FINAL PERFORMANCE REPORT

Federal Aid Grant No. F17AP00040 (E-81-R-4)

Processing and Vouchering of Fish Samples Collected from Annual Monitoring Efforts for the Arkansas River Shiner (*Notropis girardi*) in the Canadian River

Oklahoma Department of Wildlife Conservation

January 1, 2017 through December 31, 2018

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State: Oklahoma **Grant Number:** F17AP00040 (E-81-R-4)

Grant Program: Endangered Species Act Section 6

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Project Leader: Shannon Brewer, PhD., Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State University

A. ABSTRACT

The Arkansas River Shiner (*Notropis girardi*) is a federally threatened Great Plains cyprinid that is monitored biannually by the U.S. Fish and Wildlife Service (USFWS). Our objective was to enumerate and analyze fish collections made by USFWS to determine the number and relative abundance of Arkansas River Shiners and associated fish species in the Canadian river system. The abundance of Arkansas River Shiner at sample locations varied substantially among years. As expected, the size distribution of individuals sampled was skewed toward larger fish in the spring compared to autumn size distributions. Compared with earlier years, very few Arkansas River Shiners were collected in 2017 and 2018, but water levels prevented sampling at several sites. We recommend USFWS consider pairing sites for spring and autumn samples so the proportion of juveniles and adults at each of the sites might be compared and related to discharge conditions. It is difficult to recommend a sampling period (spring or autumn) because sites were not all sampled during both periods and spring samples likely reflect more adult fishes whereas fall sampling picks up more juveniles (i.e., the choice depends on the objective of the agency). Some of the sites may be more important spawning than rearing locations and vice versa.

B. BACKGROUND

The large, sandy-bottom rivers of western and central Oklahoma support populations of the Arkansas River Shiner (*Notropis girardi*) a pelagic-spawning minnow that is currently listed as threatened under the Endangered Species Act. While historically found throughout the Arkansas River watershed, the only extant population in Oklahoma occurs in the Canadian River, from the Oklahoma/Texas state line north of Roll, OK downstream to Lake Eufaula reservoir.
The Oklahoma Ecological Services Field Office of the U.S. Fish and Wildlife Service (USFWS) conducts annual monitoring surveys for the Arkansas River Shiner in the Canadian river in Oklahoma and adjacent states. Under a separate Section 6 grant, biologists from the Oklahoma Department of Wildlife Conservation (ODWC) assist USFWS staff with fish collection by conducting standardized seine hauls at each monitoring station along the river (usually access

points near bridges). These potentially complex samples of cyprinid fish are then preserved in the field for later sorting and analysis. The processing of large numbers of small fish, particularly small cyprinids, is a time-consuming process, and because of limited wildlife agency staff resources, the results of each year's monitoring efforts can be delayed by a year or more until biologists have the time to process the collected samples. Under this grant, the Oklahoma Cooperative Fish and Wildlife Unit (OCFWRU) processed the fish that were collected by the ODWC and the USFWS during their fish population monitoring surveys in the Canadian River. The Principal Investigator, Dr. Shannon Brewer, has extensive experience identifying small fish species from streams and rivers in the central United States.

Data regarding the relative abundance of Arkansas River Shiners in the Canadian River is essential for long term monitoring and trend analysis. As in previous years, monitoring and comparing annual fluctuations in the population of *N. girardi* has been important in terms of measuring changes resulting from stochastic events; these include extreme weather, drought, and/or anthropogenic activities. Lastly, processing of these samples can detect the presence of invasive species in the Canadian River that have the potential to negatively impact *N. girardi*, such as the Red River Shiner (*N. bairdi*).

C. OBJECTIVE:

Enumerate and analyze one year of fish collections provided by the U.S. Fish and Wildlife Service to determine the number and relative abundance of Arkansas River Shiners and associated fish species in the Canadian river system.

D. PROCEDURES

Fish samples were brought to OSU for identification. Samples that were still in formalin were rinsed in water and transferred to 70% ethanol. Fish were identified using published keys and several other keys developed at the OSU lab.

We developed an Access® database that includes fish count data and the physical attributes of each study site. The datasheets were provided to us from the USFWS and often gave multiple descriptions for the same site, so a map was used to determine which sites were 'the same' and then each site was given a unique description and name (Table 1). The latitude and longitude of each site was used to create a map showing standard locations of the sampling sites (Figure 1). Each species of fish identified was also given a unique abbreviation (Table 2). If latitude and longitude were not provided, Google Maps® was used to find the latitude and longitude based on the description. We refer to 'spring samples' if they were collected before July and 'fall samples' if they were collected after July (no samples have been collected in July to date). We also provided directions to ODWC and USFWS on how to link the tables together in Access (see Appendix A). Data from previously identified fishes (prior to 2011) were provided by the USFWS and also entered into the Access database for consistency. The spring samples for 2016 were retained and identified by the USFWS due to extremely low abundances, and we have not yet received those data to include in the database (thus, not included in this report). We completed the processing of spring 2018 samples and those data are included in this report. USFWS did sample in fall 2018, but we have not yet received those samples for processing. We

provide comparisons across years in the results given the overall interest in trends. The sample ID indicates the year within the sample code (the first two numbers). For example, BAB**11**27 is a 2011 sample whereas BAB**12**07 is a 2012 sample and **18**DBF02 is a 2018 sample.

E. RESULTS AND DISCUSSION

A total of 36 species have been identified since the database began in 2013 (Figure 2). We also included six additional categories in our identifications: 1) unknown (UNK), which generally contained cyprinids too small to identify with high confidence 2) *Carpiodes* spp, 3) *Pimephales* spp, 4) Lepisosteus spp, 5) Cyprinidae spp, and 6) Lepomis spp. Collectively, Red Shiner (*Cyprinella lutrensis)* comprised the majority of the catch. In samples identified in 2018, we identified 19 fish species, with Red Shiner again comprising the majority of the catch (Figure 3). Arkansas River Shiner (*Notropis girard)* was most abundant at Camargo, Mustang, Caddo Jake Bridge, Bridgeport, and, in recent samples, Amarillo and Ada (Table 3). However, the abundance of Arkansas River Shiner at those sites varied substantially among years (Table 4). As expected, the size distribution of individuals sampled was skewed toward larger fish in the spring collections (Figure 4). However, larger fish were sampled more often at downstream sites of the Canadian River (downstream of Oakwood, Figure 5). We would have expected to sample larger fish upstream but given the drought in 2011-2013, fish migrations may have been restricted during some periods. However, the Arkansas River Shiners collected from the upstream sites in spring 2018 were large, but no downstream sites were sampled for appropriate comparison (Figure 6).

