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MONTANA PRAIRIE RIPARIAN NATIVE SPECIES STUDY



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Abstract.—Information on the distribution and abundance of fish, amphibians, reptiles, birds, and small mammals in and around Montana prairie streams is scarce. This information is important for resource managers to better understand and manage prairie species and their habitats. During the 2003 field season, we sampled fish, amphibians, reptiles, birds, and small mammals at 40 sites within prairie ecoregions in Montana. Five of these sites were sampled twice to allow an estimate of temporal variability in biological assemblages.

Introduction

An analysis of Montana Fish, Wildlife and Park's (MFWP) Montana River Information System database indicated that more than 18,000 miles of streams in the Montana database have not been surveyed. The overwhelming majority of these waters are small, warmwater prairie streams located in eastern Montana. Many of these streams likely contain intact, diverse assemblages of native non-game fish. Similarly, data is scarce or non-existent for amphibians, reptiles, birds, and small mammals in the riparian and upland areas adjacent to these prairie streams. The purpose of this study is to gain a greater understanding of the vertebrate fauna that occurs in prairie streams and associated habitats by performing a survey of fish, amphibians, reptiles, birds, and mammals. This information will enable resource managers to better understand and manage prairie ecosystems.

Study Area and Methods

We sampled sites in the Northern Great Plains and Northern Glaciated Plains Ecoregions in the eastern two thirds of Montana, which include portions of the Missouri, Yellowstone, and Little Missouri river basins. A total of 40 sites were sampled for fishes, reptiles, amphibians, and mammals, whereas 39 sites were sampled for birds.

The sampling effort consisted of two phases:

1. Phase 1 (Bird surveys)—Birds were surveyed from late May through June, during the season when males were actively singing on their territories.

2. Phase 2 (Fish, reptile, amphibian, and small mammal surveys)—These taxa were surveyed during June through September at the same sites sampled during Phase 1.

To assess temporal variability in species assemblages a subset of five sites were sampled four times. Five of the sites sampled early in Phase 1 were resampled towards the end of Phase 1 sampling. These same five sites were then sampled for the other taxa early and late in Phase 2 sampling. Quantification of within-site temporal variability will allow comparison to between-site variability to ascertain the extent to which differences among sites are caused by time of sampling.

Reptiles and amphibians.—Visual encounter surveys (VES) were used to determine the relative abundances of amphibians and reptiles (Heyer et al. 1994). Two 300-m VES transects were surveyed along the stream banks (2 banks x 300 m), and three 140-m transects were surveyed perpendicular to the stream along the mammal traplines. We recorded incidental observations of reptiles and amphibians during all other site activities, including vocalizations of frogs and toads heard while camping near sampling sites.

Fishes.—Fishes were surveyed at each site by seining a 300-m reach of stream. All fishes captured were identified to species, and lengths of at least 20 randomly selected individuals were recorded for each species. Up to ten voucher specimens for each species were preserved, and voucher specimens were examined in the laboratory to verify field identification of species. Specimens of *Phoxinus* sp. were identified as northern redbelly dace or northern redbelly dace x finescale dace hybrids by examining pharyngeal teeth in the laboratory.

Birds.—Three point-counts were conducted at each site using standard point-count protocols (Ralph et al. 1995); one point-count was conducted at the center of the fish survey reach and the others were located 300 m straight-line-distance upstream and downstream from the center point within the riparian zone. Bird surveys were conducted between May 24 and June 30, 2003. Each point-count was conducted for 10 minutes, and all birds detected visually or aurally were recorded. General vegetation condition and structure were recorded at each point-count site. These measurements were modified from protocols established for forested areas (Hutto et al.

2001). Point-count protocols were consistent with state-wide bird monitoring protocols under development as part of the Montana Bird Conservation Plan to enable incorporation of our data into the state-wide database.

Mammals.—Three, 140-meter line transects, centered on each bird point-count site, and running perpendicular to the stream channel were established at each site. Paired snap-traps and Sherman live traps baited with peanut butter and oats were set along this transect, evenly spaced at every ten meters along each transect (16 sets/transect x 2 traps/set x 3 transects = 96 traps/site). Traps were set in the late afternoon or evening, and checked the following morning. Mammals captured were identified to species, except for *Peromyscus* sp. The two species of *Peromyscus*, the deer mouse and the white-footed mouse are difficult to separate in the field (Foresman 2001; John Carlson, Montana Natural Heritage Program, personal communication), so these two species were grouped as *Peromyscus* sp.

Aquatic and riparian habitat.—We surveyed habitat in the same location as the fish sampling following the U. S. Environmental Protection Agency protocol for physical habitat characterization (Kaufmann and Robison 1998), which includes measures of channel dimensions, channel gradient, substrate size and type, habitat complexity and cover, riparian vegetation cover and structure, anthropogenic alterations, and channel-riparian interaction.

Water chemistry.—Water conductivity (micromhos/cm), dissolved oxygen (mg/L), pH, salinity (ppt), turbidity (NTU), water and air temperature (°C), and time of sample were recorded at each site.

Collaboration with Montana Fish, Wildlife, and Parks.—We conducted a fish identification workshop for MFWP field technicians at Montana State University (MSU) and prepared taxonomic keys for study guides and field use. A field techniques workshop was conducted at the Charles M. Russell National Wildlife Refuge in April. We demonstrated fish sampling, site layout, and habitat measurement techniques. Fish voucher specimen verification was conducted at MSU where we worked with MFWP technicians Theresa Frank, Ryan Lott, Dale Nixdorf, and

Brad Tribby. Bob Bramblett prepared a written fish and habitat sampling protocol and data sheets for MFWP.

