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Fish Community Monitoring at Tallgrass Prairie National Preserve: 2001 – 2008 Trend Report

Natural Resource Technical Report NPS/HTLN/NRTR—2010/325

ON THE COVER
Fish collection with a minnow seine at Tallgrass Prairie National Preserve.
Photograph by: The Heartland Inventory and Monitoring Network and Prairie Cluster Prototype Monitoring Program.

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Hope R. Dodd

National Park Service
Heartland I&M Network and Prairie Cluster Prototype Monitoring Program
Wilson's Creek National Battlefield
6424 West Farm Road 182
Republic, MO 65738

Lloyd W. Morrison

National Park Service
Heartland I&M Network and Prairie Cluster Prototype Monitoring Program
Wilson's Creek National Battlefield
6424 West Farm Road 182
Republic, MO 65738

David G. Peitz

National Park Service
Heartland I&M Network and Prairie Cluster Prototype Monitoring Program
Wilson's Creek National Battlefield
6424 West Farm Road 182
Republic, MO 65738

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Executive Summary

Tallgrass Prairie National Preserve (TAPR), located in the Flint Hills region of Kansas, was established to protect, preserve, and interpret the tallgrass prairie ecosystem. An important component of tallgrass systems is water quality and quantity and biotic integrity of prairie streams. Due to land use changes contributing to habitat degradation or loss, and poor water quality in prairie streams, many native fish populations have been negatively affected throughout their ranges. TAPR provides some of the least impacted prairie stream habitat remaining in the Midwest.

In 2001, an annual fish monitoring program was initiated at TAPR to determine the status and long-term trends in fish community composition, and to correlate this community data to water quality and habitat conditions. Fish communities were sampled at several reaches located in 12 streams throughout TAPR from 2001 to 2008. Physical habitat and water quality were collected in conjunction with fish sampling.

In general, streams at TAPR have good biotic integrity and provide suitable habitat for a relatively stable native fish community. Fish species richness, community diversity, species abundance, and stream integrity fluctuated within acceptable limits of variability during the eight year sampling period, relative to baselines established from the first three years of data. Most reaches had moderate to high diversity and good stream integrity scores, suggesting that fish communities are healthy and diverse. Topeka Shiners were found at five reaches, although 80% of the shiners were caught in a single reach located in the upper portion of a tributary that lies primarily outside the park boundary. The total number of Topeka shiners caught declined significantly over most time periods evaluated, decreasing from a high of 72 in 2002 to only 1 in 2008. The geographical location of the reaches where Topeka Shiners were caught suggests that larger source populations of shiners may exist outside the park boundaries.

Exploratory analyses of habitat and water quality variables as predictors of fish community metrics did not produce models with high explanatory power. Variables associated with site dimensions were most commonly included in the models. Habitat variables such as depth and area varied substantially over the sampling period while fish communities were relatively stable across time. This suggests that physical and chemical properties of these prairie streams are dynamic, and the fish communities are adapted to living in this harsh and changing environment.

Acknowledgments

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Introduction

Tallgrass Prairie National Preserve (TAPR), located in the Flint Hills region of Kansas, was established to protect, preserve, and interpret the tallgrass prairie ecosystem. An integral part of tallgrass systems is water quality and quantity and biotic integrity of prairie streams. TAPR is approximately 44 km^2, consisting of more than 39 km^2 of tallgrass prairie and containing 43 km of prairie streams. A severe threat to tallgrass prairie systems has been the conversion of large portions of grasslands to cropland or livestock pasture (Knopf and Samson 1997) during the last century. This change in land use has increased sedimentation, nutrient loading, other chemical pollution, and altered habitat of prairie streams. Many native fish populations have been adversely impacted throughout their ranges by a number of factors associated with land use changes. As a result of habitat loss and decline of water quality conditions in Midwestern streams, the Topeka Shiner (*Notropis topeka*), a native prairie stream fish found at TAPR, has been listed as federally endangered under the Endangered Species Act of 1973. Currently, the Topeka Shiner inhabits less than 10% of its historic range (Tabor 1998). In addition to this federally protected species, populations of several other stream fishes are impaired due to habitat loss and fragmentation in the Midwest, making it necessary to protect these native species. Although anthropogenic disturbances at the watershed scale can dramatically alter a lotic system, protecting portions of prairie streams on publicly owned lands may offer refuges for native species. TAPR provides some of the least impacted prairie stream habitat remaining in the Midwest and contains habitat critical for sustaining populations of native fishes (Federal Register 2002).

Fish communities are an important component of prairie stream systems. Because changes or shifts in stream habitat complexity and water quality can influence structure of biotic communities, including fish (Lazorchak *et al*. 1998), monitoring trends in fish community composition along with associated habitat conditions serves as a strong basis for measuring stream integrity. Many fish species are intolerant of habitat alterations, and monitoring their assemblages can serve as a useful tool to assess changes in water and habitat quality (Karr 1981; Robison and Buchanan 1988; Pflieger 1997; Barbour *et al*. 1999). Accordingly, trends in the composition and abundance of fish populations historically have been used to assess the biological integrity of streams (Karr 1981; Barbour *et al*. 1999; Moulton *et al.* 2002). In addition to their value as environmental indicators, the intrinsic value of fish to the public as a recreational opportunity makes the status of fish diversity a valuable interpretive topic for park visitors as well as an informative tool for preserving and conserving aquatic resources at TAPR and for supporting management decisions.

Objectives

The specific objectives for fish community monitoring at TAPR are: (1) to determine the status and long term trends in fish richness, diversity, abundance, and community composition, and (2) to correlate the long-term community data to overall water quality and habitat condition.

Methods

Methods and procedures used in this report follow Dodd *et al.* 2008. Details on site selection, fish sampling methods, and habitat and water quality data collection not listed in this report can be found in the Protocol for Monitoring Fish Communities in Small Streams in the Heartland Inventory and Monitoring Network (Dodd *et al.* 2008)

Study Area and Reach Selection

Streams at TAPR were stratified into upper, middle, and lower reaches. A reach was defined as a section of stream that encompassed all channel units (riffles, runs, pools, glides) available within the stream, resulting in a representative fish sample. Because many prairie streams become pooled or dry during the summer, establishing the location of reaches and reach length was based on the ability to find areas of the stream with adequate water to collect fish from five sample sites (i.e., channel units) within the reach. Most sites consisted of pool habitat due to the high proportion of pool channel units in these streams compared to riffle or run units. During 2001-2006, 18 reaches from 11 streams were sampled annually (Figure 1). A sample reach on Fox Creek (35 lower; Figure 2) was added in 2006 due to the lack of information on fish communities in this stream. Beginning in 2007, only the downstream-most reach in each stream was retained for sampling fish communities (Figure 2). The rationale for sampling the downstream-most reach was that the further one goes downstream, the more representative the site is of the overall watershed. The only exception is the middle reach of stream 1. This reach was retained in addition to the lower reach of stream 1 because the middle reach consistently produced Topeka Shiners, a T&E species in need of monitoring. Thus, a total of 13 reaches in 12 streams have been retained for annual monitoring. Only the set of retained reaches (n=13) that is currently being sampled and will be sampled in the future are analyzed in this report. Reaches that were sampled in previous years but will no longer be sampled were not included, to reduce potential variability resulting from site differences.

Fish Collection

Fish communities were sampled in September-October from 2001 to 2008. Fish were collected using a common sense seine of 1.8 m depth and a mesh size of 6.44 mm. Every effort was made to collect fish from three to five sites (channel units) within each reach, although in some years only one or two sites were available to sample at some reaches due to dry conditions. Additionally, some reaches were not sampled in some years due to dry conditions, so the numbers of both reaches and sites sampled were not equal across years. In pool or run channel units, a two-person crew dragged the seine across the bottom, trapping fish against a bank or shallow water area until the seine could be raised out of the water. Block seines were deployed if flow between pools was present in an attempt to isolate fish in the selected pool. In riffle channel units, kick seining was used with one or two people disturbing the substrate in a downstream direction, dislodging fish into the seine. Fish were retained in the net in water or in an aerated bucket of water until they could be examined. All fish were identified to species, if possible, and counted. Topeka Shiners were measured, weighed, sexed, and aged (juvenile vs. adult). Beginning in 2006, a subsample of 30 individuals per species at each reach were also measured and weighed, and any diseases or anomalies were recorded. Fish that were too small or that were difficult to identify in the field were preserved for laboratory identification. All other fish were released back into the sample reach.

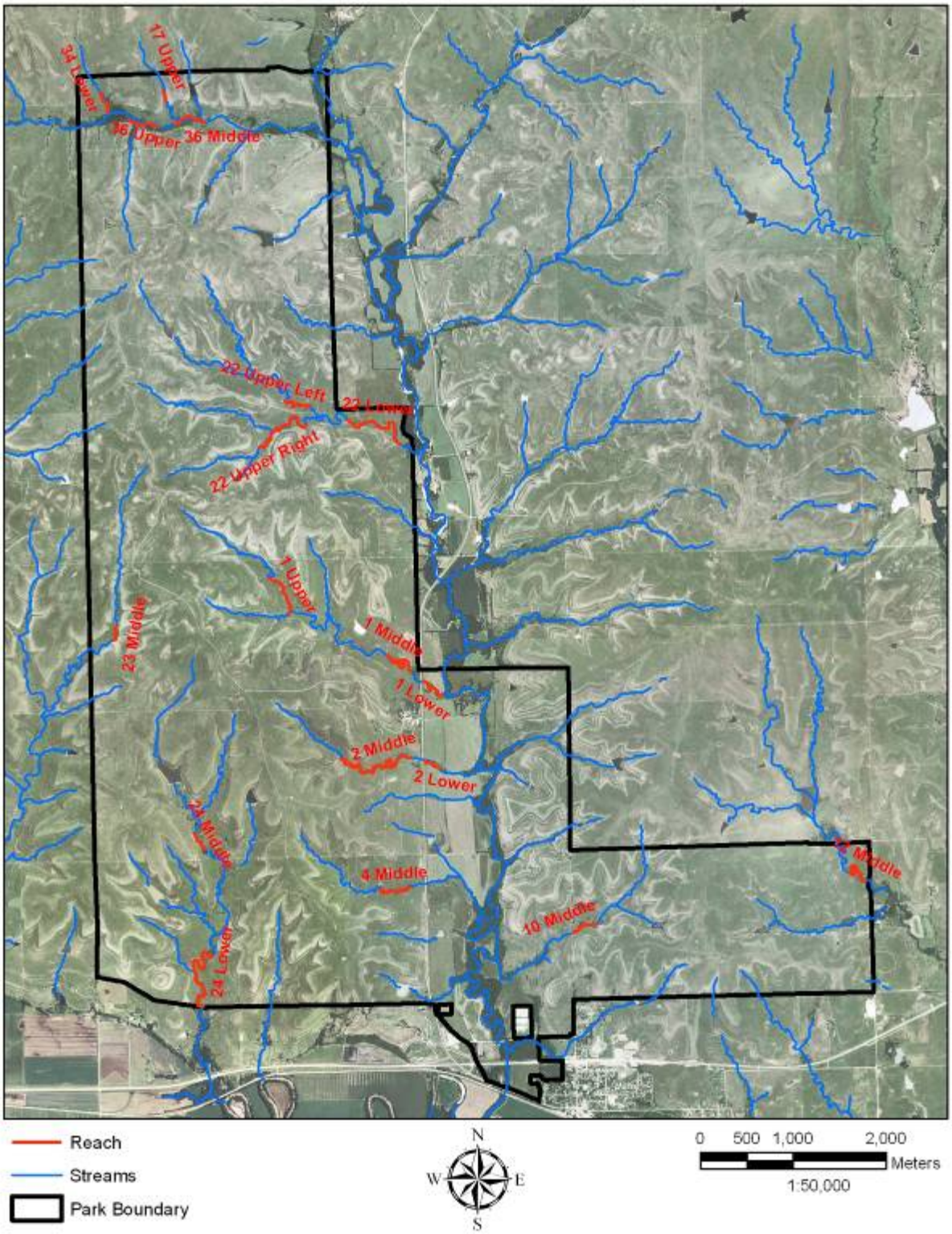

Figure 1. Locations of reaches sampled annually 2001-2006.

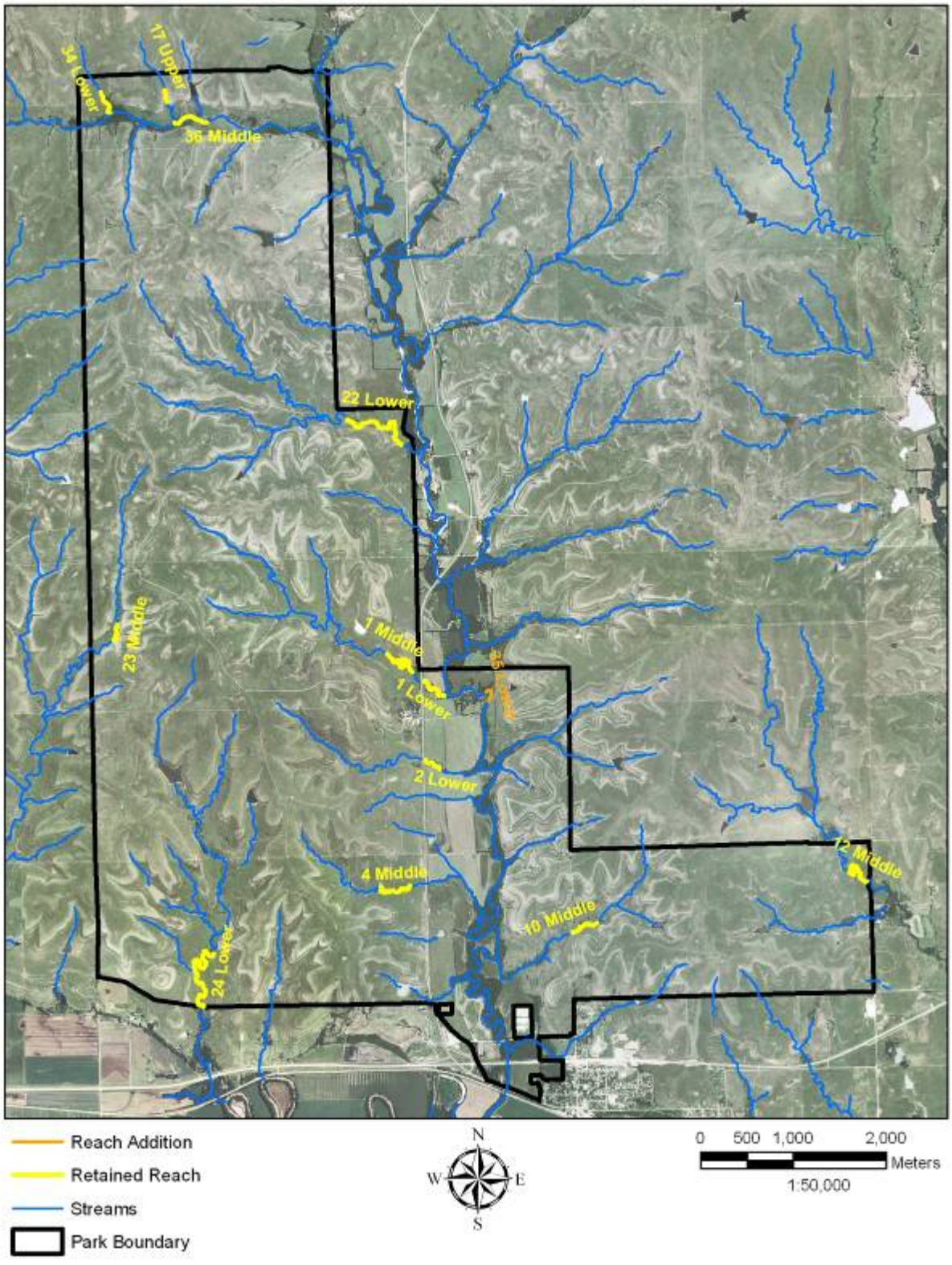

Figure 2. Locations of reaches retained for annual sampling (yellow) and the added reach on Fox Creek (orange).

Habitat and Water Quality

Physical habitat and water quality were collected in conjunction with fish sampling during 2001-2008. In-stream habitat (width, depth, length, substrate), streambank erosion, and riparian vegetation were collected at each site within the reach (see Dodd *et al*. 2008 for a list of all habitat parameters collected). Prior to fish collection, discrete water quality measurements (temperature, dissolved oxygen, pH, turbidity and conductivity) were collected at each site within the reach using calibrated hand-held meters. Continuous water quality sampling was added in 2006 at streams 1 and 23 (streams with Topeka Shiners) and streams 35 (Fox Creek) and 36 (Palmer Creek). Data loggers were deployed at these four streams to obtain hourly temperature, dissolved oxygen, pH, specific conductance, and turbidity (CORE 5 data, see Dodd *et al.* 2008) for 48 hours.

Data Analysis

Fish Metrics

Biological metrics were calculated for the 13 retained reaches sampled during 2001-2008. These metrics reflect fish community diversity (species richness and Simpson's Diversity Index), abundance (catch per area), and overall stream integrity (Index of Biotic Integrity). Community diversity, assessed using Simpson's Diversity Index, gives the probability that two individuals picked at random from the site are the same species. This index has an inverse relationship with diversity; the index decreases as diversity increases. Because it is more intuitive that an increasing index score correspond to increasing diversity, the inverse of the Simpson's Index (1-SI) was used in analyses. Therefore, a diversity value (1-SI) of 1 corresponds to a completely diverse community while a value of 0 indicates no diversity. The Index of Biotic Integrity (IBI) developed by Karr (1981) and used in Midwest steams by Fausch *et al.* (1984) was used to assess overall stream health and includes 12 metrics: 1) total number of fish species; 2) number and identity of darter species; 3) number and identity of sunfish species; 4) number and identity of sucker species; 5) number and identity of intolerant species; 6) proportion of individuals as green sunfish; 7) proportion of individuals as omnivores; 8) proportion of individuals as insectivorous cyprinids; 9) proportion of individuals as top carnivores; 10) number of individuals in sample; 11) proportion of individuals as hybrids; 12) proportion with an anomaly (disease, eroded fins, lesions, or tumors). Each of the 12 raw metric values was scored as 1 (worst), 3, or 5 (best). The metric scores were added to calculate an IBI score that ranges from 0 to 60. Based on this IBI score, the overall integrity of the stream is classified from very poor to excellent: very poor = 0-20; poor = 21-30; fair = 31-40; good = 41-50; excellent (reference condition) = 51-60. More detailed methods on calculating biological metrics used in this report can be found in Dodd *et al.* 2008, Karr 1981, and Fausch *et al*. 1984.

Control charts

Control charts indicate when a system may be going 'out of control' by plotting through time some measure of a stochastic process with reference to its expected value. The expected value is often a baseline that represents the averages of empirical measurements, and serves as a reference point for establishment of control limits. Control limits specify thresholds beyond which variability in the indicator of interest indicates a process is going out of control (Morrison

2008). We used both univariate and multivariate control charts in assessing these data. The reach was the unit of replication for these analyses.

Univariate Control Charts: Mean species richness, species diversity (inverse of Simpson's index, 1-SI), and IBI were calculated on a park-wide basis for each year from 2001-2008 and plotted in univariate control charts. For species richness and diversity, the first three years of data were used as a baseline, and sample means and standard deviations were averaged over these three years to obtain estimates of population means and standard deviations. Using these estimates, 95% and 99% confidence intervals (CI) were calculated and plotted as warning (WL) and control limits (CL), respectively. Assuming a normal distribution, these thresholds would result in 95% and 99% of sample means from the same population falling within these limits. Accordingly, the probability of a Type I error (concluding that one has found a biologically important change when there was none, because the extreme observations were due to chance variability, rather than an actual trend) is 5% and 1%, respectively. Because we are interested in a decline in species richness and diversity, a 'directional' hypothesis is implied and thresholds were plotted only on the low side for both variables. This is analogous to testing the hypothesis that future observations come from a different population than that which was used to determine the baseline and control limits, with a one-tailed test at a critical value of 0.05 and 0.01, respectively. For the IBI, a warning limit was set at 40, and a control limit was set at 35. These values correspond to the upper and middle of the 'fair' IBI category, respectively.

Multivariate Control Charts: Relative abundances of each species was evaluated by multivariate control charts to examine trends in overall fish assemblage. Two metrics were used to describe the species abundance relationships: catch and catch per area (CPA). Catch was the number of individuals of each species caught summed over all sites in each reach. CPA was calculated by dividing the total catch for each reach by the cumulative surface area of all sites sampled within that reach. Multivariate control charts are derived from a distance-based ordination approach. These charts consider the relative abundance relationships of all species in a community and compute the distance of the community at any point in time from a baseline centroid (that represents the normal community state) in multivariate *p*-space. This distance is then plotted over time, and a bootstrapping technique is used to generate percentiles that serve as control limits (Anderson and Thompson 2004). We used the program *control chart.exe* to construct the multivariate control charts (Anderson 2008), inputting catch or CPA for each species in each year at a reach. We considered the first three years as a baseline period, and evaluated the divergence from this period in future years. CY dissimilarity, which modifies zero values by adding a constant before logarithmic transformations, was used as the distance measure. The 95th percentile of the distribution of deviations across all sites was used as a control limit.

Habitat Metrics

We conducted exploratory analyses of physical habitat and water quality parameters to examine relationships between these habitat variables and fish communities. The individual sample sites (i.e., channel units) of each retained reach were used as replicates; therefore, habitat and water quality at the site level was used in these analyses. Fish metrics (richness, diversity, and CPA) were also calculated by site for analyses with habitat parameters. Separate analyses were done for each year.

Evaluation of Habitat Predictors: To evaluate which habitat variables may be important in explaining or predicting fish community metrics, we employed an information–theoretic approach. This approach uses the covariance matrix and number of parameters in a model to calculate a statistic that summarizes the information represented by the model, in balancing a trade-off between a penalty term and a lack of fit term (Burnham and Anderson 2002). Three response variables were evaluated: species richness, diversity (1-SI), and CPA. We evaluated 11 predictor variables: site length, site width, site depth, site area, air temperature, water temperature, turbidity, dissolved oxygen, conductivity, specific conductance, and pH. All the response and predictor variables were evaluated for evidence of departures from normality. Most variables satisfied the assumption of normality, and for most of those that did not (species richness, CPA, site length, site depth, and site area) a logarithmic (base 10) transformation was successful in normalizing the data. Only one predictor variable, turbidity, did not appear to come from a normal distribution, nor could it be adequately normalized.

Akaike's Information Criterion (AIC) was used to select the best model. In general, this method attempts to select the most parsimonious model (i.e., the model with the best predictive or explanatory power and the fewest predictor variables). Although it will select the best such model given a subset of predictor variables, the resulting model may not be a good explanatory or predictive model in an absolute sense (i.e., if none of the predictor variables are very good). Thus, all predictor variables in all years were prescreened to determine whether they possessed explanatory power. This was done by conducting simple linear regressions of each predictor variable against each response variable in each year (11 x 3 x 8 = 264 individual regressions). Any predictor variables that were significant ($P < 0.05$) in the simple linear regressions were then entered into the information–theoretic modeling, for that response variable and year.

In this method, the model with the lowest AIC score is the one that is closest to the 'true model', although models within 2 AIC units of the lowest AIC score are considered to have 'substantial support' (Burnham and Anderson 2002). The AIC score does not convey any unique information in itself, and is only relevant within a given analysis; thus AIC scores are not reported here. The models with AIC scores within 2 AIC units of the lowest AIC score for each response variable and each year were selected. The explanatory power of each resulting model was evaluated by calculating the coefficient of multiple determination (R^2), which is indicative of the amount of variability in the response variable that is explained by variability in the predictor variable(s). Models were ordered by number of predictor variables, and any models that did not yield a > 0.003 R^2 value increase compared to models with one less predictor variable were deleted from consideration. The 0.003 threshold was arbitrary, but did represent a discontinuity in R^2 values among the suite of models considered. This was done because a small increase in explanatory power is not worth the additional complication of the resulting model due to adding variables.

Results

Fish Community

Richness and Diversity

A total of 37 species were collected from all reaches sampled in 2001-2008, with 36 species collected in the 13 retained reaches during this eight year period. Average species richness ranged from 7.7 species in 2003 to 11.4 species in 2006, although only 5 reaches were sampled in 2006 (Table 1). Species richness did not decline below the 95% warning limit (95% CI based on the first three years) indicating no significant decrease below the baseline period (Figure 3). Richness in 2006 revealed the highest variability, which is attributed to the large number of species found in Fox Creek (reach 35 lower) and the low number of reaches (n=5) sampled in that year due to dry conditions (Table 1). Reach 24 lower had the highest richness in six of the seven years the reach was sampled. Reach 17 upper had the lowest richness in five of the six years it was sampled; no fish were collected at that reach in 2007.

Table 1. Species richness for retained reaches sampled in 2001-2008. A missing value indicates that the reach was not sampled in that year.

Reach	2001	2002	2003	2004	2005	2006	2007	2008
1 lower	6	11	10	13	14		13	8
1 middle	7	7	5	11	14		7	4
2 lower	7	9	7	10	9			7
4 middle	6	6	10	11	11		11	9
10 middle	4	5	4	6	11		4	8
12 middle		13	8	12	11	8		10
17 upper		4	1	4	2		0	1
22 lower	11	3	7	10	16			5
23 middle	11	11	8	13	9	10	9	8
24 lower	15	14	15	17	17		11	15
34 lower	4	5	6	7	7	6	6	5
35 lower						22	17	15
36 middle	7	12	10	11	9	11	13	7
Mean	7.8	8.3	7.6	10.4	10.8	11.4	9.1	7.8
Standard Error	1.1	1.1	1.0	1.0	1.2	2.8	1.6	1.1

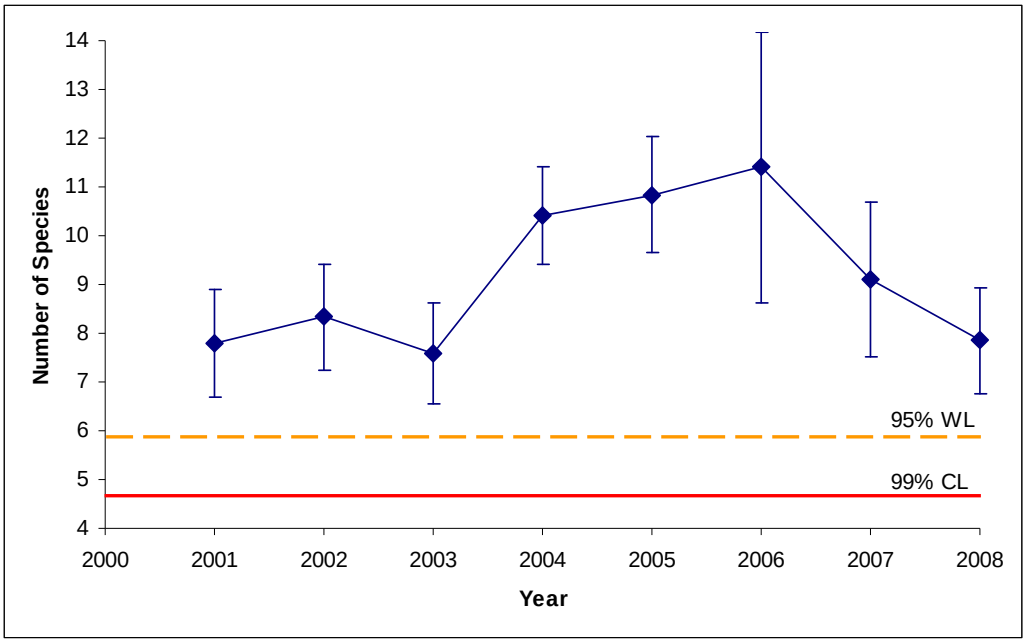

Figure 3. Average species richness ± one standard error for all retained reaches sampled from 2001-2008. Yellow dashed line is the 95% warning limit (WL) and the red solid line is the 99% control limit (CL).

