenburgeri	Kiamichi Shiner	14
13	Pimephales notatus	Bluntnose Minnow	1
14	Campostoma anomalum	Central Stoneroller	22
14	Cyprinella whipplei	Steelcolor Shiner	2
14	Etheostoma radiosum	Orangebelly Darter	2
14	Gambusia affinis	Western Mosquitofish	1
14	Labidesthes sicculus	Brook Silverside	1
14	Lepomis megalotis	Longear Sunfish	2
14	Micropterus punctulatus	Spotted Bass	1
14	Notropis boops	Bigeye Shiner	19
15	Campostoma anomalum	Central Stoneroller	5
15	Cyprinella whipplei	Steelcolor Shiner	5
15	Gambusia affinis	Western Mosquitofish	14
15	Labidesthes sicculus	Brook Silverside	3
15	Lepomis spp.		7
15	Micropterus punctulatus	Spotted Bass	1
15	Notropis boops	Bigeye Shiner	36
15	Noturus eleutherus	Mountain Madtom	1
16	Campostoma anomalum	Central Stoneroller	15
16	Cyprinella whipplei	Steelcolor Shiner	6
16	Etheostoma radiosum	Orangebelly Darter	2
16	Etheostoma spectabile	Orange Throat Darter	1
16	Fundulus olivaceus	Blackspotted Topminnow	13
16	Gambusia affinis	Western Mosquitofish	12
16	Labidesthes sicculus	Brook Silverside	1
16	Lythrurus umbratilis	Redfin Shiner	5
16	Micropterus punctulatus	Spotted Bass	1
16	Notropis boops	Bigeye Shiner	55
17	Campostoma anomalum	Central Stoneroller	1
17	Cyprinella whipplei	Steelcolor Shiner	5
17	Fundulus olivaceus	Blackspotted Topminnow	4
17	Notropis boops	Bigeye Shiner	130
17	Unidentified		2
18	Campostoma anomalum	Central Stoneroller	1
18	Cyprinella whipplei	Steelcolor Shiner	8
18	Fundulus olivaceus	Blackspotted Topminnow	1
18	Labidesthes sicculus	Brook Silverside	1
18	Notropis boops	Bigeye Shiner	194
19	Labidesthes sicculus	Brook Silverside	10
19	Micropterus salmoides	Largemouth Bass	1
19	Notropis atrocaudalis	Blackspot Shiner	1
20	Notropis boops	Bigeye Shiner	9
21	Campostoma anomalum	Central Stoneroller	2
21	Etheostoma artesiae	Redspot Darter	2
21	Fundulus notatus	Blackstripe Topminnow	2
21	Notropis boops	Bigeye Shiner	4
22	Campostoma anomalum	Central Stoneroller	3
22	Cyprinella whipplei	Steelcolor Shiner	7
22	Fundulus olivaceus	Blackspotted Topminnow	11
22	Lepomis megalotis	Longear Sunfish	6
22	Micropterus punctulatus	Spotted Bass	3
22	Notropis boops	Bigeye Shiner	45
22	Percina sciera	Dusky Darter	2

22	Pimephales notatus	Bluntnose Minnow	3
23	Hybognathus nuchalis	Mississippi Silvery Minnow	3
24	Fundulus olivaceus	Blackspotted Topminnow	1
24	Lepomis cyanellus	Green Sunfish	1
24	Lepomis spp.		2
24	Micropterus salmoides	Largemouth Bass	1
24	Unidentified		10
25	Fundulus notatus	Blackstripe Topminnow	1
25	Notropis boops	Bigeye Shiner	6
26	Campostoma anomalum	Central Stoneroller	2
26	Labidesthes sicculus	Brook Silverside	7
26	Moxostoma erythurum	Golden Redhorse	1
26	Notropis boops	Bigeye Shiner	4
28	Cyprinella whipplei	Steelcolor Shiner	1
28	Fundulus notatus	Blackstripe Topminnow	4
28	Labidesthes sicculus	Brook Silverside	2
28	Lepomis megalotis	Longear Sunfish	2
28	Micropterus punctulatus	Spotted Bass	1
28	Notropis boops	Big Eye Shiner	31
29	Campostoma anomalum	Central Stoneroller	1
29	Lepomis megalotis	Longear Sunfish	4
29	Micropterus punctulatus	Spotted Bass	1
29	Notropis boops	Bigeye Shiner	60
29	Notropis boops	Bigeye Shiner	8
30	Notropis boops	Bigeye Shiner	4
31	Cyprinella whipplei	Steelcolor Shiner	16
31	Notropis boops	Bigeye Shiner	1
32	Campostoma anomalum	Central Stoneroller	1
32	Notropis boops	Bigeye Shiner	51
32	Notropis boops	Bigeye Shiner	7
32	Notropis ortenburgeri	Kiamichi Shiner	8
