

AQUATIC BIOPHYSICAL INVENTORY OF MAJOR TRIBUTARIES IN THE AOSERP STUDY AREA VOLUME II ATLAS

by

Gordon L. Walder Peggy L. Strankman Eric B. Watton Kathryn A. Bruce



environmental research associates

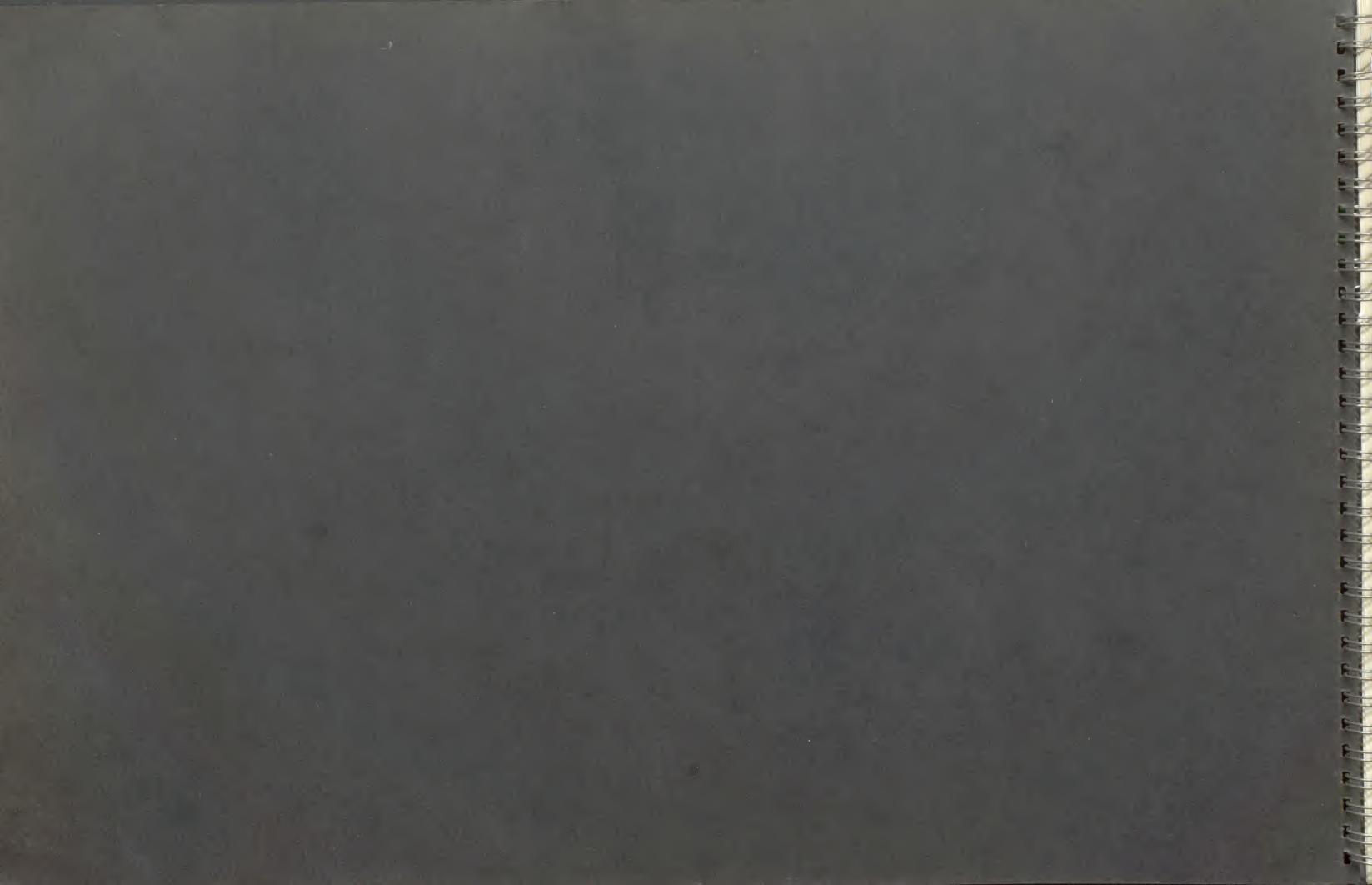
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ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM

Project WS 3.4 April 1980





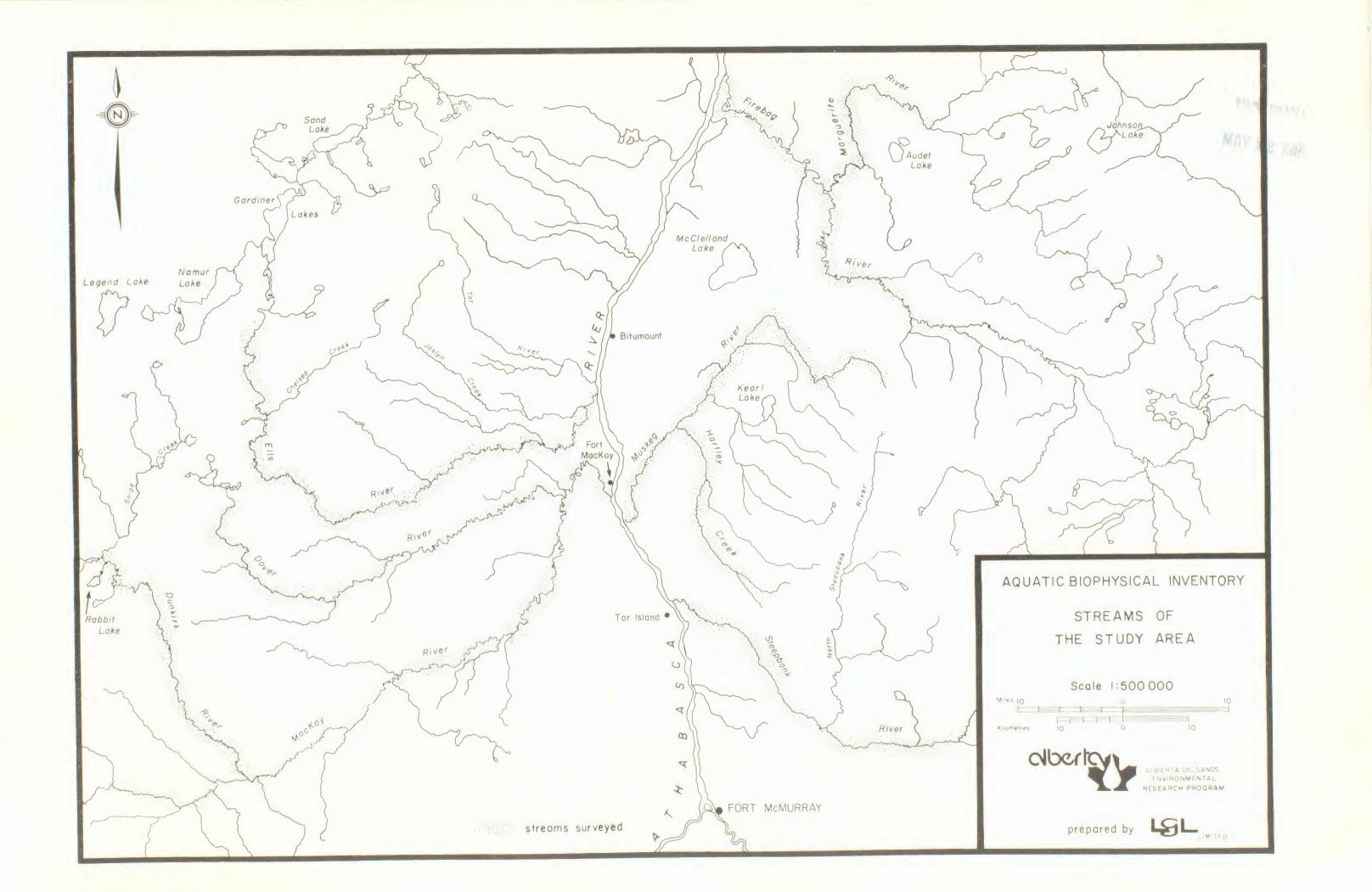


TABLE OF CONTENTS

Page

STREAMS OF THE STUDY AR	EA1	
FIREBAG RIVER		
Reach 1)
Reach 2		1
Reach 3	10)
Reach 4	12	}
Reach 5	14	ł
Reach 6	17	7
MARGUERITE RIVER		
Reach 1		3
Reach 2		5
Reach 3		7
Reach 4		9
Reach 5		2
MUSKEG RIVER		5
Reach 1		7
Reach 2		9
Reach 3		}
Reach 4		3
Reach 5		9
Reach 6		1
HARTLEY CREEK		5
Reach 1	5	57
Reach 2	5	;9
Reach 3		51
Reach 4		54
Reach 5		66
STEEPBANK RIVER	6	59
		71
		73
		75

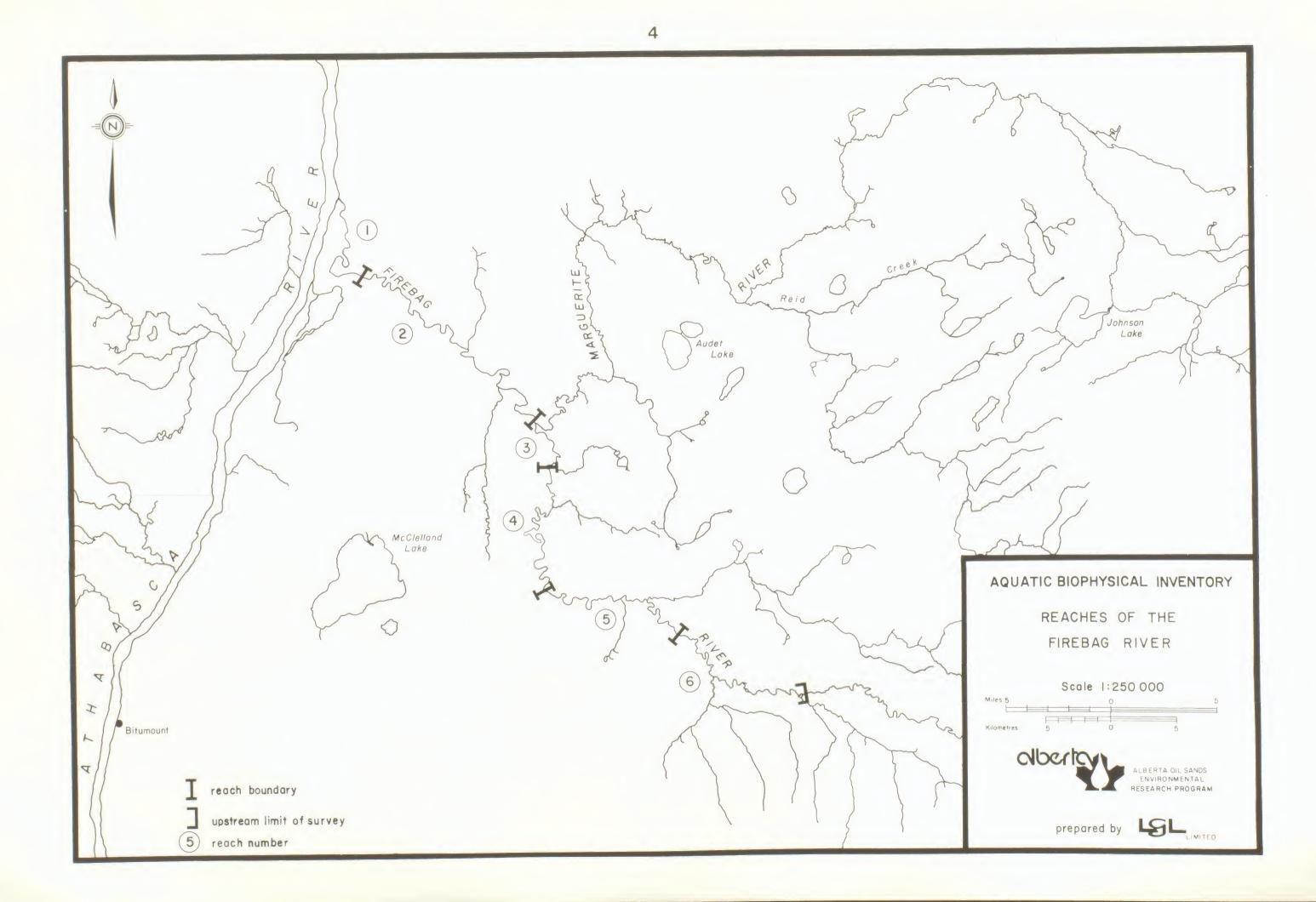
Reach	4.				•	,		• •					•			•	•	•
Reach	5.			•	•		•					•	•	,	•	•		•
MACKAY RI	VEF	2			•				•									
Reach	1									,		•		•				
Reach	2					•	•						•	•	٠	•		
Reach	3										•							
Reach	4						٠		۰	,				•	•	•	•	
Reach	5			-	•	,		• •				•			0	۰	•	
Reach	6	• •					0	•				,	۰	•	٠	٠	•	
Reach	7	• •				,	۰	•			•	•	•	۰	•	٠	٠	
DOVER RIV	ER									•	•				۰	•	•	
Reach	1			-											•		•	
Reach	2		-									•		•	•	•		
Reach	3						۰		•		•		•		•		•	
Reach	4						۰					•			•	•	•	
Reach	5											•		•	•			
Reach	6		•	•			•		•						•			
DUNKIRK F	R I V	EF	2	•					•									
Reach	}			•		•					•	• •						
Reach	2		• •	•	•				•	•	•	•		• •				•
Reach	3		• •			•			•			•			•		•	
ELLS RIVI	ER									•			•	¢		•		
Reach																		
Reach	2			•					•		•	•	•	,		•	•	
Reach	3			•	•								•		•	•		•
Reach	4						•			•	•	•	•			•	•	
Reach	5	•							•	•		•				1		
Reach	6		• •				•		۰	•		•	•	•		•		
Reach	7		• •				•		•	•	•	•	•	•		•	•	
Reach	8	•							•	٠	٠			•	•	٠		

Page

 					79
 	• •				81
 					85
 					87
 					89
 					91
 					95
 					98
 					102
 		• •			107
 				•	111
 				•	113
 				•	115
 				•	117
 	• •	• •		•	119
 					122
 • •	• •	• •		•	126
 				•	129
 				•	131
 					133
 		• •	• •	•	137
 					141
					143
 					145
 					147
 					149
 					152
 					154
 				0	163
 				•	165

FIREBAG RIVER





						Reach length (km)	13.0	This reach, wh
1			niles and			Channel width (m) Channel area (ha)	95	regularly meanderin in at least the low tions in the Athaba
	Adults		of-the-year		1 Numbers	Gradient (m/km)	0.3	the lowest in the s swirling and a high
			September		September	Total pools (%)	90	is almost entirely
			3		3	Pattern	irregularly meandering	of the riparian ve
			0			Confinement	unconfined	Northern pike
ND	1	ND	0	ND	1		40	stickleback, which in the occasional
ND	2	ND	2	ND	4		95	whitefish, capture
ND	1	ND	0	ND	1	gravels (2-64 mm)	5	lake whitefish pre
ND	28	ND	6	ND	34	larges (>64 mm)	0	substrates. Sever
						bedrock and/or oil sand	0	spawn over sandy s River; they may sp
								jams, overhanging feeding areas for pike. The many po overwintering area
R	Bank cover. Conifero Deciduou Shrubs Grasses Barren Channel co	age (%) us trees s trees ver (%)						
								And Albert and
	ND ND ND	ND 0 ND 22 ND 2 ND 1 ND 2 ND 1 ND 2 ND 1 ND 28 ND 28 ND 1 RIPARIAN VEGETA Bank cover Conifero Deciduou Shrubs Grasses Barren Channel co Overhang	ND 0 ND ND 22 ND ND 2 ND ND 1 ND ND 1 ND ND 1 ND ND 28 ND	ND 0 ND 3 ND 22 ND 1 ND 2 ND 0 ND 1 ND 0 ND 2 ND 2 ND 1 ND 0 ND 2 ND 0 ND 2 ND 0 ND 2 ND 0 ND 28 ND 6	ND 0 ND 3 ND ND 22 ND 1 ND ND 2 ND 0 ND ND 1 ND 0 ND ND 2 ND 2 ND ND 1 ND 0 ND ND 1 ND 0 ND ND 28 ND 6 ND NO 45 1 NO 45 Grasses 10 0 Barren 0 Channel cover (%) 0 0 0	ND 0 ND 3 ND 3 ND 22 ND 1 ND 23 ND 2 ND 0 ND 2 ND 1 ND 0 ND 1 ND 2 ND 2 ND 1 ND 2 ND 2 ND 4 ND 1 ND 0 ND 1 ND 28 ND 6 ND 34 BENTHIC ALGAL PRODUCTIVITY Bank coverage (%) Coniferous trees 30 Deciduous trees 30 Shrubs 45 Grasses 10 Barren 0 Channel cover (%) 0 0 0	May September May September May September ND 0 ND 3 ND 3 ND 2 ND 1 ND 23 ND 1 ND 0 ND 1 ND 2 ND 0 ND 1 ND 1 ND 0 ND 1 ND 1 ND 0 ND 1 ND 1 ND 0 ND 1 ND 28 ND 6 ND 34	May September May September Hay September ND 0 ND 3 ND 3 ND 2 ND 1 ND 23 ND 2 ND 0 ND 2 ND 2 ND 0 ND 2 ND 1 ND 0 ND 1 ND 2 ND 6 ND 34 ND 28 ND 6 ND 34 ND 28 ND 6 ND 34 Deciduos trees 30 Sptistic composition (%) 1 Integes (>64 mm) 0 Deciduos trees 30 Deciduos trees 30 Sptistic for this reach No data available for this reach No data available for this reach No data available for this reach No d

FISH UTILIZATION

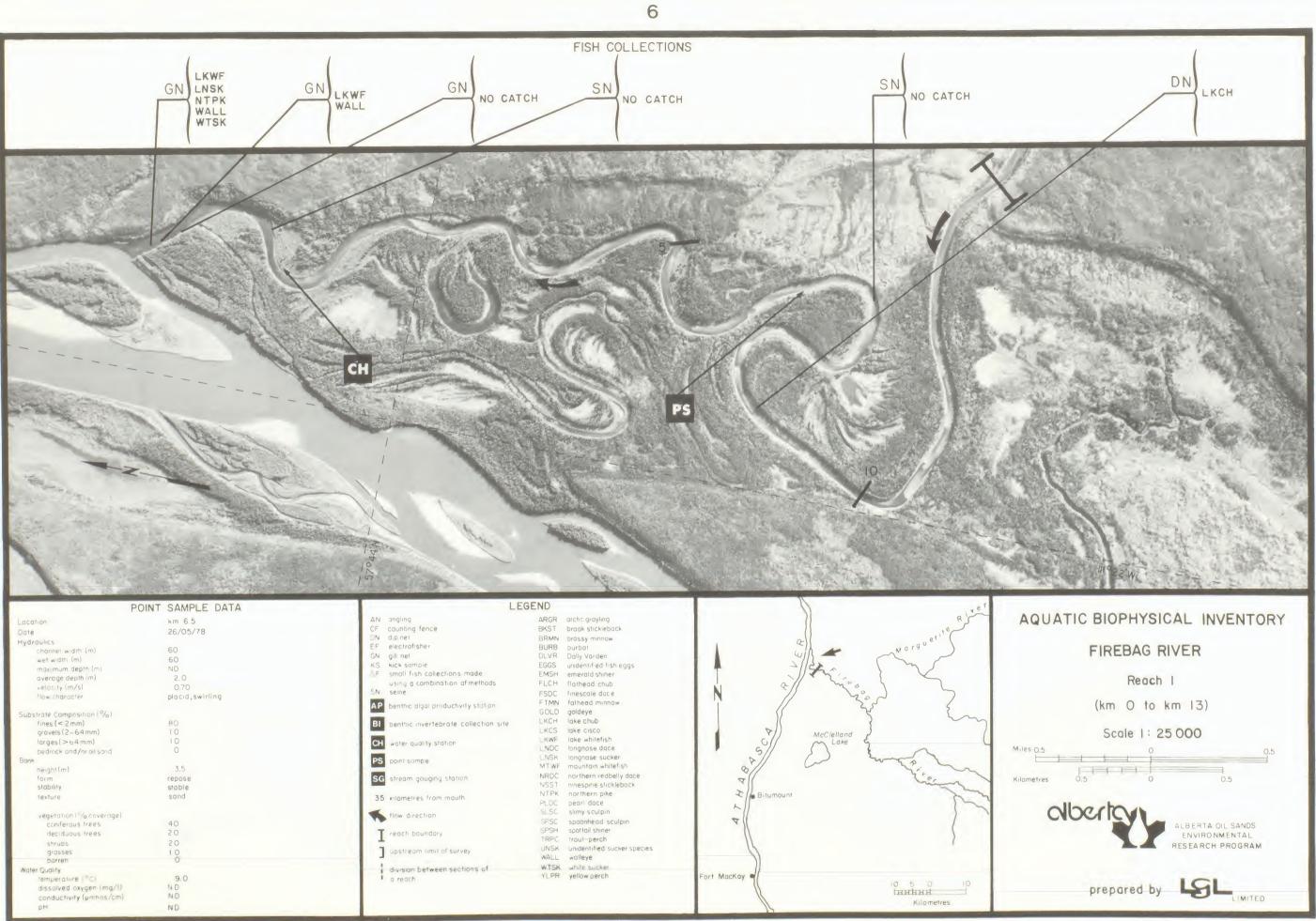
ich lies largely within the Athabasca River floodplain, is irng and has many areas of unstable banks. Water levels and flow er portion of this reach are affected by water level fluctuasca River. Gradient and water velocities in this section are tudied portion of the Firebag River. Water flow is primarily proportion of the reach is composed of pools. The substrate fines. Although deciduous shrubs are an abundant component etation, little of this growth overhangs the channel. which were captured in this reach, and brook and ninespine were captured further upstream in the Firebag River, may spawn rassy shallows along the banks within this reach. Adult lake in this reach during autumn, may also spawn here. Although er to spawn over rocky substrates, they will spawn over sandy forage fish species (e.g., trout-perch and pearl dace) that bstrates were captured within other reaches of the Firebag wn in this reach. The reach is considered to be a relaarea for fish because of the slow waters and the presence rassy shallows within which young fish may take refuge. Log anks, and the many deep pools provide excellent resting and dult fish of larger piscivores such as walleye and northern ls and relatively deep water in the reach provide abundant for fish.

WATER QUALITY

Water Survey of Canada station number	00AT07DC	0011	
	Mean	Maximum	Minimum
Total alkalinity (mg CaCO₃/l) pH	7.77	129.2	
Total hardness (mg CaCO ₃ /1)	108.5	124.0	94.1
Conductance (µS/cm)	198	231	171
Total filterable			
residue fixed (mg/l)	110	130	100
Total non-filterable			
residue fixed (mg/1)	6	13	< 0.4
Total organic carbon (mg C/1)	9.2	11.0	7.0
Silica (mg SiO ₂ /1)	11.8	16.0	9.7
Nitrate and nitrite nitrogen (mg N/1)	0.046	0.090	< 0.003
Total Kjeldahl nitrogen (mg N/l)	0.95	1.07	0.82
Total Phosphorus (mg P/1)	0.044	0.051	0.034
Orthophosphate (mg P/1)	0.013	0.016	0.010
Sulphate (mg SO ₄ /1)	3.0	5.0	0.1

Data for the period January 1976 to December 1977 obtained from the National Water Quality Data Bank (NAQUADAT).

AQUATIC BIOPHYSICAL INVENTORY FIREBAG RIVER Reach | (km O to km 13) abertar ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by LIMITED



PO	INT SAMPLE DATA	LE	EGEND	0	ver	
Location	km 6.5	AN angling	ARGR arctic grayling	1	R	AQ
Date	26/05/78	CF counting fence	BKST brack stickleback		, e	
Hydraulics	20,00,0	CN dipinet	BRMN brassy minnow	2	Morgueri	
chonnel width (m)	60	EF electrofisher	BURB burbot	Luik -	Marg)	
wet width (m)	60	GN gill net	DLVR Dally Varden	w//5		
maximum depth (m)	ND	KS kick sample	EGGS unidentified fish eggs	-1/2c		
average depth m)	2,0	SF small fish collections made	EMSH emerald shiner	112		
velocity (m/s)	0.70	using a combination of methods	FLCH flathead chub	A 4/1	m~o }	
flow character	placid, swirling	SN seine	FSDC finescale dace	N 7/	So 2 7	
10 H 10 100 101	provide provide a second	AP benthic algal productivity station	FTMN fathead minnow		2.	
Substrate Composition (%)		bennie ager proceentry starte	GOLD goldeye		¥ ?	
fines (< 2mm)	80	BI benthic invertebrate collection site	LKCH lake chub		2	
grovels (2-64mm)	10		LKCS lake cisco	V) McCle	lland)	
larges(>64mm)	10	CH water quality station	LKWF lake whitefish	GIL MICCIE	ake &	
bedrock and/or oil sand	0	worer quointy station	LNDC longnose dace	s'	1 1	Miles 0.5
Bank		PS point sample	LNSK longnase sucker	All C.	where I	
height(m)	3,5		MTWF mountain whitefish	8/1	Si m	
form	repose	SG stream gauging station	NRDC northern redbelly dace	5	2'er	Kilometre
stability	stable		NSST ninespine stickleback		mill	
texture	sand	35 kilometres from mouth	NTPK northern pike	Z / Bitumount	2 mg	
			PLDC pearl doce	6 II	12	
vegetation (^c /o coverage)		flow direction	SLSC slimy sculpin			
coniferaus trees	40		SPSC spaonhead sculpin	7		
deciduous trees	20	T reach boundary	SPSH spottail shiner	()		
shrups	20	1	TRPC trout-perch		/	
grasses	10	upstream limit of survey	UNSK unidentified sucker species			
borren	Ũ		WALL walleye			
Water Quality		division between sections of	WTSK white sucker			
temperature (°C)	9.0	a reach	YLPR yellow perch	Fort MacKay	10 0 10	
dissolved oxygen (mg/l)	ND					
conductivity (umhos/cm)	ND					
pH	ND				Kilometres	

NUMBERS OF FISH COLLECTED (1978)

	,	Adults		eniles and -of-the-year	Total Numbers		
Species	May	September	May	September	May	September	
arctic grayling	0	0	1	0	1	0	
brook stickleback	0	0	1	0	1	0	
lake chub	0	0	37	0	37	0	
lake whitefish	0	3	0	0	0	3	
longnose dace	0	0	30	0	30	0	
longnose sucker	0	0	0	1	0	1	
bearl dace	0	0	11	0	11	0	
slimy sculpin	0	0	9	2	9	2	
valleye	0	1	0	0	0	1	
white sucker	0	1	73	0	73	1	
Total	0	5	162	3	162	8	

PHYSICAL CHARACTERISTICS

R <mark>eac</mark> h length (km)	32.
Channel width (m)	80
Channel area (ha)	260.0
Gradient (m/km)	0.6
Flow character	swirling, rolling, broken
Total pools ()	90
Pattern	irregularly meandering
Confinement	confined
Unstable banks ()	25
Substrate composition (*)	
fines (*2 mm)	70
gravels (2-64 mm)	25
larges (=64 mm)	3
bedrock and/or oil sand	2
Debris	low

REACH DESCRIPTION AND FISH UTILIZATION

This reach is located above the Athabasca River floodplain and is irregularly meandering with some near-vertical cut banks up to 40 m high. Areas with unstable banks are common. Gradient and water velocities are greater than those in Reach | but lower than those in upstream reaches of the Firebag River. The water is moderately deep and although some rapids are present, pools comprise most of the total reach area. Flow character is mixed, with swirling, rolling and broken waters. Fines comprise the majority of the substrate. Coniferous and deciduous trees predominate in the riparian vegetation and there is no overhanging vegetation.

Lake whitefish and a few of the forage fish species captured in the Firebag River that spawn over sandy substrates may spawn in this reach. Limited spawning of other fish species that normally spawn over gravelly substrates may also occur. Because of the relatively low water velocities and presence of debris, the rearing potential for fish is considered to be moderate. During the spring, moderate numbers of young lake chub, longnose dace and white sucker were captured. The presence of these smaller fish suggests that there is at least some feeding potential for northern pike and walleye in this reach. The many pools and moderately deep waters provide resting and feeding areas for adults of larger fish and also provide good overwintering areas.

BENTHIC INVER	
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PELECYPOD	A
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Odonata	
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Diptera	
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	ronominae
	ypodinae
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	iidae
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Empid	
Lepiu	1000

RIPARIAN VEGETATION Bank coverage Coniferous trees 40 Deciduous trees 35 Shrubs 10 Grasses 20	BENTHIC ALGAL PRODUCTIVITY No data available for this reach	STREAM GAUGING DATA Water Survey of Ennote station number 070.001 Maximu total annual discharge: 1075.6 x 10 = (1975) Minimu total annual discharge: 341.7 x 10 ⁶ = (1976) Maximu annual mean discharge: 33.98 m /s (1975) Minimu annual mean discharge: 21.72 m /s (1976)
Barren 0 Channel cover (除) Overhang 0 Crown 0		Maximum monthly mean discharge: 97.13 m /s (August 1973) Mini-u monthly mean discharge: 7.08 m /s (February 1972) Maximum dailv discharge: 238.14 m /s (Aug. 10, 1973) Mini-u daily di charge: 6.94 - / Febr. 10, 1978) Data for 1971 to 1978 compiled from Loeppky and Suitzer (1977). Warner and Sp tzer (1979) and Warner (1979).
	13	
Broken saturs at k 28.5.		Swirling contitions, typical of reach 2, at k= 36.

WATER QUALITY

Tot Tot

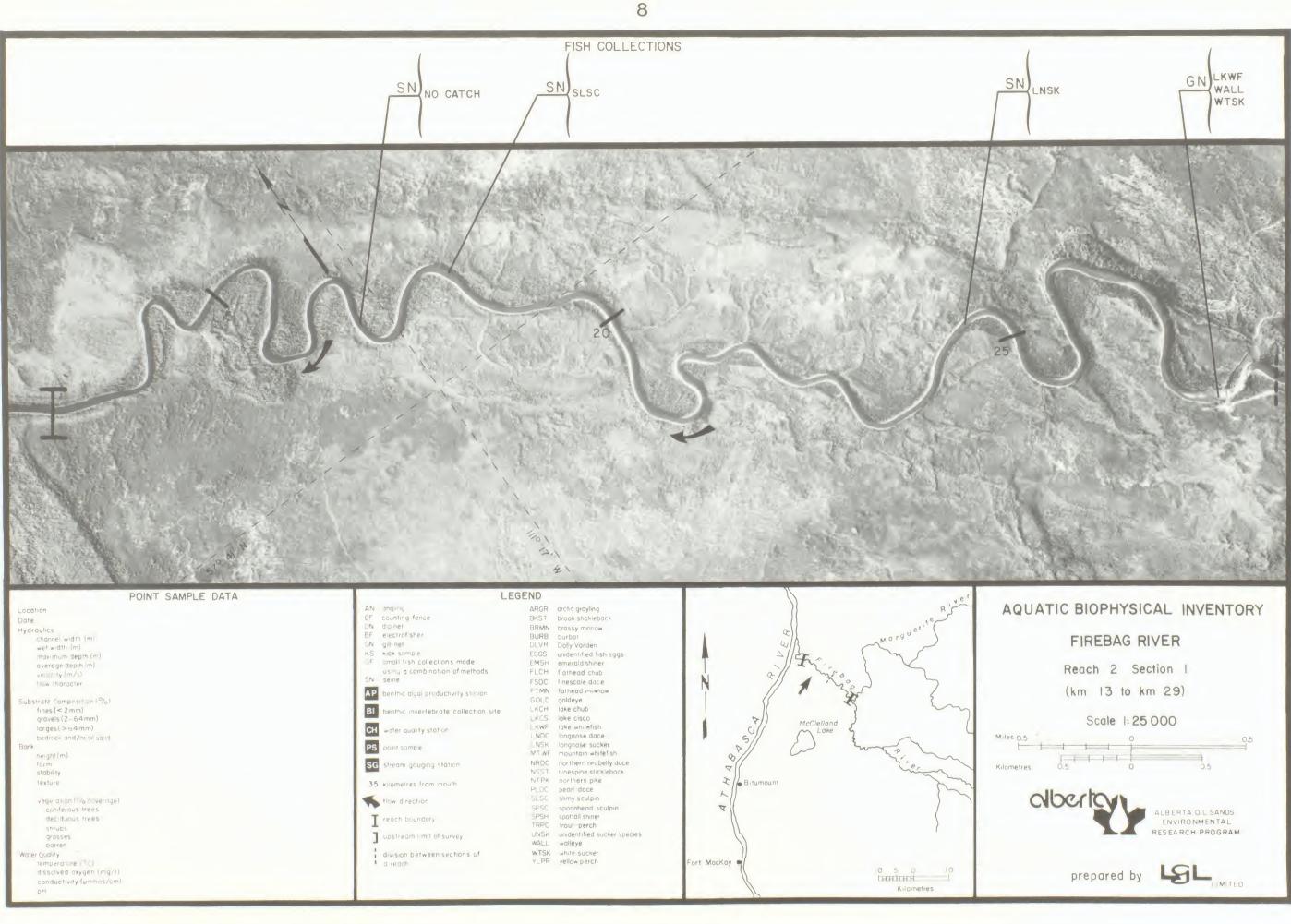
Water Survey of Eanada station nu ber 00AT07DC0010

	Mean	Maximum	Minimum	
al alkalinity (mg CaCO /1)	111.0	219.0 8.40	43.2 5.ú0	
al hardness (mg CaCO /1)	112.0	227.0	63.9	
ductance ("S/cm)	208	433	105	
al filterable				
esidue fixed (mg/1)	105	149	60	
al non-filterable				
esidue fixed (mg/l)	4	56	<0.4	
al organic carbon (mg C/l)	11.0	24.5	1.0	
ica (mg SiOz/1)	13.1	29.6	6.6	
rate and nitrite nitrogen (mg N/1)	0.080	0.400	<0.003	
al Kleldahl nitrogen (mg N/l)	0.89	5.40	0.20	
al Phosphorus (mg P/l)		0.180	0.023	
hophosphate (mg P/1)		0.060	0.005	
phate ing SO./11	4.7	17.5	0.1	

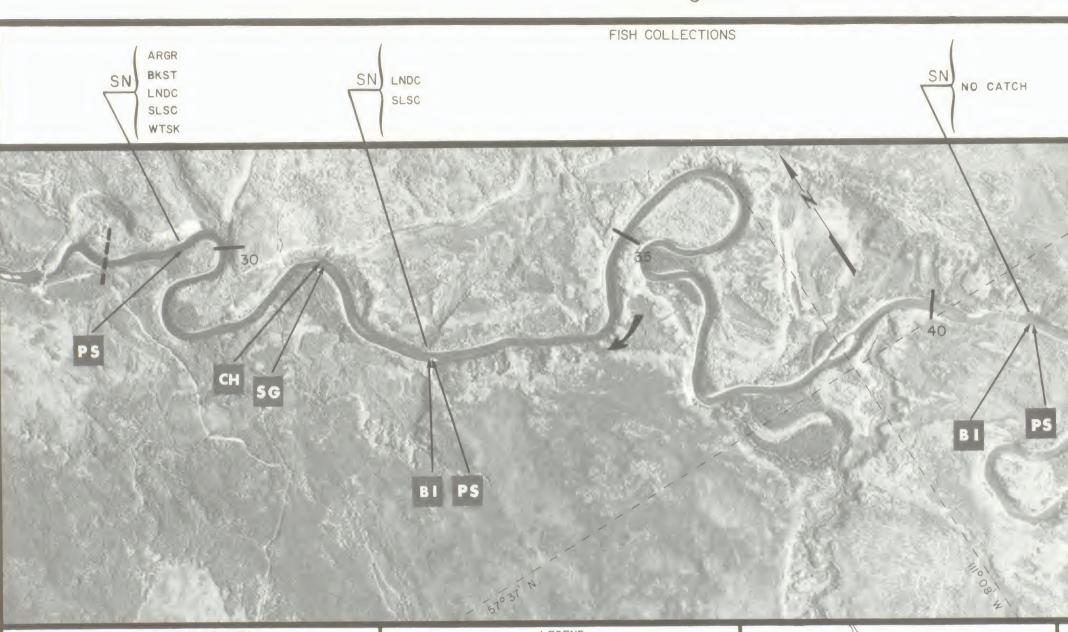
Data for the period January 1976 to December 1979 obtained from the National Water Quality Data Bank (NAQUADAT).

AQUATIC BIOPHYSICAL INVENTORY FIREBAG RIVER Reach 2 (km 13.0 to km 45.5) abertan ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM

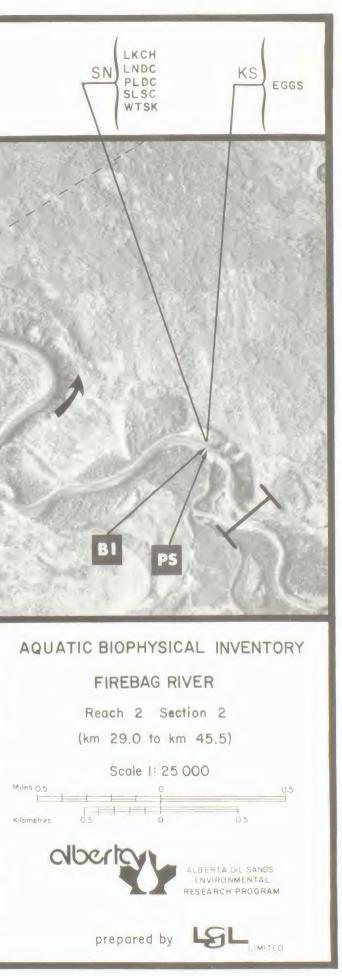
prepared by LIMITED







	POINT SAM	PLE DATA	4		LE	GEND			
location	km 29.5	km 33	km 41	km 45	AN inging		arctic grayling	}	R
Date	25/05/78	25/05/78	25/05/78	23/05/78	CF counting fence		brook stickleback		1e
Hydraulics					DN dipnet		brassy minnow	0-1	Margueri
"hannel width (m)	50	55	80	45	EF electrofisher		burbot		Marg)
wet width (m)	50	55	80	45	GN gill net		Dolly Varden		\sim
maximum depth (m)	ND	ND	ND	ND	KS kick sample		unidentified tish eggs	-112L ~	
average depth (m)	20	1.0	1.0	1.0	EF amol fish collections made		emerald shiner		
verocity (m/s)	0.80	0.80	0.90	1.40	using a combination of methods		flathead chub	4/ ~	200
fliw harocler	placid,	owirling	swirling,	rolling,	SN seine		finescale dace	N 11	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
	swirling		rolling	broken	AP benthic algal productivity station		falhead minnow		2.2
Substrate Composition 1%)							goldeye		R
fines (< 2mm)	80	40	30	25	BI benthic invertebrate collection site		lake chub		
gravels (2-64mm)	20	30	20	15			lake cisco	R)) McClello	and S
larges(>64mm)	0	30	50	60	CH. water quality station		lake whitefish	G// ~ Lo	
bedrock and/or bill sand	0	0	0	0			Engnose dace	5// 5	1
Bonk					PS point sample		longnose sucker	All C	man 1
height(m)	4.5	0.8	1,5	2.0			mountain whitefish	8/1	
form	repose	ND	repose	repose	SG stream gauging station		northern redbelly dace	V	2 er
stability	stable	ND	stable	stoble		NSST	nnespine slickleback		- mental
texture	sand	sand,	sand,	sand	35 kilometres from mouth	NTPK	northern pike	₹ / Bitumount	2
		CIQY	clay			PIDE	pearl dace	K)	}
vegetation 1% coverage)					tlow direction		slimy sculpin	5)
conferous trees	30	40	60	45		SPSC	spoonhead sculpin	A	/
deciduous trees	20	30	30	25	T reach acundary	EPSH			1
Shrubs	15	15	20	55			trout-perch		(
grasses	15	20	20	30	upstream limit of survey		unidentified Tucker species		
Darren	10	0	0	0			walleye		
Nater Quality				100	division between sections of	WTSK			
temperature (PE)	11.0	11.0	11.0	12.0	o reach	TPR	yellow perch	Fort MacKay	0 5 0
dissolved oxygen (mg/1)	ND	ND	ND	ND					тнннн
conductivity (umhos. cm)	ND	ND	ND	ND					Kilometres
PH	ND	ND	ND	ND					Kitometres



NUMBERS OF FISH COLLECTED (1978)

	1			Juveniles and Young-of-the-year		Total Numbers	
Species	May	September	May	September	May	September	
arctic grayling	1	1	1	0	2	1	
lake chub	0	0	136	381	136	381	
longnose dace	0	0	0	19	0	19	
longnose sucker	5	1	56	10	61	11	
northern pike	0	2	0	0	0	2	
pearl dace	0	0	13	0	13	0	
slimy sculpin	0	0	0	3	0	3	
trout-perch	0	0	11	0	11	0	
unidentified suckers	0	0	0	20	0	20	
white sucker	0	0	251	27	251	27	
Total	6	4	468	460	474	464	

PHYSICAL CHARACTERISTICS

Reach length (km)	6.5
Channel width (m)	45
Channel area (ha)	29.3
Gradient (m/km)	1.9
Flow character	rolling
Total pools (%)	50
Pattern	irregular
Confinement	frequently confined
Unstable banks (%)	20
Substrate composition (%)	
fines (<2 mm)	10
gravels (2-64 mm)	25
larges (>64 mm)	60
bedrock and/or oil sand	5
Debris	low

REACH DESCRIPTION AND FISH UTILIZATION

This section is a short, irregularly meandering reach. River banks are up to 40 m high and unstable areas are common. Water velocities and gradient are moderately high. Flow character throughout the reach is almost entirely rolling, and pools comprise about half of the total reach area. Larges (rubble and boulders) and gravels are dominant substrates. Deciduous trees form the dominant component of the riparian vegetation, and coniferous trees, deciduous shrubs and grasses are all present in smaller amounts. Some vegetation overhangs the river.

The potential of this reach for spawning is considered to be good or excellent for most fish that occur in the river, because it contains a diversity of substrate sizes, current velocities and water depths. Unidentified fish eggs, collected in late May, provided proof of spawning in the reach. Adults of arctic grayling and longnose sucker, both spring spawners, were captured in May. The combination of occasional grassy shallow backwaters, areas shaded by overhanging vegetation, and substrate composed of gravels and larges provides good rearing areas for most fish species in the river. Large numbers of young lake chub, white sucker and longnose sucker were captured in this reach. Most young forage fish prefer the quiet sheltered areas, whereas young arctic grayling prefer rocky substrates. The areas of overhanging riparian vegetation and the numerous pools provide good resting and feeding areas for larger fish. The high numbers of forage fish, particularly lake chub, provide a good food source for piscivorous fishes. Although there are many pools in this reach, the relatively shallow water depths may preclude overwintering of fish.

BENTHIC INVERTEBRATES OLIGOCHAETA GASTROPODA Physa PELECYPODA Musculium INSECTA Ephemeroptera Baetis Rhithrogena Stenonema Odonata Ophiogomphus Plecoptera Isoperla Trichoptera Cheumatopsyche Glossosoma Hydropsyche Diptera Chironominae Tanypodinae Orthocladiinae Rhagionidae Atherix	RIPARIAN VEGETATIONBank coverage (%) Coniferous trees20 Deciduous trees40 ShrubsShrubs20 Grasses20 Barren0Channel cover (%) Overhang2 Crown0	BENTHIC ALGAL PRODUCTIVITY No data available for this reach	STREAM GAUGING DATA No data available for this reach	WATER QU No d
				AQU
	A placid section at km 51.5 near	the upper boundary of reach 3.		

JALITY

data available for this reach

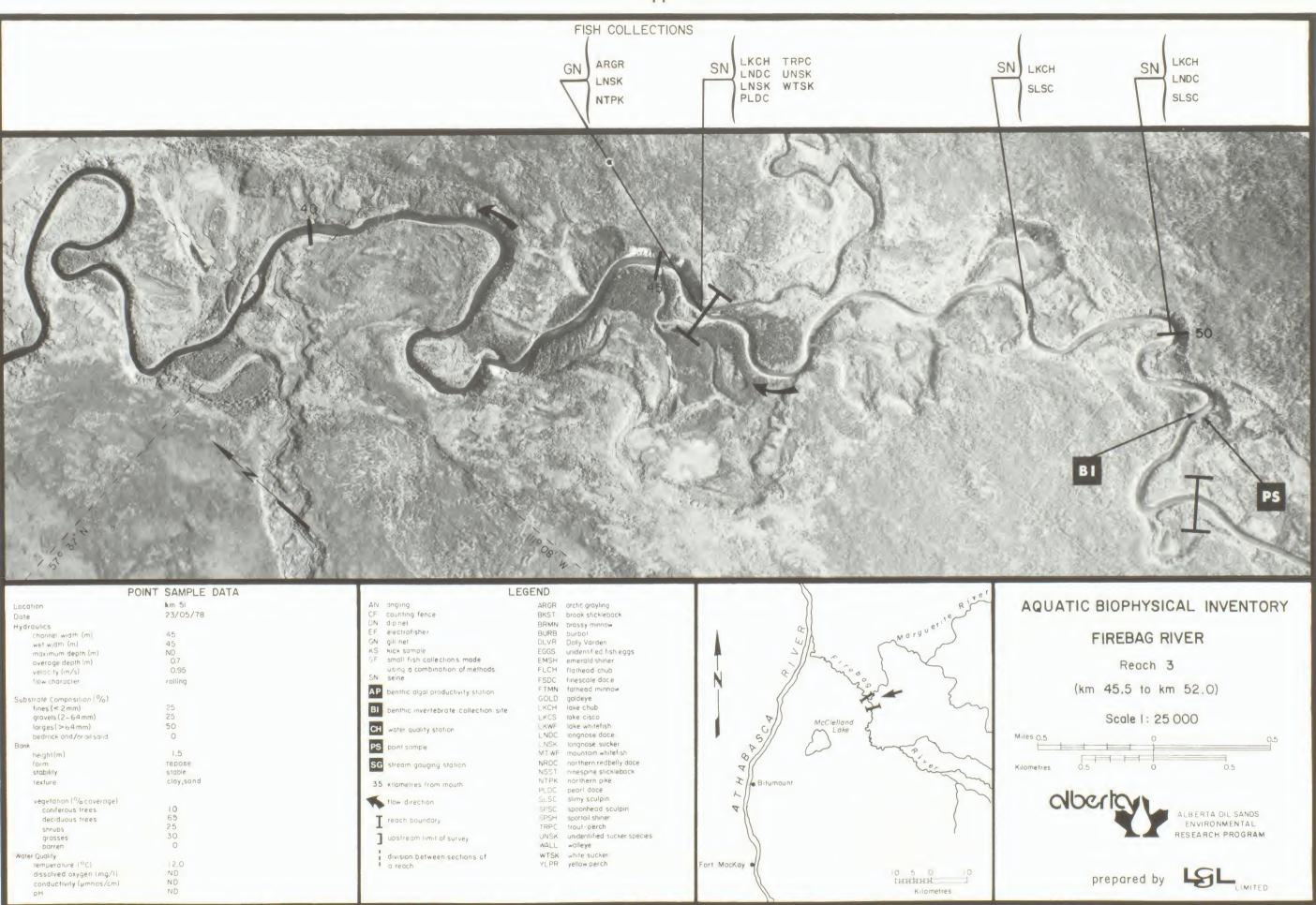
JATIC BIOPHYSICAL INVENTORY

FIREBAG RIVER

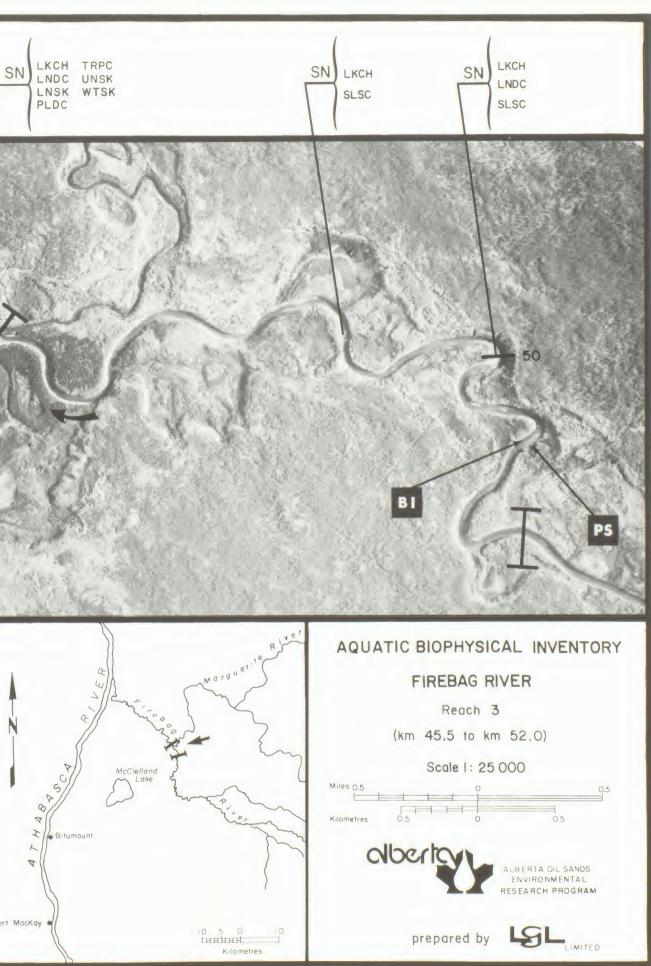
Reach 3 (km 45.5 to km 52.0)



prepared by LSL



PO	INT SAMPLE DATA	LEGEND	
Location	km 51	AN angling ARGR arctic grayling	
Date	23/05/78	CF counting fence BKST brook stickleback	1
Hydraulics		DN dipinet BRMN brassy minnow	
channel width (m)	45	EF electrofisher BURB burbot	
wet width (m)	45	GN gill net DLVR Dolly Varden	1 4
maximum depth (m)	ND	KS kick sample EGGS unidentified fish eggs	
average depth (m)	0.7	SF small fish collections made EMSH emerald shiner	
velocity (m/s)	0.95	using a combination of methods FLCH flathead chub	0
flow character	rolling	SN seine FSDC finescale dace	
		AP benthic algal productivity station FTMN fathead minnow	
Substrate Composition (%)		GOLD goldeye	
fines (< 2mm)	25	BI benthic invertebrate collection site LKCH lake chub	
gravels (2-64mm)	25	LKCS lake cisco	(/8
larges(>64mm)	50	CH water quality station	c.//
bedrock and/or oil sarid	0	LNDC longnose dace	5
Bank		PS point sample	P//4
height(m)	1.5	MTWF mountain whitefish	01
form	repose	SG stream gauging station NRDC northern redbelly dace	.//
stability	stable	NSST ninespine stickleback	V (
texture	clay, sand	35 kilometres from mouth NTPK northern pike	I Bitumou
		PLDC pearl date	
vegetation (% coverage)		flow direction SLSC slimy sculpin	~ []
coniferous trees	10	SPSC spoonhead sculpin	7 ((
deciduous trees	65	T reach boundary SPSH spottail shiner	
shrubs	25	TRPC trout-perch	
grasses	30	upstream limit of survey UNSK unidentified sucker species	
barren	0	WALL wolleye	
Water Quality		division between sections of WTSK white sucker))
temperature (°C)	2.0	o reach YLPR yellow perch	Fort MacKay
dissolved oxygen (mg/l)	ND		7(
conductivity (umhos/cm)	ND		
pH	ND		
P.I.			1



NUMBERS OF FISH COLLECTED (1978)

	,	Adults		Juveniles and Young-of-the-year		Total Numbers	
Species	May	September	May	September	May	Septembe	
arctic grayling	3	0	3	0	6	0	
lake chub	0	0	0	1 32	0	1 32	
longnose dace	0	0	0	50	0	50	
longnose sucker	2	0	1	23	3	23	
ninespine stickleback	0	0	0	2	0	2	
northern pike	0	4	0	0	0	4	
pearl dace	0	0	0	10	0	10	
slimy sculpin	0	0	2	3	2	3	
trout-perch	0	0	0	3	0	3	
unidentified suckers	0	0	0	5	0	5	
walleye	1	2	1	0	2	2	
white sucker	0	5	2	14	2	19	
Total	6	11	9	242	15	253	

RIPARIAN VEGETATION

Bank coverage (%)

PHYSICAL	CHARAC	TERIST	103
----------	--------	--------	-----

Reach length (km)	23.0
Channel width (m)	55
Channel area (ha)	126.5
Gradient (m/km)	1.0
Flow character	swirling
Total pools (%)	85
Pattern	irregularly meandering
Confinement	frequently confined
Unstable banks (%)	40
Substrate composition (2)	
fines (<2 mm)	15
gravels (2-64 mm)	35
larges (>64 mm)	40
bedrock and/or oil sand	10
Debris	moderate

STREAM GAUGING DATA

No data available for this reach

REACH DESCRIPTION AND FISH UTILIZATION

Due to river erosion of sand-clay and sand-bitumen cut banks, many of the river banks in this irregularly meandering reach are unstable. Water velocities and gradient are moderate. A high proportion of the reach is composed of pools, and the flow character is swirling throughout almost the entire reach. Larges (rubble and boulders) and gravels are dominant substrates. Deciduous trees dominate riparian vegetation, and grasses and deciduous shrubs overhand the channel. More debris is found in this reach than in any other surveyed in the Firebag River.

Because of the diversity of substrate sizes, current velocities and water depths, the spawning potential of this reach for most fish that are found in the river is considered to be good to excellent. Unidentified fish eggs were collected in gravelly shallows in late May and all adults captured in this reach in the spring were spent. Adult spring spawners captured here in the spring include arctic grayling, longnose sucker and walleye. Rearing potential for most young fish is considered to be good because of the presence of areas sheltered by overhanging vegetation, rocky substrates and moderate quantities of debris. Young lake chub and longnose dace were particularly numerous in this reach. The high number of pools and areas shaded by overhanging vegetation provide good feeding and resting areas for larger fish. Sheltered backwaters inhabited by forage fish, particularly lake chub, provide good feeding areas for walleye and northern pike. Although pools compose a high percentage of the total reach area, water depths are shallow and fish overwintering is probably limited to isolated deep pools.

NEMATI	ODA
PELEC	YPODA
	Sphaerium
INSEC	
Ephe	emeroptera
	Baetis
	Ephem rella
	Thithrogena
0dor	nata
	Ophiogomphus
Plea	coptera
	Diura
	Isoperla
	Pteronarcys
Tri	choptera
	Brachycentrus
	Cheumatopsyche
	Hydropsyche
	Lepidostoma
	Potamyia
	eoptera
	lmidae
	tera
	ipulidae
C	hironomidae
	Chironominae
	Tanypodinae
	imuliidae
R	hagionidae
_	Atherix
E	mpididae

	Coniferous trees 10 Deciduous trees 70 Shrubs 20 Grasses 45 Barren 0 Channel cover (%) Overhang 2 Crown 0		
е			QUA
	Swirling flow character at km 60.5 is representative of reach 4.	Sand and clay bank at km 71.5.	

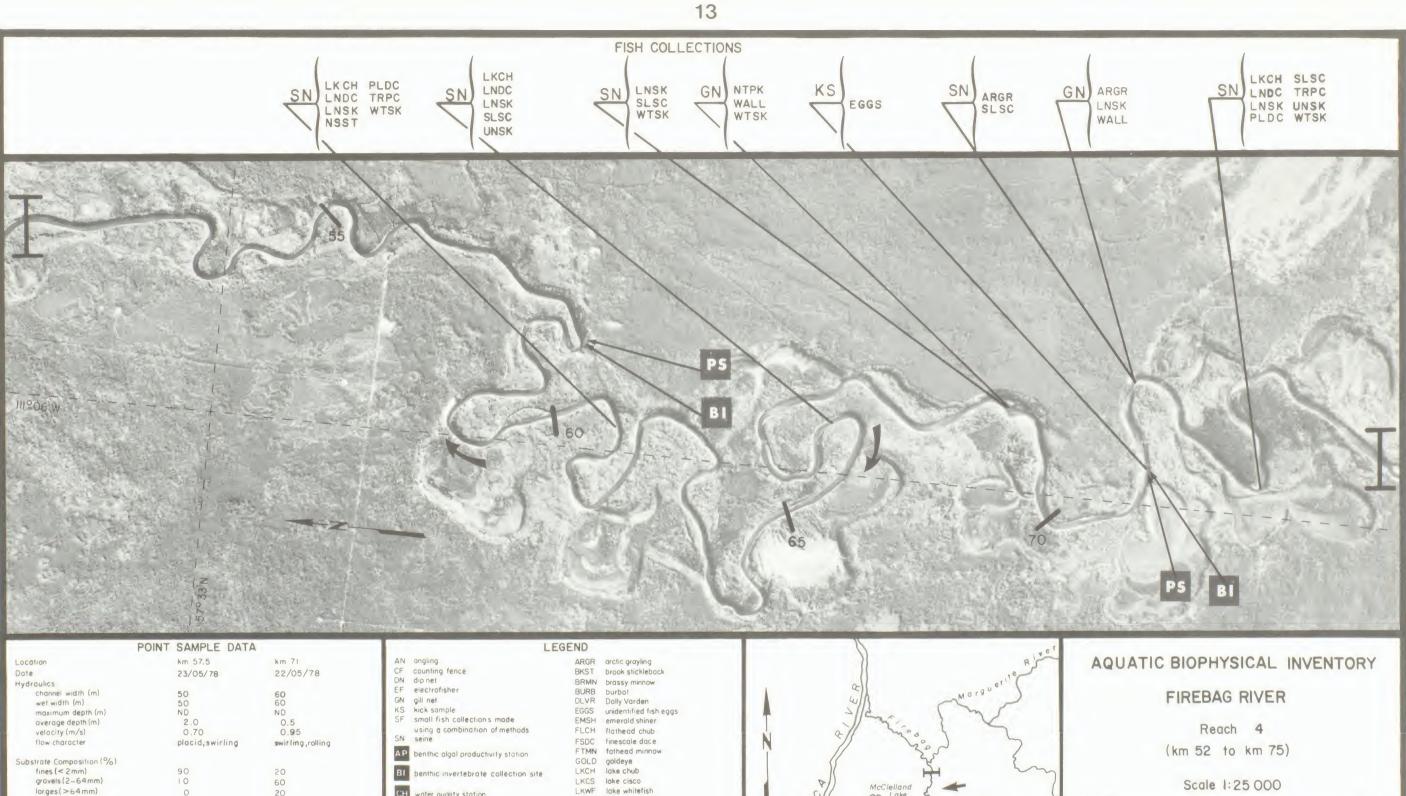
BENTHIC ALGAL PRODUCTIVITY

No data available for this reach

WATER QUALITY

No data available for this reach

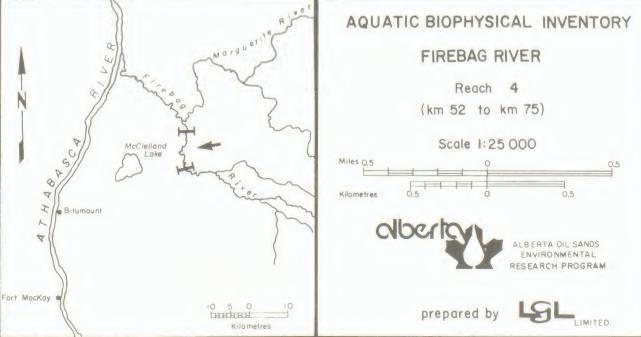




	POINT	SAMPLE DATA	
Location		km 57.5	km 71
Date		23/05/78	22/05/
Hydraulics			
channel width (m)		50	60
wet width (m)		50	60
maximum depth (m)		ND	ND
average depth (m)		2.0	0.5
velocity (m/s)		0.70	0.95
flow character		placid, swirling	swirling,r
Substrate Composition (%)			
fines (< 2mm)		90	20
gravels (2-64mm)		10	60
larges(>64mm)		0	20
bedrock and/or oil sand		0	0
Bank			
height(m)		3.0	1.0
form		repose	repose
stability		failing	failing
texture		sand	sand, clay oil sand
vegetation (% coverage)			
coniferous trees		10	45
deciduous trees		75	35
shrubs		15	20
grasses		25	25
barren		5	15
Water Quality			
temperature (°C)		12.0	13.0
dissolved oxygen (mg/l)		ND	ND
conductivity (µmhos/cm)		ND	ND
pH		ND	ND

		LEGENI
N	angling	AF
F	counting fence	BK
	dip net	BF
	electrofisher	BL
	gill net	DL
	kick sample	EG
F	small fish collections made	EN
	using a combination of methods	FL
N	seine	FS
P	benthic algal productivity station	FI
	control orger proceeding proceeding	G
31	benthic invertebrate collection site	LH
		LP
H	water quality station	LH
		L
°S.	point sample	
-		M
SG	stream gauging station	NF
		NS
35	kilometres from mouth	N.
_		PL
	flow direction	SL
-		SF
T	reach boundary	SP
-		TF
	upstream limit of survey	U
1		W
1	division between sections of	W
	a reach	YI

RGR	arctic grayling
ST	brook stickleback
RMN	brassy minnow
JRB	burbol
VR	Dolly Varden
GS	unidentified fish eggs
1SH	emerald shiner
CH	flathead chub
SDC	finescale dace
MN	fathead minnow
OLD	goldeye
KCH	lake chub
(CS	lake cisco
WF	lake whitefish
NDC	longnose dace
VSK	longnose sucker
TWF	mountain whitefish
RDC	northern redbelly dace
SST	ninespine stickleback
TPK	northern pike
DC	pearl dace
SC	slimy sculpin
PSC	spoonhead sculpin
PSH	spottail shiner
RPC	trout-perch
VSK	unidentified sucker species
ALL	walleye
TSK	white sucker
PR	yellow perch



HBERS OF FISH COLLECTED (1978)						PHYSICAL CHARACTERISTICS		REACH DESCRIPTION AND FISH UTI This reach is essentia
							Reach length (km)	21.0	of the reach area is compos
							Channel width (m)	50	Areas of unstable river ban
				eniles and			Channel area (ha)	105.0	Moderate water velocities a
		Adults	Young	-of-the-year	Tota	al Numbers	Gradient (m/km)	1.7	ter varies from swirling to
Species	May	September	May	September	May	September	Flow character	swirling, rolling broken	marily of larges and gravel
ctic grayling	0	3	0	35	0	38	Total pools (%)	25	grasses and deciduous shrub
athead chub	0	0	0	1	0	30	Pattern	irregularly meandering	The diversity of water
ke chub	0	0	0	12	0	12	Confinement	frequently confined	good spawning areas which a
ngnose dace	0	0	0	4	0	4	Unstable banks (%)	30	the Firebag River. Fine su
gnose sucker	0	0	0	2	0	2	Substrate composition (%)	-	and pearl dace and also pos
nern pike	0	4	0	1	0	5	fines (<2 mm)	10	in areas with fine substrate
t-perch	0	0	0	2	0	2	gravels (2-64 mm)	40	species found in the river
entified suckers	0	0	0	10	0	10	larges (>64 mm)	50	strates composed of gravels
e sucker	0	1	3	1	3	2	bedrock and/or oil sand	0	from an area with rubble and
1	0	8	-	(0)	_	7/	Debris	low	by overhanging riparian vege
al	0	0	3	68	3	76			provide good rearing areas
									river, and the abundance of young arctic grayling. Rela
							1		captured in this reach. Bac
									suitable areas for most larg
							1		areas provide good feeding h
									is limited to the few deep p
GASTROPODA Gyraulus PELECYPODA Musculium Sphaerium INSECTA Ephemeroptera Baetis Stenonema Plecoptera Claassenia Diura Isoperla Pteronarcys Trichoptera Cheumatopsyche Glossosoma Hydropsyche Lepidostoma		Bank covera Coniferou Deciduous Shrubs Grasses Barren Channel cov Overhang Crown	us trees s trees ver (%)	10 55 35 40 20 2 0	No data a	vailable for th	is reach	No data available for this re	ach
pleoptera Elmidae iptera Chironomidae Tanypodinae Simuliidae Tabanidae Rhagionidae <i>Atherix</i> Empididae	alt in all								Ad
						No.			

REACH DESCRIPTION AND FISH UTIL

TILIZATION

ially a riffle area. Only a relatively small proportion osed of pools, and waters are generally shallow. anks are numerous in this irregularly meandering reach. and gradient prevail in this reach and the flow characto rolling to broken. The substrate consists pri-

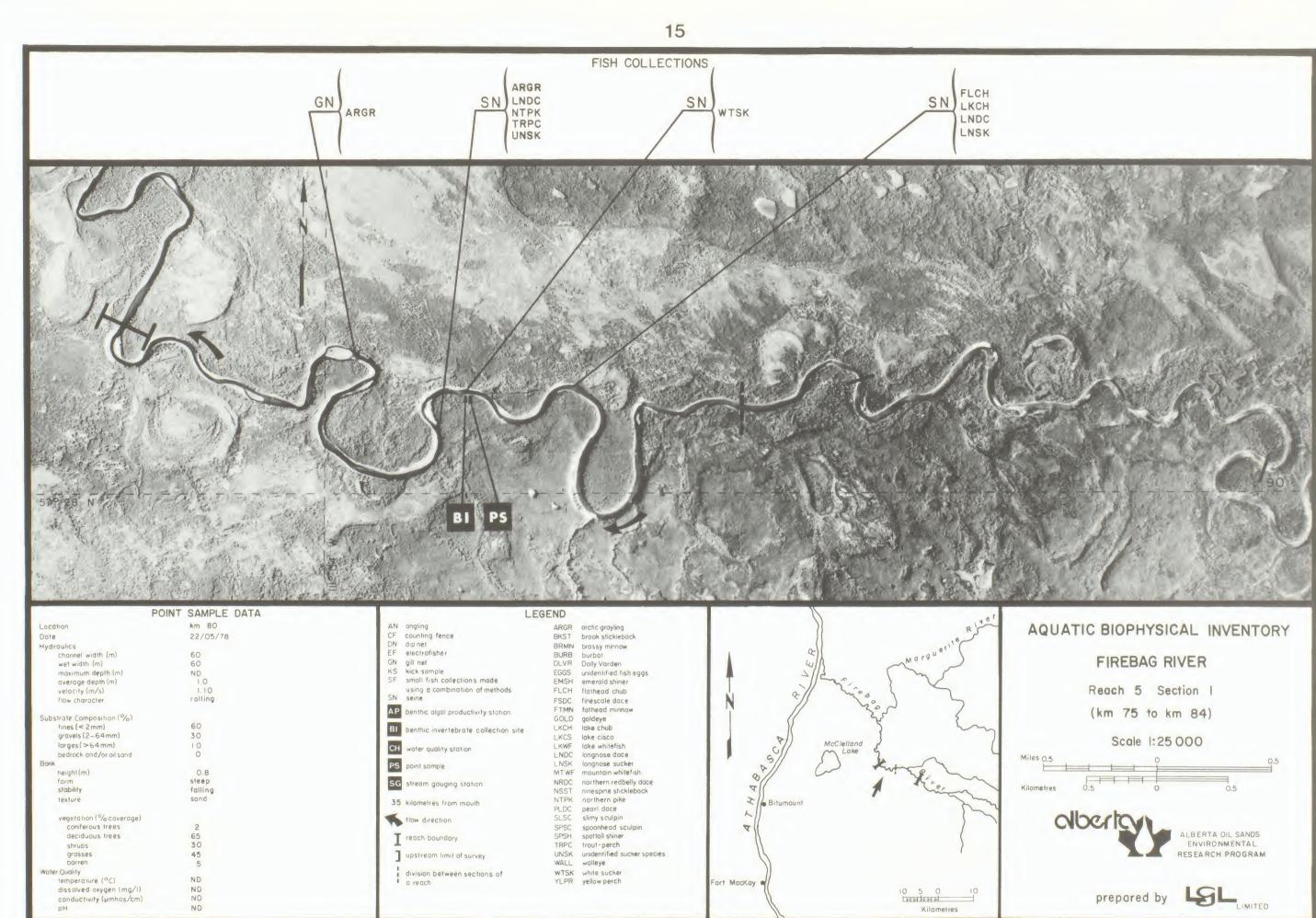
els. Riparian vegetation is mostly deciduous trees, ubs, some of which overhang the banks.

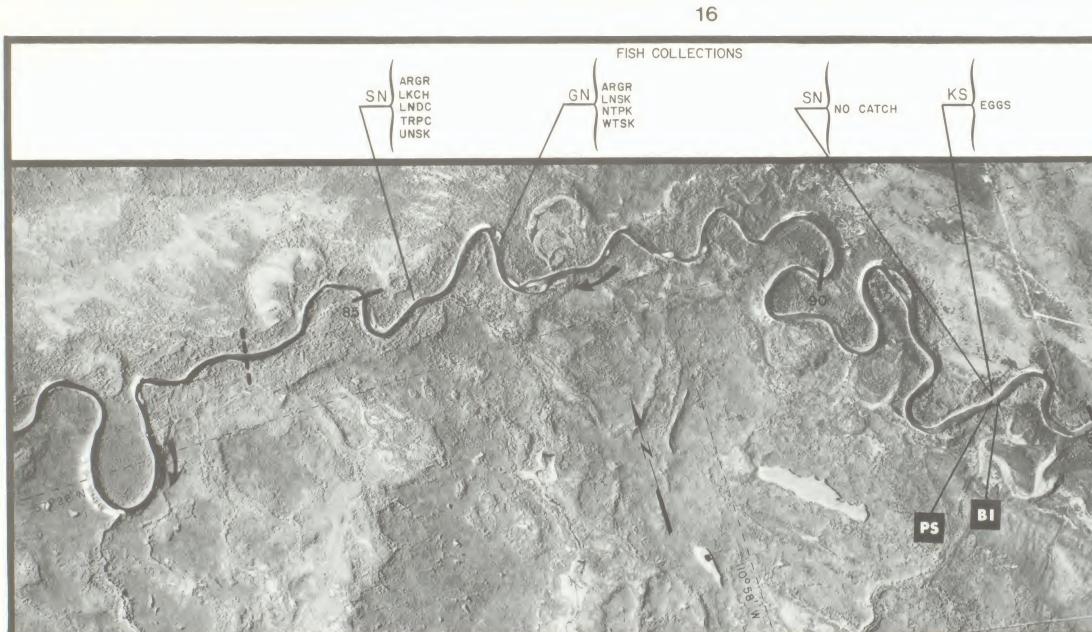
er velocities, water depths and substrate sizes provide are suitable for most fish species that are found in substrates are suitable for spawning of trout-perch ossibly for spawning of lake whitefish. Grassy shallows ates are suitable for northern pike spawning. All other (including arctic grayling) may spawn over the subls and larges. Unidentified fish eggs were collected and gravel substrates in this reach. Areas sheltered egetation, grassy shallows and sheltered backwaters for the young of most fish species in the of gravel and rubble substrates is excellent for elatively high numbers of young arctic grayling were Backwaters sheltered by overhanging vegetation are arger fish to rest and feed. The predominating riffle habitat for arctic grayling. Overwintering potential pools in the reach.

