APPENDICES

Table A1. Local-scale environmental variables (57) used in this study.

Category	Abbreviation	Variable
Habitat type	HAB_TYPE	Habitat type score (riffle, run, pool, or glide) averaged across transects
	NO_RIFF	Number of riffles in study reach
Substrate	BEDROCK	Percent of substrate that is bedrock
	LG_BLDR	Percent of substrate that is large boulders (>45 cm)
	SM_BLDR	Percent of substrate that is small boulders (25-45 cm)
	COBBLE	Percent of substrate that is cobble (6-25 cm)
	GRAVEL	Percent of substrate that is gravel (2-60 mm)
	SAND	Percent of substrate that is sand (0.06-2 mm)
	MUDSILT	Percent of substrate that is mud or silt (<0.06 mm)
	GRV_LRG	Percent of substrate that is gravel or larger
	EMBEDDED	Substrate embeddedness (percent of boulders and cobble covered in fine sediment)
Algae/macrophytes	ALGAE_AB	Abundance of algae in study reach (scored as abundant, common, rare, or absent)
	MCRPH_AB	Abundance of aquatic macrophytes in study reach (scored as abundant, common, rare, or absent)
Instream cover	STRM_COV	Visually estimated percent cover
	FILA_ALG	Percent of instream cover provided by filamentous algae
	MICRALG	Percent of instream cover provided by microalgae and biofilms
	MACRPHYT	Percent of instream cover provided by aquatic macrophytes
	LWD	Percent of instream cover provided by large woody debris
	SWD	Percent of instream cover provided by small woody debris
	ROOTS	Percent of instream cover provided by submerged roots
	OVR_VEG	Percent of instream cover provided by overhanging terrestrial vegetation
	UNDERCUT	Percent of instream cover provided by undercut banks
	LEAFPACK	Percent of instream cover provided by leaf packs
	BOULDER	Percent of instream cover provided by boulders and other large substrates
	ARTIFICL	Percent of instream cover provided by artificial objects (e.g., tires, cement blocks)
	COV_TYPE	Number of the above cover types present

Table A1 Continued. Local-scale environmental variables (57) used in this study.

Category	Abbreviation	Variable
Stream morphology	STRMBEND	Number of stream bends in study reach
	WELLBEND	Number of well-defined stream bends in study reach
	MODBEND	Number of moderately-defined stream bends in study reach
	POORBEND	Number of poorly-defined stream bends in study reach
	WETWIDTH	Wetted width of stream (averaged across transects)
	AVG_DEP	Average stream depth
	THAL_DEP	Thalweg depth (averaged across transects)
	POOL_WID	Maximum pool width
	POOL_DEP	Maximum pool depth
	VELDEPTH	Velocity/depth regime score (optimal, suboptimal, marginal, or poor)
Flow	FLOWSTAT	Flow status score (high, moderate, low, or no flow)
	DISCHARG	Discharge (instantaneous stream flow in ft^3/s)
Roots/woody debris	CWD_WET	Count of wetted coarse woody debris in study reach
	CWD_BKF	Count of dry coarse woody debris within bank-full stream width
	ROOT_WET	Count of wetted root wads in study reach
	ROOT_BKF	Count of dry root wads within bank-full stream width
Riparian buffer	BUFFER	Width of riparian buffer (averagedacross transects)
	RIP_TREE	Percent of riparian vegetation consisting of trees
	RIP_SHRB	Percent of riparian vegetation consisting of shrubs
	RIP_GRAS	Percent of riparian vegetation consisting of grasses/forbs
	RIP_CULT	Percent of riparian vegetation consisting of cultivated fields
	OTHER	Percent of riparian vegetation consisting of other types
	CANOPY	Percent of stream shaded by tree canopy (measured with densitometer)
Aesthetics	AESTHET	Aesthetics score (wilderness, natural area, common setting, or offensive)
Bank characteristics	BNK_SLOP	Bank slope (averaged across transects)
	EROSION	Percentage of bank with evident or potential erosion
	SOIL_EXP	Percentage of exposed soil on banks
Water parameters	DO	Instantaneous dissolved oxygen (mg/L)
	PH	pH
	SPCOND	Specific conductivity (µs)
	TEMP	Water temperature (°C)

Table A2. Landscape-scale environmental variables used in this study

Variable	Description
LAT_DS	Latitude, decimal degrees
LONG_DS	Longitude, decimal degrees
EcoLev3	Level 3 ecoregion
PRECIP	Mean annual precipitation, calculated for watershed
ELEV_M	Mean elevation
WSLOPE	Mean watershed slope
WSHEDKM2	Watershed area
DAMS_CT	Number of dams in watershed
OUT_MGD	Cumulative permitted outfall discharge rate within watershed (million gallons per day)
OUT_CT	Number of outfalls
RESV_CT	Number of reservoirs within watershed
RESV_PCT	% of land covered by reservoirs within watershed
WATER	% of land covered by water within watershed
DEV_TOT	% developed land
FOR_TOT	% forested land, including forested wetlands
SHRUB	% shrubland
GRASS	% grassland
PASTURE	% pasture
ROWCROP	% rowcrop
WET_TOT	% wetland
AG_TOT	% agriculture (crop + pasture)
IMP_PCT	% impervious cover
CNPY_PCT	% canopy cover

Table A3. Metrics used to calculate the habitat quality index (HQI) for stream sites.

Abbreviation	HQI Metric
COV_SC	Score for instream cover metric
SUB_SC	Score for substrate stability metric
RIFF_SC	Score for number of riffles metric
POOL_SC	Score for pool dimensions metric
FLOW_SC	Score for flow status metric
BANK_SC	Score for bank stability metric
SIN_SC	Score for channel sinuosity metric
BUFF_SC	Score for riparian buffer metric
AEST_SC	Score for aesthetics metric
HQI_SC	HQI score

Table A4. Metrics used to calculate the index of biotic integrity (IBI) for fish communities.

