A Comprehensive Aquatics Survey of Minnesota River Tributaries

by

Andy Burgess and Jeff Shearer

South Dakota Game, Fish and Parks

February 13, 2008

Study Background

This study was made possible through a State Wildlife Grant T-17-R, study number 2604. Jeff Shearer (formerly of SD Game, Fish and Parks, SDGFP) and Steve Wall completed all field work. Doug Backlund (SDGFP) identified freshwater mussel shells collected during the survey. Andy Burgess (Aquatic Biologist, SDGFP) compiled the collected data into report form.

Methods / Results

Field surveys were conducted on 17 streams draining to the Minnesota River watershed in South Dakota. Fish, mussels and aquatic insect communities were sampled once during the summer of 2005, in July and August. Study sites and sampling dates are listed in Appendix A. The fish community was sampled by seining or backpack electrofishing (depending on the amount of in-stream habitat available at each site). Fish were identified in the field, a list of fish species across sampling sites is provided in Appendix B. Mussels were surveyed using methods described in Perkins et al. (1997). Live mussels were identified in the field and a representative sample of shells present were gathered and returned to the lab for expert identification. A list of all mussels sampled across sites is provided in Appendix C. The macroinvertebrate community was sampled with a D-frame kick net. A total of eight kick samples were taken from all habitats and composited to form a reach-wide sample. Macroinvertebrates were preserved in 95% Ethyl alcohol in the field and returned to the lab for identification. Macroinvertebrates were removed from samples and identified to the lowest feasible taxonomic level by personnel at the Valley City State University, Macroinvertebrate lab, Valley City, ND. A list of Macroinvertebrate taxa identified across sampling sites is provided in Appendix D. A summary of the relative distribution of macroinvertebrate functional and taxonomic traits across sampling sites is provided in Appendix E. A simple subjective summary of habitat conditions was completed at each sampling site when possible. A survey of relative distribution of stream channel units and significant instream habitat was recorded. An index of microhabitat and riparian condition within each study site was also conducted. A mean index value was provided for each variable and an overall mean index value was calculated for each study site. Sampling site values for: habitat, mussels, fish and macroinvertebrates sampled along with associated field notes are provided here for each study site.

Results:

Sampling reach: Checapa Creek 1
Date sampled: 08/24/2005
Fish sampling method: Electrofishing

Field notes: None taken

Habitat survey
Not completed
Sampling reach length: 150m

Habitat index:
Not completed

Mussels sampled:
None found

Fish sampled:

Species	Abundance	% Abundance
Blacknose dace	3	13.64
Creek chub	19	86.36
Total =	22	100.00

Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Optioservus	L	8	2.52
Optioservus	A	2	0.63
Chironominae	L	6	1.89
Orthocladiinae	L	33	10.38
Chironomidae	P	1	0.31
Simulium	L	160	50.31
Tipulidae	L	1	0.31
Dicranota	L	2	0.63
Pericoma	L	1	0.31
Baetis	N	86	27.04
Haemopis	.	1	0.31
Gammarus	.	5	1.57
Oligochaeta	.	1	0.31
Ceratopsyche	L	4	1.26
Limnephilidae	L	5	1.57
Arachnida		1	0.31
Tipula	L	1	0.31
	Total=	318	100.00

Sampling reach: Cobb Creek 1
Date sampled: 07/28/2005
Fish sampling method: Seining

Field notes: Decent site, lightly grazed pasture, lots of fish in pools; 1 matching pair of giant floaters found.

Habitat survey:

Habitat variable	Value
Sampling reach length	100m
Sampling reach mean width	2.3m
Percent riffle	30%
Percent run	20%
Percent pool	50%
Large woody debris	rare
Periphyton / Macrophytes	moderate
Canopy Shading	5-14%

Habitat index:

Habitat variables	Score
Epifaunal Substrate/Available cover	3
Embeddedness	2
Belocity/Depth Regime	3
Sediment Deposition	3
Channel Alteration	4
Vegetative Cover left bank	3
Vegetative Cover right bank	3
Riparian Zone Width Left bank	5
Riparian Zone Width Right bank	5
Local Disturbance	4
Mean score=	**3.5**
5=optimal; 4-3=suboptimal; 2-1=marginal; 0=poor	

Mussels sampled:

Common name	Genus	Species	Live	Half shells	Matched shells
Giant floater	Pyganodon	*grandis*			1

Cobb Creek 1 (continued)

Fish sampled:

Species	Abundance	% Abundance
Bigmouth shiner	118	6.61
Blacknose dace	342	19.16
Bluntnose minnow	29	1.62
Brassy minnow	194	10.87
Brook stickleback	14	0.78
Central stoneroller	454	25.43
Common shiner	369	20.67
Creek chub	205	11.48
Fathead minnow	27	1.51
Hornyhead chub	12	0.67
Johnny darter	13	0.73
White sucker	8	0.45
Total=	1785	100.00

Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Dubiraphia	L	11	3.77
Ceratopsyche	L	39	13.36
Caenis	N	38	13.01
Baetidae	N	21	7.19
Hyalella *azteca*	.	4	1.37
Chironomidae	P	2	0.68
Heptageniidae	N	1	0.34
Pisidium	.	3	1.03
Helicopsyche	L	2	0.68
Corixidae	N	2	0.68
Hydracarina	.	1	0.34
Helophorus	A	1	0.34
Hexagenia	N	1	0.34
Tanypodinae	L	17	5.82
Chironominae	L	93	31.85
Orthocladiinae	L	17	5.82
Probezzia	L	1	0.34
Oligochaeta	.	1	0.34
Stenelmis	L	5	1.71
Optioservus	L	16	5.48
Cheumatopsyche	L	12	4.11
Hydropsychidae	L	3	1.03
Empididae	P	1	0.34
	Total=	292	100.00

Sampling reach: Cobb Creek 2
Date sampled: 07/28/2005
Fish sampling method: Seining

Field notes: Site in pasture, cattle using stream banks, lots of sand and fine gravel, good flows.

Habitat survey

Habitat variable	Value
Sampling reach length	104
Sampling reach mean width	2.6
Percent riffle	.
Percent run	.
Percent pool	.
Large woody debris	.
Periphyton / Macrophytes	.
Canopy Shading	.