F. RECOMMENDATIONS

The project is completed. We recommend USFWS consider pairing sites for spring and autumn samples so the proportion of juveniles and adults at each of the sites might be compared and related to discharge conditions. It is difficult to recommend a sampling period (spring or autumn) based on abundance at sample sites (Table 5) because sites were not all sampled during both periods and spring samples likely reflect more adult fishes while fall sampling picks up more juveniles (i.e., the choice depends on the objective of the agency). Some of the sites may be more important spawning than rearing locations and vice versa.

G. SIGNIFICANT DEVIATIONS

No significant deviations.

H. EQUIPMENT

No equipment purchased during this period.

I. PREPARED BY:

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DATE: 27 February 2018

APPROVED BY:

Wildlife Division Administration
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Table 1. Location of each site where the USFWS-collected Canadian River fish samples were collected.

County	River	Description	Site Name	Lat.	Long.
Pontotoc	Canadian	US 377, 7 miles N. of Ada, OK	Ada	34.933	-96.683
Potter	Canadian	US 287, 20 miles N. of Amarillo, TX	Amarillo	35.470	-101.880
Pottawatomie	Canadian	Asher, OK	Asher	34.965	-96.929
Hutchinson	Canadian	FM 2277, N. of Borger, TX	Borger 1	35.747	-101.347
Hutchinson	Dickson Cr.	FM 2277, N. of Borger, TX	Borger 2	35.743	-101.342
Oldham	Canadian	US 385, near Boys Ranch, TX	Boys Ranch	35.520	-102.261
Caddo	Canadian	US 281, near Bridgeport, OK	Bridgeport	35.541	-98.321
Canadian	Canadian	Co. Rd. 2720 Caddo Jake Bridge, 7 mile N. of Cogar, OK	Caddo Jake Bridge	35.454	-98.149
Hughes	Canadian	US 75, 1 mile N. of Calvin, OK	Calvin	34.975	-96.241
Dewey	Canadian	OK 34, near Camargo, OK	Camargo	36.002	-99.291
Hemphill	Canadian	US 83, 1/2 mile N. of Canadian, TX	Canadian	35.943	-100.378
Ellis	Canadian	Co. Rd. N1710 4 miles N., 1 mile W. of Durham, OK	Durham	35.907	-99.943
Grady	Canadian	OK 4, near Mustang, OK	Mustang	35.326	-97.724
Cleveland	Canadian	I-35, near Norman, OK	Norman	35.194	-97.485
Dewey	Canadian	Co. Rd. E0730, 7 miles NNW of Oakwood, OK	Oakwood	35.956	-98.826
Ellis	Canadian	US 283, 7 miles N. of Roll, OK	Roll	35.869	-99.728
Dewey	Canadian	US 183, near Taloga, OK	Taloga	36.054	-98.969
Custer	Canadian	OK 33, near Thomas, OK	Thomas	35.771	-98.674
Grady	Canadian	Hwy 81, near Union City, OK	Union City	35.366	-97.929
Pottawatomie	Canadian	SH 102, 3 miles S. of Wanette, OK	Wanette	34.920	-97.049

Table 2.- Abbreviations of fishes collected from the Canadian River.

Abbreviation	Common Name	Scientific Name
ARS	Arkansas River Shiner	*Notropis girardi*
BB	Black Bullhead	*Ameiurus melas*
BBU	Black Buffalo	*Ictiobus niger*
BC	Black Crappie	*Pomoxis nigromaculatus*
BCF	Blue Catfish	*Ictalurus furcatus*
BHM	Bullhead Minnow	*Pimephales vigilax*
BM	Bluntnose Minnow	*Pimephales notatus*
BMB	Bigmouth Buffalo	*Ictiobus cyprinellus*
BRS	Brook Silverside	*Labidesthes sicculus*
BS	Bluegill	*Lepomis macrochirus*
CC	Common Carp	*Cyprinus carpio*
CCF	Channel Catfish	*Ictalurus punctatus*
CS	Central Stoneroller	*Campostoma anomalum*
ES	Emerald Shiner	*Notropis atherinoides*
FC	Flathead Chub	*Platygobio gracilis*
FHC	Flathead Catfish	*Pylodictis olivaris*
FD	Freshwater Drum	*Aplodinotus grunniens*
FM	Fathead Minnow	*Pimephales promelas*
GDS	Golden Shiner	*Notemigonus crysoleucas*
GSF	Green Sunfish	*Lepomis cyanellus*
GS	Ghost Shiner	*Notropis buchanani*
GZS	Gizzard Shad	*Dorosoma cepedianum*
IS	Inland Silverside	*Menidia beryllina*
LB	Largemouth Bass	*Micropterus salmoides*
LG	Longnose Gar	*Lepisosteus osseus*
LP	Logperch	*Percina caprodes*
LS	Longear Sunfish	*Lepomis megalotis*
NPK	Northern Plains Killifish	*Fundulus kansae*
OS	Orangespotted Sunfish	*Lepomis humilis*
PK	Plains Killifish	*Fundulus zebrinus*
PM	Plains Minnow	*Hybognathus placitus*
RC	River Carpsucker	*Carpiodes carpio*
RES	Redear Sunfish	*Lepomis microlophus*
RRP	Red River Pupfish	*Cyprinodon rubrofluviatilis*
RRS	Red River Shiner	*Notropis bairdi*
RS	Red Shiner	*Cyprinella lutrensis*
SG	Shortnose Gar	*Lepisosteus platostomus*
SIC	Silver Chub	*Macrhybopsis storeriana*
SPG	Spotted Gar	*Lepisosteus oculatus*

SMB	Smallmouth Buffalo	*Ictiobus bubalus*
SMM	Suckermouth Minnow	*Phenacobius mirabilis*
SS	Sand Shiner	*Notropis stramineus*
TS	Threadfin Shad	*Dorosoma petenense*
WB	White Bass	*Morone chrysops*
WC	White Crappie	*Pomoxis annularis*
WMF	Western Mosquitofish	*Gambusia affinis*
WS	Warmouth	*Lepomis gulosus*
UNK	Unknown	
YB	Yellow Bullhead	*Ameiurus natalis*

Table 3.- Summary of collections identified by OSU that contained the federally-threatened Arkansas River Shiner (ARS). The Field number links back to a database that we created for the USFWS and ODWC that contains all identified fishes from these collections. These results include data collected from 2011 to spring 2018. Blanks reflect information that was missing from data sheets provided to OSU.