Abbreviation	IBI Metric
RICHNESS	Species richness
NATCYPR	Percent of fishes classified as native cyprinids
BENTINV	Percent of fishes classified asbenthic invertebrate feeders
SUNFISH	Percent of fishes classified as*Lepomis* sunfish species
%INTOL	Percent of fishesconsidered intolerant of pollution
%TOL	Percent of fishesconsidered tolerant of pollution
%OMNIV	Percent of fishes classified as omnivores
%INVERTI	Percent of fishes classified as invertebrate feeders
%PISCIV	Percent of fishes classified as piscivores
SEINE	Percent of fishes captured with seine
MIN	Number of minutes electrofished
%NONNAT	Percent of fishes classified asnon-native
%ANOM	Percent of fishes that are*Campostoma anomalum*
RICHSC	Score for species richness metric
CYPRSC	Score for native cyprinid metric
BENINVSC	Score for benthic invertebrate feeder metric
SUNSC	Score for*Lepomis* sunfish metric
TOLSC	Score for pollution tolerance metric
OMNIVSC	Score for omnivorous species metric
INVERTSC	Score for invertebrate feeder metric
PISCIVSC	Score for piscivorous species metric
SEINESC	Score for proportion captured with seine metric
MINSC	Score for electrofishing minutes metric
NONNATSC	Score for nonnative species metric
ANOMSC	Score for*Campostoma anomalum* metric
IBI	IBI score
ALURANK	Aquatic Life Use (ALU) ranking

Table A5. Correlation coefficents and p values for best fit environmental vectors describing relationships between landscape variables and fish community structure in the Cross Timbers ecoregion. Values are based on rotational vector fitting between environmental variables and NMS scores for each site.

	2006		2008	
Variable	**r**	***p***	**r**	***p***
BASIN	**0.5624**	**0.0020**	**0.6867**	**0.0010**
LAT_DS	**0.6814**	**0.0020**	**0.8114**	**0.0010**
LONG_DS	0.1714	0.6156	0.4774	0.0050
PRECIP	**0.4212**	**0.0480**	**0.5094**	**0.0020**
ELEV_M	0.0742	0.9049	**0.4107**	**0.0410**
WSLOPE	0.1630	0.6316	0.3144	0.1732
WSHEDKM2	**0.6108**	**0.0010**	**0.6528**	**0.0010**
DAMS_CT	**0.5641**	**0.0020**	**0.7121**	**0.0010**
OUT_MGD	**0.4333**	**0.0350**	**0.4976**	**0.0090**
OUT_CT	**0.5670**	**0.0030**	**0.4858**	**0.0090**
RESV_CT	**0.5131**	**0.0030**	0.2928	0.2092
RESV_PCT	**0.4309**	**0.0240**	0.2161	0.4525
WATER	0.3792	0.0771	**0.5010**	**0.0030**
DEV_TOT	**0.4338**	**0.0340**	**0.4810**	**0.0090**
FOR_TOT	0.4114	0.0521	0.3971	0.0631
SHRUB	0.2980	0.2312	**0.5884**	**0.0010**
GRASS	0.1508	0.6887	**0.4994**	**0.0050**
PASTURE	**0.7490**	**0.0010**	**0.7685**	**0.0010**
ROWCROP	**0.5008**	**0.0110**	0.3115	0.1682
WET_TOT	0.3305	0.1421	0.3699	0.0721
AG_TOT	**0.6144**	**0.0010**	**0.4950**	**0.0070**
IMP_PCT	0.3979	0.0601	**0.3973**	**0.0440**
CNPY_PCT	**0.4448**	**0.0330**	**0.4450**	**0.0270**

Table A6. Correlation coefficents and p values for best fit environmental vectors describing relationships between in-stream habitat variables and community structure in the ecoregion 29. Values are based on rotational vector fitting between variables and NMS scores for each site.

	2006		2008	
Variable	**r**	***p***	**r**	***p***
WETWIDTH	0.4072	0.0541	0.2048	0.4875
AVG_DEP	0.2585	0.3223	**0.4461**	**0.0190**
DISCHARG	**0.4507**	**0.0170**	0.3917	0.0581
FLOWSTAT	**0.5970**	**0.0020**	0.2336	0.3834
POOL_WID	**0.5119**	**0.0050**	0.2364	0.3604
POOL_DEP	0.2484	0.3594	0.2411	0.3594
STRMBEND	0.1351	0.7307	0.1225	0.7638
WELLBEND	0.1513	0.6877	0.1358	0.7267
MODBEND	0.0607	0.9359	0.1084	0.8218
POORBEND	0.3169	0.1542	0.1214	0.7518
VELDEPTH	**0.5360**	**0.0030**	0.3195	0.1502
NO_RIFF	**0.6434**	**0.0010**	0.1620	0.6557
EMBEDDED	0.2309	0.4114	0.3956	0.0541
GRV_LRG	0.1993	0.5445	**0.4139**	**0.0320**
BEDROCK	0.1200	0.7928	0.2072	0.4815
LG_BLDR	0.0494	0.9520	0.0730	0.9079
SM_BLDR	0.1383	0.6997	0.0293	0.9860
COBBLE	0.1170	0.8178	0.0813	0.8919
GRAVEL	0.1627	0.6697	**0.4257**	**0.0310**
SAND	0.2642	0.3083	0.2563	0.3103
MUDSILT	**0.6326**	**0.0010**	**0.6178**	**0.0010**
STRM_COV	0.3596	0.0811	0.2218	0.4074
FILA_ALG	0.1929	0.5285	0.3913	0.0571
MICRALG	0.3017	0.2192	**0.4475**	**0.0290**
MACRPHYT	0.1950	0.5445	0.2566	0.2923
LWD	0.1961	0.5285	**0.4658**	**0.0160**
SWD	0.2690	0.2733	0.0765	0.8969
ROOTS	0.1534	0.6597	0.2890	0.1992
OVR_VEG	0.4133	0.0450	0.1733	0.5596
UNDERCUT	0.0526	0.9499	0.1693	0.5946
LEAFPACK	**0.4342**	**0.0360**	0.2097	0.4825
BOULDER	0.1937	0.5135	0.0853	0.8579
ARTIFICL	**0.4191**	**0.0410**	0.3015	0.1702
COV_TYPE	0.0936	0.8549	0.0513	0.9499
CWD_WET	**0.4735**	**0.0130**	**0.5578**	**0.0030**
CWD_BKF	0.1935	0.5155	0.1112	0.7838
ROOT_WET	0.2132	0.4755	0.2670	0.2773
ROOT_BKF	0.2492	0.3493	0.2566	0.3203

