COMPLETION REPORT:

FISH SURVEY OF TELEGRAPH, BOX ELDER AND THIRD CREEKS

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INTRODUCTION

A large portion of the Telegraph Creek drainage basin in Phillips County, Montana has been acquired by the American Prairie Foundation (APF). A goal of the APF is "To accumulate and wisely manage, based on sound science, enough private land to create and maintain a fully-functioning prairie-based wildlife reserve." Little information exists on the fish assemblages in the Telegraph Creek drainage basin (Bramblett and Zale 2000). Current baseline information on fish assemblages in the Telegraph Creek basin is needed to help achieve APF's goal of creating and maintaining a fully-functioning prairie reserve. Stream and riparian habitats are crucial elements of the Northern Great Plains ecosystem, and the dependent biological assemblages have been affected by anthropogenic influences including changes in vegetation caused by livestock grazing, loss of connectivity and altered stream flow regimes caused by irrigation diversions and stock ponds, and potential biological interactions with introduced species.

Our objectives for this project were to document the presence and relative abundance of fish species and habitat conditions on Telegraph, Box Elder, and Third creeks, compare the fish assemblages to other Montana prairie stream fish assemblages, and provide recommendations on management of these streams. We also recorded incidental observations of amphibians, reptiles, and birds.

METHODS

Survey design.—Our goal was to sample at least two sites on Telegraph, Box Elder, and Third creeks: one site located in the downstream reaches and one site located near the upstream limit of water presence on each creek. In addition to the two sites per stream, we also took opportunistic samples as time allowed. All sample sites were chosen based on access points and Martha Kauffman's (Oxbow, Inc.) knowledge of the longitudinal distribution of water. We named sample sites by the stream name and the longitudinal position; i.e., site A is the farthest downstream sample site.

Fishes.—Fish were sampled using one of two sampling protocols. We used the *standard protocol* where continuous reaches of water or large interrupted standing pools were present; fishes were sampled by seining a 300-m reach of stream. A 300-m length of stream is usually sufficient to capture 100% of fish species present in a reach of stream in the Great Plains (Patton et al. 2000). The number of seine hauls we took in reach depended on seining efficiency and varied from about 5 to 10 hauls for each 300-m reach. The seine was 6.1 m long x 1.8 m tall with 6.4 mm mesh. This is the standard protocol we use at the Montana Cooperative Fishery Research Unit for our prairie streams research, and also is the same method used by Montana Fish, Wildlife and Parks for their prairie streams surveys.

We used the *exploration protocol* at locations with less water present, where we sampled fish over longer reaches of stream to increase the probability of detecting the presence of fish. We used the seine in larger pools and the dip nets in small, shallow pools. The dip nets were 0.46 m wide x 0.46 m high x 0.46 m deep with 4.8 mm mesh.

All fishes captured were identified to species, and lengths of at least 20 randomly selected individuals were recorded for each species. Up to ten voucher specimens for each species were preserved, and voucher specimens were examined in the laboratory to verify field identifications.

Fish assemblage data were used to calculate Index of Biotic Integrity (IBI) scores for each site sampled (Bramblett et al. 2005). The IBI is composed of 10 metrics based on fish species richness and composition, trophic and reproductive guilds, and age structure, and has been demonstrated to be an effective tool for detecting anthropogenic impairment of Montana prairie streams (Bramblett et al. 2005). Fish species richness metric scores are scaled to expectations based on the watershed area above the sample location; i.e., more fish species are expected at sites with larger watershed areas. IBI scores from fish collections taken during this project were then compared to a database of IBI scores from 86 samples taken from 61 Montana prairie streams, and native fish species richness was

compared to that at 28 Montana prairie streams with watershed areas less than 800 km^2 (Bramblett, unpublished data).

Aquatic and riparian habitat.—We surveyed habitat at locations where the *standard sampling protocol* was used for sampling fish; we did not do habitat surveys at *exploration sampling protocol* sites. The 300-m sample reach was laid out using a measuring tape, and 11 transects were established perpendicular to the stream channel, with one transect located every 30 m along the reach. Channel width, depth of water, and substrate were measured at 5 cm off the left and right banks and at 0.25, 0.50, and 0.75 wetted width along each transect, and at 10 points located 3 m apart along the thalweg between transects.