Field No.	State	County	River	Site	ARS (number)
BAB1105	OK	Ellis	Canadian	Durham	40
BAB1107	OK	Dewey	Canadian	Camargo	459
BAB1109	OK	Custer	Canadian	Thomas	89
BAB1111	OK	Canadian	Canadian	Caddo Jake Bridge	44
BAB1112					23
BAB1113	OK	Grady	Canadian	Mustang	141
BAB1114					21
BAB1115					30
BAB1116					37
BAB1120	OK	Beaver	Cimarron	Forgan	0
BAB1121	OK	Beaver	Cimarron	Knowles	0
BAB1122					0
BAB1124					0
BAB1125					0
BAB1126	OK	Harper	Cimarron	Buffalo	0
BAB1127	OK	Woods	Cimarron	Freedom	0
BAB1128	OK	Woods	Cimarron	Waynoka	0
BAB1130	OK	Major	Cimarron	Ringwood	0
BAB1131	OK	Major	Cimarron	Ames	0
BAB1205	TX	Oldham	Canadian	Boys Ranch	1
BAB1206	TX	Potter	Canadian	Amarillo	0
BAB1207	TX	Hutchinson	Canadian	Borger 1	0
BAB1208	TX	Hutchinson	Dickson Cr.	Borger 2	0
BAB1211	TX	Hemphill	Canadian	Canadian	0
BAB1213	OK	Ellis	Canadian	Roll	0
BAB1214	OK	Dewey	Canadian	Camargo	0
BAB1216	OK	Custer	Canadian	Thomas	0
BAB1219	OK	Hughes	Canadian	Calvin	4
BAB1220	OK	Pontotoc	Canadian	Ada	5
BAB1301	TX	Oldham	Canadian	Boys Ranch	0
BAB1302	TX	Potter	Canadian	Amarillo	4
BAB1303	TX	Hemphill	Canadian	Canadian	0
BAB1304	OK	Ellis	Canadian	Durham	0
BAB1305	OK	Ellis	Canadian	Roll	0
BAB1306	OK	Dewey	Canadian	Camargo	2

BAB1307	OK	Dewey	Canadian	Taloga	0
BAB1308	OK	Custer	Canadian	Thomas	0
BAB1309	OK	Caddo	Canadian	Bridgeport	0
BAB1310	OK	Grady	Canadian	Union City	1
BAB1311	OK	Cleveland	Canadian	Norman	7
BAB1312	OK	Pontotoc	Canadian	Ada	2
BAB1313	OK	Hughes	Canadian	Calvin	0
BAB1314	OK	Ellis	Canadian	Durham	0
BAB1315	OK	Ellis	Canadian	Roll	0
BAB1316	OK	Dewey	Canadian	Camargo	0
BAB1317	OK	Dewey	Canadian	Taloga	28
BAB1318	OK	Custer	Canadian	Thomas	0
BAB1319	OK	Caddo	Canadian	Bridgeport	0
BAB1320	OK	Canadian	Canadian	Caddo Jake	0
BAB1321					12
BAB1322	OK	Pottawatomie	Canadian	Wanette	5
BAB1323	OK	Cleveland	Canadian	Norman	52
BAB1324	OK	Pontotoc	Canadian	Ada	20
BAB1325	OK	Hughes	Canadian	Calvin	15
BAB1401	TX	Oldham	Canadian	Boys Ranch	122
BAB1401-J	OK	Ellis	Canadian	Durham	0
BAB1402	TX	Potter	Canadian	Amarillo	15
BAB1402-J	OK	Ellis	Canadian	Roll	0
BAB1403	TX	Hemphill	Canadian	Canadian	0
BAB1403-J	OK	Dewey	Canadian	Camargo	0
BAB1404	OK	Ellis	Canadian	Durham	0
BAB1404-J	OK	Dewey	Canadian	Taloga	2
BAB1405	OK	Ellis	Canadian	Roll	6
BAB1405-J	OK	Custer	Canadian	Thomas	6
BAB1406	OK	Dewey	Canadian	Camargo	0
BAB1406-J	OK	Caddo	Canadian	Bridgeport	235
BAB1407	OK	Dewey	Canadian	Oakwood	0
BAB1408	OK	Custer	Canadian	Thomas	0
BAB1409	OK	Caddo	Canadian	Bridgeport	9
BAB1410	OK	Canadian	Canadian	Caddo Jake	4
BAB1411	OK	Grady	Canadian	Union City	10
BAB1412	OK	Cleveland	Canadian	Norman	18
BAB1413	OK	Pontotoc	Canadian	Ada	11
BAB1501	OK	Ellis	Canadian	Durham	0
BAB1502	OK	Ellis	Canadian	Roll	0
BAB1503	OK	Dewey	Canadian	Taloga	6

