FISH SURVEY OF TELEGRAPH, BOX ELDER AND THIRD CREEKS 2008

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Fathead minnows: male, gravid female and female

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INTRODUCTION

In keeping with the American Prairie Foundation's (APF) goal of creating and maintaining a fully-functioning prairie-based wildlife reserve, efforts have been made to restore natural stream corridors in the Telegraph Creek basin. These efforts include removal of instream diversion dams that may limit connectivity thereby restricting fish movements in the basin. Connectivity is needed in prairie stream networks to ensure that fish are able to maintain metapopulations in intermittent stream reaches where local extirpations may occur due to disturbances such as drought.

In 2007, three dams were removed in the Telegraph Creek watershed. The dam on Third Creek, approximately 4.7 km from the confluence with Telegraph Creek was breached to allow fish passage. On Box Elder Creek, an irrigation structure was modified to reconnect flows. A check dam replaced an earthen berm approximately 3 km from the Telegraph Creek confluence, which would allow fish passage after sufficient irrigation water is obtained. The third dam that was breached was a large earthen berm in Telegraph Creek (17.6 kmfrom Fourchette confluence) that had a 24 inch culvert perched about 4 feet above the downstream channel bottom. We observed fish below this culvert in 2007.

In a prior survey during May 2006, we documented the presence and relative abundance of fish species and habitat conditions on Telegraph, Box Elder, and Third creeks (Bramblett and Kauffman 2006). Three sites were sampled on each creek, designated as A, B, and C, with A being the farthest downstream, and C the farthest upstream. This survey indicated that fish were present in Telegraph and Box Elder creeks, but possibly absent in Third Creek. Four native fish species were captured at Telegraph Creek A; fathead minnow (*Pimephales promelas*), white sucker (*Catostomus commersonii*), plains minnow (*Hybognathus placitus*), and brook stickleback (*Culea inconstans*). Two introduced fish species were captured at Telegraph Creek A; common carp (*Cyprinus carpio*) and black bullhead (*Ameiurus melas*). Fathead minnows were captured at Telegraph Creek B, and fathead minnows and white suckers were captured at Telegraph

Creek C. In Box Elder Creek, fathead minnows were captured at sites B and C, and no fish were captured at site A. In Third Creek, no fish were captured at any of the sites; however, sites B and C were dry.

Virtually no precipitation fell during spring 2008 through late May; as a result most of the creeks in the area probably did not flow. However from May 21 through June 12, 5.6 inches of rain fell on the APR, causing all the creeks to run. Our sampling occurred on June 23 – 25 and July 1-2, 2008.

The removal of these dams probably increased connectivity and increased colonization opportunities for fish in the basin. Our objectives for this project were to document changes in the fish assemblage at sites previously sampled on Telegraph, Box Elder, and Third creeks. We also recorded incidental observations of amphibians and aquatic invertebrates.

METHODS

Survey design.—Our goal was to resample the sites we sampled in 2006. 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 used by the Montana Cooperative Fishery Research Unit and Montana Fish, Wildlife and Parks for prairie stream 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.

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.

Aquatic habitat.—We measured channel widths and maximum depths at the upstream and downstream ends and midpoints of the sampled reaches.

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

RESULTS

We sampled two sites on Telegraph Creek (A, B); we were unable to acquire permission to sample Telegraph Creek C. We sampled sites A, B, and C on Box Elder Creek. We were unable to sample any sites on Third Creek because of wet conditions that made road access impossible (Table 1; Figure 1). In a follow-up visit on July 1-2, 2008, Kauffman and APF intern, Keith McHugh sampled the Third Creek A and B sites. Third Creek C is on private land, and we were unable to sample this site.

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 (Photograph 1). However, we were unable to effectively sample the entire 300-m reach because this site had two pools that were too deep to wade. We captured two native fish species (fathead minnow *Pimephales promelas* and white sucker *Catostomus commersonii*) and two introduced (common carp *Cyprinus carpio* and black bullhead *Ameiurus melas*; Table 2). We also observed a dead bigmouth buffalo (*Ictiobus cyprinellus*), about 900 mm in total length along the bank (Photograph 2). The IBI score for Telegraph Creek A was 36 (Table 3).

