Montana Fish, Wildlife & Parks

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Abstract

A survey of 123 sites comprised of 120 Region 4 streams was conducted as part of a Montana prairie stream inventory. Sampling started on April 13, 2005 and concluded on September 1, 2005. This was the first time that the majority of streams had been sampled for fish. Ninety-seven sites were randomly selected based on stream length, 4th Code Hydrologic Unit (HUC), and lack of previous sampling. Montana Fish Wildlife and Parks fishery staff selected 26 sites to sample based on prior sampling and interest in updated results. Six prairie stream survey sites from 2004 were resampled and fish species observed were generally similar to the prior year. Ninety-nine surveys sites were located on private lands and 24 were on public lands (12-state, 8-Bureau of Land Management, and 4-United States Fish and Wildlife Service). Fifty-three (43%) of the sites had water present and 70 (57%) of the sites were dry. Of the wetted sites, four (8%) had continuous standing water, 25 (47%) had flowing water, and 24 (45%) had interrupted standing pools. Seines were used to sample a 300m reach on the wetted streams when possible. Thirty-two (60.4%) of the wetted sites had fish present. A total of 16,325 fish were collected consisting of 29 species (21 native, 8 introduced) and nine families. Fathead minnows (*Pimephales promelas*) were the most abundant (*n* = 7,723 - 47%) fish captured and had the highest distribution (20 sites, 63%). The common carp (*Cyprinus carpio*) was the most abundant and most widely distributed introduced fish species observed (*n* = 978, 38% of sites). The Teton River had the greatest fish diversity with 17 species observed. Northern redbelly dace x finescale dace (*Phoxinus eos* x *P. neogaeus*) hybrids were found in an oxbow pond off of Sheep Creek, a tributary to the Two Medicine River. Brassy minnows (*Hybognathus hankinsoni*) were observed in streams draining into the Two Medicine River and upper Marias River, and brook stickleback (*Culaea inconstans*) were seen in waters within the upper Marias River and upper Teton River drainages, which is a westward expansion to both species' previously documented ranges within Region 4. Analysis of water quality in which fish were observed showed a temperature range of 8.0–29.9ºC, a pH range of 7.35–9.31, a conductivity range of 193.8–16,760µS, and a turbidity range of 1.45-189 NTU. Thirteen species of reptiles and amphibians comprised of eight families were observed while at or in transit to survey sites. Tiger salamanders (*Ambystoma tigrinum*) had the highest abundance (*n* = 141) while boreal chorus frogs (*Pseudacris maculata*) had the greatest distribution (12 sites) of amphibians encountered. Spiny softshell turtles (*Apalone spinifera*) had the highest abundance (*n* = 9) and gopher snakes (*Pituophis catenifer*) were the most widely distributed (6 sites) of reptiles observed. Larval fish were sampled weekly from April 18 to July 18, 2005 at two sites on the Judith River.

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INTRODUCTION

A survey of 123 sites comprised of 120 Region 4 streams (Figure 1 and Appendix A) was conducted between April 13 and September 1, 2005. This survey was performed as part of a Montana prairie stream inventory to document the occurrence and distribution of fish, amphibian, and reptile species in the prairie streams of Regions 4, 5, 6, and 7. This was the first time that the majority of streams had been sampled for fish. Water quality assessments were conducted at most survey sites. Observations of reptiles and amphibians at survey sites or while in transit were also documented.

METHODS

Site Location and Sampling -
Steve Carson, Programmer/Analyst for Montana Fish Wildlife and Parks (MFWP), performed random survey site generation. Random sites were selected based on stream length, 4th Code Hydrologic Unit (HUC), and lack of previous sampling. A latitude and longitude coordinate in decimal degree units was associated with each random survey site. Appendix B outlines complete random site generation procedures. A primary and alternate site was generated for each survey stream. If access was denied at the primary site an attempt was made at the alternate location. If neither site could be accessed, then the nearest public land or area where landowner permission was granted was sampled. If a site was dry, an attempt was made to locate a wetted portion of stream within a one mile radius of both the primary and alternate sites as described in Dr. Bob Bramblett's protocol (Appendix C). MFWP fishery staff selected additional survey sites based on prior sampling and interest in updated results. Individual survey sites were located using a Garmin *e*Trex VISTA global positioning system (GPS) unit in conjunction with Bureau of Land Management (BLM) maps, and topographic maps (DeLorme 2001). Once accessible sites were located, layouts of a 300-meter sample reach were performed using methods described by Bramblett (Appendix C), in addition to sampling the most wetted portion. Sites were classified as dry, interrupted standing pools, continuous standing water, or water flowing. GPS decimal degree coordinates and photographs were taken at each sample site.

Fish Survey -
Sites were sampled using seines, dip nets, or a backpack electrofishing unit if water conductivities were favorable. Seines used included: 6' x 20', 4' x 15', 6' x 30' with a 6' x 6' x 6' bag, and 4' x 12' with a 4' x 4' x 4' bag. Mesh size and type on all seines was ¼" heavy delta, except for the 4' x 12' bag seine which was 3/16" mesh. Seine size and use of block nets was determined by stream morphology. Seine hauls were performed by a two-person crew applying Bramblett's protocols (Appendix C). Captured fish were sorted into buckets of like species. Bramblett's protocol (Appendix C) was used in processing captured fish. Fish were anesthetized using tricaine methyl sulfonate (MS-222) and identified. Help in field identification of fish was accomplished using Holton and Johnson (2003) and a looking glass. If numbers allowed, total lengths in millimeters (mm) were recorded on at least 20 of each species, typically a minimum of ten individuals were preserved in a 10% Formalin solution to voucher for proper identification confirmation at a later date. If possible, a minimum of 20 specimens were

vouchered in the genus *Hybognathus* and *Phoxinus*. Fish data was recorded on "Rite in the Rain" data sheets (Appendix D). Fish that were not measured or preserved were counted and released. Identification validation of vouchered specimens was done at a later date, and if errors occurred, number totals were adjusted by extrapolation on a percentage basis.

Judith River Larval Fish Survey -
Larval fish were sampled at two sites on the Judith River from April 18 to July 18, 2004. Methods are summarized and added to the appendices of this report.

Amphibian and Reptile Survey -
All amphibian and reptile sightings at survey sites or while in transit were recorded. Reichel and Flath (1995) and Werner et al. (2004) were used for species identification. Date, species, number of adults or larvae observed, location description including county, and GPS coordinates were documented.

Water Quality Survey -
Water turbidity data was taken using a LaMotte 2020 Turbidimeter and reported as nephelometric turbidity units (NTU). Water temperature (° C), conductivity (µS), and pH data was collected using a waterproof Oakton Portable pH/CON 10 Meter. Conductivity measurements were compensated to 25° C.

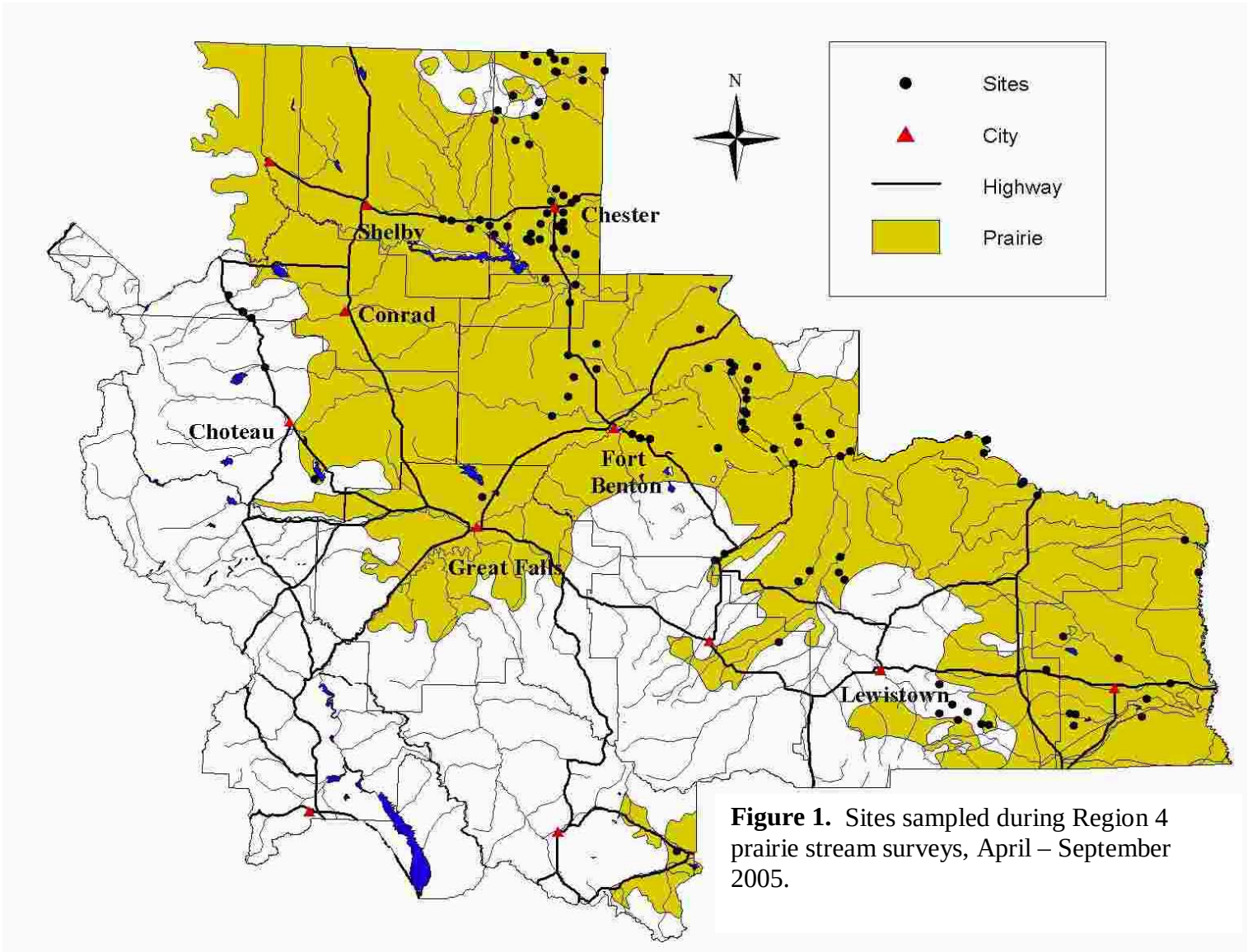

Figure 1. Sites sampled during Region 4 prairie stream surveys, April – September 2005.

RESULTS

Site Surveys

One hundred and twenty-three sites comprised of 120 Region 4 streams were sampled. Ninety-seven sites were randomly selected, and MFWP fisheries staff selected the remaining 26. Ninety-nine survey sites were located on private lands and 24 were on public lands (12-state, 8-BLM, and 4-USFWS). Fifty-three (43%) of the sites had water present and 70 (57%) of the sites were dry (Figure 2). Of the wetted sites four (3%) had continuous standing water, 25 (20%) had flowing water, and 24 (20%) had interrupted standing pools (Figure 2). Fish were observed at 32 (60.4%) of the wetted sites sampled.

Fish Surveys

A total of 16,325 fish were collected from 32 survey sites, consisting of 29 species (21 native, 8 introduced) and nine families (Table 1). Fathead minnows (*Pimephales promelas*) were the most abundant (n = 7,723 – 47%) fish captured and had the highest distribution (20 sites – 63%) as seen in Table 1. The common carp (*Cyprinus carpio*) was the most abundant and most widely distributed introduced fish species observed with a total of 978 captured at 12 (38%) of survey sites with fish present (Table 1). The Teton River (a non-random/selected site) had the greatest fish diversity with 17 species observed (Table 2 & Figure 4). Northern redbelly dace x finescale dace (*Phoxinus eos* x *P. neogaeus*) hybrids were captured in an oxbow pond off of Sheep Creek, a tributary to the Two Medicine River. Brassy minnows (*Hybognathus hankinsoni*) were observed in streams draining into the Two Medicine River (HUC 10030201) and upper Marias River (HUC 10030203), therefore extending their range westward in region 4 according to data reviewed in Holton and Johnson (2003) and the Montana Fisheries Information System (MFISH). Brook stickleback (*Culaea inconstans*) were seen in waters within the upper Marias River HUC (10030203) and upper Teton River HUC (10030205) which was a westward expansion to their previously documented range as seen in Holton and Johnson (2003) and MFISH. Percent fish species composition observed by site can be seen in Appendix E.

Amphibian and Reptile Surveys

Thirteen species of amphibians and reptiles comprised of eight families were observed while at or in transit to survey sites (Table 3 & Appendix F). Tiger salamanders (*Ambystoma tigrinum*) had the highest abundance (n = 141) of amphibians encountered, while boreal chorus frogs (*Pseudacris maculata*) had the greatest distribution (n = 12 sites) as seen in Table 3. Spiny softshell turtles (*Apalone spinifera*) had the highest abundance (n = 9) of reptiles observed and gopher snakes (*Pituophis catenifer*) had the highest distribution (n = 6 sites)(Table 3).

Water Quality Surveys

Analysis of water quality in which live fish were observed showed a temperature range of 8.0-29.9°C, a pH range of 7.35–9.31, a conductivity range of 193.8–16,760µS, and a turbidity range of 1.45-189 NTU (Table 5). Measured water conductivities ranged from 193.8µS to 19,940µS, with a mean of 4,077µS. Measured pH ranged from 7.05 to 9.31, with a mean of 8.02. Measured turbidity ranged from 1.45 to 326 NTU, with a mean of

39.87 NTU. Measured water temperature ranged from 6.8°C to 39.6°C, with a mean of 19.7°C (Table 6).

Judith River Larval Fish Surveys
Judith River larval fish survey results are summarized in Appendix H.

Major Observations by HUC

10030102 – Upper Missouri River

Four sites were sampled including Black Horse Lake Flat, Boyle Coulee, Early Coulee, and Foucher Coulee. Three sites had flowing water and one site, Black Horse Lake Flat, had interrupted standing pools. Water at each site is believed to be ephemeral runoff. No sites contained fish, but three boreal chorus frogs were observed at Black Horse Lake Flat (Table 4). A western rattlesnake (*Crotalus viridis*) was observed while in transit (Appendix F).

10030104 – Sun River

One site, Dipping Tank Creek, was sampled in this HUC. It contained interrupted standing pools of water where brook stickleback were the only species observed (Table 2).

10030201 – Two Medicine

Two sites, Sheep Creek* and an oxbow pond* off of Sheep Creek, were sampled. Sheep Creek was flowing and the pond contained continuous standing water (Table 6). Eight species of fish (Table 2) and a northern leopard frog (*Rana pipiens*) (Table 4) were observed in Sheep Creek. Northern redbelly dace (*Phoxinus eos*) and northern redbelly dace x finescale dace hybrids (*P. eos* x *P. neogaeus*) were captured in the oxbow pond (Table 2) using a backpack electrofishing unit along the shoreline. The dace hybrids are a native species of special concern in Montana (Holton and Johnson 2003) and this observation is a range extension according to MFISH. Brassy minnows were also captured at Sheep Creek, which is an expansion to their previous range as seen in Holton and Johnson (2003) and MFISH.

10030203 – Marias River

Thirty-three sites were sampled, including: Arnst Coulee, Badger Coulee, Beebe Coulee, Bison Coulee, Bourne Coulee, Clausen Coulee, Clayton Coulee, Cox Coulee, Eagle Creek, Feye Coulee, Goosebill Coulee, Heimbigner Coulee, Horse Coulee, Jensen Coulee*, Keith Coulee, Kjar Coulee, Larson Coulee, Layton Coulee, Little Horse Creek,

* Non-random site

Manton Coulee, McTosh Coulee, the Middle Fork of the Dry Fork of the Marias*, Poverty Coulee, Sagebrush Coulee, Slide Out Coulee, the South Fork of the Dry Fork of the Marias*, Spring Coulee, Stellner Coulee, Stewart Coulee, Tiber Coulee, Tootsie Creek, Twelvemile Coulee, and Wolfe Coulee. Twenty-six of the sites were dry, two had water flowing, four contained interrupted standing pools, and one site held continuous standing water (Figure 3). Sampling at Jensen Coulee produced six species of fish and one amphibian species (Table 2, Table 4). Four species of fish (Table 2) and two common garter snakes (*Thamnophis sirtalis*) (Table 4) were observed at the Middle Fork of the Dry Fork of the Marias while six fish species (Table 2) and one tiger salamander (Table 4) were captured at the South Fork of the Dry Fork of the Marias. A tiger salamander was observed at Spring Coulee, while a boreal chorus frog was seen at McTosh Coulee (Table 4). A terrestrial garter snake (*Thamnophis elegans*) and western rattlesnake were observed while in transit within this HUC (Appendix F). Brassy minnows and brook stickleback were observed at Jensen Coulee and the South Fork of the Dry Fork of the Marias (Table 2), which is an extension of their ranges as shown by Holton and Johnson (2003) and MFISH. A few brook stickleback captured at the Middle and South Forks of the Dry Fork of the Marias displayed large cyst-like xenomas. Specimens displaying these characteristics were preserved and forwarded to Jim Peterson, the MFWP Fish Health Coordinator, for analysis. Peterson confirmed that the xenomas were infected with thousands of individual microsporean parasites (*Glugea spp.*) in various stages of development. These are the first known cases documented in Montana, however it has been documented in many states, including several reports in stickleback (conversation, Jim Peterson).