ATER QUALITY

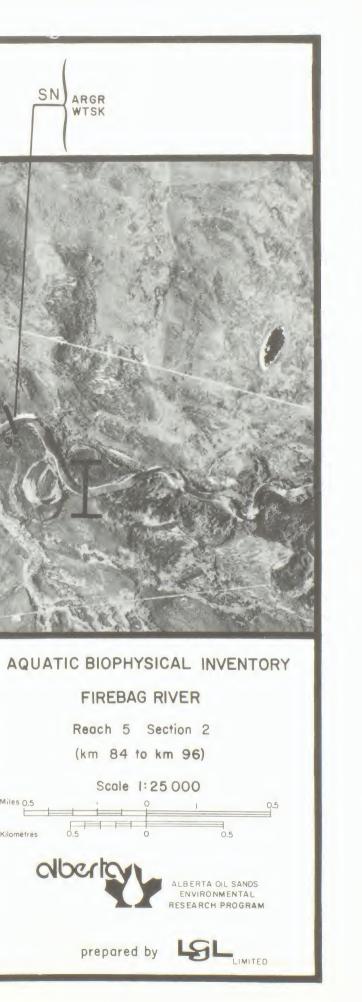
No data available for this reach







POI	NT SAMPLE DATA	LE	GEND		iver
Location Date Hydraulics	km 94 22/05/78	AN angling CF counting fence DN dipinet	ARGR arctic grayling BKST brook stickleback BRMN brossy minnow		Marguerile Rich
channel width (m) wet width (m) maximum depth (m) average depth (m)	55 55 ND 0.4	EF electrofisher GN gill nel KS kick sample SF small fish collections made using a combination of methods	BURB burbot DLVR Dolly Varden EGGS unidentified fish eggs EMSH emerald shiner	il il contra	Morgo
velocity (m/s) flow character Substrate Composition (%)	0.90 rolling,broken	SN seine AP benthic algal productivity station	FLCH flathead chub FSDC finescale dace FTMN falhead minnow GOLD goldeye	N & measure	2 2
fines (< 2 mm) gravels (2-64 mm) larges (>64 mm)	20 50 30	BI benthic invertebrate collection site CH water quality station	LKCH lake chub LKCS lake cisco LKWF lake whitefish	McClelland CLake	m
bedrock and/or oil sand Bank height(m) form	0.3 repose	PS point sample SG stream gauging station	LNDC longnose dace LNSK longnose sucker MTWF mountain whitefish NRDC northern redbelly dace	8 ⁵ 2 Au	the and
stability Texture	stable ND	35 kilometres from mouth	NSST ninespine stickleback NTPK northern pike PLDC pearl dace		and the second
vegetation (% coverage) coniferous trees deciduous trees shrubs	10 75 25	flow direction I reach boundary	SLSC slimy sculpin SPSC spoonheid sculpin SPSH spottail shiner TRPC trout-perch	7	
grasses barren Water Quality	30 0	upstream limit of survey	UNSK unidentified sucker species WALL walleye WTSK white sucker	5	
temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)	I 3.0 ND ND	a reach	YLPR yellow perch	Fort MacKay	10 5 0 10



Species arctic grayling lake chub	Мау	Adults		eniles and of-the-year			Reach length (km) Channel width (m)	27.0 30	th t was surveyed zone with the occa
arctic grayling			roung		Tota	al Numbers	Channel area (ha)	81.0	This reach has the
arctic grayling		September	May	September	May	September	Gradient (m/km) Flow character	3.3 rolling, broken	the surveyed port character is rolli
	1	1		47	4	48	Total pools (%)	30	pools. As in Read
	1	0	3	4 /	0	1	Pattern	irregularly meandering	strate material. channel in some a
ongnose dace	0	0	1	5	1	5	Confinement	unconfined 5	The potentia
ongnose sucker	0	1	1	0	1	1	Unstable banks (%) Substrate composition (considered to be
inespine stickleback	0	0	0	2	0	2	fines (<2 mm)	10	areas for norther
orthern pike	5	7	0	12	5	19	gravels (2-64 mm)	30	are excellent spa
limy sculpin	0	0	2	5	2	5	larges (>64 mm)	60	Walleye in the re
rout-perch	0	0	0	1	0	1	bedrock and/or oil sa		northern pike and
inidentified suckers	0	0	0	31	0	31	Debris	low	potential for spo
alleye	2	0	0	0	2	0	Debris	TOW	arctic grayling w
white sucker	0	8	0	1	0	9			northern pike wer
		17		105	15	122	1		riffle areas shou
Total	8	17	7	105	15	122			northern pike and
Ephemeroptera Stenonema Trichoptera Ceraclea Cheumatopsyche Glossosoma Polycentropus		Grasses Barren Channel co Overhang Crown		25 0 2 0					
Coleoptera Elmidae Diptera Tipulidae Chironomidae Chironominae Tanypodinae Orthocladiinae								Man and a second	M
					1.100	Sector Sector	States and the states of the s	and the second sec	

ISH UTILIZATION

the most upstream reach of the portion of the Firebag River meanders irregularly and is pri arily an extensive riffle ional moving pool. The river banks are generally stable. steepest gradient and highest water velocities encountered in of the Firebag River. Waters are shallow and the flow and broken. A relatively small proportion of the reach is 5, gravels and larges are the dominant components of the subciduous shrubs dominate riparian vegetation and overhang the

of this reach for spawning of both sport and forage fish is cellent. Numerous grassy side sloughs provide good spawning ike and some forage fish. The many areas with rocky substrates ng areas for arctic grayling and some species of forage fish. may spawn in a variety of areas. (Adult arctic grayling, lleye were captured in the spring in this reach.) Rearing fish is considered to be excellent; many young-of-the-year captured in shallow gravel riffles, and young-of-the-year aptured in weedy areas with sandy substrates. The gravelly provide excellent feeding areas for arctic grayling, and lleye can feed in the more placid backeddies and side sloughs. nter only in the deeper backwaters of the reach.

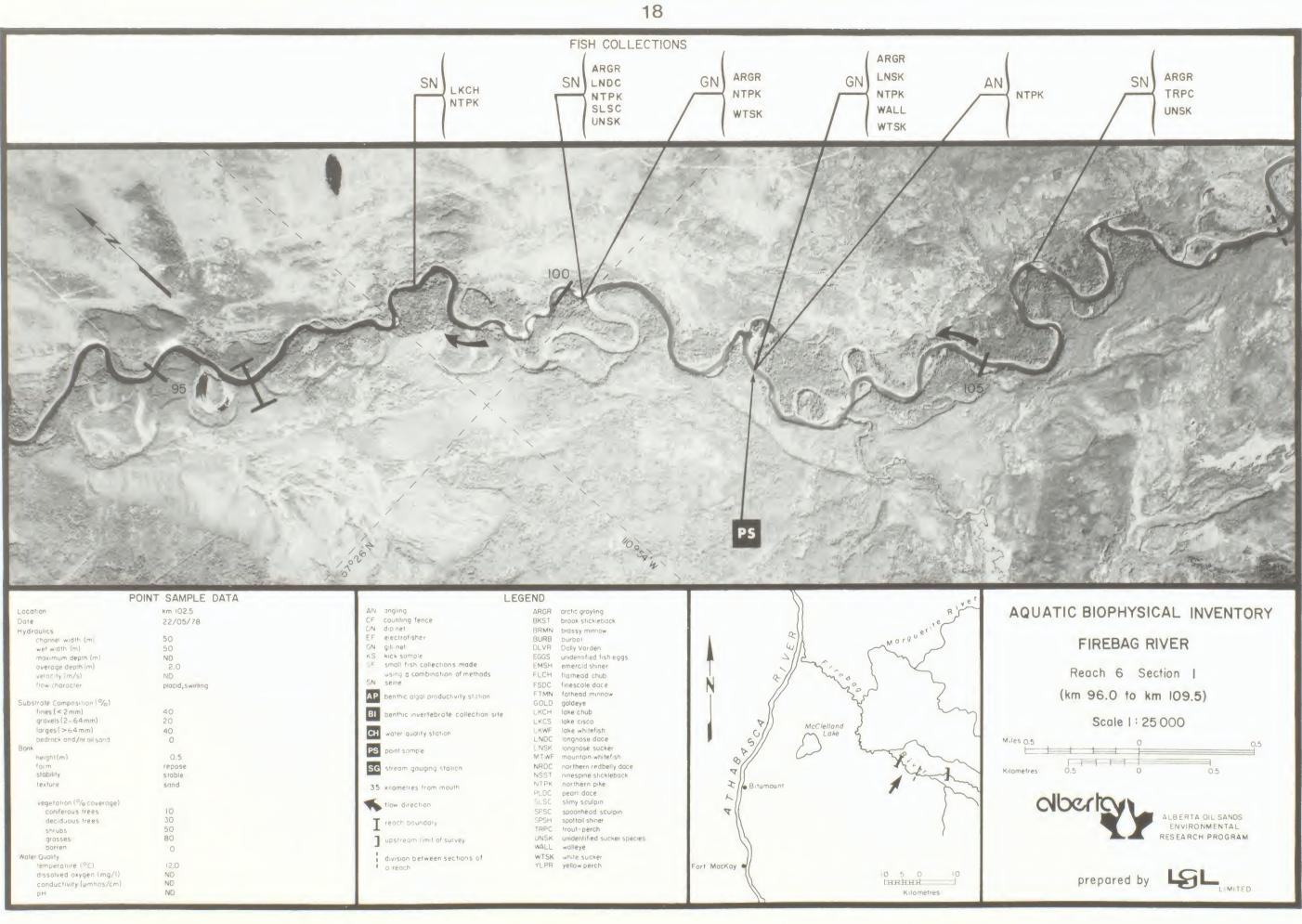
WATER QUALITY

No data available for this reach

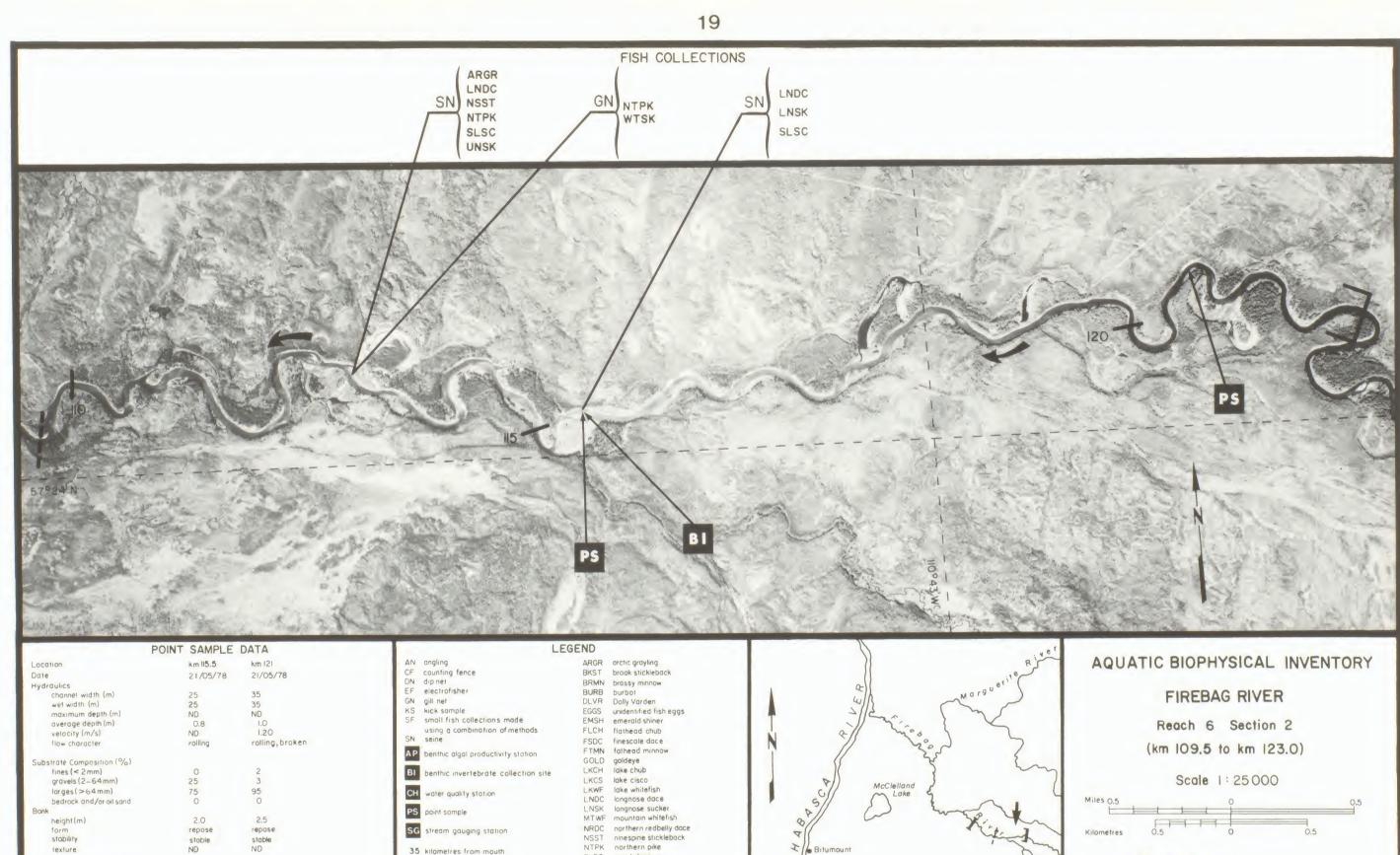


Reach 6 (km 96 to km 123)



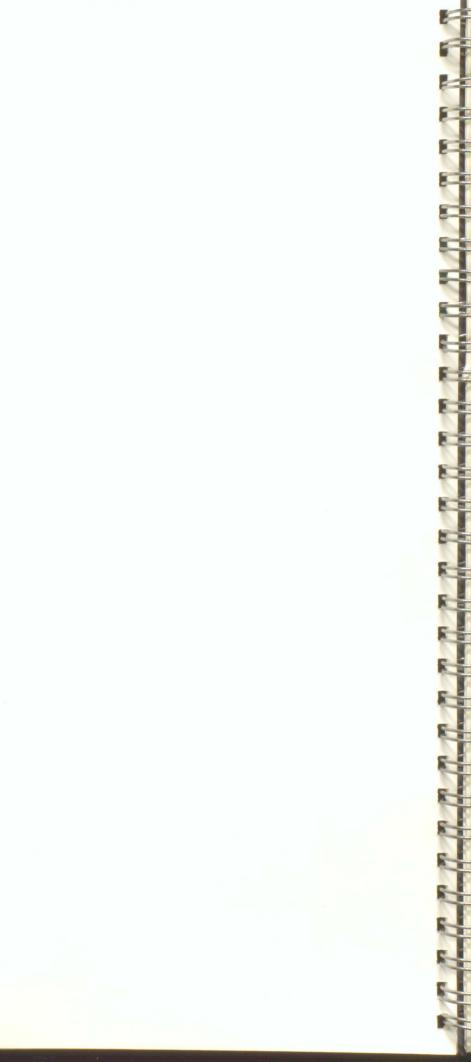


P	DINT SAMPLE DATA	LE	GEND			, er
Location	km 102.5	AN angling	ARGR arc	ctic grayling		R'
Date	22/05/78	CF counting fence		ook stickleback		Morguerite
Hydraulics		DN dipinet	BRMN bro	assy minnow		011
channel width (m)	50	EF electrofisher		rbot		u g r g u
wet width (m)	50	GN gill net	DLVR Do	olly Vorden	4/3	M
maximum depth (m)	ND	KS kick somple		identified fish eggs	2/12	(m C
overage depth (m)	2.0	SF small fish collections made	EMSH en	nercld shiner	T	
velocity (m/s)	ND	using a combination of methods	FLCH flo	athead chub		mes 1
flow character	placid, swirling	SN seine	FSDC fin	nescale dace		Joe J
		AP benthic algal productivity station	ETMN fo	thead minnow		205
Substrate Composition 1%)		bernine algur productivity station	GOLD go	oldeye		5
fines (< 2mm)	40	BI benthic invertebrate collection site	LKCH lat) m
gravels (2-64mm)	20	Dennic invertebrate conection site	LKCS lak	ke cisco		}
larges(>64mm)	40	CH water quality station		ke whitefish	Mc	Clelland
bedrock and/or oil sand	0	Chi water quality station	LNDC for	ngnose dace	s// s	Loke 2
Bank		PS point sample	LNSK IO	ngnose sucker	RII Com	
height(m)	0.5	Point sumple	MTWF me	ountain whitefish	8×11 ~	The has
form	repose	SG stream gauging station	NRDC no	orthern redbelly dace	-//	Nº 4
stability	stable	Sincern grouping states	NSST nir	nespine stickleback	7	things I
lexture	sand	35 kilometres from mouth	NTPK no	orthern pike	₹ / Bitumount	1 - James
		55 kilometres from filotos	PLDC pe	earl dace	~ II	·
vegetation (% coverage)		flow direction	SLSC sli	imy sculpin	~()	
coniferous trees	10		SPSC sp	poonhead sculpin	7 (
deciduous trees	30	T reach boundary		oottail shiner		(
shrubs	50	T	TRPC tro			
grasses	80	upstream limit of survey		hidentified sucker species		
borren	0		WALL wo	alleye		
Water Quality		division between sections of		hite sucker		
temperature (°C)	12.0	o reach	YLPR ye	ellowperch	Fort MacKay	
dissolved oxygen (mg/l)	ND					10 5 0 10
conductivity (umhos/cm)	ND					іннінні
pH	ND					Kilometres



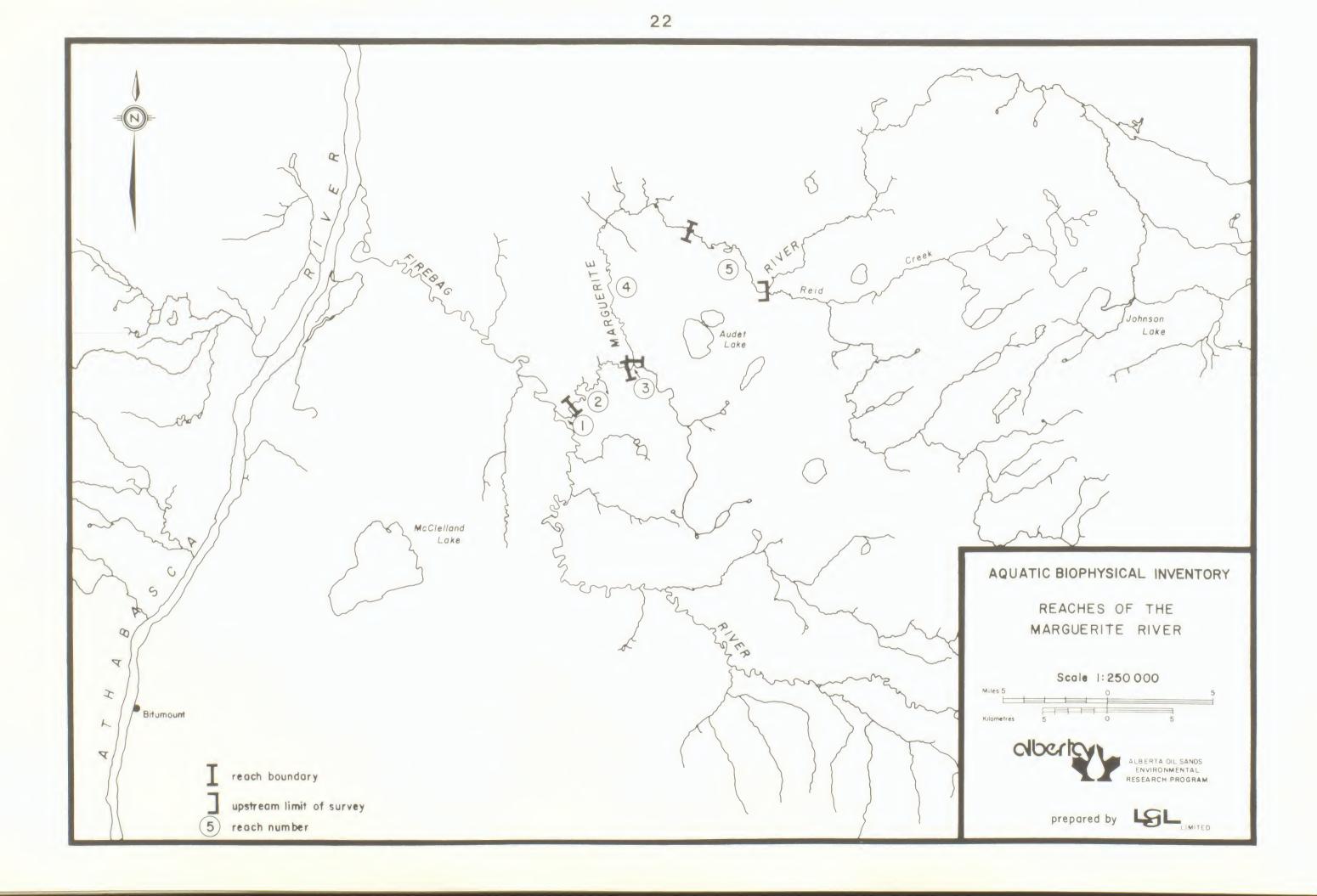
F	UNI SAMPLE	DATA	LE	GEND			
Location	km 115.5	km 121	AN angling CF counting fence	ARGR	arctic grayling brook stickleback	}{	R
Date	21/05/78	21/05/78	DN dipinet				Marguerite
Hydraulics			EF electrofisher		brassy minnow	2)(2	a ver (
channel width (m)	25	35	GN gill net		burbot		(Marg)
wet width (m)	25	35			Dolly Varden		
maximum depth (m)	ND	ND	KS kick sample SE small fish collections made	EGGS	unidentified fish eggs	-1/2	
average depth (m)	0.8	1.0			emerald shiner		n'a l
velocity (m/s)	ND	1.20	using a combination of methods	FLCH	flathead chub	4	mes 1
flow character	rolling	rolling, broken	SN seine		finescale dace	N 11	So a 7
			AP benthic algal productivity station		fathead minnow		24
Substrate Composition (%)				GOLD			Y S
fines (< 2mm)	0	2	BI benthic invertebrate collection site	LKCH	lake chub		2
gravels (2-64mm)	25	3		LKCS	lake cisco	R/)	IcClelland
larges (>64mm)	75	95	CH water quality station	LKWF	lake whitefish		~ Lake
bedrock and/or oil sand	0	0	Worer dourry station	LNDC	longnose dace	5/1 5	
Bank			PS point sample	LNSK	longnose sucker	P// C) man)
height(m)	2.0	2.5		MTWF	mountain whitefish	811	Se the
form	repose	repose	SG stream gauging station	NRDC	northern redbelly dace	T	124. 7
stability	stable	stable		NSST	ninespine stickleback	Y	wind
texture	ND	ND	35 kilometres from mouth	NTPK	northern pike	Z Bitumount	
			33 kilometres from mount	PLDC	pearl dace		1
vegetation (% coverage)			flow direction	SLSC	slimy sculpin		
coniferous trees	ND	30		SPSC	spoonhead sculpin	7	
deciduous trees	ND	20	T reach boundary	SPSH	spottail shiner		(
shrubs	20	10		TRPC	Irout-perch	//	>
grasses	70	70	upstream limit of survey	UNSK	unidentified sucker species		1
barren	0	0	_ up site date initial of solvey	WALL	walleye		
Water Quality	-	-	division between sections of	WTSK	white sucker		
temperature (°C)	ND	14.0	a reach		yellow perch	Fort MacKay	
dissolved oxygen (mg/l)	ND	ND	u reduit				10 5 0 10
conductivity (pmhos/cm)	ND	ND					тынны
pH	ND	ND					Kilometres
pn							





MARGUERITE RIVER





BERS OF FISH COLLECTED (19	978)					PHYSICAL CHARACTERISTICS Reach length (km)	3.0 40	REACH DESCRIPTION A A relativel the river banks
		Juv	veniles and			Channel width (m) Channel area (ha)	12.0	gradient is the A low proportion
	Adults	Young	j-of-the-year	Total	numbers	Gradient (m/km)	1.4 broken, tumbling	ter is primarily
Species	May Septemb		September	May	September	Flow character Total pools (%)	10	the river flows gravels and larg
arctic grayling	1 1 0 0	1	0 8	2	8	Pattern	irregular	riparian vegeta
lake chub longnose dace	0 0	0	13	0	13	Confinement	frequently confined	the channel.
longnose sucker	5 1	0	10	5	11	Unstable banks (%) Substrate composition (%)	10	The divers
orthern pike	0 2	0	0	0	2	fines (<2 mm)	10	are probably su
limy sculpin	0 0	0	1	0	1	gravels (2-64 mm)	25	River. Arctic spawn over the
rout-perch	0 1	0	7	0	8	larges (>64 mm)	45	either the rock
unidentified suckers	0 0	0	3	0	3	bedrock and/or oil sand	20	suckers, both s
white sucker	0 0	0	8	0	8	Debris	moderate	strates, modera
Total	6 5	1	50	7	55			rearing areas f
								are shaded by c of pools preclu
ITHIC INVERTEBRATES GASTROPODA Stagnicola PELECYPODA Musculium Sphaerium INSECTA Ephemeroptera Baetis Drunella Ephemera Paraleptophlebia Stenonema Plecoptera Pteronarcys Trichoptera Cheumatopsyche	Con Deci Shru Gras Barr Channe Over	overage (%) Ferous trees duous trees ses es en l cover (%) hang	20 40 20 40 0 5 0		PRODUCTIVITY ailable for thi		IREAM GAUGING DATA No data available for this r	reach

7

1

ISH UTILIZATION

nort reach, this section flows in an irregular pattern and relatively stable. Water velocities are the highest and and highest recorded in the surveyed portion of the river. the total reach area is composed of pools. The flow characken and tumbling, with occasional white-water rapids where limestone ledges. Substrate composition is varied, with redominating. Deciduous trees and grasses dominate the and there is a moderate amount of vegetation overhanging

substrate types in this reach provides spawning areas which e for many of the fish species found in the Marguerite ing, mountain whitefish, suckers, and some of the minnows may substrates, and the remaining species may spawn over the sandy substrates. Adult arctic grayling and longnose spawners, were captured here in the spring. The rocky subantities of debris, and overhanging vegetation provide some veral fish species. Young individuals of seven species were ch. Because of the relatively high water velocities and the resting and feeding potential for larger fish is con-Ithough some larger fish may inhabit areas near the banks which nging vegetation. Shallow water depths and the low number gnificant overwintering of fish in the reach.

WATER QUALITY

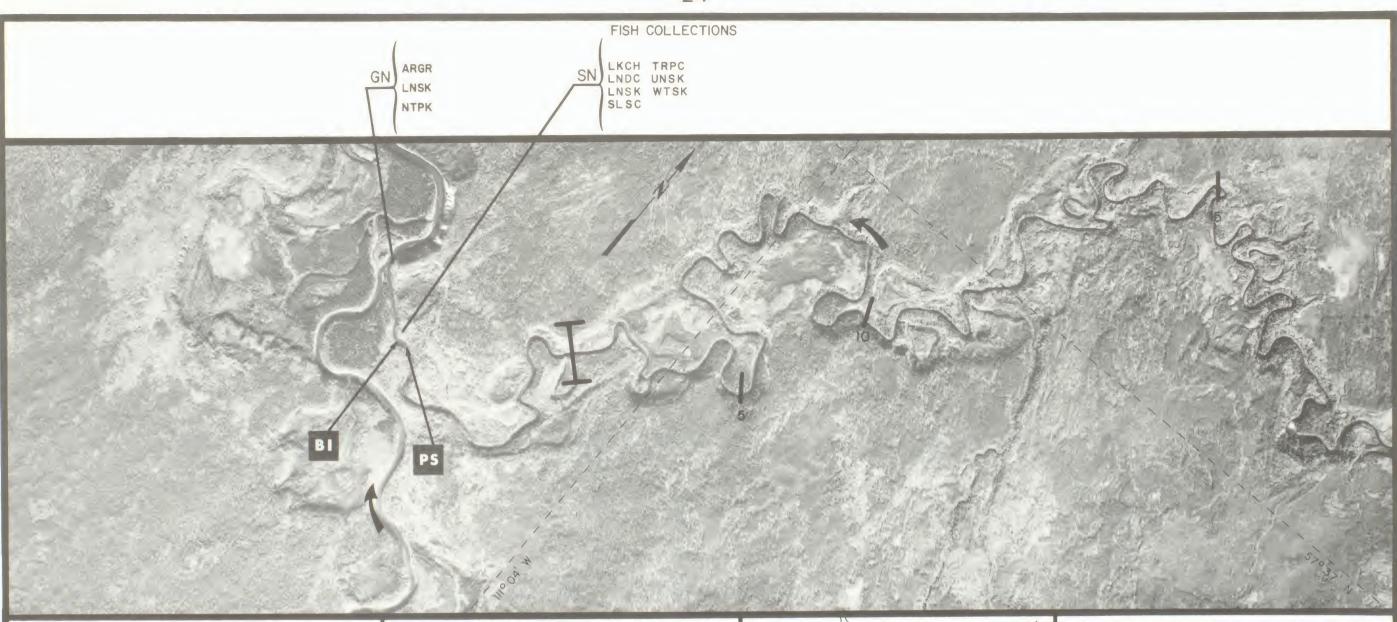
No data available for this reach

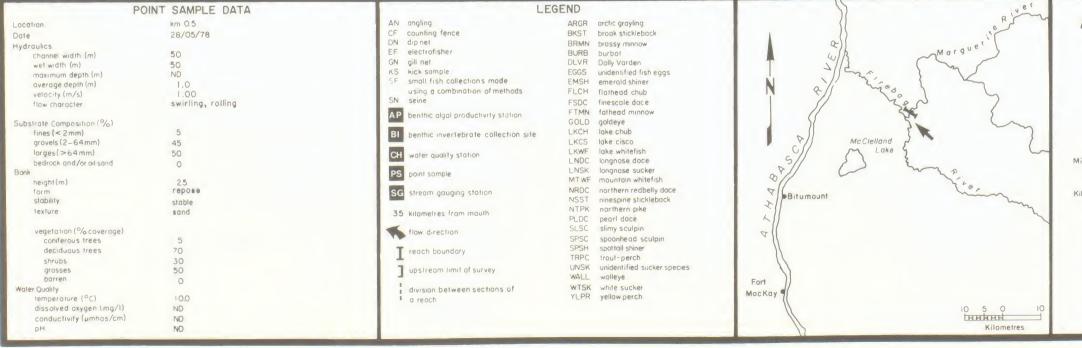
AQUATIC BIOPHYSICAL INVENTORY

MARGUERITE RIVER

Reach I (km O to km 3)







	(1978)						PHY	YSICAL CHARACTERISTICS		REA
								Reach length (km)	15.5	
								Channel width (m)	30	
		0.1.1.5.5		eniles and	Tet	1 Munhanta		Channel area (ha)	46.5	
		Adults	Young	-of-the-year	lot	al Numbers		Gradient (m/km)	0.8	
Species	May	September	May	September	May	September		Flow character	placid, swirling	
tic grayling	0	0	3	0	3	0		Total pools (⅔) Pattern	90 tortuously meandering	
ok stickleback	0	0	0	1	0	1		Confinement	confined	
chub	0	0	1	44	1	L4 L4		Unstable banks (%)	25	
nose dace	0	0	0	9	0	9		Substrate composition (4)	- /	
nose sucker	0	0	2	14	2	14		fines (<2 mm)	70	1
/ sculpin	0	0	0	4	0	4				
head sculpin	0	0	2	0	2	0		gravels (2-64 mm)	30	
t-perch	0	0	0	3	0	3		larges (>64 mm)	0	1
entified suckers	0	0			0			bedrock and/or oil sand	0	
		0	0	7 8		7 8		Debris	low	
e sucker	0		3	8	3					
1	0	0	11	90	11	90				
LECYPODA Museulium SECTA Hemiptera Corixidae Diptera			erage (%) cous trees ous trees			AL PRODUCTIVITY available for t	his react		REAM GAUGING DATA No data available for this re	each
LECYPODA Musculium SECTA Hemiptera Corixidae		Bank cove Conifer Deciduo Shrubs Grasses	erage (%) rous trees bus trees cover (%)	25 25 25 60			his react			each
NSECTA Hemiptera Corixidae Diptera Tipulidae Chironomidae Chironominae Tanypodinae		Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	erage (%) rous trees bus trees cover (%)	25 25 25 60 0			his reach			each

DESCRIPTION AND FISH UTILIZATION

This section is tortuously neandering and is essentially a long continuously wirling or placid pool. Gradient and water velocities are moderate. The subtrate is mostly fines with some gravels. Coniferous and deciduous trees and eciduous shrubs are all important components of the riparian vegetation, and rasses are abundant. A moderate a ount of vegetation overhangs the channel. The predominating sandy substrates provide areas suitable for spawning a few of the forage fish (e.g., trout-perch, pearl dace) found in the reach. reas with gravelly substrates which may be suitable for spawning of the other pecies found in the river are limited. "To adults were captured in this reach uring the study. Rearing potential is considered to be poor to moderate; the oderate amount of overhanging vegetation and the small amount of debris provide he only suitable areas. Young lake chub were the most abundant fish collected. oderate numbers of small forage fish and young of larger species captured in the each provide a food source for piscivores, such as northern pike. Resting and eeding potential for larger fish is considered to be good to excellent because the many pools in the reach. Overwintering potential is considered to be cellent because of the generally deep waters and large number of pools.

WATER QUALITY

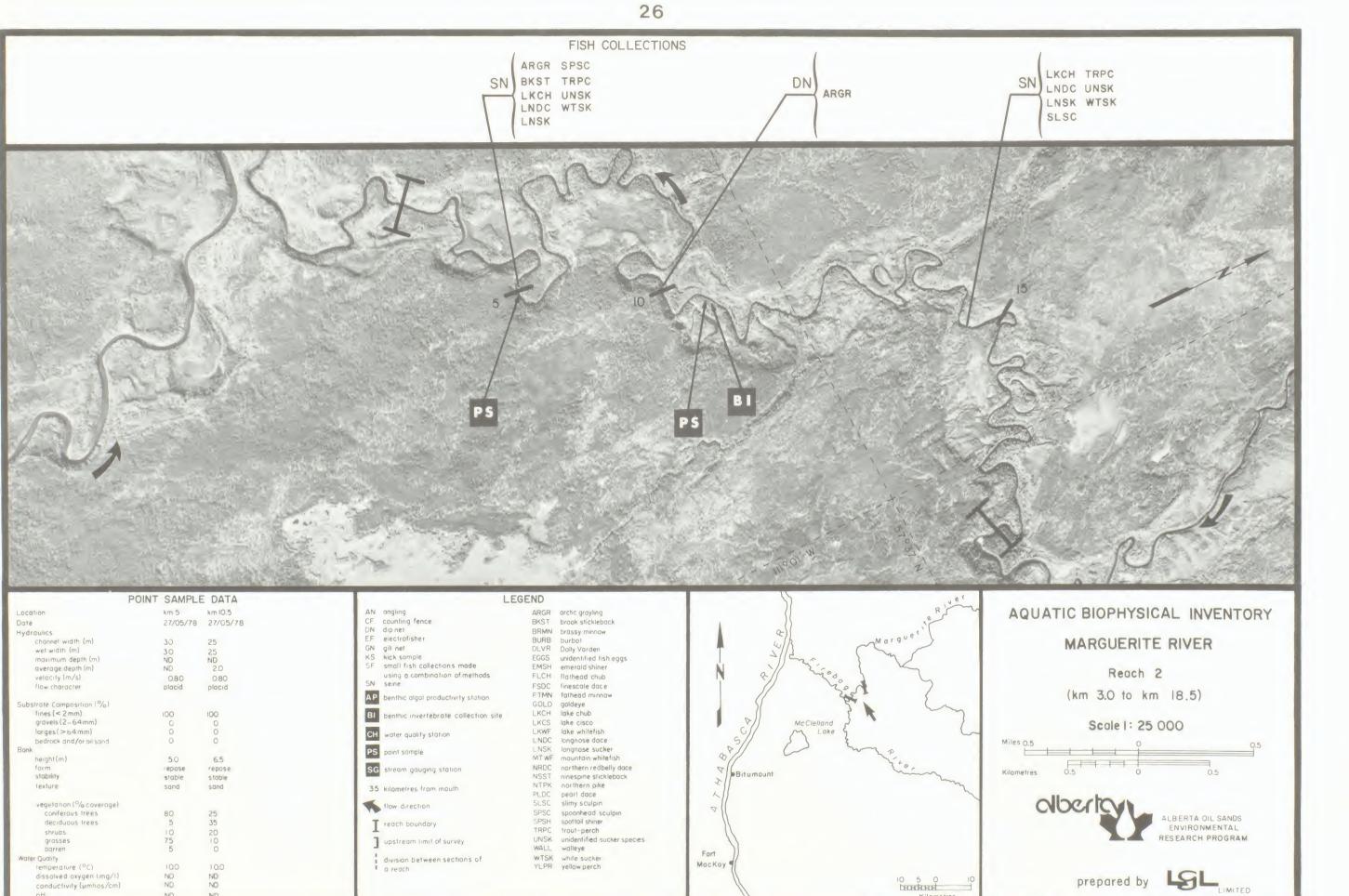
No data available for this reach

AQUATIC BIOPHYSICAL INVENTORY

MARGUERITE RIVER

Reach 2 (km 3.0 to km 18.5)







	(1978)						PHYSICAL CHARACTERISTICS		REACH DESCRIPTION AND F
							Reach length (km)	1.5	this reach is a
							Channel width (m)	25	of the Marguerite Ri
	A	dults		eniles and -of-the-year	Tota	al Numbers	Channel area (ha) Gradient (m/km)	3.8	the most abundant.
Species	May	September	May	September	May	September	Flow character Total pools (%)	broken, tumbling 10	tion of the channel Because the rea
arctic grayiing	0	0	5	4	5	4	Pattern	irregularly meandering	and water depths, sp
lake chub	0	0	0	3	0	3	Confinement	confined	The collection of un
longnose dace	0	0	1	2	1	2	Unstable banks ())	25	In the reach. Reari
longnose sucker	0	0	0	7	0	7	Substrate composition (8)		Substrates, Moderate
mountain whitefish northern pike	0	0	0	6	0	6	fines (<2 mm)	30	hanging vegetation.
slimy sculpin	0	1	13	47	0	2 48	gravels (2-64 mm)	15	aliny sculpin were e
trout-perch	0	0	15	0	13	48	larges (>64 mm) bedrock and/or oil sand	40	fish is considered t
unidentified suckers	0	0	0	1	0	1	Debris	15 moderate	under overhanging ve
white sucker	0	0	4	4	4	4	DEDITS	noderate	of pools li it the r depths and the low n
Total	0	- 3	24	74	24	77			heptins and the new h
ENTHIC INVERTEBRATES	F	RIPARIAN VEGETA	ATION	BE	ENTHIC ALGA	AL PRODUCTIVITY		AM GAUGING DATA	
ENTHIC INVERTEBRATES OLIGOCHAETA HIRUDINEA INSECTA Ephemeroptera Martie imminila Aphine mella consta Odonata Odonata Corixidae Trichoptera Coraziaa	Ē	Bank cover Coniferc	rage (%) Dus trees Us trees	25 25 25 25 0 10 0		AL PRODUCTIVITY available for th		AM GAUGING DATA No data available for this re	ach

1

No.

FISH UTILIZATION

a short section which is almost entirely riffles. Gradient water velocities the second highest in the serveyed portion River. Substrate type, are varied, with larves and fines being Coniferous and deciduous trues, deciduous shruls, and grasses components of the rinorian vegetation and a fairly high proporis covered by overhanging shrubs.

each contains a diversity of substrate sizes, current velocities, spauning potential is considered to be good to excellent. unidentified fish equs in late May provided proof of spawning ring potential is considered to be good because of the rocky te quantities of debris, and the relative abundance of uver-Young of eight fish species were captured in this reach and especially abundant. Resting and feeding potential for larger to be poor to moderate; the major suitable areas being those vegetation. Relatively high Water velocities and the low number resting and feeding potential for larger fish. Shallow water number of pools probably preclude overwintering of fish.

WATER QUALITY

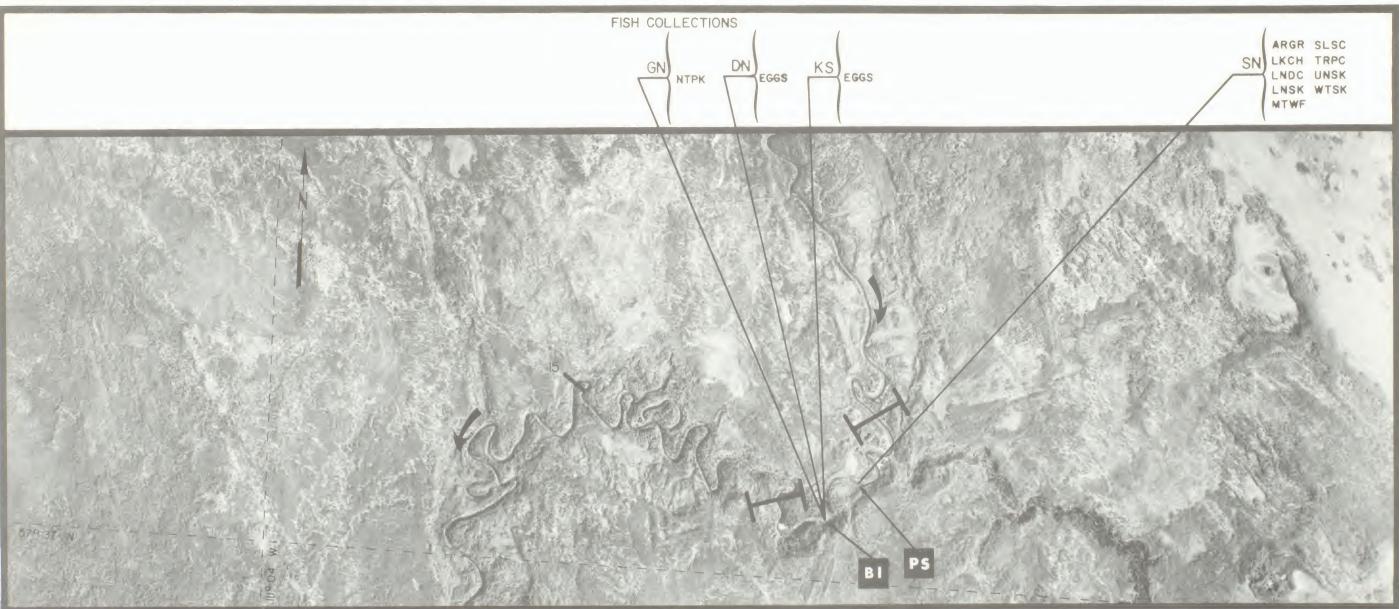
No data available for this reach

AQUATIC BIOPHYSICAL INVENTORY

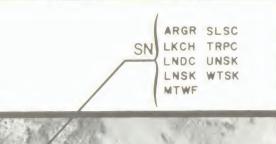
MARGUERITE RIVER

Reach 3 (km 18.5 to km 20.0)





	POINT SAMPLE DATA	LE	GEND	Ver
ocation	km 19.5	AN angling	ARGR arctic graying	R
Date	27/05/78	CF counting fence	BKST brook stickleback	
tydraulics		DN dipinet	BRMN brossy minnow	
channe width m	32	EF electrofisher	BURB burbot	() A Morguet
wetwidth (m)	32	GN gill net	DLVR Dolly Varden	
maximum depth (m)	ND	KS kick sample	EGGS unidentified fish eggs	2/1cm m S
average depth (m)	08	F small fish collections made	EMSH emerold shiner	
velocity m/s)	120	using a combination of methods	FLCH flathead chub	R &// ~~~~~
fic w haracter	broken	SN seine	FSDC finescale dace	1 Yo A 7
		AP benthic algal productivity station	FTMN fathead minnow	251
substrate Composition 1%)		bernic agar productivity station	GOLD goldeye	
fines (< 2mm)	50	BI benthic invertebrate collection site	LKCH lake chub	
gravels (2-64mm)	0	bennie interrebiete concentar site	LKCS lake cisco	V/ McClelland 2
larges(>64mm)	50	CH water quality station	LKWF lake whitefish	C/ m Loke g
bedrock and/or pillsand	0	where duality station	LNDC longnose dace	5/1 5 6
Bank		PS point sample	NSK longnose sucker	is a marine
height(m)	10	· · · · · · · · · · · · · · · · · · ·	MTWF mountain whitefish	
form	repose	SG stream gauging station	NRDC northern redbelly doce	8/
stability	stable		NSST ninespine stickleback	Bitumount
lexture	sand	35 kilometres from mouth	NTPK northern pike	X.
			PLDC pearl dace	
vegetation (% coverage)		tlow direction	SLSC slimy sculpin	2
coniferous trees	45		SPSC spoonhead sculpin	
deciduous trees	35	T reach boundary	5PSH spottail shiner	
shrubs	55		TRPC Irout-perch	
grasses	5	upstream limit of survey	UNSK unidentified sucker species	
barren	0		WALL walkeye	Fort
Water Quality		division between sections of	WTSK while sucker	MacKay
'emperature ("Ci	9.5	1 a reach	YLPR yellow perch	MUCRUY
dissolved oxygen (mg/l)				10 5 0 10
conductivity (umhos/cm)) NO			стания стани
pH	NO			Kilometres



AQUATIC BIOPHYSICAL INVENTORY

MARGUERITE RIVER

Reach 3 (km 18.5 to km 20.0)

Scale 1: 25 000



NUMBE	RS OF	FISH	COLLECTED	(1978)
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	,	Adults		eniles and -of-the-year	Total Numbers		
Species	May	September	May	September	May	Septembe	
arctic grayling	0	1	4	0	4	1	
brook stickleback	0	0	0	2	0	2	
lake chub	0	0	0	244	0	244	
longnose dace	0	0	0	1	0	1	
longnose sucker	0	0	1	15	1	15	
northern pike	0	2	0	0	0	2	
pearl dace	0	0	0	L ₄	0	4	
slimy sculpin	0	1	0	17	0	18	
spoonhead sculpin	0	0	1	1	1	1	
trout-perch	0	0	0	22	0	22	
unidentified suckers	0	0	0	8	0	8	
white sucker	0	2	0	34	0	36	
Total		6	6	348	6	354	

PHYSICAL CHARACTERISTICS

Reach length (km)	41.0
Channel width (m)	25
Channel area (ha)	102.5
Gradient (m/km)	0.4
Flow character	placid
Total pools (%)	90
Pattern	irregularly meandering
Confinement	occasionally confined
Unstable banks (%)	20
Substrate composition (%)	
fines (<2 mm)	90
gravels (2-64 mm)	0
larges (>64 mm)	10
bedrock and/or oil sand	0
Debris	high

REACH DESCRIPTION AND FISH UTILIZATION

This is the longest of the reaches in the surveyed portion of the Marguerite River, and it is essentially a long, irregularly meandering placid pool. Water velocities and gradient are the lowest in the surveyed portion of the river. Most of the substrate in the reach is fines, but larges are present in some areas. Riparian vegetation is dominated by coniferous trees and deciduous shrubs and a relatively high proportion of the channel area is covered by overhanging vegetation. Large quantities of debris are present in this reach. The substrate material in this reach is not suitable for spawning by the

majority of the fish species captured in the reach. A few forage fish that normally spawn over sandy substrates would find ample suitable spawning areas in this reach. Large quantities of debris, an abundance of overhanging vegetation, and low water velocities provide good to excellent rearing areas in the reach. Very high numbers of young fish, particularly lake chub, were captured here in September. Excellent resting and feeding habitat for larger fish in the reach is provided by the many pools and areas sheltered by overhanging vegetation and debris. Piscivores have an abundant food supply in this reach. Although there are many pools in the reach, they may not be deep enough for fish to overwinter in.

BENTHIC INVERTEBRATES	RIPARIAN VEGETATION	BENTHIC ALGAL PRODUCTIVITY	STREAM GAUGING DATA	WATEI		
OLIGOCHAETA HIRUDINEA PELECYPODA Musculium INSECTA Hemiptera Corixidae Trichoptera Limmephilus/Philanctus Diptera Tipulidae Chironominae Tanypodinae	Bank coverage (%) No data available for this reaction Coniferous trees 50 Deciduous trees 5 Shrubs 45 Grasses 20 Barren 0 Channel cover (%) 0 Overhang 20 Crown 0					
Orthocladiinae				AC		
	Slow-moving pool at km 45 is re	epresentative of reach 4.				

ATER QUALITY

No data available for this reach

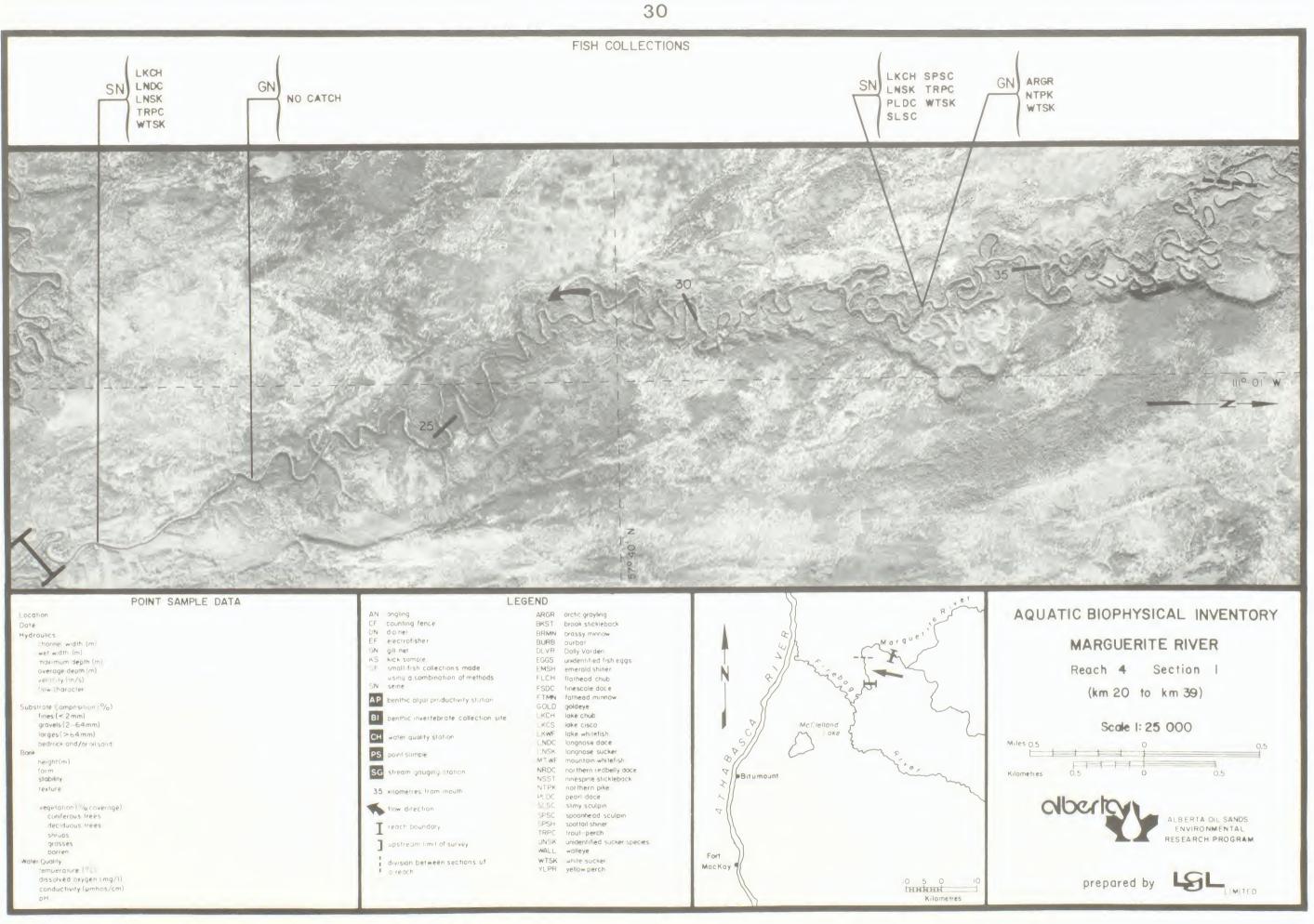
AQUATIC BIOPHYSICAL INVENTORY

MARGUERITE RIVER

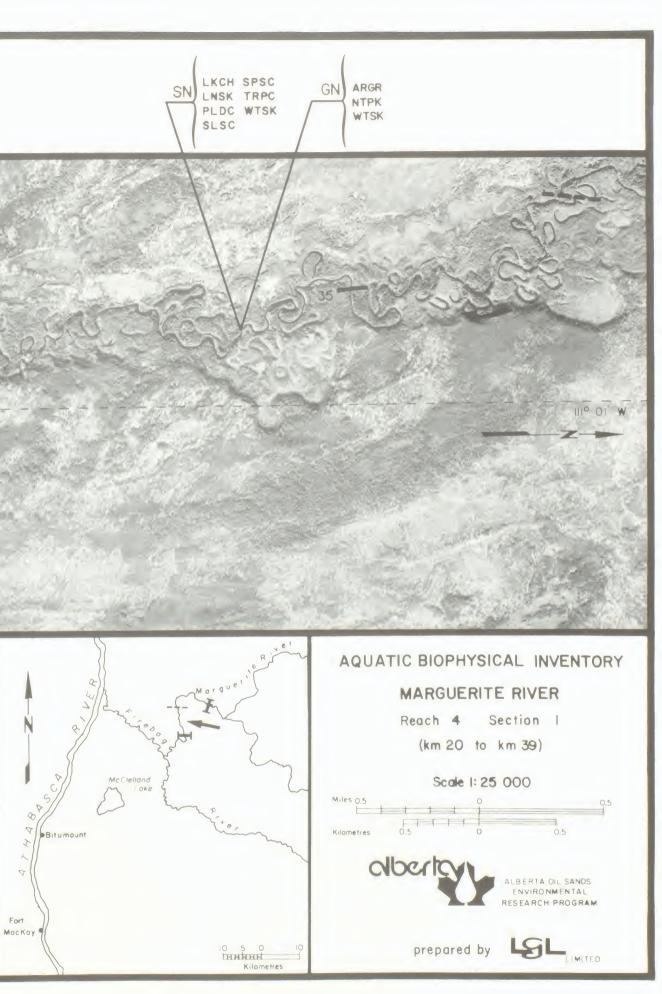
Reach 4 (km 20 to km 61)

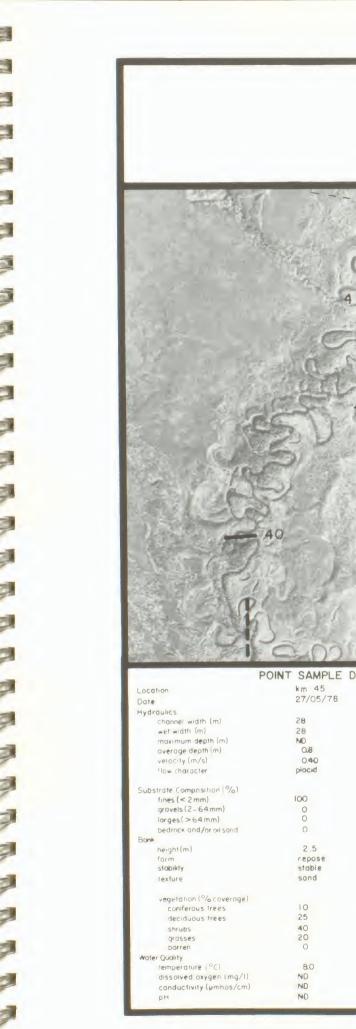


prepared by LSL



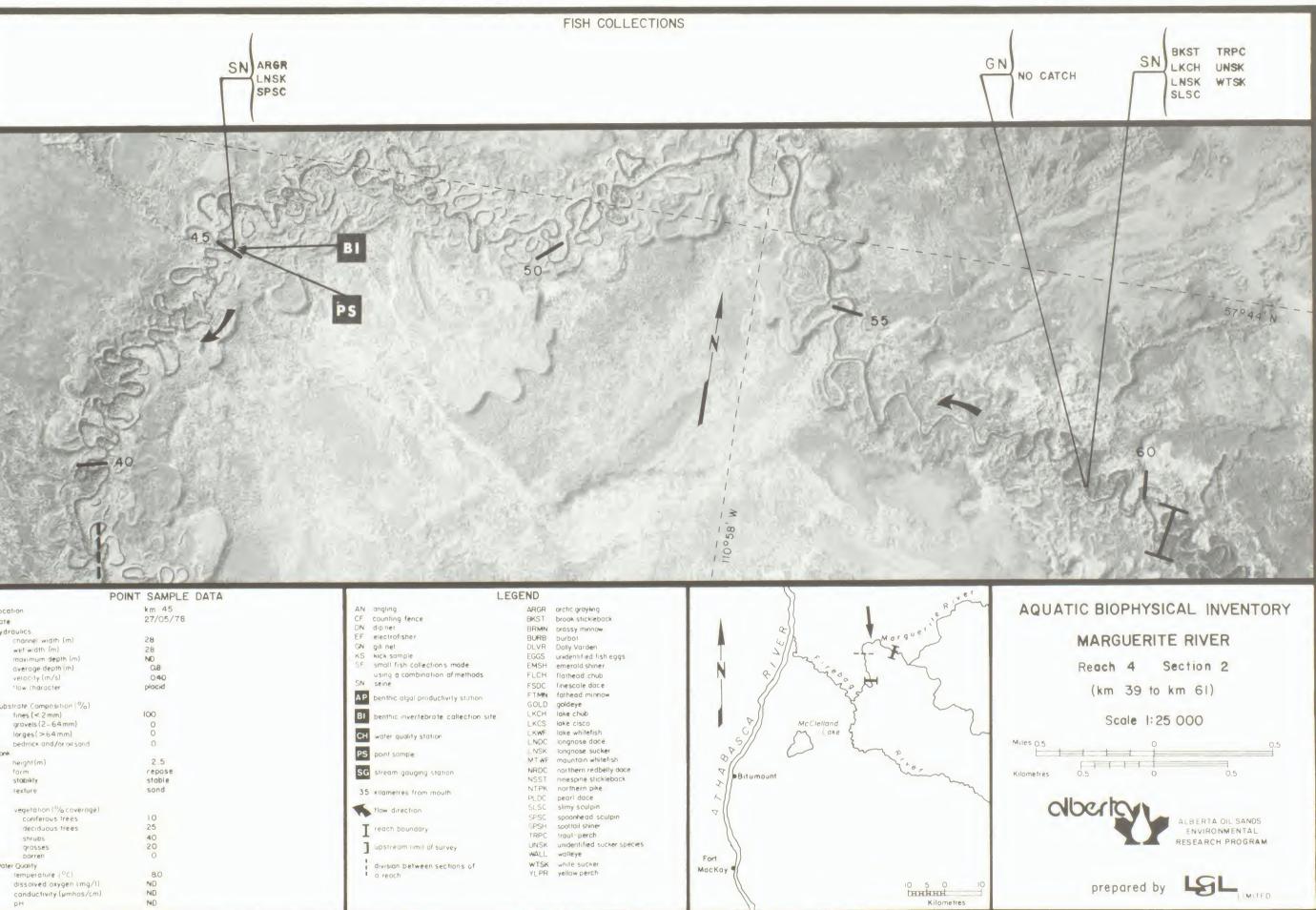
Hydroulics
hannel width (m
wet width (m)
maximum depth (m)
average depth m)
velocity m/s)
flow character
Substrate composition %)
fines (< 2 mm)
gravels (2 64mm)
larges (>64 mm)
bedrock and/or oil sarid
Bonk
height(m)
form
stability
texture
vegetation 10% coverage)
coniferous trees
deciduous trees
shrubs
grasses
barren
Water Quality
temperature (%)
dissolved pxygen (mg/l)
conductivity (umhos/cm)





	LE	LEGEND							
	angling	ARGR	arctic graying						
5	counting fence	BKST	brook stickleback						
N	dip net	BRMN	brassy minnow						
	electrofisher	BURB	burbot						
	gill net	DLVR	Dolly Varden						
S	kick sample	EGGS	unidentified fish eq						
F	small fish collections made	EMSH	emerald shiner						
	using a cambination of methods	FLCH	flathead chub						
N	seine	FSDC	finescale dace						
P	benthic algal productivity station		fathead minnow						
		GOLD	goldeye						
31	benthic invertebrate callection site	LKCH	lake chub						
		LKCS	lake cisco						
н	water quality station	LKWF	lake whitefish						
_	Harer quality station	LNDC	longnose dace						
S	point sample	NSK	longnose sucker						
		MTWF	mauntain whitefis						
G	stream gauging station	NRDC	northern redbelly						
		NSST	ninespine stickleb						
35	kilametres from mouth	NTPK	northern pike						
		PLDC	pearl dace						
5	tlow direction	SLSC	slimy sculpin						
		SPSC	spoonhead sculp						
Τ	reach boundary	SPSH	spottail shiner						
	,	TRPC	traut perch						
1	upstream limit of survey		unidentified sucke						
		WALL	walleye						
1	division between sections of	WTSK	while sucker						
Ĵ.	a reach	YLPR	yellow perch						

N al de la contra
McClelland C Bitumount C C C C C C C C C C C C C
Fort MacKay



JMBERS OF FISH COLLECTED (1	978)						PHYSICA	_ CHARACTERISTICS		REACH DESCRIPTION AND F This reach is t	
Species	Мау	Adults September		eniles and -of-the-year September	Tot	al Numbers September	CI CI G	each length (km) nannel width (m) nannel area (ha) radient (m/km) low character	14.0 20 28.0 0.8 rolling, broken	River. It is an irr water velocities are strate is characteri Deciduous trees are relatively high prop	e modera ized by the dom
arctic grayling slimy sculpin Total	0 3 3 3		6 7 13		6 10 16		Tr P. C U S	otal pools (%) attern onfinement hstable banks (%) ubstrate composition (% fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil san ebris	20 irregularly meandering unconfined 5) 20 20 40	As in Reach 4, large Although very f ditions are consider Marguerite River bec substrate sizes. An strate materials pro The potential for re fair; the few pools would be most suitab pools limit overwint	e quanti few fish red to b cause of n abunda ovides g esting a present ole. Sh
ENTHIC INVERTEBRATES OLIGOCHAETA HIRUDINEA Glossiphoniidae GASTROPODA Stagnicola PELECYPODA Musculium Sphaerium INSECTA Ephemeroptera Baetis Drunella Ephemerella Faraleptophlebia Stinconema Odonata Ophiogomphus Plecoptera Claassenia Isoperla Pteronareys Trichoptera Glososoma		RIPARIAN VEGETA Bank cover Conifero Deciduou Shrubs Grasses Barren Channel co Overhang Crown	age (%) us trees s trees ver (%)	15 65 20 10 0		AL PRODUCTIVITY available for th	s reach		STREAM GAUGING DATA No data available for this rea	ach	WA
Hydropsyche Lepidostoma Occetis Folycentropus Coleoptera Elmidae Diptera Tipulidae Psychodidae Chironomidae Chironominae Tanypodinae Orthocladiinae Simuliidae Rhagionidae Atherix Empididae											A

LIZATION

ermost section of the surveyed portion of the Marguerite ly meandering section with stable banks. Gradient and ate and the majority of the reach is riffles. The suban abundance of larges mixed with fines and gravels. minant component of the riparian vegetation and a of the channel is shaded by overhanging vegetation. ities of debris are present in this reach.

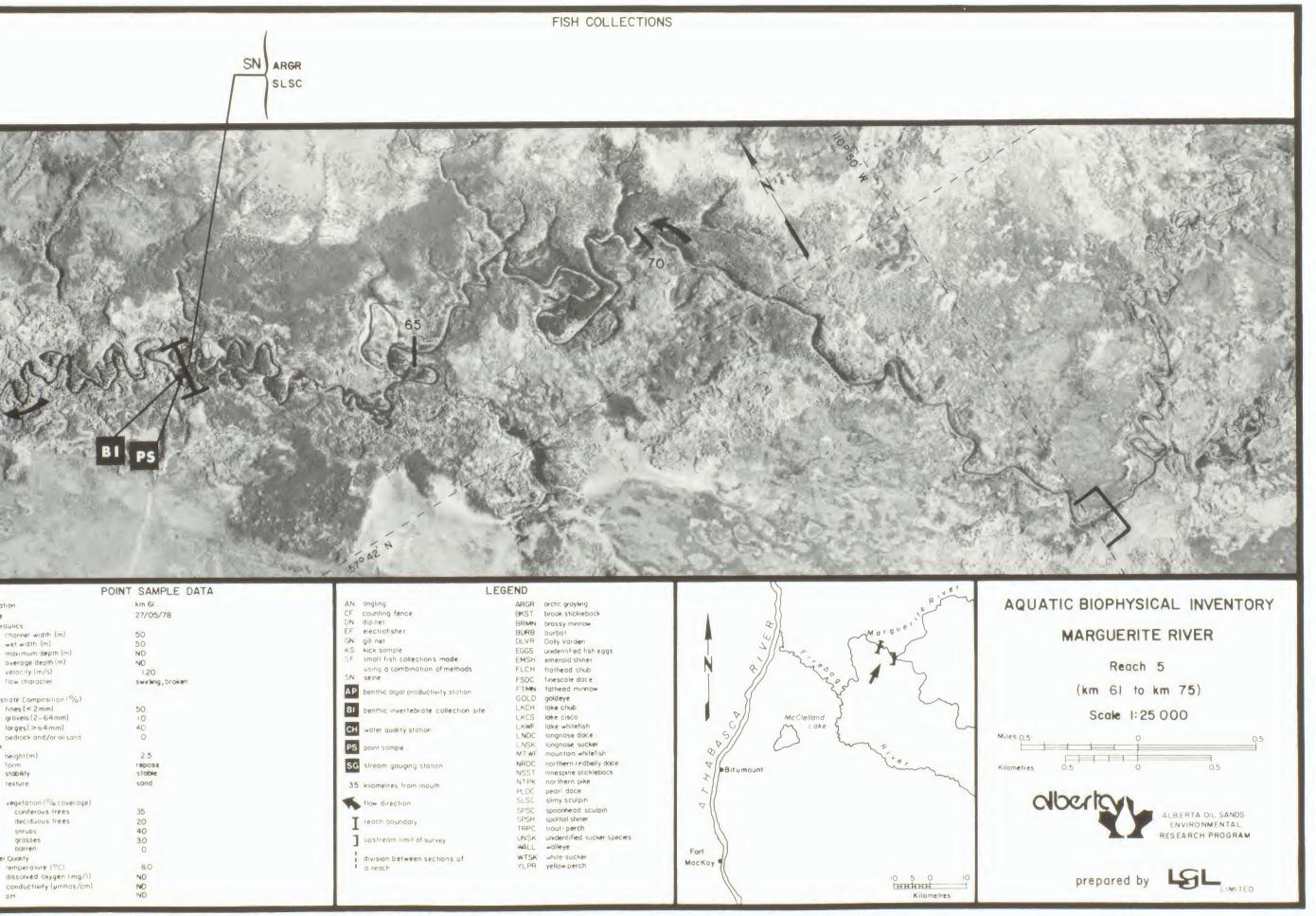
h were collected in this reach during the study, conbe excellent for spawning of most fish species in the f the diversity of water depths, water velocities and ance of debris, overhanging vegetation, and rocky subgood to excellent rearing conditions for most fish. and feeding of larger fish is considered to be only t and those areas shaded by overhanging vegetation hallow water depths and the relative paucity of deep potential in this reach.

