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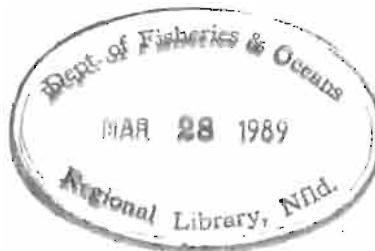
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**A Fish Habitat Survey Of
The Jacquet River Watershed,
Restigouche County, N.B.
Volume 4: Species Composition and Relative Abundance
Of Benthic Macro-invertebrates**

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**Canadian Data Report of
Fisheries and Aquatic Sciences
No. 724 (Vol. 4)**



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Canadian Data Report of Fisheries and Aquatic Sciences

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Canadian Data Report of
Fisheries and Aquatic Sciences No.724 (Vol. 4)

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A Fish Habitat Survey of the Jacquet River Watershed,
Restigouche County, N.B.
Volume 4 - Species Composition and Relative Abundance
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by

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Fish Habitat and Enhancement Division

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ABSTRACT

Ritchie, W.B., 1989. A Fish Habitat Survey of the Jacquet River Watershed, Restigouche County, N.B. Volume 4 - Species Composition and Relative Abundance of Benthic Macro-invertebrates. Can. Data Rep. Fish. Aquat. Sci. 724 (Vol. 4), 45p.

This report, Volume 4 of a four volume series, is a compilation of benthological data collected on the Jacquet River System in August, 1984. Species composition and relative abundance of benthic macro-invertebrates are presented. Other topics are :

- Volume 1 - Hydraulic and Physiographic Data
- Volume 2 - Water and Sediment Chemistry Data
- Volume 3 - Estimated Fish Densities and Biological Data for Salmonid Specimens

Key words: benthic macro-invertebrate, Surber sampler, Ekman dredge, relative abundance, species composition.

RESUMÉ

Ritchie, W.B., 1989. A Fish Habitat Survey of the Jacquet River Watershed, Restigouche County, N.B. Volume 4 - Species Composition and Relative Abundance of Benthic Macro-invertebrates. Can. Data Rep. Fish. Aquat. Sci. 724 (Vol. 4), 45p.

Ce rapport, le quatrième d'une série de quatre volumes, consiste d'une compilation de données benthologiques recueillies sur le réseau hydrographique Jacquet en août 1984. La composition d'espèces et l'abondance relative des macro-invertébrés benthiques sont présentées. D'autres sujets sont:

- Volume 1 - Hydraulic and Physiographic Data
- Volume 2 - Water and Sediment Chemistry Data
- Volume 3 - Estimated Fish Densities and Biological Data for Salmonid Specimens

Mots clés: macro-invertébrés benthiques, échantillonner Surber, drague Ekman, abondance relative, composition d'espèces

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INTRODUCTION

The Jacquet River, a medium sized salmon stream approximately 50 km in linear length in Restigouche Co., New Brunswick contains ideal spawning and rearing habitat for Atlantic salmon (*salmo salar*). With the exception of logging activity, the watershed is largely undeveloped. In 1965, Brunswick Mining and Smelting, Ltd. installed a water intake structure approximately 2 km from the mouth of the Jacquet River. They are presently operating on a water license from the New Brunswick Department of Fisheries and Environment (now the N.B. Dept. of Municipal Affairs and Environment). This license, renewed in 1974, expiring in 1979 and not since renewed, entitles them to withdraw 39312 cu. meters/day for their consumption in the lead smelter and the fertilizer plant as well as for domestic use in two adjacent town sites in Belledune.

Five previous studies of the river have been undertaken within the last twenty years. Three were qualitative in scope offering visual descriptions of available habitat and fish present (Smith 1956, N.B.D.N.R. (unpublished 1969 report), and IEC Beak 1984). Two studied the micro-habitat requirements of salmon in the area downstream from the water intake station (Morantz 1983, IEC Beak 1982). None of these studies presented quantitative data for water or sediment quality or hydrology.

In August, 1984, the Gulf Region's Fish Habitat Division conducted a survey on the Jacquet River to determine site-specific baseline conditions for hydrology, water chemistry, sediment chemistry, fish and macro-invertebrate populations, and habitat quality. The area of study consisted of 24 sites along the main stem of the river and seven of its major tributaries: Big Hole Brook, Antinouri Lake Brook, Lower South Branch, Lower McNair Brook, Upper South Branch, Upper McNair Brook and Rocky Brook. This report, the fourth in a series of four data reports, presents the benthological data collected on the survey.

MATERIALS AND METHODS

Benthic macro-invertebrate sampling within the Jacquet River Watershed was conducted at study site locations selected according to criteria described in Volume 1 of this series.

A Surber sampler was used for benthic macro-invertebrate sampling in streams and an Ekman dredge was used at one lake site.

The Surber sampler supplied by Wildco (Saginaw Mi., U.S.A.) consists of hinged brass frames attached to a

nylon net with mesh openings of 1024 microns. The brass frame confines an actual sampling area of .09 m².

Three Surber samples were collected from each of 16 stream study sites. Each sampling station was considered to be typical of benthic invertebrate habitat and had adequate stream flow to permit effective operation of the sampler. The sampler was placed on the stream substrate and firmly held in position while substrate within the brass frame was cleaned for a period of 60 seconds, allowing benthic invertebrates and organic material to detach from the substrate and drift into the net. Contents of the net were then washed into a pail having a screened bottom, transferred to 500 ml polyethelene bottles and preserved in a 10% formaldehyde solution.

Three Ekman dredge samples were collected at selected sampling stations at one lake. The Ekman dredge, supplied by Wildco consists of a box-like device with two clam shell jaws containing a chamber volume of 3540 cm³ (volume of sample). Secured samples were washed through a screened tub, transferred to 500ml polyethelene bottles and preserved in a 10% formaldehyde solution.

Preserved samples from stream and lake study sites were sorted in the laboratory with the aid of a Wild M3 dissecting microscope. In this procedure, benthic macro-invertebrates were removed from detritus and organic material in the sample and preserved in labelled glass vials with a 10% formaldehyde solution.

Preserved invertebrate specimens were then transferred to the Atlantic Reference Centre of the Huntsman Marine Laboratory in St. Andrews, N.B. and identified to species, where possible, using criteria described by Bednarik and McCafferty, (1979), Pennak (1953), Merrit and Cummins (1984), Simpson and Bode (1980), Ward and Whipple (1959), and Wiggins (1977).

RESULTS

Relative abundance of each species was compiled and tabulated for each sample from all represented sites and presented in this report.

Insects, which comprised the majority of invertebrates sampled, are listed at the beginning of each table and followed by taxa of the remaining organisms which include amphipods, annelids, molluscs and turbellarians.

ACKNOWLEDGEMENTS

The author is much indebted to W. E. Hogans of the Huntsman Marine Laboratory's Atlantic Reference Centre, who identified invertebrate specimens. Appreciation is also extended to L. Haight who provided the site drawings and to D.R. Alexander and L. Anthony who critically reviewed the manuscript.

REFERENCES

- Arnett, R.H. The Beetles of the United States. The American Entomologic Institute, Ann Arbor, Michigan. 1512p
- Bednarik, A. F., W. P. McCafferty, 1979. Biosystematic Revision of the Genus *Stenonema* (Ephemeroptera: Heptageniidae) Canadian Bulletin of Fisheries and Aquatic Sciences Bulletin 201.
- IEC Beak. 1982. An examination of Water Withdrawal Effects on Atlantic Salmon Habitats and Populations in the Lower Jacquet River, N.B. - a report for the Brunswick Mining and Smelting Corp. Ltd., Smelting Division, Belledune, N.B.
- IEC Beak. 1984. Assessment of Juvenile Atlantic Salmon Stocks in the South Branch, Jacquet River. - a report for the Brunswick Mining and Smelting Corp. Ltd., Smelting Division, Belledune, N.B.
- Pennak, R. W., 1953. Freshwater Invertebrates of the United States, Ronald Press Company, New York.
- Merrit, R. W., K. W. Cummins, 1984. An Introduction to the Aquatic Insects of North America, 2nd Edition Kendall-Hunt, Dubuque, Iowa.
- Morantz, D. 1983. Instream Flow Incremental Flow Methodology (IFIM) for minimum flow requirements in the Jacquet River, an unpublished report. Department of Fisheries and Oceans. Scotia Fundy Region.
- New Brunswick Dept. of Natural Resources. 1969. Habitat River Survey - unpublished data.
- Simpson, K. W., R. W. Bode, 1980. Common Larvae of Chironomidae (Diptera), from New York State Streams and Rivers, New York State Museum Bulletin 439.
- Smith, K. 1956. Jacquet River Salmon Survey. - an unpublished report for the Department of Fisheries and Oceans.
- Ward, H. B., G. C. Whipple, 1959. Freshwater Biology (2nd Edition), John Wiley and Sons Inc.
- Wiggins, G. B., 1977. Larvae of the North American Caddisfly Genera (Trichoptera), University of Toronto Press.

FIG. 4.1 LOCATION OF SAMPLING SITES, JACQUET RIVER WATERSHED,
AUGUST 1984

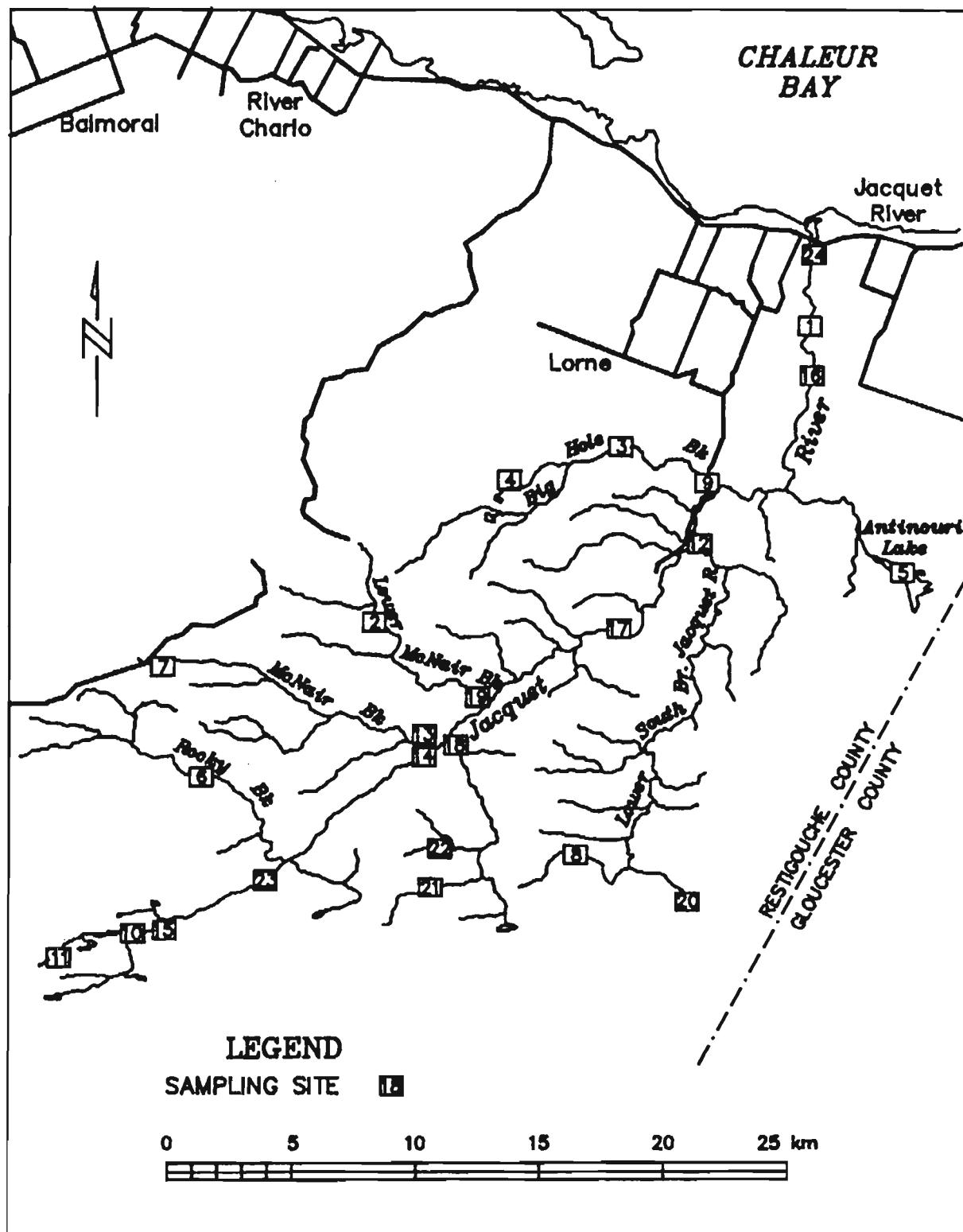
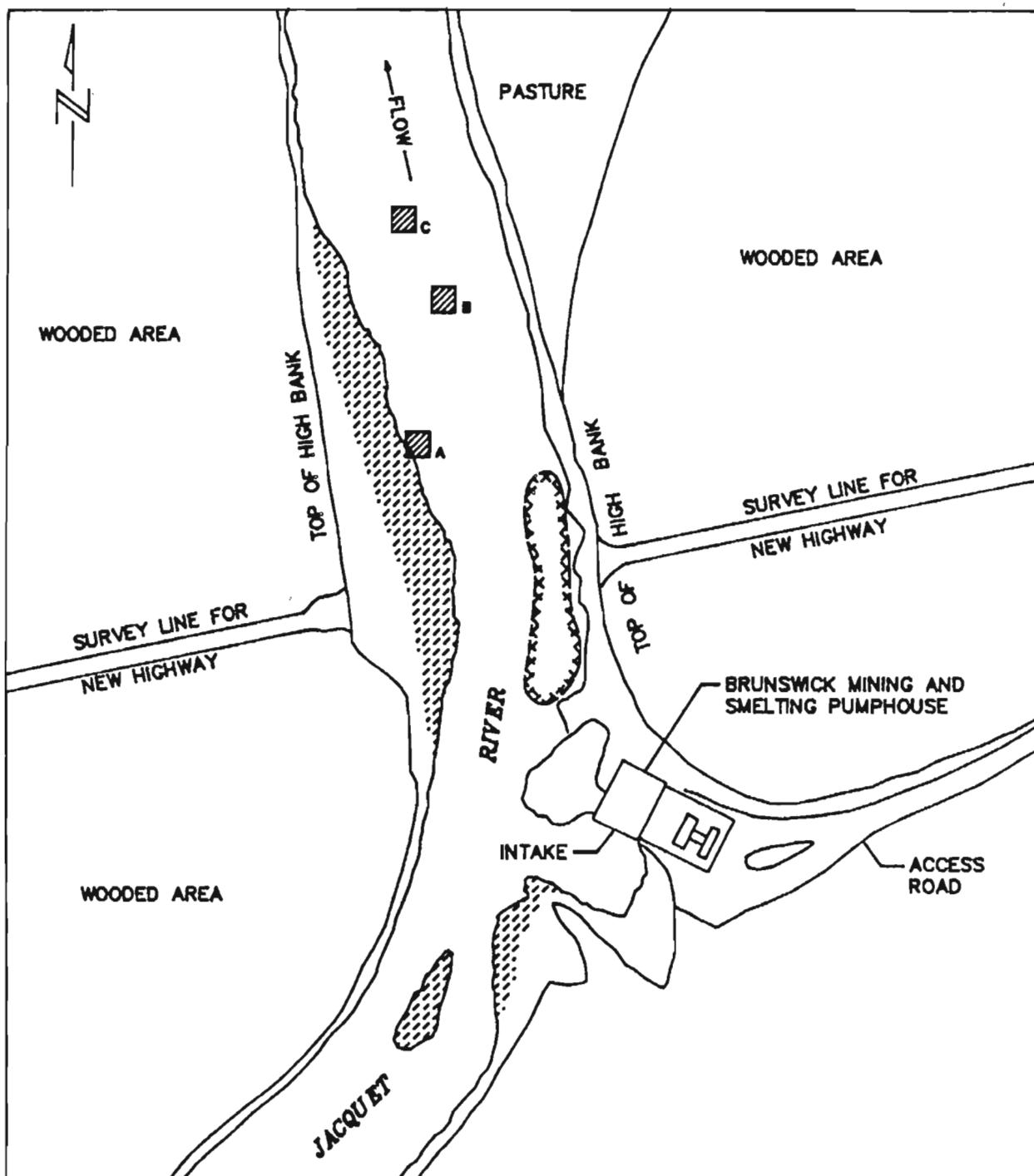