Incidental observations of other biota.—We recorded the presence of amphibians, reptiles, and birds that we observed incidentally while we were at the sampling sites. No effort was made to standardize the effort among sites.

RESULTS

We sampled or visited three sites each on Telegraph, Box Elder, and Third creeks on May 22-24, 2006 (Table 1; Figure 1). Fish were present at all three Telegraph Creek sites, at two Box Elder Creek sites, and at none of the Third Creek sites.

Site results

Telegraph Creek A.—This site was located on the Charles M. Russell National Wildlife Refuge (CMR), less than 100 m above the confluence of Fourchette Creek, and was sampled using the standard sampling protocol (Photo 1). We captured a total of 2,009 individual fish of five native fish taxa and two introduced fish species (Table 2; Photo 2). The native taxa in order of abundance were fathead minnow (*Pimephales promelas*), white sucker (*Catostomus commersoni*), plains minnow (*Hybognathus placitus*), and brook stickleback (*Culea inconstans*). The fifth native taxon was a single specimen of a putative hybrid between plains minnow and western silvery minnow (*H. argyritis*) that

was captured at the Telegraph Creek A site. I tentatively identified this specimen in the field as a western silvery minnow or potential hybrid, because its eyes were relatively larger than the eyes of the plains minnows we collected at this site. I later dissected the specimen in the laboratory and observed that the width of the basiocciptal process was intermediate in shape and width between a plains minnow and a western silvery minnow, and concluded that it may be a hybrid between these two species. The two introduced species in order of abundance were common carp (*Cyprinus carpio*) and black bullhead (*Ameiurus melas*; Table 2). The IBI score for Telegraph Creek A was 41 (Table 3); this score ranks at the 25th percentile (from the bottom) of 86 IBI scores based on fish collections taken from 61 Montana prairie streams. The native species richness at this site was lower than at most Montana prairie streams based on watershed area (Figure 2).

Telegraph Creek A was the widest and deepest site we sampled (Table 4). Wetted stream width ranged to 13.7 m and depth ranged to 82 cm. Substrate was comprised entirely of fines (silt, clay, or muck, < 0.6 mm).

Photo 1. Telegraph Creek A.