TER QUALITY No data available for this reach

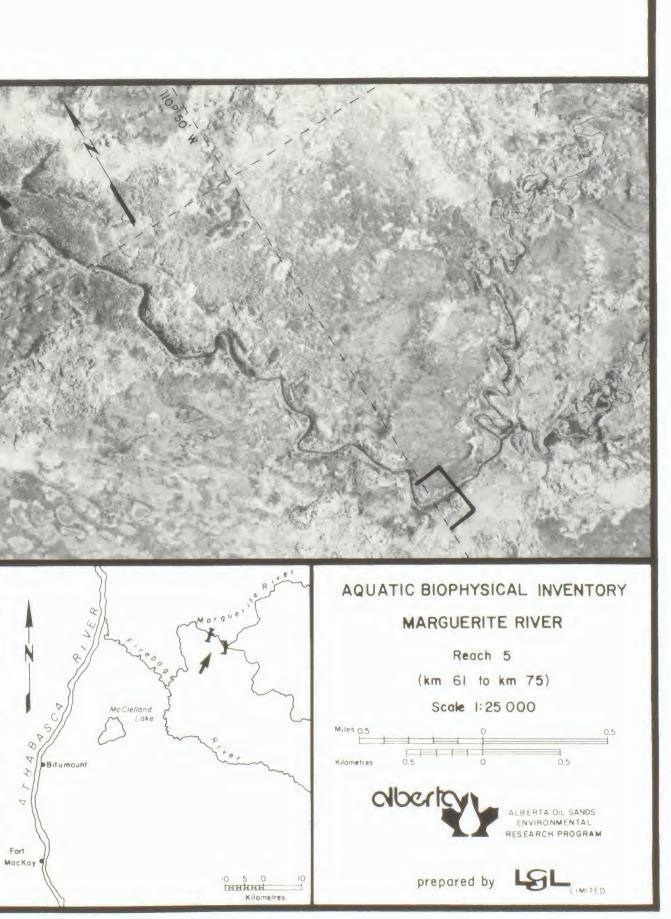
QUATIC BIOPHYSICAL INVENTORY MARGUERITE RIVER Reach 5 (km 61 to km 75)

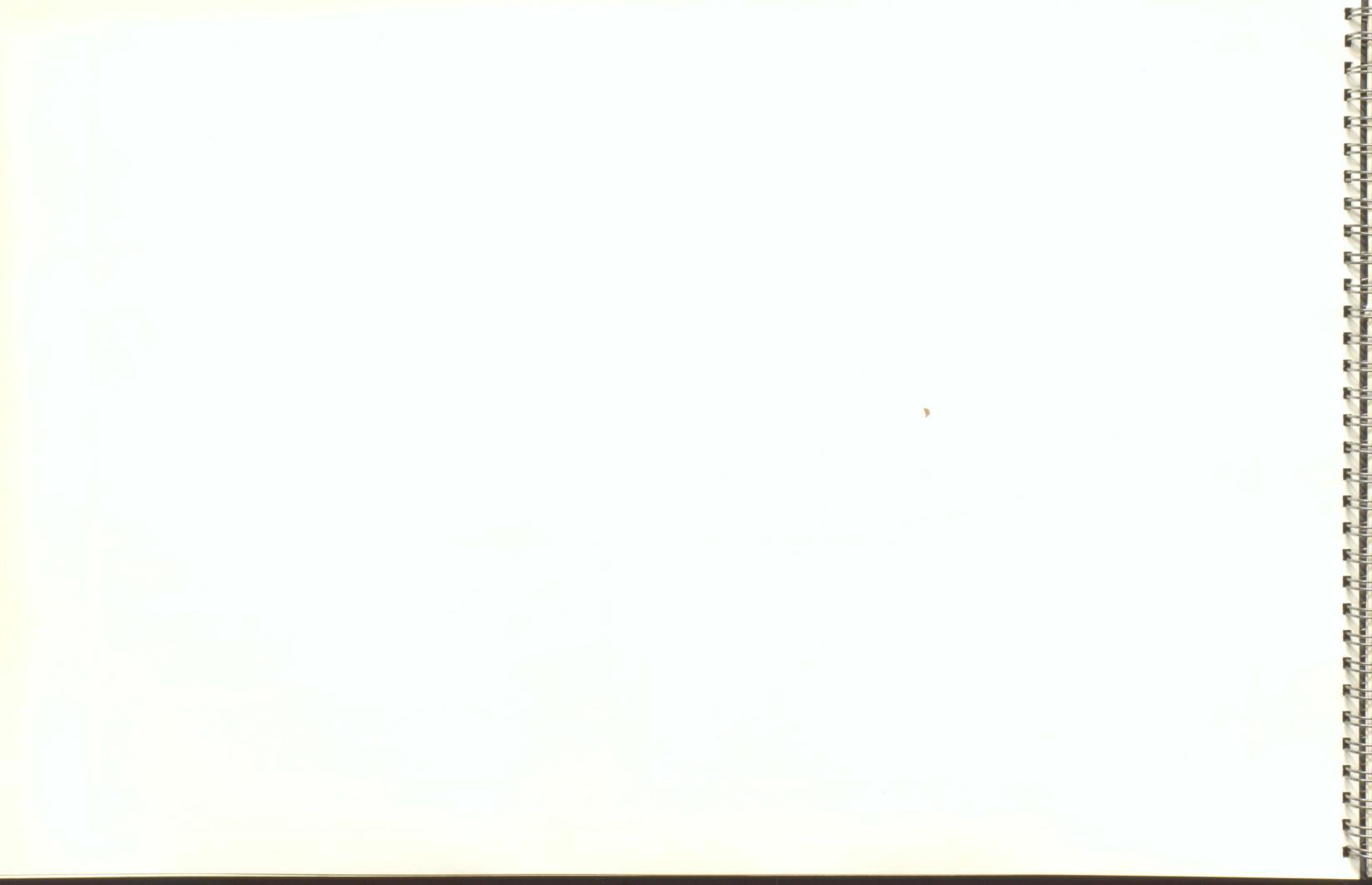


1 1 1 1 -km 6l Location 27/05/78 Date Hydroulics 50 50 channel width (m) wet width (m) maximum depth (m) ND average depth (m) ND 1.20 velocity (m/s) flow character swirling, broken Substrate Composition (%) fines (< 2 mm) 50 grovels (2-64mm) larges(>64mm) 40 bedrock and/or oil sand 0 Bank 2.5 height(m) repose stability stoble texture sond vegetation (% coverage) coniferous trees 35 deciduous trees 20 40 shrubs grasses 30 barren 0 Nater Quality 8.0 temperature (°C) dissolved oxygen (mg/l) ND ND conductivity (umhos/cm) ND





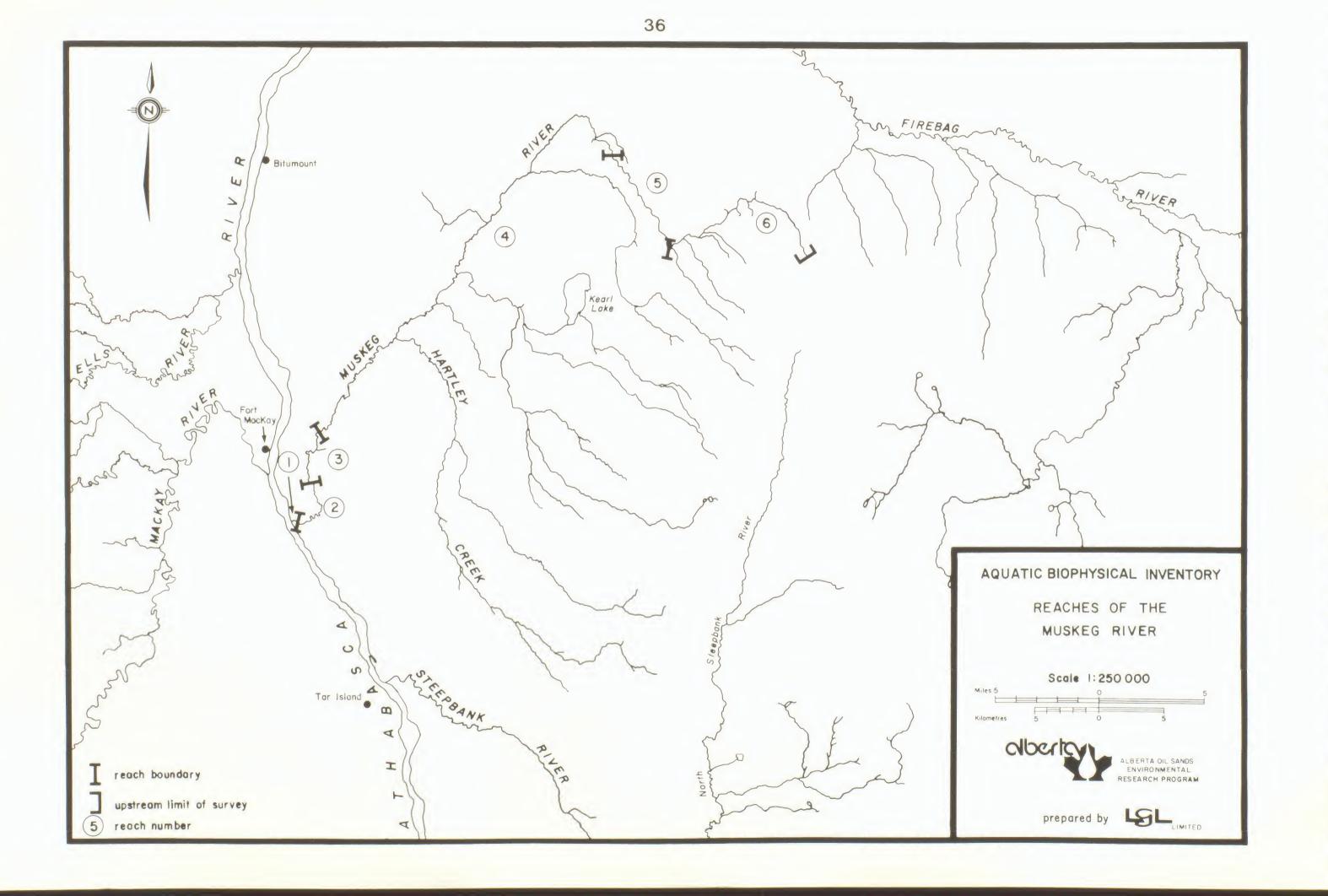




MUSKEG RIVER

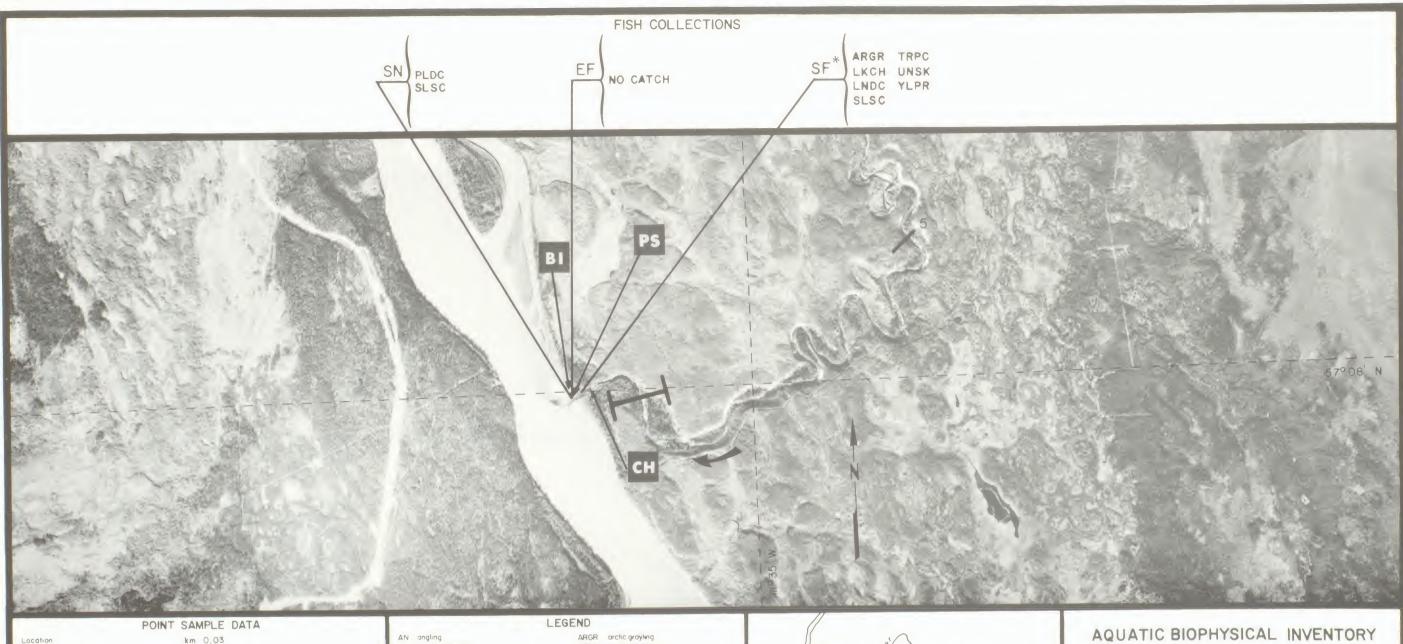
35





NUMBERS OF FISH COLLECTED (SEPTEM						
Species pearl dace slimy sculpin Total	MBER 1979) Juveniles a Adults Voung-of-the 0 2 0 2 - 0 4	PHYSICAL CHARACTERISTICS Reach length (km) Channel width (m) Channel area (ha) Gradient (m/km) Flow character Total pools (%) Pattern Confinement Unstable banks (%) Substrate composition fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil s Debris	20 50 30	fluence with the Atha River and is conseque The gradient is moder reach area, the prese high proportion of ur of fines and gravels, substantial proportio deciduous trees. Dec are present. Little Although the sar in this reach would a species of fish that sucker, white sucker, farther upstream in t sidered good; there a habitat. Juveniles a in this reach. The p the mouth region of t piscivorous species. area during upstream in the Athabasca Rive	SH UTILIZATION a of the Muskeg River extends 0.5 km up abasca River. It lies within the flood antly influenced by fluctuations of wat ately high, and although pools comprise ance of riffles is a prominent feature. Astable banks. The substrate in most a but there are several areas with subs ans of cobbles. The riparian vegetation diduous shrubs are also fairly abundant vegetation overhangs the river channel and gravel substrates and the variet ppear to provide areas suitable for sp occur in the Muskeg River (e.g., arcti trout-perch), most of these species a he Muskeg River. Rearing potential for are ample shallow backwater areas that and young-of-the-year of several species aresence of forage species and young-of he Muskeg River would appear to provid The mouth region may also be of some migrations of some species (e.g., lake are. Water depths in this reach are gen overwintering of fish.	dplain of the Athabasca ter levels in that river. se the majority of the . There is a relatively areas consists primarily strates containing on is dominated by t and some conifers 1. ty of water velocities pawning of several ic grayling, longnose are believed to spawn or most species is con- provide suitable es have been collected f-the-year suckers in de good forage for importance as a resting e whitefish and walleye)
BENTHIC INVERTEBRATES OLIOCHAETA GASTROPODA Fernissia Branicala PELECYPOD Musandium NSECTA Epheneoptera Stemmena Diptera Chironominae Tabanidae	RIPARIAN VEGETATION Bank coverage (%) Coniferous trees 50 Deciduous trees 70 Shrubs 30 Grasses 30 Barren 5 Channel cover (%) 0 Overhang 2 Crown 0		STREAM GAUGING DATA No data available for this reach		MUSKEG RI Reach (km 0.0 to km	Mean Maximum Minimum 255.0 790.0 113.6 7.90 8.30 7.40 229.2 638.3 97.4 473 1360 205 241 728 90 3 8 0.4 25.0 63.0 10.0 15.0 57.0 2.6 0.130 0.600 0.210 1.75 3.94 0.55 0.030 0.700 0.005 0.010 0.020 0.004 3.5 10.9 0.5





PO	INT SAMPLE DATA	LE	GEND		
Location	km 0.03	AN angling	ARGR orctic graying		
Date	19/09/79	CF counting fence	BKST brook stickleback	0- (Bitumount	
	15/05/15	DN dipnet	BRMN brassy minnow		
Hydraulics Channel width (m)	24.4	EF electrofisher	BURB burbot		
wet width (m)	18 8	GN gill net	DLVR Dolly Varden		T
maximum depth (m)	0.8	KS kick sample	EGGS unidentified fish eggs	> 5*	
average depth (m)	0.6	SF small fish collections made	EMSH emerald shiner	- MU	Ň
		using a combination of methods	FLCH flathead chub		
velocity (m/s)	0.67 swirling	SN seine	FSDC finescale dace	C I	
flow character	swiring		FTMN fathead minnow		
(Q/)		AP benthic algal productivity station	GOLD goldeye	Fort MacKay	
Substrate Composition (%) fines (< 2 mm)	35		LKCH lake chub		4
		BI benthic invertebrate collection site	LKCS lake cisco		
gravels (2-64mm)	55		LKWF lake whitefish	TP 21	
lorges(>64mm)	0	CH, water quality station	LNDC longnose dace	1 0 1	
bedrock and/or oil sand	0		LNSK longnose sucker		
Bonk		PS point sample	MTWF mountain whitefish		
height (m)	1.5		NRDC northern redbelly dace		
form	repose	SG stream gauging station	NSST ninespine stickleback	Tar Island	
stability	stable		NTPK northern pike		
texture	silt, sond	35 kilometres from mouth	PLDC pearl dace		
		1	SLSC slimy sculpin	A	
vegetation (% coverage)		flow direction	SPSC spoonhead sculpin		
coniferous trees	5		SPSH spotal shiner		
deciduous trees	75	T reach boundary	TRPC trout-perch	C J	
shrubs	25		UNSK unidentified sucker species	4	
grasses	40	upstream imit of survey	WALL walleye	(00	
barren	5				
Water Quality	10.0	division between sections of	WTSK while sucker YLPR yellow perch	10 5 0 10	
remperature (°C)	10.0	a reach	TER yenow perch		
dissolved oxygen (mg/l)	9				
conductivity (µmhos/cm)	260			Kilometres FORT MCMURRAY	
pH	8.60	* Data from Bond and Machniak (1979)		V /	

MUSKEG RIVER Reach I (km 0.0 to km 0.5) Scale I: 25 000 Miles 0.5 Kilometres 0.5 COCOCOO ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM

				39		
NUMBERS OF FISH COLLECTED (SEP	<u>tember 1979)</u>			PHYSICAL CHARACTERISTICS Reach length (km)	8.5	REACH DESCRIPTION AND FIS This irregularly deep, narrow canyon wi banks appear to be com
Species	Adults	Juveniles and Young-of-the-year	Total Numbers	Channel width (m) Channel area (ha) Gradient (m/km)	15 12.8 3.2	relatively high and th substrate consists pri
Species arctic grayling longnose dace pearl dace slimy sculpin white sucker Total	0 0 3 1 0 4	2 4 8 11 2 27	2 4 11 12 2 31	Flow characterswirling, rol brokenTotal pools (*)30Patternirregularly mealConfinemententrenchesUnstable banks (?)55Substrate composition (*)10fines (<2 mm)	swirling, rolling, broken 30 irregularly meandering entrenched 55 10 70 20	substrate consists pr present in pool areas and shrubs, but conifo overhangs the river cl
ENTHIC INVERTEBRATES GASTROPODA Parriania Starnicoia PELECYPODA Musculian INSECTA Ephemeroptera Bastia Bastia Starnicoia Commendia Commendia Starnicoia Bastia Commendia Starnicoia Commendia Starnicoia Commendia Starnicoia Commendia Starnicoia Commendia Starnicoia Commendia Starnicoia Commendia Starnicoia Commendia Starnicoia Commendia Starnicoia Commendia Starnicoia Commendia Starnicoia Starnicoia Commendia Starnicoia Commendia Starnico	Conif Decic Shrut Grass Barre	overage (2) Ferous trees 15 Juous trees 65 Jos 35 Ses 45 En 5 I cover (%) Dang 2	NTHIC ALGAL PRODUCTIVITY No data available for thi		REAM GAUGING DATA No data available for this re	ach
Plecoptera Acerminari Plecoptera Acerminari Plecoptera Plecoptera Trichoptera Prachurentrus Coleoptera Dryopidae Elmidae Diptera Tipulidae Chironomidae Chironomidae Chironomidae Abanidae Rhagionidae Abanidae						
	Muskeg River	at the hot			gravel bank at km 7.	

T

SH UTILIZATION

meandering section of the Muskeg River is entrenched in a ith a high proportion of unstable banks. The high, slumping mposed primarily of sand, gravel and silt. The gradient is he reach is a series of alternating pools and riffles. The imarily of gravels and larges, but some sand and silt are The riparian vegetation is dominated by deciduous trees erous trees are also fairly abundant. Little vegetation hannel in this reach. Moderate amounts of woody debris are es of the channel.

ols and riffles and the variety of substrates in this reach wning potential for many of the fish species that occur in ., arctic grayling, white sucker, longnose sucker, longnose y sculpin, trout-perch). The numerous shallow areas along nel, where water velocities are low and debris provides some ring areas for a variety of fish species. The many shallow le good feeding areas for juvenile arctic grayling. The pools y good areas for resting and feeding of larger fish, and the cies provides an abundant food source for piscivorous species. pools are moderately deep and at least some pool areas may be ng sites for some fish.

WATER QUALITY

No data available for this reach

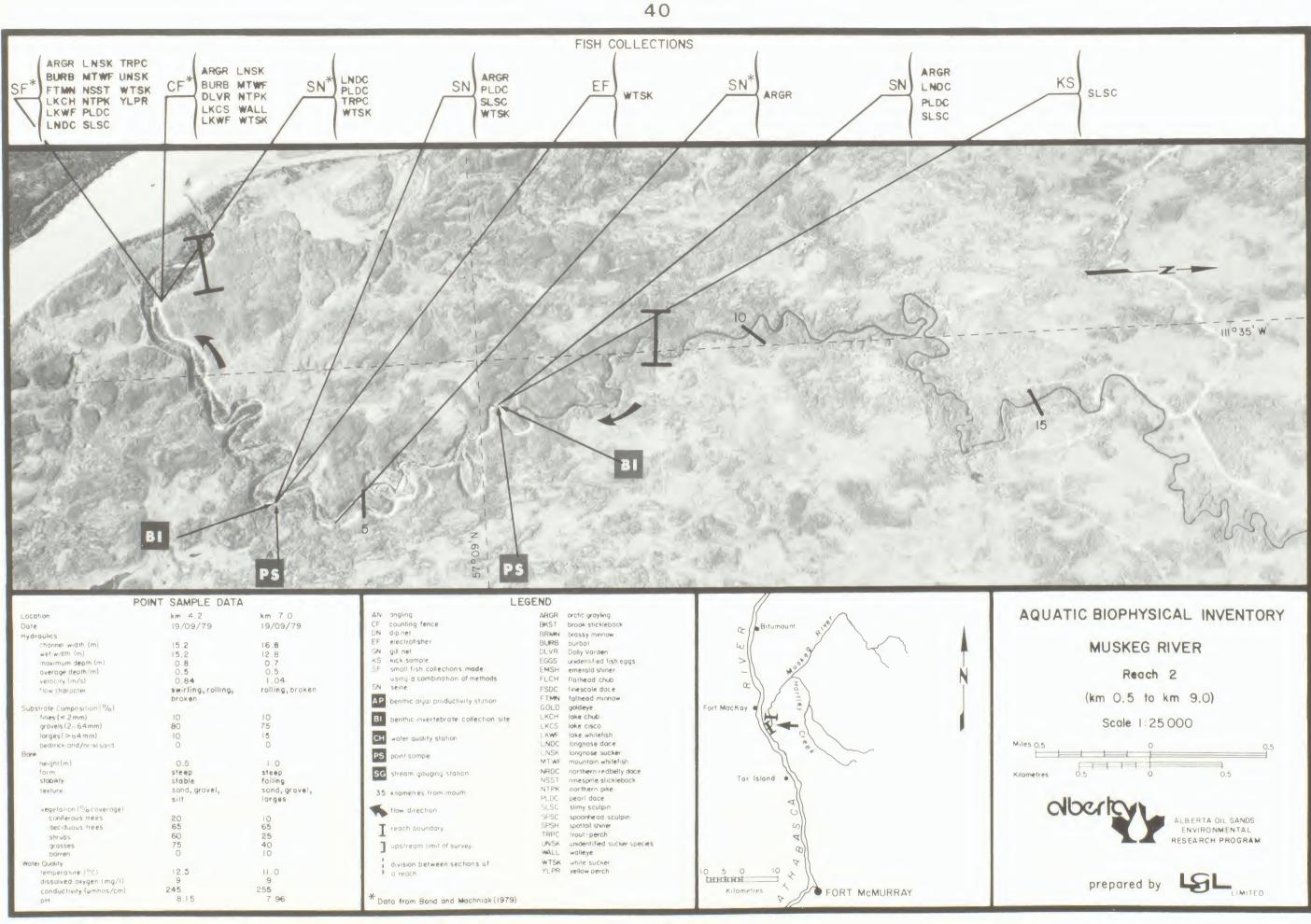
AQUATIC BIOPHYSICAL INVENTORY

MUSKEG RIVER

Reach 2 (km 0.5 to km 9.0)

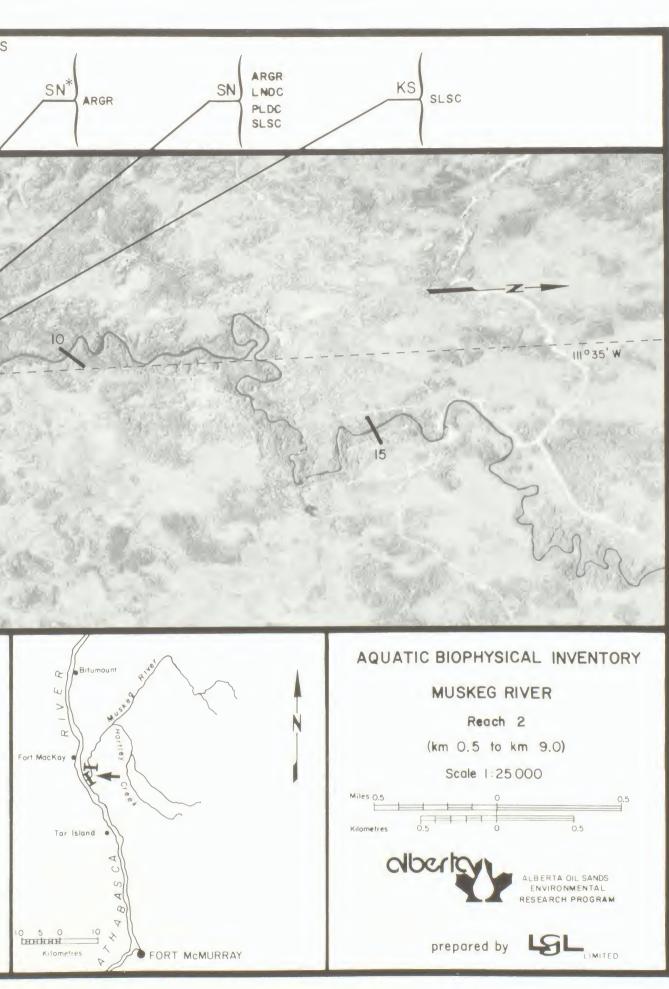


prepared by LIMITED



19/09/79	19/09/79
15.2 15.2 0.8 0.5 0.84	16.8 12.8 0.7 0,5 1.04
swirling, rolling,	rolling, broken
broken	
10	10
80	75
10	15
0	0
0.5	1.0
steep	steep
stable	failing
sond, gravel,	sand, gravel,
silt	larges
20	10
65	65
60	25
75	40
0	10
12.5	11_0
9	9
245	255
OIE	7 00

		LEGEND
AN	angling	ARGE
CF	counting fence dipinet	BKST
	electrofisher	BRM
	gill net	BURE
	kick sample	EGGS
F	small fish collections made	EMSH
	using a combination of methods	FLCH
SN	seine	
-		FSDO
AP	benthic algal productivity station	FTM
		GOLI
BI	benthic invertebrate collection site	
-		LKCS
CH	water quality station	LND
		LNSI
PS	point sample	MTW
		NRD
SG	stream gauging station	NSS
		NTP
35	kilometres from mouth	PL DO
-		SLSO
	flow direction	SPS
-		SPSF
	reach boundary	TRP
	and and and a second second	UNS
	upstream limit of survey	MAL
	· · · · · · · · · · · · · · · · · · ·	WTS
1	division between sections of	YLP
	a reach	
¥.		



				41		المراجع المراجع
NUMBERS OF FISH COLLECTED (SEPTE	MBER 1979)			PHYSICAL CHARACTERISTICS Reach length (km) Channel width (m)	7.5	TEACH DESCRIPTION AND F This relatively is a region of trans Reach 2. The gradier
Species	Adults	Juveniles and Young-of-the-year	Total Numbers	Channel area (ha) Gradient (m/km)	10.5	nlacid to swirling to The substrate is com
Species longnose sucker northern pike pearl dace slimy sculpin Total	0 2 0 1 	2 2 17 1 22	2 4 17 2 25	Gradient (m/km) Flow character Total pools (?) Pattern Confinement Unstable banks (?) Substrate composition (?) fines (<2 mm) gravels (2-64 mm) larges (≥64 mm) bedrock and/or oil sand Debris	placid, swirling, rolling 80 irregularly meandering occasionally confined 10 30 50 20	present in pools and trees and shrubs, wi vegetation overhangs present along the edu The spawning po over gravel substrate trout-nerch, longnose moderate a ounts of limited spawning of m erous shallow areas al weedy shallows, an provide good rearing deep, and at least se
BENTHIC INVERTEBRATES OLIGOCHAETA GASTROPODA Gyrau'us PELECYPODA Muscul'us P'staium INSECTA Ephemeropters Am latus Bast's su Famalentephlema	Coni Deci Shru Gras Barr	GETATION S overage (%) ferous trees 10 duous trees 65 bs 35 S ses 55 en 2 1 cover (%) hang 5 n 2	THIC ALGAL PRODUCTIVITY tanding crop expressed as mean: 1.9 × 10 maximum: 3.9 × 10 mininum: 1.1 × 10 ¹ tanding crop expressed as mean: 27.3 maximum: 65.7 minimum: 8.7 rimary productivity (mg C- mean: 26.5 maximum: 107.8 minimum: 6.9 a from Hickman 2 2. (198	cell counts (number.m ⁻²) chlorophyll ((ng.m ⁻²) h ⁻¹ .m ⁻¹) Da	REAM GAUGING DATA Water Survey of Canada station nu Maximum total annual discharge: Minimum total annual discharge: Maximum annual mean discharge: Maximum monthly mean discharge: Minimum monthly mean discharge: Minimum daily discharge: Minimum daily discharge: ta for 1974 to 1978 compiled from Warner and Spitzer (1979) and War	199. T × 10 (1974) 65.6 × 10 (1974) 6.31 m ² /s (1974) 2.07 m ³ /s (1976) 21.95 m ³ /s (September 1978) 0.21 m ³ /s (Apr. 28, 1974) 3.14 m ³ /s (Dec. 17, 1976) Loeppky and Smitzer (1977),
Odonata Feritinamia Plecoptera Ptoronaraya i a nicoterya Hemiptera Corixidae Trichoptera Coleoptera Elmidae Diptera Chironomidae Tanypodinae Tabanidae Dolichopodidae						
	Swirling an	d rolling flow, common in th	is reach, at km 10.4.	A large, swirling p	bool at km 13.8.	

RIPTION AND FISH UTILIZATION

is relatively short and irregularly eandering section of the Muskey River gion of transition between the low gradient Reach 4 and the high gradient The gradient is moderate and the flow character is mixed, varying from to swirling to rolling. Most of the reach area is composed of mools. strate is composed mainly of sand, gravels and cobbles, but some silt is in pools and backwaters. The riparian vegetation is ostly deciduous nd shrubs, with some conifers in the lower portion of the reach. So e ion overhangs the channel in most areas. Moderate a punts of debris are along the edges of the river channel.

spawning potential of this reach is good for those species that spawn avel substrates (e.g., arctic grayling, longmose sucker, white sucker, erch, longnose dace). There are a few backwater areas with low to amounts of aquatic vegetation that may provide suitable habitat for spawning of northern pike and brook stickleback in this reach. The numhallow areas with low water velocities and gravel substrates, the occasionshallows, and the moderate a ounts of debris and overhanging vegetation good rearing habitat. In most areas of this reach the water is moderately nd at least some of the pools are probably suitable for overwintering of

WATER QUALITY

Water Survey of Canada station number 00AT07DA0080

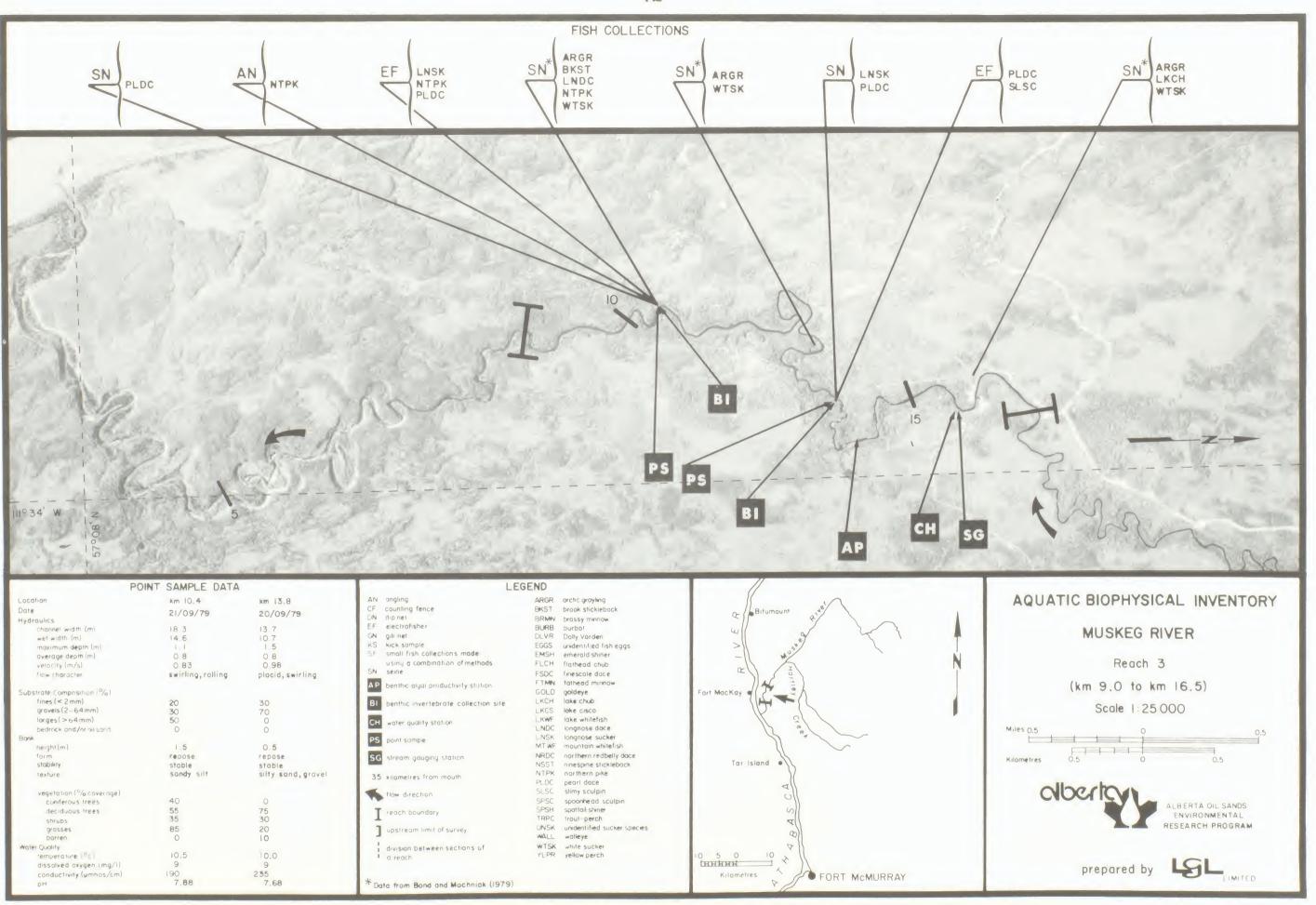
	Mean	Maximur	Minîmu
otal alkalinity (mg CaCO ₃ /1) H	172.4 7.80	289. 1 8.29	55.7 7.28
otal hardness (mg CaCO_/1)	171.5	280.9	59.7
onductance (US/cm)	309	520	115
otal filterable			
residue fixed (mg/1)	156	308	49
otal non-filterable			
residue fixed (mg/1)	2	39	- 0.4
otal organic carbon (mg C/l)	25.0	53.0	6.0
ilica (mg SiO /1)	9.0	25.0	1.8
itrate and nitrite nitrogen (q N/1)	0.040	0.310	-0.003
otal Kjeldahl nitrogen (mg N/l)	1.20	3.00	0.28
otal Phosphorus (mg P/1)	0.040	0.190	0.005
rthophosphate (mg P/1)	0.010	0.141	-0.003
ulphate (ng S0./1)	5.3	42.5	0.1

Data for the period January 1976 to Dece ber 1979 obtained from the National Water Quality Data Bank (NAQUADAT).

AQUATIC BIOPHYSICAL INVENTORY MUSKEG RIVER

Reach 3 (km 9.0 to km 16.5)

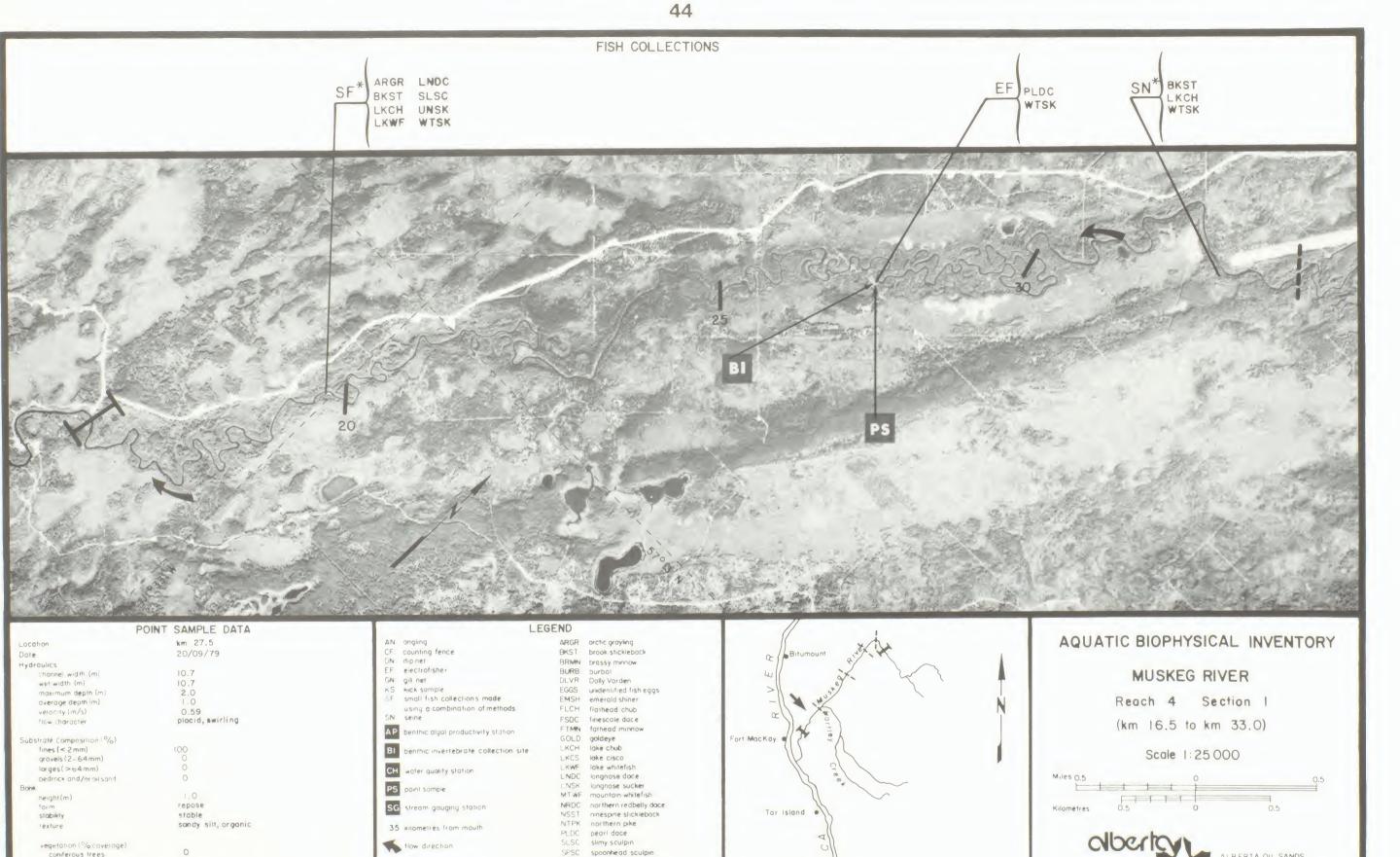




PO	INT SAMPLE DATA		LE	EGEND			
Location	km 10.4	km 13.8	AN angling		orctic grayling		A
Date	21/09/79	20/09/79	CF counting fence	BKST	brook stickleback	0- Bitumount	
Hydraulics	21/03/13	20/03/13	DN dipnet		brassy minnow		
channel width (m)	18_3	13_7	EF electrofisher		burbot		
wet width (m)	14_6	10_7	GN gill net		Dolly Varden		
maximum depth (m)	1.1	1_5	KS kick sample		unidentified fish eggs	>	
average depth (m)	0_8	0.8	SF small fish collections made		emerald shiner	- 14	
velocity (m/s)	0.83	0.98	using a combination of methods	FLCH	flathead chub		
flow character	swirling, rolling	placid, swirling	SN seine		finescale dace		
			AP benthic algal productivity station	FTMN	fathead minnow	11	
Substrate Composition 1%)					goldeye	Fort MacKay	
fines (< 2 mm)	20	30	BI benthic invertebrate collection site		lake chub		
gravels (2 – 64 mm)	20 30	70			lake cisco		
lorges(>64mm)	50	0	CH water quality station		lake whitefish		
bedrock and/or bit sand	0	0			longnose dace		Mile
Bank			PS point sample	NSK	longnose sucker		
height (m)	1.5	0.5			mountain whitefish		
form	repose	repose	SG stream gauging station	NRDC	northern redbelly doce		Kilo
stability	stable	stable		NSST	ninespine stickleback	Tar Island	
lexture	sandy silt	silty sand, gravel	35 kilometres from mouth	NTPK	northern pike		
				PL DC	pearl dace		
vegetation (% coverage)			flow direction				
coniferous trees	40	0		SPSC	spoonhead sculpin		
deciduous trees	55 35	75 30	T reach boundary	SPSH	spottail shiner	S N	
shrubs			1	TRPC	trout-perch	V	
grasses	85	20	upstream limit of survey	UNSK	unidentified sucker species		
Darren	0	10		WALL	walleye		
Water Quality			division between sections of		white sucker	2	
remperature (PC)	10.5	10.0	a reach	YLPR	yellow perch	10 5 0 10 2	
dissolved oxygen (mg/l)	9	9				тинни х	
conductivity (umhos/cm)	190	235				Kilometres FORT MCMURRAY	
рн	7.88	7.68	* Data from Bond and Machniak (1979)			R /	

				43			
NUMBERS OF FISH COLLECTED (SEPTEM Species pearl dace white sucker Total	ER 1979) Adults Juveniles and Young-of-the-year Total Numbers 0 1 1 0 1 1 0 2 2		Reach length (km)63.5Channel width (n)10Channel area (ha)63.5Gradient (m/km)0.3Flow characterplacidTotal pools (*)95Patterntortuously meandering, irregularly meanderingConfinementunconfinedUnstable banks (*)0Substrate composition (*)100 gravels (2-64 mm)fines (<2 mm)100 bedrock and/or oil sandDebrismoderate		REACH DESCRIPTION AND FISH UTILIZATION This long, low-gradient reach eanders through a large area of mar- muskeg. The reach is nearly all pools and the water flow is slow. The deep and the banks drop off sharply at the edge of the channel. There beaver dams in this reach, particularly upstream from Hartley Creek. The strate is entirely silt and sand with moderate to very high organic der content. Aquatic vegetation is abundant. The riparian vegetation is a entirely deciduous trees and shrubs with a very dense growth of grasses cover due to overhanging shrubs varies from moderate in the lower port reach to very high in the upper portion of the reach. Channel debris a from moderate to high. The abundant aquatic vegetation in this reach provides numerous and for spawning of brook stickleback and northern pike. The reach does no to be suitable for spawning of other species. Rearing potential is good there is ample shelter provided by woody debris and aquatic vegetation depths in this reach appear to be sufficient to allow overwintering of		
BENTHIC INVERTEBRATES OLIGOCHAETA GASTROPODA PELECYPODA CRUSTACEA Cladocera Copepoda Anphipoda TTAL and TTAL INSECTA Ephemeroptera Plecoptera Hemiptera Corixidae Metaloptera Trichoptera	RIPARIAN VEGETATION Bank coverage (%) Coniferous trees Deciduous trees Shrubs Grasses Barren Channel cover (%) Overhang Crown	No d. 80 15 95 0	<u>C ALGAL PRODUCTIVITY</u> ata available for this re	ach	STREAM GAUGING DATA No data available for this reac		WATER QUALITYWater Survey of Canada station number 00AT07DA0085Total alkalinity ing CaC0./1)212.3 327.2 76.0pH7.608.207.1Total hardness (mg CaC0./1)207.7 327.6 74.6Conductance (IS/cm)380610120Total filterable380610120residue fixed (mg/1)20333179Total onon-filterable4300.4residue fixed (g/1)4300.4Silica (mg Si0./1)11.217.04.2Nitrate and nitrite nitrogen (mg N/1)1.455.500.5Total Phosphorus (mg P/1)0.0100.0300.0Sulphate (mg S0./1)3.79.20.1Data for the period January 1976 to December 1979 obtained from the National Water Quality Data Bank (NAQUADAT).
bur ar borrar Diptera Chironomidae Chironominae Tanypodinae	Placid flow and heavily	grassed banks at km	n 27.5 are typical of th	s reach. Dense overhangi	ng bank veuetation at km 42.		AQUATIC BIOPHYSICAL INVENTORY MUSKEG RIVER Reach 4 (km 16.5 to km 80.0)



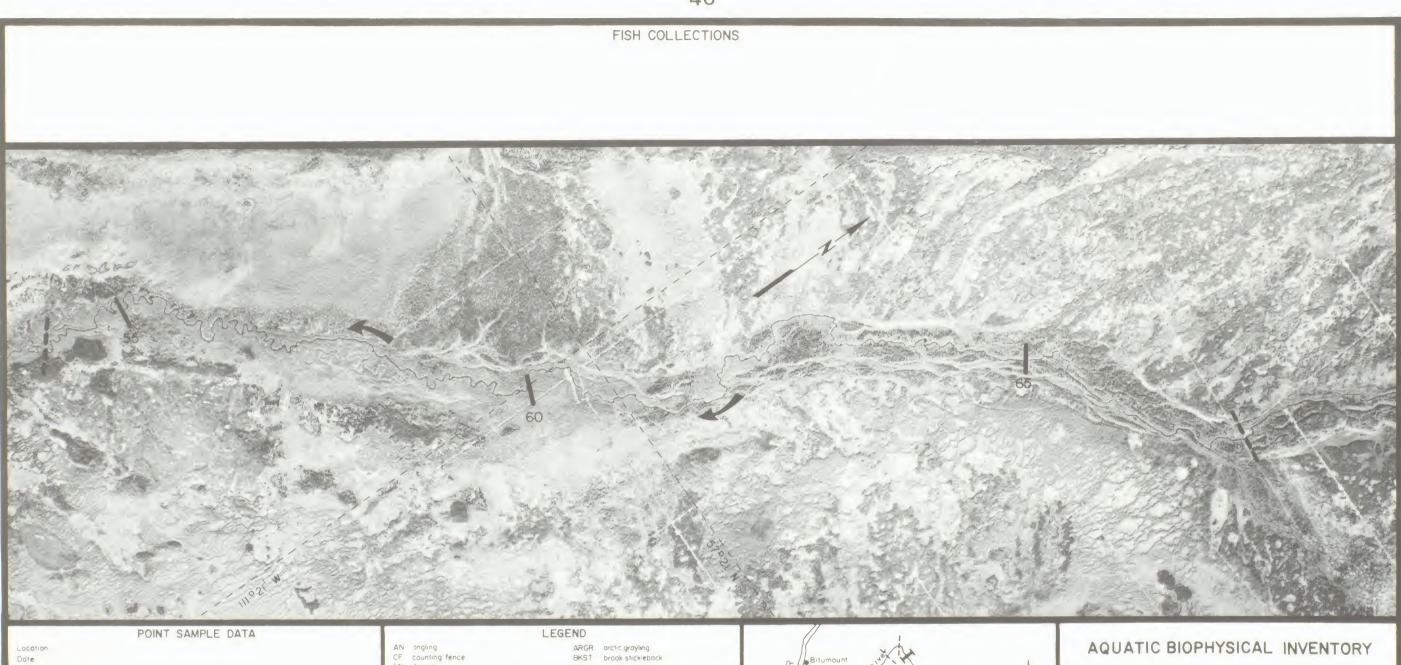


	POINT SAMPLE DATA	L	EGEND	
Location	km 27.5	AN angling	ARGR arctic grayling	l v A.
Date	20/09/79	CF counting fence	BKST brook stickleback	Bitumount
Hydraulics	20,00,10	DN dipnet	BRMN brassy minnow	C Birumouni e
Ehannel width (m)	10.7	EF electrofisher	BURB burbol	
wet width (m)	10.7	GN gill net	DLVR Dolly Vorden	
maximum depth (m)	2.0	KS kick sample	EGGS unidenlified fish eggs	× ×
average depth (m)	1.0	5F small fish collections made	EMSH emerald shiner	
velocity (in/s)	0.59	using a combination of methods	FLCH flathead chub	
flow character	plocid, swirling	SN seine	FSDC finescale dace	
now endrocher	proorest entries	AP benthic algal productivity station	FTMN fathead minnow	
Substrate Composition %)		Denthic digat productivity station	GOLD goldeye	Fort MacKay
fines (< 2 mm)	100	BI benthic invertebrate collection site	LKCH lake chub	
grovels (2-64 mm)	0	Dennic invertebrate conection site	LKCS lake cisco	
lorges(>64 mm)	0		LKWF lake whitefish	1 2
bedrock and/or bi sand	0	CH water quality station	LNDC longnose dace	
Bonk	5	PS point sample	LNSK longnose sucker	
height(m)	1.0	point sumple	MTWF mountain whitefish	
form	repose	SG stream gauging station	NRDC northern redbelly dace	
stability	stable	Sta siredin gauging station	NSST ninespine slickleback	Tar Island
texture	sandy silt, organic	35 kilometres from mouth	NTPK northern pike	
		55 kilomeres from hiodin	PLDC pearl dace	
vegetation (% coverage)		tiow direction	SLSC slimy sculpin	
coniferous trees	0		SPSC spoonhead sculpin	
deciduous trees	75	T reach boundary	SPSH spottail shiner	S
shrups	20		TRPC trout-perch	A
grasses	95	upstream limit of survey	UNSK unidentified sucker species	
borren	0		WALL walleye	
Water Quality		division between sections of	WTSK white sucker	A
temperature (%)	10.5	a reach	YLPR yellow perch	10 5 0 10 2
dissolved oxygen (mg/1)	8			LHHHHH (V)
conductivity (umbos/cm)	182	*		Kilometres FORT MCMURRAY
PH	7.78	Data from Bond and Machniak (197	9)	R / CITCHIONICHICA

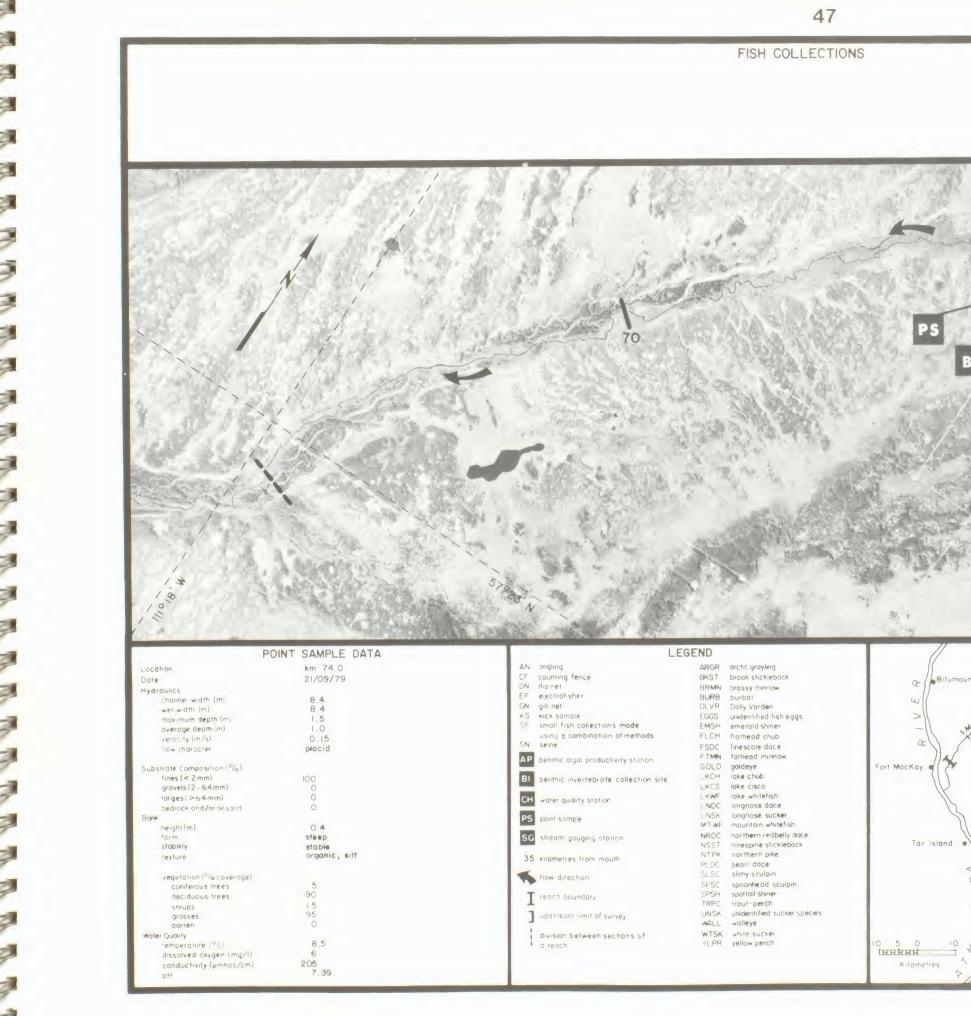


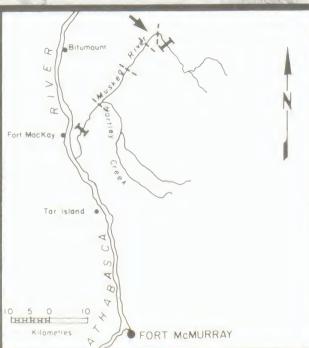
prepared by Limited





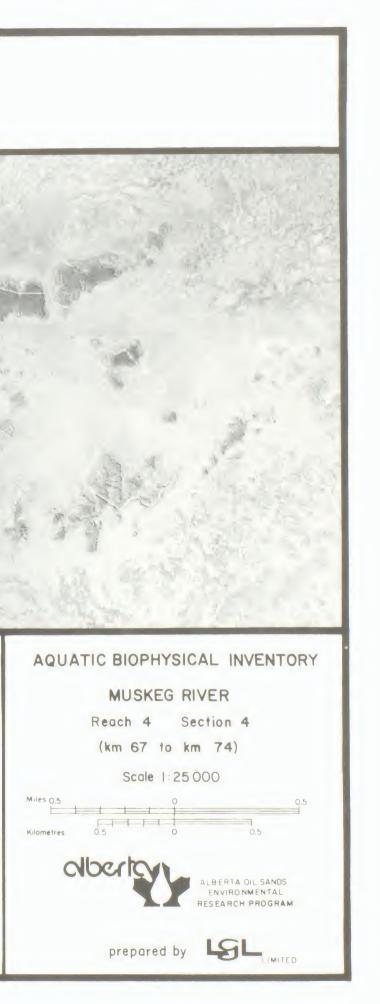


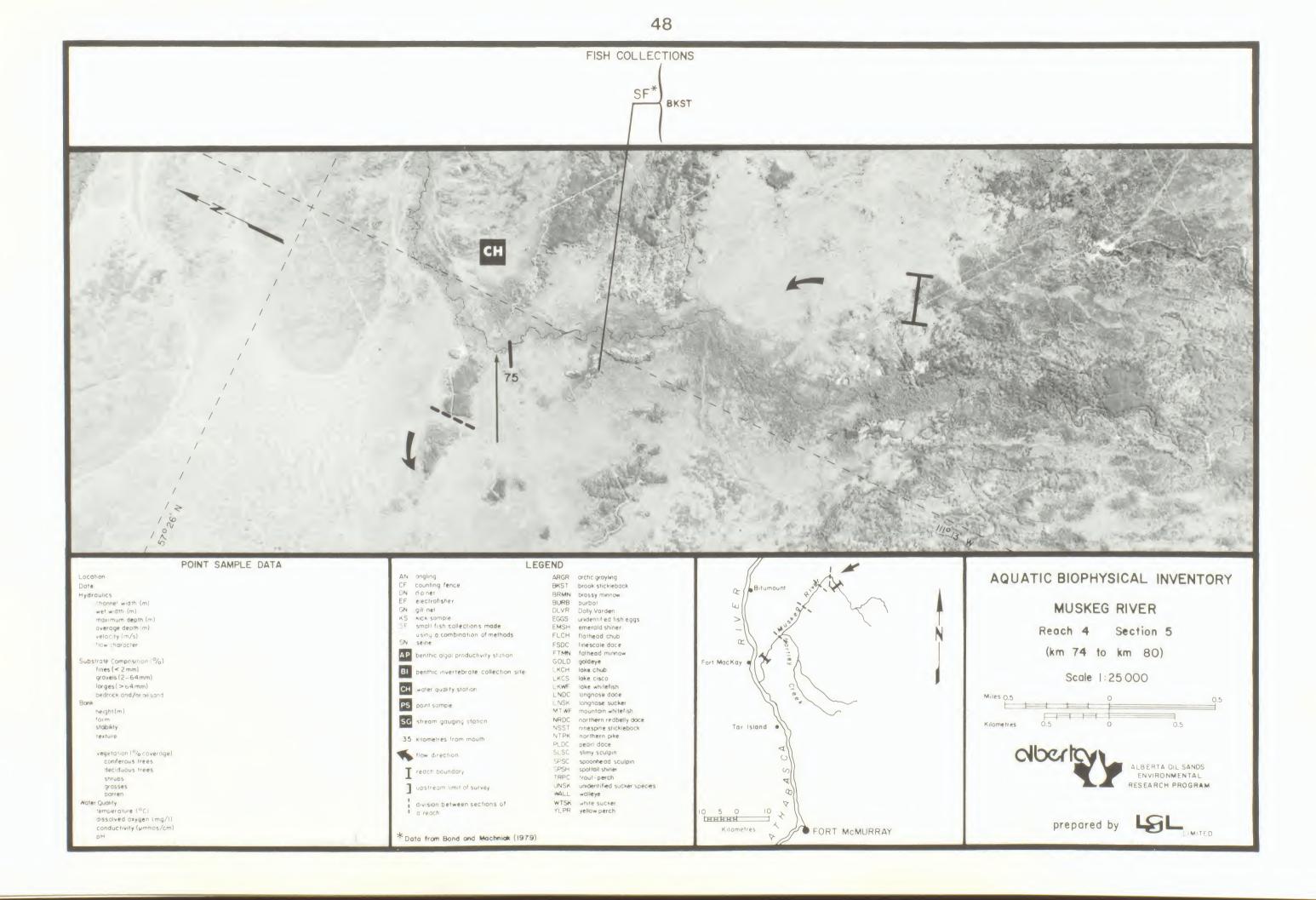




EF

NO CATCH





				49		
NUMBERS OF FISH COLLECTED (SEPTEN	MBER 1979)			PHYSICAL CHARACTERISTICS Reach length (km)	13.0	REACH DESCRIPTION AND FISH This Lection of the The reach is almost entir
Species	Adults	uveniles and Young-of-the-year	Total Numbers	Channel width (=) Channel area (ha) Gradient (m/k=)	9 11.7 2.8	detritus content, but the and cobbles. Coniferous
brook stickleback pearl dace white sucker Total	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		Flow character Total pools (%) Pattern Confinement Unstable banks (%) Substrate composition (%) fines (<2 mm) gravels (2-64 mm) larges (~64 mm) bedrock and/or oil sand Debris	placid, swirling 90 irregularly meandering occasionally confined 0 80 10 10	reach, but deciduous tree frowth of grasses. Chann funken woody debris is ab Move ent of the larg severely limited by beave and a few young-of-the-ve The brook stickleback, la residents of this reach.	
BENTHIC INVERTEBRATES OLIGOCHAETA GASTROPODA In milan Anadoma Varianta PELECYPODA Anadoma Masailium Pelecypotera Masailium Pelecypotera Masailium Praining Spharmetra	Conife Decidu Shrubs Grasse Barrer Channel Overha Crown	verage () erous trees 60 jous trees 35 s 15 es 90 n 0 cover (2)	BENTHIC ALGAL PRODUCTIVITY No data available for th		STREAM GAUGING DATA No data available for this reach	
Chironomidae Chironominae Tanypodinae Orthocladiinae	Dense overha at km 83.7.		and abundant debris, typica)	of reach 5, A section of reach	5 flowing through danse sornice fo	arest at km 90.

ND FISH UTILIZATION

of the Muskeg River mas a much higher gradient than does Reach 4. t entirely pools, nowever, because the flow is inceded by number The substrate is generally sand and silt with moderate organic but there are so e areas with fairly high proportions of gravels ferous trees dominate the riparian vegetation over much of the ous trees and shrubs are also abundant and there is a dense Channel cover is very high due to overhanging shruhs.

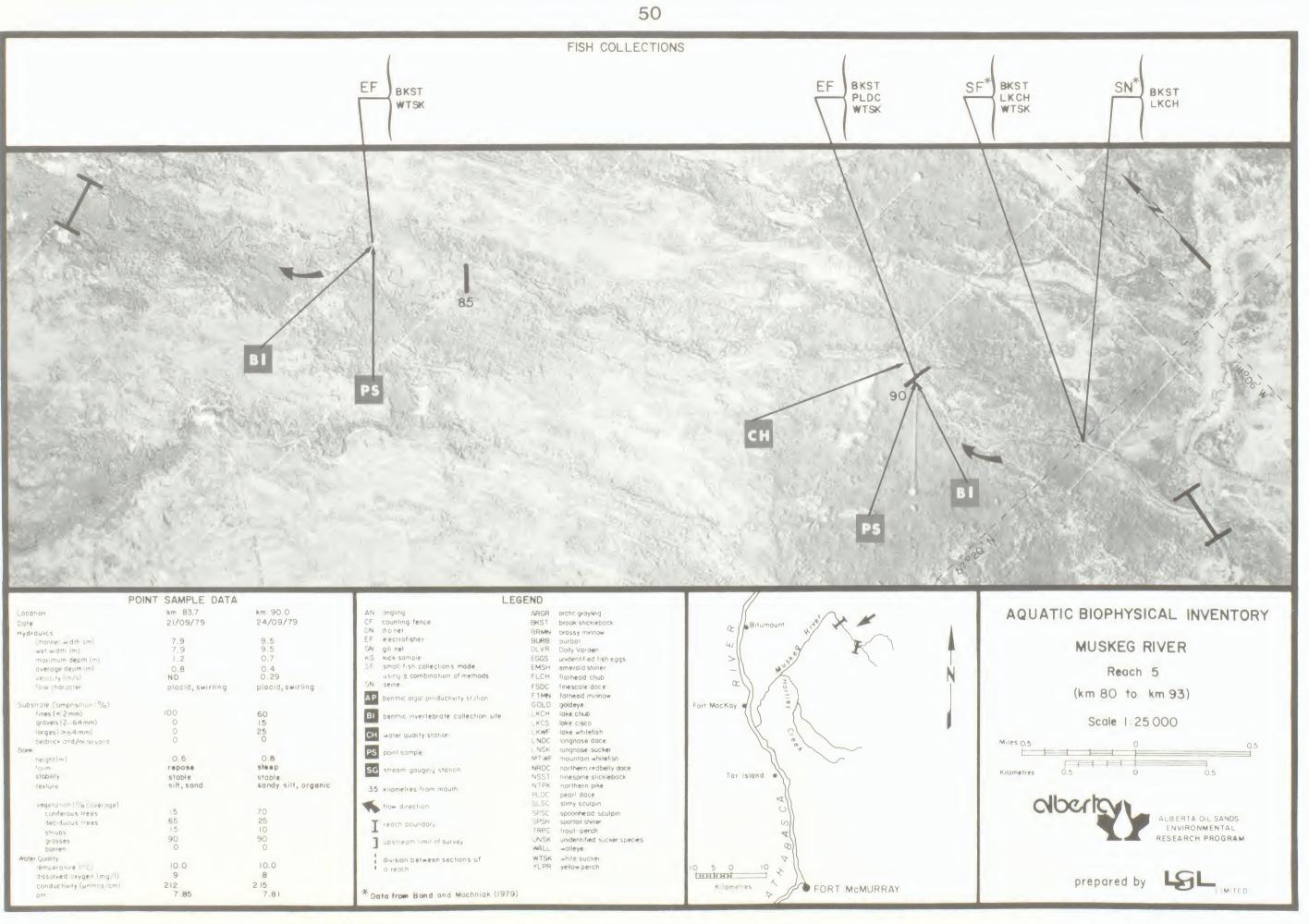
the larger fish into this reach from downstrea regions is by beaver dams. Only brook stickleback, lake chub, pearl dace, -the-year white suckers have been collected in this reach. back, lake chub, and pearl dace are almost certainly year-round

WATER QUALITY

ater Survey of Canada station number	DOATO7DAG	094	
	Mean	Maximum	Mininum
otal alkalinity (g CaCO /l) H	238.3	720.0	74.2
otal hardness (mg CaCO_/1)	224.0	656.0	78.3
onductance (uS/cm)	417	1200	142
otal filterable			
residue fixed (-g/1)	206	691	81
otal non-filterable			
residue fixed (q/1)	7	30	0.4
otal organic carbon (mg C/1)	21.0	29.0	12.0
ilica (g SiO-/1)	19.0	72.0	4.0
itrate and nitrite nitrogen (mg N/1)	0.010	0.010	0.003
otal Kjeldahl nitrogen (mg N/1)	2.05	4.0	0.39
otal Phosphorus (mg P/1)	0.130	0.320	0.031
rthophosphate (mg P/1)	0.020	0.060	0.010
ulphate (g SO /1)	4.6	8.5	0.5

Data for the period January 1976 to December 1979 obtained from the National Water Quality Data Bank (NAQUADAT).