Table A6 continued. Correlation coefficents and p values for relationships between fish community structure and in stream habitat variables in the Cross Timbers ecoregion.

	2006		2008	
Variable	**r**	***p***	**r**	***p***
EROSION	**0.4367**	**0.0360**	**0.4312**	**0.0200**
SOIL_EXP	**0.4644**	**0.0170**	0.3867	0.0531
BNK_SLOP	0.0917	0.8609	**0.5393**	**0.0010**
BUFFER	0.0653	0.9469	0.1540	0.6637
RIP_TREE	0.2817	0.2583	**0.4143**	**0.0480**
RIP_SHRB	0.0519	0.9510	0.2493	0.3243
RIP_GRAS	0.2850	0.2262	**0.4209**	**0.0400**
RIP_CULT	0.2397	0.3854	0.2849	0.2382
OTHER	0.0865	0.8739	0.1085	0.8098
CANOPY	0.2297	0.4244	0.3188	0.1421
AESTHET	0.1998	0.5135	**0.4065**	**0.0390**
ALGAE_AB	0.3577	0.1211	0.3718	0.0731
HAB_TYPE	**0.4966**	**0.0070**	0.2164	0.4234
MCRPH_AB	0.1682	0.6406	0.2475	0.3504
THAL_DEP	0.2129	0.4625	0.2833	0.2202
DO	0.1585	0.6426	0.2567	0.3083
PH	0.2540	0.3053	0.1247	0.7668
SPCOND	0.3012	0.1932	**0.4123**	**0.0340**
TEMP	0.2087	0.4525	0.3326	0.1241

Table A7. . Correlation coefficents and p values for best fit environmental vectors describing relationships between HQI metrics and fish community structure in the Cross Timbers ecoregion. Values are based on rotational vector fitting between environmental variables and NMS scores for each site.

	2006		2008	
Variable	**r**	**pval**	**r**	**pval**
COV_SC	0.2041	0.4755	0.1877	0.5155
SUB_SC	0.2378	0.4204	0.3070	0.1892
RIFF_SC	**0.6107**	**0.0010**	0.0987	0.8549
POOL_SC	**0.4172**	**0.0390**	0.3625	0.0761
FLOW_SC	**0.5970**	**0.0020**	0.2336	0.3834
BANK_SC	0.2970	0.2182	**0.5020**	**0.0070**
SIN_SC	0.1364	0.7447	0.0417	0.9670
BUFF_SC	0.0849	0.8919	0.1544	0.6867
AEST_SC	0.1998	0.5135	0.2262	0.4024
HQI_SC	**0.6171**	**0.0020**	0.2408	0.3544

TableA8. Correlation coefficents and p values for best fit environmental vectors describing relationships between fish IBI metrics and community structure in the Cross Timbers ecoregion. Values are based on rotational vector fitting between environmental variables and NMS scores for each site.

	2006		2008	
Variable	**r**	**pval**	**r**	**pval**
RICHNESS	**0.6625**	**0.0010**	0.2557	0.3263
.NATCYPR	**0.7026**	**0.0010**	0.3892	0.0581
.BENTINV	0.3236	0.1321	0.0585	0.9359
.SUNFISH	0.3775	0.0741	0.3676	0.1001
.INTOL	**0.6081**	**0.0010**	0.2697	0.2472
X.TOL	0.3768	0.0821	**0.5738**	**0.0010**
X.OMNIV	0.1790	0.6036	0.1719	0.6086
X.INVERTI	0.1349	0.7327	**0.6368**	**0.0010**
X.PISCIV	0.3250	0.1592	**0.7193**	**0.0010**
.SEINE	0.3343	0.1321	**0.5517**	**0.0050**
.MIN	0.2581	0.3493	0.3056	0.1942
X.NONNAT	0.0987	0.8599	**0.5111**	**0.0050**
X.ANOM	**0.4503**	**0.0210**	0.1790	0.5826
RICHSC	**0.5242**	**0.0080**	0.3560	0.0991
CYPRSC	**0.7207**	**0.0010**	0.2510	0.3133
BENINVSC	0.2503	0.3153	0.1269	0.7668
SUNSC	0.1541	0.6426	**0.4279**	**0.0490**
TOLSC	0.2732	0.2893	**0.5301**	**0.0040**
OMNIVSC	0.3061	0.1351	0.2205	0.3964
INVERTSC	0.2190	0.4414	**0.5836**	**0.0020**
PISCIVSC	0.3094	0.1822	**0.6024**	**0.0020**
SEINESC	0.3207	0.1562	**0.5087**	**0.0060**
MINSC	0.1928	0.5425	0.3604	0.0961
NONNATSC	0.2224	0.4845	0.3432	0.1441
ANOMSC	0.7071	0.4024	0.3522	0.0961
IBI	0.3756	0.0971	0.1591	0.6637
ALURANK	0.3599	0.1111	0.1860	0.5455

Table A9. Correlation coefficents and p-values for relationships between fish community structure and landscape variables in the Blackland prairie ecoregion.