Results

Fishes.—Fishes were present at 21 of the 40 sites, 21 (53%). A total of 15,160 individual fishes of 21 taxa were captured (Table 1). The majority of fish taxa and individuals captured were native to Montana. Sixteen taxa and 14,453 individual fishes (95%) were native, and the remaining four species and 707 individual fishes were introduced species.

Fathead minnow were the most commonly occurring species; they were present at all sites that had fish present ($N = 21$). Black bullhead, white sucker, and brook stickleback were present at more than 50% of sites with fish. Brassy minnow, lake chub, plains minnow, sand shiner, common carp, green sunfish, longnose dace, *Phoxinus* sp., flathead chub, and pearl dace were present at 10 to 50% of sites with fish. Channel catfish, Iowa darter, plains killifish, and river carpsucker were each present at 5% of sites with fish.

Fathead minnow were the most numerous, comprising 65% of the total catch. Plains minnow and lake chub comprised 10% and 7% of the catch, respectively. Brook stickleback, white sucker, brassy minnow, black bullhead, *Phoxinus* sp., and green sunfish each comprised from 1 to 5% of the catch. River carpsucker, pearl dace, common carp, sand shiner, longnose dace, flathead chub, channel catfish, plains killifish, and Iowa darter comprised less than 1% of the catch. Fish collection records and latitude and longitude of sample locations will be forwarded to Steve Carson for incorporation into the MFISH database.

Amphibians and reptiles.— A total of five amphibian species, (northern leopard frog, tiger salamander, Woodhouse's toad, western chorus frog, and plains spadefoot) and six reptile species (gophersnake, painted turtle, plains garter snake, racer, snapping turtle, western rattlesnake) were observed (Table 2).

Northern leopard frog was the most commonly occurring species; they were present at all 18 of 40 sites (45%). Painted turtle and plains garter snake were each present at 10 sites (25%).

Chorus frog, Woodhouse's toad, western rattlesnake, gophersnake, plains spadefoot, racer, snapping turtle, and tiger salamander were present at 4 or fewer sites (= 10%).

Birds.—A total of 2,410 individual birds of 92 species was observed during point-count surveys (Table 3). The most common species observed was western meadowlark, which was present at 95% of sites. The eight next most common species, respectively, were red-winged blackbird, brown-headed cowbird, mourning dove, killdeer, mallard, eastern kingbird, Brewer's blackbird, and horned lark; each of these species was present ant more than 50% of sites. We observed an additional 12 bird species through incidental observations at the sampling sites.

Mammals.—A total of 445 individual mammals of 4 taxa was captured (Table 4). The catch was dominated by *Peromyscus* sp.; 99% of the mammals captured were *Peromyscus* sp. The other species captured were northern grasshopper mouse, house mouse, and prairie vole.

Plans for 2004

We plan to have another full field season in 2004, when we will obtain another set of 40 samples. Bob Bramblett will conduct a prairie fish identification workshop at MSU and a field sampling methods workshop again this year, as well as continuing to assist MFWP field crews with voucher specimen identification. We will begin to construct models for all fish species in the prairie ecoregions of Montana, and assess the relative importance of site-level and landscape habitat features. By identifying the relationships between fish distribution and habitat characteristics, we hope to identify critical habitat for conservation of native fish species and assemblages.

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Table 1. Fish captured during 2003.

Site	Date	Species	Number captured
Assiniboine Creek	7/11/2003	brassy minnow	1
		brook stickleback	1
		fathead minnow	3
		northern redbelly dace	1
		northern redbelly dace x finescale dace	1
		pearl dace	77
		<i>Phoxinus</i> sp.	102
		white sucker	5
		Total	191
Assiniboine Creek	9/17/2003	brassy minnow	3
		brook stickleback	1
		fathead minnow	280
		northern redbelly dace x finescale dace	3
		northern redbelly dace	1
		pearl dace	7
		<i>Phoxinus</i> sp.	16
		Total	311
Black Coulee	8/24/2003	fathead minnow	1,600
Cabin Creek	7/27/2003	black bullhead	112
		common carp	23
		green sunfish	42
		sand shiner	6
		Total	183
Cameron Creek	8/5/2003	no fish	
Chip Creek	8/18/2003	no fish	
Cottonwood Coulee	8/22/2003	no fish	
Cottonwood Creek (Big Muddy)	9/6/2003	brook stickleback	9
		fathead minnow	1,040
		white sucker	137
Cottonwood Creek (Frenchman)	8/21/2003	no fish	

Crow Creek	7/10/2003	brassy minnow	3
		fathead minnow	193
		lake chub	444
		plains minnow	243
		white sucker	18
Crow Creek	9/18/2003	black bullhead	119
		brassy minnow	412
		fathead minnow	2,738
		Iowa darter	1
		lake chub	376
		plains minnow	310
		white sucker	165
Dog Creek	7/14/2003	brook stickleback	3
		fathead minnow	49
		flathead chub	1
		lake chub	30
		white sucker	89
Dog Creek	9/19/2003	no fish	
Dry Creek	7/29/2003	black bullhead	2
		green sunfish	2
Duck Creek (Big Sandy)	8/24/2003	no fish	
Duck Creek (Redwater)	9/9/2003	no fish	
East Fork Fox Creek	9/5/2003	brook stickleback	19
		fathead minnow	4
		Total	23
East Fork Little Porcupine Creek	9/7/2003	brassy minnow	6
		brook stickleback	443
		fathead minnow	519
		lake chub	5
		northern redbelly dace x finescale dace	2
		lake chub	5
		northern redbelly dace	2
		<i>Phoxinus</i> sp.	64
		white sucker	44
		Total	1,085
Fogarty Coulee	8/19/2003	no fish	