	POINT SAMPLE DATA		LE	EGEND			
Location	km 83.7	km 90.0	AN ongling	ARGR	orctic graying		
Date	21/09/79	24/09/79	CF counting fence		brook stickleback	Bitumount	
Hydraulics			UN dipiner	BRMN	brassy minnow	C Bitumount	
hanne width (m	7.9	9.5	EF electrofisher		burbot		
wet width ml	7.9	9.5	GN gill net	DLVR	Dolly Varden	Y RI	
maximum depth (m)	1.2	0.7	KS kick sample	EGGS	unidentified fish eggs	>	
overage depth (m)	0,8	0.4	F small fish collections made	EMSH	emerald shiner	- Nur	
velocity m/s)	ND	0.29	using a combination of methods	FLCH	flathead chub	NA	
flow haracter	placid, swirling	placid, swirling	SN seine	FSDC	finescale dace	CC I	
			AP benthic algal productivity station	FTMN	fathead minnow		
Substrate Composition 1%)			Dennie diger productivity station	GOLD	goldeye	Fort MacKay	
fines (< 2mm)	100	60	BI benthic invertebrate collection site	LKCH	lake chub		
gravels (2-64mm)	0	15		LKCS	lake cisco		
larges >64 mm)	0	25	CH water quality station	LKWE	lake whitefish		
bedrock and/or bill sand	0	0	Chi worer quarry station	LNDC	longnose dace		Mil
Bonk			PS point sample	LNSK	longnose sucker		
neight(m)	0.6	0.8		MTWF	mountain whitefish		
form	repose	steep	SG stream gauging station	NRDC	northern redbelly dace		Kild
stability	stable	stable		NSST	ninespine stickleback	Tar Island	KIIG
texture	silt, sond	sandy silt, organic	35 kilometres from mouth	NTPK	northern pike		
			So kilonenes horrineen		pearl dace	The second se	
vegetation 1% covernget			flow direction	SLSC	slimy sculpin		
coniferous trees	15	70		SPSC	spoonhead sculpin		
deciduous trees	65	25	T reach boundary	SPSH		(N)	
shrubs	15	10		TRPC		A	
grasses	90	90	Jupstream limit of survey		unidentified sucker species		
barren	0	0			walleye		1
Water Quality			division between sections of		white sucker	Z	
emperature / PC	10.0	10.0	a reach	YLPR	yellow perch	10 5 0 10 2	
dissolved oxygen [mg/])		8				(ниннн	
conductivity (umhos/cm)		2 15				Kilometres FORT MCMURRAY	
PH	7.85	7.81	* Data from Bond and Mochniak (1975))		P - FORT MCMORRAT	

NUMBERS OF FISH COLLECTED (SEPTEMBER 1979)			HARACTERISTICS h length (km) nel width (m) nel area (ha) ient (m/km) character l pools (7) ern inement able banks (%) trate composition (*) nes (<2 mm) avels (2-64 mm) rges (>64 mm) drock and/or oil sand is	19.0 8 15.2 4.2 placid 100 irregularly meandering unconfined 0 100 0 0 high	REACH DESCRIPTION AND FIS This section of t a very marshy region. that reduce the flow, pools. No sites were strate is probably sam vegetation consists of The stream channel is woody debris is abunda No fish collection the habitat is suitable residents of the area.	the Mu Alth and t sampl nd and f deci almos ant. ons we le onl
BENTHIC INVERTEBRATES No benthic samples were taken in this reach.		<section-header></section-header>		AM GAUGING DATA No data available for this rea	ach	A

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-1

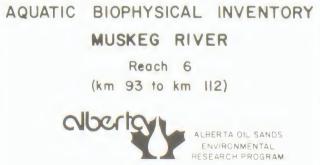
-

JTILIZATION

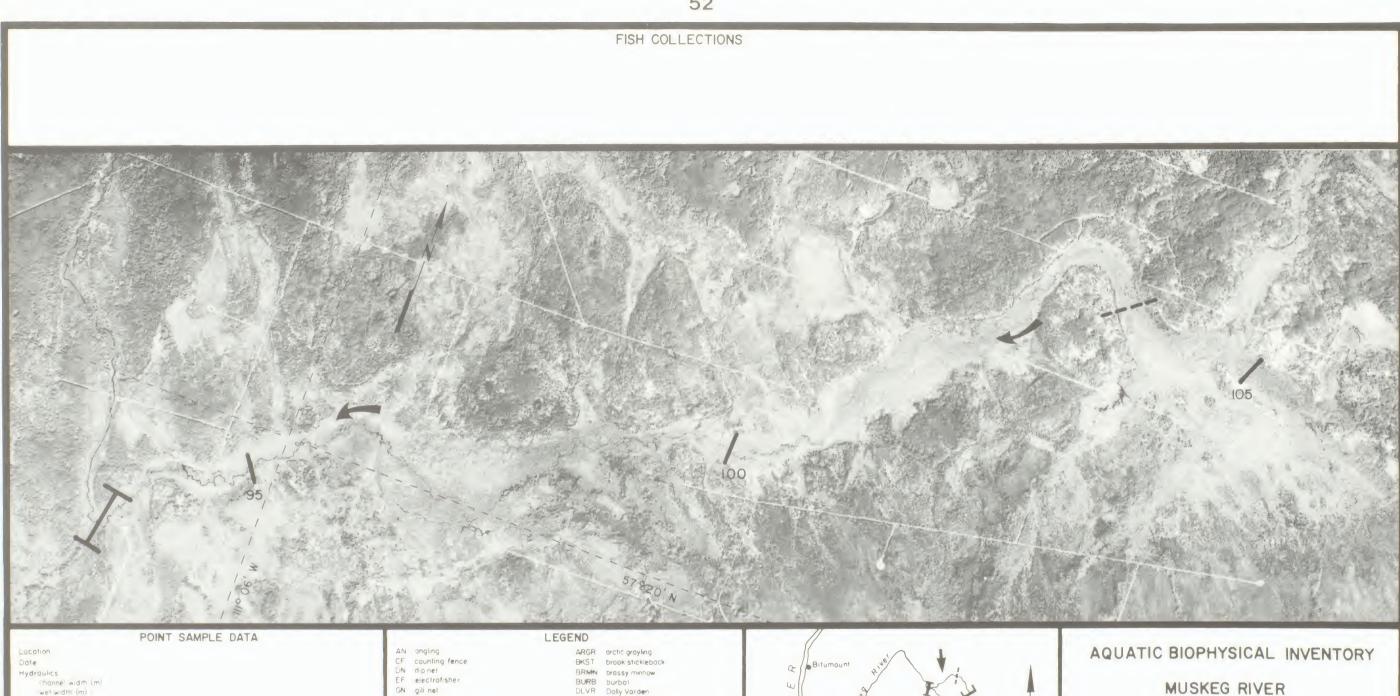
Muskeg River meanders in an irregular pattern through Ithough the gradient is high, there are many beaver dams the reach consequently consists entirely of placid mpled in this reach, but it is expected that the suband silt with a high organic detritus content. Riparian eciduous trees and shrubs and a dense growth of grasses. most completely covered by overhanging vegetation, and

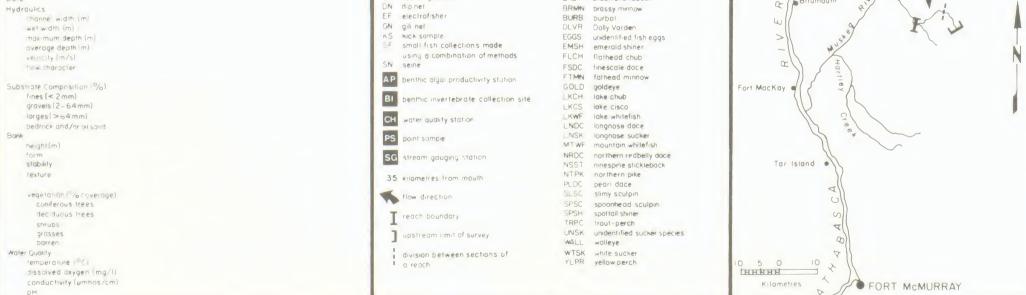
were made in this reach. It is probable, however, that only for brook stickleback, which would be year-round

WATER QUALITY No data available for this reach



prepared by LIMITED

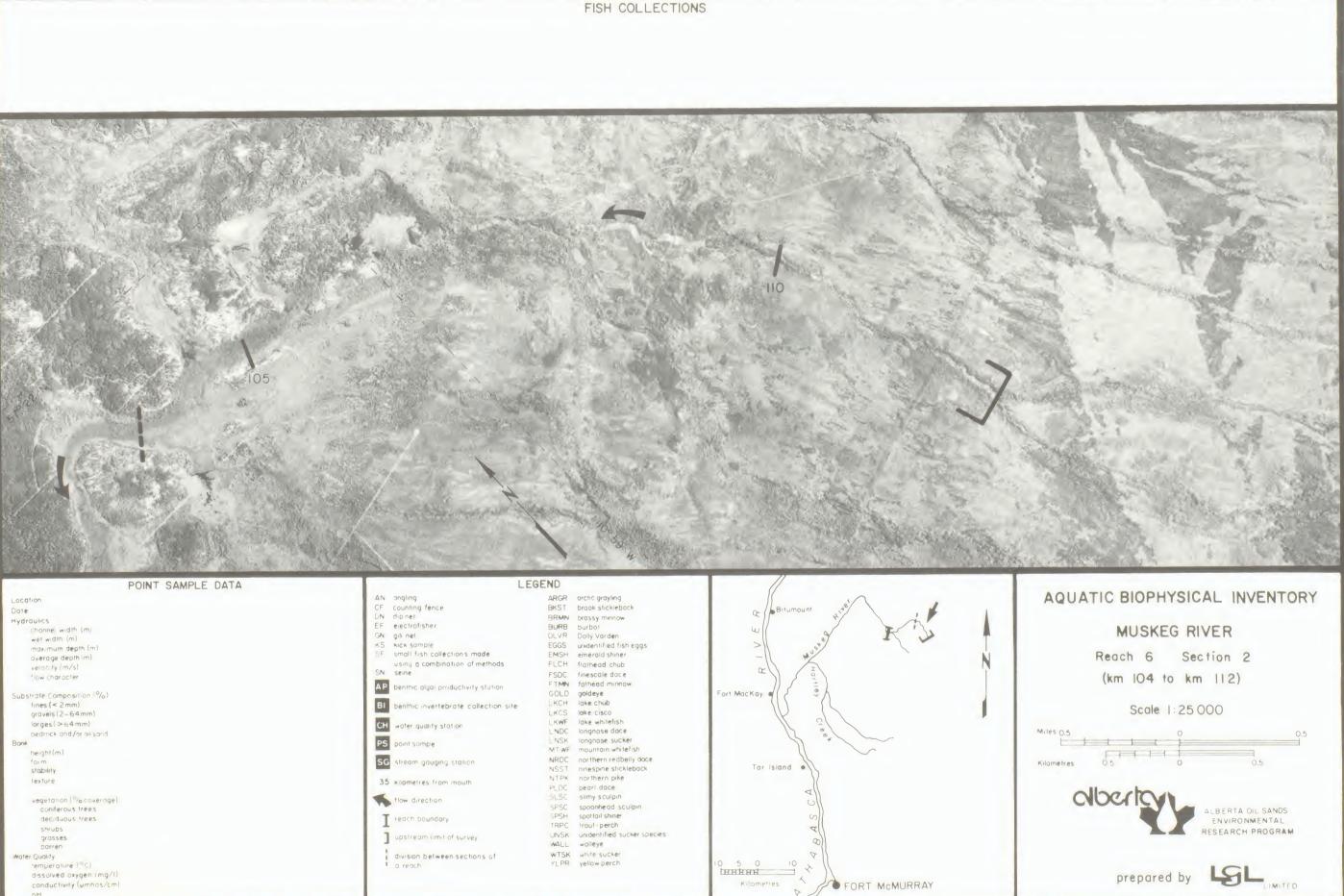




Reach 6 Section | (km 93 to km 104)

Scale 1:25000





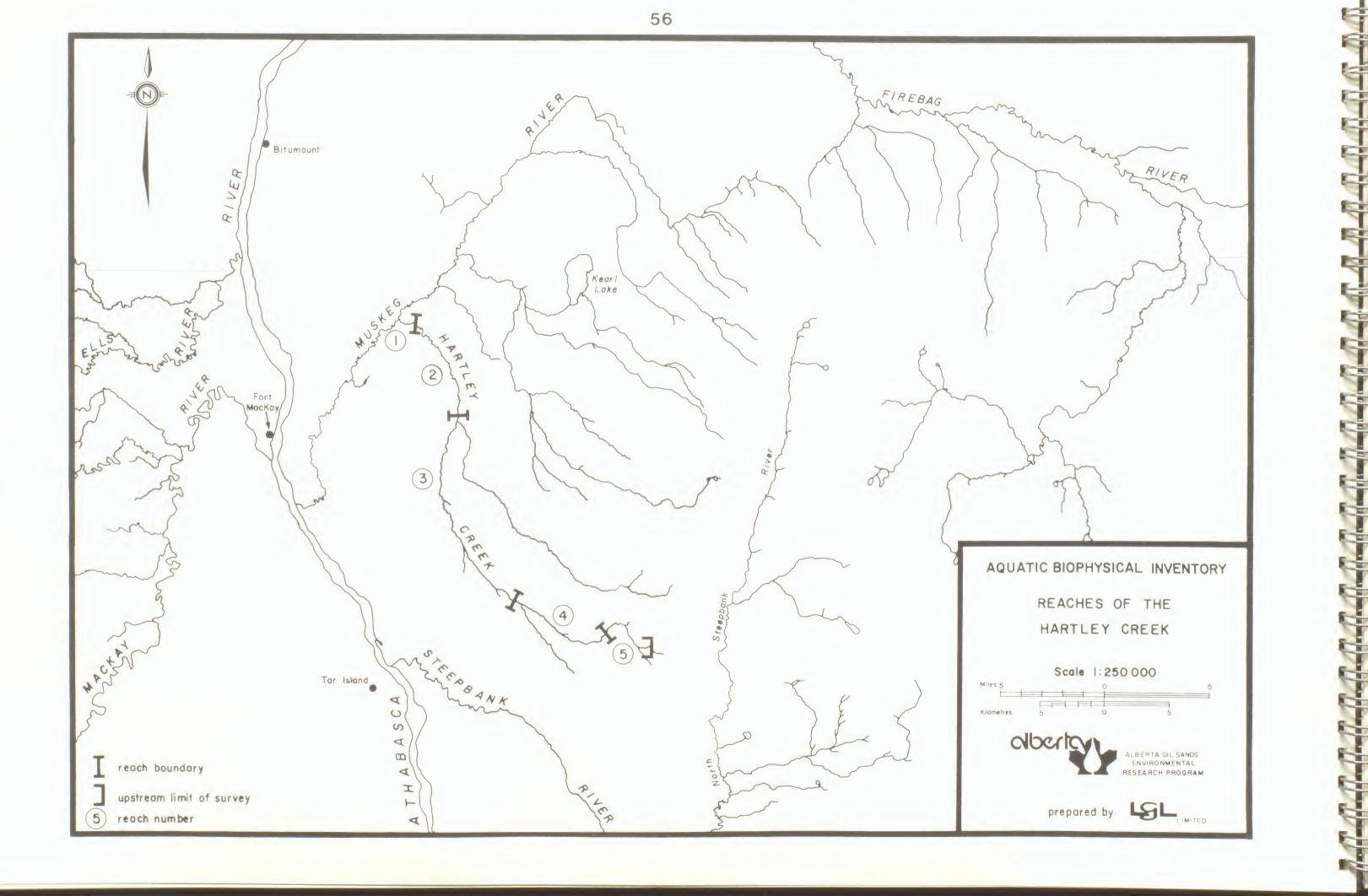




HARTLEY CREEK

55





IMBERS OF FISH COLLECTED (SEPT	EMBER 1979)			PHYSICAL CHARACTERISTICS		REACH DESCRIPTION AND FI
Species	Adults	Juveniles and Young-of-the-year	Total Numbers	Reach length (km) Channel width (m) Channel area (ha)	4.5 9 4.1 1.1	This short, tort confluence of Hartley low and the reach is substrate is entirely
brook stickleback pearl dace Total	1 0 	0 3 3	1 3 4	Gradient (m/km) Flow character Total pools (%) Pattern Confinement Unstable banks (%) Substrate composition (%) fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sand Debris	placid, swirling 95 tortuously meandering unconfined 0 100 0 0	riparian vegetation of grasses. Substantia this reach. There is Weedy areas alor back and northern pill is considered poor. of pearl dace and lak overhanging vegetatio conditions in this re appears to be suffici
ENTHIC INVERTEBRATES NEMATODA OLIGOCHAETA PELECYPODA Macmalian INSECTA Ephemeroptera Corixidae Diptera Chironomidae Tanypodinae	Conit Decid Shrut Grass Barre	bverage (%) ferous trees 0 duous trees 75 bs 35 ses 90 en 0 1 cover (%) hang 10	ENTHIC ALGAL PRODUCTIVITY No data available for this r	each		62.2 x 10 (1978) 20.1 x 10 m ² (1977) 1.97 m ⁷ /s (1978) 0.63 m ⁷ /s (1977) 9.20 m ⁷ /s (September 1978) 0.01 m ⁷ /s (February 1978) 14.81 m ⁷ /s (July 20, 1975) 0.01 m ⁷ /s (Jan. 12, 1978) Loeppky and Spitzer (1977).
Diptera Chironomidae						

ションランジョ

ISH UTILIZATION

tuously meandering reach extends upstream 4.5 km from the ey Creek and the Muskeg River. The gradient is relatively almost entirely pools with placid or swirling flow. The y silt and sand with a low organic detritus content. The consists of deciduous trees and shrubs and a dense growth of al amounts of shrubs overhang the stream channel throughout is a moderate amount of debris in the channel.

ng the banks provide good spawning habitat for brook stickleke. The spawning potential of this reach for other species Some areas with sand substrates may be suitable for spawning ke chub. The low water velocities and the abundant debris, on, and aquatic vegetation along the banks provide good rearing

each. The water is moderately deep throughout the reach and ient for overwintering of fish.

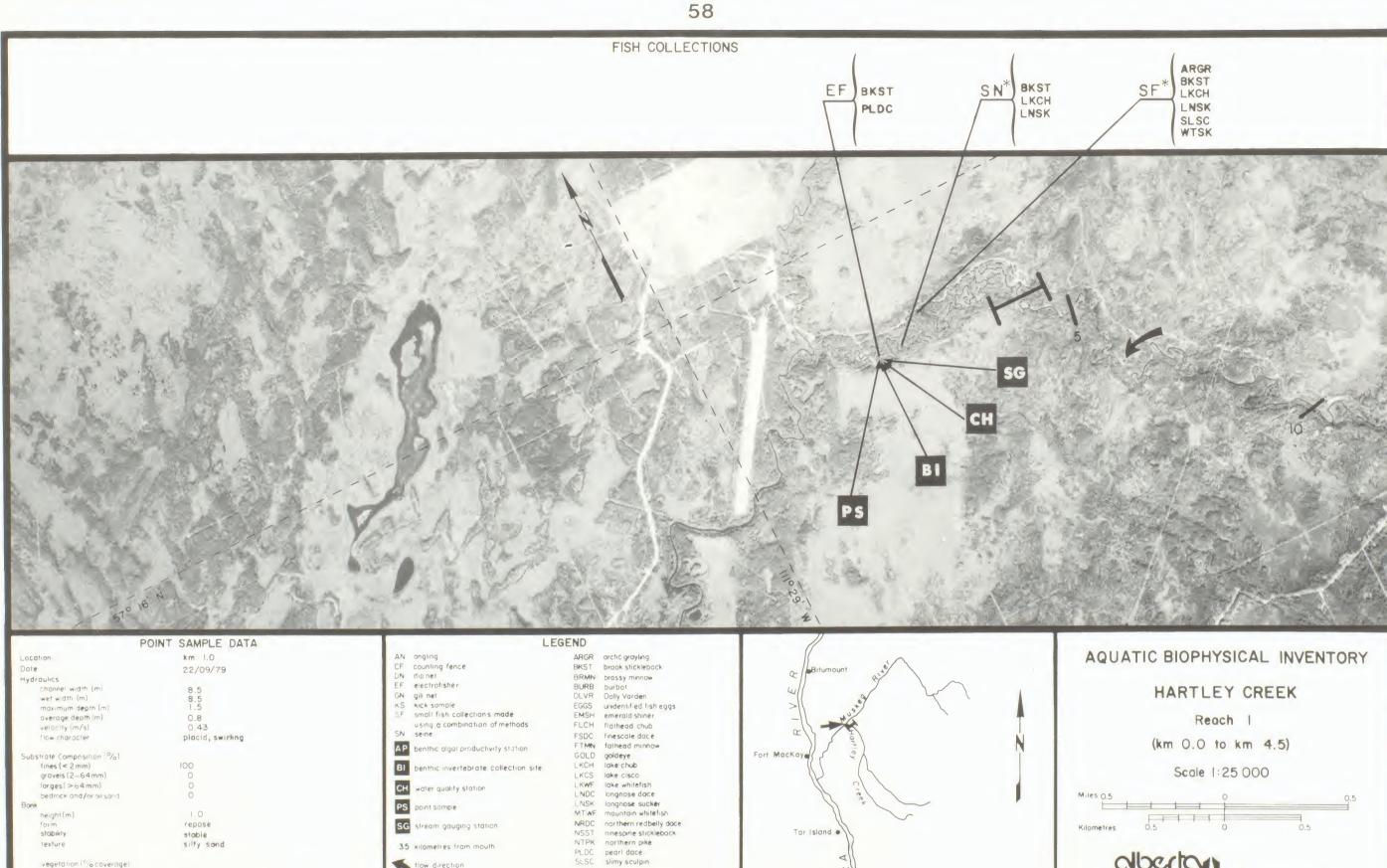
WATER QUALITY

00AT07DA0	090	
Mean	Maximum	Minimum
163.4		
140.0	317.0	43.1
292	660	100
144	383	49
15	400	0.4
28.0	96.0	9.0
8.8	16.8	1.7
0.050	0.420	0.003
1.23	4.05	0.35
0.050	0.330	0.005
5 . 0	14.0	0.1
	Mean 163.4 7.70 140.0 292 144 15 28.0 8.8 0.150 1.23 0.050 0.010	163.4 348.2 7.70 8.65 140.0 317.0 292 660 144 383 15 400 28.0 96.0 8.8 16.8 0.750 0.420 1.23 4.95 0.050 0.330 0.010 0.060

Data for the period January 1976 to December 1979 obtained from the National Water Quality Data Bank (NAQUADAT).

AQUATIC BIOPHYSICAL INVENTORY HARTLEY CREEK Reach I (km 0.0 to km 4.5) abertar







80

30 90

130 7.89

8.0



.

SPSC spoonhead sculpin SPSH spottail shiner TRPC trout-perch

WALL walleye

WTSK white sucker YLPR yellow perch

UNSK unidentified sucker species

10 5 0 10 ×

P

Kilometres

FORT MCMURRAY

flow direction

T reach boundary

upstream limit of survey

division between sections of a reach



				59	
1BERS OF FISH COLLECTED (SEF	PTEMBER 1979)			PHYSICAL CHARACTERISTICS	
Species	Adults	Juveniles and Young-of-the-year	Total Numbers	Reach length (km) Channel width (m) Channel area (ha) Gradient (m/km)	16.5 10 16.5 2.1
arctic grayling brook stickleback slimy sculpin white sucker Total	0 3 0 0 3	2 1 3 1 7	2 4 3 1 10	Flow character Total pools (%) Pattern Confinement Unstable banks ()) Substrate composition (*) fines (=2 mm) gravels (2-64 mm) larges (=64 mm) bedrock and/or oil sand Debris	placid, swirling, rolling 70 irregularly meandering occasionally confined 0 90 5 5 5 0 moderate
THIC INVERTEBRATES NEMATODA OLIGOCHAETA GASTROPODA Ferrizeiz Juracluz PELECYPODA Muselian Fisidium Sphaerian ARACHNIDA Hydracarina INSECTA	Coni Decia Shrut Grass Barre	overage (%) ferous trees 15 duous trees 40 os 35 ses 85 en 0 1 cover (%) nang 5	BENTHIC ALGAL PRODUCTIVITY No data available for this r		TREAM GAUGING DATA No data available for this rea
Ephemeroptera Amelicus Individua Etimanema Plecoptera Claaseris Jagerua Jagerua Jagerua Fernanaya Tercharata Brashgeetema Charatoringuch Limmephilua Mierzaama Coleoptera Dryopidae Elimidae Diptera Tipulidae Ceratopogonidae Chironominae Tanypodinae Orthocladiinae					
	A small rif	fle area et km 8.7.		Placid pool at km 16	

NUME

BENT

Water Survey of Canada station number 00AT07DA0082 Mean Maximum Minimum 134.4 303.0 56.4 Total alkalinity (mg CaCO /1) 8.30 51.0 116.6 Total hardness (mg CaCO /1) 115 Conductance (US/cm) Total filterable residue fixed (mg/1) Total non-filterable 14 residue fixed (mg/l) 41.0 Total organic carbon (mg C/1) Silica (mg SiO /1) Nitrate and nitrite nitrogen (mg N/1) 0.060 Total Kjeldahl nitrogen (mg N/1) 0.85 1.50 Total Phosphorus (mg P/1) 0.040 0.080 Orthophosphate (mg P/1) Sulphate (mg S0 /1)

REACH DESCRIPTION AND FISH UTILIZATION

This irregularly meandering section of Hartley Creek has a moderate gradient. Although the reach is mostly pools, riffle areas are fairly numerous. The flow character is mixed, varying from placid to swirling to rolling. There were several beaver dams present in this reach at the time the stream was surveyed in 1979. The substrate in most of the reach is sand with small amounts of silt; however, a number of areas (the riffle sections) do have gravelly and cobble substrates. Most quiet areas along the banks have some aquatic vegetation. The riparian vegetation is primarily deciduous trees and shrubs, but there are scattered patches of conifers. There is also a dense growth of grasses, and there is some overhanging vegetation throughout this reach. Moderate amounts of debris are present in the stream channel.

The sections of this reach with gravel and cobble substrates provide good spawning potential for a number of fish species (e.g., arctic grayling, longnose sucker, white sucker, longnose dace, slimy sculpin). The weedy shallow areas along the banks probably provide suitable spawning habitat for brook stickleback. The rearing potential of this reach is considered good because there are many areas with low water velocities and abundant shelter. The many deep pools in this reach are probably good for resting and feeding of larger fish. Water depths appear to be sufficient for overwintering of fish.

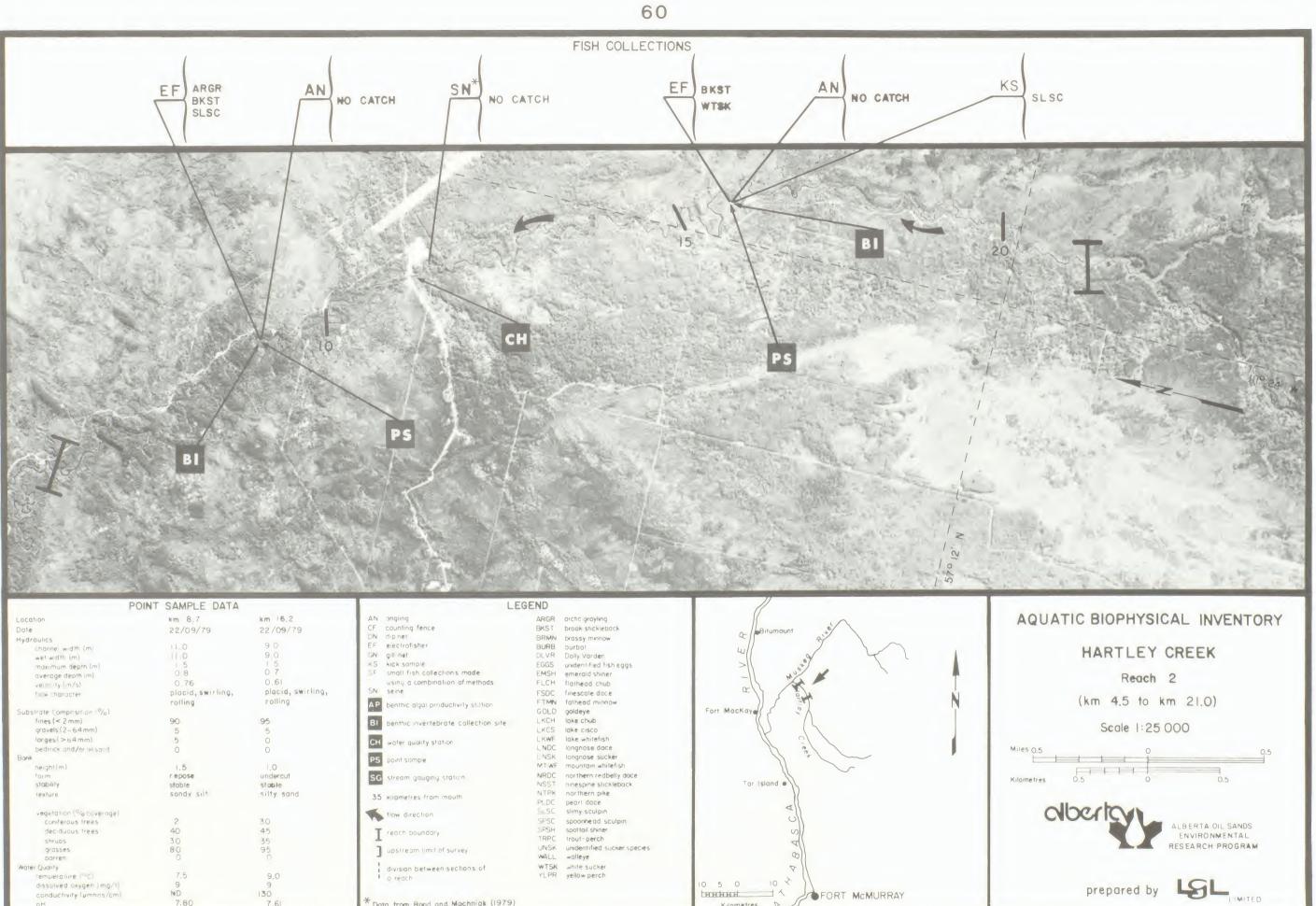
WATER QUALITY

Data for the period January 1976 to December 1979 obtained From the National Water Quality Data Bank (NAQUADAT).

AQUATIC BIOPHYSICAL INVENTORY HARTLEY CREEK Reach 2

(km 4.5 to km 21.0)





PO	INT SAMPLE DATA		LE	EGEND		
Location	km 8,7	km 16.2	AN angling CF counting fence	ARGR arctic grayling BKST brook stickleback		4
Date	22/09/79	22/09/79	UN dip net	BRMN brassy minnow	Q- Bitumount	
Hydroulics	11.0	90	EF electrofisher	BURB burbot		
channe width (m)	11.0	9 0	GN all net	DLVR Dolly Varden		
wet width (m)	1 5	1 5	KS kick sample	EGGS unidentified fish eggs		
maximum depth (m)	0.8	07	SF small fish collections made	EMSH emerald shiner		
average depth (m) ventority (m/s)	0.76	0.61	using a combination of methods	FLCH flathead chub		
fice character	placid, swirling,	placid, swirling,	SN seine	FSDC finescale date		
new Endrocher	rolling	rolling		FTMN fathead minnow		
Substrate Composition %	loung		AP benthic algal productivity station	GOLD goldeye	Fort MacKay	
fines (< 2 mm)	90	95		LKCH lake chub		
gravels (2-64mm)	5	5	BI benthic invertebrate collection site	LKCS lake cisco		
largest > 64mm)	5	0	199	LKWF lake whitefish		1
bedrock and/or oil saud	5	0	CH water quality station	LNDC longnose doce	i l	Mile
Bonk	0	0	PS point sample	LNSK longnose sucker		
height(m)	1.5	0.1	PS point sample	MTWF mountain whitefish		1
form	repose	undercut	SG stream gauging station	NRDC northern redbelly dace		
stability	stable	stable	So shearn guaging station	NSST ninespine stickleback	Tar Island	Kilo
lexture	sondy silt	silty sand	35 Kilometres from mouth	NTPK northern pike		1
			3.5 kilometres from moun	PLDC pearl dace		
vegetation (^d /occverage)			flow direction	SLSC slimy sculpin		
coniferous trees	2	30	NOW DIRECTION	SPSC spoonhead sculpin		
deciduous trees	40	45	T reach boundary	SPSH spottail shiner		
shrups	30	35		TRPC trout-perch		
grasses	80	95	Jupstream limit of survey	UNSK unidentified sucker species		
parren	Ō	0		WALL walleye		
Nater Quality			division between sections of	WTSK white sucker		
'emperature ("C)	7.5	9.0	o reach	YLPR yellow perch		
dissolved exygen img/1	9	9			10 5 0 10 ×	
conductivity (umbos/cm)	ND	130			FORT MCMURRAY	
pH	7.80	7.61	* Data from Bond and Machniak (1979)		Kilometres P	

			61		
NUMBERS OF FISH COLLECTED (SEPTEME	<u>BER 1979)</u>		PHYSICAL CHARACTERISTICS Reach length (km)	28.0	REACH DESCRIPTION AND I This section of marshy area. The gr
Species pearl dace Total	Juveniles and Adults Young-of-the-yea 0 3 - 0 3	r Total Numbers	Channel width (m) Channel area (ha) Gradient (m/km) Flow character Total pools (%) Pattern Confinement Unstable banks (%) Substrate composition (*) fines (<2 mm) qravels (2-64 mm) larges (>64 mm) bedrock and/or oil sand Debris	7 19.6 1.3 placid, swirling 95 tortuously meandering unconfined 0 90 5 5 5 0 high	A high proportion of riffle areas. Seven stream was surveyed sists of sand and s The riparian vegetal of coniferous trees the channel cover du woody debris are pro The spawning po substrates is consid riffle areas. Many spawning of pearl du spawning habitat for vegetation, and the suitable for rearing ficient to allow over
BENTHIC INVERTEBRATES DLIGOCHAETA PELECYPODA ARACHNIDA Hydracarina CRUSTACEA Amphipoda Cammuna tunno tunno timmen. Mailla uters INSECTA Ephemeroptera Catsidae Trichoptera Corixidae Trichoptera Coleoptera Gyrinidae Elmidae Diptera Ceratopogonidae Chironominae Tabanidae	RIPARIAN VEGETATION Bank coverage (?) Coniferous trees 15 Deciduous trees 60 Shrubs 20 Grasses 95 Barren 0 Channel cover (?) 0 Overhang 25 Crown 5	BENTHIC ALGAL PRODUCTIVITY No data available for this n	reach	REAM GAUGING DATA No data available for this reach	
	Hartley Creek at k 26.		Dverhamming shrubs a	nd heavily grasted banks at km	38.5.

アラフラフ

D FISH UTILIZATION

of Hartley Creek meanders in a tortuous pattern through a gradient is low and the flow is generally placid or swirling. of the reach consists of pools, but there are some small veral beaver dams were present in this reach at the time the ed in 1979. Although the substrate in most of the reach consilt, there are a few areas with gravel and cobble substrates. tation is dominated by deciduous trees and shrubs and some areas es are present. There is a very dense growth of grasses, and due to overhanging shrubs is fairly high. Large amounts of present in the stream channel.

potential of this reach for those species that require gravel sidered poor. The only suitable locations are the few small ny areas with sand substrates are probably suitable for dace, and the abundant aquatic vegetation provides suitable for brook stickleback. The low water velocities, the aquatic he large amounts of debris provide any areas that appear ing purposes. Water depths in this reach appear to be sufoverwintering of fish.

WATER QUALITY

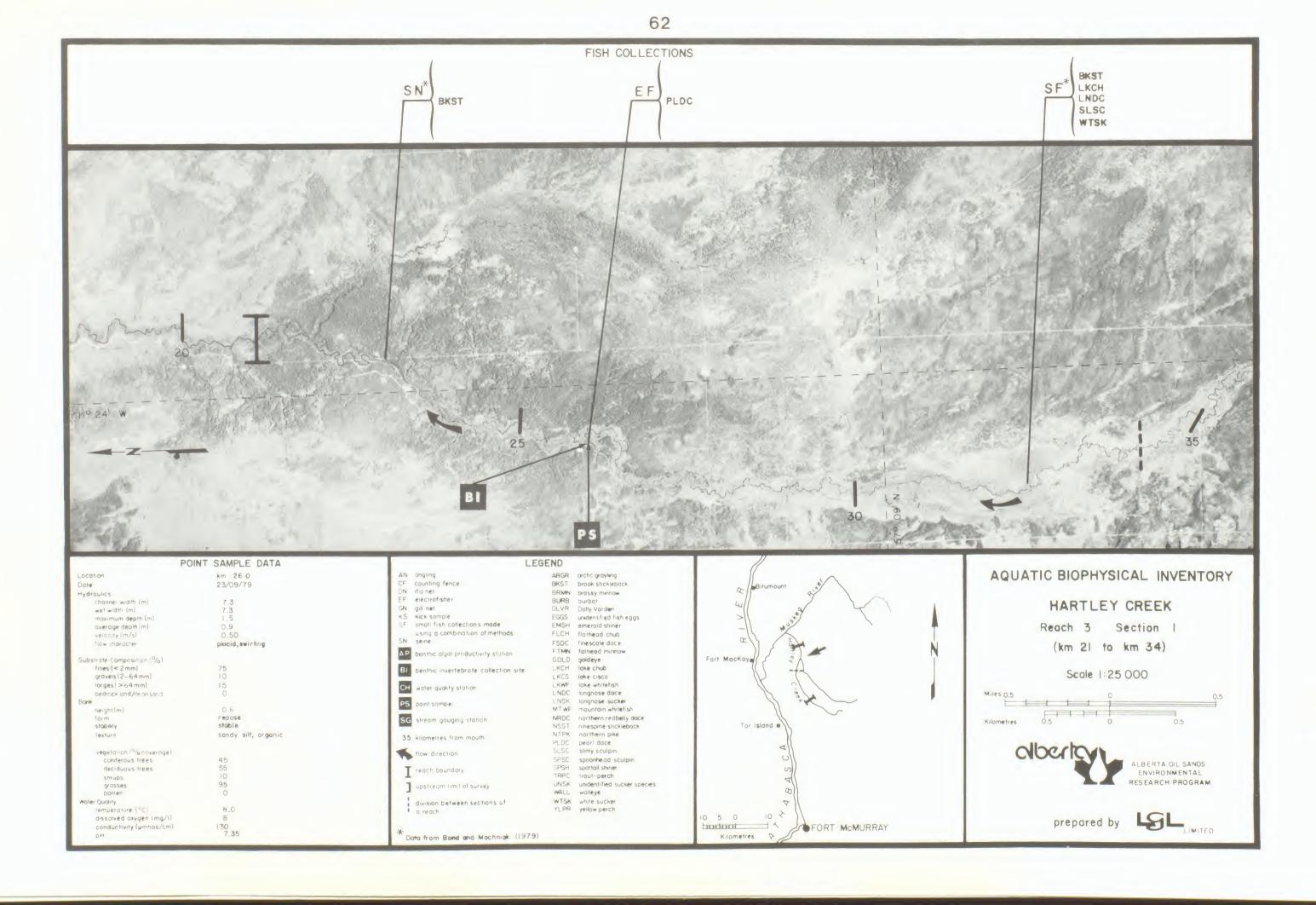
QOATO7DAC	095	
Mean	Max imum	Minimum
163.0		
135.0	252.6	60.5
306	590	131
		-
155	322	74
15	46	-0.4
25.0	40.5	7.0
8.3	20.0	3.4
0.01		0.706
		0.10
0.110	0.500	
5.3	10.8	0.6
	Mean 163.0 7.50 135.0 306 155 15 25.0 8.3 0.01 1.42 0.110 0.020	163.0 307.0 7.50 8.10 135.0 252.6 306 590 155 322 15 46 25.0 40.5 8.3 20.0 0.01 0.01 1.42 4.17 0.110 0.500 0.020 0.40

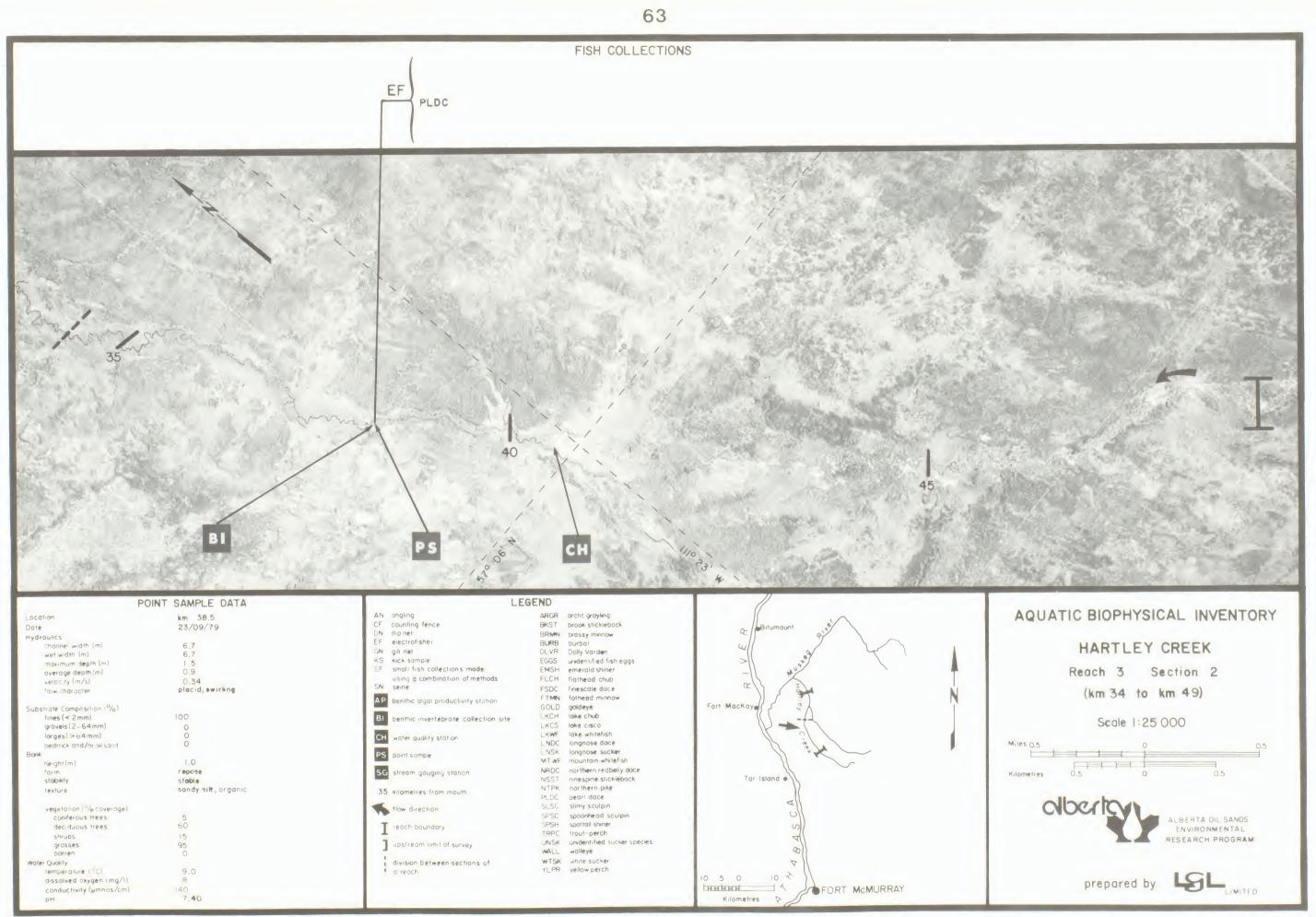
Data for the period January 1976 to December 1979 dutained from the National Water Quality Data Bank (NAQUADAT).

AQUATIC BIOPHYSICAL INVENTORY HARTLEY CREEK

Reach 3 (km 21 to km 49)







PHYSICAL CHARACTERISTICS NUMBERS OF FISH COLLECTED (SEPTEMBER 1979) REACH DESCRIPTION AND FISH UTILIZATION Reach length (km) 12.5 20 25.0 Channel area (ha) Juveniles and Specles Adults Young-of-the-year Total Numbers 6.6 Gradient (m/km) placid, swirling, brook stickleback 6 4 white sucker 0 90 Total pools (7) irregularly meandering 26 Pattern Total 6 occasionally confined Confinement Unstable banks (//) 0 Substrate composition (3) fines (-2 mm) gravels (2-64 mm) 0 larges (>64 mm) undoubtedly a year-round resident in this reach. bedrock and/or oil sand high BENTHIC ALGAL PRODUCTIVITY STREAM GAUGING DATA BENTHIC INVERTEBRATES RIPARIAN VEGETATION No data available for this reach No data available for this reach HIRUDINEA Bank coverage (') Coniferous trees Glossiphoniidae 30 GASTROPODA 40 Deciduous trees CRUSTACEA Shrubs Amphipoda Grasses 90 Barren INSECTA Ephemeroptera Channel cover () Overhang Crown Odonata Libellulidae Hemiptera Corixidae Megaloptera Trichoptera Coleoptera Haliplidae Dytiscidae Elmidae Diptera Tipulidae Ceratopogonidae Chironomidae Chironominae Tanypodinae Orthocladiinae Tabanidae

Pond created by beaver dar at k 52.5.

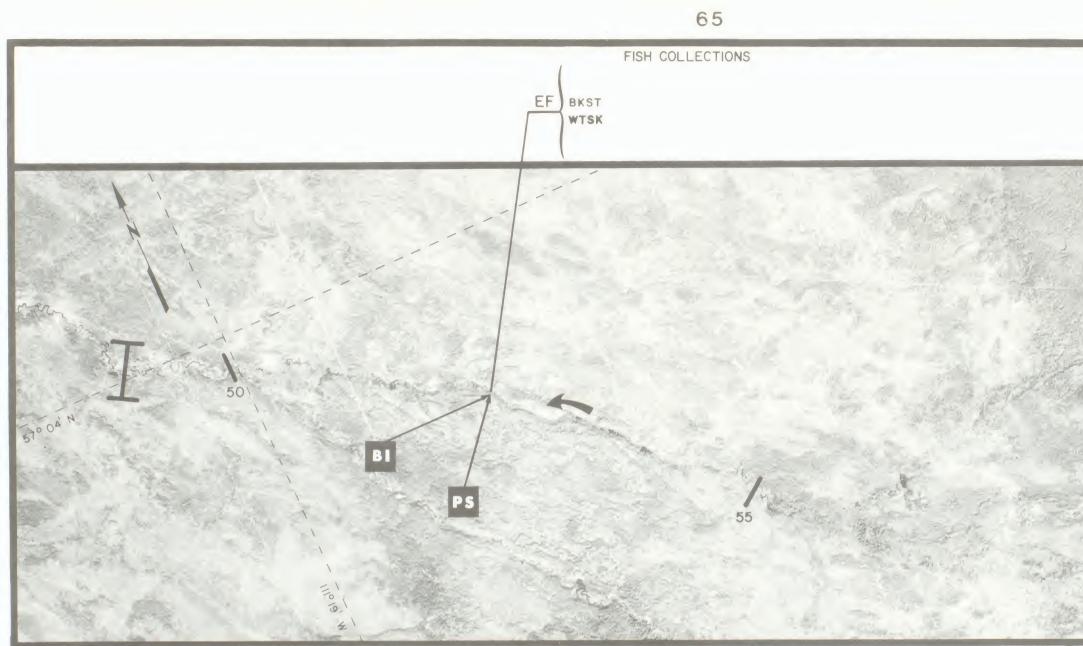
Area of old beaver dam impoundment at km 61.

This irregularly meandering section of Hartley Creek has a high gradient, and the flow character is mixed, varying from placid to swirling to rolling. Although the gradient is high, flow is impeded by the very many beaver dams, some of which are partially vegetated and appear to be very old. Because of the many beaver dams, the majority of the reach consists of pools. Some riffle areas are present immediately downstream from beaver dams. Substrates in most of the reach consist of silt and sand, but some gravel is present in the short riffle areas. The riparian vegetation is dominated by deciduous trees and shrubs in much of the reach, but coniferous trees are abundant in some areas. There are relatively small amounts of overhanging vegetation and large amounts of debris. This reach is not considered to be suitable for spawning of most fish species; suitable substrates are extremely limited and the beaver dams severely limit movements of larger fish. There are many areas with abundant aquatic vegetation that are good spawning and rearing areas for brook stickleback. This species is

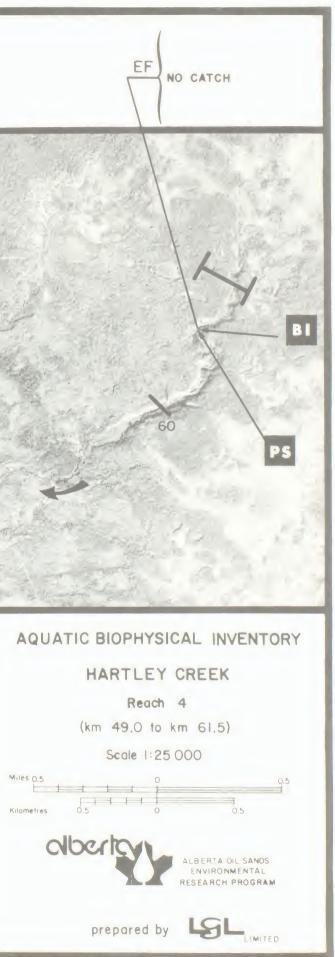
WATER QUALITY

No data available for this reach

AQUATIC BIOPHYSICAL INVENTORY HARTLEY CREEK Reach 4 (km 49.0 to km 61.5) aberta ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by LIMITED



POINT SAMPLE DATA	LEGEND	
Location km 52.5 km 61.0 Date 23/09/79 24/09/79 Hydraulics Ehannel width (m) 9.5 6.7 maximum depth (m) 2.0 0.8 0.4 average depth (m) 0.6 0.4 0.24 vetocity (in/s) 0.13 0.24 100 flow character plactd, swirling plactd, swirling, ralling ralling Substrate composition %) 100 95	AN angling ARGR arctic grayling CF counting fence BKST brook stickleback CN dip net BRIM brook stickleback EF electrofisher BURB burbot GN gill net DUR Dolly Varden KS kick sample EGS uxidentified fish eggs EF small fish collections made EMSH emeraid shiner using a combination of methods FLCH flathead chub SN seine FSCC finescale dace AP benthic algai productivity station GOLD goldeye BI benthic invertebrate collection site LKCH lake whitefish LKCH lake whitefish LNCC longnose sucker PS point sample MTWF mountain whitefish SG stream gauging station NRCC northern redelity dace NST index from mouth PLC pearl dace SS kilometres from mouth SLCS slockleback SS kilometres from mouth SPSC sponhead sculpin <td>Fort Mackaye Tar Island •</td>	Fort Mackaye Tar Island •
Water (Judity) (Water (Judity) Imperature (PC) 10.5 7.5 dissolved oxygen (mg/l) 8 9 conductivity (jumhos/cm) 130 84 pH 7.66 7.39	a reach YLPR yellow perch	10 5 0 10 + FORT MCMURRAY Kilometres P



NO fish collections were made		PHYSICAL CHARACTERIS Reach length Channel width Channel area Gradient (m/ku Flow characte Total pools (* Pattern Confinement Unstable bank Substrate com fines (<2 m gravels (2- larges (>64 bedrock and Debris	(km) 7.5 (m) 15 (ha) 11.3 m) 5.2 rr placid 7) 100 irregularly meandering unconfined as () 0 nposition () 100 100 100 100 100 100 100 10	REACH DESCRIPTION AND FISH UTILIZA This section of Hartley Cu very marshy area. Although no se is believed to consist of sand detritus content. The riparian deciduous trees, and deciduous masses. A large proportion of and there is a large amount of No fish collections were us the habitat is suitable only for residents of the area.
RENTHIC INVERTEBRATES No benthic sam les were taken in this reach.	Bank coverage (*) Coniferous trees 35 Deciduous trees 25 Shrubs 35 Grasses 95 Barren 0 Channel cover (*) 35 Overhang 35 Crown 20	BENTHIC ALGAL PRODUCTIVITY No data available for this reach	STREAM GAUGING DATA No data available for this rea	ach No
				AQU

IZATION

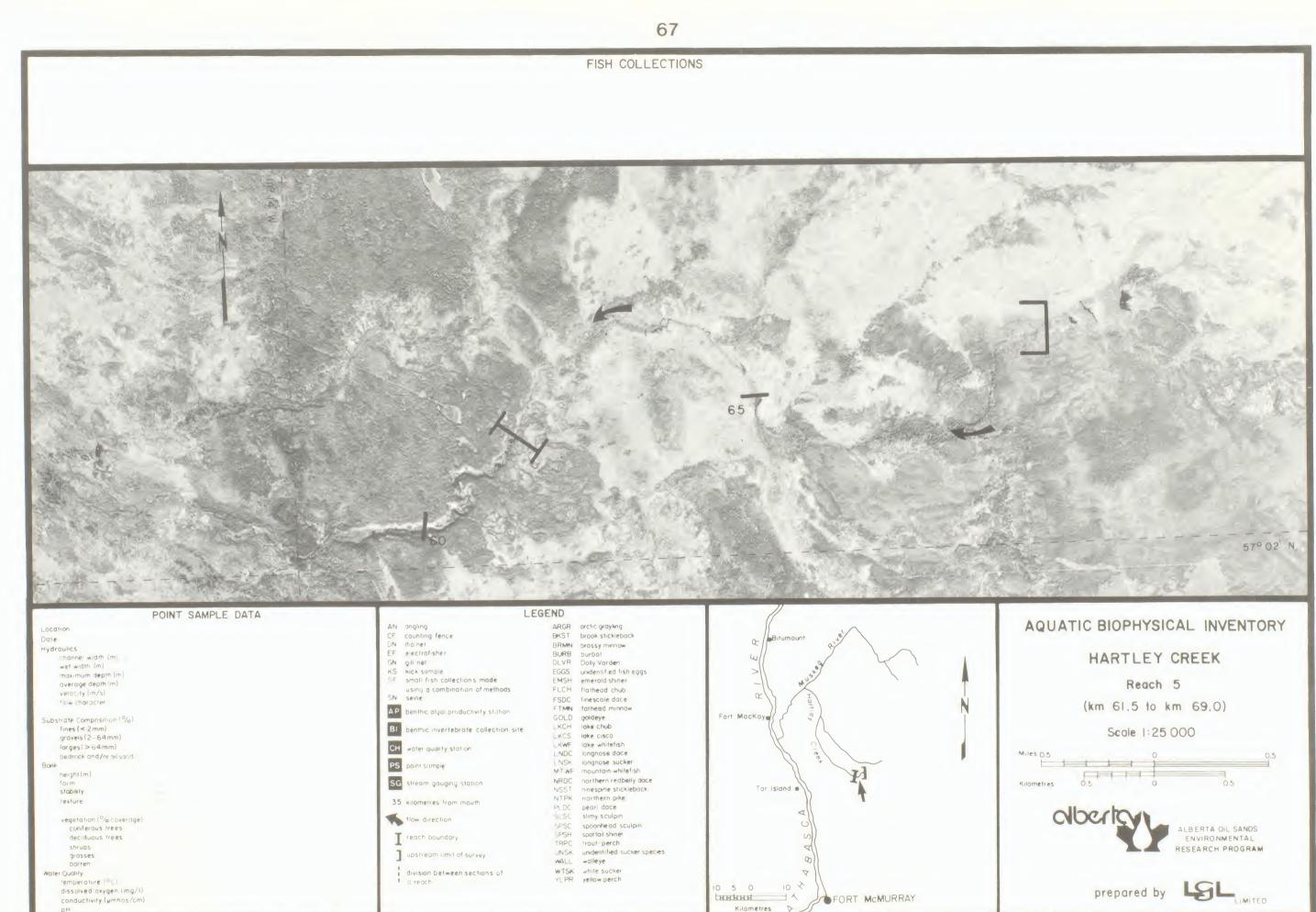
Creek meanders in an irregular pattern through a the gradient is high, water flow is impeded by mean on Is poorly drained. The reach consists entirely o sites were sampled in this reach, the substrate and and silt, and it probably has a high organic ian vegetation is a mixture of coniferous trees, us shrubs. There is also a very dense growth of of the stream is covered by overhanging vegetation of debris.

9

e made in this reach. It is probable, however, that for brook stickleback, which would be year-round

R QUALITY No data available for this reach

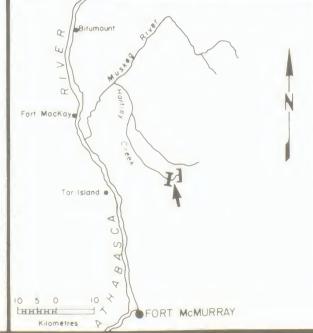


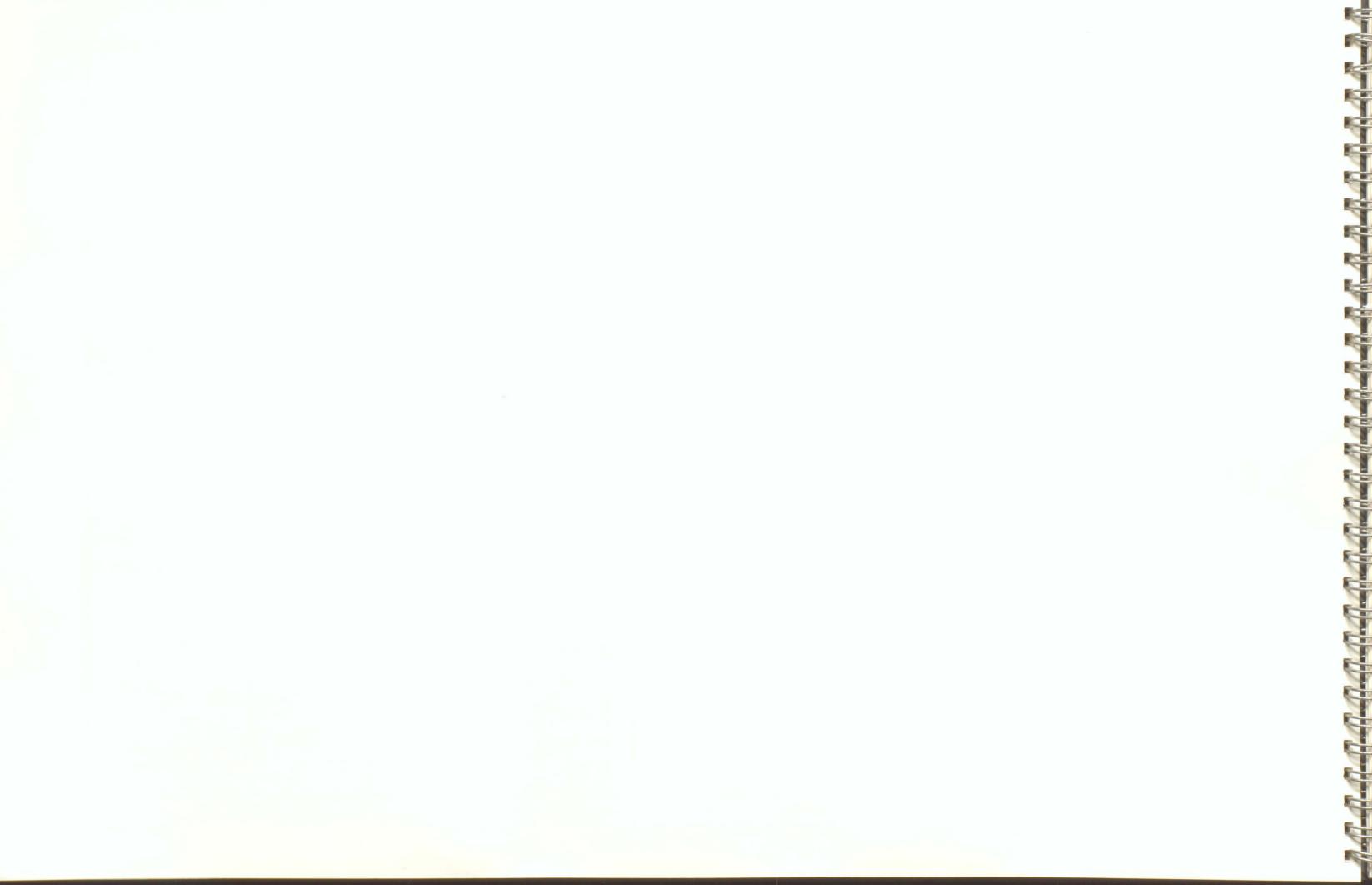


	1 0111.	Oran	In the	Praire
Location				
Date				
Hydraulics				
channel width (m)				
wet width (m)				
maximum depth (m)				
average depth m)				
velocity (m/s)				
fow character				
Substrate Composition (%)				
fines (< 2 mm)				
gravels (2-64mm)				
larges > 64 mm)				
bedrock and/or billsand				
Bonk				
height(m)				
form				
stability				
lexture				
vegetation (% coverage)				
coniferous trees				
deciduous trees				
shrubs				
grosses				
barren				
Water Quality				
emperature (PG)				
dissolved axygen (mg/l)				
conductivity (µmhos/cm)				
pH				

		LEGEND
AN	angling	ARG
CF	counting fence	BKST
UN	dipinet	BRM
EF	electrofisher	BUR
GN	gilt net	DLVI
KS	kick sample	EGGS
SF	small fish collections made	EMS
	using a combination of methods	FLCI
SN	seine	FSD
AP	benthic algai productivity station	FTM
	bennic algar productivity station	GOL
BI	benthic invertebrate collection site	KCI
	bein ne interfebruie concerior sin	LKC:
CH	water quality station	LKW
Cri	water dadiny station	LND
PS	point sample	NS
	Post of the	MTA
SG	stream gauging station	NRD
	33-3	NSS
35	kilometres from mouth	NTP
		PL D
-	flow direction	54 S
		SPS
Т	reach boundary	5PS
-		TRP
]	upstream limit of survey	UNS
		WAL
i	division between sections of	WTS
	a reach	YLP

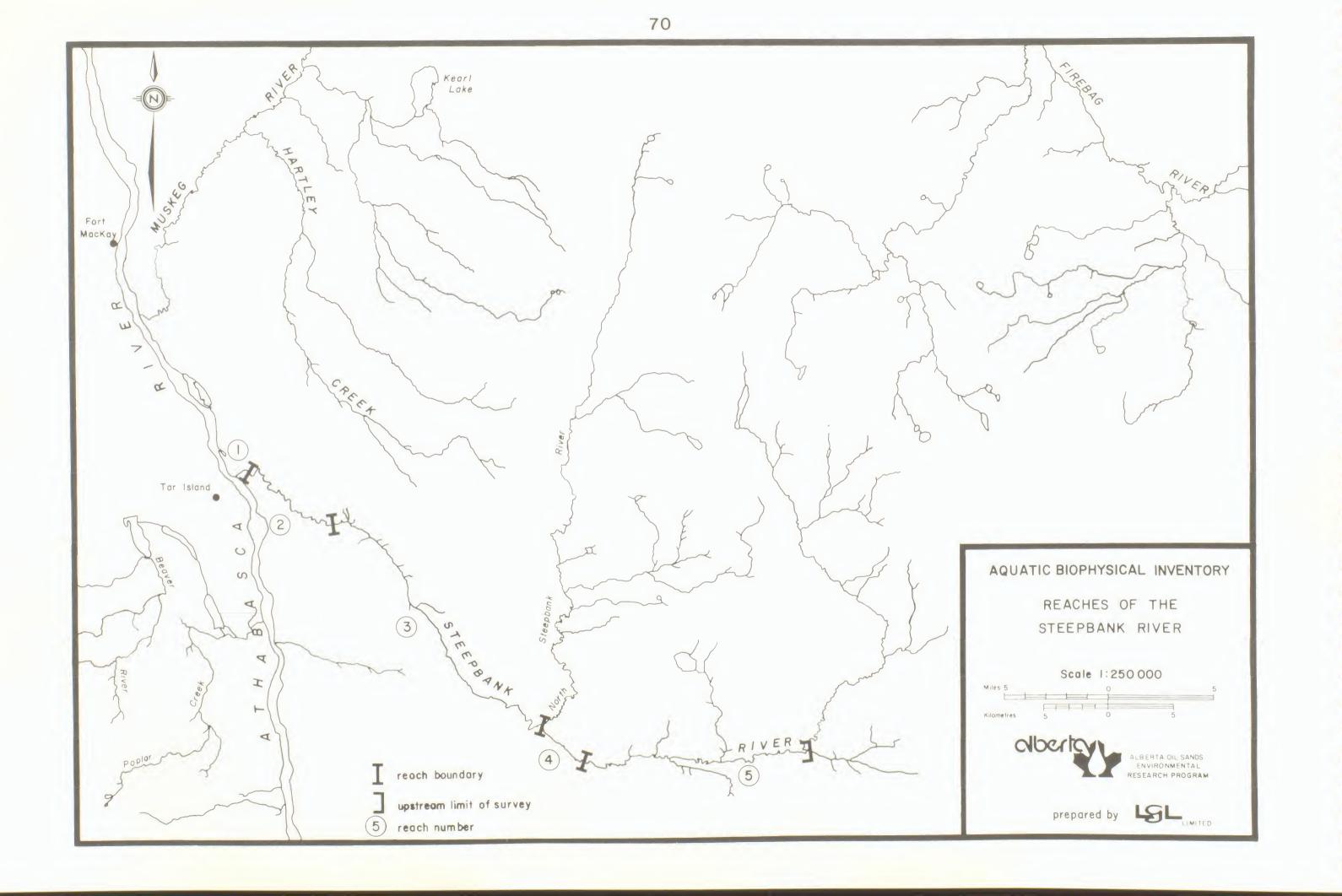
RGR	orctic grayling
KST	brook stickleback
RMN	brassy minnow
URB	burbot
LVR	Dolly Varden
GGS	unidentified fish eggs
MSH	emerald shiner
LCH	flathead chub
SDC	finescale dace
TMN	fathead minnaw
OLD	goldeye
КСН	lake chub
KCS	lake cisco
KWF	lake whitefish
NDC	longnose doce
NSK	longnose sucker
TWF	mountain whitefish
RDC	northern redbelly dace
ISST	ninespine slickleback
TPK	northern pike
1 DC	pearl dace
SC	slimy sculpin
PSC	spoonhead sculpin
PSH	spottail shiner
RPC	trout-perch
INSK	unidentified sucker specie
WALL	walleye
VTSK	white sucker
LPR	yellow perch





STEEPBANK RIVER





NUMBERS OF FISH COLLECTED (1978)

	Adults		Juveniles and Young-of-the-year		Total Numbers	
Species	June	September	June	September	June	September
rctic grayling	0	0	0	6	0	6
ake chub	1	0	0	7	0	8
ongnose dace	1	0	4	3	5	3
ongnose sucker	0	0	2	4	2	4
ountain whitefish	0	0	0	4	0	4
earl dace	0	0	0	2	0	2
limy sculpin	0	0	0	48	0	48
poonhead sculpin	2	0	0	0	2	0
rout-perch	1	L ₄ .	3	7	4	11
nidentified suckers	0	0	0	2	0	2
hite sucker	0	0	0	2	0	2
otal	5	4	9	85	13	90

PHYSICAL CHARACTERISTICS

Reach length (km)	2.0
Channel width (m)	20
Channel area (ha)	4.0
Gradient (m/km)	2.7
Flow character	swirling, rolling
Total pools (*)	50
Pattern	irregular
Confinement	occasionally confine
Unstable banks (2)	10
Substrate composition (*)	
fines (-2 mm)	15
gravels (2-64 mm)	50
larges (>64 mm)	35
bedrock and/or oil sand	0
Debris	low

REACH DESCRIPTION AND FISH UTILIZATION

This short, lower reach of the Steepbank River lies within the Athabasca River floodplain and is affected by water levels in that river. Gradient is relatively high and there are a few areas of unstable banks. Flow character is primarily swirling and rolling and about half of the total reach area is composed of pools. Gravels and larges are the Dominant substrate materials. Riparian vegetation is dominated by deciduous trees but confers are also fairly abundant. There is no vegetation overhanging the river channel.

Spawning potential for fish that normally spawn over rocky substrates is excellent and there are also some areas that are suitable for fish that normally spawn over sandy substrates. Adults of several forage fish species were captured in this reach during the study. Rearing potential is considered to be moderate; the most suitable rearing areas in the reach are the spaces between large stones and rocks. Young slimy sculpin were particularly abundant in September. The moderately deep water and numerous pools in the reach provide suitable resting, feeding and overwintering areas for larger fish. There are numerous forage species and young of larger species in this reach that would serve as prey for piscivores (e.g., northern pike, walleye).

BENTHIC INVERTEBRATES

Ephemeroptera Odonata Plecoptera Trichoptera the matoriaje Diptera Chironomidae Chironominae Tanypodinae Orthocladiinae Simuliidae Rhagionidae Empididae

RIPARIAN VEGETATION		BENTHI
Bank coverage (%) Coniferous trees Deciduous trees Shrubs Grasses Barren	25 50 15 5	Stan ma mi Stan me ma ma
Channel cover (%) Overhang Crown	0	Pri me ma mi

IC ALGAL PRODUCTIVITY nding crop expressed as cell counts (number. -)) ean: 1.6 x 10 aximum: 2.6 x 10 nding crop expressed as chlorophyll a (mg.m.) ary productivity (mg C·h⁻¹·m⁻²) inimum: 3.4 Data from Hickman, fr. (1980).

STREAM GAUGING DATA

No data available for this reach



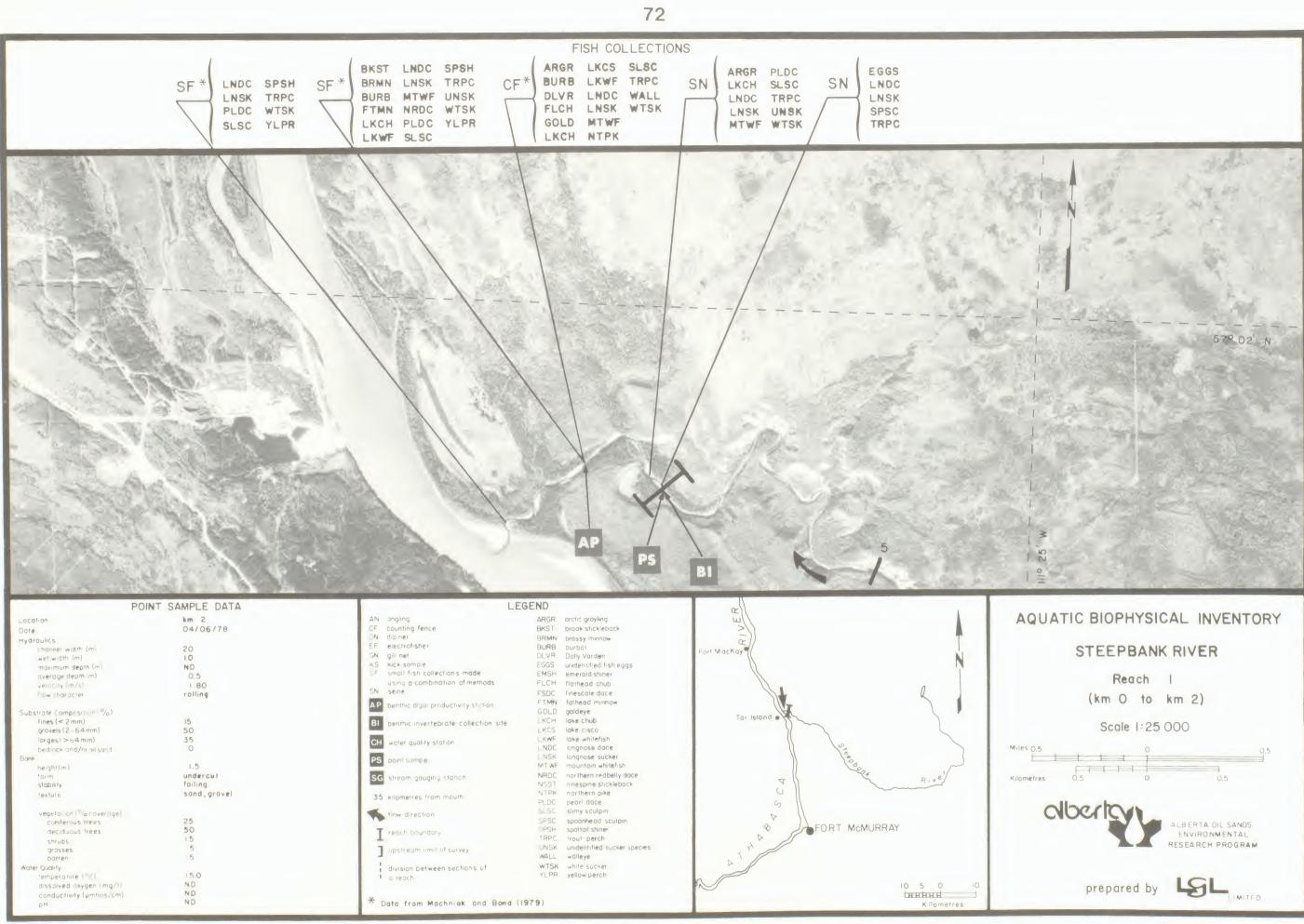
WATER QUALITY No data available for this reach

AQUATIC BIOPHYSICAL INVENTORY

STEEPBANK RIVER

Reach | (km O to km 2)







BERS OF FISH COLLECTED (1	978)					PHYSICAL CHARACT	ERISTICS		REACH DESCRIPTION AND This irregula
Species arctic grayling lake chub	Adults June September 0 31 0 0	Young-of-	les and -the-year September 6 6	Total June 0 0	Numbers September 37 6	Reach leng Channel wi Channel ar Gradient (Flow chara Total pool Pattern Confinemen	dth (m) ea (ha) m/km) cter s (š)	12.0 12 14.4 3.1 rolling, broken 50 irregularly meandering entrenched	in deep (up to 60 of unstable banks relatively high, of The substrate is of is dominated by do is no vegetation of Because of th the spawning poter
longnose dace longnose sucker pearl dace slimy sculpin white sucker Total	$ \begin{array}{cccc} 0 & 0 \\ 0 & 0 \\ 0 & 9 \\ 0 & 2 \\ \hline 0 & 42 \end{array} $	0 2 0 0 2	2 1 0 51 0 66	0 0 2 0 <u>0</u> 2	2 1 0 60 2 108	Unstable b Substrate fines (< gravels larges (anks (*) composition (%) 2 mm) (2-64 mm)	20 15 30 40 15 10w	species that pref adult arctic gray burposes is consi the major suitabl were slimy sculpi fish because the reasons, overwint
THIC INVERTEBRATES	RIPARIAN VEGE	TATION	BENT	THIC ALGAL	PRUDINCTIVITY			M GAUGING DATA	
THIC INVERTEBRATES No benthic samples were taken in this reach.	Bank cove Conife Decidue Shrubs Grasse Barren	erage (2) rous trees bus trees s cover (%)			ERODUCTIVITY vailable for thi	is reach	Wata Max Min Max Min Max Min Max Min Data	M GAUGING DATA er Survey of Curada station n imum total annual discharge inum annual mean discharge inum annual mean discharge inum onthly mean discharge inum onthly mean discharge inum daily discharge i um daily discharge for 1972 to 1978 compiled fro mer and Spitzer (1979) and Wa	331.8 × 10 [±] (1975) 55.8 × 10 [±] m (1977) 10.53 - /s (1975) 33 /s (1977) 30.30 - /s (September 19 0.30 - /s (Dece ber 197 60.18 /s (Apr. 27, 197 1.25 - 3/s (Dec. 18, 197) Loeppky and Spitzer (197
No benthic samples were taken in this	Bank cov Conife Deciduu Shrubs Grasse Barren Channel o Overhau	erage (2) rous trees bus trees s cover (%)	20 50 15 10 15			is reach	Wata Max Min Max Min Max Min Max Min Data	er Survey of Canada station n imum total annual discharge imum total annual discharge imum annual mean discharge; imum annual mean discharge; imum onthly mean discharge imum daily discharge; imum daily discharge; for 1972 to 1978 compiled fro	331.8 × 10 ⁵ (1975) 5.8 × 10 ⁷ (1977) 10-53 /s (1975) 33 /s (1977) 30.30 r/s (September 1 0.30 r /s (December 19 60.18 /s (Apr. 7, 19 1.25 - ³ /s (Dec. 18, 19) Loeppky and Spitzer (19

ヨーヨーヨーヨ

FISH UTILIZATION

arly meandering section of the Steepbank River is confined with-=) canyon walls of the McMurray Oil Sands formation, and areas are numerous. Although gradient and water velocities are about half of the area of this reach is co posed of peolo. composed primarily of larges and gravels. Riparian vegetation eciduous trees, lut conifers are also fairly abundant. There overhanging the channel.

he diversity of substrate sizes and water velocities and depths, ntial is considered to be excellent, particularly for those er to spawn over rocky substrates. A relatively high number of ling were captured in this reach. The potential for rearing dered to be moderate, with the large rocky substrates providing

areas. The most abundant young fish captured during the study . This reach is rated as good for resting and feeding of larner water is relatively deep and pools are numerous. For similar ering potential is considered to be nood.

WATER QUALITY

later Survey of Canada station number	DOATO7DA	0060	
	Mean	Maximum	Miniman
fotal alkalinit, (mg CaCO /1) oH	168.0	362-0	43.8
otal hardness ing CaCO /11	148.0		49.8
Conductance (.S/cm)	307	625	89
Total filterable			
residue fixed (g/l)	153	364	40
Total non-filterable			
residue fixed (mg/l)	17	151	-0.4
Total organic carbon (mg C/1)	20.0	33.0	6.5
Silica (mg Si0_/1)	8.0	14.5	1.3
Nitrate and nitrite nitrogen (og N/1)	0.110	0.406	0.003
Total Kjeldahl nitrogen (mg N/1)	1.00	2.28	0.36
Total Phosphorus (mg P/1)		0.220	0.016
		0.150	-0.003
Orthophosphate (rg P/1) Sulphate (rg SO ₄ /1)	8.0	16.0	1.9

Data for the period January 1976 to December 1979 Obtained from the National Water Quality Data Bank (NAQUMDAT).