Photograph 1. Telegraph Creek A.

Photograph 2. Dead bigmouth buffalo observed at Telegraph Creek A.

Telegraph Creek A was the widest and deepest site we sampled (Table 4). Wetted stream width ranged to 11.7 m and depth ranged to 110 cm. Substrate was comprised almost entirely of fines (silt, clay, or muck, < 0.6 mm), although some gravel substrate was detected while wading.

Telegraph Creek B.—This site was located upstream of the bridge north of the ranch house, approximately 0.5 km upstream of the breached dam. It was sampled using the standard sampling protocol. We captured 455 fathead minnows at this site (Table 2). Wetted stream width ranged to 7 m and depth ranged to 82 cm. Substrate was not quantitatively measured, but appeared to be similar to 2006; comprised primarily of fines (silt, clay, or muck, < 0.6 mm diameter), with some wood, and very little gravel (2 to 64 mm diameter). Woody vegetation on banks increased from the downstream to the upstream end of the sampled reach (Photographs 3 and 4). The IBI score for Telegraph Creek B was 44 (Table 3).

Photograph 3. Telegraph Creek B at the downstream end of sampled reach, looking upstream.

Photograph 4. Telegraph Creek B at the upstream end of sampled reach, looking downstream.

Telegraph Creek C.—This site was located upstream of the Reynolds Hill Road crossing. We did not sample this site because we did not have landowner permission, but we

observed that water was present, and it appeared that more water was present than during May 2006.

Box Elder Creek A.—This site was located upstream of the road crossing near the ranch house, and downstream of the irrigation diversion structure which had been modified to increase connectivity in 2007 (Photograph 5). We used the standard sampling protocol, but captured no fish (Table 2). Therefore the IBI score for this site is zero. Wetted stream width ranged to 4.3 m and depth ranged to 85 cm. Substrate was comprised entirely of fines (silt, clay, or muck, < 0.6 mm).

Photograph 5. Box Elder Creek A.

Box Elder Creek B.—This site was located less than 1 km upstream of Box Elder Creek A, and approximately 170 m upstream of the modified dam (Photograph 6). We sampled several small isolated pools with dip nets and captured two fathead minnows. The IBI score for this site was 55 (Table 3).

Photograph 6. Box Elder Creek B.

Box Elder Creek C.—This site was located downstream of the Reynolds Hill Road crossing (Photograph 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 four fathead minnows. The IBI score for this site was 58 (Table 3).

Photograph 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, approximately 250 m upstream of the dam breached in 2007 (Photograph 8). We were unable to access this site due to wet conditions on June 23-24, 2008. However on July 1, 2008 Kauffman and McHugh sampled this site using the standard sampling protocol. We captured 19 fathead minnows. A large fish, most likely a common carp, escaped from the net and could not be positively identified. The IBI score for this site was 51 (Table 3).

Photograph 8. Third Creek A – looking downstream from top of sampled reach

Third Creek B.—This site was located about 8 km downstream of where Dry Fork Road crosses Third Creek (Photograph 9). We were unable to access this site on June 25th due to wet conditions. On July 3nd Martha Kauffman sampled several hundred meters of isolated pools using the exploration sampling protocol but found no fish. The IBI score for this site was zero.

Photograph 9. Third Creek B

Third Creek C.—This site was located just downstream of where Dry Fork Road crosses Third Creek (Photograph 10). The site had abundant water in wetlands, and probably in the creek channel, but we were unable to sample because we did not have landowner permission.

Photograph 10. Third Creek C.

Incidental observations of other biota. We observed four taxa of aquatic invertebrates: snails, beetle larva, damselfly larva, and dragonfly larva. We also observed two amphibians species: boreal chorus frog (*Pseudacris maculata*) and tiger salamander (*Ambystoma tigrinum*), and unidentified tadpoles.