Reaches showed moderate to high average diversity, ranging from 0.60 in 2002 to 0.75 in 2004 (Table 2). Reach 17 upper had zero diversity in 2003 and 2008, when only Green Sunfish were collected at this location, and no fish were found at this reach in 2007. The highest diversity was found at Palmer Creek (36 middle) in 2004. Diversity did not decline below the 95% warning limit, indicating no significant decrease relative to the baseline period (Figure 4).

Table 2. Community diversity (1-SI) for retained reaches sampled in 2001-2008. A missing value indicates that the reach was not sampled in that year. NF indicates the reach was sampled, but no fish were caught.

Reach	2001	2002	2003	2004	2005	2006	2007	2008
1 lower	0.51	0.72	0.76	0.81	0.85		0.76	0.84
1 middle	0.66	0.72	0.71	0.75	0.69		0.82	0.69
2 lower	0.75	0.52	0.61	0.70	0.73			0.50
4 middle	0.79	0.65	0.75	0.79	0.79		0.78	0.60
10 middle	0.56	0.36	0.45	0.66	0.71		0.49	0.59
12 middle		0.82	0.74	0.76	0.75	0.79		0.83
17 upper		0.10	0.00	0.63	0.40		NF	0.00
22 lower	0.80	0.60	0.31	0.75	0.85			0.77
23 middle	0.76	0.80	0.78	0.78	0.81	0.82	0.30	0.79
24 lower	0.73	0.66	0.86	0.87	0.85		0.40	0.73
34 lower	0.70	0.54	0.70	0.61	0.51	0.40	0.63	0.70
35 lower						0.82	0.84	0.77
36 middle	0.70	0.76	0.81	0.87	0.74	0.69	0.63	0.69
Mean	0.69	0.60	0.62	0.75	0.72	0.71	0.63	0.65
Standard Error	0.03	0.06	0.07	0.02	0.04	0.08	0.06	0.06

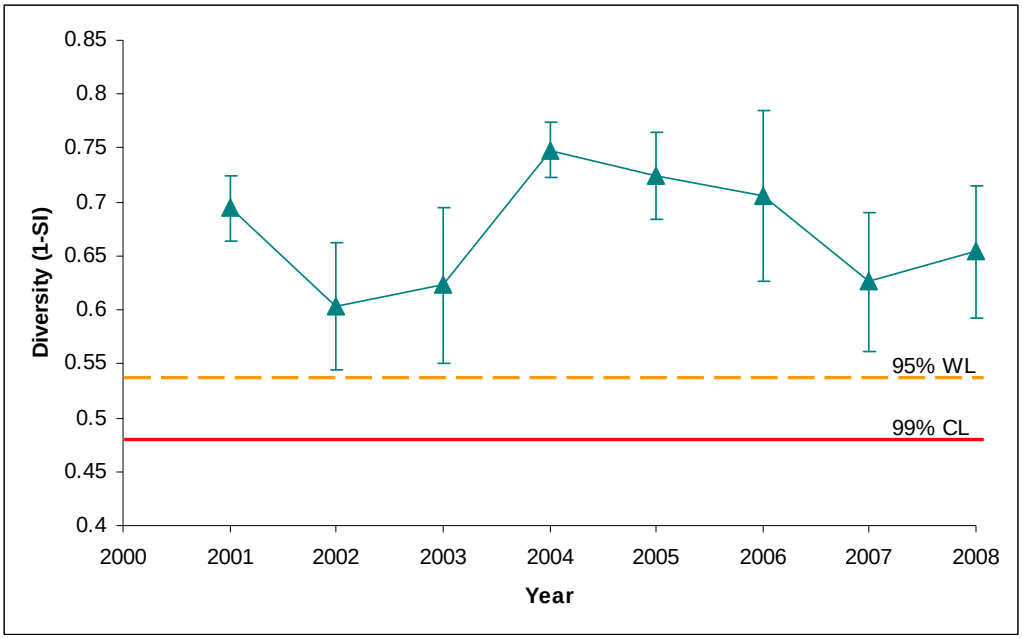

Figure 4. Average diversity (1-SI) ± one standard error for all retained reaches sampled from 2001-2008. Yellow dashed line is the 95% warning limit (WL) and the red solid line is the 99% control limit (CL).

Stream Integrity

On average, stream quality was rated as good (i.e., average IBI > 40) for all eight years (Table 3), and average IBI scores never fell below the warning limit (Figure 5). Reaches in 2003 had the lowest average IBI score at 40.3 as well as the lowest richness, while reaches in 2004 had the highest average score at 44.5 and the highest average diversity (Tables 2 and 3). Stream quality was lowest at reach 17 upper, which was rated poor (IBI score = 28) in 2003, 2005, and 2008; this reach had the lowest IBI score of all sampled reaches in four of the six years it was sampled (Table 3). Reach 1 lower, in 2002, had the highest biotic integrity observed at TAPR, with an excellent rating (IBI score = 52), and had the highest IBI score in five of the seven years the reach was sampled.

Table 3. IBI (and condition ratings) for retained reaches sampled in 2001-2008. A missing value indicates that the reach was not sampled in that year. Ratings are: VP = very poor; P = poor; F = fair; G = good; E = excellent. NF indicates no fish were caught at that reach.

Reach	2001	2002	2003	2004	2005	2006	2007	2008
1 lower	40 F	52 E	46 G	50 G	50 G		50 G	42 G
1 middle	42 G	44 G	40 F	46 G	50 G		44 G	32 F
2 lower	34 F	46 G	40 F	46 G	38 F			36 F
4 middle	38 F	40 F	38 F	46 G	42 G		50 G	48 G
10 middle	40 F	42 G	38 F	46 G	46 G		32 F	44 G
12 middle		46 G	44 G	40 F	44 G	42 G		40 F
17 upper		36 F	28 P	32 F	28 P		NF	28 P
22 lower	46 G	32 F	38 F	42 G	42 G			38 F
23 middle	48 G	50 G	42 G	48 G	42 G	42 G	40 F	44 G
24 lower	42 G	46 G	42 G	50 G	44 G		42 G	48 G
34 lower	38 F	46 G	42 G	46 G	44 G	44 G	44 G	44 G
35 lower						44 G	48 G	46 G
36 middle	42 G	46 G	46 G	42 G	40 F	40 F	44 G	40 F
Mean	41.0	43.8	40.3	44.5	42.5	42.4	43.8	40.8
Standard Error	1.3	1.6	1.4	1.4	1.7	0.7	1.8	1.7

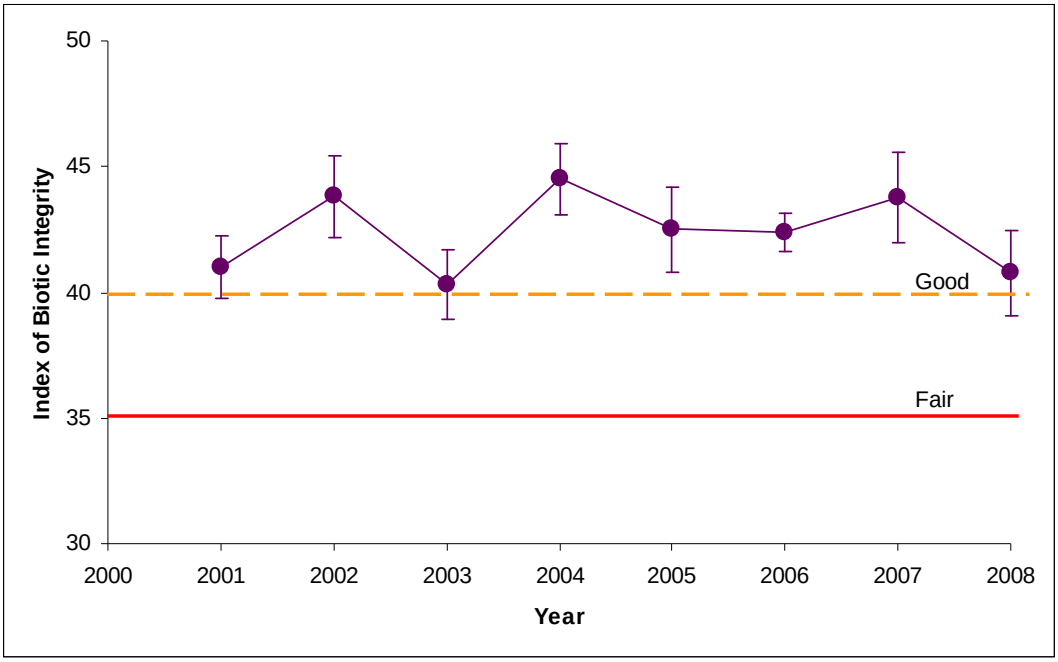

Figure 5. Average IBI ± one standard error for retained reaches sampled from 2001-2008. Yellow dashed line is the warning limit (line between good and fair category rating) and the red solid line is the control limit (midpoint of the fair category rating).

Abundance

Total catch per area (CPA) ranged from 0.5 fish/m^2 in 2003 to 4.0 fish/m^2 in 2007 (Table 4). Reach 17 upper had the lowest CPA in three of the six years this location was sampled. The highest CPA at TAPR occurred at reach 2 lower in 2002 with 7.2 fish/m^2 collected.

Species catch and CPA were dominated by eight species that made up about 88% of the total abundance from 2001 to 2008 (Appendix 1). The Central Stoneroller (*Campostoma anomalum*) was the most abundant fish (7842 fish; 43.0 fish/m^2; ~30%) in the park. The other seven most abundant species included: Cardinal Shiner (*Luxilus cardinalis*; ~ 13%), Redfin Shiner (*Lythrurus umbratilis*; ~11%), Green Sunfish (*Lepomis cyanellus*; ~ 8%), Bluntnose Minnow (*Pimephales notatus*; ~ 8%), Orangethroat Darter (*Etheostoma spectabile*; ~ 8%), Creek Chub (*Semotilus atromaculatus*; ~6%), and Red Shiner (*Cyprinella lutrensis*; ~ 4%). Additional information on numbers of fish collected for each species at each reach can be found in Appendix 1.

No reaches ever exceeded the control limit for species catch (Figure 6). When sampling area was taken into account (i.e., CPA), two reaches (22 lower and 34 lower) exceeded the control limit to small degrees (Figure 7). CPA for reach 22 lower fell above the control limit for each year sampled from 2004 to 2008. Species CPA for 34 lower fell just above the control limit for 2004 and 2005, but came back 'in control' for 2006-2008.

Table 4. Catch per area (no./m^2) for retained reaches sampled in 2001-2008. A missing value indicates that the reach was not sampled in that year.

Reach	2001	2002	2003	2004	2005	2006	2007	2008
1 lower	1.0	0.9	1.0	0.7	1.2		3.4	0.1
1 middle	0.2	1.7	0.2	1.4	1.5		4.2	0.4
2 lower	0.8	7.2	0.6	1.8	0.3			0.5
4 middle	0.1	2.5	0.3	2.8	1.1		5.7	1.5
10 middle	0.8	2.9	0.3	5.2	2.5		2.4	2.8
12 middle		0.8	0.3	0.4	0.7	0.6		1.6
17 upper		2.0	0.3	0.2	0.2		0.0	0.2
22 lower	1.5	0.0	0.3	0.4	0.6			0.2
23 middle	1.9	4.9	0.5	3.5	0.2	3.1	5.9	0.3
24 lower	0.6	0.8	0.2	3.2	0.8		6.5	2.7
34 lower	0.4	2.0	0.5	3.5	1.1	1.8	3.4	1.3
35 lower						4.6	3.1	1.8
36 middle	0.7	1.1	0.8	0.4	0.5	2.5	5.3	1.0
Mean	0.8	2.2	0.5	2.0	0.9	2.5	4.0	1.1
Standard Error	0.2	0.6	0.1	0.5	0.2	0.7	0.6	0.3

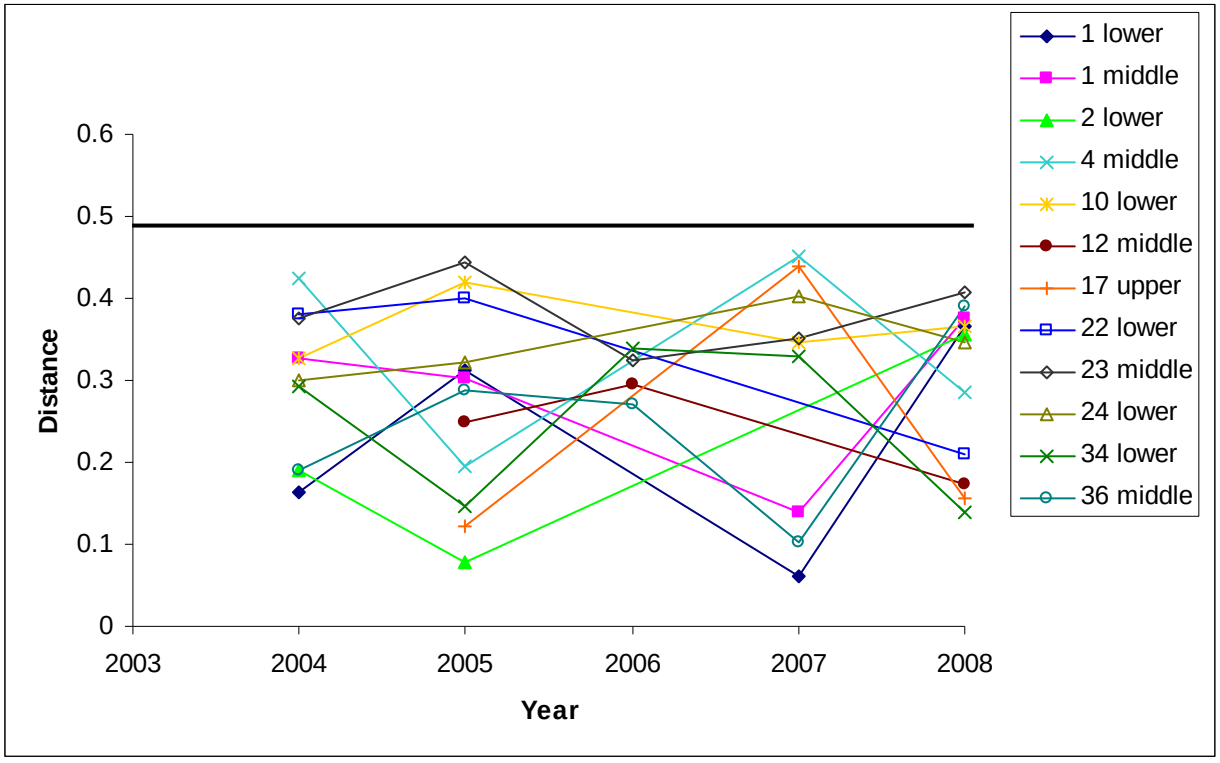

Figure 6. Multivariate control chart for individual species catch at each retained reach sampled from 2001-2008. The first three years of data were used as baseline and, therefore, are not shown. The black horizontal line is the 95% control limit. Distance on the y-axis indicates the distance to a baseline centroid (b = 3).

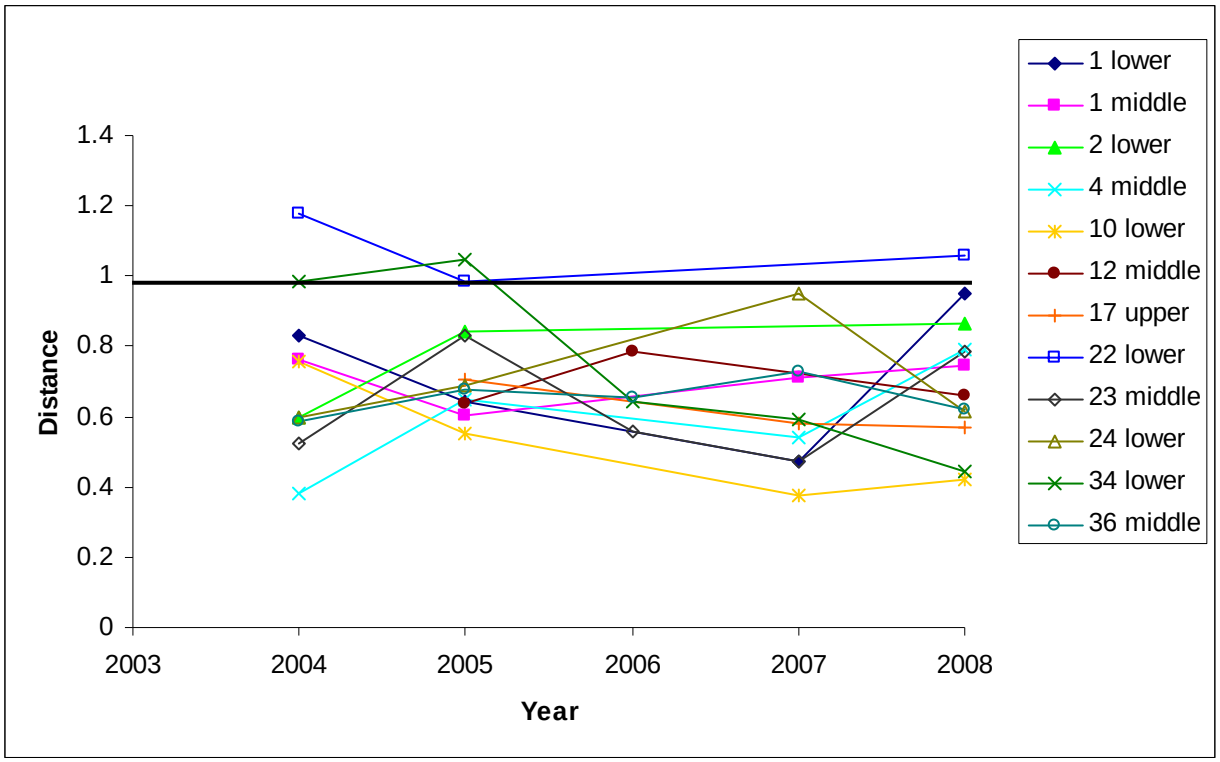

Figure 7. Multivariate control chart for individual species catch per area at each retained reach sampled in 2001-2008. The first three years of data were used as baseline and, therefore, are not shown. The black horizontal line is the 95% control limit. Distance on the y-axis indicates the distance to a baseline centroid (b = 3).

Topeka Shiners were found in five reaches, of which three reaches have been retained for current and future monitoring (Table 5). A total of 157 Topeka Shiners were collected from 2001 to 2008, with reach 23 middle accounting for 80% of the total abundance of Topeka Shiners. Topeka Shiner abundance generally declined over time, from a high of 72 in 2002 to only 1 shiner caught in 2008 (Figure 8). A linear regression analysis including all data (2001-2008) found no significant trend ($F = 1.92$, $P = 0.22$, n = 8), due to the small number caught in 2001. The statistical significance of simple linear regressions based on such relatively small sample sizes can change with the addition or deletion of a single data point. If the 2002 data point is removed from the analysis due to the high number of Topeka Shiners collected in that year compared to other years, there is again no significant relationship ($F = 0.68$, $P = 0.446$, n = 7). However, regressions conducted with the previous four (2005-2008), five (2004-2008), six (2003-2008), or seven (2002-2008; Figure 8) years of data were all significant (each $P < 0.05$). Regressions were not attempted with n < 4. This indicates that the number of Topeka Shiners caught has declined significantly over all reasonable time periods considered, except the longest period (i.e., n = 8 years).

Table 5. Numbers of Topeka Shiners collected at reaches sampled in 2001-2008. Reaches in bold type are those reaches retained for long-term monitoring.

Reach	2001	2002	2003	2004	2005	2006	2007	2008	Total
1 Lower	0	1	0	0	0	0	0	0	1
1 Middle	0	9	0	0	16	0	1	0	26
2 Middle	0	0	0	3	0	0	0	0	3
22 Upper Left	0	0	0	1	0	0	0	0	1
23 Middle	7	62	15	20	3	10	8	1	126

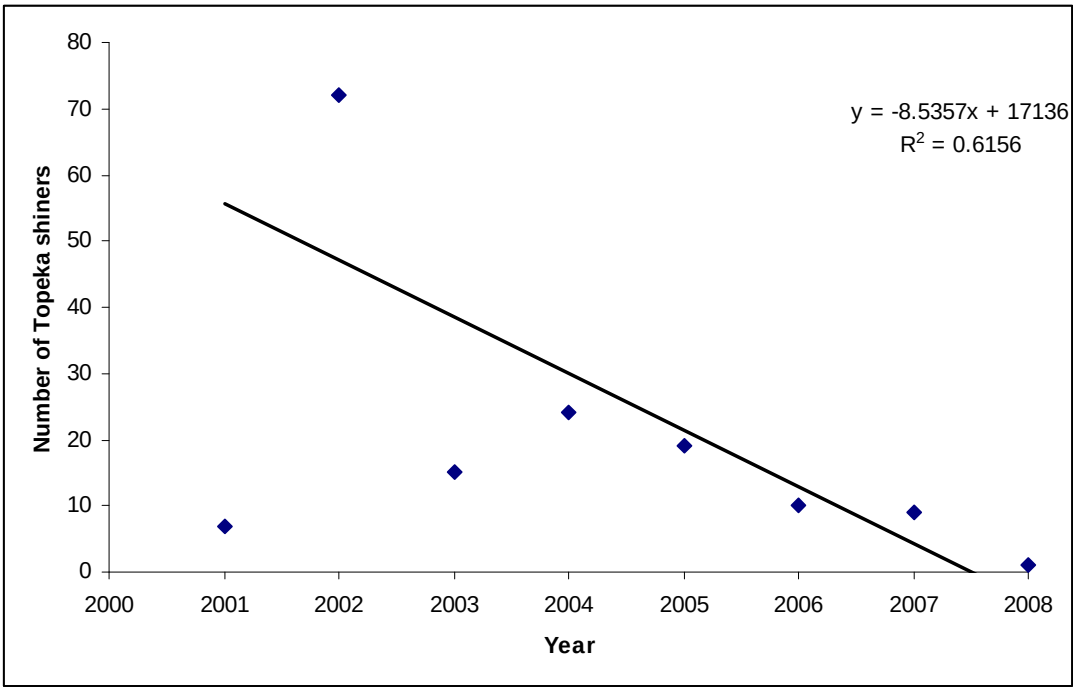

Figure 8. Total number of Topeka Shiners caught over time at the five reaches containing shiners. Line represents line of best fit for last seven years (2002-2008) ($F = 8.01$, $p = 0.037$).

Habitat and Water Quality

A diversity of models was selected for the three response variables (richness, diversity, CPA; Appendices 2-4). In most years, multiple models were found to have 'substantial' support. Overall, site width, length, area, depth, and water temperature were selected more frequently than other predictor variables, although each of the 11 predictor variables was represented in at least one model. Values of the coefficient of multiple determination (R^2) were low to moderate for the models selected (species richness: 0.09-0.49, Appendix 2; diversity: 0.12-0.51, Appendix 3; CPA: 0.09-0.34, Appendix 4). Thus, for most models in most years, the majority of the variability in the response variable could not be explained by variability in the available habitat parameters. In general, species richness and diversity were positively associated with larger site dimensions, whereas CPA was negatively correlated with site dimensions, suggesting greater efficiency in sampling smaller sites. CPA was also associated with water temperature in several models. For both diversity and CPA, no predictor variables were found to be significant by the simple linear regressions in two of the eight years (Appendices 3 and 4); therefore, no models were constructed by the AIC method in those years.

Of the five variables most frequently selected in the modeling (i.e., site width, length, area, depth, and water temperature), length, area, and depth revealed considerable variability over time (Figures 9 and 10; Appendices 5 and 6). Average area ranged from 23.7 to 88.7 m^2, whereas average depth ranged from 21.5 to 47.6 cm. Thus, sites were more than twice as deep in some years than others, and had over three times as much surface area. Such differences could result in channel unit volumes that varied by almost an order of magnitude. This data represents sites that were actually sampled; some sites were too low (or dry) in some years and were not sampled at all, further emphasizing the variability inherent in site water volumes over time. Higher variability among reaches in 2006 (i.e., larger standard error bars) was due primarily to the low number of reaches sampled (n = 5) that year.

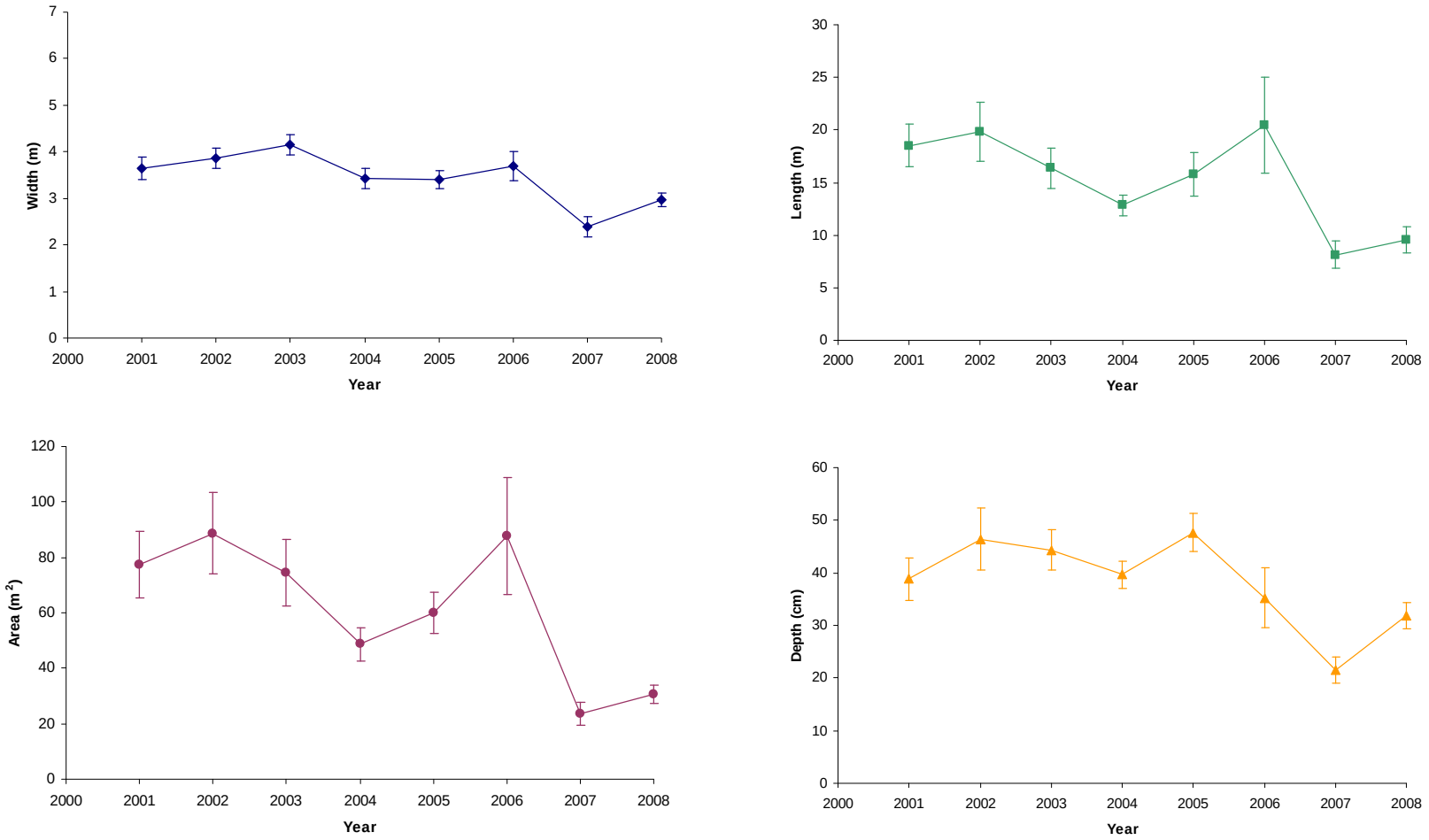

Figure 9. Average width, length, area, and depth (± one standard error) for sites (i.e., channel units) in retained reaches sampled from 2001-2008.