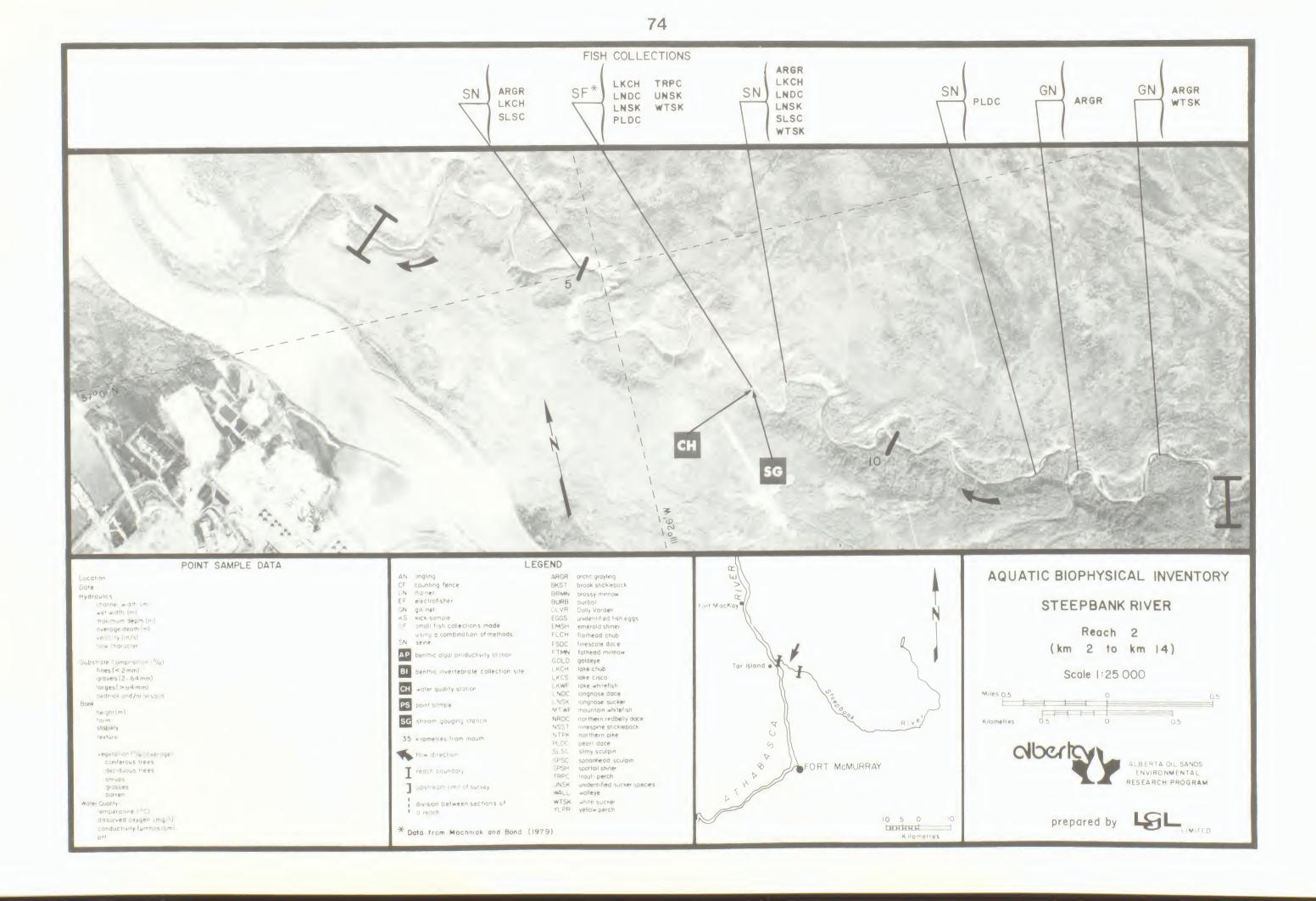
AQUATIC BIOPHYSICAL INVENTORY STEEPBANK RIVER

Reach 2 (km 2 to km 14)





prepared by LSL



NUMBERS OF FISH COLLECTED (1978)

Species	Adults		Juveniles and Young-of-the-year		Total Numbers	
	June	September	June	September	June	September
arctic grayling	2	0	2	2	Lj	2
lake chub	0	L	8	22	8	26
longnose dace	1	0	11	10	12	10
longnose sucker	2	0	2	8	4	8
pearl dace	0	0	6	11	6	11
sli y sculpin	5	0	7	69	12	69
trout-perch	0	0	11	7	11	7
walleye	0	0	2	0	2	0
white sucker	0	0	3	8	3	8
Total	10	4	52	137	62	141

PHYSICAL CHARACTERISTICS

Reach length (km)	28.0
Channel width (m)	12
Channel area (ha)	33.6
Gradient (/km)	4 _ 4
Flow character	swirling, rolling, broker
Total pools ()	40
Pattern	sinuous
Confinement	confined
Unstable banks (2)	10
Substrate composition (a)	
fines (2 mm)	15
gravels (2-64 mm)	45
larges (=64 mm)	40
bedrock and/or oil sand	0
Debris	low

REACH DESCRIPTION AND FISH UTILIZATION

This reach extends upstream from the near-vertical canvon walls of Rea o 2 to the confluence of the Steepbank and North Steepbank rivers. This section flows in a sinuous pattern and the gradient is the highest recorded for the Steepbank River. Water velocity is generally high and flow character varies reach than in other sections of the river. Substrates are composed primarily of gravels and larges. Coniferous trees are the do inant riparian venetation and there is little vegetation overhanging the channel.

The diversity of substrate sizes, stream velocities, and water depths provides areas that should be excellent for spawning of most fish species found in the river, particularly those that require rocky substrates to spawn over. Arctic grayling adults netted here during this study were either developing or spent adults, and may have spawned in this reach. The grassy shallows present In this reach are excellent for spawning of northern pike and stickleback. substrates and grassy areas along the insides of bends where the water is shallow. Hinher numbers of young fish were captured in the reach during this study than in other sections of the Steepbank River. The numbers of sliny sculpin were particularly high. Suitable areas for larger fish to rest and feed are found in the pools. Moderately deep waters and pools provide some overwintering potential

BENTHIC INVERTEBRATES INSECTA Ephemeroptera Odonata Plecoptera Trichoptera Halm stille lap lant wit 11- 11 2.º cmi. Diptera Tipulidae Rhagionidae Empididae

RIPARIAN VEGETATION Bank coverage (1) 60 Coniferous trees Deciduous trees Grasses Barren Channel Cover (Overhang

BENTHIC ALGAL PRODUCTIVITY

No data available for this reach

STREAM GAUGING DATA

No data available for this reach



High, unstable and and mravel bank at km 15.

Section of riffles at km 30-

WATER QUALITY

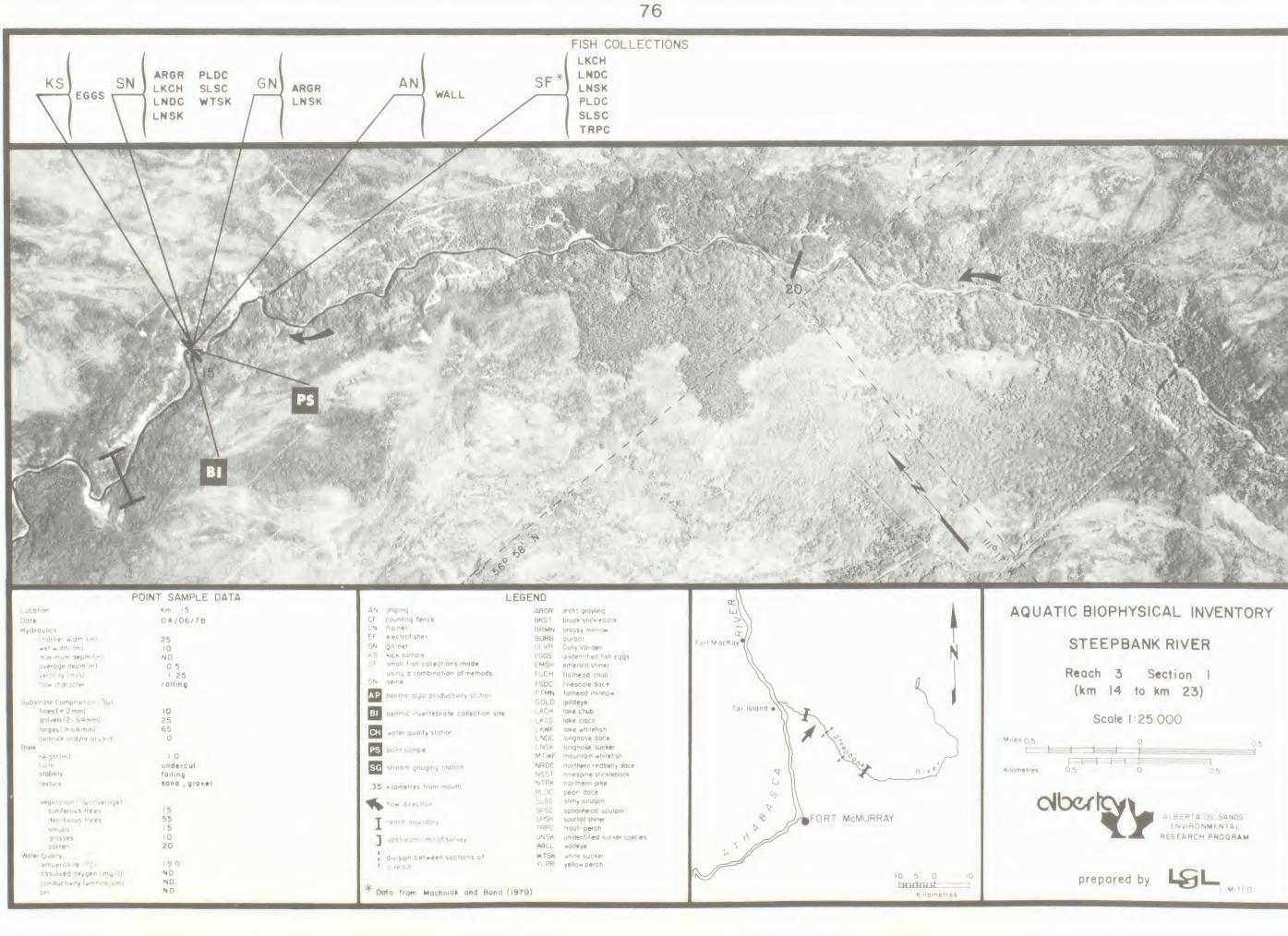
No data available for this reach

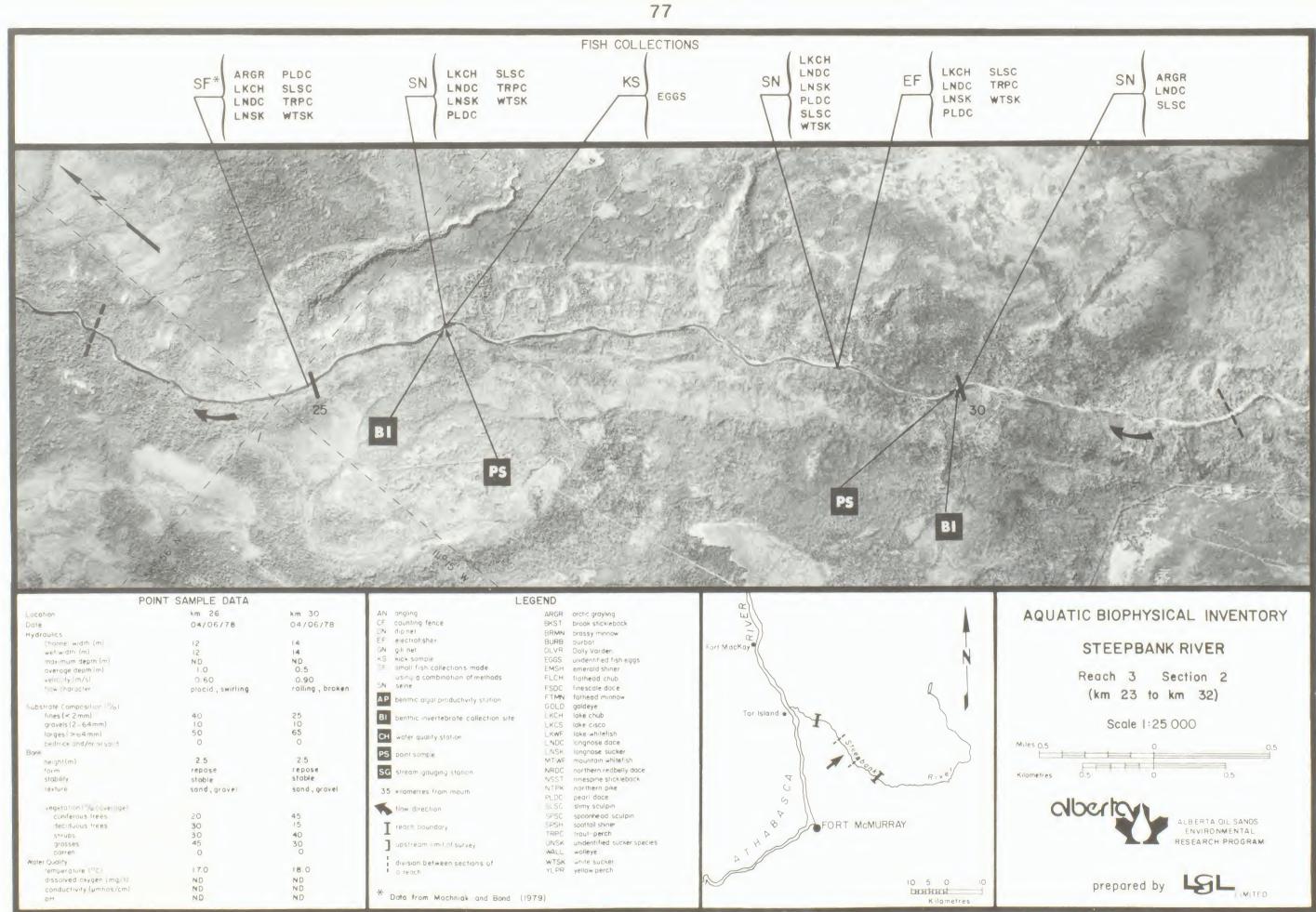
AQUATIC BIOPHYSICAL INVENTORY

STEEPBANK RIVER

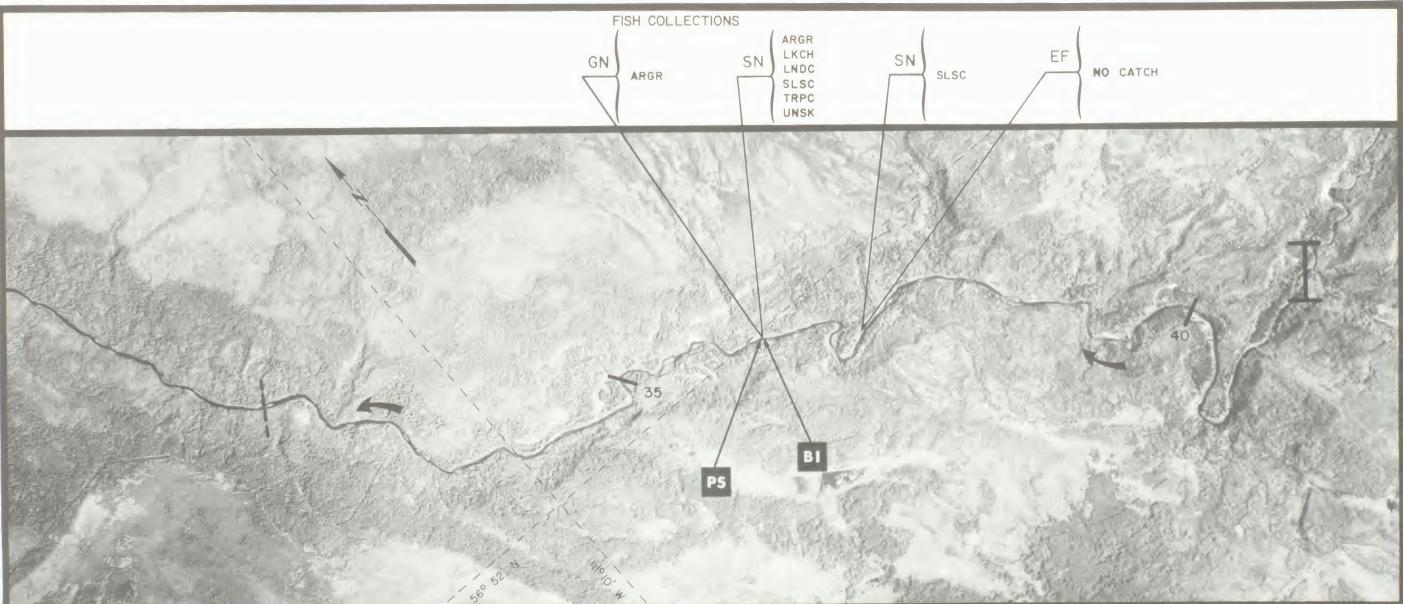
Reach 3 (km 14 to km 42)







	POINT SAMPLE DATA		L	EGEND		α	
Locotion	km 26	km 30	AN angling	ARGR	orchic grayling	w/	
Date	04/06/78	04/06/78	CF counting fence	BKST	brook stickleback	2	
Hydraulics	04/00//0	04/00/10	UN dipinet	BRMN	brassy minnow		A
hannel width (m	12	14	EF electrofisher	BURB	burbot	¢//	
wet width (m)	12	14	GN gill net	DLVR	Dolly Varden	Fort MacKay	
maximum depth (m)	ND	ND	KS KICK SUMPle	EGGS	unidentified fish eggs		N
average depth m)	1.0	0.5	SE smoll fish collections made	EMSH	emerald shiner		1
vein=ty (m/s)	0.60	0.90	using a combination of methods	FLCH	flathead chub		
flaw Lharacter	plocid, swirling	rolling , broken	SN seine	FSDC	finescale dace		Ω
	proofic , strengt		AP benthic olgal productivity station	FTMN	fothead minnow		4
Substrate Composition %)			bernie older productivity station	GOLD	goldeye	lh	
fines (< 2 mm)	40	25	BI benthic invertebrote collection site	LKCH	lake chub	Tor Island	
gravels (2-64mm)	10	10	Den ne invertebrote conection site	LKCS	lake cisco		
larges > 64 mm)	50	65	CH water quality station	LKWF	loke whitefish		
bedrock and/or billsa d	0	0	worer godiny station	LNDC	longnose dace		
Bonk			PS point sample	LNSK	longnose sucker		
height(m)	2.5	2.5	Point Sumple	MTWE	mountain whitefish		\sim
form	repose	repose	SG stream gauging station	NRDC	northern redbelly dace	P+x	
stability	stoble	stable	a set googing stone :	NSST	ninespine stickleback	X () V	RIVE
lexture	sand, gravel	sand, gravel	35 kilometres from mouth	NTPK	northern pike	G	~~~~
			So witheres from mount	PLDC	pearl doce	5	
vegetation (Procovernge)			1 low direction	5_SC	slimy sculpin		
coniferous trees	20	45		SPSC	spoonheod sculpin	8	
deciduous trees	30	15	T reach boundary	5PSH	spottail shiner	S FORT MCMUF	(RAY
shrubs	30	40	1	TRPC	trout-perch	A	
grosses	45	30	Lipstream limit of survey	UNSK	unidentified sucker species	H	
barren	0	0		WALL	wolleye	1 T	
Water Quality			division between sections of	WTSK	white sucker	H H	
remperature ("Ch	17.0	18.0	a reach	YLPR	yellow perch		
dissolved oxygen (mg/l)	ND	ND					10 5 0 10
conductivity (umhos/cm)	ND	ND	*				LERHHH
рH	ND	ND	Data from Machniak and Bond (1979)			Kilometres
and the second design of the s							



POINT SAMPLE DATA	LEGEND	
Location km 36 Date 03/06/78 Hydraulics 15 internet width (m) 15 maximum depth (m) 0.5 overage depth m) 0.5 overage depth m) 0.5 velotinty (m/s) 0.90 international (constraint) 0.90 international (constraint) 15 gravels(2-64mm) 45 larges) > 64mm) 40 pedmick (nd/ar pilspild) 0 Bonk 2.0 form repose stability stable texture sand, gravel	AN angling ARGR archic grayling CF counting fence BKST brook stickleback IN dipinet BRMN brassy minnow EF electrofisher BURB burbat SN gli net DUV anden. KS kick sample EGS unidentifed fish eggs SF small fish collections made EMSH emerald shiner using a combination of methods FLCH flathead chub SN seine FSDC finescole dace AP benthic algai pri ductivity stution FTMN fathead minnow GOLD goldeye Bl benthic invertebrate collection site LKCH lake chub LKCS lake cisco LKWF lake whitefish GC water quality station LKWF lake whitefish Mog stream gauging italian NRDC northern redbelly dace NSST <ninespine stickleback<="" td=""> NSST ninespine stickleback 35< kilometres from mouth</ninespine>	Tar Island • For Mackay
vegetation 1% (Average) conferous trees 50 deciduous trees 5 simulation 15 grasses 20 barren 0 Water Quality 17.0 dissolved axygen 1mg/11 ND conductivity (umbasicm) ND pH ND	Image: the widirection 5LSC slimy sculpin Image: the widirection SPSC spootball solution Image: the wid	A T H A FORT MCMURRAY

AQUATIC BIOPHYSICAL INVENTORY

STEEPBANK RIVER

Reach 3 Section 3 (km 32 to km 42)

Scale 1:25 000



1978)	ED (1978)	LEC	COLI	FISH	0 F	UMBERS
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ノーション

Species	Adults		Juveniles and Young-of-the-year		Total Numbers	
	June	September	June	September	June	September
arctic grayling	0	0	0	0	0	0
prook stickleback	0	0	0	1	0	1
longnose dace	2	0	0	1	2	1
pearl dace	0	0	2	0	2	0
slimy sculpin	2	1	3	17	5	18
unidentified fry	N/A	NZA	13	0	13	0
Total	4	1	18	19	22	20

ICAL CHARACTERISTICS	
Reach length (km)	5.0
Channel width (m)	10
Channel area (ha)	5.0
Gradient (m/km)	2.0
Flow character	swirling, rolling, broken
Total pools (?)	50
Pattern	sinuous
Confinement	confined
Unstable banks (>)	5
Substrate composition (2)	
fines (<2 mm)	20
gravels (2-64 mm)	20
larges (-64 mm)	60
bedrock and/or oil sand	0
Debris	low

REACH DESCRIPTION AND FISH UTILIZATION velocities are moderate. Approximately half of the reach area consists of pools. The river banks are stable. The substrate consists mainly of large with smaller amounts of both fines and gravels. The riparian venetation consists of a dense growth of grasses and a fixture of deciduous shrubs, deciduous trees and conifernus.

trees. Little vegetation overhangs the channel. Spawning potential in this reach is excellent for those fish that require

rocky substrates. There are also nu erous areas that are suitable for fish that normally spawn over sandy substrates. Suitable rearing areas for any fish are found in the rocky substrates (young-of-the- ear fish) and the few areas sheltered by overhanging vegetation (juvenile fish). Pools provide the ajor suitable resting and feeding areas for larger fills. Although pools are numerous in this reach, they are not carticularly deep; therefore, over.interim potential may be

BENTHIC INVERTEBRATES PELECYPODA "dared" INSECTA Ephemeroptera Bastis Summaria Francisa Summaria Francisa Odonata Trichoptera Brashganatas	RIPARIAN VEGETATIONBank coverage (1)Coniferous trees30Deciduous trees30Shrubs50Grasses50Barren0Channel cover (1)0Overhang2Crown0	MENTHIC ALSAL PRODUCTIVITY	<u>ETPEAM QAUGING DATA</u> No data available for this reach	
Charana mancha it da magnin h,				

Aerial view of reach 4, looking downstrea iron about km 44.

Riffle area with large substrate material at km 46.

wATER UMALIES

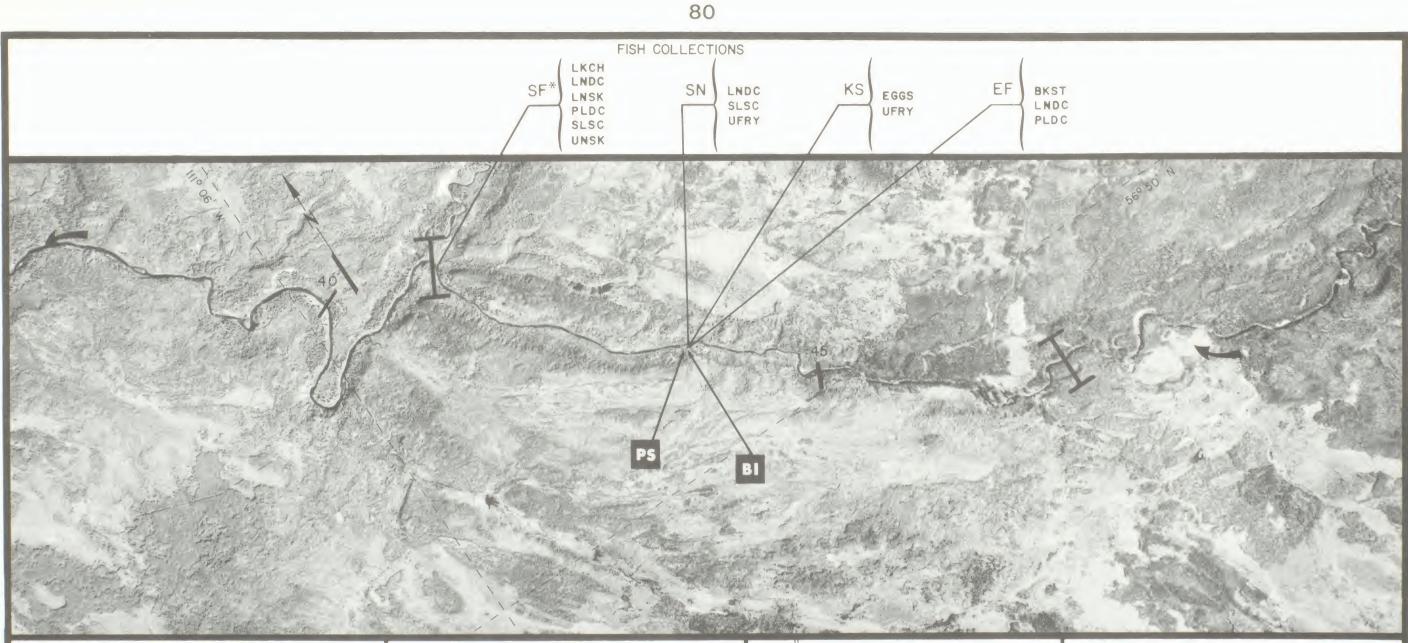
No data available for this reach

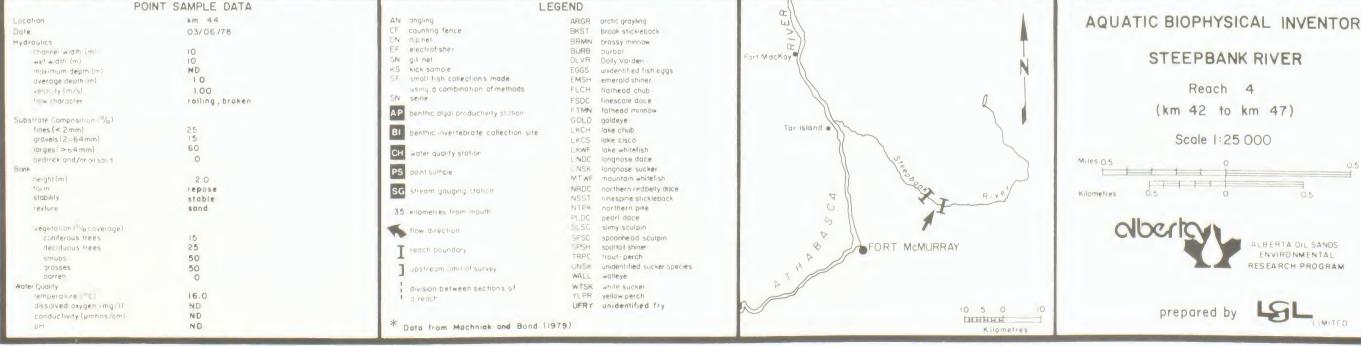
AQUATIC BIOPHYSICAL INVENTORY

STEEPBANK RIVER

Reach 4 (km 42 to km 47)







AQUATIC BIOPHYSICAL INVENTORY

ERS OF FISH COLLECTED ((1978)						PHYSICAL CHARACTERISTICS Reach length (km) Channel width (m)	28.0 12	REACH DESCRIPTION AND This section of meandering pool wit ties are the lowest
	۵	dults		niles and of-the-year	Toto	1 Numbers	Channel area (ha)	33.6	than in other secti
Species	June	September	June	September	June	September	Gradient (m/km) Flow character	1.3 placid	The substrate is a Large amounts of de
					Julie	september -	Total pools (2)	90	Deciduous trees an
ctic grayling	0	0	0	0	0	0	Pattern	irregularly meandering	conifers and grass
rook stickleback	0	0	0	1	0	1	Confinement	occasionally confined	hanging vegetation
ake chub	0	0	4		4	1	Unstable banks ()	5	Spawning pot
ongnose sucker	0	0	1	3	1	3	Substrate composition ()	(e.g., several mi
earl dace	1		27	21	27	39	fines (2 mm)	90	reach. Waters ar
limy sculpin	1	5	3	3	4	8	gravels (2-64 mm)	10	winter under the
out-perch	0	3	5	4	5	7	larges (>64 mm)	0	shallows in this
identified suckers	0	0	0	3	0	3	bedrock and/or oil san	d 0	Because of the slo
nite sucker	-	0	2	2	2	2	Debris	high	tered areas provid
otal	1	26	42	38	43	64			potential for man sheltered by over
				-					
IC INVERTEBRATES EMATODA ASTROPODA Grantiss ELECYPODA Missuiien NSECTA Ephemeroptera Bactis Cianic Schemeroila Stonomana Plecoptera Hemiptera Corixidae Trichootera	R		rage (1) ous trees us trees over (2)	15 30 30 65 0 10		AL PRODUCTIVITY available for t	his reach	<u>STREAM GAUGING DATA</u> No data available for this r	each

Placid, slow-boving pool at km 60.

A typical section of reach 5 at km 75.

DESCRIPTION AND FISH UTILIZATION

This section of the Steepbank River is essentially a narrow, irrequirily andering pool with relatively placid waters. Both gradient and water velocian in other sections of the river. The river banks in this reach are stable. ne substrate is allost entirely fines, with a very low proportion of gravels. inge amounts of debris and frequent log obstructions exist in the reach. eciduous trees and shrubs are more abundant in the riparian vegetation than are onifers and grasses are very abundant. There is a moderate amount of over-

Spawning potential for those fish that will spawn over sandy substrates e.g., several minnows, trout-perch, coremonids, and goldeye) is good in this each. Waters are probably sufficiently deep to allow burbot spawning in the nter under the ice (this species will spawn over sandy substrates). Grassy nallows in this reach are suitable for spawning of northern pike and stickleback. cause of the slow water velocities, grassy shallows, and the abundance of shelred areas provided by debris, logs, and overhanging vegetation, the rearing otential for many fish is considered to be excellent. The many pools and areas heltered by overhanning vegetation, debris, and logs provide excellent resting nd feeding areas for larger fish. Overwintering potential is nood due to the everally deep waters and nu erous pools.

WATER QUALITY

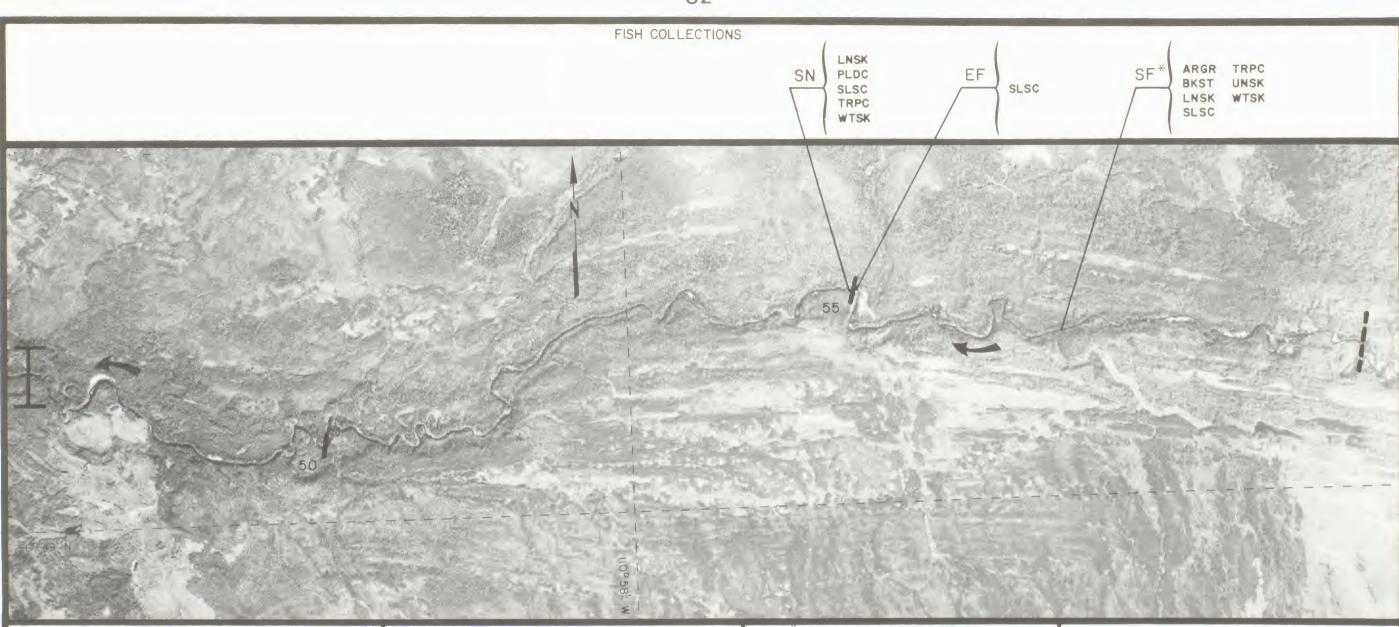
No data available for this teach

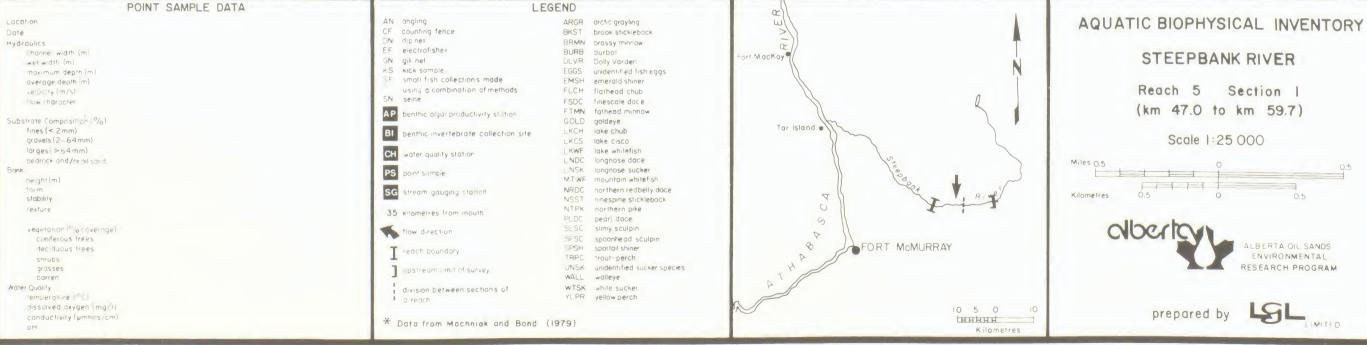
AQUATIC BIOPHYSICAL INVENTORY

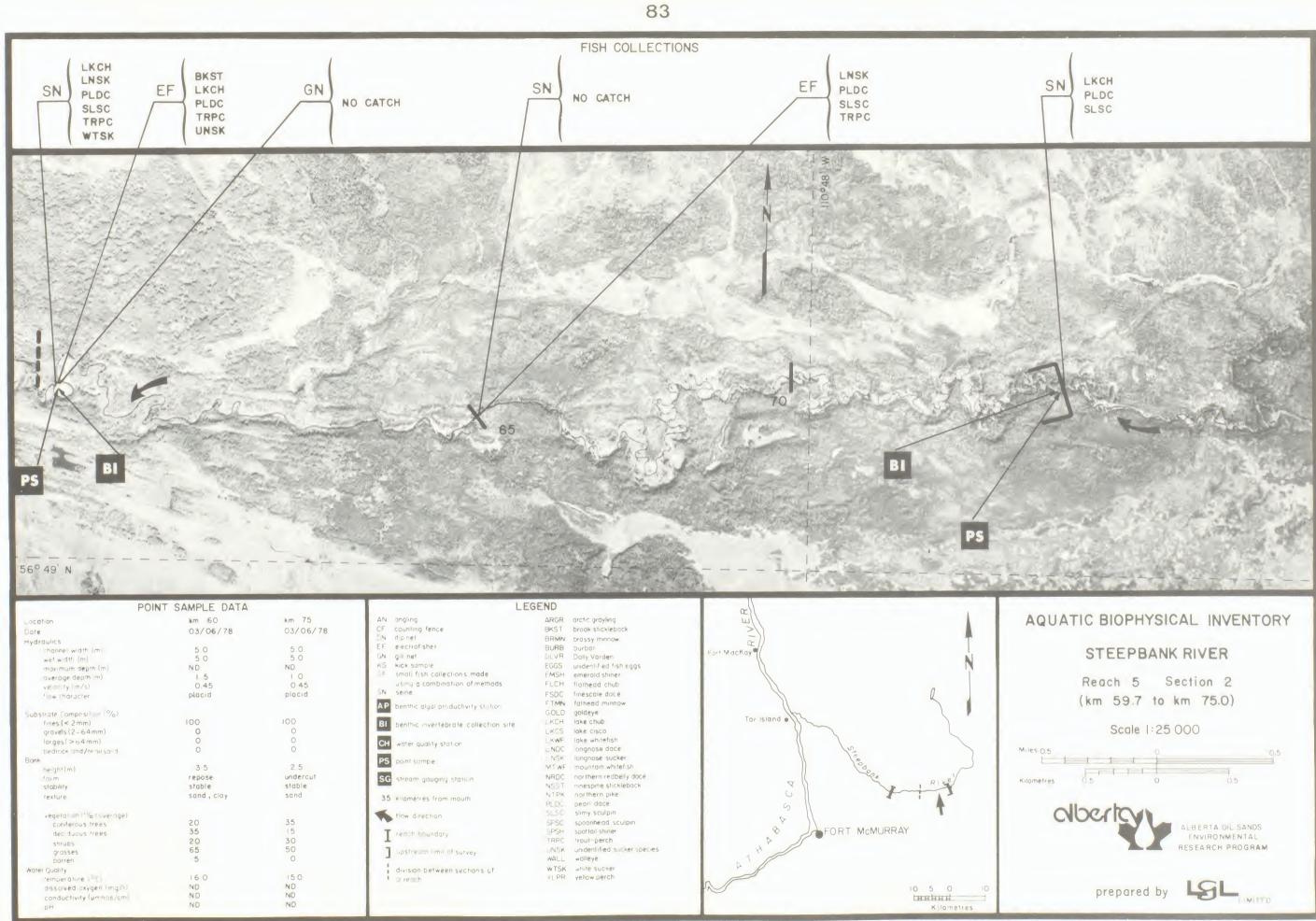
STEEPBANK RIVER

Reach 5 (km 47 to km 75)

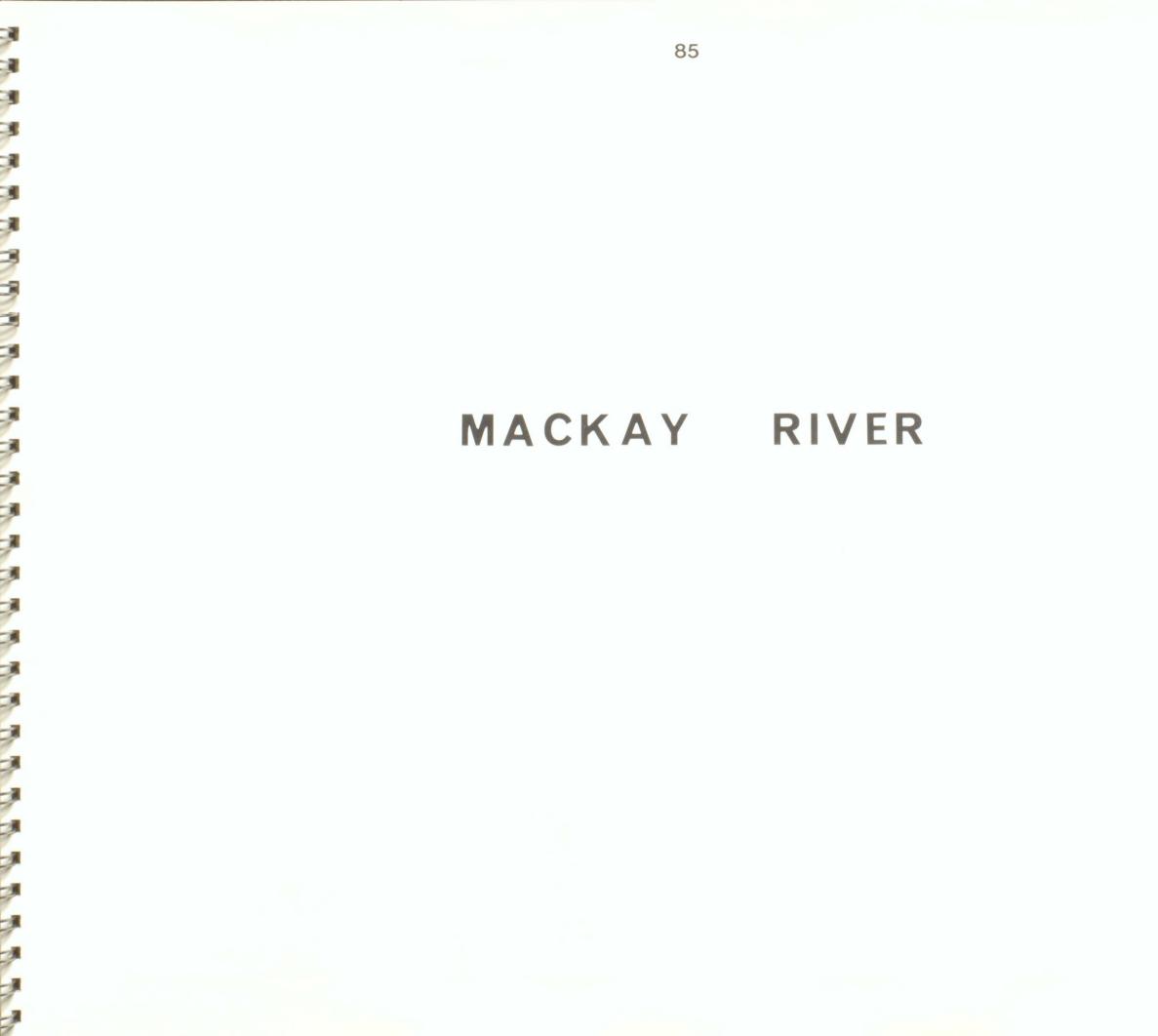




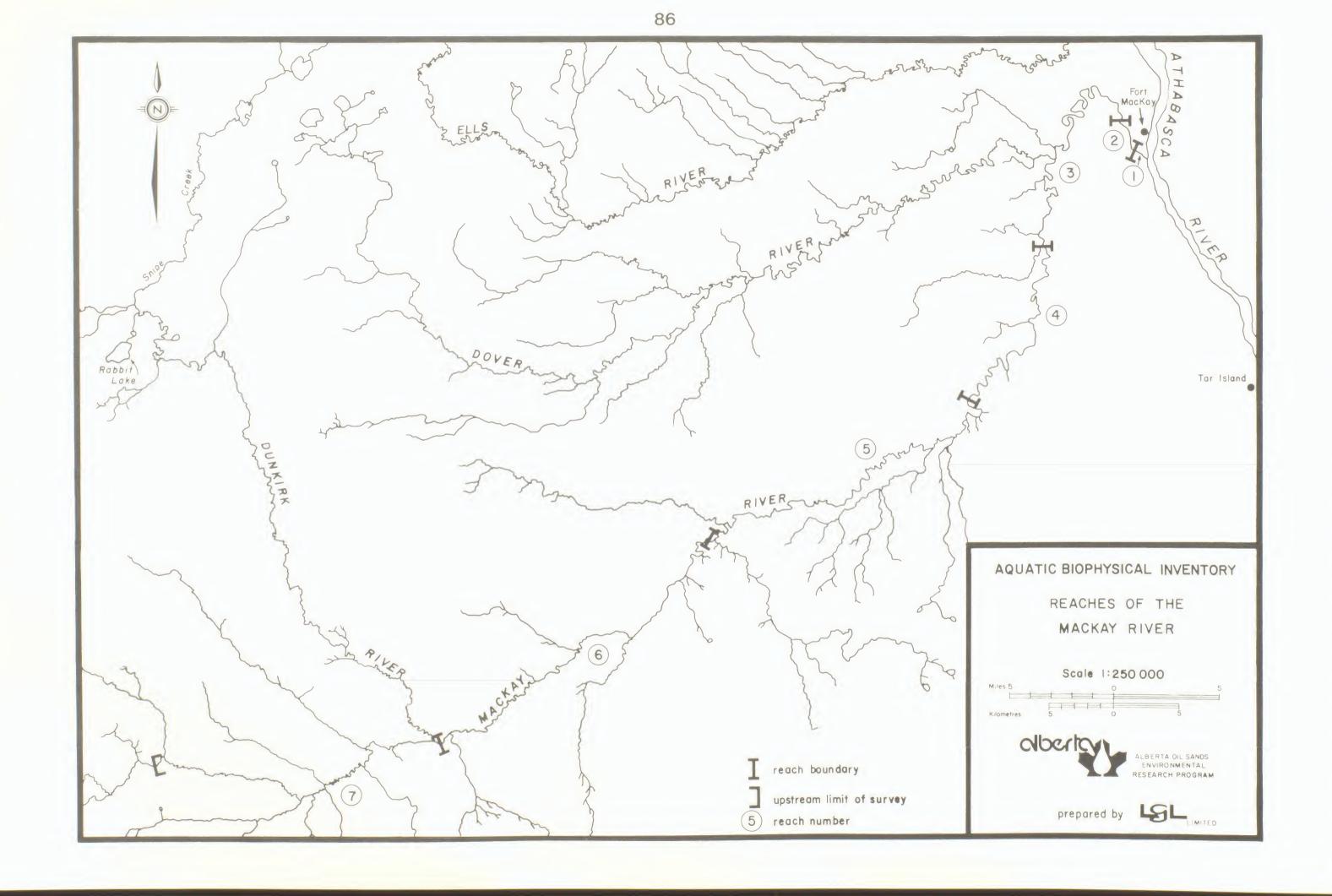




Carlos Carlos	POINT SAMPLE DATA		L	EGEND		a	
	km 60	km 75	AN angling		arctic graying	Lu (
Date	03/06/78	03/06/78	CF counting fence	BKST	brook stickleback		
Hydraulics	03/00/:0	00,00,.0	DN dipinet	BRMN	brassy minnow	-))	T
hanne width im	5.0	5.0	EF electrofisher		burbot		
wet width im	50	5.0	GN gill net		Dolly Varden	For MacKay	
maximum depth (m)	ND	ND	KS kick sample		unidentified fish eggs		N
average depth (m)	1 5	10	BF small fish collections made	EMSH	emerald shiner		
ve ac ty m/s)	0.45	0 4 5	using a cambination of methods	FLCH	flathead chub		
flow character	placid	placid	SN seine	FSDC	finescole dace		0
in the second second	P		AP benthic algal productivity station.	FTMN	fathead minnow		
Substrate Composition %)			Dennic agar productivity station	GOLD	goldeye	lh	
fines (< 2 mm)	100	100	BI benthic invertebrate collection site		lake chub	Tar Island	
gravels (2-64mm)	0	0	bennic invertebrate conection she	LKCS	lake cisco		
larges(>64mm)	0	0	CH water quality station	LKWF	lake whitefish		
bedrock land/or bil saild	0	0	Chi water quality station	LNDC	ongnose dace		S
Bonk			PS point sample	_NSK	longnose sucker		10000
ne-ght(m)	3 5	2_5	PO Down sumple	MTWF	mountain whitefish		00
form	repose	undercut	SG stream gauging station	NRDC	northern redbelly dace		R+
stability	stable	stable	See See gloging ranker	NSST	ninespine stickleback	Z ()	RIVE
fexture	sand, clay	sand	35 Kilometres from mouth	NTPK	northern pike	C	the second secon
			55 Kioneres non mount	PLDC	pearl dace	5	
vegetal an 14% = (verage)			tlow direction	SLSC	slimy sculpin		1
coniferous trees	20	35		FSC	spoonhead sculpin	8	
dec duous trees	35	15	T real-h boundary	PSH	spottail shiner	& John FOR	T MCMURRAY
Shrubs	20	30		TRPC	trout perch	A J	
grasses	65	50	upstream mit of survey	JNSK	unidentified sucker species	H	
borren	5	0		WALL	walleye		
Nater Quality			division between sections of		white sucker	× P	
emperature (action	16,0	150	I d'reach	TLPR	yellow perch		
dissolved oxygen (mg/i)	ND	ND					10 5 0
conductivity (pmnos/cm)	ND	ND					тенни
PH	ND	ND					Kilometres
					State State State State		and the second se







			87		
EMBER 1979)			PHYSICAL CHARACTERISTICS Reach length (km)	1.4	REACH DESCRIPTION AND This wide lowe floodplain and flow
Adults	Juveniles and Young-of-the-year	Total Numbers	Channel area (ha)	9.8	and many areas with sand bars are prese
0 0 4 4 4 4	1 13 2 16	1 13 6 20	Gradient (m/km) Flow character Total pools () Pattern Confinement Unstable banks () Substrate composition () fines (-2 mm) gravels (2-64 mm) larges (-64 mm) bedrock and/or oil sand Debris	1.4 swirling 90 straight confined 45 25 45 15 15 15 10w	flow characteristi ditions. The subs Deciduous trees an also fairly numero the wide channel. The gravel su for some of the fi white sucker, trou currents may be su ticularly pearl da this area is not c area may provide a River, the potenti the majority of th shallow. The shal reach.
Sank cc Conif Decid Shrub Grass Barre Channe I Overh	verage (*) erous trees 30 luous trees 65 is 70 es 85 in 5 cover (*) ang 1	BENTHIC ALGAL PRODUCTIVITY No data available for thi		REAM GAUGINS DATA No data available for thi	s reach
	Adults 0 0 4 4 4 4 0 Bank cc Conif Decid Shrub Grass Barre Channel Overh	Adults Juveniles and Young-of-the-year 0 1 0 13 4 2 4 16 8ank coverage () Coniferous trees Coniferous trees 30 Decideus trees 30 Decideus trees 50 Shrubs 70 Grasses 85 Barren 5 Channel cover () 0 Overhang 1	Adults Juveniles and Young-of-the-year Total Numbers 0 1 1 0 13 13 4 2 6 4 16 20 RIPARIAN VEGETATION Sank coverage (1) Coniferous trees 30 Deciduous trees 30 Deciduous trees 30 Coniferous trees 30 Cases 85 Barren 5 Channel cover (2) 1	EMBER 1979) PHYSICAL CHARACTERISTICS Adults Juveniles and Young-of-the-year Total Numbers 0 1 1 0 1 1 4 2 6 16 20 Substrate Composition (1) Flow character Confinement Unstable banks (2) Substrate Composition (1) fines (-2 mm) gravels (2-64 mm) larges (-54 mm) larges (-54 mm) larges (-54 mm) bedrock and/or oil sand Debris	PHYSICAL CHARACTERISTICS Aduits Juveniles and Youngrot-therwear Total Numbers 0 1 1 0 13 13 4 2 6 6 20 90 16 20 90 Pattern straight Confinement confined 1 1 1<

FISH UTILIZATION

reach of the MacKay River is within the Athabasca River in a straight pattern. There are a few high slumping banks unstable, undercut banks. Gravel bars are numerous and some nt at the mouth of the river. The gradient is moderate, and in the reach are almost entirely shallow, swirling pool conate consists primarily of gravels, with some areas of sand. shrubs dominate the riparian vegetation, but conifers are and grasses are abundant. Very little vegetation overhangs

strate in this reach possibly provides suicable spawning areas species present in the MacKay River (e.g., longnose sucker, -perch). Some of the areas with sandy substrates and moderate table for spawning by a few of the forage fish species, pare. Because of the general lack of debris or other shelter, nsidered to provide good rearing habitat. Although the mouth resting area for fish migrating upstream in the Athabasca l for resting and feeding of adult fish is considered poor in reach because there is little shelter and water depths are ow water probably precludes overwintering of fish in this

WATER QUALITY No data available for this reach

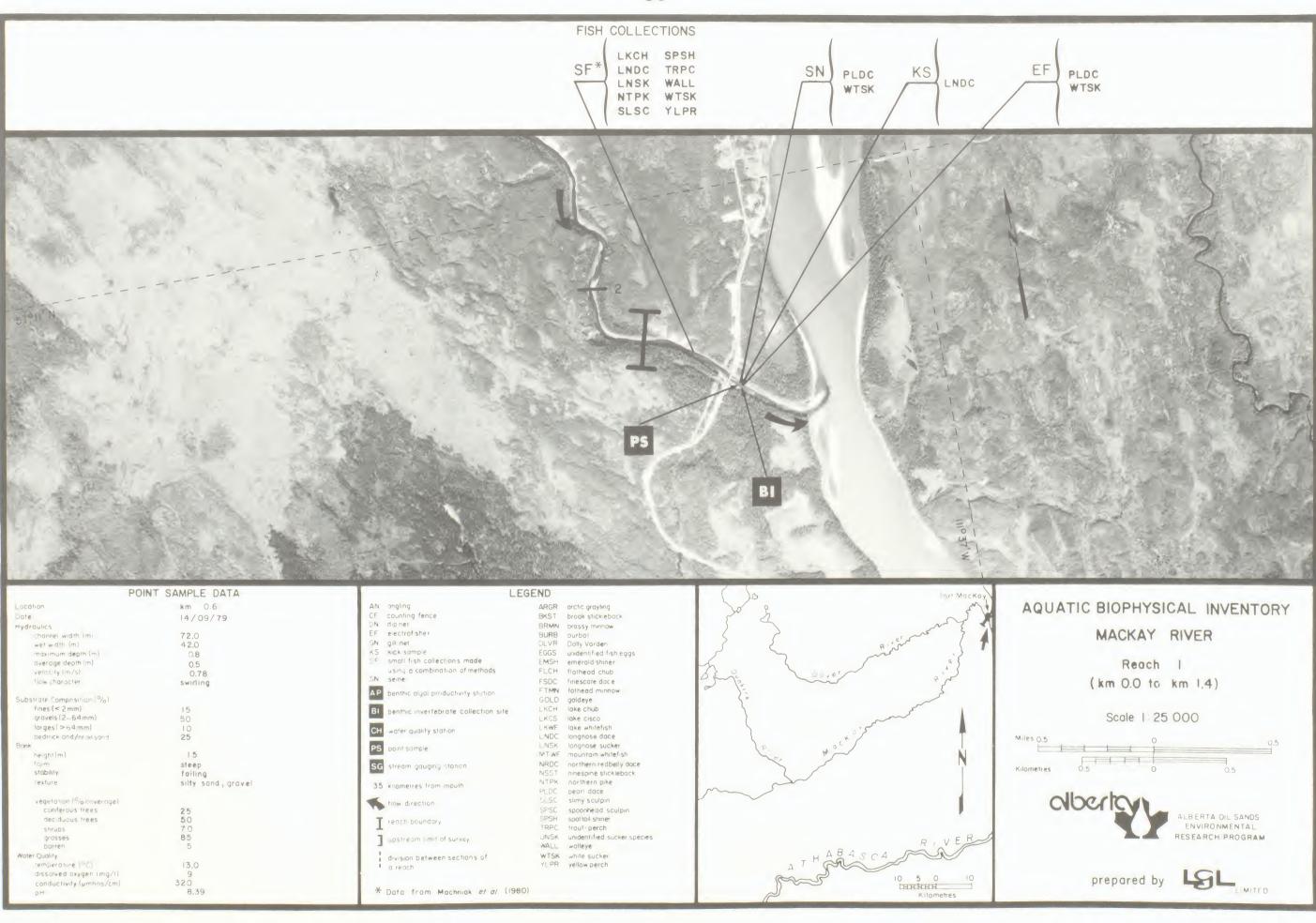
AQUATIC BIOPHYSICAL INVENTORY

MACKAY RIVER

Reach I

(km 0.0 to km 1.4)





POI	NT SAMPLE DATA	LE	GEND		()	Int Mackey
Location	km 0.6	AN angling	ARGR	arctic grayling	8	Em 1
Date	14/09/79	CF counting fence	BKST	brook stickleback	sh h	
Hydroulics		DN dipinet	BRMN	brassy minnow		m Z M
Channel width Imi	72.0	EF electrofisher	BURB			5 200 3
wet width (m)	42.0	GN gill net	DLVR	Dolly Varden		Riter (T
maximum depth (m)	0.8	KS kick sample		unidentified fish eggs		in sin
overage depth (m)	0.5	2F small fish collections made		emerald shiner	h (, e }
velocity (m/s)	0.78	using a combination of methods	FLCH	flathead chub	Si a labre	· · · · · · · · · · · · · · · · · · ·
flow character	swirling	SN seine	FSDC	finescate dace	and the	8 10
		AP benthic algal productivity station	FTMN	fothead minnow		5
Substrate Composition %)			GOLD	goldeye	5 *	
fines (< 2 mm)	15	BI benthic invertebrate collection site	LKCH	lake chub		5
gravels (2-64mm)	50		LKCS	lake cisco		~~~
lorges (>54mm)	10	CH water quality station		lake whitefish		. 150
bedrock and/or bill sand	25			longnose dace		* S
look		PS point sample		longnose sucker	\n0	
height(m)	15			mountain whitefish	La M	~ N
form	steep	SG stream gauging stolion		northern redbelly doce		
stability	failing			ninespine stickleback		
lexture	silty sand, gravel	35 kilometres from mouth		northern pike		
				pearl dace	m	
vegetation (%/o coverage)		finw direction	SUSC	slimy scutpin	P	
coniferous trees	25 50 70		SPSC	spoonhead sculpin		
deciduous trees	50	reach boundary		spottoil shiner	1	
Shrubs	70	-		trout-perch		
grasses	85	Supstream limit of survey		unidentified sucker species		RIVER
Darren	5			walteye	A 4	31 and mail
Nater Quality		division between sections of		white sucker	THAC	ASCA
emperature (PC)	13.0	a reach	YLPR	yellow perch	A	
dissolved oxygen (mg/t)	9				R	10 5 0 10
conductivity (umbos/cm)	320	+ Data from Marks at at at (100)	01) ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Тнинин
PH	8.39	* Data from Machniak et al. (198)	01			Kilometres

				89			
NUMBERS OF FISH COLLECTED (SEPT	EMBER 1979) Adults 2	Juveniles and Young-of-the-year 42	Total Numbers	PHYSICAL CHARACTERISTICS Reach length (km) Channel width (m) Channel area (ha) Gradient (m/km) Flow character	3.1 31 9.6 1 5 swirling	PEACH DESCRIPTION AND F This short read a sinuous pattern th high and there are s gradient is moderate The substrate consis pri arily deciduous	ch lies hrough several e and t sts of
trout-perch walleye white sucker Total		26 4 10 82	26 4 10 84	Total pools (k) Pattern Confinement Unstable banks (r) Substrate composition fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil s Debris	35 60 0	also abundant. This reach prov fish species that re white sucker and th MacKay River and al sidered fair; some of Because of the relat fish resting and fee good areas for overw	equire rout-pe l spawr grassy tively eding i
BENTHIC INVERTEBRATES OLIGOCHAETA GASTROPDA Ferrissia PELECYPODA Masculium INSECTA Collembola Ephemeroptera Ancletae hastinea Castie Tunal contae Odonata	Con i Dec i Shru Gras Barr Channe	overage (2) ferous trees 30 duous trees 60 bs 30 ses 60 en 5 1 cover (2) hang 1	THIC ALGAL PRODUCTIVITY No data available for this	s reach	STREAM GAUGING DATA No data available for this re	ach	<u>w</u> i
Plecoptera Plecoptera Iterconarcina Trichoptera University Polyconstructura Diptera Tipulidae Ceratopogonidae Chironomidae Chironominae	hun	hartersee	N	in the last			
Chironominae Simuliidae Tabanidae							A
	Swirling fl	ow character, typical of read	:h 2, at km 2.5.	MacKay River at k	- 2.5.		1

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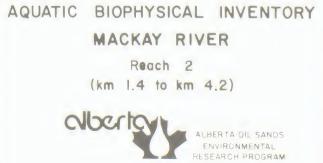
UTILIZATION

ies just above the Athabasca River floodplain and flows in gh a narrow valley. The steep valley walls are 40 to 50 m ral areas with high, near-vertical, slumping banks. The the reach consists almost entirely of swirling pools. of gravels with some sandy areas. Riparian vegetation is es and shrubs with some stands of conifers. Grasses are

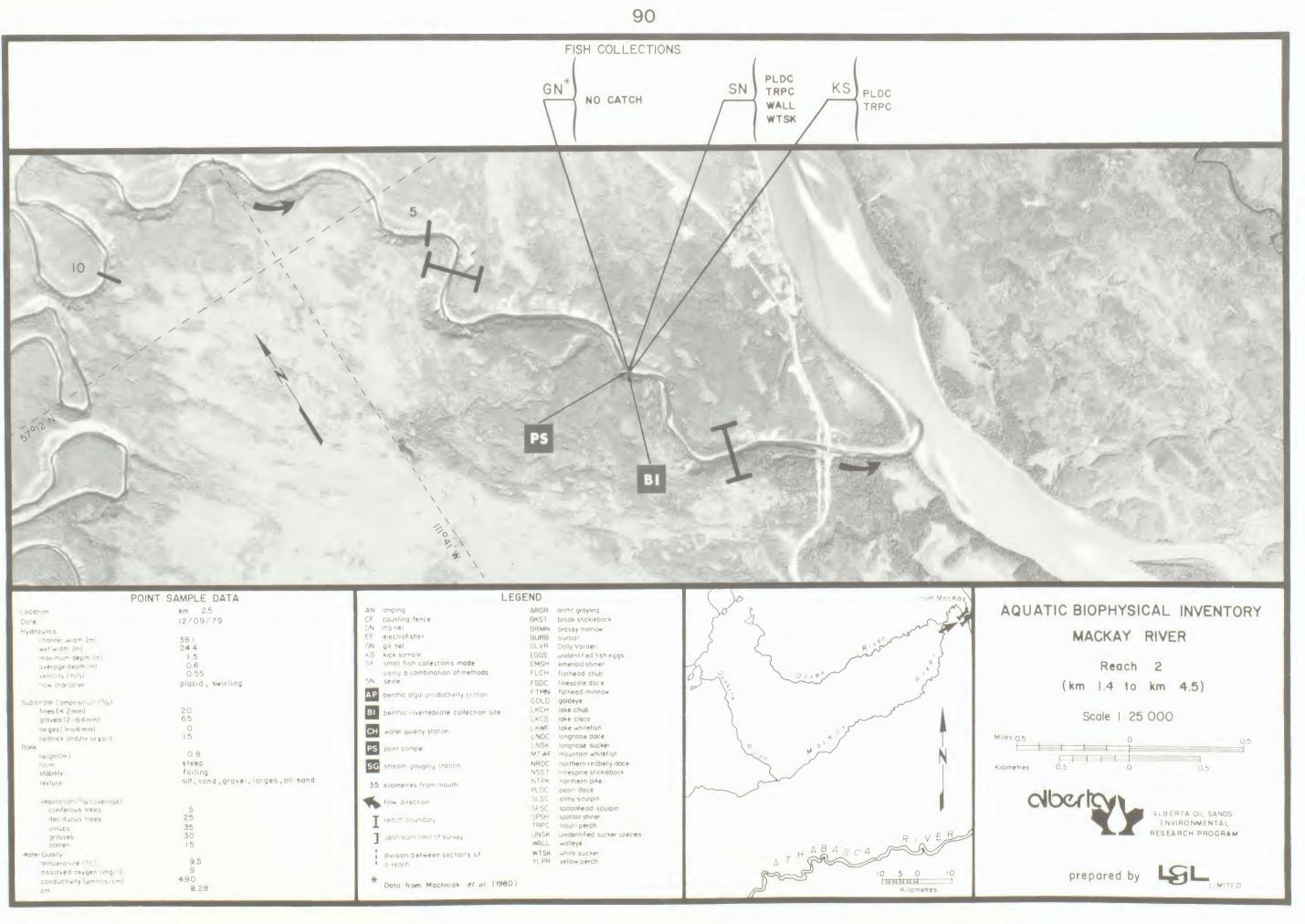
many areas that should be good for spawning of those re gravel substrates. Arctic grayling, longnose sucker, -perch have all been collected in the lower reaches of the awn over gravel substrates. Rearing potential is consy shallow areas provide the only suitable habitat. ly deep water and the many pools, the potential for adult is considered good. The deep pools also provide several ering of fish.