DISCUSSION

Reduced connectivity caused by dams can cause local fish extirpations in prairie streams (Winston et al. 1991). Therefore, restored connectivity could lead to recolonization of upstream reaches if extirpations had occurred and source populations exist. Lower Telegraph Creek has five to six native and two introduced fish species and could serve as a source for colonizing fish to move into upper Telegraph, Box Elder and Third creeks now that potential fish barriers have been removed. We documented one change in the fish assemblage that was likely the result of removal of dams in the basin after one season of streamflow during spring and early summer 2008. The presence of fathead minnows in Third Creek is noteworthy because Third Creek had no fish in 2006. Future increases in fish species richness in the upper basin may yet occur because the dams have only been removed for one year, during which one flow event occured.

Our 2008 sample at Telegraph Creek A differed from our 2006 sample. Fathead minnow were the most abundant species captured both years, although we captured almost 10 times fewer in 2008. Two native fish species, plains minnow (*Hybognathus placitus*), and brook stickleback (*Culea inconstans*) were missing from the 2008 collection. However, in 2006 we captured only a single brook stickleback, so this species may also have been present in low numbers and not captured in 2008. Plains minnow were conspicuously absent in 2008; in our 2006 sample, 30 plains minnow were captured. However, we may have missed this species because we were unable to sample two deep pools. The two introduced species, common carp (*Cyprinus carpio*) and black bullhead (*Ameiurus melas*) were captured in both 2006 and 2008.

We also observed a dead bigmouth buffalo (*Ictiobus cyprinellus*), about 900 mm in total length along the bank in 2008; this species was not seen or captured in 2006. The presence of this large native fish species illustrates the importance of small prairie streams as seasonal and perhaps spawning habitat for fishes normally associated with larger bodies of water. Adult bigmouth buffalo have rarely or never been captured in smaller Montana prairie streams, although there are reports from Canada that adults move out of lakes or large rivers into small tributaries to spawn (Scott and Crossman 1973). I have documented the presence of juvenile bigmouth buffalo in the Milk River tributary, Beaver Creek (HUC 10050014) and Little Porcupine Creek, a Yellowstone River tributary. I have also observed large numbers of juvenile bigmouth buffalo in a South Dakota tributary to the James River. I do not know if these juveniles were the result of spawning by adults in the tributaries or if they moved into tributaries from downstream spawning sources.

In both 2006 and 2008 only fathead minnows were captured Telegraph Creek B and Box Elder Creek B and C. At Telegraph Creek B, we captured many more individual fathead minnows in 2008. However, the increase is may be partially due to local reproduction, rather than fish moving into this habitat. Fathead minnows are able to spawn and survive in most permanent pools of intermittent Montana prairie streams, even if adjacent reaches go dry. Numbers of fathead minnows in Box Elder creek were very low in both 2006 and 2008. We do not know if they are spawning and surviving locally in low numbers, or if they are dispersing from other areas in Box Elder Creek. However it appears that the habitat at these two sites is not currently providing for high populations.

The IBI score at Telegraph Creek A was lower in 2008 (IBI = 36) than in 2006 (IBI = 41) because we captured two fewer native species (brook stickleback and plains minnow). IBI scores at Telegraph Creek B (44) and Box Elder Creek B (55) and C (58) did not change because we captured only fathead minnow in both 2006 and 2008. As in 2006, 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 (Bramblett and Kauffman 2006).

The most significant change in IBI scores was at Third Creek A where fathead minnow were captured in 2008 (IBI = 51) and no fish were captured in 2006 (IBI = 0). This change can most likely be attributed to the breaching of the dam on Third Creek in 2007.