Lake Creek	8/25/2003	no fish	
Little Cottonwood Creek	7/12/2003	brassy minnow	8
		brook stickleback	34
		fathead minnow	315
		white sucker	5
		Total	362
Little Pumpkin Creek	7/24/2003	lake chub	14
Lost Creek	8/12/2003	no fish	
North Fork Willow Creek	7/22/2003	black bullhead	5
		brassy minnow	19
		fathead minnow	107
		sand shiner	1
		white sucker	3
		Total	135
North Sunday Creek	9/4/2003	black bullhead	22
		channel catfish	19
		common carp	6
		fathead minnow	177
		flathead chub	26
		green sunfish	10
		longnose dace	14
		plains minnow	103
		river carpsucker	91
		Total	468
Owl Creek	8/11/2003	black bullhead	30
		fathead minnow	230
		lake chub	106
		longnose dace	1
		white sucker	4
		Total	371
Pine Creek	7/28/2003	brassy minnow	1
		brook stickleback	24
		Total	25
Sage Creek	8/23/2003	no fish	
Sand Creek	7/24/2003	no fish	
Sixshooter Creek	8/4/2003	no fish	

South Cottonwood Creek	7/26/2003	black bullhead	3
		common carp	22
		fathead minnow	325
		green sunfish	7
		plains minnow	63
		sand shiner	2
		white sucker	7
		Total	429
South Fork Lisk Creek	9/8/2003	no fish	
Sprague Creek	7/21/2003	no fish	
Steves Fork	7/10/2003	black bullhead	6
		brook stickleback	18
		common carp	1
		fathead minnow	109
		plains minnow	2
		Total	136
Steves Fork	9/16/2003	black bullhead	3
		brassy minnow	64
		common carp	11
		fathead minnow	417
		plains minnow	15
		sand shiner	2
		Total	512
Telegraph Creek	7/13/2003	fathead minnow	5
Thompson Creek	7/9/2003	black bullhead	19
		brook stickleback	6
		fathead minnow	270
		lake chub	3
		plains minnow	469
		sand shiner	21
		Total	788
Thompson Creek	9/15/2003	black bullhead	44
		brook stickleback	6
		fathead minnow	1,095
		lake chub	3
		longnose dace	1
		plains minnow	281
		sand shiner	7

		white sucker	9
		Total	1,446
Timber Creek	7/25/2003	no fish	
Trail Creek	8/10/2003	no fish	
Tullock Creek	8/9/2003	black bullhead	13
		common carp	13
		fathead minnow	373
		green sunfish	12
		plains killifish	5
		sand shiner	3
		white sucker	37
		Total	456
Uall Creek	8/8/2003	no fish	
West Blacktail Creek	8/7/2003	black bullhead	97
		fathead minnow	14
		green sunfish	78
		Total	189
Wildhorse Creek	8/20/2003	no fish	
Willow Creek	8/6/2003	lake chub	35
		longnose dace	12
		white sucker	18
		Total	65
		Grand total	15,195

Table 2. Amphibians and reptiles observed in 2003.

Site	Date	Survey or incidental	Species	Number observed
Assiniboine Creek	7/11/2003	survey	northern leopard frog	1
		incidental	northern leopard frog	2
			painted turtle	4
Assiniboine Creek	9/17/2003	survey	northern leopard frog	5
Black Creek	8/24/2003	survey	plains garter snake	1
Cabin Creek	7/27/2003	survey	northern leopard frog	2
			plains garter snake	1
		incidental	northern leopard frog	1
Cameron Creek	8/5/2003	survey	none	
Chip Creek	8/18/2003	survey	none	
Cottonwood Coulee	8/22/2003	survey	none	
Cottonwood Creek (Big Muddy)	9/5/2003	survey	northern leopard frog	4
			painted turtle	1
Cottonwood Creek (Frenchman)	8/21/2003	survey	none	
		incidental	chorus frog	2
Crow Creek (Rock)	7/10/2003	survey	none	
		incidental	northern leopard frog	1
Crow Creek (Rock)	9/18/2003	survey	northern leopard frog	1
		incidental	chorus frog	1
			northern leopard frog	1
Dog Creek	7/15/2003	survey	plains garter snake	1
			racer	1
		incidental	northern leopard frog	1
			racer	1

Dog Creek	9/19/2003	survey	none	
Dry Creek	7/29/2003	survey	northern leopard frog	20
Duck Creek (Big Sandy)	8/24/2003	survey	none	
Duck Creek (Redwater)	9/8/2003	survey	painted turtle	1
East Fork Fox Creek	9/4/2003	survey	none	
		incidental	northern leopard frog painted turtle	50 2
East Fork Little Porcupine	9/6/2003	survey	plains garter snake	1
Fogarty Coulee	8/19/2003	survey	none	
		incidental	tiger salamander	1
Lake Creek	8/25/2003	survey	none	
Little Cottonwood Creek	7/12/2003	survey	northern leopard frog painted turtle	11 2
		incidental	northern leopard frog plains garter snake	1 1
Little Pumpkin Creek	7/24/2003	survey	northern leopard frog	7
		incidental	plains garter snake	1
Lost Creek	8/12/2003	survey	none	
North Fork Willow Creek	7/22/2003	survey	northern leopard frog painted turtle	14 2
North Sunday Creek	9/3/2003	survey	none	
		incidental	northern leopard frog Woodhouse's toad	1 1
Owl Creek	8/11/2003	survey	northern leopard frog	83