WATER QUALITY

No data available for this reach



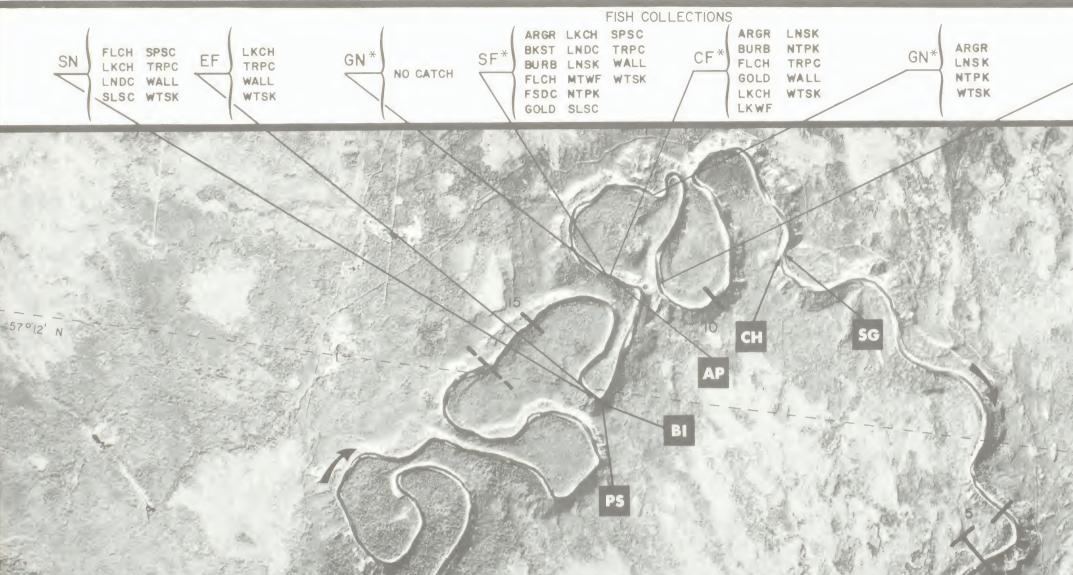
prepared by LIMITED



Location	KIT L.O		Alton diene großing	W h
Date	12/09/79	CF counting fence	BKST brook stickleback	
Hydraulics		UN dipinet	BRMN brassy minnow	
Thanne: width (m	38.1	EF electrofisher	BURB burbot	S C erano 1
wet width (m)	244	GN gill net	DLVR Dolly Varden	Right (
moximum depth (m)	15	KS kick sample	EGGS unidentified fish eggs	
average depth (m)	0.6	SE small fish collections made	EMSH emerald shiner	
relacity m/s)	0.55	using a combination of methods	FLCH flathead chub	Share Dover a's
fow thatacter	placid, swirling	SN seine	FSDC finescale dace	a the state of the
a didiocier	proofed ; switting		FTMN fathead minnow	Dr F
Substrate Composition 1%)		AP benthic algai productivity station	GOLD goldeye	
fines (< 2 mm)	20		LKCH loke chub	
gravels (2 – 64 mm)	65	BI benthic invertebrate collection site	LKCS lake cisco	
	0		KWE lake whitefish	1 months
larges (>64mm)	15	CH water quality station	LNDC longnose dace	
bedrock and/or billsand	15		NSK longnose sucker	
Bonk	0.8	PS point sample	MTWF mountain whitefish	A H M
height (m)				
form	steep	SG stream gauging station	NRDC northern redbelly dace	
stability	failing	-	NSST ninespine slickleback NTPK northern pike	
texture	silt, sand, gravel, larges, oil sand	35 kilometres from mouth		m.
			PLDC pearl dace	
vegetation 14/o coverage)		tiow direction	SLSC slimy sculpin	
coniferous trees	5		SPSC spoonhead sculpin	
deciduous trees	25	T reach boundary	PSH spottail shiner	
Shrubs	35		TRPC trout-perch	
grasses	30	upstream limit of survey	UNSK unidentified sucker species	RIVER
Darren	15		WALL wolleye	ABARCA MA
Water Quality		division between sections of	WTSK white sucker	THADASCA
temperature	9.5	a reach	YLPR yellow perch	A
dissolved oxygen img/1	9			B
conductivity (umhos/cm)	490	* Data from Macharak at at 1990	1	Нинни
DH	8.28	Data from Machniak et al. (1980	/	Kilometres
-				

				91			
NUMBERS OF FISH COLLECTED (SEPT Species flathead chub lake chub longnose dace longnose sucker pearl dace sli y sculpin spoonhead sculpin trout-perch unidentified fry walleye white sucker Total	EMBER 1979) Adults 0 1 0 0 0 0 0 1 8 8 N/A 0 0 0 10	Juveniles and Young-of-the-year 3 9 5 2 207 2 0 11 20 3 6 268	Total Numbers 3 10 5 2 207 2 1 1 19 20 3 6 278	PHYSICAL CHARACTERISTICS Reach length (km) Channel width () Channel area (ha) Gradient (n/km) Flow character Total pools () Pattern Confinement Unstable banks () Substrate composition fines (~2 m) gravels (2-64 mm) bedrock and/or oil to Debris	10 30 20	40 to 50 deep into proportion of unstab areas. Exposed oil surface is visible f are moderate, and th deep pools. The sub being a major compon- is dominated by deci- conifers. Very litt Several areas, w spawning of a number sucker, trout-perch) species are provided and rock substrates. MacKay River have be provide good resting fish species and you piscivores. The wat	ISH UTILIZATION meandering section is entrenched within a canyon that is out the McMurray Oil Sands for ation. There is a very high le banks, which are primarily high, near-vertical, slupping sands deposits are comon, and a fill of oil on the water rom the air in many places. Gradient and water velocities ere are numerous riffle areas in addition to many relatively strate consists primarily of gravels and larges with oil sand ent of the substrate in any places. The riparian vegetation duous trees and shrubs and there are scattered patches of le vegetation overhangs the banks. where the substrate is primarily gravel, appear suitable for of fish species (e.g., arctic grayling, longnose sucker, white . Suitable rearing areas for young-of-the- ear of many by the numerous shallow areas with slow currents and gravel Adults and juveniles of most fish species that occur in the en collected in this reach. The numerous pools of this reach and feeding areas for adult fish and the abundance of forage ng of other species provides good feeding potential for er depths in any of the large pools in this reach are prob- llow overwintering by fish.
BENTHIC INVERTEBRATES OLIGOCHAETA PELECYPODA Marchin Preising INSECTA Ephemeroptera Marchin Berlie B	Con Dec Shr Gra Bar Chann	coverage (2) iferous trees 5 iduous trees 65 ubs 40 isses 60 iren 10 mel cover (2) erhang 1	BENTHIC ALGAL PRODUCTIVITY Standing crop expressed as ce ean: 381.0 x 10 axiu :: 1400. x 10 mini un: 14.0 x 10 Standing crop expressed as ce mean: 12.6 mean: 30.7 minimum: 0.3 Primary productivity (mg C.6) mean: 8.2 maximum: 26.0 minimum: 0.5 Data from Hickman (1980)	hloropHyll 0 (mg·m ^{−2}) [−] *)	STRFAM GAUGING DATA Water Survey of Canada station nu Maximus total annual discharnes Minimus total annual discharnes Maximus annual mean discharnes Maximus annual mean discharnes Maximus onthly mean discharnes Maximus onthly mean discharnes Maximus daily discharnes Minimum daily discharnes Data for 1972 to 1978 consiled from Warner and Spitzer (1979) and War	852.3 × 10 (1973) 185.0 × 10 - (1977) 27.01 m /s (1973) 5.89 1/ (1977) 157.16 m /s (June 1973) 0.10 m /s (February 1973) 1.02 /s (March 2, 1973) LOPPPKy and Snitzer (1977).	WATER DUALITYWater Survey of Lanada station number DDATD7DB0011Mean Maximum MinimuTotal alkalinity (ng CaCO /l)163.0 577.0 13.4pH7.80 8.50 6.30Total hardness (ng CaCO /l)166.0 433.1 59.3Conductance (S/cm)392 1370 102Total filterableresidue fixed (g/l)198 781 51Total non-literableresidue fixed (g/l)198 781 51Total organic carbon (ng C/l)31.0 59.0 9.0Silica (g Si0 /l)Nitrate and nitrite nitrogen (ng N/l)0.130 0.534 0.00Ortal Kjeldahl nitrogen (ng N/l)0.330 0.100 0.01Ortal Kjeldahl nitrogen (ng N/l)0.330 0.100 0.01Ortal Kjeldahl nitrogen (ng P/l)0.330 0.100 0.01Orthopho phate (ng P/l)0.330 0.100 0.01Suta for the periou January 1976 to December 1975 ostatned from the National Water Quality Data Bank NA00ADAT
	Unstable	Bank at ke (3.4.		MacKay River at	4 km 28.5		AQUATIC BIOPHYSICAL INVENTORY MACKAY RIVER Reach 3 (km 4.2 to km 40.0)





	the second se
	POINT SAMPLE DATA
Location	km 13.8
Date	12/09/79
Hydraulics	
channel width Im	33.5
wetwoth m)	22.9
	1.3
maximum depth (m)	0.8
average depth m)	1 03
ve beity (m/s)	
flow character	swirling, rolling, broken
Substrate Composition 1%)	
fines (< 2mm)	10
gravels (2-64mm)	40
larges (>64mm)	45
bedrock and/or billsand	5
Bank	
he ght(m)	1.5
form	steep
stability	failing
texture	silt, sond, gravel, larges
vegeta ion (¹⁰ /o toveringe)	
coniferous trees	2
deciduous trees	25
Shrups	20
grasses	10
barren	20
Water Quality	
'emperature	11 5
emperatore	0

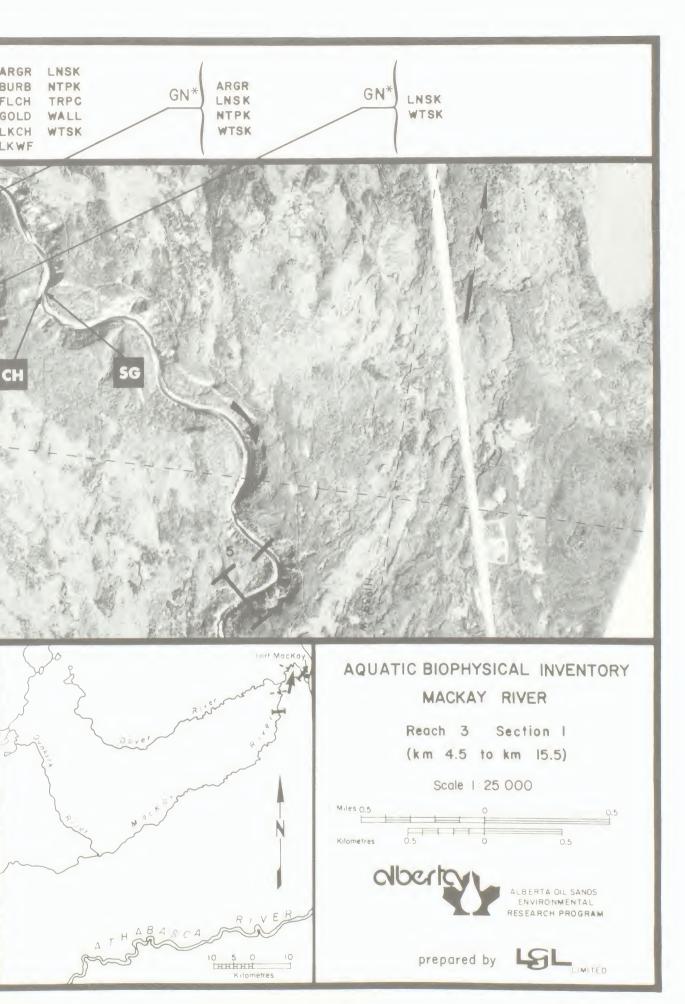
dissolved oxygen img/II

conductivity (umbins/cm)

430 8 33

LEGENE AN angling CF counting fence UN dipinet EF electrofisher GN gill net KS kick sample BF small fish collections made using a combination of methods SN seine AP benthic algal productivity station BI benthic invertebrate collection site CH water quality station PS point sumple SG stream gauging station 35 kilometres from mouth flow direction. T reach boundary apstream limit of survey division between sections of a reach * Data from Machniak et al (1980)

D	
RGR	orctic grayling
KST	brook stickieback
RMN	brassy minnow
URB	Durbol
LVR	Dolly Varden
GGS	unidentif ed fish eggs
MSH	emerold shiner
LCH	flathead chub
SDC	finescale dace
TMN	fathead minnow
OLD	goldeye
ксн	lake chub
KCS	lake cisco
KWF	lake whitefish
NDC	longnose dace
NSK	longnose sucker
TWF	mountain whitefish
RDC	northern redbelly dace
SET	ninespine stickleback
TPK	northern pike
LDC	pearl dace
LSC	slimy sculpin
PSC	spoonhead sculpin
PSH	spottail shiner
RPC	trout-perch
INSK.	unidentified sucker species
WALL	walleye
VTSK	white sucker
LPR	yellow perch

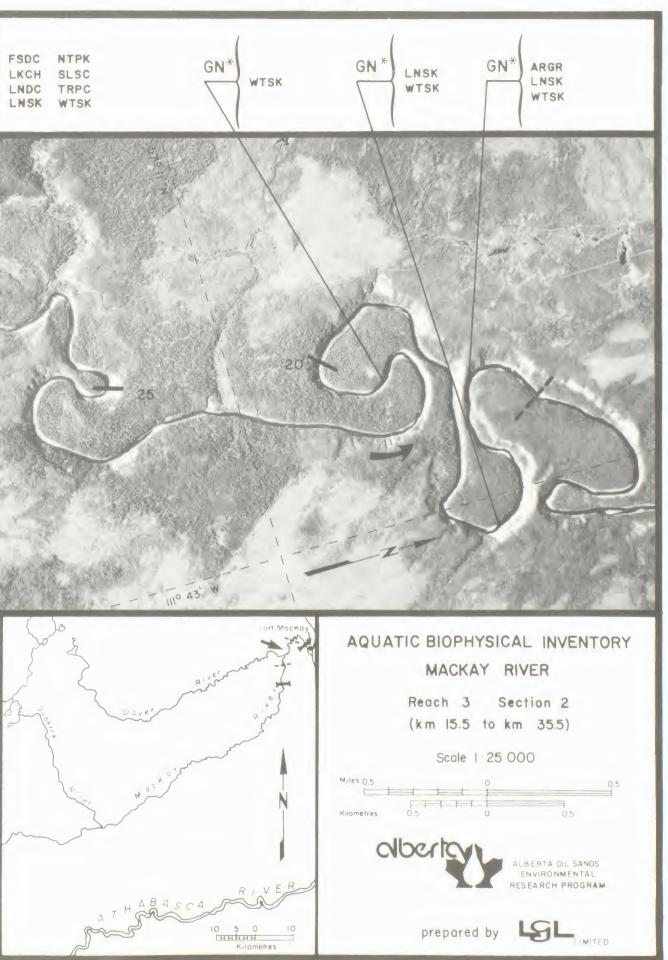


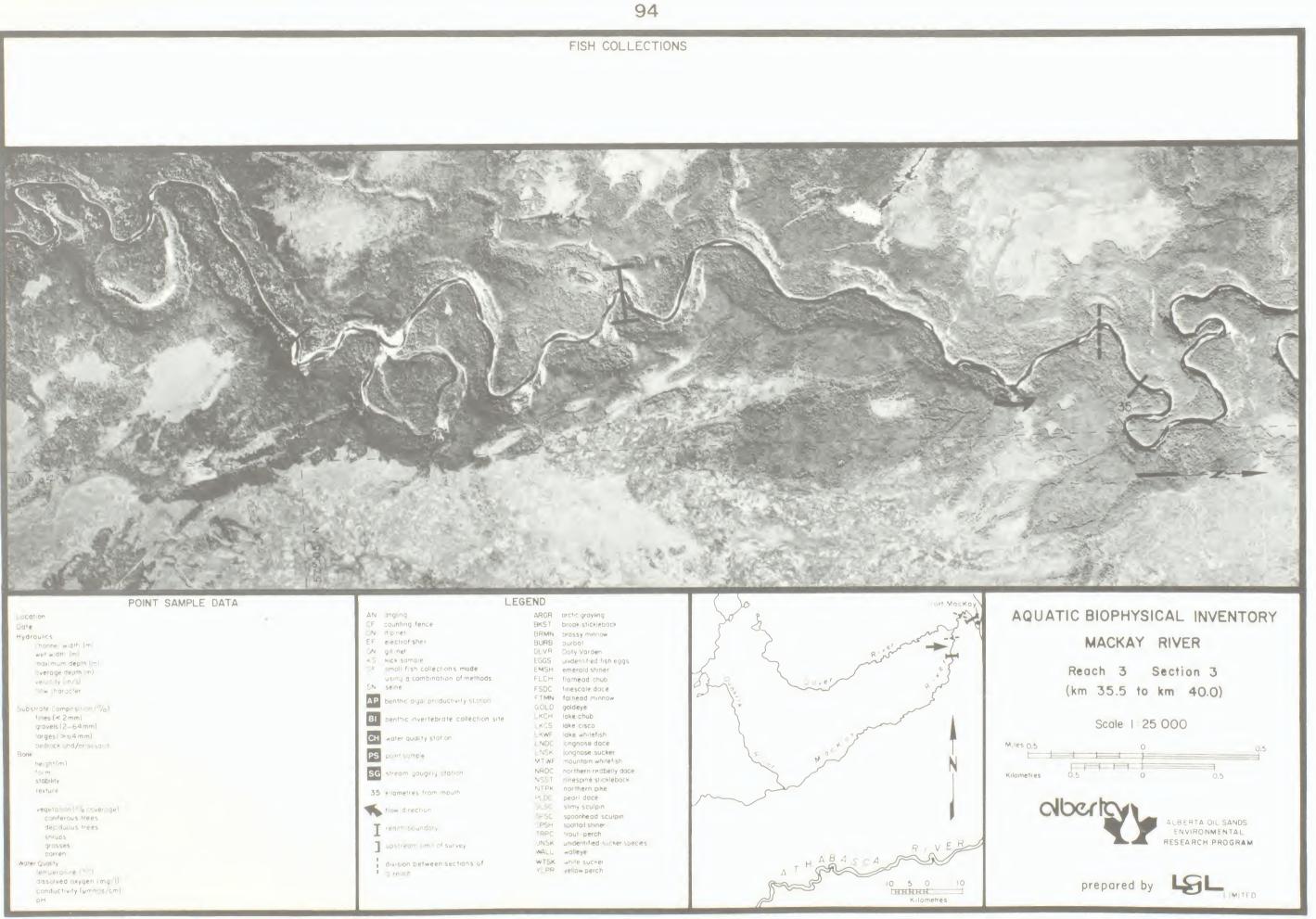
93 FISH COLLECTIONS LNDC LNSK LNDC FSDC NTPK SF* GN* EF SN PLDC LNSK LKCH SLSC WTSK LNDC TRPC TRPC PLDC UFRY LNSK WTSK WTSK WTSK PS

PO	NT SAMPLE DATA	
Location	km 28.5	AN angling
Date	12/09/79	CF counting fe
Hydraulics		CN dipinet
hanne width (m)	39_6	EF electrofishe
wet width (m)	16.8	GN gill net
maximum depth (m)	2.0	KS kick sample
average depth (m)	1-2	SF small fish a
velocity m/s)	0.72	using a con
'low charac'er	placid, swirling, rolling	SN seine
Substrate Composition 1%)		AP benthic algo
fines (< 2mm)	10	BI benthic inve
gravels (2-64mm)	10	Bi Denmic Inve
lorges (>64mm)	40	CH water audit
bedrock and/or bill sand	40	CH water qualit
Bonk		PS point sample
height(m)	2.0	PO Down Sumple
form	steep	SG stream gau
stability	stable	
lexture	sandy silt, larges, oil sand	35 kilometres
vegetation 10% coverage		tiow direct
coniferous trees	5	HOW GREEN
dec duous trees	50	T reach boun
shrubs	25	
grasses	45	1 upstreum (
barren	10	1
Water Quality		division be
remperature (PC)	9.5	I a reach
dissolved exygen (mg/1)	9	
conductivity (umbos/cm)	340	* Data face
DH	8.24	" Data from

		EGEND	
V	angling	ARGR	arctic
	counting fence	BKST	brook
Ŵ.	dipinet	BRMN	brass
	electrofisher	BURB	burbo
4	gill net	DLVR	Dolly
5	kick sample	EGGS	unide
	small fish collections made	EMSH	emer
	using a combination of methods	FLCH	flathe
N	seine	FSDC	fines
P	benthic algal productivity station	FTMN	fathe
	bennic agai productivity station	GOLD	golde
1	benthic invertebrate collection site	LKCH	lake
	bennic invertebrute conection site	LKCS	loke
Н	water quality station	LKWF	lake
	worer duality station	LNDC	longn
S	point sample	NSK	longn
•	point sumple	MTWF	mour
G	stream gauging station	NRDC	north
-	groging store t	NSST	nines
5	Rilometres from mouth	NTPK	north
	anomenes nom moum		pear
5	tiow direction	SLSC	slimy
		SPSC	spoor
T	reach boundary	PSH	spotte
T.		TRPC	Irout
]	upstream limit of survey	UNSK	unide
4		WALL	walle
ł	division between sections of	WTSK	white
8	d redch	YLPR	yellow
		UFRY	unide
	Data from Machniak et al. (1	980)	

RGR	arctic grayling
ST	brook stickleback
RMN	brassy minnow
JRB	burbot
VR	Dolly Varden
GS	unidentified fish eggs
1SH	emerald shiner
CH.	flathead chub
SDC	finescale dace
MN	fathead minnow
OLD	goldeye
(CH	lake chub
(CS	lake cisco
WF	lake whitefish
NDC	longnose dace
VSK	longnose sucker
TWF	mountain whitefish
RDC	northern redbelly doce
SST	ninespine stickleback
TPK	northern pike
DC	pearl dace
SC	slimy sculpin
PSC	spoonhead sculpin
PSH	spottail shiner
RPC	trout perch
VSK	unidentified sucker species
	wolleye
	white sucker
	yellow perch
FRY	unidentified fry







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	_			95	
IMBERS OF FISH COLLECTED (SEF	PTEMBER 1979)			PHYSICAL CHARACTERISTICS	
Species	Adults	Juveniles and Young-of-the-year	Total Numbers	Reach length (km) Channel width (m) Channel area (ha) Gradient (m/km)	25.5 50 127.5 2.2
finescale dace longnose dace pearl dace trout-perch white sucker Total	4 0 0 0 <u>0</u> 4	15 11 128 3 4 161	19 11 128 3 4 165	Flow character Total pools () Pattern Confinement Unstable banks () Substrate composition () fines (2 mm) gravels (2-64 m) larges (64 mm) bedrock and/or oil sand Debris	swirling, rolling 60 irregularly meandering confined 15 20 40 40 40 0 low
NTHIC INVERTEBRATES NEMATODA OLIGOCHAETA GASTROPODA Igracue	Coni	overage (Z) ferous trees 15 duous trees 50	<u>BENTHI: ALGAL PRODULT</u> Nd data available for tr		EAM GAUGING DATA No data available for this read
PELECYPODA Maraulium Pisidium INSECTA Ephemeroptera Ameletus Patisea Ephemera Ephemera Ianteptophlania Stencnema Odonata Aphiopermhus	Shrui Gras Barru Channe Overi Crown	ses 70 en 5 1 cover (*) hang 0			Hiteria
Plecoptera Trichoptera John polosio Diptera Tipulidae Chironominae Chironominae Tanypodinae Orthocladiinae Tabanidae Dolichopodidae					

Section of riffles with slumping bank on left at km 45.1.

High, eroding bank of sand and silt at km 63.8.

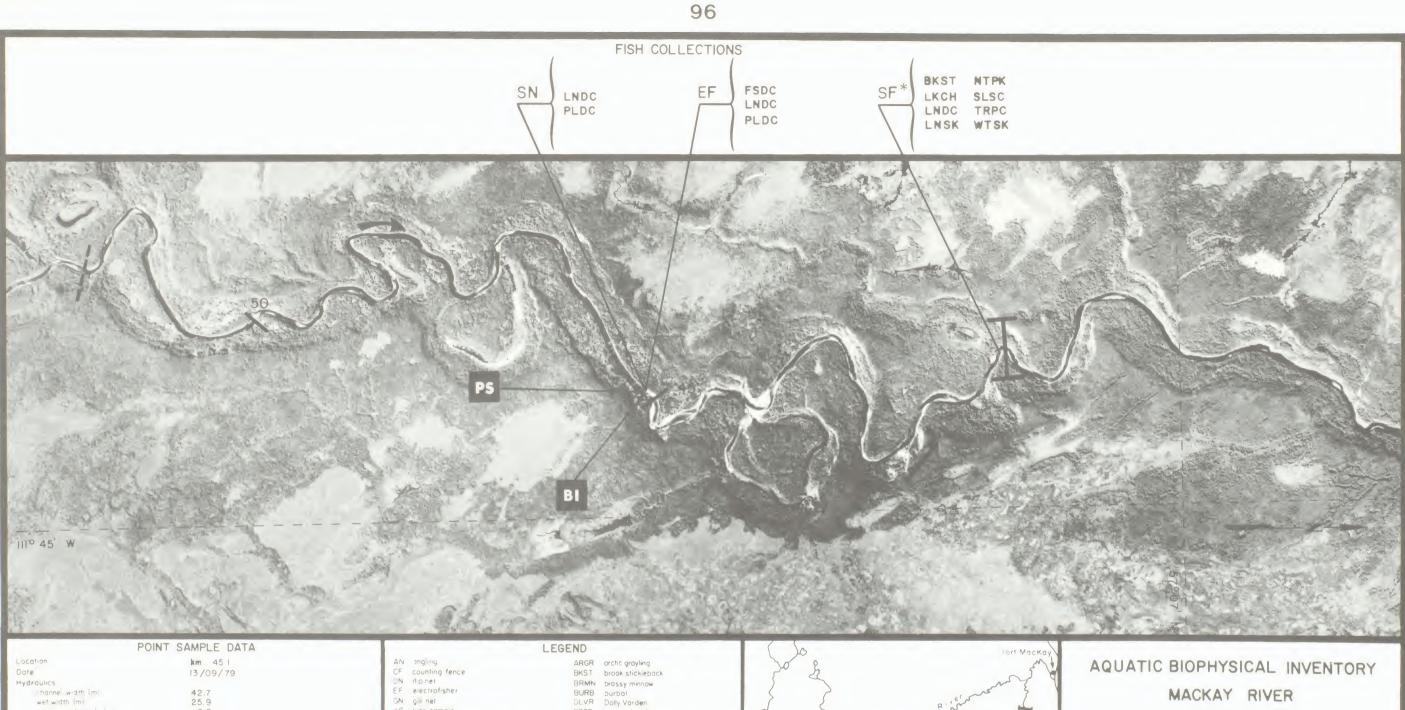
REACH DESCRIPTION AND FISH UTILIZATION

This irregularly meandering section is confined by the valley walls, but evidence of lateral channel movement (i.e., oxbows and meander scars) within the valley is present. The banks on the outside of bends in the river are often steep and slumping, but the proportion of the banks that are unstable is much less than in Reach 3. The gradient in this reach is steeper than in Reach 3 and water velocities are relatively high. Pools comprise a little over half of the reach area and are generally shallow. The substrate in this reach consists primarily of larges and coarse gravels, with sand and silt present in the pools. Although the riparian vegetation is mostly deciduous trees and shrubs, some patches of conifers are present and grasses are abundant.

The gravel substrates and many riffles in this reach provide areas that are excellent for spawning of arctic grayling, longnose sucker, white sucker, longnose dace and trout-perch. Those areas with large rocks and slower currents are probably suitable for spawning of lake chub and slimy sculpin. The rearing potential of this reach is considered good because areas with large rock substrates provide adequate shelter. Areas suitable for resting and feeding of adult fish are provided by the numerous pools in this reach. Because forage fish are abundant in this reach, feeding potential for piscivorous species is considered good. Because the pools in this reach are relatively shallow, overwintering of fish is probably not possible except in isolated deep pools.

WATER QUALITY No data available for this reach





unidentified fish eggs emerald shiner

flathead chub finescale dace

fathead minnow

longnose sucker mountain whitefish

northern redbelly dace ninespine stickleback northern pike

goldeye lake chub

lake cisco lake whitefish longnose dace

pearl dace

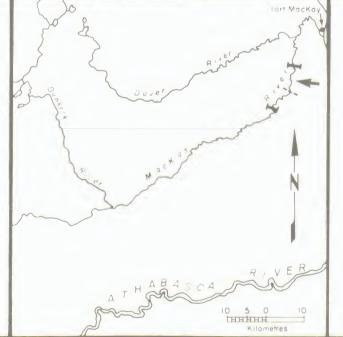
slimy sculpin spoonhead sculpin

spottail shiner trout-perch unidentified sucker species

walleye white sucker yellow perch

	POINT SAMPLE DATA
Location	km 45 I
Date	13/09/79
Hydraulics	
channel width (m) wet width (m) inaximum depth (m) average depth (m)	42.7 25.9 0.8 0.6
verality im/si	0.96
linw character	swirling, rolling, broken
Substrate Composition %	
fines (< 2mm)	20
gravels (2-64mm)	40
larges > 54 mm)	40
gedruck and/or billsard	0
Bonk	
neight m)	1.5
form	undercut
stability	failing
lexture	silt, sand, gravel, larges
vegetation Placeverage)	
coniferous trees	0
deciduous trees	40
shrubs	30
grosses	45
borren	15
Noter Quality	
temperature (PC)	9.0
dissolved axygen (mg/1)	9
conductivity (pmhas, cm)	210
рч	8.04

AN angling CF counting fence M dipinet EF electrofisher GN gail net KS kick sample F small fish collections made using a combination of methods SN seine AP benthic algal productivity station BI benthic invertebrate collection si CH water quality station	ARGI BKS BRM BUR DLVI
DN dipinet EF electrofisher GN gill net KS kick sample SF small fish collections made using a combination of methods SN seine AP benthic algal productivity station BI benthic invertebrate collection si	BRM BUR DLVI
EF electrofisher GN gill net KS kick sample F small fish collections made using a combination of methods SN seine AP benthic algal productivity station BI benthic invertebrate collection si	BUR
GN gill net KS kick sample SF small fish collections made using a combination of methods SN seine AP benthic algal productivity station BI benthic invertebrate collection si	DLVI
 KCK sample F small fish collections made using a combination of methods SN seine AP benthic algal productivity station BI benthic invertebrate collection si 	
 Small fish collections made using a combination of methods SN seine AP benthic algal preductivity station BI benthic invertebrate collection si 	
using a combination of methods SN seine AP benthic algal productivity station BI benthic invertebrate collection si	EGGS
SN seine AP benthic algal productivity station BI benthic invertebrate collection si	EMS
AP benthic algal preductivity station BI benthic invertebrate collection si	FLCI
BI benthic invertebrate collection si	FSD
BI benthic invertebrate collection si	FTM
-	GOL
-	1.40
CH water quality station	LKC
CR water quality station	LKW
	LND
PS point simple	LNS
PS point stimple	MTW
SG stream gauging station	NRD
Stream gruging hanon	NSS
76	NTP
35 kilometres from mouth	PL DI
tlow direction	SLS
now direction	SES
T	JPS
I reach boundary	TRP
Dupstream imit of survey	UNS
] upstream imit of survey	WAL
division between sections of	WTS
a reach	YLP
• d reach	
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* Data from Machniak et al. (1	



MACKAY RIVER

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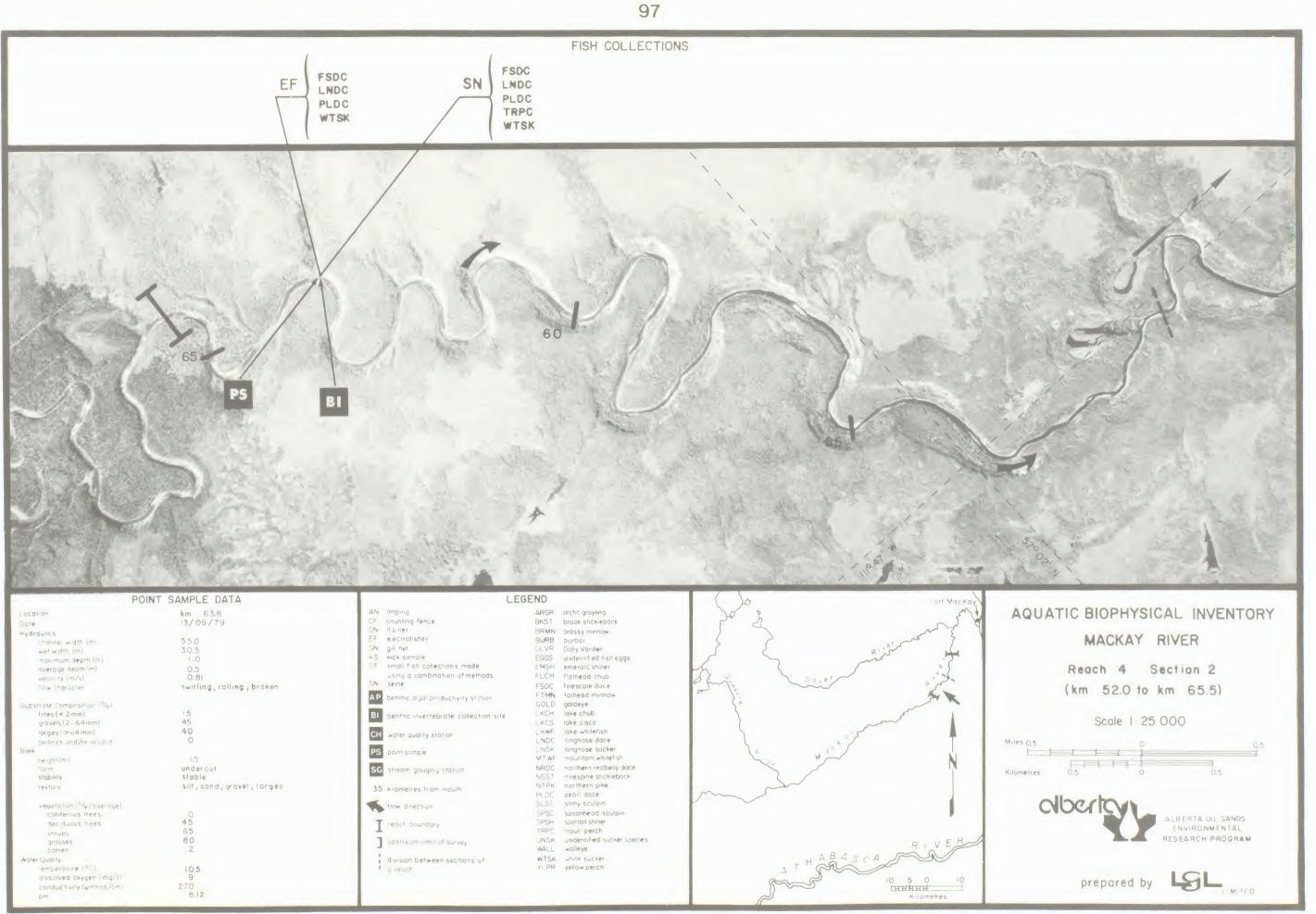
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Page 1

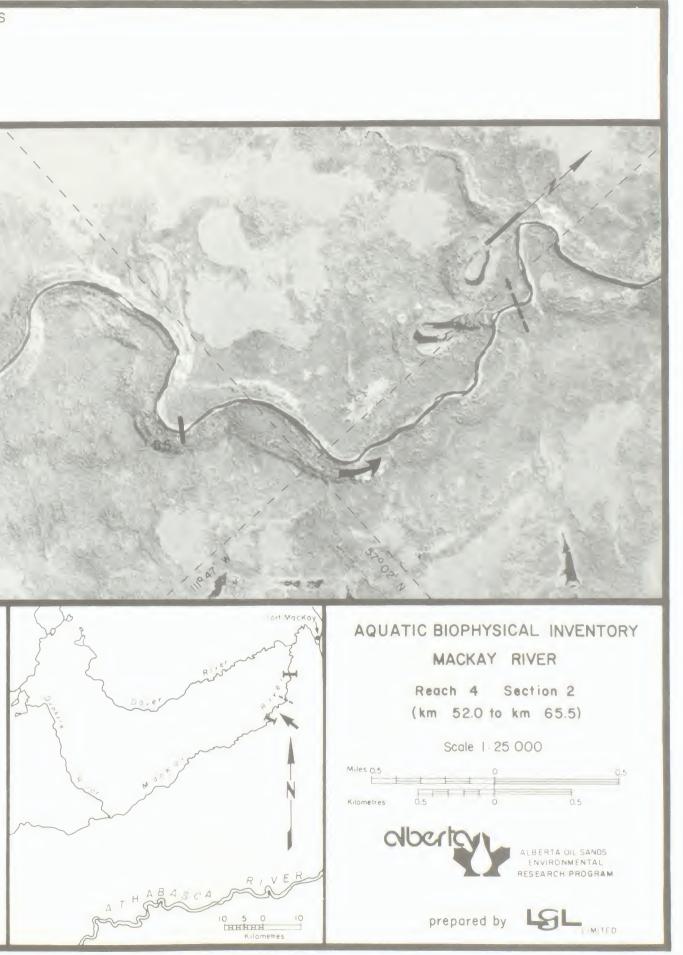
Reach 4 Section 1 (km 40 to km 52)

Scale 1:25 000





	POINT SAMPLE DATA	L	EGEND	
	km 63.8	AN angling	ARGR	arc
Date	13/09/79	CF counting fence	BKST	bro
Hydraulics		DN dipnet	BRMN	bra
Channel width Iml	55.0	EF eectrofisher	BURB	Du
wet width (m)	30.5	GN gill net	DLVR	Do
naximum depth (m)	1.0	KS kick sample	EGGS	UDH
everage depth (m)	0.5	F small fish collections made	EMSH	em
velocity m/s	0.81	using a combination of methods	FLCH	fla
w har cter	swirling, rolling, broken	SN seine	FSDC	fine
		AP benthic algal productivity station	FTMN	fai
Substrate Composition %)		Dennie digur productivity station	GOLD	90
fines (< 2 mm)	15	BI benthic invertebrate collection site	_KCH	lak
gravels 2-64mm	45	bennic invertebrate collection site	LKCS	lok
larges (>>4mm)	40	CH water quality station	LKWF	lak
bedrock and/or bills d	0	worer dudiny starion	LNDC	lor
Book		PS point sample	LNSK	lor
neight(m)	1.5	Point stanple	MTWF	mo
'um	undercut	SG stream gauging station	NRDC	no
stability	stable	Se sheeth guoging humin	NSST	nin.
lexture	silt, sand, gravel, larges	35 kilometres from mouth	NTPK	no
		55 knometres from modim	PLDC	pe
vegetalion 1% roverngel		tlow direction	SLSC	sh
conferous trees	0	now direction	SP SC	sp
dec duitus trees	45	T reach boundary	JPSH	Sp
shrubs	65	1 reden boundary	TRPC	110
grasses	80	Dipstream (im L of survey	JNSK	un
barren	2	a spancate inter a survey	WALL	wo
Water Quality		division between sections of	WTSK	wh
remperature	10.5	a reach	YLPR	ye
dissolved axygen (mg/1)	9	a reality		
conductivity (umbrs.cm)	270			
pH	8.12			



NUMBERS OF FISH COLLECTED (SEP	TEMBER 1979)			PHYSICAL CHARACTERISTICS		REACH DESCRIPTIC This lor
Species	Juveniles and Adults Young-of-the-year		Cha Cha	Reach length (km) Channel vidth (m) Channel area (ha) Gradient (m/km)	46.0 45 207.0 2.4	is essential sists of poo flow character banks are fai of the river sandy areas component of numerous. Th little overha Although grayling, suc large sizes of The rearing p by large rock Because there swiftly flow is relatively habitat for a not sufficien
Species finescale dace longnose dace pearl dace trout-perch white sucker Total	1 0 10 0 0 11	0 2 206 2 9 219	1 2 216 2 9 230	Flow character swirling, polling, broken Total pools (n) 40 Pattern irregularly meandering Confinement frequently confined Unstable banks (n) 10 Substrate composition (k) fines (<2 mm) 10 gravels (2-64 mm) 50 larges (.64 mm) 40 bedrock and/or oil sand 0 Denris low		
NENTHI INVERTERATES NEMATDA OLIGOCHAETA GASTROPODA Contaction PELECYPODA Minoration ARACHNIDA Hydracarina CRUSTACEA Cladocera Amphipoda Nesetta	Conif Decid Shrut Grass Barre	Verage () Ferous trees 50 duous trees 30 os 30 ses 85 en 5 1 cover (?) hang 1	HIC ALLAL PRODUCTIVILY No data availante for thi		No data available for this r	e oc h
Ephemeroptera And La and Ephemeroptera Carrie Carrie Carrie Carrie Carrie Carrie Corixidae Megaloptera Corixidae Megaloptera Corixidae Megaloptera Corixidae Megaloptera Corixidae C						

ugh the spawning potential of this reach is considered good for arctic suckers, longnose dace and slimy sculpin, high water velocities and the of the substrate materials may limit spawning over much of the reach. potential of this reach is considered moderate; shelter is provided ocks in shallow areas along the banks and there are few grassy shallows. ere are relatively few pools and the water is generally shallow and owing, the resting and feeding potential for adults of the larger species ely poor. However, the many riffle areas should provide good feeding arctic grayling. The water depths in most of this reach are probably ient for overwintering of fish.

TION AND FISH UTILIZATION

long, irregularly meandering section has a relatively high gradient and ally a series of riffles. The proportion of the reach area that conpols is the lowest in the surveyed portion of the MacKay River, and the cter varies from swirling to rolling to broken. Areas with unstable fairly common but are less frequent here than in the four lower reaches er. The substrate is almost entirely larges and gravels, with some in guiet shallows along the banks. Coniferous trees are a dominant of the riparian vegetation and deciduous trees and shrubs are also There is usually a dense growth of grasses along the banks and very rhanging vegetation.

WATER ONALITY

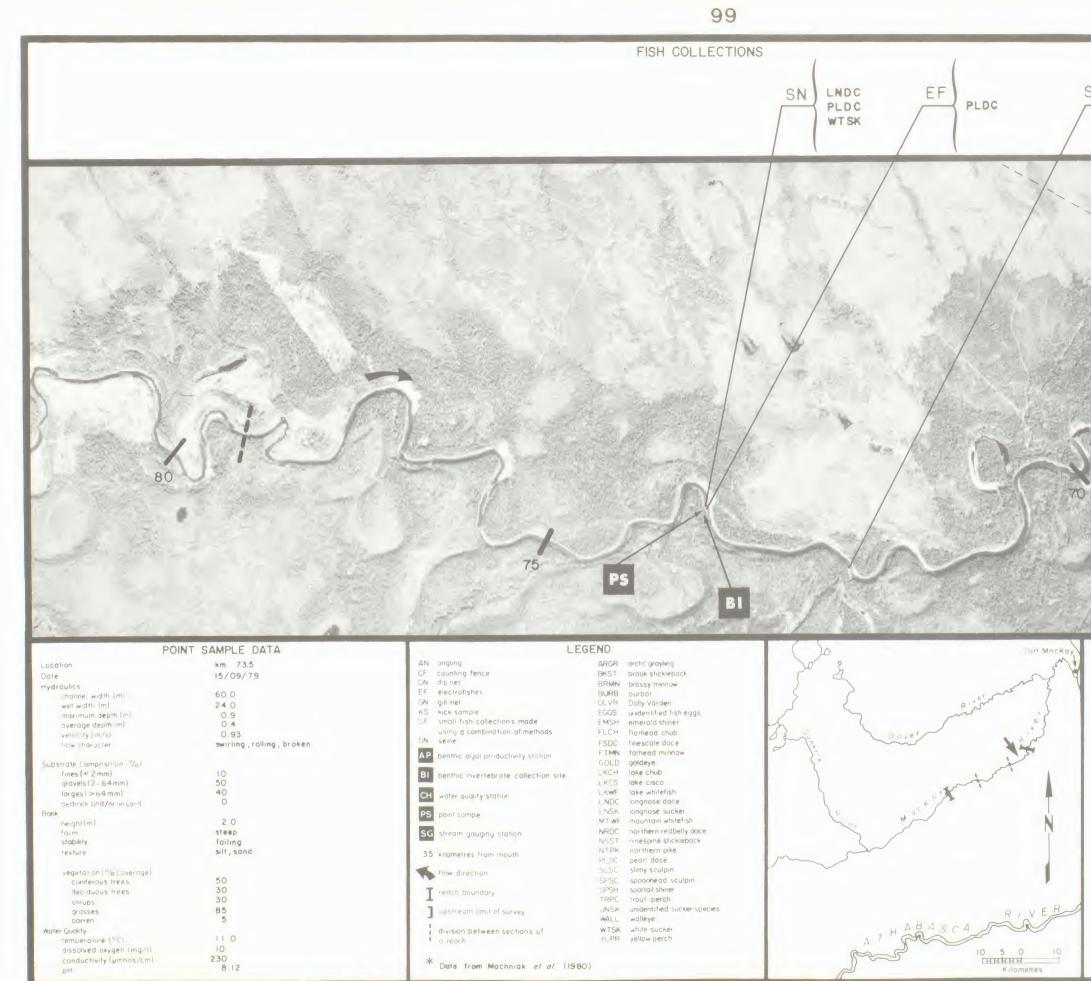
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AQUATIC BIOPHYSICAL INVENTORY MACKAY RIVER

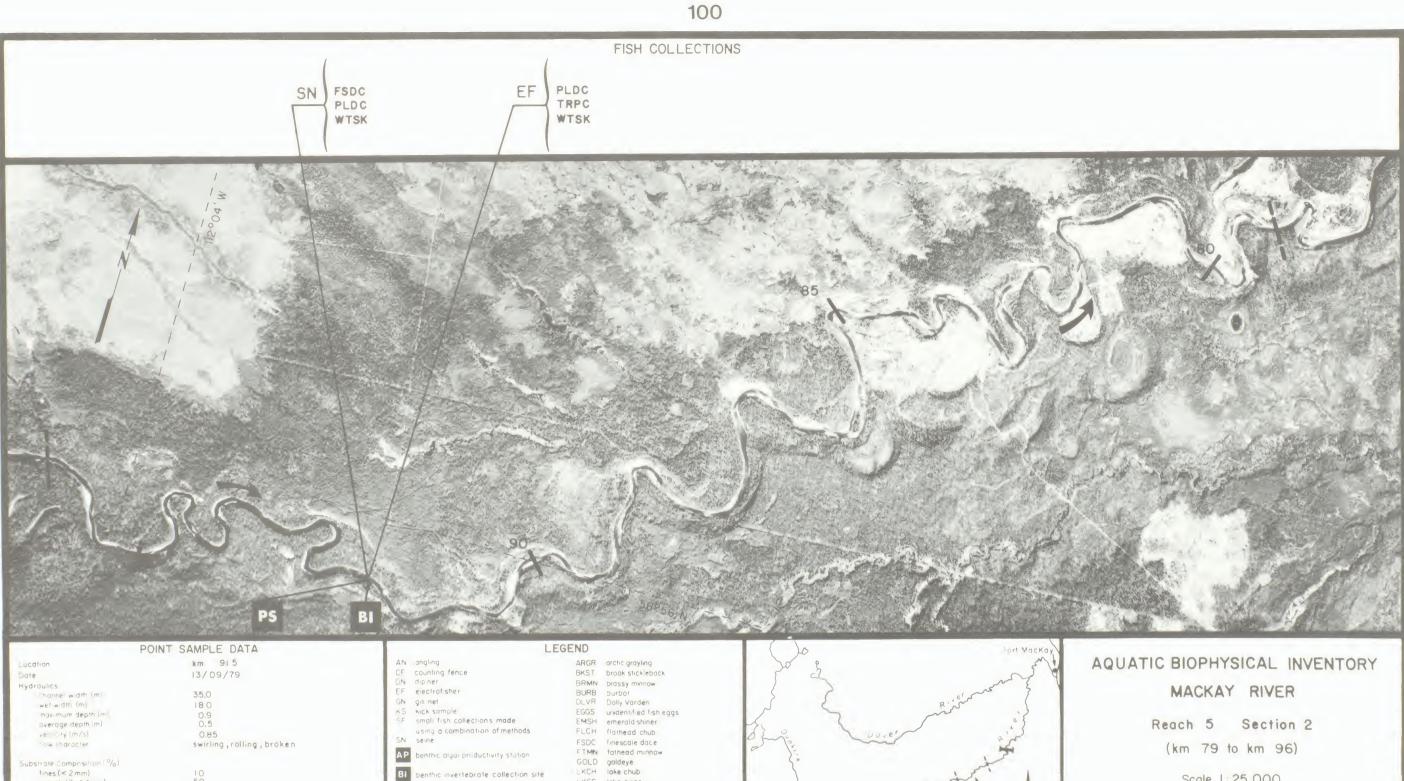
Reach 5 (km 65.5 to km 111.5)







SF* ARGR LNSK BKST PLDC FSDC SLSC LKCH TRPC LNDC WTSK
R
M. Som
AQUATIC BIOPHYSICAL INVENTORY MACKAY RIVER
Reach 5 Section I (km 65.5 to km 79.0)
Scale 1:25 000 Miles 0.5 F 1 1 1 0 0.5 Kilametres 0.5 0.5
ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM
prepared by



fines (< 2mm) gravels (2-64mm) lorges (>64mm) bedrock and/or billing d Honk height (m) stability lexture vegetation 1% or overaget coniferous trees deciduous trees shrubs grasses Darren Water Quality 'emperature Phot dissolved axygen I mg M

conductivity (umh. s.cm)

1.5 repose stable sandy silt, gravel, larges

40

40 25 20

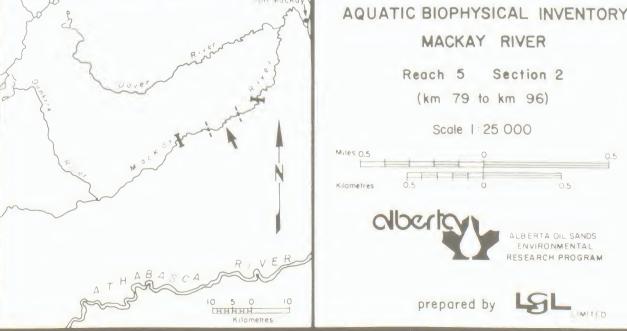
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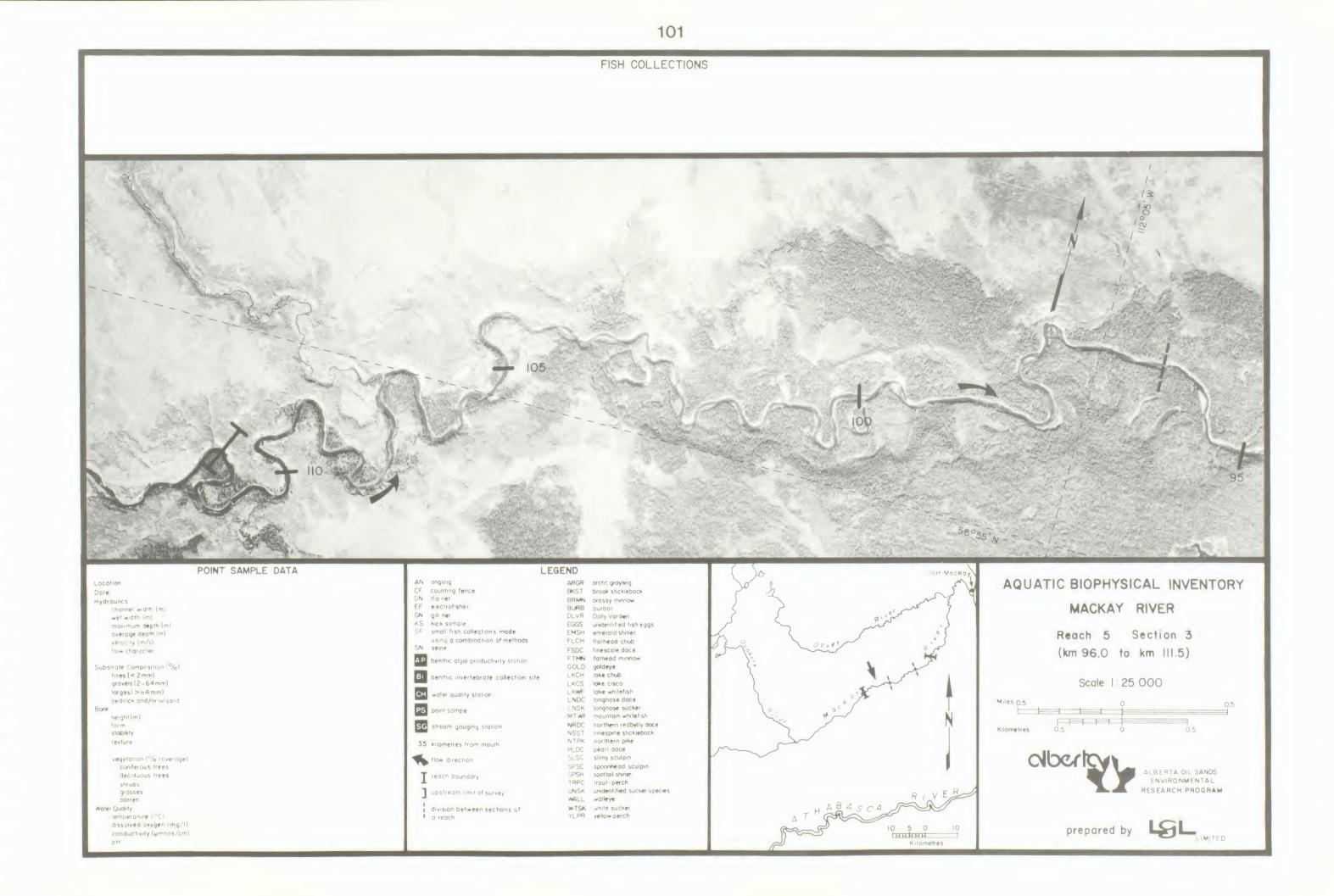
11.5

9 220 8.07 PS point sumple SG stream gauging station 35 kilometres from mouth tiow direction T reach boundary upst/eam limit of survey division between sections of a reach

CH water quality station

_KCH lake chub LKCS lake cisco LKWF lake whitefish LNDC longnose dace NSK longnose sucker MTWF mountain whitefish NRDC northern redbelly dace NSST ninespine stickleback NTPK northern pike PLDC pearl dace SPSC spoonhead sculpin SPSH spottal shiner TRPC trout-perch UNSK unidentified sucker species WALL wolleye WTSK white sucker YLPR yellow perch * Data from Machniak et al (1980)





BERS OF FISH COLLECTED	(SEPTEMBER 1979)		
Species	Adults	Juveniles and Young-of-the-year	Total Number
finescale dace	0	14	14
northern pike	0	3	3
pearl dace	2	89	91
slimy sculpin	4	0	4
white sucker	1	9	10
Total	7	115	122

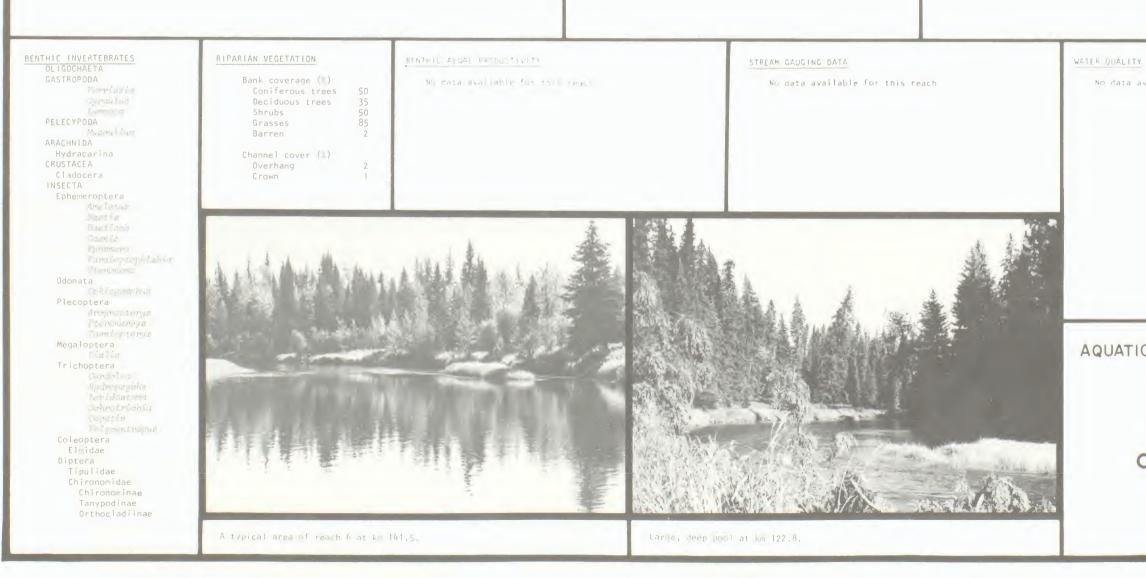
PHYSI	CAL	CHA	RACT	ERI	ST	10

Reach length (km)	40.0
Channel width (m)	38
Channel area (ha)	152.0
Gradient (m/km)	0.7
Flow character	placid, swirling, rolling
Total pools (2)	90
Pattern	irregularly meandering
Confinement	occasionally confined
Jnstable banks ()	2
Substrate composition (2)	
fines (=2 mm)	50
gravels (2-64 mm)	35
larges (>64 mm)	15
bedrock and/or oil sand	0
Debris	hīgh

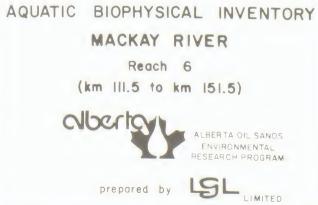
REACH DESCRIPTION AND FISH UTILIZATION

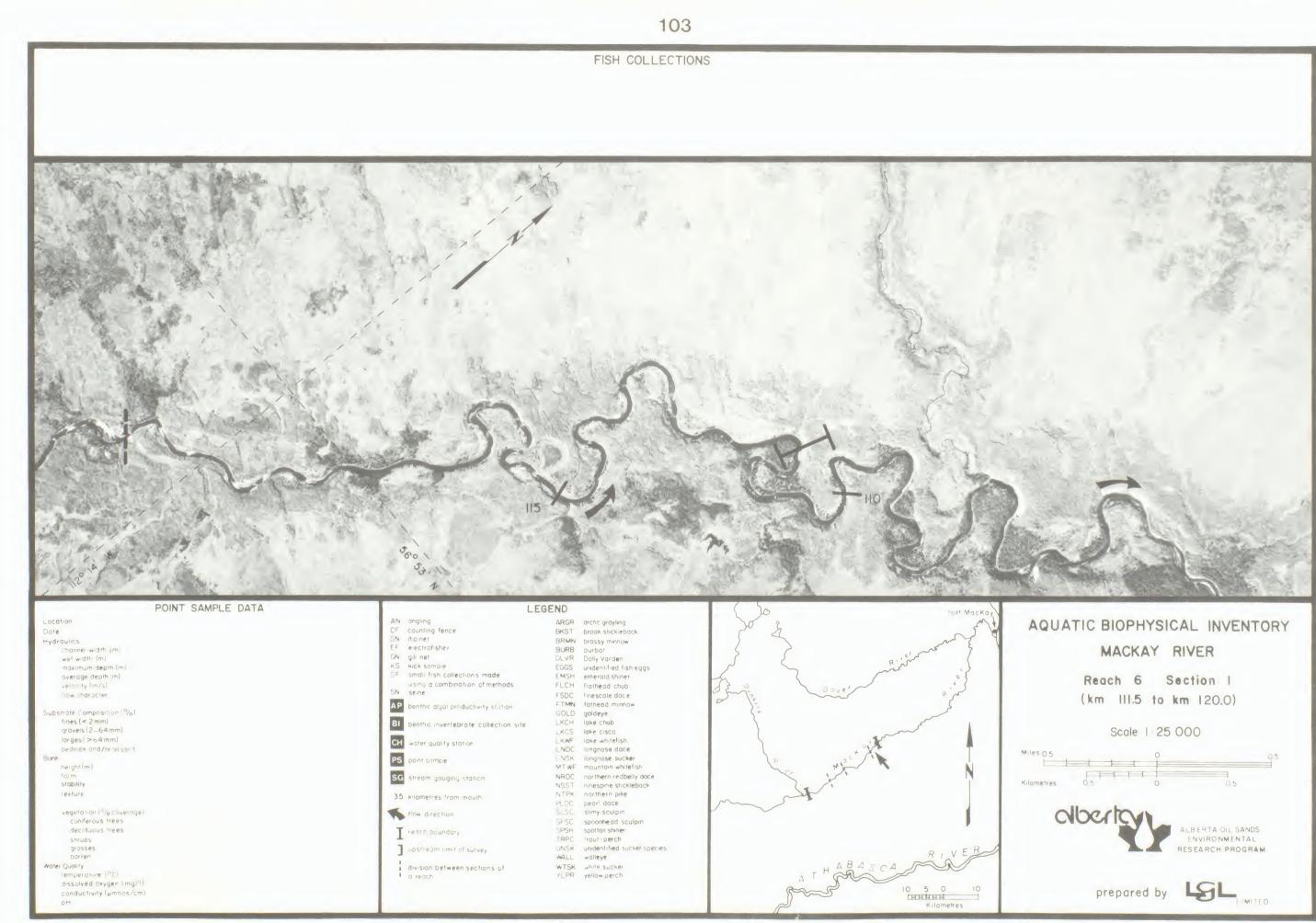
This section of the MacKay River has a much lower gradient than Reach 5 and meanders in an irregular pattern. Most of the reach consists of pools with placid or swirling flow, but there are a few riffle sections. Several beaver da s were present in this reach at the time the river was surveyed in 1979. The substrate consists primarily of fines and small gravels with some cobbles and boulders. Coniferous trees dominate the riparian vegetation over much of the reach, but deciduous trees and shrubs are also abundant and there is a dense growth of grasses in most places. There is a large amount of debris in the

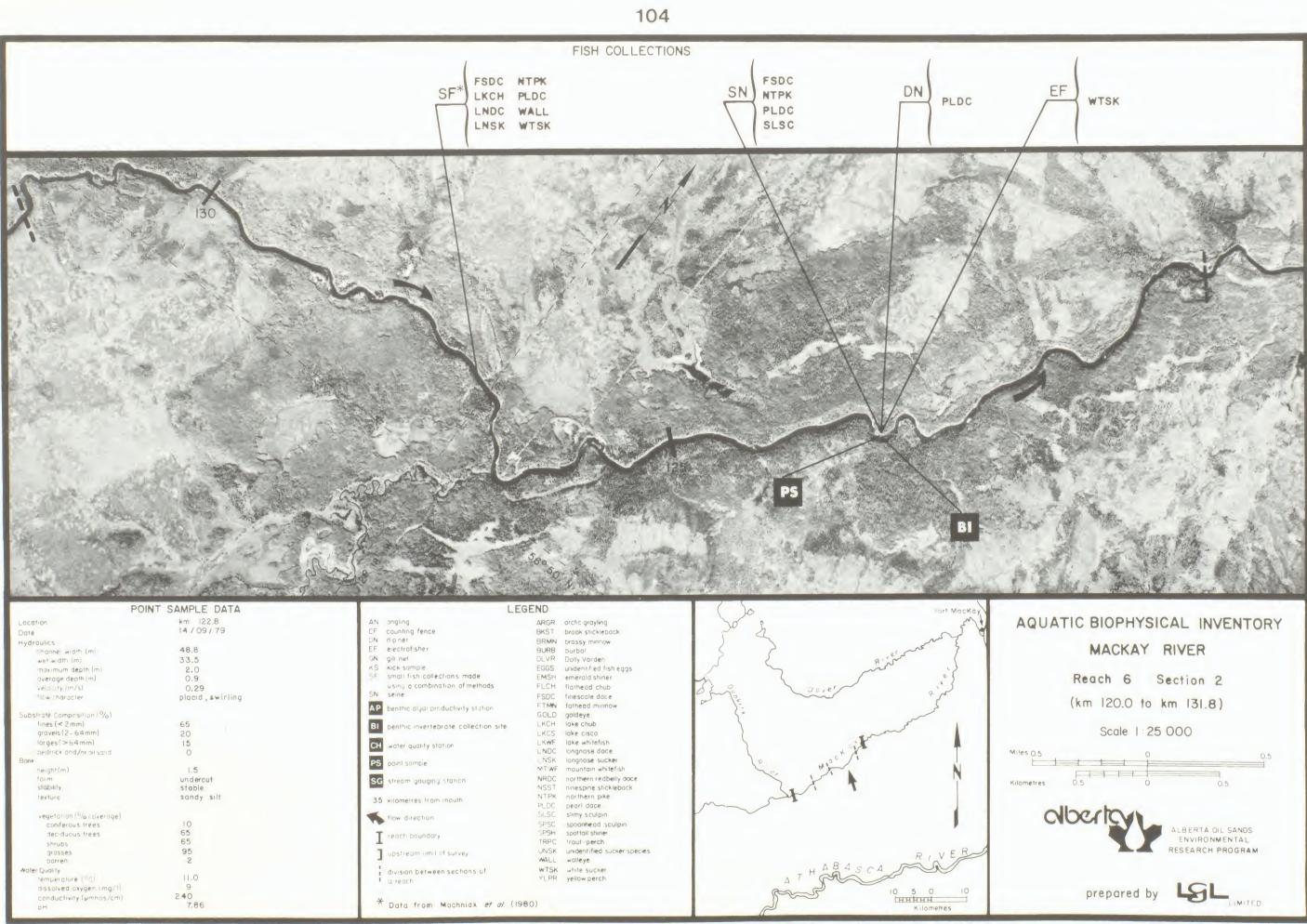
For most of the larger fish species, the spawning potential of the reach is poor. There are many areas, however, that are probably suitable for spawning of some forage fish species that spawn over sand or silt substrates. Some northern pike may also spawn in this reach. The rearing potential of this reach is considered very good; shelter is provided by abundant debris in shallow pool areas and there are some weedy shallows. The many deep pools and abundant debris provide good resting and feeding areas for adults of some of the larger fish species, particularly suckers and northern pike. The water depths over much of the reach are probably sufficient to allow overwintering of fish.

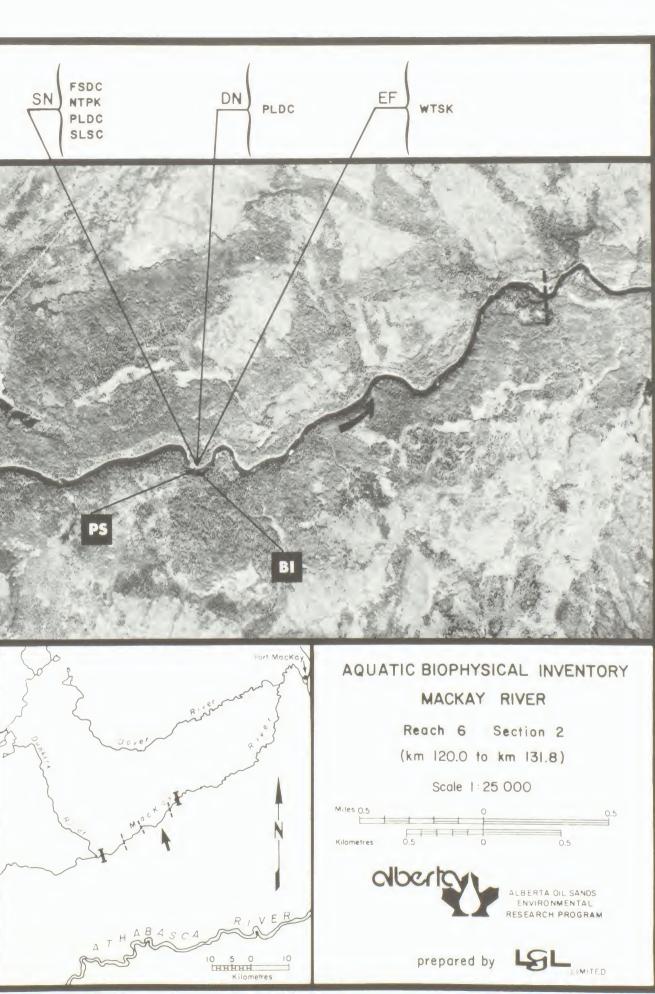


No data available for this reach

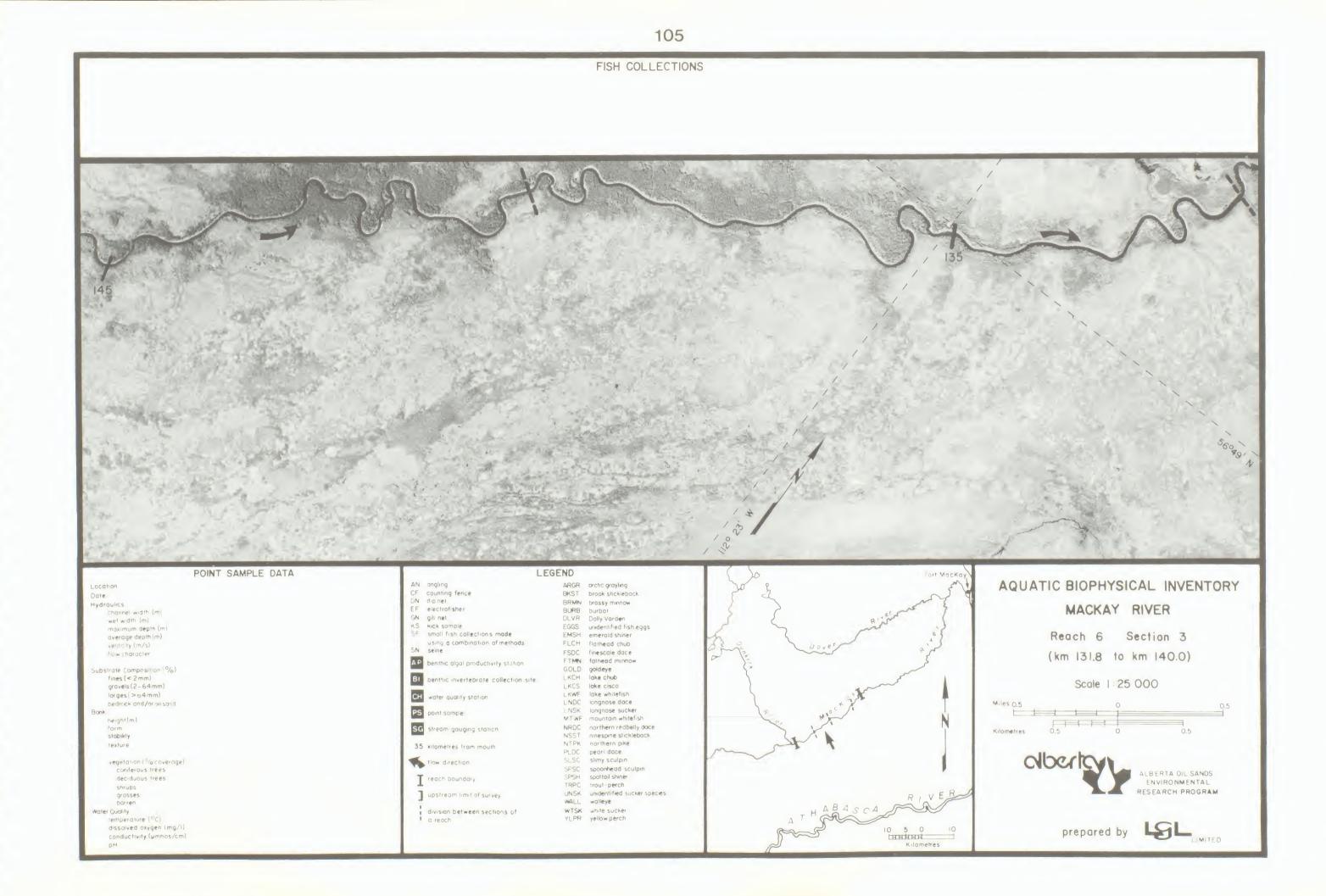


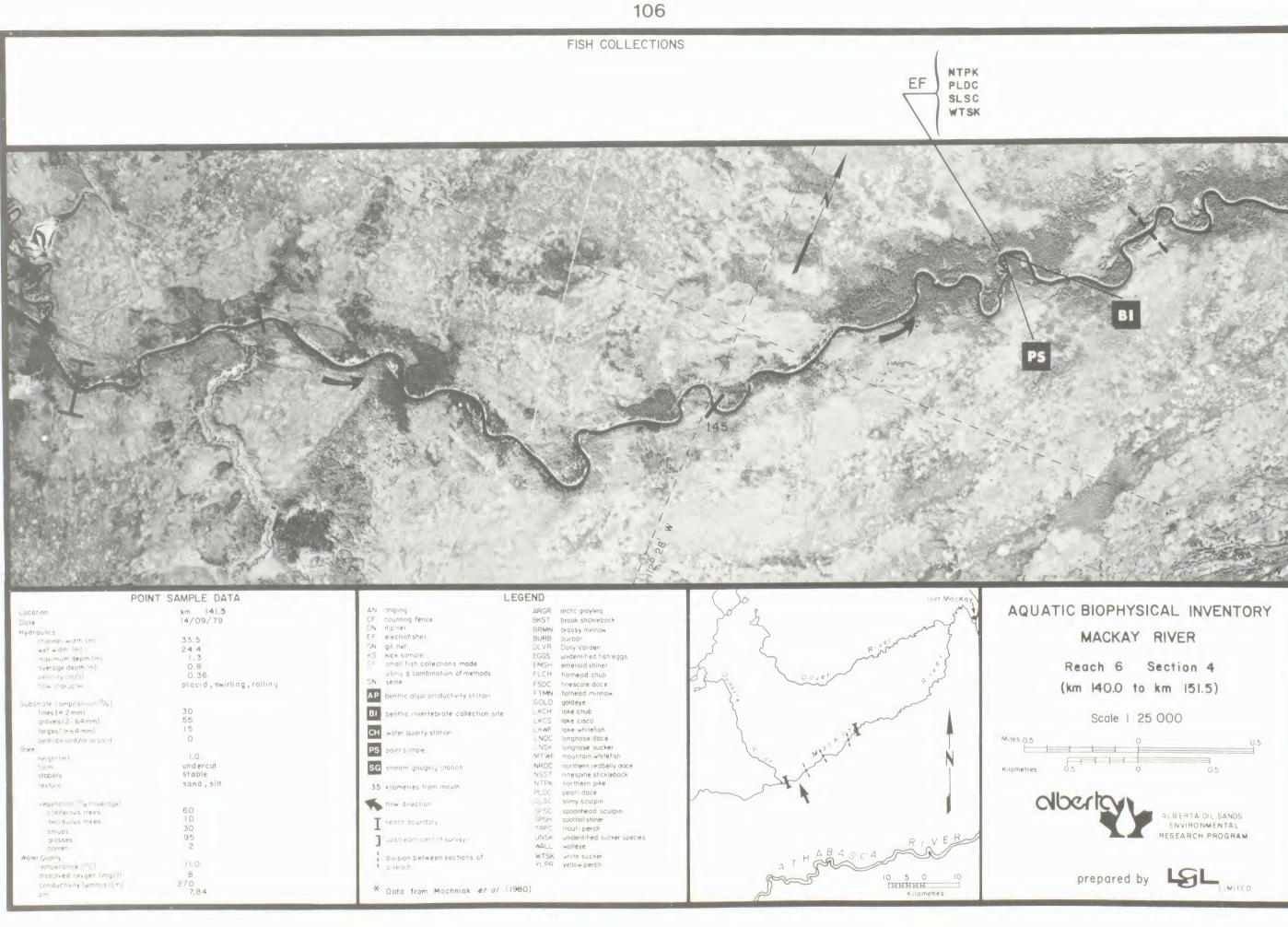






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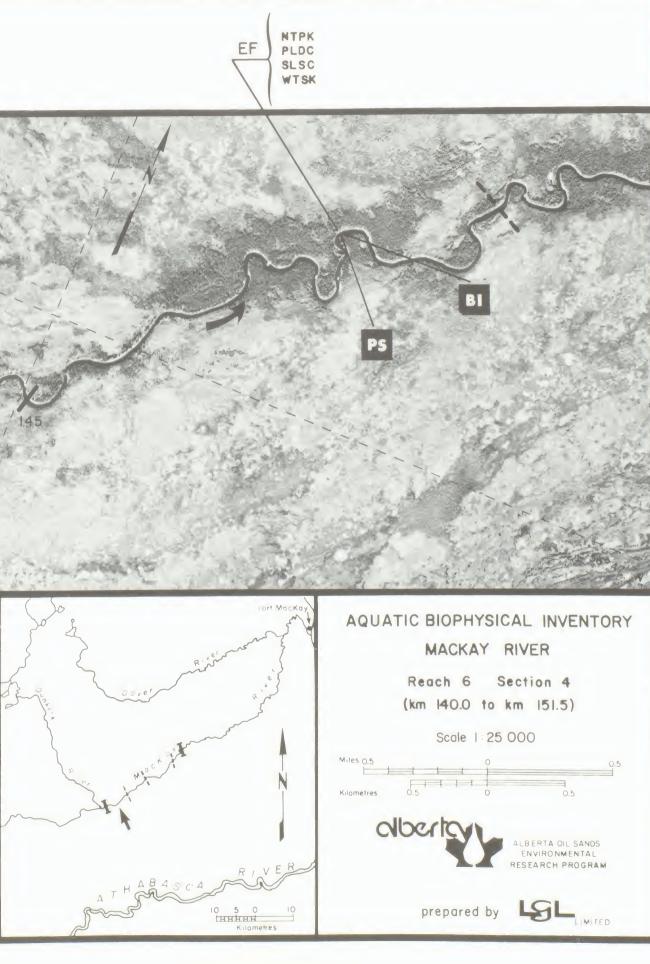




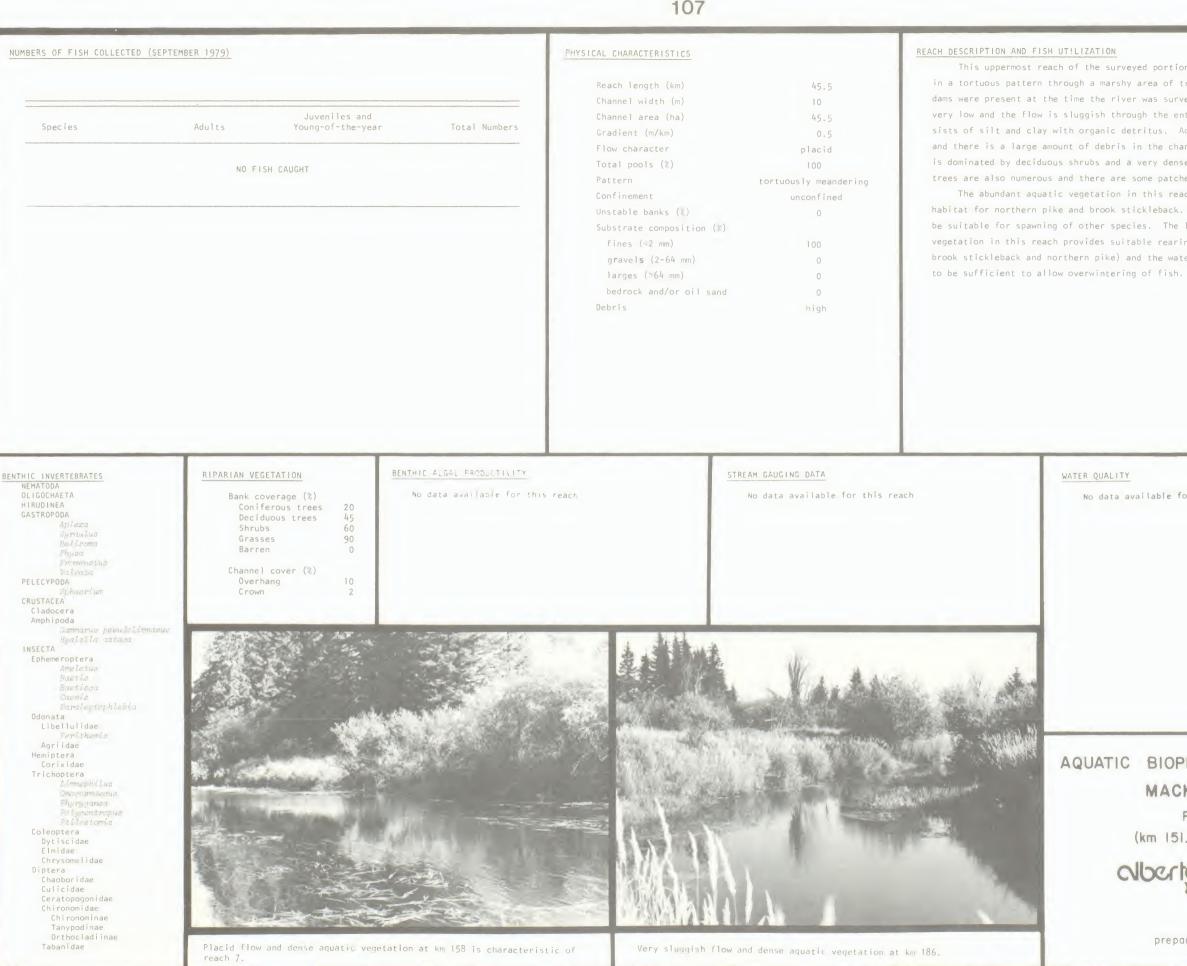
			_	
DOINT	CA	MOL	5	DATA

	I OINT ORANI EL
Locotion	km 14
Date	14/09/
Hydroulics	
channel width Im	33.5
wet width Im.	24.4
maximum depth (m)	1.3
average depth (m)	0.8
velocity (in/5)	0.36
"In w harscher	placid,
substrate (omposition 1%)	
fines (< 2 mm)	30
grovels (2-64mm)	55
larges(>64mm)	15
bedrock and/or busand	0
Bonk	
he ght(m)	1.0
'gi m	undercu
stability	stable
texture	sand, s
vegetation (¹⁵ /or hveringe)	
conferous trees	60
deciduous trees	10
shrubs	30
grasses	95
barren	2
Nater Quality	
'emperonire	11.0
dissolved axygen img/11	8
conductivity (pmn.s.cm)	270
DH	7.84

ND	
ARGR	orctic groyling
BKST	brook sticklebock
BRMN	brassy minnow
BURB	burbo!
DLVR	Dolly Varden
EGGS	unidentified fish eggs
EMSH	emerald shiner
FLCH	flatheod chub
FSDC	finescole dace
FTMN	fothead minnow
GOLD	goldeye
_KCH	loke chub
LKCS	loke cisco
LKWF	loke whitefish
LNDC	longnose dace
LNSK	longnose sucker
MTWF	mountain whitefish
NRDC	northern redbelly dace
NSST	ninespine stickleback
NTPK	northern pike
PLDC	pearl doce
SUSC	slimy sculpin
SPSC	spoonheod sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	wolleye
WTSK	white sucker
YL PR	yellow perch



-



This uppermost reach of the surveyed portion of the MacKay River meanders in a tortuous pattern through a marshy area of treed muskeg. Several beaver dams were present at the time the river was surveyed in 1979. The gradient is very low and the flow is sluggish through the entire reach. The substrate consists of silt and clay with organic detritus. Aquatic vegetation is abundant, and there is a large amount of debris in the channel. The riparian vegetation is dominated by deciduous shrubs and a very dense growth of grasses. Deciduous trees are also numerous and there are some patches of conifers.