Habitat index

Habitat variables	Score
Epifaunal Substrate/Available cover	3
Embeddedness	3
Belocity/Depth Regime	4
Sediment Deposition	3
Channel Alteration	4
Vegetative Cover left bank	3
Vegetative Cover right bank	3
Riparian Zone Width Left bank	3
Riparian Zone Width Right bank	3
Local Disturbance	3
Mean score=	**3.2**
5=optimal; 4-3=suboptimal; 2-1=marginal; 0=poor	

Mussels sampled:

Common name	Genus	Species	Live	Half shells	Matched shells
Giant floater	Pyganodon	*grandis*		2	
White heelsplitter	Lasmigona	*complanata*	2	1	
Creek heelsplitter	Lasmigona	*compressa*		1	2
Cylindrical papershell	Anodontoides	*ferussacianus*			4

Cobb Creek 2 (continued)

Fish sampled:

Species	Abundance	% Abundance
Bigmouth shiner	24	4.56
Blacknose dace	9	1.71
Bluntnose minnow	15	2.85
Brassy minnow	12	2.28
Brook stickleback	2	0.38
Central stoneroller	114	21.67
Common shiner	197	37.45
Creek chub	76	14.45
Fathead minnow	5	0.95
Hornyhead chub	42	7.98
Johnny darter	26	4.94
White sucker	4	0.76
Total=	526	100.00

Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Sphaerium	.	13	4.44
Cincinnatia *cincinnatiensis*	.	12	4.10
Orconectes	.	1	0.34
Cheumatopsyche	L	35	11.95
Caenis	N	19	6.48
Tricorythodes	N	2	0.68
Baetidae	N	4	1.37
Heptageniidae	N	1	0.34
Helicopsyche	L	1	0.34
Hyalella *azteca*	.	2	0.68
Chironomidae	P	2	0.68
Hydracarina	.	3	1.02
Dubiraphia	L	13	4.44
Nectopsyche	L	1	0.34
Coenagrionidae	L	1	0.34
Hexagenia	N	1	0.34
Oligochaeta	.	10	3.41
Ceratopogonidae	L	2	0.68
Dicranota	L	2	0.68
Chironominae	L	87	29.69
Tanypodinae	L	25	8.53
Orthocladiinae	L	34	11.60
Pisidium	.	5	1.71
Physa	.	2	0.68
Ceratopsyche	L	3	1.02
Macronychus	L	3	1.02
Stenelmis	L	8	2.73
Hydrophilidae	L	1	0.34
	Total=	293	100.00

Sampling reach: Cobb Creek 3
Date sampled: 08/02/2005
Fish sampling method: Seining

Field notes: Light grazing, cows using stream; lots of complex habitat with big pools. Cobles/boulders present, some siltation. Nice site.

Habitat survey:

Habitat variable	Value
Sampling reach length	212
Sampling reach mean width	5.1
Percent riffle	10
Percent run	40
Percent pool	50
Large woody debris	rare
Periphyton / Macrophytes	moderate
Canopy Shading	5-14%

Habitat index

Habitat variables	Score
Epifaunal Substrate/Available cover	4
Embeddedness	3
Belocity/Depth Regime	4
Sediment Deposition	3
Channel Alteration	5
Vegetative Cover left bank	4
Vegetative Cover right bank	4
Riparian Zone Width Left bank	3
Riparian Zone Width Right bank	3
Local Disturbance	4
Mean score=	**3.7**
5=optimal; 4-3=suboptimal; 2-1=marginal; 0=poor	

Mussels sampled:

Common name	Genus	Species	Live	Half shells	Matched shells
Cylindrical papershell	Anodontoides	*ferussacianus*		3	
Creeper	Strophitus	*undulatus*		1	
Fat mucket	Lapsilis	*siliquoidea*		1	
Creek heelsplitter	Lasmigona	*compressa*			1
Fingernail clam	Sphaerium	*sp.*			1

Cobb Creek 3 (continued)

Fish Sampled:

Species	Abundance	% Abundance
Bigmouth shiner	8	1.48
Black bullhead	1	0.18
Blacknose dace	30	5.55
Blackside darter	1	0.18
Bluntnose minnow	25	4.62
Brassy minnow	8	1.48
Brook stickleback	4	0.74
Central stoneroller	170	31.42
Common carp	1	0.18
Common shiner	164	30.31
Creek chub	60	11.09
Fathead minnow	15	2.77
Hornyhead chub	30	5.55
Johnny darter	13	2.40
White sucker	11	2.03
Total=	541	100.00

Cobb Creek 3 (continued)
Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Cincinnatia *cincinnatiensis*	.	32	11.15
Mollusca	.	9	3.14
Sphaerium	L	5	1.74
Helicopsyche	L	56	19.51
Caenis	N	9	3.14
Baetidae	N	10	3.48
Hexagenia	N	10	3.48
Dubiraphia	L	22	7.67
Optioservus	A	2	0.70
Hydropsychidae	L	2	0.70
Gomphidae	N	1	0.35
Corixidae	N	5	1.74
Coenagrionidae	L	2	0.70
Chironomidae	P	1	0.35
Dicranota	L	3	1.05
Oecetis	L	1	0.35
Oligochaeta	.	5	1.74
Probezzia	L	2	0.70
Ostracoda	.	3	1.05
Chironominae	L	40	13.94
Tanypodinae	L	25	8.71
Orthocladiinae	L	4	1.39
Physa	.	5	1.74
Stenonema	L	2	0.70
Leucrocuta	N	2	0.70
Stenelmis	L	8	2.79
Optioservus	L	4	1.39
Dubiraphia	A	1	0.35
Empididae	P	1	0.35
Ceratopsyche	L	1	0.35
Cheumatopsyche	L	2	0.70
Pisidium	.	3	1.05
Isonychia	N	9	3.14
	Total=	287	100.00

Sampling reach: Crow Timber Creek 1
Date sampled: 07/27/2005
Fish sampling method: Seining

Field notes: Site in pasture; Good spring inflow, light grazing; Iron deposits; Cool water.

Habitat survey:

Habitat variable	Value
Sampling reach length	100
Sampling reach mean width	2.5
Percent riffle	10
Percent run	50
Percent pool	40
Large woody debris	rare
Periphyton / Macrophytes	abundant
Canopy Shading	5-14%

Habitat index:

Habitat variables	Score
Epifaunal Substrate/Available cover	3
Embeddedness	1
Belocity/Depth Regime	3
Sediment Deposition	2
Channel Alteration	5
Vegetative Cover left bank	4
Vegetative Cover right bank	4
Riparian Zone Width Left bank	4
Riparian Zone Width Right bank	4
Local Disturbance	4
Mean score=	**3.4**
5=optimal; 4-3=suboptimal; 2-1=marginal; 0=poor	

Mussels sampled:
None found

Fish sampled:

Species	Abundance	% Abundance
Blacknose dace	86	22.93
Brassy minnow	6	1.60
Brook stickleback	106	28.27
Central stoneroller	16	4.27
Creek chub	35	9.33
Fathead minnow	70	18.67
Iowa darter	52	13.87
Johnny darter	2	0.53
White sucker	2	0.53
Total=	375	100.00

Crow Timber Creek 1 (continued)

Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Hyalella *azteca*	.	51	15.50
Dubiraphia	L	34	10.33
Tipula	L	1	0.30
Chrysops	L	1	0.30
Berosus	L	1	0.30
Baetidae	N	11	3.34
Caenis	N	8	2.43
Physa	.	8	2.43
Ceratopsyche	L	1	0.30
Dubiraphia	A	2	0.61
Corixidae	A	1	0.30
Collembola	.	2	0.61
Orthocladiinae	L	5	1.52
Chironomidae	P	1	0.30
Hydrophilidae	A	1	0.30
Dytiscidae	L	1	0.30
Chironominae	L	163	49.54
Tanypodinae	L	24	7.29
Thysanoptera	.	1	0.30
Cyclopoida	.	2	0.61
Daphniidae	.	3	0.91
Annelida	.	1	0.30
Hydracarina	.	1	0.30
Optioservus	L	4	1.22
Sialis	L	1	0.30
	Total=	329	100.00

Sampling reach: Gary Creek 1
Date sampled: 07/26/2005
Fish sampling method: Electrofishing

Field notes: Site on GPA, has heavy silt in some areas; trout present, not many other fish.