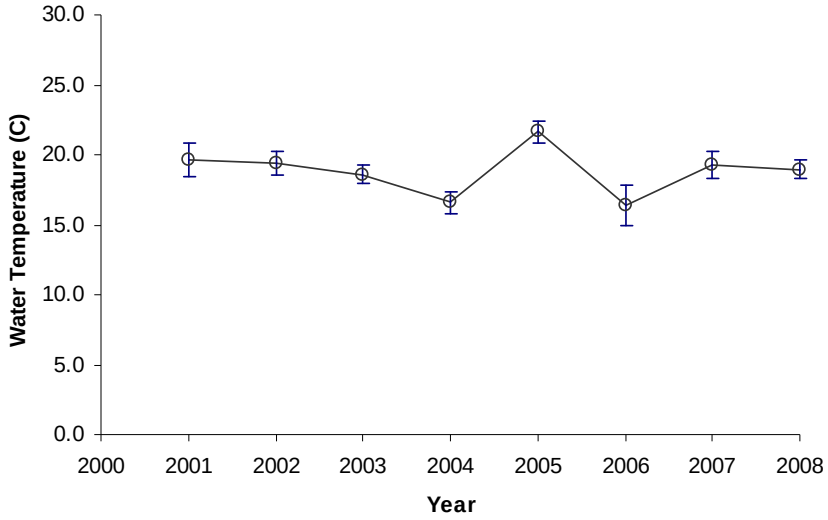

Figure 10. Average water temperature (± one standard error) for sites (i.e., channel units) in retained reaches sampled from 2001-2008.

Discussion

Overall, species richness, community diversity, and stream integrity did not vary greatly over the eight year sampling period, with most reaches having moderate to high diversity and good stream integrity (i.e., IBI) scores, and no control limits were exceeded. Species abundance relationships (catch and CPA) did not vary significantly from baseline conditions (first three years of data) with the exception of relatively small deviations for CPA for two reaches (22 lower and 34 lower). Because only CPA revealed such deviations and not catch, it is likely that the CPA results could be due to the relatively large variability inherent in site dimensions over time, potential relative efficiencies or inefficiencies in sampling some sites, or an interaction of the two. At this point, these results do not indicate a clear trend of continued dissimilarity from baseline conditions for these two reaches, and additional years of data will allow for a more complete evaluation of their trajectories. In general, richness and diversity of prairie streams are typically low, and assemblages are relatively tolerant (Pflieger 1997, Bramblett et al. 2005, Peitz 2005, Fischer and Paukert 2008). Overall, our results were similar in richness to sites sampled by Kansas Department of Wildlife and Parks (Kansas Department of Wildlife and Parks, unpublished data; Appendix 7) in adjacent watersheds, and our richness and abundance data were similar to other least disturbed Great Plains streams (Fischer and Paukert 2008). This suggests that fish communities at TAPR are relatively stable, healthy, and diverse.

Reaches in 2004 had the highest fish diversity and stream quality, on average, while reaches in 2003 had the lowest richness, stream integrity, and total fish abundance (i.e., total CPA). No one particular reach dominated as having the greatest richness, diversity, and biotic integrity over the eight year sampling period. Reach 24 lower, however, had the highest richness in most years the reach was sampled, while 1 lower had the highest biotic integrity score in most years. Both of these reaches are located in tributaries with sufficient water levels to remain connected to larger streams (Cottonwood River and Fox Creek, respectively), which likely act as a source for these tributaries and potentially explain the higher richness and biotic integrity. In contrast, reach 17 upper had very low richness, diversity, stream quality, and CPA for most years the reach was sampled. The poor overall stream integrity and lack of diversity at this reach is likely due to a natural barrier rather than anthropogenic disturbances. A small bedrock ledge (~1 m in height) located at the confluence of this tributary with Palmer Creek (stream 36) potentially blocks immigration from other stream sources during dry summer conditions, creating a population sink. In years with heavier spring time flows, stream 17 becomes reconnected with Palmer Creek, allowing for re-population of the stream.

Although diversity of most reaches was relatively high, fish communities at TAPR were dominated by eight species that made up over 88% of the total abundance. Of these eight species, five species are moderately tolerant to human disturbance and poor water quality conditions. The Central Stoneroller was the dominant fish across sample reaches (30% of total abundance). This species thrives in prairie streams that are clear with open canopy and clean gravel substrate (i.e., low turbidity and little sedimentation) where attached algae, their primary food source, can readily grow. Data collected by Kansas Department of Wildlife and Parks also found that Central Stonerollers as well as Red Shiners, Cardinal Shiners, and Bluntnose Minnow were in high abundance in adjacent watersheds to the park (Kansas Department of Wildlife and Parks, unpublished data; Appendix 7).

Topeka Shiners have been found at only 5 reaches at TAPR, and a single reach (23 middle) accounted for 80% of all shiners found. Topeka Shiners were found consistently at this reach, although abundances varied greatly, ranging from 1 to 62. Reach 23 middle is located in the headwaters of a tributary to the Cottonwood River that is located primarily outside the park boundary (Figure 1). The finding of so many shiners in this tributary suggests that this watershed (most of which lies outside the park) may support a large Topeka Shiner population. The decline in Topeka Shiners over most time periods considered was driven by reach 23 middle, as the other reaches had very few or no shiners in a given year. Because this reach lies very close to the park boundary, and the majority of the watershed of this tributary lies outside the park, the potential mechanisms underlying this decline may stem from processes outside the park. The other four reaches had no shiners in most years. Reaches 1 middle and 1 lower, which together accounted for 27 of the 31 shiners not found in reach 23 middle, are located relatively low in their watershed near Fox Creek and the park boundary (Figure 1). No Topeka Shiners were ever found in 1 upper, suggesting that a larger population of shiners may also exist outside the park boundary in Fox Creek and be a source of Topeka Shiners found in 1 middle and 1 lower. Overall, streams within TAPR may function as a refuge for Topeka Shiners. This species may find their way up a few tributaries in the park from larger source populations outside the park. During dry conditions when predators may concentrate in the larger streams, smaller tributaries with flow from springs or seeps can act as refuges for Topeka Shiners. Kansas Department of Wildlife and Parks also found a few Topeka Shiners (total of 27) in smaller tributaries of the Cottonwood River watershed during 1994-2007 (Kansas Department of Wildlife and Parks, unpublished data; Appendix 7). Additional surveys of Topeka Shiners in surrounding watersheds would be invaluable in evaluating the status of the Topeka Shiner in the TAPR region and the potential role of TAPR in the overall conservation of this species.

The multimodel inferences necessitated by the information-theoretic approach (i.e., the challenge of choosing among multiple competing models) will often make it difficult to select a single "best" model. Construction of multiple models that are not clearly superior or inferior to each other, however, can increase our knowledge of the system under study. In this case, most models performed relatively poorly (low R^2 value), and explained very little of the variability in the data set analyzed. We did find that variables related to site dimensions were selected most frequently in the models, explaining some variability in richness, diversity, and abundance. Smaller sites had higher richness and diversity, but lower abundance. A study conducted in two regions of the Great Plains also found that stream size explained variability in fish richness and abundance with wider streams containing more species but fewer fish (Fischer and Paukert 2008). This study also found that fish assemblages were associated with instream cover (macrophytes, algae, undercut banks), substrate type, and conductivity. Although substrate and instream cover were not analyzed in this report, we did not find conductivity to be a significant factor in explaining variability in fish communities. Analysis of additional habitat or environmental variables could increase the explanatory power of the models, although the increase in R^2 for each additional variable may be very small, and not worth the effort of measurement. With many ecological systems, it is possible that many dozens of habitat variables (all with very small amounts of explanatory power) would have to be included in a model to obtain high R^2 values (Burnham and Anderson 2002).

Perhaps the most revealing aspect of this analysis was that different models or sets of models were selected in different years, indicating a basic instability in the relationships of habitat and water quality with fish communities over time. For example, prairie streams consist mostly of fine substrates that are frequently changing and shifting, and variation in rainfall and other climatic variables results in changing site dimensions over time, as documented here (Figs. 8 and 9). It is likely that these changes may occur on a temporal scale that is more rapid than the ability of the fish communities to respond, in terms of increasing or decreasing in population sizes. In other words, these streams may be characterized by natural chronic disturbances, yet the overall resident fish communities are adapted to these harsh and ever changing conditions, and remain relatively consistent over time (Bramblett et al 2005, Fischer and Paukert 2008).

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Appendix 1. Species list and numbers caught in retained reaches. Blanks indicate reach was not sampled that year.

Family	Common Name	Genus	Species	2001	2002	2003	2004	2005	2006	2007	2008
		1 lower									
Atherinidae	Brook Silverside	*Labidesthes*	*sicculus*	0	0	0	0	0		0	0
Catostomidae	Golden Redhorse	*Moxostoma*	*erythrurum*	0	0	0	1	0		0	0
Catostomidae	Spotted Sucker	*Minytrema*	*melanops*	0	0	0	0	2		0	0
Catostomidae	White Sucker	*Catostomus*	*commersoni*	0	0	0	0	0		0	0
Centrarchidae	Bluegill	*Lepomis*	*macrochirus*	0	2	12	3	32		1	0
Centrarchidae	Green Sunfish	*Lepomis*	*cyanellus*	0	8	0	1	49		7	4
Centrarchidae	Largemouth Bass	*Micropterus*	*salmoides*	2	2	0	1	0		1	0
Centrarchidae	Longear Sunfish	*Lepomis*	*megalotis*	0	0	0	0	0		2	0
Centrarchidae	Orangespotted Sunfish	*Lepomis*	*humilis*	0	0	46	2	17		2	0
Centrarchidae	Spotted Bass	*Micropterus*	*punctulatus*	0	0	1	0	0		0	0
Cyprinidae	Bluntnose Minnow	*Pimephales*	*notatus*	0	34	33	1	19		1	7
Cyprinidae	Cardinal Shiner	*Luxilus*	*cardinalis*	44	17	125	8	120		36	5
Cyprinidae	Carmine Shiner	*Notropis*	*percobromus*	0	0	0	0	6		0	0
Cyprinidae	Central Stoneroller	*Campostoma*	*anomalum*	168	13	30	14	38		85	1
Cyprinidae	Common Carp	*Cyprinus*	*carpio*	0	0	0	0	0		0	0
Cyprinidae	Common Shiner	*Luxilus*	*cornutus*	0	0	0	0	0		0	0
Cyprinidae	Creek Chub	*Semotilus*	*atromaculatus*	0	10	5	14	24		15	2
Cyprinidae	Fathead Minnow	*Pimephales*	*promelas*	0	0	0	0	0		0	0
Cyprinidae	Golden Shiner	*Notemigonus*	*crysoleucas*	0	0	0	3	3		0	0
Cyprinidae	Mimic Shiner	*Notropis*	*volucellus*	0	0	0	0	0		0	0
Cyprinidae	Non-carp minnow spp.	*Cyprinidae*	*spp.*	0	0	0	0	0		0	0
Cyprinidae	Notropis spp.	*Notropis*	*spp.*	0	0	0	0	0		0	0
Cyprinidae	Red Shiner	*Cyprinella*	*lutrensis*	23	5	15	20	8		7	0
Cyprinidae	Redfin Shiner	*Lythrurus*	*umbratilis*	0	92	26	23	46		47	10
Cyprinidae	Sand Shiner	*Notropis*	*stramineus*	0	0	0	0	0		0	1
Cyprinidae	Slim Minnow	*Pimephales*	*tenellus*	0	0	0	0	0		0	0
Cyprinidae	Suckermouth Minnow	*Phenacobius*	*mirabilis*	0	0	0	0	0		0	0
Cyprinidae	Topeka Shiner	*Notropis*	*topeka*	0	1	0	0	0		0	0
Fundulidae	Blackstripe Topminnow	*Fundulus*	*notatus*	0	0	0	0	0		0	0
Ictaluridae	Black Bullhead	*Ameiurus*	*melas*	0	0	0	0	0		0	0
Ictaluridae	Channel Catfish	*Ictalurus*	*punctatus*	0	0	0	0	0		0	0
Ictaluridae	Stonecat	*Noturus*	*flavus*	0	0	0	0	0		0	0
Ictaluridae	Yellow Bullhead	*Ameiurus*	*natalis*	3	0	0	0	1		1	0
Percidae	Johnny Darter	*Etheostoma*	*nigrum*	0	0	0	0	0		0	0
Percidae	Logperch	*Percina*	*caprodes*	0	0	0	0	0		0	0
Percidae	Orangethroat Darter	*Etheostoma*	*spectabile*	9	6	2	50	24		7	4
Poeciliidae	Mosquitofish	*Gambusia*	*affinis*	0	0	0	0	0		0	0
TOTAL				249	190	295	141	389		212	34
		1 middle									
Atherinidae	Brook Silverside	*Labidesthes*	*sicculus*	0	0	0	0	0		0	0
Catostomidae	Golden Redhorse	*Moxostoma*	*erythrurum*	0	0	0	0	0		0	0
Catostomidae	Spotted Sucker	*Minytrema*	*melanops*	0	0	0	0	0		0	0
Catostomidae	White Sucker	*Catostomus*	*commersoni*	0	0	0	0	0		0	0
Centrarchidae	Bluegill	*Lepomis*	*macrochirus*	0	0	0	4	20		0	0
Centrarchidae	Green Sunfish	*Lepomis*	*cyanellus*	3	13	0	5	9		11	14
Centrarchidae	Largemouth Bass	*Micropterus*	*salmoides*	0	0	0	0	0		0	0
Centrarchidae	Longear Sunfish	*Lepomis*	*megalotis*	0	0	0	1	2		0	0
Centrarchidae	Orangespotted Sunfish	*Lepomis*	*humilis*	0	0	0	7	77		0	0

Appendix 1. Species list and numbers caught in retained reaches. Blanks indicate reach was not sampled that year, cont.

Family	Common Name	Genus	Species	2001	2002	2003	2004	2005	2006	2007	2008
Centrarchidae	Spotted Bass	*Micropterus*	*punctulatus*	0	0	0	0	0		0	0
Cyprinidae	Bluntnose Minnow	*Pimephales*	*notatus*	0	121	7	1	32		12	2
Cyprinidae	Cardinal Shiner	*Luxilus*	*cardinalis*	1	0	15	1	6		0	0
Cyprinidae	Carmine Shiner	*Notropis*	*percobromus*	0	0	0	0	0		0	0
Cyprinidae	Central Stoneroller	*Campostoma*	*anomalum*	26	50	4	82	7		22	0
Cyprinidae	Common Carp	*Cyprinus*	*carpio*	0	0	0	0	0		0	0
Cyprinidae	Common Shiner	*Luxilus*	*cornutus*	0	0	0	0	0		0	0
Cyprinidae	Creek Chub	*Semotilus*	*atromaculatus*	3	24	0	71	7		10	6
Cyprinidae	Fathead Minnow	*Pimephales*	*promelas*	0	0	0	0	0		0	0
Cyprinidae	Golden Shiner	*Notemigonus*	*crysoleucas*	0	0	0	0	0		0	0
Cyprinidae	Mimic Shiner	*Notropis*	*volucellus*	0	0	0	0	0		0	0
Cyprinidae	Non-carp minnow spp.	*Cyprinidae*	*spp.*	0	0	0	0	0		0	0
Cyprinidae	Notropis spp.	*Notropis*	*spp.*	0	0	0	0	0		0	0
Cyprinidae	Red Shiner	*Cyprinella*	*lutrensis*	1	0	21	2	2		0	0
Cyprinidae	Redfin Shiner	*Lythrurus*	*umbratilis*	12	113	0	27	187		6	13
Cyprinidae	Sand Shiner	*Notropis*	*stramineus*	0	0	0	0	0		0	0
Cyprinidae	Slim Minnow	*Pimephales*	*tenellus*	0	0	0	0	0		0	0
Cyprinidae	Suckermouth Minnow	*Phenacobius*	*mirabilis*	0	0	0	0	0		0	0
Cyprinidae	Topeka Shiner	*Notropis*	*topeka*	0	9	0	0	16		1	0
Fundulidae	Blackstripe Topminnow	*Fundulus*	*notatus*	0	0	0	0	0		0	0
Ictaluridae	Black Bullhead	*Ameiurus*	*melas*	0	0	0	0	1		0	0
Ictaluridae	Channel Catfish	*Ictalurus*	*punctatus*	0	0	0	0	0		0	0
Ictaluridae	Stonecat	*Noturus*	*flavus*	0	0	0	0	0		0	0
Ictaluridae	Yellow Bullhead	*Ameiurus*	*natalis*	0	0	0	0	1		0	0
Percidae	Johnny Darter	*Etheostoma*	*nigrum*	0	0	0	0	0		0	0
Percidae	Logperch	*Percina*	*caprodes*	0	0	0	0	0		0	0
Percidae	Orangethroat Darter	*Etheostoma*	*spectabile*	3	3	2	32	1		14	0
Poeciliidae	Mosquitofish	*Gambusia*	*affinis*	0	0	0	0	0		0	0
TOTAL				49	333	49	233	368		76	35
		2 lower									
Atherinidae	Brook Silverside	*Labidesthes*	*sicculus*	0	0	0	0	0			0
Catostomidae	Golden Redhorse	*Moxostoma*	*erythrurum*	0	1	3	0	0			0
Catostomidae	Spotted Sucker	*Minytrema*	*melanops*	0	0	0	0	0			0
Catostomidae	White Sucker	*Catostomus*	*commersoni*	0	0	0	0	0			0
Centrarchidae	Bluegill	*Lepomis*	*macrochirus*	0	0	0	4	6			0
Centrarchidae	Green Sunfish	*Lepomis*	*cyanellus*	21	26	7	1	17			8
Centrarchidae	Largemouth Bass	*Micropterus*	*salmoides*	0	0	0	2	1			0
Centrarchidae	Longear Sunfish	*Lepomis*	*megalotis*	0	0	0	0	0			0
Centrarchidae	Orangespotted Sunfish	*Lepomis*	*humilis*	1	14	17	2	8			0
Centrarchidae	Spotted Bass	*Micropterus*	*punctulatus*	0	0	0	0	0			0
Cyprinidae	Bluntnose Minnow	*Pimephales*	*notatus*	0	3	6	8	0			1
Cyprinidae	Cardinal Shiner	*Luxilus*	*cardinalis*	0	0	60	6	0			0
Cyprinidae	Carmine Shiner	*Notropis*	*percobromus*	0	0	0	0	0			0
Cyprinidae	Central Stoneroller	*Campostoma*	*anomalum*	50	0	4	30	3			4
Cyprinidae	Common Carp	*Cyprinus*	*carpio*	0	0	0	0	0			0
Cyprinidae	Common Shiner	*Luxilus*	*cornutus*	0	0	0	0	0			0
Cyprinidae	Creek Chub	*Semotilus*	*atromaculatus*	1	4	0	0	2			0
Cyprinidae	Fathead Minnow	*Pimephales*	*promelas*	42	2	0	0	0			2
Cyprinidae	Golden Shiner	*Notemigonus*	*crysoleucas*	0	0	0	0	0			0

Appendix 1. Species list and numbers caught in retained reaches. Blanks indicate reach was not sampled that year, cont.

Family	Common Name	Genus	Species	2001	2002	2003	2004	2005	2006	2007	2008
Cyprinidae	Mimic Shiner	*Notropis*	*volucellus*	0	0	0	0	0			0
Cyprinidae	Non-carp minnow spp.	*Cyprinidae*	*spp.*	0	0	0	0	0			4
Cyprinidae	Notropis spp.	*Notropis*	*spp.*	0	0	0	0	0			0
Cyprinidae	Red Shiner	*Cyprinella*	*lutrensis*	2	4	3	0	6			45
Cyprinidae	Redfin Shiner	*Lythrurus*	*umbratilis*	49	130	0	3	37			1
Cyprinidae	Sand Shiner	*Notropis*	*stramineus*	0	0	0	0	0			0
Cyprinidae	Slim Minnow	*Pimephales*	*tenellus*	0	0	0	0	0			0
Cyprinidae	Suckermouth Minnow	*Phenacobius*	*mirabilis*	0	0	0	0	0			0
Cyprinidae	Topeka Shiner	*Notropis*	*topeka*	0	0	0	0	0			0
Fundulidae	Blackstripe Topminnow	*Fundulus*	*notatus*	0	0	0	0	0			0
Ictaluridae	Black Bullhead	*Ameiurus*	*melas*	0	9	0	0	0			0
Ictaluridae	Channel Catfish	*Ictalurus*	*punctatus*	0	0	0	1	0			0
Ictaluridae	Stonecat	*Noturus*	*flavus*	0	0	0	0	0			0
Ictaluridae	Yellow Bullhead	*Ameiurus*	*natalis*	0	0	0	1	1			0
Percidae	Johnny Darter	*Etheostoma*	*nigrum*	0	0	0	0	0			0
Percidae	Logperch	*Percina*	*caprodes*	0	0	0	0	0			0
Percidae	Orangethroat Darter	*Etheostoma*	*spectabile*	0	0	0	0	0			0
Poeciliidae	Mosquitofish	*Gambusia*	*affinis*	0	0	0	0	0			0
TOTAL				166	193	100	58	81			65
		4 middle									
Atherinidae	Brook Silverside	*Labidesthes*	*sicculus*	0	0	0	0	0		0	0
Catostomidae	Golden Redhorse	*Moxostoma*	*erythrurum*	0	0	0	0	4		0	0
Catostomidae	Spotted Sucker	*Minytrema*	*melanops*	0	0	0	0	0		0	0
Catostomidae	White Sucker	*Catostomus*	*commersoni*	0	0	0	0	0		0	0
Centrarchidae	Bluegill	*Lepomis*	*macrochirus*	0	0	0	0	2		0	0
Centrarchidae	Green Sunfish	*Lepomis*	*cyanellus*	4	0	3	27	7		12	23
Centrarchidae	Largemouth Bass	*Micropterus*	*salmoides*	1	0	0	1	1		0	0
Centrarchidae	Longear Sunfish	*Lepomis*	*megalotis*	0	0	1	0	0		0	0
Centrarchidae	Orangespotted Sunfish	*Lepomis*	*humilis*	6	0	4	10	30		11	0
Centrarchidae	Spotted Bass	*Micropterus*	*punctulatus*	0	0	0	0	0		0	0
Cyprinidae	Bluntnose Minnow	*Pimephales*	*notatus*	2	32	19	67	21		9	3
Cyprinidae	Cardinal Shiner	*Luxilus*	*cardinalis*	0	0	0	5	0		8	3
Cyprinidae	Carmine Shiner	*Notropis*	*percobromus*	1	0	0	0	0		0	0
Cyprinidae	Central Stoneroller	*Campostoma*	*anomalum*	1	109	39	48	59		92	22
Cyprinidae	Common Carp	*Cyprinus*	*carpio*	0	0	0	0	0		0	0
Cyprinidae	Common Shiner	*Luxilus*	*cornutus*	0	0	0	0	0		0	0
Cyprinidae	Creek Chub	*Semotilus*	*atromaculatus*	0	2	6	25	15		5	0
Cyprinidae	Fathead Minnow	*Pimephales*	*promelas*	0	0	0	6	0		0	0
Cyprinidae	Golden Shiner	*Notemigonus*	*crysoleucas*	0	0	0	0	0		0	0
Cyprinidae	Mimic Shiner	*Notropis*	*volucellus*	0	0	0	0	0		0	0
Cyprinidae	Non-carp minnow spp.	*Cyprinidae*	*spp.*	0	0	0	0	0		0	2
Cyprinidae	Notropis spp.	*Notropis*	*spp.*	0	0	0	0	0		2	4
Cyprinidae	Red Shiner	*Cyprinella*	*lutrensis*	0	9	6	8	7		82	98
Cyprinidae	Redfin Shiner	*Lythrurus*	*umbratilis*	0	77	3	117	11		56	6
Cyprinidae	Sand Shiner	*Notropis*	*stramineus*	0	0	0	0	0		0	0
Cyprinidae	Slim Minnow	*Pimephales*	*tenellus*	0	0	0	0	0		0	0
Cyprinidae	Suckermouth Minnow	*Phenacobius*	*mirabilis*	0	0	0	0	0		0	0
Cyprinidae	Topeka Shiner	*Notropis*	*topeka*	0	0	0	0	0		0	0

Appendix 1. Species list and numbers caught in retained reaches. Blanks indicate reach was not sampled that year, cont