	2006		2008	
Variable	**r**	***p***	**r**	***p***
BASIN	0.3767	0.5195	0.5432	0.2723
LAT_DS	0.4625	0.3804	0.6491	0.1191
LONG_DS	0.3877	0.4675	0.5389	0.2683
PRECIP	0.3348	0.5706	0.5538	0.2322
ELEV_M	0.4849	0.3363	0.3295	0.6126
WSLOPE	0.3917	0.5235	0.3502	0.5846
WSHEDKM2	0.6151	0.1692	0.5809	0.1932
DAMS_CT	0.4284	0.4274	0.4262	0.4565
OUT_MGD	0.3512	0.5285	0.4886	0.3554
OUT_CT	0.4047	0.4875	0.4729	0.3724
RESV_CT	0.2187	0.7057	0.5801	0.2603
RESV_PCT	0.2187	0.7237	0.5801	0.2392
WATER	0.6220	0.1522	0.5967	0.1712
DEV_TOT	**0.8752**	**0.0030**	0.6728	0.0991
FOR_TOT	0.2923	0.6977	0.0392	0.9970
SHRUB	0.3836	0.4715	0.2759	0.7187
GRASS	0.4763	0.3393	0.3697	0.5666
PASTURE	**0.7647**	**0.0220**	0.6328	0.1381
ROWCROP	0.3440	0.6607	0.1229	0.9359
WET_TOT	0.4624	0.3914	0.4541	0.3764
AG_TOT	0.4620	0.3754	0.4934	0.3323
IMP_PCT	**0.8004**	**0.0160**	**0.7744**	**0.0250**
CNPY_PCT	0.2131	0.8278	0.1283	0.9489

Table A10. Correlation coefficents and p values for relationships between fish community structure and in stream habitat variables in the Blackland prairie ecoregion.

	2006		2008	
Variable	**r**	***p***	**r**	***p***
WETWIDTH	0.1340	0.9309	0.3892	0.5295
AVG_DEP	0.7145	0.0611	0.6121	0.1582
DISCHARG	0.5328	0.2683	**0.7242**	**0.0541**
FLOWSTAT	0.4335	0.4414	**0.7729**	**0.0210**
POOL_WID	0.4224	0.4815	0.2401	0.7628
POOL_DEP	0.3108	0.7107	0.4809	0.3493
STRMBEND	0.1293	0.9289	0.1393	0.9349
WELLBEND	0.5864	0.1872	0.4046	0.4474
MODBEND	0.5552	0.2202	0.4613	0.3874
POORBEND	0.2404	0.7958	0.1921	0.8539
VELDEPTH	0.5494	0.2282	0.3885	0.5175
NO_RIFF	**0.8667**	**0.0040**	**0.7521**	**0.0270**
EMBEDDED	0.4706	0.3313	**0.8256**	**0.0070**
GRV_LRG	0.4408	0.4344	**0.7681**	**0.0350**
BEDROCK	0.6883	0.0731	0.5400	0.2633
LG_BLDR	0.3831	0.4414	0.3076	0.5135
SM_BLDR	0.5308	0.2533	0.3697	0.5385
COBBLE	**0.7695**	**0.0260**	**0.7574**	**0.0320**
GRAVEL	0.1656	0.8769	0.7313	0.0561
SAND	0.5692	0.2142	0.3280	0.6386
MUDSILT	0.3528	0.5896	**0.7647**	**0.0340**
STRM_COV	0.3829	0.5425	0.6164	0.1542
FILA_ALG	0.4867	0.3243	0.5939	0.1742
MICRALG	0.5024	0.3183	0.1374	0.9019
MACRPHYT	0.3868	0.5245	0.2411	0.7347
LWD	0.5204	0.2803	**0.8985**	**0.0050**
SWD	0.1786	0.8639	0.4631	0.3854
ROOTS	0.3448	0.5646	0.4200	0.4925
OVR_VEG	0.5479	0.2533	0.1814	0.8799
UNDERCUT	0.2934	0.6436	0.0660	0.9850
LEAFPACK	0.2743	0.7177	0.5969	0.1782
BOULDER	0.4052	0.4585	0.6368	0.1231
ARTIFICL	0.6105	0.1632	0.6053	0.1491
COV_TYPE	0.1482	0.8969	0.1177	0.9429
CWD_WET	0.2521	0.7558	0.4335	0.4364
CWD_BKF	0.2266	0.7918	0.2757	0.7447
ROOT_WET	0.6208	0.1161	0.4515	0.4224
ROOT_BKF	**0.7765**	**0.0230**	0.2125	0.8258

Table A10 continued. Correlation coefficents and p values for relationships between fish community structure and in stream habitat variables in the Blackland prairie ecoregion.

	2006		2008	
Variable	**r**	***p***	**r**	***p***
EROSION	0.2087	0.8498	0.3446	0.5946
SOIL_EXP	0.2174	0.8348	0.3881	0.5085
BNK_SLOP	0.6120	0.1251	0.6217	0.1351
BUFFER	0.1063	0.9620	0.3304	0.6236
RIP_TREE	0.1577	0.8899	0.1799	0.8869
RIP_SHRB	0.1832	0.8569	**0.7322**	**0.0340**
RIP_GRAS	0.1652	0.8979	0.5262	0.2883
OTHER	0.5014	0.2402	0.4932	0.3323
CANOPY	0.4502	0.4054	0.4224	0.4625
AESTHET	0.4229	0.4675	0.4012	0.4975
ALGAE_AB	0.3037	0.6837	0.1554	0.9019
HAB_TYPE	0.5023	0.3373	**0.8396**	**0.0100**
MCRPH_AB	0.4182	0.4414	0.2321	0.7678
THAL_DEP	0.6509	0.1191	**0.7857**	**0.0230**
DO	0.4543	0.3353	0.5024	0.3243
PH	0.2114	0.8218	0.3901	0.5435
SPCOND	0.2103	0.8649	0.4398	0.4525
TEMP	0.3893	0.5135	0.0734	0.9840

Table A11. Correlation coefficents and p values for relationships between fish community structure and in habitat metric scores in the Blackland prairie ecoregion.