10030204 – Willow Creek

Nine sites were sampled comprising of Clift Coulee, Coyote Coulee, Dodge Coulee, Edmister Coulee, Kolstad Coulee, Moran Coulee, Sleeper Coulee, Snow Coulee, and Wilson Coulee. All sites were dry except for Snow Coulee, where water was flowing (Figure 3, Table 6), but fish were absent. Boreal chorus frogs were observed while in transit within this HUC (Appendix F).

10030205 – Teton River

Five sites were sampled, including: Bullberry Coulee, Chimney Rock coulee, Muddy Creek*, Teton River*, and West Fork Coulee. Chimney Rock Coulee and West Dry Fork Coulee were both dry (Table 6). Bullberry Coulee had continuous standing water where over a hundred tiger salamander larvae and one adult tiger salamander (Table 4) were seined. Muddy Creek was flowing and seven species of fish were observed (Table 2). A backpack electrofishing unit was initially used to sample Muddy Creek, but was not as effective as seining. Some brook stickleback seined in Muddy Creek displayed xenomas with a *Glugea spp.* parasite present. Jim Peterson confirmed the parasites from

* Non-random site

vouchered specimens. Northern crayfish (*Orconectes virilis*) were also observed at Muddy Creek.

The Teton River, which contained interrupted standing pools of water (Table 6), had the greatest fish species diversity (*n*=17, Table 2 & Figure 4) of all prairie streams sampled in Region 4 during 2005. Fish species observed were similar to Frank and Tews (2004) and Tabor (2004), with the addition of brassy minnows, brook stickleback, an emerald shiner (*Notropis atherinoides*), a spottail shiner (*Notropis hudsonius*), and a western silvery minnow (*Hybognathus argyritis*). Plains minnows (*Hybognathus placitus*) were not observed in 2005 sampling efforts.

10040101 – Bullwhacker/Dog Creeks

Twenty-three sites were sampled, including: Alkali Creek, Arrow Creek*, Birch Creek*, Bullwhacker Creek*, Butcher Knife Canyon, Coal Mine Coulee, Crooked Coulee, Cut Bank Coulee, Dog Creek*, Dry Fork Coulee, Eagle Creek*, Eightmile Coulee, Holden Coulee, Jackson Coulee, Little Sandy Creek*, Lone Tree Coulee, Mud Springs Coulee, Pigtail Coulee, Rattlesnake Coulee, Sage Coulee, Sandstone Coulee, Sheep Shed Coulee, and Sherry Coulee. Fifteen sites were dry, four had interrupted standing pools, and four had flowing water (Table 6, Figure 3). Alkali Creek produced seven species of fish that included two juvenile brown trout (*Salmo trutta*) (Table 2), two amphibian species, and a spiny softshell turtle (Table 4). Eleven species of fish (Table 2) and one amphibian and two reptile species (Table 4) were observed at Arrow Creek, which was sampled approximately 300 meters above its confluence with the Missouri River. Birch Creek had barely flowing water, a temperature of 39.6° C (Table 6), and one deceased flathead chub (*Platygobio gracilis*), in addition to over a hundred unidentifiable (<15mm) minnows (Table 2) on August 1, 2005. Fifteen northern leopard frogs were witnessed while sampling Birch Creek (Table 4). Three species of fish (Table 2), and one amphibian and two reptile species (Table 4) were observed at Bullwhacker Creek. Dog Creek seining produced no visible fish because of large amounts of silt and mud collected in the bag, though, greater than a hundred small (<15mm) minnows were observed swimming in the pool prior to conducting seine hauls. Nine species of fish (Table 2) and 23 northern leopard frogs (Table 4) were observed at Eagle Creek. Eight fish species (Table 2) and three painted turtles (*Chrysemys picta*) (Table 4) were observed at the mouth of Little Sandy Creek. An eastern racer (*Coluber constrictor*) was observed at Pigtail Coulee, while two great plains toads (*Bufo cognatus*) were seen at Sheep Shed Coulee (Table 4). Two species of reptiles were observed while in transit within this HUC (Appendix F).

*Non-random site

10040102 – Arrow Creek

The three sites sampled here included Arrow Creek[*], Little Battle Creek, and an unnamed drainage. Water was flowing at the former two while the latter was dry. Ten species of fish (Table 2) were captured at Arrow Creek and a boreal chorus frog and gopher snake (*Pituophis catenifer*) (Table 4) were observed. Fish species observed in Arrow Creek were similar to those of Frank and Tews 2004, and Tabor 2004. Fish were absent at Little Battle Creek, but four boreal chorus frogs (Table 4) were observed and several others's calls could be heard. A western rattlesnake was observed and safely removed off of highway 223 while in transit within this HUC (Appendix F).

10040103 – Judith River

Six sites were sampled, including: Ming Coulee, Ox Creek, Plum Creek, Squaw Coulee, Willow Creek, and Wolf Creek[*]. One site was dry, two contained interrupted standing pools, and three had flowing water (Figure 3). Lake chubs (*Couesius plumbeus*) were the only species observed at Plum Creek (Table 2) and one species of amphibian (Table 4) and one fish species (Table 2) were observed at Squaw Coulee. Wolf Creek produced five species of fish (Table 2) that were similar to findings by Tabor (2004). Two gopher snakes were seen while in transit within this HUC (Appendix F).

10040104 – Fort Peck Reservoir

Six sites were sampled, including: Antelope Creek[*R6], Armells Creek[*], Bull Creek[* R6], Cow Creek[* R6], Two Calf Creek[*], and Woodhawk Creek[*]. Two sites were dry, three contained interrupted standing pools, and one had continuous standing water (Figure 3). Seven species of fish (Table 2) were observed at Armells Creek, which were similar to those observed by Tabor (2004), with the addition of river carpsuckers (*Carpiodes carpio*) and longnose suckers (*Catostomus catostomus*). Ten species of fish (Table 2) were observed at Bull Creek, which was sampled at its confluence with the Missouri River. Seven species of fish (Table 2) and one species each of amphibian and reptile (Table 4) were seen at Two Calf Creek. One common carp was caught at Woodhawk Creek (Table 2). Five spiny softshell turtles were observed while camping along the Missouri River in this HUC (Appendix F).

[*]Non-random site
[R6] Region 6

10040201 – Upper Musselshell River

Gillis Creek was the only site sampled and was dry. Several irrigation ditches were observed and most of the minor streams appeared to be diverted and dry throughout the area.

10040203 – Flatwillow Creek

Seven sites were sampled, including: Beaver Ball Creek, Johnson Coulee, Potter Creek, Racehorse Coulee, Snoose Creek, and two sites on Yellow Water Creek*. Five sites were dry and two had flowing water (Figure 3). Johnson Coulee, which drains into Petrolia Reservoir was hardly flowing and produced two species of fish (Table 2) and amphibians (Table 4). A single northern leopard frog was observed at Snoose Creek. At Yellow Water Creek a single brassy minnow and northern redbelly dace were captured in a spring immediately downstream of the confluence of the North Fork of Yellow Water Creek.

10040204 – Box Elder Creek

Nine sites were sampled, including: Blacktail Creek, Briggs Coulee, Duck Creek, Gorman Coulee, Horsethief Coulee, Rose Canyon, Shale Coulee, Surenuff Creek*, and Tyler Creek. Four sites were dry, two had interrupted standing pools, and three had flowing water (Figure 3). A backpack electrofishing unit was initially used to sample Surenuff and Tyler Creeks because of the large amounts of brush present, but was not as effective as using a seine for capturing fish. Twenty-eight tiger salamanders were seined from Duck Creek (Table 4). Horsethief Coulee produced two species of fish (Table 2). A single fathead minnow (Table 2) and eight boreal chorus frogs (Table 4) were observed at Shale Coulee approximately 300 m downstream of Vogel Reservoir. Three species of fish were observed at Surenuff Creek and four fish species at Tyler Creek (Table 2). Two reptile species were observed while in transit within this HUC (Appendix F).

10040205 – Lower Musselshell River

Two sites were sampled within this HUC, Crooked Creek* (Sacagawea River) and the lower Musselshell River*. Six species of fish (Table 2) were captured at the Crooked Creek site that contained interrupted standing pools of water. Species observed were similar to Tabor 2004 (six fish species) with the addition of longnose dace (*Rhinichthys cataractae*), whereas 2003 sampling revealed nine species of fish including black bullheads (*Ameiurus melas*), flathead chubs (*Platygobio gracilis*), green sunfish (*Lepomis cyanellus*), and white suckers (*Catostomus commersoni*) (Frank and Tews, 2004), which were not observed in 2004 and 2005 sampling efforts.

*Non-random site

The Musselshell River was flowing and was seined at approximately the same location as in 2003 and 2004. Fourteen species of fish (Table 2) and a woodhouse's toad (*Bufo woodhousii*) (Table 4) were observed. Fish species observed were similar to Frank and Tews (2004) and Tabor (2004), with the addition of goldeye (*Hiodon alosoides*) and a flathead chub. Smallmouth bass (*Micropterus dolomieu*) and white suckers (*Catostomus commersoni*) were observed in 2003 (Frank and Tews, 2004), but not during 2004 (Tabor, 2004) and 2005 sampling efforts.

Two species of reptiles were observed while in transit (Appendix F).

10050002 – Upper Milk River

Police Creek and Ribbon Gulch were both sampled. Police Creek had interrupted standing pools that proved fishless upon seining. Twenty-eight brook trout (*Salvelinus fontinalis*) (Table 2) were kicked-seined from Ribbon Gulch, which was flowing and appeared to be a mountain stream. A terrestrial garter snake was observed at Ribbon Gulch (Table 4). Boreal chorus frogs were seen while in transit within this HUC (Appendix F).

10050006 – Little Sage Creek

Ten sites were sampled, including: Bobcat Coulee, Carvers Coulee, Chicken Coulee, Desert Coulee, Flat Coulee, Kinreed Coulee, Lost Coulee, Mac Coulee, Simminook Creek, and Strode Coulee. Five sites were dry, one was flowing, and four were comprised of interrupted standing pools (Figure 3). No fish were observed within this HUC and most wetted areas appeared to be ephemeral runoff. Boreal chorus frogs were observed at Bobcat Coulee, a tiger salamander was seen at Carvers Coulee, and both were spotted at Lost Coulee (Table 4).

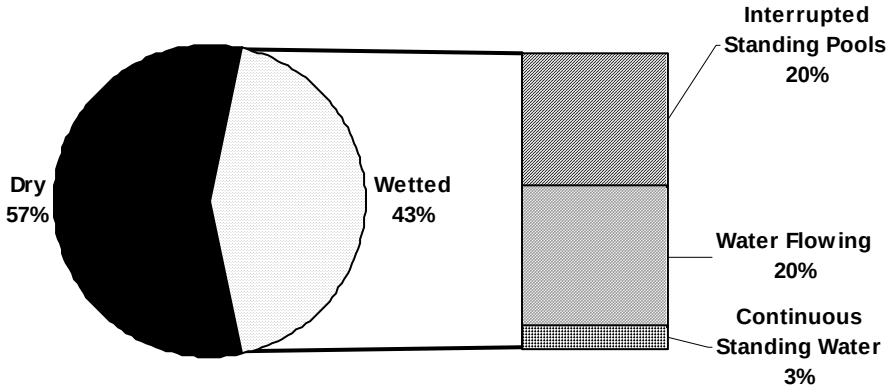

Figure 2. Percent water types observed in Region 4 prairie stream surveys, April - September 2005.

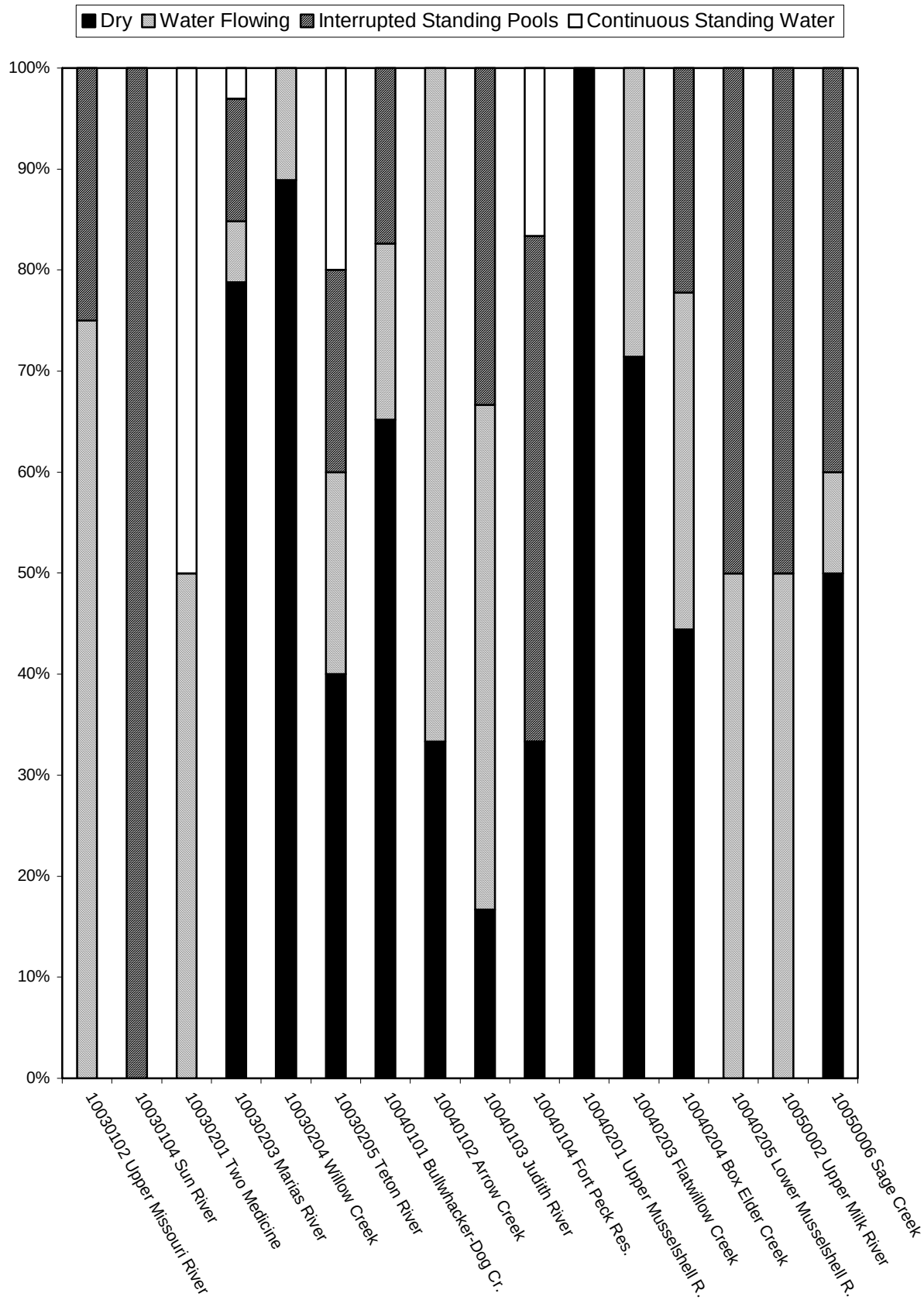

Figure 3. Water types observed by HUC during Region 4 prairie stream surveys, April - September 2005.