Family	Common Name	Genus	Species	2001	2002	2003	2004	2005	2006	2007	2008
Fundulidae	Blackstripe Topminnow	*Fundulus*	*notatus*	0	0	0	0	0		0	0
Ictaluridae	Black Bullhead	*Ameiurus*	*melas*	0	0	0	0	1		0	0
Ictaluridae	Channel Catfish	*Ictalurus*	*punctatus*	0	0	0	0	0		0	0
Ictaluridae	Stonecat	*Noturus*	*flavus*	0	0	0	0	0		0	0
Ictaluridae	Yellow Bullhead	*Ameiurus*	*natalis*	0	0	0	0	0		0	0
Percidae	Johnny Darter	*Etheostoma*	*nigrum*	0	0	0	0	0		1	2
Percidae	Logperch	*Percina*	*caprodes*	0	0	0	0	0		0	0
Percidae	Orangethroat Darter	*Etheostoma*	*spectabile*	0	1	8	12	0		0	0
Poeciliidae	Mosquitofish	*Gambusia*	*affinis*	0	0	1	0	0		150	0
TOTAL				15	230	90	326	158		428	163
		10 middle									
Atherinidae	Brook Silverside	*Labidesthes*	*sicculus*	0	0	0	0	0		0	0
Catostomidae	Golden Redhorse	*Moxostoma*	*erythrurum*	0	0	0	0	0		0	0
Catostomidae	Spotted Sucker	*Minytrema*	*melanops*	0	0	0	0	0		0	0
Catostomidae	White Sucker	*Catostomus*	*commersoni*	0	0	0	0	0		0	0
Centrarchidae	Bluegill	*Lepomis*	*macrochirus*	0	0	0	0	2		0	0
Centrarchidae	Green Sunfish	*Lepomis*	*cyanellus*	12	7	0	3	33		33	51
Centrarchidae	Largemouth Bass	*Micropterus*	*salmoides*	0	0	0	0	0		0	0
Centrarchidae	Longear Sunfish	*Lepomis*	*megalotis*	0	0	0	0	0		0	0
Centrarchidae	Orangespotted Sunfish	*Lepomis*	*humilis*	0	0	1	0	9		0	2
Centrarchidae	Spotted Bass	*Micropterus*	*punctulatus*	0	0	0	0	0		0	0
Cyprinidae	Bluntnose Minnow	*Pimephales*	*notatus*	0	1	0	0	49		0	6
Cyprinidae	Cardinal Shiner	*Luxilus*	*cardinalis*	14	0	0	1	24		0	1
Cyprinidae	Carmine Shiner	*Notropis*	*percobromus*	0	0	0	0	0		0	0
Cyprinidae	Central Stoneroller	*Campostoma*	*anomalum*	84	424	7	201	137		80	218
Cyprinidae	Common Carp	*Cyprinus*	*carpio*	0	0	0	0	0		0	0
Cyprinidae	Common Shiner	*Luxilus*	*cornutus*	0	0	0	0	0		0	0
Cyprinidae	Creek Chub	*Semotilus*	*atromaculatus*	0	42	3	127	13		1	48
Cyprinidae	Fathead Minnow	*Pimephales*	*promelas*	0	0	0	0	2		0	0
Cyprinidae	Golden Shiner	*Notemigonus*	*crysoleucas*	0	0	0	0	0		0	0
Cyprinidae	Mimic Shiner	*Notropis*	*volucellus*	0	0	0	0	0		0	0
Cyprinidae	Non-carp minnow spp.	*Cyprinidae*	*spp.*	0	0	0	0	0		0	0
Cyprinidae	Notropis spp.	*Notropis*	*spp.*	0	0	0	0	0		0	0
Cyprinidae	Red Shiner	*Cyprinella*	*lutrensis*	0	0	0	2	0		0	0
Cyprinidae	Redfin Shiner	*Lythrurus*	*umbratilis*	0	0	0	0	6		0	8
Cyprinidae	Sand Shiner	*Notropis*	*stramineus*	0	0	0	0	0		0	0
Cyprinidae	Slim Minnow	*Pimephales*	*tenellus*	0	0	0	0	0		0	0
Cyprinidae	Suckermouth Minnow	*Phenacobius*	*mirabilis*	0	0	0	0	0		0	0
Cyprinidae	Topeka Shiner	*Notropis*	*topeka*	0	0	0	0	0		0	0
Fundulidae	Blackstripe Topminnow	*Fundulus*	*notatus*	0	0	0	0	0		0	0
Ictaluridae	Black Bullhead	*Ameiurus*	*melas*	0	0	0	0	0		0	0
Ictaluridae	Channel Catfish	*Ictalurus*	*punctatus*	0	0	0	0	0		0	0
Ictaluridae	Stonecat	*Noturus*	*flavus*	0	0	0	0	0		0	0
Ictaluridae	Yellow Bullhead	*Ameiurus*	*natalis*	0	0	0	0	0		0	0
Percidae	Johnny Darter	*Etheostoma*	*nigrum*	0	0	0	0	0		0	0
Percidae	Logperch	*Percina*	*caprodes*	0	0	0	0	1		0	0
Percidae	Orangethroat Darter	*Etheostoma*	*spectabile*	23	65	29	116	5		7	27
Poeciliidae	Mosquitofish	*Gambusia*	*affinis*	0	0	0	0	0		0	0
TOTAL				133	539	40	450	281		121	361

Appendix 1. Species list and numbers caught in retained reaches. Blanks indicate reach was not sampled that year, cont

Family	Common Name	Genus	Species	2001	2002	2003	2004	2005	2006	2007	2008
		12 middle									
Atherinidae	Brook Silverside	*Labidesthes*	*sicculus*		0	0	0	0	0		0
Catostomidae	Golden Redhorse	*Moxostoma*	*erythrurum*		1	1	1	4	0		0
Catostomidae	Spotted Sucker	*Minytrema*	*melanops*		0	0	5	3	0		0
Catostomidae	White Sucker	*Catostomus*	*commersoni*		0	0	0	0	0		0
Centrarchidae	Bluegill	*Lepomis*	*macrochirus*		71	15	51	49	17		48
Centrarchidae	Green Sunfish	*Lepomis*	*cyanellus*		35	2	7	12	7		25
Centrarchidae	Largemouth Bass	*Micropterus*	*salmoides*		5	3	1	0	0		6
Centrarchidae	Longear Sunfish	*Lepomis*	*megalotis*		0	0	1	3	0		0
Centrarchidae	Orangespotted Sunfish	*Lepomis*	*humilis*		1	0	0	0	0		1
Centrarchidae	Spotted Bass	*Micropterus*	*punctulatus*		0	0	0	0	4		0
Cyprinidae	Bluntnose Minnow	*Pimephales*	*notatus*		63	26	25	2	0		27
Cyprinidae	Cardinal Shiner	*Luxilus*	*cardinalis*		0	14	0	0	0		0
Cyprinidae	Carmine Shiner	*Notropis*	*percobromus*		0	0	0	0	0		0
Cyprinidae	Central Stoneroller	*Campostoma*	*anomalum*		9	2	0	3	2		17
Cyprinidae	Common Carp	*Cyprinus*	*carpio*		0	0	0	0	0		0
Cyprinidae	Common Shiner	*Luxilus*	*cornutus*		0	0	0	0	0		0
Cyprinidae	Creek Chub	*Semotilus*	*atromaculatus*		2	0	0	0	6		0
Cyprinidae	Fathead Minnow	*Pimephales*	*promelas*		0	0	0	0	0		0
Cyprinidae	Golden Shiner	*Notemigonus*	*crysoleucas*		2	0	1	8	2		1
Cyprinidae	Mimic Shiner	*Notropis*	*volucellus*		0	0	0	0	0		0
Cyprinidae	Non-carp minnow spp.	*Cyprinidae*	*spp.*		0	0	0	0	0		0
Cyprinidae	Notropis spp.	*Notropis*	*spp.*		0	0	0	0	0		0
Cyprinidae	Red Shiner	*Cyprinella*	*lutrensis*		5	0	1	0	0		1
Cyprinidae	Redfin Shiner	*Lythrurus*	*umbratilis*		92	1	14	43	0		0
Cyprinidae	Sand Shiner	*Notropis*	*stramineus*		0	0	0	0	0		0
Cyprinidae	Slim Minnow	*Pimephales*	*tenellus*		0	0	0	0	0		0
Cyprinidae	Suckermouth Minnow	*Phenacobius*	*mirabilis*		0	0	0	0	0		0
Cyprinidae	Topeka Shiner	*Notropis*	*topeka*		0	0	0	0	0		0
Fundulidae	Blackstripe Topminnow	*Fundulus*	*notatus*		20	0	4	4	1		23
Ictaluridae	Black Bullhead	*Ameiurus*	*melas*		0	0	0	0	0		0
Ictaluridae	Channel Catfish	*Ictalurus*	*punctatus*		0	0	0	0	0		0
Ictaluridae	Stonecat	*Noturus*	*flavus*		0	0	0	0	0		0
Ictaluridae	Yellow Bullhead	*Ameiurus*	*natalis*		0	0	0	0	0		0
Percidae	Johnny Darter	*Etheostoma*	*nigrum*		0	0	0	0	0		0
Percidae	Logperch	*Percina*	*caprodes*		0	0	0	0	0		0
Percidae	Orangethroat Darter	*Etheostoma*	*spectabile*		18	0	9	3			16
Poeciliidae	Mosquitofish	*Gambusia*	*affinis*		0	0	0	0	0		0
TOTAL					324	64	120	134	43		165
		17 upper									
Atherinidae	Brook Silverside	*Labidesthes*	*sicculus*		0	0	0	0		0	0
Catostomidae	Golden Redhorse	*Moxostoma*	*erythrurum*		0	0	0	0		0	0
Catostomidae	Spotted Sucker	*Minytrema*	*melanops*		0	0	0	0		0	0
Catostomidae	White Sucker	*Catostomus*	*commersoni*		0	0	0	0		0	0
Centrarchidae	Bluegill	*Lepomis*	*macrochirus*		0	0	2	0		0	0
Centrarchidae	Green Sunfish	*Lepomis*	*cyanellus*		107	7	9	4		0	5
Centrarchidae	Largemouth Bass	*Micropterus*	*salmoides*		0	0	0	0		0	0
Centrarchidae	Longear Sunfish	*Lepomis*	*megalotis*		0	0	0	0		0	0

Appendix 1. Species list and numbers caught in retained reaches. Blanks indicate reach was not sampled that year, cont

Family	Common Name	Genus	Species	2001	2002	2003	2004	2005	2006	2007	2008
Centrarchidae	Orangespotted Sunfish	*Lepomis*	*humilis*		0	0	0	1		0	0
Centrarchidae	Spotted Bass	*Micropterus*	*punctulatus*		0	0	0	0		0	0
Cyprinidae	Bluntnose Minnow	*Pimephales*	*notatus*		0	0	0	0		0	0
Cyprinidae	Cardinal Shiner	*Luxilus*	*cardinalis*		0	0	0	0		0	0
Cyprinidae	Carmine Shiner	*Notropis*	*percobromus*		0	0	0	0		0	0
Cyprinidae	Central Stoneroller	*Campostoma*	*anomalum*		0	0	0	0		0	0
Cyprinidae	Common Carp	*Cyprinus*	*carpio*		0	0	0	0		0	0
Cyprinidae	Common Shiner	*Luxilus*	*cornutus*		0	0	0	0		0	0
Cyprinidae	Creek Chub	*Semotilus*	*atromaculatus*		0	0	0	0		0	0
Cyprinidae	Fathead Minnow	*Pimephales*	*promelas*		0	0	0	0		0	0
Cyprinidae	Golden Shiner	*Notemigonus*	*crysoleucas*		3	0	0	0		0	0
Cyprinidae	Mimic Shiner	*Notropis*	*volucellus*		0	0	0	0		0	0
Cyprinidae	Non-carp minnow spp.	*Cyprinidae*	*spp.*		0	0	0	0		0	0
Cyprinidae	Notropis spp.	*Notropis*	*spp.*		0	0	0	0		0	0
Cyprinidae	Red Shiner	*Cyprinella*	*lutrensis*		0	0	2	0		0	0
Cyprinidae	Redfin Shiner	*Lythrurus*	*umbratilis*		2	0	2	0		0	0
Cyprinidae	Sand Shiner	*Notropis*	*stramineus*		0	0	0	0		0	0
Cyprinidae	Slim Minnow	*Pimephales*	*tenellus*		0	0	0	0		0	0
Cyprinidae	Suckermouth Minnow	*Phenacobius*	*mirabilis*		0	0	0	0		0	0
Cyprinidae	Topeka Shiner	*Notropis*	*topeka*		0	0	0	0		0	0
Fundulidae	Blackstripe Topminnow	*Fundulus*	*notatus*		0	0	0	0		0	0
Ictaluridae	Black Bullhead	*Ameiurus*	*melas*		0	0	0	0		0	0
Ictaluridae	Channel Catfish	*Ictalurus*	*punctatus*		0	0	0	0		0	0
Ictaluridae	Stonecat	*Noturus*	*flavus*		0	0	0	0		0	0
Ictaluridae	Yellow Bullhead	*Ameiurus*	*natalis*		0	0	0	0		0	0
Percidae	Johnny Darter	*Etheostoma*	*nigrum*		0	0	0	0		0	0
Percidae	Logperch	*Percina*	*caprodes*		0	0	0	0		0	0
Percidae	Orangethroat Darter	*Etheostoma*	*spectabile*		1	0	0	0		0	0
Poeciliidae	Mosquitofish	*Gambusia*	*affinis*		0	0	0	0		0	0
TOTAL					113	7	15	5		0	5
		22 lower									
Atherinidae	Brook Silverside	*Labidesthes*	*sicculus*	0	0	0	0	0			0
Catostomidae	Golden Redhorse	*Moxostoma*	*erythrurum*	0	0	0	0	9			0
Catostomidae	Spotted Sucker	*Minytrema*	*melanops*	0	0	0	0	0			0
Catostomidae	White Sucker	*Catostomus*	*commersoni*	0	0	0	0	0			0
Centrarchidae	Bluegill	*Lepomis*	*macrochirus*	0	0	2	0	28			0
Centrarchidae	Green Sunfish	*Lepomis*	*cyanellus*	6	0	0	3	22			0
Centrarchidae	Largemouth Bass	*Micropterus*	*salmoides*	0	0	0	0	0			1
Centrarchidae	Longear Sunfish	*Lepomis*	*megalotis*	0	0	0	1	16			0
Centrarchidae	Orangespotted Sunfish	*Lepomis*	*humilis*	9	0	0	6	11			0
Centrarchidae	Spotted Bass	*Micropterus*	*punctulatus*	0	0	0	0	0			0
Cyprinidae	Bluntnose Minnow	*Pimephales*	*notatus*	23	1	13	11	87			7
Cyprinidae	Cardinal Shiner	*Luxilus*	*cardinalis*	26	0	131	1	45			0
Cyprinidae	Carmine Shiner	*Notropis*	*percobromus*	0	0	0	0	0			0
Cyprinidae	Central Stoneroller	*Campostoma*	*anomalum*	47	1	5	76	9			0
Cyprinidae	Common Carp	*Cyprinus*	*carpio*	0	0	0	0	0			0
Cyprinidae	Common Shiner	*Luxilus*	*cornutus*	0	0	0	0	0			0
Cyprinidae	Creek Chub	*Semotilus*	*atromaculatus*	1	0	0	21	3			0
Cyprinidae	Fathead Minnow	*Pimephales*	*promelas*	0	0	0	0	1			0

Appendix 1. Species list and numbers caught in retained reaches. Blanks indicate reach was not sampled that year, cont

Family	Common Name	Genus	Species	2001	2002	2003	2004	2005	2006	2007	2008
Cyprinidae	Mimic Shiner	*Notropis*	*volucellus*	0	0	0	0	0			0
Cyprinidae	Non-carp minnow spp.	*Cyprinidae*	*spp.*	0	0	0	0	0			0
Cyprinidae	Notropis spp.	*Notropis*	*spp.*	0	0	0	0	0			0
Cyprinidae	Red Shiner	*Cyprinella*	*lutrensis*	103	0	1	0	5			3
Cyprinidae	Redfin Shiner	*Lythrurus*	*umbratilis*	3	4	6	50	68			0
Cyprinidae	Sand Shiner	*Notropis*	*stramineus*	81	0	0	0	4			5
Cyprinidae	Slim Minnow	*Pimephales*	*tenellus*	0	0	0	0	0			0
Cyprinidae	Suckermouth Minnow	*Phenacobius*	*mirabilis*	0	0	0	0	0			0
Cyprinidae	Topeka Shiner	*Notropis*	*topeka*	0	0	0	0	0			0
Fundulidae	Blackstripe Topminnow	*Fundulus*	*notatus*	0	0	0	0	0			0
Ictaluridae	Black Bullhead	*Ameiurus*	*melas*	0	0	0	0	0			0
Ictaluridae	Channel Catfish	*Ictalurus*	*punctatus*	0	0	0	0	0			0
Ictaluridae	Stonecat	*Noturus*	*flavus*	0	0	0	0	0			0
Ictaluridae	Yellow Bullhead	*Ameiurus*	*natalis*	1	0	0	0	3			0
Percidae	Johnny Darter	*Etheostoma*	*nigrum*	0	0	0	0	0			0
Percidae	Logperch	*Percina*	*caprodes*	0	0	0	0	0			0
Percidae	Orangethroat Darter	*Etheostoma*	*spectabile*	25	0	1	20	13			2
Poeciliidae	Mosquitofish	*Gambusia*	*affinis*	0	0	0	0	0			0
TOTAL				325	6	159	190	325			18
		23 middle									
Atherinidae	Brook Silverside	*Labidesthes*	*sicculus*	0	0	0	0	0	0	0	0
Catostomidae	Golden Redhorse	*Moxostoma*	*erythrurum*	0	0	0	0	0	0	0	0
Catostomidae	Spotted Sucker	*Minytrema*	*melanops*	0	0	0	0	0	0	0	0
Catostomidae	White Sucker	*Catostomus*	*commersoni*	0	0	0	0	0	0	0	0
Centrarchidae	Bluegill	*Lepomis*	*macrochirus*	2	2	0	8	9	16	1	0
Centrarchidae	Green Sunfish	*Lepomis*	*cyanellus*	95	63	44	49	16	49	311	5
Centrarchidae	Largemouth Bass	*Micropterus*	*salmoides*	0	0	0	0	2	2	0	4
Centrarchidae	Longear Sunfish	*Lepomis*	*megalotis*	0	6	1	0	0	0	0	0
Centrarchidae	Orangespotted Sunfish	*Lepomis*	*humilis*	0	36	0	18	21	0	0	0
Centrarchidae	Spotted Bass	*Micropterus*	*punctulatus*	0	0	0	0	0	0	0	0
Cyprinidae	Bluntnose Minnow	*Pimephales*	*notatus*	0	0	0	21	3	3	0	2
Cyprinidae	Cardinal Shiner	*Luxilus*	*cardinalis*	6	0	0	0	0	0	0	0
Cyprinidae	Carmine Shiner	*Notropis*	*percobromus*	0	0	0	0	0	0	0	0
Cyprinidae	Central Stoneroller	*Campostoma*	*anomalum*	42	69	21	316	8	33	26	5
Cyprinidae	Common Carp	*Cyprinus*	*carpio*	0	0	0	0	0	0	0	0
Cyprinidae	Common Shiner	*Luxilus*	*cornutus*	0	0	0	0	0	0	0	0
Cyprinidae	Creek Chub	*Semotilus*	*atromaculatus*	0	21	16	91	0	35	10	3
Cyprinidae	Fathead Minnow	*Pimephales*	*promelas*	12	0	0	5	0	0	0	0
Cyprinidae	Golden Shiner	*Notemigonus*	*crysoleucas*	0	10	4	6	0	0	1	5
Cyprinidae	Mimic Shiner	*Notropis*	*volucellus*	0	0	0	0	0	0	0	0
Cyprinidae	Non-carp minnow spp.	*Cyprinidae*	*spp.*	0	0	0	0	0	0	0	0
Cyprinidae	Notropis spp.	*Notropis*	*spp.*	0	0	0	0	0	0	1	0
Cyprinidae	Red Shiner	*Cyprinella*	*lutrensis*	160	0	0	17	0	0	0	0
Cyprinidae	Redfin Shiner	*Lythrurus*	*umbratilis*	22	166	45	164	3	0	0	18
Cyprinidae	Sand Shiner	*Notropis*	*stramineus*	23	0	0	0	0	0	0	0
Cyprinidae	Slim Minnow	*Pimephales*	*tenellus*	0	0	0	0	0	0	0	0
Cyprinidae	Suckermouth Minnow	*Phenacobius*	*mirabilis*	0	0	0	0	0	0	0	0
Cyprinidae	Topeka Shiner	*Notropis*	*topeka*	7	62	15	20	3	10	8	1
Fundulidae	Blackstripe Topminnow	*Fundulus*	*notatus*	0	0	0	0	0	0	0	0

Appendix 1. Species list and numbers caught in retained reaches. Blanks indicate reach was not sampled that year, cont

Family	Common Name	Genus	Species	2001	2002	2003	2004	2005	2006	2007	2008
Ictaluridae	Black Bullhead	*Ameiurus*	*melas*	0	1	0	1	0	1	8	0
Ictaluridae	Channel Catfish	*Ictalurus*	*punctatus*	0	0	0	0	0	0	0	0
Ictaluridae	Stonecat	*Noturus*	*flavus*	0	0	0	0	0	0	0	0
Ictaluridae	Yellow Bullhead	*Ameiurus*	*natalis*	1	0	0	0	0	1	0	0
Percidae	Johnny Darter	*Etheostoma*	*nigrum*	0	0	0	0	0	0	0	0
Percidae	Logperch	*Percina*	*caprodes*	0	0	0	0	0	0	0	0
Percidae	Orangethroat Darter	*Etheostoma*	*spectabile*	24	20	1	127	1	36	7	0
Poeciliidae	Mosquitofish	*Gambusia*	*affinis*	0	0	0	0	0	0	0	0
TOTAL				394	456	147	843	66	186	373	43
		24 lower									
Atherinidae	Brook Silverside	*Labidesthes*	*sicculus*	3	27	7	0	0		0	2
Catostomidae	Golden Redhorse	*Moxostoma*	*erythrurum*	0	0	1	5	12		0	1
Catostomidae	Spotted Sucker	*Minytrema*	*melanops*	1	0	15	0	0		0	0
Catostomidae	Bluegill	*Catostomus*	*commersoni*	0	0	0	0	0		0	0
Centrarchidae	Green Sunfish	*Lepomis*	*macrochirus*	1	16	48	1	32		0	0
Centrarchidae	Largemouth Bass	*Lepomis*	*cyanellus*	27	18	5	14	18		4	3
Centrarchidae	Longear Sunfish	*Micropterus*	*salmoides*	0	0	2	1	3		0	0
Centrarchidae	Orangespotted Sunfish	*Lepomis*	*megalotis*	6	2	7	1	2		0	3
Centrarchidae	Spotted Bass	*Lepomis*	*humilis*	1	0	4	11	104		2	4
Centrarchidae	Bluntnose Minnow	*Micropterus*	*punctulatus*	0	0	0	0	0		0	0
Cyprinidae	Cardinal Shiner	*Pimephales*	*notatus*	157	64	48	60	24		3	6
Cyprinidae	Carmine Shiner	*Luxilus*	*cardinalis*	2	14	0	6	0		0	2
Cyprinidae	Central Stoneroller	*Notropis*	*percobromus*	0	0	0	0	0		0	0
Cyprinidae	Common Carp	*Campostoma*	*anomalum*	16	25	0	49	17		154	115
Cyprinidae	Common Shiner	*Cyprinus*	*carpio*	1	0	0	0	0		0	0
Cyprinidae	Creek Chub	*Luxilus*	*cornutus*	0	0	0	0	0		0	0
Cyprinidae	Fathead Minnow	*Semotilus*	*atromaculatus*	0	11	1	4	6		5	28
Cyprinidae	Golden Shiner	*Pimephales*	*promelas*	54	0	0	8	7		4	3
Cyprinidae	Mimic Shiner	*Notemigonus*	*crysoleucas*	0	1	0	0	0		0	0
Cyprinidae	Non-carp minnow spp.	*Notropis*	*volucellus*	0	0	0	0	0		0	0
Cyprinidae	Notropis spp.	*Cyprinidae*	*spp.*	0	0	0	0	0		0	0
Cyprinidae	Red Shiner	*Notropis*	*spp.*	0	0	0	0	0		0	0
Cyprinidae	Redfin Shiner	*Cyprinella*	*lutrensis*	123	82	2	80	3		2	3
Cyprinidae	Sand Shiner	*Lythrurus*	*umbratilis*	0	368	15	60	51		2	23
Cyprinidae	Slim Minnow	*Notropis*	*stramineus*	0	0	0	0	0		0	0
Cyprinidae	Suckermouth Minnow	*Pimephales*	*tenellus*	0	0	0	0	0		0	0
Cyprinidae	Topeka Shiner	*Phenacobius*	*mirabilis*	0	0	0	8	0		0	0
Cyprinidae	Blackstripe Topminnow	*Notropis*	*topeka*	0	0	0	0	0		0	0
Fundulidae	Black Bullhead	*Fundulus*	*notatus*	6	8	21	5	9		4	4
Ictaluridae	Channel Catfish	*Ameiurus*	*melas*	0	0	0	0	0		0	0
Ictaluridae	Stonecat	*Ictalurus*	*punctatus*	0	0	0	0	1		0	0
Ictaluridae	Yellow Bullhead	*Noturus*	*flavus*	0	0	0	0	0		0	0
Ictaluridae	Johnny Darter	*Ameiurus*	*natalis*	1	0	0	0	1		0	0
Percidae	Logperch	*Etheostoma*	*nigrum*	0	0	0	0	0		0	0
Percidae	Orangethroat Darter	*Percina*	*caprodes*	0	0	0	0	0		0	0
Percidae	Mosquitofish	*Etheostoma*	*spectabile*	1	10	9	47	15		4	47
Poeciliidae	Mosquitofish	*Gambusia*	*affinis*	0	10	27	18	47		16	3
TOTAL				400	656	212	378	352		200	247

Appendix 1. Species list and numbers caught in retained reaches. Blanks indicate reach was not sampled that year, cont

Family	Common Name	Genus	Species	2001	2002	2003	2004	2005	2006	2007	2008
		34 lower									
Atherinidae	Brook Silverside	*Labidesthes*	*sicculus*	0	0	0	0	0	0	0	0
Catostomidae	Golden Redhorse	*Moxostoma*	*erythrurum*	0	2	0	0	0	0	0	0
Catostomidae	Spotted Sucker	*Minytrema*	*melanops*	0	0	0	0	0	0	0	0
Catostomidae	White Sucker	*Catostomus*	*commersoni*	0	0	0	0	0	0	0	0
Centrarchidae	Bluegill	*Lepomis*	*macrochirus*	0	0	0	0	0	0	0	0
Centrarchidae	Green Sunfish	*Lepomis*	*cyanellus*	0	0	0	4	1	12	55	4
Centrarchidae	Largemouth Bass	*Micropterus*	*salmoides*	0	0	0	0	0	0	0	0
Centrarchidae	Longear Sunfish	*Lepomis*	*megalotis*	0	0	1	0	0	0	0	0
Centrarchidae	Orangespotted Sunfish	*Lepomis*	*humilis*	0	0	0	5	3	6	0	0
Centrarchidae	Spotted Bass	*Micropterus*	*punctulatus*	0	0	0	0	0	0	0	0
Cyprinidae	Bluntnose Minnow	*Pimephales*	*notatus*	0	0	0	1	0	0	0	0
Cyprinidae	Cardinal Shiner	*Luxilus*	*cardinalis*	44	122	8	10	5	19	168	65
Cyprinidae	Carmine Shiner	*Notropis*	*percobromus*	0	0	0	0	0	0	0	0
Cyprinidae	Central Stoneroller	*Campostoma*	*anomalum*	39	524	76	550	229	687	290	44
Cyprinidae	Common Carp	*Cyprinus*	*carpio*	0	0	0	0	0	0	0	0
Cyprinidae	Common Shiner	*Luxilus*	*cornutus*	0	0	0	0	0	0	0	0
Cyprinidae	Creek Chub	*Semotilus*	*atromaculatus*	6	151	64	312	12	67	15	13
Cyprinidae	Fathead Minnow	*Pimephales*	*promelas*	0	0	0	0	0	0	0	0
Cyprinidae	Golden Shiner	*Notemigonus*	*crysoleucas*	0	0	0	0	0	0	0	0
Cyprinidae	Mimic Shiner	*Notropis*	*volucellus*	0	0	0	0	0	0	0	0
Cyprinidae	Non-carp minnow spp.	*Cyprinidae*	*spp.*	0	0	0	0	0	0	0	0
Cyprinidae	Notropis spp.	*Notropis*	*spp.*	0	0	0	0	0	0	0	0
Cyprinidae	Red Shiner	*Cyprinella*	*lutrensis*	0	0	0	0	1	0	1	0
Cyprinidae	Redfin Shiner	*Lythrurus*	*umbratilis*	0	0	1	0	0	0	0	0
Cyprinidae	Sand Shiner	*Notropis*	*stramineus*	0	0	0	0	0	0	0	0
Cyprinidae	Slim Minnow	*Pimephales*	*tenellus*	0	0	0	0	0	0	0	0
Cyprinidae	Suckermouth Minnow	*Phenacobius*	*mirabilis*	0	0	0	0	0	0	0	0
Cyprinidae	Topeka Shiner	*Notropis*	*topeka*	0	0	0	0	0	0	0	0
Fundulidae	Blackstripe Topminnow	*Fundulus*	*notatus*	0	0	0	0	0	0	0	0
Ictaluridae	Black Bullhead	*Ameiurus*	*melas*	0	0	0	0	0	0	0	0
Ictaluridae	Channel Catfish	*Ictalurus*	*punctatus*	0	0	0	0	0	0	0	0
Ictaluridae	Stonecat	*Noturus*	*flavus*	0	0	0	0	0	0	0	0
Ictaluridae	Yellow Bullhead	*Ameiurus*	*natalis*	0	0	0	0	0	0	0	0
Percidae	Johnny Darter	*Etheostoma*	*nigrum*	0	0	0	0	0	0	0	0
Percidae	Logperch	*Percina*	*caprodes*	0	0	0	0	0	0	0	0
Percidae	Orangethroat Darter	*Etheostoma*	*spectabile*	42	25	63	157	119	116	30	26
Poeciliidae	Mosquitofish	*Gambusia*	*affinis*	0	0	0	0	0	0	0	0
TOTAL				131	824	213	1039	370	907	559	152
		35 lower									
Atherinidae	Brook Silverside	*Labidesthes*	*sicculus*						27	0	0
Catostomidae	Golden Redhorse	*Moxostoma*	*erythrurum*						32	9	0
Catostomidae	Spotted Sucker	*Minytrema*	*melanops*						1	0	0
Catostomidae	White Sucker	*Catostomus*	*commersoni*						0	0	0
Centrarchidae	Bluegill	*Lepomis*	*macrochirus*						9	7	0
Centrarchidae	Green Sunfish	*Lepomis*	*cyanellus*						71	7	1
Centrarchidae	Largemouth Bass	*Micropterus*	*salmoides*						3	8	3
Centrarchidae	Longear Sunfish	*Lepomis*	*megalotis*						142	33	4
Centrarchidae	Orangespotted Sunfish	*Lepomis*	*humilis*						19	22	0