	2006		2008	
Variable	**r**	**pval**	**r**	**pval**
COV_SC	0.4605	0.3964	0.5514	0.2372
SUB_SC	0.5660	0.2002	**0.8319**	**0.0070**
RIFF_SC	**0.9091**	**0.0020**	**0.7538**	**0.0270**
POOL_SC	0.3219	0.7177	0.4663	0.4284
FLOW_SC	0.4335	0.4414	**0.7729**	**0.0210**
BANK_SC	0.3990	0.5055	0.6478	0.1181
SIN_SC	0.5864	0.1882	0.4046	0.4474
BUFF_SC	0.1583	0.9029	0.5195	0.3413
AEST_SC	0.4229	0.4675	0.4012	0.4985
HQI_SC	0.5412	0.2472	0.3550	0.5726

Table A12. Correlation coefficents and p values for relationships between fish community structure and in index of biotic integrity metric scores in the Blackland prairie ecoregion.

	2006		2008	
Variable	**r**	**pval**	**r**	**pval**
RICHNESS	**0.7780**	**0.0210**	0.3187	0.6607
NATCYPR	0.6705	0.0911	0.5648	0.2302
BENTINV	0.3766	0.5395	0.4024	0.5255
SUNFISH	**0.7540**	**0.0280**	0.5717	0.1962
%INTOL	0.3356	0.6647	0.1723	0.8919
%TOL	0.6015	0.1602	0.6080	0.1632
%OMNIV	0.7382	0.0531	0.5236	0.2983
%INVERTI	0.5244	0.2813	0.2542	0.7608
%PISCIV	0.7448	0.0460	0.6489	0.1171
.SEINE	0.4202	0.4885	0.6332	0.1281
.MIN	0.6533	0.0921	0.6243	0.1351
%NONNAT	0.5367	0.2793	**0.7870**	**0.0130**
X.ANOM	0.2600	0.7357	0.3769	0.5526
RICHSC	**0.7535**	**0.0270**	0.2322	0.7928
CYPRSC	0.6806	0.0801	0.5592	0.2422
BENINVSC	0.3766	0.5395	0.4052	0.5225
SUNSC	**0.7876**	**0.0210**	0.4879	0.3093
TOLSC	0.4607	0.3914	0.5822	0.2182
OMNIVSC	0.6179	0.1842	0.3127	0.6316
INVERTSC	0.4837	0.3744	0.7592	0.3433
PISCIVSC	0.6204	0.1281	0.5671	0.2022
SEINESC	0.3139	0.7107	0.2953	0.7247
MINSC	0.6208	0.1421	0.6894	0.0711
NONNATSC	0.6157	0.1832	0.7027	0.0821
ANOMSC	0.3563	0.5445	0.2492	0.7618
IBI	0.5044	0.3203	0.4660	0.3684
ALURANK	0.5141	0.3143	0.3149	0.6256

Table A13. Correlation coefficents and p values for relationships between fish community structure and landscape variables in the East Central Texas plains ecoregion.

	2006		2008	
Variable	**r**	***p***	**r**	***p***
BASIN	0.6213	0.0611	0.5454	0.1031
LAT_DS	0.4075	0.3353	0.2365	0.7057
LONG_DS	0.5870	0.0891	0.5400	0.1351
PRECIP	0.5837	0.0911	**0.6565**	**0.0360**
ELEV_M	0.5459	0.1111	0.4831	0.2072
WSLOPE	**0.7673**	**0.0080**	**0.6916**	**0.0160**
WSHEDKM2	0.1762	0.8278	**0.6224**	**0.0470**
DAMS_CT	0.2155	0.7658	0.2345	0.7067
OUT_MGD	0.3355	0.4995	0.3167	0.5475
OUT_CT	0.1835	0.8128	0.2185	0.7578
RESV_CT	0.3134	0.5235	0.3706	0.4154
RESV_PCT	0.3355	0.4995	**0.7641**	**0.0240**
WATER	0.1692	0.8458	**0.6979**	**0.0220**
DEV_TOT	0.2272	0.7528	0.2415	0.6947
FOR_TOT	**0.6804**	**0.0280**	0.5848	0.0751
SHRUB	0.1878	0.8038	0.2190	0.7357
GRASS	0.3306	0.5165	0.3107	0.5335
PASTURE	**0.6704**	**0.0290**	0.4675	0.2222
ROWCROP	**0.6461**	**0.0450**	**0.8650**	**0.0040**
WET_TOT	**0.8707**	**0.0010**	**0.7558**	**0.0070**
AG_TOT	**0.8099**	**0.0030**	**0.6795**	**0.0220**
IMP_PCT	0.3829	0.3744	0.3762	0.3814
CNPY_PCT	**0.8030**	**0.0040**	**0.7014**	**0.0160**

Table A14. Correlation coefficents and p values for relationships between fish community structure and in stream habitat variables in the East Central Texas plains ecoregion.

