
PHASE 2 Technical Memorandum for Red and Assiniboine Ammonia Criteria Study

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To: City of Winnipeg Project Management Committee
Study Team Members

Subject: **Fish Habitat Technical Memorandum # FH 02**

Title: **BENTHIC INVERTEBRATE AND SEDIMENT DATA TO
CHARACTERIZE FISH HABITAT IN THE RED AND
ASSINIBOINE RIVERS**

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EXECUTIVE SUMMARY

This memorandum is one of a series of three memoranda that have been produced to describe fish habitat in the Red and Assiniboine rivers within the City of Winnipeg Ammonia Criteria Study Area. This document describes the benthic invertebrate community and sediment characteristics, while two other memoranda describe physical attributes of fish habitat and water chemistry. Data from all three memoranda will be used to explain fish distributions within the Study Area.

Two surveys were conducted to describe the benthic invertebrate community and bottom substrate in the Red and Assiniboine rivers. The first survey was conducted during winter, 1999, and the second during fall, 1999. A benthic sampling program was developed using the segments previously designated by the physical habitat surveys, with the Red and Assiniboine rivers divided into 86 and 30 segments, respectively.

During the first survey, the benthic invertebrate community and bottom substrate composition were quantitatively sampled in 32 segments using a 'petit' Ponar Dredge; 26 segments were sampled on the Red River and six segments on the Assiniboine River. Usually three dredge samples (replicates) were taken at each site to determine within-site benthic organism and substrate variability. During the second survey, the benthic invertebrate community and bottom substrate composition were quantitatively sampled in 37 segments using a 'petit' Ponar Dredge; 28 segments were sampled on the Red River and nine on the Assiniboine River. Generally three replicates were taken at each site. Benthic invertebrate community composition was also qualitatively sampled in 16 segments using Artificial Substrate Samplers (samplers) during the second survey; 10 segments were sampled on the Red River and six on the Assiniboine River. Three samplers were installed at each site. All sampling locations are geo-referenced with UTM coordinates and benthic data are presented by river segment.

Data presented in this document will be used to produce a report comparing the benthic invertebrate community observed among zones in the Study Area exposed to "low", "medium", and "high" concentrations of ammonia, among different bottom substrate types, between sampling periods (seasons), and to historical data available for the Red and Assiniboine rivers.

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1.0

INTRODUCTION

Fish distribution, abundance, and health are dependent on the quality and quantity of habitat. Fish habitat is generally a function of physical (i.e., substrate, water depth, water velocity, and riparian conditions), chemical (i.e., dissolved oxygen, turbidity, water temperature, pH, and ammonia concentration), and/or biological (i.e., benthic invertebrate community abundance and composition) factors. To explain differences in distribution, abundance, and condition of fish inhabiting various locations, we must have an understanding of how habitat parameters differ among those sites.

This technical memorandum is one of a series of three memoranda that have been prepared to describe fish habitat within the City of Winnipeg Ammonia Criteria Study Area (Figure 1) and contribute to the understanding of fish distributions in the Red and Assiniboine rivers. This document describes the benthic invertebrate community and bottom substrate characteristics of the rivers, including benthic invertebrate densities and dry weights, and organic content and particle size of bottom sediments. A description of the physical attributes of fish habitat and water chemistry of the Red and Assiniboine rivers within the Study Area are provided in two other technical memoranda entitled:

Fish Habitat Technical Memorandum # FH 01: Physical Data to Characterize Fish Habitat in the Red and Assiniboine Rivers.

Fish Habitat Technical Memorandum # FH 03: Water Chemistry Data to Characterize Fish Habitat in the Red and Assiniboine Rivers.

The objective of the benthic program was to describe the benthic invertebrate community and characterize the bottom sediments of fish habitat within those portions of the Red and Assiniboine rivers that lie within the Study Area.

Data presented here will be used to produce an additional document comparing the benthic invertebrate community observed among zones in the Study Area potentially exposed to “low”, “medium”, and “high” concentrations of ammonia, among different bottom substrate types, between sampling periods (seasons), and to historical data available for the Red and Assiniboine rivers.

2.0

METHODS

The benthic sampling program was developed using the segments previously designated by the physical habitat surveys (as discussed in Fish Habitat Technical Memorandum # FH 01). The Red and Assiniboine rivers had been divided into 86 and 30 segments, respectively. A reference area (zone 1A) was established further upstream, near Ste. Agathe on the Red River, to provide a sampling area remote from all wastewater discharges of concern in the Study Area.

Prior to conducting the benthic surveys, it was decided that the second survey (to be conducted in fall, 1999) was to be more comprehensive than the first (to be conducted the previous winter). The winter benthic program was less extensive and was conducted for comparative purposes only; as a result, a reduced benthic program was conducted with only selected areas being sampled.

2.1 BENTHIC SURVEY I

The first benthic survey was conducted on the Red and Assiniboine rivers from February 25 to March 19, 1999. The sampling program encompassed select segments of the rivers within the Study Area and included the following tasks:

- C sampling at a site within a segment where there was likely to be soft to medium bottom substrate (i.e., where it was physically possible to collect a benthic sample);
- C determining UTM coordinates for the sampling site;
- C collecting three benthic samples at the site and measuring the depth each sample was taken at;
- C collecting a sediment sub-sample from each benthic sample for organic content and particle size analysis; and,
- C recording the number of non-recoverable samples at a site and providing a qualitative bottom substrate characterization.

Access to sampling locations was by snowmobile, with sleds towed to accommodate sampling equipment. Open-water sampling in the vicinity of and downstream of the NEWPCC (North End Water Pollution Control Centre) outfall was conducted by boat. Due

to dangerous ice conditions, areas immediately downstream of the SEWPCC (South End WPCC) and WEWPCC (West End WPCC) outfalls were avoided. UTM co-ordinates (Zone 14U, NAD 27 or NAD 83) were determined with a hand-held navigational quality GPS (Global Positioning System) unit. Nominal accuracy of the GPS unit was ± 50 m.

Benthic samples were collected using a 'petit' Ponar dredge (0.023 m² opening) with attached lead weights. Usually three dredge samples (replicates) were taken at each location to determine within-site benthic organism and substrate variability. Nine benthic samples were collected immediately downstream of the NEWPCC outfall to better characterize the aquatic habitat encompassing the NEWPCC non-mixed plume.

A separate hole of adequate diameter was drilled for each Ponar sample. The sample was retrieved to the ice surface and carefully placed in a plastic bag. A sub-sample of approximately 100 ml of substrate was taken with a 5 cm diameter core tube (0.002 m² surface area) and frozen for subsequent organic content and particle size analysis. The remaining Ponar sample (0.021 m²) was placed in a cooler to avoid or limit freezing and then processed the same day in the laboratory at North/South Consultants Inc. Samples were washed through a 500 μ m mesh rinsing bag with a PVC codend and all invertebrates retained were transferred to plastic jars and fixed with 10 % formalin. Fixed samples were transferred to 70 % ethanol, stained with Rose Bengal to facilitate removal of organisms, and sorted under a magnifying lamp. Invertebrates from two replicates were identified to major group, family, or sub-family and enumerated by an invertebrate taxonomist (six replicates from the vicinity of the NEWPCC outfall); the third replicate (including substrate sub-sample) was archived for any necessary future analyses (three replicates from the NEWPCC outfall).

The dry weight of benthic invertebrates (major taxonomic groups) was determined using a method modified from Downing and Rigler (1984). Total organic content analysis was determined by weight loss after sample combustion at 500 EC for 12 hours. Particle size analysis was done according to procedures for silty sediments outlined in Holme and McIntyre (1984).

During the first survey, 26 segments were sampled on the Red River and six segments on the Assiniboine River. A total of 149 Ponar Dredges were attempted during the winter

sampling period; 80 grabs were successful and 69 grabs were non-recoverable due to either hard bottom substrate or slush build-up under the ice.

2.2 BENTHIC SURVEY II

The second benthic survey was conducted on the Red and Assiniboine rivers between August 03 and October 02, 1999, and included the same tasks as the first survey (see Section 2.1). The fall benthic program was designed to provide additional information which would be used to refine the description of fish habitat in the Red and Assiniboine rivers by:

- C sampling more extensively within the Study Area;
- C sampling bottom substrates too hard to penetrate with a Ponar Dredge; and,
- C sampling littoral areas which are de-watered during periods of reduced flow (e.g., during winter).

Artificial Substrate Samplers (samplers) were chosen as the sampling device to obtain a qualitative estimate of the benthic invertebrate community composition and dry weight on hard bottom substrates in the rivers. The samplers were installed in segments with known hard bottom substrate in the Red and Assiniboine rivers from August 03 to August 06, 1999. Three samplers were also installed on hard substrate within the NEWPCC non-mixed plume. The samplers were left in the rivers for a colonization period of approximately 7 - 8 weeks, with retrieval occurring from September 28 to October 02, 1999 (with the exception of three, which were provided to the Toxicity Workstream). Access to all locations during the second benthic survey was by boat.

Each Ponar sample was brought to the surface and carefully placed in a 500 µm mesh rinsing bag with a PVC codend. Samples were sieved over the side of the boat and all invertebrates retained by the screen were transferred to plastic jars and fixed with 10 % formalin. Further processing of the fall Ponar samples (invertebrates and sediment sub-samples) and identification of invertebrates were the same as for winter samples (see Section 2.1). In addition to sampling in the NEWPCC non-mixed plume, sampling was also conducted immediately downstream of the SEWPCC and WWPCC outfalls during the second survey.

The samplers consisted of a “bag” (43 cm X 25.5 cm) constructed with galvanized welded wire mesh (2.5 cm²) containing 20 - 30, 3 - 10 cm diameter “river rocks”. Three samplers were installed at each site with hard bottom substrate in a “triangle” shape, approximately 10 - 20 m off a river bank. The three samplers were tied together in tandem with sideline, leaving approximately 10 - 20 m between samplers. One of the three samplers was secured to a river bank with sideline. UTM coordinates of installation sites were determined with a hand-held navigational quality GPS unit; tie-off points on the river banks were as close to the water surface as possible and marked with fluorescent flagging tape.

Upon retrieval, samplers were brought to the surface slowly. When the sampler became visible beneath the water, a 500 µm mesh rinsing bag with a PVC codend was lowered and enclosed the sampler before it could break the surface. By retrieving samplers in this manner, the loss of organisms was limited. The sampler was disassembled, each rock cleaned individually, and all organisms and residue removed were washed through the 500 µm mesh rinsing bag. Further processing of samples and identification of invertebrates were the same as for winter samples (see Section 2.1). All flagging tape and sideline was removed from sites during retrieval of the samplers.

During the second survey, 28 segments on the Red River and nine segments on the Assiniboine River were sampled using the Ponar Dredge. A total of 181 Ponar Dredges were attempted during the fall sampling period; 115 grabs were successful and 66 grabs were non-recoverable due to hard bottom substrate. Samplers were placed in 10 segments on the Red River and six on the Assiniboine River. Of the 48 samplers installed, 34 were successfully retrieved and three were provided to the Toxicity Workstream. Eleven samplers were lost due to vandalism and/or debris flowing downstream causing sideline to break away from tie-off points. Sites where samplers were lost were thoroughly inspected and any debris remaining from the samplers was removed.

3.0 BENTHIC INVERTEBRATE AND SEDIMENT DATA

The Red River was divided into 86 segments (Figures 2 and 3) and the Assiniboine River was divided into 30 segments (Figure 2). During the first benthic survey, 26 segments on the Red River and six on the Assiniboine River were sampled using a Ponar Dredge. During the second benthic survey, 28 segments on the Red River and nine on the Assiniboine River were sampled using a Ponar Dredge. Ten segments on the Red River and six on the Assiniboine River were also sampled using Artificial Substrate Samplers.

Benthic invertebrate and sediment data collected as described above are provided in the following sections. Additional bottom substrate information collected as a component of the physical habitat study are provided in the Physical Data Technical Memorandum.

4.0

REFERENCES

DOWNING, J.A. and F.H. RIGLER (ed.). 1984. A manual on methods for the assessment of secondary productivity in fresh waters. Second Edition. IBP Hand Book 17. Blackwell Scientific Publications.

HOLME, N.A. and A.D. McINTYRE (ed.). 1984. Methods for the study of marine benthos. Second Edition. IBP Hand Book 16. Blackwell Scientific Publications.

NEWPCC - North End Water Pollution Control Centre
 SEWPCC - South End Water Pollution Control Centre
 WEWPCC - West End Water Pollution Control Centre
 - Study Area

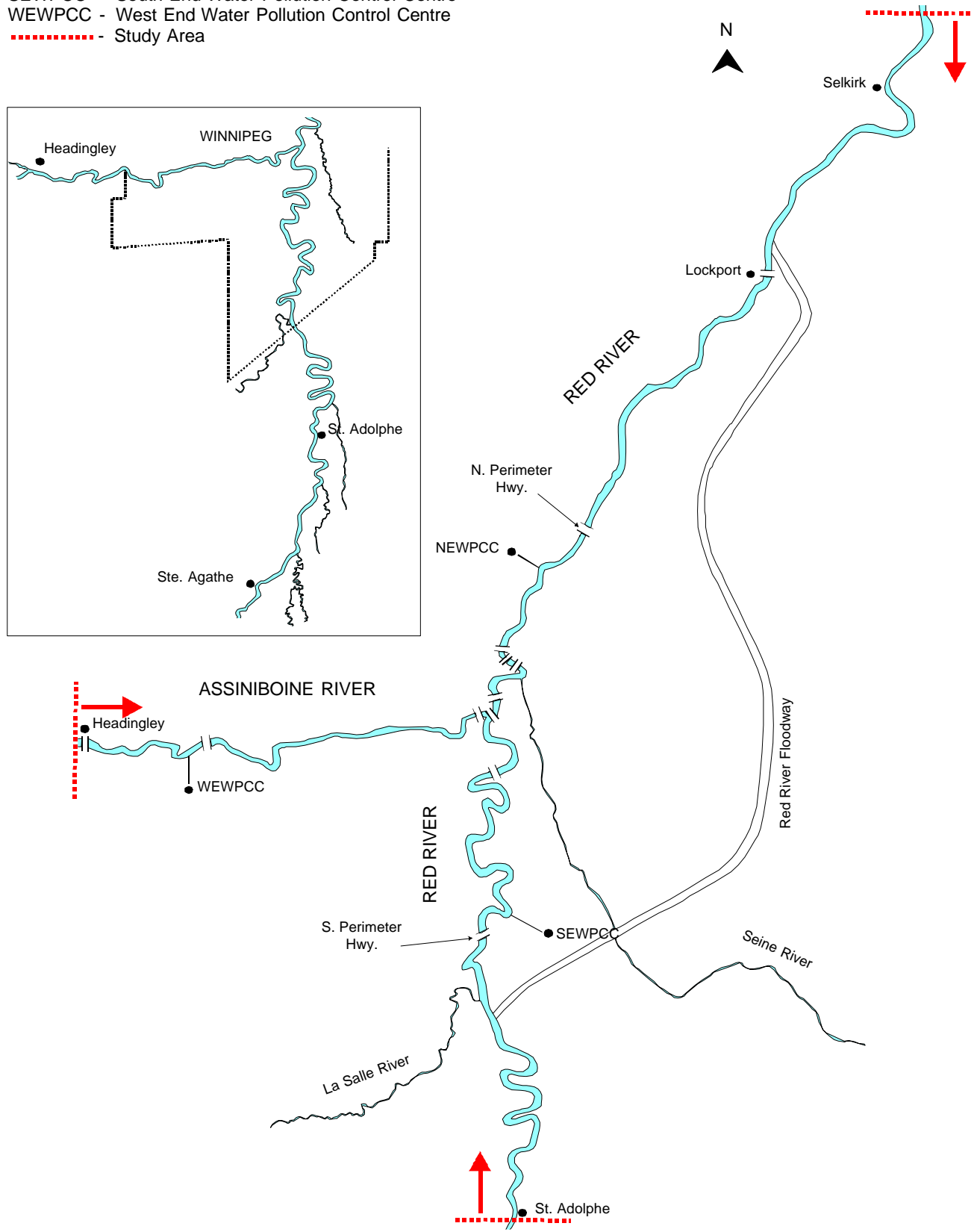


Figure 1. Study Area for the City of Winnipeg Ammonia Criteria Study.



Figure 2. Fish habitat survey segments on the Red River, south of the Forks, and on the Assiniboine River.

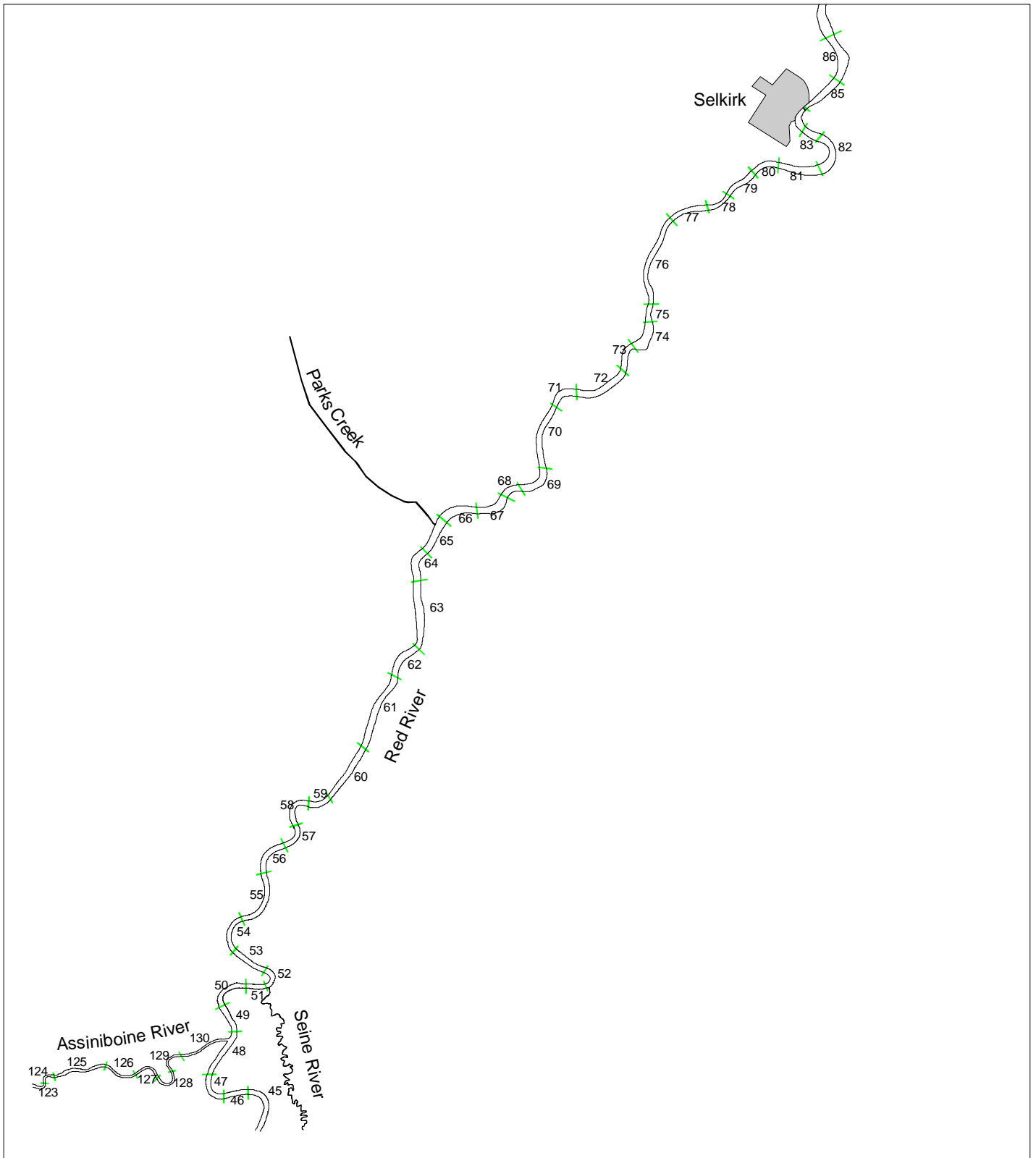


Figure 3. Fish habitat survey segments on the Red River north of the Forks.

3.1 RED RIVER (Segments 1 - 86)

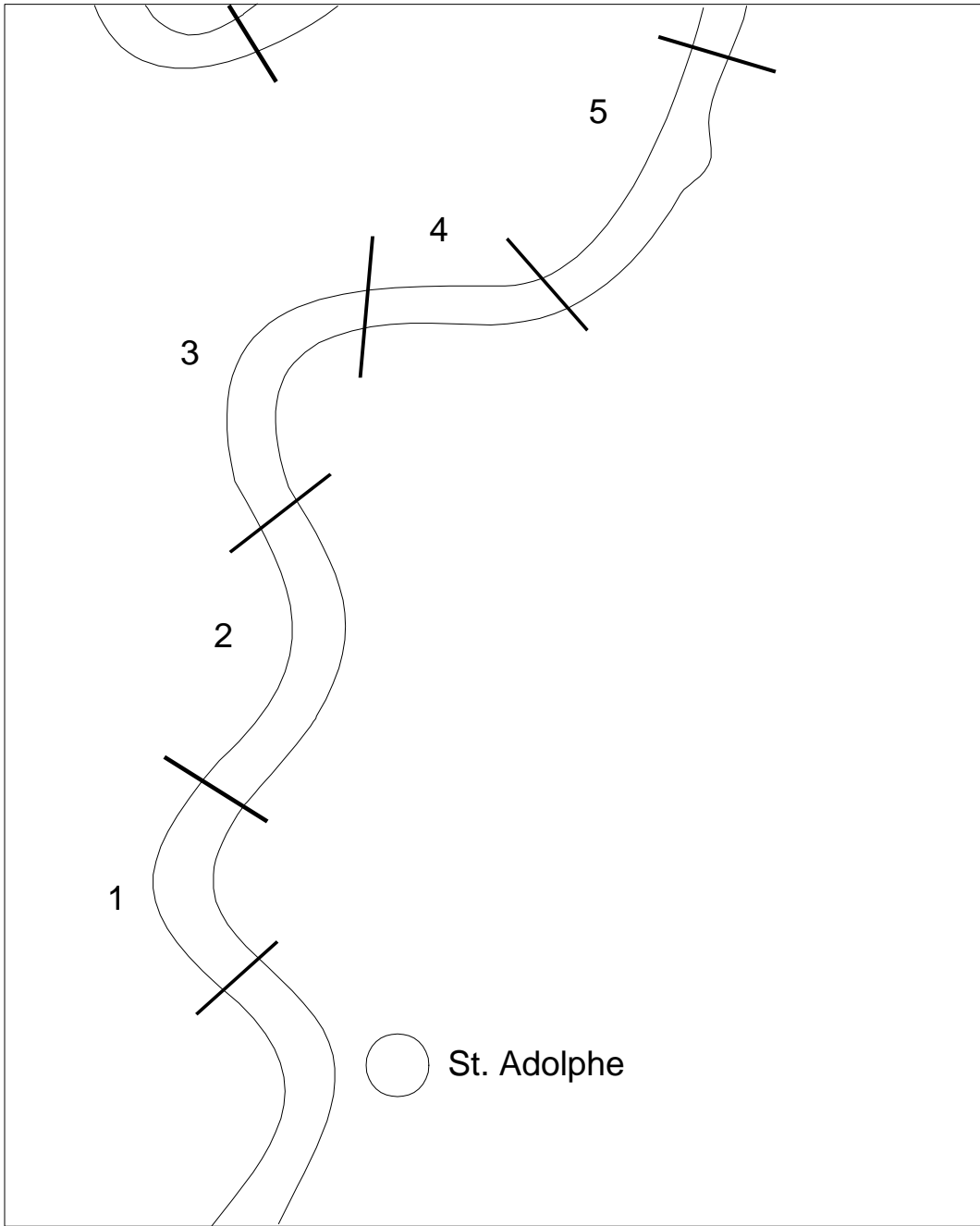


Figure 4. Red River segments 1 - 5.

RIVER: Red River
SEGMENT: 1A (Ste. Agathe)

Winter Ponar Dredge Sampling
 Date _____ - _____
 UTM (14U) _____ - _____

Fall Ponar Dredge Sampling
 Date 28-Sep-99
 UTM (14U) E-0636522 N-5501288

Fall Artificial Substrate Sampling
 Installation Date 5-Aug-99
 Retrieval Date 28-Sep-99
 UTM (14U) E-0631462 N-5491326

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	3	3
Annelida						
Oligochaeta						
F. Tubificidae	-	238	-	-	0	-
F. Lumbriculidae	-	48	-	-	0	-
F. Naididae	-	0	-	-	0	-
Total Oligochaeta	-	286	-	0.024	0	-
Insecta						
Trichoptera						
F. Brachycentridae	-	0	-	-	6	-
F. Hydropsychidae	-	48	-	-	119	-
F. Leptoceridae	-	0	-	-	1	-
F. Limnephilidae	-	0	-	-	0	-
F. Polycentropodidae	-	24	-	-	1	-
Total Trichoptera	-	71	-	0.024	127	0.036
Ephemeroptera						
F. Ametropodidae	-	0	-	-	0	-
F. Baetidae	-	0	-	-	0	-
F. Caenidae	-	0	-	-	0	-
F. Ephemeridae	-	24	-	-	0	-
F. Heptageniidae	-	0	-	-	1	-
F. Leptophlebiidae	-	0	-	-	0	-
F. Polymitarcyidae	-	0	-	-	0	-
F. Siphonuridae	-	0	-	-	0	-
F. Tricorythidae	-	0	-	-	1	-
Total Ephemeroptera	-	24	-	0.000	1	0.001

SEGMENT: 1A (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	-	0	-	-	0	-
F. Perlodidae	-	0	-	-	0	-
F. Pteronarcyidae	-	0	-	-	0	-
Total Plecoptera	-	0	-	-	0	-
Coleoptera						
F. Dytiscidae	-	0	-	-	0	-
F. Elmidae	-	0	-	-	1	-
Total Coleoptera	-	0	-	-	1	0.001
Hemiptera						
F. Corixidae	-	0	-	-	0	-
Megaloptera						
F. Corydalidae	-	0	-	-	0	-
F. Sialidae (<i>Sialis</i> sp.)	-	0	-	-	0	-
Total Megaloptera	-	0	-	-	0	-
Odonata						
F. Gomphidae	-	0	-	-	0	-
Diptera						
F. Athericidae	-	0	-	-	0	-
F. Chironomidae	-	-	-	0.000	-	0.001
SubF. Chironominae	-	24	-	-	1	-
SubF. Orthoclaadiinae	-	0	-	-	0	-
SubF. Tanypodinae	-	0	-	-	0	-
F. Ceratopogonidae	-	24	-	-	0	-
F. Chaoboridae	-	0	-	-	0	-
F. Dolichopodidae	-	0	-	-	0	-
F. Empididae	-	0	-	-	0	-
F. Simuliidae	-	0	-	-	0	-
F. Tipulidae	-	0	-	-	1	-
Total Diptera	-	48	-	0.024	1	0.001
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	-	0	-	-	0	-
Copepoda	-	0	-	-	0	-
Cladocera	-	0	-	-	0	-
Total Crustacea	-	0	-	-	0	-
Arachnida						
Hydracarina	-	0	-	-	1	0.000
Mollusca						
Bivalvia						
F. Sphaeriidae	-	48	-	-	1	-
F. Unionidae	-	0	-	-	0	-
Total Bivalvia	-	48	-	0.000	1	0.001

SEGMENT: 1A (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	3	3
Gastropoda						
F. Ancyliidae	-	0	-	-	0	-
F. Hydrobiidae (<i>Ammicola</i> sp.)	-	24	-	-	0	-
F. Valvatidae (<i>Valvata</i> sp.)	-	0	-	-	0	-
Total Gastropoda	-	24	-	0.024	0	-
Hydrozoa (<i>Hydra</i> sp.)	-	0	-	-	0	-
Nematoda	-	0	-	-	0	-
Turbellaria (<i>Planaria</i> sp.)	-	0	-	-	0	-
TOTAL INVERTEBRATES	-	500	-	0.096	131	0.040

Observations: ¹ calculated average of 2 replicates;

Ponar Dredge sampling was not conducted during the winter sampling period;

the third replicate was archived for any necessary future analyses;

the 3 Artificial Substrate Samplers installed were all retrieved;

Artificial Substrate Samplers contained little debris or mud.