BAB1504	OK	Custer	Canadian	Thomas	28
BAB1505	OK	Caddo	Canadian	Bridgeport	16
BAB1506	OK	Cleveland	Canadian	Norman	30
BAB1510	OK	Ellis	Canadian	Durham	0
BAB1511	OK	Ellis	Canadian	Roll	1
BAB1512	OK	Dewey	Canadian	Camargo	0
BAB1513	OK	Dewey	Canadian	Taloga	0
BAB1514	OK	Custer	Canadian	Thomas	2
BAB1515	OK	Caddo	Canadian	Bridgeport	24
BAB1516	OK	Canadian	Canadian	Caddo Jake	241
BAB1517	OK	Grady	Canadian	Union City	53
BAB1519	OK	Pottawatomie	Canadian	Asher	99
BAB1521	OK	Hughes	Canadian	Calvin	0
BAB1620	TX	Hemphill	Canadian	Canadian	0
BAB1621	TX	Oldham	Canadian	Boys Ranch	
BAB1622	OK	Potter	Canadian	Amarillo	137
BAB1623	OK	Ellis	Canadian	Roll	0
BAB1625	OK	Dewey	Canadian	Taloga	0
BAB1626	OK	Custer	Canadian	Thomas	28
BAB1626-1	OK	Canadian	Canadian	Caddo Jake	21
BAB1627	OK	Grady	Canadian	Union City	22
BAB1628	OK	Cleveland	Canadian	Norman	14
BAB1629	OK	Pontotoc	Canadian	Ada	61
BAB1701	OK	Hughes	Canadian	Calvin	1
BAB1702	OK	Pototoc	Canadian	Ada	271
BAB1703	OK	Cleveland	Canadian	Norman	3
BAB1704	OK	Grady	Canadian	Union City	33
BAB1705	OK	Canadian	Canadian	Caddo Jake	22
BAB1706	OK	Custer	Canadian	Thomas	44
BAB1707	OK	Dewey	Canadian	Taloga	12
BAB1708	OK	Dewey	Canadian	Camargo	0
BAB1709	OK	Ellis	Canadian	Roll	0
BAB1710	OK	Ellis	Canadian	Durham	0
BAB1711	TX	Hemphill	Canadian	Canadian	0
BAB1712	TX	Potter	Canadian	Amarillo	6
BAB1713	TX	Oldham	Canadian	Boys Ranch	0
17DBF01	OK	Custer	Canadian	Thomas	2
17DBF02	OK	Dewey	Canadian	Taloga	0
17DBF03	OK	Dewey	Canadian	Camargo	0
17DBF04	OK	Ellis	Canadian	Roll	3
17DBF05	OK	Ellis	Canadian	Durham	0

17DBF06	TX	Hemphill	Canadian	Canadian	0
18DBF01	TX	Hemphill	Canadian	Canadian	0
18DBF02	TX	Oldham	Canadian	Boys Ranch	17
18DBF03	TX	Potter	Canadian	Amarillo	5
18DBF04	OK	Ellis	Canadian	Durham	0
18DBF05	OK	Ellis	Canadian	Roll	0
18DBF06	OK	Dewey	Canadian	Camargo	0
18DBF07	OK	Dewey	Canadian	Taloga	1
18DBF08	OK	Custer	Canadian	Thomas	17

Table 4.- Summary of the number of Arkansas River Shiner collected at each site by year. Some sites were sampled twice during a year (combined in this table). NA indicates that OSU did not identify samples from that site in that year whereas 0 reflects the species was not collected in the sampling effort. These results reflect data collected from 2011 to spring 2018.

Site	2011	2012	2013	2014	2015	2016	2017	2018
Ada	NA	5	22	11	NA	61	271	NA
Amarillo	NA	0	4	15	NA	137	6	5
Ames	0	NA	NA	NA	NA	NA	NA	NA
Asher	NA	NA	NA	NA	99	NA	NA	NA
Borger 1	NA	0	NA	NA	NA	NA	NA	NA
Borger 2	NA	0	NA	NA	NA	NA	NA	NA
Boys Ranch	NA	1	0	122	NA	NA	0	17
Bridgeport	NA	NA	0	244	40	NA	NA	NA
Buffalo	0	NA	NA	NA	NA	NA	NA	NA
Caddo Jake Bridge	44	NA	0	4	241	21	22	NA
Calvin	NA	4	15	NA	0	NA	1	NA
Camargo	459	0	2	0	0	NA	0	0
Canadian	NA	0	0	0	NA	0	0	0
Durham	40	NA	0	0	0	NA	0	0
Forgan	0	NA	NA	NA	NA	NA	NA	NA
Freedom	0	NA	NA	NA	NA	NA	NA	NA
Knowles	0	NA	NA	NA	NA	NA	NA	NA
Mustang	141	NA	NA	NA	NA	NA	NA	NA
Norman	NA	NA	59	18	30	14	3	NA
Oakwood	NA	NA	NA	0	NA	NA	NA	NA
Ringwood	0	NA	NA	NA	NA	NA	NA	NA
Roll	NA	0	0	6	1	0	3	NA
Taloga	NA	NA	28	2	6	0	12	1
Thomas	89	0	0	6	30	28	46	17
Union City	NA	NA	1	10	53	22	33	NA
Wanette	NA	NA	5	NA	NA	NA	NA	NA
Waynoka	0	NA	NA	NA	NA	NA	NA	NA

Table 5.- Summary of the number of Arkansas River Shiner collected at each site during spring and fall sampling. NA indicates that OSU did not identify samples from that site in that year. The USFWS did not sample in fall of 2011 and spring in 2012. Spring samples in 2016 were retained by the USFWS. Some sites were not sampled in other years due to extreme low or high water.

Site	2011 S	2011 F	2012 S	2012 F	2013 S	2013 F	2014 S	2014 F	2015 S	2015 F	2016 F	2017 S	2017 F	2018 S
Ada	NA	NA	NA	5	2	20	NA	11	NA	NA	61	271	NA	NA
Amarillo	NA	NA	NA	0	4	NA	NA	15	NA	NA	137	6	NA	5
Ames	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Asher	NA	NA	NA	NA	NA	NA	NA	NA	NA	99	NA	NA	NA	NA
Borger 1	NA	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Borger 2	NA	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boys Ranch	NA	NA	NA	1	0	NA	NA	122	NA	NA	NA	0	NA	17
Bridgeport	NA	NA	NA	NA	0	0	235	9	16	24	NA	NA	NA	NA
Buffalo	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caddo Jake Bridge	44	NA	NA	NA	NA	0	NA	4	NA	241	21	22	NA	NA
Calvin	NA	NA	NA	4	0	15	NA	NA	NA	0	NA	1	NA	NA
Camargo	459	NA	NA	0	2	0	0	0	NA	0	NA	0	0	0
Canadian	NA	NA	NA	0	0	NA	NA	0	NA	NA	0	0	0	0
Durham	40	NA	NA	NA	0	0	0	0	0	0	NA	0	0	0
Forgan	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freedom	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Knowles	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mustang	141	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Norman	NA	NA	NA	NA	7	52	NA	18	30	NA	14	3	NA	NA
Oakwood	NA	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	NA	NA
Ringwood	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Roll	NA	NA	NA	0	0	0	0	6	0	1	0	0	3	0
Taloga	NA	NA	NA	NA	0	28	2	NA	6	0	0	12	0	1
Thomas	89	NA	NA	0	0	0	6	0	28	2	28	44	2	17