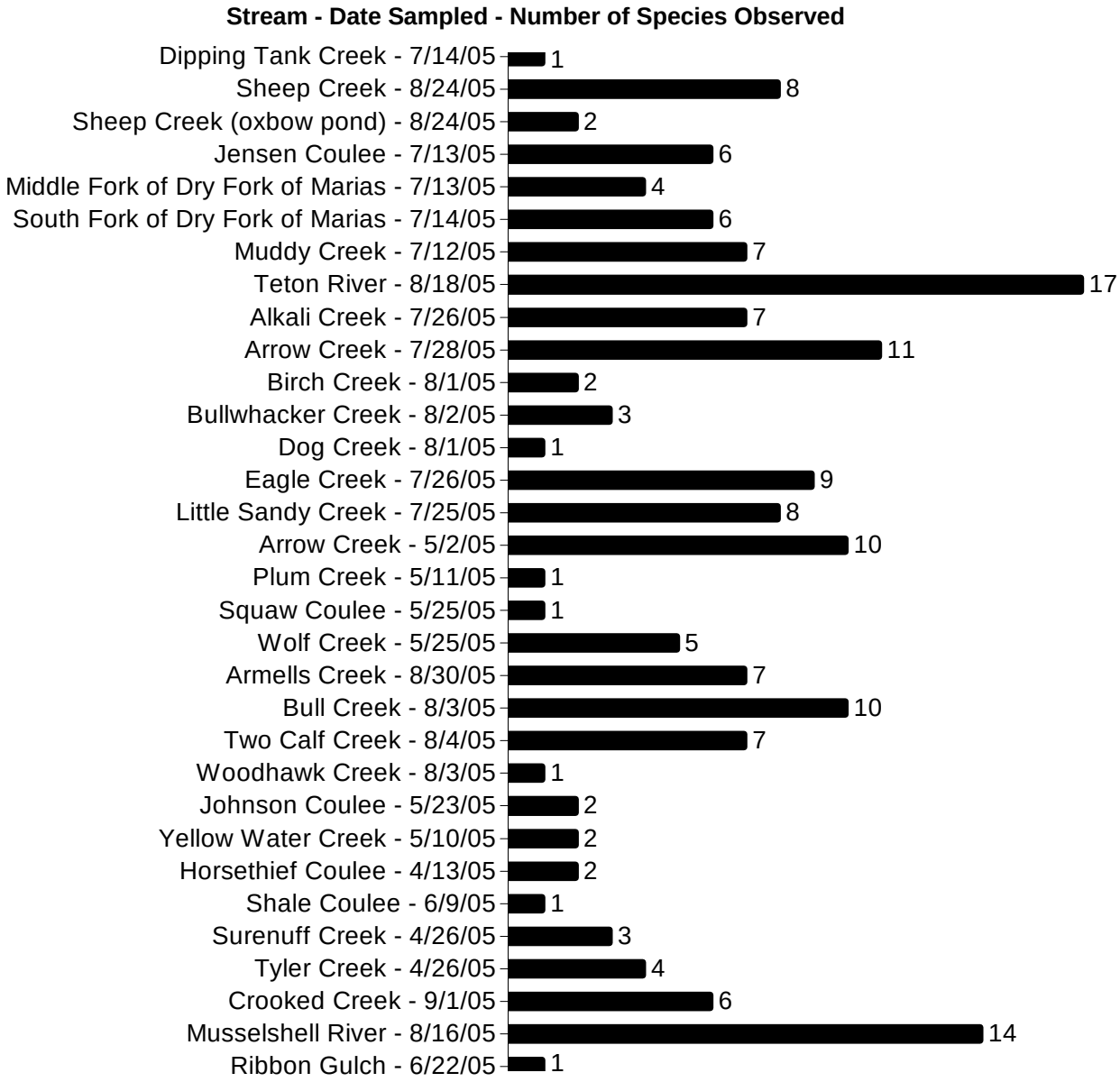

Figure 4. Number of fish species observed at Region 4 prairie stream sites, April – September 2005.

DISCUSSION AND RECOMMENDATIONS

A two-person crew performed the fieldwork in 2005. Two people proved adequate for the majority of prairie stream surveys conducted. The 4' x 12' bag seine was the most useful and efficient means of fish sampling since it spanned most prairie stream widths and water depths and the bag facilitated fish capture efficiency during hauls. Location of sampling at single random sites will not reflect total species distribution throughout the entire stream. Many survey sites occurred at uppermost extremes of the drainage systems, possibly limiting the presence of water and fish depending upon the time of year the area was sampled. Some wetted sites sampled showed large masses of range grasses growing on the streambed and were filled with tumbleweeds, indicating that recent precipitation and runoff events likely provided ephemeral water at the time of sampling. Most of these sites proved fishless upon seining. Nearly all of the prairie stream survey sites classified as dry, interrupted standing pools, continuous standing water, and flowing water could display any of these characteristics depending on the season and extent of precipitation, therefore biasing any presence/absence data collected during a "one time" sampling event. For this reason, repeated longitudinal and seasonal sampling of the first time survey sites is recommended to gain a more thorough understanding of the prairie streams sampled. Since this was the first time that fish surveys had been performed on the majority of the surveyed sites there is limited information available for site comparisons. Several sites should be revisited in addition to the remaining 136 random sites provided by Steve Carson that have yet to be sampled within Region 4. A request has been made to further sample Sheep Creek (tributary to the Two Medicine River) in 2006. Repeated sampling efforts should be performed near the mouths of streams draining into the middle Missouri River between river mile 2034.0 (Virgelle Ferry) and river mile 1921.2 (Fred Robinson Bridge) to further explore the importance of these streams in relation to the middle Missouri River and vice versa. A biological evaluation and comprehensive inventory of fish and fauna in 4th order prairie streams in Region 4, including water quality, seasonal and spatial distribution of prairie fishes and associated aquatic fauna should be further explored. Though many smaller prairie streams in these 4th order drainages have been recently sampled, many have been dry and/or without fish in the wake of several low flow years. Professional judgment suggests that the larger 4th order systems may be necessary to harbor assemblages of native and aquatic species that could utilize the smaller tributaries during wet years.

Table 1. Fish species captured at thirty-two sites during Region 4 prairie stream surveys, April – September 2005.

Family	Species	Native or Introduced	Number Observed	Percent of Total Observed[1]	Number of Sites Where Observed	Percent Observation at Sites Containing Fish [1]
Mooneye	**Hiodontidae**					
Goldeye	*Hiodon alosoides*	Native	24	0%	3	9%
Sucker	**Catostomidae**					
White sucker	*Catostomus commersoni*	Native	796	5%	14	44%
River carpsucker	*Carpiodes carpio*	Native	603	4%	9	28%
Mountain sucker	*Catostomus platyrhynchus*	Native	38	0%	5	16%
Longnose sucker	*Catostomus catostomus*	Native	62	0%	3	9%
Shorthead redhorse	*Moxostoma macrolepidotum*	Native	22	0%	2	6%
Minnow	**Cyprinidae**					
Fathead minnow	*Pimephales promelas*	Native	7,723	47%	20	63%
Lake chub	*Couesius plumbeus*	Native	950	6%	13	41%
Common carp	*Cyprinus carpio*	Introduced	978	6%	12	38%
Northern redbelly dace	*Phoxinus eos*	Native	508	3%	11	34%
Flathead chub	*Platygobio gracilis*	Native	348	2%	9	28%
Plains minnow	*Hybognathus placitus*	Native	805	5%	8	25%
Longnose dace	*Rhinichthys cataractae*	Native	275	2%	8	25%
Brassy minnow	*Hybognathus hankinsoni*	Native	41	0%	7	22%
Sand shiner	*Notropis stramineus*	Native	1,309	8%	6	19%
Western silvery minnow	*Hybognathus argyritis*	Native	232	1%	6	19%
Emerald shiner	*Notropis atherinoides*	Native	75	0%	4	13%
Spottail shiner	*Notropis hudsonius*	Introduced	2	0%	2	6%
Northern redbelly dace X finescale dace (hybrid)	*Phoxinus eos x P. neogaeus*	Native	2	0%	1	3%
Trout	**Salmonidae**					
Brook trout	*Salvelinus fontinalis*	Introduced	28	0%	1	3%
Brown trout	*Salmo trutta*	Introduced	2	0%	1	3%
Bullhead Catfish	**Ictaluridae**					
Channel catfish	*Ictalurus punctatus*	Native	99	1%	3	9%
Stonecat	*Noturus flavus*	Native	6	0%	1	3%
Stickleback	**Gasterosteidae**					
Brook stickleback	*Culaea inconstans*	Native	1,384	8%	8	25%
Sunfish	**Centrarchidae**					
Green sunfish	*Lepomis cyanellus*	Introduced	8	0%	1	3%
Pumpkinseed	*Lepomis gibbosus*	Introduced	1	0%	1	3%
Perch	**Percidae**					
Walleye	*Sander vitreum*	Introduced	2	0%	2	6%
Yellow perch	*Perca flavescens*	Introduced	1	0%	1	3%
Sculpin	**Cottidae**					
Mottled sculpin	*Cottus bairdi*	Native	1	0%	1	3%
		Total	16,325			

[1] to nearest 1%

Table 2. Statistics of seine captured fish by HUC and site during prairie stream surveys, April –September 2005.

HUC (Drainage)	Site Name / Date	Species	Total Length (mm) N	Min	Max	Mean
10030104 Sun River	Dipping Tank Creek 7/14/2005	Brook stickleback	114	26	59	44.6
10030201 Two Medicine	Sheep Creek 8/24/2005	Brassy minnow	15	39	90	62.5
		Fathead minnow	49	28	75	51.0
		Lake chub	49	36	157	59.3
		Longnose dace	17	42	72	52.8
		Mottled sculpin	1	92	92	92
		Mountain sucker	13	51	95	65.8
		Northern redbelly dace	2	27	69	48
		White sucker	135	58	247	115.1
10030201 Two Medicine	Sheep Creek (oxbow pond) 8/24/2005	Northern redbelly dace	20	38	72	52.4
		Northern redbelly dace X finescale dace (hybrid)	2	52	55	53.5
10030203 Marias River	Jensen Coulee 7/13/2005	Brassy minnow	12	46	76	55.7
		Brook stickleback	566	38	71	46.4
		Fathead minnow	256	37	67	53.5
		Lake chub	36	50	102	75.5
		Mountain sucker	1	58	58	58.0
		White sucker	66	63	90	73.5
10030203 Marias River	Middle Fork of Dry Fork of Marias 7/13/2005	Brook stickleback	162	47	60	53.5
		Fathead minnow	72	52	73	60.0
		Lake chub	1	95	95	95.0
		White sucker	29	64	226	147.3
10030203 Marias River	South Fork of Dry Fork of Marias 7/14/2005	Brassy minnow	3	48	70	56.0
		Brook stickleback	469	24	72	42.2
		Fathead minnow	230	26	68	55.9
		Lake chub	10	31	40	34.3
		Longnose dace	1	58	58	58.0
		White sucker	28	77	190	109.6
10030205 Teton River	Muddy Creek 7/12/2005	Brook stickleback	15	18	55	40.0
		Lake chub	20	42	72	53.9
		Longnose dace	196	42	73	53.4
		Mountain sucker	13	49	80	60.6
		Northern redbelly dace	3	43	57	49.3
		White sucker	9	63	90	74.2
		Yellow perch	1	36	36	36.0

Table 2 – continued.

HUC (Drainage)	Site Name / Date	Species	N	Total Length (mm) Min	Max	Mean
10030205 Teton River	Teton River 8/18/2005	Brassy minnow	2	70	74	72.0
		Brook stickleback	1	39	39	39.0
		Channel catfish	6	146	640	312.0
		Common carp	5	123	146	134.4
		Emerald shiner	1	62	62	62.0
		Fathead minnow	97	43	58	50.6
		Flathead chub	8	35	114	79.9
		Lake chub	89	46	94	68.9
		Longnose dace	16	28	71	50.4
		Longnose sucker	39	43	174	75.3
		Mountain sucker	9	39	91	69.7
		River carpsucker	2	40	450	245.0
		Sand shiner	1,183	42	58	49.0
		Shorthead redhorse	18	35	418	196.4
		Spottail shiner	1	62	62	62.0
		Western silvery minnow	1	132	132	132.0
		White sucker	387	38	187	65.3
10040101 Bullwhacker-Dog Cr.	Alkali Creek 7/26/2005	Brook stickleback	4	36	45	40.8
		Brown trout	2	73	75	74.0
		Common carp	3	34	60	43.0
		Fathead minnow	26	51	68	58.7
		Plains minnow	22	73	105	92.4
		River carpsucker	1	28	28	28.0
		White sucker	9	44	71	61.3
10040101 Bullwhacker-Dog Cr.	Arrow Creek 7/28/2005	Channel catfish	1	680	680	680.0
		Common carp	5	44	60	50.4
		Fathead minnow	4	47	57	51.0
		Flathead chub	123	78	179	128.3
		Goldeye	1	281	281	281.0
		Longnose dace	6	49	87	65.3
		Longnose sucker	11	121	175	146.2
		Plains minnow	118	64	86	71.2
		River carpsucker	4	30	93	62.0
		Stonecat	6	82	159	123.2
		Western silvery minnow	51	60	76	70.2
10040101 Bullwhacker-Dog Cr.	Birch Creek 8/1/2005	Flathead chub	1	42	42	42.0
		Unidentified minnows	100+		<15	
10040101 Bullwhacker-Dog Cr.	Bullwhacker Creek 8/2/2005	Common carp	3	41	64	55.7
		Flathead chub	5	26	34	28.8
		River carpsucker	20	18	28	22.4
10040101 Bullwhacker-Dog Cr.	Dog Creek 8/1/2005	Unidentified minnows	100+		<15	

Table 2 – continued.

HUC (Drainage)	Site Name / Date	Species	N	Total Length (mm) Min	Max	Mean
10040101 Bullwhacker-Dog Cr.	Eagle Creek 7/26/2005	Brassy minnow	2	49	57	53.0
		Brook stickleback	53	32	48	40.5
		Common carp	53	41	103	61.4
		Fathead minnow	413	36	58	43.7
		Lake chub	5	28	35	32.4
		Plains minnow	1	72	72	72.0
		Pumpkinseed	1	88	88	88.0
		Sand shiner	5	45	57	49.8
		White sucker	60	32	145	68.2
10040101 Bullwhacker-Dog Cr.	Little Sandy Creek 7/25/2005	Common carp	11	26	45	33.6
		Emerald shiner	42	42	74	52.0
		Fathead minnow	713	26	42	37.4
		Flathead chub	3	27	39	31.0
		Northern redbelly dace	1	40	40	40.0
		River carpsucker	5	20	31	27.2
		Sand shiner	12	41	52	46.7
		Western silvery minnow	6	49	88	71.7
10040102 Arrow Creek	Arrow Creek 5/2/2005	Brassy minnow	6	61	69	64.0
		Fathead minnow	75	31	68	52.0
		Flathead chub	106	31	170	70.0
		Lake chub	252	33	101	50.5
		Longnose dace	10	62	78	72.1
		Longnose sucker	8	125	414	171.0
		Mountain sucker	2	54	103	78.5
		Northern redbelly dace	46	42	49	45.6
		Plains minnow	38	41	87	57.4
		White sucker	13	99	156	122.8
10040103 Judith River	Plum Creek 5/11/2005	Lake chub	28	44	148	85.0
10040103 Judith River	Squaw Coulee 5/25/2005	Fathead minnow	149	41	84	60.6
10040103 Judith River	Wolf Creek 5/25/2005	Fathead minnow	6	53	71	63.5
		Lake chub	357	39	108	61.8
		Longnose dace	25	53	72	58.9
		Northern redbelly dace	2	51	57	54.0
		White sucker	50	60	218	129.8
10040104 Fort Peck	Armells Creek 8/30/2005	Common carp	773	24	510	57.7
		Fathead minnow	164	31	59	39.3
		Flathead chub	50	31	138	65.3
		Longnose sucker	4	46	75	62.3
		Plains minnow	5	72	86	75.4
		River carpsucker	447	30	49	36.9
		Sand shiner	72	56	65	60.9

Table 2 – continued.