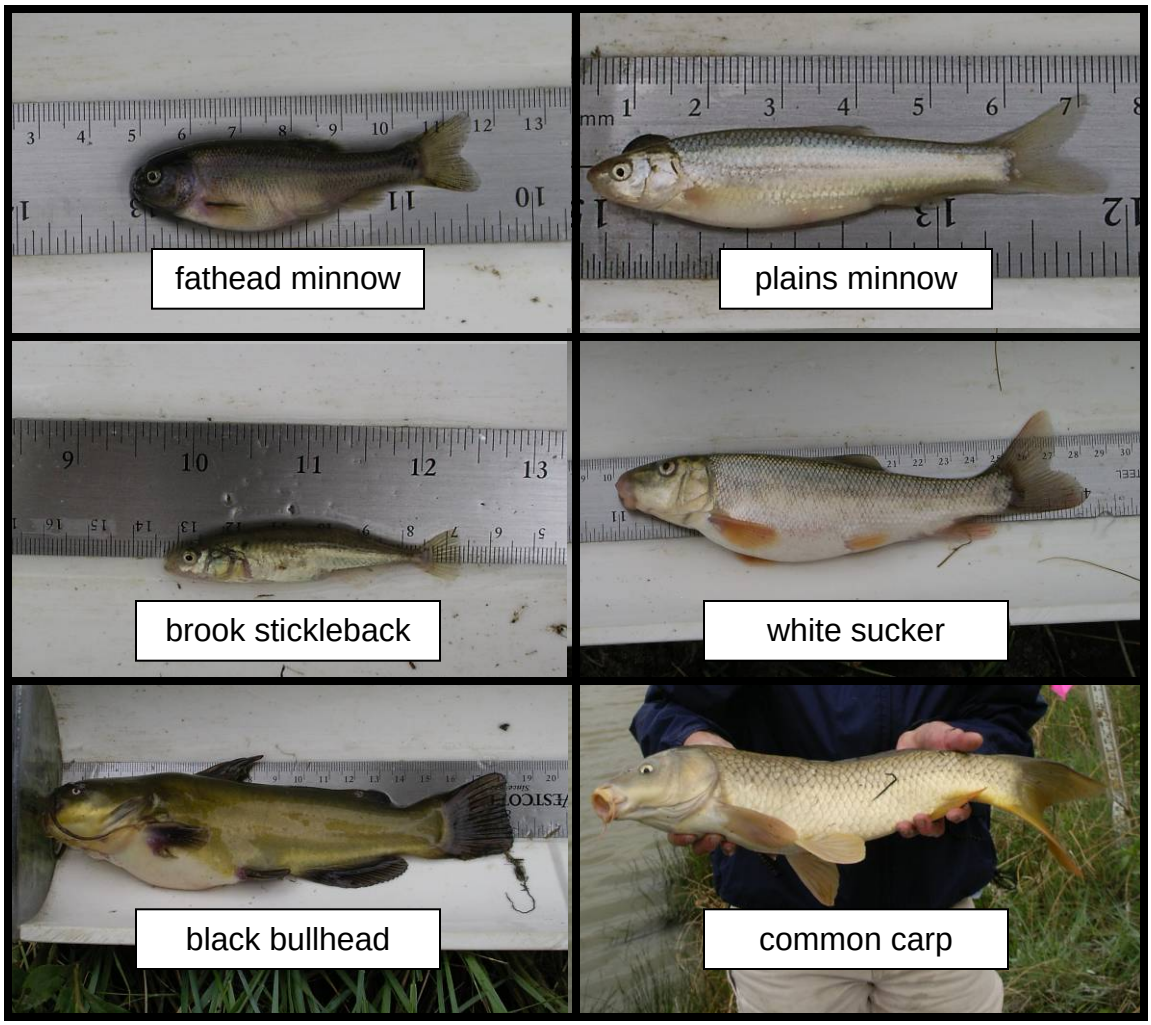

Photo 2. Six of the seven fish taxa captured, Telegraph Creek basin, May 22-24, 2006.

Telegraph Creek B.—This site was located upstream of the bridge north of the ranch house, and was sampled using the standard sampling protocol. We captured 13 fathead minnows at this site (Table 2). The IBI score for Telegraph Creek B was 44 (Table 3); this score ranks at the 31st percentile of 86 IBI scores based on fish collections taken from 61 Montana prairie streams. The native species richness at this site was lower than at most Montana prairie streams based on watershed area (Figure 2).

Wetted stream width ranged to 4.7 m and depth ranged to 54 cm. Substrate was comprised primarily of fines (silt, clay, or muck, < 0.6 mm diameter), with 10% wood,

and less than 1% gravel (2 to 64 mm diameter). Woody vegetation on banks increased from the downstream to the upstream end of the sampled reach (Photos 3 and 4).

Photo 3. Telegraph Creek B near the downstream end of sampled reach.

Photo 4. Telegraph Creek B near the upstream end of sampled reach.

Telegraph Creek C.—This site was located upstream of the Reynolds Hill Road crossing (Photo 5). We did not use the standard sampling protocol at this site because we did not have landowner permission, but we opportunistically sampled a single approximately 60-

m long x 10-m wide pool. We captured 346 fathead minnows and 24 white suckers at this site (Table 2). The IBI score for at this site was 51 (Table 3); this score ranks at the 35th percentile of 86 IBI scores based on fish collections taken from 61 Montana prairie streams. The native species richness of two species is lower than at most Montana prairie streams based on watershed area (Figure 2); however if we had used the standard sampling protocol, we may have captured more species.

Photo 5. Telegraph Creek C.

Box Elder Creek A.—This site was located upstream of the road crossing near the ranch house, and downstream of the irrigation diversion structure (Photo 6). We used the standard sampling protocol, but captured no fish. Therefore the IBI score for this site is zero, and Montana prairie streams of a similar size can have up to 7 native species present (Figure 2). Wetted stream width ranged to 17.8 m and depth ranged to 57 cm. Substrate was comprised entirely of fines (silt, clay, or muck, < 0.6 mm).

Photo 6. Box Elder Creek A.