	2006		2008	
Variable	**r**	***p***	**r**	***p***
WETWIDTH	0.4888	0.2052	0.3750	0.3814
AVG_DEP	0.4476	0.2723	0.5637	0.0921
DISCHARG	0.5527	0.1201	0.4229	0.3043
FLOWSTAT	0.5032	0.1822	0.2699	0.6386
POOL_WID	0.2503	0.6697	0.3755	0.4014
POOL_DEP	0.2556	0.6577	0.0690	0.9700
STRMBEND	**0.7852**	**0.0020**	0.1097	0.9279
WELLBEND	0.4033	0.3173	0.2358	0.7187
MODBEND	0.5250	0.1311	0.3634	0.4454
POORBEND	0.3442	0.4424	0.4408	0.2703
VELDEPTH	0.5069	0.1742	0.5367	0.1311
NO_RIFF	0.2584	0.6677	0.4897	0.1622
EMBEDDED	0.2415	0.6847	0.4716	0.2142
GRV_LRG	0.5062	0.1622	0.4664	0.2252
BEDROCK	0.5701	0.0881	0.4764	0.1792
LG_BLDR	0.5964	0.1251	0.5220	0.2102
SM_BLDR	0.5178	0.1401	0.4726	0.1792
COBBLE	0.2590	0.6837	**0.7417**	**0.0140**
GRAVEL	0.2879	0.6006	0.2913	0.6096
SAND	0.5536	0.1121	0.3378	0.4895
MUDSILT	0.5460	0.1191	**0.7454**	**0.0160**
STRM_COV	0.4676	0.2282	0.3904	0.3323
FILA_ALG	0.3053	0.5325	**0.6389**	**0.0400**
MICRALG	0.2973	0.5536	0.1318	0.9049
MACRPHYT	0.3365	0.5025	0.2872	0.6326
LWD	**0.7563**	**0.0060**	0.2665	0.6496
SWD	**0.6503**	**0.0501**	**0.7885**	**0.0050**
ROOTS	0.6256	0.0631	0.2412	0.7147
OVR_VEG	0.3534	0.4535	0.5873	0.0841
UNDERCUT	0.4613	0.2272	0.2045	0.7708
LEAFPACK	0.3764	0.4124	**0.6813**	**0.0350**
BOULDER	0.5431	0.1071	**0.7389**	**0.0140**
ARTIFICL	**0.6132**	**0.0440**	0.3978	0.3283
COV_TYPE	**0.7102**	**0.0200**	0.3862	0.3574
CWD_WET	0.5668	0.0961	0.3743	0.4164
CWD_BKF	0.5513	0.1091	**0.8084**	**0.0050**
ROOT_WET	0.3393	0.4835	0.2343	0.7197
ROOT_BKF	0.2829	0.6196	0.6121	0.0721

Table A14 continued. Correlation coefficents and p values for relationships between fish community structure and in stream habitat variables in the East central Texas plains ecoregion.

	2006		2008	
Variable	**r**	***p***	**r**	***p***
EROSION	0.4717	0.2132	0.0616	0.9770
SOIL_EXP	0.3825	0.3804	0.0284	0.9900
BNK_SLOP	0.2765	0.6386	0.2805	0.6166
BUFFER	0.1756	0.8408	0.4057	0.3293
RIP_TREE	0.5531	0.1141	0.2989	0.5816
RIP_SHRB	0.5120	0.1722	0.1836	0.8118
RIP_GRAS	**0.7266**	**0.0160**	0.4904	0.2252
RIP_CULT	0.1380	0.8899	NA	1.0000
OTHER	NA	1.0000	**0.7405**	**0.0110**
CANOPY	0.4815	0.2012	**0.8267**	**0.0080**
AESTHET	0.2203	0.7538	0.1390	0.9109
ALGAE_AB	0.2678	0.6386	**0.6506**	**0.0330**
HAB_TYPE	**0.7334**	**0.0180**	**0.6921**	**0.0170**
MCRPH_AB	0.4473	0.2623	0.3598	0.4394
THAL_DEP	0.4028	0.3944	0.5185	0.1421
DO	0.5134	0.1742	**0.8943**	**0.0010**
PH	0.5784	0.0811	**0.6814**	**0.0350**
SPCOND	0.1762	0.8398	0.3396	0.4925
TEMP	0.2481	0.6967	0.5501	0.1191

Table A15. coefficents and p values for relationships between fish community structure and in habitat metric scores in the East central Texas plains ecoregion.

	2006		2008	
Variable	**r**	**pval**	**r**	**pval**
COV_SC	0.4027	0.3113	0.2078	0.7588
SUB_SC	0.4436	0.2653	0.4417	0.2573
RIFF_SC	0.2026	0.7868	0.4620	0.2172
POOL_SC	0.3764	0.3804	0.2502	0.7427
FLOW_SC	0.5032	0.1822	0.2699	0.6386
BANK_SC	0.5960	0.0871	0.2340	0.7157
SIN_SC	0.6330	0.0551	0.2493	0.6907
BUFF_SC	0.3126	0.5425	0.3780	0.3844
AEST_SC	0.2203	0.7538	0.1390	0.9099
HQI_SC	0.1828	0.8358	0.3492	0.4474

Table A16. Correlation coefficents and p values for relationships between fish community structure and in index of biotic integrity metric scores in the East central Texas ecoregion.