HUC (Drainage)	Site Name / Date	Species	N	Total Length (mm) Min	Max	Mean
10040104 Fort Peck	Bull Creek 8/3/2005	Common carp	23	28	447	63.4
		Emerald shiner	17	45	83	54.2
		Fathead minnow	7	47	50	48.9
		Flathead chub	21	29	83	61.1
		Goldeye	9	40	316	83.1
		Plains minnow	112	44	81	63.3
		River carpsucker	4	26	43	35.8
		Walleye	1	238	238	238.0
		Western silvery minnow	123	48	130	81.1
		White sucker	2	48	50	49.0
10040104 Fort Peck	Two Calf Creek 8/4/2005	Common carp	67	22	151	58.5
		Flathead chub	30	21	59	30.6
		Plains minnow	4	34	39	35.5
		River carpsucker	115	23	45	32.9
		Spottail shiner	1	30	30	30.0
		Western silvery minnow	4	28	43	35.3
		White sucker	3	28	40	33.0
10040104 Fort Peck	Woodhawk Creek 8/3/2005	Common carp	1	98	98	98.0
10040203 Flatwillow	Johnson Coulee 5/23/2005	Fathead minnow	86	43	58	47.6
		Northern redbelly dace	3	35	52	41.3
10040203 Flatwillow	Yellow Water Creek 5/10/2005	Brassy minnow	1	66	66	66.0
		Northern redbelly dace	1	49	49	49.0
10040204 Box Elder Creek	Horsethief Coulee 4/13/2005	Fathead minnow	5,295	47	68	56.7
		Northern redbelly dace	427	38	69	53.5
10040204 Box Elder Creek	Shale Coulee 6/9/2005	Fathead minnow	1	31	31	31.0
10040204 Box Elder Creek	Surenuff Creek 4/26/2005	Fathead minnow	1	63	63	63.0
		Northern redbelly dace	2	26	36	31.0
		White sucker	4	89	112	98.5
10040204 Box Elder Creek	Tyler Creek 4/26/2005	Lake chub	15	52	111	85.3
		Longnose dace	3	81	99	89.3
		Northern redbelly dace	1	59	59	59.0
		White sucker	1	142	142	142.0
10040205 Lower Musselshell	Crooked Creek 9/1/2005	Common carp	4	66	75	71.0
		Fathead minnow	74	30	56	44.6
		Lake chub	86	39	87	66.3
		Longnose dace	1	72	72	72.0
		Plains minnow	504	34	88	60.0
		Sand shiner	36	36	56	50.7

Table 2 – continued.

HUC (Drainage)	Site Name / Date	Species	N	Total Length (mm) Min	Max	Mean
10040205 Lower Musselshell	Musselshell River 8/16/2005	Channel catfish	92	40	570	129.3
		Common carp	30	39	493	81.0
		Emerald shiner	15	60	88	67.8
		Fathead minnow	4	33	47	38.3
		Flathead chub	1	92	92	92.0
		Goldeye	14	54	92	76.3
		Green sunfish	8	49	90	63.9
		Lake chub	2	61	62	61.5
		Plains minnow	2	78	78	78.0
		River carpsucker	5	51	408	233.4
		Sand shiner	1	38	38	38.0
		Shorthead redhorse	4	97	205	127.5
		Walleye	1	100	100	100.0
		Western silvery minnow	47	80	115	90.6
10050002 Upper Milk	Ribbon Gulch 6/22/2005	Brook trout	28	88	240	129.4

Table 3. Reptiles and amphibians observed while conducting prairie stream surveys, April – September 2005.

Family Common Name	**Species**	**Number of Sites**	**Total Observed**
Ambystomatidae **(mole salamanders)**			
Tiger salamander	*Ambystoma tigrinum*	7	141
Bufonidae **(true toads)**			
Great plains toad	*Bufo cognatus*	1	2
Woodhouse's toad	*Bufo woodhousii*	5	19
Hylidae **(treefrogs)**			
Boreal chorus frog	*Pseudacris maculata*	12	55
Ranidae **(true frogs)**			
Northern leopard frog	*Rana pipiens*	6	56
Emydidae **(pond turtles)**			
Painted turtle	*Chrysemys picta*	1	3
Trionychidae **(softshells)**			
Spiny softshell	*Apalone spinifera*	5	9
Colubridae **(colubrids)**			
Common garter snake	*Thamnophis sirtalis*	2	3
Gopher (bull) snake	*Pituophis catenifer*	6	6
Plains garter snake	*Thamnophis radix*	3	3
Eastern racer	*Coluber constrictor*	2	2
Terrestrial garter snake	*Thamnophis elegans*	2	2
Viperidae **(vipers)**			
Western rattlesnake	*Crotalus viridis*	3	3

Table 4. Reptiles and amphibians observed by HUC and survey site during prairie stream surveys, April –September 2005.

HUC (Drainage)	Site Name / Date	Species	Number of Adults	Number of Larvae
10030102 Upper Missouri River	Black Horse Lake Flat 6/16/2005	Boreal chorus frog	3	
10030201 Two Medicine	Sheep Creek 8/24/2005	Northern leopard frog	1	
10030203 Marias River	Jensen Coulee 7/13/2005	Northern leopard frog		15
10030203 Marias River	McTosh Creek 6/21/2005	Boreal chorus frog	1	
10030203 Marias River	Middle Fork of Dry Fork of Marias 7/13/2005	Common garter snake	2	
10030203 Marias River	South Fork of Dry Fork of Marias 7/14/2005	Tiger salamander		1
10030203 Marias River	Spring Coulee 6/21/2005	Tiger salamander		1
10030205 Teton River	Bullberry Coulee 6/15/2005	Tiger salamander	1	100+
10040101 Bullwhacker-Dog Cr.	Alkali Creek 7/26/2005	Boreal chorus frog Northern leopard frog Spiny softshell	 1 1	18
10040101 Bullwhacker-Dog Cr.	Arrow Creek 7/28/2005	Spiny softshell Woodhouse's toad Plains garter snake	1 1 1	
10040101 Bullwhacker-Dog Cr.	Birch Creek 8/1/2005	Northern leopard frog	15	
10040101 Bullwhacker-Dog Cr.	Bullwhacker Creek 8/2/2005	Plains garter snake Woodhouse's toad Spiny softshell	1 1 1	
10040101 Bullwhacker-Dog Cr.	Eagle Creek 7/26/2005	Northern leopard frog	23	
10040101 Bullwhacker-Dog Cr.	Little Sandy Creek 7/25/2005	Painted turtle	3	
10040101 Bullwhacker-Dog Cr.	Pigtail Coulee 5/31/2005	Eastern racer	1	

Table 4 – continued.

HUC (Drainage)	Site Name / Date	Species	Number of Adults	Number of Larvae
10040101 Bullwhacker-Dog Cr.	Sheep Shed Coulee 7/27/2005	Great plains toad	2	
10040102 Arrow Creek	Arrow Creek 5/2/2005	Boreal chorus frog Gopher snake	1 1	
10040102 Arrow Creek	Little Battle Creek 6/13/2005	Boreal chorus frog	4	
10040103 Judith River	Squaw Coulee 5/25/2005	Tiger salamander	2	
10040104 Fort Peck	Two Calf Creek 8/4/2005	Woodhouse's toad Plains garter snake	14 1	
10040203 Flatwillow	Johnson Creek 5/23/2005	Woodhouse's toad Boreal chorus frog	2 4	
10040203 Flatwillow	Snoose Creek 5/10/2005	Northern leopard frog	1	
10040204 Box Elder Creek	Duck Creek 6/9/2005	Tiger salamander	2	26
10040204 Box Elder Creek	Shale Coulee 6/9/2005	Boreal chorus frog		8
10040205 Lower Musselshell R.	Musselshell River 8/16/2005	Woodhouse's toad	1	
10050002 Upper Milk	Ribbon Gulch 6/22/2005	Terrestrial garter snake	1	
10050006 Sage Creek	Bobcat Coulee 6/28/2005	Boreal chorus frog	4	
10050006 Sage Creek	Carvers Coulee 6/22/2005	Tiger salamander		1
10050006 Sage Creek	Lost Coulee 6/28/2005	Tiger salamander Boreal chorus frog	6	7

Table 5. Water quality and total length statistics of fish species captured during R-4 prairie stream surveys, April – September 2005.

Species	Number of Sites	N	Mean Total Length (mm)	Ranges				
				Total Length (mm)	Temp. (˚C)	pH	Conductivity (µS)	Turbidity (NTU)
Brassy minnow	7	41	60.0	39 - 90	11.4 – 24.5	7.41 – 8.55	536 – 2,790	7.39 – 24.4
Brook stickleback	8	1,384	44.5	18 - 72	16.1 – 25.9	7.67 – 9.31	334 – 2,790	7.39 – 81.7
Brook trout	1	28	129.4	88 - 240	13.1	7.35	193.8	4.02
Brown trout	1	2	74.0	73 - 75	16.2	8.53	1,339	81.7
Channel catfish	3	99	190.3	40 - 680	16.1 – 24.5	8.14 – 8.3	1,912 – 3,920	24.4 – 127
Common carp	12	978	63.8	22 - 510	16.1 – 29.4	7.66 – 9.12	447 – 16,760	17.9 – 127
Emerald shiner	4	75	57.4	42 - 88	16.1 – 24.8	7.66 – 8.3	447 – 2,370	24.4 – 127
Fathead minnow	20	7,723	50.8	26 - 84	8.0 – 29.9	7.41 – 9.08	447 – 7,830	1.45 – 189
Flathead chub	9	348	65.8	21 - 179	14.2 – 28.0	7.66 – 9.12	447 – 7,830	19.1 – 127
Goldeye	3	24	87.4	40 - 316	20.8 – 24.8	7.8 – 8.21	447 – 3,920	33.4 – 127
Green sunfish	1	8	63.9	49 - 90	20.8	8.21	2,370	127
Lake chub	13	950	65.2	28 - 157	8.5 – 25.7	7.41 – 9.31	334 – 6,120	4.68 – 127
Longnose dace	8	275	58.1	28 - 99	8.7 – 25.7	7.41 – 9.31	334 – 6,120	11.5 – 92.9
Longnose sucker	3	62	110.0	43 - 414	14.2 – 24.5	7.73 – 8.3	1,912 – 7,830	19.1 – 52
Mottled sculpin	1	1	92.0	92	14.8	7.41	536	20.6
Mountain sucker	5	38	65.5	39 - 103	14.2 – 25.7	7.41 – 9.31	334 – 2,580	7.39 – 24.4
Northern redbelly dace	11	508	49.5	26 - 72	8.0 – 25.7	7.41 – 9.31	334 – 6,120	1.45 – 54.5
Northern redbelly dace X finescale dace (hybrid)	1	2	53.5	52 - 55				
Plains minnow	8	805	66.2	34 - 105	14.2 – 25.1	7.73 – 8.77	447 – 7,830	19.1 – 127
Pumpkinseed	1	1	88.0	88	24.5	8.55	1,585	21.3
River carpsucker	9	603	50.0	18 - 450	16.1 – 28.0	7.66 – 9.12	447 – 7,830	24.4 – 127
Sand shiner	6	1,309	52.0	36 - 65	16.1 – 24.5	7.66 – 8.71	483 – 7,830	21.3 – 127
Shorthead redhorse	2	22	183.9	35 - 418	16.1 – 20.8	8.21 – 8.3	1,912 – 2,370	24.4 – 127
Spottail shiner	2	2	46	30 - 62	16.1 – 25.1	8.3 – 8.77	1,912 – 3,530	24.4 – 92.5
Stonecat	1	6	123.2	82 - 159	24.5	8.14	3,920	52
Walleye	2	2	169.0	100 - 238	20.8 – 24.8	7.8 – 8.21	447 – 2,370	33.4 – 127
Western silvery minnow	6	232	79.5	28 - 132	16.1 – 25.1	7.66 – 8.77	447 – 3,920	24.4 – 127
White sucker	14	796	98.0	28 - 247	8.0 – 25.7	7.41 – 9.31	334 – 6,120	7.35 – 92.5
Yellow perch	1	1	36	36	25.7	9.31	334	11.5
Total Water Quality Ranges Where Fish Were Observed					8.0 – 29.9	7.35 – 9.31	193.8 – 16,760	1.45 – 189

Table 6. Water type and quality measurement data collected during prairie stream surveys, April – September 2005 by HUC.

Site		Water Quality Measurements			
Date	Water Type	Water Temperature (˚C)	Conductivity (µS)	pH	Turbidity (NTU)
	10030102 – Upper Missouri River				
Blackhorse Lake Flat [2] 6/16/05	Interrupted Standing Pools	19.0	1,191	7.19	326
Boyle Coulee 6/15/05	Water Flowing	19.3	13,030	7.62	5.59
Early Coulee 6/15/05	Water Flowing	20.1	19,940	8.40	20.5
Foucher Coulee 6/15/05	Water Flowing	15.1	6,350	7.54	5.83
	10030104 – Sun River				
Dipping Tank Creek [1] 7/14/05	Interrupted Standing Pools	25.9	1,888	7.88	47.8
	10030201 – Two Medicine River				
Sheep Creek [1, 2] 8/24/05	Water Flowing	14.8	536	7.41	20.6
Sheep Creek (oxbow pond) [1] 8/24/05	Continuous Standing Water	No Data	No Data	No Data	No Data
	10030203 – Marias River				
Arnst Coulee 6/16/05	Dry				
Badger Coulee 6/16/05	Dry				
Beebe Coulee 6/16/05	Dry				
Bourne Coulee 6/21/05	Dry				
Bison Coulee 6/28/05	Dry				
Clausen Coulee 6/14/05	Dry				
Clayton Coulee 6/28/05	Dry				
Cox Coulee 6/14/05	Dry				
Eagle Creek 6/29/05	Dry				

[1] Fish Present
[2] Amphibians Present
[3] Reptiles Present

Table 6 – continued.

Site	Date	Water Type	Water Quality Measurements: Water Temperature (˚C)	Conductivity (µS)	pH	Turbidity (NTU)
10030203 – Marias River (continued)						
Feye Coulee	6/16/05	Dry				
Goosebill Coulee	6/15/05	Dry				
Heimbigner Coulee	6/28/05	Dry				
Horse Coulee	6/15/05	Dry				
Jensen Coulee [1, 2]	7/13/05	Continuous Standing Water	18.6	1,161	7.67	7.39
Keith Coulee	6/28/05	Dry				
Kjar Coulee	6/29/05	Dry				
Larson Coulee	6/29/05	Dry				
Layton Coulee	6/29/05	Dry				
Little Horse Creek	6/22/05	Dry				
Manton Coulee	6/29/05	Dry				
McTosh Coulee [2]	6/21/05	Water Flowing	15.6	334	8.10	26.9
Middle Fork of Dry Fork of Marias [1, 3]	7/13/05	Interrupted Standing Pools	20.4	1,308	8.51	16.2
Poverty Coulee	6/14/05	Dry				
Sagebrush Coulee	6/15/05	Dry				
Slide Out Coulee	6/15/05	Interrupted Standing Pools	17.4	13,960	8.91	8.76
South Fork of Dry Fork of Marias [1, 2]	7/14/05	Interrupted Standing Pools	17.6	2,790	7.98	17.4

[1] Fish Present
[2] Amphibians Present
[3] Reptiles Present

Table 6 – continued.

Site	Date	Water Type	Water Quality Measurements: Water Temperature (˚C)	Conductivity (µS)	pH	Turbidity (NTU)
		10030203 – Marias River (continued)				
Spring Coulee [2]	6/21/05	Interrupted Standing Pools	23.1	951	7.11	27.8
Stellner Coulee	6/14/05	Dry				
Stewart Coulee	6/16/05	Dry				
Tiber Coulee	6/16/05	Dry				
Tootsie Creek	6/21/05	Water Flowing	23.5	251	7.42	4.32
Twelvemile Coulee	6/29/05	Dry				
Wolfe Coulee	6/15/05	Dry				
		10030204 – Willow Creek				
Clift Coulee	6/29/05	Dry				
Coyote Coulee	6/29/05	Dry				
Dodge Coulee	6/29/05	Dry				
Edmister Coulee	6/29/05	Dry				
Kolstad Coulee	6/29/05	Dry				
Moran Coulee	6/29/05	Dry				
Sleeper Coulee	6/22/05	Dry				
Snow Coulee	6/22/05	Water Flowing	14.9	1,250	7.07	12.9
Wilson Coulee	6/29/05	Dry				
		10030205 – Teton River				
Bullberry Coulee [2]	6/15/05	Continuous Standing Water	21.5	9,680	8.14	4.91

[1] Fish Present
[2] Amphibians Present
[3] Reptiles Present

Table 6 – continued.

Site	Date	Water Type	Water Quality Measurements: Water Temperature (˚C)	Conductivity (µS)	pH	Turbidity (NTU)
		10030205 – Teton River (continued)				
Chimney Rock Coulee	6/15/05	Dry				
Muddy Creek [1]	7/12/05	Water Flowing	25.7	334	9.31	11.5
Teton River [1]	8/18/05	Interrupted Standing Pools	16.1	1,912	8.30	24.4
West Dry Fork Coulee	6/15/05	Dry				
		10040101 – Bullwhacker-Dog Creeks				
Alkali Creek [1, 2, 3]	7/26/05	Interrupted Standing Pools	16.2	1,339	8.53	81.7
Arrow Creek [1, 2, 3]	7/28/05	Water Flowing	24.5	3,920	8.14	52.0
Birch Creek [1, 2]	8/1/05	Water Flowing	39.6 [4]	1,702	8.45	45.4
Bullwhacker Creek [1, 2, 3]	8/2/05	Interrupted Standing Pools	28.0	3,070	9.12	No Data
Butcher Knife Canyon	7/26/05	Dry				
Coal Mine Coulee	7/26/05	Dry				
Crooked Coulee	6/13/05	Water Flowing	18.0	6,870	8.41	6.61
Cutbank Coulee	7/26/05	Dry				
Dog Creek [1]	8/1/05	Interrupted Standing Pools	29.9	2,280	9.08	90.0
Dry Fork Coulee	6/13/05	Dry				
Eagle Creek [1, 2]	7/26/05	Water Flowing	24.5	1,585	8.55	21.3
Eightmile Coulee	5/31/05	Dry				
Holden Coulee	5/31/05	Dry				

[1] Fish Present
[2] Amphibians Present
[3] Reptiles Present
[4] Fish Deceased

Table 6 – continued.