Box Elder Creek B.—This site was located less than 1 km upstream of Box Elder Creek A. We sampled several small isolated pools with dip nets and captured four fathead minnows. The IBI score for this site was 55 (Table 3), which ranks at the 45th percentile of 86 IBI scores based on fish collections taken from 61 Montana prairie streams.

Box Elder Creek C.—This site was located downstream of the Reynolds Hill Road crossing near the old bus (Photo 7). We used the exploration sampling protocol with seines and dip nets over a reach several hundred meters long with many isolated pools, and captured two fathead minnows. The IBI score for this site was 58 (Table 3), which ranks at the 50th percentile for Montana prairie streams.

Photo 7. Box Elder Creek C.

Third Creek A.—This site was located upstream of the diversion at the western property boundary of APF deeded land (Photo 8). We used the exploration sampling protocol with seines and dip nets over a reach several hundred meters long with many isolated pools, but captured no fish. Fish may be absent from this site because of reduced connectivity and streamflows caused by irrigation diversions or upstream stock dams.

Photo 8. Third Creek A.

Third Creek B.—This site was located about 8 km downstream of where Dry Fork Road crosses Third Creek. The site was completely dry (Photo 9).

Photo 9. Third Creek B.

Third Creek C.—This site was located just downstream of where Dry Fork Road crosses Third Creek (Photo 10). The site was completely dry.

Photo 10. Third Creek C.

Incidental observations of other biota. We observed eight taxa of aquatic invertebrates: a leech, snail, beetle adult and larva, giant water bug (Photo 11), backswimmer, damselfly larva, whirligig beetle, and crayfish (Table 5). We observed seven bird species, including a scissor-tailed flycatcher (*Tyrannus forficatus*), which is an extremely unusual sighting for Montana. There are only 12 records of scissor-tailed flycatchers being sighted in Montana (Montana Bird Distribution Database 2006). Our observation has been submitted as a rare bird report for inclusion in the Montana Bird Distribution Database. We also observed two amphibians species: boreal chorus frog (*Pseudacris maculata*) and tiger salamander (*Ambystoma tigrinum*; Photo 11), and unidentified tadpoles. We observed two reptile species: painted turtle (*Chrysemys picta*) and plains garter snake (*Thamnophis radix*) (Table 5; Photo 11).

Photo 11. Four taxa observed incidental to fish and habitat surveys, Telegraph Creek basin, May 22-24, 2006.

DISCUSSION

The low IBI scores for these sites was caused primarily by high percent of tolerant individuals, low percent invertivorous cyprinids, low percent litho-obligate reproductive guild individuals, and high percent tolerant reproductive guild individuals. Moreover, the native species richness at these sites was generally lower than other Montana prairie streams based on watershed area (Figure 1). This suggests that the fish assemblages in Telegraph, Box Elder and Third creeks may currently be below their potential in terms of both ecological function and species richness. There were 13 additional fish species captured in a survey of 18 small streams on the CMR in 1999 (Bramblett and Zale 2000). Some of these species could possibly be expected to occur in the Telegraph Creek basin including lake chub (*Couesius plumbeus*), brassy minnow (*Hybognathus hankinsoni*), flathead chub (*Platygobio gracilis*), longnose dace (*Rhinichthys cataractae*), and northern redbelly dace (*Phoxinus eos*).

Reduced fish species richness may be caused by water diversions and headwater stock dams, which lessen streamflows thereby reducing connectivity and permanent accessible refugia in the basin. An additional concern for maintaining fish species diversity in the Telegraph Creek basin is the potential effect of Fort Peck Reservoir. Prior to the closure of Fort Peck Dam in 1937, Telegraph Creek was a tributary of the Missouri River; now Telegraph Creek discharges to Fort Peck Reservoir. As a result, Telegraph Creek may have altered metapopulation dynamics (Hanski and Gilpin 1991) because connectivity and recolonization opportunities may have changed because of the presence of Fort Peck Reservoir (Bramblett and Zale 2000). For example, if some fish species in the Telegraph Creek basin have been extirpated because of flood, drought, or anthropogenic stressors, populations could be refounded by dispersers from Fort Peck Reservoir or its tributaries. However, such refounding may be unlikely because the open lentic waters of Fort Peck Reservoir, which is managed to support large numbers of introduced piscivorous fish, may be a poor source for small, native fish, and Fort Peck Reservoir may also represent more of a barrier than a corridor between tributary streams.