Habitat survey:

Habitat variable	Value
Sampling reach length	160
Sampling reach mean width	4.03
Percent riffle	30
Percent run	40
Percent pool	30
Large woody debris	moderate
Periphyton / Macrophytes	moderate
Canopy Shading	65-84%

Habitat index:

Habitat variables	Score
Epifaunal Substrate/Available cover	4
Embeddedness	3
Belocity/Depth Regime	4
Sediment Deposition	3
Channel Alteration	5
Vegetative Cover left bank	5
Vegetative Cover right bank	5
Riparian Zone Width Left bank	5
Riparian Zone Width Right bank	5
Local Disturbance	4
Mean score=	**4.3**
5=optimal; 4-3=suboptimal; 2-1=marginal; 0=poor	

Mussels sampled:
None found

Fish sampled:

Species	Abundance	% Abundance
Blacknose dace	43	17.48
Brassy minnow	67	27.24
Brown trout	10	4.07
Central stoneroller	2	0.81
Creek chub	22	8.94
Fathead minnow	97	39.43
Johnny darter	2	0.81
Northern redbelly dace	3	1.22
Total=	246	100.00

Gary Creek 1 (continued)

Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Optioservus	L	2	0.67
Tanypodinae	L	2	0.67
Chironominae	L	138	46.31
Orthocladiinae	L	28	9.40
Dicranota	L	3	1.01
Chironomidae	P	2	0.67
Baetidae	N	7	2.35
Erpobdellidae	.	3	1.01
Oligochaeta	.	53	17.79
Ostracoda	.	16	5.37
Sphaerium	.	1	0.34
Ceratopsyche	L	25	8.39
Hydroptilidae	L	1	0.34
Hydracarina	.	6	2.01
Caenis	N	1	0.34
Cheumatopsyche	L	8	2.68
Hesperophylax	L	1	0.34
Probezzia	L	1	0.34
	Total=	298	100.00

Sampling reach: Monigan Creek 1
Date sampled: 07/25/2005
Fish sampling method: Electrofishing.

Field notes: Site on GPA; Nice stream, lots of boulders.

Habitat survey:

Habitat variable	Value
Sampling reach length	164
Sampling reach mean width	4.1
Percent riffle	50
Percent run	10
Percent pool	40
Large woody debris	rare
Periphyton / Macrophytes	moderate
Canopy Shading	5-14%

Habitat index:

Habitat variables	Score
Epifaunal Substrate/Available cover	3
Embeddedness	4
Belocity/Depth Regime	4
Sediment Deposition	4
Channel Alteration	5
Vegetative Cover left bank	5
Vegetative Cover right bank	5
Riparian Zone Width Left bank	5
Riparian Zone Width Right bank	5
Local Disturbance	4
Mean score=	**4.4**
5=optimal; 4-3=suboptimal; 2-1=marginal; 0=poor	

Mussels sampled:
None found

Fish sampled:

Species	Abundance	% Abundance
Bigmouth shiner	10	0.82
Blacknose dace	287	23.45
Brassy minnow	3	0.25
Brook stickleback	1	0.08
Central stoneroller	235	19.20
Common shiner	30	2.45
Creek chub	128	10.46
Fathead minnow	453	37.01
Hornyhead chub	61	4.98
Johnny darter	16	1.31
Total=	1224	100.00

Monigan Creek 1 (continued)

Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Ceratopsyche	L	42	13.64
Neotrichia	L	1	0.32
Ochrotrichia	L	2	0.65
Hydroptila	L	3	0.97
Nectopsyche	L	1	0.32
Stenelmis	L	32	10.39
Baetidae	N	39	12.66
Caenis	N	19	6.17
Pisidium	.	3	0.97
Physa	.	2	0.65
Arachnida	.	1	0.32
Stenelmis	A	1	0.32
Hemerodromia	L	5	1.62
Oligochaeta	.	9	2.92
Atherix	L	1	0.32
Hydrophilidae	L	1	0.32
Paracymus	A	1	0.32
Chironomidae	P	1	0.32
Gomphidae	N	1	0.32
Chironominae	L	91	29.55
Orthocladiinae	L	27	8.77
Probezzia	L	1	0.32
Acroneuria	N	1	0.32
Orconectes	.	1	0.32
Cheumatopsyche	L	4	1.30
Optioservus	L	9	2.92
Dicranota	L	4	1.30
Optioservus	A	1	0.32
Hydracarina	.	3	0.97
Hexagenia	N	1	0.32
	Total=	308	100.00

Sampling reach: Monigan Creek 2
Date sampled: 08/02/2005
Fish sampling method: Seining.

Field notes: Transect A = big pool.

Habitat survey:

Habitat variable	Value
Sampling reach length	100
Sampling reach mean width	2.3
Percent riffle	.
Percent run	.
Percent pool	.
Large woody debris	.
Periphyton / Macrophytes	.
Canopy Shading	.

Habitat index:
Not completed

Mussels sampled:

Common name	Genus	Species	Live	Half shells	Matched shells
White heelsplitter	Lasmigona	*complanata*	1		
Cylindrical papershell	Anodontoides	*ferussacianus*		4	
Fat mucket	Lapsilis	*siliquoidea*		1	

Fish sampled:

Species	Abundance	% Abundance
Black bullhead	26	3.40
Blacknose dace	70	9.16
Brassy minnow	6	0.79
Brook stickleback	12	1.57
Central stoneroller	25	3.27
Common shiner	254	33.25
Creek chub	69	9.03
Fathead minnow	204	26.70
Green sunfish	2	0.26
Hornyhead chub	22	2.88
Iowa darter	33	4.32
Johnny darter	22	2.88
Northern redbelly dace	15	1.96
Orangespotted sunfish	1	0.13
White sucker	3	0.39
Total=	764	100.00

Monigan Creek 2 (continued)

Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Stenelmis	L	126	42.57
Sphaerium	.	7	2.36
Physa	.	2	0.68
Caenis	N	13	4.39
Baetidae	N	12	4.05
Hexagenia	N	1	0.34
Hydropsychidae	L	3	1.01
Hyalella *azteca*		4	1.35
Chrysops	L	1	0.34
Stenelmis	A	2	0.68
Erpobdella *punctata*	.	1	0.34
Oligochaeta	.	2	0.68
Dicranota	L	1	0.34
Chironominae	L	50	16.89
Tanypodinae	L	9	3.04
Orthocladiinae	L	4	1.35
Optioservus	L	14	4.73
Dubiraphia	L	27	9.12
Pisidium	.	11	3.72
Ceratopsyche	L	4	1.35
Cheumatopsyche	L	1	0.34
Orconectes		1	0.34
	Total=	296	100.00

Sampling reach: Monigan Creek 3
Date sampled: 08/01/2005
Fish sampling method: Electrofishing.