Pine Creek	7/28/2003	survey	northern leopard frog	4
			plains garter snake	6
			tiger salamander	1
			western rattlesnake	1
Sage Creek (Wild Horse Lake)	8/23/2003	survey	none	
Sand Creek	7/23/2003	survey	northern leopard frog	1
		incidental	painted turtle	1
			western rattlesnake	1
Sixshooter Creek	8/4/2003	survey	none	
South Cottonwood Creek	7/26/2003	survey	none	
South Fork Lisk Creek	9/7/2003	survey	none	
Sprague Creek	7/21/2003	survey	none	
Steves Fork	7/9/2003	survey	Woodhouse's toad	2
		incidental	chorus frog	2
			plains spadefoot	2
Steves Fork	9/16/2003	incidental	northern leopard frog	2
Telegraph Creek	7/13/2003	survey	plains garter snake	1
Thompson Creek	7/8/2003	survey	gophersnake	1
			northern leopard frog	3
			plains garter snake	2
			Woodhouse's toad	2
		incidental	northern leopard frog	11
Thompson Creek	9/15/2003	survey	northern leopard frog	25
			painted turtle	1
			plains garter snake	1
Timber Creek	7/25/2003	survey	chorus frog	1

Tullock Creek	8/9/2003	survey	painted turtle	1
		incidental	northern leopard frog	2
			snapping turtle	1
U All Creek	8/8/2003	survey	none	
West Blacktail Creek	8/7/2003	survey	painted turtle	1
Wild Horse Creek	8/20/2003	survey	none	
Willow Creek	8/6/2003	survey	none	
		incidental	northern leopard frog	1
		Grand total		310

Table 3. Birds observed during May-June 2003.

Site	Date	Survey or incidental	Species	Number observed
Assiniboine Creek	5/26/2003	Survey	American robin	3
			American wigeon	1
			black-billed magpie	1
			blue-winged teal	1
			Brewer's blackbird	1
			brown thrasher	2
			brown-headed cowbird	5
			California gull	1
			Canada goose	8
			common grackle	6
			common snipe	4
			eastern kingbird	2
			killdeer	6
			lark sparrow	1
			mallard	1
			marbled godwit	4
			mourning dove	4
			northern shoveller	1
			red-winged blackbird	10
			ring-necked pheasant	4
			unknown blackbird	1
			western kingbird	5
			western meadowlark	7
			willet	4
			Wilson's phalarope	5
			Total	88
		Incidental	American wigeon	
			bank swallow	
			cliff swallow	
			common yellowthroat	
			gadwall	
			mallard	
			northern pintail	

Assiniboine Creek	6/25/2003	Survey	American robin	1
			bank swallow	1
			blue-winged teal	1
			Brewer's blackbird	4
			brown-headed cowbird	1
			common grackle	3
			common nighthawk	9
			eastern kingbird	3
			gray partridge	1
			horned lark	1
			killdeer	2
			mallard	1
			marbled godwit	5
			mourning dove	7
			red-winged blackbird	29
			western meadowlark	8
			willet	2
			Wilson's phalarope	2
			Total	81
Black Coulee	6/20/2003	Survey		
			ring-necked pheasant	
			brown-headed cowbird	2
			cliff swallow	14
			eastern kingbird	2
			horned lark	12
			killdeer	9
			lark bunting	13
			mallard	6
			mourning dove	1
			red-winged blackbird	18
			unknown gull	1
			unknown sparrow	1
			western kingbird	1
			Total	80
		Incidental		
			gadwall	
		Incidental		
			northern pintail	

Cabin Creek	6/13/2003	Survey	blue-winged teal	1
			Brewer's sparrow	3
			brown-headed cowbird	3
			common grackle	2
			lark bunting	2
			mourning dove	2
			northern flicker	1
			red-winged blackbird	14
			western meadowlark	9
			willet	1
			Total	38
Cameron Creek	6/11/2003	Survey	clay-colored sparrow	3
			cliff swallow	1
			horned lark	8
			killdeer	2
			lark bunting	4
			mourning dove	1
			red-winged blackbird	1
			rock wren	1
			say's phoebe	1
			vesper sparrow	2
			western meadowlark	9
			Total	33
Chip Creek	5/27/2003	Survey		
Cabin Creek	6/13/2003	Incidental	Canada goose	
			common nighthawk	
			Wilson's phalarope	
Cameron Creek	6/11/2003	Incidental	eastern kingbird	
Chip Creek	5/27/2003	Survey	brown-headed cowbird	8
			cliff swallow	3
			killdeer	1
			mallard	2
			marbled godwit	1
			mourning dove	1
			red-winged blackbird	5
			ring-necked pheasant	1
			say's phoebe	1

			vesper sparrow	4
			western meadowlark	10
			Total	37
		Incidental	cliff swallow	
			upland sandpiper	
			willet	
Cottonwood Coulee	5/25/2003	Survey	American wigeon	2
			Baird's sparrow	1
			blue-winged teal	4
			brown-headed cowbird	1
			chestnut-collared longspur	5
			horned lark	6
			killdeer	7
			mallard	2
			marbled godwit	2
			northern harrier	1
			northern shoveller	1
			red-winged blackbird	10
			savannah sparrow	1
			western meadowlark	3
			willet	1
			Wilson's phalarope	12
			Total	59
		Incidental	McCown's longspur	
Cottonwood Creek (Big Muddy)	6/8/2003	Survey	American robin	1
			bank swallow	2
			Brewer's blackbird	1
			brown-headed cowbird	8
			clay-colored sparrow	4
			cliff swallow	29
			common grackle	4
			eastern kingbird	3
			European starling	1
			grasshopper sparrow	2
			horned lark	2
			house sparrow	3

			killdeer	1
			lark bunting	6
			least flycatcher	1
			mallard	3
			mourning dove	2
			red-winged blackbird	2
			ring-necked pheasant	3
			savannah sparrow	1
			song sparrow	3
			Sprague's pipit	2
			vesper sparrow	1
			warbling vireo	1
			western kingbird	2
			western meadowlark	6
			Total	94
		Incidental	American white pelican	
			bank swallow	
			blue-winged teal	
			common snipe	
			gadwall	
			lesser scaup	
			northern pintail	
			say's phoebe	
Cottonwood Creek (Frenchman)	5/24/2003	Survey	brown thrasher	3
			brown-headed cowbird	6
			field sparrow	2
			mallard	1
			merlin	1
			mourning dove	5
			red-winged blackbird	5
			spotted towhee	3
			western meadowlark	12
			Total	38
		Incidental	black-billed magpie	
			gray catbird	
			gray partridge	
			lesser scaup	