Site	Date	Water Type	Water Quality Measurements: Water Temperature (˚C)	Conductivity (µS)	pH	Turbidity (NTU)
		10040101 – Bullwhacker-Dog Creeks (continued)				
Jackson Coulee	7/25/05	Dry				
Little Sandy Creek [1, 3]	7/25/05	Interrupted Standing Pools	22.1	483	7.66	34.9
Lonetree Coulee	6/13/05	Dry				
Mud Spring Coulee	7/27/05	Dry				
Pigtail Coulee [3]	5/31/05	Dry				
Rattlesnake Coulee	7/26/05	Dry				
Sage Coulee	5/31/05	Dry				
Sandstone Coulee	5/31/05	Dry				
Sheep Shed Coulee [2]	7/27/05	Dry				
Sherry Coulee	7/27/05	Dry				
		10040102 – Arrow Creek				
Arrow Creek [1, 2, 3]	5/2/05	Water Flowing	14.2	2,580	8.00	19.1
Little Battle Creek [2]	6/13/05	Water Flowing	26.2	3,770	7.75	14.4
Unnamed	6/13/05	Dry				
		10040103 – Judith River				
Ming Coulee	5/11/05	Interrupted Standing Pools	8.6	14,790	8.13	6.5
Ox Creek	5/25/05	Dry				
Plum Creek [1]	5/11/05	Water Flowing	8.5	5,420	8.04	4.68
Squaw Coulee [2]	5/25/05	Interrupted Standing Pools	13.2	2,910	7.69	18.9

[1] Fish Present
[2] Amphibians Present
[3] Reptiles Present

Table 6 – continued.

Site	Date	Water Type	Water Quality Measurements: Water Temperature (˚C)	Conductivity (µS)	pH	Turbidity (NTU)
		10040103 – Judith River (continued)				
Willow Creek	5/11/05	Water Flowing	6.8	17,850	8.05	20.7
Wolf Creek [1]	5/25/05	Water Flowing	18.1	6,120	8.16	18.5
		10040104 – Fort Peck Reservoir				
Antelope Creek	8/4/02	Dry				
Armells Creek [1]	8/30/05	Interrupted Standing Pools	17.5	7,830	7.73	40.5
Bull Creek [1]	8/3/05	Continuous Standing Water	24.8	447	7.80	33.4
Cow Creek	8/3/05	Dry				
Two Calf Creek [1, 2, 3]	8/4/05	Interrupted Standing Pools	25.1	3,530	8.77	92.5
Woodhawk Creek [1]	8/3/05	Interrupted Standing Pools	29.4	16,760	8.39	17.9
		10040201 – Upper Musselshell River				
Gillis Creek	5/24/05	Dry				
		10040203 – Flatwillow Creek				
Beaver Ball Creek	4/13/05	Dry				
Johnson Coulee [1, 2]	5/23/05	Water Flowing	21.0	2,290	8.57	54.5
Potter Creek	4/13/05	Dry				
Racehorse Coulee	6/9/05	Dry				
Snoose Creek [2]	5/10/05	Dry				
Yellow Water Creek [1]	5/10/05	Water Flowing	11.4	1,407	7.68	8.49
Yellow Water Creek	5/10/05	Dry				

[1] Fish Present
[2] Amphibians Present
[3] Reptiles Present

Table 6 – continued.

Site	Date	Water Type	Water Quality Measurements: Water Temperature (˚C)	Conductivity (µS)	pH	Turbidity (NTU)
10040204 – Box Elder Creek						
Briggs Coulee	5/23/05	Dry				
Duck Creek [2]	6/9/05	Interrupted Standing Pools	13.2	932	7.05	217
Gorman Coulee	6/9/05	Dry				
Horsethief Coulee [1]	4/13/05	Water Flowing	13.5	883	7.80	1.45
Rose Canyon	4/13/05	Dry				
Shale Coulee [1, 2]	6/9/05	Interrupted Standing Pools	20.6	2,920	7.75	189
Surenuff Creek [1]	4/26/05	Water Flowing	8.0	1,378	8.13	7.35
Tyler Creek [1]	4/26/05	Water Flowing	8.7	2,280	8.21	35.1
10040205 – Lower Musselshell						
Crooked Creek [1]	9/1/05	Interrupted Standing Pools	20.4	3,400	8.71	92.9
Musselshell River [1, 2]	8/16/05	Water Flowing	20.8	2,370	8.21	127
10050002 – Upper Milk River						
Police Creek	6/22/05	Interrupted Standing Pools	25.1	3,470	7.89	6.18
Ribbon Gulch [1, 3]	6/22/05	Water Flowing	13.1	193.8	7.35	4.02
10050006 – Sage Creek						
Bobcat Coulee [2]	6/28/05	Water Flowing	20.7	687	7.26	>200 (out of range)
Carvers Coulee [2]	6/22/05	Interrupted Standing Pools	22.0	3,010	7.83	8.72
Chicken Coulee	6/28/05	Dry				
Desert Coulee	6/28/05	Dry				

[1] Fish Present
[2] Amphibians Present
[3] Reptiles Present

Table 6 – continued.

Site	Date	Water Type	Water Quality Measurements: Water Temperature (˚C)	Conductivity (µS)	pH	Turbidity (NTU)
		10050006 – Sage Creek (continued)				
Flat Coulee	6/22/05	Interrupted Standing Pools	31.5	1,925	7.49	13.1
Kinreed Coulee	6/22/05	Interrupted Standing Pools	28.8	2,210	8.07	11.1
Lost Coulee [2]	6/28/05	Interrupted Standing Pools	20.5	2,530	8.23	9.7
Mac Coulee	6/22/05	Dry				
Simminook Creek	6/28/05	Dry				
Strode Coulee	6/28/05	Dry				

[1] Fish Present
[2] Amphibians Present
[3] Reptiles Present

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Appendix A. Name and location by HUC of Region 4 prairie stream survey sites sampled, April – September 2005.

Name	LLID	Latitude	Longitude	Township	Range	Section	Land Ownership
10030102 – Upper Missouri River							
Black Horse Lake Flat	1112461476104	47.59268	-111.28226	21N	3E	12	Private
Boyle Coulee	1105425477998	47.78672	-110.55296	24N	9E	35	Private
Early Coulee	1105535478467	47.79954	-110.58888	24N	9E	28	Private
Foucher Coulee	1105425477999	47.78488	-110.50447	24N	10E	31	Private
10030104 – Sun River							
Dipping Tank Creek	1120517477122	47.635	-112.06577	22N	4W	25	Private
10030201 – Two Medicine River							
Sheep Creek [a]		48.20447	-112.49483	28N	7W	3	Private
Sheep Creek (oxbow pond) [a]		48.2041	-112.4879	28N	7W	3	Private
10030203 – Marias River							
Arnst Coulee	1110810484032	48.40754	-111.09783	31N	5E	33	Private
Badger Coulee	1109656485240	48.52906	-110.98872	32N	6E	17	Private
Beebe Coulee	1110055483894	48.40053	-111.0806	31N	5E	33	Private
Bison Coulee	1109477485226	48.53843	-110.86852	32N	7E	18	Private
Bourne Coulee	1110358486801	48.70578	-111.09898	34N	5E	17	Private
Clausen Coulee	1109514484503	48.46289	-110.92926	31N	6E	10	Private
Clayton Coulee	1109250485258	48.52507	-110.89149	32N	6E	13	Private
Cox Coulee	1109705484209	48.43959	-110.92919	31N	6E	15	Private
Eagle Creek	1111908483691	48.44801	-111.19202	31N	4E	15	Private
Feye Coulee	1110158484016	48.45667	-111.03719	31N	5E	11	Private
Goosebill Coulee	1107553480423	48.08368	-110.76151	27N	7E	24	Private
Heimbigner Coulee	1109350485448	48.54756	-110.93164	32N	6E	10	Private
Horse Coulee	1108393482449	48.21144	-110.89144	28N	6E	1	Private
Jensen Coulee [a]		48.15408	-112.42506	28N	6W	30	Private
Keith Coulee	1109654485271	48.56654	-110.96786	32N	6E	4	Private
Kjar Coulee	1108694483638	48.36395	-110.86998	30N	7E	18	Private
Larson Coulee	1108812483425	48.36353	-110.8686	30N	7E	18	Private
Layton Coulee	1108983483528	48.37878	-110.91241	30N	6E	11	Private
Little Horse Creek	1111578487150	48.71807	-111.16156	34N	4E	12	Private
Manton Coulee	1109395484917	48.49416	-110.92917	32N	6E	34	Private
McTosh Coulee	1110702487947	48.79578	-111.07175	35N	5E	15	State
Middle Fork of Dry Fork of Marias [a]		48.15553	-112.42915	28N	6W	30	Private
Poverty Coulee	1109564484340	48.44947	-110.95254	31N	6E	16	State
Sagebrush Coulee	1110158484015	48.40786	-111.03873	31N	5E	35	Private
Slide Out Coulee	1107141480029	48.00455	-110.7603	26N	8E	18	Private
South Fork of Dry Fork of Marias [a]		48.1373	-112.38736	28N	6W	33	Private
Spring Coulee	1110044482720	48.28357	-111.00766	29N	6E	7	Private

[a] Non-random, selected sites

Appendix A – continued.

Name	LLID	Latitude	Longitude	Township	Range	Section	Land Ownership
10030203 – Marias River (continued)							
Stellner Coulee	1109455484345	48.43669	-110.92911	31N	6E	22	Private
Stewart Coulee	1110763484154	48.42583	-111.08064	31N	5E	21	Private
Tiber Coulee	1109925484627	48.4901	-111.00803	32N	6E	31	Private
Tootsie Creek	1110688487789	48.83897	-111.05421	36N	5E	34	State
Twelvemile Coulee	1109474483787	48.38261	-110.97174	30N	6E	4	State
Wolfe Coulee	1108640482689	48.26848	-110.86468	29N	7E	18	Private
10030204 – Willow Creek							
Clift Coulee	1113351484508	48.46665	-111.32465	31N	3E	10	Private
Coyote Coulee	1114562484639	48.46174	-111.45907	31N	2E	10	State
Dodge Coulee	1114971484680	48.46516	-111.50055	31N	2E	8	Private
Edmister Coulee	1113645484430	48.43615	-111.37	31N	3E	20	Private
Kolstad Coulee	1112540484106	48.42157	-111.25261	31N	4E	29	Private
Moran Coulee	1112889484220	48.4484	-111.27588	31N	3E	13	Private
Sleeper Coulee	1113267487852	48.7799	-111.26337	35N	4E	19	Private
Snow Coulee	1113043488054	48.81021	-111.25243	35N	4E	7	Private
Wilson Coulee	1112540484175	48.41981	-111.25459	31N	4E	30	Private
10030205 – Teton River							
Bullberry Coulee	1108700479615	47.97802	-110.86665	26N	7E	29	State
Chimney Rock Coulee	1108707479517	48.04627	-110.89566	27N	6E	36	Private
Muddy Creek [a]		47.98363	-112.31196	26N	6W	25	Private
Teton River [a]		47.8552	-110.96716	24N	6E	9	Private
West Dry Fork Coulee	1108515479135	47.91713	-110.89104	25N	6E	13	Private
10040101 – Bullwhacker-Dog Creeks							
Alkali Creek	1093364474966	48.01664	-110.11694	26N	12E	12	Private
Arrow Creek [a]		47.7121	-109.83593	22N	15E	6	Private
Birch Creek [a]		47.7511	-109.57202	23N	17E	20	Private
Bullwhacker Creek [a]		47.80219	-109.01928	24N	21E	34	BLM
Butcher Knife Canyon	1100625478701	47.87071	-110.05739	24N	13E	3	Private
Coal Mine Coulee	1100645478767	47.87645	-110.06953	25N	13E	33	BLM
Crooked Coulee	1101118479849	47.97736	-110.05117	26N	13E	28	Private
Cut Bank Coulee	1100699479387	47.94145	-110.06254	25N	13E	9	Private
Dog Creek		47.73529	-109.61942	23N	16E	25	Private
Dry Fork Coulee	1102528480667	48.13279	-110.27768	28N	11E	35	Private
Eagle Creek [a]		47.91523	-110.05815	25N	13E	16	BLM
Eightmile Coulee	1097089477765	47.77957	-109.81558	23N	15E	8	Private
Holden Coulee	1096638478038	47.80654	-109.66665	24N	16E	34	BLM

[a] Non-random, selected sites

Appendix A – continued.

Name	LLID	Latitude	Longitude	Township	Range	Section	Land Ownership
10040101 – Bullwhacker-Dog Creeks (continued)							
Jackson Coulee	1102408480117	48.01131	-110.23808	26N	12E	18	Private
Little Sandy Creek [a]		48.02903	-110.13522	26N	12E	12	BLM
Lone Tree Coulee	1101200479994	48.01665	-110.00774	26N	13E	11	Private
Mud Spring Coulee	1100621478204	47.81859	-110.06269	24N	13E	22	BLM
Pigtail Coulee	1096699477750	47.80381	-109.66412	24N	16E	34	BLM
Rattlesnake Coulee	110122840029	48.00285	-110.12675	26N	12E	13	Private
Sage Coulee	1098060478271	47.8297	-109.80544	24N	15E	28	Private
Sandstone Coulee	1098414478508	47.85881	-109.81679	24N	15E	17	Private
Sheep Shed Coulee	1099249477599	47.7574	-109.92622	23N	14E	15	Private
Sherry Coulee	1100712478400	47.84132	-110.07384	24N	13E	16	State
10040102 – Arrow Creek							
Arrow Creek [a]		47.4063	-110.2004	19N	12E	16	State
Little Battle Creek	1101520474248	47.42586	-110.15466	19N	12E	11	Private
Unnamed	1101924477551	47.75886	-110.18983	23N	12E	10	Private
10040103 – Judith River							
Ming Coulee	1096719473624	47.34521	-109.59641	18N	17E	6	Private
Ox Creek	1097837473461	47.33981	-109.81131	18N	15E	9	Private
Plum Creek	1096125472368	47.41854	-109.616	19N	16E	12	Private
Squaw Coulee	1098715472024	47.14942	-109.90123	16N	14E	13	Private
Willow Creek	1096517473981	47.36938	-109.62598	19N	16E	36	State
Wolf Creek [a]		47.37299	-109.75768	19N	15E	36	State
10040104 – Fort Peck Reservoir							
Antelope Creek [a]		47.65292	-108.7648	22N	23E	21	USFWS
Armells Creek [a]		47.60796	-108.70341	21N	23E	1	USFWS
Bull Creek [a]		47.78267	-108.94009	23N	22E	6	Private
Cow Creek [a]		47.78615	-108.93509	23N	22E	6	Private
Two Calf Creek [a]		47.64494	-108.77841	22N	23E	28	USFWS
Woodhawk Creek [a]		47.74471	-108.94968	23N	22E	19	BLM
10040201 – Upper Musselshell River							
Gillis Creek	1103532465049	46.48963	-110.35972	9N	11E	32	State
10040203 – Flatwillow Creek							
Beaver Ball Creek	1087705469193	46.88855	-108.93444	13N	22E	16	Private
Johnson Coulee	1082417469350	46.91008	-108.23327	13N	27E	12	State

[a] Non-random, selected sites

Appendix A – continued.