33	Cyprinella whipplei	Steelcolor Shiner	4
33	Lepomis macrochirus	Bluegill Sunfish	1
33	Lythrurus snelsnoni	Ouachita Mountain Shiner	2
33	Notropis boops	Bigeye Shiner	11
33	Unidentified		4
34	Campostoma anomalum	Central Stoneroller	1
34	Cyprinella whipplei	Steelcolor Shiner	1
34	Lepomis microlophus	Redear Sunfish	1
34	Micropterus punctulatus	Spotted Bass	1
34	Notropis boops	Bigeye Shiner	7
34	Unidentified		1
35	Notropis boops	Bigeye Shiner	6
36	Campostoma anomalum	Central Stoneroller	1
36	Micropterus spp.		1
36	Notropis boops	Bigeye Shiner	4
37	Notropis boops	Bigeye Shiner	1
38	Cyprinella whipplei	Steelcolor Shiner	1
38	Labidesthes sicculus	Brook Silverside	2
38	Notropis boops	Bigeye Shiner	1
39	Labidesthes sicculus	Brook Silverside	1
39	Lythrurus snelsnoni	Ouachita Mountain Shiner	2
39	Micropterus salmoides	Largemouth Bass	1

39	Notropis boops	Bigeye Shiner	4
40	Campostoma anomalum	Central Stoneroller	1
40	Cyprinella whipplei	Steelcolor Shiner	1
40	Etheostoma radiosum	Orangebelly Darter	1
40	Notropis boops	Bigeye Shiner	4
41	Cyprinella whipplei	Steelcolor Shiner	4
41	Etheostoma radiosum	Orangebelly Darter	1
41	Labidesthes sicculus	Brook Silverside	1
41	Notropis boops	Bigeye Shiner	8
42	Cyprinella whipplei	Steelcolor Shiner	2
42	Cyprinella whipplei	Steelcolor Shiner	2
42	Etheostoma asprigene	Mud Darter	3
42	Gambusia affinis	Western Mosquitofish	1
42	Notropis boops	Bigeye Shiner	3
42	Noturus eleutherus	Mountain Madtom	2
43	Cyprinella whipplei	Steelcolor Shiner	5
43	Gambusia affinis	Western Mosquitofish	7
43	Lepomis macrochirus	Bluegill Sunfish	3
43	Lythrurus umbratilis	Redfin Shiner	4
43	Notropis ortenburgeri	Kiamichi Shiner	1
44	Cyprinella whipplei	Steelcolor Shiner	4
44	Etheostoma radiosum	Orangebelly Darter	2
44	Gambusia affinis	Western Mosquitofish	2
44	Lepomis megalotis	Longear Sunfish	1
44	Lythrurus umbratilis	Redfin Shiner	3
44	Percina sciera	Dusky Darter	1
45	Campostoma anomalum	Central Stoneroller	2
45	Cyprinella whipplei	Steelcolor Shiner	6
45	Etheostoma asprigene	Mud Darter	1
45	Gambusia affinis	Western Mosquitofish	1
45	Notropis boops	Bigeye Shiner	2
45	Notropis boops	Bigeye Shiner	2
45	Noturus eleutherus	Mountain Madtom	1
45	Percina copelandi	Channel Darter	1
46	Cyprinella whipplei	Steelcolor Shiner	4
46	Gambusia affinis	Western Mosquitofish	1
46	Lepomis macrochirus	Bluegill Sunfish	2
46	Lythrurus umbratilis	Redfin Shiner	2
46	Notropis boops	Bigeye Shiner	2
47	Cyprinella whipplei	Steelcolor Shiner	2
47	Dorosoma cepedianum	Gizzard Shad	3
47	Lepomis cyanellus	Green Sunfish	1
47	Lythrurus umbratilis	Redfin Shiner	4
47	Notropis boops	Bigeye Shiner	7
47	Noturus eleutherus	Mountain Madtom	1
48	Cyprinella whipplei	Steelcolor Shiner	2
48	Gambusia affinis	Western Mosquitofish	9
48	Lepomis cyanellus	Green Sunfish	1
48	Lepomis macrochirus	Bluegill Sunfish	1
48	Lythrurus umbratilis	Redfin Shiner	3
48	Notropis boops	Bigeye Shiner	2
48	Pimephales notatus	Bluntnose Minnow	2
49	Campostoma anomalum	Central Stoneroller	1

49	Notropis boops	Bigeye Shiner	4
50	Campostoma anomalum	Central Stoneroller	4
50	Etheostoma radiosum	Orangebelly Darter	2
50	Etheostoma radiosum	Orangebelly Darter	2
50	Gambusia affinis	Western Mosquitofish	1
50	Notropis boops	Bigeye Shiner	1
54	Campostoma anomalum	Central Stoneroller	1
54	Etheostoma spectabile	Orangethroat Darter	2
54	Luxilus chrysocephalus	Striped Shiner	3