			loggerhead shrike	
			merlin	
			pied-billed grebe	
			sharp-tailed grouse	
			Sprague's pipit	
			upland sandpiper	
Crow Creek	5/24/2003	Survey	American wigeon	1
			black-billed magpie	2
			Brewer's blackbird	10
			brown thrasher	2
			brown-headed cowbird	16
			eastern kingbird	3
			loggerhead shrike	3
			mallard	1
			mourning dove	4
			red-winged blackbird	6
			ring-billed gull	2
			sharp-tailed grouse	2
			vesper sparrow	1
			western meadowlark	4
			willet	2
			Total	59
		Incidental	Baird's sparrow	
			bank swallow	
			blue-winged teal	
			bobolink	
			Canada goose	
			clay-colored sparrow	
			gadwall	
			killdeer	
			northern pintail	
			sharp-tailed grouse	
			Sprague's pipit	
			upland sandpiper	
			willet	
Crow Creek	6/25/2003	Survey	Brewer's blackbird	12
			brown thrasher	1
			brown-headed cowbird	1

			eastern kingbird	3
			gadwall	2
			horned lark	7
			lark bunting	8
			lesser scaup	4
			loggerhead shrike	1
			marbled godwit	5
			mourning dove	3
			red-winged blackbird	5
			ring-necked pheasant	1
			Sprague's pipit	3
			western meadowlark	14
			Total	70
		Incidental	American wigeon	
			bank swallow	
			common nighthawk	
			great blue heron	
			killdeer	
			mallard	
			ring-necked pheasant	
			sharp-tailed grouse	
			willet	
Dog Creek	5/27/2003	Survey	American kestrel	3
			American robin	3
			black-billed magpie	7
			brown-headed cowbird	1
			Canada goose	5
			common raven	1
			gadwall	4
			killdeer	1
			mallard	2
			mourning dove	3
			northern flicker	1
			pinyon jay	6
			ring-necked pheasant	1
			rock dove	5
			unknown blackbird	1
			unknown swallow	7
			western meadowlark	2

			Total	53
		Incidental	American goldfinch chipping sparrow rock wren spotted towhee vesper sparrow violet-green swallow	
Dog Creek	6/26/2003	Survey	American kestrel American robin black-billed magpie cliff swallow golden eagle mourning dove northern flicker ring-necked pheasant rock dove rock wren western meadowlark Total	2 2 5 44 1 5 1 1 5 2 5 73
		Incidental	black-capped chickadee chipping sparrow common nighthawk lark sparrow mountain bluebird spotted towhee vesper sparrow violet-green swallow	
Dry Creek	6/8/2003	Survey	bank swallow Brewer's blackbird brown thrasher brown-headed cowbird eastern kingbird field sparrow killdeer mourning dove red-winged blackbird upland sandpiper	1 2 1 9 3 4 2 3 5 1

			vesper sparrow	2
			western meadowlark	6
			yellow warbler	2
			Total	41
		Incidental	mallard	
Duck Creek (Big Sandy)	6/21/2003	Survey	American goldfinch	1
			brown-headed cowbird	1
			eastern kingbird	1
			European starling	1
			horned lark	10
			killdeer	2
			mourning dove	2
			red-winged blackbird	14
			unknown sparrow	1
			vesper sparrow	1
			western meadowlark	1
			yellow-headed blackbird	8
			Total	43
		Incidental	American crow	
			clay-colored sparrow	
Duck Creek (Redwater)	6/7/2003	Survey	Baird's sparrow	2
			bank swallow	3
			brown-headed cowbird	2
			chestnut-collared longspur	1
			gadwall	4
			horned lark	1
			killdeer	1
			mallard	3
			marbled godwit	3
			northern shoveller	1
			red-winged blackbird	10
			savannah sparrow	4
			unknown blackbird	1
			western meadowlark	9
			Total	45

East Fork Fox Creek	6/7/2003	Survey	bank swallow	3
			blue-winged teal	5
			brown-headed cowbird	1
			Canada goose	2
			gadwall	1
			grasshopper sparrow	1
			mallard	5
			mourning dove	2
			red-winged blackbird	15
			ring-necked pheasant	1
			western meadowlark	6
			Wilson's phalarope	2
			yellow-headed blackbird	1
			Total	45
		Incidental	killdeer	
East Fork Little Porcupine Creek	6/22/2003	Survey	American wigeon	3
			blue-winged teal	5
			brown-headed cowbird	18
			common grackle	1
			eastern kingbird	4
			horned lark	2
			killdeer	2
			lark bunting	15
			red-winged blackbird	4
			savannah sparrow	1
			vesper sparrow	1
			western meadowlark	2
			Total	58
		Incidental	black-billed magpie	
			brown thrasher	
			chestnut-collared longspur	
			gadwall	
			loggerhead shrike	
			mallard	
			western meadowlark	