FIG. 4.2 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 1,
JACQUET RIVER, AUGUST 9, 1984



LEGEND

- BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

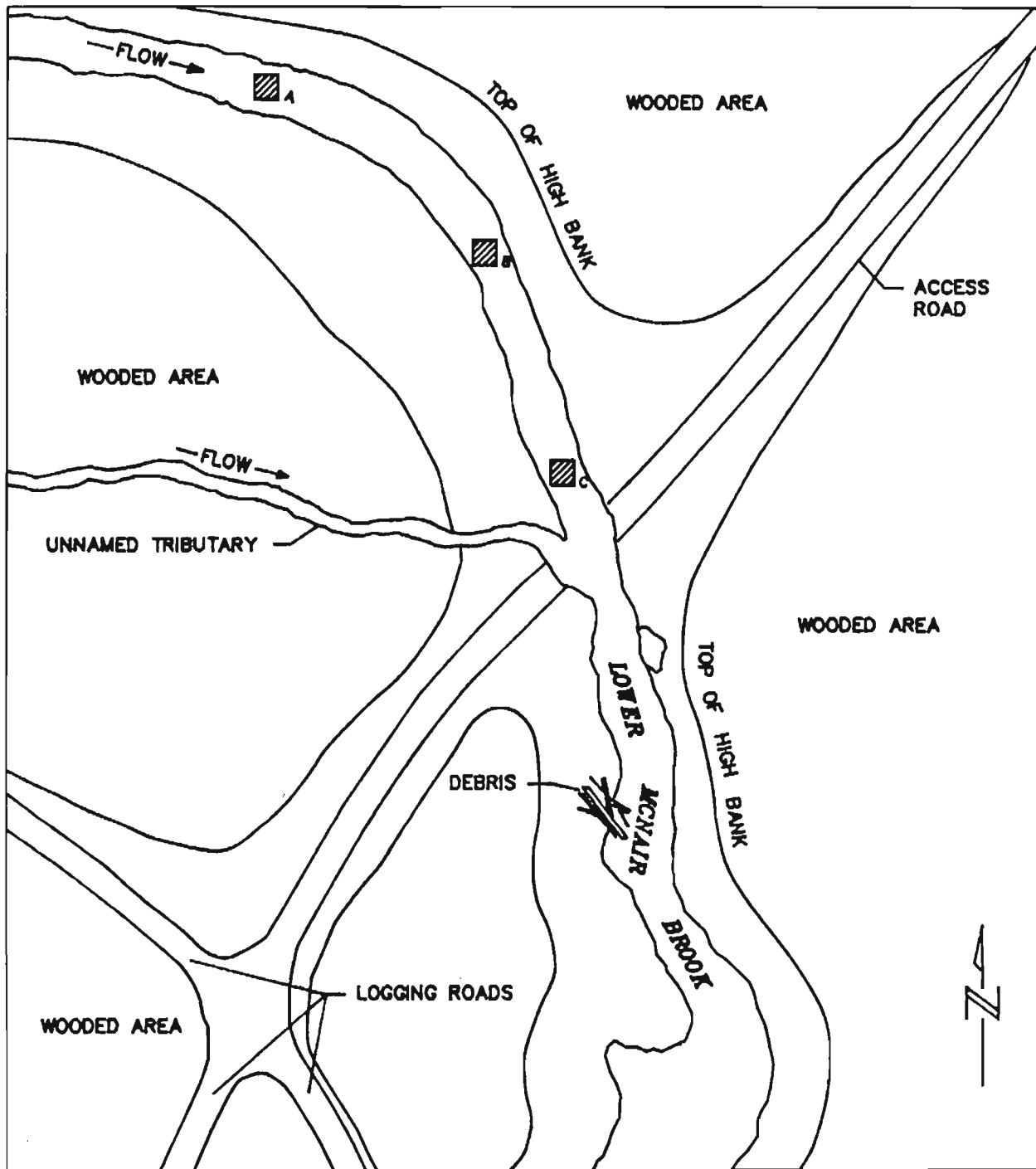
SCALE 0 10 20 m (APPROX.)
 TOPOGRAPHIC MAP 21-0/16
 MILITARY GRID 223 093

TABLE 4.1
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 1, JACQUET RIVER, August 9, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
COLEOPTERA					
Elmidae					
<i>Heterelmis sp.*</i>	6	1	7	2.3	
DIPTERA sp.	1			1	0.3
Chironomidae					
Chironominae					
<i>Tanytarsus sp.</i>	1			1	0.3
Orthocladiinae					
<i>Cardiocladus</i>					
<i>Albiplumus</i>	3			3	1.0
<i>Cricotopus sp.</i>	3			3	1.0
Heleidae					
<i>Palpomyia sp.</i>		3		3	1.0
Tipulidae					
<i>Tipula sp.</i>			1	1	0.3
Tanyderidae					
<i>Protoplasa fitchii</i>			1	1	0.3
EPHEMEROPTERA sp.	2			2	0.6
Baetidae					
<i>Baetis sp.</i>			1	1	0.3
<i>B. vagans</i>		1		1	0.3
Heptageniidae					
<i>Stenonema femorata</i>	1		1	2	0.6
PLECOPTERA					
Perlidae					
<i>Acroneuria abnormis</i>	1			1	0.3
TRICHOPTERA					
Brachycentridae					
<i>Brachycentrus americanus</i>			1	1	0.3
Hydropsychidae					
<i>Macronema zebratum</i>	1			1	0.3
ODONATA					
Gomphidae					
<i>Gomphus sp.</i>			1	1	0.3
ANNELIDA					
<i>Oligochaeta sp.</i>	10			10	3.3
MOLLUSCA					
Pelecypoda					
<i>Musculium sp.</i>	2			2	0.6
<hr/>					
	TOTAL	11	24	7	42
					14.0

*According to Arnett (1968) the genus *Heterelmis* is more properly named *Stenelmis*

FIG. 4.3 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 2,
LOWER MCNAIR BROOK, AUGUST 10, 1984



LEGEND

- A BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

SCALE 0 10 20 m (APPROX.)
 TOPOGRAPHIC MAP 21-0/16
 MILITARY GRID 052 956

TABLE 4.2

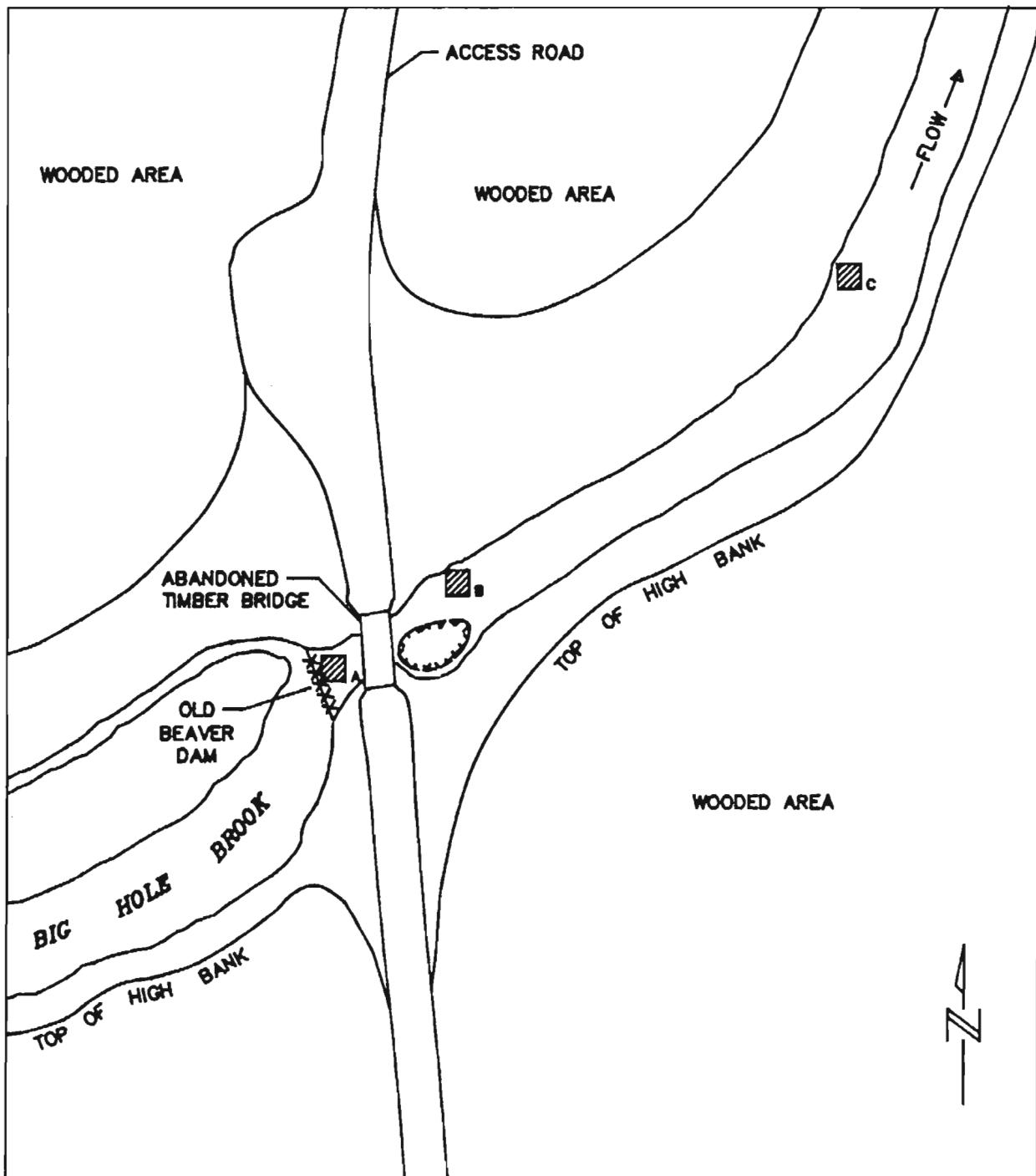
Species Composition and Relative Abundance of
Benthic Macro-Invertebrates
SITE 2, LOWER MCNAIR BROOK, August 10, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
COLEOPTERA					
Elmidae					
<i>Heterelmis sp.</i>	59	9	68	22.6	
DIPTERA					
Chironomidae					
Chironominae					
<i>Chironomus sp.</i>	4		4	1.3	
<i>Tendipes tendans</i>	4		4	1.3	
<i>Tanytarsus sp.</i>	2		2	0.6	
Diamesinae					
<i>Diamesa sp.</i>	7		7	2.3	
Orthocladiinae					
<i>Orthocladius</i>	14	23	37	12.3	
<i>albiplumus</i>	2	1	3	1.0	
<i>Eukiefferiella</i>					
<i>claripennis</i>	2	11	13	4.3	
Tanypodinae					
<i>Tanypodus sp.</i>	1	3	4	1.3	
Heleidae					
<i>Palpomyia sp.</i>	2		2	0.6	
Rhagionidae					
<i>Atheryx variegata</i>	17	7	24	8.0	
Stratomyidae					
<i>Odontomyia sp.</i>	4		4	1.3	
Tipulidae					
<i>Hexatomia sp.</i>		2	2	0.6	
EPHEMEROPTERA					
Baetidae					
<i>Baetis intermedius</i>	17		17	5.6	
<i>B. vagans</i>		2	2	0.6	
Ephemerellidae					
<i>Ephemerella</i>					
<i>attenuata</i>	1	7	6	4.6	
<i>E. lata</i>			2	0.6	
<i>E. varga</i>		12	12	4.0	
Heptageniidae					
<i>Isonychia humeralis</i>	1	10		3.6	
<i>Ironodes sp.</i>			1	0.3	
<i>Stenonema femorata</i>	2	18	20	6.6	
Leptophlebiidae					
<i>Paraleptophlebia</i>					
<i>guttata</i>	3	9	12	4.0	
Tricorythidae					
<i>Tricorythodes sp.</i>		1	1	0.3	