SEGMENT: 1A (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	-	-	3	3
Dry Weight of Sample	-	-	37.733	-
Weight of Ashed Sample	-	-	36.259	-
Organic Content	-	-	1.474	3.8
Particle Size:				
> 2 mm	-	-	0.000	0.00
> 1 mm	-	-	0.008	0.02
> 500 µm	-	-	0.044	0.12
> 250 µm	-	-	0.171	0.52
> 125 µm	-	-	1.238	3.39
> 63 µm	-	-	1.351	3.82
Total Gravel	-	-	0.000	0.00
Total Sand	-	-	2.812	7.86
Total Silt/Clay	-	-	33.447	92.14

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

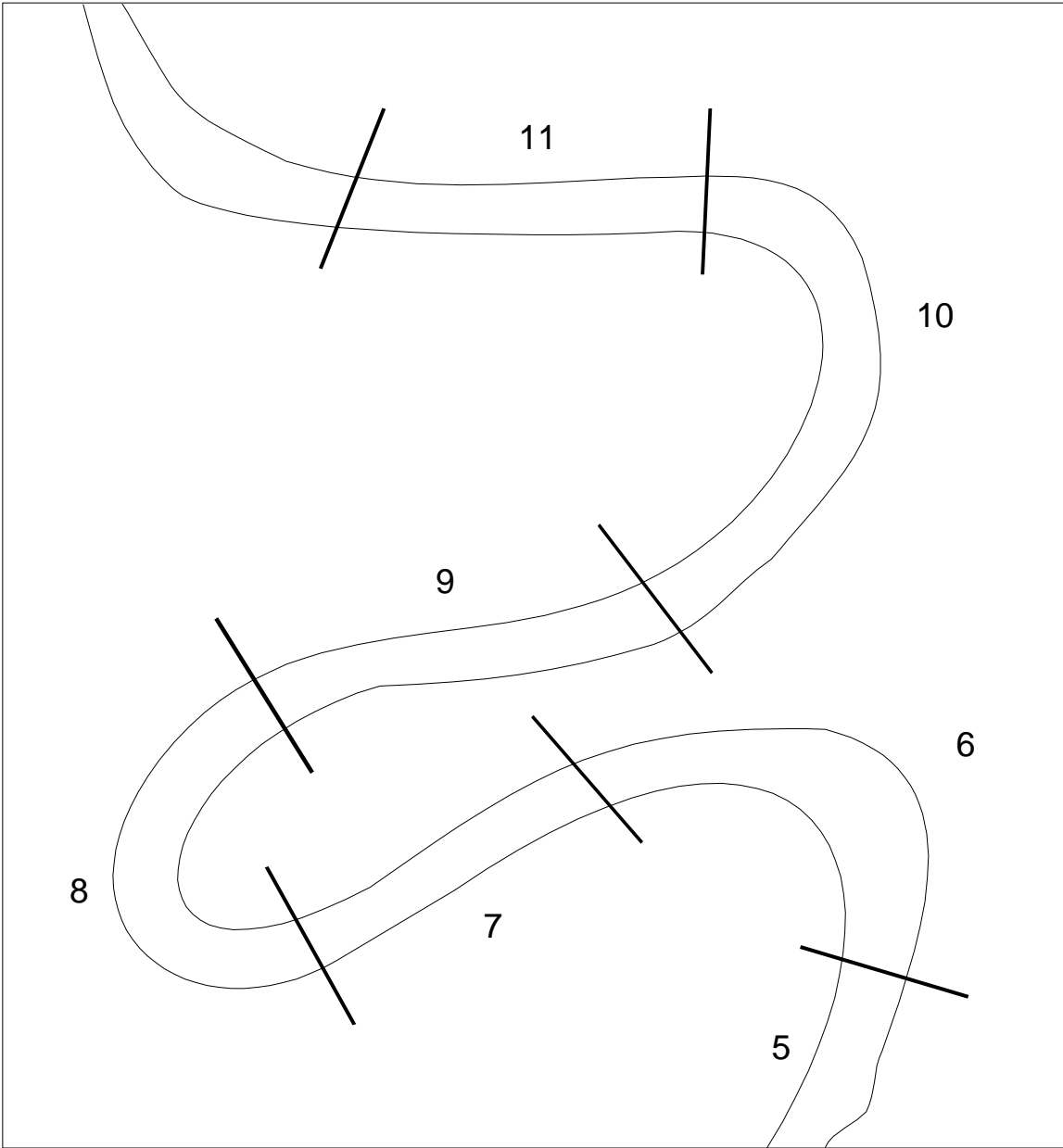


Figure 5. Red River segments 6 - 11.

RIVER: Red River
SEGMENT: 6

Winter Ponar Dredge Sampling		
Date	-	-
UTM (14U)	-	-
Fall Ponar Dredge Sampling		
Date	22-Sep-99	
UTM (14U)	E-0637081	N-5507260
Fall Artificial Substrate Sampling		
Installation Date	-	-
Retrieval Date	-	-
UTM (14U)	-	-

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	-	0	-	-	-	-
F. Lumbriculidae	-	0	-	-	-	-
F. Naididae	-	0	-	-	-	-
Total Oligochaeta	-	0	-	-	-	-
Insecta						
Trichoptera						
F. Brachycentridae	-	0	-	-	-	-
F. Hydropsychidae	-	0	-	-	-	-
F. Leptoceridae	-	0	-	-	-	-
F. Limnephilidae	-	0	-	-	-	-
F. Polycentropodidae	-	0	-	-	-	-
Total Trichoptera	-	0	-	-	-	-
Ephemeroptera						
F. Ametropodidae	-	0	-	-	-	-
F. Baetidae	-	0	-	-	-	-
F. Caenidae	-	0	-	-	-	-
F. Ephemeridae	-	0	-	-	-	-
F. Heptageniidae	-	0	-	-	-	-
F. Leptophlebiidae	-	0	-	-	-	-
F. Polymitarcyidae	-	0	-	-	-	-
F. Siphonuridae	-	0	-	-	-	-
F. Tricorythidae	-	0	-	-	-	-
Total Ephemeroptera	-	0	-	-	-	-

SEGMENT: 6 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	-	0	-	-	-	-
F. Perlodidae	-	0	-	-	-	-
F. Pteronarcyidae	-	0	-	-	-	-
Total Plecoptera	-	0	-	-	-	-
Coleoptera						
F. Dytiscidae	-	0	-	-	-	-
F. Elmidae	-	0	-	-	-	-
Total Coleoptera	-	0	-	-	-	-
Hemiptera						
F. Corixidae	-	0	-	-	-	-
Megaloptera						
F. Corydalidae	-	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	-	0	-	-	-	-
Total Megaloptera	-	0	-	-	-	-
Odonata						
F. Gomphidae	-	0	-	-	-	-
Diptera						
F. Athericidae	-	0	-	-	-	-
F. Chironomidae	-	-	-	-	-	-
SubF. Chironominae	-	0	-	-	-	-
SubF. Orthoclaadiinae	-	0	-	-	-	-
SubF. Tanypodinae	-	0	-	-	-	-
F. Ceratopogonidae	-	0	-	-	-	-
F. Chaoboridae	-	0	-	-	-	-
F. Dolichopodidae	-	0	-	-	-	-
F. Empiidae	-	0	-	-	-	-
F. Simuliidae	-	0	-	-	-	-
F. Tipulidae	-	0	-	-	-	-
Total Diptera	-	0	-	-	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	-	0	-	-	-	-
Copepoda	-	0	-	-	-	-
Cladocera	-	0	-	-	-	-
Total Crustacea	-	0	-	-	-	-
Arachnida						
Hydracarina	-	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	-	1905	-	-	-	-
F. Unionidae	-	0	-	-	-	-
Total Bivalvia	-	1905	-	2.143	-	-

SEGMENT: 6 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	-	-
Gastropoda						
F. Ancyliidae	-	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	-	190	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	-	0	-	-	-	-
Total Gastropoda	-	190	-	0.976	-	-
Hydrozoa (<i>Hydra</i> sp.)	-	0	-	-	-	-
Nematoda	-	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	-	0	-	-	-	-
TOTAL INVERTEBRATES	-	2095	-	3.119	-	-

Observations: ¹ calculated average of 2 replicates;

Ponar Dredge sampling was not conducted during the winter sampling period;

1 non-recoverable Ponar Dredge (rock substrate);

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 6 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	-	-	3	3
Dry Weight of Sample	-	-	41.838	-
Weight of Ashed Sample	-	-	41.137	-
Organic Content	-	-	0.701	1.6
Particle Size:				
> 2 mm	-	-	1.602	5.24
> 1 mm	-	-	2.818	9.13
> 500 µm	-	-	9.272	23.38
> 250 µm	-	-	14.260	32.01
> 125 µm	-	-	4.266	9.59
> 63 µm	-	-	1.803	4.00
Total Gravel	-	-	1.602	5.24
Total Sand	-	-	32.419	78.11
Total Silt/Clay	-	-	7.116	16.65

Observations: ¹ calculated average of 2 replicates

the third replicate was archived for any necessary future analyses.

RIVER: Red River
SEGMENT: 10

Winter Ponar Dredge Sampling
 Date 3-Mar-99
 UTM (14U) E-0636937 N-5508801

Fall Ponar Dredge Sampling
 Date 22-Sep-99
 UTM (14U) E-0636647 N-5507828

Fall Artificial Substrate Sampling
 Installation Date 3-Aug-99
 Retrieval Date 28-Sep-99
 UTM (14U) E-0636745 N-5508750

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period						
Number of Replicates	2	3	2	3	3	3
Annelida						
Oligochaeta						
F. Tubificidae	24	24	-	-	-	-
F. Lumbriculidae	0	0	-	-	-	-
F. Naididae	0	0	-	-	-	-
Total Oligochaeta	24	24	0.000	0.000	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	95	1048	-	-	-	-
F. Leptoceridae	0	0	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	95	1048	0.071	0.167	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	48	24	-	-	-	-
F. Heptageniidae	0	24	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	48	48	0.119	0.071	-	-

SEGMENT: 10 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	24	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	24	0	0.024	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	0	0	-	-	-	-
Total Coleoptera	0	0	-	-	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.095	-	-	-
SubF. Chironominae	95	0	-	-	-	-
SubF. Orthoclaadiinae	0	0	-	-	-	-
SubF. Tanypodinae	143	0	-	-	-	-
F. Ceratopogonidae	0	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empididae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	238	0	0.095	-	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	48	619	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	48	619	0.000	0.595	-	-

SEGMENT: 10 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	3	3
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Ammicola</i> sp.)	0	71	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	71	-	0.286	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	476	1810	0.309	1.119	-	-

Observations: ¹ calculated average of 2 replicates;

5 non-recoverable Ponar Dredges (hard clay) during winter sampling;

only 2 replicates were collected during winter sampling due to high number of non-recoverable Ponar Dredges;

2 non-recoverable Ponar Dredges (hard clay) during fall sampling;

the third replicate collected during fall sampling was archived for any necessary future analyses;

the 3 Artificial Substrate Samplers installed were all lost due to vandalism.

SEGMENT: 10 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	2	2	3	3
Dry Weight of Sample	28.085	-	31.892	-
Weight of Ashed Sample	27.040	-	31.230	-
Organic Content	1.045	3.7	0.662	2.3
Particle Size:				
> 2 mm	0.175	0.49	0.059	0.18
> 1 mm	0.053	0.15	0.143	0.44
> 500 µm	0.049	0.16	3.738	11.35
> 250 µm	0.064	0.25	11.967	33.12
> 125 µm	0.109	0.41	2.436	6.81
> 63 µm	0.084	0.33	0.835	2.43
Total Gravel	0.175	0.49	0.059	0.18
Total Sand	0.357	1.29	19.119	54.15
Total Silt/Clay	26.509	98.22	12.051	45.67

Observations: ¹ calculated average of 2 replicates

only 2 replicates were collected during winter sampling due to high number of non-recoverable Ponar Dredges;

the third replicate collected during fall sampling was archived for any necessary future analyses.

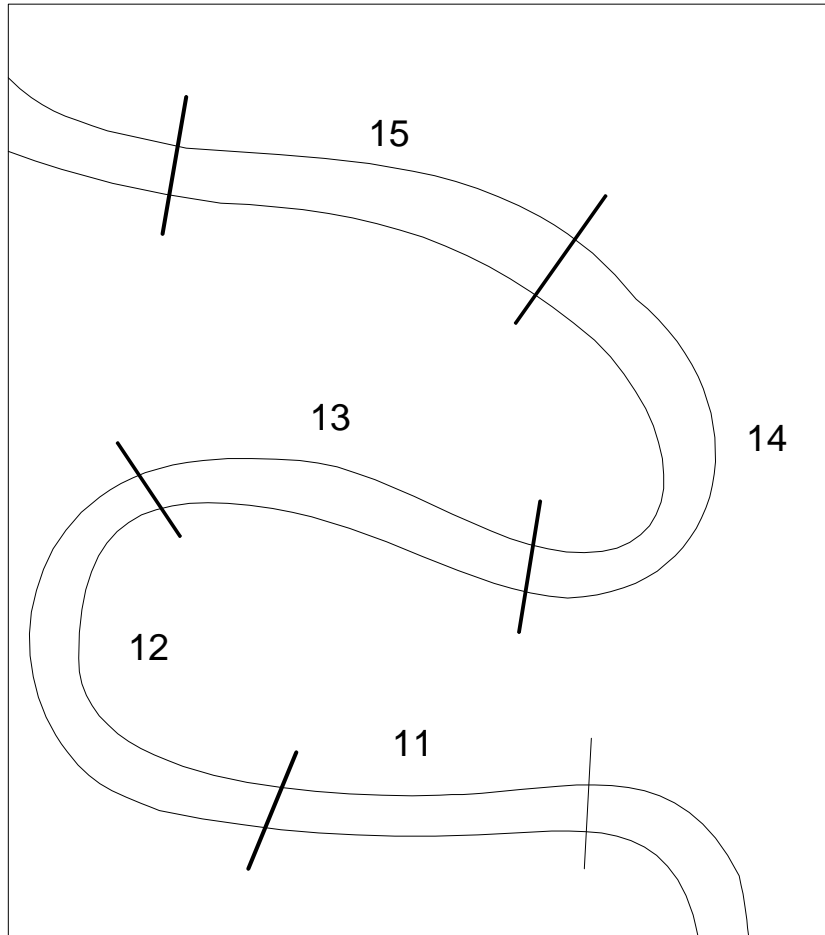


Figure 6. Red River segments 11 - 15.

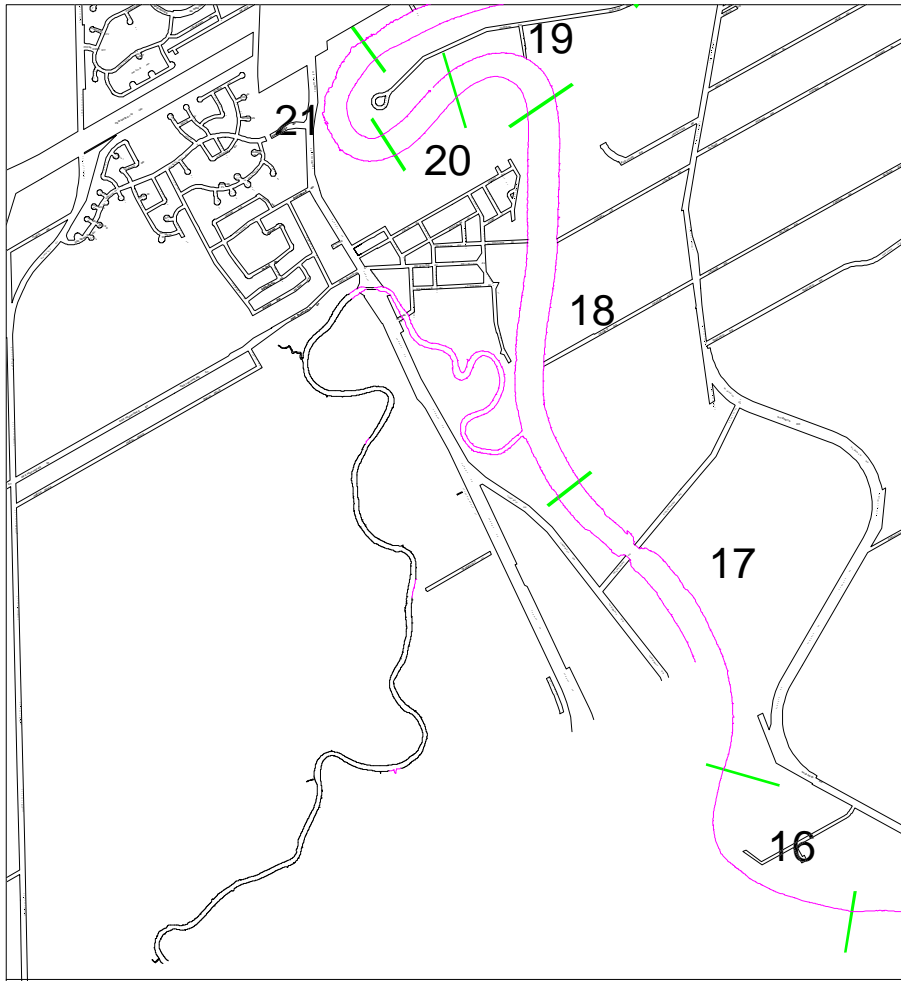


Figure 7. Red River segments 16-21.

RIVER: Red River
SEGMENT: 16

Winter Ponar Dredge Sampling
 Date 3-Mar-99
 UTM (14U) E-0634859 N-5511040

Fall Ponar Dredge Sampling
 Date 22-Sep-99
 UTM (14U) E-0634914 N-5510664

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period						
Number of Replicates	3	3	3	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	0	24	-	-	-	-
F. Lumbriculidae	48	0	-	-	-	-
F. Naididae	0	0	-	-	-	-
Total Oligochaeta	48	24	0.000	0.071	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	0	48	-	-	-	-
F. Leptoceridae	0	24	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	0	71	-	0.000	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	119	238	-	-	-	-
F. Heptageniidae	0	48	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	119	286	0.119	0.095	-	-

SEGMENT: 16 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	0	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	0	0	-	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	0	0	-	-	-	-
Total Coleoptera	0	0	-	-	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.262	-	-	-
SubF. Chironominae	167	0	-	-	-	-
SubF. Orthoclaadiinae	24	0	-	-	-	-
SubF. Tanypodinae	310	0	-	-	-	-
F. Ceratopogonidae	48	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	24	-	-	-	-
F. Empididae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	548	24	0.310	0.024	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	48	24	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	48	24	0.048	0.024	-	-

SEGMENT: 16 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	762	429	0.477	0.214	-	-

Observations: ¹ calculated average of 2 replicates;

1 non-recoverable Ponar Dredge (hard clay) during winter sampling;

3 non-recoverable Ponar Dredges (hard clay and/or cobble) during fall sampling;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 16 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	3	3	3	3
Dry Weight of Sample	24.586	-	30.814	-
Weight of Ashed Sample	23.496	-	29.339	-
Organic Content	1.090	4.4	1.474	4.5
Particle Size:				
> 2 mm	0.000	0.00	0.311	1.52
> 1 mm	0.008	0.03	0.163	0.79
> 500 µm	0.056	0.25	0.183	0.89
> 250 µm	0.105	0.47	0.102	0.49
> 125 µm	0.132	0.57	0.091	0.34
> 63 µm	0.137	0.59	0.030	0.13
Total Gravel	0.000	0.00	0.311	1.52
Total Sand	0.436	1.92	0.570	2.63
Total Silt/Clay	23.060	98.08	28.459	95.85

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

RIVER: Red River
SEGMENT: 17

Winter Ponar Dredge Sampling
 Date 3-Mar-99
 UTM (14U) E-0634768 N-5512080

Fall Ponar Dredge Sampling
 Date 22-Sep-99
 UTM (14U) E-0634767 N-5511975

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) - -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	667	24	-	-	-	-
F. Lumbriculidae	0	0	-	-	-	-
F. Naididae	0	0	-	-	-	-
Total Oligochaeta	667	24	0.262	0.000	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	0	24	-	-	-	-
F. Leptoceridae	0	71	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	0	95	-	0.095	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	143	95	-	-	-	-
F. Heptageniidae	0	0	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	143	95	0.119	0.214	-	-

SEGMENT: 17 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	0	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	0	0	-	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	0	24	-	-	-	-
Total Coleoptera	0	24	-	0.024	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.071	-	-	-
SubF. Chironominae	48	0	-	-	-	-
SubF. Orthoclaadiinae	0	0	-	-	-	-
SubF. Tanypodinae	167	0	-	-	-	-
F. Ceratopogonidae	0	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empiidae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	214	0	0.071	-	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	71	524	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	71	524	0.024	0.190	-	-

SEGMENT: 17 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	143	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	143	-	0.619	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	1095	905	0.476	1.142	-	-

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 17 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	3	3	3	3
Dry Weight of Sample	37.055	-	58.268	-
Weight of Ashed Sample	35.258	-	54.470	-
Organic Content	1.797	4.8	3.798	6.4
Particle Size:				
> 2 mm	0.000	0.00	1.928	3.57
> 1 mm	0.019	0.05	0.756	1.43
> 500 µm	0.072	0.21	1.017	1.93
> 250 µm	0.240	0.72	1.623	3.11
> 125 µm	0.211	0.64	1.777	3.40
> 63 µm	0.131	0.40	0.899	1.68
Total Gravel	0.000	0.00	1.928	3.57
Total Sand	0.673	2.03	6.073	11.55
Total Silt/Clay	34.585	97.97	46.470	84.89

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

RIVER: Red River
SEGMENT: 18

Winter Ponar Dredge Sampling
 Date 9-Mar-99
 UTM (14U) E-0633868 N-5513233

Fall Ponar Dredge Sampling
 Date 22-Sep-99
 UTM (14U) E-0633868 N-5513233

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) - -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
Number of Replicates	3	3	3	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	24	24	-	-	-	-
F. Lumbriculidae	0	0	-	-	-	-
F. Naididae	0	0	-	-	-	-
Total Oligochaeta	24	24	0.000	0.000	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	190	24	-	-	-	-
F. Leptoceridae	0	0	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	190	24	0.333	0.000	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	71	48	-	-	-	-
F. Heptageniidae	0	0	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	71	48	0.048	0.071	-	-

SEGMENT: 18 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	24	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	24	0	0.000	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	0	0	-	-	-	-
Total Coleoptera	0	0	-	-	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.262	0.024	-	-
SubF. Chironominae	48	0	-	-	-	-
SubF. Orthoclaadiinae	24	0	-	-	-	-
SubF. Tanypodinae	833	24	-	-	-	-
F. Ceratopogonidae	24	0	-	-	-	-
F. Chaoboridae	24	48	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empiidae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	952	71	0.286	0.048	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	0	286	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	0	286	-	0.095	-	-

SEGMENT: 18 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	1262	452	0.667	0.214	-	-

Observations: ¹ calculated average of 2 replicates;
the third replicate was archived for any necessary future analyses;
Artificial Substrate Samplers were not installed.

SEGMENT: 18 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	3	3	3	3
Dry Weight of Sample	18.877	-	31.402	-
Weight of Ashed Sample	17.702	-	30.127	-
Organic Content	1.175	6.2	1.275	4.2
Particle Size:				
> 2 mm	0.000	0.00	1.963	4.83
> 1 mm	0.001	0.00	0.185	0.46
> 500 µm	0.009	0.07	0.129	0.32
> 250 µm	0.046	0.31	0.205	0.52
> 125 µm	0.177	0.88	0.286	0.72
> 63 µm	0.108	0.53	0.190	0.49
Total Gravel	0.000	0.00	1.963	4.83
Total Sand	0.340	1.80	0.995	2.51
Total Silt/Clay	17.362	98.20	27.168	92.66

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

RIVER: Red River
SEGMENT: 21

Winter Ponar Dredge Sampling
 Date 1-Mar-99
 UTM (14U) E-0633045 N-5514834

Fall Ponar Dredge Sampling
 Date 22-Sep-99
 UTM (14U) E-0633070 N-5514507

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period						
Number of Replicates	3	3	3	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	452	0	-	-	-	-
F. Lumbriculidae	0	0	-	-	-	-
F. Naididae	0	0	-	-	-	-
Total Oligochaeta	452	0	0.071	-	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	0	1167	-	-	-	-
F. Leptoceridae	0	24	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	0	1190	-	0.595	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	95	24	-	-	-	-
F. Heptageniidae	0	24	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	95	48	0.476	0.048	-	-

SEGMENT: 21 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	0	24	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	0	24	-	0.000	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	0	71	-	-	-	-
Total Coleoptera	0	71	-	0.119	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	24	0	-	-	-	-
Total Megaloptera	24	0	0.048	-	-	-
Odonata						
F. Gomphidae	24	0	1.429	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.190	-	-	-
SubF. Chironominae	24	0	-	-	-	-
SubF. Orthoclaadiinae	48	0	-	-	-	-
SubF. Tanypodinae	524	0	-	-	-	-
F. Ceratopogonidae	0	0	-	-	-	-
F. Chaoboridae	24	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empididae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	619	0	0.190	-	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	48	167	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	48	167	0.143	0.167	-	-

SEGMENT: 21 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	1262	1500	2.357	0.929	-	-

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 21 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	3	3	3	3
Dry Weight of Sample	31.064	-	32.986	-
Weight of Ashed Sample	29.264	-	31.881	-
Organic Content	1.800	5.8	1.105	3.6
Particle Size:				
> 2 mm	0.311	3.59	16.977	48.21
> 1 mm	0.007	0.01	0.261	0.95
> 500 µm	0.041	0.10	0.343	1.30
> 250 µm	0.377	0.82	0.253	0.95
> 125 µm	1.216	2.68	0.203	0.76
> 63 µm	0.281	0.73	0.153	0.55
Total Gravel	0.311	3.59	16.977	48.21
Total Sand	1.921	4.33	1.212	4.52
Total Silt/Clay	27.033	92.08	13.692	47.27

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

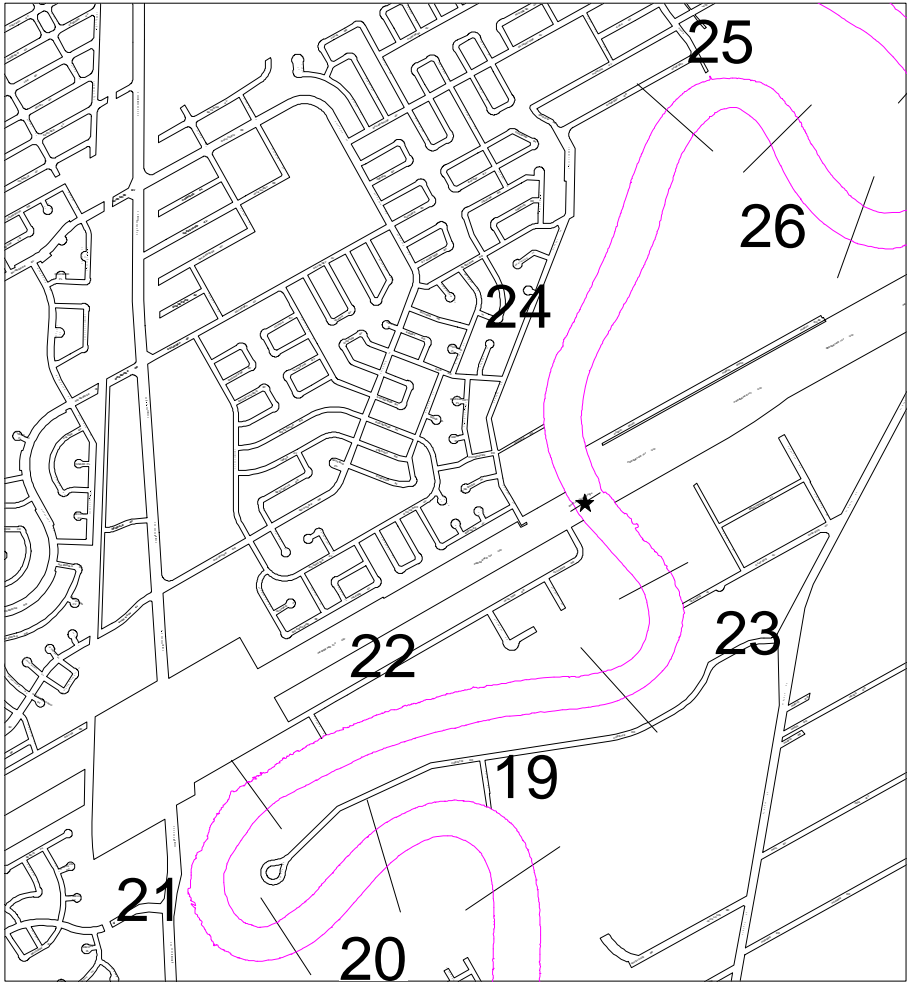


Figure 8. Red River segments 19-26.

RIVER: Red River
SEGMENT: 25

Winter Ponar Dredge Sampling
 Date 1-Mar-99
 UTM (14U) E-0634684 N-5517798

Fall Ponar Dredge Sampling
 Date 22-Sep-99
 UTM (14U) E-0634827 N-5517310

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) - -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	167	95	-	-	-	-
F. Lumbriculidae	0	0	-	-	-	-
F. Naididae	0	0	-	-	-	-
Total Oligochaeta	167	95	0.000	0.048	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	0	0	-	-	-	-
F. Leptoceridae	0	0	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	0	0	-	-	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	310	0	-	-	-	-
F. Heptageniidae	0	0	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	310	0	1.952	-	-	-

SEGMENT: 25 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	24	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	24	0	0.024	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	0	0	-	-	-	-
Total Coleoptera	0	0	-	-	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.238	-	-	-
SubF. Chironominae	167	0	-	-	-	-
SubF. Orthoclaadiinae	0	0	-	-	-	-
SubF. Tanypodinae	405	0	-	-	-	-
F. Ceratopogonidae	0	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empididae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	571	0	0.238	-	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	24	381	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	24	381	0.024	0.595	-	-

SEGMENT: 25 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	190	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	190	-	0.571	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	1095	667	2.238	1.214	-	-

Observations: ¹ calculated average of 2 replicates;

5 non-recoverable Ponar Dredges (hard clay) during fall sampling;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 25 (continued)

Sampling Method	PONAR			
	Mean Sediment Particle Size Composition ¹			
Measurement	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Sampling Period				
Number of Replicates	3	3	3	3
Dry Weight of Sample	40.181	-	50.725	-
Weight of Ashed Sample	37.640	-	49.925	-
Organic Content	2.541	6.3	0.800	1.6
Particle Size:				
> 2 mm	0.638	1.22	6.642	9.63
> 1 mm	0.314	0.60	9.820	14.54
> 500 µm	0.653	1.26	5.145	11.55
> 250 µm	0.467	0.91	15.056	38.69
> 125 µm	0.442	1.07	1.256	2.34
> 63 µm	0.473	1.50	0.544	0.94
Total Gravel	0.638	1.22	6.642	9.63
Total Sand	2.348	5.33	31.822	68.05
Total Silt/Clay	34.654	93.45	11.461	22.32

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

RIVER: Red River
SEGMENT: 26

Winter Ponar Dredge Sampling
 Date 1-Mar-99
 UTM (14U) E-0634996 N-5517554

Fall Ponar Dredge Sampling
 Date 16-Sep-99
 UTM (14U) E-0634922 N-5517370

Fall Artificial Substrate Sampling
 Installation Date 3-Aug-99
 Retrieval Date 28-Sep-99
 UTM (14U) E-0635264 N-5517132

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period						
Number of Replicates	3	3	3	3	3	3
Annelida						
Oligochaeta						
F. Tubificidae	190	143	-	-	1	-
F. Lumbriculidae	0	0	-	-	0	-
F. Naididae	71	0	-	-	0	-
Total Oligochaeta	262	143	0.095	0.000	1	0.000
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	0	-
F. Hydropsychidae	0	0	-	-	73	-
F. Leptoceridae	0	0	-	-	0	-
F. Limnephilidae	0	0	-	-	0	-
F. Polycentropodidae	0	0	-	-	1	-
Total Trichoptera	0	0	-	-	74	0.023
Ephemeroptera						
F. Ametropodidae	0	0	-	-	0	-
F. Baetidae	0	0	-	-	0	-
F. Caenidae	0	0	-	-	0	-
F. Ephemeridae	48	0	-	-	0	-
F. Heptageniidae	0	0	-	-	1	-
F. Leptophlebiidae	0	0	-	-	0	-
F. Polymitarcyidae	0	0	-	-	0	-
F. Siphonuridae	0	0	-	-	0	-
F. Tricorythidae	0	0	-	-	0	-
Total Ephemeroptera	48	0	0.024	-	1	0.000

SEGMENT: 26 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	0	-
F. Perlodidae	0	0	-	-	1	-
F. Pteronarcyidae	0	0	-	-	0	-
Total Plecoptera	0	0	-	-	1	0.001
Coleoptera						
F. Dytiscidae	0	0	-	-	0	-
F. Elmidae	0	24	-	-	2	-
Total Coleoptera	0	24	-	0.024	2	0.002
Hemiptera						
F. Corixidae	0	0	-	-	0	-
Megaloptera						
F. Corydalidae	0	0	-	-	0	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	0	-
Total Megaloptera	0	0	-	-	0	-
Odonata						
F. Gomphidae	24	24	0.881	0.310	0	-
Diptera						
F. Athericidae	0	0	-	-	0	-
F. Chironomidae	-	-	0.405	0.024	-	0.000
SubF. Chironominae	500	0	-	-	1	-
SubF. Orthocladiinae	286	0	-	-	0	-
SubF. Tanypodinae	310	24	-	-	0	-
F. Ceratopogonidae	48	0	-	-	0	-
F. Chaoboridae	0	0	-	-	0	-
F. Dolichopodidae	0	0	-	-	0	-
F. Empiidae	0	0	-	-	0	-
F. Simuliidae	0	0	-	-	1	-
F. Tipulidae	0	0	-	-	0	-
Total Diptera	1143	24	0.429	0.024	1	0.000
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	0	-
Copepoda	0	0	-	-	0	-
Cladocera	0	0	-	-	0	-
Total Crustacea	0	0	-	-	0	-
Arachnida						
Hydracarina	0	0	-	-	0	-
Mollusca						
Bivalvia						
F. Sphaeriidae	71	0	-	-	0	-
F. Unionidae	0	0	-	-	0	-
Total Bivalvia	71	0	0.786	-	0	-

SEGMENT: 26 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	3	3
Gastropoda						
F. Ancyliidae	0	0	-	-	1	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	0	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	0	-
Total Gastropoda	0	0	-	-	1	0.004
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	0	-
Nematoda	0	0	-	-	0	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	0	-
TOTAL INVERTEBRATES	1548	214	2.215	0.358	80	0.030

Observations: ¹ calculated average of 2 replicates;

3 non-recoverable Ponar Dredges (cobble) during winter sampling;

the third replicate was archived for any necessary future analyses;

the 3 Artificial Substrate Samplers installed were all retrieved;

Artificial Substrate Samplers contained little debris or mud.