Field notes: Very warm water; Fish kill likely; Lots of vegetation in pools; tough to shock; Poor looking site but NRP present; Grazing pressure light.

Habitat survey:

Habitat variable	Value
Sampling reach length	100
Sampling reach mean width	2.3
Percent riffle	20
Percent run	0
Percent pool	80
Large woody debris	rare
Periphyton / Macrophytes	abundant
Canopy Shading	<5%

Habitat index:

Habitat variables	Score
Epifaunal Substrate/Available cover	3
Embeddedness	2
Belocity/Depth Regime	3
Sediment Deposition	3
Channel Alteration	4
Vegetative Cover left bank	3
Vegetative Cover right bank	3
Riparian Zone Width Left bank	3
Riparian Zone Width Right bank	3
Local Disturbance	4
Mean score=	**3.1**
5=optimal; 4-3=suboptimal; 2-1=marginal; 0=poor	

Mussels sampled:

Common name	Genus	Species	Live	Half shells	Matched shells
Creek heelsplitter	Lasmigona	*compressa*			2
Cylindrical papershell	Anodontoides	*ferussacianus*		7	

Monigan Creek 3 (continued)

Fish sampled:

Species	Abundance	% Abundance
Blacknose dace	20	5.25
Brassy minnow	5	1.31
Brook stickleback	78	20.47
Central stoneroller	30	7.87
Common shiner	32	8.40
Creek chub	97	25.46
Fathead minnow	92	24.15
Iowa darter	19	4.99
Johnny darter	1	0.26
Northern redbelly dace	6	1.57
White sucker	1	0.26
Total=	381	100.00

Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Pisidiidae	.	68	24.03
Planorbella *trivolvis*	.	2	0.71
Hyalella *azteca*	.	63	22.26
Stenelmis	L	33	11.66
Caenis	N	29	10.25
Baetidae	N	3	1.06
Helicopsyche	L	5	1.77
Orconectes	.	2	0.71
Coenagrionidae	N	2	0.71
Stenelmis	A	1	0.35
Oligochaeta	.	6	2.12
Placobdella *ornata*	.	1	0.35
Chironomidae	P	1	0.35
Corixidae	N	1	0.35
Dytiscidae	L	1	0.35
Chironominae	L	17	6.01
Tanypodinae	L	10	3.53
Orthocladiinae	L	1	0.35
Probezzia	L	1	0.35
Ferrissia	.	3	1.06
Physa	.	7	2.47
Dubiraphia	L	16	5.65
Arachnida	.	1	0.35
Laccobius	L	1	0.35
Pisidium	.	8	2.83
	Total=	283	100.00

Sampling reach: North Fork Yellowbank River 1
Date sampled: 08/30/2005
Fish sampling method: Seining.

Field notes: Stream site is a series of beaver pools, heavy algae and snags;

Habitat survey:

Habitat variable	Value
Sampling reach length	
Sampling reach mean width	
Percent riffle	0
Percent run	20
Percent pool	80
Large woody debris	moderate
Periphyton / Macrophytes	abundant
Canopy Shading	5-14%

Habitat index:
Not completed

Mussels sampled:

Common name	Genus	Species	Live	Half shells	Matched shells
Fat mucket	Lapsilis	*siliquoidea*	2		
Pond mussel	Ligumia	*subrostrata*		1	

Fish sampled:

Species	Abundance	% Abundance
Black bullhead	412	40.04
Blacknose dace	7	0.68
Blackside darter	1	0.10
Bluntnose minnow	17	1.65
Common shiner	510	49.56
Creek chub	10	0.97
Fathead minnow	2	0.19
Green sunfish	4	0.39
Hornyhead chub	16	1.55
Johnny darter	11	1.07
Northern pike	1	0.10
Tadpole madtom	37	3.60
White sucker	1	0.10
Total=	1029	100.00

North Fork Yellowbank River 1 (continued)

Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Pisidium	.	32	10.03
Physa	.	8	2.51
Corixidae	N	129	40.44
Caenidae	N	14	4.39
Dubiraphia	L	10	3.13
Enallagma	L	8	2.51
Hyalella *azteca*	.	2	0.63
Ceratopogonidae	L	2	0.63
Chironomidae	P	1	0.31
Tanypodinae	L	9	2.82
Chironominae	L	38	11.91
Simulium	L	1	0.31
Oligochaeta	.	38	11.91
Cyclopidae	.	3	0.94
Daphniidae	.	4	1.25
Sphaerium	.	9	2.82
Ferrissia	.	1	0.31
Palmacorixa	A	1	0.31
Sigara	A	3	0.94
Haliplus	L	1	0.31
Probezzia	L	4	1.25
Helisoma *anceps*	.	1	0.31
	Total=	319	100.00

Sampling reach: North Fork Yellowbank River 2
Date sampled: 07/09/2005
Fish sampling method: Electrofishing.

Field notes: Big pools lots of boulders. Sampled subsection of transects

Habitat survey:
Not completed

Habitat index:
Not completed

Mussels sampled:

Common name	Genus	Species	Live	Half shells	Matched shells
Wabash Pigtoe	Fusconaia	*flava*			2
Cylindrical papershell	Anodontoides	*ferussacianus*		8	
Giant floater	Pyganodon	*grandis*		19	1
Fat mucket	Lapsilis	*siliquoidea*		3	3
Creeper	Strophitus	*undulatus*		6	
White heelsplitter	Lasmigona	*complanata*			1

Fish sampled:

Species	**Abundance**	**% Abundance**
Bigmouth shiner	8	0.91
Black bullhead	2	0.23
Blacknose dace	60	6.80
Blackside darter	14	1.59
Bluntnose minnow	67	7.60
Brassy minnow	7	0.79
Central mudminnow	5	0.57
Central stoneroller	245	27.78
Common carp	1	0.11
Common shiner	200	22.68
Creek chub	134	15.19
Fathead minnow	3	0.34
Green sunfish	9	1.02
Hornyhead chub	38	4.31
Iowa darter	4	0.45
Johnny darter	16	1.81
Orangespotted sunfish	22	2.49
Rock bass	20	2.27
Carmine shiner	3	0.34
Sand shiner	1	0.11
White sucker	23	2.61
Total=	882	100.00

North Fork Yellowbank River 2 (continued)

Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Hyalella *azteca*	.	3	0.96
Stenelmis	L	4	1.29
Tanypodinae	L	3	0.96
Chironominae	L	21	6.75
Orthocladiinae	L	4	1.29
Chironomidae	P	1	0.32
Caenidae	L	257	82.64
Stenacron	N	5	1.61
Physa	.	2	0.64
Coenagrionidae	L	2	0.64
Pisidiidae	.	1	0.32
Cheumatopsyche	L	5	1.61
Oecetis	L	1	0.32
Hydracarina	.	1	0.32
Amnicola *limosa*	.	1	0.32
	Total=	311	100.00

Sampling reach: South Fork Whetstone 1
Date sampled: 08/23/2005
Fish sampling method: Seining.