Appendix 1. Species list and numbers caught in retained reaches. Blanks indicate reach was not sampled that year, cont

Family	Common Name	Genus	Species	2001	2002	2003	2004	2005	2006	2007	2008
Centrarchidae	Spotted Bass	*Micropterus*	*punctulatus*						3	0	0
Cyprinidae	Bluntnose Minnow	*Pimephales*	*notatus*						680	35	12
Cyprinidae	Cardinal Shiner	*Luxilus*	*cardinalis*						430	137	104
Cyprinidae	Carmine Shiner	*Notropis*	*percobromus*						0	0	0
Cyprinidae	Central Stoneroller	*Campostoma*	*anomalum*						82	60	20
Cyprinidae	Common Carp	*Cyprinus*	*carpio*						0	0	0
Cyprinidae	Common Shiner	*Luxilus*	*cornutus*						0	0	1
Cyprinidae	Creek Chub	*Semotilus*	*atromaculatus*						12	2	0
Cyprinidae	Fathead Minnow	*Pimephales*	*promelas*						0	0	0
Cyprinidae	Golden Shiner	*Notemigonus*	*crysoleucas*						0	0	0
Cyprinidae	Mimic Shiner	*Notropis*	*volucellus*						69	0	19
Cyprinidae	Non-carp minnow spp.	*Cyprinidae*	*spp.*						0	0	0
Cyprinidae	Notropis spp.	*Notropis*	*spp.*						0	0	0
Cyprinidae	Red Shiner	*Cyprinella*	*lutrensis*						30	10	16
Cyprinidae	Redfin Shiner	*Lythrurus*	*umbratilis*						191	16	13
Cyprinidae	Sand Shiner	*Notropis*	*stramineus*						10	0	2
Cyprinidae	Slim Minnow	*Pimephales*	*tenellus*						0	0	0
Cyprinidae	Suckermouth Minnow	*Phenacobius*	*mirabilis*						3	0	0
Cyprinidae	Topeka Shiner	*Notropis*	*topeka*						0	0	0
Fundulidae	Blackstripe Topminnow	*Fundulus*	*notatus*						19	4	5
Ictaluridae	Black Bullhead	*Ameiurus*	*melas*						0	0	0
Ictaluridae	Channel Catfish	*Ictalurus*	*punctatus*						0	0	1
Ictaluridae	Stonecat	*Noturus*	*flavus*						0	1	1
Ictaluridae	Yellow Bullhead	*Ameiurus*	*natalis*						0	0	0
Percidae	Johnny Darter	*Etheostoma*	*nigrum*						0	0	0
Percidae	Logperch	*Percina*	*caprodes*						2	1	0
Percidae	Orangethroat Darter	*Etheostoma*	*spectabile*						14	33	78
Poeciliidae	Mosquitofish	*Gambusia*	*affinis*						193	20	0
TOTAL									2042	405	280
		36 middle									
Atherinidae	Brook Silverside	*Labidesthes*	*sicculus*	0	0	0	0	0	0	0	0
Catostomidae	Golden Redhorse	*Moxostoma*	*erythrurum*	0	2	6	10	0	1	2	0
Catostomidae	Spotted Sucker	*Minytrema*	*melanops*	0	0	0	0	0	0	0	0
Catostomidae	White Sucker	*Catostomus*	*commersoni*	0	0	0	0	0	0	0	0
Centrarchidae	Bluegill	*Lepomis*	*macrochirus*	0	0	0	0	0	0	0	0
Centrarchidae	Green Sunfish	*Lepomis*	*cyanellus*	36	78	64	15	20	323	66	3
Centrarchidae	Largemouth Bass	*Micropterus*	*salmoides*	0	0	0	1	0	3	1	0
Centrarchidae	Longear Sunfish	*Lepomis*	*megalotis*	0	1	24	8	0	14	43	0
Centrarchidae	Orangespotted Sunfish	*Lepomis*	*humilis*	0	27	28	17	6	9	3	0
Centrarchidae	Spotted Bass	*Micropterus*	*punctulatus*	0	0	0	0	0	0	0	0
Cyprinidae	Bluntnose Minnow	*Pimephales*	*notatus*	0	18	14	4	3	27	19	7
Cyprinidae	Cardinal Shiner	*Luxilus*	*cardinalis*	244	168	47	30	37	271	506	92
Cyprinidae	Carmine Shiner	*Notropis*	*percobromus*	0	0	0	0	6	0	0	0
Cyprinidae	Central Stoneroller	*Campostoma*	*anomalum*	190	372	111	29	89	673	514	44
Cyprinidae	Common Carp	*Cyprinus*	*carpio*	0	0	0	0	0	0	0	0
Cyprinidae	Common Shiner	*Luxilus*	*cornutus*	0	0	0	0	0	0	0	0
Cyprinidae	Creek Chub	*Semotilus*	*atromaculatus*	63	80	21	30	5	19	12	8
Cyprinidae	Fathead Minnow	*Pimephales*	*promelas*	0	0	0	0	0	0	0	0

Appendix 1. Species list and numbers caught in retained reaches. Blanks indicate reach was not sampled that year, cont

Family	Common Name	Genus	Species	2001	2002	2003	2004	2005	2006	2007	
Cyprinidae	Golden Shiner	*Notemigonus*	*crysoleucas*	0	0	0	0	0	0	1	0
Cyprinidae	Mimic Shiner	*Notropis*	*volucellus*	0	0	0	0	0	0	0	0
Cyprinidae	Non-carp minnow spp.	*Cyprinidae*	*spp.*	0	0	0	0	0	0	0	0
Cyprinidae	Notropis spp.	*Notropis*	*spp.*	0	0	0	0	0	0	0	0
Cyprinidae	Red Shiner	*Cyprinella*	*lutrensis*	8	1	0	0	0	0	0	0
Cyprinidae	Redfin Shiner	*Lythrurus*	*umbratilis*	0	45	167	10	0	0	9	4
Cyprinidae	Sand Shiner	*Notropis*	*stramineus*	0	0	0	0	0	0	0	0
Cyprinidae	Slim Minnow	*Pimephales*	*tenellus*	23	0	0	0	0	0	0	0
Cyprinidae	Suckermouth Minnow	*Phenacobius*	*mirabilis*	0	0	0	0	0	0	0	0
Cyprinidae	Topeka Shiner	*Notropis*	*topeka*	0	0	0	0	0	0	0	0
Fundulidae	Blackstripe Topminnow	*Fundulus*	*notatus*	0	0	0	0	0	0	0	0
Ictaluridae	Black Bullhead	*Ameiurus*	*melas*	0	0	0	0	0	0	0	0
Ictaluridae	Channel Catfish	*Ictalurus*	*punctatus*	0	0	0	0	0	0	0	0
Ictaluridae	Stonecat	*Noturus*	*flavus*	0	0	0	0	0	0	0	0
Ictaluridae	Yellow Bullhead	*Ameiurus*	*natalis*	0	1	0	0	1	2	1	0
Percidae	Johnny Darter	*Etheostoma*	*nigrum*	0	0	0	0	0	0	0	0
Percidae	Logperch	*Percina*	*caprodes*	0	0	0	0	0	0	0	0
Percidae	Orangethroat Darter	*Etheostoma*	*spectabile*	18	90	18	34	43	108	12	35
Poeciliidae	Mosquitofish	*Gambusia*	*affinis*	0	0	0	0	0	0	0	0
TOTAL				582	883	500	188	210	1450	1189	193

Appendix 2. Best multiple linear regression models for species richness by year, as determined by the AIC criteria. For each year, models are ranked by increasing number of predictor variables; within the suite of models with the same number of predictor variables, models with higher R^2 values are presented first. The response variable in the models is log(richness).

Year	Model	R^2	N
2001 [A]	0.90818 + 0.057128(Width) - 0.023885(Water temperature)	0.282	45
2002 [B]	0.059185 + 0.38161(log[Depth])	0.086	50
2003	- 0.34096 - 0.82957(log[Length]) + 1.07929(log[Area])	0.450	57
	0.27729 - 0.025249 (Water temperature) - 0.75655(log[Length]) + 0.94540(log[Area])	0.474	
	0.03436 - 0.011371(Air temperature) - 0.80371(log[Length]) + 1.01420(log[Area])	0.459	
	0.21077 - 0.054243(Width) - 0.025333(Water temperature) - 1.29081(log[Length]) + 1.46546(log[Area])	0.480	
2004	-0.75325 + 0.049646(Water temperature) + 0.66335(log[Length])	0.464	55
	-0.50091 + 0.040042(Water temperature) - 0.001048844(Turbidity) + 0.62966(log[Length])	0.487	
	-0.57157 + 0.042699(Water temperature) - 0.001208834(Turbidity) + 0.45485(log[Length]) + 0.14079(log[Area])	0.493	
2005	0.30174 + 0.27792(log[Area])	0.197	59
	0.33971 + 0.37182(log[Length])	0.183	

Appendix 2. Best multiple linear regression models for species richness by year, as determined by the AIC criteria. For each year, models are ranked by increasing number of predictor variables; within the suite of models with the same number of predictor variables, models with higher R^2 values are presented first. The response variable in the models is log(richness), cont.

Year	Model	R^2	N
2006	0.32851 + 0.29038(log[Area])	0.364	20
	0.39590 + 0.36891(log[Length])	0.330	
	0.47363 + 0.09510(Width)	0.314	
	0.34494 + 0.05570 (Width) + 0.23570(log[Length])	0.394	
	0.33781 + 0.03355(Width) + 0.21242(log[Area])	0.377	
	0.49104 + 0.22961(Width) + 1.57771(log[Length]) - 1.37442(log[Area])	0.442	
2007	0.12727 + 0.47672(log[Area])	0.440	40
	0.06503 + 0.09264(log[Depth]) + 0.43297(log[Area])	0.448	
2008	-0.04627 + 0.46920(log[Area])	0.273	58
	-0.12482 + 0.13805(log[Depth]) + 0.38396 (log[Area])	0.286	
	0.15781 - 0.010821(Water temperature) + 0.47005(log[Area])	0.283	
	0.56423 - 0.078411(pH) + 0.47182(log[Area])	0.280	
	0.04996 - 0.005526(Air temperature) + 0.48160(log[Area])	0.279	
	0.02209 - 0.011346(Air temperature) + 0.22712(log[Depth]) + 0.35443(log[Area])	0.307	
	0.14376 - 0.015905(Water temperature) + 0.19319(log[Depth]) + 0.35116(log[Area])	0.306	

[A] In 2001, no data were available for conductivity, specific conductance, or pH.

[B] In 2002, no data were available for specific conductance.

Appendix 3. Best multiple linear regression models for diversity (1-SI) by year, as determined by the AIC criteria. For each year, models are ranked by increasing number of predictor variables; within the suite of models with the same number of predictor variables, models with higher R^2 values are presented first.

Year	Model	R^2	N
2001 [A]	0.34811 + 0.050376(Width)	0.116	45
2002 [B]	[C]		
2003	-0.42654 - 0.88098(log[Length]) + 1.07638(log[Area])	0.392	57
	-0.33621 + 0.07447(Width) + 0.26762(log[Area])	0.371	
2004	0.36884 - 0.001651105(Turbidity) + 0.32262(log[Length])	0.216	55
2005	[C]		
2006	0.84444 - 0.000582851(Specific conductance)	0.509	20
	0.83879 - 0.000430135(Conductivity)	0.498	
2007	0.16194 + 0.38774(log[Length])	0.168	40
	0.19519 + 0.24232(log[Area])	0.165	
	0.31670 + 0.06917(Width)	0.134	
	0.16573 + 0.03508(Width) + 0.28133(log[Length])	0.190	
	0.16188 + 0.22308(log[Length]) + 0.11484(log[Area])	0.175	
	0.18310 + 0.19141(Width) + 1.19275(log[Length]) - 0.96643(log[Area])	0.231	

Appendix 3. Best multiple linear regression models for diversity (1-SI) by year, as determined by the AIC criteria. For each year, models are ranked by increasing number of predictor variables; within the suite of models with the same number of predictor variables, models with higher R^2 values are presented first, cont.

Year	Model	R^2	N
2008	- 0.14143 + 0.46131(log[Area])	0.209	58
	1.44459 - 0.20370(pH) + 0.46813(log[Area])	0.247	
	- 0.21260 - 0.060372(Width) + 0.64075(log[Area])	0.222	
	1.31030 - 0.051402(Width) - 0.19424(pH) + 0.62060(log[Area])	0.256	

[A] In 2001, no data were available for conductivity, specific conductance, or pH.

[B] In 2002, no data were available for specific conductance.

[C] No predictor variables were significant in individual regression pre-screening.

Appendix 4. Best multiple linear regression models for catch per area by year, as determined by the AIC criteria. For each year, models are ranked by increasing number of predictor variables; within the suite of models with the same number of predictor variables, models with higher R^2 values are presented first. The response variable in the models is log(CPA).

Year	Model	R^2	N
2001[A]	0.75262 - 0.28364(log[Area])	0.216	45
	0.76715 - 0.42532(log[Length])	0.216	
	0.95264 - 0.034691(Dissolved oxygen) - 0.24405(log[Area])	0.263	
	0.92044 - 0.029967(Dissolved oxygen) - 0.35891(log[Length])	0.249	
2002[B]	0.72543 - 0.32275(log[Length])	0.137	50
	0.73684 - 0.22509(log[Area])	0.135	
	0.72611 - 0.019314(Width) - 0.26021(log[Length])	0.145	
2003	0.51577 - 0.020131(Water temperature)	0.111	57
2004	0.67662 + 0.040368(Water temperature) - 0.59961(log[Depth])	0.305	55
	-1.39665 + 0.033151 (Water temperature) + 0.27148(pH) - 0.56219(log[Depth])	0.335	
	-1.41651 + 0.016517(Width) + 0.028791(Water temperature) + 0.28168(pH) - 0.51898(log[Depth])	0.340	
	-1.50959 - 0.006774888(Air temperature) + 0.043246(Water temperature) + 0.28257(pH) - 0.55970(log[Depth])	0.340	
2005	0.69981 - 0.26755(log[Depth])	0.090	59

Appendix 4. Best multiple linear regression models for catch per area by year, as determined by the AIC criteria. For each year, models are ranked by increasing number of predictor variables; within the suite of models with the same number of predictor variables, models with higher R^2 values are presented first. The response variable in the models is log(CPA), cont.

Year	Model	R^2	N
2006	[C]		
2007	-0.046292 + 0.028546(Air temperature)	0.194	40
2008	[C]		

[A] In 2001, no data were available for conductivity, specific conductance, or pH.

[B] In 2002, no data were available for specific conductance.

[C] No predictor variables were significant in individual regression pre-screening.

Appendix 5. Average in-stream habitat parameters collected at retained reaches in 2001-2008. NS indicates the reach was not sampled in that year. A blank indicates that the parameter was not collected for that reach.

Reach	2001	2002	2003	2004	2005	2006	2007	2008
				Width (m)				
1 lower	4.1	4.2	4.7	3.9	4.5	NS	3.3	4.0
1 middle	3.0	2.9	2.9	3.1	2.7	NS	1.5	2.6
2 lower	4.2	4.8	3.1	4.8	3.8	NS	NS	3.1
4 middle	2.8	2.8	4.7	2.3	2.6	NS	1.9	2.7
10 middle	2.4	2.6	3.0	2.1	2.4	NS	1.4	2.6
12 middle	NS	3.7	4.7	3.5	3.3	2.7	NS	4.0
17 upper	NS	2.1	2.2	2.6	1.4	NS	1.9	2.1
22 lower	2.8	5.8	5.1	4.8	3.8	NS	NS	2.6
23 middle	3.5	2.6	3.8	3.5	3.8	2.0	2.3	3.6
24 lower	4.3	3.9	4.7	2.0	4.2	NS	2.0	2.2
34 lower	3.7	4.6	4.4	4.8	4.2	4.2	2.8	2.8
35 lower	NS	NS	NS	NS	NS	5.0	3.0	3.2
36 middle	5.6	5.9	5.5	5.0	3.7	4.1	3.5	3.1
				Length (m)				
1 lower	12.2	12.3	12.3	10.8	14.0	NS	6.3	12.5
1 middle	20.4	13.5	15.3	10.9	17.6	NS	4.1	8.9
2 lower	16.9	5.6	11.0	6.6	15.4	NS	NS	9.4
4 middle	13.5	11.1	11.9	10.0	11.2	NS	9.9	8.1
10 middle	13.1	14.1	9.6	8.3	9.4	NS	7.3	9.9
12 middle	NS	22.9	10.1	17.1	11.6	6.4	NS	8.5
17 upper	NS	6.8	5.2	6.5	5.6	NS	3.1	4.1
22 lower	15.3	30.6	22.3	20.2	28.7	NS	NS	7.2
23 middle	14.9	12.0	16.0	17.1	14.6	10.2	9.1	11.4
24 lower	29.9	40.6	35.9	11.9	22.3	NS	3.9	10.3
34 lower	17.5	17.6	18.1	12.6	15.9	23.3	11.7	8.6
35 lower	NS	NS	NS	NS	NS	22.6	8.8	9.9
36 middle	28.2	28.7	21.8	17.7	21.1	36.4	12.7	13.1
				Area (m^2)				
1 lower	55.4	52.9	57.9	43.3	61.1	NS	24.3	50.6
1 middle	65.9	41.4	44.7	36.1	50.2	NS	7.6	23.3
2 lower	59.8	26.9	31.8	31.7	51.0	NS	NS	29.4
4 middle	37.6	31.5	47.1	26.1	31.0	NS	24.7	22.1
10 middle	38.7	40.7	29.2	17.7	24.9	NS	10.3	25.7
12 middle	NS	90.6	48.0	63.1	40.4	21.0	NS	35.1
17 upper	NS	13.5	11.3	16.6	8.2	NS	5.2	8.8
22 lower	47.5	186.4	118.4	88.2	123.8	NS	NS	20.6
23 middle	57.3	34.5	71.1	64.9	60.5	22.4	24.4	44.4
24 lower	162.5	168.9	193.0	25.2	106.3	NS	7.8	18.8
34 lower	68.4	84.9	81.9	60.4	67.3	104.4	37.7	27.5
35 lower	NS	NS	NS	NS	NS	110.8	26.6	32.4
36 middle	153.6	176.1	121.9	99.7	86.0	159.9	52.2	53.5
				Depth (cm)				
1 lower	32.2	44.8	34.2	39.4	44.0	NS	24.3	37.1
1 middle	48.6	39.0	39.2	45.0	49.6	NS	16.4	41.6
2 lower	73.3	75.0	70.8	91.0	67.0	NS	NS	36.5

Appendix 5. Average in-stream habitat parameters collected at retained reaches in 2001-2008. NS indicates the reach was not sampled in that year. A blank indicates that the parameter was not collected for that reach, cont.

Reach	2001	2002	2003	2004	2005	2006	2007	2008
4 middle	50.0	44.3	52.2	34.6	49.4	NS	13.0	34.6
10 middle	22.4	34.0	33.0	25.6	32.0	NS	8.9	24.9
12 middle	NS	58.0	67.2	61.4	62.2	40.3	NS	41.3
17 upper	NS	36.3	51.5	38.6	35.0	NS	25.4	32.3
22 lower	24.0	42.0	48.0	40.0	37.2	NS	NS	20.9
23 middle	32.5	31.7	39.8	41.5	58.0	23.7	29.6	47.0
24 lower	54.0	47.8	43.2	23.2	50.4	NS	34.8	37.4
34 lower	24.8	24.0	17.4	26.6	28.8	17.2	16.5	16.0
35 lower	NS	NS	NS	NS	NS	45.2	22.0	29.9
36 middle	43.2	94.2	39.4	50.6	55.6	51.4	29.1	24.7
				Velocity (m/s)				
1 lower						NS	0.000	0.007
1 middle						NS	0.000	0.009
2 lower						NS	NS	0.000
4 middle						NS	0.000	0.002
10 middle						NS	0.000	0.002
12 middle						0.000	NS	0.000
17 upper						NS	0.000	0.000
22 lower						NS	NS	0.000
23 middle						0.000	0.000	0.003
24 lower						NS	0.000	0.052
34 lower						0.000	0.031	0.043
35 lower						0.000	0.062	0.087
36 middle						0.000	0.011	0.038

Appendix 6. Average water quality parameters and air temperature for retained reaches sampled in 2001-2008. NS indicates the reach was not sampled in that year. A blank indicates that the parameter was not collected for that reach.

Reach	2001	2002	2003	2004	2005	2006	2007	2008
				Water Temperature (^{o}C)				
1 lower	20.7	18.3	17.8	17.3	20.2	NS	17.3	17.8
1 middle	24.8	17.3	18.7	16.3	20.1	NS	21.6	20.9
2 lower	23.1	21.8	20.7	19.8	25.9	NS	NS	22.5
4 middle	23.1	17.4	18.4	20.6	26.2	NS	26.7	24.0
10 middle	17.1	16.8	21.7	16.8	20.2	NS	17.1	18.8
12 middle	NS	18.1	19.6	15.5	23.9	19.4	NS	18.1
17 upper	NS	25.2	18.6	15.1	20.1	NS	19.2	17.8
22 lower	13.9	16.0	16.3	12.5	24.3	NS	NS	17.7
23 middle	17.3	21.4	22.0	19.5	19.6	13.0	16.4	21.4
24 lower	22.9	17.2	16.8	17.9	19.8	NS	18.0	16.8
34 lower	17.3	23.0	18.2	13.9	19.1	15.6	19.3	16.5
35 lower	NS	NS	NS	NS	NS	20.1	18.4	16.4
36 middle	16.2	19.9	14.5	13.7	20.5	13.8	19.1	17.5
				Air Temperature (^{o}C)				
1 lower	20.8	21.9	23.6	26.4	20.4	NS	24.5	22.0
1 middle	31.7	17.3	25.8	18.6	17.6	NS	28.3	25.0
2 lower	31.8	21.0	28.2	30.0	33.2	NS	NS	25.6
4 middle	30.3	14.7	25.0	26.2	33.4	NS	27.0	24.0
10 middle	21.4	13.8	29.0	17.2	23.0	NS	20.8	20.0
12 middle	NS	20.8	27.0	17.0	32.0	29.6	NS	21.0
17 upper	NS	32.3	29.0	22.2	29.3	NS	15.7	20.7
22 lower	11.4	23.8	20.4	13.8	32.0	NS	NS	15.0
23 middle	19.5	23.3	30.0	27.8	16.0	18.0	18.5	27.0
24 lower	30.7	18.9	23.8	26.0	16.0	NS	29.1	20.5
34 lower	19.4	32.8	27.0	19.6	26.0	22.2	20.0	17.0
35 lower	NS	NS	NS	NS	NS	24.8	16.4	14.8
36 middle	16.4	27.8	21.6	16.0	22.0	15.0	18.8	17.0
				Turbidity (cm)				
1 lower	102.0	17.8	102.7	94.8	116.8	NS	83.0	120.0
1 middle	100.4	22.8	120.0	16.4	116.4	NS	38.5	109.3
2 lower	94.8	21.0	109.8	35.0	67.9	NS	NS	74.2
4 middle	50.4	44.7	95.6	37.8	63.8	NS	17.8	17.8
10 middle	87.6	17.0	120.0	13.0	120.0	NS	66.4	107.8
12 middle	NS	20.8	23.2	13.0	94.2	72.5	NS	42.0
17 upper	NS	24.8	107.5	101.4	120.0	NS	61.5	69.7
22 lower	62.6	16.8	34.2	72.0	116.0	NS	NS	54.8
23 middle	50.8	54.7	120.0	12.5	79.6	52.3	39.7	48.5
24 lower	20.5	16.8	94.0	34.0	54.6	NS	89.8	73.5
34 lower	120.0	92.8	120.0	120.0	120.0	120.0	111.6	99.2
35 lower	NS	NS	NS	NS	NS	60.0	96.6	50.8
36 middle	120.0	96.6	120.0	120.0	120.0	95.3	112.6	117.8
				Dissolved Oxygen (mg/L)				
1 lower	5.32	6.51	6.43	6.07	3.50	NS	4.04	5.23
1 middle	9.33	6.68	6.98	6.62	5.14	NS	5.90	6.37
2 lower	8.90	5.20	7.96	9.20	7.40	NS	NS	6.90

Appendix 6. Average water quality parameters and air temperature for retained reaches sampled in 2001-2008. NS indicates the reach was not sampled in that year. A blank indicates that the parameter was not collected for that reach, cont.