SEGMENT: 26 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	3	3	3	3
Dry Weight of Sample	29.714	-	45.096	-
Weight of Ashed Sample	28.958	-	43.113	-
Organic Content	0.756	2.5	1.983	4.4
Particle Size:				
> 2 mm	0.000	0.00	0.000	0.00
> 1 mm	0.009	0.02	0.017	0.04
> 500 µm	0.122	0.33	0.078	0.19
> 250 µm	0.940	2.80	0.739	1.78
> 125 µm	0.821	3.14	3.247	7.79
> 63 µm	0.345	1.54	0.355	0.84
Total Gravel	0.000	0.00	0.000	0.00
Total Sand	2.236	7.84	4.436	10.63
Total Silt/Clay	26.722	92.16	38.677	89.37

Observations: ¹ calculated average of 2 replicates;
the third replicate was archived for any necessary future analyses.

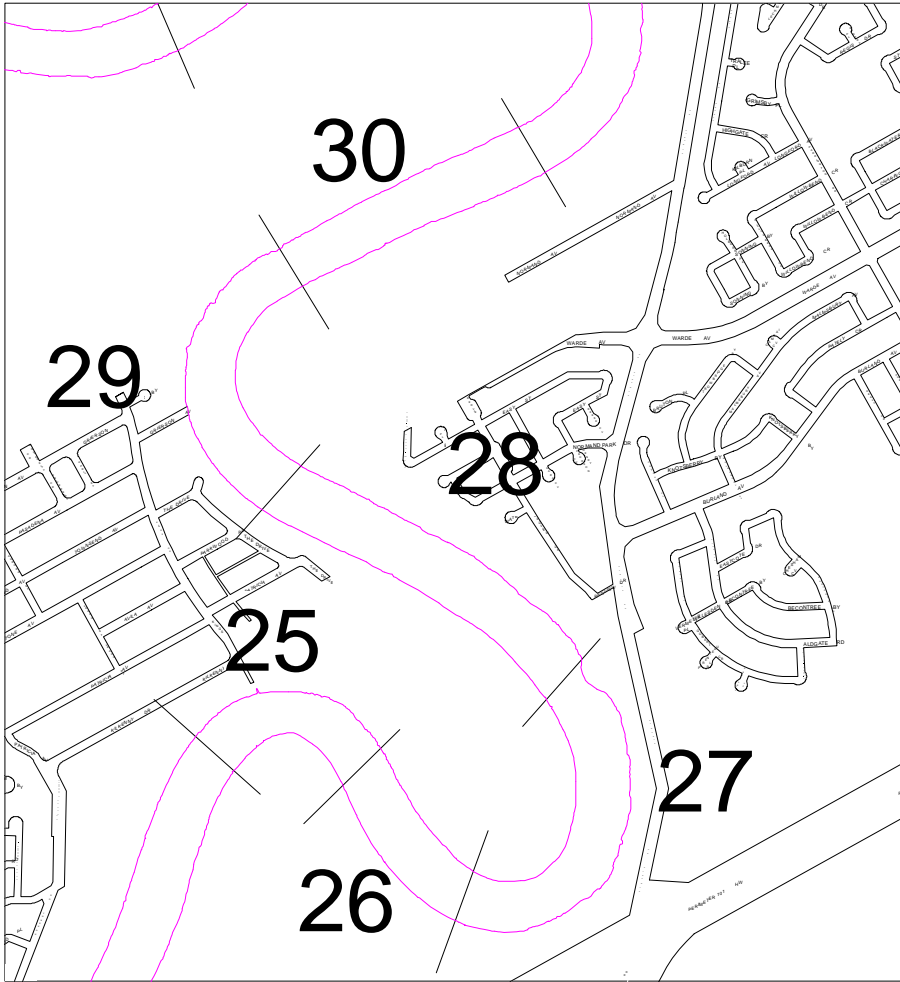


Figure 9. Red River segments 25-30.

RIVER: Red River
SEGMENT: 27

Winter Ponar Dredge Sampling			
Date	-		
UTM (14U)	-	-	
Fall Ponar Dredge Sampling			
Date	16-Sep-99		
Start UTM (14U)	E-0635505	N-5517125	
End UTM (14U)	E-0635655	N-5517513	
Fall Artificial Substrate Sampling			
Installation Date	-		
Retrieval Date	-		
UTM (14U)	-	-	

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	7	-	7	-	-
Annelida						
Oligochaeta						
F. Tubificidae	-	10	-	-	-	-
F. Lumbriculidae	-	0	-	-	-	-
F. Naididae	-	0	-	-	-	-
Total Oligochaeta	-	10	-	0.000	-	-
Insecta						
Trichoptera						
F. Brachycentridae	-	0	-	-	-	-
F. Hydropsychidae	-	19	-	-	-	-
F. Leptoceridae	-	0	-	-	-	-
F. Limnephilidae	-	0	-	-	-	-
F. Polycentropodidae	-	0	-	-	-	-
Total Trichoptera	-	19	-	0.000	-	-
Ephemeroptera						
F. Ametropodidae	-	0	-	-	-	-
F. Baetidae	-	0	-	-	-	-
F. Caenidae	-	0	-	-	-	-
F. Ephemeridae	-	324	-	-	-	-
F. Heptageniidae	-	0	-	-	-	-
F. Leptophlebiidae	-	0	-	-	-	-
F. Polymitarcyidae	-	0	-	-	-	-
F. Siphonuridae	-	0	-	-	-	-
F. Tricorythidae	-	0	-	-	-	-
Total Ephemeroptera	-	324	-	0.171	-	-

SEGMENT: 27 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	7	-	7	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	-	0	-	-	-	-
F. Perlodidae	-	0	-	-	-	-
F. Pteronarcyidae	-	0	-	-	-	-
Total Plecoptera	-	0	-	-	-	-
Coleoptera						
F. Dytiscidae	-	0	-	-	-	-
F. Elmidae	-	0	-	-	-	-
Total Coleoptera	-	0	-	-	-	-
Hemiptera						
F. Corixidae	-	0	-	-	-	-
Megaloptera						
F. Corydalidae	-	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	-	10	-	-	-	-
Total Megaloptera	-	10	-	0.000	-	-
Odonata						
F. Gomphidae	-	10	-	0.438	-	-
Diptera						
F. Athericidae	-	0	-	-	-	-
F. Chironomidae	-	-	-	0.000	-	-
SubF. Chironominae	-	10	-	-	-	-
SubF. Orthoclaadiinae	-	0	-	-	-	-
SubF. Tanypodinae	-	0	-	-	-	-
F. Ceratopogonidae	-	0	-	-	-	-
F. Chaoboridae	-	0	-	-	-	-
F. Dolichopodidae	-	0	-	-	-	-
F. Empididae	-	0	-	-	-	-
F. Simuliidae	-	0	-	-	-	-
F. Tipulidae	-	0	-	-	-	-
Total Diptera	-	10	-	0.000	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	-	0	-	-	-	-
Copepoda	-	0	-	-	-	-
Cladocera	-	0	-	-	-	-
Total Crustacea	-	0	-	-	-	-
Arachnida						
Hydracarina	-	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	-	229	-	-	-	-
F. Unionidae	-	0	-	-	-	-
Total Bivalvia	-	229	-	0.143	-	-

SEGMENT: 27 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	7	-	7	-	-
Gastropoda						
F. Ancyliidae	-	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	-	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	-	0	-	-	-	-
Total Gastropoda	-	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	-	0	-	-	-	-
Nematoda	-	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	-	0	-	-	-	-
TOTAL INVERTEBRATES	-	610	-	0.752	-	-

Observations: ¹ calculated average of 5 replicates;

sampling conducted within the SEWPCC outfall plume;

Ponar Dredge sampling was not conducted during the winter sampling period;

6 non-recoverable Ponar Dredges (hard clay with sand and/or gravel) during fall sampling;

the sixth and seventh replicates were archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 27 (continued)

Sampling Method	PONAR			
	Mean Sediment Particle Size Composition ¹			
Measurement	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Sampling Period				
Number of Replicates	-	-	7	7
Dry Weight of Sample	-	-	29.359	-
Weight of Ashed Sample	-	-	27.743	-
Organic Content	-	-	1.616	5.6
Particle Size:				
> 2 mm	-	-	1.784	6.04
> 1 mm	-	-	0.225	0.68
> 500 µm	-	-	0.191	0.66
> 250 µm	-	-	0.291	1.11
> 125 µm	-	-	0.340	1.31
> 63 µm	-	-	0.214	0.85
Total Gravel	-	-	1.784	6.04
Total Sand	-	-	1.262	4.61
Total Silt/Clay	-	-	24.697	89.35

Observations: ¹ calculated average of 5 replicates;

the sixth and seventh replicates were archived for any necessary future analyses.

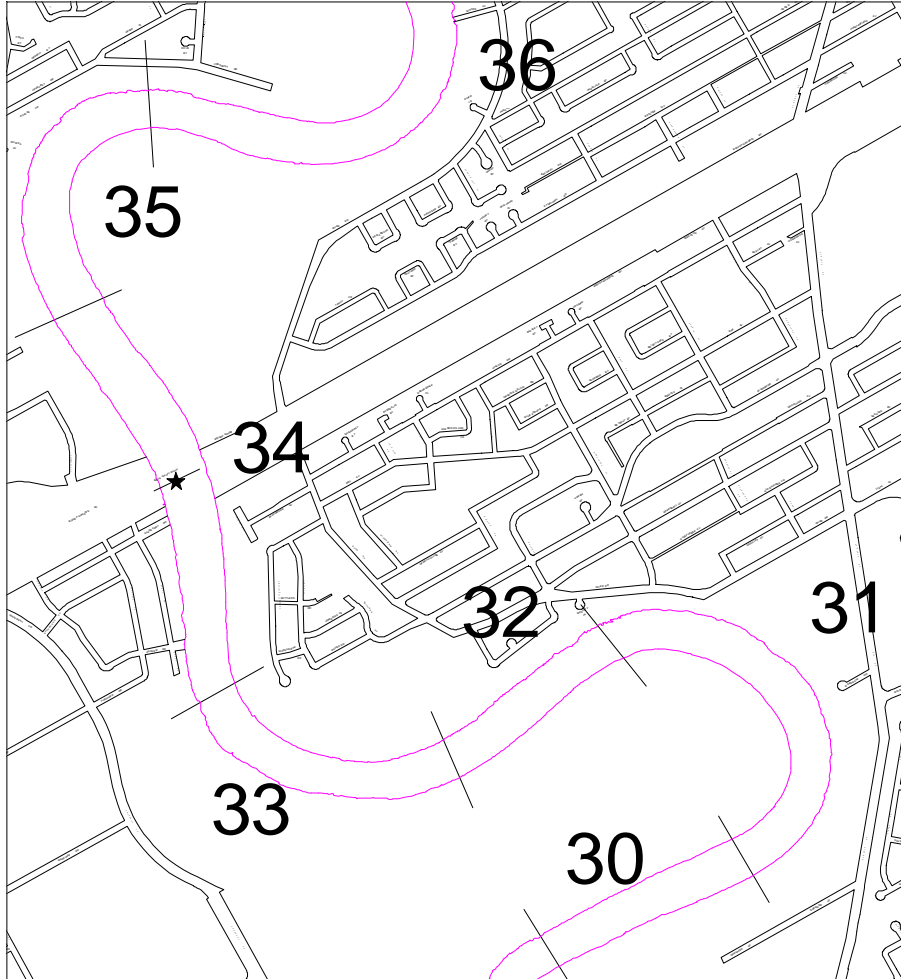


Figure 10. Red River segments 30-35.

RIVER: Red River
SEGMENT: 34

Winter Ponar Dredge Sampling
 Date 26-Feb-99
 UTM (14U) E-0633459 N-5520646

Fall Ponar Dredge Sampling
 Date 16-Sep-99
 UTM (14U) E-0633369 N-5520492

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) - -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	48	0	-	-	-	-
F. Lumbriculidae	0	119	-	-	-	-
F. Naididae	0	0	-	-	-	-
Total Oligochaeta	48	119	0.048	0.095	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	0	0	-	-	-	-
F. Leptoceridae	0	0	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	0	0	-	-	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	286	48	-	-	-	-
F. Heptageniidae	0	0	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	286	48	0.548	0.024	-	-

SEGMENT: 34 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	24	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	24	0	0.000	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	0	0	-	-	-	-
Total Coleoptera	0	0	-	-	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	24	-	0.024	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.119	0.024	-	-
SubF. Chironominae	167	24	-	-	-	-
SubF. Orthoclaadiinae	333	0	-	-	-	-
SubF. Tanypodinae	238	0	-	-	-	-
F. Ceratopogonidae	48	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empididae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	786	24	0.119	0.024	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	95	0	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	95	0	0.452	-	-	-

SEGMENT: 34 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	24	-	0.000	-	-
TOTAL INVERTEBRATES	1238	238	1.167	0.167	-	-

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 34 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	3	3	3	3
Dry Weight of Sample	32.580	-	35.452	-
Weight of Ashed Sample	30.950	-	33.529	-
Organic Content	1.630	5.0	1.923	5.6
Particle Size:				
> 2 mm	1.790	3.35	1.940	4.59
> 1 mm	0.726	1.36	0.224	0.53
> 500 µm	0.711	1.39	0.253	0.60
> 250 µm	1.018	3.17	0.180	0.43
> 125 µm	0.939	4.38	0.121	0.29
> 63 µm	0.282	0.92	0.079	0.19
Total Gravel	1.790	3.35	1.940	4.59
Total Sand	3.675	11.22	0.856	2.04
Total Silt/Clay	25.485	85.43	30.733	93.37

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

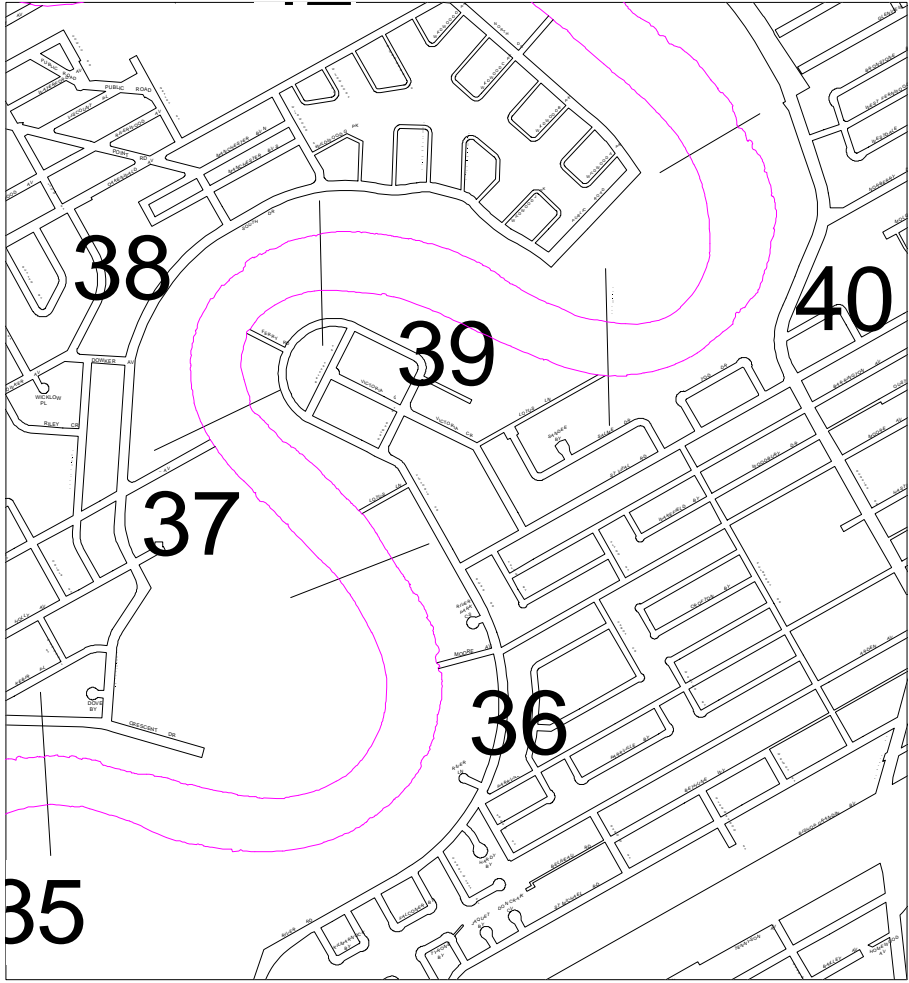


Figure 11. Red River segments 36-40.

RIVER: Red River
SEGMENT: 38

Winter Ponar Dredge Sampling
 Date 26-Feb-99
 UTM (14U) E-0634138 N-5522888

Fall Ponar Dredge Sampling
 Date 16-Sep-99
 UTM (14U) E-0634019 N-5522464

Fall Artificial Substrate Sampling
 Installation Date 3-Aug-99
 Retrieval Date 29-Sep-99
 UTM (14U) E-0634034 N-5522384

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period						
Number of Replicates	3	3	3	3	3	3
Annelida						
Oligochaeta						
F. Tubificidae	0	167	-	-	0	-
F. Lumbriculidae	0	0	-	-	0	-
F. Naididae	0	0	-	-	0	-
Total Oligochaeta	0	167	-	0.024	0	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	1	-
F. Hydropsychidae	24	0	-	-	252	-
F. Leptoceridae	0	0	-	-	1	-
F. Limnephilidae	0	0	-	-	0	-
F. Polycentropodidae	0	0	-	-	46	-
Total Trichoptera	24	0	0.024	-	299	0.156
Ephemeroptera						
F. Ametropodidae	0	0	-	-	0	-
F. Baetidae	0	0	-	-	0	-
F. Caenidae	0	0	-	-	2	-
F. Ephemeridae	190	24	-	-	0	-
F. Heptageniidae	24	0	-	-	6	-
F. Leptophlebiidae	0	0	-	-	1	-
F. Polymitarcyidae	0	0	-	-	0	-
F. Siphonuridae	0	0	-	-	0	-
F. Tricorythidae	0	0	-	-	0	-
Total Ephemeroptera	214	24	0.310	0.000	8	0.002

SEGMENT: 38 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	0	-
F. Perlodidae	48	0	-	-	1	-
F. Pteronarcyidae	0	0	-	-	0	-
Total Plecoptera	48	0	0.000	-	1	0.001
Coleoptera						
F. Dytiscidae	0	0	-	-	0	-
F. Elmidae	0	0	-	-	1	-
Total Coleoptera	0	0	-	-	1	0.000
Hemiptera						
F. Corixidae	0	0	-	-	0	-
Megaloptera						
F. Corydalidae	0	0	-	-	0	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	0	-
Total Megaloptera	0	0	-	-	0	-
Odonata						
F. Gomphidae	0	0	-	-	0	-
Diptera						
F. Athericidae	0	0	-	-	0	-
F. Chironomidae	-	-	0.143	-	-	0.001
SubF. Chironominae	595	0	-	-	0	-
SubF. Orthoclaadiinae	238	0	-	-	1	-
SubF. Tanypodinae	190	0	-	-	1	-
F. Ceratopogonidae	48	0	-	-	0	-
F. Chaoboridae	0	0	-	-	0	-
F. Dolichopodidae	0	0	-	-	0	-
F. Empididae	0	0	-	-	0	-
F. Simuliidae	0	0	-	-	1	-
F. Tipulidae	0	0	-	-	0	-
Total Diptera	1071	0	0.143	-	3	0.001
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	0	-
Copepoda	0	0	-	-	0	-
Cladocera	0	0	-	-	0	-
Total Crustacea	0	0	-	-	0	-
Arachnida						
Hydracarina	0	0	-	-	0	-
Mollusca						
Bivalvia						
F. Sphaeriidae	48	6357	-	-	0	-
F. Unionidae	0	0	-	-	0	-
Total Bivalvia	48	6357	0.048	4.071	0	-

SEGMENT: 38 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	3	3
Gastropoda						
F. Ancyliidae	0	0	-	-	0	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	167	-	-	0	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	0	-
Total Gastropoda	0	167	-	0.619	0	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	0	-
Nematoda	0	0	-	-	0	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	2	0.001
TOTAL INVERTEBRATES	1405	6714	0.525	4.714	312	0.161

Observations: ¹ calculated average of 2 replicates;

4 non-recoverable Ponar Dredges (mud and cobble) during winter sampling;

2 non-recoverable Ponar Dredges (rock) during fall sampling;

the third replicate was archived for any necessary future analyses;

of the 3 Artificial Substrate Samplers installed, 2 were retrieved (1 was provided to the Toxicity Workstream);

Artificial Substrate Samplers contained little debris.

SEGMENT: 38 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	2	2	3	3
Dry Weight of Sample	20.108	-	42.471	-
Weight of Ashed Sample	19.177	-	41.648	-
Organic Content	0.931	4.6	0.823	1.9
Particle Size:				
> 2 mm	0.000	0.00	0.143	0.36
> 1 mm	0.007	0.02	0.943	2.33
> 500 µm	0.114	0.34	11.360	27.43
> 250 µm	1.152	3.50	16.973	41.84
> 125 µm	1.194	4.14	1.525	3.88
> 63 µm	0.331	1.47	0.292	0.72
Total Gravel	0.000	0.00	0.143	0.36
Total Sand	2.796	9.47	31.094	76.19
Total Silt/Clay	16.381	90.54	10.411	23.45

Observations: ¹ calculated average of 2 replicates;

only 2 replicates were collected during winter sampling due to high number of non-recoverable Ponar Dredges;

the third replicate collected during fall sampling was archived for any necessary future analyses.

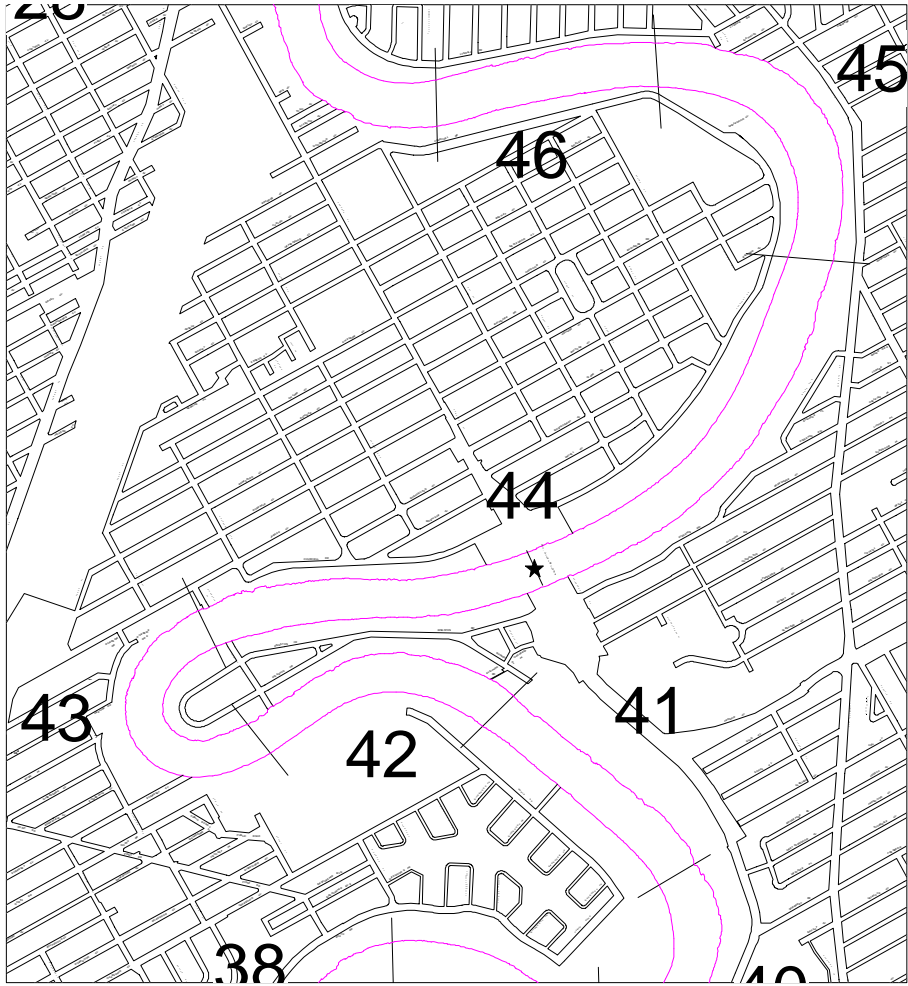


Figure 12. Red River segments 41-46.

RIVER: Red River
SEGMENT: 44

Winter Ponar Dredge Sampling
 Date 26-Feb-99
 UTM (14U) E-0634112 N-5524124

Fall Ponar Dredge Sampling
 Date 16-Sep-99
 UTM (14U) E-0634362 N-5524024

Fall Artificial Substrate Sampling
 Installation Date 3-Aug-99
 Retrieval Date 29-Sep-99
 UTM (14U) E-0633802 N-5523894

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period						
Number of Replicates	3	3	3	3	3	3
Annelida						
Oligochaeta						
F. Tubificidae	262	95	-	-	1	-
F. Lumbriculidae	0	24	-	-	0	-
F. Naididae	0	0	-	-	0	-
Total Oligochaeta	262	119	0.095	0.024	1	0.000
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	0	-
F. Hydropsychidae	24	24	-	-	53	-
F. Leptoceridae	0	24	-	-	1	-
F. Limnephilidae	0	0	-	-	1	-
F. Polycentropodidae	0	0	-	-	12	-
Total Trichoptera	24	48	0.000	0.000	66	0.023
Ephemeroptera						
F. Ametropodidae	0	0	-	-	0	-
F. Baetidae	0	0	-	-	0	-
F. Caenidae	0	24	-	-	0	-
F. Ephemeridae	262	95	-	-	1	-
F. Heptageniidae	95	0	-	-	1	-
F. Leptophlebiidae	0	0	-	-	1	-
F. Polymitarcyidae	0	0	-	-	0	-
F. Siphonuridae	0	0	-	-	0	-
F. Tricorythidae	0	0	-	-	0	-
Total Ephemeroptera	357	119	0.405	0.548	2	0.000

SEGMENT: 44 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	0	-
F. Perlodidae	0	0	-	-	0	-
F. Pteronarcyidae	0	0	-	-	0	-
Total Plecoptera	0	0	-	-	0	-
Coleoptera						
F. Dytiscidae	0	0	-	-	0	-
F. Elmidae	0	0	-	-	0	-
Total Coleoptera	0	0	-	-	0	-
Hemiptera						
F. Corixidae	0	0	-	-	0	-
Megaloptera						
F. Corydalidae	0	0	-	-	0	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	0	-
Total Megaloptera	0	0	-	-	0	-
Odonata						
F. Gomphidae	24	0	1.667	-	0	-
Diptera						
F. Athericidae	0	0	-	-	0	-
F. Chironomidae	-	-	0.167	0.000	-	0.000
SubF. Chironominae	357	48	-	-	0	-
SubF. Orthocladiinae	24	0	-	-	1	-
SubF. Tanypodinae	286	0	-	-	0	-
F. Ceratopogonidae	0	0	-	-	0	-
F. Chaoboridae	0	0	-	-	0	-
F. Dolichopodidae	0	0	-	-	0	-
F. Empididae	24	0	-	-	0	-
F. Simuliidae	0	0	-	-	0	-
F. Tipulidae	0	0	-	-	0	-
Total Diptera	690	48	0.215	0.000	1	0.000
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	0	-
Copepoda	0	0	-	-	0	-
Cladocera	0	0	-	-	0	-
Total Crustacea	0	0	-	-	0	-
Arachnida						
Hydracarina	0	0	-	-	0	-
Mollusca						
Bivalvia						
F. Sphaeriidae	24	0	-	-	1	-
F. Unionidae	0	0	-	-	0	-
Total Bivalvia	24	0	0.024	-	1	0.000

SEGMENT: 44 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	3	3
Gastropoda						
F. Ancyliidae	0	0	-	-	0	-
F. Hydrobiidae (<i>Ammicola</i> sp.)	0	0	-	-	0	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	0	-
Total Gastropoda	0	0	-	-	0	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	0	-
Nematoda	0	0	-	-	0	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	1	0.001
TOTAL INVERTEBRATES	1381	333	2.406	0.572	72	0.024

Observations: ¹ calculated average of 2 replicates;

1 non-recoverable Ponar Dredge (hard clay) during winter sampling;

6 non-recoverable Ponar Dredges (hard clay) during fall sampling;

the third replicate was archived for any necessary future analyses;

of the 3 Artificial Substrate Samplers installed, 2 were retrieved (1 was provided to the Toxicity Workstream);

Artificial Substrate Samplers contained some debris.