Fogarty Coulee	6/23/2003	Survey	American avocet	1
			Brewer's blackbird	8
			brown-headed cowbird	7
			horned lark	3
			killdeer	2
			marbled godwit	3
			northern pintail	1
			red-winged blackbird	3
			unknown gull	6
			vesper sparrow	8
			western meadowlark	5
			willet	7
			Total	54
		Incidental	bank swallow	
			blue-winged teal	
			gadwall	
			northern pintail	
Lake Creek	6/19/2003	Survey	bank swallow	1
			Brewer's blackbird	1
			brown-headed cowbird	2
			horned lark	29
			killdeer	1
			mallard	2
			marbled godwit	3
			red-winged blackbird	1
			unknown sparrow	3
			upland sandpiper	1
			western meadowlark	1
			willet	7
			yellow-headed blackbird	6
			Total	58
		Incidental	American wigeon	
			lark bunting	
			mallard	
			northern shoveller	
Little Cottonwood Creek	5/25/2003	Survey	American goldfinch	1
			American kestrel	2

			black-billed magpie	1
			brown thrasher	1
			brown-headed cowbird	5
			European starling	1
			gadwall	3
			killdeer	5
			lark bunting	2
			mallard	12
			mourning dove	4
			turkey vulture	1
			western kingbird	3
			western meadowlark	11
			willet	2
			Total	54
		Incidental	Baltimore oriole	
			bank swallow	
			Brewer's blackbird	
			eastern kingbird	
			gray partridge	
			lark sparrow	
			loggerhead shrike	
			marbled godwit	
			mountain bluebird	
			northern flicker	
			northern pintail	
			northern shoveller	
			red-winged blackbird	
			sharp-tailed grouse	
Little Pumpkin Creek	6/5/2003	Survey	American goldfinch	1
			Brewer's blackbird	1
			common grackle	6
			common yellowthroat	2
			lark sparrow	1
			mourning dove	7
			red-winged blackbird	14
			ring-necked pheasant	1
			sandhill crane	2
			tree swallow	2
			unknown blackbird	4

			unknown duck	1
			violet-green swallow	4
			western wood-pewee	1
			yellow warbler	3
			yellow-headed blackbird	1
			Total	51
		Incidental	blue-winged teal	
			bobolink	
			brown-headed cowbird	
			Bullock's oriole	
			killdeer	
			lark sparrow	
			sora	
			Wilson's phalarope	
Lost Creek	6/12/2003	Survey	American crow	2
			American goldfinch	1
			American kestrel	3
			black-billed magpie	1
			Brewer's blackbird	13
			European starling	5
			gray catbird	2
			lazuli bunting	2
			mourning dove	1
			spotted towhee	2
			vesper sparrow	1
			western meadowlark	6
			yellow warbler	1
			Total	40
		Incidental	common nighthawk	
			vesper sparrow	
North Fork Willow Creek	6/5/2003	Survey	American goldfinch	1
			bank swallow	6
			eastern kingbird	1
			European starling	5
			gadwall	2
			horned lark	2
			killdeer	1

			lark bunting	8
			mallard	2
			northern harrier	1
			red-winged blackbird	40
			western meadowlark	8
			yellow-headed blackbird	3
			Total	80
		Incidental	American wigeon	
			blue-winged teal	
			gadwall	
			northern shoveller	
			willet	
			Wilson's phalarope	
North Sunday Creek	6/4/2003	Survey	American kestrel	2
			American robin	4
			brown-headed cowbird	1
			Bullock's oriole	2
			eastern kingbird	1
			European starling	1
			field sparrow	1
			house wren	5
			mallard	2
			mourning dove	4
			red-winged blackbird	10
			western meadowlark	8
			yellow warbler	4
			Total	45
		Incidental	ring-necked pheasant	
Owl Creek	6/11/2003	Survey	American goldfinch	1
			American robin	2
			black-capped chickadee	2
			Brewer's blackbird	10
			brown-headed cowbird	1
			eastern kingbird	1
			gray catbird	2
			house wren	5
			lark sparrow	2
			lazuli bunting	1

			least flycatcher	3
			mourning dove	2
			northern flicker	2
			northern rough-winged swallow	1
			red-eyed vireo	2
			unknown duck	1
			veery	2
			western wood-pewee	1
			yellow warbler	6
			yellow-breasted chat	2
			Total	49
		Incidental	American crow	
			Bullock's oriole	
			European starling	
			gray catbird	
			house wren	
			lark sparrow	
			lazuli bunting	
			least flycatcher	
			northern rough-winged swallow	
			ovenbird	
			red-eyed vireo	
			ring-necked pheasant	
			spotted towhee	
			veery	
			western meadowlark	
			western wood-pewee	
			yellow warbler	
Pine Creek	6/20/2003	Survey	bobolink	3
			eastern kingbird	6
			killdeer	2
			mourning dove	2
			red-winged blackbird	9
			sharp-tailed grouse	2
			upland sandpiper	2
			western meadowlark	6
			Wilson's phalarope	2
			Total	34

		Incidental	common nighthawk mallard mourning dove sharp-tailed grouse	
Sage Creek (Wild Horse Lake)	6/22/2003	Survey	Brewer's blackbird Canada goose clay-colored sparrow common nighthawk eastern kingbird gadwall horned lark lark bunting mallard marbled godwit mourning dove northern harrier red-winged blackbird ring-necked pheasant unknown gull upland sandpiper western meadowlark Wilson's phalarope Total	7 6 2 1 2 2 15 13 1 1 8 1 11 1 2 2 7 4 86
		Incidental	American avocet American bittern western kingbird willet	
Sand Creek	6/5/2003	Survey	American crow American robin Brewer's blackbird brown-headed cowbird eastern kingbird house wren lark sparrow lazuli bunting mountain bluebird mourning dove	1 1 1 5 5 4 4 1 2 1

			northern flicker	3
			red-winged blackbird	3
			unknown Empidonax	1
			western meadowlark	7
			yellow warbler	7
			Total	46
		Incidental	American robin	
			bank swallow	
			Bullock's oriole	
			killdeer	
			western wood-pewee	
Sixshooter Creek	6/19/2003	Survey	Brewer's blackbird	6
			brown-headed cowbird	3
			chestnut-collared longspur	5
			cliff swallow	14
			horned lark	5
			long-billed curlew	1
			upland sandpiper	3
			western meadowlark	5
			Total	42
South Cottonwood Creek	6/10/2003	Survey	American kestrel	1
			Brewer's blackbird	1
			brown-headed cowbird	4
			common grackle	2
			common nighthawk	1
			eastern kingbird	3
			European starling	1
			horned lark	2
			loggerhead shrike	3
			mourning dove	7
			northern flicker	2
			red-winged blackbird	4
			upland sandpiper	4
			western meadowlark	6
			Total	41
		Incidental	killdeer	
			ring-necked pheasant	