Field notes: Did not sample reach, no fish observed; Sampled pool under bridge

Habitat survey:
Not completed

Habitat index:
Not completed

Mussels sampled:

Common name	Genus	Species	Live	Half shells	Matched shells
Fingernail clam	Sphaerium			1	
Cylindrical papershell	Anodontoides	*ferussacianus*		1	4

Fish sampled:

Species	**Abundance**	**% Abundance**
Black bullhead	130	98.48
Orangespotted sunfish	1	0.76
Yellow perch	1	0.76
Total=	132	100.00

Macroinvertebrates sampled:

Taxa	**Life Stage**	**Count**	**%Abundance**
Physa	.	17	5.45
Hyalella *azteca*	.	21	6.73
Dubiraphia	L	41	13.14
Peltodytes	A	1	0.32
Chironomidae	P	4	1.28
Corixidae	N	3	0.96
Stenacron	L	1	0.32
Enallagma	L	6	1.92
Tanypodinae	L	45	14.42
Chironominae	L	138	44.23
Orthocladiinae	L	4	1.28
Oligochaeta	.	15	4.81
Ceratopogonidae	L	8	2.56
Ostracoda	.	4	1.28
Baetidae	N	1	0.32
Peltodytes	L	1	0.32
Sigara	A	1	0.32
Placobdella *ornata*	.	1	0.32
	Total=	312	100.00

Sampling reach: South Fork Whetstone 2
Date sampled: 08/30/2005
Fish sampling method: Electrofishing

Field notes:
None taken

Habitat survey:

Habitat variable	Value
Sampling reach length	150
Sampling reach mean width	
Percent riffle	15
Percent run	25
Percent pool	60
Large woody debris	abundant
Periphyton / Macrophytes	rare
Canopy Shading	35-64%

Habitat index:
Not completed

Mussels sampled:

Common name	Genus	species	Live	Half shells	Matched shells
Cylindrical papershell	Anodontoides	*ferussacianus*		27	
Creek heelsplitter	Lasmigona	*compressa*		1	

Fish sampled:

Species	Abundance	% Abundance
Bigmouth shiner	11	1.89
Black bullhead	1	0.17
Blacknose dace	59	10.14
Brassy minnow	56	9.62
Central stoneroller	37	6.36
Common shiner	59	10.14
Creek chub	270	46.39
Fathead minnow	35	6.01
White sucker	54	9.28
Total=	582	100.00

South Fork Whetstone 2 (continued)

Macroinvertebrates sampled

Taxa	Life Stage	Count	%Abundance
Dubiraphia	L	56	19.18
Caenis	N	68	23.29
Heptageniidae	N	3	1.03
Hyalella *azteca*	.	8	2.74
Oligochaeta	.	27	9.25
Chrysops	L	1	0.34
Sphaerium	.	8	2.74
Physa	.	6	2.05
Ostracoda	.	4	1.37
Stenelmis	A	1	0.34
Coenagrionidae	N	2	0.68
Hexagenia	N	1	0.34
Cheumatopsyche	L	4	1.37
Dytiscidae	L	1	0.34
Probezzia	L	4	1.37
Chironominae	L	54	18.49
Tanypodinae	L	2	0.68
Stenelmis	L	25	8.56
Optioservus	L	4	1.37
Pisidium	.	5	1.71
Ceratopogonidae	L	2	0.68
Orthocladiinae	L	6	2.05
	Total=	292	100

Sampling reach: South Fork Yellowbank 1
Date sampled: 08/22/2005
Fish sampling method: Electrofishing

Field notes: Moderate grazing, cows using much of the stream bank; Lots of sediment except in riffles.

Habitat survey:

Habitat variable	Value
Sampling reach length	236
Sampling reach mean width	5.9
Percent riffle	15
Percent run	45
Percent pool	40
Large woody debris	rare
Periphyton / Macrophytes	moderate
Canopy Shading	5-14%

Habitat index:

Habitat variables	Score
Epifaunal Substrate/Available cover	3
Embeddedness	1
Belocity/Depth Regime	3
Sediment Deposition	1
Channel Alteration	5
Vegetative Cover left bank	3
Vegetative Cover right bank	3
Riparian Zone Width Left bank	5
Riparian Zone Width Right bank	5
Local Disturbance	4
Mean score=	**3.3**
5=optimal; 4-3=suboptimal; 2-1=marginal; 0=poor	

Mussels sampled:

Common name	Genus	Species	Live	Half shells	Matched shells
Cylindrical papershell	Anodontoides	*ferussacianus*		3	
Creek heelsplitter	Lasmigona	*compressa*			2

South Fork Yellowbank 1 (continued)

Fish sampled:

Species	Abundance	% Abundance
Bigmouth shiner	53	2.79
Blacknose dace	276	14.50
Blackside darter	1	0.05
Bluntnose minnow	62	3.26
Brassy minnow	33	1.73
Brook stickleback	1	0.05
Central stoneroller	541	28.43
Common shiner	367	19.29
Creek chub	205	10.77
Fathead minnow	16	0.84
Green sunfish	5	0.26
Hornyhead chub	138	7.25
Johnny darter	171	8.99
White sucker	32	1.68
Yellow perch	2	0.11
Total=	1903	100.00

Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Stenelmis	L	86	28.96
Stenelmis	A	9	3.03
Baetidae	N	21	7.07
Caenis	N	24	8.08
Stenonema	N	5	1.68
Hydropsychidae	L	8	2.69
Atherix	L	2	0.67
Dicranota	L	5	1.68
Erpobdella *punctata*	.	1	0.34
Chironomidae	P	2	0.67
Helicopsyche	L	3	1.01
Pisidium	.	6	2.02
Hyalella *azteca*	.	2	0.67
Probezzia	.	1	0.34
Hydracarina	.	1	0.34
Oligochaeta	.	3	1.01
Tanypodinae	L	3	1.01
Chironominae	L	37	12.46
Orthocladiinae	L	4	1.35
Optioservus	L	51	17.17
Optioservus	A	2	0.67
Heptageniidae	N	4	1.35
Ceratopsyche	L	5	1.68
Cheumatopsyche	L	6	2.02
Isonychia	N	5	1.68
Antocha	L	1	0.34
	Total=	297	100.00

Sampling reach: South Fork Yellowbank 2
Date sampled: 08/23/2005
Fish sampling method: Electrofishing

Field notes: Heavily silted pools; Cobble abundant in riffles; Very light grazing but heavier upstream.