Reach	2001	2002	2003	2004	2005	2006	2007	2008
4 middle	6.47	6.17	6.29	9.40	7.58	NS	9.49	7.05
10 middle	7.55	5.99	7.14	5.79	4.98	NS	3.17	5.54
12 middle	NS	6.70	7.16	5.42	5.23	7.60	NS	5.72
17 upper	NS	5.74	5.40	5.65	4.90	NS	4.36	3.78
22 lower	7.45	6.72	7.53	6.99	6.74	NS	NS	6.99
23 middle	7.55	5.13	6.39	7.64	5.52	3.83	4.93	6.23
24 lower	7.70	6.77	7.02	8.69	6.14	NS	4.45	6.31
34 lower	9.30	9.32	8.52	7.50	6.78	5.89	9.24	8.28
35 lower	NS	NS	NS	NS	NS	6.92	5.17	7.31
36 middle	7.75	4.67	7.57	6.22	6.11	4.64	5.34	5.70
				Conductivity (uS/cm)				
1 lower		387.5	440.0	463.0	478.4	NS	549.0	475.4
1 middle		388.0	443.8	349.4	411.6	NS	657.0	512.8
2 lower		404.0	474.0	497.0	485.4	NS	NS	449.6
4 middle		484.0	463.2	498.2	470.8	NS	386.8	509.8
10 middle		363.6	460.2	364.6	502.4	NS	507.4	483.0
12 middle	NS	379.6	242.8	397.0	562.8	574.5	NS	499.3
17 upper	NS	610.3	529.5	491.6	548.0	NS	576.0	534.3
22 lower		265.8	330.6	409.2	483.0	NS	NS	390.6
23 middle		414.0	503.2	315.5	449.2	381.7	380.7	380.0
24 lower		405.4	464.4	414.4	468.6	NS	492.5	479.0
34 lower		584.4	543.4	557.2	572.6	965.4	759.0	537.7
35 lower	NS	NS	NS	NS	NS	512.0	470.0	381.6
36 middle		560.2	461.4	474.0	541.0	464.3	606.6	411.4
				Specific Conductance (uS/cm)				
1 lower			509.4	544.0	345.6	NS	414.0	557.0
1 middle			506.2	419.6	293.4	NS	467.7	564.8
2 lower			516.6	552.0	324.6	NS	NS	473.7
4 middle			526.2	544.8	343.4	NS	256.0	526.7
10 middle			521.4	430.0	363.6	NS	383.6	549.6
12 middle	NS		270.6	485.8	386.6	416.5	NS	521.3
17 upper	NS		602.0	607.0	395.5	NS	424.7	620.3
22 lower			397.2	537.4	330.4	NS	NS	454.9
23 middle			536.4	351.5	327.6	307.3	289.3	411.8
24 lower			550.2	479.4	341.0	NS	365.5	567.0
34 lower			617.8	708.0	419.6	731.2	555.6	643.4
35 lower	NS	NS	NS	NS	NS	366.0	346.4	459.3
36 middle			579.0	618.8	389.2	367.8	444.4	482.2
				pH				
1 lower		7.68	7.76	7.57	7.51	NS	7.36	7.61
1 middle		7.58	7.80	7.95	7.73	NS	7.50	7.74
2 lower		7.80	7.85	7.81	7.84	NS	NS	7.86
4 middle		7.03	7.82	8.02	7.60	NS	7.60	7.92
10 middle		7.55	7.63	7.84	7.47	NS	7.16	7.53
12 middle	NS	7.75	7.82	7.62	7.77	7.17	NS	7.61
17 upper	NS	7.55	7.31	7.76	7.45	NS	7.33	7.54
22 lower		7.96	7.57	7.71	7.77	NS	NS	8.07

Appendix 6. Average water quality parameters and air temperature for retained reaches sampled in 2001-2008. NS indicates the reach was not sampled in that year. A blank indicates that the parameter was not collected for that reach, cont.

Reach	2001	2002	2003	2004	2005	2006	2007	2008
23 middle		7.52	7.49	8.05	7.73	6.88	7.13	7.96
24 lower		7.82	7.85	8.19	7.94	NS	7.25	7.65
34 lower		7.92	7.72	7.98	7.82	7.50	7.47	8.15
35 lower	NS	NS	NS	NS	NS	7.29	7.11	7.93
36 middle		7.55	7.82	7.77	7.59	7.09	7.03	8.01

Appendix 7. Fish species and numbers collected in streams of Chase County, Kansas by the Stream Assessment and Monitoring Program of the Kansas Department of Wildlife and Parks (KDWP) from 1994-2007. Fish were collected with a combination of seining and electrofishing techniques. Data was provided by March Van Scoyoc of KDWP and Kristen Hase (formerly of KDWP, now employed by NPS).

Stream	Date	Common Name	Scientific Name	Catch
Bloody Creek	07/13/95	Golden Redhorse	*Moxostoma erythrurum*	19
Bloody Creek	07/13/95	Spotted Sucker	*Minytrema melanops*	1
Bloody Creek	07/13/95	Bluegill	*Lepomis macrochirus*	4
Bloody Creek	07/13/95	Green Sunfish	*Lepomis cyanellus*	21
Bloody Creek	07/13/95	Largemouth Bass	*Micropterus salmoides*	2
Bloody Creek	07/13/95	Longear Sunfish	*Lepomis megalotis*	25
Bloody Creek	07/13/95	Orangespotted Sunfish	*Lepomis humilis*	29
Bloody Creek	07/13/95	Spotted Bass	*Micropterus punctulatus*	1
Bloody Creek	07/13/95	Bluntface Shiner	*Cyprinella camura*	43
Bloody Creek	07/13/95	Bluntnose Minnow	*Pimephales notatus*	54
Bloody Creek	07/13/95	Cardinal Shiner	*Luxilus cardinalis*	534
Bloody Creek	07/13/95	Central Stoneroller	*Campostoma anomalum*	423
Bloody Creek	07/13/95	Creek Chub	*Semotilus atromaculatus*	4
Bloody Creek	07/13/95	Mimic Shiner	*Notropis volucellus*	12
Bloody Creek	07/13/95	Red Shiner	*Cyprinella lutrensis*	201
Bloody Creek	07/13/95	Redfin Shiner	*Lythrurus umbratilus*	122
Bloody Creek	07/13/95	Sand Shiner	*Notropis stramineus*	12
Bloody Creek	07/13/95	Slim Minnow	*Pimephales tenellus*	2
Bloody Creek	07/13/95	Suckermouth Minnow	*Phenacobius mirabilis*	18
Bloody Creek	07/13/95	Blackstripe Topminnow	*Fundulus notatus*	6
Bloody Creek	07/13/95	Stonecat	*Noturus flavus*	2
Bloody Creek	07/13/95	Yellow Bullhead	*Ameiurus natalis*	3
Bloody Creek	07/13/95	Longnose Gar	*Lepisosteus osseus*	1
Bloody Creek	07/13/95	Channel Darter	*Percina copelandi*	1
Bloody Creek	07/13/95	Fantail Darter	*Etheostoma flabellare*	4
Bloody Creek	07/13/95	Orangethroat Darter	*Etheostoma spectabile*	130
Bloody Creek	07/13/95	Ozark Logperch	*Percina caprodes*	6
Bloody Creek	07/11/96	Redhorse (unidentified)	*Moxostoma sp.*	358

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Stream	Date	Common Name	Scientific Name	Catch
Bloody Creek	07/11/96	Largemouth Bass	*Micropterus salmoides*	75
Bloody Creek	07/11/96	Green Sunfish	*Lepomis cyanellus*	68
Bloody Creek	07/11/96	Longear Sunfish	*Lepomis megalotis*	27
Bloody Creek	07/11/96	Orangespotted Sunfish	*Lepomis humilis*	20
Bloody Creek	07/11/96	Bluntface Shiner	*Cyprinella camura*	9
Bloody Creek	07/11/96	Bluntnose Minnow	*Pimephales notatus*	131
Bloody Creek	07/11/96	Cardinal Shiner	*Luxilus cardinalis*	288
Bloody Creek	07/11/96	Central Stoneroller	*Campostoma anomalum*	927
Bloody Creek	07/11/96	Creek Chub	*Semotilus atromaculatus*	383
Bloody Creek	07/11/96	Fathead Minnow	*Pimephales promelas*	1
Bloody Creek	07/11/96	Mimic Shiner	*Notropis volucellus*	15
Bloody Creek	07/11/96	Red Shiner	*Cyprinella lutrensis*	307
Bloody Creek	07/11/96	Redfin Shiner	*Lythrurus umbratilus*	263
Bloody Creek	07/11/96	Sand Shiner	*Notropis stramineus*	15
Bloody Creek	07/11/96	Suckermouth Minnow	*Phenacobius mirabilis*	6
Bloody Creek	07/11/96	Topeka Shiner	*Notropis topeka*	1
Bloody Creek	07/11/96	Blackstripe Topminnow	*Fundulus notatus*	5
Bloody Creek	07/11/96	Black Bullhead	*Ameiurus melas*	2
Bloody Creek	07/11/96	Yellow Bullhead	*Ameiurus natalis*	1
Bloody Creek	07/11/96	Longnose Gar	*Lepisosteus osseus*	3
Bloody Creek	07/11/96	Orangethroat Darter	*Etheostoma spectabile*	55
Bloody Creek	07/11/96	Ozark Logperch	*Percina caprodes*	12
Bloody Creek	07/14/97	Golden Redhorse	*Moxostoma erythrurum*	37
Bloody Creek	07/14/97	Bluegill	*Lepomis macrochirus*	1
Bloody Creek	07/14/97	Green Sunfish	*Lepomis cyanellus*	74
Bloody Creek	07/14/97	Largemouth Bass	*Micropterus salmoides*	20
Bloody Creek	07/14/97	Longear Sunfish	*Lepomis megalotis*	36

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Stream	Date	Common Name	Scientific Name	Catch
Bloody Creek	07/14/97	Orangespotted Sunfish	*Lepomis humilis*	41
Bloody Creek	07/14/97	Bluntface Shiner	*Cyprinella camura*	26
Bloody Creek	07/14/97	Bluntnose Minnow	*Pimephales notatus*	37
Bloody Creek	07/14/97	Cardinal Shiner	*Luxilus cardinalis*	873
Bloody Creek	07/14/97	Central Stoneroller	*Campostoma anomalum*	281
Bloody Creek	07/14/97	Creek Chub	*Semotilus atromaculatus*	58
Bloody Creek	07/14/97	Mimic Shiner	*Notropis volucellus*	23
Bloody Creek	07/14/97	Red Shiner	*Cyprinella lutrensis*	406
Bloody Creek	07/14/97	Redfin Shiner	*Lythrurus umbratilus*	302
Bloody Creek	07/14/97	Sand Shiner	*Notropis stramineus*	30
Bloody Creek	07/14/97	Suckermouth Minnow	*Phenacobius mirabilis*	5
Bloody Creek	07/14/97	Topeka Shiner	*Notropis topeka*	1
Bloody Creek	07/14/97	Blackstripe Topminnow	*Fundulus notatus*	7
Bloody Creek	07/14/97	Yellow Bullhead	*Ameiurus natalis*	2
Bloody Creek	07/14/97	Channel Darter	*Percina copelandi*	17
Bloody Creek	07/14/97	Fantail Darter	*Etheostoma flabellare*	90
Bloody Creek	07/14/97	Orangethroat Darter	*Etheostoma spectabile*	380
Bloody Creek	07/14/97	Ozark Logperch	*Percina caprodes*	9
Bloody Creek	07/14/97	Slenderhead Darter X Logperch hybrid	*Percina phoxocephala X P. caprodes*	1
Bloody Creek	07/03/03	Golden Redhorse	*Moxostoma erythrurum*	1
Bloody Creek	07/03/03	Green Sunfish	*Lepomis cyanellus*	1
Bloody Creek	07/03/03	Bluntface Shiner	*Cyprinella camura*	5
Bloody Creek	07/03/03	Bluntnose Minnow	*Pimephales notatus*	14
Bloody Creek	07/03/03	Cardinal Shiner	*Luxilus cardinalis*	26
Bloody Creek	07/03/03	Central Stoneroller	*Campostoma anomalum*	122
Bloody Creek	07/03/03	Creek Chub	*Semotilus atromaculatus*	6
Bloody Creek	07/03/03	Mimic Shiner	*Notropis volucellus*	5
Bloody Creek	07/03/03	Red Shiner	*Cyprinella lutrensis*	150

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Stream	Date	Common Name	Scientific Name	Catch
Bloody Creek	07/03/03	Redfin Shiner	*Lythrurus umbratilus*	220
Bloody Creek	07/03/03	Sand Shiner	*Notropis stramineus*	6
Bloody Creek	07/03/03	Blackstripe Topminnow	*Fundulus notatus*	1
Bloody Creek	07/03/03	Yellow Bullhead	*Ameiurus natalis*	4
Bloody Creek	07/03/03	Fantail Darter	*Etheostoma flabellare*	2
Bloody Creek	07/03/03	Orangethroat Darter	*Etheostoma spectabile*	30
Bloody Creek	07/03/03	Western Mosquitofish	*Gambusia affinis*	21
Cannonball Creek	06/02/95	Bluegill X Green Sunfish hybrid	*Lepomis macrochirus x L. cyanellus*	2
Cannonball Creek	06/02/95	Green Sunfish	*Lepomis cyanellus*	33
Cannonball Creek	06/02/95	Orangespotted Sunfish	*Lepomis humilis*	1
Cannonball Creek	06/02/95	Cardinal Shiner	*Luxilus cardinalis*	53
Cannonball Creek	06/02/95	Central Stoneroller	*Campostoma anomalum*	129
Cannonball Creek	06/02/95	Creek Chub	*Semotilus atromaculatus*	1
Cannonball Creek	06/02/95	Topeka Shiner	*Notropis topeka*	2
Cannonball Creek	06/02/95	Orangethroat Darter	*Etheostoma spectabile*	10
Cedar Creek	06/05/97	Brook Silverside	*Labidesthes sicculus*	6
Cedar Creek	06/05/97	Bigmouth Buffalo	*Ictiobus cyprinellus*	1
Cedar Creek	06/05/97	Golden Redhorse	*Moxostoma erythrurum*	10
Cedar Creek	06/05/97	Pealip Redhorse	*Moxostoma pisolabrum*	1
Cedar Creek	06/05/97	River Carpsucker	*Carpiodes carpio*	1
Cedar Creek	06/05/97	Smallmouth Buffalo	*Ictiobus bubalus*	1
Cedar Creek	06/05/97	Spotted Sucker	*Minytrema melanops*	1
Cedar Creek	06/05/97	Bluegill	*Lepomis macrochirus*	3
Cedar Creek	06/05/97	Green Sunfish	*Lepomis cyanellus*	12
Cedar Creek	06/05/97	Longear Sunfish	*Lepomis megalotis*	73
Cedar Creek	06/05/97	Orangespotted Sunfish	*Lepomis humilis*	40
Cedar Creek	06/05/97	Spotted Bass	*Micropterus punctulatus*	1

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Stream	Date	Common Name	Scientific Name	Catch
Cedar Creek	06/05/97	White Crappie	*Pomoxis annularis*	1
Cedar Creek	06/05/97	Bluntface Shiner	*Cyprinella camura*	116
Cedar Creek	06/05/97	Bluntnose Minnow	*Pimephales notatus*	418
Cedar Creek	06/05/97	Cardinal Shiner	*Luxilus cardinalis*	11
Cedar Creek	06/05/97	Central Stoneroller	*Campostoma anomalum*	84
Cedar Creek	06/05/97	Mimic Shiner	*Notropis volucellus*	24
Cedar Creek	06/05/97	Red Shiner	*Cyprinella lutrensis*	888
Cedar Creek	06/05/97	Redfin Shiner	*Lythrurus umbratilus*	47
Cedar Creek	06/05/97	Sand Shiner	*Notropis stramineus*	4
Cedar Creek	06/05/97	Slim Minnow	*Pimephales tenellus*	307
Cedar Creek	06/05/97	Suckermouth Minnow	*Phenacobius mirabilis*	35
Cedar Creek	06/05/97	Blackstripe Topminnow	*Fundulus notatus*	10
Cedar Creek	06/05/97	Brindled Madtom	*Noturus miurus*	5
Cedar Creek	06/05/97	Channel Catfish	*Ictalurus punctatus*	4
Cedar Creek	06/05/97	Stonecat	*Noturus flavus*	9
Cedar Creek	06/05/97	Longnose Gar	*Lepisosteus osseus*	1
Cedar Creek	06/05/97	Channel Darter	*Percina copelandi*	7
Cedar Creek	06/05/97	Orangethroat Darter	*Etheostoma spectabile*	34
Cedar Creek	06/05/97	Ozark Logperch	*Percina caprodes*	17
Cedar Creek	06/05/97	Slenderhead Darter	*Percina phoxocephala*	92
Cedar Creek	07/26/00	Brook Silverside	*Labidesthes sicculus*	52
Cedar Creek	07/26/00	Black Buffalo	*Ictiobus niger*	1
Cedar Creek	07/26/00	Golden Redhorse	*Moxostoma erythrurum*	34
Cedar Creek	07/26/00	Pealip Redhorse	*Moxostoma pisolabrum*	57
Cedar Creek	07/26/00	Spotted Sucker	*Minytrema melanops*	1
Cedar Creek	07/26/00	Green Sunfish	*Lepomis cyanellus*	7
Cedar Creek	07/26/00	Longear Sunfish	*Lepomis megalotis*	52
Cedar Creek	07/26/00	Orangespotted Sunfish	*Lepomis humilis*	7

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Stream	Date	Common Name	Scientific Name	Catch
Cedar Creek	07/26/00	Spotted Bass	*Micropterus punctulatus*	17
Cedar Creek	07/26/00	Bluntface Shiner	*Cyprinella camura*	88
Cedar Creek	07/26/00	Bluntnose Minnow	*Pimephales notatus*	117
Cedar Creek	07/26/00	Cardinal Shiner	*Luxilus cardinalis*	15
Cedar Creek	07/26/00	Central Stoneroller	*Campostoma anomalum*	365
Cedar Creek	07/26/00	Creek Chub	*Semotilus atromaculatus*	11
Cedar Creek	07/26/00	Mimic Shiner	*Notropis volucellus*	82
Cedar Creek	07/26/00	Red Shiner	*Cyprinella lutrensis*	419
Cedar Creek	07/26/00	Redfin Shiner	*Lythrurus umbratilus*	9
Cedar Creek	07/26/00	Slim Minnow	*Pimephales tenellus*	139
Cedar Creek	07/26/00	Suckermouth Minnow	*Phenacobius mirabilis*	169
Cedar Creek	07/26/00	Blackstripe Topminnow	*Fundulus notatus*	2
Cedar Creek	07/26/00	Brindled Madtom	*Noturus miurus*	4
Cedar Creek	07/26/00	Channel Catfish	*Ictalurus punctatus*	23
Cedar Creek	07/26/00	Flathead Catfish	*Pylodictis olivaris*	13
Cedar Creek	07/26/00	Stonecat	*Noturus flavus*	19
Cedar Creek	07/26/00	Yellow Bullhead	*Ameiurus natalis*	1
Cedar Creek	07/26/00	Longnose Gar	*Lepisosteus osseus*	1
Cedar Creek	07/26/00	Channel Darter	*Percina copelandi*	5
Cedar Creek	07/26/00	Fantail Darter	*Etheostoma flabellare*	45
Cedar Creek	07/26/00	Orangethroat Darter	*Etheostoma spectabile*	76
Cedar Creek	07/26/00	Ozark Logperch	*Percina caprodes*	27
Cedar Creek	07/26/00	Slenderhead Darter	*Percina phoxocephala*	50
Cedar Creek	07/26/00	Western Mosquitofish	*Gambusia affinis*	9
Cedar Creek	07/26/00	Freshwater Drum	*Aplodinotus grunniens*	1
Cedar Creek	06/06/01	Brook Silverside	*Labidesthes sicculus*	15
Cedar Creek	06/06/01	Golden Redhorse	*Moxostoma erythrurum*	39
Cedar Creek	06/06/01	Smallmouth Buffalo	*Ictiobus bubalus*	1

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Stream	Date	Common Name	Scientific Name	Catch
Cedar Creek	06/06/01	Green Sunfish	*Lepomis cyanellus*	9
Cedar Creek	06/06/01	Longear Sunfish	*Lepomis megalotis*	8
Cedar Creek	06/06/01	Orangespotted Sunfish	*Lepomis humilis*	1
Cedar Creek	06/06/01	Spotted Bass	*Micropterus punctulatus*	4
Cedar Creek	06/06/01	Bluntface Shiner	*Cyprinella camura*	27
Cedar Creek	06/06/01	Bluntnose Minnow	*Pimephales notatus*	69
Cedar Creek	06/06/01	Central Stoneroller	*Campostoma anomalum*	37
Cedar Creek	06/06/01	Mimic Shiner	*Notropis volucellus*	68
Cedar Creek	06/06/01	Red Shiner	*Cyprinella lutrensis*	1270
Cedar Creek	06/06/01	Redfin Shiner	*Lythrurus umbratilus*	228
Cedar Creek	06/06/01	Slim Minnow	*Pimephales tenellus*	131
Cedar Creek	06/06/01	Suckermouth Minnow	*Phenacobius mirabilis*	1
Cedar Creek	06/06/01	Blackstripe Topminnow	*Fundulus notatus*	5
Cedar Creek	06/06/01	Brindled Madtom	*Noturus miurus*	2
Cedar Creek	06/06/01	Stonecat	*Noturus flavus*	5
Cedar Creek	06/06/01	Longnose Gar	*Lepisosteus osseus*	2
Cedar Creek	06/06/01	Orangethroat Darter	*Etheostoma spectabile*	35
Cedar Creek	06/06/01	Ozark Logperch	*Percina caprodes*	3
Cedar Creek	06/06/01	Slenderhead Darter	*Percina phoxocephala*	8
Cedar Creek	08/15/07	Brook Silverside	*Labidesthes sicculus*	145
Cedar Creek	08/15/07	Golden Redhorse	*Moxostoma erythrurum*	10
Cedar Creek	08/15/07	Pealip Redhorse	*Moxostoma pisolabrum*	11
Cedar Creek	08/15/07	River Carpsucker	*Carpiodes carpio*	1
Cedar Creek	08/15/07	Smallmouth Buffalo	*Ictiobus bubalus*	1
Cedar Creek	08/15/07	Bluegill	*Lepomis macrochirus*	24
Cedar Creek	08/15/07	Green Sunfish	*Lepomis cyanellus*	81
Cedar Creek	08/15/07	Largemouth Bass	*Micropterus salmoides*	5
Cedar Creek	08/15/07	Longear Sunfish	*Lepomis megalotis*	30

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Stream	Date	Common Name	Scientific Name	Catch
Cedar Creek	08/15/07	Orangespotted Sunfish	*Lepomis humilis*	31
Cedar Creek	08/15/07	Spotted Bass	*Micropterus punctulatus*	20
Cedar Creek	08/15/07	White Crappie	*Pomoxis annularis*	1
Cedar Creek	08/15/07	Gizzard Shad	*Dorosoma cepedianum*	2
Cedar Creek	08/15/07	Bluntface Shiner	*Cyprinella camura*	9
Cedar Creek	08/15/07	Bluntnose Minnow	*Pimephales notatus*	200
Cedar Creek	08/15/07	Cardinal Shiner	*Luxilus cardinalis*	220
Cedar Creek	08/15/07	Central Stoneroller	*Campostoma anomalum*	95
Cedar Creek	08/15/07	Creek Chub	*Semotilus atromaculatus*	1
Cedar Creek	08/15/07	Mimic Shiner	*Notropis volucellus*	68
Cedar Creek	08/15/07	Red Shiner	*Cyprinella lutrensis*	291
Cedar Creek	08/15/07	Redfin Shiner	*Lythrurus umbratilus*	35
Cedar Creek	08/15/07	Slim Minnow	*Pimephales tenellus*	37
Cedar Creek	08/15/07	Suckermouth Minnow	*Phenacobius mirabilis*	274
Cedar Creek	08/15/07	Blackstripe Topminnow	*Fundulus notatus*	9
Cedar Creek	08/15/07	Channel Catfish	*Ictalurus punctatus*	17
Cedar Creek	08/15/07	Flathead Catfish	*Pylodictis olivaris*	9
Cedar Creek	08/15/07	Freckled Madtom	*Noturus nocturnus*	1
Cedar Creek	08/15/07	Stonecat	*Noturus flavus*	30
Cedar Creek	08/15/07	Yellow Bullhead	*Ameiurus natalis*	3
Cedar Creek	08/15/07	Longnose Gar	*Lepisosteus osseus*	2
Cedar Creek	08/15/07	Channel Darter	*Percina copelandi*	2
Cedar Creek	08/15/07	Fantail Darter	*Etheostoma flabellare*	61
Cedar Creek	08/15/07	Logperch	*Percina caprodes*	4
Cedar Creek	08/15/07	Orangethroat Darter	*Etheostoma spectabile*	136
Cedar Creek	08/15/07	Slenderhead Darter	*Percina phoxocephala*	39
Cedar Creek	08/15/07	Freshwater Drum	*Aplodinotus grunniens*	2

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Stream	Date	Common Name	Scientific Name	Catch
Collett Creek	07/31/96	Golden Redhorse	*Moxostoma erythrurum*	8
Collett Creek	07/31/96	Green Sunfish	*Lepomis cyanellus*	44
Collett Creek	07/31/96	Largemouth Bass	*Micropterus salmoides*	2
Collett Creek	07/31/96	Longear Sunfish	*Lepomis megalotis*	10
Collett Creek	07/31/96	Orangespotted Sunfish	*Lepomis humilis*	1
Collett Creek	07/31/96	Bluntnose Minnow	*Pimephales notatus*	25
Collett Creek	07/31/96	Cardinal Shiner	*Luxilus cardinalis*	205
Collett Creek	07/31/96	Central Stoneroller	*Campostoma anomalum*	1082
Collett Creek	07/31/96	Creek Chub	*Semotilus atromaculatus*	163
Collett Creek	07/31/96	Fathead Minnow	*Pimephales promelas*	1
Collett Creek	07/31/96	Red Shiner	*Cyprinella lutrensis*	15
Collett Creek	07/31/96	Redfin Shiner	*Lythrurus umbratilus*	79
Collett Creek	07/31/96	Topeka Shiner	*Notropis topeka*	1
Collett Creek	07/31/96	Blackstripe Topminnow	*Fundulus notatus*	7
Collett Creek	07/31/96	Yellow Bullhead	*Ameiurus natalis*	18
Collett Creek	07/31/96	Orangethroat Darter	*Etheostoma spectabile*	138
Collett Creek	07/31/97	Golden Redhorse	*Moxostoma erythrurum*	3
Collett Creek	07/31/97	Bluegill	*Lepomis macrochirus*	3
Collett Creek	07/31/97	Green Sunfish	*Lepomis cyanellus*	106
Collett Creek	07/31/97	Largemouth Bass	*Micropterus salmoides*	22
Collett Creek	07/31/97	Longear Sunfish	*Lepomis megalotis*	6
Collett Creek	07/31/97	Orangespotted Sunfish	*Lepomis humilis*	9
Collett Creek	07/31/97	Bluntnose Minnow	*Pimephales notatus*	61
Collett Creek	07/31/97	Cardinal Shiner	*Luxilus cardinalis*	219
Collett Creek	07/31/97	Central Stoneroller	*Campostoma anomalum*	1053
Collett Creek	07/31/97	Creek Chub	*Semotilus atromaculatus*	112
Collett Creek	07/31/97	Red Shiner	*Cyprinella lutrensis*	57
Collett Creek	07/31/97	Suckermouth Minnow	*Phenacobius mirabilis*	5
Collett Creek	07/31/97	Topeka Shiner	*Notropis topeka*	1

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Stream	Date	Common Name	Scientific Name	Catch
Collett Creek	07/31/97	Yellow Bullhead	*Ameiurus natalis*	8
Collett Creek	07/31/97	Orangethroat Darter	*Etheostoma spectabile*	471
Cottonwood River	07/20/95	Largemouth Bass	*Micropterus salmoides*	1
Cottonwood River	07/20/95	Orangespotted Sunfish	*Lepomis humilis*	2
Cottonwood River	07/20/95	Bluntface Shiner	*Cyprinella camura*	1
Cottonwood River	07/20/95	Bluntnose Minnow	*Pimephales notatus*	62
Cottonwood River	07/20/95	Central Stoneroller	*Campostoma anomalum*	15
Cottonwood River	07/20/95	Common Carp	*Cyprinus carpio*	6
Cottonwood River	07/20/95	Creek Chub	*Semotilus atromaculatus*	1
Cottonwood River	07/20/95	Fathead Minnow	*Pimephales promelas*	1
Cottonwood River	07/20/95	Ghost Shiner	*Notropis buchanani*	5
Cottonwood River	07/20/95	Golden Shiner	*Notemigonus crysoleucas*	1
Cottonwood River	07/20/95	Red Shiner	*Cyprinella lutrensis*	652
Cottonwood River	07/20/95	Redfin Shiner	*Lythrurus umbratilus*	1
Cottonwood River	07/20/95	Sand Shiner	*Notropis stramineus*	5
Cottonwood River	07/20/95	Slim Minnow	*Pimephales tenellus*	16
Cottonwood River	07/20/95	Suckermouth Minnow	*Phenacobius mirabilis*	5
Cottonwood River	07/20/95	Channel Catfish	*Ictalurus punctatus*	2
Cottonwood River	07/20/95	Flathead Catfish	*Pylodictis olivaris*	1
Cottonwood River	07/20/95	Stonecat	*Noturus flavus*	5
Cottonwood River	07/20/95	White Bass	*Morone chrysops*	1
Cottonwood River	07/20/95	Channel Darter	*Percina copelandi*	1
Cottonwood River	07/20/95	Orangethroat Darter	*Etheostoma spectabile*	1
Cottonwood River	07/20/95	Slenderhead Darter	*Percina phoxocephala*	51
Cottonwood River	07/20/95	Western Mosquitofish	*Gambusia affinis*	1
Cottonwood River	07/20/95	Freshwater Drum	*Aplodinotus grunniens*	2
Cottonwood River	07/22/96	Buffalo (unidentified)	*Ictiobus spp.*	2

Appendix 7. Fish species and numbers collected in streams of Chase County, Kansas by the Stream Assessment and Monitoring Program of the Kansas Department of Wildlife and Parks (KDWP) from 1994-2007. Fish were collected with a combination of seining and electrofishing techniques. Data was provided by Mark Van Scoyoc of KDWP and Kristen Hase (formerly of KDWP, now employed by NPS), cont.