SEGMENT: 44 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	3	3	3	3
Dry Weight of Sample	17.915	-	33.362	-
Weight of Ashed Sample	17.420	-	31.340	-
Organic Content	0.495	2.8	2.022	5.5
Particle Size:				
> 2 mm	2.108	7.94	0.010	0.06
> 1 mm	0.121	0.45	0.011	0.05
> 500 µm	0.237	1.06	0.025	0.13
> 250 µm	0.296	1.75	0.044	0.23
> 125 µm	0.252	2.02	0.080	0.40
> 63 µm	0.148	1.28	0.203	0.94
Total Gravel	2.108	7.94	0.010	0.06
Total Sand	1.054	6.56	0.364	1.74
Total Silt/Clay	14.259	85.51	30.966	98.20

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

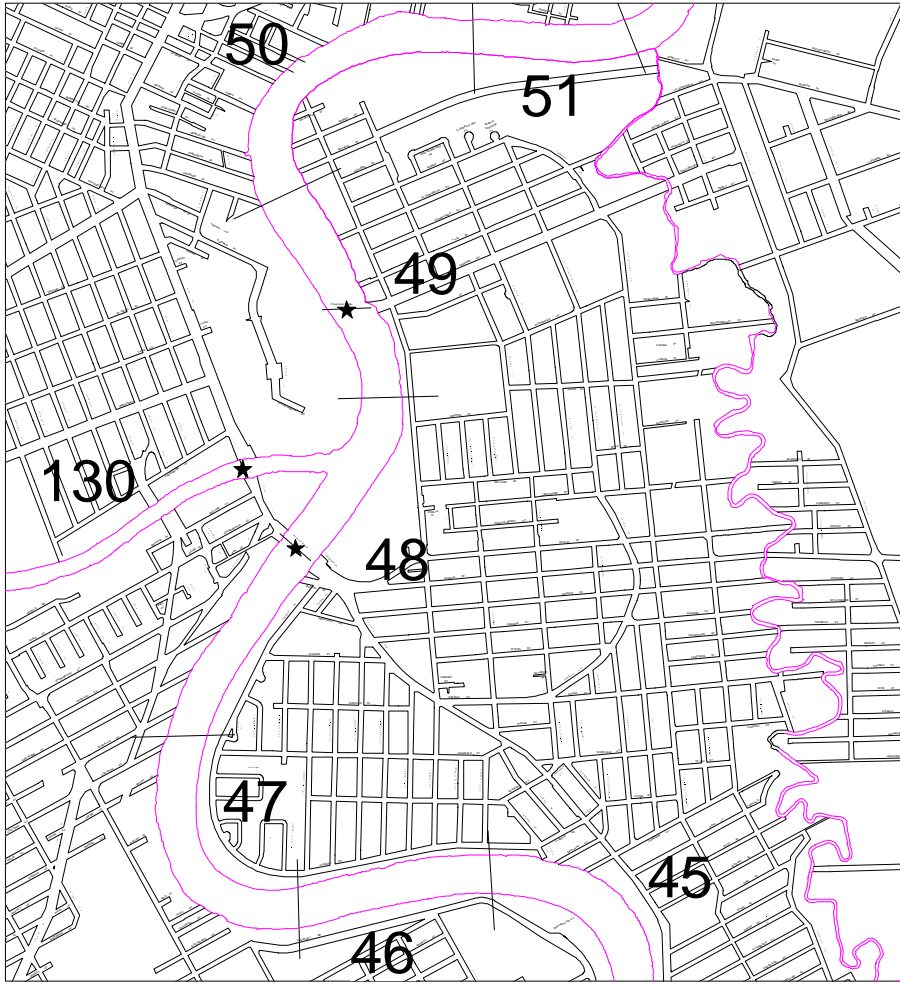


Figure 13. Red River segments 46-51.

RIVER: Red River
SEGMENT: 50

Winter Ponar Dredge Sampling
 Date 25-Feb-99
 UTM (14U) E-0634219 N-5528776

Fall Ponar Dredge Sampling
 Date 16-Sep-99
 UTM (14U) E-0634269 N-5528386

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) - -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period						
Number of Replicates	1	3	1	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	4714	690	-	-	-	-
F. Lumbriculidae	143	48	-	-	-	-
F. Naididae	4905	24	-	-	-	-
Total Oligochaeta	9762	762	1.667	0.071	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	0	24	-	-	-	-
F. Leptoceridae	0	24	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	0	48	-	0.000	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	24	-	-	-	-
F. Ephemeridae	0	0	-	-	-	-
F. Heptageniidae	0	24	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	0	48	-	0.000	-	-

SEGMENT: 50 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	1	3	1	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	0	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	0	0	-	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	48	0	-	-	-	-
Total Coleoptera	48	0	0.143	-	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.381	-	-	-
SubF. Chironominae	571	0	-	-	-	-
SubF. Orthoclaadiinae	238	0	-	-	-	-
SubF. Tanypodinae	238	0	-	-	-	-
F. Ceratopogonidae	48	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empididae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	1095	0	0.429	-	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	48	24	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	48	24	0.000	0.000	-	-

SEGMENT: 50 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	1	3	1	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	10952	881	2.239	0.071	-	-

Observations: ¹ calculated average of 2 replicates;

1 non-recoverable Ponar Dredge (rock) and slush under the ice during winter sampling;

only 1 replicate was collected during winter sampling due to non-recoverable Ponar Dredge and slush under the ice;

6 non-recoverable Ponar Dredges (rock) during fall sampling;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 50 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	1	1	3	3
Dry Weight of Sample	12.687	-	35.945	-
Weight of Ashed Sample	12.259	-	34.328	-
Organic Content	0.428	3.4	1.617	4.8
Particle Size:				
> 2 mm	0.000	0.00	0.323	2.02
> 1 mm	0.000	0.00	0.045	0.28
> 500 µm	0.001	0.01	0.081	0.50
> 250 µm	0.041	0.33	0.178	1.10
> 125 µm	0.120	0.98	1.201	5.73
> 63 µm	0.184	1.50	3.882	10.73
Total Gravel	0.000	0.00	0.323	2.02
Total Sand	0.346	2.82	5.388	18.34
Total Silt/Clay	11.913	97.18	28.617	79.65

Observations: ¹ calculated average of 2 replicates;

only 1 replicate was collected during winter sampling due to non-recoverable Ponar Dredge and slush under the ice;

the third replicate collected during fall sampling was archived for any necessary future analyses.

RIVER: Red River
SEGMENT: 51

Winter Ponar Dredge Sampling
 Date 25-Feb-99
 UTM (14U) E-0635032 N-5529165

Fall Ponar Dredge Sampling
 Date 17-Sep-99
 UTM (14U) E-0635032 N-5529165

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) - -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	4	3	4	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	571	524	-	-	-	-
F. Lumbriculidae	24	119	-	-	-	-
F. Naididae	0	24	-	-	-	-
Total Oligochaeta	595	667	0.024	0.167	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	0	310	-	-	-	-
F. Leptoceridae	0	48	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	0	357	-	0.095	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	24	-	-	-	-
F. Ephemeridae	119	71	-	-	-	-
F. Heptageniidae	0	0	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	119	95	0.143	0.024	-	-

SEGMENT: 51 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	4	3	4	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	24	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	24	0	0.000	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	24	48	-	-	-	-
Total Coleoptera	24	48	0.000	0.024	-	-
Hemiptera						
F. Corixidae	0	24	-	0.000	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.571	0.143	-	-
SubF. Chironominae	857	214	-	-	-	-
SubF. Orthoclaadiinae	95	0	-	-	-	-
SubF. Tanypodinae	476	0	-	-	-	-
F. Ceratopogonidae	0	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empididae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	1429	214	0.571	0.143	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	3548	0	-	-	-	-
Total Crustacea	3548	0	0.071	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	95	0	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	95	0	0.167	-	-	-

SEGMENT: 51 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	4	3	4	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	5833	1405	0.976	0.453	-	-

Observations: ¹ calculated average of 2 replicates;

the third and fourth replicates collected during winter sampling were archived for any necessary future analyses;

3 non-recoverable Ponar Dredges (hard clay with cobble) during fall sampling;

the third replicate collected during fall sampling was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 51 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	4	4	3	3
Dry Weight of Sample	45.288	-	34.012	-
Weight of Ashed Sample	43.170	-	32.421	-
Organic Content	2.118	4.7	1.591	4.5
Particle Size:				
> 2 mm	0.044	0.08	0.450	1.74
> 1 mm	0.851	1.46	0.035	0.14
> 500 µm	0.724	1.25	0.121	0.46
> 250 µm	0.818	1.65	0.210	0.80
> 125 µm	0.652	1.45	0.673	1.77
> 63 µm	0.733	1.39	1.164	2.96
Total Gravel	0.044	0.08	0.450	1.74
Total Sand	3.778	7.19	2.204	6.13
Total Silt/Clay	39.348	92.73	29.767	92.13

Observations: ¹ calculated average of 2 replicates;

the third and fourth replicates collected during winter sampling were archived for any necessary future analyses;

the third replicate collected during fall sampling was archived for any necessary future analyses.

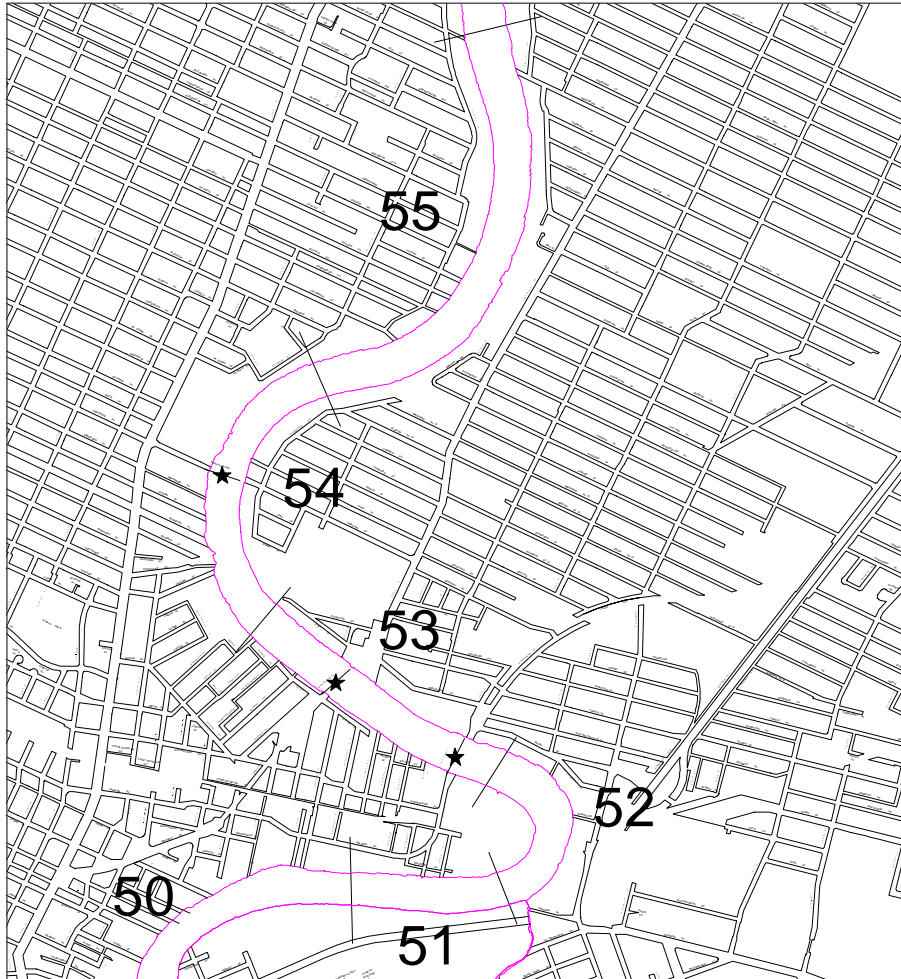


Figure 14. Red River segments 51-55.

RIVER: Red River
SEGMENT: 52

Winter Ponar Dredge Sampling
 Date 7-Mar-99
 UTM (14U) E-0635714 N-5529450

Fall Ponar Dredge Sampling
 Date 17-Sep-99
 UTM (14U) E-0635615 N-5529046

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) - -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period						
Number of Replicates	3	3	3	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	2262	810	-	-	-	-
F. Lumbriculidae	238	0	-	-	-	-
F. Naididae	786	0	-	-	-	-
Total Oligochaeta	3286	810	1.214	0.238	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	0	24	-	-	-	-
F. Leptoceridae	0	0	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	0	24	-	0.000	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	24	500	-	-	-	-
F. Heptageniidae	24	0	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	48	500	0.286	0.357	-	-

SEGMENT: 52 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	48	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	48	0	0.024	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	0	0	-	-	-	-
Total Coleoptera	0	0	-	-	-	-
Hemiptera						
F. Corixidae	24	0	0.071	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	24	-	0.071	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.643	0.095	-	-
SubF. Chironominae	881	119	-	-	-	-
SubF. Orthoclaadiinae	24	0	-	-	-	-
SubF. Tanypodinae	190	0	-	-	-	-
F. Ceratopogonidae	0	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empiidae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	1095	119	0.643	0.095	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	167	-	-	-	-
Total Crustacea	0	167	-	0.024	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	0	0	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	0	0	-	-	-	-

SEGMENT: 52 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	4500	1643	2.238	0.785	-	-

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 52 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	3	3	3	3
Dry Weight of Sample	25.871	-	49.160	-
Weight of Ashed Sample	25.058	-	47.349	-
Organic Content	0.813	3.1	1.811	4.0
Particle Size:				
> 2 mm	0.000	0.00	0.000	0.00
> 1 mm	0.003	0.01	0.022	0.05
> 500 µm	0.009	0.04	0.055	0.12
> 250 µm	0.025	0.09	0.107	0.31
> 125 µm	0.061	0.25	2.270	3.51
> 63 µm	0.156	0.59	5.483	8.57
Total Gravel	0.000	0.00	0.000	0.00
Total Sand	0.253	0.97	7.937	12.56
Total Silt/Clay	24.805	99.03	39.412	87.44

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

RIVER: Red River
SEGMENT: 55

Winter Ponar Dredge Sampling
 Date 25-Feb-99
 UTM (14U) E-0636278 N-5532851

Fall Ponar Dredge Sampling
 Date 17-Sep-99
 UTM (14U) E-0635569 N-5531615

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) - -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	4	3	4	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	500	905	-	-	-	-
F. Lumbriculidae	0	119	-	-	-	-
F. Naididae	0	0	-	-	-	-
Total Oligochaeta	500	1024	0.190	0.167	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	0	24	-	-	-	-
F. Leptoceridae	0	0	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	0	24	-	0.071	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	48	0	-	-	-	-
F. Heptageniidae	0	0	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	48	0	0.167	-	-	-

SEGMENT: 55 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	4	3	4	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	0	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	0	0	-	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	24	0	-	-	-	-
Total Coleoptera	24	0	0.048	-	-	-
Hemiptera						
F. Corixidae	24	0	0.119	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.262	0.024	-	-
SubF. Chironominae	262	48	-	-	-	-
SubF. Orthoclaadiinae	214	0	-	-	-	-
SubF. Tanypodinae	643	0	-	-	-	-
F. Ceratopogonidae	24	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empiidae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	1143	48	0.286	0.024	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	48	0	-	-	-	-
Cladocera	333	0	-	-	-	-
Total Crustacea	381	0	0.071	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	190	595	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	190	595	0.167	0.786	-	-

SEGMENT: 55 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	4	3	4	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	24	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	24	-	0.119	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	2310	1714	1.048	1.167	-	-

Observations: ¹ calculated average of 2 replicates;

2 non-recoverable Ponar Dredges (hard clay) during winter sampling;

the third and fourth replicates collected during winter sampling were archived for any necessary future analyses;

the third replicate collected during fall sampling was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 55 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	4	4	3	3
Dry Weight of Sample	20.368	-	49.293	-
Weight of Ashed Sample	19.397	-	47.629	-
Organic Content	0.971	4.8	1.664	3.6
Particle Size:				
> 2 mm	0.358	1.27	0.391	0.81
> 1 mm	0.037	0.13	3.064	7.13
> 500 µm	0.139	0.53	7.159	16.70
> 250 µm	0.909	5.91	3.413	7.44
> 125 µm	1.088	7.85	2.682	4.67
> 63 µm	0.426	2.27	3.101	5.38
Total Gravel	0.358	1.27	0.391	0.81
Total Sand	2.599	16.69	19.420	41.32
Total Silt/Clay	16.441	82.04	27.818	57.87

Observations: ¹ calculated average of 2 replicates;

the third and fourth replicates collected during winter sampling were archived for any necessary future analyses;

the third replicate collected during fall sampling was archived for any necessary future analyses.

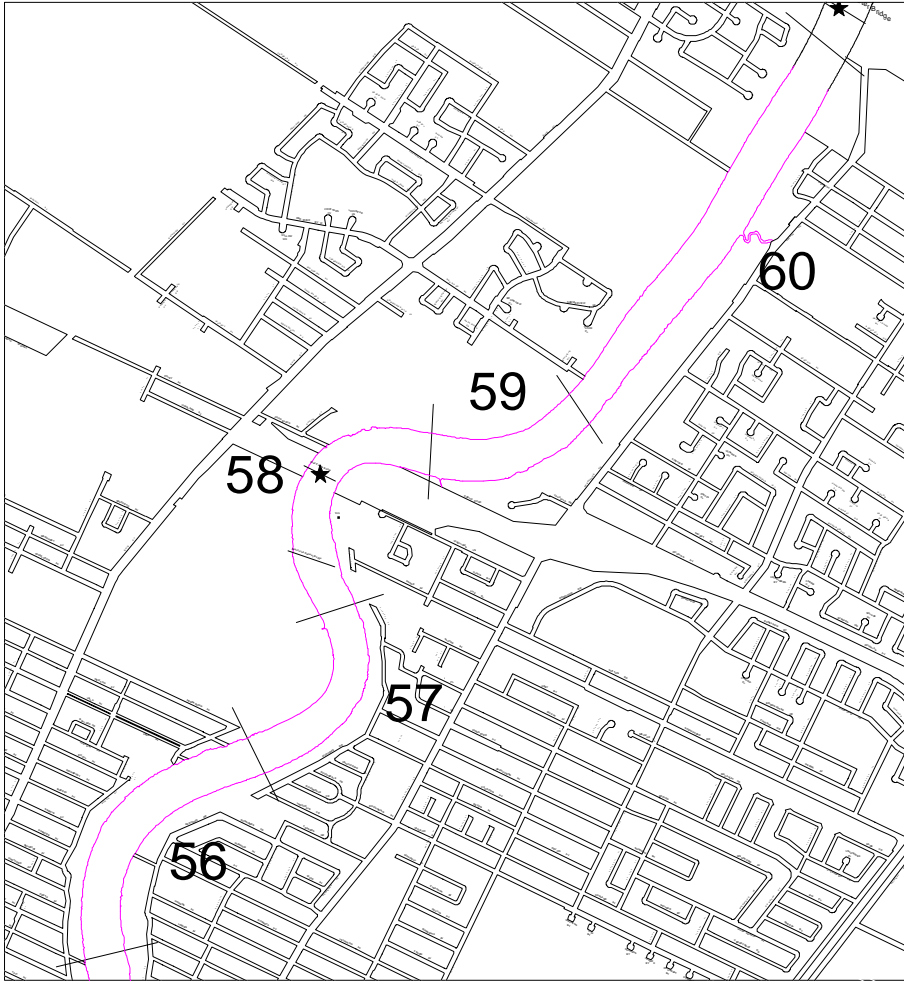


Figure 15. Red River segments 56-60.

RIVER: Red River
SEGMENT: 56

Winter Ponar Dredge Sampling
 Date 25-Feb-99
 UTM (14U) E-0635786 N-5533574

Fall Ponar Dredge Sampling
 Date 17-Sep-99
 UTM (14U) E-0636048 N-5533300

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) - -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period						
Number of Replicates	3	3	3	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	466	738	-	-	-	-
F. Lumbriculidae	48	0	-	-	-	-
F. Naididae	0	0	-	-	-	-
Total Oligochaeta	513	738	0.046	0.095	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	565	0	-	-	-	-
F. Leptoceridae	0	0	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	65	0	-	-	-	-
Total Trichoptera	630	0	0.739	-	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	24	-	-	-	-
F. Ephemeridae	135	0	-	-	-	-
F. Heptageniidae	22	0	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	156	24	0.334	0.095	-	-

SEGMENT: 56 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	0	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	0	0	-	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	217	0	-	-	-	-
Total Coleoptera	217	0	0.043	-	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.345	-	-	-
SubF. Chironominae	847	0	-	-	-	-
SubF. Orthoclaadiinae	263	0	-	-	-	-
SubF. Tanypodinae	665	0	-	-	-	-
F. Ceratopogonidae	22	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empididae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	1796	0	0.367	-	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	217	0	-	-	-	-
Total Crustacea	217	0	0.022	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	152	0	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	152	0	0.245	-	-	-

SEGMENT: 56 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	3683	762	1.796	0.190	-	-

Observations: ¹ calculated average of 2 replicates;

3 non-recoverable Ponar Dredges (mud with gravel) during winter sampling;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 56 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	1	1	3	3
Dry Weight of Sample	77.434	-	31.296	-
Weight of Ashed Sample	75.780	-	29.436	-
Organic Content	1.654	2.1	1.861	6.2
Particle Size:				
> 2 mm	0.022	0.03	0.000	0.00
> 1 mm	2.176	2.87	0.013	0.04
> 500 µm	18.722	24.71	0.056	0.18
> 250 µm	24.943	32.92	0.167	0.61
> 125 µm	2.514	3.32	1.225	4.10
> 63 µm	0.468	0.62	2.267	7.75
Total Gravel	0.022	0.03	0.000	0.00
Total Sand	48.823	64.43	3.727	12.68
Total Silt/Clay	26.935	35.54	25.708	87.32

Observations: ¹ calculated average of 2 replicates;

only 1 replicate was collected during winter sampling due to high number of non-recoverable Ponar Dredges;

the third replicate collected during fall sampling was archived for any necessary future analyses.

RIVER: Red River
SEGMENT: 57

Winter Ponar Dredge Sampling
 Date 17-Mar-99
 UTM (14U) E-0636595 N-5534255

Fall Ponar Dredge Sampling
 Date 17-Sep-99
 UTM (14U) E-0636535 N-5534273

Fall Artificial Substrate Sampling
 Installation Date 3-Aug-99
 Retrieval Date 29-Sep-99
 UTM (14U) E-0636269 N-5533569

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period						
Number of Replicates	3	3	3	3	3	3
Annelida						
Oligochaeta						
F. Tubificidae	182	0	-	-	6	-
F. Lumbriculidae	0	24	-	-	0	-
F. Naididae	0	0	-	-	0	-
Total Oligochaeta	182	24	0.091	0.000	6	0.001
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	4	-
F. Hydropsychidae	22	0	-	-	480	-
F. Leptoceridae	0	0	-	-	1	-
F. Limnephilidae	0	0	-	-	0	-
F. Polycentropodidae	0	0	-	-	20	-
Total Trichoptera	22	0	0.087	-	503	0.213
Ephemeroptera						
F. Ametropodidae	0	0	-	-	0	-
F. Baetidae	0	0	-	-	0	-
F. Caenidae	0	0	-	-	9	-
F. Ephemeridae	158	0	-	-	2	-
F. Heptageniidae	0	0	-	-	7	-
F. Leptophlebiidae	0	0	-	-	1	-
F. Polymitarcyidae	0	0	-	-	0	-
F. Siphonuridae	0	0	-	-	0	-
F. Tricorythidae	0	0	-	-	7	-
Total Ephemeroptera	158	0	0.141	-	24	0.007

SEGMENT: 57 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	0	-
F. Perlodidae	0	0	-	-	3	-
F. Pteronarcyidae	0	0	-	-	0	-
Total Plecoptera	0	0	-	-	3	0.001
Coleoptera						
F. Dytiscidae	0	0	-	-	0	-
F. Elmidae	196	0	-	-	0	-
Total Coleoptera	196	0	0.065	-	0	-
Hemiptera						
F. Corixidae	0	0	-	-	0	-
Megaloptera						
F. Corydalidae	0	0	-	-	0	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	0	-
Total Megaloptera	0	0	-	-	0	-
Odonata						
F. Gomphidae	0	0	-	-	0	-
Diptera						
F. Athericidae	0	0	-	-	0	-
F. Chironomidae	-	-	0.184	-	-	0.000
SubF. Chironominae	158	0	-	-	3	-
SubF. Orthoclaadiinae	158	0	-	-	2	-
SubF. Tanypodinae	224	0	-	-	3	-
F. Ceratopogonidae	0	0	-	-	0	-
F. Chaoboridae	0	0	-	-	0	-
F. Dolichopodidae	0	0	-	-	0	-
F. Empididae	0	0	-	-	0	-
F. Simuliidae	0	0	-	-	1	-
F. Tipulidae	0	0	-	-	1	-
Total Diptera	540	0	0.184	-	9	0.000
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	0	-
Copepoda	0	0	-	-	0	-
Cladocera	22	0	-	-	0	-
Total Crustacea	22	0	0.000	-	0	-
Arachnida						
Hydracarina	0	0	-	-	0	-
Mollusca						
Bivalvia						
F. Sphaeriidae	65	643	-	-	0	-
F. Unionidae	0	0	-	-	1	-
Total Bivalvia	65	643	0.174	1.167	1	0.001

SEGMENT: 57 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	3	3
Gastropoda						
F. Ancyliidae	0	0	-	-	0	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	476	-	-	0	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	0	-
Total Gastropoda	0	476	-	1.476	0	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	0	-
Nematoda	0	0	-	-	0	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	3	0.001
TOTAL INVERTEBRATES	1185	1143	0.742	2.643	547	0.224

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses;

of the 3 Artificial Substrate Samplers installed, 2 were retrieved (1 was provided to the Toxicity Workstream);

Artificial Substrate Samplers contained some debris.

SEGMENT: 57 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	2	2	3	3
Dry Weight of Sample	21.642	-	34.814	-
Weight of Ashed Sample	20.716	-	34.179	-
Organic Content	0.926	4.3	0.635	1.8
Particle Size:				
> 2 mm	1.399	6.75	0.030	0.10
> 1 mm	0.362	1.75	0.903	2.70
> 500 µm	0.291	1.40	5.092	14.80
> 250 µm	0.469	2.26	20.876	59.74
> 125 µm	0.698	3.37	4.519	14.30
> 63 µm	0.556	2.68	0.783	2.35
Total Gravel	1.399	6.75	0.030	0.10
Total Sand	10.896	11.47	32.172	93.89
Total Silt/Clay	20.206	81.78	1.977	6.02

Observations: ¹ calculated average of 2 replicates;

only 2 replicates were collected during winter sampling due to partial Ponar Dredge sample;

the second replicate collected during winter sampling was archived for any necessary future analyses;

the third replicate collected during fall sampling was archived for any necessary future analyses.

RIVER: Red River
SEGMENT: 58

Winter Ponar Dredge Sampling

Date 17-Mar-99
 Start UTM (14U) E-0636440 N-5534815
 End UTM (14U) E-0636935 N-5534905

Fall Ponar Dredge Sampling

Date 17-Sep-99
 Start UTM (14U) E-0636440 N-5534815
 End UTM (14U) E-0636935 N-5534905

Fall Artificial Substrate Sampling

Installation Date 3-Aug-99
 Retrieval Date 29-Sep-99
 UTM (14U) E-0636407 N-5534752

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	9	9	9	9	3	3
Annelida						
Oligochaeta						
F. Tubificidae	3048	2714	-	-	0	-
F. Lumbriculidae	16	127	-	-	0	-
F. Naididae	0	0	-	-	0	-
Total Oligochaeta	3063	2841	0.651	0.603	0	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	13	-
F. Hydropsychidae	8	32	-	-	258	-
F. Leptoceridae	0	0	-	-	6	-
F. Limnephilidae	0	0	-	-	0	-
F. Polycentropodidae	0	0	-	-	10	-
Total Trichoptera	8	32	0.008	0.063	287	0.366
Ephemeroptera						
F. Ametropodidae	0	0	-	-	0	-
F. Baetidae	0	0	-	-	0	-
F. Caenidae	0	16	-	-	0	-
F. Ephemeridae	48	8	-	-	0	-
F. Heptageniidae	0	8	-	-	2	-
F. Leptophlebiidae	0	0	-	-	0	-
F. Polymitarcyidae	0	0	-	-	0	-
F. Siphonuridae	0	0	-	-	0	-
F. Tricorythidae	0	0	-	-	0	-
Total Ephemeroptera	48	32	0.262	0.016	2	0.000

SEGMENT: 58 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	9	9	9	9	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	0	-
F. Perlodidae	0	8	-	-	1	-
F. Pteronarcyidae	0	0	-	-	0	-
Total Plecoptera	0	8	-	0.016	1	0.000
Coleoptera						
F. Dytiscidae	0	0	-	-	0	-
F. Elmidae	16	8	-	-	1	-
Total Coleoptera	16	8	0.016	0.000	1	0.000
Hemiptera						
F. Corixidae	8	0	0.079	-	0	-
Megaloptera						
F. Corydalidae	0	0	-	-	0	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	0	-
Total Megaloptera	0	0	-	-	0	-
Odonata						
F. Gomphidae	0	0	-	-	0	-
Diptera						
F. Athericidae	0	0	-	-	0	-
F. Chironomidae	-	-	0.381	0.056	-	0.001
SubF. Chironominae	516	40	-	-	1	-
SubF. Orthocladiinae	95	0	-	-	1	-
SubF. Tanypodinae	183	0	-	-	6	-
F. Ceratopogonidae	8	0	-	-	0	-
F. Chaoboridae	0	0	-	-	0	-
F. Dolichopodidae	0	0	-	-	0	-
F. Empididae	0	0	-	-	0	-
F. Simuliidae	0	0	-	-	0	-
F. Tipulidae	0	0	-	-	0	-
Total Diptera	802	40	0.381	0.056	8	0.001
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	0	-
Copepoda	8	0	-	-	0	-
Cladocera	810	0	-	-	0	-
Total Crustacea	817	0	0.063	-	0	-
Arachnida						
Hydracarina	0	0	-	-	0	-
Mollusca						
Bivalvia						
F. Sphaeriidae	24	79	-	-	0	-
F. Unionidae	0	0	-	-	1	-
Total Bivalvia	24	79	0.151	0.095	1	3.162

SEGMENT: 58 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	9	9	9	9	3	3
Gastropoda						
F. Ancyliidae	0	0	-	-	1	-
F. Hydrobiidae (<i>Ammicola</i> sp.)	0	0	-	-	0	-
F. Valvatidae (<i>Valvata</i> sp.)	8	0	-	-	0	-
Total Gastropoda	8	0	0.103	-	1	0.000
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	3	0.000
Nematoda	0	270	-	0.016	0	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	3	0.001
TOTAL INVERTEBRATES	4794	3310	1.714	0.865	304	3.530

Observations: ¹ calculated average of 6 replicates;

sampling conducted within the NEWPCC outfall plume;

6 non-recoverable Ponar Dredges (hard clay and/or gravel) during fall sampling;

the seventh, eighth, and ninth replicates were archived for any necessary future analyses;

the 3 Artificial Substrate Samplers installed were all retrieved;

Artificial Substrate Samplers contained little debris.