Name	LLID	Latitude	Longitude	Township	Range	Section	Land Ownership
10040203 – Flatwillow Creek (continued)							
Potter Creek	1089876468611	46.9045	-109.07624	13N	21E	9	Private
Racehorse Coulee	1081343469489	46.96448	-108.20799	14N	28E	20	Private
Snoose Creek	1084840469019	46.88427	-108.54388	13N	25E	15	Private
Yellow Water Creek [a]		46.92102	-108.56281	13N	25E	4	Private
Yellow Water Creek [a]		46.91817	-108.53629	13N	25E	3	Private
10040204 – Box Elder Creek							
Blacktail Creek	1088808469933	46.89239	-108.96901	13N	22E	17	Private
Briggs Coulee	1086443470423	47.05939	-108.67043	15N	24E	15	Private
Duck Creek	1085548471591	47.1647	-108.58848	16N	25E	8	Private
Gorman Coulee	1080891469763	47.01208	-108.09877	15N	29E	31	Private
Horsethief Coulee	1090859470463	47.01698	-109.16201	15N	20E	35	Private
Rose Canyon	1089731469965	46.93039	-109.03014	14N	21E	35	Private
Shale Coulee	1083390470916	47.09369	-108.3377	15N	27E	6	Private
Surenuff Creek		46.95215	-109.10086	14N	21E	30	Private
Tyler Creek	1090814469925	46.92678	-109.16387	14N	20E	34	Private
10040205 – Lower Musselshell River							
Crooked Creek [a]		47.46106	-108.02051	20N	29E	28	Private
Musselshell River [a]		47.35946	-107.95768	19N	29E	36	USFWS
10050002 – Upper Milk River							
Police Creek	1111289489838	48.98624	-111.12893	37N	5E	7	Private
Ribbon Gulch	1112015488652	48.85875	-111.18063	36N	4E	23	Private
10050006 – Sage Creek							
Bobcat Coulee	1108410489170	48.91105	-110.84743	36N	7E	5	Private
Carvers Coulee	1109645489521	48.97583	-110.98474	37N	6E	7	Private
Chicken Coulee	1109736489418	48.93324	-110.97357	37N	6E	29	Private
Desert Coulee	1108754488196	48.82662	-110.92567	35N	6E	3	Private
Flat Coulee	1110617489577	48.96627	-111.06512	37N	5E	15	Private
Kinreed Coulee	1110012489960	48.99386	-111.00414	37N	6E	6	Private
Lost Coulee	1108164489168	48.94365	-110.85118	37N	7E	20	Private
Mac Coulee	1109576489476	48.93739	-110.98036	37N	6E	29	Private
Simminook Creek	1108720489311	48.97025	-110.9351	37N	6E	15	Private
Strode Coulee	1107409488748	48.94288	-110.74555	37N	7E	24	Private

[a] Non-random, selected sites

Appendix B. Procedures used to determine Eastern Montana prairie stream survey sites.

Goal: Select 160 eastern Montana streams by HUC that have not been sampled before and fall within the Northern Plains area ecoregion.

Data Layers used:

- Bailey's Ecoregions layer-Great Plains polygon, too gross a scale for analysis
- Climax vegetation layer-from Natural resources Information System (NRIS), represents the same Great Plains Prairie area as Bailey's but at a finer scale.
- 100,000K stream routes-MFWP-built on the National Hydrography from the named streams
- 4th code HUCs- from Natural resources Information System (NRIS)
- Montana Rivers Information System (MRIS) database-for determining sampled streams

Steps:

1. Intersected the Prairie area (climax veg layer) with the 4th code HUCs to find HUCs that fell within the prairie. Dropped those HUCs that are less than 50% Prairie.
2. Determined the number of streams to sample in each HUC by dividing the amount of prairie in each HUC by the total amount of Prairie in Eastern Montana and then multiplying by 160(the total number of streams to be sampled).
3. Generated a list of streams that are sampled within the HUC's in step 1.
4. Intersected the remainder of streams (the unsurveyed with the Prairie Area) to remove streams that were in a HUC but not in an area of Prairie.
5. Sorted these unsurveyed streams by HUC and descending by length.
6. Selected the number of streams to sample for each HUC (from step2) starting with the longest streams. The alternatives were selected by taking the next consecutive streams in the list (approximately twice the number of sample streams). Length was chosen as the criteria as the perennial-intermittent stream category was not useable.
7. A random river mile was derived from each selected stream. A Lat-long was determined for each point and whether that point fell within public land.

The Numbers:

52 HUC's determined to fall within the Prairie ecoregion.
4207 unsurveyed streams in these 52 HUC's.
367 streams surveyed in these 52 HUC's

<u>1-9 streams selected to sample in each HUC.</u>
160 samples, 264 alternates, total of 424 streams selected
84% if the streams have some public access along them
21% of the selected sample points fall in public land

Appendix C. Fish and habitat sampling protocol and gear list for prairie stream surveys in Region 4, April – September 2005.

1. ***Site location***.-Locate the sampling site using GPS for random sites, or by convenience for non-random sites. The GPS location will be the center of the reach, this is where you place the "F" flag (see Step 2). If the site is dry, shift the reach up or downstream to capture the most wetted channel possible on the parcel of land where you have permission for sampling.
2. ***Laying out the sample reach***.-Lay out a 300 m sample reach using a measuring tape and a set of 11 pin flags (labeled A-K). Follow the curves in the stream channel with the measuring tape; do not cut across curves. To avoid spooking fish, walk along the bank, not in the stream. Place a flag every 30 m. The "A" flag will be at the downstream end; the "K" flag will be at the upstream end of the reach. The "F" flag will go in the center of the reach.
3. ***Block nets***.-Place block nets (these can be old seines, 1/4" mesh) at the upstream (K flag) and downstream (A flag) ends of the sample reach if the water in the channel is continuous, deeper than 25 cm, and relatively clear. This prevents fish from leaving the sample reach.
4. ***Seining***.-Select the seine based on the size of the stream to be sampled. The seine length to be used should be approximately equal to or slightly greater than the stream width, and the seine height should be about 1.5 to 2 times greater than the depth of the stream. Dip nets can be used in very shallow, small habitats. Seining begins at the upstream end (K flag) and proceeds downstream to the A flag. Two people perform seining, one on each end of the seine. In pools, the seine is pulled down the stream channel, using the shore and other natural habitat features as barriers. Begin with the seine rolled up on each seine braille. The seine is typically set perpendicular to shore and hauled downstream parallel to shore. As you proceed, let out enough seine so that the seine forms a "U" shape, but not so much that the net is hard to control. Adjust the length of the seine by rolling or un-rolling net on the seine braille. The speed of seining should be fast enough to maintain the "U" shape, but not so fast that the floats become submerged, or that the seine's lead line come way up off the bottom of the stream. If rocks or other snags are on the bottom, the seine can be lifted off the bottom for a moment to avoid the snag, or one of the netters can bring the seine around the snag to avoid it, all the while maintaining the forward progress of the seine. Similarly, areas of dense aquatic vegetation can be avoided. It is important not to stop the forward progress, because fish will swim out of the seine. It is better to avoid a snag while keeping moving than to become snagged, which will allow fish to escape. In "snaggy" waters, keep more of your seine rolled up for better control.

   Proceed downstream while seining. In narrow streams, the entire channel width is spanned with the seine. In wider streams, one person walks along the shore, while the other wades through the channel. The length of each seine haul will depend on the natural features of the stream channel and shoreline, but seine hauls should not normally be more than 60 or 90 m long. Side channel bars or the end of a

standing pool are good areas to haul out or "beach" the seine. Where a large bar or end of a standing pool is present both netters can simply run the net up on the shore. In streams with steep banks or lack of obvious seine beaching areas the "snap" technique can be used. At the end of the haul, the person near shore stops, while the person farthest out turns into shore, quickly, until the seine is up against the bank. The two netters then walk away from each other, taking the slack out of the seine, and keeping the seine's lead line up against the bank.

In riffles, with moderate to fast current, the "kick seine" technique can be used. The seine is held stationary in a "U" shape, while the other team member disturbs the substrate immediately upstream of the net. Then the net is quickly "snapped" out of the water by both team members using an upstream scooping motion.

Seine the entire 300 m reach, covering the linear distance at least once. If part of the 300 m is dry, just skip it. If the stream is much wider than your seine, do extra seine hauls in the large pools to cover the extra width. Sample all habitat types (shoreline, thalweg, side channels, backwaters).

After each seine haul, place fish in a bucket. If the water is warm, or you have captured many fish, place fish in a fish bag to keep them alive until seining is completed. If you have to work up fish before seining is completed, release processed fish in an area that has already been seined, as far away from the area remaining to be seined as possible (or outside of the block nets). Large fish such as northern pike, common carp, white sucker, shorthead redhorse, or channel catfish, can be measured, given a small clip to the lower caudal fin and released immediately.

5. ***Processing captured fish***.-Record the species of each fish captured, and measure 20 "randomly" selected fish to the nearest millimeter, total length. If the species of fish is unknown, try to at least record it as Unknown type 1, Unknown type 2, etc. Keep track of and record the minimum and maximum length of each species.

   For each species, preserve a subsample of at least 10 individuals per site to serve as voucher specimens. Record a small letter "v" next to the recorded length of the fish that is vouchered to allow for later validation. For Hybognathus spp., voucher up to 20 individuals per site. Kill the fish to be vouchered by placing them in a small bucket or 1000 ml nalgene jar with an overdose solution of MS-222. After fish processing is completed, drain the MS-222 solution and place the fish in a 1000 ml nalgene jar with a 10% solution of formalin (in clear water, if possible). For specimens longer than 150 mm, an incision should be made on the right ventral side of the abdomen after death, to allow fixative to enter the body cavity. The volume of formalin solution should be approximately equal to the twice the volume of fish tissue to be preserved, and the fish volume should be considered water when concentrations are

determined. For example, if the fish take up 250 ml of the 1000 ml volume, you need about 500 ml of 10 % formalin solution (75 ml formalin and 425 ml water) in the 1000 ml nalgene jar. If necessary, use a second jar to accommodate all of the specimens. Use safety glasses and gloves when pouring formalin. Do not let the fish "cook" in the sun for a while and preserve them later, do it as soon as possible. Label all jars inside and out with Site, Site Number, Lat/Long, Date, Collectors names. Use pencil on Write-In-the-Rain or high rag paper for inside labels (just put the label right in with the fish), use a sticker label on the outside, cover it with clear (ScotchPad high performance packing tape pad 3750-P). Fish specimens should be left in formalin solution for at least 2-7 days. Fish specimens must have formalin solution soaked out before being handled extensively. Specimens should be soaked in water for at least 2 days, and water should be changed at least four times during this period. After soaking out the formalin, the fish specimens should be placed in either 70% ethanol or 40% isopropanol for long-term storage.

6. ***Habitat survey***.-Channel width, depth of water, and substrate will be measured at 11 transects perpendicular to the stream channel (located at Flags A-K), and along the thalweg in 10 thalweg intervals between transects (deepest part of channel). Stream width is measured to the nearest 0.1 m, depth is measured to the nearest cm, and substrate sizes and codes are on the data sheet. One person will be in the stream taking measurements while the other records data. Record the Latitude and Longitude (in digital degrees) of the F flag, the stream name, site number, the date, the flow status (flowing, continuous standing water, or interrupted standing water) and the names of the crewmembers on the data sheet. Take photographs of the site, capturing as much of the sampling reach as possible. Make sure the date feature on the camera is turned on, to allow for later identification of site photographs.

   Transects.-Start on the left bank (facing downstream) at Flag A. Measure and record the wetted width of the channel to the nearest 0.1 m. Measure and record (separated by a comma on the data sheet) five equally spaced depth and substrate measurements across the wetted stream channel:

   1. Left Bank-5 cm from the left bank;
   2. Left Center-halfway between the Center and the Left Bank;
   3. Center-center of the wetted stream;
   4. Right Center-halfway between the Center and the Right Bank;
   5. Right Bank-5 cm from the right bank

   Thalweg.-Begin by recording the depth and substrate 3 m upstream of the transect, in the deepest part of the channel (thalweg). Proceed up the thalweg to Flag B, recording depth and substrate every 3 m along the thalweg. You will record a total of 10 depths and substrates between each pair of transects. If the stream channel is dry, record a 0 for depth, and record the substrate. The last thalweg measurement point should fall on the next upstream transect. The 3 m interval can be

estimated, and it is helpful if the data recorder helps to keep the person in the stream from "squeezing" or "stretching" the thalweg measurements.

Repeat this procedure until all 11 transects and 10 thalweg intervals are completed.

Gear List

- 20', x 6' x ¼" heavy delta seines
- 15' x 4' x ¼" heavy delta
- 30' x 6' x ¼" heavy delta (or delta) with 6' x 6' x 6' bag
- Fish bags: nylon diver's bags, ¼" mesh 18" x 30"
- Mudders – 109.00 at Ben Meadows
- Block nets, Tent stakes
- Stream Conductivity meter
- Thermometer
- Turbidity meter (LaMotte, Ben Meadows 224805, $795.00-might try the ""transparency tube" Ben Meadows 224196, $52.95)
- Waders (breathable waders are essential for this work-Cabelas has them for about $100/pair), hip boots are usually too low
- Lug sole wading boots (Cabelas)
- Habitat pole (I make habitat poles out of 1.0" OD PVC pipe. 1.5 m long including caps. Score the pipe every 10 cm with a pipe cutter, then use a Sharpie to mark rings around the pole at the scores, and label the pole 10, 20, 30, etc. 5 cm marks are made between the 10 cm rings, you can visually estimate between the 5 cm marks to get to the nearest cm. Spray or brush a Urethane finish on the pole or your marks will come off fast with sunscreen and bug dope.)
- Metric 30 m tape (Ace Hardware actually carries a tape with metric on one side)
- Measuring boards, one short 300 mm (half a 6" PVC works well for Hybognathus "fin flotation", one long, ~0.5-1 m, you can just use a meter stick for the odd big fish)
- Hand lens
- Small 1 gallon red bucket from Ace for doping fish
- 5 gallon buckets
- MS-222
- Labels and tape pads for fish samples
- 1000 ml Nalgene jars
- Formalin (buffered is great, but more expensive-I throw a Rolaids in each jar of fish to neutralize the acidity)
- Clip board
- 11 Pin flags labeled A-F

Appendix D. Fish data entry form used during Region 4 prairie stream surveys, 2005.

Site: ______________________ Date: ____________ Water Flowing: ________

HUC: ______________ Continuous Standing Water: ________

Interrupted Standing Pools: ________

Latitude: ________________ Observers: ________________

Longitude: ________________ ________________

Species Total Length (mm)

	Total Count						Max. Length
							Min. Length

	Total Count						Max. Length
							Min. Length

	Total Count						Max. Length
							Min. Length

	Total Count						Max. Length
							Min. Length

	Total Count						Max. Length
							Min. Length

	Total Count						Max. Length
							Min. Length

Temperature: __________________

pH: __________________

Conductivity: __________________

Turbidity: __________________ Page_____of_____

Additional Comments:

Appendix E. Percent fish species composition observed by HUC and site during Region 4 prairie stream surveys, April – September 2005.

HUC (Drainage)	Site Name	Date	Species	N	Percent Composition
10030104 Sun River	Dipping Tank Creek		Brook stickleback	114	100.0
		7/14/2005	**Total**	**114**	**100.0**
10030201 Two Medicine	Sheep Creek		White sucker	135	48.0
		8/24/2005	Fathead minnow	49	17.4
			Lake chub	49	17.4
			Longnose dace	17	6.0
			Brassy minnow	15	5.3
			Mountain sucker	13	4.6
			Northern redbelly dace	2	0.7
			Mottled sculpin	1	0.4
			Total	**281**	**100.0**
10030201 Two Medicine	Sheep Creek (oxbow pond)		Northern redbelly dace	20	90.9
		8/24/2005	Northern redbelly dace X finescale dace (hybrid)	2	9.1
			Total	**22**	**100.0**
10030203 Marias River	Jensen Coulee		Brook stickleback	566	60.4
		7/13/2005	Fathead minnow	256	27.3
			White sucker	66	7.0
			Lake chub	36	3.8
			Brassy minnow	12	1.3
			Mountain sucker	1	0.1
			Total	**937**	**100.0**
10030203 Marias River	Middle Fork of Dry Fork of Marias		Brook stickleback	162	61.4
		7/13/2005	Fathead minnow	72	27.3
			White sucker	29	11.0
			Lake chub	1	0.4
			Total	**264**	**100.0**
10030203 Marias River	South Fork of Dry Fork of Marias		Brook stickleback	469	63.3
		7/14/2005	Fathead minnow	230	31.0
			White sucker	28	3.8
			Lake chub	10	1.3
			Brassy minnow	3	0.4
			Longnose dace	1	0.1
			Total	**741**	**100.0**
10030205 Teton River	Muddy Creek		Longnose dace	196	76.3
		7/12/2005	Lake chub	20	7.8
			Brook stickleback	15	5.8
			Mountain sucker	13	5.1
			White sucker	9	3.5
			Northern redbelly dace	3	1.2
			Yellow perch	1	0.4
			Total	**257**	**100.0**

Appendix E – continued.