The abundant aquatic vegetation in this reach provides excellent spawning habitat for northern pike and brook stickleback. The reach does not appear to be suitable for spawning of other species. The large amount of debris and aquatic vegetation in this reach provides suitable rearing habitat for some species (e.g., brook stickleback and northern pike) and the water depth in this reach appears

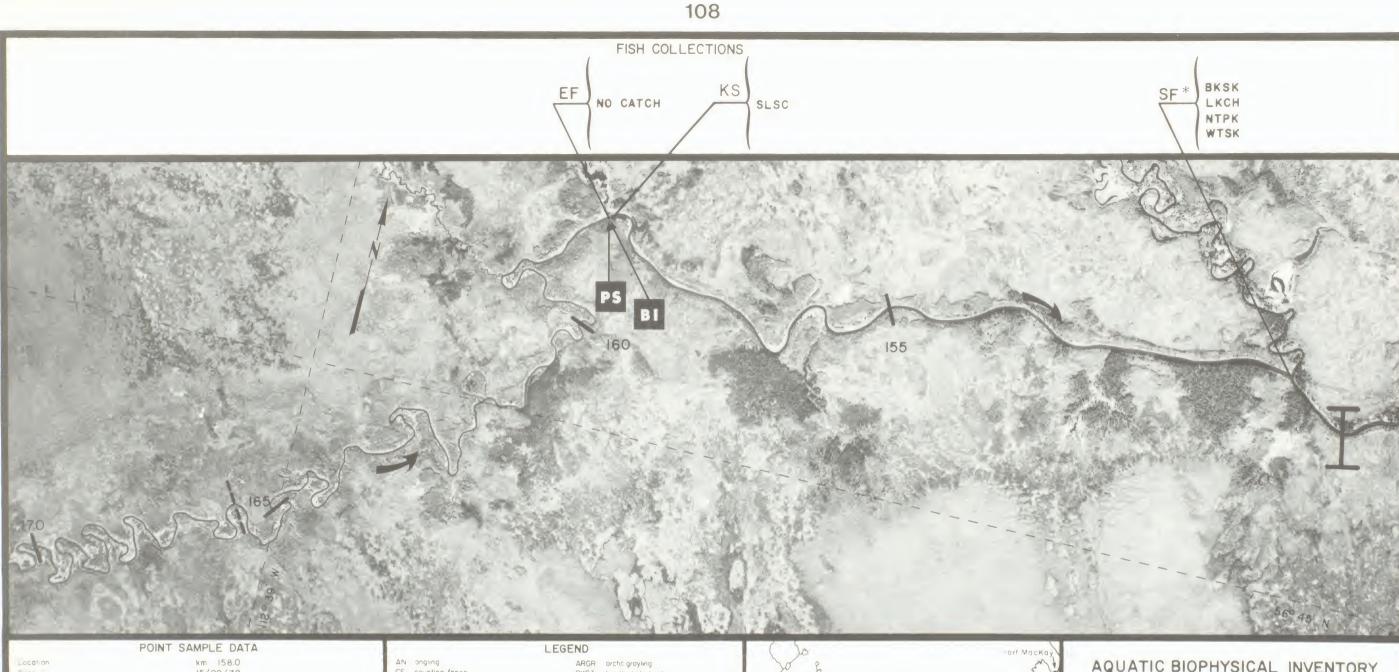
> WATER QUALITY No data available for this reach

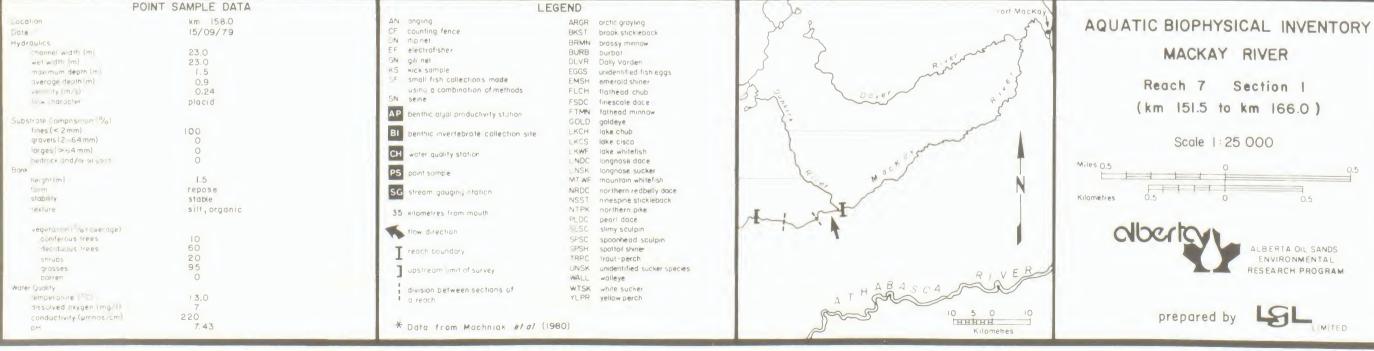
AQUATIC BIOPHYSICAL INVENTORY

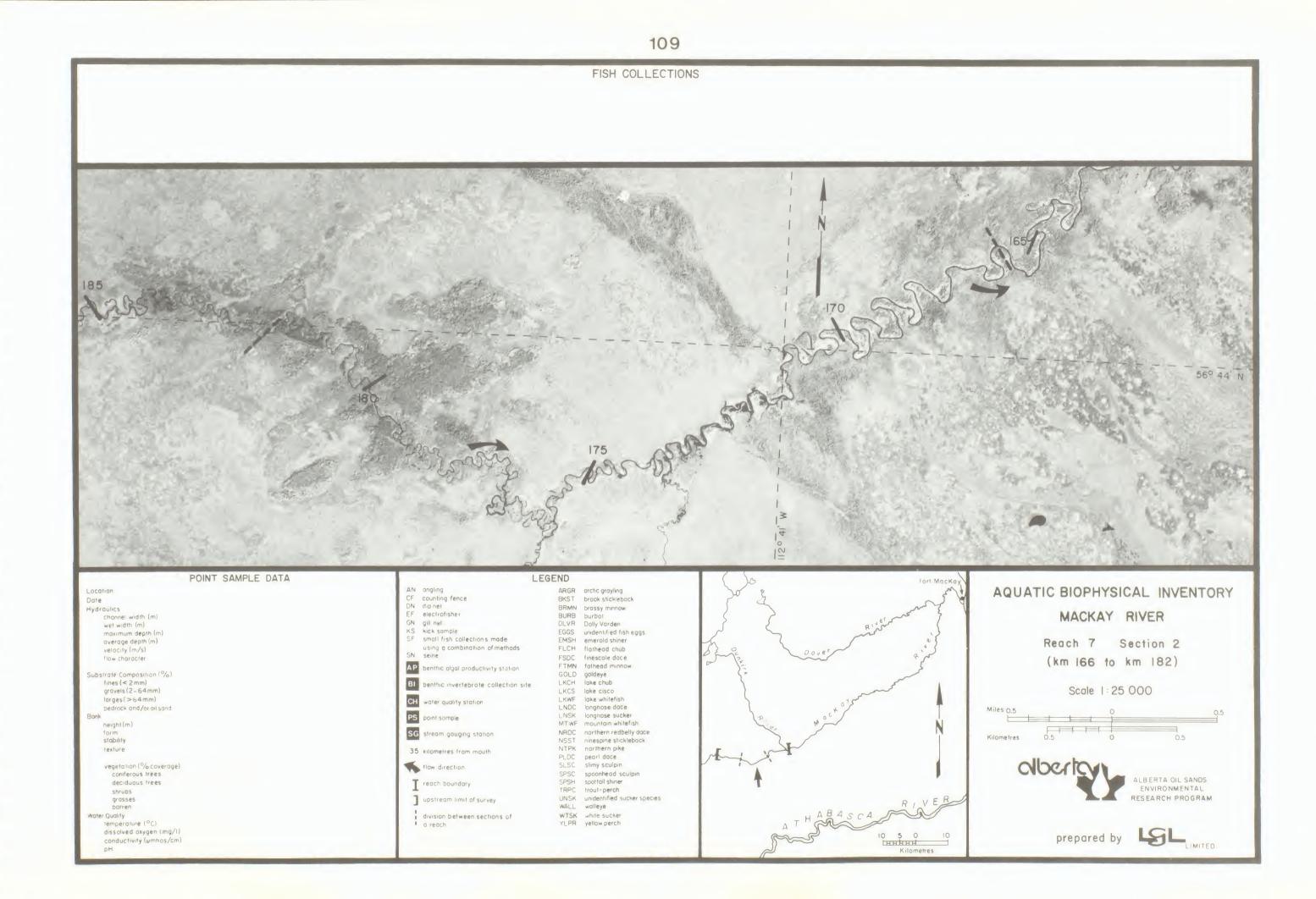
MACKAY RIVER

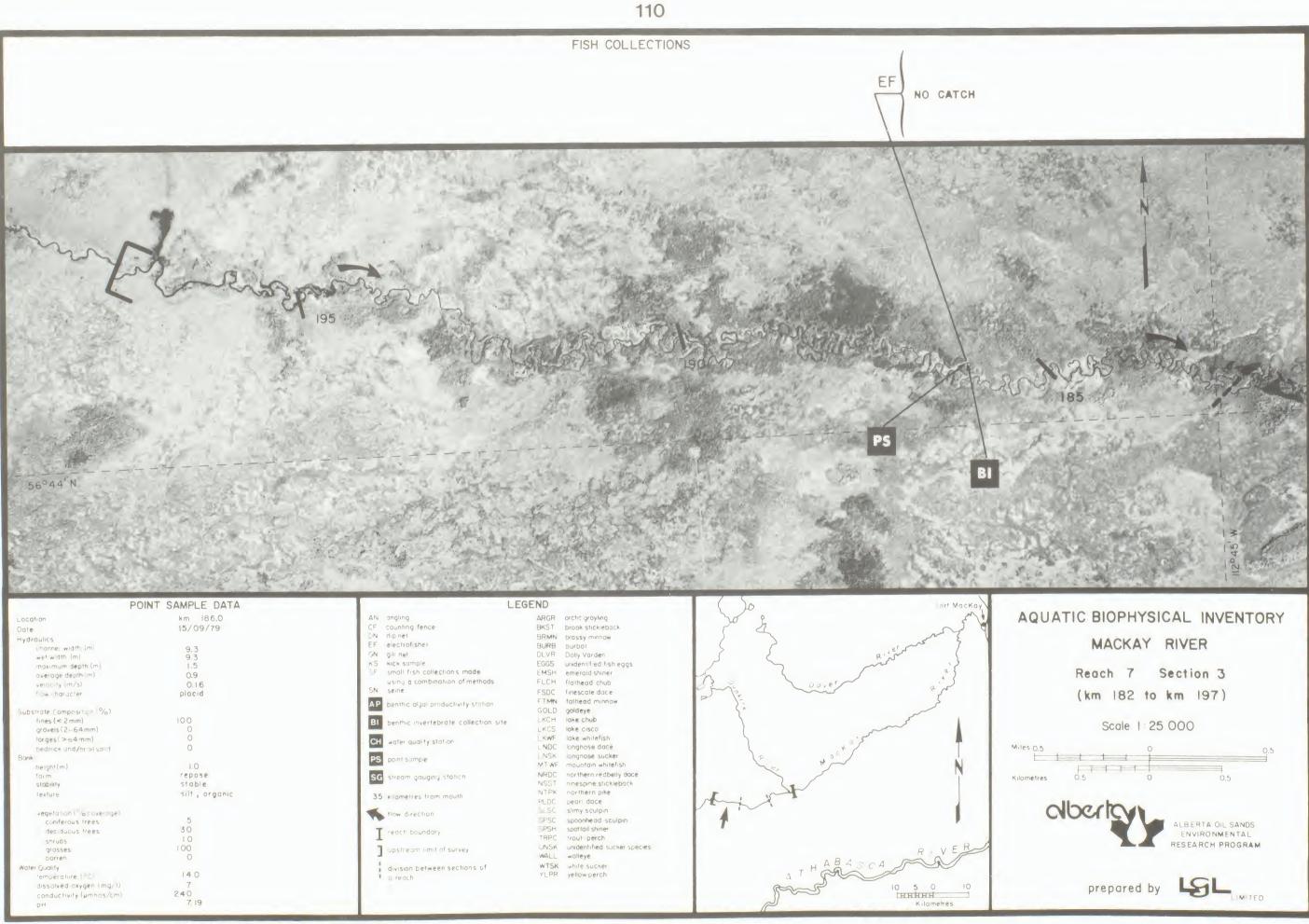
Reach 7 (km 151.5 to km 200.0)

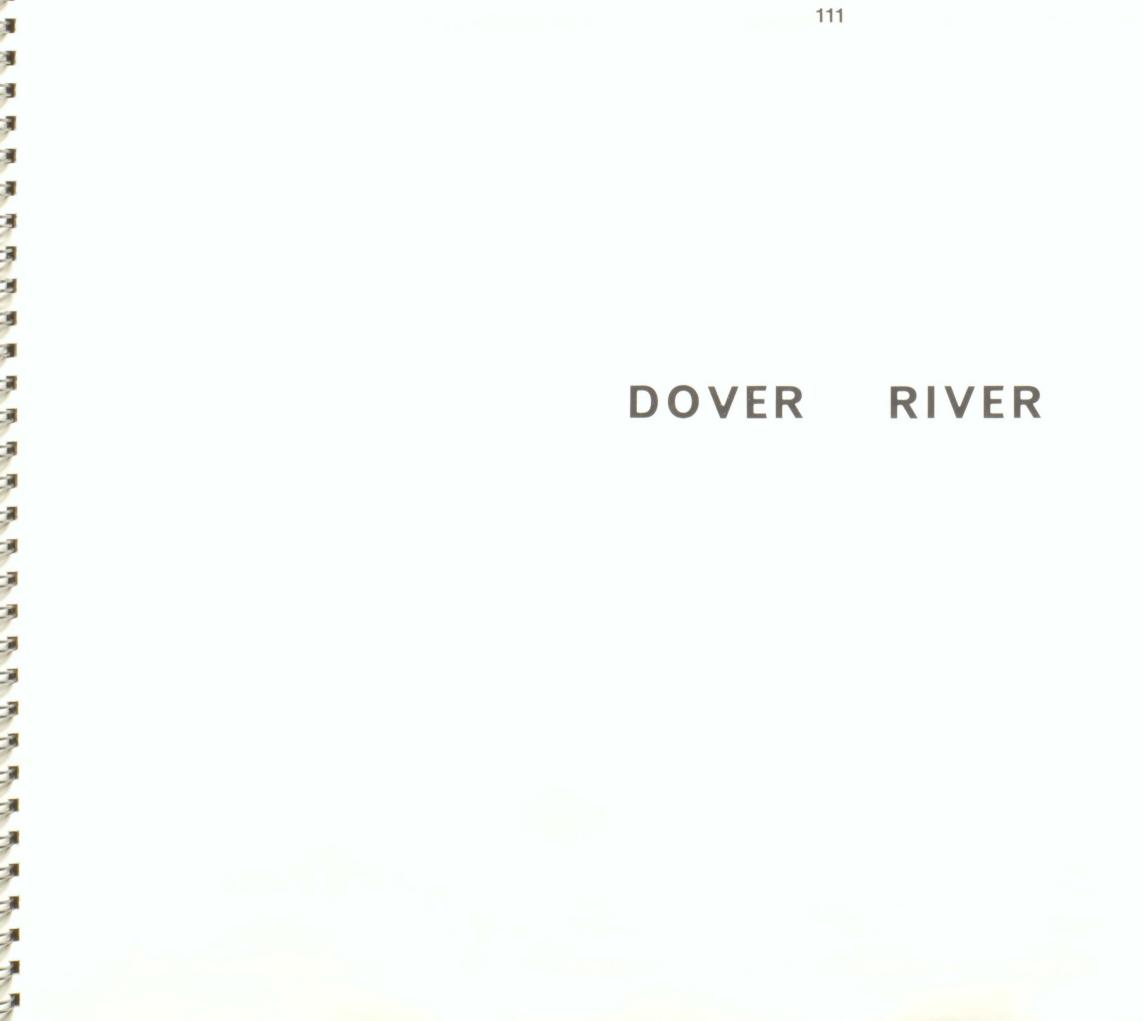




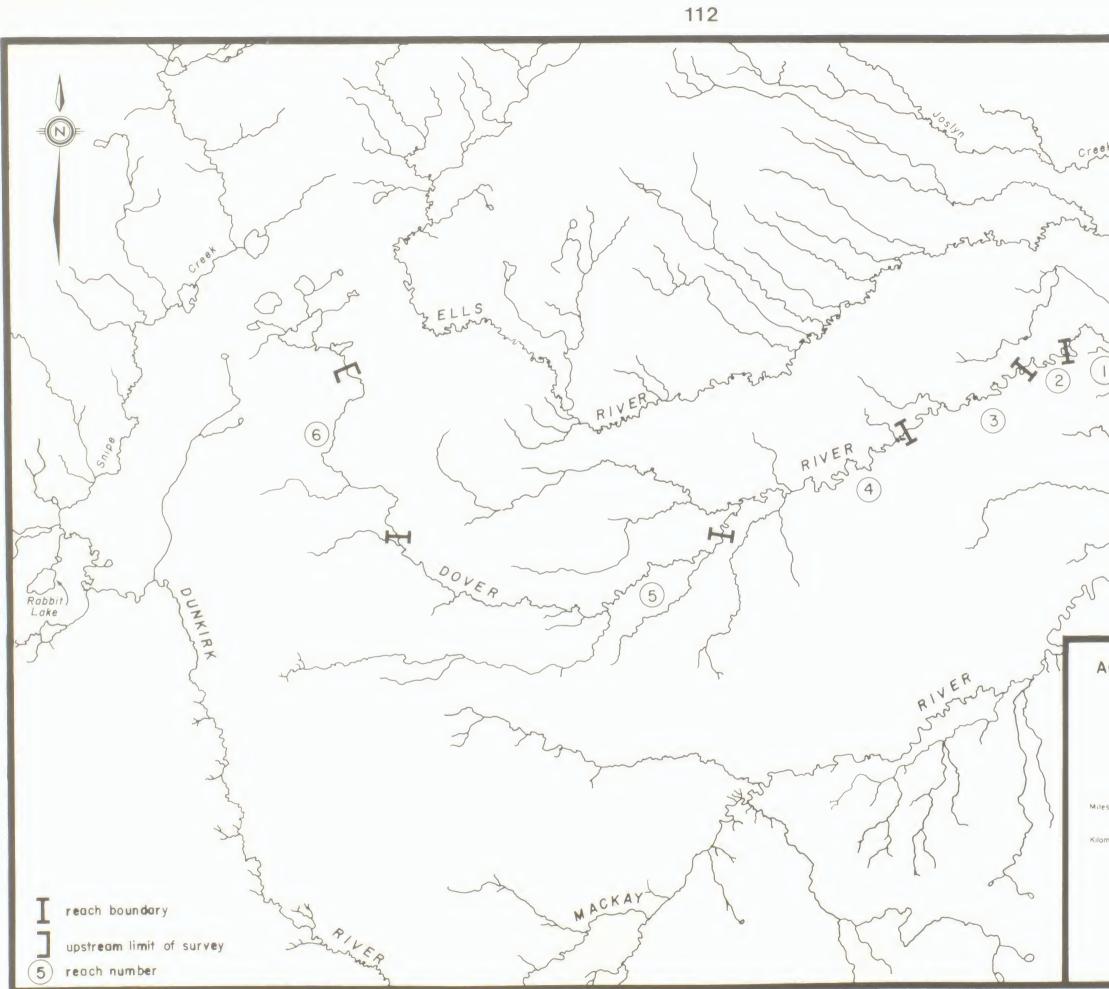












ATHABASCA BA
QUATIC BIOPHYSICAL INVENTORY
REACHES OF THE DOVER RIVER
Scale 1:250 000 55 0 5 metres 5 0 5
ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM
prepared by LIMITED

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BERS OF FISH COLLECTED (SEP	TEMBER 1979)			PHYSICAL CHARACTERISTICS		REACH DESCRIPTION AND
		Juveniles and		Reach length (km) Channel width (m) Channel area (ha)	12.5 10 12.5	This lower rea upstream 12.5 km fi is irregularly mean banks that consist
Species	Adults	Young-of-the-year	Total Numbers	Gradient (m/km)	4.1	at the time the ri
ongnose dace ongnose sucker pearl dace white sucker		3 13 122 1	3 13 122 1	Flow character Total pools () Pattern Confinement Unstable banks (&)	swirling, rolling, broken 70 irregularly meandering confined 40	is relatively high are moderate and a consists primarily fine gravel substr shrubs, with some
íota l	0	139	139	Substrate composition (fines (*2 mm) gravels (2-64 mm) larges (*64 mm) bedrock and/or oil sam	20 40 35	of grasses and li present in the ri The spawning of fish that have provide suitable
				Debris	moderate	strates (e.g., wh gravel substrates ticularly pearl d vided by debris a in this reach. G by the numerous s are probably suit
NTHIC INVERTEBRATES OLIGOCHAETA HIRUDINEA Glossiphonidae GASTROPODA Typeignic Uprice Uprice Comparison PELECYPODA Hydracarina INSECTA Ephemeroptera Are the Uprice Comparison	Conif Decid Shrub Grass Barre	verage (%) erous trees 2 uous trees 60 s 40 es 80 n 5 cover (%) ang 2	ENTHIC ALGAL PRODUCTIVITY No data available for this re.	ach	Maximum monthly mean discharge: Mininum monthly mean discharge:	ND ND 9.74 m'/s (April 1976) 0.03 m'/s (March 1977) 24.61 m ⁴ /s (April 13, 19 0.03 - ³ /s (March 3, 197
Tarriort phrabio Titones mir Odonata shi prema Plecoptera Later P Titone of trans Hemiptera Corixidae Megaloptera firia Trichoptera chremitmanna						H. M.
Coleoptera Elmidae Diptera Tipulidae Ceratopogonidae Chironomidae Chironominae						

SCRIPTION AND FISH UTILIZATION

This lower reach of the Dover River is a high gradient section that extends eam 12.5 km from the confluence with the MacKay River. The river channel regularly meandering, and there is a relatively high proportion of unstable that consist of silt, sand and gravel. Several beaver dams were present e time the river was surveyed in 1979. Although the gradient in this reach latively high and riffles are numerous, water velocities in most of the reach oderate and a high proportion of the reach consists of pools. The substrate sts primarily of larges and coarse gravels, but there are areas with sand and gravel substrates. The riparian vegetation is mostly deciduous trees and s, with some patches of coniferous trees. There is a relatively dense growth asses and little overhanging vegetation. A moderate amount of debris is nt in the river channel.

The spawning potential of this reach is considered good for several species sh that have been collected from the Dover River. The numerous riffle areas de suitable spawning locations for some species that spawn over gravel subes (e.g., white sucker, longnose dace). Other areas with sand and fine substrates may be suitable for spawning of some of the forage fish, pararly pearl dace. Numerous shallow backwaters and the abundant shelter proby debris and some aquatic vegetation provide very good rearing potential is reach. Good resting and feeding locations for larger fish are provided e numerous swirling pools. There are a number of moderately deep pools that robably suitable for overwintering of fish.

WATER QUALITY

Sulphate (mg S0,/1)

Water Survey of Canada station number 00AT07DB0020 Maximum Mini u Mean 67.2 Total alkalinity (mg CaCO /1) 8.40 56.9 Total hardness (mg CaCO /1) 216.7 339.4 564 Total filterable residue fixed (mg/l) 519 Total non-filterable residue fixed (mg/1) Total organic carbor (mg C/1) 26.0 8.9 Silica (mg SiO_/1) Nitrate and nitrite nitrogen (mg N/1) -0.00 otal Kieldahl nitrogen (mg N/1) otal Phosphorus (mg P/1) 0.020 0.1139 31.4 83. rthophosphate (mg P/1)

Data for the period January 1976 to December 1979 obtained From the National Water Quality Data Bank (NAQUADAT).

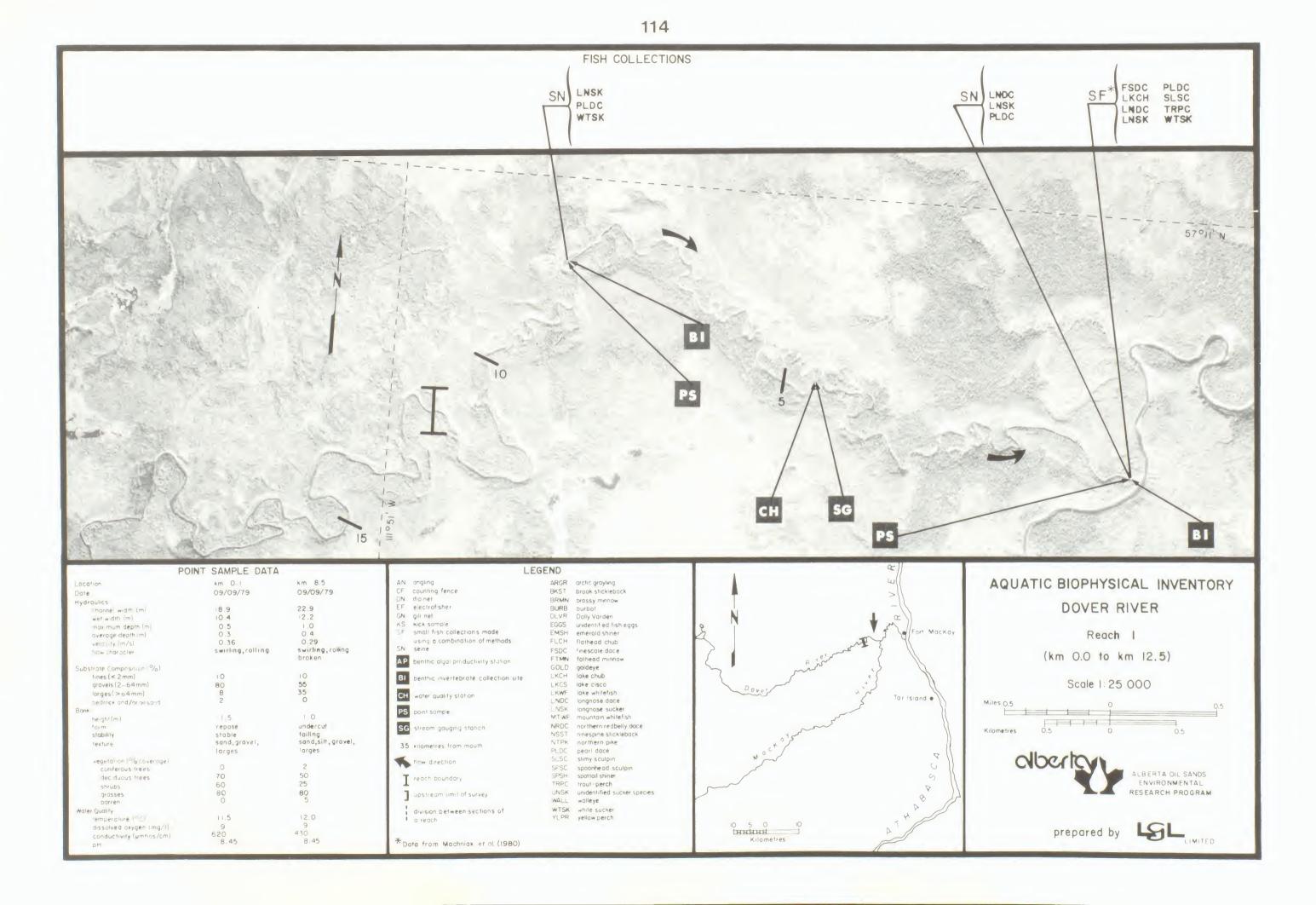
6.5

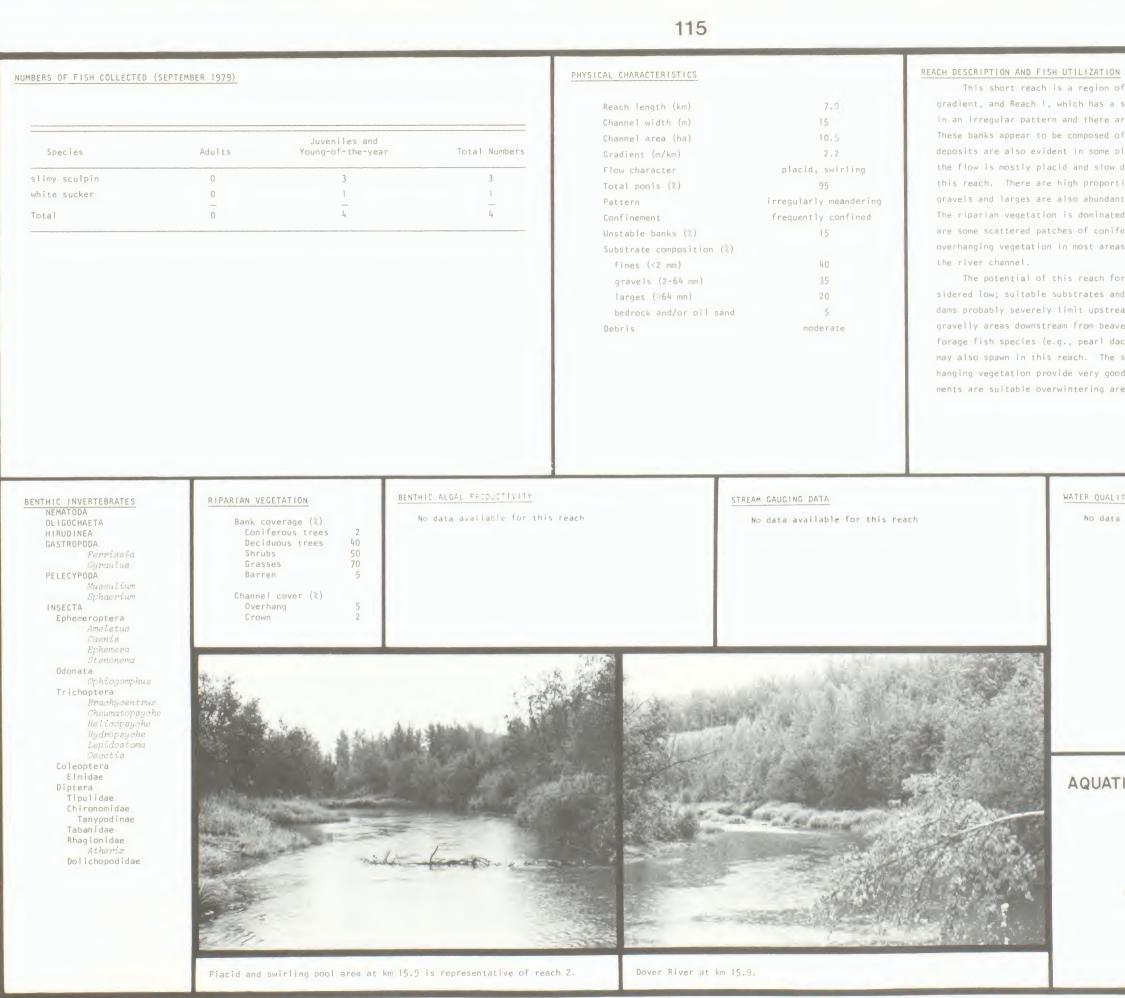
AQUATIC BIOPHYSICAL INVENTORY

DOVER RIVER

Reach | (km 0.0 to km 12.5)







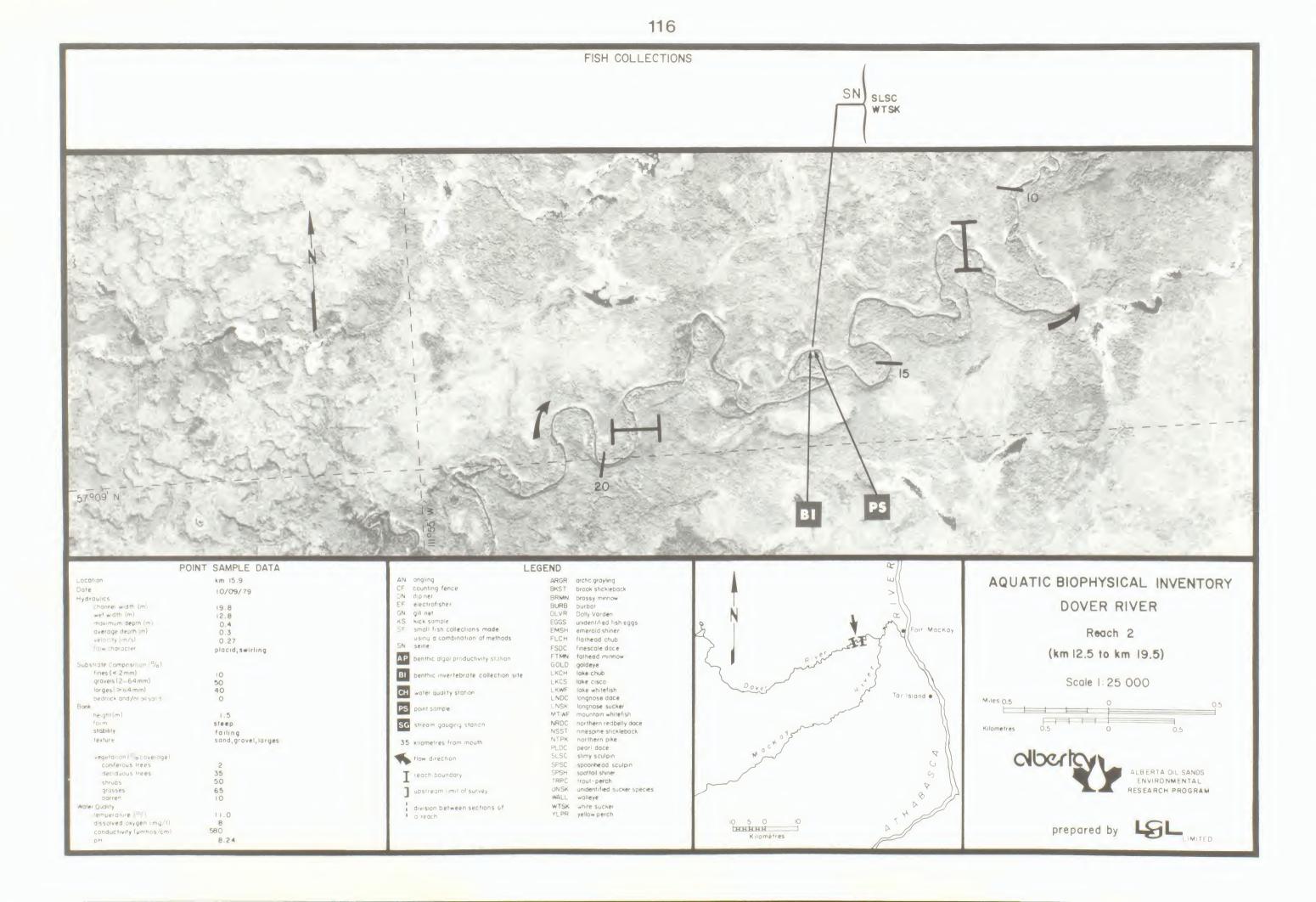
This short reach is a region of transition between Reach 3, which has a low gradient, and Reach 1, which has a steep gradient. The river channel meanders in an irregular pattern and there are a few areas with high, unstable banks. These banks appear to be composed of silt, sand and gravel. Exposed oil sands deposits are also evident in some places. Although the gradient is moderate, the flow is mostly placid and slow due to the large number of beaver dams in this reach. There are high proportions of silt and sand in the substrate, but gravels and larges are also abundant, particularly downstream from beaver dams. The riparian vegetation is dominated by deciduous trees and shrubs, but there are some scattered patches of conifers. Grasses are abundant and there is some overhanging vegetation in most areas. There is a moderate amount of debris in

The potential of this reach for spawning of the larger fish species is considered low; suitable substrates and riffle areas are not abundant, and the beaver dams probably severely limit upstream movement of the larger fish. The small gravelly areas downstream from beaver dams may be suitable for spawning of some forage fish species (e.g., pearl dace, trout-perch, slimy sculpin). Some suckers may also spawn in this reach. The shallow backwaters, abundant debris, and overhanging vegetation provide very good rearing habitat, and the deep beaver impoundments are suitable overwintering areas for forage fish and possibly suckers.

WATER QUALITY

No data available for this reach





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N W W

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A A A

				117		
NUMBERS OF FISH COLLECTED (SEP	TEMBER 1979)			PHYSICAL CHARACTERISTICS		REACH DESCRIPTION AND This section o
Species	Adults	Juveniles and Young-of-the-year	Total Numbers	Reach length (km) Channel width (m) Channel area (ha)	19.7 20 39.4	area of treed muske pools. Beaver dams silt with some orga
northern pike trout-perch white sucker Total		1 2 5 8	1 2 5 8	Gradient (m/km) Flow character Total pools (2) Pattern Confinement Unstable banks (4) Substrate composition (1) fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sand Debris	39.4 0.9 placid 100 irregularly meandering occasionally confined 5 95 5 0 0 0 moderate	strates immediately well vegetated. The dense growth of gra patches of conifers the river channel. result of beaver act Because the nu of larger fish and tential for most of many areas, however that will spawn ove spawning of suckers aquatic vegetation northern pike. The vegetation provide trout-perch and whi beaver dams provide
BENTHIC INVERTEBRATES NEMATODA OLIGOCHAETA GASTROPODA PELECYPODA CRUSTACEA Cladocera Darbonia sp. Amphipoda Hualalia astera INSECTA Ephemeroptera Ampiicas Bastic	Conif Decid Shrub Grass Barre	verage (%) erous trees 2 uous trees 30 s 60 es 90 n 0 cover (%) ang 5	BINTHID ALGAL PRESNETTIVITY No data avaliable for this		EAM GAUGING DATA No cata available for this re	ach
Linevie Ethomeno Africation for a formation Odonata A sina A sina						
	Beaver dan a	t km 31.5.		Pool upstream of beave	r dam at km 31.5.	

FISH UTILIZATION

of the Dover River meanders in an irregular pattern through an keg. The gradient is low and the reach is virtually all placid ms are very numerous. The substrate is almost entirely sand and ganic detritus, but there are some small areas with gravel subly downstream from beaver dams. The river banks are stable and he riparian vegetation is dominated by deciduous shrubs and a rasses. Deciduous trees are also numerous, but only scattered rs are present. In most areas, some grasses and shrubs overhang Debris in the river channel, most of which appears to be the activity, is moderate.

numerous beaver dams are certain to severely limit the movement because areas with gravel substrates are few, the spawning pof the larger fish species is considered to be poor. There are r, that appear to be suitable for spawning of those forage fish ver sandy substrates (e.g., pearl dace, trout-perch). Some rs may also occur in this reach and the moderate amounts of may provide some spawning areas for brook stickleback and ne numerous weedy shallows, abundant debris, and overhanging good rearing areas in this reach. Juvenile northern pike, ite sucker were collected here. The deep ponds formed behind e good overwintering areas.

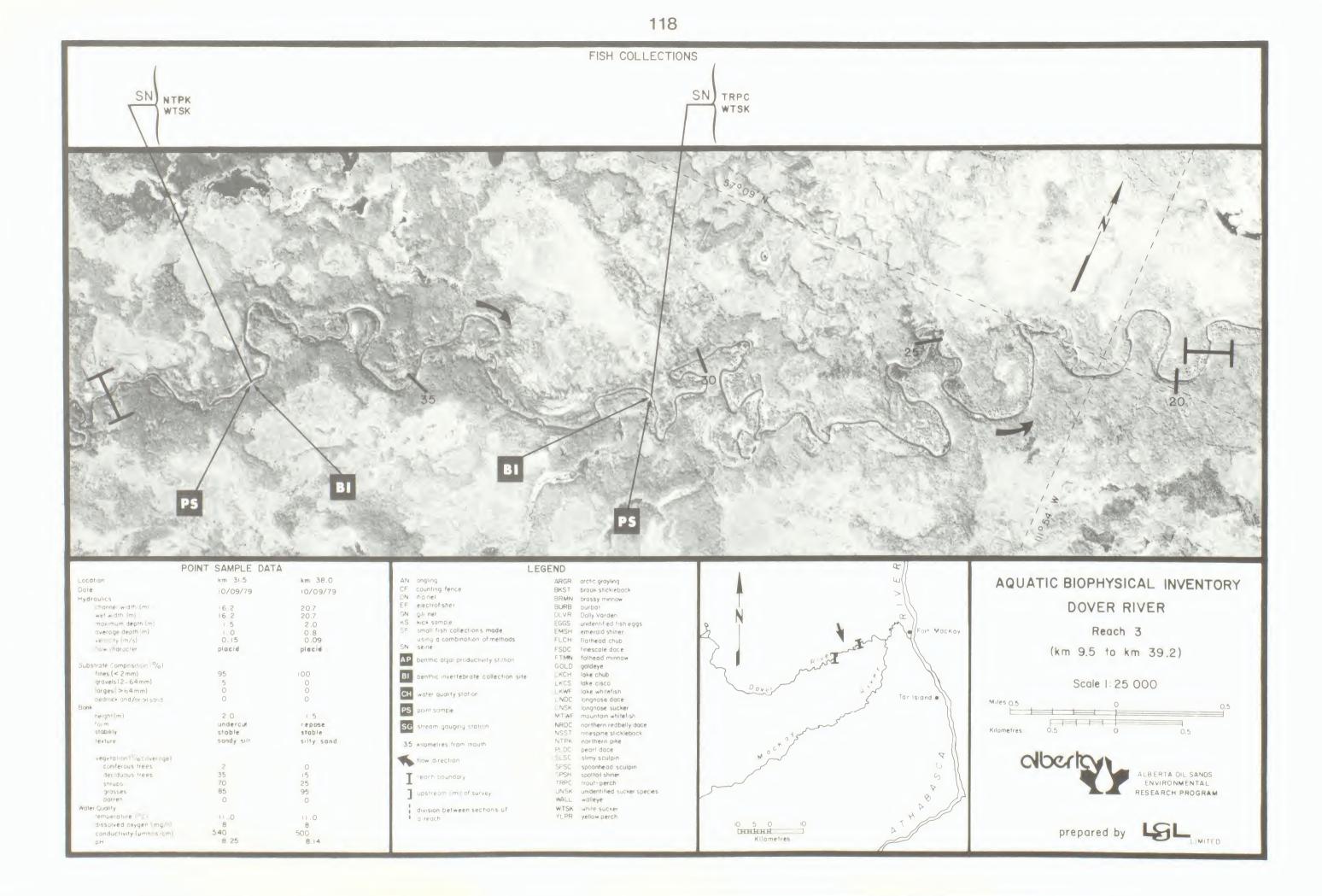
WATER QUALITY No data available for this reach

AQUATIC BIOPHYSICAL INVENTORY

DOVER RIVER

Reach 3 (km 19.5 to km 39.2)





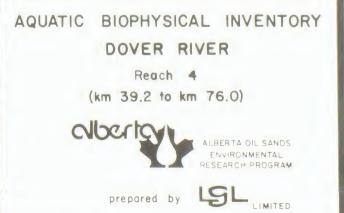
				119		
NUMBERS OF FISH COLLECTED (SEPTE	MBER 1979)			PHYSICAL CHARACTERISTICS		REACH DESCRIFTION AND FI
Spacias	Adults	Juveniles and Young-of-the-year	Total Numbers	Reach length (km) Channel width (m) Channel area (ha)	36=8 14 51.5	3, and the entire rea ous, although not as banks are undercut ar
Species pearl dace slimy sculpin white sucker Total	0 0 0 0 	1 3 1 5	1 1 3 1 	Gradient (m/km) Flow character Total pools (*) Pattern Confinement Unstable banks (%) Substrate composition (*) fines (<2 mm) gravels (2-54 mm) larges (>64 mm) bedrock and/or oil sand Debris	1.0 placid, swirling 100 tortuously meandering unconfined 5 60 40 0 0 high	and sand throughout m strates are fairly no and trees with scatte grasses. Shrubs and there are large amoun The areas with s spawning areas for se here (e.g., lake chul and white suckers hav species may also occu of aquatic vegetation The large amounts of abundant rearing area wintering of fish.
BENTHIC INVERTEBRATES OLIGOCHAETA GASTROPODA Formissia Avartika itamiata PELECYPODA fusculium	Conife Decidu Shrubs Grasse Barren	erage (%) rous trees 10 bus trees 50 65 s 90 0 cover (%) ng 10	BENTHIC ALGAL PRODUCTIVITY No data available for this		AM GAUGING DATA No data available for this r	each
Am Letus Gania Gania Erhemena Rihemereila Paralustophiehin Paramuleua Erhemene Plecoptera Tanpona Hemiptera Corixidae Megaloptera Nalie Trichoptera Arctopagaha Onestis Falgeentropus Diptera Chironomidae Chironominae Tabanidae			etation at km 47.5 are typical of	of reach 4. Dover River at km 63.		

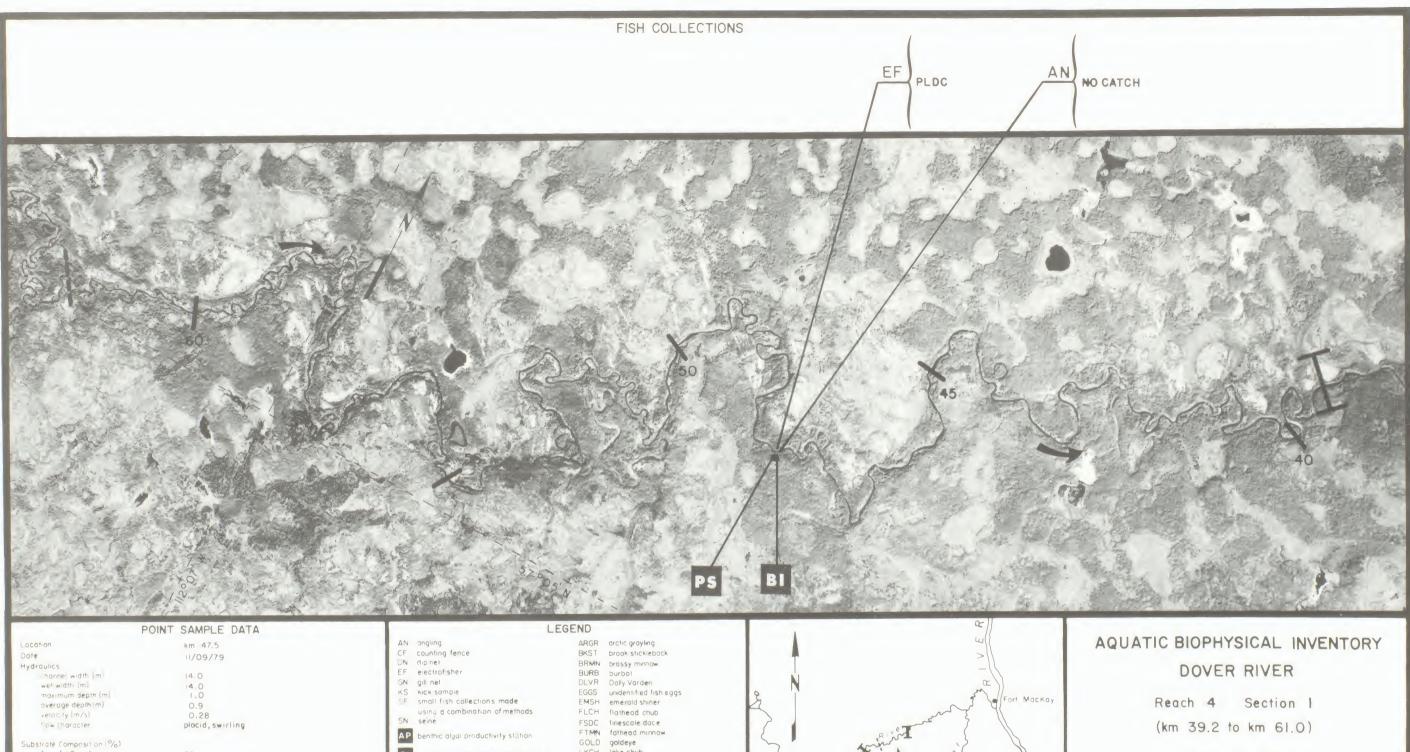
FISH UTILIZATION

ly meandering reach has a low gradient similar to that of Reach reach consists of slowly flowing pools. Beaver dams are numeras abundant as in Reach 3. The stream is fairly deep and the and stabilized by vegetation. The substrate consists of silt much of the reach, but areas with sand and fine gravel subnumerous. The riparian vegetation consists of deciduous shrubs ttered patches of conifers. There is also a dense growth of nd grasses overhang the river channel throughout the reach and ounts of debris in the channel.

sand and gravel substrates in this reach may provide suitable several of the forage fish species that have been collected hub, pearl dace, trout-perch, slimy sculpin). Longnose suckers have been collected in this reach and some spawning of these ccur in the reach. Several areas with low to moderate amounts ion are probably suitable for spawning of brook stickleback. of debris, undercut banks, and overhanging vegetation provide reas. The water depth is probably sufficient to allow over-

WATER QUALITY No data available for this reach





Substrate Composit on 1%) fines (< 2 mm) gravels (2-64 mm) 20 70 larges(>o4mm) bedrock and/or pil said Bonk height(m) form 2.5 undercut stability stable lexture sandy silt vegetation 1% coverage) coniferous trees dec duous trees 40 shrubs 15 grasses barren 95

10.01

410 8.05

8

Water Guality

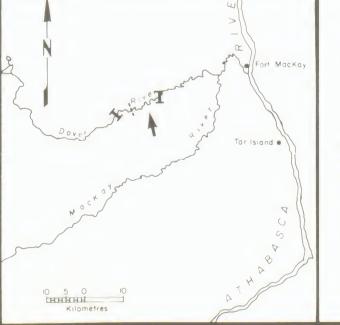
remperature Inc

dissolved oxygen (mg/l)

conductivity (umhos/cm)

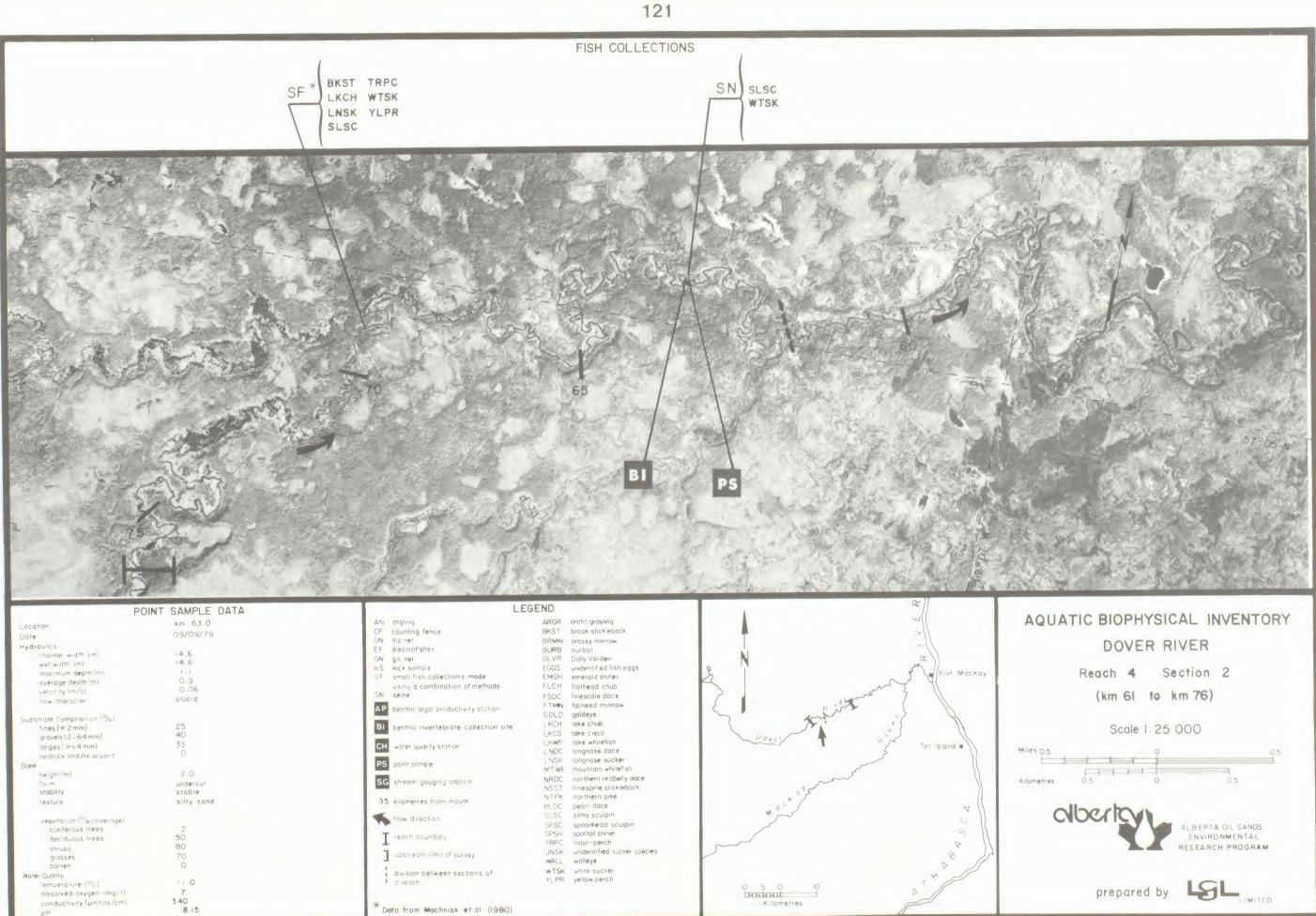
BI benthic invertebrate collection site CH water quality station PS point sample SG stream gauging station 35 kilometres from mouth flow direction T reach boundary Jupstream limit of survey division between sections of a reach

and i the	
ARGR	arctic grayling
BKST	brook stickleback
BRMN	brassy minnow
BURB	burbot
DLVR	Dolly Varden
EGGS	unidentified fish eggs
EMSH	emerald shiner
FLCH	flathead chub
FSDC	finescale dace
FTMN	fathead minnow
GOLD	goldeye
LKCH	lake chub
LKCS	lake cisco
LKWF	lake whitefish
LNDC	longnose dace
LNSK	longnose sucker
MTWF	mountain whitefish
NRDC	northern redbelly dace
NSST	ninespine stickleback
NTPK	northern pike
PLDC	pearl dace
5LSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch



Scale 1:25 000

Miles 0.5 0 Kilometres 0.5 alberta ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by



	km 63.0
Date	09/09/79
Hydraulics	
chonnel width (m)	14.6
wet width (m)	14.6
maximum depth (m)	1.1
average depth (m)	0.9
velocity (m/s)	0.06
flow character	placid
Substrate Composition %)	
fines (< 2mm)	25
gravels (2-64mm)	40
larges(>04mm)	35
bedrock and/or oil sand	0
Bank	
height(m)	2.0
form	undercut
stability	stable
fexture	silty sand
vegetation (% criverage)	
coniferous trees	2
deciduous trees	50
shrubs	80
grasses	70
parren	0
Water Quality	
'emperature	11.0
dissolved oxygen (mg/1)	7
conductivity (umhos/cm)	340
pH	8.15

-		
		LEGEN
٩N	angling	AR
CF	counting fence	BK
IN	dipinet	BR
F	electrof sher	BL
SN	gill net	DL
	kick sample	EG
F	small fish collections made	EN
	using a combination of methods	FL
SN	seine	FS
AP	benthic algal productivity station	FT
_		GC
BI	benthic invertebrate collection site	
_		LH
CH	water quality station	
		Lt
PS	point sample	M
-		NE
SG	stream gauging station	N
20		N
35	Kilometres from mouth	PL
<	tlow direction	SI
	now direction	SI
T	reach boundary	54
1		TI
1	upstream limit of survey	U
		W
1	division between sections of	W
1	a reach	Y
* -		
Do	ta from Machniak et al. (1980))
-		

N N N N N N N N N N N N N N N N N N N
Oover Tar Island
a your on some a
NO 5 0 10 HHHHHH Kilometres
Kilometres

Juveniles and Adults Young-of-the-yea		Reach length (km) Channel width (m)	56.5	This section of the area of muskeg. The gra
	r Total Numbers	Channel area (ha) Gradient (m/km) Flow character Total pools (2) Pattern Confinement Unstable banks (2) Substrate composition (2) fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sand Debris	7 39.6 1.6 placid, swirling 100 tortuously meandering occasionally confined 2 95 5 0 0 0 high	gradient in Reaches 3 a entirely pools. The ri The substrate is almost sand and gravel. Organ The riparian vegetation trees, and deciduous sh the river channel is co amounts of woody debris fallen into the water. This reach does no that occur in the Dover may be suitable for bro some of the sandy subst to the large amounts of tation. Water depths a
RIPARIAN VEGETATIONBank coverage (%)Coniferous treesDeciduous trees25Shrubs35Grasses85BarrenOverhang20Crown25	BENTHIC ALGAL PRODUCTIVITY No data available for th			reach
	Bank coverage (%) Coniferous trees 45 Deciduous trees 25 Shrubs 35 Grasses 85 Barren 0 Channel cover (%) Overhang 20 Crown 25	Bank coverage (%) Coniferous trees 45 Deciduous trees 25 Shrubs 35 Grasses 85 Barren 0 Channel cover (%) Overhang 20 Crown 25	RIPARIAN VEGETATION EXTINC ALCAL PRODUCTION Gravels (2-64 mm) larges (246 mm) lar	EIRANIAN VICE/ATION EISTING 10 and 10 before and/or oil seed 0 Bank coverage (3) EISTING 10 and 10 before and/or oil seed 0 Bank coverage (3) EISTING 10 and 10 before and/or oil seed 0 Bank coverage (3) EISTING 10 and 10 before and/or oil seed 0 Bank coverage (3) EISTING 10 and 10 before and/or oil seed 0 Bank coverage (3) EISTING 10 before and/or oil seed 0 Bank coverage (3) EISTING 10 before and/or oil seed 0 Bank coverage (3) EISTING 10 before and/or oil seed 0 Bank coverage (3) EISTING 10 before and/or oil seed 0 Bank coverage (3) EISTING 10 before and/or oil seed 0 Bank coverage (3) EISTING 10 before and/or oil seed 0 Chaseel cover (8) 20 EISTING 10 before and/or oil seed 0 Crown 200 EISTING 200 EISTING 10 before and/or oil seed 0 Storeword per land overhamping bank vegetation at the 86 are representation Eageging eighting at use 86 is type ad this reach.

FISH UTILIZATION

of the Dover River meanders in a tortuous pattern through an The gradient is fairly low, but somewhat steeper than the es 3 and 4. Beaver dams are fairly numerous and the reach is The river banks are undercut, but are stabilized by vegetation. almost entirely silt and sand, with only a few small areas of Organic detritus is also abundant in the substrate material. tation consists of a mixture of deciduous trees, coniferous ous shrubs. There is also a dense growth of grasses. Much of is covered by overhanging shrubs and trees. There are large debris in the channel and many places where dead trees have

oes not contain areas suitable for spawning of most fish species Dover River. There are some areas with aquatic vegetation that or brook stickleback spawning. Pearl dace may also spawn over substrates in this reach. The rearing potential is good due nts of debris, undercut banks, and abundant overhanging vegepths are probably sufficient for overwintering of fish.

WATER QUALITY No data available for this reach

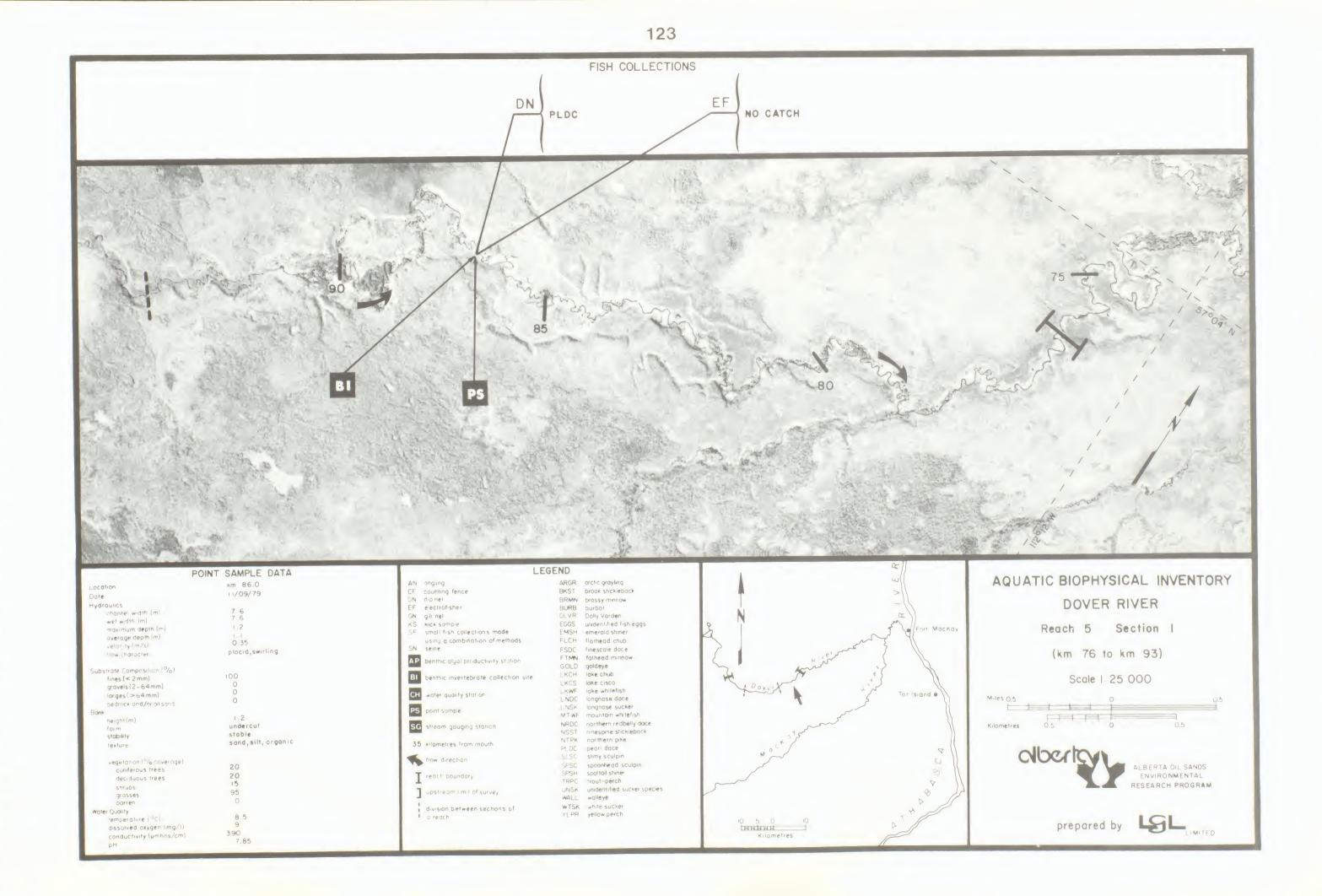
AQUATIC BIOPHYSICAL INVENTORY

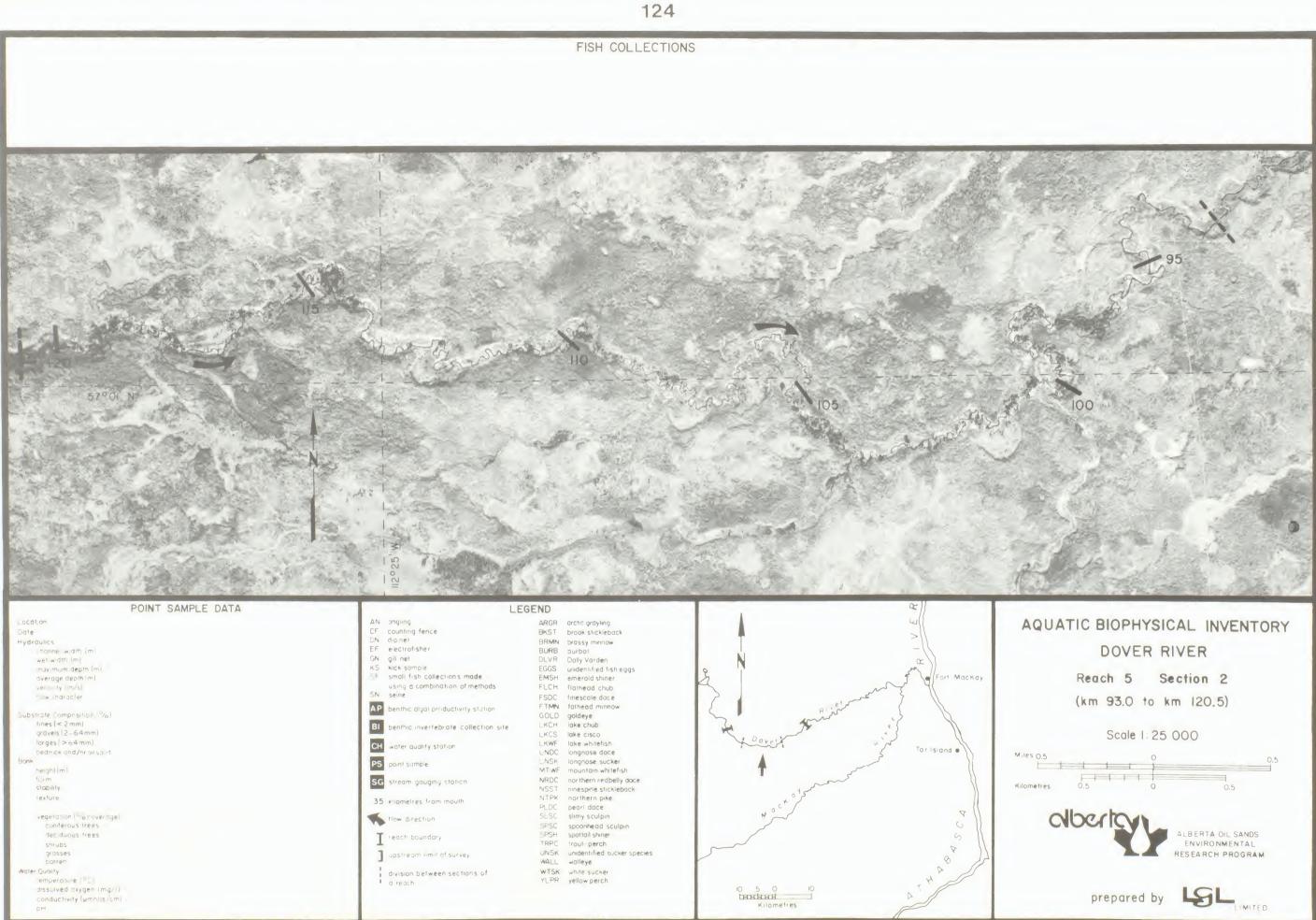
DOVER RIVER Reach 5

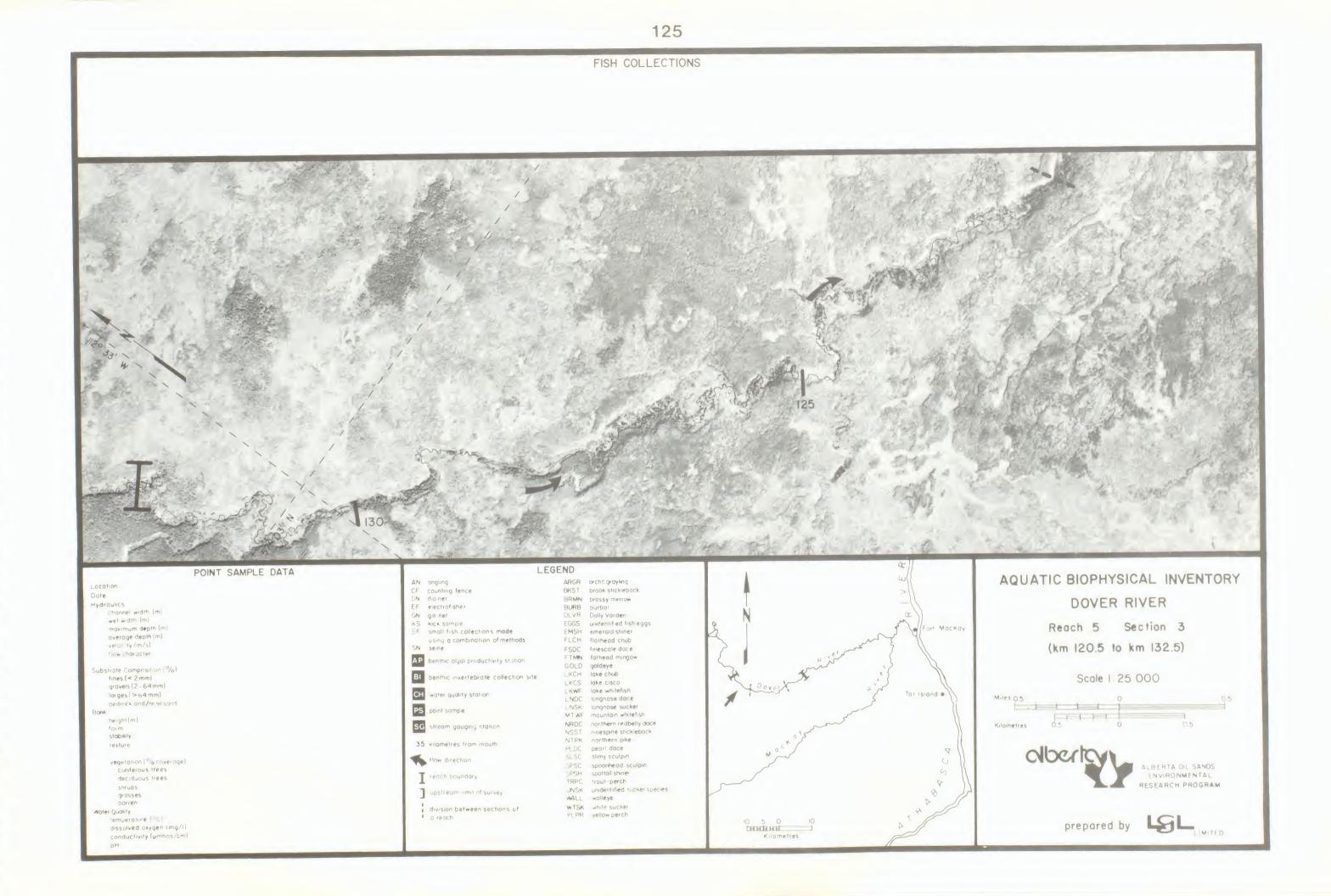
(km 76.0 to km 132.5)











TEMBER 979)			MYSICAL CHARACTERISTICS		REACH DESCRIPTION AND FISH This reach is a lon
Adults 9 9 9	Juveniles and Young-of-the-year 7 7 7	Total Numbers	fines (≈2 mm) gravels (2-∯4 mm) larges (≥64 mm)	95 5 0	and the stream flow is v reach. The substrate co tus, but there are a few tation is primarily grass deciduous and coniferous vegetation and moderate The abundant aquati tial for brook stickleba were collected from this sidered poor, but some f successfully in this rea cover is provided by log ably sufficient to allow
Bank co Coni Deci Shrut Grass Barre Channe Overt	overage (*) ferous trees 10 duous trees 10 bs 80 ses 90 en 0 1 cover (*) hang 15		s reach	STREAM GAUGING DATA No data available for this	reach
	Adults 9 9 9 9 9 9 9	Adults Juveniles and Young-of-the-year 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7	Adults Juveniles and Young-of-the-year Total Numbers 9 7 16 9 7 16 9 7 16 9 7 16 9 7 16 9 7 16 9 7 16	Adults Juveniles and Young-of-the-year Total Numbers 9 7 16 9 7 16 9 7 16 9 7 16 10 Channel width (m) Channel width (m) Station (m/km) Flow character Total pools (m) Substrate composition (m) Fines (-2 m) grasses (2-64 m) Bedrock and/or oil sand Debris Strobs 10 Strobs 80 Grasses 90 Barren 0 Barren 0 Channel cover (k) Overhang 15 15	Adults Juveniles and Young-of-the-year Total Numbers 9 7 16 9 7 16 9 7 16 9 7 16 9 7 16 9 7 16 9 7 16 9 7 16 9 7 16 9 7 16 10 0 9 7 16 10 0 11 0 12 0 13 0 14 0 15 0 14 0 15 0 15 0 16 0 16 0 17 0 18 0 19 0 19 0 19 0 19 0 19 0 19 0 19 0 19 0 19 0 19 0 19 0 19 0 19 0 19

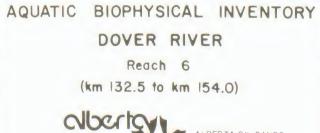
UTILIZATION

ng marshy section in a muskeg region. The gradient is low very slow. Many beaver dams are present throughout this onsists almost entirely of sand, silt, and organic detriareas with fine gravel substrates. The riparian vegesses and deciduous shrubs, but there are also some trees. There is a relatively large amount of overhanging amounts of debris in the river channel.