Habitat survey:

Habitat variable	Value
Sampling reach length	252
Sampling reach mean width	6.3
Percent riffle	20
Percent run	30
Percent pool	50
Large woody debris	moderate
Periphyton / Macrophytes	rare
Canopy Shading	35-64%

Habitat index:

Habitat variables	Score
Epifaunal Substrate/Available cover	3
Embeddedness	1
Belocity/Depth Regime	4
Sediment Deposition	1
Channel Alteration	5
Vegetative Cover left bank	5
Vegetative Cover right bank	5
Riparian Zone Width Left bank	5
Riparian Zone Width Right bank	5
Local Disturbance	4
Mean score=	**3.8**
5=optimal; 4-3=suboptimal; 2-1=marginal; 0=poor	

Mussels sampled:
None found:

South Fork Yellowbank 2 (Continued)
Fish sampled:

Species	Abundance	% Abundance
Bigmouth shiner	19	1.24
Blacknose dace	136	8.88
Blackside darter	7	0.46
Bluntnose minnow	33	2.15
Brassy minnow	18	1.17
Central stoneroller	574	37.47
Common shiner	282	18.41
Creek chub	139	9.07
Fathead minnow	6	0.39
Green sunfish	1	0.07
Hornyhead chub	144	9.40
Iowa darter	1	0.07
Johnny darter	30	1.96
Tadpole madtom	1	0.07
White sucker	19	1.24
Yellow perch	122	7.96
Total=	1532	100.00

Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Stenelmis	L	58	18.71
Atherix	L	2	0.65
Tipula	L	1	0.32
Hexagenia	N	1	0.32
Isonychia	N	16	5.16
Acroneuria	N	1	0.32
Chrysops	L	1	0.32
Sphaerium	.	8	2.58
Physa	.	1	0.32
Heptageniidae	N	40	12.90
Caenis	N	36	11.61
Baetidae	N	7	2.26
Paraleptophlebia	N	15	4.84
Stenelmis	A	5	1.61
Cheumatopsyche	L	6	1.94
Sialis	L	1	0.32
Oligochaeta	.	13	4.19
Chironomidae	P	1	0.32
Chironominae	L	47	15.16
Tanypodinae	L	5	1.61
Orthocladiinae	L	2	0.65
Dubiraphia	L	1	0.32
Optioservus	L	21	6.77
Cincinnatia *cincinnatiensis*	.	1	0.32
Optioservus	A	1	0.32
Stenonema	L	12	3.87
Stenacron	L	7	2.26
	Total=	310	100.00

Sampling reach: South Fork Yellowbank 3
Date sampled: 08/23/2005
Fish sampling method: Seining

Field notes: Sampled backwater on transect A; too many fish to process, had to estimate abundance halfway through

Habitat survey:

Habitat variable	Value
Sampling reach length	232
Sampling reach mean width	5.8
Percent riffle	
Percent run	
Percent pool	
Large woody debris	
Periphyton / Macrophytes	
Canopy Shading	

Habitat index:
Not completed

Mussels sampled:

Common name	Genus	Species	Live	Half shells	Matched shells
Pond mussel	Ligumia	*subrostrata*	Many	49	
White heel splitter	Lasmigona	*complanata*			2
Fragile papershell	Lamptodea	*fragilis*	3	39	
Wabash pigtoe	Fusconaia	*flava*		1	1
Creek heelsplitter	Lasmigona	*compressa*			4
Fat Mucket	Lapsilis	*siliquoidea*			4

Fish sampled:

Species	Abundance	% Abundance
Bigmouth shiner	37	1.48
Black bullhead	83	3.33
Blacknose dace	9	0.36
Bluntnose minnow	153	6.14
Brassy minnow	39	1.56
Central stoneroller	219	8.78
Common shiner	658	26.39
Common shiner	940	37.71
Creek chub	101	4.05
Fathead minnow	80	3.21
Hornyhead chub	79	3.17
Johnny darter	56	2.25
Carmine shiner	10	0.40
Tadpole madtom	11	0.44
White sucker	18	0.72
Total=	2493	100.00

South Fork Yellowbank 3 (continued)

Macroinvertebrates sampled

Taxa	Life Stage	Count	%Abundance
Sphaerium	.	25	8.62
Physa	.	1	0.34
Dubiraphia	L	30	10.34
Caenis	N	72	24.83
Hexagenia	N	9	3.10
Chironomidae	P	7	2.41
Helicopsyche	L	2	0.69
Gomphidae	N	1	0.34
Chironominae	L	130	44.83
Orthocladiinae	L	5	1.72
Probezzia	L	4	1.38
Pisidium	.	4	1.38
	Total=	290	100.00

Sampling reach: Tributary to North Fork Yellowbank River 1
Date sampled: 08/31/2005
Fish sampling method: Electrofishing

Field notes: Nice site, clean gravel bottom, lightly grazed pasture.

Habitat survey:

Habitat variable	Value
Sampling reach length	150
Sampling reach mean width	2.6
Percent riffle	20
Percent run	40
Percent pool	40
Large woody debris	rare
Periphyton / Macrophytes	moderate
Canopy Shading	5-14%

Habitat index:

Habitat variables	Score
Epifaunal Substrate/Available cover	5
Embeddedness	5
Belocity/Depth Regime	5
Sediment Deposition	5
Channel Alteration	5
Vegetative Cover left bank	3
Vegetative Cover right bank	3
Riparian Zone Width Left bank	4
Riparian Zone Width Right bank	4
Local Disturbance	4
Mean score=	**4.3**
5=optimal; 4-3=suboptimal; 2-1=marginal; 0=poor	

Mussels sampled:
None found

Tributary to North Fork Yellowbank River 1(continued)

Fish sampled:

Species	Abundance	% Abundance
Bigmouth shiner	17	1.35
Black bullhead	1	0.08
Blacknose dace	515	40.87
Bluntnose minnow	10	0.79
Brassy minnow	12	0.95
Brook stickleback	2	0.16
Central stoneroller	395	31.35
Common shiner	63	5.00
Creek chub	193	15.32
Fathead minnow	40	3.17
Iowa darter	4	0.32
Johnny darter	5	0.40
Tadpole madtom	1	0.08
White sucker	2	0.16
Total=	1260	100.00