HUC (Drainage)	Site Name	Date	Species	N	Percent Composition
10030205 Teton River	Teton River		Sand shiner	1,183	63.4
		8/18/2005	White sucker	387	20.8
			Fathead minnow	97	5.2
			Lake chub	89	4.8
			Longnose sucker	39	2.1
			Shorthead redhorse	18	1.0
			Longnose dace	16	0.9
			Mountain sucker	9	0.5
			Flathead chub	8	0.4
			Channel catfish	6	0.3
			Common carp	5	0.3
			Brassy minnow	2	0.1
			River carpsucker	2	0.1
			Brook stickleback	1	0.1
			Emerald shiner	1	0.1
			Spottail shiner	1	0.1
			Western silvery minnow	1	0.1
			Total	**1,865**	**100.0**
10040101 Bullwhacker-Dog Cr.	Arrow Creek		Flathead chub	123	37.3
		7/28/2005	Plains minnow	118	35.8
			Western silvery minnow	51	15.5
			Longnose sucker	11	3.3
			Longnose dace	6	1.8
			Stonecat	6	1.8
			Common carp	5	1.5
			Fathead minnow	4	1.2
			River carpsucker	4	1.2
			Channel catfish	1	0.3
			Goldeye	1	0.3
			Total	**330**	**100.0**
10040101 Bullwhacker-Dog Cr.	Alkali Creek		Fathead minnow	26	38.8
		7/26/2005	Plains minnow	22	32.8
			White sucker	9	13.4
			Brook stickleback	4	6.0
			Common carp	3	4.5
			Brown trout	2	3.0
			River carpsucker	1	1.5
			Total	**67**	**100.0**
10040101 Bullwhacker-Dog Cr.	Birch Creek		Unidentified minnows	100+	99.0
		8/1/2005	Flathead chub	1	1.0
			Total	**101+**	**100.0**
10040101 Bullwhacker-Dog Cr.	Bullwhacker Creek		River carpsucker	20	71.4
		8/2/2005	Flathead chub	5	17.9
			Common carp	3	10.7
			Total	**28**	**100.0**

Appendix E – continued.

HUC (Drainage)	Site Name	Date	Species	N	Percent Composition
10040101 Bullwhacker-Dog Cr.	Dog Creek		Unidentified minnows	100+	100.0
		8/1/2005	**Total**	**100+**	**100.0**
10040101 Bullwhacker-Dog Cr.	Eagle Creek		Fathead minnow	413	69.6
		7/26/2005	White sucker	60	10.1
			Brook stickleback	53	8.9
			Common carp	53	8.9
			Lake chub	5	0.8
			Sand shiner	5	0.8
			Brassy minnow	2	0.3
			Plains minnow	1	0.2
			Pumpkinseed	1	0.2
			Total	**593**	**100.0**
10040101 Bullwhacker-Dog Cr.	Little Sandy Creek		Fathead minnow	713	89.9
		7/25/2005	Emerald shiner	42	5.3
			Sand shiner	12	1.5
			Common carp	11	1.4
			Western silvery minnow	6	0.8
			River carpsucker	5	0.6
			Flathead chub	3	0.4
			Northern redbelly dace	1	0.1
			Total	**793**	**100.0**
10040102 Arrow Creek	Arrow Creek		Lake chub	252	45.3
		5/2/2005	Flathead chub	106	19.1
			Fathead minnow	75	13.5
			Northern redbelly dace	46	8.3
			Plains minnow	38	6.8
			White sucker	13	2.3
			Longnose dace	10	1.8
			Longnose sucker	8	1.4
			Brassy minnow	6	1.1
			Mountain sucker	2	0.4
			Total	**556**	**100.0**
10040103 Judith River	Plum Creek		Lake chub	28	100.0
		5/11/2005	**Total**	**28**	**100.0**
10040103 Judith River	Squaw Coulee		Fathead minnow	149	100.0
		5/25/2005	**Total**	**149**	**100.0**
10040103 Judith River	Wolf Creek		Lake chub	357	81.1
		5/25/2005	White sucker	50	11.4
			Longnose dace	25	5.7
			Fathead minnow	6	1.4
			Northern redbelly dace	2	0.5
			Total	**440**	**100.0**

Appendix E – continued.

HUC (Drainage)	Site Name	Date	Species	N	Percent Composition
10040104 Fort Peck	Armells Creek		Common carp	773	51.0
		8/30/2005	River carpsucker	447	29.5
			Fathead minnow	164	10.8
			Sand shiner	72	4.8
			Flathead chub	50	3.3
			Plains minnow	5	0.3
			Longnose sucker	4	0.3
			Total	**1,515**	**100.0**
10040104 Fort Peck	Bull Creek		Western silvery minnow	123	38.6
		8/3/2005	Plains minnow	112	35.1
			Common carp	23	7.2
			Flathead chub	21	6.6
			Emerald shiner	17	5.3
			Goldeye	9	2.8
			Fathead minnow	7	2.2
			River carpsucker	4	1.3
			White sucker	2	0.6
			Walleye	1	0.3
			Total	**319**	**100.0**
10040104 Fort Peck	Two Calf Creek		River carpsucker	115	51.3
		8/4/2005	Common carp	67	29.9
			Flathead chub	30	13.4
			Plains minnow	4	1.8
			Western silvery minnow	4	1.8
			White sucker	3	1.3
			Spottail shiner	1	0.4
			Total	**224**	**100.0**
10040104 Fort Peck	Woodhawk Creek		Common carp	1	100.0
		8/3/2005	**Total**	**1**	**100.0**
10040203 Flatwillow	Johnson Coulee		Fathead minnow	86	96.6
		5/23/2005	Northern redbelly dace	3	3.4
			Total	**89**	**100.0**
10040203 Flatwillow	Yellow Water Creek		Brassy minnow	1	50.0
		5/10/2005	Northern redbelly dace	1	50.0
			Total	**2**	**100.0**
10040204 Box Elder Creek	Horsethief Coulee		Fathead minnow	5,295	92.5
		4/13/2005	Northern redbelly dace	427	7.5
			Total	**5,722**	**100.0**
10040204 Box Elder Creek	Shale Coulee		Fathead minnow	1	100.0
		6/9/2005	**Total**	**1**	**100.0**
10040204 Box Elder Creek	Surenuff Creek		White sucker	4	57.1
		4/26/2005	Northern redbelly dace	2	28.6
			Fathead minnow	1	14.3
			Total	**7**	**100.0**

Appendix E – continued.

HUC (Drainage)	Site Name	Date	Species	N	Percent Composition
10040204 Box Elder Creek	Tyler Creek		Lake chub	15	75.0
		4/26/2005	Longnose dace	3	15.0
			Northern redbelly dace	1	5.0
			White sucker	1	5.0
			Total	**20**	**100.0**
10040205 Lower Musselshell	Crooked Creek		Plains minnow	504	71.5
		9/1/2005	Lake chub	86	12.2
			Fathead minnow	74	10.5
			Sand shiner	36	5.1
			Common carp	4	0.6
			Longnose dace	1	0.1
			Total	**705**	**100.0**
10040205 Lower Musselshell	Musselshell River		Channel catfish	92	40.7
		8/16/2005	Western silvery minnow	47	20.8
			Common carp	30	13.3
			Emerald shiner	15	6.6
			Goldeye	14	6.2
			Green sunfish	8	3.5
			River carpsucker	5	2.2
			Fathead minnow	4	1.8
			Shorthead redhorse	4	1.8
			Lake chub	2	0.9
			Plains minnow	2	0.9
			Flathead chub	1	0.4
			Sand shiner	1	0.4
			Walleye	1	0.4
			Total	**226**	**100.0**
10050002 Upper Milk	Ribbon Gulch		Brook trout	28	100.0
		6/22/2005	**Total**	**28**	**100.0**

Appendix F. Amphibians and reptiles observed in Region 4 during prairie stream surveys, April – September 2005.

SPECIES	LOCATION	HUC	COUNTY	LATITUDE / LONGITUDE (decimal degrees)	DATE	# ADULTS	# LARVAE
Boreal chorus frog	Black Horse Lake Flat	10030102	Cascade	47.59268, -111.28226	6/16/2005	3	
Western rattlesnake	10 miles SE of Fort Benton	10030102	Choteau	47.77882, -110.51835	6/21/2005	1	
Northern leopard frog	Sheep Creek	10030201	Pondera	48.20447, -112.49483	8/24/2005	1	
Boreal chorus frog	McTosh Creek	10030203	Liberty	48.79578, -111.07175	6/21/2005	1	
Common garter snake	Middle Fork of Dry Fork of Marias off of HWY 89	10030203	Pondera	48.15553, -112.42915	7/13/2005	2	
Northern leopard frog	Jensen Coulee off of HWY 89	10030203	Pondera	48.15408, -112.42506	7/13/2005		15
Terrestrial garter snake	15 miles south of the Sweet Grass Hills	10030203	Liberty	48.74189, -111.08253	6/21/2005	1	
Tiger salamander	South Fork of Dry Fork of Marias off of HWY 89	10030203	Pondera	48.13730, -112.38736	7/14/2005		1
Tiger salamander	Spring Coulee site	10030203	Liberty	48.28357, -111.00766	6/21/2005		1
Western rattlesnake	On HWY 223	10030203	Choteau	48.06260, -110.89126	6/14/2005	1	
Boreal chorus frog	South of Galata in transit	10030204	Toole	48.46236, -111.34634	6/29/2005	4	
Tiger salamander	Bullberry Coulee	10030205	Choteau	47.97802, -110.86665	6/15/2005	1	100
Boreal chorus frog	Alkali Creek	10040101	Choteau	48.01664, -110.11694	7/26/2005		18
Boreal chorus frog	Above Lone Tree Coulee site in mud puddle	10040101	Choteau	48.01596, -110.00828	6/13/2005	1	
Eastern racer	Pigtail Coulee site	10040101	Choteau	47.80381, -109.66412	5/31/2005	1	
Gopher snake	Hwy 236, 1.5 miles south of Suffolk	10040101	Fergus	47.44430, -109.33056	5/31/2005	1	
Great plains toad	Sheep Shed Coulee	10040101	Choteau	47.75740, -109.92622	7/27/2005	2	
Northern leopard frog	Alkali Creek	10040101	Choteau	48.01664, -110.11694	7/26/2005	1	
Northern leopard frog	Birch Creek	10040101	Choteau	47.75110, -109.57202	8/1/2005	15	
Northern leopard frog	Eagle Creek Mouth	10040101	Choteau	47.91523, -110.05815	7/26/2005	23	
Painted turtle	Little Sandy Creek	10040101	Choteau	48.02903, -110.13522	7/25/2005	3	

Appendix F – continued.

SPECIES	LOCATION	HUC	COUNTY	LATITUDE / LONGITUDE (decimal degrees)	DATE	# ADULTS	# LARVAE
Plains garter snake	Arrow Creek near mouth	10040101	Choteau	47.71519, -109.83384	7/28/2005	1	
Spiny softshell turtle	Alkali Creek	10040101	Choteau	48.01664, -110.11694	7/26/2005	1	
Spiny softshell turtle	Arrow Creek near mouth	10040101	Choteau	47.715190, -109.83384	7/27/2005	1	
Spiny softshell turtle	Missouri River	10040101	Fergus	47.78220, -109.12901	8/1/2005	1	
Woodhouse's toad	Arrow Creek near mouth	10040101	Choteau	47.715190, -109.83384	7/28/2005	1	
Boreal chorus frog	Arrow Creek sampling site	10040102	Fergus	47.4063, -110.2004	5/2/2005	1	
Boreal chorus frog	Little Battle Creek site	10040102	Choteau	47.42586, -110.15466	6/13/2005	4	
Gopher snake	Arrow Creek sampling site	10040102	Fergus	47.4063, -110.2004	5/2/2005	1	
Western rattlesnake	On HWY 223 approx. 18 miles N of Stanford	10040102	Fergus	47.38932, -110.17632	6/14/2005	1	
Gopher snake		10040103	Judith Basin	47.17899, -109.91547	5/25/2005	1	
Gopher snake		10040103	Fergus	47.66827, -109.62231	5/31/2005	1	
Tiger salamander	Squaw Coulee site	10040103	Judith Basin	47.1492, -109.90123	5/25/2005	2	
Plains garter snake	Bullwhacker Creek	10040104	Fergus	47.80219, -109.01928	8/2/2005	1	
Plains garter snake	Two Calf Creek	10040104	Fergus	47.64494, -108.77841	8/4/2005	1	
Spiny softshell turtle	Bullwhacker Creek	10040104	Fergus	47.80219, -109.01928	8/2/2005	1	
Spiny softshell turtle	Missouri River	10040104	Phillips	47.69097, -108.79357	8/3/2005	5	
Woodhouse's toad	Bullwhacker Creek	10040104	Fergus	47.80219, -109.01928	8/2/2005	1	
Woodhouse's toad	Two Calf Creek	10040104	Fergus	47.64494, -108.77841	8/4/2005	14	
Boreal chorus frog	Johnson Coulee site	10040203	Petroleum	46.91008, -108.23327	5/23/2005	4	
Northern leopard frog	Downstream of Snoose Creek site	10040203	Petroleum	46.88483, -108.54142	5/10/2005	1	
Woodhouse's toad	Johnson Coulee site	10040203	Petroleum	46.91008, -108.23327	5/23/2005	2	
Boreal chorus frog	Slate Coulee site	10040204	Petroleum	47.09369, -108.33770	6/9/2005		8
Common garter snake	1/4 mile S.W. of Forest Grove on Surenough Rd.	10040204	Fergus	46.98698, -109.07828	4/26/2005	1	

Appendix F – continued.

SPECIES	LOCATION	HUC	COUNTY	LATITUDE / LONGITUDE (decimal degrees)	DATE	# ADULTS	# LARVAE
Gopher snake	1 mile E of Teigan on HWY 200	10040204	Petroleum	47.03658, -108.58433	5/23/2005	1	
Tiger salamander	Duck Creek site	10040204	Petroleum	47.16470, -108.58848	6/9/2005	2	26
Eastern racer	Dovetail Rd	10040205	Petroleum	47.28027, -108.28589	8/16/2005	1	
Gopher snake	Dovetail Rd	10040205	Petroleum	47.27726, -108.28561	8/16/2005	1	
Woodhouse's toad	Musselshell river	10040205	Petroleum	47.35946, -107.95768	8/16/2005	1	
Boreal chorus frog	In Transit	10050002	Liberty	48.98473, -111.12141	6/22/2005	1	
Terrestrial garter snake	Ribbon Gulch	10050002	Liberty	48.85867, -111.18178	6/22/2005	1	
Boreal chorus frog	Bobcat Coulee	10050006	Liberty	48.91105, -110.84743	6/28/2005	4	
Boreal chorus frog	Lost Coulee	10050006	Liberty	48.94365, -110.85118	6/28/2005	6	
Tiger salamander	Carvers Coulee	10050006	Liberty	48.97583, -110.98474	6/22/2005		1
Tiger salamander	Lost Coulee	10050006	Liberty	48.94365, -110.85118	6/28/2005		7

Appendix G. Statistics from fish captured by angling and experimental gill nets on the middle Missouri River while conducting prairie stream surveys, July 25 – August 4, 2005.