SEGMENT: 58 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	9	9	9	9
Dry Weight of Sample	33.908	-	31.018	-
Weight of Ashed Sample	32.389	-	29.778	-
Organic Content	1.519	4.5	1.240	4.0
Particle Size:				
> 2 mm	1.551	4.29	0.491	3.75
> 1 mm	2.549	7.07	0.035	0.21
> 500 µm	1.896	5.26	0.112	0.61
> 250 µm	3.196	7.22	2.522	7.02
> 125 µm	2.813	5.45	5.456	12.65
> 63 µm	0.443	0.95	1.905	5.34
Total Gravel	1.551	4.29	0.491	3.75
Total Sand	10.896	25.95	10.031	25.82
Total Silt/Clay	20.206	69.75	19.256	70.43

Observations: ¹ calculated average of 6 replicates;

the seventh, eighth, and ninth replicates were archived for any necessary future analyses.

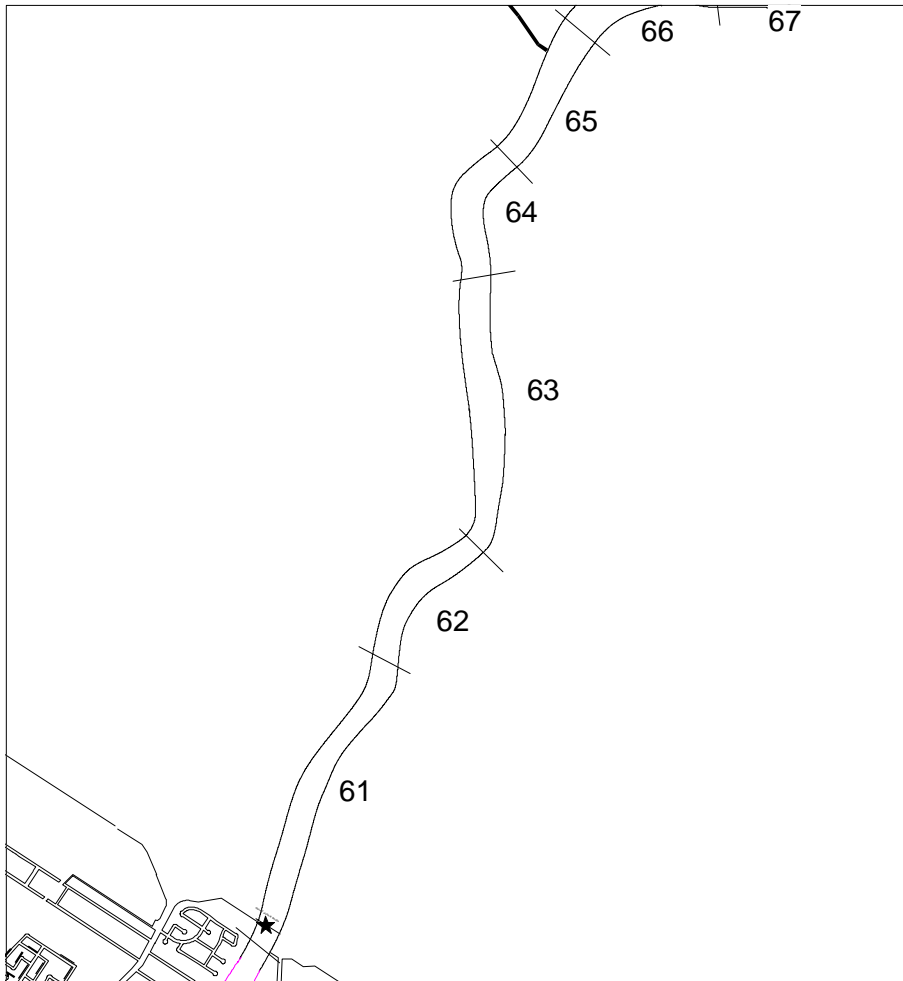


Figure 16. Red River segments 61-65.

RIVER: Red River
SEGMENT: 61

Winter Ponar Dredge Sampling
 Date 19-Mar-99
 UTM (14U) E-0638969 N-5537729

Fall Ponar Dredge Sampling
 Date 17-Sep-99
 UTM (14U) E-0639056 N-5537780

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) - -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	1119	548	-	-	-	-
F. Lumbriculidae	0	0	-	-	-	-
F. Naididae	0	0	-	-	-	-
Total Oligochaeta	1119	548	0.262	0.095	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	0	786	-	-	-	-
F. Leptoceridae	0	0	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	0	786	-	0.238	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	24	-	-	-	-
F. Ephemeridae	143	214	-	-	-	-
F. Heptageniidae	0	95	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	24	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	143	357	1.619	0.667	-	-

SEGMENT: 61 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	0	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	0	0	-	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	0	48	-	-	-	-
Total Coleoptera	0	48	-	0.024	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.310	0.095	-	-
SubF. Chironominae	143	119	-	-	-	-
SubF. Orthoclaadiinae	0	0	-	-	-	-
SubF. Tanypodinae	381	24	-	-	-	-
F. Ceratopogonidae	24	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empididae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	548	143	0.334	0.095	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	238	71	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	238	71	0.881	0.286	-	-

SEGMENT: 61 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	24	0	0.048	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	2071	1952	3.144	1.405	-	-

Observations: ¹ calculated average of 2 replicates;

2 non-recoverable Ponar Dredges (clay and cobble) during fall sampling;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 61 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	3	3	3	3
Dry Weight of Sample	50.597	-	23.740	-
Weight of Ashed Sample	48.780	-	23.066	-
Organic Content	1.818	3.6	0.674	2.8
Particle Size:				
> 2 mm	0.000	0.00	3.987	16.71
> 1 mm	0.096	0.21	0.303	1.32
> 500 µm	0.779	1.32	0.562	2.44
> 250 µm	17.736	29.95	0.672	2.88
> 125 µm	1.762	3.59	1.374	6.05
> 63 µm	0.487	1.23	1.214	5.51
Total Gravel	0.000	0.00	3.987	16.71
Total Sand	20.859	36.30	4.124	18.19
Total Silt/Clay	27.921	63.70	14.956	65.10

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

RIVER: Red River
SEGMENT: 63

Winter Ponar Dredge Sampling
 Date 19-Mar-99
 UTM (14U) E-0640390 N-5540123

Fall Ponar Dredge Sampling
 Date 20-Sep-99
 UTM (14U) E-0640336 N-5539529

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) - -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	738	429	-	-	-	-
F. Lumbriculidae	0	0	-	-	-	-
F. Naididae	0	0	-	-	-	-
Total Oligochaeta	738	429	0.405	0.024	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	0	0	-	-	-	-
F. Leptoceridae	0	0	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	24	0	-	-	-	-
Total Trichoptera	24	0	0.000	-	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	24	143	-	-	-	-
F. Heptageniidae	0	0	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	24	143	0.071	0.024	-	-

SEGMENT: 63 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	0	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	0	0	-	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	24	0	-	-	-	-
Total Coleoptera	24	0	0.095	-	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.310	0.024	-	-
SubF. Chironominae	476	24	-	-	-	-
SubF. Orthoclaadiinae	0	0	-	-	-	-
SubF. Tanypodinae	524	0	-	-	-	-
F. Ceratopogonidae	0	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empiidae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	1000	24	0.310	0.024	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	262	0	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	262	0	0.310	-	-	-

SEGMENT: 63 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	24	0	-	-	-	-
Total Gastropoda	24	0	0.048	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	24	0	0.024	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	2119	595	1.263	0.072	-	-

Observations: ¹ calculated average of 2 replicates;

5 non-recoverable Ponar Dredges (rock) during fall sampling;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 63 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	3	3	3	3
Dry Weight of Sample	31.821	-	50.173	-
Weight of Ashed Sample	31.156	-	47.695	-
Organic Content	0.665	2.1	2.479	4.8
Particle Size:				
> 2 mm	5.761	18.80	0.495	1.21
> 1 mm	0.771	2.51	0.145	0.27
> 500 µm	0.643	2.10	0.358	0.63
> 250 µm	4.110	13.22	0.507	0.88
> 125 µm	3.170	10.19	2.780	6.01
> 63 µm	0.597	1.91	3.649	8.34
Total Gravel	5.761	18.80	0.495	1.21
Total Sand	9.290	29.93	7.439	16.12
Total Silt/Clay	16.106	51.27	39.761	82.67

Observations: ¹ calculated average of 2 replicates;
the third replicate was archived for any necessary future analyses.

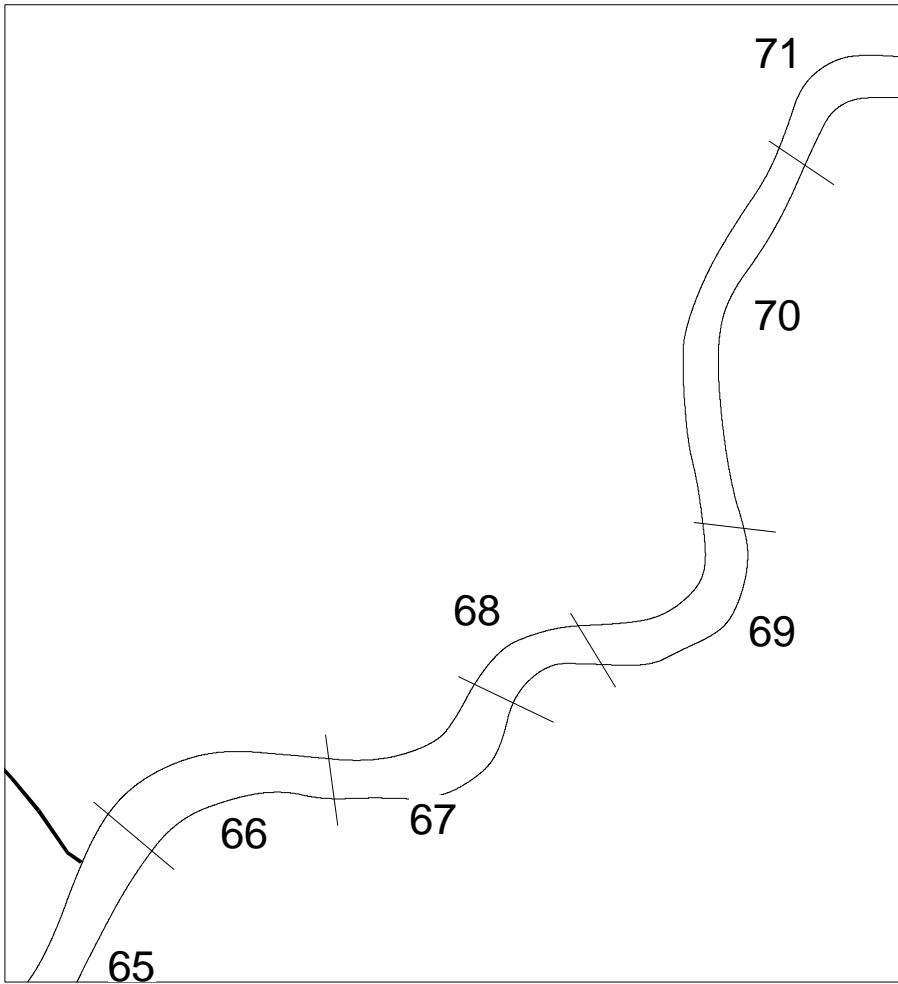


Figure 17. Red River segments 66-70.

RIVER: Red River
SEGMENT: 66

Winter Ponar Dredge Sampling
 Date -
 UTM (14U) -

Fall Ponar Dredge Sampling
 Date 20-Sep-99
 UTM (14U) E-0641146 N-5543875

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	-	690	-	-	-	-
F. Lumbriculidae	-	0	-	-	-	-
F. Naididae	-	24	-	-	-	-
Total Oligochaeta	-	714	-	0.095	-	-
Insecta						
Trichoptera						
F. Brachycentridae	-	0	-	-	-	-
F. Hydropsychidae	-	0	-	-	-	-
F. Leptoceridae	-	0	-	-	-	-
F. Limnephilidae	-	0	-	-	-	-
F. Polycentropodidae	-	0	-	-	-	-
Total Trichoptera	-	0	-	-	-	-
Ephemeroptera						
F. Ametropodidae	-	0	-	-	-	-
F. Baetidae	-	0	-	-	-	-
F. Caenidae	-	0	-	-	-	-
F. Ephemeridae	-	310	-	-	-	-
F. Heptageniidae	-	0	-	-	-	-
F. Leptophlebiidae	-	0	-	-	-	-
F. Polymitarcyidae	-	0	-	-	-	-
F. Siphonuridae	-	0	-	-	-	-
F. Tricorythidae	-	0	-	-	-	-
Total Ephemeroptera	-	310	-	0.190	-	-

SEGMENT: 66 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	-	0	-	-	-	-
F. Perlodidae	-	0	-	-	-	-
F. Pteronarcyidae	-	0	-	-	-	-
Total Plecoptera	-	0	-	-	-	-
Coleoptera						
F. Dytiscidae	-	0	-	-	-	-
F. Elmidae	-	0	-	-	-	-
Total Coleoptera	-	0	-	-	-	-
Hemiptera						
F. Corixidae	-	0	-	-	-	-
Megaloptera						
F. Corydalidae	-	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	-	0	-	-	-	-
Total Megaloptera	-	0	-	-	-	-
Odonata						
F. Gomphidae	-	0	-	-	-	-
Diptera						
F. Athericidae	-	0	-	-	-	-
F. Chironomidae	-	-	-	0.071	-	-
SubF. Chironominae	-	48	-	-	-	-
SubF. Orthoclaadiinae	-	0	-	-	-	-
SubF. Tanypodinae	-	0	-	-	-	-
F. Ceratopogonidae	-	0	-	-	-	-
F. Chaoboridae	-	0	-	-	-	-
F. Dolichopodidae	-	0	-	-	-	-
F. Empididae	-	0	-	-	-	-
F. Simuliidae	-	0	-	-	-	-
F. Tipulidae	-	0	-	-	-	-
Total Diptera	-	48	-	0.071	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	-	0	-	-	-	-
Copepoda	-	0	-	-	-	-
Cladocera	-	0	-	-	-	-
Total Crustacea	-	0	-	-	-	-
Arachnida						
Hydracarina	-	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	-	119	-	-	-	-
F. Unionidae	-	0	-	-	-	-
Total Bivalvia	-	119	-	3.691	-	-

SEGMENT: 66 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	-	-
Gastropoda						
F. Ancyliidae	-	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	-	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	-	0	-	-	-	-
Total Gastropoda	-	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	-	0	-	-	-	-
Nematoda	-	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	-	0	-	-	-	-
TOTAL INVERTEBRATES	-	1190	-	4.047	-	-

Observations: ¹ calculated average of 2 replicates;

Ponar Dredge sampling was not conducted during the winter sampling period;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 66 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	-	-	3	3
Dry Weight of Sample	-	-	28.383	-
Weight of Ashed Sample	-	-	27.141	-
Organic Content	-	-	1.243	4.2
Particle Size:				
> 2 mm	-	-	2.793	12.10
> 1 mm	-	-	0.047	0.20
> 500 µm	-	-	0.068	0.29
> 250 µm	-	-	0.153	0.66
> 125 µm	-	-	0.645	2.68
> 63 µm	-	-	0.305	1.18
Total Gravel	-	-	2.793	12.10
Total Sand	-	-	1.217	5.01
Total Silt/Clay	-	-	23.130	82.89

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

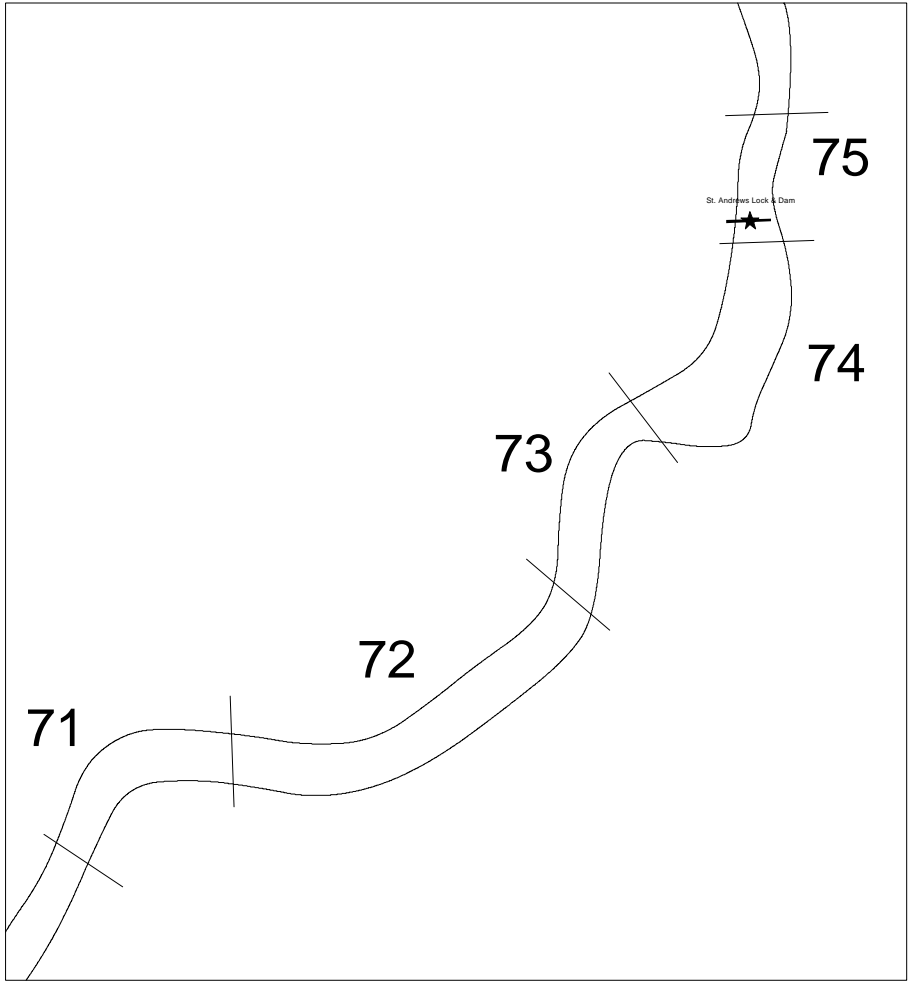


Figure 18. Red River segments 71-75.

RIVER: Red River
SEGMENT: 72

Winter Ponar Dredge Sampling
 Date 8-Mar-99
 UTM (14U) E-0646536 N-5548445

Fall Ponar Dredge Sampling
 Date 20-Sep-99
 UTM (14U) E-0646113 N-5547848

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) - -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	714	143	-	-	-	-
F. Lumbriculidae	0	0	-	-	-	-
F. Naididae	0	0	-	-	-	-
Total Oligochaeta	714	143	0.119	0.048	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	48	24	-	-	-	-
F. Leptoceridae	0	0	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	48	24	0.071	0.000	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	24	0	-	-	-	-
F. Heptageniidae	0	24	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	24	24	0.024	0.000	-	-

SEGMENT: 72 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	0	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	0	0	-	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	0	0	-	-	-	-
Total Coleoptera	0	0	-	-	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.500	-	-	-
SubF. Chironominae	690	0	-	-	-	-
SubF. Orthoclaadiinae	0	0	-	-	-	-
SubF. Tanypodinae	595	0	-	-	-	-
F. Ceratopogonidae	0	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empididae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	1286	0	0.500	-	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	0	0	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	0	0	-	-	-	-

SEGMENT: 72 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	24	0	0.024	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	2095	190	0.738	0.048	-	-

Observations: ¹ calculated average of 2 replicates;

2 non-recoverable Ponar Dredges (rock) during winter sampling;

only 2 replicates were collected during winter sampling due to non-recoverable Ponar Dredges;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 72 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	2	2	3	3
Dry Weight of Sample	25.796	-	29.121	-
Weight of Ashed Sample	24.935	-	27.654	-
Organic Content	0.861	3.3	1.466	4.9
Particle Size:				
> 2 mm	0.008	0.05	0.000	0.00
> 1 mm	0.001	0.01	0.000	0.00
> 500 µm	0.153	1.10	0.001	0.01
> 250 µm	1.250	8.92	0.003	0.01
> 125 µm	0.456	2.53	0.014	0.06
> 63 µm	0.295	1.20	0.014	0.06
Total Gravel	0.008	0.05	0.000	0.00
Total Sand	2.154	13.75	0.032	0.13
Total Silt/Clay	22.774	86.20	27.622	99.87

Observations: ¹ calculated average of 2 replicates;

only 2 replicates were collected during winter sampling due to non-recoverable Ponar Dredges;

the third replicate was archived for any necessary future analyses.

RIVER: Red River
SEGMENT: 74

Winter Ponar Dredge Sampling
 Date 8-Mar-99
 UTM (14U) E-0647471 N-5549740

Fall Ponar Dredge Sampling
 Date 20-Sep-99
 UTM (14U) E-0646927 N-5548967

Fall Artificial Substrate Sampling
 Installation Date 3-Aug-99
 Retrieval Date 2-Oct-99
 UTM (14U) E-0647486 N-5549539

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	3	0	3	3	3
Annelida						
Oligochaeta						
F. Tubificidae	-	24	-	-	8	-
F. Lumbriculidae	-	0	-	-	0	-
F. Naididae	-	0	-	-	0	-
Total Oligochaeta	-	24	-	0.000	8	0.001
Insecta						
Trichoptera						
F. Brachycentridae	-	0	-	-	6	-
F. Hydropsychidae	-	0	-	-	129	-
F. Leptoceridae	-	0	-	-	1	-
F. Limnephilidae	-	0	-	-	0	-
F. Polycentropodidae	-	0	-	-	2	-
Total Trichoptera	-	0	-	-	137	0.077
Ephemeroptera						
F. Ametropodidae	-	0	-	-	0	-
F. Baetidae	-	0	-	-	0	-
F. Caenidae	-	0	-	-	2	-
F. Ephemeridae	-	71	-	-	1	-
F. Heptageniidae	-	0	-	-	2	-
F. Leptophlebiidae	-	0	-	-	1	-
F. Polymitarcyidae	-	0	-	-	0	-
F. Siphonuridae	-	0	-	-	0	-
F. Tricorythidae	-	0	-	-	1	-
Total Ephemeroptera	-	71	-	0.000	6	0.002

SEGMENT: 74 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	3	0	3	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	-	0	-	-	0	-
F. Perlodidae	-	0	-	-	1	-
F. Pteronarcyidae	-	0	-	-	0	-
Total Plecoptera	-	0	-	-	1	0.000
Coleoptera						
F. Dytiscidae	-	0	-	-	0	-
F. Elmidae	-	0	-	-	1	-
Total Coleoptera	-	0	-	-	1	0.000
Hemiptera						
F. Corixidae	-	0	-	-	0	-
Megaloptera						
F. Corydalidae	-	0	-	-	0	-
F. Sialidae (<i>Sialis</i> sp.)	-	0	-	-	1	-
Total Megaloptera	-	0	-	-	1	0.001
Odonata						
F. Gomphidae	-	0	-	-	0	-
Diptera						
F. Athericidae	-	0	-	-	0	-
F. Chironomidae	-	-	-	0.000	-	0.001
SubF. Chironominae	-	0	-	-	0	-
SubF. Orthoclaadiinae	-	0	-	-	1	-
SubF. Tanypodinae	-	95	-	-	6	-
F. Ceratopogonidae	-	0	-	-	0	-
F. Chaoboridae	-	0	-	-	0	-
F. Dolichopodidae	-	0	-	-	0	-
F. Empididae	-	0	-	-	0	-
F. Simuliidae	-	0	-	-	0	-
F. Tipulidae	-	0	-	-	0	-
Total Diptera	-	95	-	0.000	7	0.001
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	-	0	-	-	0	-
Copepoda	-	0	-	-	0	-
Cladocera	-	0	-	-	0	-
Total Crustacea	-	0	-	-	0	-
Arachnida						
Hydracarina	-	0	-	-	0	-
Mollusca						
Bivalvia						
F. Sphaeriidae	-	24	-	-	1	-
F. Unionidae	-	0	-	-	1	-
Total Bivalvia	-	24	-	0.000	1	0.001

SEGMENT: 74 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	3	0	3	3	3
Gastropoda						
F. Ancyliidae	-	0	-	-	0	-
F. Hydrobiidae (<i>Ammicola</i> sp.)	-	0	-	-	0	-
F. Valvatidae (<i>Valvata</i> sp.)	-	0	-	-	0	-
Total Gastropoda	-	0	-	-	0	-
Hydrozoa (<i>Hydra</i> sp.)	-	0	-	-	0	-
Nematoda	-	0	-	-	0	-
Turbellaria (<i>Planaria</i> sp.)	-	0	-	-	5	0.000
TOTAL INVERTEBRATES	-	214	-	0.000	164	0.083

Observations: ¹ calculated average of 2 replicates;

6 non-recoverable Ponar Dredges (rock) during winter sampling;

no replicates were collected during winter sampling due to non-recoverable Ponar Dredges;

the third replicate was archived for any necessary future analyses;

the 3 Artificial Substrate Samplers installed were all retrieved;

Artificial Substrate Samplers contained some debris (1 with mud).

SEGMENT: 74 (continued)

Sampling Method	PONAR			
	Mean Sediment Particle Size Composition ¹			
Measurement	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Sampling Period				
Number of Replicates	0	0	3	3
Dry Weight of Sample	-	-	15.386	-
Weight of Ashed Sample	-	-	14.630	-
Organic Content	-	-	0.756	4.9
Particle Size:				
> 2 mm	-	-	0.000	0.00
> 1 mm	-	-	0.000	0.00
> 500 µm	-	-	0.002	0.01
> 250 µm	-	-	0.012	0.07
> 125 µm	-	-	0.111	0.61
> 63 µm	-	-	0.292	1.61
Total Gravel	-	-	0.000	0.00
Total Sand	-	-	0.417	2.30
Total Silt/Clay	-	-	14.213	97.70

Observations: ¹ calculated average of 2 replicates;

no replicates were collected during winter sampling due to non-recoverable Ponar Dredges;

the third replicate was archived for any necessary future analyses.

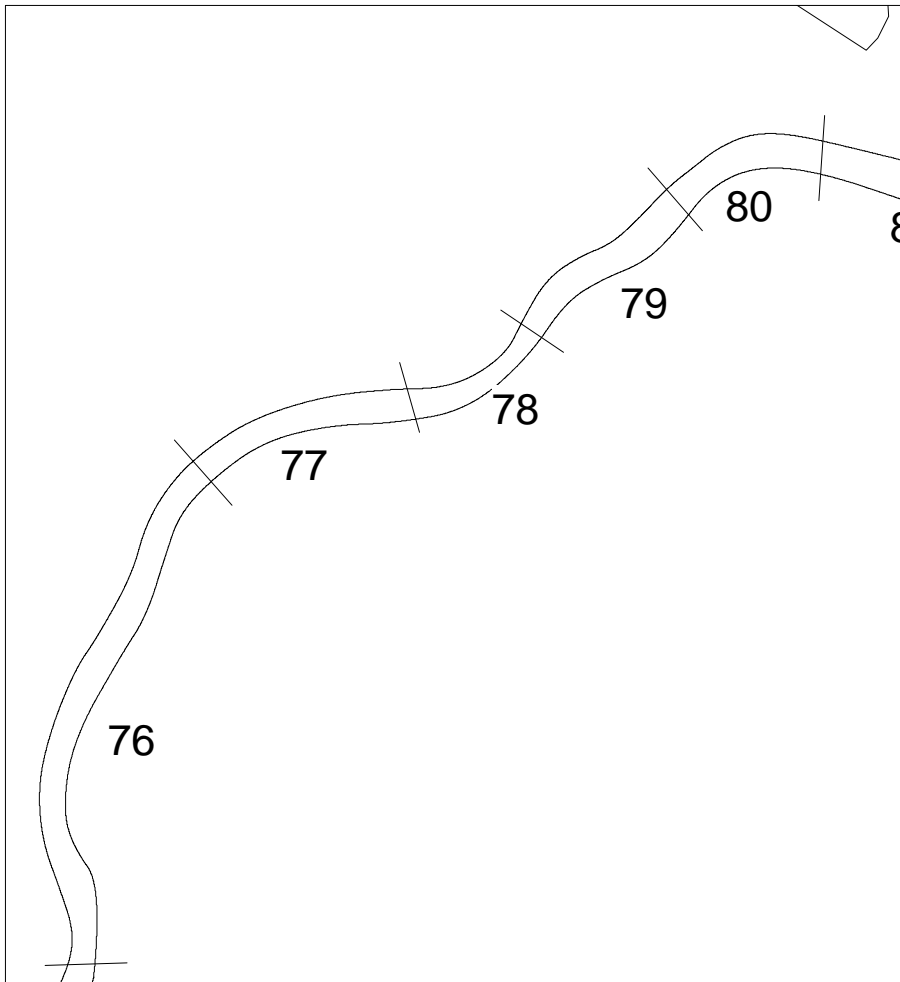


Figure 19. Red River segments 76-80.