	2006		2008	
Variable	**r**	**pval**	**r**	**pval**
RICHNESS	0.2898	0.5596	**0.6965**	**0.0200**
NATCYPR	0.1713	0.8248	**0.8760**	**0.0010**
BENTINV	0.1573	0.8669	**0.6907**	**0.0300**
SUNFISH	**0.6949**	**0.0160**	0.4344	0.2863
%INTOL	0.2333	0.7247	**0.6682**	**0.0320**
%TOL	**0.8676**	**0.0030**	**0.9371**	**0.0010**
%OMNIV	0.1788	0.8318	0.2431	0.7007
%INVERTI	0.5571	0.1081	0.6237	0.0521
%PISCIV	**0.7191**	**0.0120**	**0.7602**	**0.0090**
.SEINE	0.6060	0.0611	**0.7781**	**0.0060**
.MIN	0.4048	0.3534	**0.6328**	**0.0480**
%NONNAT	NA	1.0000	0.1354	0.7968
X.ANOM	0.1960	0.7728	0.4652	0.2442
RICHSC	0.1706	0.8218	**0.7068**	**0.0160**
CYPRSC	0.2350	0.7017	**0.7707**	**0.0080**
BENINVSC	0.3096	0.4284	0.4007	0.3614
SUNSC	**0.7510**	**0.0050**	0.2715	0.5686
INTOLSC	0.3342	0.4755	0.4275	0.2813
TOLSC	**0.8741**	**0.0010**	**0.8581**	**0.0010**
OMNIVSC	0.1322	0.9199	0.0491	0.9890
INVERTSC	0.6350	0.7277	0.6418	0.5145
PISCIVSC	0.4768	0.2372	0.5185	0.1572
SEINESC	0.5158	0.1331	0.6173	0.0591
MINSC	0.6417	0.7277	0.6078	0.1221
NONNATSC	0.6350	0.7277	0.6418	0.5145
ANOMSC	0.2913	0.5986	0.3451	0.4855
IBI	0.4612	0.2372	0.5138	0.1692
ALURANK	0.3265	0.4935	0.4387	0.2833

Table A17. Correlation coefficients and p values for relationships between fish community structure landscape variables, habitat variables, and HQI scores for all three years by ecoregion.

	Ecoregion 29		Ecoregion 32		Ecoregion 33	
	r	pval	r	pval	r	Pval
BASIN	**0.3710**	**0.0030**	**0.7961**	**0.0030**	**0.5350**	**0.0050**
LAT_DS	**0.5853**	**0.0010**	**0.8631**	**0.0010**	0.3180	0.1712
LONG_DS	0.1682	0.2973	**0.6884**	**0.0080**	**0.6044**	**0.0020**
PRECIP	0.1061	0.6156	0.4917	0.1181	**0.6943**	**0.0010**
ELEV_M	**0.3711**	**0.0030**	**0.8267**	**0.0010**	**0.5717**	**0.0040**
WSLOPE	**0.2890**	**0.0310**	**0.7168**	**0.0080**	**0.7345**	**0.0010**
WSHEDKM2	**0.3600**	**0.0040**	0.5421	0.0651	**0.5729**	**0.0030**
DAMS_CT	**0.6284**	**0.0010**	0.2999	0.4895	0.0526	0.9399
OUT_MGD	**0.3778**	**0.0030**	**0.6672**	**0.0150**	0.2939	0.2462
OUT_CT	**0.2917**	**0.0240**	0.5614	0.0611	0.2283	0.4314
RESV_CT	0.1185	0.5646	NA	1.0000	0.3823	0.0641
RESV_PCT	0.1265	0.5145	NA	1.0000	**0.6698**	**0.0010**
WATER	**0.3447**	**0.0150**	0.2675	0.5836	**0.6351**	**0.0010**
DEV_TOT	0.1528	0.3844	**0.8574**	**0.0010**	0.3214	0.1582
FOR_TOT	0.1680	0.3103	**0.7583**	**0.0040**	**0.6626**	**0.0010**
SHRUB	0.1365	0.4715	**0.6885**	**0.0090**	0.2741	0.2783
GRASS	0.2129	0.1562	0.1845	0.7598	**0.6238**	**0.0010**
PASTURE	**0.5640**	**0.0010**	**0.8567**	**0.0010**	**0.6470**	**0.0010**
ROWCROP	0.1912	0.2092	**0.6701**	**0.0130**	**0.7962**	**0.0010**
WET_TOT	0.2642	0.0581	0.5130	0.1121	**0.7798**	**0.0010**
AG_TOT	0.2623	0.0561	0.2489	0.6156	**0.7391**	**0.0010**
IMP_PCT	**0.3061**	**0.0230**	**0.8692**	**0.0010**	**0.4881**	**0.0150**
CNPY_PCT	0.1992	0.1832	**0.8275**	**0.0010**	**0.7585**	**0.0010**
WETWIDTH	0.2111	0.1612	0.4235	0.2573	0.2757	0.2693
AVG_DEP	**0.4102**	**0.0010**	0.5564	0.0601	**0.5708**	**0.0020**
DISCHARG	**0.6735**	**0.0010**	0.3202	0.4715	**0.4782**	**0.0100**
FLOWSTAT	**0.5542**	**0.0010**	0.1822	0.7618	0.2948	0.2222
POOL_WID	0.0671	0.8338	0.4613	0.1702	0.3191	0.1652
POOL_DEP	**0.3823**	**0.0030**	**0.5779**	**0.0460**	0.3303	0.1552
STRMBEND	0.1957	0.1922	0.1039	0.9269	0.3294	0.1662
WELLBEND	0.1758	0.2733	0.1011	0.9359	0.1684	0.6266
MODBEND	0.0734	0.8088	0.5137	0.0911	0.2756	0.2903
POORBEND	0.1448	0.4154	0.5655	0.0571	**0.4577**	**0.0270**
VELDEPTH	**0.3547**	**0.0030**	0.2211	0.6807	**0.4776**	**0.0120**
NO_RIFF	**0.3180**	**0.0120**	**0.7471**	**0.0040**	**0.4432**	**0.0230**
EMBEDDED	0.2166	0.1502	0.5770	0.0571	0.3563	0.1021

Table A17 continued.