Date Method (duration) River Mile	Habitat Type	Species	N	Total Length (inches) Min	Max	Mean	Weight (lbs.) Min	Max	Mean	Mean Relative Weight
7/25/05	TRM	Goldeye	5	11.8	12.9	12.4	0.47	0.80	0.57	NA
Angling (5.5 hours)		Freshwater drum	1	15.5	15.5	15.5	1.50	1.50	1.50	86.55
2,025.4		Shorthead redhorse	1	19.5	19.5	19.5	3.50	3.50	3.50	114.81
7/25/05	TRM	Channel catfish	9	16.0	25.7	20.5	1.25	7.00	3.45	97.80
Gill Net (13.0 hours)		Northern pike	1	34.2	34.2	34.2	7.90	7.90	7.90	78.21
2,025.4										
7/26/05	SCN	Goldeye	9	11.6	13.2	12.4	0.42	0.70	0.60	NA
Gill Net (12.5 hours)		Sauger	2	10.5	12.7	11.6	0.35	0.58	0.47	90.81
2,013.7		Stonecat	1	6.5	6.5	6.5	0.12	0.12	0.12	NA
		Walleye	1	12.0	12.0	12.0	0.55	0.55	0.55	89.24
7/27/05	TRM	Channel catfish	1	17.2	17.2	17.2	1.65	1.65	1.65	94.77
Gill Net (14.5 hours)		Goldeye	1	11.9	11.9	11.9	0.52	0.52	0.52	NA
1,995.7		Sauger	2	11.5	13.5	12.5	0.42	0.74	0.58	90.55
8/1/05	TRM	Channel catfish	2	16.0	21.0	18.5	1.45	2.80	2.13	118.10
Angling (4.0 hours)		Flathead chub	1	8.1	8.1	8.1	0.15	0.15	0.15	NA
1,959.9		Goldeye	4	11.9	12.7	12.3	0.42	0.55	0.48	NA
8/1/05	TRM	Channel catfish	7	13.5	26.2	19.2	0.75	7.1	3.20	99.52
Gill Net (14.0 hours)		Common carp	1	18.4	18.4	18.4	2.65	2.65	2.65	83.94
1,959.9		River carpsucker	2	8.6	11.0	9.8	0.30	0.60	0.45	92.22
8/2/05	TRM	Channel catfish	4	12.5	18.6	15.9	0.60	1.95	1.23	88.11
Angling (1.5 hours)		Goldeye	1	12.0	12.0	12.0	0.48	0.48	0.48	NA
1,950.9										
8/3/05	SCC	Channel catfish	9	12.0	25.0	17.0	0.50	5.20	1.86	88.23
Angling (7.0 hours)		Flathead chub	1	5.8	5.8	5.8	0.06	0.06	0.06	NA
1,948.4		Goldeye	1	13.9	13.9	13.9	0.80	0.80	0.80	NA
8/4/05	SCC	Channel catfish	11	8.7	20.1	12.5	0.20	2.92	0.74	100.44
Angling (6.0 hours)		Goldeye	2	10.7	12.1	22.8	0.43	0.58	0.51	NA
1,933.0										

TRM – tributary mouth
SCN – side channel not connected
SCC – side channel connected

Appendix H. 2005 Judith River Larval Fish Survey

Montana Fish, Wildlife & Parks

Fisheries Division Report
State Project Number: 3412
Project Title: Judith River Larval Fish Survey 2005 – Region 4

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December 2005

Abstract

Larval fish sampling was conducted weekly on the Judith River between April 18 and July 18, 2005 to evaluate spawning success and determine species presence with a primary focus on blue suckers (*Cycleptus elongatus*) and sauger (*Sander canadense*). Sampling occurred from shore at two sites, the Anderson Bridge (river mile 21.7) and PN Ranch (river mile 6.5). Sampling efforts included four trials per site with ½ meter round plankton nets fished near the bottom of the river. The mean time nets were fished was 26.4 minutes and ranged from 5 to 80 minutes depending on flow conditions and amount of suspended debris. Mean net volume of water filtered was 4,840 ft^3 with a range of 870 to 13,995 ft^3. Weekly sampling captured a total of 373 larval fish, 269 eggs, and 21 juvenile or adult fish. Larvae where identified to most practical taxon. No *Sander spp.* larvae were observed, but one specimen captured at Anderson Bridge on April 18 was believed to be a blue sucker. Catostomid larvae densities peaked the week of June 6, with the majority of these being identified as shorthead redhorse (*Moxostoma macrolepidotum*). Cyprinid larvae were first observed on June 27, with peak densities occurring on July 11. Goldeye (*Hiodon alosoides*) eggs were first observed on May 23, and densities peaked on June 6. Additional identified larval fish included river carpsucker (*Carpiodes carpio*), white sucker (*Catostomus commersoni*), common carp (*Cyprinus carpio*), longnose dace (*Rhinichthys cataractae*), and one possible *Ictiobus spp*. Juvenile and adult fish species captured included longnose dace, lake chub (*Couesius plumbeus*), stonecat (*Noturus flavus*), northern redbelly dace (*Phoxinus eos*), flathead chub (*Platygobio gracilis*), and fathead minnow (*Pimephales promelas*). Mean daily flow near the sampling sites throughout the sampling period was 497 ft^3/s with a range of 143 to 1,450 ft^3/s; mean daily water temperature was 61.5º F with a range of 40.6 – 77.2º F; and, mean combined Secchi reading was1.3 feet with a range of 0.1 to 3.2 feet. All fish larvae and eggs captured and identified have been retained for future reference and validation. Samples of interest will be sent to outside sources to confirm or validate MFWP personnel findings.

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INTRODUCTION

Larval fish sampling was conducted weekly on the Judith River between April 18 and July 18, 2005 to evaluate spawning success and determine species presence with a primary focus on blue suckers (*Cycleptus elongatus*) and sauger (*Sander canadense*). Sampling occurred from shore at two sites, the Anderson Bridge (river mile 21.7) and PN Ranch (river mile 6.5). This survey was performed in conjunction with MFWP Region 4 Prairie Stream Surveys.

METHODS

Larval fish sampling was conducted from the shore weekly on the Judith River at the Anderson Bridge and PN Ranch. Sampling efforts included four trials per site where fence posts had been driven into the stream bed along the left bank, left center of the thalweg, right center of the thalweg, and the right bank were baseline flows could be waded. Round plankton net samplers consisted of a six-foot Nitex net (750 micron mesh) attached to a ½ meter diameter ring. The nets were fastened to the sampling posts by a 3-rope harness and fished near the bottom of the river. Two nets were fished at a time on separate posts. The nets were each fished for 5 to 80 minutes depending on flow conditions and amount of suspended debris. The volume of water filtered was determined using a General Oceanic flow meter (Model 2030 with a standard 3-inch diameter rotor) that was attached in the center of the plankton net ring. Larval fish samples and accumulated debris were preserved in the field with ethanol treated with Phloxene 'B', a biological stain. Larval fish were manually sorted from debris in the lab using forceps and a graded tray and placed in labeled vials of 5% formalin solution. Retained larvae were identified to family or most practical taxon in the lab using taxonomic keys and guides authored by Auer (1982), Holland-Bartells et al. (1990), Kay et al. (1994), and Wallus et al. (1990). Water temperatures and Secchi depth readings were recorded at each site prior to sampling. Provisional flow and temperature data were obtained from a USGS gauging station near the PN Ranch site.

RESULTS

Three hundred and seventy-three larval fish, 269 eggs, and 21 larger[1] fish were captured during weekly larval fish sampling on the Judith River between April 18 and July 18, 2005 (Table 1). Sampling was conducted at the Anderson Bridge and PN Ranch weekly for 14 weeks for a total of 112 samples (Table 2). No *Sander spp.* larvae were observed, but one specimen captured at Anderson Bridge on April 18 was believed to be a blue sucker. Catostomid larvae densities peaked the week of June 6 (Table 3, Figure 1), with the majority of these being identified as shorthead redhorse (*Moxostoma macrolepidotum*) larvae. Cyprinid larvae were first observed on June 27, with peak densities occurring on July 11 at both Anderson Bridge (39.4 larvae / 10,000 ft^3) and the PN Ranch (25.6 larvae / 10,000 ft^3) (Table 3). The majority of unidentified eggs were captured at the PN Ranch site (139 total) (Table 3) and densities peaked on June 21

[1] Fish > 30mm and taxonomically identifiable without magnification

(Figure 1). Goldeye (*Hiodon alosoides*) eggs were first observed at the Anderson Bridge and PN Ranch sites on May 23, and densities peaked on June 6 (Table 3, Figure 1). Goldeye spawning appeared to be triggered when the mean daily water temperature exceeded 61.7º F.

Mean daily flow near the sampling sites throughout the sampling period was 497 ft^3/s with a range of 143 to 1,450 ft^3/s (Figure 1). Mean daily water temperature was 61.5º F with a range of 40.6 – 77.2º F (Figure 1). The mean combined Secchi reading was 1.3 feet with a range of 0.1 to 3.2 feet (Table 2).

Additional identified larval fish included river carpsucker (*Carpiodes carpio*), white sucker (*Catostomus commersoni*), common carp (*Cyprinus carpio*), longnose dace (*Rhinichthys cataractae*), and one possible *Ictiobus spp*. Juvenile and adult fish species captured included longnose dace, lake chub (*Couesius plumbeus*), stonecat (*Noturus flavus*), northern redbelly dace (*Phoxinus eos*), flathead chub (*Platygobio gracilis*), and fathead minnow (*Pimephales promelas*). All species observed have been previously documented in the Judith River as indicated by the Montana Fisheries Information System (MFISH).

Table 1. Number of specimens collected during 2005 Judith River larval fish sampling by site and date. Blanks indicate no specimens were collected.

Site	Specimen Collected	4/18	4/25	5/2	5/9	5/16	5/23	5/31	6/6	6/13	6/21	6/27	7/5	7/11	7/18	Total
PN Ranch	Larval Fish		1		4	1		10	8	3	1	20	41	66	11	166
	Egg		21			6	40	6	49	17	24	25	7	2		197
	Large Fish[1]			1						5		3				9
Anderson Bridge	Larval Fish	1	1		1	2	1		9		3	24	136	25	4	207
	Egg					1	6	1	40	17	4		3			72
	Large Fish[1]		1	1	1				2	2	4	1				12
Total	Larval Fish	1	2		5	3	1	10	17	3	4	44	177	91	15	373
	Egg		21			7	46	7	89	34	28	25	10	2		269
	Large Fish[1]		1	2	1				2	7	4	4				21

[1] Fish > 30mm and taxonomically identifiable without magnification

Table 2. Physical measurements accompanying larval fish samples collected with ½ m round plankton nets in the Judith River, 2005.

Station	Number Samples	Average Net Velocity (ft/s)	Average Net Volume (ft^3)	Average Net Flow (ft^3/s)	Average Time (minutes)	Average Temperature (°F)	Average Secchi (ft)
PN Ranch	56	1.66 (0.55-2.95)	5,093 (870-9,654)	3.50 (1.16-6.24)	24.1 (5.0-30.0)	62.6 (44.0-76.0)	1.2 (0.1-3.2)
Anderson Bridge	56	1.29 (0.24-2.78)	4,582 (930-13,995)	2.73 (0.52-5.87)	28.6 (5.0-80.0)	64.4 (50.0-74.0)	1.4 (0.3-2.8)
Total	112	1.48 (0.24-2.95)	4,840 (870-13,995)	3.12 (0.52-6.24)	26.4 (5.0-80.0)	63.5 (44.0-76.0)	1.3 (0.1-3.2)

Table 3. Average densities (number/10,000 ft^3) of larvae sampled with ½ meter round plankton nets in the Judith River, 2005. Blanks indicate no specimens were collected.

		Sampling Period													Total #
Taxon[1]	Station[2]	4/18	4/25	5/2	5/9	5/16	5/23	5/31	6/6	6/13	6/21	6/27	7/5	7/11	7/18	Larvae
Catostomid	AB	0.6	0.7		0.5	0.9			15.9		2.9	1.9	2.2		1.1	32
	PN		0.5		1.4	0.3		3.6	10.3	2.3			1.2	1.6	0.8	34
Cyprinid	AB											13.0	27.6	39.4	1.1	182
	PN											15.4	22.8	25.6	3.7	130
Goldeye Egg	AB						0.8		51.1	5.4						35
	PN						2.9		55.2	9.1						58
Unknown Egg	AB					0.4	1.6	0.4	19.4	17.5	3.9		0.7			37
	PN		10.2			2.1	13.6	2.2	6.4	10.3	38.6	21.1	4.2	0.8		139

[1] As identified by MFWP staff
[2] AB = Anderson Bridge; PN = PN Ranch

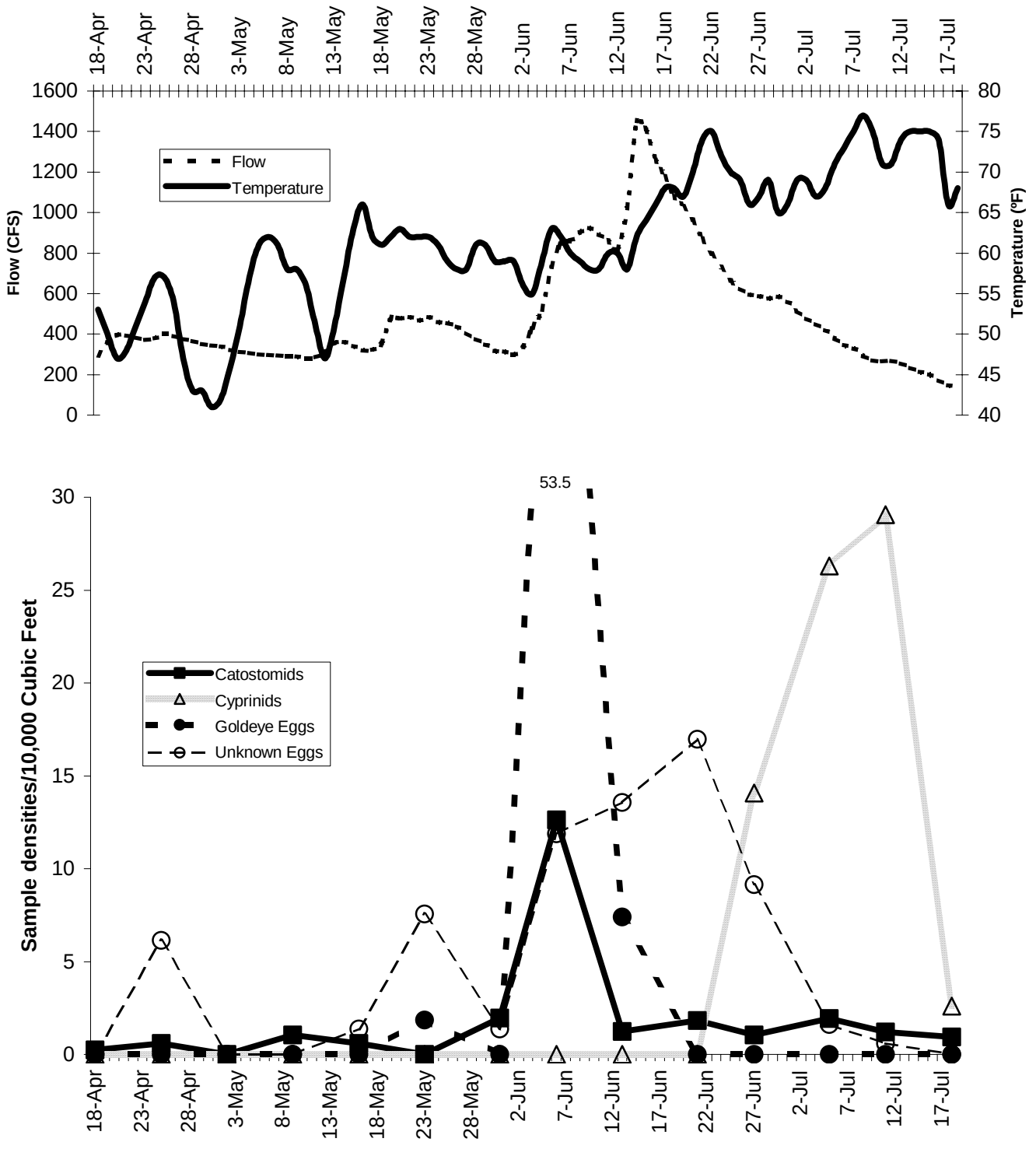

Figure 1. Mean daily water temperature and flow data with average densities (number/10,000ft^3) of larval fish and eggs captured during Judith River larval fish sampling, April 18 to July 18, 2005.

DISCUSSION AND RECOMMENDATIONS

Montana Fish, Wildlife and Parks (1989) stated blue suckers migrant to the Judith River and that sauger are among the most abundant game fish. Professional judgment suggests that both species would utilize the Judith River as a spawning tributary, yet the data from the larvae and eggs sampled in 2005 was insufficient to verify this opinion. No *Sander* larvae were identified in 2004 or 2005. However, specimens likely to be blue suckers were identified during the first sampling period in both 2004 and 2005.

It may be worthwhile to start sampling in late March or the 1st week of April to ensure biologists do not miss critical spawning times of blue sucker or *Sander*. Though, overall mean Secchi readings were 1.3 feet (Table 2), sampling for larval fish may prove more productive during dawn, dusk, or nighttime efforts to compensate for diel drift (Snyder, 1983). Ethanol did not work well as the initial preservative of samples. Specimens were extremely rigid and distorted and would not lie flat on microscope slides to allow for precise measurements and myomere counts. Use of 3 to 5% formalin in water as recommended by Snyder (1983) would improve identification of larvae collected. A polarized lense filter on the microscope would also be helpful for larval fish identification.

All fish larvae and eggs captured and identified have been retained for future reference and validation. Samples of interest will be sent to outside sources to confirm or validate MFWP personnel findings.

AKNOWLEDGEMENTS

Thanks to the area landowners for allowing reasonable stream access to conduct this project. Dave Stearns and Lucas Bateman performed the majority of fieldwork activities and equipment maintenance. Lucas Bateman assisted greatly in sorting and picking of larvae. Bill Gardner and Anne Tews assisted with technical advice and support.

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