Macroinvertebrates sampled:

Taxa	Life Stage	Count	%Abundance
Dubiraphia	L	52	18.98
Caenis	N	77	28.10
Ceratopsyche	L	6	2.19
Oecetis	L	2	0.73
Helicopsyche	L	1	0.36
Paraleptophlebia	N	10	3.65
Baetidae	N	4	1.46
Hyalella *azteca*	.	2	0.73
Chironomidae	P	3	1.09
Stenelmis	A	1	0.36
Gomphidae	N	3	1.09
Sphaerium	.	5	1.82
Hydracarina	.	5	1.82
Chironominae	L	74	27.01
Tanypodinae	L	9	3.28
Orthocladiinae	L	3	1.09
Oligochaeta	.	7	2.55
Corixidae	N	1	0.36
Probezzia	.	1	0.36
Optioservus	L	7	2.55
Ochthebius	A	1	0.36
	Total=	274	100.00

Appendix A: Minnesota River Tributary sampling sites

Stream	Sampling date
Checapa Creek 1 (Sica Hollow)	08/24/2005
Cobb Creek 1	07/28/2005
Cobb Creek 2	07/28/2005
Cobb Creek 3	08/02/2005
Crow Timber Creek 1	07/27/2005
Gary Creek 1	07/26/2005
Monigan Creek 1	07/25/2005
Monigan Creek 2	08/02/2005
Monigan Creek 3	08/01/2005
North Fork Yellowbank River 1	08/30/2005
North Fork Yellowbank River 2	07/09/2005
South Fork Whetstone River 1	08/23/2005
South Fork Whetstone River 2	08/30/2005
South Fork Yellowbank River 1	08/22/2005
South Fork Yellowbank River 2	08/23/2005
South Fork Yellowbank River 3	08/23/2005
Tributary to North Fork Yellowbank River 1	08/31/2005

Appendix B: Fish collected across Minnesota River Tributary sampling sites.

Order	Family	Genus *species*	Common name
Cypriniformes	Catostomidae	Catostomus *commersoni*	White sucker
Cypriniformes	Cyprinidae	Campostoma *anomalum*	Central stoneroller
Cypriniformes	Cyprinidae	Cyprinus *carpio*	Common carp
Cypriniformes	Cyprinidae	Hybognathus *hankinsoni*	Brassy minnow
Cypriniformes	Cyprinidae	Luxilus *cornutus*	Common shiner
Cypriniformes	Cyprinidae	Nocomis *biguttatus*	Hornyhead chub
Cypriniformes	Cyprinidae	Notropis *dorsalis*	Bigmouth shiner
Cypriniformes	Cyprinidae	Notropis *percobromus*	Carmine shiner
Cypriniformes	Cyprinidae	Notropis *stramineus*	Sand shiner
Cypriniformes	Cyprinidae	Phoxinus *eos*	Northern redbelly dace
Cypriniformes	Cyprinidae	Pimephales *notatus*	Bluntnose minnow
Cypriniformes	Cyprinidae	Pimephales *promelas*	Fathead minnow
Cypriniformes	Cyprinidae	Rhinichthys *atratulus*	Blacknose dace
Cypriniformes	Cyprinidae	Semotilus *atromaculatus*	Creek chub
Esociformes	Esocidae	Esox *lucius*	Northern pike
Esociformes	Umbridae	Umbra *limi*	Central mudminnow
Gasterosteiformes	Gasterosteidae	Culaea *inconstans*	Brook stickleback
Perciformes	Centrarchidae	Ambloplites *rupestris*	Rock Bass
Perciformes	Centrarchidae	Lepomis *cyanellus*	Green sunfish
Perciformes	Centrarchidae	Lepomis *humilis*	Orangespotted sunfish
Perciformes	Percidae	Percina *maculata*	Blackside darter
Perciformes	Percidae	Etheostoma *exile*	Iowa darter
Perciformes	Percidae	Etheostoma *nigrum*	Johnny darter
Perciformes	Percidae	Perca *flavescens*	Yellow Perch
Salmoniformes	Salmonidae	Salmo *trutta*	Brown trout
Siluriformes	Ictaluridae	Ameiurus *melas*	Black bullhead
Siluriformes	Ictaluridae	Noturus *gyrinus*	Tadpole Madtom

Appendix C: Mussels collected across Minnesota River Tributary sampling sites

Genus	species	Common name
Anodontoides	*ferussacianus*	Cylindrical papershell
Fusconaia	*flava*	Wabash pigtoe
Lamptodea	*fragilis*	Fragile papershell
Lapsilis	*siliquoidea*	Fat mucket
Lasmigona	*complanata*	White heelsplitter
Lasmigona	*compressa*	Creek heelsplitter
Ligumia	*subrostrata*	Pond mussel
Pyganodon	*grandis*	Giant floater
Sphaerium	*sp.*	Fingernail clam
Strophitus	*undulatus*	Creeper

Appendix D: Macroinvertebrates collected across Minnesota River Tributary sampling sites

Phylum	Class	SubClass	Order	Family	SubFamily	Genus	Species	Stage
Annelida	Clitellata	Hirudinea	Arhynchobdellida	Erpobdellidae	.	Erpobdella	punctata	.
Annelida	Clitellata	Hirudinea	Arhynchobdellida	Haemopidae	.	Haemopis	.	.
Annelida	Clitellata	Hirudinea	Rhynchobdellida	Glossiphoniidae	.	Placobdella	ornata	.
Annelida	Clitellata	Oligochaeta	.	.	.	.	.	.
Arthropoda	Arachnida	.	.	.	.	.	.	.
Arthropoda	Arachnida	Acarina	Hydracarina	.	.	.	.	.
Arthropoda	Branchiopoda	Phyllopoda	Diplostraca	Daphniidae	.	.	.	.
Arthropoda	Entognatha	.	Collembola	.	.	.	.	.
Arthropoda	Insecta	Pterygota	Coleoptera	Dytiscidae	.	.	.	L
Arthropoda	Insecta	Pterygota	Coleoptera	Elmidae	.	Dubiraphia	.	A
Arthropoda	Insecta	Pterygota	Coleoptera	Elmidae	.	Dubiraphia	.	L
Arthropoda	Insecta	Pterygota	Coleoptera	Elmidae	.	Macronychus	.	L
Arthropoda	Insecta	Pterygota	Coleoptera	Elmidae	.	Optioservus	.	A
Arthropoda	Insecta	Pterygota	Coleoptera	Elmidae	.	Optioservus	.	L
Arthropoda	Insecta	Pterygota	Coleoptera	Elmidae	.	Stenelmis	.	A
Arthropoda	Insecta	Pterygota	Coleoptera	Elmidae	.	Stenelmis	.	L
Arthropoda	Insecta	Pterygota	Coleoptera	Haliplidae	.	Haliplus	.	L
Arthropoda	Insecta	Pterygota	Coleoptera	Haliplidae	.	Peltodytes	.	A
Arthropoda	Insecta	Pterygota	Coleoptera	Haliplidae	.	Peltodytes	.	L
Arthropoda	Insecta	Pterygota	Coleoptera	Hydraenidae	.	Ochthebius	.	A
Arthropoda	Insecta	Pterygota	Coleoptera	Hydrophilidae	.	Berosus	.	L
Arthropoda	Insecta	Pterygota	Coleoptera	Hydrophilidae	.	Helophorus	.	A
Arthropoda	Insecta	Pterygota	Coleoptera	Hydrophilidae	.	Laccobius	.	L
Arthropoda	Insecta	Pterygota	Coleoptera	Hydrophilidae	.	Paracymus	.	A
Arthropoda	Insecta	Pterygota	Diptera	Athericidae	.	Atherix	.	L
Arthropoda	Insecta	Pterygota	Diptera	Ceratopogonidae	.	Probezzia	.	L
Arthropoda	Insecta	Pterygota	Diptera	Chironomidae	.	.	.	P
Arthropoda	Insecta	Pterygota	Diptera	Chironomidae	Chironominae	.	.	L
Arthropoda	Insecta	Pterygota	Diptera	Chironomidae	Orthocladiinae	.	.	L