TABLE 4.2 (continued)
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 2, LOWER MCNAIR BROOK, August 10, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
ODONATA					
Gomphidae					
<i>Gomphus sp.</i>	6			6	2.0
<i>Lanthus vernalis</i>	7	4		11	3.6
PLECOPTERA					
Chloroperlidae					
<i>Chloroperla cydippe</i>			3	3	1.0
Nemouridae					
<i>Leuctra claasseni</i>	3		3	6	2.0
Perlidae					
<i>Acroneuria abnormis</i>		3		3	1.0
Perlodidae					
<i>Isoperla bilineata</i>			1	1	0.3
Pteronarcyidae					
<i>Pteronarcys nobilis</i>	2			2	0.6
TRICHOPTERA					
Glossosomatidae					
<i>Glossosoma lividum</i>	5			5	1.6
Hydropsychidae sp.				1	0.3
<i>Arctopsyche</i>					
<i>ladogensis</i>	1	25	5	31	10.3
Limnephilidae					
<i>Apatania incerta</i>				1	0.3
<i>Platycentropus</i>					
<i>radiatus</i>			1	1	0.3
Polycentropodidae					
<i>Polycentropus sp.</i>				1	0.3
Rhyacophilidae					
<i>Rhyacophila fuscula</i>	2		1	3	1.0
MOLLUSCA					
Gastropoda sp.				1	0.3
TOTAL	17	241	84	342	114.0

FIG. 4.4 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 3,
BIG HOLE BROOK, AUGUST 11, 1984



LEGEND

- A BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

SCALE 0 5 10 15 m (APPROX.)
 TOPOGRAPHIC MAP 21-0/16
 MILITARY GRID 139 019

TABLE 4.3
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 3. BIG HOLE BROOK, August 11, 1984

Species	<u>Relative Abundance</u>			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
COLEOPTERA					
Elmidae					
<i>Heterelmis sp.</i>	6	15	12	33	11.0
DIPTERA					
Chironomidae					
Chironominae					
<i>Dictrotendipes sp.</i>		1		1	0.3
<i>Phaenospectra sp.</i>			4	4	1.3
Diamesinae					
<i>Diamesa</i>					
<i>spinacies</i>	3		1	4	1.3
<i>Orthocladiinae</i> sp.			2	2	0.6
<i>Gymnometriocnemus brumali</i>	1			1	0.3
Heleidae					
<i>Palpomyia sp.</i>	3	2	2	7	2.3
Rhagionidae					
<i>Atheryx variegata</i>	1	1	1	3	1.0
Tipulidae					
<i>Limnophila sp.</i>		1		1	0.3
<i>Tipula sp.</i>			2	2	0.6
EPHEMEROPTERA					
Baetidae					
<i>Baetis intermedius</i>			11	11	3.6
<i>B. vagans</i>	8	13		21	7.0
<i>Callibaetis americanus</i>	1			1	0.3
Ephemerellidae					
<i>Ephemerella attenuata</i>		1	1	2	0.6
Heptageniidae					
<i>Ison humeralis</i>		4	1	5	1.6
<i>Stenonema femorata</i>	1	4	1	6	2.0
Leptophlebiidae					
<i>Paraleptophlebia guttata</i>		1		1	0.3
HEMIPTERA					
Mesovelidiidae					
<i>Mesovelia mulsanti</i>	3			3	1.0
<i>Rhagovelia flavicinta</i>		1		1	0.3
ODONATA					
Gomphidae					
<i>Lanthus vernalis</i>			1	1	0.3

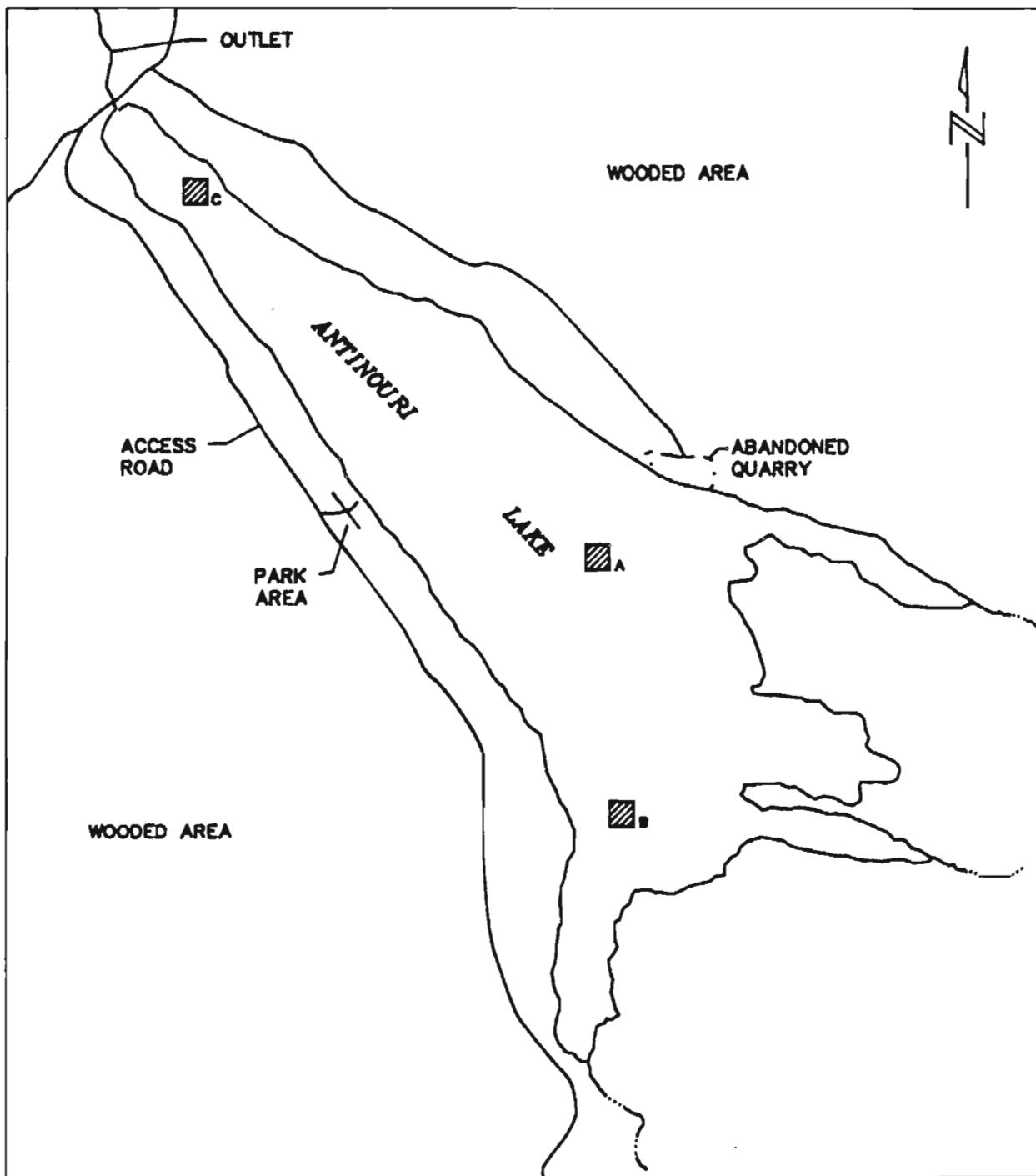
TABLE 4.3 (continued)

Species Composition and Relative Abundance of
Benthic Macro-Invertebrates

SITE 3. BIG HOLE BROOK, August 11, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
PLECOPTERA					
Nemouridae					
<i>Leuctra claasseni</i>		24	4	28	9.3
Perlidae					
<i>Acroneuria abnormis</i>	2	4	3	9	3.0
TRICHOPTERA					
Brachycentridae					
<i>Brachycentrus americanus</i>			4	4	1.3
Hydropsychidae					
<i>Arctopsyche ladogensis</i>			6	6	2.0
<i>Hydropsyche morosa</i>			4	4	1.3
Rhyacophilidae					
<i>Rhyacophila sp.</i>	1		1	2	0.6
AMPHIPODA					
Talitridae					
<i>Hyalella azteca</i>			1	1	0.3
	TOTAL	26	78	60	164
					54.6

FIG. 4.5 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 5,
ANTINOURI LAKE, AUGUST 12, 1984



LEGEND

- BENTHOS SAMPLING STATION**
- RIFFLE AREA**
- POOL**
- BARRIER**
- GRAVEL**

SCALE 0 200 400 m (APPROX)
 TOPOGRAPHIC MAP 21-P/13
 MILITARY GRID 773 975

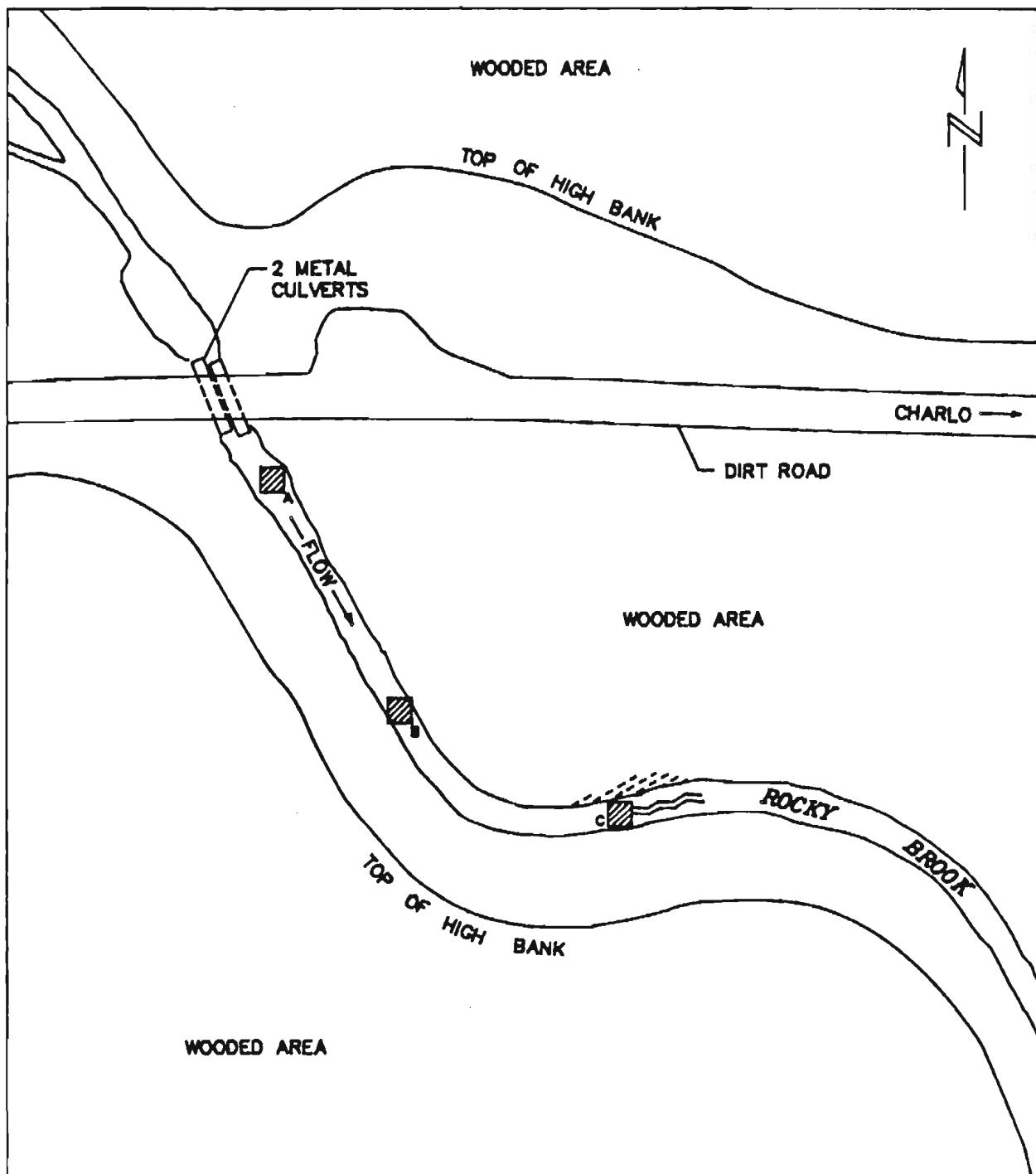
TABLE 4.4

Species Composition and Relative Abundance of
Benthic Macro-Invertebrates

SITE 5, ANTINOURI LAKE, August 12, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per 3540 cm ³
COLEOPTERA					
Elmidae					
<i>Heterelmis sp.</i>				11	11
DIPTERA					
Chironomidae					
Chironominae					
<i>Chironomus sp.</i>			1	1	0.3
Tanypodinae					
<i>Procladius sp.</i>			3	3	1.0
Heleidae					
<i>Palpomyia sp.</i>			1	3	4
EPHEMEROPTERA					
Tricorythidae					
<i>Tricorythodes sp.</i>	1			1	0.3
ODONATA					
Gomphidae					
<i>Gomphus sp.</i>			2	2	0.6
TRICHOPTERA					
Polycentropodidae					
<i>Polycentropus sp.</i>	1			1	0.3
AMPHIPODA					
Talitridae					
<i>Hyalella azteca</i>	19	16	7	42	14.0
ANNELIDA					
Hirudinea					
<i>Neophalopsis obscurus</i>			1	1	0.6
MOLLUSCA					
Pelecypoda					
<i>Musculium sp.</i>			3	19	22
					7.3
TOTAL					
	21	27	41	89	29.6

FIG. 4.6 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 6, ROCKY BROOK, AUGUST 14, 1984