Union City	NA	NA	NA	NA	1	NA	NA	10	NA	53	22	33	NA	NA
Wanette	NA	NA	NA	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	NA
Waynoka	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

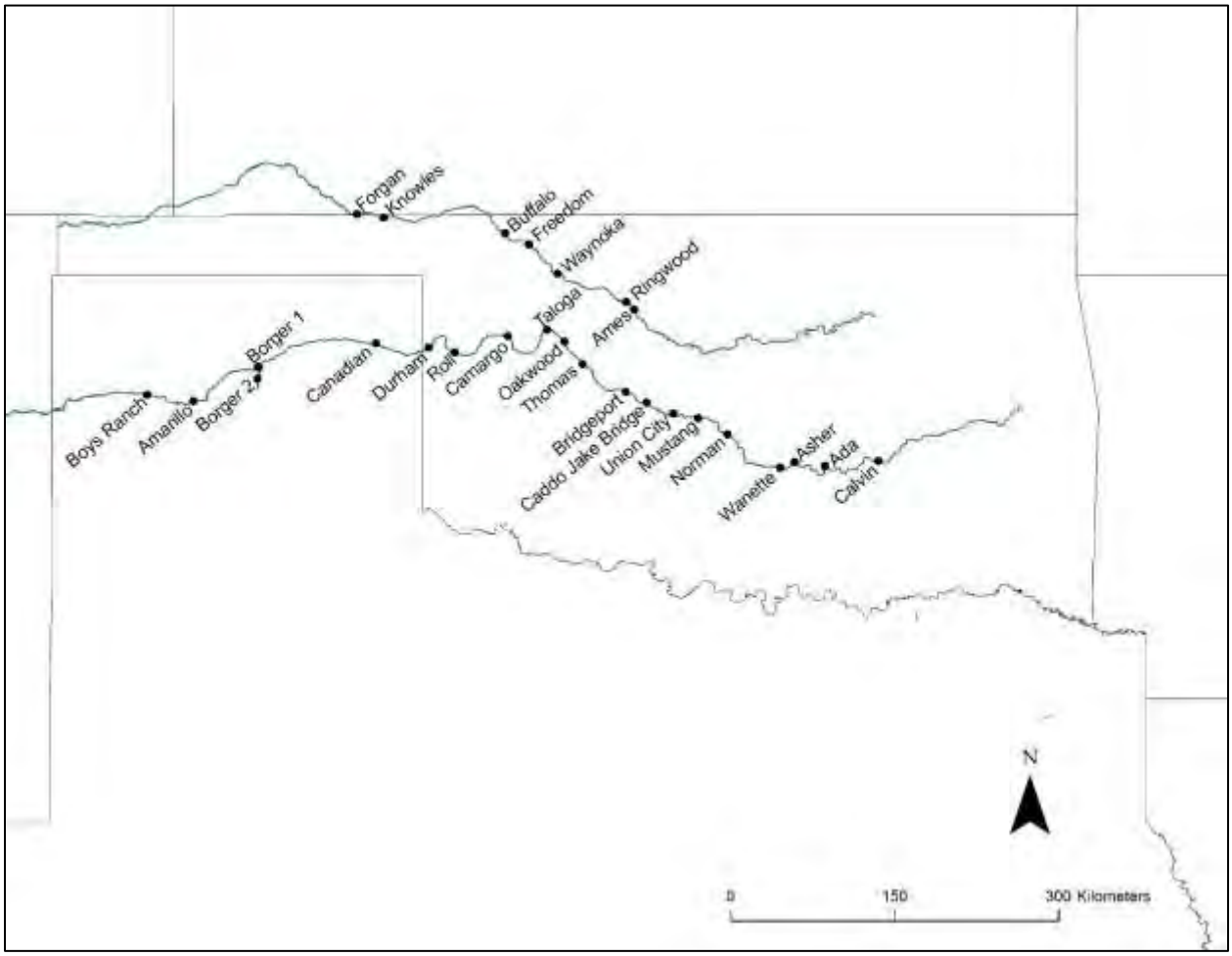

Figure 1.-Map showing the sites sampled by the USFWS on the Cimarron and Canadian rivers in Oklahoma and Texas. Only sites that had collections identified by OSU are shown. **Note: no collections from the Cimarron River were processed in 2018.*

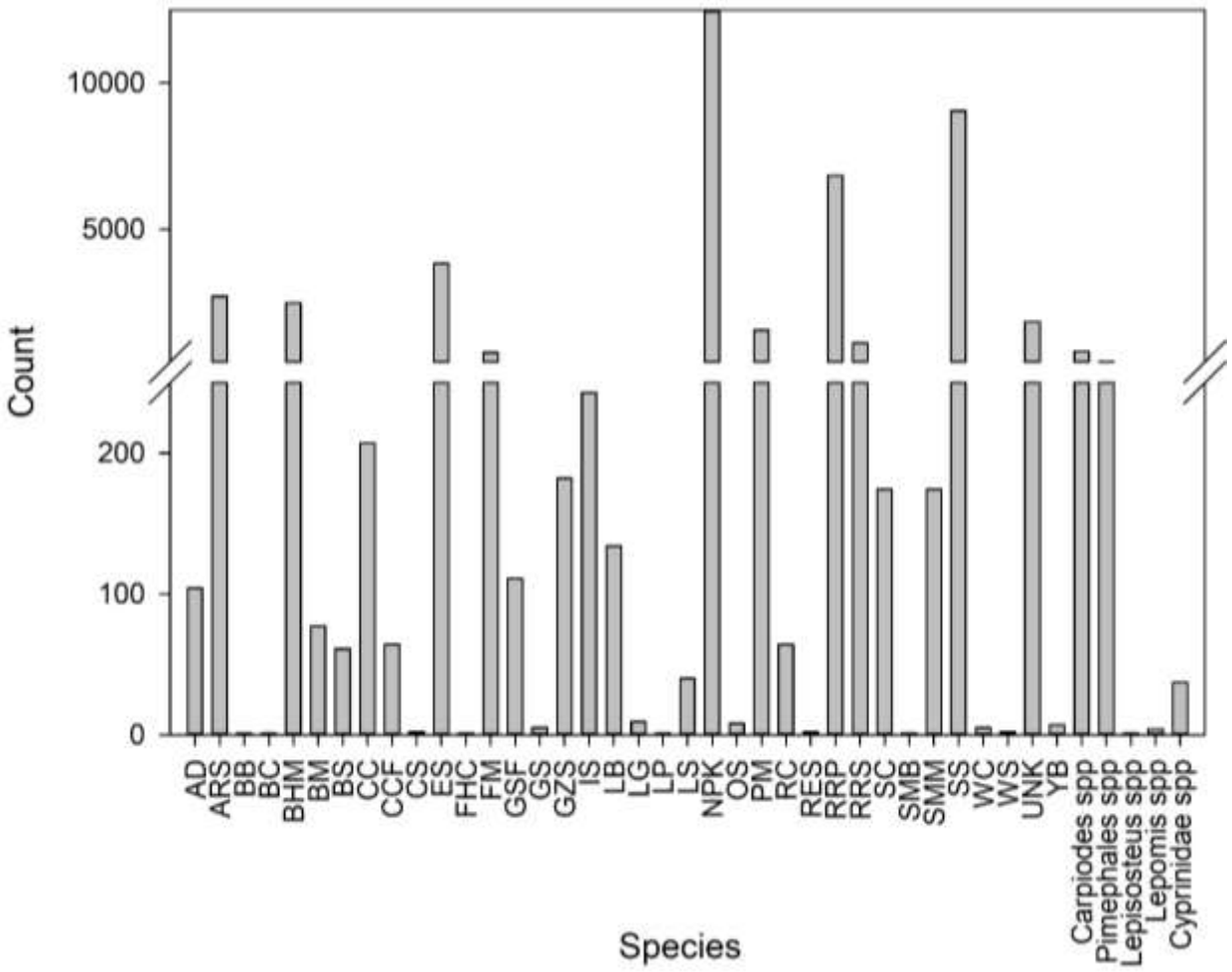

Figure 2.- Abundance of fishes collected via USFWS from 2011 to 2018 (BAB1105-18DBF08). Red Shiner and Western Mosquitofish were removed to better reflect abundances of the assemblage. From 2011-2018, there were 98,465 Red Shiner and 26,181 Western mosquitofish collected. There were 12,446 Northern Plains Killifish collected during the sample period, but this value was cut off by the scale used on the figure to show abundances of less common fishes. Fish species abbreviations are defined in 'design view' of the Access Database (see instructions in Appendix A) and in Table 2 of this report.

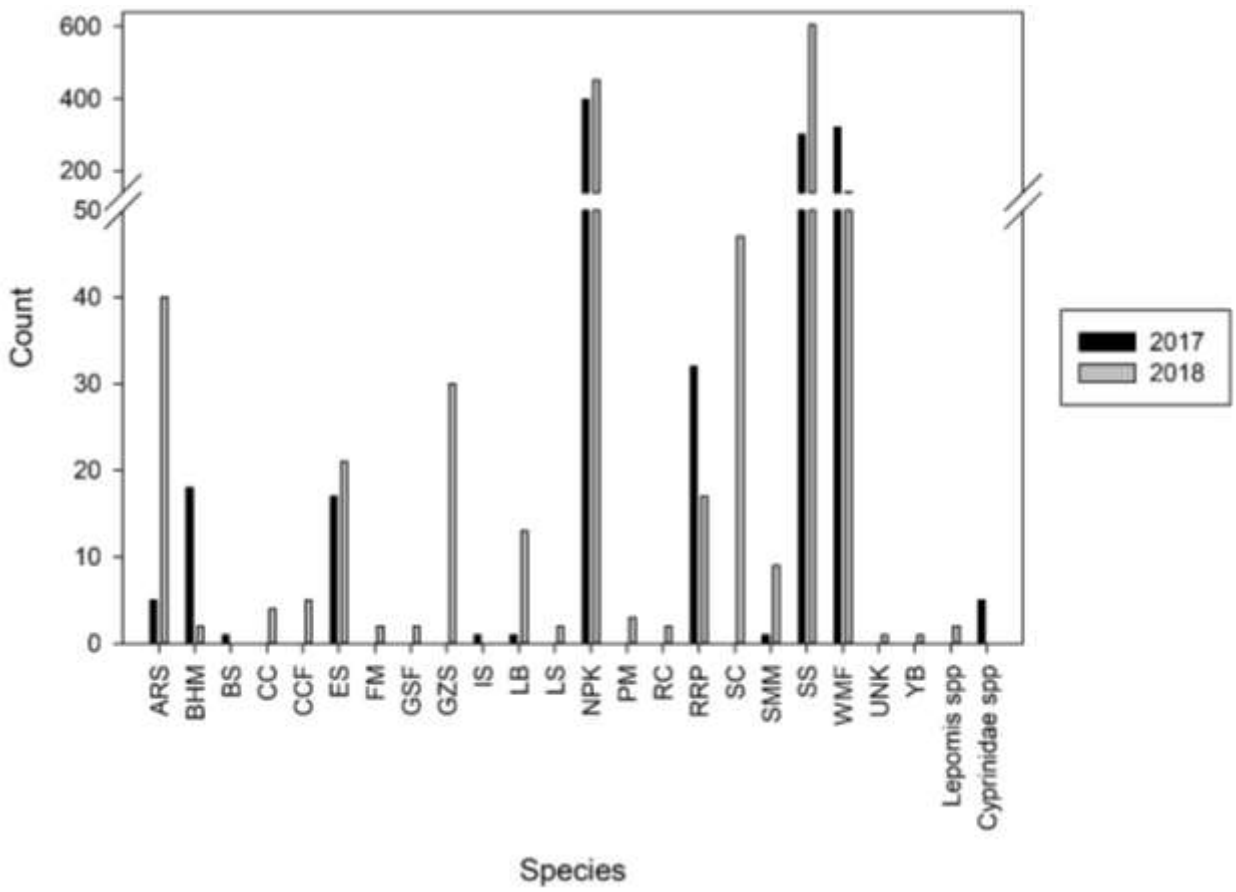

Figure 3.- Abundance of fishes collected via the Canadian River in 2017-2018 (17DBF01-18DBF08). Red Shiner was removed from this figure due to their high abundance (3,312 in 2016 and 4,501 in 2017) to better show the abundance of less common fishes. Fish species abbreviations are defined in 'design view' of the Access Database (see instructions in Appendix A) and in Table 2 of the report.