Appendix D (Continued)

Phylum	Class	SubClass	Order	Family	SubFamily	Genus	Species	Stage
Arthropoda	Insecta	Pterygota	Diptera	Chironomidae	Tanypodinae	.	.	L
Arthropoda	Insecta	Pterygota	Diptera	Empididae	.	.	.	P
Arthropoda	Insecta	Pterygota	Diptera	Empididae	.	Hemerodromia	.	L
Arthropoda	Insecta	Pterygota	Diptera	Psychodidae	.	Pericoma	.	L
Arthropoda	Insecta	Pterygota	Diptera	Simuliidae	.	Simulium	.	L
Arthropoda	Insecta	Pterygota	Diptera	Tabanidae	.	Chrysops	.	L
Arthropoda	Insecta	Pterygota	Diptera	Tipulidae	.	Antocha	.	L
Arthropoda	Insecta	Pterygota	Diptera	Tipulidae	.	Dicranota	.	L
Arthropoda	Insecta	Pterygota	Diptera	Tipulidae	.	Tipula	.	L
Arthropoda	Insecta	Pterygota	Ephemeroptera	Baetidae	.	Baetis	.	L
Arthropoda	Insecta	Pterygota	Ephemeroptera	Caenidae	.	Caenis	.	L
Arthropoda	Insecta	Pterygota	Ephemeroptera	Ephemeridae	.	Hexagenia	.	L
Arthropoda	Insecta	Pterygota	Ephemeroptera	Heptageniidae	.	Leucrocuta	.	L
Arthropoda	Insecta	Pterygota	Ephemeroptera	Heptageniidae	.	Stenacron	.	L
Arthropoda	Insecta	Pterygota	Ephemeroptera	Heptageniidae	.	Stenonema	.	L
Arthropoda	Insecta	Pterygota	Ephemeroptera	Isonychiidae	.	Isonychia	.	L
Arthropoda	Insecta	Pterygota	Ephemeroptera	Leptophlebiidae	.	Paraleptophlebia	.	L
Arthropoda	Insecta	Pterygota	Ephemeroptera	Leptohyphidae	.	Tricorythodes	.	L
Arthropoda	Insecta	Pterygota	Hemiptera	Corixidae	.	.	.	N
Arthropoda	Insecta	Pterygota	Hemiptera	Corixidae	.	Palmacorixa	.	A
Arthropoda	Insecta	Pterygota	Hemiptera	Corixidae	.	Sigara	.	A
Arthropoda	Insecta	Pterygota	Megaloptera	Sialidae	.	Sialis	.	L
Arthropoda	Insecta	Pterygota	Odonata	Coenagrionidae	.	Enallagma	.	L
Arthropoda	Insecta	Pterygota	Odonata	Gomphidae	.	.	.	L
Arthropoda	Insecta	Pterygota	Plecoptera	Perlidae	.	Acroneuria	.	L
Arthropoda	Insecta	Pterygota	Thysanoptera	.	.	.	.	.
Arthropoda	Insecta	Pterygota	Trichoptera	Helicopsychidae	.	Helicopsyche	.	L
Arthropoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	.	Ceratopsyche	.	L
Arthropoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	.	Cheumatopsyche	.	L

Appendix D (Continued)

Phylum	Class	SubClass	Order	Family	SubFamily	Genus	Species	Stage
Arthropoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	.	Hydroptila	.	L
Arthropoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	.	Neotrichia	.	L
Arthropoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	.	Ochrotrichia	.	L
Arthropoda	Insecta	Pterygota	Trichoptera	Leptoceridae	.	Nectopsyche	.	L
Arthropoda	Insecta	.	Trichoptera	Leptoceridae	.	Oecetis	.	L
Arthropoda	Insecta	.	Trichoptera	Limnephilidae	.	.	.	L
Arthropoda	Insecta	.	Trichoptera	Limnephilidae	.	Hesperophylax	.	L
Arthropoda	Malacostraca	.	Amphipoda	Hyalellidae	.	Gammarus	.	.
Arthropoda	Malacostraca	.	Amphipoda	Hyalellidae	.	Hyalella	azteca	.
Arthropoda	Malacostraca	.	Decapoda	Cambaridae	.	Orconectes	.	.
Arthropoda	Maxillipoda	.	Cyclopoida	Cyclopidae	.	.	.	.
Arthropoda	Ostracoda	.	.	.	.	.	.	.
Mollusca	Bivalvia	Heterodonta	Veneroida	Pisidiidae	.	Pisidium	.	.
Mollusca	Bivalvia	Heterodonta	Veneroida	Pisidiidae	.	Sphaerium	.	.
Mollusca	Gastropoda	.	Basommatophora	Ancylidae	.	Ferrissia	.	.
Mollusca	Gastropoda	.	Basommatophora	Physidae	.	Physa	.	.
Mollusca	Gastropoda	.	Basommatophora	Planorbidae	.	Helisoma	anceps	.
Mollusca	Gastropoda	.	Basommatophora	Planorbidae	.	Planorbella	trivolvis	.
Mollusca	Gastropoda	.	Neotaenioglossa	Hydrobiidae	.	Amnicola	limosa	.
Mollusca	Gastropoda	.	Neotaenioglossa	Hydrobiidae	.	Cincinnatia	cincinnatiensis	.

Literature cited

Perkins, K., D. Skadsen, and D. Backlund. 1997. A survey for unionid mussels in Day, Deuel, Grant, and Roberts counties, South Dakota, August – October 1995. Report to South Dakota Game, Fish and Parks.