The sample taken in Fourchette Creek in July, 1999 (Bramblett and Zale 2000) also had seven taxa of fish present, but the July 1999 Fourchette Creek sample differed from the Telegraph Creek A sample in that there was one lake chub and over one hundred western silvery minnows present, and brook stickleback were absent. However, presence based on the capture of a single individual suggests that the species is rare and easily missed.

RECOMMENDATIONS

1) Conduct a systematic survey of the Telegraph Creek basin to determine which fish species are present. This survey should include the Fourchette Creek basin because fish species present in Fourchette Creek should have access to lower Telegraph Creek.
2) Conduct a spatial connectivity survey to identify fish refugia and potential barriers to fish movement. Quantify potential increases in streamflow and connectivity that could be achieved by removing stock dams and diversions.
3) Identify dispersal bottlenecks and potential to increase connectivity and refugia for fishes by integrating and synthesizing fish distribution data, potential for increased streamflows, and spatial connectivity analysis.
4) Conduct a thorough analysis to determine if any fish species that could reasonably be expected in the Telegraph Creek basin are "missing." This analysis would include an analysis of all available fish distribution and habitat data to determine a) which fish species are truly "missing"; and b) determining if currently existing, or restored habitat conditions in the Telegraph Creek basin are suitable for these fish species.
5) Developing a plan to reintroduce missing native fish species.

ACKNOWLEDGEMENTS

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TABLES

Table 1. Latitudes and longitudes and estimated watershed areas of sites sampled on Telegraph, Third, and Box Elder creeks, May 2006.

Site	Latitude, longitude	Watershed area (km^2)
Telegraph Creek A	47.70484, 107.78554	668.8
Telegraph Creek B	47.77893, 107.76729	185.8
Telegraph Creek C	47.80822, 107.67345	127.5
Box Elder Creek A	47.73950, 107.76090	26.5
Box Elder Creek B	47.74055, 107.75994	26.5
Box Elder Creek C	47.73000, 107.67040	8.5
Third Creek A	47.76715, 107.80424	38.2
Third Creek B	47.79687, 107.92805	8.5
Third Creek C	47.80367, 108.00311	6.3

Table 2. Fish captured on Telegraph, Box Elder, and Third creeks, May 2006.

Sample	Date	Flow status	Species	Origin[a]	Number captured	Minimum total length (mm)	Maximum total length (mm)	Mean total length (mm)
Telegraph Creek A	5/23/2006	Slight flow	black bullhead	I	1	182	182	182.0
			brook stickleback	N	1	65	65	65.0
			common carp	I	10	62	670	229.9
			fathead minnow	N	1,946	30	58	49.4
			plains minnow	N	30	55	72	64.2
			Hybognathus hybrid[b]	N	1	88	88	88.0
			white sucker	N	20	62	190	90.2
Telegraph Creek B	5/22/2006	Continuous standing pools	fathead minnow	N	13	53	71	59.8
Telegraph Creek C	5/23/2006	Interrupted pools	fathead minnow	N	346	35	67	49.9
			white sucker	N	24	65	200	99.0
Box Elder Creek A	5/22/2006	Interrupted pools	no fish					
Box Elder Creek B	5/22/2006	Interrupted pools	fathead minnow	N	4	41	49	45.3
Box Elder Creek C	5/23/2006	Interrupted pools	fathead minnow	N	2	60	62	61.0
Third Creek A	5/23/2006	Interrupted pools	no fish					
Third Creek B	5/24/2006	Dry	no fish					
Third Creek C	5/24/2006	Dry	no fish					

a N = Native; I = Introduced

b This specimen was examined in lab on 7/6/06. The basiocciptal process was wider than a plains minnow, narrower than a western silvery minnow, and widened at the tip.

Table 3. Index of Biotic Integrity metrics and scores for Telegraph and Box Elder creeks, May 2006.