RIVER: Red River
SEGMENT: 76

Winter Ponar Dredge Sampling
 Date 2-Mar-99
 UTM (14U) E-0647728 N-5552346

Fall Ponar Dredge Sampling
 Date -
 UTM (14U) - -

Fall Artificial Substrate Sampling
 Installation Date 6-Aug-99
 Retrieval Date 2-Oct-99
 UTM (14U) E-0647950 N-5552606

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	-	0	-	3	3
Annelida						
Oligochaeta						
F. Tubificidae	-	-	-	-	-	-
F. Lumbriculidae	-	-	-	-	-	-
F. Naididae	-	-	-	-	-	-
Total Oligochaeta	-	-	-	-	-	-
Insecta						
Trichoptera						
F. Brachycentridae	-	-	-	-	-	-
F. Hydropsychidae	-	-	-	-	-	-
F. Leptoceridae	-	-	-	-	-	-
F. Limnephilidae	-	-	-	-	-	-
F. Polycentropodidae	-	-	-	-	-	-
Total Trichoptera	-	-	-	-	-	-
Ephemeroptera						
F. Ametropodidae	-	-	-	-	-	-
F. Baetidae	-	-	-	-	-	-
F. Caenidae	-	-	-	-	-	-
F. Ephemeridae	-	-	-	-	-	-
F. Heptageniidae	-	-	-	-	-	-
F. Leptophlebiidae	-	-	-	-	-	-
F. Polymitarcyidae	-	-	-	-	-	-
F. Siphonuridae	-	-	-	-	-	-
F. Tricorythidae	-	-	-	-	-	-
Total Ephemeroptera	-	-	-	-	-	-

SEGMENT: 76 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	-	0	-	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	-	-	-	-	-	-
F. Perlodidae	-	-	-	-	-	-
F. Pteronarcyidae	-	-	-	-	-	-
Total Plecoptera	-	-	-	-	-	-
Coleoptera						
F. Dytiscidae	-	-	-	-	-	-
F. Elmidae	-	-	-	-	-	-
Total Coleoptera	-	-	-	-	-	-
Hemiptera						
F. Corixidae	-	-	-	-	-	-
Megaloptera						
F. Corydalidae	-	-	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	-	-	-	-	-	-
Total Megaloptera	-	-	-	-	-	-
Odonata						
F. Gomphidae	-	-	-	-	-	-
Diptera						
F. Athericidae	-	-	-	-	-	-
F. Chironomidae						
SubF. Chironominae	-	-	-	-	-	-
SubF. Orthoclaadiinae	-	-	-	-	-	-
SubF. Tanypodinae	-	-	-	-	-	-
F. Ceratopogonidae	-	-	-	-	-	-
F. Chaoboridae	-	-	-	-	-	-
F. Dolichopodidae	-	-	-	-	-	-
F. Empididae	-	-	-	-	-	-
F. Simuliidae	-	-	-	-	-	-
F. Tipulidae	-	-	-	-	-	-
Total Diptera	-	-	-	-	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	-	-	-	-	-	-
Copepoda	-	-	-	-	-	-
Cladocera	-	-	-	-	-	-
Total Crustacea	-	-	-	-	-	-
Arachnida						
Hydracarina	-	-	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	-	-	-	-	-	-
F. Unionidae	-	-	-	-	-	-
Total Bivalvia	-	-	-	-	-	-

SEGMENT: 76 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	-	0	-	3	3
Gastropoda						
F. Ancyliidae	-	-	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	-	-	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	-	-	-	-	-	-
Total Gastropoda	-	-	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	-	-	-	-	-	-
Nematoda	-	-	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	-	-	-	-	-	-
TOTAL INVERTEBRATES	-	-	-	-	-	-

Observations: ¹ calculated average of 2 replicates;

9 non-recoverable Ponar Dredges (rock) during winter sampling;

no replicates were collected during winter sampling due to non-recoverable Ponar Dredges;

Ponar Dredge sampling was not conducted during the fall sampling period;

the 3 Artificial Substrate Samplers installed were all lost.

SEGMENT: 76 (continued)

Sampling Method	PONAR			
	Mean Sediment Particle Size Composition ¹			
Measurement	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Sampling Period				
Number of Replicates	0	0	-	-
Dry Weight of Sample	-	-	-	-
Weight of Ashed Sample	-	-	-	-
Organic Content	-	-	-	-
Particle Size:				
> 2 mm	-	-	-	-
> 1 mm	-	-	-	-
> 500 µm	-	-	-	-
> 250 µm	-	-	-	-
> 125 µm	-	-	-	-
> 63 µm	-	-	-	-
Total Gravel	-	-	-	-
Total Sand	-	-	-	-
Total Silt/Clay	-	-	-	-

Observations: ¹ calculated average of 2 replicates;

no replicates were collected during winter sampling due to non-recoverable Ponar Dredges.

RIVER: Red River
SEGMENT: 79

Winter Ponar Dredge Sampling		
Date	<u>2-Mar-99</u>	
UTM (14U)	<u>E-0650224</u>	<u>N-5554352</u>
Fall Ponar Dredge Sampling		
Date	<u>-</u>	
UTM (14U)	<u>-</u>	<u>-</u>
Fall Artificial Substrate Sampling		
Installation Date	<u>-</u>	
Retrieval Date	<u>-</u>	
UTM (14U)	<u>-</u>	<u>-</u>

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	-	0	-	-	-
Annelida						
Oligochaeta						
F. Tubificidae	-	-	-	-	-	-
F. Lumbriculidae	-	-	-	-	-	-
F. Naididae	-	-	-	-	-	-
Total Oligochaeta	-	-	-	-	-	-
Insecta						
Trichoptera						
F. Brachycentridae	-	-	-	-	-	-
F. Hydropsychidae	-	-	-	-	-	-
F. Leptoceridae	-	-	-	-	-	-
F. Limnephilidae	-	-	-	-	-	-
F. Polycentropodidae	-	-	-	-	-	-
Total Trichoptera	-	-	-	-	-	-
Ephemeroptera						
F. Ametropodidae	-	-	-	-	-	-
F. Baetidae	-	-	-	-	-	-
F. Caenidae	-	-	-	-	-	-
F. Ephemeridae	-	-	-	-	-	-
F. Heptageniidae	-	-	-	-	-	-
F. Leptophlebiidae	-	-	-	-	-	-
F. Polymitarcyidae	-	-	-	-	-	-
F. Siphonuridae	-	-	-	-	-	-
F. Tricorythidae	-	-	-	-	-	-
Total Ephemeroptera	-	-	-	-	-	-

SEGMENT: 79 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	-	0	-	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	-	-	-	-	-	-
F. Perlodidae	-	-	-	-	-	-
F. Pteronarcyidae	-	-	-	-	-	-
Total Plecoptera	-	-	-	-	-	-
Coleoptera						
F. Dytiscidae	-	-	-	-	-	-
F. Elmidae	-	-	-	-	-	-
Total Coleoptera	-	-	-	-	-	-
Hemiptera						
F. Corixidae	-	-	-	-	-	-
Megaloptera						
F. Corydalidae	-	-	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	-	-	-	-	-	-
Total Megaloptera	-	-	-	-	-	-
Odonata						
F. Gomphidae	-	-	-	-	-	-
Diptera						
F. Athericidae	-	-	-	-	-	-
F. Chironomidae						
SubF. Chironominae	-	-	-	-	-	-
SubF. Orthocladiinae	-	-	-	-	-	-
SubF. Tanypodinae	-	-	-	-	-	-
F. Ceratopogonidae	-	-	-	-	-	-
F. Chaoboridae	-	-	-	-	-	-
F. Dolichopodidae	-	-	-	-	-	-
F. Empididae	-	-	-	-	-	-
F. Simuliidae	-	-	-	-	-	-
F. Tipulidae	-	-	-	-	-	-
Total Diptera	-	-	-	-	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	-	-	-	-	-	-
Copepoda	-	-	-	-	-	-
Cladocera	-	-	-	-	-	-
Total Crustacea	-	-	-	-	-	-
Arachnida						
Hydracarina	-	-	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	-	-	-	-	-	-
F. Unionidae	-	-	-	-	-	-
Total Bivalvia	-	-	-	-	-	-

SEGMENT: 79 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	-	0	-	-	-
Gastropoda						
F. Ancyliidae	-	-	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	-	-	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	-	-	-	-	-	-
Total Gastropoda	-	-	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	-	-	-	-	-	-
Nematoda	-	-	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	-	-	-	-	-	-
TOTAL INVERTEBRATES	-	-	-	-	-	-

Observations: ¹ calculated average of 2 replicates;

6 non-recoverable Ponar Dredges (rock) during winter sampling;

no replicates were collected during winter sampling due to non-recoverable Ponar Dredges;

Ponar Dredge sampling was not conducted during the fall sampling period;

Artificial Substrate Samplers were not installed.

SEGMENT: 79 (continued)

Sampling Method	PONAR			
	Mean Sediment Particle Size Composition ¹			
Measurement	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Sampling Period				
Number of Replicates	0	0	-	-
Dry Weight of Sample	-	-	-	-
Weight of Ashed Sample	-	-	-	-
Organic Content	-	-	-	-
Particle Size:				
> 2 mm	-	-	-	-
> 1 mm	-	-	-	-
> 500 µm	-	-	-	-
> 250 µm	-	-	-	-
> 125 µm	-	-	-	-
> 63 µm	-	-	-	-
Total Gravel	-	-	-	-
Total Sand	-	-	-	-
Total Silt/Clay	-	-	-	-

Observations: ¹ calculated average of 2 replicates;

no replicates were collected during winter sampling due to non-recoverable Ponar Dredges.

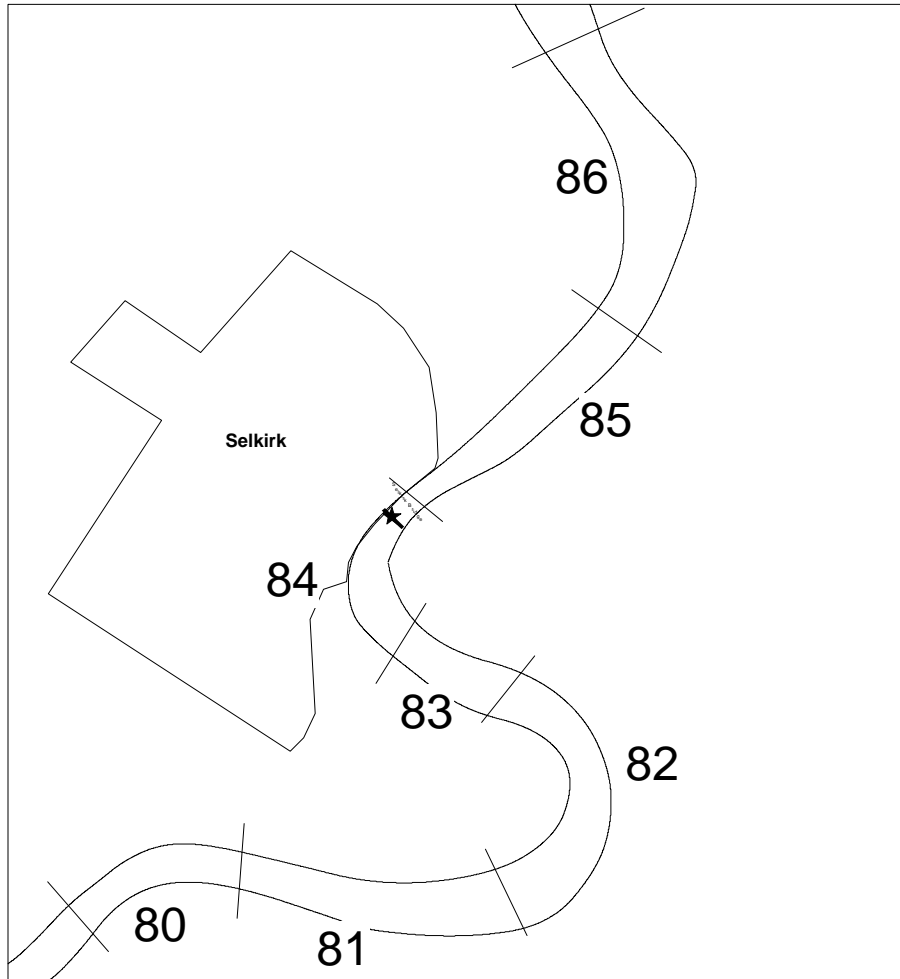


Figure 20. Red River segments 80-86.

RIVER: Red River
SEGMENT: 82

Winter Ponar Dredge Sampling
 Date 11-Mar-99
 UTM (14U) E-0653137 N-5555167

Fall Ponar Dredge Sampling
 Date 24-Sep-99
 UTM (14U) E-0653163 N-5555148

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) - -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	1548	1714	-	-	-	-
F. Lumbriculidae	0	24	-	-	-	-
F. Naididae	0	143	-	-	-	-
Total Oligochaeta	1548	1881	0.429	0.476	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	0	0	-	-	-	-
F. Leptoceridae	0	0	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	0	0	-	-	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	48	95	-	-	-	-
F. Heptageniidae	0	0	-	-	-	-
F. Leptophlebiidae	24	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	71	95	0.119	0.071	-	-

SEGMENT: 82 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	0	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	0	0	-	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	0	0	-	-	-	-
Total Coleoptera	0	0	-	-	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.190	0.000	-	-
SubF. Chironominae	71	0	-	-	-	-
SubF. Orthoclaadiinae	0	0	-	-	-	-
SubF. Tanypodinae	190	71	-	-	-	-
F. Ceratopogonidae	0	0	-	-	-	-
F. Chaoboridae	24	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empiidae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	286	71	0.190	0.000	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	24	24	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	24	24	0.095	0.024	-	-

SEGMENT: 82 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	1929	2071	0.833	0.571	-	-

Observations: ¹ calculated average of 2 replicates;

1 non-recoverable Ponar Dredge during winter sampling;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 82 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	3	3	3	3
Dry Weight of Sample	17.629	-	37.147	-
Weight of Ashed Sample	16.584	-	34.669	-
Organic Content	1.045	5.9	2.478	6.6
Particle Size:				
> 2 mm	0.091	0.57	0.000	0.00
> 1 mm	0.000	0.00	0.000	0.00
> 500 µm	0.000	0.00	0.001	0.00
> 250 µm	0.002	0.01	0.006	0.02
> 125 µm	0.003	0.02	0.018	0.05
> 63 µm	0.002	0.01	0.079	0.22
Total Gravel	0.091	0.57	0.000	0.00
Total Sand	0.007	0.04	0.104	0.29
Total Silt/Clay	16.486	99.39	34.565	99.71

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

RIVER: Red River
SEGMENT: 83

Winter Ponar Dredge Sampling
 Date 2-Mar-99
 UTM (14U) E-0652665 N-5555781

Fall Ponar Dredge Sampling
 Date 24-Sep-99
 UTM (14U) E-0652585 N-5555525

Fall Artificial Substrate Sampling
 Installation Date 6-Aug-99
 Retrieval Date 2-Oct-99
 UTM (14U) E-0652783 N-5555563

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	3	3
Annelida						
Oligochaeta						
F. Tubificidae	299	238	-	-	0	-
F. Lumbriculidae	0	0	-	-	0	-
F. Naididae	0	71	-	-	0	-
Total Oligochaeta	299	310	0.043	0.048	0	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	0	-
F. Hydropsychidae	0	0	-	-	326	-
F. Leptoceridae	0	0	-	-	3	-
F. Limnephilidae	0	0	-	-	0	-
F. Polycentropodidae	0	0	-	-	16	-
Total Trichoptera	0	0	-	-	344	0.233
Ephemeroptera						
F. Ametropodidae	0	0	-	-	0	-
F. Baetidae	0	0	-	-	0	-
F. Caenidae	0	0	-	-	2	-
F. Ephemeridae	158	119	-	-	0	-
F. Heptageniidae	0	0	-	-	21	-
F. Leptophlebiidae	0	0	-	-	0	-
F. Polymitarcyidae	0	0	-	-	0	-
F. Siphonuridae	0	0	-	-	1	-
F. Tricorythidae	0	0	-	-	0	-
Total Ephemeroptera	158	119	0.377	0.071	23	0.005

SEGMENT: 83 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	0	-
F. Perlodidae	0	0	-	-	2	-
F. Pteronarcyidae	0	0	-	-	0	-
Total Plecoptera	0	0	-	-	2	0.000
Coleoptera						
F. Dytiscidae	0	0	-	-	4	-
F. Elmidae	0	0	-	-	1	-
Total Coleoptera	0	0	-	-	5	0.001
Hemiptera						
F. Corixidae	0	0	-	-	0	-
Megaloptera						
F. Corydalidae	0	0	-	-	0	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	0	-
Total Megaloptera	0	0	-	-	0	-
Odonata						
F. Gomphidae	0	0	-	-	0	-
Diptera						
F. Athericidae	0	0	-	-	0	-
F. Chironomidae	-	-	0.067	0.000	-	0.000
SubF. Chironominae	24	71	-	-	1	-
SubF. Orthoclaadiinae	43	0	-	-	3	-
SubF. Tanypodinae	133	24	-	-	2	-
F. Ceratopogonidae	0	0	-	-	0	-
F. Chaoboridae	0	0	-	-	0	-
F. Dolichopodidae	0	0	-	-	0	-
F. Empididae	0	0	-	-	0	-
F. Simuliidae	0	0	-	-	1	-
F. Tipulidae	0	0	-	-	0	-
Total Diptera	200	95	0.067	0.000	5	0.000
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	0	-
Copepoda	0	0	-	-	0	-
Cladocera	1017	0	-	-	0	-
Total Crustacea	1017	0	0.022	-	0	-
Arachnida						
Hydracarina	0	0	-	-	0	-
Mollusca						
Bivalvia						
F. Sphaeriidae	113	119	-	-	0	-
F. Unionidae	0	0	-	-	0	-
Total Bivalvia	113	119	0.137	0.024	0	-

SEGMENT: 83 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	3	3
Gastropoda						
F. Ancyliidae	0	0	-	-	0	-
F. Hydrobiidae (<i>Ammicola</i> sp.)	0	0	-	-	0	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	0	-
Total Gastropoda	0	0	-	-	0	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	0	-
Nematoda	0	0	-	-	0	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	2	0.001
TOTAL INVERTEBRATES	1787	643	0.646	0.143	380	0.240

Observations: ¹ calculated average of 2 replicates;

3 non-recoverable Ponar Dredges (rock) during winter sampling;

only 2 replicates were collected during winter sampling due to non-recoverable Ponar Dredges;

the third replicate was archived for any necessary future analyses;

the 3 Artificial Substrate Samplers installed were all retrieved;

Artificial Substrate Samplers contained some debris.

SEGMENT: 83 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	1	1	3	3
Dry Weight of Sample	9.680	-	39.562	-
Weight of Ashed Sample	9.148	-	38.318	-
Organic Content	0.532	5.5	1.243	3.5
Particle Size:				
> 2 mm	0.000	0.00	0.006	0.02
> 1 mm	0.002	0.02	0.020	0.07
> 500 µm	0.020	0.22	0.069	0.16
> 250 µm	1.143	12.49	10.527	22.58
> 125 µm	1.537	16.80	6.273	17.44
> 63 µm	0.360	3.94	2.308	6.88
Total Gravel	0.000	0.00	0.006	0.02
Total Sand	3.062	33.47	19.196	47.13
Total Silt/Clay	6.086	66.53	19.117	52.85

Observations: ¹ calculated average of 2 replicates;

only 1 replicate was collected during winter sampling due to non-recoverable Ponar Dredges and partial Ponar Dredge sample;

the third replicate was archived for any necessary future analyses.

RIVER: Red River
SEGMENT: 86

Winter Ponar Dredge Sampling
 Date 11-Mar-99
 UTM (14U) E-0653429 N-5558004

Fall Ponar Dredge Sampling
 Date 24-Sep-99
 UTM (14U) E-0653377 N-5557393

Fall Artificial Substrate Sampling
 Installation Date -
 Retrieval Date -
 UTM (14U) -

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period						
Number of Replicates	3	3	3	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	929	833	-	-	-	-
F. Lumbriculidae	0	0	-	-	-	-
F. Naididae	0	190	-	-	-	-
Total Oligochaeta	929	1024	0.286	0.333	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	0	0	-	-	-	-
F. Leptoceridae	0	0	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	0	0	-	-	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	71	71	-	-	-	-
F. Heptageniidae	0	0	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	0	-	-	-	-
Total Ephemeroptera	71	71	0.667	0.143	-	-

SEGMENT: 86 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	24	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	24	0	0.048	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	0	0	-	-	-	-
Total Coleoptera	0	0	-	-	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	0.381	0.024	-	-
SubF. Chironominae	167	24	-	-	-	-
SubF. Orthoclaadiinae	0	0	-	-	-	-
SubF. Tanypodinae	357	0	-	-	-	-
F. Ceratopogonidae	24	0	-	-	-	-
F. Chaoboridae	24	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empiidae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	571	24	0.452	0.024	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	0	48	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	0	48	-	0.000	-	-

SEGMENT: 86 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	24	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	24	-	0.071	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	1595	1190	1.453	0.571	-	-

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 86 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	3	3	3	3
Dry Weight of Sample	42.480	-	31.895	-
Weight of Ashed Sample	40.516	-	30.418	-
Organic Content	1.965	4.6	1.478	4.6
Particle Size:				
> 2 mm	0.000	0.00	0.000	0.00
> 1 mm	0.005	0.01	0.002	0.01
> 500 µm	0.011	0.03	0.003	0.01
> 250 µm	0.161	0.39	0.017	0.07
> 125 µm	0.212	0.51	0.015	0.06
> 63 µm	0.047	0.12	0.016	0.06
Total Gravel	0.000	0.00	0.000	0.00
Total Sand	0.435	1.05	0.052	0.20
Total Silt/Clay	40.081	98.95	30.366	99.80

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

3.2 ASSINIBOINE RIVER (Segments 101 - 130)

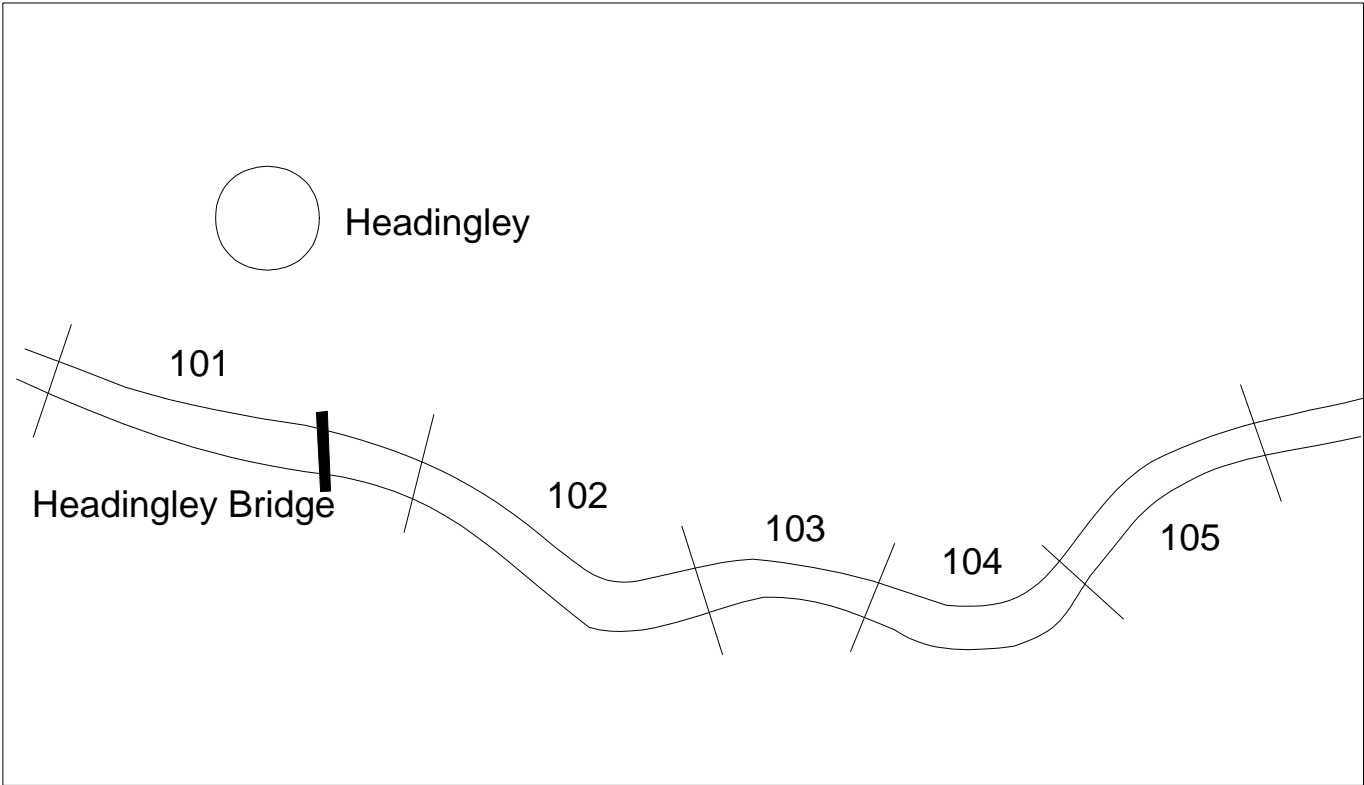


Figure 21. Assiniboine River segments 101 - 105.

RIVER: Assiniboine River
SEGMENT: 101

Winter Ponar Dredge Sampling
 Date 5-Mar-99
 UTM (14U) E-0614447 N-5525093

Fall Ponar Dredge Sampling
 Date 23-Sep-99
 UTM (14U) E-0614085 N-5525172

Fall Artificial Substrate Sampling
 Installation Date 4-Aug-99
 Retrieval Date 1-Oct-99
 UTM (14U) E-0614412 N-5525074

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	3	0	3	3	3
Annelida						
Oligochaeta						
F. Tubificidae	-	595	-	-	0	-
F. Lumbriculidae	-	0	-	-	0	-
F. Naididae	-	0	-	-	0	-
Total Oligochaeta	-	595	-	0.024	0	-
Insecta						
Trichoptera						
F. Brachycentridae	-	0	-	-	21	-
F. Hydropsychidae	-	0	-	-	12	-
F. Leptoceridae	-	0	-	-	0	-
F. Limnephilidae	-	0	-	-	0	-
F. Polycentropodidae	-	0	-	-	0	-
Total Trichoptera	-	0	-	-	32	0.073
Ephemeroptera						
F. Ametropodidae	-	48	-	-	0	-
F. Baetidae	-	0	-	-	0	-
F. Caenidae	-	0	-	-	0	-
F. Ephemeridae	-	71	-	-	0	-
F. Heptageniidae	-	0	-	-	1	-
F. Leptophlebiidae	-	0	-	-	0	-
F. Polymitarcyidae	-	0	-	-	0	-
F. Siphonuridae	-	0	-	-	0	-
F. Tricorythidae	-	0	-	-	0	-
Total Ephemeroptera	-	119	-	0.048	1	0.001

SEGMENT: 101 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	3	0	3	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	-	0	-	-	0	-
F. Perlodidae	-	24	-	-	2	-
F. Pteronarcyidae	-	0	-	-	0	-
Total Plecoptera	-	24	-	0.048	2	0.001
Coleoptera						
F. Dytiscidae	-	0	-	-	1	-
F. Elmidae	-	0	-	-	0	-
Total Coleoptera	-	0	-	-	1	0.000
Hemiptera						
F. Corixidae	-	0	-	-	0	-
Megaloptera						
F. Corydalidae	-	0	-	-	0	-
F. Sialidae (<i>Sialis</i> sp.)	-	0	-	-	0	-
Total Megaloptera	-	0	-	-	0	-
Odonata						
F. Gomphidae	-	0	-	-	0	-
Diptera						
F. Athericidae	-	0	-	-	0	-
F. Chironomidae	-	-	-	0.000	-	0.003
SubF. Chironominae	-	71	-	-	10	-
SubF. Orthoclaadiinae	-	0	-	-	0	-
SubF. Tanypodinae	-	0	-	-	0	-
F. Ceratopogonidae	-	0	-	-	0	-
F. Chaoboridae	-	0	-	-	0	-
F. Dolichopodidae	-	0	-	-	0	-
F. Empididae	-	0	-	-	0	-
F. Simuliidae	-	0	-	-	0	-
F. Tipulidae	-	0	-	-	0	-
Total Diptera	-	71	-	0.000	10	0.003
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	-	0	-	-	0	-
Copepoda	-	0	-	-	0	-
Cladocera	-	0	-	-	0	-
Total Crustacea	-	0	-	-	0	-
Arachnida						
Hydracarina	-	0	-	-	0	-
Mollusca						
Bivalvia						
F. Sphaeriidae	-	0	-	-	0	-
F. Unionidae	-	48	-	-	0	-
Total Bivalvia	-	48	-	0.238	0	-

SEGMENT: 101 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	3	0	3	3	3
Gastropoda						
F. Ancyliidae	-	0	-	-	0	-
F. Hydrobiidae (<i>Ammicola</i> sp.)	-	0	-	-	0	-
F. Valvatidae (<i>Valvata</i> sp.)	-	0	-	-	0	-
Total Gastropoda	-	0	-	-	0	-
Hydrozoa (<i>Hydra</i> sp.)	-	0	-	-	0	-
Nematoda	-	0	-	-	0	-
Turbellaria (<i>Planaria</i> sp.)	-	0	-	-	0	-
TOTAL INVERTEBRATES	-	857	-	0.358	45	0.078

Observations: ¹ calculated average of 2 replicates;

6 non-recoverable Ponar Dredges (rock) during winter sampling;

no replicates were collected during winter sampling due to non-recoverable Ponar Dredges;

2 non-recoverable Ponar Dredges (rock) during fall sampling;

the 3 Artificial Substrate Samplers installed were all retrieved;

Artificial Substrate Samplers contained some debris (1 with mud and sand).