South Fork Lisk Creek	6/8/2003	Survey	American goldfinch	2
			American robin	2
			black-capped chickadee	3
			brown thrasher	4
			brown-headed cowbird	7
			eastern kingbird	3
			gray catbird	3
			house wren	8
			least flycatcher	3
			marbled godwit	5
			mourning dove	3
			red-winged blackbird	2
			ring-necked pheasant	7
			spotted towhee	1
			Sprague's pipit	1
			western kingbird	5
			western meadowlark	6
			yellow warbler	7
			Total	72
Sprague Creek	6/23/2003	Incidental	common nighthawk	
			Swainson's hawk	
			yellow-breasted chat	
		Survey	Brewer's blackbird	4
			brown-headed cowbird	3
			chipping sparrow	1
			common nighthawk	1
			killdeer	2
			lark sparrow	1
			mourning dove	1
			red-winged blackbird	4
			western meadowlark	14
			Total	31
Steves Fork	5/22/2003	Survey		
		Incidental	brown-headed cowbird	
		Survey	American white pelican	7
			Brewer's blackbird	3
			Brewer's sparrow	2

			brown-headed cowbird	3
			Canada goose	1
			cliff swallow	13
			horned lark	1
			killdeer	1
			lark bunting	20
			mallard	3
			northern shoveller	2
			red-winged blackbird	6
			unknown gull	1
			western meadowlark	5
			Total	68
		Incidental	American wigeon	
			Canada goose	
			gadwall	
			mourning dove	
			unknown hawk	
Steves Fork	6/26/2003	Survey	Brewer's blackbird	6
			Brewer's sparrow	2
			brown-headed cowbird	2
			cliff swallow	19
			double-crested cormorant	1
			horned lark	1
			lark bunting	19
			mallard	1
			mourning dove	2
			red-winged blackbird	2
			unknown gull	3
			western meadowlark	3
			Total	61
		Incidental	California gull	
			common snipe	
			killdeer	
Telegraph Creek	6/24/2003	Survey	American goldfinch	2
			American robin	3
			black-capped chickadee	1
			Brewer's blackbird	5

			brown thrasher	3
			brown-headed cowbird	5
			eastern kingbird	3
			house wren	3
			killdeer	3
			lark sparrow	1
			mallard	2
			mourning dove	7
			northern pintail	9
			red-winged blackbird	1
			ring-necked pheasant	2
			spotted sandpiper	1
			spotted towhee	4
			western kingbird	2
			western meadowlark	12
			western wood-pewee	2
			willet	2
			Wilson's phalarope	1
			yellow warbler	7
			Total	81
		Incidental	blue-winged teal	
			common nighthawk	
			grasshopper sparrow	
			northern shoveller	
			sora	
Thompson Creek	5/23/2003	Survey	American goldfinch	1
			brown-headed cowbird	6
			Canada goose	4
			grasshopper sparrow	1
			horned lark	8
			lark bunting	9
			mallard	2
			mourning dove	2
			red-winged blackbird	8
			western meadowlark	12
			Wilson's phalarope	3
			Total	56
		Incidental	chestnut-collared longspur	

			grasshopper sparrow	
			lark sparrow	
			mallard	
			McCown's longspur	
			northern harrier	
			rock wren	
			vesper sparrow	
Thompson Creek	6/25/2003	Survey	field sparrow	1
			grasshopper sparrow	1
			horned lark	5
			killdeer	1
			lark bunting	15
			mourning dove	3
			red-winged blackbird	6
			western meadowlark	5
			Total	37
		Incidental	chestnut-collared longspur	
			grasshopper sparrow	
			lark sparrow	
Timber Creek	6/9/2003	Survey	brown-headed cowbird	2
			horned lark	1
			lark bunting	15
			mallard	3
			mourning dove	6
			northern flicker	2
			red-winged blackbird	11
			western meadowlark	11
			Wilson's phalarope	1
			Total	52
		Incidental	common nighthawk	
			eastern kingbird	
			killdeer	
			upland sandpiper	
Tullock Creek	6/9/2003	Survey	American crow	1
			American robin	1
			bank swallow	1

			common grackle	2
			common nighthawk	1
			eastern kingbird	4
			European starling	4
			house wren	2
			killdeer	1
			lark sparrow	1
			mallard	8
			mourning dove	3
			northern flicker	1
			northern rough-winged swallow	2
			red-winged blackbird	5
			ring-necked pheasant	6
			rock dove	2
			tree swallow	3
			western kingbird	4
			western meadowlark	5
			western wood-pewee	1
			wild turkey	1
			yellow warbler	4
			Total	63
		Incidental	American goldfinch	
			Bullock's oriole	
			great blue heron	
			lark sparrow	
			spotted towhee	
			violet-green swallow	
			wood duck	
U All Creek	6/25/2003	Survey	bank swallow	2
			cliff swallow	1
			grasshopper sparrow	2
			horned lark	16
			killdeer	2
			mourning dove	2
			red-winged blackbird	1
			savannah sparrow	1
			western kingbird	3