Stream	Date	Common Name	Scientific Name	Catch
Cottonwood River	07/22/96	Largemouth Bass	*Micropterus salmoides*	1
Cottonwood River	07/22/96	Orangespotted Sunfish	*Lepomis humilis*	2
Cottonwood River	07/22/96	Bluntface Shiner	*Cyprinella camura*	2
Cottonwood River	07/22/96	Bluntnose Minnow	*Pimephales notatus*	9
Cottonwood River	07/22/96	Central Stoneroller	*Campostoma anomalum*	5
Cottonwood River	07/22/96	Common Carp	*Cyprinus carpio*	1
Cottonwood River	07/22/96	Red Shiner	*Cyprinella lutrensis*	87
Cottonwood River	07/22/96	Sand Shiner	*Notropis stramineus*	1
Cottonwood River	07/22/96	Slim Minnow	*Pimephales tenellus*	1
Cottonwood River	07/22/96	Suckermouth Minnow	*Phenacobius mirabilis*	16
Cottonwood River	07/22/96	Channel Catfish	*Ictalurus punctatus*	106
Cottonwood River	07/22/96	Flathead Catfish	*Pylodictis olivaris*	21
Cottonwood River	07/22/96	Stonecat	*Noturus flavus*	14
Cottonwood River	07/22/96	Longnose Gar	*Lepisosteus osseus*	2
Cottonwood River	07/22/96	Orangethroat Darter	*Etheostoma spectabile*	1
Cottonwood River	07/22/96	Slenderhead Darter	*Percina phoxocephala*	47
Cottonwood River	07/22/96	Western Mosquitofish	*Gambusia affinis*	4
Cottonwood River	07/22/96	Freshwater Drum	*Aplodinotus grunniens*	3
Cottonwood River	07/22/97	Golden Redhorse	*Moxostoma erythrurum*	1
Cottonwood River	07/22/97	Redhorse (unidentified)	*Moxostoma sp.*	17
Cottonwood River	07/22/97	Bluegill	*Lepomis macrochirus*	27
Cottonwood River	07/22/97	Green Sunfish	*Lepomis cyanellus*	10
Cottonwood River	07/22/97	Largemouth Bass	*Micropterus salmoides*	34
Cottonwood River	07/22/97	Orangespotted Sunfish	*Lepomis humilis*	10
Cottonwood River	07/22/97	White Crappie	*Pomoxis annularis*	38
Cottonwood River	07/22/97	Gizzard Shad	*Dorosoma cepedianum*	6
Cottonwood River	07/22/97	Bluntface Shiner	*Cyprinella camura*	5
Cottonwood River	07/22/97	Bluntnose Minnow	*Pimephales notatus*	104
Cottonwood River	07/22/97	Central Stoneroller	*Campostoma anomalum*	222

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Stream	Date	Common Name	Scientific Name	Catch
Cottonwood River	07/22/97	Common Carp	*Cyprinus carpio*	39
Cottonwood River	07/22/97	Creek Chub	*Semotilus atromaculatus*	13
Cottonwood River	07/22/97	Fathead Minnow	*Pimephales promelas*	11
Cottonwood River	07/22/97	Ghost Shiner	*Notropis buchanani*	3
Cottonwood River	07/22/97	Red Shiner	*Cyprinella lutrensis*	785
Cottonwood River	07/22/97	Redfin Shiner	*Lythrurus umbratilus*	23
Cottonwood River	07/22/97	Sand Shiner	*Notropis stramineus*	15
Cottonwood River	07/22/97	Slim Minnow	*Pimephales tenellus*	14
Cottonwood River	07/22/97	Suckermouth Minnow	*Phenacobius mirabilis*	64
Cottonwood River	07/22/97	Blackstripe Topminnow	*Fundulus notatus*	11
Cottonwood River	07/22/97	Black Bullhead	*Ameiurus melas*	3
Cottonwood River	07/22/97	Channel Catfish	*Ictalurus punctatus*	8
Cottonwood River	07/22/97	Flathead Catfish	*Pylodictis olivaris*	9
Cottonwood River	07/22/97	Stonecat	*Noturus flavus*	15
Cottonwood River	07/22/97	Yellow Bullhead	*Ameiurus natalis*	2
Cottonwood River	07/22/97	Longnose Gar	*Lepisosteus osseus*	2
Cottonwood River	07/22/97	White Bass	*Morone chrysops*	2
Cottonwood River	07/22/97	Channel Darter	*Percina copelandi*	1
Cottonwood River	07/22/97	Orangethroat Darter	*Etheostoma spectabile*	19
Cottonwood River	07/22/97	Slenderhead Darter	*Percina phoxocephala*	82
Cottonwood River	07/22/97	Western Mosquitofish	*Gambusia affinis*	1
Diamond Creek	07/19/95	Golden Redhorse	*Moxostoma erythrurum*	4
Diamond Creek	07/19/95	Smallmouth Buffalo	*Ictiobus bubalus*	1
Diamond Creek	07/19/95	Bluegill	*Lepomis macrochirus*	1
Diamond Creek	07/19/95	Green Sunfish	*Lepomis cyanellus*	7
Diamond Creek	07/19/95	Largemouth Bass	*Micropterus salmoides*	4
Diamond Creek	07/19/95	Longear Sunfish	*Lepomis megalotis*	54
Diamond Creek	07/19/95	Orangespotted Sunfish	*Lepomis humilis*	55

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Stream	Date	Common Name	Scientific Name	Catch
Diamond Creek	07/19/95	Bluntface Shiner	*Cyprinella camura*	1
Diamond Creek	07/19/95	Bluntnose Minnow	*Pimephales notatus*	30
Diamond Creek	07/19/95	Central Stoneroller	*Campostoma anomalum*	34
Diamond Creek	07/19/95	Common Carp	*Cyprinus carpio*	1
Diamond Creek	07/19/95	Creek Chub	*Semotilus atromaculatus*	1
Diamond Creek	07/19/95	Red Shiner	*Cyprinella lutrensis*	451
Diamond Creek	07/19/95	Redfin Shiner	*Lythrurus umbratilus*	35
Diamond Creek	07/19/95	Sand Shiner	*Notropis stramineus*	3
Diamond Creek	07/19/95	Slim Minnow	*Pimephales tenellus*	3
Diamond Creek	07/19/95	Suckermouth Minnow	*Phenacobius mirabilis*	2
Diamond Creek	07/19/95	Channel Catfish	*Ictalurus punctatus*	3
Diamond Creek	07/19/95	Stonecat	*Noturus flavus*	5
Diamond Creek	07/19/95	Shortnose Gar	*Lepisosteus platostomus*	2
Diamond Creek	07/19/95	Channel Darter	*Percina copelandi*	1
Diamond Creek	07/19/95	Orangethroat Darter	*Etheostoma spectabile*	3
Diamond Creek	07/19/95	Ozark Logperch	*Percina caprodes*	1
Diamond Creek	07/19/95	Slenderhead Darter	*Percina phoxocephala*	25
Diamond Creek	07/19/95	Western Mosquitofish	*Gambusia affinis*	5
Diamond Creek	07/19/95	Freshwater Drum	*Aplodinotus grunniens*	1
East Branch Sharpes Creek	07/06/95	Central Stoneroller	*Campostoma anomalum*	109
East Branch Sharpes Creek	07/06/95	Creek Chub	*Semotilus atromaculatus*	21
East Branch Sharpes Creek	07/06/95	Orangethroat Darter	*Etheostoma spectabile*	38
East Branch Sharpes Creek	06/04/01	Central Stoneroller	*Campostoma anomalum*	14
East Branch Sharpes Creek	06/04/01	Creek Chub	*Semotilus atromaculatus*	19
Fox Creek	06/27/95	Brook Silverside	*Labidesthes sicculus*	2
Fox Creek	06/27/95	Golden Redhorse	*Moxostoma erythrurum*	14
Fox Creek	06/27/95	Bluegill	*Lepomis macrochirus*	20

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Stream	Date	Common Name	Scientific Name	Catch
Fox Creek	06/27/95	Bluegill X Green Sunfish hybrid	*Lepomis macrochirus x L. cyanellus*	3
Fox Creek	06/27/95	Green Sunfish	*Lepomis cyanellus*	48
Fox Creek	06/27/95	Longear Sunfish	*Lepomis megalotis*	66
Fox Creek	06/27/95	Orangespotted Sunfish	*Lepomis humilis*	28
Fox Creek	06/27/95	Bluntnose Minnow	*Pimephales notatus*	142
Fox Creek	06/27/95	Cardinal Shiner	*Luxilus cardinalis*	15
Fox Creek	06/27/95	Central Stoneroller	*Campostoma anomalum*	23
Fox Creek	06/27/95	Red Shiner	*Cyprinella lutrensis*	269
Fox Creek	06/27/95	Redfin Shiner	*Lythrurus umbratilus*	253
Fox Creek	06/27/95	Sand Shiner	*Notropis stramineus*	8
Fox Creek	06/27/95	Suckermouth Minnow	*Phenacobius mirabilis*	1
Fox Creek	06/27/95	Blackstripe Topminnow	*Fundulus notatus*	4
Fox Creek	06/27/95	Channel Catfish	*Ictalurus punctatus*	2
Fox Creek	06/27/95	Stonecat	*Noturus flavus*	4
Fox Creek	06/27/95	Yellow Bullhead	*Ameiurus natalis*	4
Fox Creek	06/27/95	Channel Darter	*Percina copelandi*	3
Fox Creek	06/27/95	Orangethroat Darter	*Etheostoma spectabile*	67
Fox Creek	06/27/95	Ozark Logperch	*Percina caprodes*	4
Fox Creek	06/27/95	Slenderhead Darter	*Percina phoxocephala*	1
Fox Creek	06/27/95	Western Mosquitofish	*Gambusia affinis*	2
Fox Creek	07/22/02	Brook Silverside	*Labidesthes sicculus*	5
Fox Creek	07/22/02	Pealip Redhorse	*Moxostoma pisolabrum*	13
Fox Creek	07/22/02	River Carpsucker	*Carpiodes carpio*	1
Fox Creek	07/22/02	Smallmouth Buffalo	*Ictiobus bubalus*	1
Fox Creek	07/22/02	Spotted Sucker	*Minytrema melanops*	1
Fox Creek	07/22/02	Bluegill	*Lepomis macrochirus*	33
Fox Creek	07/22/02	Green Sunfish	*Lepomis cyanellus*	9
Fox Creek	07/22/02	Largemouth Bass	*Micropterus salmoides*	22

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Stream	Date	Common Name	Scientific Name	Catch
Fox Creek	07/22/02	Longear Sunfish	*Lepomis megalotis*	15
Fox Creek	07/22/02	Orangespotted Sunfish	*Lepomis humilis*	51
Fox Creek	07/22/02	Spotted Bass	*Micropterus punctulatus*	1
Fox Creek	07/22/02	Gizzard Shad	*Dorosoma cepedianum*	6
Fox Creek	07/22/02	Bluntnose Minnow	*Pimephales notatus*	67
Fox Creek	07/22/02	Central Stoneroller	*Campostoma anomalum*	100
Fox Creek	07/22/02	Common Carp	*Cyprinus carpio*	1
Fox Creek	07/22/02	Red Shiner	*Cyprinella lutrensis*	186
Fox Creek	07/22/02	Redfin Shiner	*Lythrurus umbratilus*	307
Fox Creek	07/22/02	Slim Minnow	*Pimephales tenellus*	24
Fox Creek	07/22/02	Suckermouth Minnow	*Phenacobius mirabilis*	13
Fox Creek	07/22/02	Blackstripe Topminnow	*Fundulus notatus*	2
Fox Creek	07/22/02	Channel Catfish	*Ictalurus punctatus*	4
Fox Creek	07/22/02	Stonecat	*Noturus flavus*	1
Fox Creek	07/22/02	Channel Darter	*Percina copelandi*	5
Fox Creek	07/22/02	Orangethroat Darter	*Etheostoma spectabile*	19
Fox Creek	07/22/02	Ozark Logperch	*Percina caprodes*	8
Fox Creek	07/22/02	Slenderhead Darter	*Percina phoxocephala*	1
Fox Creek	07/22/02	Western Mosquitofish	*Gambusia affinis*	4
Fox Creek	07/22/02	Freshwater Drum	*Aplodinotus grunniens*	2
Fox Creek	07/23/02	Golden Redhorse	*Moxostoma erythrurum*	21
Fox Creek	07/23/02	Pealip Redhorse	*Moxostoma pisolabrum*	9
Fox Creek	07/23/02	Bluegill	*Lepomis macrochirus*	7
Fox Creek	07/23/02	Bluegill X Green Sunfish hybrid	*Lepomis macrochirus x L. cyanellus*	2
Fox Creek	07/23/02	Green Sunfish	*Lepomis cyanellus*	36
Fox Creek	07/23/02	Largemouth Bass	*Micropterus salmoides*	12
Fox Creek	07/23/02	Longear Sunfish	*Lepomis megalotis*	54
Fox Creek	07/23/02	Orangespotted Sunfish	*Lepomis humilis*	5

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Stream	Date	Common Name	Scientific Name	Catch
Fox Creek	07/23/02	Bluntface Shiner	*Cyprinella camura*	1
Fox Creek	07/23/02	Bluntnose Minnow	*Pimephales notatus*	22
Fox Creek	07/23/02	Cardinal Shiner	*Luxilus cardinalis*	116
Fox Creek	07/23/02	Central Stoneroller	*Campostoma anomalum*	599
Fox Creek	07/23/02	Red Shiner	*Cyprinella lutrensis*	79
Fox Creek	07/23/02	Redfin Shiner	*Lythrurus umbratilus*	98
Fox Creek	07/23/02	Sand Shiner	*Notropis stramineus*	11
Fox Creek	07/23/02	Slim Minnow	*Pimephales tenellus*	11
Fox Creek	07/23/02	Suckermouth Minnow	*Phenacobius mirabilis*	36
Fox Creek	07/23/02	Black Bullhead	*Ameiurus melas*	1
Fox Creek	07/23/02	Channel Catfish	*Ictalurus punctatus*	7
Fox Creek	07/23/02	Stonecat	*Noturus flavus*	18
Fox Creek	07/23/02	Yellow Bullhead	*Ameiurus natalis*	1
Fox Creek	07/23/02	Spotted Gar	*Lepisosteus oculatus*	1
Fox Creek	07/23/02	Orangethroat Darter	*Etheostoma spectabile*	167
Fox Creek	07/23/02	Ozark Logperch	*Percina caprodes*	20
Fox Creek	07/24/02	Golden Redhorse	*Moxostoma erythrurum*	7
Fox Creek	07/24/02	Pealip Redhorse	*Moxostoma pisolabrum*	1
Fox Creek	07/24/02	Bluegill	*Lepomis macrochirus*	2
Fox Creek	07/24/02	Green Sunfish	*Lepomis cyanellus*	18
Fox Creek	07/24/02	Largemouth Bass	*Micropterus salmoides*	16
Fox Creek	07/24/02	Longear Sunfish	*Lepomis megalotis*	34
Fox Creek	07/24/02	Spotted Bass	*Micropterus punctulatus*	1
Fox Creek	07/24/02	Bluntface Shiner	*Cyprinella camura*	1
Fox Creek	07/24/02	Bluntnose Minnow	*Pimephales notatus*	38
Fox Creek	07/24/02	Cardinal Shiner	*Luxilus cardinalis*	412
Fox Creek	07/24/02	Central Stoneroller	*Campostoma anomalum*	553
Fox Creek	07/24/02	Creek Chub	*Semotilus atromaculatus*	16

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Stream	Date	Common Name	Scientific Name	Catch
Fox Creek	07/24/02	Redfin Shiner	*Lythrurus umbratilus*	217
Fox Creek	07/24/02	Black Bullhead	*Ameiurus melas*	1
Fox Creek	07/24/02	Channel Catfish	*Ictalurus punctatus*	1
Fox Creek	07/24/02	Stonecat	*Noturus flavus*	19
Fox Creek	07/24/02	Yellow Bullhead	*Ameiurus natalis*	1
Fox Creek	07/24/02	Orangethroat Darter	*Etheostoma spectabile*	265
Fox Creek	07/24/02	Ozark Logperch	*Percina caprodes*	6
Little Bloody Creek	06/30/03	Bluegill	*Lepomis macrochirus*	8
Little Bloody Creek	06/30/03	Green Sunfish	*Lepomis cyanellus*	58
Little Bloody Creek	06/30/03	Largemouth Bass	*Micropterus salmoides*	6
Little Bloody Creek	06/30/03	Longear Sunfish	*Lepomis megalotis*	21
Little Bloody Creek	06/30/03	Orangespotted Sunfish	*Lepomis humilis*	2
Little Bloody Creek	06/30/03	Bluntnose Minnow	*Pimephales notatus*	46
Little Bloody Creek	06/30/03	Cardinal Shiner	*Luxilus cardinalis*	5
Little Bloody Creek	06/30/03	Central Stoneroller	*Campostoma anomalum*	367
Little Bloody Creek	06/30/03	Creek Chub	*Semotilus atromaculatus*	31
Little Bloody Creek	06/30/03	Red Shiner	*Cyprinella lutrensis*	9
Little Bloody Creek	06/30/03	Redfin Shiner	*Lythrurus umbratilus*	37
Little Bloody Creek	06/30/03	Fantail Darter	*Etheostoma flabellare*	1
Little Bloody Creek	06/30/03	Orangethroat Darter	*Etheostoma spectabile*	27
Little Bloody Creek	06/30/03	Western Mosquitofish	*Gambusia affinis*	1
Little Bloody Creek	07/01/03	Brook Silverside	*Labidesthes sicculus*	3
Little Bloody Creek	07/01/03	Bluegill	*Lepomis macrochirus*	1
Little Bloody Creek	07/01/03	Green Sunfish	*Lepomis cyanellus*	4
Little Bloody Creek	07/01/03	Largemouth Bass	*Micropterus salmoides*	4
Little Bloody Creek	07/01/03	Longear Sunfish	*Lepomis megalotis*	39
Little Bloody Creek	07/01/03	Orangespotted Sunfish	*Lepomis humilis*	31

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Stream	Date	Common Name	Scientific Name	Catch
Little Bloody Creek	07/01/03	Bluntface Shiner	*Cyprinella camura*	1
Little Bloody Creek	07/01/03	Bluntnose Minnow	*Pimephales notatus*	47
Little Bloody Creek	07/01/03	Cardinal Shiner	*Luxilus cardinalis*	20
Little Bloody Creek	07/01/03	Central Stoneroller	*Campostoma anomalum*	49
Little Bloody Creek	07/01/03	Creek Chub	*Semotilus atromaculatus*	8
Little Bloody Creek	07/01/03	Red Shiner	*Cyprinella lutrensis*	81
Little Bloody Creek	07/01/03	Redfin Shiner	*Lythrurus umbratilus*	27
Little Bloody Creek	07/01/03	Blackstripe Topminnow	*Fundulus notatus*	37
Little Bloody Creek	07/01/03	Black Bullhead	*Ameiurus melas*	6
Little Bloody Creek	07/01/03	Yellow Bullhead	*Ameiurus natalis*	2
Little Bloody Creek	07/01/03	Fantail Darter	*Etheostoma flabellare*	1
Little Bloody Creek	07/01/03	Orangethroat Darter	*Etheostoma spectabile*	4
Little Bloody Creek	07/01/03	Western Mosquitofish	*Gambusia affinis*	8
Little Cedar Creek	07/17/95	Golden Redhorse	*Moxostoma erythrurum*	1
Little Cedar Creek	07/17/95	Bluegill	*Lepomis macrochirus*	1
Little Cedar Creek	07/17/95	Green Sunfish	*Lepomis cyanellus*	129
Little Cedar Creek	07/17/95	Largemouth Bass	*Micropterus salmoides*	6
Little Cedar Creek	07/17/95	Longear Sunfish	*Lepomis megalotis*	5
Little Cedar Creek	07/17/95	Orangespotted Sunfish	*Lepomis humilis*	16
Little Cedar Creek	07/17/95	Bluntnose Minnow	*Pimephales notatus*	11
Little Cedar Creek	07/17/95	Cardinal Shiner	*Luxilus cardinalis*	82
Little Cedar Creek	07/17/95	Central Stoneroller	*Campostoma anomalum*	503
Little Cedar Creek	07/17/95	Creek Chub	*Semotilus atromaculatus*	39
Little Cedar Creek	07/17/95	Red Shiner	*Cyprinella lutrensis*	1
Little Cedar Creek	07/17/95	Redfin Shiner	*Lythrurus umbratilus*	39
Little Cedar Creek	07/17/95	Blackstripe Topminnow	*Fundulus notatus*	3
Little Cedar Creek	07/17/95	Fantail Darter	*Etheostoma flabellare*	9
Little Cedar Creek	07/17/95	Orangethroat Darter	*Etheostoma spectabile*	139

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Stream	Date	Common Name	Scientific Name	Catch
Little Cedar Creek	06/17/97	Green Sunfish	*Lepomis cyanellus*	63
Little Cedar Creek	06/17/97	Largemouth Bass	*Micropterus salmoides*	19
Little Cedar Creek	06/17/97	Longear Sunfish	*Lepomis megalotis*	33
Little Cedar Creek	06/17/97	Orangespotted Sunfish	*Lepomis humilis*	10
Little Cedar Creek	06/17/97	Bluntnose Minnow	*Pimephales notatus*	87
Little Cedar Creek	06/17/97	Cardinal Shiner	*Luxilus cardinalis*	50
Little Cedar Creek	06/17/97	Carmine Shiner	*Notropis percobromus*	5
Little Cedar Creek	06/17/97	Central Stoneroller	*Campostoma anomalum*	119
Little Cedar Creek	06/17/97	Red Shiner	*Cyprinella lutrensis*	5
Little Cedar Creek	06/17/97	Redfin Shiner	*Lythrurus umbratilus*	342
Little Cedar Creek	06/17/97	Sand Shiner	*Notropis stramineus*	2
Little Cedar Creek	06/17/97	Topeka Shiner	*Notropis topeka*	12
Little Cedar Creek	06/17/97	Blackstripe Topminnow	*Fundulus notatus*	36
Little Cedar Creek	06/17/97	Black Bullhead	*Ameiurus melas*	1
Little Cedar Creek	06/17/97	Channel Catfish	*Ictalurus punctatus*	1
Little Cedar Creek	06/17/97	Longnose Gar	*Lepisosteus osseus*	1
Little Cedar Creek	06/17/97	Fantail Darter	*Etheostoma flabellare*	18
Little Cedar Creek	06/17/97	Orangethroat Darter	*Etheostoma spectabile*	95
Little Cedar Creek	06/17/97	Ozark Logperch	*Percina caprodes*	2
Mercer Creek	06/16/97	Golden Redhorse	*Moxostoma erythrurum*	9
Mercer Creek	06/16/97	Green Sunfish	*Lepomis cyanellus*	29
Mercer Creek	06/16/97	Largemouth Bass	*Micropterus salmoides*	1
Mercer Creek	06/16/97	Longear Sunfish	*Lepomis megalotis*	46
Mercer Creek	06/16/97	Orangespotted Sunfish	*Lepomis humilis*	6
Mercer Creek	06/16/97	Spotted Bass	*Micropterus punctulatus*	1
Mercer Creek	06/16/97	Bluntnose Minnow	*Pimephales notatus*	71
Mercer Creek	06/16/97	Cardinal Shiner	*Luxilus cardinalis*	783
Mercer Creek	06/16/97	Carmine Shiner	*Notropis percobromus*	22

Appendix 7. Fish species and numbers collected in streams of Chase County, Kansas by the Stream Assessment and Monitoring Program of the Kansas Department of Wildlife and Parks (KDWP) from 1994-2007. Fish were collected with a combination of seining and electrofishing techniques. Data was provided by Mark Van Scoyoc of KDWP and Kristen Hase (formerly of KDWP, now employed by NPS), cont.