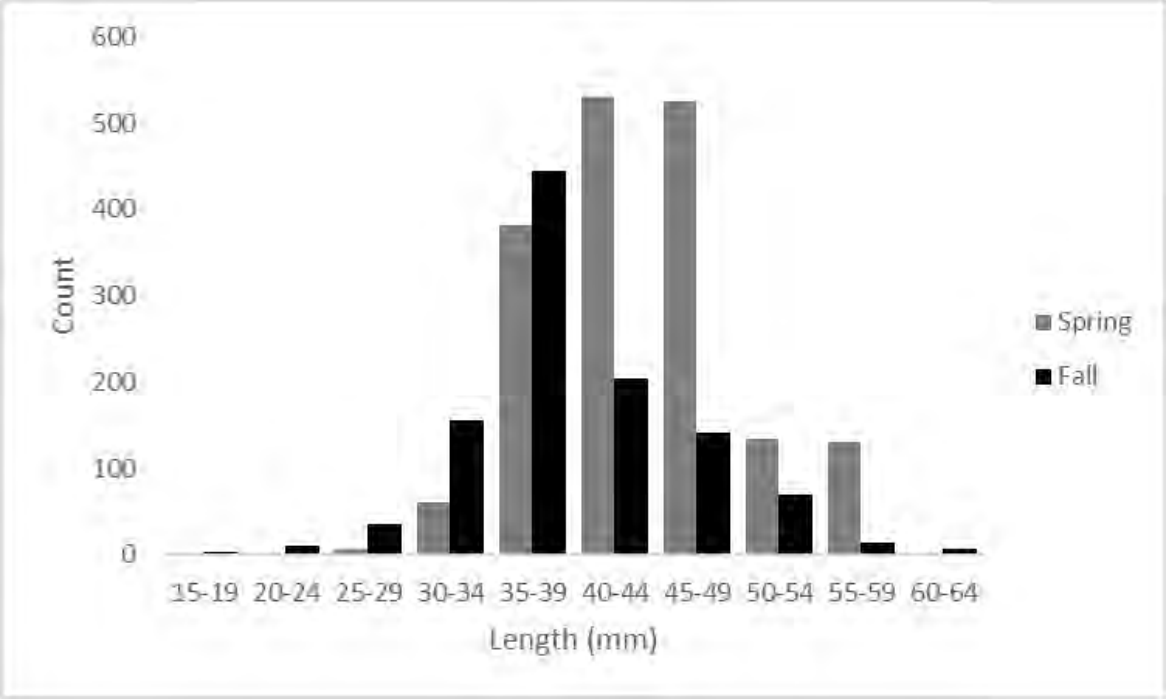

Figure 4.-Size distribution of all Arkansas River Shiner collected 2011-2018. The frequency distribution is divided by spring and fall sampling periods.

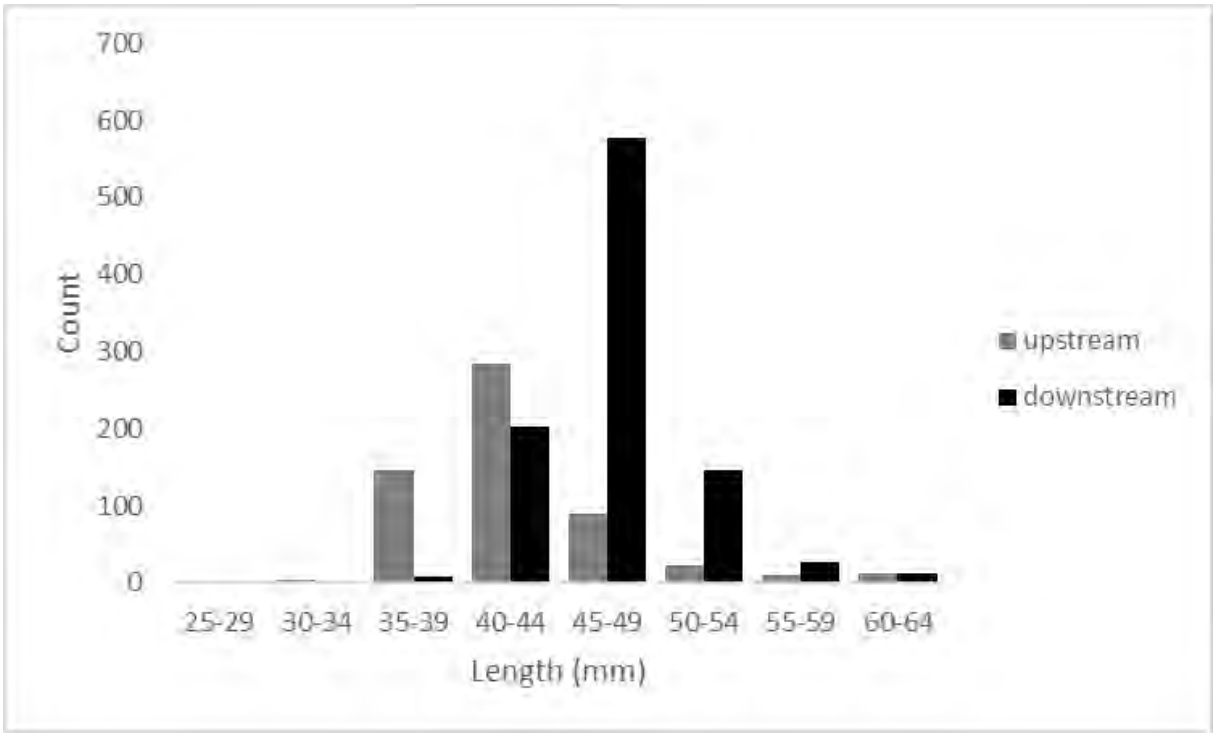

Figure 5.-Size distribution of Arkansas River Shiner for all samples collected in spring (2011-2018). The samples were divided into upstream and downstream sites. The upstream sites were: Boys Ranch, Amarillo, Borger 1 and 2, Canadian, Durham, Roll, Camargo, Taloga, and Oakwood. The downstream sites were: Thomas, Bridgeport, Caddo Jake Bridge, Union City, Mustang, Norman, Wanette, Asher, Ada, and Calvin. Site locations are identified in Figure 1 of the report.