LEGEND

- BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

SCALE 0 10 20 m (APPROX)
 TOPOGRAPHIC MAP 21-0/9
 MILITARY GRID 986 885

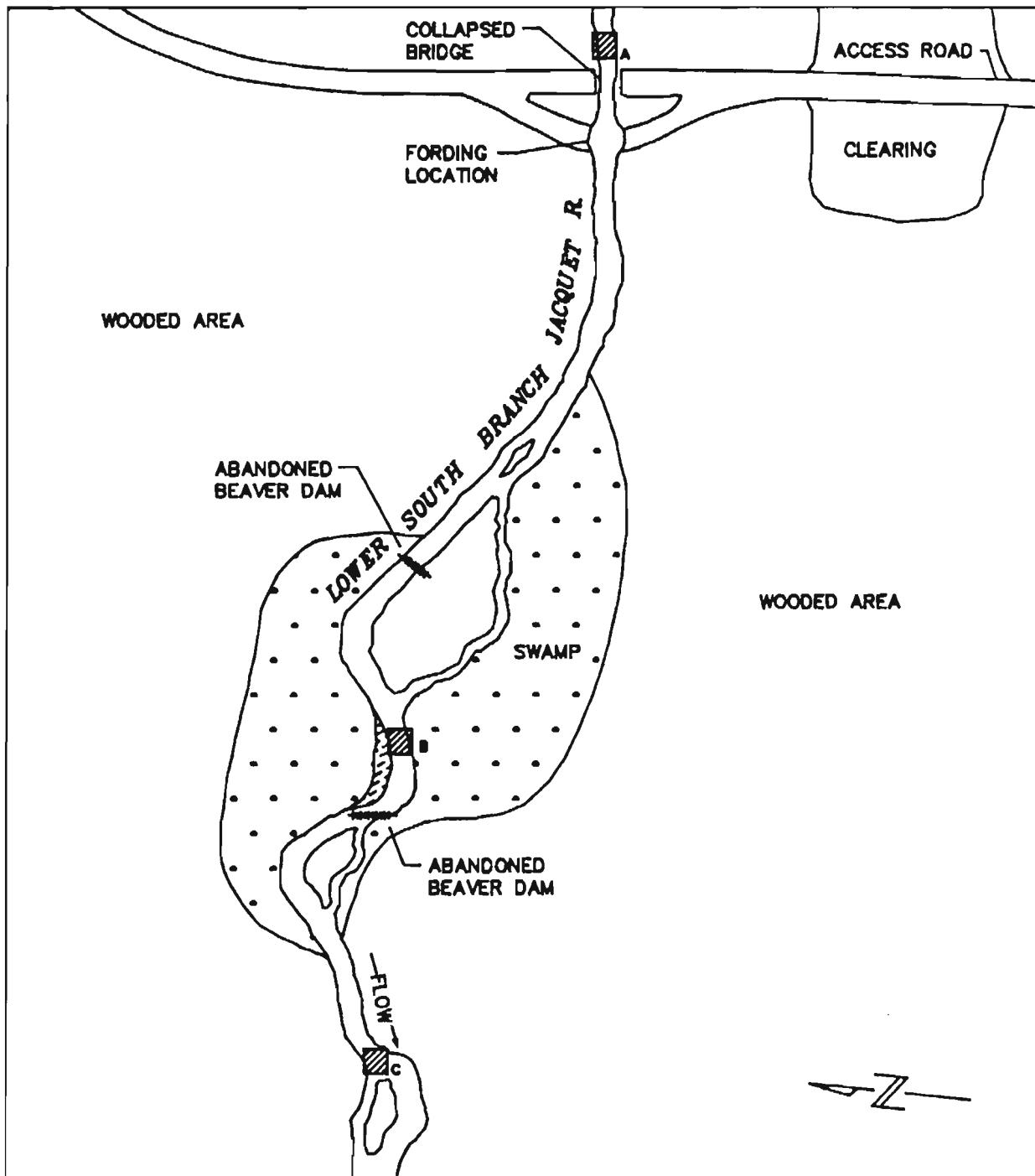
TABLE 4.5
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 6, ROCKY BROOK, August 14, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
COLEOPTERA					
Elmidae					
<i>Heterelmis sp.</i>	9	16	30	55	18.3
DIPTERA					
Chironomidae					
Chironominae					
<i>Tanytarsus sp.</i>	1			1	0.3
Orthocladiinae					
<i>Cricotopus sp.</i>			4	4	1.3
<i>Hydrobaenus johannseni</i>			2	2	0.6
Heleidae					
<i>Palpomyia sp.</i>				1	0.3
Rhagionidae					
<i>Atheryx variegata</i>	2	7	5	14	4.6
Simuliidae					
<i>Simulium venustum</i>	6		1	7	2.3
Tipulidae					
<i>Hexatoma sp.</i>			4	4	1.3
EPHEMEROPTERA					
Baetidae					
<i>Baetis intermedius</i>	3			3	1.0
<i>B. vagans</i>			4	4	1.3
Ephemerellidae					
<i>Ephemerella attenuata</i>		3	1	4	1.3
Heptageniidae					
<i>Ison humeralis</i>	9			9	3.0
<i>Stenonema femorata</i>	9	2	4	15	5.0
Leptophlebiidae					
<i>Habrophleboides americana</i>			5	5	1.6
DONATA					
Gomphidae					
<i>Hagenius brevistylus</i>		3	3	6	2.0
<i>Lanthus vernalis</i>			1	1	0.3
PLECOPTERA					
Perlidae					
<i>Neophasganophora capitata</i>	1	6	2	9	3.0
Pteronarcyidae					
<i>Pteronarcys nobilis</i>		1	2	3	1.0

TABLE 4.5 (continued)
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 6, ROCKY BROOK, August 14, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
TRICHOPTERA					
Brachycentridae					
<i>Brachycentrus americanus</i>		2		2	0.6
Glossosomatidae					
<i>Glossosoma lividum</i>	1		2	3	1.0
Hydropsychidae					
<i>Arctopsyche ladogensis</i>		8	1	9	3.0
<i>Hydropsyche morosa</i>	3	1	9	13	4.3
Philopotamidae					
<i>Chimarra atterima</i>			4	4	1.3
Rhyacophilidae					
<i>Rhyacophila fuscula</i>	3			3	1.0
ANNELIDA					
<i>Oligochaeta sp.</i>		6	10	16	5.3
MOLLUSCA					
Pelecypoda					
<i>Musculium sp.</i>		6		6	2.0
TOTAL	47	61	95	203	67.6

FIG. 4.7 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 8,
LOWER SOUTH BRANCH JACQUET RIVER, AUGUST 18, 1984



LEGEND



- BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

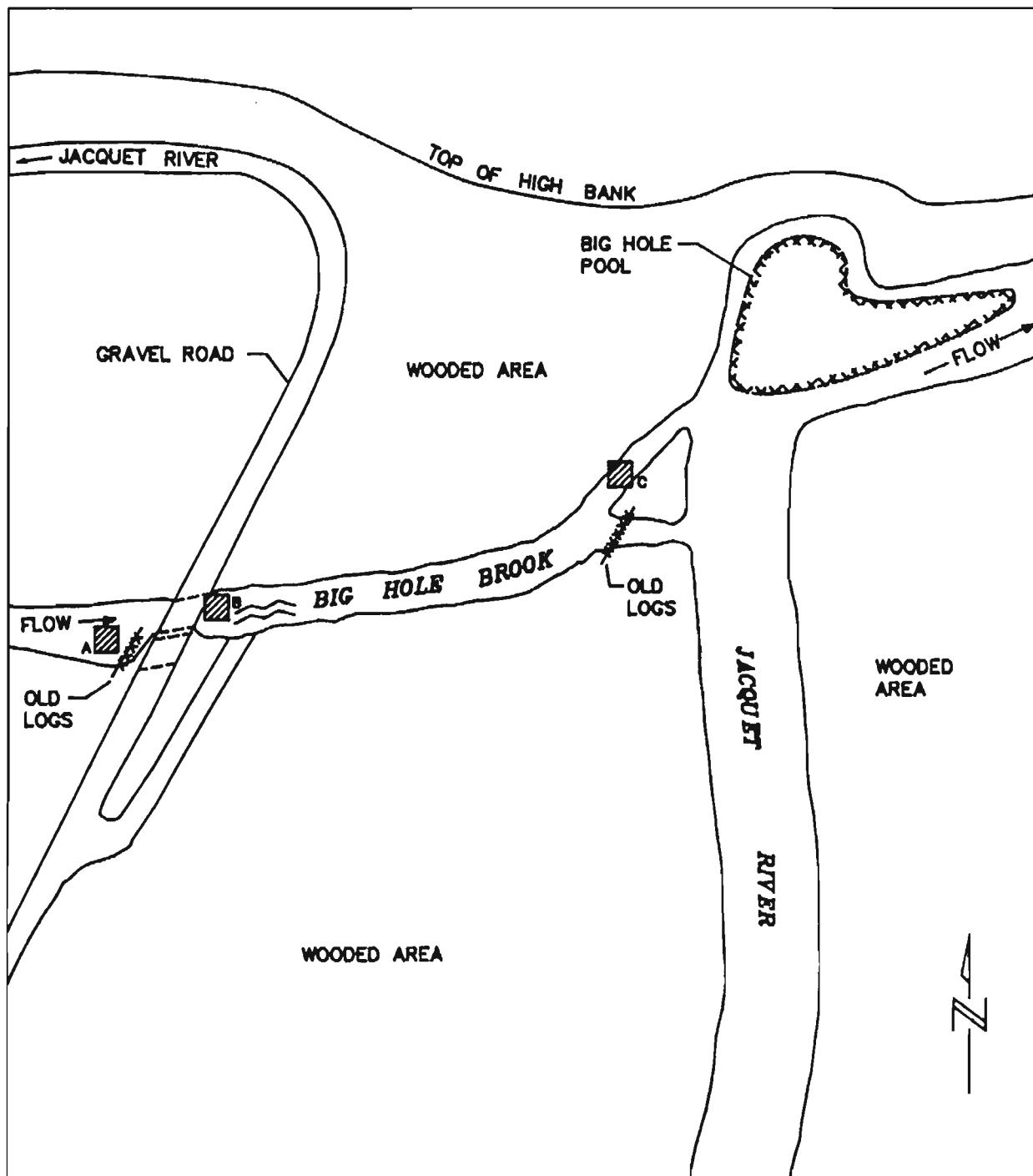
SCALE 0 5 10 15 m (APPROX.)
 TOPOGRAPHIC MAP 21-0/9
 MILITARY GRID 133 859

TABLE 4.6

Species Composition and Relative Abundance of
Benthic Macro-Invertebrates
SITE 8, LOWER SOUTH BRANCH JACQUET RIVER
August 18, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
COLEOPTERA					
Elmidae					
<i>Heterelmis sp.</i>	2	4	1	7	2.3
DIPTERA					
Chironomidae					
Diamesinae					
<i>Diamesa</i>					
<i>spinacies</i>	7			7	2.3
<i>Orthocladiinae sp.</i>		1		1	0.3
<i>Cricotopus sp.</i>		2		2	0.6
<i>Gymnometriocnemus</i>					
<i>brumalis</i>	1			1	0.3
Padonominae					
<i>Parochlus</i>					
<i>kiefferi</i>	2			2	0.6
Heleidae					
<i>Palpomyia sp.</i>		3	1	4	1.3
Tipulidae					
<i>Hexatoma sp.</i>			1	1	0.3
<i>Tipula sp.</i>	1			1	0.3
EPHEMEROPTERA sp.			1		0.3
Baetidae					
<i>Baetis sp.</i>	1			1	0.3
<i>B. vagans</i>		2		2	0.6
Ephemerellidae					
<i>Ephemerella</i>					
<i>attenuata</i>		1		1	0.3
Ephemeridae					
<i>Hexagenia bilineata</i>		3	9	12	4.0
Heptageniidae					
<i>Stenonema femorata</i>		2	1	3	1.0
Tricorythidae					
<i>Tricorythodes sp.</i>	1			1	0.3
HEMIPTERA sp.				6	2.0
TRICHOPTERA					
Glossosomatidae					
<i>Glossosoma lividum</i>		4		4	1.3
Limnephilidae					
<i>Psycoglypha</i>					
<i>subborealis</i>	4	1		5	1.6
TOTAL	19	24	19	62	20.6

FIG. 4.8 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 9,
BIG HOLE BROOK, AUGUST 17, 1984



LEGEND

- A BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

SCALE 0 10 20 m (APPROX.)
 TOPOGRAPHIC MAP 21-1/16
 MILITARY GRID 187 008

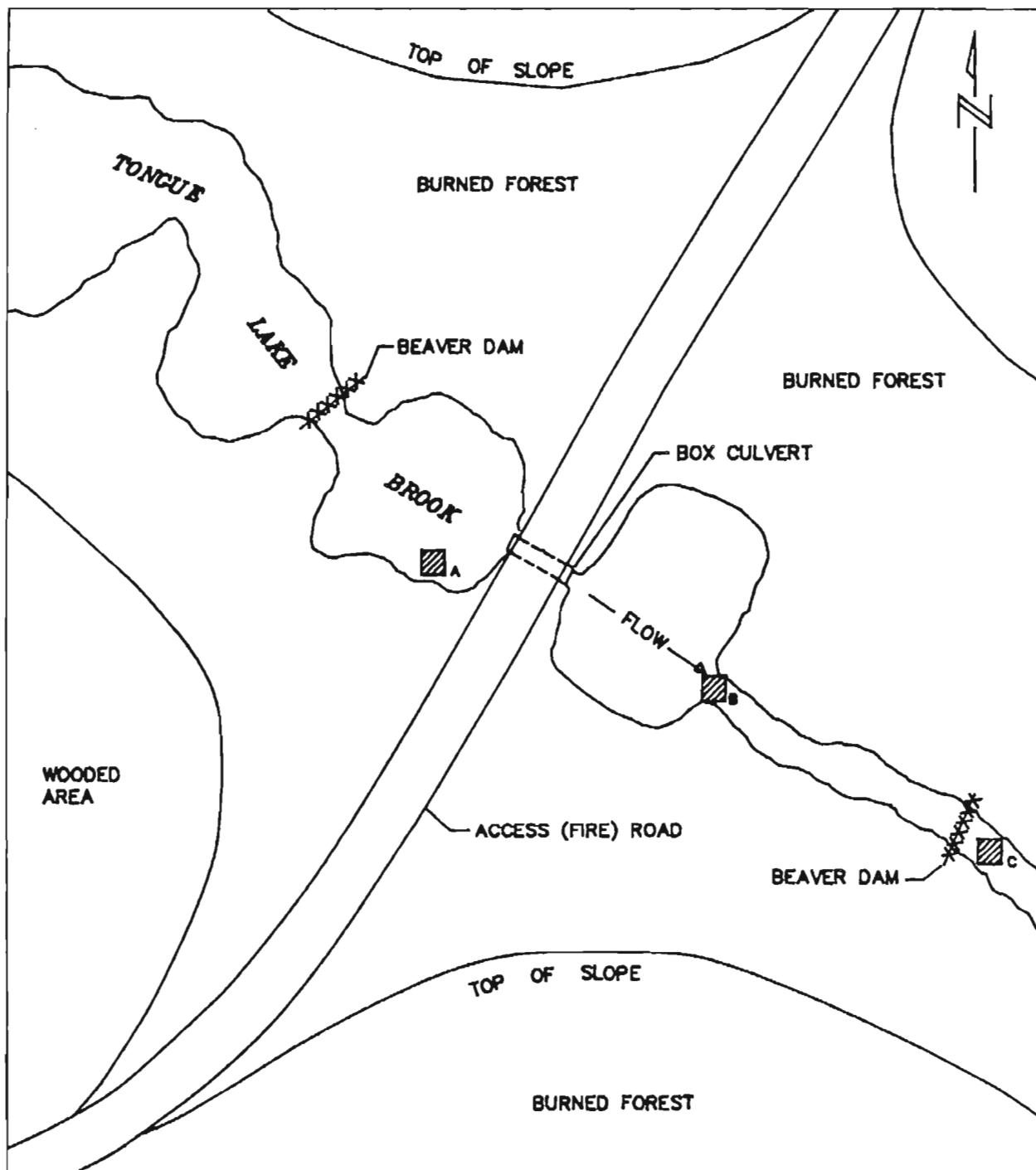
TABLE 4.7
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 9, BIG HOLE BROOK, August 17, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
COLEOPTERA					
Elmidae					
<i>Heterelmis sp.</i>	10	2	12	24	8.0
DIPTERA					
Chironomidae					
Chironominae					
<i>Tanytarsus sp.</i>	6	1		7	2.3
Orthocladiinae					
<i>Cricotopus sp.</i>			2	2	0.6
<i>Orthocladius sp.</i>		6		6	2.0
<i>Parakieferiella cornata</i>	2			2	0.6
Tanytropidinae					
<i>Ablabesmyia sp.</i>			1	1	0.3
<i>Procladius sp.</i>			2	2	0.6
Heleidae					
<i>Palpomyia sp.</i>			1	1	0.3
Rhagionidae					
<i>Atheryx variegata</i>		2		2	0.6
Tipulidae					
<i>Hexatoma sp.</i>			1	1	0.3
EPHEMEROPTERA					
Baetidae					
<i>Baetis sp.</i>	4			4	1.3
<i>Centroptilum album</i>		1	10	11	3.6
Ephemerellidae					
<i>Ephemerella attenuata</i>	6			6	2.0
Heptageniidae					
<i>Stenonema femorata</i>		2	7	9	3.0
Leptophlebiidae					
<i>Habrophlebia vibrans</i>	3			3	1.0
<i>Paraleptophlebia guttata</i>				1	0.3
Tricorythidae					
<i>Tricorythodes allactus</i>	2			2	0.6
ODONATA					
Gomphidae					
<i>Hagenius brevistylus</i>	1			1	0.3