	Site									
	Telegraph Creek A		Telegraph Creek B		Telegraph Creek C		Box Elder Creek B		Box Elder Creek C	
Metric	Raw metric value	Metric score	Raw metric value	Metric score	Raw metric value	Metric score	Raw metric value	Metric score	Raw metric value	Metric score
Number of native species	5	7	1	6	2	7	1	9	1	10
Number of native families	3	8	1	5	2	7	1	7	1	8
Number of native sucker and catfish species	0	5	0	7	1	8	0	10	0	10
Percent of tolerant individuals	98	0	100	0	100	0	100	0	100	0
Percent of invertivorous minnows	0	0	0	0	0	0	0	0	0	0
Number of native benthic invertivorous species	0	6	0	8	0	9	0	10	0	10
Percent of litho-obligate reproductive guild individuals	1	0	0	0	7	1	0	0	0	0
Percent of tolerant reproductive guild individuals	97	0	100	0	94	0	100	0	100	0
Percent of native individuals	99	10	100	10	100	10	100	10	100	10
Number of native species with long-lived individuals	1	6	0	8	0	8	0	10	0	10
Total IBI score		41		44		51		55		58

Table 4. Physical habitat measured on Telegraph, and Box Elder creeks, May 2006.

Parameter	Telegraph Creek A	Telegraph Creek B	Box Elder Creek A
Date	5/23/2006	5/22/2006	5/22/2006
Minimum stream width (m)	0.3	1.2	0
Maximum stream width (m)	13.7	4.7	17.8
Mean stream width (m)	5.9	3.4	4.5
Minimum stream depth (cm)	1	3	0
Maximum stream depth (cm)	82	54	57
Mean stream depth (cm)	42	33	19
Percent fine substrate	100	90	100
Percent gravel substrate	0	<1	0
Percent wood substrate	0	10	0

Table 5. Incidental observations of biota on Telegraph, Box Elder, and Third creeks, May 2006.

Site	Date	Taxonomic group	Taxon
Telegraph Creek A	5/23/2006	Reptiles	painted turtle
Telegraph Creek B	5/22/2006	Birds	Barn Swallow
			Bullock's Oriole
			Eastern Kingbird
			Scissortail Flycatcher
			Western Kingbird
			Western Meadowlark
			Western Tanager
		Invertebrates	crayfish
		Reptiles	plains garter snake
			tiger salamander
Telegraph Creek C	5/23/2006	Amphibians	tadpoles
Box Elder Creek A	5/22/2006	Amphibians	tadpoles
		Birds	American Widgeon
			Bullock's Oriole
			Cinnamon Teal
			Gadwall
			Mourning Dove
			Northern Flicker
			Red-winged Blackbird
			Western Meadowlark
		Invertebrates	beetle adults
			beetle larvae
			whirligig beetles
			leech
		Reptiles	plains garter snake
Box Elder Creek B	5/23/2006	Amphibians	chorus frog
			tadpoles
		Invertebrates	beetle larvae
			giant water bug
			damselfly larvae
			backswimmer bug
			snails
Third Creek A	5/22/2006	Amphibians	tadpoles
		Invertebrates	beetle larvae