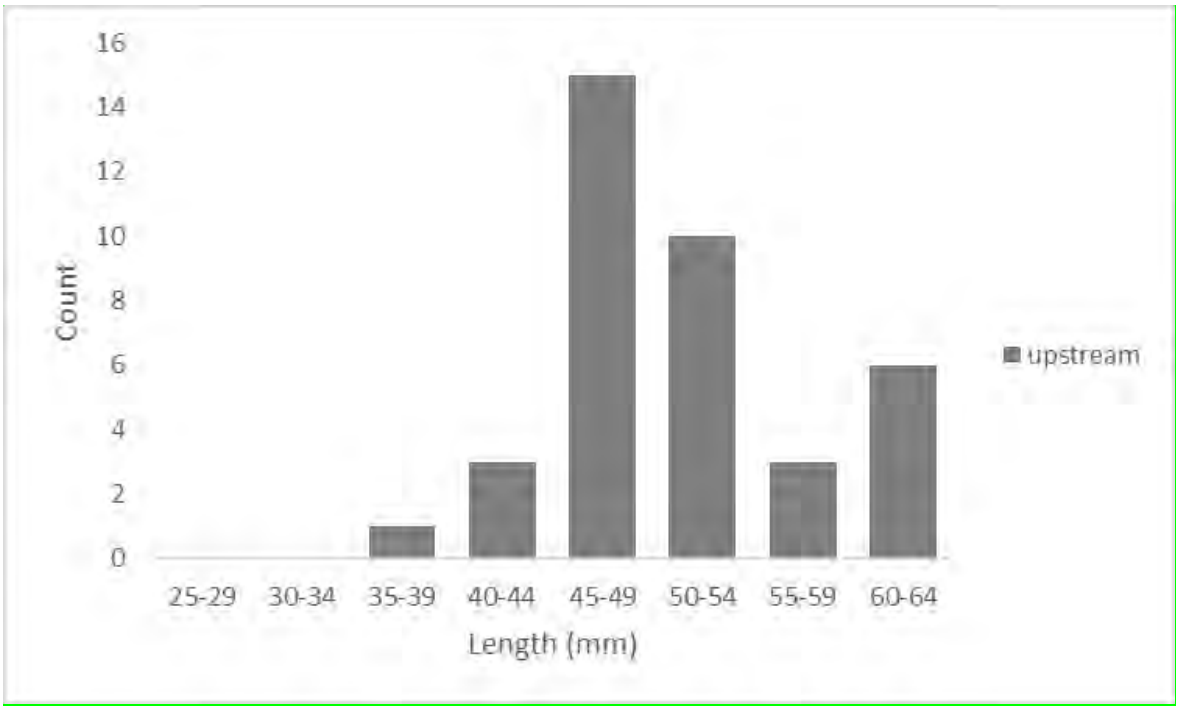

Figure 6.-Length-frequency distribution of Arkansas River Shiner sampled in spring 2018. All samples were from upstream sites: Boys Ranch, Amarillo, Canadian, Durham, Roll, Camargo, and Taloga. Site locations are identified in Figure 1 of the report.

Appendix A. Directions for linking the tables of fish samples and data in Microsoft Access. These data have been provided to USFWS and ODWC.

Using Microsoft Access

1. Open the database.
2. Double click either field info or fish counts to open the table you want to view (located on the left-hand side of the page).
3. To close the table you are viewing right click the tab above the table (it has the table name on it) and click close.
4. To obtain further information about either table, open the table and click the picture of a pencil and ruler above where it says view (located in the top left-hand corner under file).
   Note: This is where the abbreviations from the fish count table are defined.
5. Column headers can be changed by right clicking on the header and selecting your desired option.
6. Linking tables allows you to take some or all of the data from either table and put it together in a single table. To link the tables:
   a. Click database tools (located on the top of the page by file, home, etc.)
   b. Click relationships, a pop-up box will appear.
   c. Click field info, then click add.
   d. Repeat for fish counts, then click close.
   e. There will be boxes for both field info and fish counts.
      i. In those boxes field no. should have a key by it, click on field no. in one box and drag it to field no. in the other box, a pop-up box will appear.
      ii. Choose the option that says join type, select option three, then click create.
7. To make a new table from existing tables:
   Note: Make sure the tables are linked that you want to combine
   a. Choose the create option (located at the top of the page by file, home, etc.).
   b. Click query wizard, a pop-up box will appear to guide you through the wizard.
   c. Select simple query wizard, then click ok.
   d. There will be an option that says tables/queries and under that should be a drop-down box.
      i. If you click the down arrow that is on the box it will allow you to select which information you want to pull from each table.
   e. As an example I will create a table with the field no, Arkansas River Shiner counts, the longitude, and the latitude.
      i. Choose field info in the drop-down box.
      ii. Select field no. in the options under available fields.
      iii. Click the top button located between available fields and selected fields (a single angle bracket pointing toward the right of the screen).
      iv. Choose latitude and repeat.
      v. Same for longitude. (The button located under the one we are using allows you to select all the data from whichever table you are using.)
   f. Now go back to the drop-down box and select fish counts.
      i. Choose ARS (Arkansas River Shiner)
   g. Select finish.
8. Now you have a new table with the field number, latitude, longitude, and the count for Arkansas River Shiners. You can make tables using any combination of information you like; you can even import other tables made in access or excel, link those to the already linked tables, and use information from them.