TABLE 4.7 (continued)
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 9, BIG HOLE BROOK, August 17, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
PLECOPTERA					
Nemouridae					
<i>Leuctra claasseni</i>	4	2	31	37	12.3
Perlidae					
<i>Neophasganophora</i>					
<i>capitata</i>		2	5	7	2.3
TRICHOPTERA					
Limnephilidae					
<i>Psycoglypha</i>					
<i>subborealis</i>			1	1	0.3
TOTAL	38	18	74	130	43.3

FIG. 4.9 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 10,
TONGUE LAKE BROOK, AUGUST 19, 1984



LEGEND

- A BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

SCALE 0 5 10 m (APPROX)
 TOPOGRAPHIC MAP 21-0/9
 MILITARY GRID 958 812

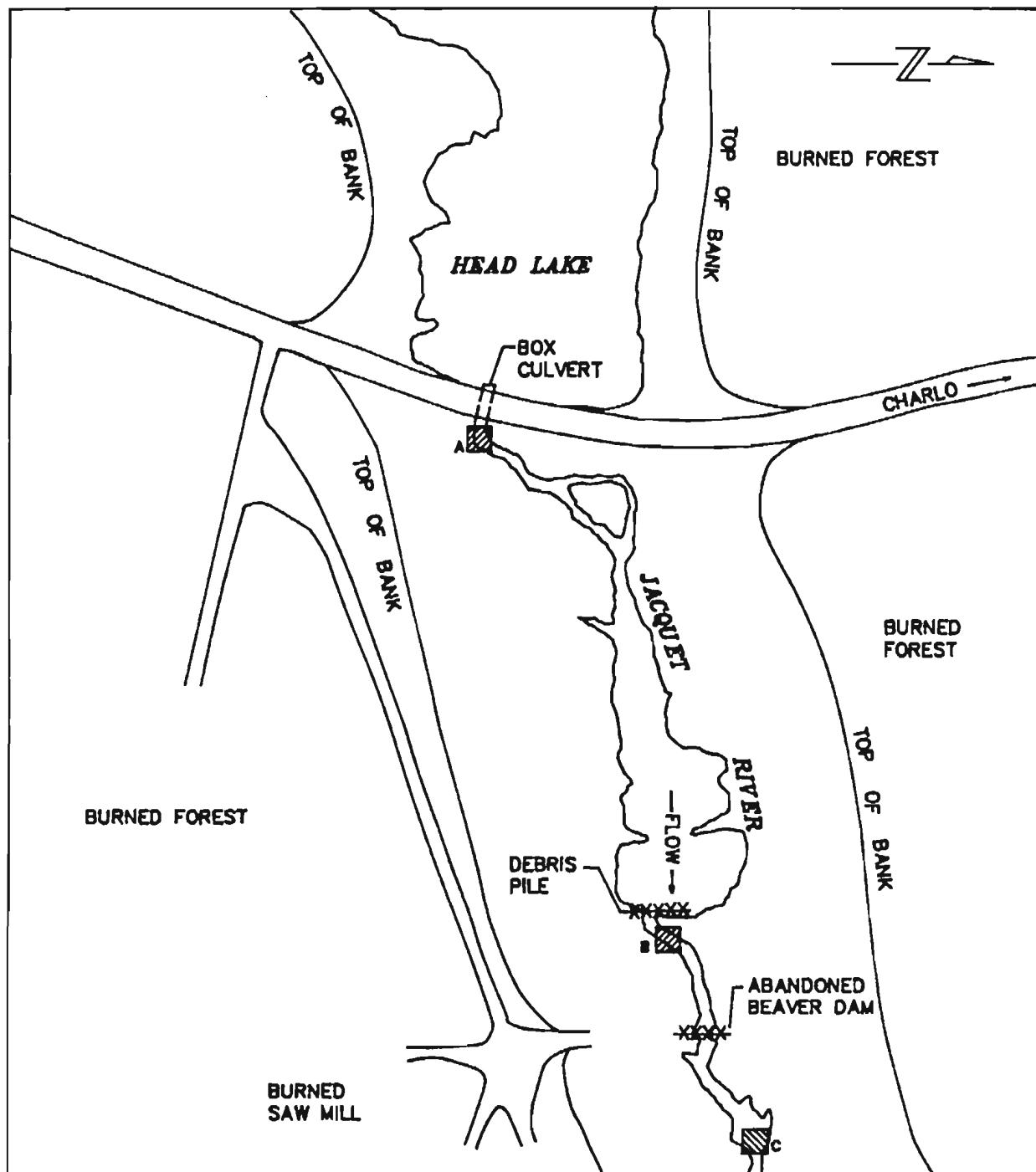
TABLE 4.8
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 10, TONGUE LAKE BROOK, August 19, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
COLEOPTERA					
Dysticidae					
<i>Ilybius sp.</i>				2	2
Elmidae					
<i>Heterelmis sp.</i>	2			3	5
Diptera					
Simuliidae					
<i>Simulium venustum</i>	4				4
Stratomyidae					
<i>Odontomyia sp.</i>		1			1
Tabanidae sp.				1	1
Tipulidae					
<i>Tipula sp.</i>				3	3
Ephemeroptera					
Baetidae					
<i>Baetis intermedius</i>				4	4
<i>B. vagans</i>	2				2
<i>Pseudocleon sp.</i>		2			2
Caenidae					
<i>Caenis sp.</i>				2	2
Ephemerellidae					
<i>Ephemerella attenuata</i>				7	7
Ephemeridae					
<i>Hexagenia bilineata</i>				2	2
Heptageniidae					
<i>Stenonema femorata</i>	1				1
Leptophlebiidae					
<i>Paraleptophlebia guttata</i>				3	3
ODONATA					
Cordulegastridae					
<i>Cordulegaster sp.</i>		4			4
Trichoptera					
Hydropsychidae					
<i>Arctopsyche ladogensis</i>	6				6
<i>Hydropsyche morosa</i>		1			1
<i>Macronema zebratum</i>	1				1
Limnephilidae sp.				1	1
Philopotamidae					
<i>Chimarra atterima</i>		1			1
Polycentropodidae					
<i>Polycentropus sp.</i>	1				1
					0.3

TABLE 4.8 (continued)
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 10, TONGUE LAKE BROOK, August 19, 1984

Species	<u>Relative Abundance</u>			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
<hr/>					
AMPHIPODA					
Talitridae					
<i>Hyalella azteca</i>				64	64
ANNEELIDA					
Hirudinea					
<i>Neophalopsis obscurus</i>				1	1
<hr/>					
TOTAL	17	9	93	119	39.6

FIG. 4.10 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 11, HEAD LAKE, AUGUST 21, 1984



LEGEND

- A BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

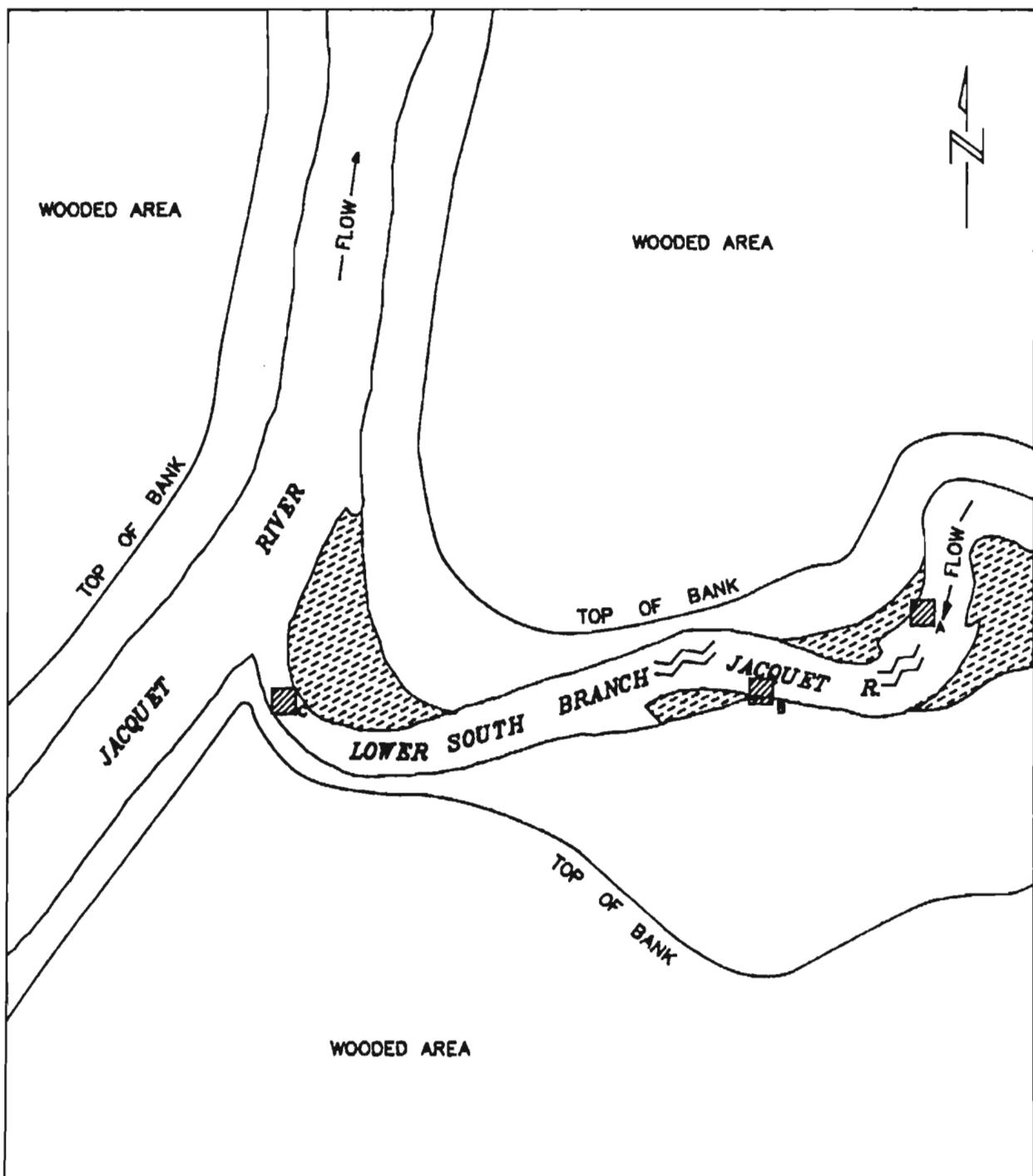
SCALE 0 10 20 30 m (APPROX.)
TOPOGRAPHIC MAP 21-0/9
MILITARY GRID 926 809

TABLE 4.9

Species Composition and Relative Abundance of
Benthic Macro-Invertebrates
SITE 11, HEAD LAKE OUTFLOW, August 21, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
COLEOPTERA					
Elmidae					
<i>Heterelmis sp.</i>	1			1	0.3
DIPTERA					
Chironomidae					
Orthocladiinae					
<i>Eukiefferiella claripennis</i>		2		2	0.6
Tanytropidinae					
<i>Procladius sp.</i>		7		7	2.3
Simuliidae					
<i>Simulium venustum</i>		46		46	15.3
Tipulidae					
<i>Tipula sp.</i>		6		6	2.0
EPHEMEROPTERA					
Baetidae					
<i>Baetis sp.</i>	1			1	0.3
Ephemerellidae					
<i>Ephemerella attenuata</i>		36		36	12.0
Leptophlebiidae					
<i>Paraleptophlebia guttata</i>		1		1	0.3
TRICHOPTERA					
Hydropsychidae					
<i>Hydropsyche morosa</i>		55		55	18.3
Rhyacophilidae					
<i>Rhyacophila sp.</i>	8		22	30	10.0
AMPHIPODA					
Talitridae					
<i>Hyalella azteca</i>		73		73	24.3
ANNELIDA					
Hirudinea					
<i>Neopalopsis obscurus</i>	26	16		42	14.0
PLATYHELMINTHES					
Turbellaria sp.		1	8	9	3.0
MOLLUSCA					
Gastropoda					
<i>Gyraulus circumstriatus</i>		1		1	0.3
<i>Physa sp.</i>		1		1	0.3
Pelecypoda					
<i>Musculium sp.</i>		10		10	3.3
<hr/>					
TOTAL	34	103	184	321	107.0