SEGMENT: 101 (continued)

Sampling Method	PONAR			
	Mean Sediment Particle Size Composition ¹			
Measurement	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Sampling Period				
Number of Replicates	0	0	3	3
Dry Weight of Sample	-	-	74.082	-
Weight of Ashed Sample	-	-	72.583	-
Organic Content	-	-	1.499	2.0
Particle Size:				
> 2 mm	-	-	0.000	0.00
> 1 mm	-	-	0.022	0.03
> 500 µm	-	-	1.456	1.88
> 250 µm	-	-	28.392	38.40
> 125 µm	-	-	7.870	11.02
> 63 µm	-	-	7.609	10.67
Total Gravel	-	-	0.000	0.00
Total Sand	-	-	45.349	61.99
Total Silt/Clay	-	-	27.234	38.01

Observations: ¹ calculated average of 2 replicates;

no replicates were collected during winter sampling due to non-recoverable Ponar Dredges;

the third replicate was archived for any necessary future analyses.

RIVER: Assiniboine River
SEGMENT: 104

Winter Ponar Dredge Sampling
 Date 5-Mar-99
 UTM (14U) E-0616588 N-5524749

Fall Ponar Dredge Sampling
 Date 23-Sep-99
 UTM (14U) E-0616463 N-5524561

Fall Artificial Substrate Sampling
 Installation Date 4-Aug-99
 Retrieval Date 1-Oct-99
 UTM (14U) E-0616980 N-5524532

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	1	3	1	3	3	3
Annelida						
Oligochaeta						
F. Tubificidae	0	1333	-	-	0	-
F. Lumbriculidae	0	0	-	-	0	-
F. Naididae	0	0	-	-	0	-
Total Oligochaeta	0	1333	-	0.143	0	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	109	-
F. Hydropsychidae	0	0	-	-	1167	-
F. Leptoceridae	0	95	-	-	2	-
F. Limnephilidae	0	0	-	-	2	-
F. Polycentropodidae	0	0	-	-	3	-
Total Trichoptera	0	95	-	0.024	1283	1.296
Ephemeroptera						
F. Ametropodidae	0	0	-	-	0	-
F. Baetidae	0	0	-	-	0	-
F. Caenidae	0	48	-	-	10	-
F. Ephemeridae	0	119	-	-	0	-
F. Heptageniidae	0	24	-	-	8	-
F. Leptophlebiidae	0	0	-	-	0	-
F. Polymitarcyidae	0	0	-	-	0	-
F. Siphonuridae	0	0	-	-	2	-
F. Tricorythidae	0	0	-	-	1	-
Total Ephemeroptera	0	190	-	0.071	20	0.003

SEGMENT: 104 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	1	3	1	3	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	10	-
F. Perlodidae	0	0	-	-	27	-
F. Pteronarcyidae	0	0	-	-	1	-
Total Plecoptera	0	0	-	-	37	0.038
Coleoptera						
F. Dytiscidae	0	0	-	-	0	-
F. Elmidae	0	0	-	-	8	-
Total Coleoptera	0	0	-	-	8	0.004
Hemiptera						
F. Corixidae	0	0	-	-	0	-
Megaloptera						
F. Corydalidae	0	0	-	-	0	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	0	-
Total Megaloptera	0	0	-	-	0	-
Odonata						
F. Gomphidae	0	0	-	-	1	0.002
Diptera						
F. Athericidae	0	0	-	-	1	-
F. Chironomidae	-	-	-	0.048	-	0.009
SubF. Chironominae	0	48	-	-	1	-
SubF. Orthoclaadiinae	0	0	-	-	1	-
SubF. Tanypodinae	0	0	-	-	51	-
F. Ceratopogonidae	0	0	-	-	0	-
F. Chaoboridae	0	0	-	-	0	-
F. Dolichopodidae	0	0	-	-	0	-
F. Empididae	0	0	-	-	0	-
F. Simuliidae	0	0	-	-	0	-
F. Tipulidae	0	0	-	-	5	-
Total Diptera	0	48	-	0.048	57	0.021
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	1	-
Copepoda	0	0	-	-	0	-
Cladocera	0	0	-	-	0	-
Total Crustacea	0	0	-	-	1	0.002
Arachnida						
Hydracarina	0	0	-	-	0	-
Mollusca						
Bivalvia						
F. Sphaeriidae	0	262	-	-	0	-
F. Unionidae	0	95	-	-	7	-
Total Bivalvia	0	357	-	0.619	7	0.021

SEGMENT: 104 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	1	3	1	3	3	3
Gastropoda						
F. Ancyliidae	0	0	-	-	1	-
F. Hydrobiidae (<i>Ammicola</i> sp.)	0	0	-	-	0	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	0	-
Total Gastropoda	0	0	-	-	1	0.000
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	0	-
Nematoda	0	0	-	-	0	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	5	0.005
TOTAL INVERTEBRATES	0	2024	-	0.905	1416	1.392

Observations: ¹ calculated average of 2 replicates;

5 non-recoverable Ponar Dredges (rock) during winter sampling;

only 1 replicate was collected during winter sampling due to non-recoverable Ponar Dredges;

2 non-recoverable Ponar Dredges (rock) during fall sampling;

the 3 Artificial Substrate Samplers installed were all retrieved;

Artificial Substrate Samplers contained some debris.

SEGMENT: 104 (continued)

Sampling Method	PONAR			
	Mean Sediment Particle Size Composition ¹			
Measurement	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Sampling Period				
Number of Replicates	0	0	3	3
Dry Weight of Sample	-	-	53.511	-
Weight of Ashed Sample	-	-	52.527	-
Organic Content	-	-	0.985	1.8
Particle Size:				
> 2 mm	-	-	0.036	0.06
> 1 mm	-	-	0.008	0.02
> 500 µm	-	-	0.064	0.15
> 250 µm	-	-	2.324	5.56
> 125 µm	-	-	15.267	32.02
> 63 µm	-	-	7.064	12.77
Total Gravel	-	-	0.036	0.06
Total Sand	-	-	24.726	50.53
Total Silt/Clay	-	-	27.765	49.42

Observations: ¹ calculated average of 2 replicates;

no replicates were collected during winter sampling due to non-recoverable Ponar Dredges and partial Ponar Dredge sample;

the third replicate was archived for any necessary future analyses.

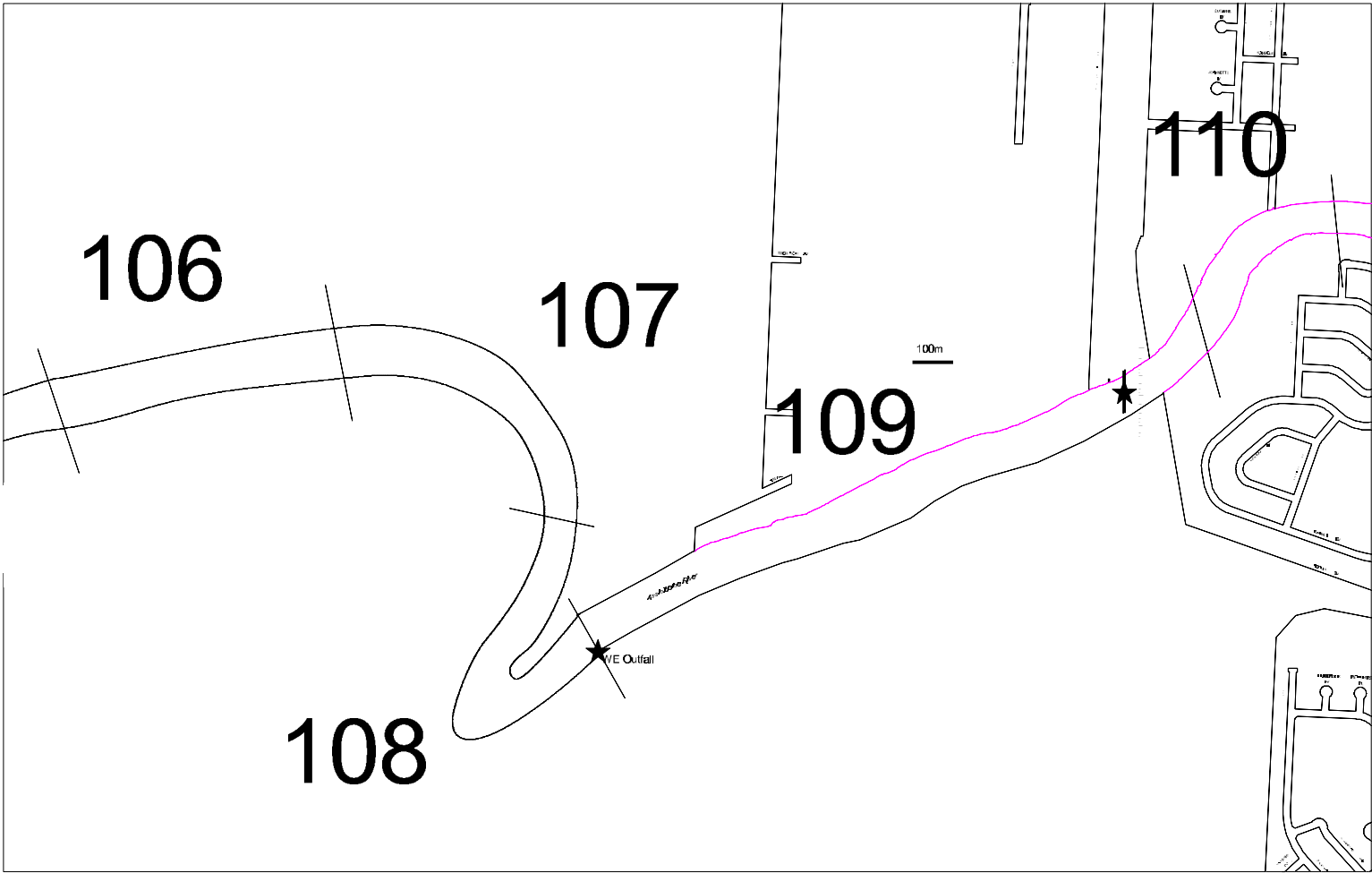


Figure 22. Assiniboine River segments 106-110.

RIVER: Assiniboine River
SEGMENT: 108

Winter Ponar Dredge Sampling
 Date 5-Mar-99
 UTM (14U) E-0618606 N-5524627

Fall Ponar Dredge Sampling
 Date 23-Sep-99
 UTM (14U) E-0618677 N-5524533

Fall Artificial Substrate Sampling
 Installation Date 4-Aug-99
 Retrieval Date 1-Oct-99
 UTM (14U) E-0618574 N-5524595

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement	individuals/m ²		g/m ²		individuals/trap	g/trap
Sampling Period	individuals/m ²		g/m ²		individuals/trap	g/trap
Number of Replicates	0	0	0	0	3	3
Annelida						
Oligochaeta						
F. Tubificidae	-	-	-	-	0	-
F. Lumbriculidae	-	-	-	-	0	-
F. Naididae	-	-	-	-	0	-
Total Oligochaeta	-	-	-	-	0	-
Insecta						
Trichoptera						
F. Brachycentridae	-	-	-	-	68	-
F. Hydropsychidae	-	-	-	-	167	-
F. Leptoceridae	-	-	-	-	2	-
F. Limnephilidae	-	-	-	-	0	-
F. Polycentropodidae	-	-	-	-	0	-
Total Trichoptera	-	-	-	-	237	0.501
Ephemeroptera						
F. Ametropodidae	-	-	-	-	0	-
F. Baetidae	-	-	-	-	0	-
F. Caenidae	-	-	-	-	0	-
F. Ephemeridae	-	-	-	-	0	-
F. Heptageniidae	-	-	-	-	1	-
F. Leptophlebiidae	-	-	-	-	0	-
F. Polymitarcyidae	-	-	-	-	0	-
F. Siphonuridae	-	-	-	-	0	-
F. Tricorythidae	-	-	-	-	0	-
Total Ephemeroptera	-	-	-	-	1	0.000

SEGMENT: 108 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	0	0	0	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	-	-	-	-	0	-
F. Perlodidae	-	-	-	-	2	-
F. Pteronarcyidae	-	-	-	-	0	-
Total Plecoptera	-	-	-	-	2	0.000
Coleoptera						
F. Dytiscidae	-	-	-	-	0	-
F. Elmidae	-	-	-	-	3	-
Total Coleoptera	-	-	-	-	3	0.001
Hemiptera						
F. Corixidae	-	-	-	-	0	-
Megaloptera						
F. Corydalidae	-	-	-	-	0	-
F. Sialidae (<i>Sialis</i> sp.)	-	-	-	-	0	-
Total Megaloptera	-	-	-	-	0	-
Odonata						
F. Gomphidae	-	-	-	-	0	-
Diptera						
F. Athericidae	-	-	-	-	1	-
F. Chironomidae	-	-	-	-	-	0.002
SubF. Chironominae	-	-	-	-	0	-
SubF. Orthoclaadiinae	-	-	-	-	0	-
SubF. Tanypodinae	-	-	-	-	5	-
F. Ceratopogonidae	-	-	-	-	0	-
F. Chaoboridae	-	-	-	-	0	-
F. Dolichopodidae	-	-	-	-	0	-
F. Empididae	-	-	-	-	0	-
F. Simuliidae	-	-	-	-	0	-
F. Tipulidae	-	-	-	-	3	-
Total Diptera	-	-	-	-	9	0.009
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	-	-	-	-	0	-
Copepoda	-	-	-	-	0	-
Cladocera	-	-	-	-	0	-
Total Crustacea	-	-	-	-	0	-
Arachnida						
Hydracarina	-	-	-	-	0	-
Mollusca						
Bivalvia						
F. Sphaeriidae	-	-	-	-	1	-
F. Unionidae	-	-	-	-	0	-
Total Bivalvia	-	-	-	-	1	0.000

SEGMENT: 108 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	0	0	0	0	3	3
Gastropoda						
F. Ancyliidae	-	-	-	-	0	-
F. Hydrobiidae (<i>Ammicola</i> sp.)	-	-	-	-	0	-
F. Valvatidae (<i>Valvata</i> sp.)	-	-	-	-	0	-
Total Gastropoda	-	-	-	-	0	-
Hydrozoa (<i>Hydra</i> sp.)	-	-	-	-	0	-
Nematoda	-	-	-	-	0	-
Turbellaria (<i>Planaria</i> sp.)	-	-	-	-	0	-
TOTAL INVERTEBRATES	-	-	-	-	253	0.511

Observations: ¹ calculated average of 2 replicates;

8 non-recoverable Ponar Dredges (cobble) during winter sampling;

no replicates were collected during winter sampling due to non-recoverable Ponar Dredges;

4 non-recoverable Ponar Dredges (rock) during fall sampling;

no replicates were collected during fall sampling due to non-recoverable Ponar Dredges;

of the 3 Artificial Substrate Samplers installed, 1 was retrieved;

Artificial Substrate Sampler contained some debris.

SEGMENT: 108 (continued)

Sampling Method	PONAR			
	Mean Sediment Particle Size Composition ¹			
Measurement	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Sampling Period				
Number of Replicates	0	0	0	0
Dry Weight of Sample	-	-	-	-
Weight of Ashed Sample	-	-	-	-
Organic Content	-	-	-	-
Particle Size:				
> 2 mm	-	-	-	-
> 1 mm	-	-	-	-
> 500 µm	-	-	-	-
> 250 µm	-	-	-	-
> 125 µm	-	-	-	-
> 63 µm	-	-	-	-
Total Gravel	-	-	-	-
Total Sand	-	-	-	-
Total Silt/Clay	-	-	-	-

Observations: ¹ calculated average of 2 replicates;

no replicates were collected during winter sampling due to non-recoverable Ponar Dredges;

no replicates were collected during fall sampling due to non-recoverable Ponar Dredges.

RIVER: Assiniboine River
SEGMENT: 109

Winter Ponar Dredge Sampling

Date	-	-
Start UTM (14U)	-	-
End UTM (14U)	-	-

Fall Ponar Dredge Sampling

Date	17-Sep-99	
Start UTM (14U)	E-0619267	N-5524696
End UTM (14U)	E-0620165	N-5525100

Fall Artificial Substrate Sampling

Installation Date	-	-
Retrieval Date	-	-
UTM (14U)	-	-

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	0	-	0	-	-
Annelida						
Oligochaeta						
F. Tubificidae	-	-	-	-	-	-
F. Lumbriculidae	-	-	-	-	-	-
F. Naididae	-	-	-	-	-	-
Total Oligochaeta	-	-	-	-	-	-
Insecta						
Trichoptera						
F. Brachycentridae	-	-	-	-	-	-
F. Hydropsychidae	-	-	-	-	-	-
F. Leptoceridae	-	-	-	-	-	-
F. Limnephilidae	-	-	-	-	-	-
F. Polycentropodidae	-	-	-	-	-	-
Total Trichoptera	-	-	-	-	-	-
Ephemeroptera						
F. Ametropodidae	-	-	-	-	-	-
F. Baetidae	-	-	-	-	-	-
F. Caenidae	-	-	-	-	-	-
F. Ephemeridae	-	-	-	-	-	-
F. Heptageniidae	-	-	-	-	-	-
F. Leptophlebiidae	-	-	-	-	-	-
F. Polymitarcyidae	-	-	-	-	-	-
F. Siphonuridae	-	-	-	-	-	-
F. Tricorythidae	-	-	-	-	-	-
Total Ephemeroptera	-	-	-	-	-	-

SEGMENT: 109 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	0	-	0	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	-	-	-	-	-	-
F. Perlodidae	-	-	-	-	-	-
F. Pteronarcyidae	-	-	-	-	-	-
Total Plecoptera	-	-	-	-	-	-
Coleoptera						
F. Dytiscidae	-	-	-	-	-	-
F. Elmidae	-	-	-	-	-	-
Total Coleoptera	-	-	-	-	-	-
Hemiptera						
F. Corixidae	-	-	-	-	-	-
Megaloptera						
F. Corydalidae	-	-	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	-	-	-	-	-	-
Total Megaloptera	-	-	-	-	-	-
Odonata						
F. Gomphidae	-	-	-	-	-	-
Diptera						
F. Athericidae	-	-	-	-	-	-
F. Chironomidae						
SubF. Chironominae	-	-	-	-	-	-
SubF. Orthoclaadiinae	-	-	-	-	-	-
SubF. Tanypodinae	-	-	-	-	-	-
F. Ceratopogonidae	-	-	-	-	-	-
F. Chaoboridae	-	-	-	-	-	-
F. Dolichopodidae	-	-	-	-	-	-
F. Empididae	-	-	-	-	-	-
F. Simuliidae	-	-	-	-	-	-
F. Tipulidae	-	-	-	-	-	-
Total Diptera	-	-	-	-	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	-	-	-	-	-	-
Copepoda	-	-	-	-	-	-
Cladocera	-	-	-	-	-	-
Total Crustacea	-	-	-	-	-	-
Arachnida						
Hydracarina	-	-	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	-	-	-	-	-	-
F. Unionidae	-	-	-	-	-	-
Total Bivalvia	-	-	-	-	-	-

SEGMENT: 109 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	0	-	0	-	-
Gastropoda						
F. Ancyliidae	-	-	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	-	-	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	-	-	-	-	-	-
Total Gastropoda	-	-	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	-	-	-	-	-	-
Nematoda	-	-	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	-	-	-	-	-	-
TOTAL INVERTEBRATES	-	-	-	-	-	-

Observations: ¹ calculated average of 2 replicates;
 sampling conducted within the WEWPCC outfall plume;
 Ponar Dredge Sampling was not conducted during the winter sampling period;
 6 non-recoverable Ponar Dredges (rock) during fall sampling;
 no replicates were collected during fall sampling due to non-recoverable Ponar Dredges;
 Artificial Substrate Samplers were not installed.

SEGMENT: 109 (continued)

Sampling Method	PONAR			
	Mean Sediment Particle Size Composition ¹			
Measurement	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Sampling Period				
Number of Replicates	-	-	0	0
Dry Weight of Sample	-	-	-	-
Weight of Ashed Sample	-	-	-	-
Organic Content	-	-	-	-
Particle Size:				
> 2 mm	-	-	-	-
> 1 mm	-	-	-	-
> 500 µm	-	-	-	-
> 250 µm	-	-	-	-
> 125 µm	-	-	-	-
> 63 µm	-	-	-	-
Total Gravel	-	-	-	-
Total Sand	-	-	-	-
Total Silt/Clay	-	-	-	-

Observations: ¹ calculated average of 2 replicates;

no replicates were collected during fall sampling due to non-recoverable Ponar Dredges.

RIVER: Assiniboine River
SEGMENT: 110

Winter Ponar Dredge Sampling		
Date	-	-
UTM (14U)	-	-
Fall Ponar Dredge Sampling		
Date	23-Sep-99	
UTM (14U)	E-0620526	N-5525392
Fall Artificial Substrate Sampling		
Installation Date	4-Aug-99	
Retrieval Date	1-Oct-99	
UTM (14U)	E-0620449	N-5525220

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Sampling Period	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	3	3
Annelida						
Oligochaeta						
F. Tubificidae	-	0	-	-	-	-
F. Lumbriculidae	-	0	-	-	-	-
F. Naididae	-	0	-	-	-	-
Total Oligochaeta	-	0	-	-	-	-
Insecta						
Trichoptera						
F. Brachycentridae	-	0	-	-	-	-
F. Hydropsychidae	-	0	-	-	-	-
F. Leptoceridae	-	24	-	-	-	-
F. Limnephilidae	-	0	-	-	-	-
F. Polycentropodidae	-	0	-	-	-	-
Total Trichoptera	-	24	-	0.024	-	-
Ephemeroptera						
F. Ametropodidae	-	0	-	-	-	-
F. Baetidae	-	0	-	-	-	-
F. Caenidae	-	0	-	-	-	-
F. Ephemeridae	-	0	-	-	-	-
F. Heptageniidae	-	0	-	-	-	-
F. Leptophlebiidae	-	0	-	-	-	-
F. Polymitarcyidae	-	0	-	-	-	-
F. Siphonuridae	-	0	-	-	-	-
F. Tricorythidae	-	0	-	-	-	-
Total Ephemeroptera	-	0	-	-	-	-

SEGMENT: 110 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	-	0	-	-	-	-
F. Perlodidae	-	0	-	-	-	-
F. Pteronarcyidae	-	0	-	-	-	-
Total Plecoptera	-	0	-	-	-	-
Coleoptera						
F. Dytiscidae	-	0	-	-	-	-
F. Elmidae	-	0	-	-	-	-
Total Coleoptera	-	0	-	-	-	-
Hemiptera						
F. Corixidae	-	0	-	-	-	-
Megaloptera						
F. Corydalidae	-	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	-	0	-	-	-	-
Total Megaloptera	-	0	-	-	-	-
Odonata						
F. Gomphidae	-	0	-	-	-	-
Diptera						
F. Athericidae	-	0	-	-	-	-
F. Chironomidae	-	-	-	-	-	-
SubF. Chironominae	-	0	-	-	-	-
SubF. Orthoclaadiinae	-	0	-	-	-	-
SubF. Tanypodinae	-	0	-	-	-	-
F. Ceratopogonidae	-	262	-	-	-	-
F. Chaoboridae	-	0	-	-	-	-
F. Dolichopodidae	-	0	-	-	-	-
F. Empididae	-	0	-	-	-	-
F. Simuliidae	-	0	-	-	-	-
F. Tipulidae	-	0	-	-	-	-
Total Diptera	-	262	-	0.095	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	-	0	-	-	-	-
Copepoda	-	0	-	-	-	-
Cladocera	-	0	-	-	-	-
Total Crustacea	-	0	-	-	-	-
Arachnida						
Hydracarina	-	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	-	24	-	-	-	-
F. Unionidae	-	0	-	-	-	-
Total Bivalvia	-	24	-	0.024	-	-

SEGMENT: 110 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	3	3
Gastropoda						
F. Ancyliidae	-	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	-	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	-	0	-	-	-	-
Total Gastropoda	-	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	-	0	-	-	-	-
Nematoda	-	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	-	0	-	-	-	-
TOTAL INVERTEBRATES	-	310	-	0.143	-	-

Observations: ¹ calculated average of 2 replicates;

Ponar Dredge Sampling was not conducted during the winter sampling period;

2 non-recoverable Ponar Dredges (rock) during fall sampling;

the third replicate was archived for any necessary future analyses;

the 3 Artificial Substrate Samplers installed were all lost.

SEGMENT: 110 (continued)

Sampling Method	PONAR			
	Mean Sediment Particle Size Composition ¹			
Measurement	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Sampling Period				
Number of Replicates	-	-	3	3
Dry Weight of Sample	-	-	39.532	-
Weight of Ashed Sample	-	-	39.389	-
Organic Content	-	-	0.142	0.4
Particle Size:				
> 2 mm	-	-	0.085	0.19
> 1 mm	-	-	0.283	0.67
> 500 µm	-	-	6.982	17.56
> 250 µm	-	-	28.586	72.77
> 125 µm	-	-	1.993	5.33
> 63 µm	-	-	0.081	0.23
Total Gravel	-	-	0.085	0.19
Total Sand	-	-	37.925	96.56
Total Silt/Clay	-	-	1.380	3.25

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

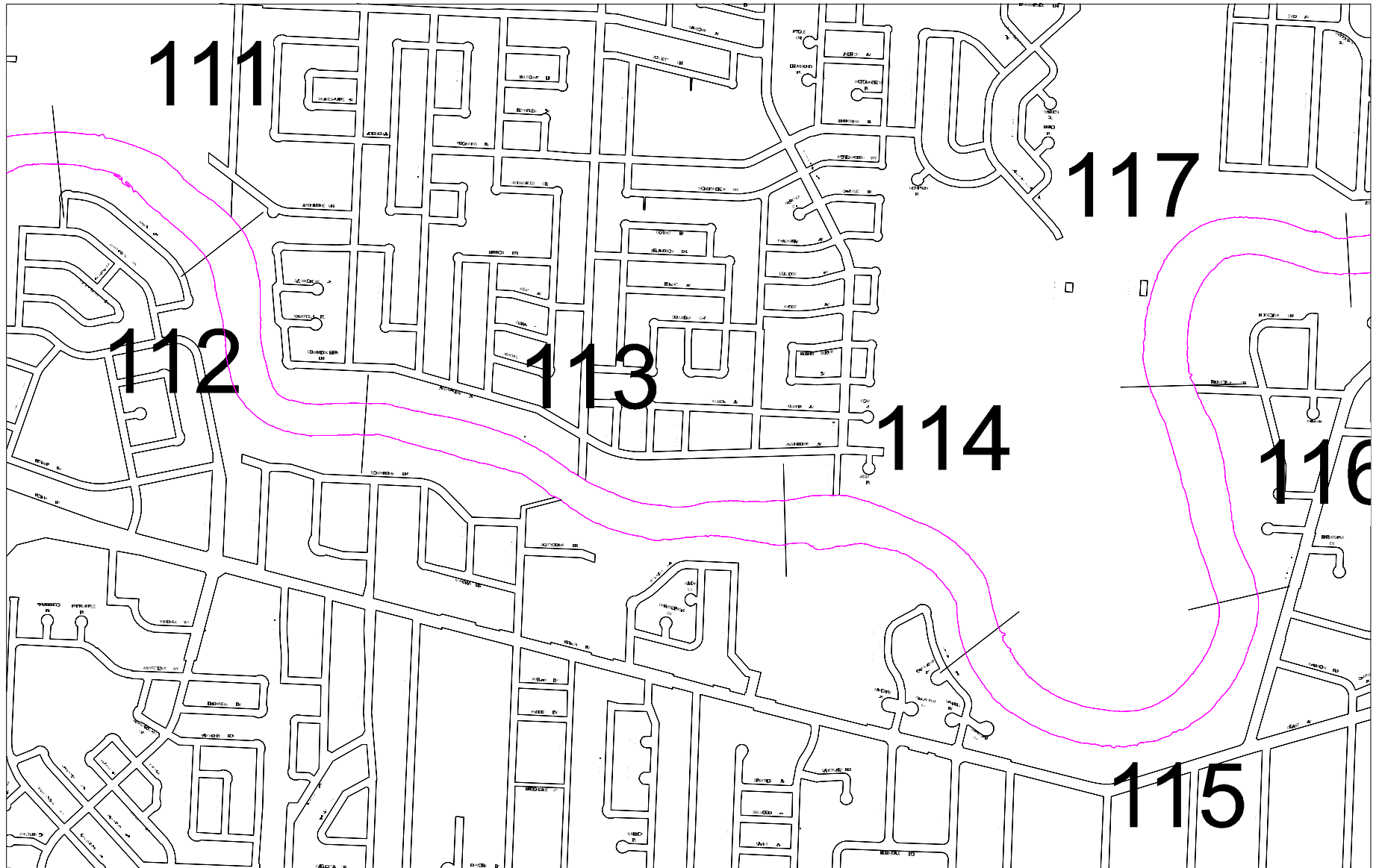


Figure 23. Assiniboine River segments 111-117.

RIVER: Assiniboine River
SEGMENT: 115

Winter Ponar Dredge Sampling
 Date 6-Mar-99
 UTM (14U) E-0623461 N-5524365

Fall Ponar Dredge Sampling
 Date 23-Sep-99
 UTM (14U) E-0623720 N-5524327

Fall Artificial Substrate Sampling
 Installation Date 4-Aug-99
 Retrieval Date 1-Oct-99
 UTM (14U) E-0623300 N-5524113

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	3	3
Annelida						
Oligochaeta						
F. Tubificidae	333	0	-	-	2	-
F. Lumbriculidae	0	0	-	-	0	-
F. Naididae	0	0	-	-	0	-
Total Oligochaeta	333	0	0.119	-	2	0.001
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	11	-
F. Hydropsychidae	95	0	-	-	255	-
F. Leptoceridae	0	0	-	-	0	-
F. Limnephilidae	0	0	-	-	0	-
F. Polycentropodidae	0	0	-	-	3	-
Total Trichoptera	95	0	0.119	-	268	0.318
Ephemeroptera						
F. Ametropodidae	0	24	-	-	0	-
F. Baetidae	0	0	-	-	0	-
F. Caenidae	0	0	-	-	1	-
F. Ephemeridae	0	0	-	-	18	-
F. Heptageniidae	0	0	-	-	2	-
F. Leptophlebiidae	0	0	-	-	0	-
F. Polymitarcyidae	0	0	-	-	0	-
F. Siphonuridae	0	0	-	-	0	-
F. Tricorythidae	0	0	-	-	0	-
Total Ephemeroptera	0	24	-	0.024	21	0.071

SEGMENT: 115 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	0	-
F. Perlodidae	0	0	-	-	3	-
F. Pteronarcyidae	0	0	-	-	0	-
Total Plecoptera	0	0	-	-	3	0.002
Coleoptera						
F. Dytiscidae	0	0	-	-	1	-
F. Elmidae	0	0	-	-	2	-
Total Coleoptera	0	0	-	-	3	0.002
Hemiptera						
F. Corixidae	0	0	-	-	1	0.002
Megaloptera						
F. Corydalidae	0	0	-	-	1	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	0	-
Total Megaloptera	0	0	-	-	1	0.000
Odonata						
F. Gomphidae	0	0	-	-	2	0.058
Diptera						
F. Athericidae	0	0	-	-	0	-
F. Chironomidae	-	-	0.048	0.024	-	0.001
SubF. Chironominae	24	24	-	-	1	-
SubF. Orthoclaadiinae	0	0	-	-	0	-
SubF. Tanypodinae	0	0	-	-	6	-
F. Ceratopogonidae	24	0	-	-	0	-
F. Chaoboridae	0	0	-	-	0	-
F. Dolichopodidae	0	0	-	-	0	-
F. Empididae	0	0	-	-	0	-
F. Simuliidae	0	0	-	-	0	-
F. Tipulidae	0	0	-	-	0	-
Total Diptera	48	24	0.072	0.024	6	0.001
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	0	-
Copepoda	0	0	-	-	0	-
Cladocera	0	0	-	-	0	-
Total Crustacea	0	0	-	-	0	-
Arachnida						
Hydracarina	0	0	-	-	0	-
Mollusca						
Bivalvia						
F. Sphaeriidae	48	95	-	-	1	-
F. Unionidae	0	0	-	-	1	-
Total Bivalvia	48	95	0.048	0.024	2	0.016

SEGMENT: 115 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	3	3	3	3	3	3
Gastropoda						
F. Ancyliidae	0	0	-	-	0	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	0	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	0	-
Total Gastropoda	0	0	-	-	0	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	0	-
Nematoda	0	0	-	-	0	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	1	0.001
TOTAL INVERTEBRATES	524	143	0.358	0.072	308	0.472

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses;

the 3 Artificial Substrate Samplers installed were all retrieved;

Artificial Substrate Samplers contained some mud and debris.

SEGMENT: 115 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	3	3	3	3
Dry Weight of Sample	46.451	-	34.388	-
Weight of Ashed Sample	46.363	-	34.101	-
Organic Content	0.088	0.2	0.286	0.8
Particle Size:				
> 2 mm	0.026	0.05	0.003	0.01
> 1 mm	0.324	0.70	0.010	0.03
> 500 µm	2.858	6.12	0.154	0.39
> 250 µm	30.150	66.69	0.674	1.82
> 125 µm	10.126	20.53	28.467	82.06
> 63 µm	0.508	1.02	2.380	7.34
Total Gravel	0.026	0.05	0.003	0.01
Total Sand	43.965	95.05	31.684	91.63
Total Silt/Clay	2.373	4.89	2.414	8.36

Observations: ¹ calculated average of 2 replicates;

the third replicate was archived for any necessary future analyses.

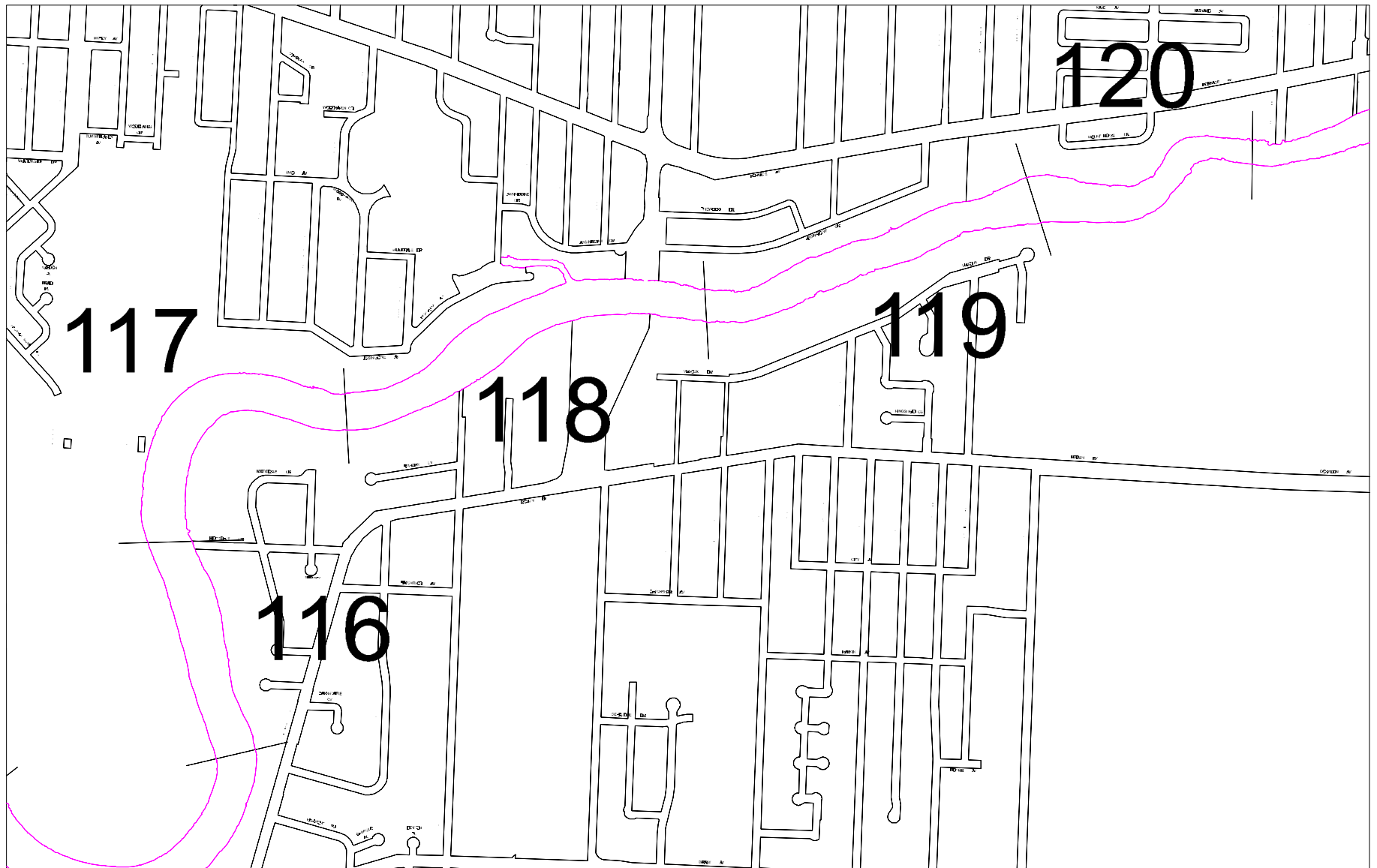


Figure 24. Assiniboine River segments 116-120.

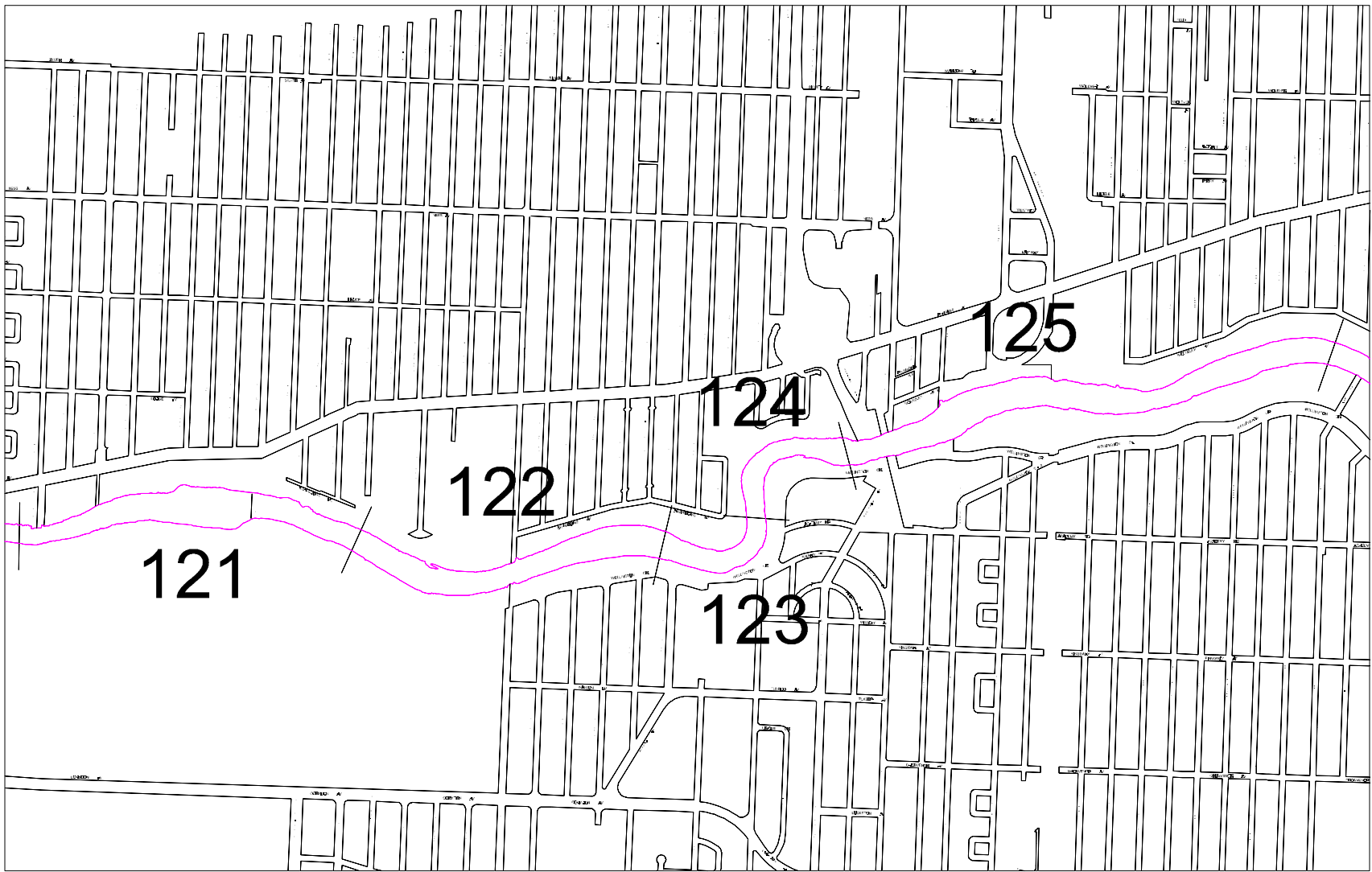


Figure 25. Assiniboine River segments 121-125.

RIVER: Assiniboine River
SEGMENT: 122

Winter Ponar Dredge Sampling		
Date	<u>6-Mar-99</u>	
UTM (14U)	<u>E-0627854</u>	<u>N-5526064</u>
Fall Ponar Dredge Sampling		
Date	<u>23-Sep-99</u>	
UTM (14U)	<u>E-0627939</u>	<u>N-5525893</u>
Fall Artificial Substrate Sampling		
Installation Date	<u>-</u>	
Retrieval Date	<u>-</u>	
UTM (14U)	<u>-</u>	<u>-</u>

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	0	452	-	-	-	-
F. Lumbriculidae	0	0	-	-	-	-
F. Naididae	48	0	-	-	-	-
Total Oligochaeta	48	452	0.000	0.048	-	-
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	-	-
F. Hydropsychidae	24	24	-	-	-	-
F. Leptoceridae	0	71	-	-	-	-
F. Limnephilidae	0	0	-	-	-	-
F. Polycentropodidae	0	0	-	-	-	-
Total Trichoptera	24	95	0.024	0.048	-	-
Ephemeroptera						
F. Ametropodidae	0	0	-	-	-	-
F. Baetidae	0	0	-	-	-	-
F. Caenidae	0	0	-	-	-	-
F. Ephemeridae	0	0	-	-	-	-
F. Heptageniidae	0	48	-	-	-	-
F. Leptophlebiidae	0	0	-	-	-	-
F. Polymitarcyidae	0	0	-	-	-	-
F. Siphonuridae	0	0	-	-	-	-
F. Tricorythidae	0	24	-	-	-	-
Total Ephemeroptera	0	71	-	0.048	-	-

SEGMENT: 122 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	0	-	-	-	-
F. Perlodidae	0	0	-	-	-	-
F. Pteronarcyidae	0	0	-	-	-	-
Total Plecoptera	0	0	-	-	-	-
Coleoptera						
F. Dytiscidae	0	0	-	-	-	-
F. Elmidae	24	0	-	-	-	-
Total Coleoptera	24	0	0.048	-	-	-
Hemiptera						
F. Corixidae	0	0	-	-	-	-
Megaloptera						
F. Corydalidae	0	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	-	-
Total Megaloptera	0	0	-	-	-	-
Odonata						
F. Gomphidae	0	0	-	-	-	-
Diptera						
F. Athericidae	0	0	-	-	-	-
F. Chironomidae	-	-	-	0.000	-	-
SubF. Chironominae	0	95	-	-	-	-
SubF. Orthoclaadiinae	0	0	-	-	-	-
SubF. Tanypodinae	0	0	-	-	-	-
F. Ceratopogonidae	24	0	-	-	-	-
F. Chaoboridae	0	0	-	-	-	-
F. Dolichopodidae	0	0	-	-	-	-
F. Empididae	0	0	-	-	-	-
F. Simuliidae	0	0	-	-	-	-
F. Tipulidae	0	0	-	-	-	-
Total Diptera	24	95	0.048	0.000	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	-	-
Copepoda	0	0	-	-	-	-
Cladocera	0	0	-	-	-	-
Total Crustacea	0	0	-	-	-	-
Arachnida						
Hydracarina	0	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	0	190	-	-	-	-
F. Unionidae	0	0	-	-	-	-
Total Bivalvia	0	190	-	0.048	-	-

SEGMENT: 122 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	-	-
Gastropoda						
F. Ancyliidae	0	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	0	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	-	-
Total Gastropoda	0	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	-	-
Nematoda	0	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	-	-
TOTAL INVERTEBRATES	119	905	0.120	0.192	-	-

Observations: ¹ calculated average of 2 replicates;

only 2 replicates were collected during winter sampling due to slush under the ice;

3 non-recoverable Ponar Dredges (hard sand) during fall sampling;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 122 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	2	2	3	3
Dry Weight of Sample	37.910	-	40.179	-
Weight of Ashed Sample	36.648	-	39.228	-
Organic Content	1.262	3.3	0.951	2.5
Particle Size:				
> 2 mm	0.008	0.02	0.000	0.00
> 1 mm	0.093	0.28	0.033	0.08
> 500 µm	1.234	3.66	0.176	0.44
> 250 µm	14.053	41.73	6.239	16.46
> 125 µm	1.700	4.92	21.407	55.18
> 63 µm	0.394	1.01	6.713	16.26
Total Gravel	0.008	0.02	0.000	0.00
Total Sand	17.473	51.60	34.568	88.41
Total Silt/Clay	19.167	48.38	4.659	11.59

Observations: ¹ calculated average of 2 replicates;

only 2 replicates were collected during winter sampling due to slush under the ice;

the third replicate was archived for any necessary future analyses.

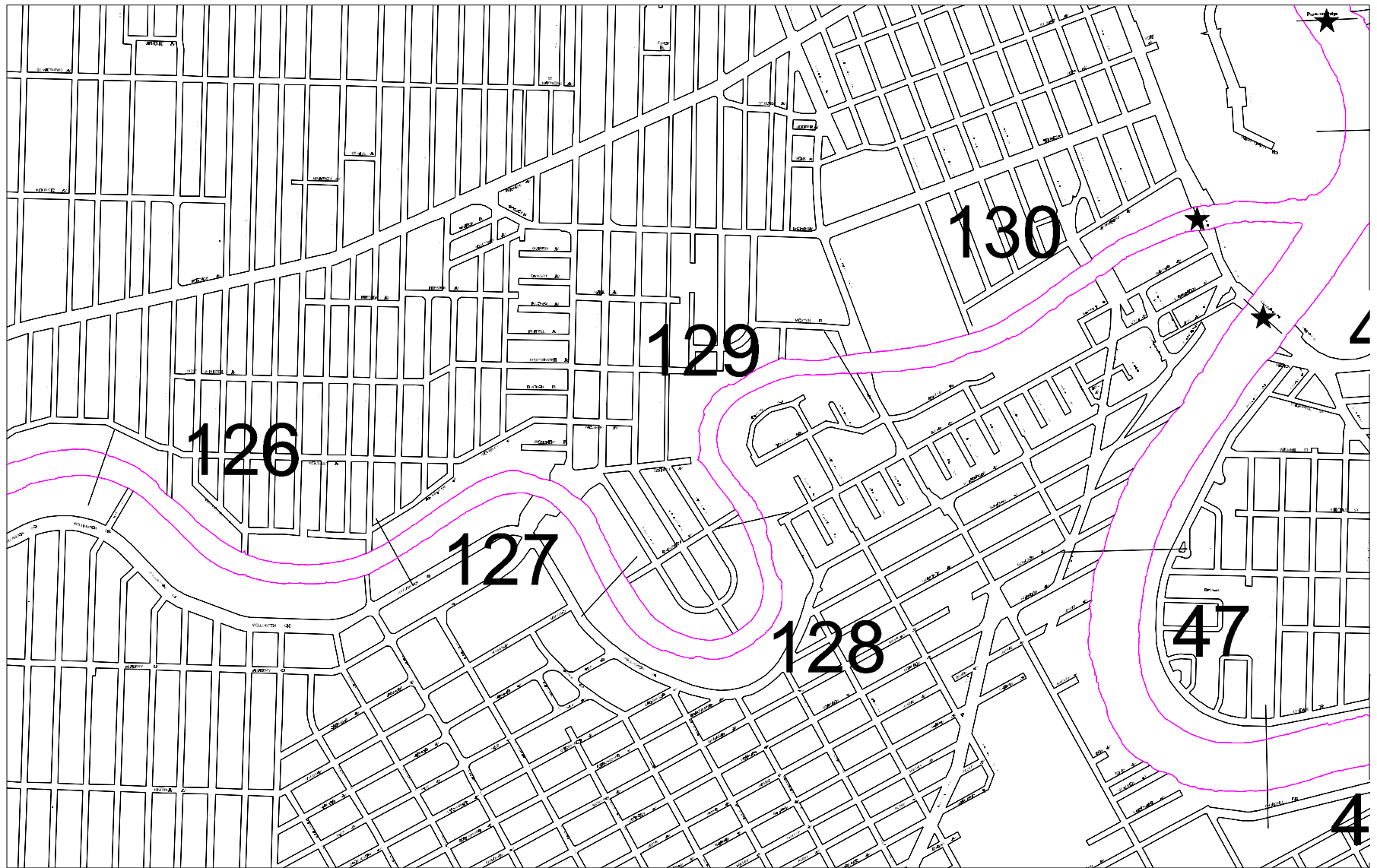


Figure 26. Assiniboine River segments 126-130.

RIVER: Assiniboine River
SEGMENT: 128

Winter Ponar Dredge Sampling
 Date 6-Mar-99
 UTM (14U) E-0632760 N-5526022

Fall Ponar Dredge Sampling
 Date 23-Sep-99
 UTM (14U) E-0632534 N-5525933

Fall Artificial Substrate Sampling
 Installation Date 4-Aug-99
 Retrieval Date 1-Oct-99
 UTM (14U) E-0632265 N-5526359

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Sampling Period	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	3	3
Annelida						
Oligochaeta						
F. Tubificidae	786	238	-	-	2	-
F. Lumbriculidae	667	0	-	-	0	-
F. Naididae	667	48	-	-	2	-
Total Oligochaeta	2119	286	0.452	0.048	3	0.001
Insecta						
Trichoptera						
F. Brachycentridae	0	0	-	-	23	-
F. Hydropsychidae	24	143	-	-	400	-
F. Leptoceridae	0	24	-	-	3	-
F. Limnephilidae	0	0	-	-	0	-
F. Polycentropodidae	0	0	-	-	1	-
Total Trichoptera	24	167	0.024	0.095	427	0.337
Ephemeroptera						
F. Ametropodidae	0	0	-	-	0	-
F. Baetidae	0	0	-	-	1	-
F. Caenidae	0	71	-	-	4	-
F. Ephemeridae	0	0	-	-	0	-
F. Heptageniidae	0	0	-	-	12	-
F. Leptophlebiidae	0	0	-	-	1	-
F. Polymitarcyidae	0	0	-	-	0	-
F. Siphonuridae	0	0	-	-	0	-
F. Tricorythidae	0	0	-	-	5	-
Total Ephemeroptera	0	71	-	0.024	21	0.001

SEGMENT: 128 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	3	3
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	0	24	-	-	0	-
F. Perlodidae	0	0	-	-	5	-
F. Pteronarcyidae	0	0	-	-	0	-
Total Plecoptera	0	24	-	0.048	5	0.002
Coleoptera						
F. Dytiscidae	0	0	-	-	1	-
F. Elmidae	0	0	-	-	2	-
Total Coleoptera	0	0	-	-	2	0.001
Hemiptera						
F. Corixidae	0	0	-	-	0	-
Megaloptera						
F. Corydalidae	0	0	-	-	0	-
F. Sialidae (<i>Sialis</i> sp.)	0	0	-	-	0	-
Total Megaloptera	0	0	-	-	0	-
Odonata						
F. Gomphidae	0	0	-	-	0	-
Diptera						
F. Athericidae	0	0	-	-	5	-
F. Chironomidae	-	-	0.119	0.024	-	0.001
SubF. Chironominae	0	24	-	-	1	-
SubF. Orthoclaadiinae	0	0	-	-	1	-
SubF. Tanypodinae	95	0	-	-	14	-
F. Ceratopogonidae	0	0	-	-	0	-
F. Chaoboridae	0	0	-	-	0	-
F. Dolichopodidae	0	0	-	-	0	-
F. Empididae	0	0	-	-	0	-
F. Simuliidae	0	0	-	-	0	-
F. Tipulidae	0	0	-	-	3	-
Total Diptera	95	24	0.119	0.024	23	0.028
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	0	0	-	-	0	-
Copepoda	0	0	-	-	0	-
Cladocera	0	0	-	-	0	-
Total Crustacea	0	0	-	-	0	-
Arachnida						
Hydracarina	0	0	-	-	0	-
Mollusca						
Bivalvia						
F. Sphaeriidae	24	24	-	-	0	-
F. Unionidae	0	0	-	-	0	-
Total Bivalvia	24	24	0.000	0.095	0	-

SEGMENT: 128 (continued)

Sampling Method Measurement Sampling Period	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	2	3	2	3	3	3
Gastropoda						
F. Ancyliidae	0	0	-	-	0	-
F. Hydrobiidae (<i>Ammicola</i> sp.)	0	0	-	-	0	-
F. Valvatidae (<i>Valvata</i> sp.)	0	0	-	-	0	-
Total Gastropoda	0	0	-	-	0	-
Hydrozoa (<i>Hydra</i> sp.)	0	0	-	-	0	-
Nematoda	24	0	0.000	-	0	-
Turbellaria (<i>Planaria</i> sp.)	0	0	-	-	1	0.000
TOTAL INVERTEBRATES	2286	595	0.595	0.334	481	0.370

Observations: ¹ calculated average of 2 replicates;

2 non-recoverable Ponar Dredges (hard sand) during winter sampling;

only 2 replicates were collected during winter sampling due to non-recoverable Ponar Dredges;

the third replicate was archived for any necessary future analyses;

the 3 Artificial Substrate Samplers installed were all retrieved;

Artificial Substrate Samplers contained some debris.

SEGMENT: 128 (continued)

Sampling Method Measurement Sampling Period	PONAR			
	Mean Sediment Particle Size Composition ¹			
	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Number of Replicates	2	2	3	3
Dry Weight of Sample	25.516	-	46.291	-
Weight of Ashed Sample	24.120	-	45.064	-
Organic Content	1.396	5.5	1.227	2.9
Particle Size:				
> 2 mm	0.000	0.00	0.000	0.00
> 1 mm	0.000	0.00	0.038	0.11
> 500 µm	0.008	0.03	0.160	0.46
> 250 µm	0.400	1.54	0.940	2.62
> 125 µm	1.360	5.55	8.695	21.51
> 63 µm	0.718	3.16	9.356	19.30
Total Gravel	0.000	0.00	0.000	0.00
Total Sand	2.486	10.29	19.190	43.98
Total Silt/Clay	21.635	89.72	25.875	56.02

Observations: ¹ calculated average of 2 replicates;

only 2 replicates were collected during winter sampling due to non-recoverable Ponar Dredges;

the third replicate was archived for any necessary future analyses.

RIVER: Assiniboine River
SEGMENT: 130

Winter Ponar Dredge Sampling		
Date	-	-
UTM (14U)	-	-
Fall Ponar Dredge Sampling		
Date	23-Sep-99	
UTM (14U)	E-0634147	N-5527466
Fall Artificial Substrate Sampling		
Installation Date	-	-
Retrieval Date	-	-
UTM (14U)	-	-

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
Measurement						
Sampling Period	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	-	-
Annelida						
Oligochaeta						
F. Tubificidae	-	1810	-	-	-	-
F. Lumbriculidae	-	0	-	-	-	-
F. Naididae	-	0	-	-	-	-
Total Oligochaeta	-	1810	-	0.381	-	-
Insecta						
Trichoptera						
F. Brachycentridae	-	0	-	-	-	-
F. Hydropsychidae	-	0	-	-	-	-
F. Leptoceridae	-	0	-	-	-	-
F. Limnephilidae	-	0	-	-	-	-
F. Polycentropodidae	-	0	-	-	-	-
Total Trichoptera	-	0	-	-	-	-
Ephemeroptera						
F. Ametropodidae	-	0	-	-	-	-
F. Baetidae	-	0	-	-	-	-
F. Caenidae	-	0	-	-	-	-
F. Ephemeridae	-	0	-	-	-	-
F. Heptageniidae	-	0	-	-	-	-
F. Leptophlebiidae	-	0	-	-	-	-
F. Polymitarcyidae	-	0	-	-	-	-
F. Siphonuridae	-	0	-	-	-	-
F. Tricorythidae	-	0	-	-	-	-
Total Ephemeroptera	-	0	-	-	-	-

SEGMENT: 130 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	-	-
Plecoptera						
F. Perlidae (<i>Acroneuria</i> sp.)	-	0	-	-	-	-
F. Perlodidae	-	0	-	-	-	-
F. Pteronarcyidae	-	0	-	-	-	-
Total Plecoptera	-	0	-	-	-	-
Coleoptera						
F. Dytiscidae	-	0	-	-	-	-
F. Elmidae	-	0	-	-	-	-
Total Coleoptera	-	0	-	-	-	-
Hemiptera						
F. Corixidae	-	0	-	-	-	-
Megaloptera						
F. Corydalidae	-	0	-	-	-	-
F. Sialidae (<i>Sialis</i> sp.)	-	0	-	-	-	-
Total Megaloptera	-	0	-	-	-	-
Odonata						
F. Gomphidae	-	0	-	-	-	-
Diptera						
F. Athericidae	-	0	-	-	-	-
F. Chironomidae	-	-	-	-	-	-
SubF. Chironominae	-	0	-	-	-	-
SubF. Orthoclaadiinae	-	0	-	-	-	-
SubF. Tanypodinae	-	0	-	-	-	-
F. Ceratopogonidae	-	0	-	-	-	-
F. Chaoboridae	-	0	-	-	-	-
F. Dolichopodidae	-	0	-	-	-	-
F. Empiidae	-	0	-	-	-	-
F. Simuliidae	-	0	-	-	-	-
F. Tipulidae	-	0	-	-	-	-
Total Diptera	-	0	-	-	-	-
Crustacea						
Amphipoda (<i>Hyalella</i> sp.)	-	0	-	-	-	-
Copepoda	-	0	-	-	-	-
Cladocera	-	0	-	-	-	-
Total Crustacea	-	0	-	-	-	-
Arachnida						
Hydracarina	-	0	-	-	-	-
Mollusca						
Bivalvia						
F. Sphaeriidae	-	0	-	-	-	-
F. Unionidae	-	0	-	-	-	-
Total Bivalvia	-	0	-	-	-	-

SEGMENT: 130 (continued)

Sampling Method	PONAR				ARTIFICIAL SUBSTRATE	
	Mean Density ¹		Mean Dry Weight ¹		Mean Number ¹	Mean Dry Weight ¹
	WINTER	FALL	WINTER	FALL	FALL	FALL
	individuals/m ²	individuals/m ²	g/m ²	g/m ²	individuals/trap	g/trap
Number of Replicates	-	3	-	3	-	-
Gastropoda						
F. Ancyliidae	-	0	-	-	-	-
F. Hydrobiidae (<i>Amnicola</i> sp.)	-	0	-	-	-	-
F. Valvatidae (<i>Valvata</i> sp.)	-	0	-	-	-	-
Total Gastropoda	-	0	-	-	-	-
Hydrozoa (<i>Hydra</i> sp.)	-	0	-	-	-	-
Nematoda	-	0	-	-	-	-
Turbellaria (<i>Planaria</i> sp.)	-	0	-	-	-	-
TOTAL INVERTEBRATES	-	1810	-	0.381	-	-

Observations: ¹ calculated average of 2 replicates;

Ponar Dredge sampling was not conducted during the winter sampling period;

the third replicate was archived for any necessary future analyses;

Artificial Substrate Samplers were not installed.

SEGMENT: 130 (continued)

Sampling Method	PONAR			
	Mean Sediment Particle Size Composition ¹			
Measurement	WINTER		FALL	
	weight (g)	% composition	weight (g)	% composition
Sampling Period				
Number of Replicates	-	-	3	3
Dry Weight of Sample	-	-	46.111	-
Weight of Ashed Sample	-	-	44.356	-
Organic Content	-	-	1.755	3.6
Particle Size:				
> 2 mm	-	-	0.000	0.00
> 1 mm	-	-	0.005	0.01
> 500 µm	-	-	0.042	0.08
> 250 µm	-	-	0.541	1.65
> 125 µm	-	-	4.790	13.01
> 63 µm	-	-	2.873	6.70
Total Gravel	-	-	0.000	0.00
Total Sand	-	-	8.251	21.45
Total Silt/Clay	-	-	36.106	78.55

Observations: ¹ calculated average of 2 replicates;
the third replicate was archived for any necessary future analyses.