Native fish species richness in the Telegraph basin is lower than expected for Montana prairie streams (Bramblett and Kauffman 2006). Maintenance of fish assemblages in intermittent prairie streams such as the Telegraph Creek basin requires an adequate source population, connectivity (lack of barriers to fish movement and adequate streamflow) and suitable habitat (permanent refugia pools in middle and upper reaches). Lower Telegraph Creek may not provide an ideal source population because the species pool in Fort Peck Reservoir is probably different than the original source population found in the Missouri River (Bramblett and Zale 2000; Bramblett and Kauffman 2006). Nonetheless, there are potential colonists in lower Telegraph Creek that are not found in other upstream habitats. The connectivity in the basin is being enhanced with removal of dams; however adequate streamflows are stochastic events. Increases in streamflows caused by dam removals may enhance refugia habitat suitability by increasing scour, leading to better groundwater connections, and more exposed gravel substrates. In summary, by restoring the natural processes of connectivity, streamflow and scour, the conditions needed for increased species richness are being restored. The presence of fathead minnows on Third Creek is likely an indication that these processes have begun. We may find more increased species richness and extended distribution in future surveys, after more time has elapsed to allow this to occur. At this time, we recommend continuing with surveys every year or every other year to monitor changes in fish assemblages and distributions. As connectivity and habitat improves in the Tlegraph Creek basin, we may begin to consider increasing species richness further by augmenting the species pool (Bramblett and Kauffman 2006).

REFERENCES

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Table 1. Latitudes, longitudes, and estimated watershed areas of sites sampled on Telegraph, Third, and Box Elder creeks, June 2008.

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
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

Table 2. Fish captured on Telegraph, Box Elder, and Third creeks, May 2006 and June 2008.

Sample	Date	Flow status	Species	Origin[a]	Number captured 2006	Number captured 2008	2008 Minimum total length (mm)	2008 Maximum total length (mm)	2008 Mean total length (mm)
Telegraph Creek A	6/23/2008	Flowing	bigmouth buffalo	N	0	1*	900	900	900
			black bullhead	I	1	2	86	97	92
			brook stickleback	N	1	0	--	--	--
			common carp	I	10	3	113	508	370
			fathead minnow	N	1,946	218	33	55	43
			plains minnow	N	30	0	--	--	--
			Hybognathus hybrid[b]	N	1	0	--	--	--
			white sucker	N	20	2	90	121	106
Telegraph Creek B	6/23/2008	Continuous standing pools	fathead minnow	N	13	455	35	57	44
Telegraph Creek C	5/23/2006	Interrupted pools?	fathead minnow	N	346	NS	--	--	--
			white sucker	N	24	NS	--	--	--
Box Elder Creek A	6/23/2008	Interrupted pools	no fish	--	0	0	--	--	--
Box Elder Creek B	6/23/2008	Interrupted pools	fathead minnow	N	4	2	48	50	49
Box Elder Creek C	6/24/2008	Interrupted pools	fathead minnow	N	2	4	55	60	56
Third Creek A	7/2/2008	Interrupted pools	fathead minnow	N	0	19	--	--	--
Third Creek B	7/3/2008	Interrupted pools	no fish	--	Dry	0	--	--	--
Third Creek C	5/24/2006	Interrupted pools	NS	--	Dry	NS	--	--	--

a N = Native; I = Introduced; b This specimen was examined in lab on 7/6/06. The basioccipital process was wider than a plains minnow, narrower than a western silvery minnow, and widened at the tip; NS = not sampled; * = this specimen found dead at site.

Table 3. Index of Biotic Integrity metrics and scores for Telegraph and Box Elder creeks, June 2008.

	Site									
	Telegraph Creek A		Telegraph Creek B		Box Elder Creek B		Box Elder Creek C		Third Creek A	
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	2	5	1	6	1	9	1	10	1	8
Number of native families	1	4	1	5	1	7	1	8	1	7
Number of native sucker and catfish species	0	5	0	7	0	10	0	10	0	9
Percent of tolerant individuals	100	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	10	0	10	0	10
Percent of litho-obligate reproductive guild	0.4	0	0	0	0	0	0	0	0	0
Percent of tolerant reproductive guild individuals	97	0	100	0	100	0	100	0	100	0
Percent of native individuals	98	10	100	10	100	10	100	10	100	10
Number of native species with long-lived individuals	1	6	0	8	0	10	0	10	0	10
Total IBI score		36		44		55		58		54