FIG. 4.11 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 12,
LOWER SOUTH BRANCH JACQUET RIVER, AUGUST 22, 1984



LEGEND

- BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

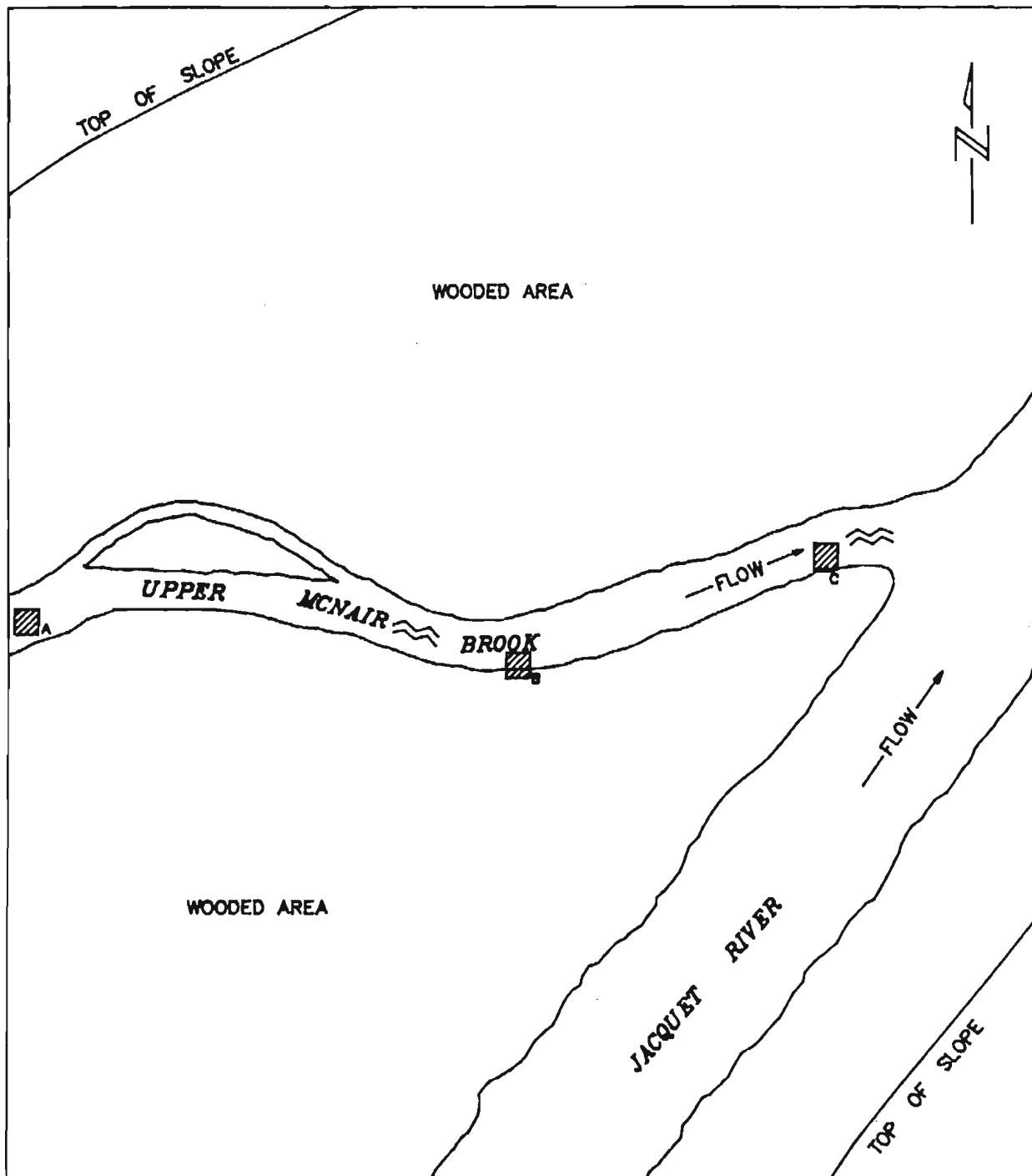
SCALE 0 10 20 m (APPROX)
TOPOGRAPHIC MAP 21-0/16
MILITARY GRID 179 989

TABLE 4.10

Species Composition and Relative Abundance of
Benthic Macro-Invertebrates
SITE 12, LOWER SOUTH BRANCH JACQUET RIVER
August 22, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
DIPTERA					
Chironomidae					
<i>Orthocladiinae</i> sp.	4			4	1.3
<i>Cricotopus</i> sp.	3			3	1.0
<i>Gymnometriocnemus</i> <i>brumalis</i>		9		9	3.0
<i>Parakieferiella</i> <i>cornata</i>		2		2	0.6
<i>Padonominae</i>					
<i>Parochlus Kiefferi</i>	2			2	0.6
Rhagionidae					
<i>Atheryx variegata</i>	2			2	0.6
Tipulidae					
<i>Limnophila</i> sp.		1		1	0.3
<i>Tipula</i> sp.		2		2	0.6
EPHEMEROPTERA					
Baetidae					
<i>Baetis vagans</i>		4		4	1.3
Ephemerellidae					
<i>Ephemerella</i> <i>attenuata</i>		2		2	0.6
Ephemeridae					
<i>Hexagenia bilineata</i>		3		3	1.0
Heptageniidae					
<i>Stenonema femorata</i>	15			1	16
Tricorythidae					
<i>Tricorythodes atratus</i>				10	10
ODONATA					
Gomphidae					
<i>Lanthus vernalis</i>	3			3	1.0
TRICHOPTERA					
Limnephilidae					
<i>Psycoglypha</i> <i>subborealis</i>	9		4	13	4.3
TOTAL	29	9	38	76	25.3

FIG. 4.12 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 13,
UPPER MCNAIR BROOK, AUGUST 23, 1984



LEGEND

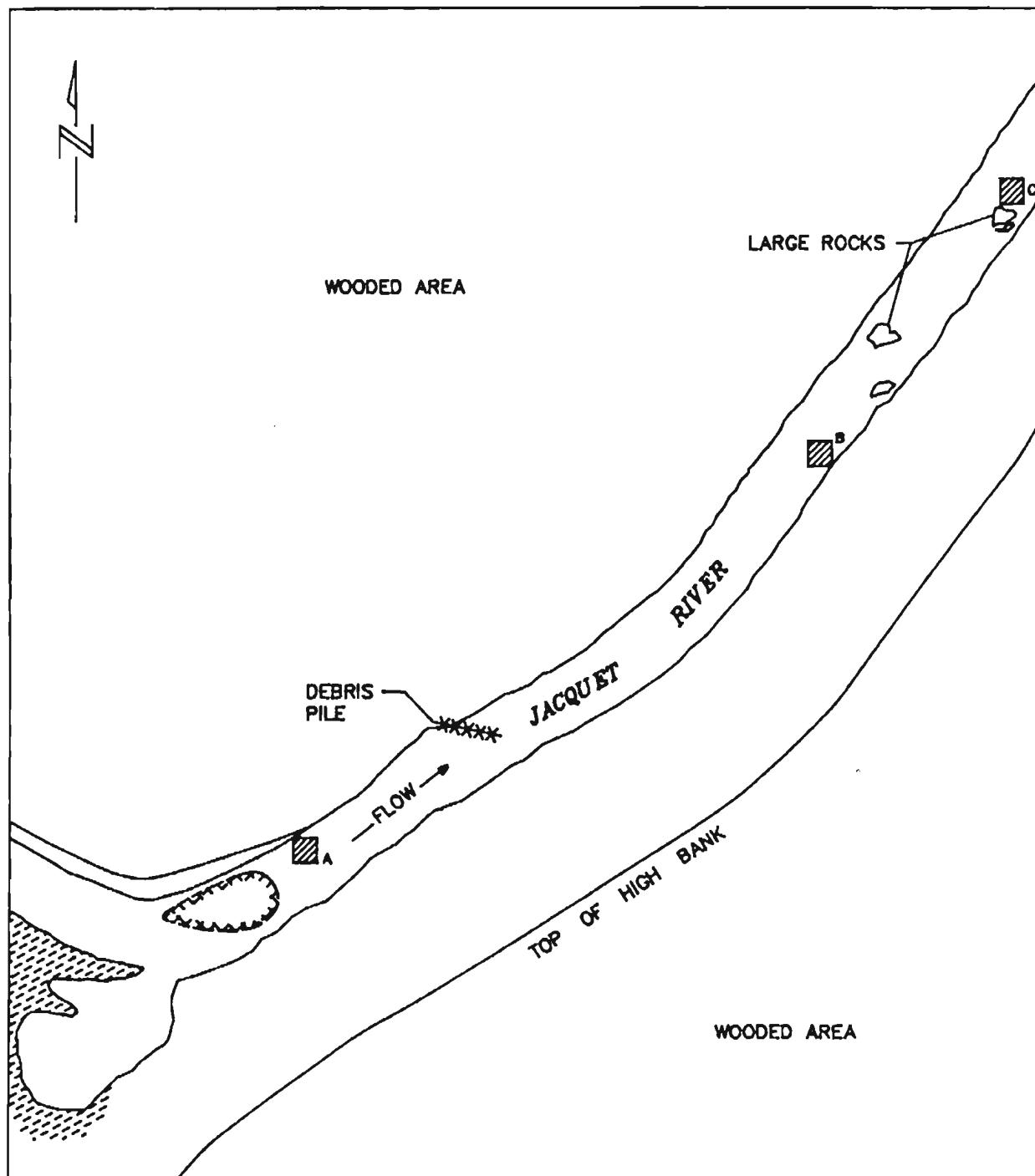
- [Hatched square] BENTHOS SAMPLING STATION
- [Wavy line] RIFFLE AREA
- [Oval with wavy line] POOL
- [Crosses] BARRIER
- [Hatched rectangle] GRAVEL

SCALE 0 5 10 15 m (APPROX)
 TOPOGRAPHIC MAP 21-0/9
 MILITARY GRID 079 901

TABLE 4.11
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 13, UPPER MCNAIR BROOK, August 23, 1984

Species	Relative Abundance			Total No.	Average No. per .09m ²
	Sample A	Sample B	Sample C		
COLEOPTERA					
Elmidae					
<i>Heterelmis sp.</i>	2	1		3	1.0
DIPTERA					
Chironomidae					
Diamesinae					
<i>Diamesa spinacies</i>	2			2	0.6
Orthocladiinae sp.	1	1		2	0.6
<i>Gymnometriocnemus brumalis</i>	2	2		4	1.3
Heleidae					
<i>Palpomyia sp.</i>	2	1		3	1.0
Rhagionidae					
<i>Atherryx variegata</i>			1	1	0.3
Simuliidae					
<i>Simulium sp.</i>		1		1	0.3
Tipulidae					
<i>Hexatoma sp.</i>			1	1	0.3
EPHEMEROPTERA					
Baetidae					
<i>Baetis sp.</i>	1			1	0.3
<i>B. Vagans</i>		6	4	10	3.3
Heptageniidae					
<i>Iron humeralis</i>			1	1	0.3
<i>Stenonema femorata</i>	1	3		4	1.3
PLECOPTERA					
Nemouridae					
<i>Leuctra classeni</i>	3	1	1	5	1.6
TRICOPTERA					
Brachycentridae					
<i>Brachycentrus americanus</i>	17	10		27	9.0
Glossosomatidae					
<i>Glossosoma lividum</i>			3	3	1.0
TOTAL	31	26	11	68	22.6

FIG. 4.13 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 14,
JACQUET RIVER, AUGUST 23, 1984



LEGEND

- BENTHOS SAMPLING STATION**
- RIFFLE AREA**
- POOL**
- BARRIER**
- GRAVEL**

SCALE (APPROX.)
 TOPOGRAPHIC MAP 21-0/9
 MILITARY GRID 079 900

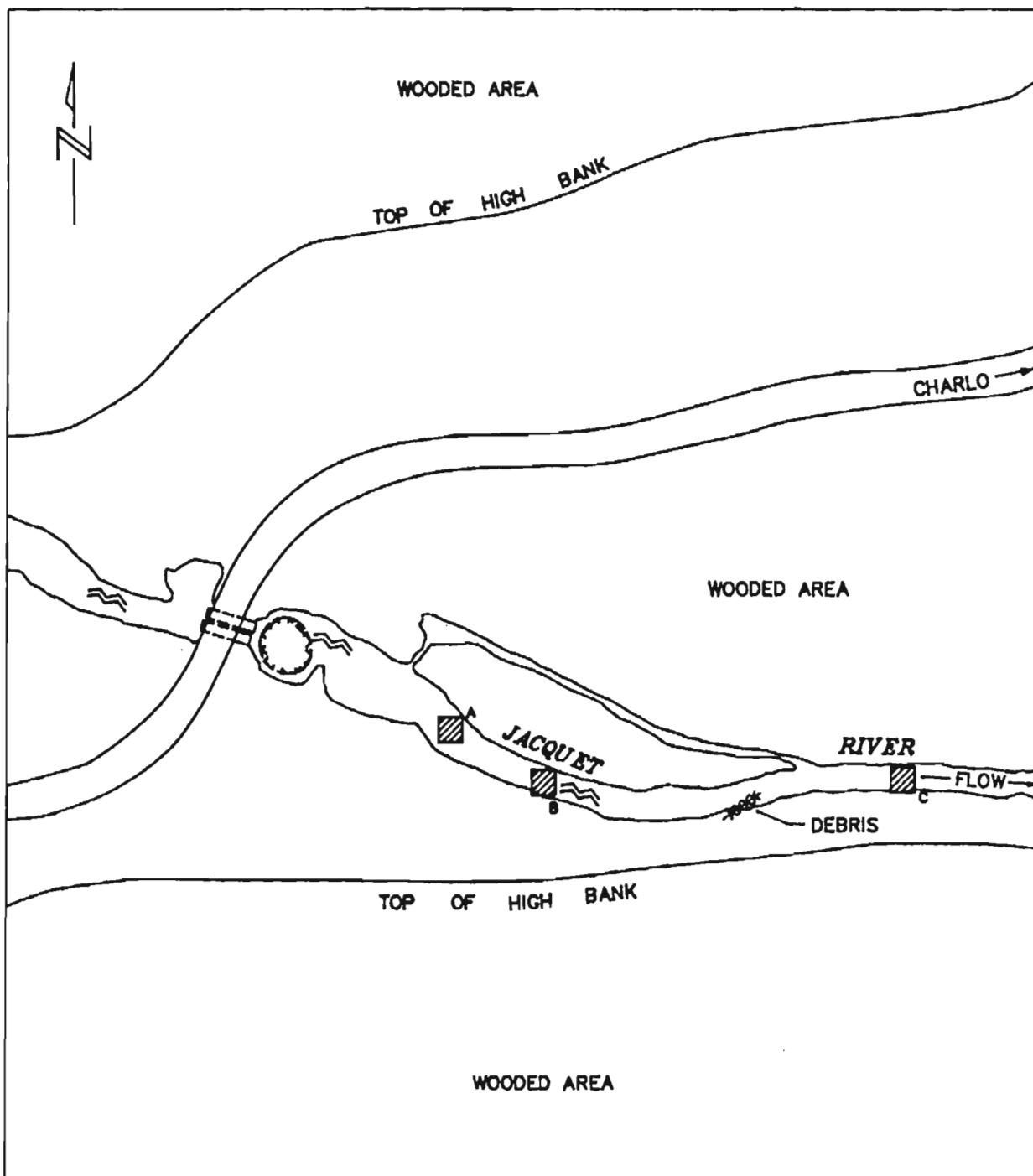
TABLE 4.12

 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates

SITE 14, JACQUET RIVER, August 23, 1984

Species	Relative Abundance			Total No.	Average No. per .09m ²		
	Sample A	Sample B	Sample C				
COLEOPTERA							
Elmidae							
<i>Heterelmis sp.</i>	9	11		20	6.6		
DIPTERA sp.		1		1	0.3		
PLECOPTERA							
Nemouridae							
<i>Leuctra claasseni</i>	1	1		2	0.6		
TRICHOPTERA							
Brachycentridae							
<i>Brachycentrus americanus</i>	79	26	6	111	37.0		
Glossosomatidae							
<i>Glossosoma lividum</i>		1		1	0.3		
MOLLUSCA sp.	1			1	0.3		
<hr/>							
TOTAL	90	40	6	136	45.3		

FIG. 4.14 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 15,
JACQUET RIVER, AUGUST 25, 1984



LEGEND

- BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

SCALE 0 10 20 m (APPROX.)
TOPOGRAPHIC MAP 21-0/9
MILITARY GRID 976 827

TABLE 4.13

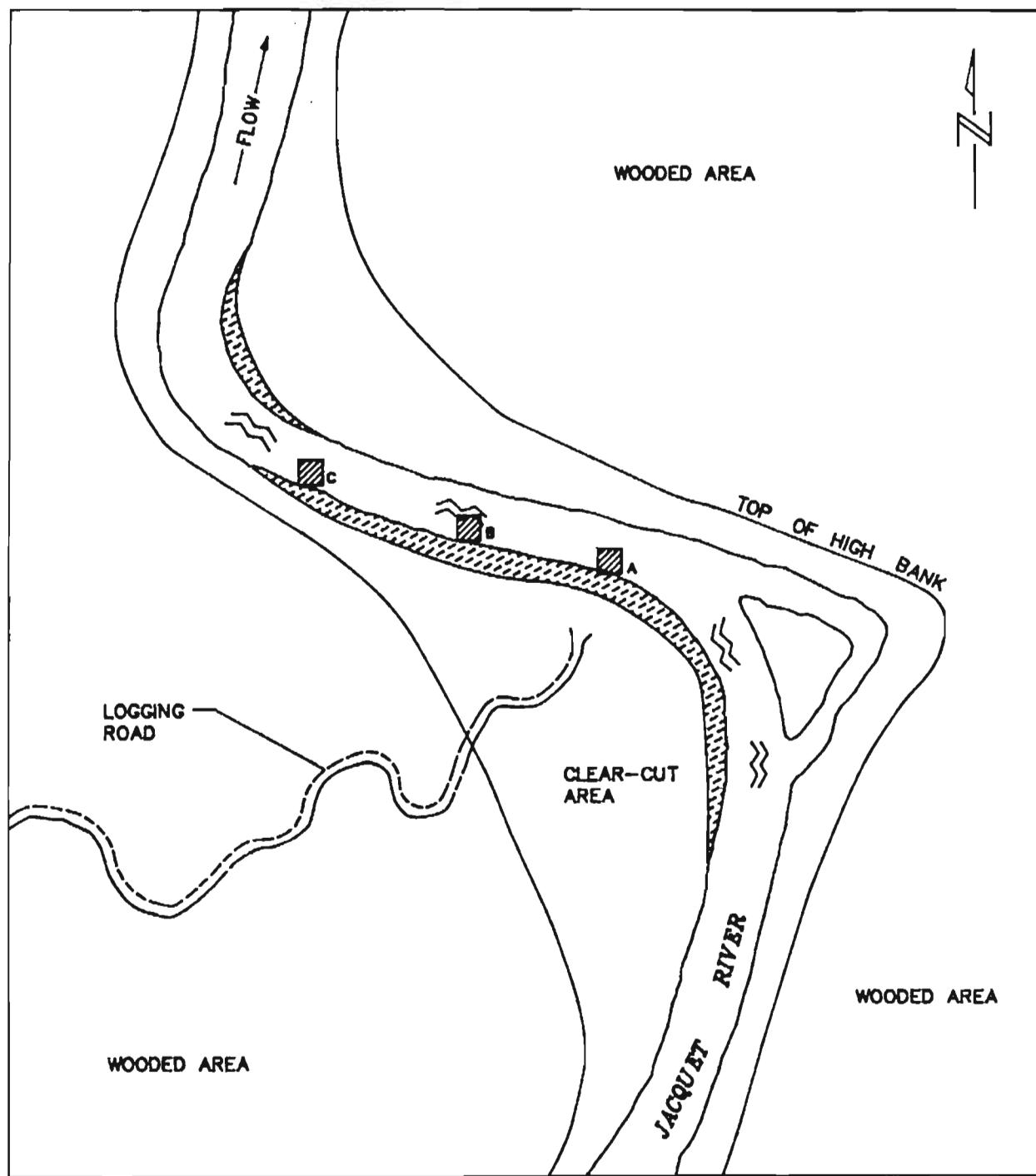
Species Composition and Relative Abundance of
Benthic Macro-Invertebrates
SITE 15, JACQUET RIVER, August 25, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
COLEOPTERA					
Elmidae					
<i>Heterelmis sp.</i>	81	55	33	169	56.3
DIPTERA					
Chironomidae					
Diamesinae					
<i>Diamesa</i>					
<i>spinacies</i>	11			11	3.6
<i>Protanypus sp.</i>	1			1	0.3
Orthocladiinae					
<i>Bryophaenocladius sp.</i>	1			1	0.3
<i>Cardiocladus</i>					
<i>albiplumus</i>	2			2	0.6
<i>Cricotopus sp.</i>	17			17	5.6
<i>Gymnometriocnemus sp.</i>	3			3	1.0
Padonominae					
<i>Parochlus</i>					
<i>kiefferi</i>				1	0.3
Heleidae					
<i>Palpomyia sp.</i>	1			1	0.3
Rhagionidae					
<i>Atheryx variegata</i>	1			5	6
Simuliidae					
<i>Simulium venustrum</i>	18	8		26	8.6
EPHEMEROPTERA					
Baetidae					
<i>Baetis sp.</i>				2	0.6
<i>B. vagans</i>	4	5		9	3.0
Ephemerellidae					
<i>Ephemerella</i>					
<i>attenuata</i>	1			1	0.3
Heptageniidae					
<i>Stenonema femorata</i>	2	6	14	22	7.3
Tricorythidae					
<i>Tricorythodes atratus</i>	17			17	5.6
PLECOPTERA					
Pteronarcyidae					
<i>Pteronarcys nobilis</i>		2	2	4	2.6

TABLE 4.13 (continued)
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 15, JACQUET RIVER, August 25, 1984

Species	<u>Relative Abundance</u>			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
TRICHOPTERA					
Brachycentridae					
<i>Brachycentrus americanus</i>	48			48	16.0
Hydropsychidae					
<i>Arctopsyche ladogensis</i>	3	2	1	6	2.0
<i>Hydropsyche morosa</i>	5	6	1	12	4.0
Polycentropodidae sp.	3			3	1.0
<i>Polycentroporus sp.</i>			5	5	1.6
Rhyacophilidae					
<i>Rhyacophila fuscula</i>				1	0.3
ANNELIDA					
Hirudinea					
<i>Neophalopsis obscurus</i>	1			1	0.3
<i>Oligochaeta sp.</i>	1			1	0.3
PLATYHELMINTHES					
<i>Turbellaria sp.</i>				4	1.3
MOLLUSCA					
Gastropoda					
<i>Physa sp.</i>	1	2		3	1.0
TOTAL	222	91	64	377	125.6

FIG. 4.15 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 16,
JACQUET RIVER, AUGUST 26, 1984



LEGEND

- BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

SCALE 0 20 40 m (APPROX.)
TOPOGRAPHIC MAP 21-0/16
MILITARY GRID 226 057

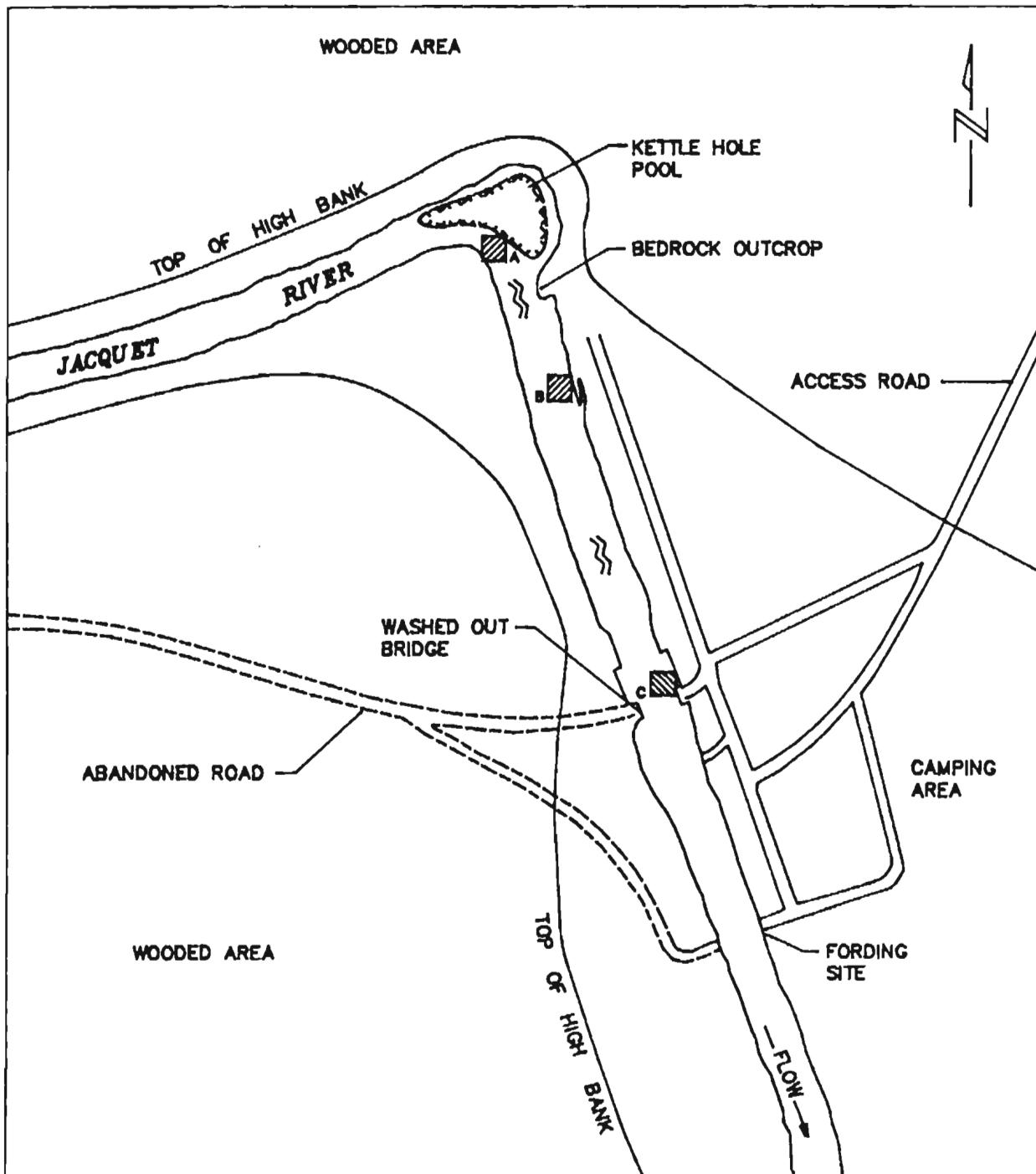
TABLE 4.14
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 16, JACQUET RIVER, August 26, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
COLEOPTERA					
Elmidae					
<i>Heterelmis sp.</i>		1		1	0.3
DIPTERA					
Chironomidae					
Diamesinae					
<i>Diamesa</i>					
<i>spinacies</i>		1		1	0.3
Tanypodinae					
<i>Procladius sp.</i>		4		4	1.3
Rhagionidae					
<i>Atheryx variegata</i>	1			1	0.3
Simuliidae					
<i>Simulium venustum</i>			7	7	2.3
Tipulidae					
<i>Hexatoma sp.</i>		1		1	0.3
EPHEMEROPTERA					
Baetidae					
<i>Baetis intermedius</i>		3		3	1.0
<i>B. vagans</i>	2		5	7	2.3
Caenidae					
<i>Caenis simulans</i>			1	1	0.3
Ephemerellidae					
<i>Ephemerella</i>					
<i>attenuata</i>			2	2	0.6
Heptageniidae					
<i>Stenonema femorata</i>	1	2	1	4	1.3
ODONATA					
Cordulegastridae					
<i>Cordulegaster sp.</i>			3	3	1.0
PLECOPTERA					
Perlidae					
<i>Acroneuria abnormis</i>	1			1	0.3
<i>Neophasganophora</i>					
<i>capitata</i>			1	1	0.3

TABLE 4.14 (continued)
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 16, JACQUET RIVER, August 26, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
TRICHOPTERA					
Brachycentridae					
<i>Brachycentrus americanus</i>	1			1	0.3
Glossosomatidae					
<i>Glossosoma lividum</i>	2			2	0.6
Hydropsychidae					
<i>Arctopsyche sp.</i>			3	3	1.0
<i>A. ladogensis</i>		1	2	3	1.0
Philopotamidae					
<i>Chimarra atterima</i>		1		1	0.3
Polycentropodidae					
<i>Polycentropus sp.</i>	1	1		2	0.6
Rhyacophilidae					
<i>Rhyacophila sp.</i>			2	2	0.6
AMPHIPODA					
Talitridae					
<i>Hyalella azteca</i>			109	109	36.3
ANNELIDA					
Hirudinea					
<i>Helobdella sp.</i>			11	11	3.6
<i>Neophalopsis obscurus</i>			21	21	7.0
TOTAL	9	16	167	192	64.0

FIG. 4.16 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 17,
AUGUST 27, 1984



LEGEND

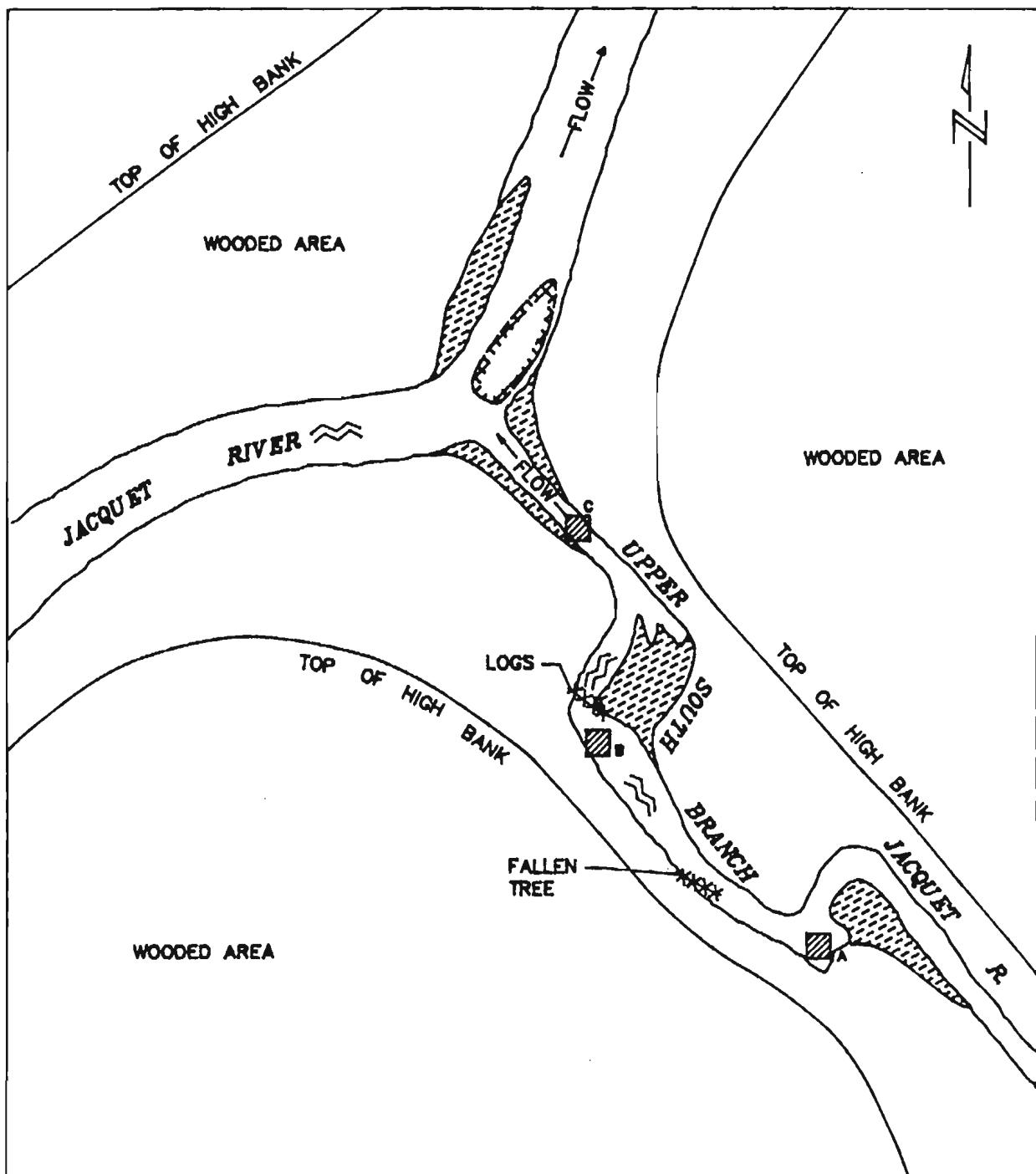
- BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

SCALE (APPROX.)
 TOPOGRAPHIC MAP 21-0/16
 MILITARY GRID 153 951

TABLE 4.15
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 17, JACQUET RIVER, August 27, 1984

Species	<u>Relative Abundance</u>		Total No.	Average No. per .09m ²
	Sample A	Sample C		
COLEOPTERA				
Elmidae				
<i>Heterelmis sp.</i>	33		33	16.5
DIPTERA				
Heleidae				
<i>Palpomyia sp.</i>	18		18	9.0
Rhagionidae				
<i>Atheryx variegata</i>	2		2	1.0
Tipulidae				
<i>Hexatoma sp.</i>	1		1	0.5
<i>Limnophila sp.</i>		1	1	0.5
EPHEMEROPTERA				
Baetidae				
<i>Baetis sp.</i>		4	4	2.0
<i>B. intermedius</i>	4		4	2.0
Baetiscidae				
<i>Baetisca obesa</i>	1		1	1.0
Ephemerellidae				
<i>Ephemerella attenuata</i>	6	4	10	5.0
Ephemeridae				
<i>Hexagenia bilineata</i>		1	1	0.5
Heptageniidae				
<i>Stenonema femorata</i>	3	12	15	7.5
Leptophlebiidae				
<i>Paraleptophlebia guttata</i>	4	1	5	2.5
Siphlonuridae				
<i>Ameletus sp.</i>		1	1	0.5
HYMENOPTERA				
Ichneumidae	<i>sp.</i>	1	1	0.5
TRICHOPTERA				
Brachycentridae				
<i>Brachycentrus americanus</i>	2		2	1.0
ANNELIDA				
Oligochaeta	<i>sp.</i>		11	5.5
TOTAL	75	36	111	55.5

FIG. 4.17 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 18,
UPPER SOUTH BRANCH JACQUET RIVER, AUGUST 28, 1984



LEGEND

- BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

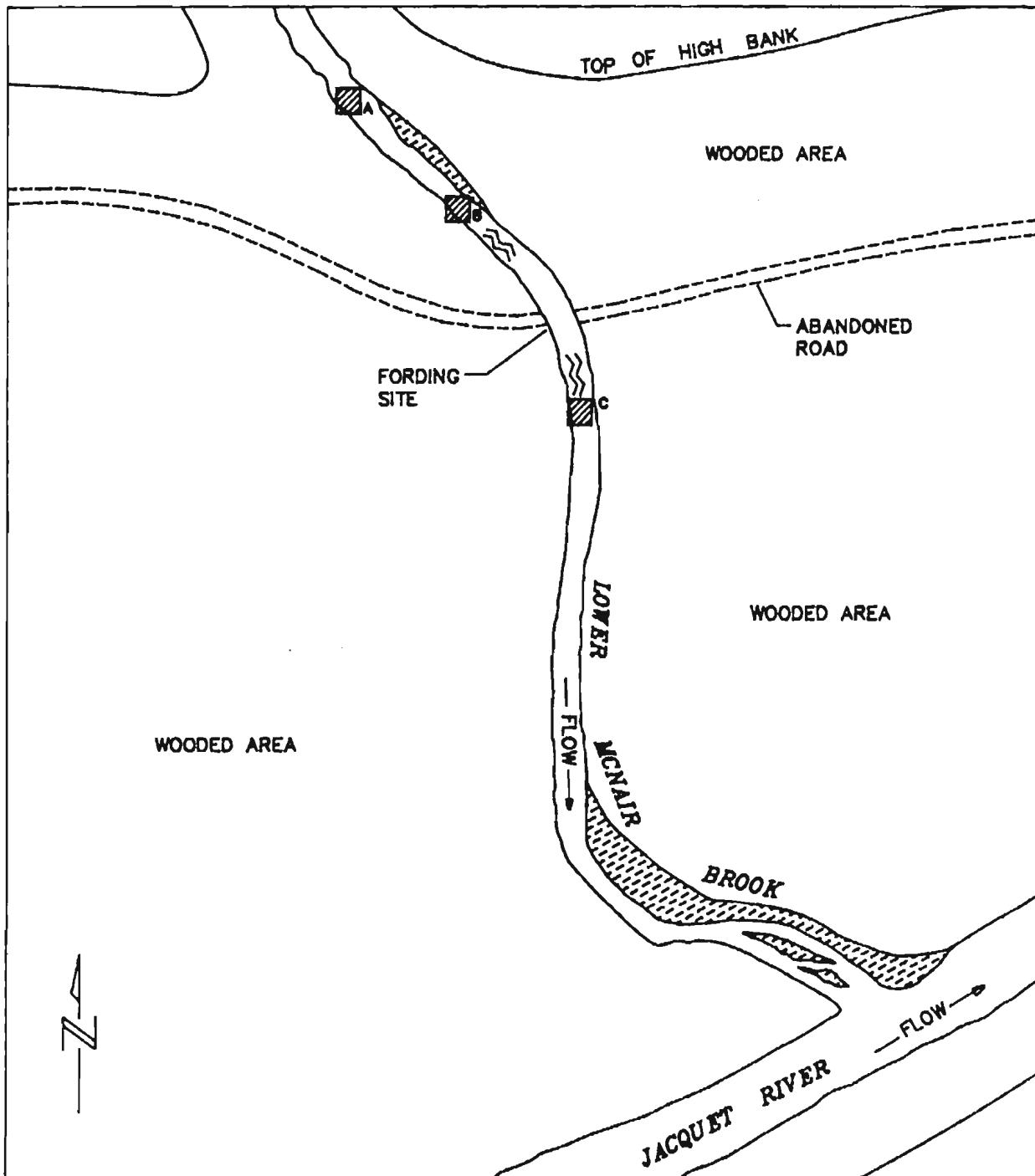
SCALE 0 10 20 m (APPROX.)
TOPOGRAPHIC MAP 21-0/9
MILITARY GRID 084 903

TABLE 4.16

Species Composition and Relative Abundance of
Benthic Macro-Invertebrates
SITE 18, UPPER SOUTH BRANCH JACQUET RIVER
August 28, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
COLEOPTERA					
Elmidae					
<i>Heterelmis sp.</i>	1			1	0.3
DIPTERA					
Rhagionidae					
<i>Atheryx variegata</i>	2	2		4	1.3
Simuliidae					
<i>Simulium venustum</i>		2		2	0.6
EPHEMEROPTERA					
Baetidae					
<i>Baetis sp.</i>	7		5	12	4.0
Ephemerellidae					
<i>Ephemerella attenuata</i>		3		3	1.0
Heptageniidae					
<i>Iron humeralis</i>	3	1		4	1.3
<i>Stenonema femorata</i>		7	16	23	7.6
Tricorythidae					
<i>Tricorythodes atratus</i>			2	2	0.6
PLECOPTERA					
Perlidae					
<i>Acroneuria abnormis</i>	1			1	0.3
Pteronarcyidae					
<i>Pteronarcys nobilis</i>	1			1	0.3
TRICHOPTERA					
Brachycentridae					
<i>Brachycentrus americanus</i>	64	9	3	76	25.3
Glossosomatidae					
<i>Glossosoma lividum</i>		16	1	17	5.6
Hydropsychidae					
<i>Hydropsyche morosa</i>		3		3	1.0
Philopotamidae					
<i>Chimarra atterima</i>			4		1.3
TOTAL	77	49	27	153	51.0

FIG. 4.18 LOCATION OF BENTHOS SAMPLING STATIONS, SITE 19,
LOWER MCNAIR BROOK, AUGUST 28, 1984



LEGEND

- BENTHOS SAMPLING STATION
- RIFFLE AREA
- POOL
- BARRIER
- GRAVEL

SCALE 0 10 20 m (APPROX)
TOPOGRAPHIC MAP 21-0/9
MILITARY GRID 098 919

TABLE 4.17
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 19, LOWER MCNAIR BROOK, August 28, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
COLEOPTERA					
Elmidae					
<i>Heterelmis sp.</i>				6	6
DIPTERA					
Chironomidae					
Orthocladiinae					
<i>Abiskomyia sp.</i>	2			2	0.6
<i>Parakieferiella cornata</i>				2	0.6
Tanytropodinae					
<i>Procladius sp.</i>		5		5	1.6
Heleidae					
<i>Palpomyia sp.</i>	1	1		2	0.6
Rhagionidae					
<i>Atheryx variegata</i>		2	3	5	1.6
Simuliidae					
<i>Simulium sp.</i>		1		1	0.3
<i>S. venustum</i>	2			2	0.6
Tipulidae					
<i>Limnophila sp.</i>		1		1	0.3
EPHEMEROPTERA					
Baetidae					
<i>Baetis sp.</i>		6	1	7	2.3
<i>B. vagans</i>	18			18	6.0
Ephemerellidae					
<i>Ephemerella doris</i>		3		3	1.0
Heptageniidae					
<i>Stenonema femorata</i>	7			7	2.3
ODONATA					
Cordulegastridae					
<i>Cordulegaster sp.</i>	1			1	0.3
PLECOPTERA					
Nemouridae					
<i>Leuctra claasseni</i>		1		1	0.3
Perlidae					
<i>Acroneuria abnormis</i>	1			1	0.3
Pteronarcyidae					
<i>Pteronarcys nobilis</i>	1	1	3	5	1.6

TABLE 4.17 (continued)
 Species Composition and Relative Abundance of
 Benthic Macro-Invertebrates
 SITE 19, LOWER MCNAIR BROOK, August 28, 1984

Species	Relative Abundance			Total	Average
	Sample A	Sample B	Sample C	No.	No. per .09m ²
TRICHOPTERA					
Brachycentridae					
<i>Brachycentrus americanus</i>	39	86	131	256	85.3
Glossosomatidae					
<i>Glossosoma lividum</i>	12	32	79	123	41.0
Hydropsychidae					
<i>Arctopsyche ladogensis</i>	1	1	6	8	2.6
<i>Hydropsyche morosa</i>		1		2	0.6
Rhyacophilidae					
<i>Rhyacophila fuscula</i>			2	2	0.6
TOTAL	88	140	232	460	153.3