Stream	Date	Common Name	Scientific Name	Catch
Mercer Creek	06/16/97	Fathead Minnow	*Pimephales promelas*	1
Mercer Creek	06/16/97	Redfin Shiner	*Lythrurus umbratilus*	15
Mercer Creek	06/16/97	Topeka Shiner	*Notropis topeka*	9
Mercer Creek	06/16/97	Blackstripe Topminnow	*Fundulus notatus*	9
Mercer Creek	06/16/97	Stonecat	*Noturus flavus*	3
Mercer Creek	06/16/97	Fantail Darter	*Etheostoma flabellare*	17
Mercer Creek	06/16/97	Orangethroat Darter	*Etheostoma spectabile*	87
Mercer Creek	06/16/97	Ozark Logperch	*Percina caprodes*	3
Middle Creek	07/15/96	Redhorse (unidentified)	*Moxostoma sp.*	33
Middle Creek	07/15/96	Bluegill	*Lepomis macrochirus*	10
Middle Creek	07/15/96	Green Sunfish	*Lepomis cyanellus*	1
Middle Creek	07/15/96	Longear Sunfish	*Lepomis megalotis*	9
Middle Creek	07/15/96	Orangespotted Sunfish	*Lepomis humilis*	10
Middle Creek	07/15/96	Spotted Bass	*Micropterus punctulatus*	3
Middle Creek	07/15/96	Bluntface Shiner	*Cyprinella camura*	1
Middle Creek	07/15/96	Bluntnose Minnow	*Pimephales notatus*	40
Middle Creek	07/15/96	Central Stoneroller	*Campostoma anomalum*	4
Middle Creek	07/15/96	Creek Chub	*Semotilus atromaculatus*	3
Middle Creek	07/15/96	Golden Shiner	*Notemigonus crysoleucas*	1
Middle Creek	07/15/96	Red Shiner	*Cyprinella lutrensis*	295
Middle Creek	07/15/96	Redfin Shiner	*Lythrurus umbratilus*	27
Middle Creek	07/15/96	Sand Shiner	*Notropis stramineus*	11
Middle Creek	07/15/96	Slim Minnow	*Pimephales tenellus*	3
Middle Creek	07/15/96	Suckermouth Minnow	*Phenacobius mirabilis*	26
Middle Creek	07/15/96	Channel Catfish	*Ictalurus punctatus*	27
Middle Creek	07/15/96	Flathead Catfish	*Pylodictis olivaris*	2
Middle Creek	07/15/96	Stonecat	*Noturus flavus*	15
Middle Creek	07/15/96	Longnose Gar	*Lepisosteus osseus*	7

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Stream	Date	Common Name	Scientific Name	Catch
Middle Creek	07/15/96	Orangethroat Darter	*Etheostoma spectabile*	3
Middle Creek	07/15/96	Ozark Logperch	*Percina caprodes*	4
Middle Creek	07/15/96	Slenderhead Darter	*Percina phoxocephala*	18
Middle Creek	07/15/96	Western Mosquitofish	*Gambusia affinis*	3
Middle Creek	07/15/97	Redhorse (unidentified)	*Moxostoma sp.*	123
Middle Creek	07/15/97	Bluegill	*Lepomis macrochirus*	13
Middle Creek	07/15/97	Green Sunfish	*Lepomis cyanellus*	8
Middle Creek	07/15/97	Largemouth Bass	*Micropterus salmoides*	12
Middle Creek	07/15/97	Longear Sunfish	*Lepomis megalotis*	26
Middle Creek	07/15/97	Orangespotted Sunfish	*Lepomis humilis*	13
Middle Creek	07/15/97	White Crappie	*Pomoxis annularis*	8
Middle Creek	07/15/97	Gizzard Shad	*Dorosoma cepedianum*	3
Middle Creek	07/15/97	Bluntnose Minnow	*Pimephales notatus*	62
Middle Creek	07/15/97	Central Stoneroller	*Campostoma anomalum*	91
Middle Creek	07/15/97	Creek Chub	*Semotilus atromaculatus*	9
Middle Creek	07/15/97	Fathead Minnow	*Pimephales promelas*	15
Middle Creek	07/15/97	Ghost Shiner	*Notropis buchanani*	1
Middle Creek	07/15/97	Red Shiner	*Cyprinella lutrensis*	588
Middle Creek	07/15/97	Redfin Shiner	*Lythrurus umbratilus*	26
Middle Creek	07/15/97	Sand Shiner	*Notropis stramineus*	10
Middle Creek	07/15/97	Slim Minnow	*Pimephales tenellus*	18
Middle Creek	07/15/97	Suckermouth Minnow	*Phenacobius mirabilis*	18
Middle Creek	07/15/97	Channel Catfish	*Ictalurus punctatus*	8
Middle Creek	07/15/97	Flathead Catfish	*Pylodictis olivaris*	2
Middle Creek	07/15/97	Stonecat	*Noturus flavus*	9
Middle Creek	07/15/97	Longnose Gar	*Lepisosteus osseus*	3
Middle Creek	07/15/97	Channel Darter	*Percina copelandi*	2
Middle Creek	07/15/97	Orangethroat Darter	*Etheostoma spectabile*	40
Middle Creek	07/15/97	Ozark Logperch	*Percina caprodes*	7

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Stream	Date	Common Name	Scientific Name	Catch
Middle Creek	07/15/97	Western Mosquitofish	*Gambusia affinis*	20
Palmer Creek	07/25/02	Golden Redhorse	*Moxostoma erythrurum*	2
Palmer Creek	07/25/02	Green Sunfish	*Lepomis cyanellus*	22
Palmer Creek	07/25/02	Orangespotted Sunfish	*Lepomis humilis*	24
Palmer Creek	07/25/02	Bluntnose Minnow	*Pimephales notatus*	23
Palmer Creek	07/25/02	Cardinal Shiner	*Luxilus cardinalis*	44
Palmer Creek	07/25/02	Central Stoneroller	*Campostoma anomalum*	1078
Palmer Creek	07/25/02	Creek Chub	*Semotilus atromaculatus*	122
Palmer Creek	07/25/02	Orangethroat Darter	*Etheostoma spectabile*	213
Peyton Creek	06/04/97	Golden Redhorse	*Moxostoma erythrurum*	9
Peyton Creek	06/04/97	Bluegill	*Lepomis macrochirus*	2
Peyton Creek	06/04/97	Green Sunfish	*Lepomis cyanellus*	14
Peyton Creek	06/04/97	Largemouth Bass	*Micropterus salmoides*	1
Peyton Creek	06/04/97	Orangespotted Sunfish	*Lepomis humilis*	3
Peyton Creek	06/04/97	Bluntface Shiner	*Cyprinella camura*	1
Peyton Creek	06/04/97	Bluntnose Minnow	*Pimephales notatus*	22
Peyton Creek	06/04/97	Cardinal Shiner	*Luxilus cardinalis*	7
Peyton Creek	06/04/97	Central Stoneroller	*Campostoma anomalum*	156
Peyton Creek	06/04/97	Creek Chub	*Semotilus atromaculatus*	19
Peyton Creek	06/04/97	Red Shiner	*Cyprinella lutrensis*	95
Peyton Creek	06/04/97	Redfin Shiner	*Lythrurus umbratilus*	45
Peyton Creek	06/04/97	Suckermouth Minnow	*Phenacobius mirabilis*	2
Peyton Creek	06/04/97	Blackstripe Topminnow	*Fundulus notatus*	3
Peyton Creek	06/04/97	Black Bullhead	*Ameiurus melas*	3
Peyton Creek	06/04/97	Yellow Bullhead	*Ameiurus natalis*	4
Peyton Creek	06/04/97	Fantail Darter	*Etheostoma flabellare*	28
Peyton Creek	06/04/97	Orangethroat Darter	*Etheostoma spectabile*	159

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Stream	Date	Common Name	Scientific Name	Catch
Pranther Creek	07/31/07	Golden Redhorse	*Moxostoma erythrurum*	8
Pranther Creek	07/31/07	Spotted Sucker	*Minytrema melanops*	1
Pranther Creek	07/31/07	Bluegill	*Lepomis macrochirus*	25
Pranther Creek	07/31/07	Green Sunfish	*Lepomis cyanellus*	12
Pranther Creek	07/31/07	Largemouth Bass	*Micropterus salmoides*	3
Pranther Creek	07/31/07	Longear Sunfish	*Lepomis megalotis*	26
Pranther Creek	07/31/07	Orangespotted Sunfish	*Lepomis humilis*	44
Pranther Creek	07/31/07	Spotted Bass	*Micropterus punctulatus*	10
Pranther Creek	07/31/07	Bluntnose Minnow	*Pimephales notatus*	56
Pranther Creek	07/31/07	Central Stoneroller	*Campostoma anomalum*	134
Pranther Creek	07/31/07	Creek Chub	*Semotilus atromaculatus*	10
Pranther Creek	07/31/07	Blackstripe Topminnow	*Fundulus notatus*	4
Pranther Creek	07/31/07	Black Bullhead	*Ameiurus melas*	1
Pranther Creek	07/31/07	Channel Catfish	*Ictalurus punctatus*	2
Pranther Creek	07/31/07	Yellow Bullhead	*Ameiurus natalis*	6
Pranther Creek	07/31/07	Logperch	*Percina caprodes*	1
Pranther Creek	07/31/07	Orangethroat Darter	*Etheostoma spectabile*	105
Pranther Creek	07/31/07	Slenderhead Darter	*Percina phoxocephala*	3
Pranther Creek	07/31/07	Western Mosquitofish	*Gambusia affinis*	5
Rock Creek	07/20/04	Bluegill X Green Sunfish hybrid	*Lepomis macrochirus x L. cyanellus*	1
Rock Creek	07/20/04	Green Sunfish	*Lepomis cyanellus*	142
Rock Creek	07/20/04	Largemouth Bass	*Micropterus salmoides*	2
Rock Creek	07/20/04	Longear Sunfish	*Lepomis megalotis*	12
Rock Creek	07/20/04	Orangespotted Sunfish	*Lepomis humilis*	3
Rock Creek	07/20/04	Bluntnose Minnow	*Pimephales notatus*	11
Rock Creek	07/20/04	Cardinal Shiner	*Luxilus cardinalis*	8
Rock Creek	07/20/04	Central Stoneroller	*Campostoma anomalum*	194

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Stream	Date	Common Name	Scientific Name	Catch
Rock Creek	07/20/04	Yellow Bullhead	*Ameiurus natalis*	1
Rock Creek	07/20/04	Fantail Darter	*Etheostoma flabellare*	4
Rock Creek	07/20/04	Orangethroat Darter	*Etheostoma spectabile*	353
Rock Creek	07/20/04	Ozark Logperch	*Percina caprodes*	1
Rock Creek	07/22/04	Golden Redhorse	*Moxostoma erythrurum*	2
Rock Creek	07/22/04	Green Sunfish	*Lepomis cyanellus*	30
Rock Creek	07/22/04	Longear Sunfish	*Lepomis megalotis*	8
Rock Creek	07/22/04	Orangespotted Sunfish	*Lepomis humilis*	3
Rock Creek	07/22/04	Spotted Bass	*Micropterus punctulatus*	1
Rock Creek	07/22/04	Bluntnose Minnow	*Pimephales notatus*	23
Rock Creek	07/22/04	Cardinal Shiner	*Luxilus cardinalis*	34
Rock Creek	07/22/04	Central Stoneroller	*Campostoma anomalum*	126
Rock Creek	07/22/04	Redfin Shiner	*Lythrurus umbratilus*	41
Rock Creek	07/22/04	Stonecat	*Noturus flavus*	1
Rock Creek	07/22/04	Yellow Bullhead	*Ameiurus natalis*	5
Rock Creek	07/22/04	Fantail Darter	*Etheostoma flabellare*	65
Rock Creek	07/22/04	Orangethroat Darter	*Etheostoma spectabile*	87
Rock Creek	07/22/04	Ozark Logperch	*Percina caprodes*	1
South Fork Cottonwood River	07/21/95	Bluegill	*Lepomis macrochirus*	1
South Fork Cottonwood River	07/21/95	Green Sunfish	*Lepomis cyanellus*	3
South Fork Cottonwood River	07/21/95	Largemouth Bass	*Micropterus salmoides*	12
South Fork Cottonwood River	07/21/95	Longear Sunfish	*Lepomis megalotis*	5
South Fork Cottonwood River	07/21/95	Orangespotted Sunfish	*Lepomis humilis*	59
South Fork Cottonwood River	07/21/95	Spotted Bass	*Micropterus punctulatus*	2
South Fork Cottonwood River	07/21/95	Bluntface Shiner	*Cyprinella camura*	93
South Fork Cottonwood River	07/21/95	Bluntnose Minnow	*Pimephales notatus*	22
South Fork Cottonwood River	07/21/95	Cardinal Shiner	*Luxilus cardinalis*	7

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Stream	Date	Common Name	Scientific Name	Catch
South Fork Cottonwood River	07/21/95	Common Carp	*Cyprinus carpio*	1
South Fork Cottonwood River	07/21/95	Creek Chub	*Semotilus atromaculatus*	3
South Fork Cottonwood River	07/21/95	Mimic Shiner	*Notropis volucellus*	6
South Fork Cottonwood River	07/21/95	Red Shiner	*Cyprinella lutrensis*	446
South Fork Cottonwood River	07/21/95	Redfin Shiner	*Lythrurus umbratilus*	6
South Fork Cottonwood River	07/21/95	Sand Shiner	*Notropis stramineus*	2
South Fork Cottonwood River	07/21/95	Slim Minnow	*Pimephales tenellus*	14
South Fork Cottonwood River	07/21/95	Suckermouth Minnow	*Phenacobius mirabilis*	8
South Fork Cottonwood River	07/21/95	Channel Catfish	*Ictalurus punctatus*	6
South Fork Cottonwood River	07/21/95	Stonecat	*Noturus flavus*	7
South Fork Cottonwood River	07/21/95	Longnose Gar	*Lepisosteus osseus*	1
South Fork Cottonwood River	07/21/95	Orangethroat Darter	*Etheostoma spectabile*	12
South Fork Cottonwood River	07/21/95	Slenderhead Darter	*Percina phoxocephala*	38
South Fork Cottonwood River	07/21/95	Western Mosquitofish	*Gambusia affinis*	5
South Fork Cottonwood River	07/25/96	Brook Silverside	*Labidesthes sicculus*	3
South Fork Cottonwood River	07/25/96	Black Buffalo	*Ictiobus niger*	1
South Fork Cottonwood River	07/25/96	Buffalo (unidentified)	*Ictiobus spp.*	7
South Fork Cottonwood River	07/25/96	Golden Redhorse	*Moxostoma erythrurum*	8
South Fork Cottonwood River	07/25/96	Pealip Redhorse	*Moxostoma pisolabrum*	4
South Fork Cottonwood River	07/25/96	River Carpsucker	*Carpiodes carpio*	1
South Fork Cottonwood River	07/25/96	Smallmouth Buffalo	*Ictiobus bubalus*	9
South Fork Cottonwood River	07/25/96	Bluegill	*Lepomis macrochirus*	3
South Fork Cottonwood River	07/25/96	Green Sunfish	*Lepomis cyanellus*	2
South Fork Cottonwood River	07/25/96	Longear Sunfish	*Lepomis megalotis*	5
South Fork Cottonwood River	07/25/96	Orangespotted Sunfish	*Lepomis humilis*	3
South Fork Cottonwood River	07/25/96	Spotted Bass	*Micropterus punctulatus*	52
South Fork Cottonwood River	07/25/96	Bluntface Shiner	*Cyprinella camura*	75

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Stream	Date	Common Name	Scientific Name	Catch
South Fork Cottonwood River	07/25/96	Cardinal Shiner	*Luxilus cardinalis*	25
South Fork Cottonwood River	07/25/96	Carmine Shiner	*Notropis percobromus*	3
South Fork Cottonwood River	07/25/96	Central Stoneroller	*Campostoma anomalum*	34
South Fork Cottonwood River	07/25/96	Creek Chub	*Semotilus atromaculatus*	2
South Fork Cottonwood River	07/25/96	Ghost Shiner	*Notropis buchanani*	2
South Fork Cottonwood River	07/25/96	Mimic Shiner	*Notropis volucellus*	15
South Fork Cottonwood River	07/25/96	Red Shiner	*Cyprinella lutrensis*	221
South Fork Cottonwood River	07/25/96	Sand Shiner	*Notropis stramineus*	8
South Fork Cottonwood River	07/25/96	Slim Minnow	*Pimephales tenellus*	60
South Fork Cottonwood River	07/25/96	Suckermouth Minnow	*Phenacobius mirabilis*	178
South Fork Cottonwood River	07/25/96	Blackstripe Topminnow	*Fundulus notatus*	9
South Fork Cottonwood River	07/25/96	Channel Catfish	*Ictalurus punctatus*	37
South Fork Cottonwood River	07/25/96	Flathead Catfish	*Pylodictis olivaris*	16
South Fork Cottonwood River	07/25/96	Freckled Madtom	*Noturus nocturnus*	3
South Fork Cottonwood River	07/25/96	Neosho madtom	*Noturus placidus*	8
South Fork Cottonwood River	07/25/96	Stonecat	*Noturus flavus*	48
South Fork Cottonwood River	07/25/96	Longnose Gar	*Lepisosteus osseus*	4
South Fork Cottonwood River	07/25/96	Channel Darter	*Percina copelandi*	1
South Fork Cottonwood River	07/25/96	Orangethroat Darter	*Etheostoma spectabile*	15
South Fork Cottonwood River	07/25/96	Ozark Logperch	*Percina caprodes*	5
South Fork Cottonwood River	07/25/96	Slenderhead Darter	*Percina phoxocephala*	106
South Fork Cottonwood River	07/25/96	Western Mosquitofish	*Gambusia affinis*	15
South Fork Cottonwood River	07/25/96	Freshwater Drum	*Aplodinotus grunniens*	1
South Fork Cottonwood River	07/29/97	Golden Redhorse	*Moxostoma erythrurum*	1
South Fork Cottonwood River	07/29/97	Redhorse (unidentified)	*Moxostoma sp.*	42
South Fork Cottonwood River	07/29/97	River Carpsucker	*Carpiodes carpio*	1
South Fork Cottonwood River	07/29/97	Smallmouth Buffalo	*Ictiobus bubalus*	1

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Stream	Date	Common Name	Scientific Name	Catch
South Fork Cottonwood River	07/29/97	Green Sunfish	*Lepomis cyanellus*	9
South Fork Cottonwood River	07/29/97	Largemouth Bass	*Micropterus salmoides*	9
South Fork Cottonwood River	07/29/97	Longear Sunfish	*Lepomis megalotis*	1
South Fork Cottonwood River	07/29/97	Orangespotted Sunfish	*Lepomis humilis*	1
South Fork Cottonwood River	07/29/97	White Crappie	*Pomoxis annularis*	1
South Fork Cottonwood River	07/29/97	Gizzard Shad	*Dorosoma cepedianum*	1
South Fork Cottonwood River	07/29/97	Bluntface Shiner	*Cyprinella camura*	68
South Fork Cottonwood River	07/29/97	Bluntnose Minnow	*Pimephales notatus*	37
South Fork Cottonwood River	07/29/97	Cardinal Shiner	*Luxilus cardinalis*	965
South Fork Cottonwood River	07/29/97	Carmine Shiner	*Notropis percobromus*	5
South Fork Cottonwood River	07/29/97	Central Stoneroller	*Campostoma anomalum*	178
South Fork Cottonwood River	07/29/97	Creek Chub	*Semotilus atromaculatus*	8
South Fork Cottonwood River	07/29/97	Fathead Minnow	*Pimephales promelas*	4
South Fork Cottonwood River	07/29/97	Mimic Shiner	*Notropis volucellus*	83
South Fork Cottonwood River	07/29/97	Red Shiner	*Cyprinella lutrensis*	584
South Fork Cottonwood River	07/29/97	Redfin Shiner	*Lythrurus umbratilus*	3
South Fork Cottonwood River	07/29/97	Sand Shiner	*Notropis stramineus*	9
South Fork Cottonwood River	07/29/97	Slim Minnow	*Pimephales tenellus*	17
South Fork Cottonwood River	07/29/97	Suckermouth Minnow	*Phenacobius mirabilis*	143
South Fork Cottonwood River	07/29/97	Channel Catfish	*Ictalurus punctatus*	86
South Fork Cottonwood River	07/29/97	Flathead Catfish	*Pylodictis olivaris*	9
South Fork Cottonwood River	07/29/97	Neosho madtom	*Noturus placidus*	9
South Fork Cottonwood River	07/29/97	Stonecat	*Noturus flavus*	40
South Fork Cottonwood River	07/29/97	Yellow Bullhead	*Ameiurus natalis*	1
South Fork Cottonwood River	07/29/97	Longnose Gar	*Lepisosteus osseus*	3
South Fork Cottonwood River	07/29/97	Channel Darter	*Percina copelandi*	4
South Fork Cottonwood River	07/29/97	Fantail Darter	*Etheostoma flabellare*	1
South Fork Cottonwood River	07/29/97	Orangethroat Darter	*Etheostoma spectabile*	8

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Stream	Date	Common Name	Scientific Name	Catch
South Fork Cottonwood River	07/29/97	Slenderhead Darter	*Percina phoxocephala*	143
South Fork Cottonwood River	07/29/97	Western Mosquitofish	*Gambusia affinis*	11
South Fork Cottonwood River	08/13/07	Bigmouth Buffalo	*Ictiobus cyprinellus*	6
South Fork Cottonwood River	08/13/07	Golden Redhorse	*Moxostoma erythrurum*	6
South Fork Cottonwood River	08/13/07	Pealip Redhorse	*Moxostoma pisolabrum*	4
South Fork Cottonwood River	08/13/07	River Carpsucker	*Carpiodes carpio*	1
South Fork Cottonwood River	08/13/07	Smallmouth Buffalo	*Ictiobus bubalus*	9
South Fork Cottonwood River	08/13/07	Bluegill	*Lepomis macrochirus*	58
South Fork Cottonwood River	08/13/07	Green Sunfish	*Lepomis cyanellus*	47
South Fork Cottonwood River	08/13/07	Largemouth Bass	*Micropterus salmoides*	19
South Fork Cottonwood River	08/13/07	Longear Sunfish	*Lepomis megalotis*	13
South Fork Cottonwood River	08/13/07	Orangespotted Sunfish	*Lepomis humilis*	13
South Fork Cottonwood River	08/13/07	Spotted Bass	*Micropterus punctulatus*	13
South Fork Cottonwood River	08/13/07	White Crappie	*Pomoxis annularis*	1
South Fork Cottonwood River	08/13/07	Bluntface Shiner	*Cyprinella camura*	10
South Fork Cottonwood River	08/13/07	Bluntnose Minnow	*Pimephales notatus*	134
South Fork Cottonwood River	08/13/07	Cardinal Shiner	*Luxilus cardinalis*	136
South Fork Cottonwood River	08/13/07	Carmine Shiner	*Notropis percobromus*	187
South Fork Cottonwood River	08/13/07	Central Stoneroller	*Campostoma anomalum*	282
South Fork Cottonwood River	08/13/07	Common Carp	*Cyprinus carpio*	3
South Fork Cottonwood River	08/13/07	Mimic Shiner	*Notropis volucellus*	203
South Fork Cottonwood River	08/13/07	Red Shiner	*Cyprinella lutrensis*	60
South Fork Cottonwood River	08/13/07	Redfin Shiner	*Lythrurus umbratilus*	28
South Fork Cottonwood River	08/13/07	Slim Minnow	*Pimephales tenellus*	30
South Fork Cottonwood River	08/13/07	Blackstripe Topminnow	*Fundulus notatus*	5
South Fork Cottonwood River	08/13/07	Channel Catfish	*Ictalurus punctatus*	7
South Fork Cottonwood River	08/13/07	Flathead Catfish	*Pylodictis olivaris*	4

Appendix 7. Fish species and numbers collected in streams of Chase County, Kansas by the Stream Assessment and Monitoring Program of the Kansas Department of Wildlife and Parks (KDWP) from 1994-2007. Fish were collected with a combination of seining and electrofishing techniques. Data was provided by Mark Van Scoyoc of KDWP and Kristen Hase (formerly of KDWP, now employed by NPS), cont.

Stream	Date	Common Name	Scientific Name	Catch
South Fork Cottonwood River	08/13/07	Stonecat	*Noturus flavus*	28
South Fork Cottonwood River	08/13/07	Longnose Gar	*Lepisosteus osseus*	5
South Fork Cottonwood River	08/13/07	Fantail Darter	*Etheostoma flabellare*	103
South Fork Cottonwood River	08/13/07	Logperch	*Percina caprodes*	5
South Fork Cottonwood River	08/13/07	Orangethroat Darter	*Etheostoma spectabile*	227
South Fork Cottonwood River	08/13/07	Slenderhead Darter	*Percina phoxocephala*	2
South Fork Cottonwood River	08/13/07	Western Mosquitofish	*Gambusia affinis*	6
Spring Creek	05/31/95	Bluegill	*Lepomis macrochirus*	4
Spring Creek	05/31/95	Bluegill X Green Sunfish hybrid	*Lepomis macrochirus x L. cyanellus*	2
Spring Creek	05/31/95	Green Sunfish	*Lepomis cyanellus*	9
Spring Creek	05/31/95	Longear Sunfish	*Lepomis megalotis*	1
Spring Creek	05/31/95	Orangespotted Sunfish	*Lepomis humilis*	11
Spring Creek	05/31/95	Bluntnose Minnow	*Pimephales notatus*	5
Spring Creek	05/31/95	Central Stoneroller	*Campostoma anomalum*	9
Spring Creek	05/31/95	Redfin Shiner	*Lythrurus umbratilus*	12
Spring Creek	05/31/95	Blackstripe Topminnow	*Fundulus notatus*	2
Spring Creek	05/31/95	Black Bullhead	*Ameiurus melas*	1
Spring Creek	05/31/95	Orangethroat Darter	*Etheostoma spectabile*	3
Tributary Rock Creek	07/21/04	Golden Redhorse	*Moxostoma erythrurum*	1
Tributary Rock Creek	07/21/04	Black Crappie	*Pomoxis nigromaculatus*	4
Tributary Rock Creek	07/21/04	Bluegill X Green Sunfish hybrid	*Lepomis macrochirus x L. cyanellus*	1
Tributary Rock Creek	07/21/04	Green Sunfish	*Lepomis cyanellus*	40
Tributary Rock Creek	07/21/04	Largemouth Bass	*Micropterus salmoides*	1
Tributary Rock Creek	07/21/04	Longear Sunfish	*Lepomis megalotis*	7
Tributary Rock Creek	07/21/04	Orangespotted Sunfish	*Lepomis humilis*	1
Tributary Rock Creek	07/21/04	Bluntnose Minnow	*Pimephales notatus*	18
Tributary Rock Creek	07/21/04	Cardinal Shiner	*Luxilus cardinalis*	2

Appendix 7. Fish species and numbers collected in streams of Chase County, Kansas by the Stream Assessment and Monitoring Program of the Kansas Department of Wildlife and Parks (KDWP) from 1994-2007. Fish were collected with a combination of seining and electrofishing techniques. Data was provided by Mark Van Scoyoc of KDWP and Kristen Hase (formerly of KDWP, now employed by NPS), cont.

Stream	Date	Common Name	Scientific Name	Catch
Tributary Rock Creek	07/21/04	Redfin Shiner	*Lythrurus umbratilus*	10
Tributary Rock Creek	07/21/04	Orangethroat Darter	*Etheostoma spectabile*	24
West Trib South Fork Cottonwood River	08/14/07	Black Crappie	*Pomoxis nigromaculatus*	1
West Trib South Fork Cottonwood River	08/14/07	Bluegill	*Lepomis macrochirus*	3
West Trib South Fork Cottonwood River	08/14/07	Green Sunfish	*Lepomis cyanellus*	13
West Trib South Fork Cottonwood River	08/14/07	Largemouth Bass	*Micropterus salmoides*	46
West Trib South Fork Cottonwood River	08/14/07	Longear Sunfish	*Lepomis megalotis*	2
West Trib South Fork Cottonwood River	08/14/07	Orangespotted Sunfish	*Lepomis humilis*	1
West Trib South Fork Cottonwood River	08/14/07	White Crappie	*Pomoxis annularis*	3
West Trib South Fork Cottonwood River	08/14/07	Bluntface Shiner	*Cyprinella camura*	15
West Trib South Fork Cottonwood River	08/14/07	Bluntnose Minnow	*Pimephales notatus*	4
West Trib South Fork Cottonwood River	08/14/07	Cardinal Shiner	*Luxilus cardinalis*	45
West Trib South Fork Cottonwood River	08/14/07	Central Stoneroller	*Campostoma anomalum*	290
West Trib South Fork Cottonwood River	08/14/07	Red Shiner	*Cyprinella lutrensis*	47
West Trib South Fork Cottonwood River	08/14/07	Redfin Shiner	*Lythrurus umbratilus*	22
West Trib South Fork Cottonwood River	08/14/07	Slim Minnow	*Pimephales tenellus*	1
West Trib South Fork Cottonwood River	08/14/07	Yellow Bullhead	*Ameiurus natalis*	16
West Trib South Fork Cottonwood River	08/14/07	Orangethroat Darter	*Etheostoma spectabile*	31
West Trib South Fork Cottonwood River	08/14/07	Western Mosquitofish	*Gambusia affinis*	3

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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National Park Service
U.S. Department of the Interior

Natural Resource Program Center
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov