Distribution, relative abundance, and habitat associations of Milk River fishes related to irrigation diversion dams
by Sean William Stash

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Fish and Wildlife Management
Montana State University


Abstract:
The structure and habitat associations of the stream fish assemblage in the Milk River are poorly understood. As the demand for water increases, changes from current water management practices are imminent and will likely further impact fish assemblages in the Milk River. My study collected baseline data on the distribution, relative abundance, and habitat associations of Milk River fishes related to irrigation diversion dams. These structures can alter the natural hydrograph, increase or decrease natural water temperatures, homogenize macrohabitat structure by reducing multiple, braided channels to a single incised channel, reduce sediment transport, sever connectivity with the flood plain, and reduce ecological connectivity between upstream and downstream reaches. I collected 10,995 fish representing 41 species and 13 families. Twenty eight species are native to the Milk River basin, 13 species are introduced, 12 species are classified as game fish, and 4 species are Montana Species of Special Concern (blue sucker, paddlefish, pearl dace, and sauger). Longitudinal distribution of species tended to increase in a downstream direction with 10 species collected in the upper-most section and 29 species collected in the lower-most section. The Morista-Horn community similarity index indicated fragmented fish communities between the free flowing section 8 and adjacent section 7 as well as between section 2 and adjacent section 1, which retains its connectivity with the Missouri River. Whereas coarse substrate is rare in the Milk River, macrohabitats (Riffles and Tailwater Zones) with greater percentages of gravel and cobble tended to have greater species richness, diversity, and fish captured per gear deployment. Mean percentage of coarse substrate, mean depth, and diversity of macrohabitats tended to increase downstream. Mean percentage of fines and mean water velocities tended to decrease downstream. Developing fish passage at Vandalia Diversion Dam would reconnect native migratory fishes of the Missouri River with an additional 251 km of the Milk River and benefit the fishery.

# DISTRIBUTION, RELATIVE ABUNDANCE, AND HABITAT ASSOCIATIONS OF MILK RIVER FISHES RELATED TO IRRIGATION DIVERSION DAMS

by

Sean William Stash

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APPROVAL

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Sean W. Stash

This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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# ABSTRACT

The structure and habitat associations of the stream fish assemblage in the Milk River are poorly understood. As the demand for water increases, changes from current water management practices are imminent and will likely further impact fish assemblages in the Milk River. My study collected baseline data on the distribution, relative abundance, and habitat associations of Milk River fishes related to irrigation diversion dams. These structures can alter the natural hydrograph, increase or decrease natural water temperatures, homogenize macrohabitat structure by reducing multiple, braided channels to a single incised channel, reduce sediment transport, sever connectivity with the flood plain, and reduce ecological connectivity between upstream and downstream reaches. I collected 10,995 fish representing 41 species and 13 families. Twenty eight species are native to the Milk River basin, 13 species are introduced, 12 species are classified as game fish, and 4 species are Montana Species of Special Concern (blue sucker, paddlefish, pearl dace, and sauger). Longitudinal distribution of species tended to increase in a downstream direction with 10 species collected in the upper-most section and 29 species collected in the lower-most section. The Morista-Horn community similarity index indicated fragmented fish communities between the free flowing section 8 and adjacent section 7 as well as between section 2 and adjacent section 1, which retains its connectivity with the Missouri River. Whereas coarse substrate is rare in the Milk River, macrohabitats (Riffles and Tailwater Zones) with greater percentages of gravel and cobble tended to have greater species richness, diversity, and fish captured per gear deployment. Mean percentage of coarse substrate, mean depth, and diversity of macrohabitats tended to increase downstream. Mean percentage of fines and mean water velocities tended to decrease downstream. Developing fish passage at Vandalia Diversion Dam would reconnect native migratory fishes of the Missouri River with an additional 251 km of the Milk River and benefit the fishery.

# INTRODUCTION

The importance of the Milk River in providing irrigation and municipal water supplies for north-central Montana is well established (Bureau of Reclamation (BOR) 1977, 1984, 1989, 1990; Fish and Wildlife Service 1983, 1984, 1988; Montana Department of Natural Resources and Conservation 1977; Montana Water Resources Board 1967). However, limited information is available on abundance, distribution, and habitat characteristics of the resident and migratory fishes in the Milk River, especially related to effects of dams and diversion structures.

Little has been published describing the pre-settlement conditions of the Milk River. Since the 1880s, the Milk River Basin has provided water for agricultural communities (BOR 1990). The first known diversion dam on the river was built in the 1890s (Simonds 1998). Diversion dams (Elser et al. 1977; Hesse and Sheets 1993; Helfrich 1999) as well as channelization (Gorman and Karr 1978; Portt et al. 1986), siltation (Berkman and Rabeni 1987; Matthews 1988), and flow modifications (Bain et al. 1988; Travnichek et al. 1995) may negatively affect habitat diversity, fish production, and community composition. Expansion of land use and all of these perturbations have occurred on the Milk River and with increasing demands for water, further impacts to the fish assemblage in the Milk River are expected.

Information based on entire fish assemblages, distributional patterns, and habitat associations is increasingly being used as a basis for formulating improved stream management practices (Tonn et al. 1983; Meffe and Sheldon 1988; Peterson and Rabeni

1995); therefore, a community-level investigation is necessary to best understand and preserve stream resource values (Orth 1987; Miller et al. 1988).

The purpose of this study was to develop baseline data on the population structure, distribution, and habitat use of fishes in the Milk River using standardized methods. The project involved a combined effort between the Montana Fish, Wildlife and Parks (MFWP), U.S. Geological Survey (USGS) Cooperative Fishery Research Unit, and the U.S. Bureau of Reclamation (BOR). Information generated will allow for future evaluations and assessment of potential impacts to the fish community structure in the Milk River. These evaluations provide support for federal actions involving repairs to and construction of project facilities, contract renewals, additional diversions, and instream flows. The specific objectives of this study were to: (1) document fish species and relative abundance in the Milk River from the eastern crossing of the Canada-Montana border downstream to the confluence with the Missouri River, (2) describe fish assemblages associated with different habitats, and (3) examine the potential effects of diversion structures on longitudinal distribution patterns.

# STUDY AREA

The Milk River is one of the longest tributaries (1,127 km) of the Missouri River. From its headwaters at the eastern edge of Glacier National Park, the river flows 72.5 km northeast before crossing the Canadian border. The system flows 275.3 km through Alberta, Canada, before re-entering Montana. After reentry, the river meanders 784.3 km to its confluence with the Missouri River near Nashua, Montana. Total drainage area is about 57,839 $km^2$.

Since initiation of the Milk River Project in 1916, the natural flow of the Milk River has been supplemented with water from the St. Mary River drainage through the 47-km St. Mary Canal. The canal originates at the St. Mary Diversion Dam, 1.2 km downstream from Lower St. Mary Lake, and discharges water into the North Fork Milk River. The canal was designed to carry up to 24.1 $m^3/s$ (850 cfs).

A short distance (85 km) after the Milk River re-enters Montana from Canada, its flow is contained and regulated by Fresno Dam. The 2,170-ha Fresno Reservoir, 23.5 km west of Havre, Montana, serves as the primary irrigation storage structure for the Milk River Project (BOR and Montana Department of Natural Resources and Conservation (DNRC) 1984). Since the completion of the dam in 1939, the highest recorded discharge was 185.5 $m^3/s$ (6550 cfs) on April 2, 1952. A discharge of 0 $m^3/s$ has occurred in 23 different years. In 1999, maximum discharge was 32.7 $m^3/s$ (1155 cfs) on July 28, and the minimum was 1.1 $m^3/s$ (39 cfs) recorded on November 15.

Currently, the Milk River Project consists of three major storage dams (Lake Sherburne, Fresno, and Nelson), five diversion dams (Swift Current, St. Mary, Paradise, Dodson, and Vandalia), 322 km of canals, 353 km of laterals, 472 km of drains, and 42,530 irrigated hectares. Two other privately owned diversion dams, Fort Belknap Irrigation Diversion Dam and Fort Belknap Reservation Diversion Dam, are also located on the Milk River below Fresno Reservoir. This network also provides irrigation water for an additional 10,009 ha served by contract and private pumpers (R. DeVore, BOR, Billings, personal communication). Principal crops produced are alfalfa, native hay, oats, wheat, barley, and sugar beets (BOR 1983). Other uses of Project water include municipal supplies, recreation, and allotments for fish and wildlife (BOR and DNRC 1984).

My study area was the section of the Milk River between the eastern crossing of the Canadian-Montana border downstream to the confluence with the Missouri River (Figure 1). Elevations range from 811.2 m at the eastern border crossing to 618.5 m at the confluence with the Missouri River, a gradient change of 0.26 m/km.

The upper section (section 8), from the eastern border crossing down to Fresno Reservoir, has an appearance different from that of the rest of the study area. Even though natural flows in this reach are influenced by supplemental water from the St. Mary Canal, this is likely the most pristine section of the study area. Characteristics include a poorly developed riparian zone lacking any substantial woody vegetation, highly fluctuating flows, and extremely high turbidity. The river channel is mostly

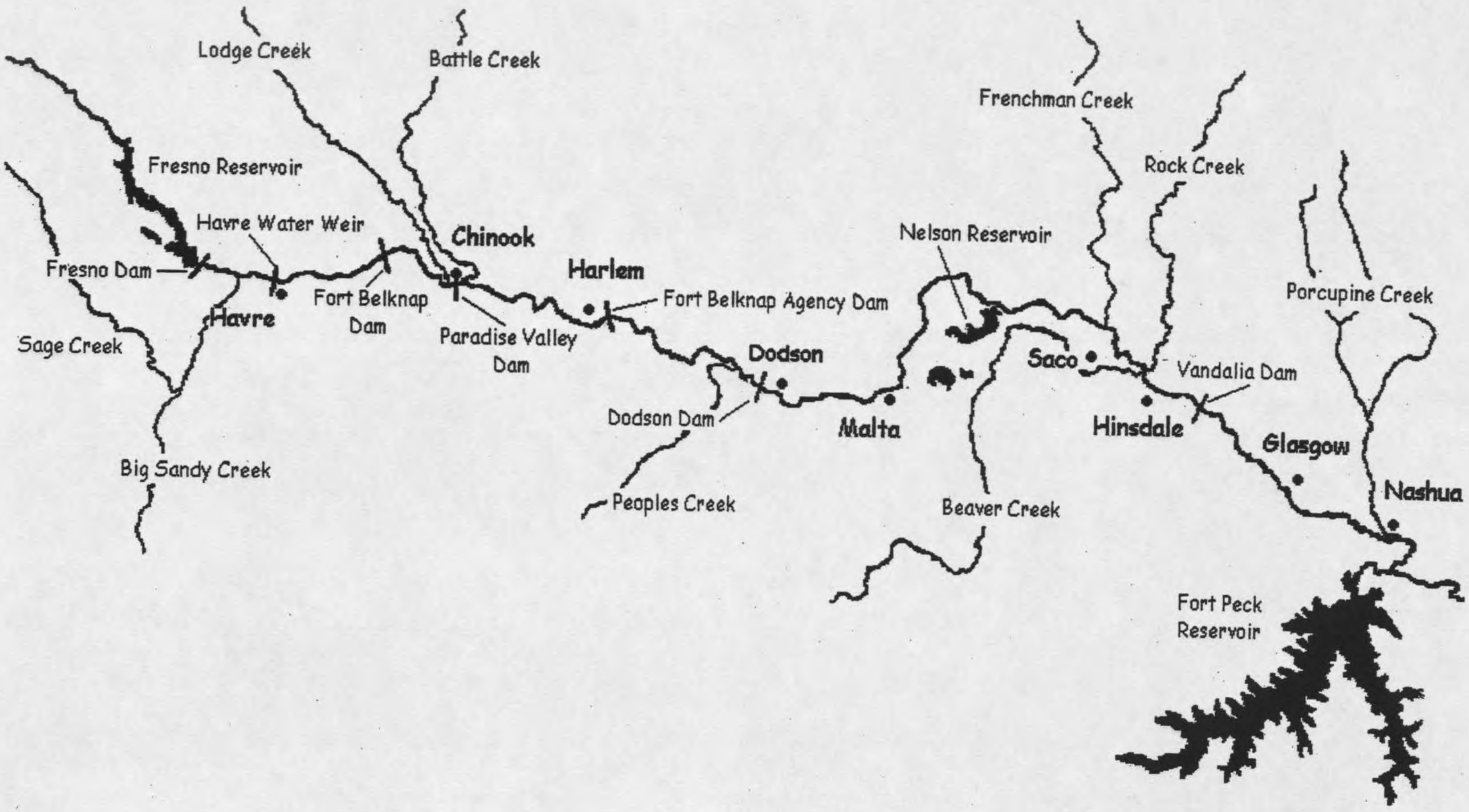


Figure 1. Milk River study area in northcentral Montana.

shallow and highly braided. Diversion dams do not exist within or above this reach on the Milk River proper.

From Fresno Dam down to Vandalia Diversion Dam, a distance of 512 km, the river is fragmented by four diversion dams and one municipal water weir (Figure 1), all of which block upstream fish movement at normal flows. The Fort Belknap Irrigation Diversion Dam may allow upstream fish passage at high flows. Cobble and riprap placed across the bottom and along the banks directly below these structures provide a unique habitat of faster, broken water.

Flows between Fresno Dam and Vandalia Diversion Dam are more stable and turbidity is less than above Fresno Reservoir. The river is confined to a single, incised channel with highly erosive, vertical banks and a moderately developed riparian area. Substrate is still dominated by sand and silt with very few areas of gravel and cobble. Deeper habitat is more common, but well-developed riffle habitat is almost nonexistent. Instream structure is rare and mostly limited to woody debris. The lower-most section from Vandalia Diversion Dam down to the confluence with the Missouri River (117 km) is the only stretch of the Milk River that is accessible to migratory fishes from the Missouri River.

After irrigation begins in the basin, usually by mid May, flow in the two lower sections (Juneberg Bridge and Nashua) declines quickly while water volume at all upriver sites is increasing (Figure 2). Water is held back at every diversion dam upstream of Vandalia Diversion Dam to help meet the water demands throughout the growing season.

The river below Vandalia Diversion Dam is a single, incised channel with well-developed riparian stands. While some steep, erosive banks exist in these lower 117 km, most unstable banks have been shored up with riprap or old car bodies to alter natural flow patterns. Deeper habitat is available and well-developed cobble riffles are more common than at upriver locations. Instream structure consists of a moderate amount of fallen trees and car bodies.

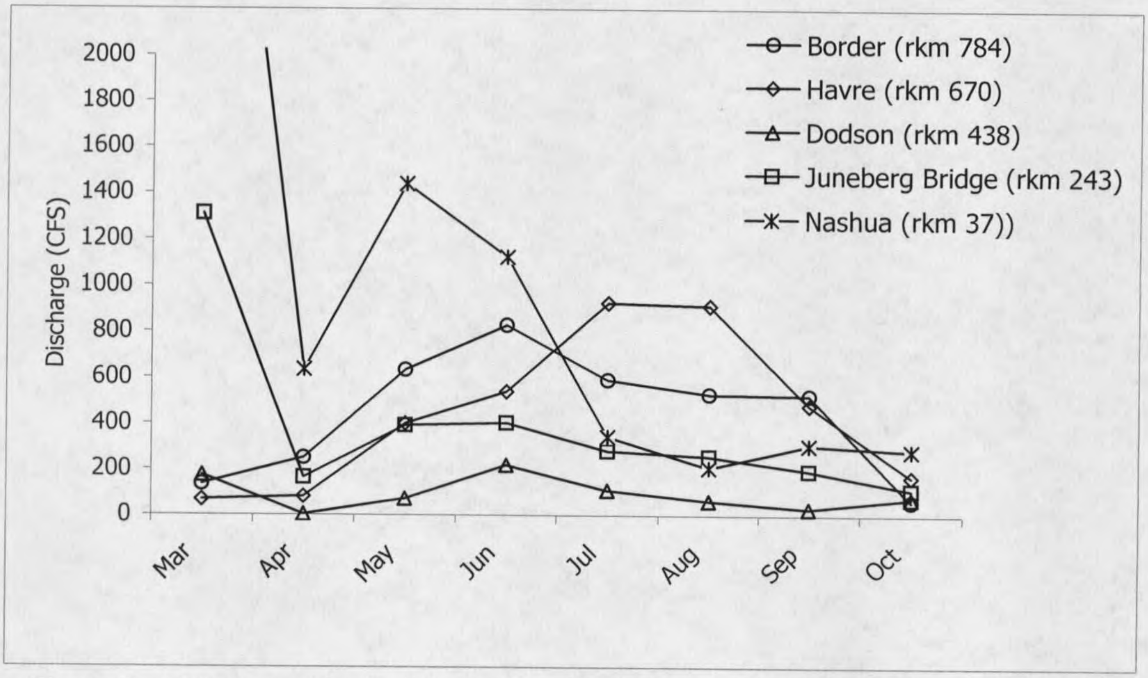


Figure 2. Mean monthly discharge of the Milk River at five USGS gauging stations, Montana (USGS 1999).

# METHODS

During the 2 year study (1999 – 2000) lotic habitats within the Milk River were sampled to collect baseline data on the population structure, distribution, and habitat use of Milk River fishes. Standardized sampling methods and habitat classification were used to allow future monitoring of the fish community and population structure in the river. Sampling techniques were similar to the Long Term Resource Monitoring Program (1995) of the National Biological Service and the Missouri River Benthic Fishes Consortium (1998) because these procedures are based on commonly accepted methods. Slight modifications to these methods were needed to accommodate for limited manpower, access, and stream size.

## Sampling Sites

The Milk River study area, from the eastern international crossing to the mouth, was divided into eight sections based on man-made structures (e.g., dams, diversions, and water weirs) that are impassible to upstream fish movement. The uppermost section (section 8), from the international crossing downstream to Fresno Reservoir, is free flowing and was divided into two segments. Sections 1 and 2 were divided into four segments each, to better represent the sampling effort for these longer sections of river and increase the probability of capturing all species that might occupy these stream reaches. River sections are defined as follows:

| Section | Description |
|---|---|
| 1 | Missouri River to Vandalia Diversion Dam<br>River Mile 0 – 117 (km 0 – 187.2) |
| 2 | Vandalia Diversion Dam to Dodson Diversion Dam<br>River Mile 117 – 274 (km 187.2 – 438.4) |
| 3 | Dodson Diversion Dam to Fort Belknap Reservation Diversion Dam<br>River Mile 274 – 333 (km 438.4 – 532.8) |
| 4 | Fort Belknap Reservation Dam to Paradise Valley Diversion Dam<br>River Mile 333 – 374 (km 532.8 – 598.4) |
| 5 | Paradise Valley Diversion Dam to Fort Belknap (Lohman) Diversion Dam<br>River Mile 374 – 393 (km 598.4 – 628.8) |
| 6 | Fort Belknap (Lohman) Diversion Dam to Havre Water Weir<br>River Mile 393 – 419 (km 628.8 – 670.4) |
| 7 | Havre Water Weir to Fresno Dam<br>River Mile 419 – 437 (km 670.4 – 699.2) |
| 8 | Fresno Reservoir to eastern crossing of Canada-Montana border<br>River Mile 437 – 490 (km 699.2 – 784.3) |

Limited legal access and physical conditions that impeded boat launching and travel necessitated a non-random selection of sample sites. Because of apparent homogeneity of the physical characteristics of the Milk River, I assumed that most existing forms of habitat could be reached within a half-hour boat ride both upstream and downstream of the access point. This concept was applied to reasonably manage available time. Latitude and longitude of each macrohabitat sampled are presented in Appendix A.

## Habitat Classification and Measurements

The range of habitats in the Milk River was selected based on the macrohabitat classifications in the Missouri River Benthic Fishes Consortium (1998). These consisted of both natural and man-made physical features that potentially provide a variety of conditions for the fish communities. These habitats are defined as follows:

Main Channel Cross-Over (CHXO) - The main channel carries the majority of the river discharge and is defined as the thalweg of the river. The channel crossover area is defined as the inflection point of the thalweg (i.e., location where the thalweg crosses over from one concave side of the river to the other concave side) and carries the greatest volume of water.

Outside Bend (OSB) - the concave side of a river bend. In the Milk River, this is commonly associated with steep, continually eroding banks.

Inside Bend (ISB) – the convex side of a river bend. This was characterized by shallow sandbars not exceeding 1.2 m in depth.

Riffle (RIF) – a shallow area of the channel composed of cobble or rubble substrate that causes the water surface to become broken and turbulent. These areas are very rare in the Milk River above Dodson Diversion Dam.

Tailwater Zones (TWZ) – the area immediately downstream of a dam or water weir. For this study these habitats were associated with the man-made structures that form the boundaries for each study section and prohibit any further upstream fish movement.

Secondary Channel Non-Connected (SCN) – these are side channels that are blocked at one end by dry land such that water velocities are essentially 0.0 m/s. Fish movement into and out of this habitat is permitted only through the end connected to the main river channel.

Tributary Mouth (TRM) – the area where smaller streams enter the Milk River. These tributaries must be at least 6.1 m wide and deep enough to allow boat passage for a distance of 45 m upstream.

Attempts were made to sample each representative macrohabitat in each section, but not all categories were found in every section. A summary of the number of macrohabitats sampled in each section is provided in Appendix A. Additionally, because some macrohabitats were more common, and therefore sampled more often than others, a standardized index of the number of individuals captured per gear deployment in each of the macrohabitat types was calculated. By dividing the total number of individuals captured in each macrohabitat by the total number of gear deployments in that macrohabitat, a simple fish:gear deployment ratio was generated.

Site-specific habitat measurements, which were believed to be most relevant to fish populations, were recorded in conjunction with fish collections. These habitat measurements included water temperature, depth, velocity, turbidity, conductivity, and substrate. Protocols for measurements were based on the standard operating procedures developed by the Missouri River Benthic Fishes Consortium (1998). Substrate was subjectively classified as percent fines (sand and silt), gravel, or cobble. Turbidity measurements were taken with a Secchi disk in sections 3 – 8 and a turbidity meter in sections 1 and 2. Therefore, only readings from sections 3 – 8 were compared. Readings were recorded as the depth (cm) into the water column at which the black and white disk was no longer visible.

I compared depth, velocity, turbidity, and substrate composition within each of the four common macrohabitat types (Channel Crossovers, Inside Bends, Outside Bends, and Tailwater Zones) between each study section to determine if habitat complexity increases in a downstream manner in the Milk River. Additionally, because longitudinal increases in trophic structure and species richness have been attributed to longitudinal increases in habitat complexity (Schlosser 1982; Patton and Hubert 1993) or moderation of environmental conditions and increased living space (Rahel and Hubert 1991; Degerman and Sers 1992), substrate composition, mean depth, and mean velocity were further examined to determine the potential significance of these variables on the total species richness, mean species richness, diversity, and fish per gear deployment in Tailwater Zone macrohabitats.

## Fish Collections

To evaluate community structure and distribution, fish were collected using a variety of sampling gears that were most effective on the greatest diversity of fish in the habitats available. An initial sampling season was used to test equipment and assess its effectiveness on fish in the Milk River. A description of fish collecting equipment and how and where it was used follows.

Bag Seine – 10.7 m long by 1.8 m deep; 1.8 m x 1.8 m x 1.8 m bag at center of net; 5 mm Ace mesh; "many ends" mudline attached to entire length at the bottom. Seining was used to sample inside bends, riffles, and secondary channels. Two seine hauls were used at each habitat site if there was enough area to avoid overlap. Sampling started at the downstream-most point. To deploy the seine, one end was anchored at the shoreline while the other end was stretched upstream and parallel to the shoreline. The upstream end of the net was then pulled into the water with a pivoting motion until the net was stretched out perpendicular to shore and then both ends were pulled downstream to a predetermined point. If snagging occurred, the haul was abandoned and another nearby site was selected. Distance of each haul was recorded to determine sampled area.

Electrofishing – Coffelt Mark 10 CPS backpack shocker, pulsed DC-60 cps, and a 14-foot Jon boat equipped with a Coffelt VVP 15 rectifying unit, a Honda 5000EX generator, and other necessary apparatus to conduct electrofishing from a boat. Backpack electrofishing was used to sample the Tailwater Zone habitats in Sections 3 – 7 whereas boat electrofishing was used to sample the Tailwater Zone habitats in Sections 1 and 2. Sampling of the Tailwater Zone started at a determined downstream point and progressed upstream until the dam or weir prevented further progress. Length of habitat sampled and the amount of shock-time (seconds) were recorded to standardize the effort. Further, because boat electrofishing was so versatile, it was used in nearly all other macrohabitat types. Sampling in each habitat started at a determined upstream point and progressed downstream. The boat was then turned around and an upstream pass of the same habitat was used to complete the sample. Length of habitat sampled and amount of shock-time were recorded.

Gill Nets – 15 m and 30 m sinking nets; 1.8 m high; divided horizontally into four equal segments of 1.9 cm, 3.8 cm, 5.0 cm, and 7.6 cm mesh size. These nets were used to sample Tailwater Zone habitats in sections 3 – 7, the main river where areas of very slow current could be found, and tributary mouths. Typical deployment strategy in deeper water involved staking one end of the net near the shoreline with a fence post while pulling the other end out into the water channel, perpendicular to the shoreline, and securing with heavy weights and a float. Because of the differing sizes of mesh, a coin was tossed to determine which end of the net would be staked near the shoreline to maintain randomness. Start-times and end-times were recorded for each effort and all nets were fished at least 12 h.

Hoop Nets – 1.1 m diameter hoops; 5.0 cm mesh size. This gear was used in Outside Bend, Inside Bend, and Main Channel Cross-Over habitats. In order to be fished effectively, water had to be at least 1.0 m deep and velocities had to be fast enough to keep the hoops standing on edge. Hoop nets were set by tossing a hoop net anchor, with 4 to 5 m of rope attached, off the bow of the boat. After the anchor was secure in the substrate, the hoop net was attached to the rope and fed off the bow as the boat drifted downstream. Once the hoop net was stretched, it was released and allowed to sink to the bottom. An additional buoy line was also attached to the anchor to help locate and retrieve the nets. Nets were fished for a minimum of 12 h. Both baited and unbaited nets were used to determine the best capture method.

Trammel Nets – 23 m; 2.5 cm inner mesh and 15.2 cm outer mesh. These nets were used to sample areas with velocities greater than 0.4 m/s. Each sample consisted of at least a 75 m drift while recording both start and finish times. To deploy the net, one member of the crew waded across the channel with one end of the net while the other member anchored the other end. Once the net was stretched, both members walked downstream at an even pace with the flow while holding on to each end of the net. When finished with the drift, one of the crew made a downstream arc to end on the same side as the other member and the net was pulled ashore. This sampling technique was used in only Sections 1 and 2 because of the difficulties of frequent snagging in all other sections. All sampling locations were documented with a Magellan NAV 5000 GPS unit to ensure sample sites could be located again for future community monitoring.

Fish collected were identified to species, enumerated, weighed, and measured. Because of the difficulties associated with larval fish identification, only fish greater than 30 mm were identified. Each fish was weighed to the nearest 0.1 g using an Ohaus CT1200 electronic balance. Fish that exceeded 1200 g were weighed to the nearest 25 g using a Yamato Accu-Weigh SM-40PK dial scale. Total length of each fish was measured to the nearest millimeter. Any specimens that could not be readily identified in the field were preserved using a 10% solution of formalin and brought back to the lab for identification.

If a large number of individuals of one species was present in a sample, a subsample of 25 was randomly selected. Any additional fish of that species were enumerated to record the total number of fish in the collection.

## Data Analysis

I determined the presence (richness) and proportion (relative abundance) of fish species for each macrohabitat type (all sections combined) and for each section. The relationship between macrohabitat and species richness, as well as study section and species richness, was examined using one-way Analysis of Variance (ANOVA) with a critical value (P) of 0.05. When significant differences were detected, Tukey's Studentized Range test was used to determine where specific differences occurred. To determine if differences in depth, velocity, and substrate existed between sections, data were $\log_{10}(x+1)$ transformed to better fit normality assumptions and compared using one-way ANOVA. Again, Tukey's test was used to determine where differences occurred.

The fish community was further described using Shannon's diversity index, $H' = -\sum p_i \log_2 p_i$, where $p_i$ is the proportion of the *i*th species in the sample, and the Morista-Horn community similarity index, $I_{mh} = [2 * \sum(an_i bn_i)]/[da + db)\ aN * bN]$, where aN is the number of individuals in site A; bN, the number of individuals in site B; $an_i$, number of individuals of the *i*th species in site A; $bn_i$, the number of individuals of the *i*th species in site B; $da = \sum an_i^2/aN^2$; and $db = \sum bn_i^2/bN^2$. These indices were used to evaluate spatial changes in fish assemblage composition in relation to barrier dams and stream gradient. Because these indices are not statistics, critical values are not associated with them. In considering similarity indices such as Morista-Horn, no absolute value exists to indicate if two adjacent fish assemblages are distinct or similar. It derives values from zero, indicating no community similarity, to one, indicating total similarity, and takes into account both taxa richness and abundance; it is highly sensitive to the abundance of the most abundant taxa (Wolda 1981). I followed suggestions of other researchers who considered Morista-Horn similarity values of about 0.67 to be indicative of high faunal similarity and values of about 0.33 and lower to represent distinct communities (Moyle and Vondracek 1985; Ross et al. 1985; Matthews et al. 1988; Travnichek et al. 1995).

I used principal components analysis to identify fish species assemblages related to the longitudinal structure of the eight study sections. Principal component analysis efficiently summarizes community data into a simpler form and assists in defining existing patterns. The data were arranged in a species presence and proportion by study section correlation matrix with species relative abundances transformed to an octave scale as suggested by Gauch (1982). This transformation was performed to reduce the effects of the most abundant species. Species that were represented by less than 1% of the total catch were excluded from the analysis to simplify interpretation of results. Gradients of community change were identified from the resulting plot that places species on either side of the axis based on principal component loadings for each species.