	Ecoregion 29		Ecoregion 32		Ecoregion 33	
	r	pval	r	pval	r	pval
GRV_LRG	**0.3453**	**0.0080**	0.5735	0.0611	**0.6242**	**0.0010**
BEDROCK	0.2446	0.0811	**0.6094**	**0.0410**	**0.5131**	**0.0100**
LG_BLDR	0.1015	0.6446	NA	1.0000	**0.4860**	**0.0170**
SM_BLDR	0.1946	0.2162	0.4685	0.1632	**0.5627**	**0.0070**
COBBLE	0.1568	0.3794	**0.6169**	**0.0370**	**0.6376**	**0.0010**
GRAVEL	**0.2985**	**0.0280**	0.5655	0.0541	**0.4468**	**0.0250**
SAND	**0.3137**	**0.0120**	**0.7556**	**0.0030**	**0.4697**	**0.0140**
MUDSILT	**0.4852**	**0.0010**	0.2961	0.5015	**0.5775**	**0.0040**
STRM_COV	0.2193	0.1381	0.0882	0.9319	0.2510	0.3253
FILA_ALG	**0.2927**	**0.0190**	0.2355	0.6366	0.3253	0.1491
MICRALG	**0.4008**	**0.0020**	0.3596	0.3483	0.2651	0.3033
MACRPHYT	**0.5032**	**0.0010**	0.1708	0.7738	0.3426	0.1171
LWD	**0.3332**	**0.0070**	0.3154	0.4484	**0.7140**	**0.0010**
SWD	0.1861	0.2442	0.1286	0.8839	0.3443	0.1201
ROOTS	0.2502	0.0741	0.1718	0.7938	0.0850	0.8919
OVR_VEG	0.2015	0.1792	0.0953	0.9359	0.1091	0.8298
UNDERCUT	0.2232	0.1221	0.2778	0.5596	0.0677	0.9249
LEAFPACK	0.2455	0.0741	0.0614	0.9770	0.2710	0.2843
BOULDER	0.1806	0.2633	0.1851	0.7528	**0.5087**	**0.0150**
ARTIFICL	0.2530	0.0521	**0.7824**	**0.0020**	0.1675	0.6476
COV_TYPE	0.1911	0.2402	0.2100	0.7217	0.3446	0.1291
CWD_WET	**0.4406**	**0.0010**	0.2234	0.6657	**0.4971**	**0.0140**
CWD_BKF	0.1283	0.5155	0.5767	0.0591	**0.4914**	**0.0050**
ROOT_WET	**0.3270**	**0.0190**	0.1594	0.8188	0.2417	0.3974
ROOT_BKF	**0.3916**	**0.0020**	0.3708	0.3183	0.3589	0.0901
EROSION	**0.3952**	**0.0020**	0.3821	0.3093	0.1688	0.6356
SOIL_EXP	**0.3671**	**0.0050**	0.4115	0.2452	0.2415	0.3724
BNK_SLOP	**0.2816**	**0.0350**	0.2693	0.5856	0.3662	0.0961
BUFFER	**0.4067**	**0.0020**	0.4858	0.1401	0.1511	0.6917
RIP_TREE	**0.3706**	**0.0040**	0.3952	0.2853	**0.4349**	**0.0390**
RIP_SHRB	**0.2696**	**0.0380**	0.2643	0.5886	0.3347	0.1401
RIP_GRAS	**0.3592**	**0.0060**	0.5658	0.0761	**0.6189**	**0.0010**
RIP_CULT	**0.4235**	**0.0030**	NA	1.0000	0.1516	0.7267
OTHER	0.2305	0.0981	0.4311	0.2022	**0.5368**	**0.0060**
CANOPY	0.2478	0.0831	**0.6971**	**0.0120**	**0.7884**	**0.0010**
AESTHET	**0.4177**	**0.0020**	0.3829	0.3213	0.1701	0.5896

Table A17 continued.

	Ecoregion 29		Ecoregion 32		Ecoregion 33	
	r	pval	r	pval	r	pval
ALGAE_AB	**0.4759**	**0.0010**	0.0725	0.9620	0.3801	0.0871
HAB_TYPE	**0.4549**	**0.0010**	**0.7520**	**0.0030**	**0.7226**	**0.0010**
MCRPH_AB	**0.4448**	**0.0010**	0.3360	0.4114	**0.4674**	**0.0080**
THAL_DEP	**0.3616**	**0.0030**	0.5775	0.0541	**0.5614**	**0.0030**
DO	**0.3396**	**0.0110**	0.1928	0.7688	**0.6716**	**0.0010**
PH	0.2091	0.1652	**0.6762**	**0.0160**	**0.6182**	**0.0020**
SPCOND	**0.4851**	**0.0010**	0.4590	0.1742	0.1738	0.6136
TEMP	0.1476	0.4004	0.4679	0.1622	0.2161	0.4715
COV_SC	0.1717	0.2973	0.0385	0.9920	0.1800	0.5656
SUB_SC	**0.3030**	**0.0260**	**0.7409**	**0.0060**	**0.6296**	**0.0010**
RIFF_SC	**0.3004**	**0.0230**	**0.6535**	**0.0150**	0.3613	0.1171
POOL_SC	**0.4456**	**0.0010**	0.5830	0.0501	0.3162	0.1682
FLOW_SC	**0.5542**	**0.0010**	0.1822	0.7618	0.2948	0.2222
BANK_SC	**0.4500**	**0.0010**	0.2765	0.5596	**0.4678**	**0.0160**
SIN_SC	0.2306	0.0971	0.1263	0.8739	0.2017	0.4965
BUFF_SC	**0.2889**	**0.0290**	0.3819	0.3143	0.1325	0.7538
AEST_SC	**0.3675**	**0.0060**	0.3829	0.3213	0.1701	0.5896
HQI_SC	**0.3815**	**0.0030**	0.3139	0.4585	0.2643	0.2813
YEAR	**0.2993**	**0.0130**	0.2081	0.7297	0.1195	0.7738