54	Notropis boops	Bigeye Shiner	1
55	Campostoma anomalum	Central Stoneroller	1
55	Etheostoma radiosum	Orangebelly Darter	1
55	Etheostoma spectabile	Orangethroat Darter	2
55	Micropterus salmoides	Largemouth Bass	1
55	Notropis boops	Bigeye Shiner	7
55	Noturus eleutherus	Mountain Madtom	1
56	Ameiurus natalis	Yellow Bullhead	1
56	Cyprinella whipplei	Steelcolor Shiner	3
56	Gambusia affinis	Western Mosquitofish	5
56	Lepomis humilis	Orangespotted Sunfish	2
56	Lepomis macrochirus	Bluegill Sunfish	1
56	Micropterus salmoides	Largemouth Bass	1
56	Notropis boops	Bigeye Shiner	9
56	Unidentified		2
57	Campostoma anomalum	Central Stoneroller	1
57	Cyprinella whipplei	Steelcolor Shiner	1
57	Etheostoma radiosum	Orangebelly Darter	3
57	Unidentified		3
58	Campostoma anomalum	Central Stoneroller	2
58	Cyprinella whipplei	Steelcolor Shiner	4
58	Etheostoma artesiae	Redspot Darter	1
58	Lepomis miniatus	Redspotted Sunfish	1
58	Unidentified		3
59	Cyprinella whipplei	Steelcolor Shiner	2
59	Lepomis megalotis	Longear Sunfish	2
59	Notropis boops	Bigeye Shiner	1
59	Unidentified		3
60	Campostoma anomalum	Central Stoneroller	1
60	Notropis athernoides	Emerald Shiner	11
60	Notropis buchanani	Ghost Shiner	1
61	Cyprinella whipplei	Steelcolor Shiner	3
61	Lepomis macrochirus	Bluegill Sunfish	1
61	Micropterus salmoides	Largemouth Bass	1
61	Notropis boops	Bigeye Shiner	1
61	Unidentified		8
62	Cyprinella whipplei	Steelcolor Shiner	6
62	Lythrurus umbratilis	Redfin Shiner	3
62	Notropis boops	Bigeye Shiner	1
62	Percina sciera	Dusky Darter	2
62	Unidentified		1
63	Campostoma anomalum	Central Stoneroller	1
63	Lepomis humilis	Orangespotted Sunfish	2
63	Notropis boops	Bigeye Shiner	3

63	Unidentified		3
63	Unidentified		1
64	Campostoma anomalum	Central Stoneroller	14
64	Etheostoma radiosum	Orangebelly Darter	4
64	Lepomis cyanellus	Green Sunfish	4
64	Lepomis megalotis	Longear Sunfish	3
64	Micropterus punctulatus	Spotted Bass	1
64	Micropterus salmoides	Largemouth Bass	1
64	Notropis boops	Bigeye Shiner	11
65	Etheostoma radiosum	Orangebelly Darter	1
65	Fundulus notatus	Blackstripe Topminnow	4
65	Labidesthes sicculus	Brook Silverside	3
65	Lepomis cyanellus	Green Sunfish	1
65	Lepomis megalotis	Longear Sunfish	5
65	Lepomis spp.		1
65	Notropis boops	Bigeye Shiner	24
65	Notropis spp.		38
65	Pimephales notatus	Bluntnose Minnow	3
66	Campostoma anomalum	Central Stoneroller	14
66	Erimyzon claviformis	Creek Chubsucker	1
66	Etheostoma collettei	Creole Darter	2
66	Labidesthes sicculus	Brook Silverside	6
66	Lepomis cyanellus	Green Sunfish	2
66	Lepomis megalotis	Longear Sunfish	6
66	Micropterus salmoides	Largemouth Bass	1
66	Moxostoma duquesni	Black Redhorse	5
66	Notropis boops	Bigeye Shiner	21
66	Pimephales notatus	Bluntnose Minnow	3
67	Campostoma anomalum	Central Stoneroller	3
67	Erimyzon claviformis	Creek Chubsucker	1
67	Etheostoma radiosum	Orangebelly Darter	2
67	Fundulus notatus	Blackstripe Topminnow	2
67	Lepomis cyanellus	Green Sunfish	1
67	Lepomis megalotis	Longear Sunfish	17
67	Notropis atrocaudalis	Blackspot Shiner	1
67	Notropis boops	Bigeye Shiner	63
67	Notropis ortenburgeri	Kiamichi Shiner	3
68	Campostoma anomalum	Central Stoneroller	11
68	Lepomis cyanellus	Green Sunfish	2
68	Lepomis megalotis	Longear Sunfish	3
68	Notropis atrocaudalis	Blackspot Shiner	2
68	Notropis boops	Bigeye Shiner	44
69	Campostoma anomalum	Central Stoneroller	1
69	Labidesthes sicculus	Brook Silverside	1
69	Lepomis megalotis	Longear Sunfish	5
69	Notropis boops	Bigeye Shiner	95
70	Ameiurus melas	Black Bullhead	1
70	Cyprinella whipplei	Steelcolor Shiner	1
70	Etheostoma radiosum	Orangebelly Darter	1
70	Fundulus notatus	Blackstripe Topminnow	5
70	Gambusia affinis	Western Mosquitofish	1
70	Lepomis megalotis	Longear Sunfish	26
70	Micropterus punctulatus	Spotted Bass	3

70	Notropis boops	Bigeye Shiner	12
71	Campostoma anomalum	Central Stoneroller	2
71	Cyprinella whipplei	Steelcolor Shiner	20
71	Etheostoma radiosum	Orangebelly Darter	1
71	Labidesthes sicculus	Brook Silverside	4
71	Lepomis megalotis	Longear Sunfish	2
71	Micropterus dolomieu	Smallmouth Bass	1
71	Notropis boops	Bigeye Shiner	43
72	Pimephales notatus	Bluntnose Minnow	8
73	Aplodinotus grunniens	Freshwater Drum	1
73	Campostoma anomalum	Central Stoneroller	3
73	Esox americanus americanus	Redfin Pickerel	2
73	Etheostoma radiosum	Orangebelly Darter	2
73	Fundulus olivaceus	Blackspotted Topminnow	7
73	Gambusia affinis	Western Mosquitofish	10
73	Lepomis cyanellus	Green Sunfish	4
73	Lepomis megalotis	Longear Sunfish	17
73	Notropis boops	Bigeye Shiner	5
74	Gambusia affinis	Western Mosquitofish	4
74	Lepomis megalotis	Longear Sunfish	3
74	Micropterus salmoides	Largemouth Bass	1
74	Notropis boops	Bigeye Shiner	26
75	Campostoma anomalum	Central Stoneroller	4
75	Lepomis cyanellus	Green Sunfish	2
75	Lepomis megalotis	Longear Sunfish	10
75	Notropis boops	Bigeye Shiner	22
75	Pimephales notatus	Bluntnose Minnow	10
76	Fundulus olivaceus	Blackspotted Topminnow	3
76	Labidesthes sicculus	Brook Silverside	39
76	Lepomis cyanellus	Green Sunfish	1
76	Lepomis megalotis	Longear Sunfish	6
76	Micropterus punctulatus	Spotted Bass	1
76	Notropis boops	Bigeye Shiner	25
76	Notropis ortenburgeri	Kiamichi Shiner	24
76	Noturus eleutherus	Mountain Madtom	1
76	Pimephales notatus	Bluntnose Minnow	3
77	Campostoma anomalum	Central Stoneroller	1
77	Cyprinella whipplei	Steelcolor Shiner	2
77	Etheostoma radiosum	Orangebelly Darter	1
77	Labidesthes sicculus	Brook Silverside	12
77	Lepomis cyanellus	Green Sunfish	1
77	Lepomis megalotis	Longear Sunfish	3
77	Micropterus dolomieu	Smallmouth Bass	1
77	Notropis boops	Bigeye Shiner	48
78	Campostoma anomalum	Central Stoneroller	8
78	Fundulus blairae	Western Starhead Topminnow	1
78	Lepomis megalotis	Longear Sunfish	2
78	Notropis atrocaudalis	Blackspot Shiner	1
78	Notropis boops	Bigeye Shiner	86
78	Notropis ortenburgeri	Kiamichi Shiner	6
79	Campostoma anomalum	Central Stoneroller	2
79	Etheostoma radiosum	Orangebelly Darter	3
79	Lepomis megalotis	Longear Sunfish	4

79	Notropis boops	Bigeye Shiner	2
79	Noturus eleutherus	Mountain Madtom	2
79	Pimephales notatus	Bluntnose Minnow	5
80	Campostoma anomalum	Central Stoneroller	2
80	Labidesthes sicculus	Brook Silverside	5
80	Lepomis megalotis	Longear Sunfish	1
80	Notropis boops	Bigeye Shiner	51
80	Notropis ortenburgeri	Kiamichi Shiner	3
81	Gambusia affinis	Western Mosquitofish	1
81	Lepomis macrochirus	Bluegill Sunfish	60
82	Aplodinotus grunniens	Freshwater Drum	1
82	Etheostoma asprigene	Mud Darter	1
82	Fundulus olivaceus	Blackspotted Topminnow	2
82	Gambusia affinis	Western Mosquitofish	5
82	Lepomis megalotis	Longear Sunfish	5
82	Notropis boops	Bigeye Shiner	13
82	Notropis ortenburgeri	Kiamichi Shiner	4
83	Esox americanus vermiculatus	Grass Pickerel	1
83	Lepomis cyanellus	Green Sunfish	10
83	Lepomis megalotis	Longear Sunfish	25
83	Pimephales notatus	Bluntnose Minnow	1
84	Aphredoderus sayanus	Pirate Perch	1
84	Campostoma anomalum	Central Stoneroller	1
84	Etheostoma asprigene	Mud Darter	2
84	Fundulus olivaceus	Blackspotted Topminnow	1
84	Lepomis megalotis	Longear Sunfish	13
84	Lythrurus umbratilis	Redfin Shiner	11
84	Moxostoma erythurum	Golden Redhorse	1
85	Labidesthes sicculus	Brook Silverside	4
85	Lepomis megalotis	Longear Sunfish	2
85	Luxilus chrysocephalus	Striped Shiner	12
85	Lythrurus umbratilis	Redfin Shiner	1
85	Notropis boops	Bigeye Shiner	2
86	Cyprinella whipplei	Steelcolor Shiner	7
86	Fundulus olivaceus	Blackspotted Topminnow	9
86	Gambusia affinis	Western Mosquitofish	17
86	Labidesthes sicculus	Brook Silverside	5
86	Lepomis macrochirus	Bluegill Sunfish	8
86	Micropterus dolomieu	Smallmouth Bass	1
86	Micropterus punctulatus	Spotted Bass	3
86	Moxostoma duquesni	Black Redhorse	1
86	Unidentified		1
87	Fundulus olivaceus	Blackspotted Topminnow	5
87	Gambusia affinis	Western Mosquitofish	4
87	Labidesthes sicculus	Brook Silverside	1
87	Lepomis macrochirus	Bluegill	1
87	Lepomis megalotis	Longear Sunfish	2
87	Lythrurus umbratilis	Redfin Shiner	37
87	Pimephales notatus	Bluntnose Minnow	2
88	Campostoma anomalum	Central Stoneroller	1
88	Centrarchus macropterus	Flier	1
88	Cyprinella whipplei	Steelcolor Shiner	2
88	Fundulus olivaceus	Blackspotted Topminnow	1

88	Labidesthes sicculus	Brook Silverside	12
88	Labidesthes sicculus	Brook Silverside	13
88	Lepomis megalotis	Longear Sunfish	11
88	Lythrurus umbratilis	Redfin Shiner	24
88	Moxostoma carinatum	River Redhorse	1
88	Notropis boops	Big Eye Shiner	66
88	Pimephales notatus	Bluntnose Minnow	5
89	Fundulus notatus	Blackstripe Topminnow	5
89	Labidesthes sicculus	Brook Silverside	16
89	Lythrurus umbratilis	Red Fin Shiner	1
89	Micropterus punctulatus	Spotted Bass	2
89	Notropis boops	Big Eye Shiner	7
89	Notropis ortenburgeri	Kiamichi Shiner	9
90	Etheostoma radiosum	Orangebelly Darter	1
90	Fundulus olivaceus	Blackspotted Topminnow	2
90	Lepomis megalotis	Longear Sunfish	2
90	Luxilus chrysocephalus	Striped Shiner	8
90	Micropterus salmoides	Largemouth Bass	1
90	Notropis ortenburgeri	Kiamichi Shiner	17
90	Unidentified		1
91	Campostoma anomalum	Central Stoneroller	7
91	Centrarchus macropterus	Flier	1
91	Cyprinella venusta	Blacktail Shiner	3
91	Cyprinella whipplei	Steelcolor Shiner	6
91	Etheostoma collettei	Creole Darter	1
91	Labidesthes sicculus	Brook Silverside	5
91	Lepomis cyanellus	Green Sunfish	1
91	Lepomis megalotis	Longear Sunfish	8
91	Luxilus chrysocephalus	Striped Shiner	1
91	Notropis boops	Bigeye Shiner	45
91	Notropis ortenburgeri	Kiamichi Shiner	17
91	Percina sciera	Dusky Darter	1

Table 4. Physical Habitat Data: Water temperature (degrees Celsius), pH and conductivity (µS/m) measured with a handheld probe; water depth (m) and flow velocity (m/s) measured with a wading rod and flowmeter; bankfull and wetted channel widths (m) measured with a measuring tape or rangefinder; visual estimates of substrate composition (percent clay, silt, sand, gravel, cobble, boulder, and bedrock); visual estimates of mesohabitat composition (percent riffle, percent pool, percent leaf litter cover in pools and percent aquatic macrophyte cover in riffles), visual estimates of riparian zone vegetation (percent cover) and canopy cover over the stream measured by a spherical densiometer (percent cover).

Site ID	Temp	pH	Conductivity	Depth	Flow	BFW	WW	Clay	Silt	Sand	Grav	Cobb	Bould	Bedrock	Riffle	Pool	Leaf Litter	Macrophyte	Riparian	Canopy
1	23.13	6.28	35.87	0.295	0.482	45	30	0	20	0	0	5	25	50	75	25	0	0	20	5
2	n/a	n/a	n/a	0.237	0.249	70	60	0	15	0	0	5	20	60	60	20	10	5	15	10
3	27.40	6.57	48.03	0.174	0.041	50	34	0	1	41	10	46	2	0	25	75	0	60	90	10
4	n/a	n/a	n/a	0.647	0.813	29	20	0	5	7.5	22.5	65	0	0	90	10	3	20	100	0
5	24.27	6.09	46.57	0.433	0.156	60	24.5	0	6	1	6.5	78	8.5	0	80	20	5	3	95	25
6	32.77	6.84	55.07	0.497	0.069	45	32	0	7	23	16	52	2	0	50	50	3	5	50	50
7	30.30	5.64	84.73	0.245	0.215	49	40	0	8	7	10	51	24	0	35	65	2	10	85	70
8	32.67	6.32	100.20	0.239	0.146	45	35	0	10.5	27	11.5	42	9	0	40	60	20	20	50	75
9	30.83	6.70	43.70	0.200	0.093	72	52	0	4.5	17.5	28	47.5	2.5	0	40	60	4	60	95	7
10	30.83	6.42	63.87	0.227	0.269	80	69	0	2.5	6.5	12.5	71.5	7	0	75	25	4	50	60	5
11	30.47	7.02	62.30	0.174	0.259	82	21	0	6.5	13	24	54	2	0	75	25	2	85	85	30
12	30.80	6.57	65.47	0.288	0.151	55	46	0	5	13	34.5	35.5	9	0	85	15	0.5	100	92	0.3
13	31.67	6.49	69.97	0.139	0.264	16.5	14	0	4.5	17.5	67.5	9.5	0	0	60	40	30	5	92	85
14	33.90	6.40	68.50	0.623	0.410	22	12	0	0	20	60	20	0	0	55	45	3.5	47.5	65	35
15	32.60	6.90	69.50	0.168	0.391	28	14	0	2.5	5.5	21	56.5	15.5	0	80	20	25	10	95	10
16	32.10	6.76	68.10	0.603	1.017	60	6	0	0	15	50	35	0	0	80	20	40	35	60	10
17	31.50	6.58	45.40	0.191	0.224	35	12	0	6	15.5	27.5	35.5	15.5	0	70	30	7	100	80	1
18	33.10	6.51	49.00	0.339	0.096	52	14	0	7	20	7.5	15.5	40	10	85	15	50	100	100	0
19	32.53	6.98	48.23	0.405	0.084	27	13	0	0	5	5	5	5	80	60	40	15	40	100	0
20	33.73	7.21	47.20	0.225	0.083	52	19	0	7.5	12.5	6.25	12.5	70	45	20	80	0	100	100	0
21	31.63	6.88	51.17	0.247	0.239	20	14	0	9	7	17	24.5	44.5	0	40	60	20	40	45	30
22	30.47	6.61	46.47	0.187	0.102	31	16	0	14.5	2	4	8	28.5	44	90	10	30	30	100	5
23	32.57	7.77	49.50	0.252	0.105	34	11	0	0	10	5	60	20	5	80	20	1	0	60	5
24	33.20	7.12	50.60	0.203	0.191	122	90	0	0	30	0	30	40	0	50	50	100	0	80	1
25	31.57	6.66	41.47	0.136	0.016	16	6	0	5	4.5	7	16	30.5	42.5	25	75	70	100	100	35
26	26.43	7.02	54.90	0.188	0.147	30	26	0	7.5	5.5	9.5	14	46.5	16.5	40	60	10	100	85	10
27	29.80	6.95	31.90	0.317	0.165	54	39	0	4	4.5	10	18	61	1.5	80	20	3	90	85	1
28	27.57	6.19	28.73	0.218	0.177	54	26	0	4.5	5.5	9.5	42.5	38	0	40	60	50	85	100	0
29	30.27	7.64	36.23	0.263	0.148	38	25	0	10.5	5.5	9.5	18	18.5	38	40	60	10	85	90	10
30	28.63	6.20	36.70	0.269	2.766	56	42	0	0	5	0	5	50	40	30	70	2	100	95	2
31	25.43	6.74	37.30	0.185	0.133	35	19	0	5.5	7	11.5	21.5	24.5	34.5	25	75	2	40	100	10
32	27.97	6.29	40.53	0.243	0.157	59	7	0	7.5	7.5	6.5	70	8	0	50	50	30	60	75	10
33	n/a	n/a	n/a	2.037	1.073	60	45	0	5	32.5	30	52.5	0	0	80	20	1	90	100	2
34	n/a	n/a	n/a	1.243	1.157	47	42	0	5	2.5	5	57.5	5	25	50	50	1	80	80	1
35	n/a	n/a	n/a	1.377	0.897	60	10	0	5	7.5	45	42.5	0	0	80	20	5	90	100	3
36	n/a	n/a	n/a	1.390	0.857	30	15	0	5	7.5	12.5	75	0	0	98	2	3	100	100	15
37	n/a	n/a	n/a	1.817	1.803	58	75	0	5	17.5	7.5	50	20	0	90	10	5	75	100	5
38	n/a	n/a	n/a	1.547	1.757	70	59	0	5	5	10	30	30	10	70	30	2	60	100	5
39	n/a	n/a	n/a	1.283	1.017	50	37	0	4.5	11.5	10	19	33.5	21.5	60	40	5	90	95	2
40	n/a	n/a	n/a	1.470	1.167	64	36	0	5	0	20	70	2.5	5	90	10	2	90	100	5
41	n/a	n/a	n/a	1.397	0.777	57	26	0	4	14	25.5	27	27.5	0	50	50	10	90	95	1
42	n/a	n/a	n/a	0.963	0.737	75	25	0	4.5	4	46.5	39.5	4.5	0	80	20	1	45	100	0
43	n/a	n/a	n/a	1.150	1.163	22	16	1	10	5	51.5	32	1	0	70	30	20	10	90	45
44	n/a	n/a	n/a	1.160	1.180	45	18	0	7	10	73	9	1	0	90	10	20	90	100	20
45	n/a	n/a	n/a	1.173	0.750	41	25	0	3	6.5	43.5	43	6	0	90	10	5	100	100	5
46	n/a	n/a	n/a	1.460	0.597	42	25	0	4.5	11.5	53.5	29	1.5	0	60	40	5	90	100	2

Site ID	Temp	pH	Conductivity	Depth	Flow	BFW	WW	Clay	Silt	Sand	Grav	Cobb	Bould	Bedrock	Riffle	Pool	Leaf Litter	Macrophyte	Riparian	Canopy
47	n/a	n/a	n/a	0.717	0.903	58	36	0	10	8.5	31	38	12.5	0	60	40	5	40	95	10
48	n/a	n/a	n/a	1.200	0.863	50	16	0	6.5	6	49	24.5	11	0	70	30	20	65	90	30
49	n/a	n/a	n/a	0.933	0.917	70	26	0	2.5	0	20	22.5	15	40	95	5	1	2	60	0
50	n/a	n/a	n/a	1.227	1.467	80	12	0	2.5	0	15	60	22.5	0	95	5	5	2	50	50
51	n/a	n/a	n/a	0.907	0.667	65	30	0	7.5	12.5	20	25	25	10	90	10	10	20	90	5
52	n/a	n/a	n/a	1.057	1.213	65	28	0	5	5	5	5	30	50	95	5	2	80	100	80
53	29.03	5.88	51.53	0.393	0.123	33	18	0	12	21.5	24.5	39	3	0	80	20	5	2	95	10
54	n/a	n/a	n/a	0.647	0.960	88	58	0	1	10	16	58	15	0	50	50	1	25	90	1
55	n/a	n/a	n/a	0.943	1.410	40	19	0	2	9	15	63	11	0	40	60	20	70	95	10
56	n/a	n/a	n/a	0.710	1.413	52	20	0	11.5	5	47.5	27	9	0	70	30	5	95	90	0
57	n/a	n/a	n/a	0.570	0.527	68	52	0	5.5	11.5	40	20.5	22.5	0	60	40	20	70	90	0
58	n/a	n/a	n/a	1.000	0.467	46	30	0	14	18.5	30.5	22	13	1	50	50	5	95	100	1
59	n/a	n/a	n/a	0.857	0.543	35	10	0	9	10.5	36.5	32.5	6.5	0	70	30	1	100	90	2
60	n/a	n/a	n/a	0.907	0.753	25	15	0	7.5	31.5	22.5	13.5	26	0	80	20	30	100	95	5
61	n/a	n/a	n/a	0.940	0.977	31	20	0	10.5	8	18.5	42.5	20.5	0	50	50	30	80	85	5
62	n/a	n/a	n/a	0.937	1.020	32	11	0	5.5	16	39	32	7.5	0	40	60	20	95	90	0
63	n/a	n/a	n/a	0.727	0.947	40	11	0	7	4.5	41	44.5	4	0	75	25	10	95	75	5
64	23.80	7.20	34.20	0.873	0.200	15	9	0	0	0	50	20	20	10	25	75	30	20	80	30
65	25.67	6.52	41.70	0.777	0.327	30	25	0	0	0	0	0	60	40	30	70	2	80	90	10
66	23.37	7.07	48.03	0.860	0.000	16	9	0	0	0	0	0	10	90	0	100	15	90	95	0
67	25.10	6.86	44.73	0.877	0.463	12	6	0	0	5	40	30	10	15	20	80	10	0	80	15
68	24.63	7.09	33.80	0.743	0.523	12	6	0	0	0	30	30	20	20	70	30	80	0	80	60
69	26.73	7.40	37.77	0.770	0.080	18	13	0	0	0	50	30	10	10	30	70	0	80	60	10
70	27.50	7.60	123.03	0.703	0.137	24	13	0	0	5	55	20	5	15	20	80	20	0	80	45
71	27.77	6.92	39.90	0.963	0.380	40	13	0	0	5	55	40	0	0	60	40	2	0	60	0
72	23.77	6.85	133.10	0.477	0.000	18	4	0	0	10	30	30	0	30	0	100	100	0	40	40
73	25.27	7.56	97.47	0.870	0.000	10	7	0	5	10	30	0	0	55	80	20	20	60	90	70
74	25.77	6.86	124.83	1.930	0.000	13	9	0	0	10	5	20	5	60	0	100	20	10	70	60
75	26.23	7.16	49.17	0.893	0.000	8	7	0	0	10	5	10	5	70	0	100	100	80	100	80
76	27.40	6.64	51.63	0.910	0.300	17	14	0	0	5	10	10	10	65	20	80	50	70	90	55
77	26.97	7.09	34.90	0.727	0.267	23	21	0	0	5	35	30	20	20	40	60	50	80	100	40
78	23.73	7.02	43.23	1.220	0.000	12	7	5	5	10	35	35	10	0	0	100	25	25	90	20
79	23.57	7.42	34.60	0.617	0.000	16	7	0	0	30	30	20	0	20	0	100	70	50	90	60
80	28.60	6.14	91.67	0.587	0.340	25	8	0	0	85	10	5	0	0	10	90	10	0	3	80
81	22.87	7.22	42.63	0.337	0.297	10	5	10	10	20	50	10	0	0	80	20	70	0	50	95
82	25.50	8.12	88.43	0.457	0.180	7	3	10	10	80	0	0	0	0	15	85	50	1	60	60
83	25.73	6.92	52.10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
84	26.00	5.84	63.93	0.817	0.000	12	6	10	10	70	10	0	0	0	0	100	65	10	80	40
85	28.13	4.57	59.40	0.590	0.000	15	9	10	10	50	10	20	0	0	0	100	100	50	45	30
86	35.60	5.88	37.03	0.730	0.117	21	11	5	5	40	10	20	0	20	40	60	100	40	100	20
87	28.77	6.54	52.47	1.130	0.000	23	15	5	5	20	20	20	20	10	0	100	10	60	75	40
88	28.03	7.02	45.57	0.963	0.073	20	12	0	0	0	10	10	30	50	10	90	55	90	70	5
89	31.97	7.39	57.27	1.260	0.000	13	10	0	0	10	30	20	20	20	0	100	70	90	65	1
90	30.87	7.43	121.77	0.537	0.283	17	9	0	0	10	70	10	0	10	10	90	95	80	30	40
91	29.73	6.81	187.27	1.220	0.000	20	14	5	5	20	50	20	0	0	0	100	100	70	100	65