To further assist in the interpretation of the resulting principal components plot, Pearson's correlations were examined between the first two principal components and mean physical habitat variables for each section as well as total species richness and total number of individuals.

# RESULTS

## Fish Community

A total of 10,995 fish, representing 41 species, was collected from the Milk River between the confluence with the Missouri River upstream to the eastern Canada-Montana border crossing from April – June and September – October, 1999 and 2000. The 41 species belong to 13 families of fishes including Acipenseridae (sturgeons, 1 species), Polydontidae (paddlefishes, 1 species), Hiodontidae (mooneyes, 1 species), Cyprinidae (minnows, 12 species), Catostomidae (suckers, 8 species), Ictaluridae (catfishes, 3 species), Esocidae (pikes, 1 species), Salmonidae (trouts, 3 species), Gadidae (codfishes, 1 species), Gasterosteidae (sticklebacks, 1 species), Centrarchidae (sunfishes, 4 species), Percidae (perches, 4 species), and Sciaenidae (drums, 1 species) (Table 1). Twenty eight of these species are native to Montana (Holton and Johnson 1996) and represented 69.9% of the total collection. The remaining 30.1% of the fish captured consisted of 13 species not native to Montana. Twelve species are designated game fish by Montana statutes (Holton and Johnson 1996). Four species, blue sucker, paddlefish, pearl dace, and sauger are Montana Fishes of Special Concern (Hunter 1997; K. McDonald, MFWP, Helena, personal communication), and two species, flathead chub and western silvery minnow are on the Montana Natural Heritage Program watch list (Roedel 1999).

Table 1. Fish species collected in the Milk River, Montana, April-June and September-October, 1999 and 2000.

| Family / Species | | Native / Introduced | Special Status |
|---|---|---|---|
| <u>Cyprinidae</u> | | | |
| Lake chub | *Couesius plumbeus* | Native | |
| Common carp | *Cyprinus carpio* | Introduced | |
| *Hybognathus* spp. | *Hybognathus spp.* | Native | Watch List |
| Brassy minnow | *Hybognathus hankinsoni* | Native | |
| Pearl dace | *Margariscus margarita* | Native | Special Concern |
| Emerald shiner | *Notropis atherinoides* | Native | |
| Spottail shiner | *Notropis hudsonius* | Introduced | |
| Northern redbelly dace | *Phoxinus eos* | Native | |
| Fathead minnow | *Pimephales promelas* | Native | |
| Flathead chub | *Platygobio gracilis* | Native | Watch List |
| Longnose dace | *Rhinichthys cataractae* | Native | |
| Creek chub | *Semotilus atromaculatus* | Native | |
| <u>Catastomidae</u> | | | |
| River carpsucker | *Carpiodes carpio* | Native | |
| Longnose sucker | *Catostomus catastomus* | Native | |
| White sucker | *Catostomus commersoni* | Native | |
| Mountain sucker | *Catostomus platyrhynchus* | Native | |
| Blue sucker | *Cycleptus elongates* | Native | Special Concern |
| Smallmouth buffalo | *Ictiobus bubalus* | Native | |
| Bigmouth buffalo | *Ictiobus cyprinellus* | Native | |
| Shorthead redhorse | *Moxostoma macrolepidotum* | Native | |
| <u>Centrarchidae</u> | | | |
| Bluegill | *Lepomis macrochirus* | Introduced | |
| Smallmouth bass | *Micropterus dolomieu* | Introduced | |
| White crappie | *Pomoxis annularis* | Introduced | |
| Black crappie | *Pomoxis nigromaculatus* | Introduced | |
| <u>Percidae</u> | | | |
| Iowa darter | *Etheostoma exile* | Native | |
| Yellow perch | *Perca flavescens* | Introduced | |
| Sauger | *Stizostedion canadense* | Native | Special Concern |
| Walleye | *Stizostedion vitreum* | Introduced | |
| <u>Ictaluridae</u> | | | |
| Black bullhead | *Ameiurus melas* | Introduced | |
| Channel catfish | *Ictalurus punctatus* | Native | |
| Stonecat | *Noturus flavus* | Native | |
| <u>Salmonidae</u> | | | |
| Lake whitefish | *Coregonus clupeaformis* | Introduced | |
| Rainbow trout | *Oncorhynchus mykiss* | Introduced | |
| Brown trout | *Salmo trutta* | Introduced | |