FIGURES

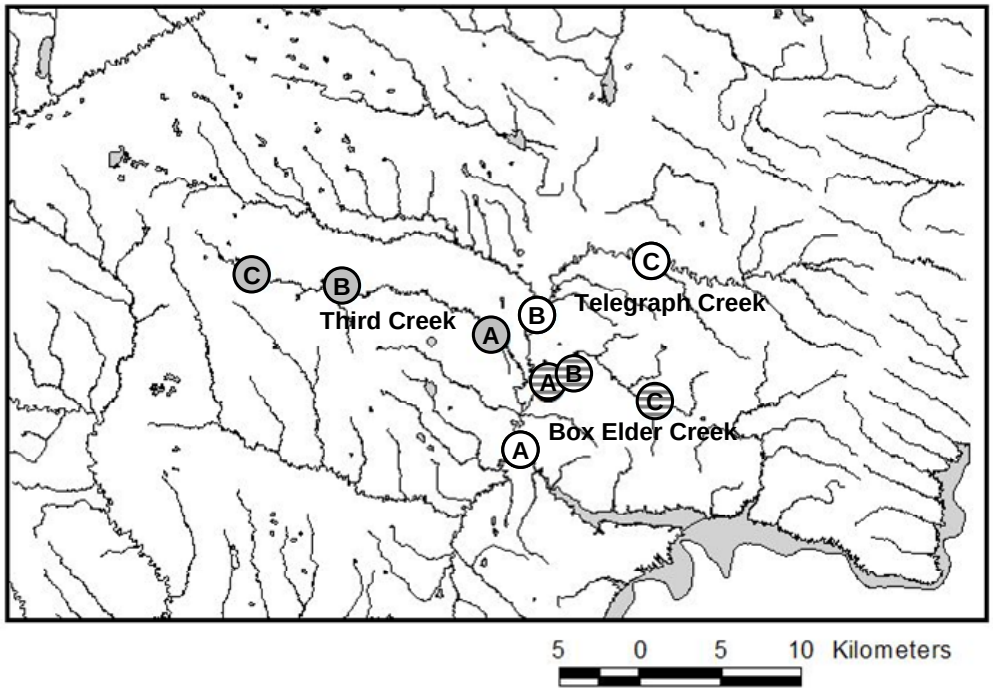

Figure 1. Locations of sampling sites on Telegraph, Box Elder, and Third creeks, May 2006.

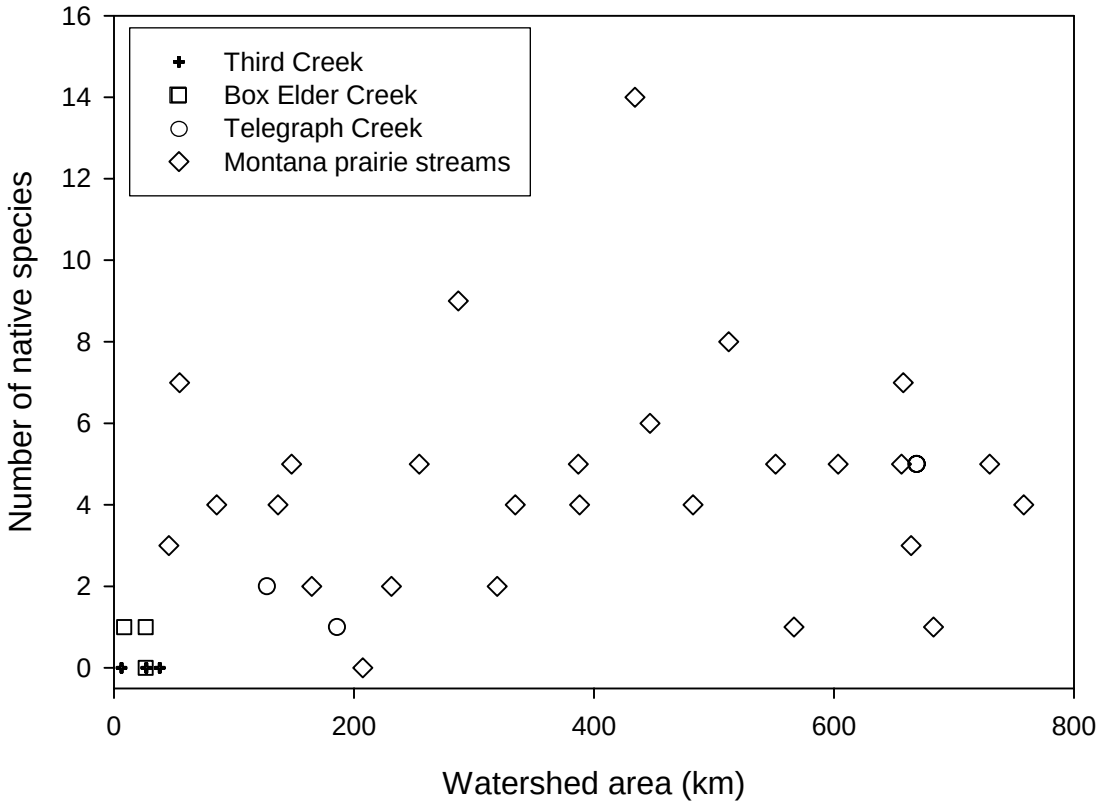

Figure 2. Native fish species richness in Telegraph, Box Elder, and Third creeks, May 2006, as a function of watershed area and in comparison to 28 Montana prairie streams with watershed areas less than 800 km^2.