			western meadowlark	17
			Total	47
West Blacktail Creek	6/10/2003	Survey	American kestrel	1
			American robin	1
			Brewer's blackbird	7
			brown-headed cowbird	2
			Canada goose	1
			common grackle	1
			eastern kingbird	3
			European starling	15
			gadwall	5
			killdeer	2
			lark bunting	6
			loggerhead shrike	2
			mourning dove	8
			northern flicker	1
			northern shoveller	1
			red-winged blackbird	1
			warbling vireo	1
			western meadowlark	6
			yellow-headed blackbird	2
			Total	66
		Incidental	American green-winged teal	
			American kestrel	
			American wigeon	
			Brewer's blackbird	
			common nighthawk	
			European starling	
			gadwall	
			loggerhead shrike	
			northern shoveller	
			prairie falcon	
			upland sandpiper	
			western wood-pewee	
			Wilson's phalarope	
Wild Horse Creek	5/26/2003	Survey	American goldfinch	4
			American kestrel	2

			bank swallow	5
			brown-headed cowbird	5
			Canada goose	2
			eastern kingbird	2
			European starling	4
			gadwall	1
			lark bunting	2
			loggerhead shrike	3
			mallard	1
			marbled godwit	3
			mourning dove	4
			red-winged blackbird	8
			ring-necked pheasant	4
			unknown gull	1
			western kingbird	1
			western meadowlark	5
			yellow warbler	4
			Total	61
		Incidental	American wigeon	
			black-billed magpie	
			Bullock's oriole	
			clay-colored sparrow	
			European starling	
			grasshopper sparrow	
			gray catbird	
			spotted towhee	
Willow Creek (Musselshell)	6/24/2003	Survey	American robin	5
			Brewer's blackbird	3
			brown-headed cowbird	4
			cliff swallow	1
			golden eagle	1
			gray catbird	2
			horned lark	2
			lazuli bunting	2
			long-billed curlew	1
			mallard	1
			mourning dove	1
			red-winged blackbird	13
			spotted sandpiper	1

	western meadowlark	2
	yellow warbler	1
	Total	40
Incidental	American robin	
	killdeer	
	vesper sparrow	
	western meadowlark	
	Grand Total	2,450

Table 4. Mammals captured during 2003.

Site	Date Set	Species	Total
Assiniboine Creek	7/11/2003	<i>Peromyscus sp.</i>	3
Assiniboine Creek	9/17/2003	<i>Peromyscus sp.</i>	15
Black Coulee	8/25/2003	<i>Peromyscus sp.</i>	7
Cabin Creek	7/27/2003	<i>Peromyscus sp.</i>	15
Cameron Creek	8/5/2003	<i>Peromyscus sp.</i>	11
Chip Creek	8/18/2003	<i>Peromyscus sp.</i>	12
Cottonwood Coulee	8/22/2003	<i>Peromyscus sp.</i>	4
Cottonwood Creek (Big Muddy)	9/5/2003	house mouse	1
		<i>Peromyscus sp.</i>	5
Cottonwood Creek (Frenchman)	8/21/2003	<i>Peromyscus sp.</i>	3
Crow Creek	9/18/2003	<i>Peromyscus sp.</i>	7
Crow Creek	7/10/2013	<i>Peromyscus sp.</i>	1
Dog Creek	7/14/2003	<i>Peromyscus sp.</i>	12
Dog Creek	9/19/2003	<i>Peromyscus sp.</i>	24
Dry Creek	7/29/2003	<i>Peromyscus sp.</i>	7
Duck Creek (Big Sandy)	8/24/2003	<i>Peromyscus sp.</i>	14
Duck Creek (Redwater)	9/8/2003	<i>Peromyscus sp.</i>	2
Fogarty Coulee	8/19/2003	<i>Peromyscus sp.</i>	5
Fox Creek	9/4/2003	<i>Peromyscus sp.</i>	5
Lake Creek	8/24/2003	<i>Peromyscus sp.</i>	7

Little Cottonwood Creek	7/12/2003	<i>Peromyscus sp.</i>	6
Little Porcupine Creek	9/6/2003	<i>Peromyscus sp.</i>	16
Little Pumpkin Creek	7/24/2003	<i>Peromyscus sp.</i>	2
Lost Creek	8/12/2003	<i>Peromyscus sp.</i>	7
North Fork Willow Creek	7/22/2003	<i>Peromyscus sp.</i>	16
North Sunday Creek	9/3/2003	<i>Peromyscus sp.</i>	39
Owl Creek	8/11/2003	<i>Peromyscus sp.</i>	8
Pine Creek	7/28/2003	<i>Peromyscus sp.</i>	6
		prairie vole	1
Sage Creek	8/23/2003	house mouse	1
		<i>Peromyscus sp.</i>	24
Sand Creek	7/23/2003	<i>Peromyscus sp.</i>	2
Sixshooter Creek	8/14/2003	northern grasshopper mouse	1
		<i>Peromyscus sp.</i>	5
South Cottonwood Creek	7/26/2003	<i>Peromyscus sp.</i>	20
South Fork Lisk Creek	9/7/2003	<i>Peromyscus sp.</i>	10
Sprague Creek	7/21/2003	<i>Peromyscus sp.</i>	2
Steves Fork	7/9/2003	<i>Peromyscus sp.</i>	7
Steves Fork	9/16/2003	<i>Peromyscus sp.</i>	7
Telegraph Creek	7/13/2003	<i>Peromyscus sp.</i>	24
Thompson Creek	7/8/2003	<i>Peromyscus sp.</i>	12
Thompson Creek	9/15/2003	<i>Peromyscus sp.</i>	13

Timber Creek	7/25/2003	<i>Peromyscus sp.</i>	7
Trail Creek	8/10/2003	<i>Peromyscus sp.</i>	4
Tullock Creek	8/9/2003	<i>Peromyscus sp.</i>	1
U All Creek	8/8/2003	none	
West Blacktail Creek	8/7/2003	<i>Peromyscus sp.</i>	23
Wild Horse Creek	8/20/2003	<i>Peromyscus sp.</i>	18
Willow Creek	8/6/2003	<i>Peromyscus sp.</i>	3
Grand Total			445