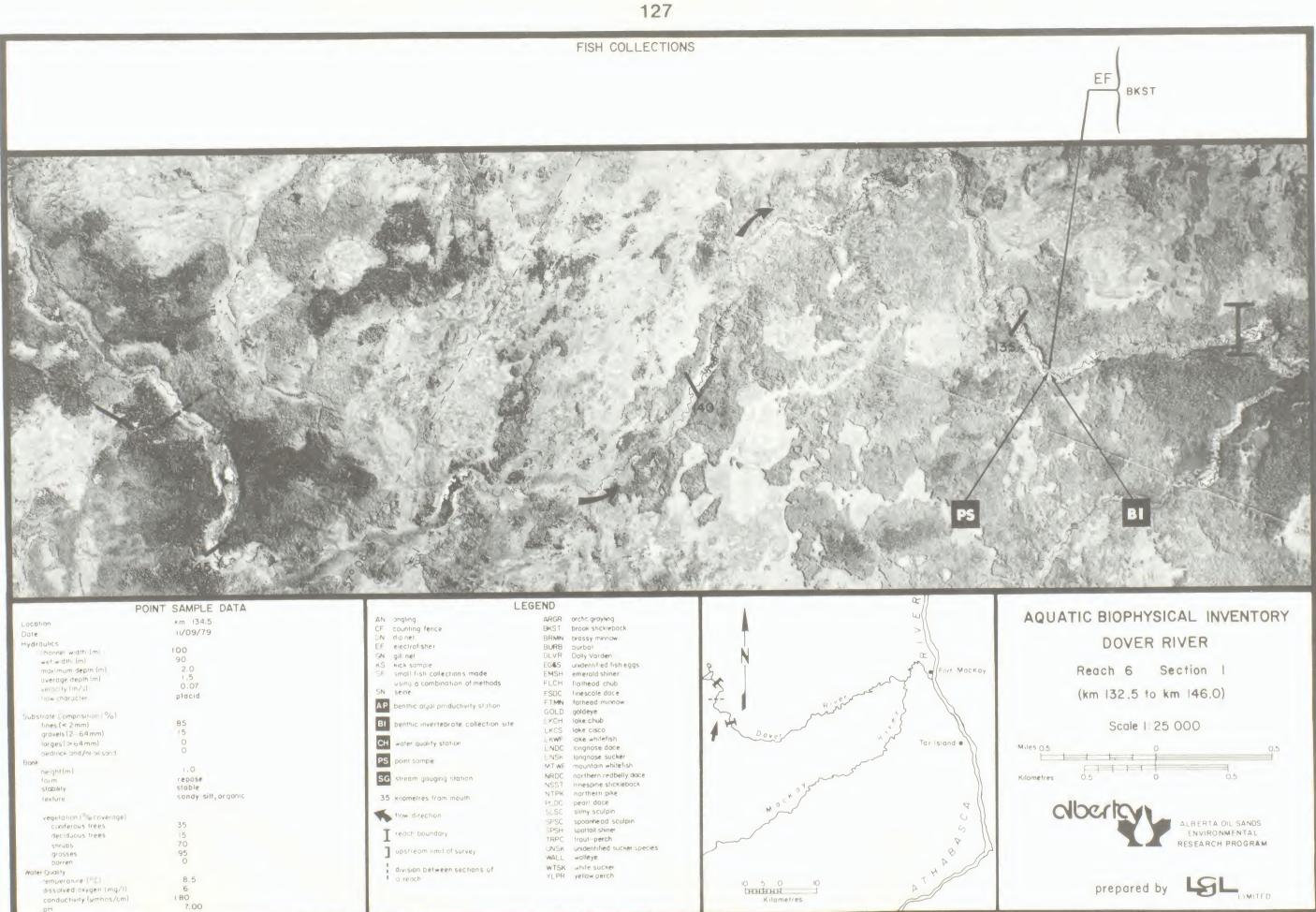
ic vegetation in this reach provides good spawning potenack and possibly northern pike (only brook stickleback reach). Spawning potential for other species is conforage species (e.g., pearl dace) may be able to spawn ach. Rearing potential is considered good because ample debris and aquatic vegetation. Water depths are proboverwintering of fish.

WATER QUALITY

No data available for this reach

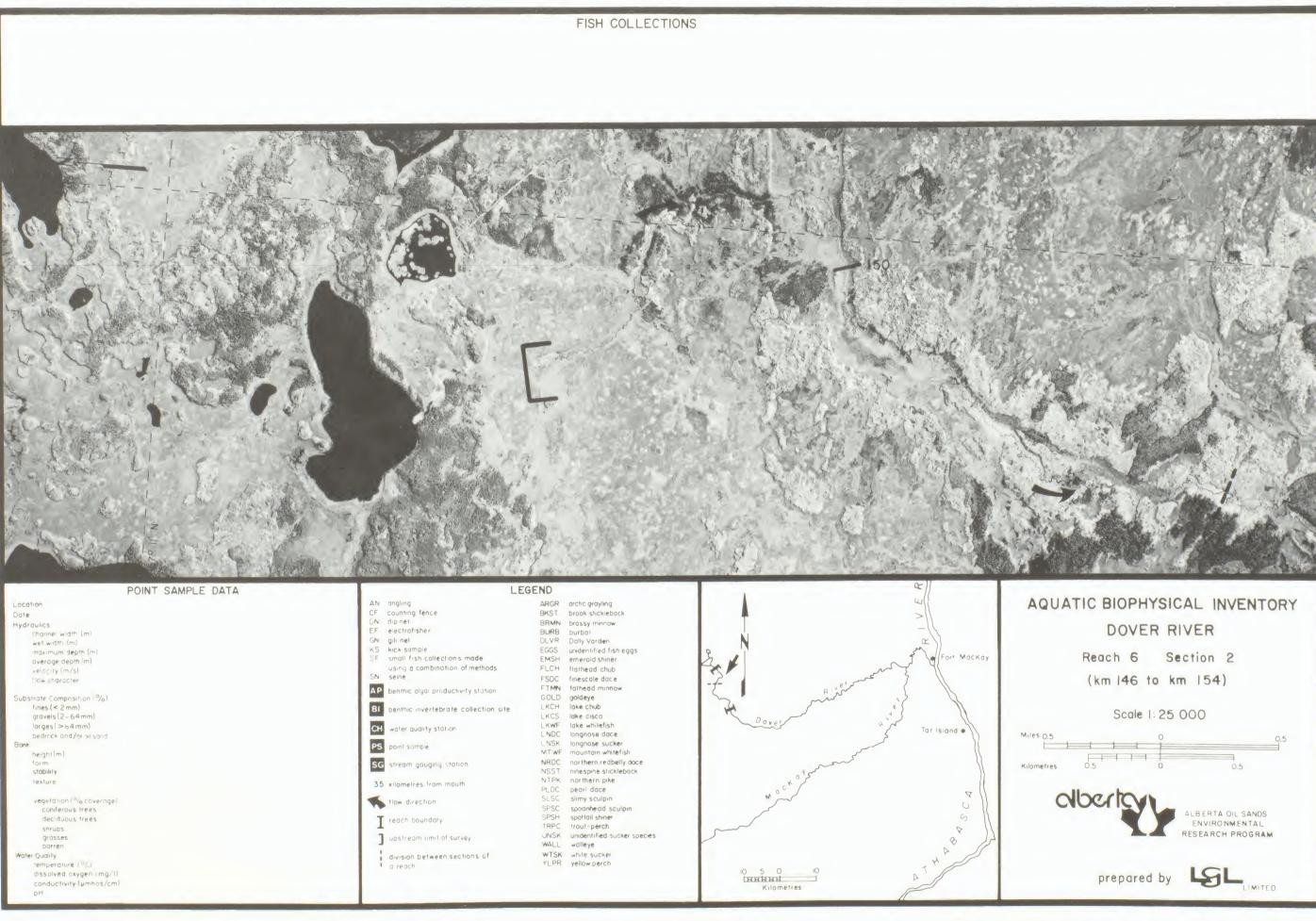


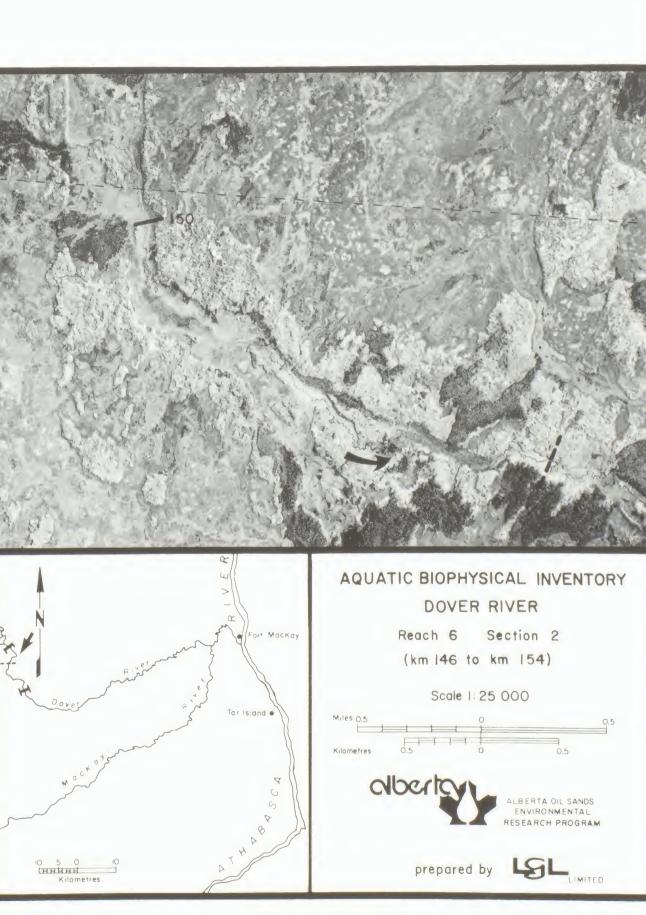




Location	⊭m 134.5
Date	11/09/79
Hydraulics	100
_hannel width (m)	90
wet width (m)	2.0
max mum depth (m)	1.5
overage depth m)	0.07
velocity (m/s)	placid
tiow character	procid
Substrate Composition %)	
fines (< 2mm)	85
gravels (2-64 mm)	15
lorges (>64mm)	0
pedrock and/or oil sarid	0
Bank	
height(m)	1.0
form	repose
stability	stable
lexture	sandy silt, organic
vegetation (% coverage)	
coniferous trees	35
deciduous trees	15
Shrubs	70
grasses	95
barren	0
Water Quality	
emperature 1961	8.5
dissolved oxygen (mg/l)	6
conductivity (umhos/cm)	180
pH	7.00

River Mackay
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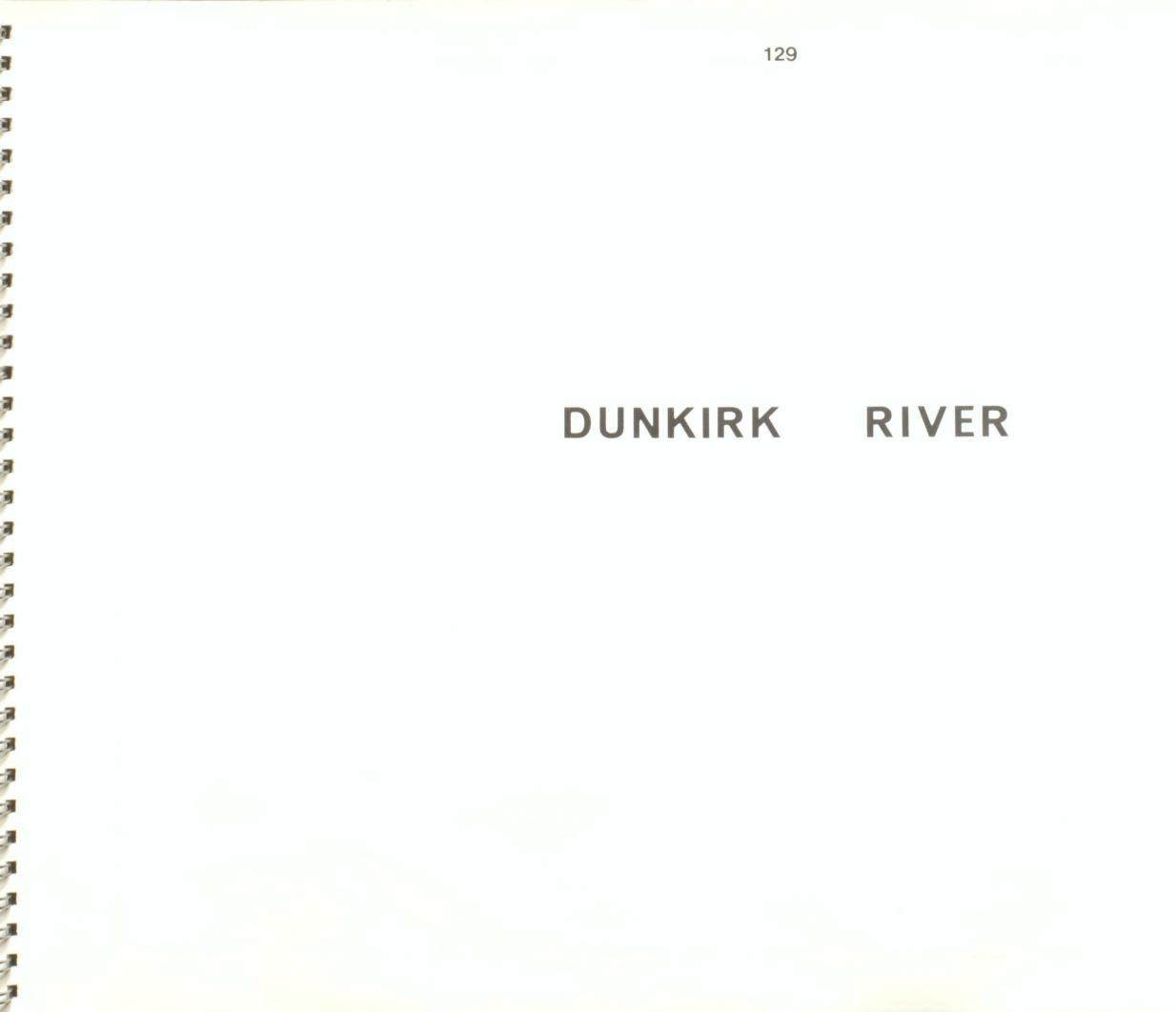


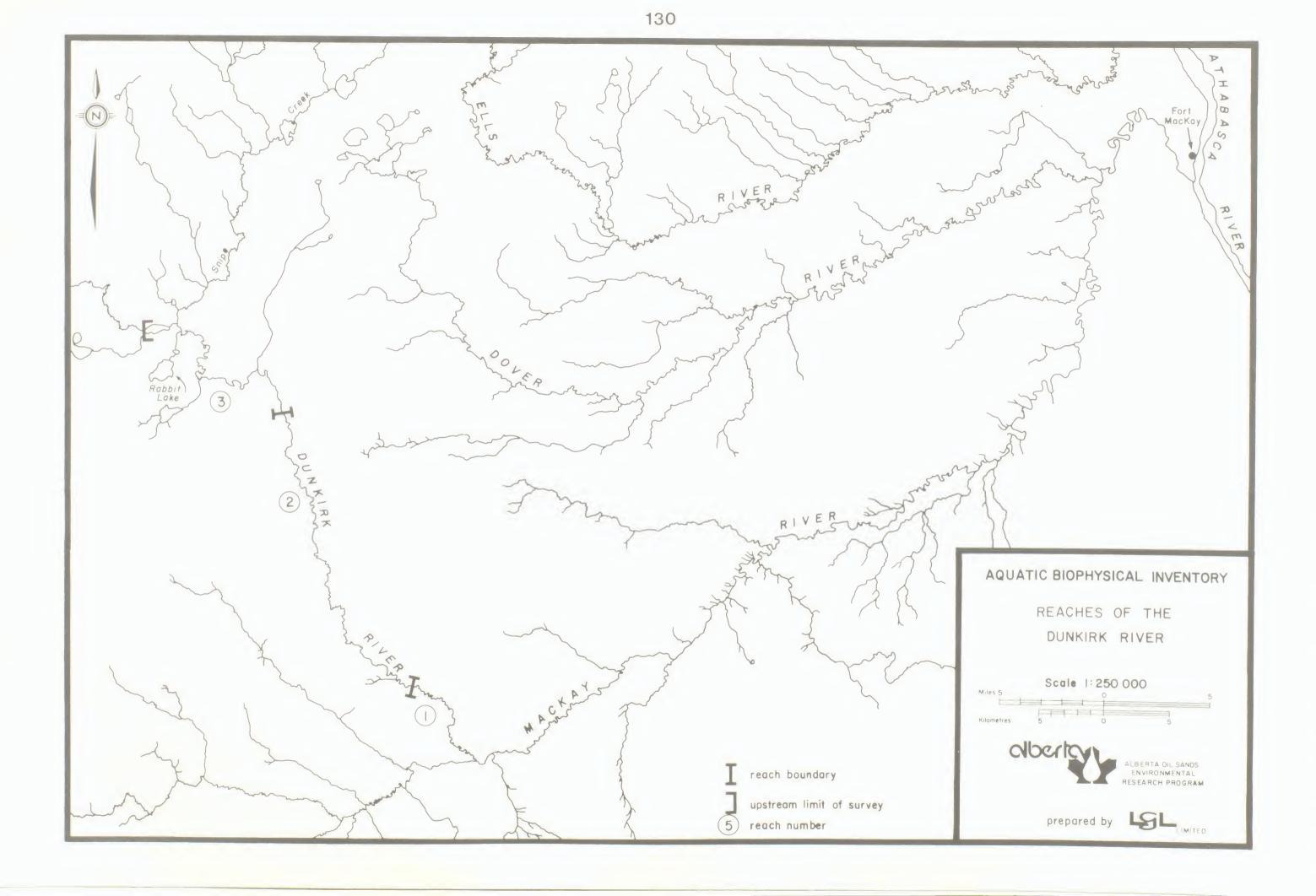
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				131		
NUMBERS OF FISH COLLECTED (SEPTE	MBER 1979)			PHYSICAL CHARACTERISTICS Reach length (km)	16.5	REACH DESCRIPTION AND FISH UTI This lower reach of th flows through an area of tr reach is a placid pool area
Species	Adults	Juveniles and Young-of-the-year	Total Numbers	Channel width (m) Channel area (ha) Gradient (m/km)	17 28.1 0.4	fairly high content of orga the riparian vegetation, bu
brook stickleback northern pike pearl dace trout-perch white sucker Total	3 0 4 0 7	0 1 11 6 11 29	3 1 11 10 11 36	Flow character Total pools (.) Pattern Confinement Unstable banks (5) Substrate composition (2) fines (2 mm) gravels (2-64 mm) larges (64 mm) bedrock and/or oil sand Debris	placid 100 tortucusly meandering unconfined 0 100 0 0 0 bigh	also a very dense growth of channel throughout most of and there are many location Aquatic vegetation is spawning habitat for northe for other species is poor, substrates ay spawn succes velocities, and the ample s an excellent rearing habitat forage species. The presen is also suitable for rearin ficient to allow overwinter
BENTH) INVERTEBRATES NEMATODA OLIGOCHAETA HIRUDINEA Glassiphoniidae GASTROPODA T PELECYPODA CRUSTACEA Anphipoda	Conif Decid Shrub Grass Barre Channe 1 Overh Crown	verage (1) erous trees 25 jous trees 45 s 50 es 95 n 0 cover (2) ang 5	SENTHIC ALGAL PRODUCTIVITY No data available for t		REAM GAUGING DATA No data available far this	reach
INSECTA Epheneroptera distante anti-tante original Orionati Aeshri dae distante original Aeshri dae	(an interest	LA				
Plecoptera in name Hemintera Corridae Gerridae Trichoptera Avgrovia Paston name Coloutera Dytiscidae Noteridae Bintera Tipulidae Chironomiae Chironomiae Chironomiae Chironomiae		1				A
Tabanidae Incididae	Placid pro)	conditions, typical of	this reach, at km 4.5.	Slumping. Andecout Ba	nk at km 14.7.	

JTILIZATION

the Dunkirk River is a tortuously meandering section that treed uskeg. The gradient is very low and the entire ea. The substrate consists of sand and silt with a rganic detritus. Deciduous shrubs and trees dominate but conifers are also abundant in some areas. There is of grasses. Shrubs and grasses overhang the river of the reach. Debris in the river channel is abundant ions where trees have fallen into or across the river. is fairly abundant in this reach and provides very good hern pike and brook stickleback. The spawning potential , but some forage fish species that will spawn over sandy cessfully at some locations in this reach. Low water shelter provided by debris and aquatic vegetation create itat for northern pike, brook stickleback, and other sence of juvenile white suckers indicates that the area ring of that species. Water depths appear to be suftering of fish in at least the lower portion of the reach.

ATER DUALITY

No data available for this reach

AQUATIC BIOPHYSICAL INVENTORY

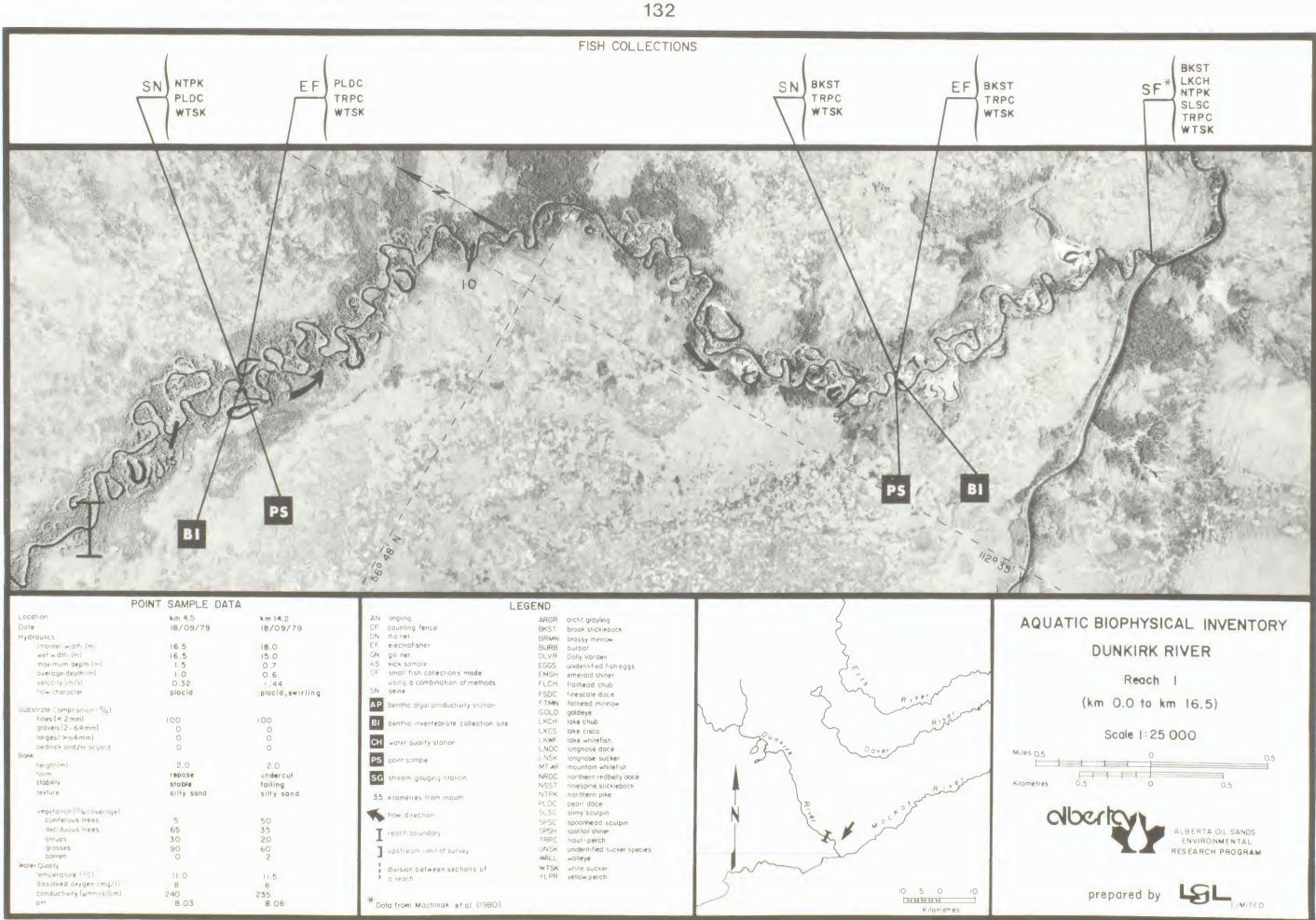
DUNKIRK RIVER

Reach I (km O to km 16)





prepared by LIMITED



				133		
NUMBERS OF FISH COLLECTED (SE	PTEMBER 1979)			PHYSICAL CHARACTERISTICS Reach length (km) Channel width (m)	39.7 22	REACH DESCRIPTION AND FI This irregularly steeper gradient than with placid and swirl
Species brook stickleback longnose sucker northern pike pearl dace slimy sculpin trout-perch white sucker Total	Adults 2 0 0 12 3 4 0 21	Juveniles and Young-of-the-year 0 1 3 40 0 3 2 49	Total Numbers 2 1 3 52 3 7 2 70	Channel area (ha) Gradient (m/km) Flow character Total pools (%) Pattern Confinement Unstable banks (%) Substrate composition (%) fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sand Debris	87.3 0.9 placid, swirling, rolling 90 irregularly meandering occasionally confined 5 50 30 20 0 high	fairly numerous in th gravel with some cobb substrate is composed portion of the reach. The riparian vegetation deciduous shrubs. Th shrubs and grasses ov woody debris in the c The gravel and so appear to be suitable sucker, slimy sculpin tential of this reach cities and abundant s The pools in this rea able for overwinterin
BENTHIC INVERTEBRATES OLIGOCHAETA HIRUDINEA GASTROPODA Farmiasia Valuata PELECYPODA Micasufium ARACHNIDA Hydracarina INSECTA Ephemeroptera Amintuca Haribacad	Con Dec Shr Gra Bar Chann	coverage (冬) iferous trees 45 iduous trees 45 ubs 35 sses 80 ren 0 el cover (%) rhang 5	NTHIC ALGAL PRODUCTIVITY No data available for this	reach	REAM GAUGING DATA Water Survey of Canada station nu Maximum total annual discharge: Minimum annual mean discharge: Maximum annual mean discharge: Minimum monthly mean discharge: Minimum monthly mean discharge: Maximum daily discharge: Minimum daily discharge: ta for 1975 to 1978 compiled fror Warner and Spitzer (1979) and War	182.6 x 10 m (1978) 70.8 x 10 m ³ (1977) 5.78 m ³ /s (1978) 2.25 m ³ /s (1977) 23.11 m ³ /s (September 1978) 0.03 m ³ /s (January 1976) 33.70 m ³ /s (Sept. 18, 1978) 0.02 m ³ /s (Feb. 28, 1978) m Loeppky and Spitzer (1977),
Frihamera Franker typicelid Stranker typicelid Odonata Plecoptera Diarr Insycrum Insycrum Instructur Instructu					and the second se	

FISH UTILIZATION

ly meandering section of the Dunkirk River has a slightly an Reach 1. Although most of the reach consists of pools rling flow, there are some riffle areas. Beaver dams are this reach. The substrate consists mainly of sand and bbles and boulders. Towards the upper end of the reach, the ed of more silt and sand and less gravel than in the lower . The river banks are generally stable and well vegetated. ion is a mixture of coniferous trees, deciduous trees, and There is also a dense growth of grasses. Moderate amounts of overhang the river channel and there are large amounts of channel.

sand substrates present in this reach provide areas that le for spawning of arctic grayling, longnose sucker, white in, lake chub, trout-perch, and pearl dace. The rearing poch is very good, due to the many areas with low water veloshelter (provided by debris and some aquatic vegetation). each are moderately deep and many of them are probably suiting of fish.

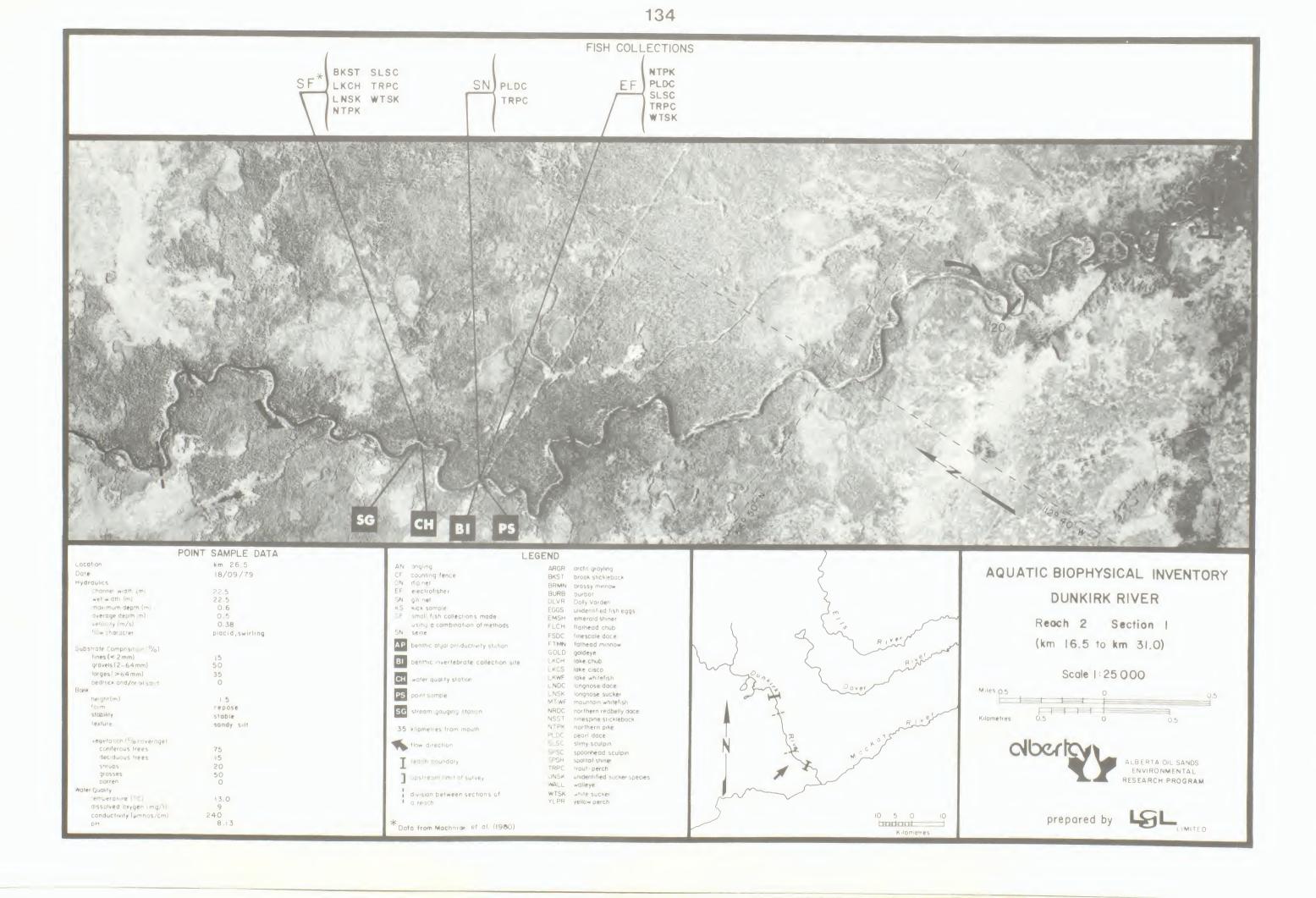
Т	Ε	R	QU	A	E.	L	Т	Y	
		_		_					

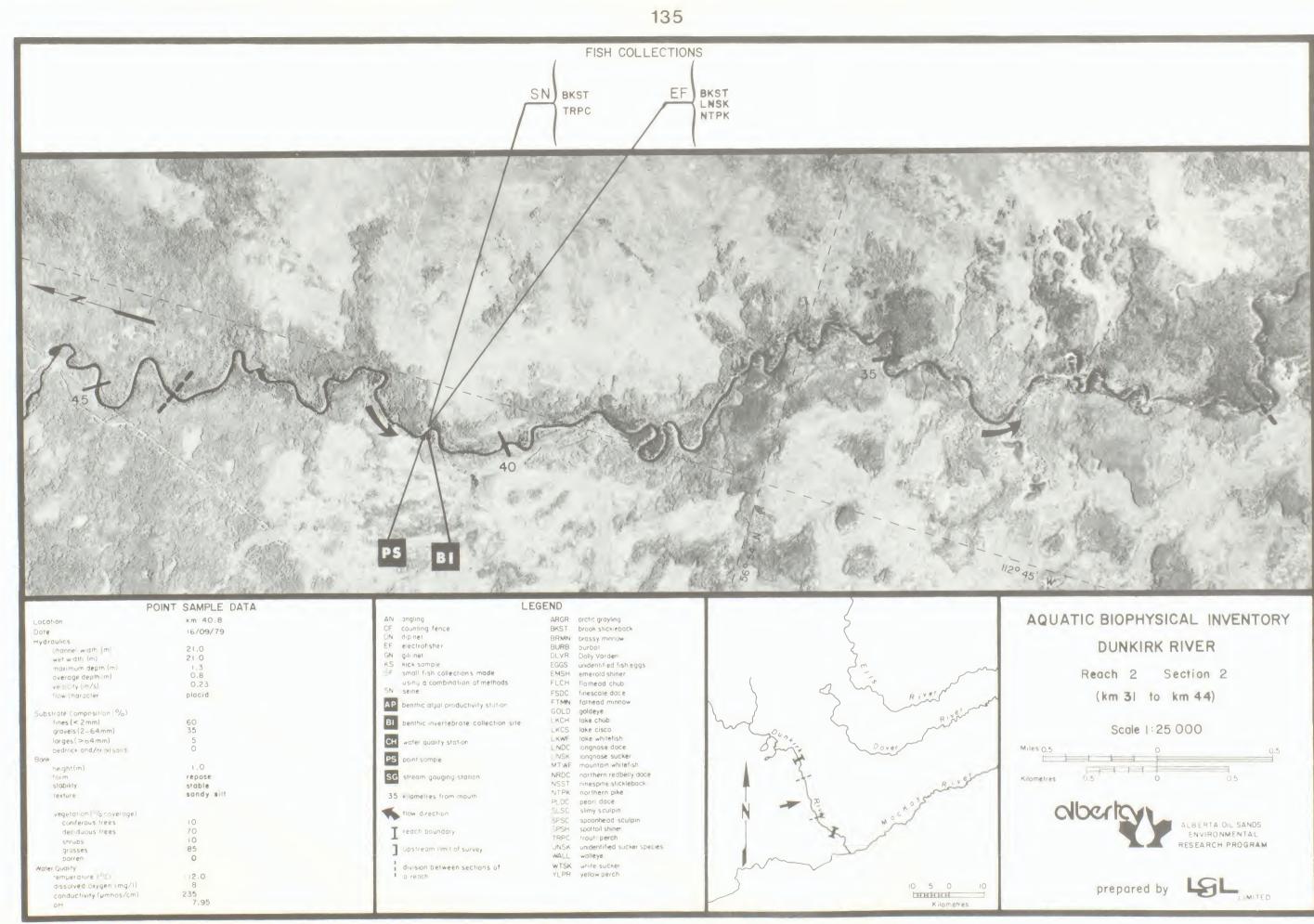
Water Survey of Canada station number 00AT07DB0030

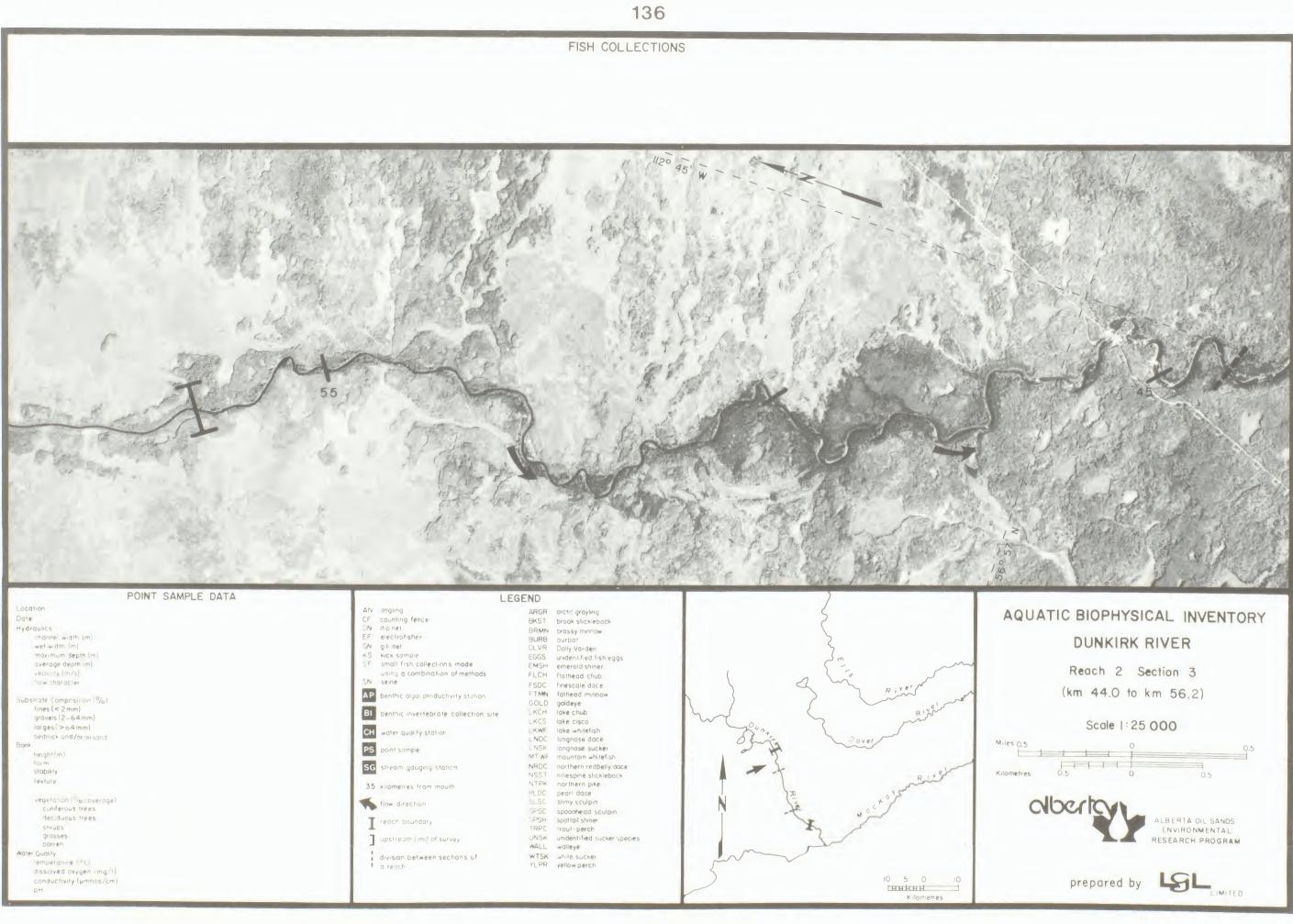
	Mean	Maximum	Minimum
otal alkalinity (mg CaCO₃/l) H	144.0	273.0	39.5
otal hardness (mg CaCO ₃ /1)	156.0	267.1	47.2
onductance (IS/cm)	313	595	83
otal filterable			
residue fixed (mg/l)	150	348	49
tal non-filterable			
residue fixed (mg/1)	12	105	= 0.4
otal organic carbon (mg C/l)	29.0	44.0	17.0
lica (mg SiO /1)	8.0	14.5	1.5
trate and nitrite nitrogen (mg N/l)	0.130	0.470	< 0.003
otal Kjeldahl nitrogen (mg N/l)	1.37	2.41	0.58
tal Phosphorus (mg P/l)	0.130	0.500	0.046
thophosphate (mg P/1)	0.040	0.180	0.008
lphate (mg S0,/1)	31.0	159.0	9.2

Data for the period January 1976 to December 1979 obtained from the National Water Quality Data Bank (NAQUADAT).

AQUATIC BIOPHYSICAL INVENTORY DUNKIRK RIVER Reach 2 (km 16.0 to km 56.2) abertan ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by LIMITED







POINT SAMPLE DATA	LE	EGEND	
Date Hydraulics well width (m) maximum depth (m) well width (m) graveis (2 - 64 mm) bark height (m) form stability texture vegetation (⁶ /occoverage) conferous trees deciduus trees shrubs grasses Darren Water Quality mergence	 AN angling CF counting fence DN dip net EF electrofisher GN gill net KS kick sample SF small fish collections made using a combination of methods SN seine AP benthic algal productivity station BI benthic invertebrate collection site CH water quality station PS point sample SG stream gauging station 35 kilometres from mouth M direction I reach boundary I upstream limit of survey division between sections of 	ARGR archic grayling BKST brook stickleback BRMN brassy minnow BURB burbot DUVD Dolly Varden EGGS unidentified fish eggs EMSH emerold shiner FLCH flathead chub FSDC finescale dace FTMN fathead minnow GOLD goldeye LKCH lake whitefish LNCS lake whitefish LNCC longnose dace UNSK longnose sucker MT WF mountain whitefish NROC northern redbelly dace NSST ninespine slickleback NTPK northern pike PLDC peori dace SLSC spottal shiner TRPC troul-perch UNSK <ur> unidentified sucker species WALL walleye</ur>	Piver Pi
dissolved oxygen (mg/l) conductivity (ymhos/cm) pH	I a reach		10 5 0 1 HHHHH Kilometres

NUMBERS OF FISH COLLECTED (SEPT	EMBER 1979		<u> </u>	HYSICAL CHARACTERISTICS		REACH DESCRIPTION AND FISH This uppermost read
Species	Adults	Juveniles and Young-of-the-year	Total Numbers	Reach length (km) Channel width (m) Channel area (ha) Gradient (m/km)	27.8 13 36.1 0.2	in an irregular pattern low, the stream channel entirely silt with a hig dant. The riparian vege
arctic grayling brook stickleback northern pike pearl dace Total	1 2 0 	0 0 2 7 9	1 2 7 12	Flow character Total pools (2) Pattern Confinement Unstable banks (2) Substrate composition (3) fines (2 mm) gravels (2-64 mm) larges (64 mm) bedrock and/or oil sand Debris	placid 100 Trregularly meandering unconfined 2 100 0 0	but patches of coniferou of shrubs and grasses ov amounts of debris are pu The abundant aquati for spawning of northerr to be suitable for spawn because of the low water and the ample shelter pu depths in this reach app
NTHIC INVERTEBRATES OLIGOCHAETA HIRUDINEA Glossiphoniidae GASTROPODA PELECYPODA CRUSTACEA Cladocera		erage ()) rous trees 15 bus trees 40 15 s 95 0 cover ())	BENTHIC ALGAL PRODUCTIVITY No data available for this rea		STREAM GAUGING DATA No data available for this re	each
Amphipoda University and second second Hyperbolic record INSECTA	48 Crown					

SH UTILIZATION

each of the surveyed portion of the Dunkirk River meanders rn through a marshy uskeg region. The gradient is very el is deep, and the water flow is slow. The substrate is high organic detritus content. Aquatic vegetation is abunegetation consists primarily of deciduous trees and shrubs, rous trees are also fairly numerous. Fairly large amounts overhang the river channel throughout the reach. Moderate present in the channel.

atic vegetation in this reach provides many areas suitable ern pike and brook stickleback. The reach does not appear awning of other fish species. Rearing potential is good ter velocities, the shade provided by overhanging vegetation, provided by woody debris and aquatic vegetation. Water appear to be sufficient to allow overwintering of fish.

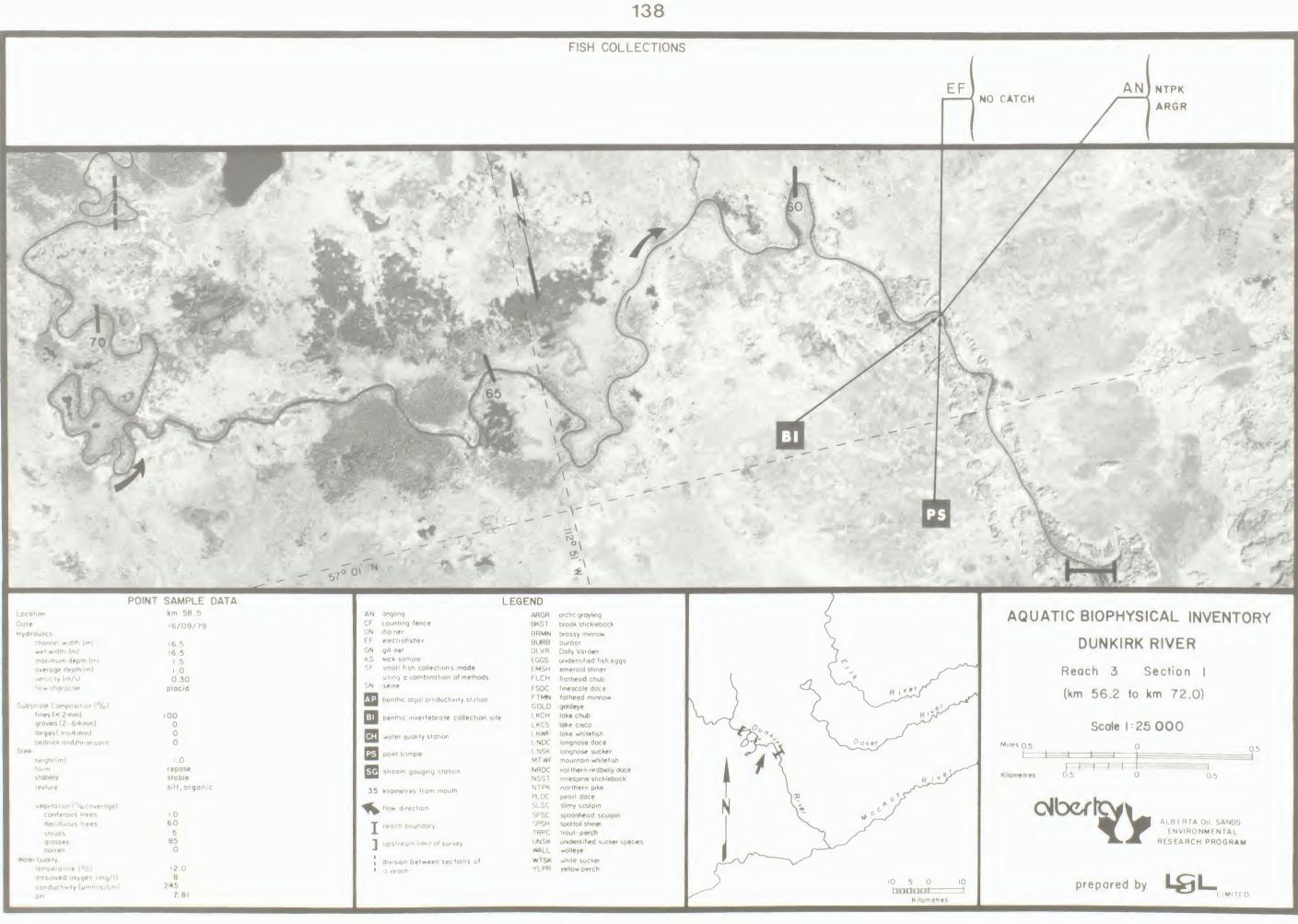
HATER QUALITY

N_ data available for this reach

AQUATIC BIOPHYSICAL INVENTORY DUNKIRK RIVER

Reach 3 (km 56.2 to km 84.0)

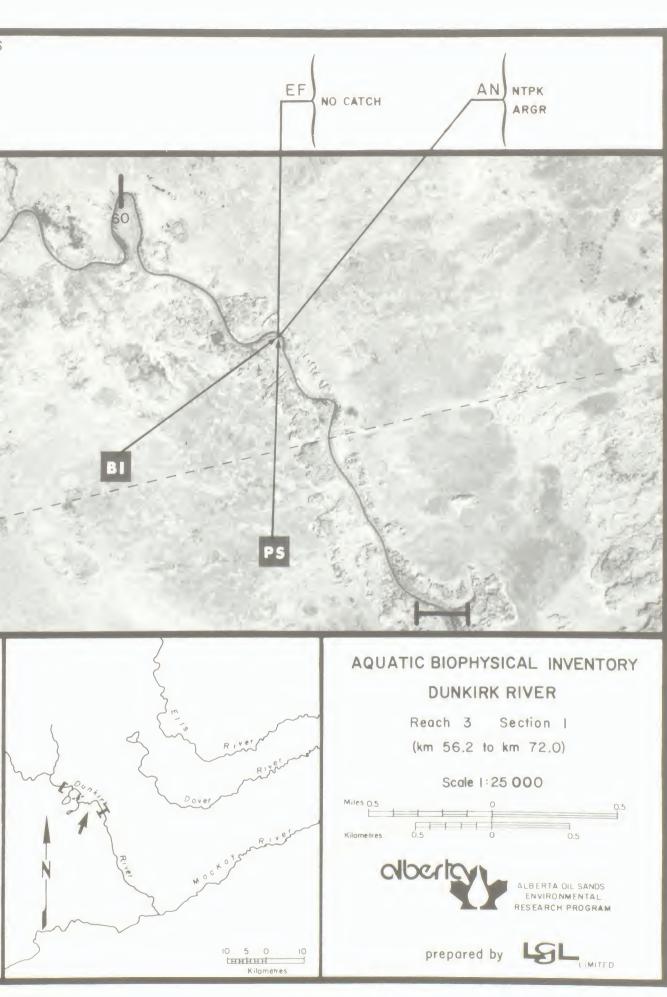


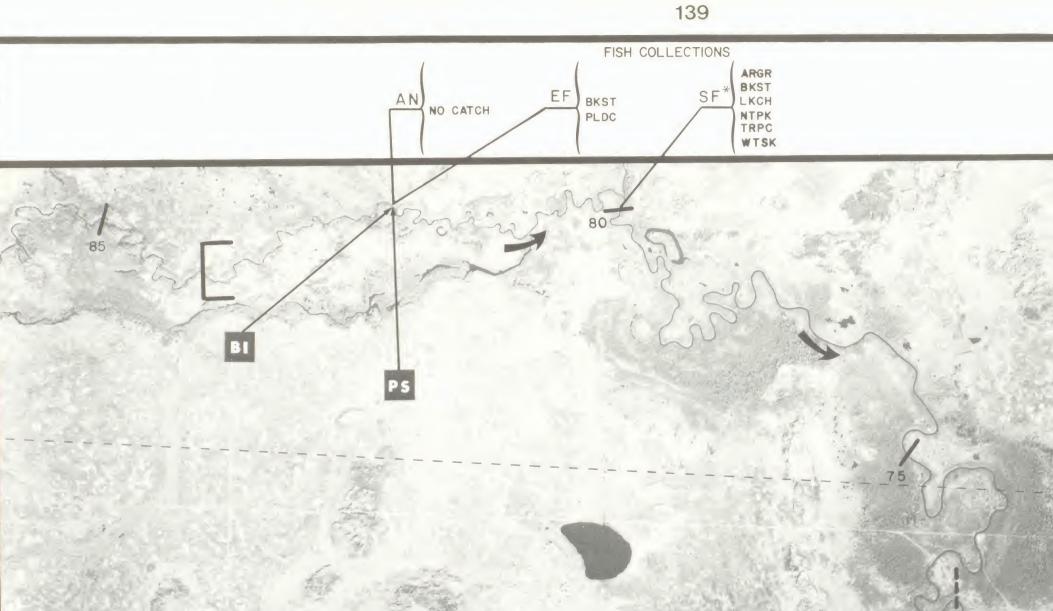


	POINT SAMPLE DATA
Location	km 58.5
Dote	16/09/79
Hydraulics	
chonnel width (m)	16.5
wet width (m)	16.5
maximum depth (m)	1.5
average depth (m)	1.0
velocity (m/s)	0.30
flow character	placid
Substrate Composition 1%)	
fines (< 2 mm)	100
gravels (2-64 mm)	0
lorges(>64mm)	0
bedrock and/or oil sand	0
Bank	
height(m)	1.0
form	repose
stability	stable
texture	silt, organic
vegetation (% coverage)	
coniferous trees	10
deciduous trees	60
shrubs	5
grasses	85
borren	0
Water Quality	
temperature 1961	12.0
dissolved oxygen (mg/l)	8
conductivity (µmhos/cm)	245
рн	7,81
	and the second s

angling counting fence	ARGR
	BKST
dipinet	BRMN
electrofisher	BURB
gill net	DLVR
kick sample	EGGS
small fish collections made	EMSH
using a combination of methods	FLCH
seine	ESDC
heather aloral and dualuutu at store	FTMN
bermic agai productivity station	GOLD
boothic investebrate collection site	LKCH
Dennic invertebrote collection site	LKCS
-ter - shits stat on	LKWE
worer quality station	LNDC
point sample	LNSK
point sumple	MTWF
stream acuaina station	NRDC
shearn googing station	NSST
kilomotros from mouth	NTPK
kilometres from moon	PLDC
flow direction	SI SC
How direction	SPSC
reach boundary	SPSH
reden boundary	TRPC
upstream limit of survey	UNSK
opo	WALL
division between sections of	WTSK
	YLPR
	kick sample small fish collections made using a combination of methods

ND	
ARGR	orctic grayling
BKST	brook stickleback
BRMN	brassy minnow
BURB	burbot
DLVR	Dolly Varden
EGGS	unidentified fish eggs
EMSH	emerold shiner
FLCH	flatheod chub
FSDC	finescale dace
FTMN	fathead minnow
GOLD	goldeye
LKCH	lake chub
LKCS	lake cisco
LKWF	loke whitefish
LNDC	longnose doce
NSK	longnose sucker
MTWF	mountain whitefish
NRDC	northern redbelly dace
NSST	ninespine stickleback
NTPK	northern pike
PLDC	pearl dace
SI SC	slimy sculpin
SPSC	spoonheod sculpin
SPSH	spottoil shiner
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	wolleye
WTSK	white sucker
YLPR	yellow perch

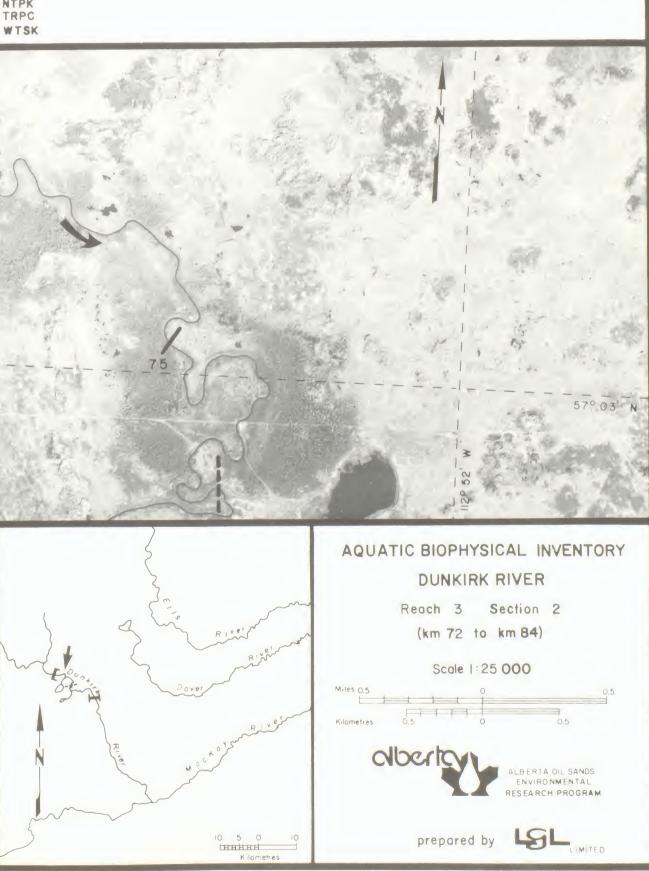


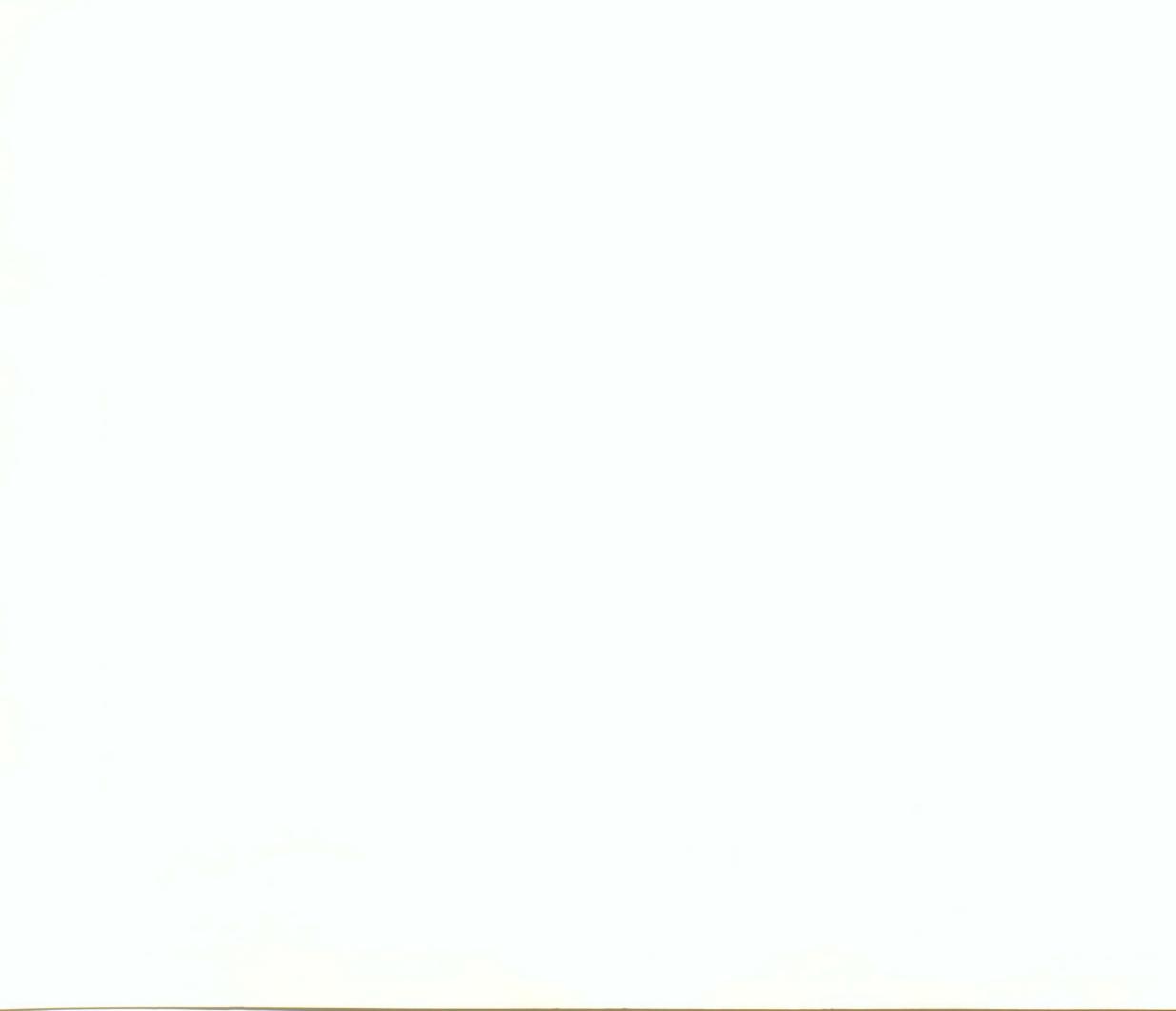


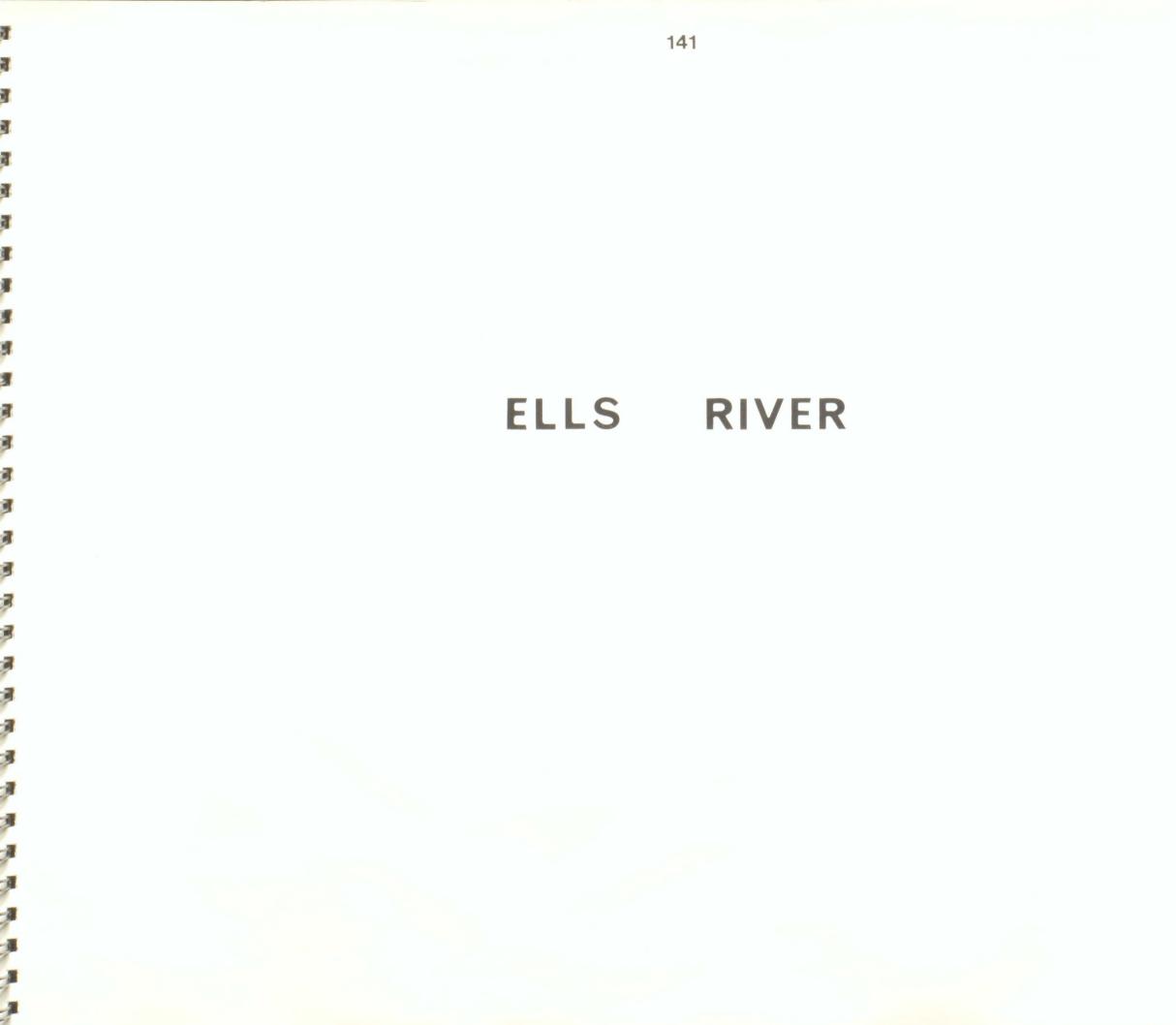
	POINT SAMPLE DATA
	PUINT SAMIFLE DATA
Location	km 82.2
Date	16/09/79
Hydraulics	
channel width (m)	10,0
wet width (m)	10,0
maximum depth (mi	2.0
average depth m)	1.0
velocity (m/s)	0.29
flow character	placid
Substrate Composition %)	
fines (< 2 mm)	00
gravels (2-64mm)	0
larges(>64mm)	0
bedrock and/or bit said	0
Bonk	
height(m)	1.5
form	repose
stability	stable
texture	silt, organic
vegetation (% covernge)	
coniferous trees	5
deciduous trees	45
shrubs	5
grasses	00
barren	0
Noter Quality	
temperature (PC)	11.0
dissolved oxygen (mg/1)	8 215
conductivity (µmhos/cm)	7.84

	and the second division of the second divisio	and the second distance of the second distanc
		LEGEND
N	angling	ARGR
F	counting fence	BKST
N	dipinet	BRMM
F	electrofisher	BURE
N	gili net	DLVR
S	kick sample	EGGS
F	small fish collections made	EMSH
	using a combination of methods	FLCH
N	seine	FSDC
P	heather alicel are disclusive station.	FTM
	benthic algal productivity station	GOLD
31	benthic invertebrate collection site	I KOW
91	bermic invertebrate conection site	LKCS
ж	star a star stat as	LKWF
	water quality station	LNDO
PS	point sample	INSH
3	point sumple	MTW
20	stream gauging station	NRDO
50	shearr gaaging station	NSST
25	Kilometres from mouth	NTPH
55	kilometres troin moom	PLDC
5	flow direction	5.50
	now onection	SESC
Т	reach boundary	SPSH
L	(Liber boander)	TRPO
٦	upstream limit of survey	UNS
1	500 CO	WALL
	division between sections of	WTS
÷	a reach	YLP
Da	ta from Machniak et al (1980)	
	(1000)	

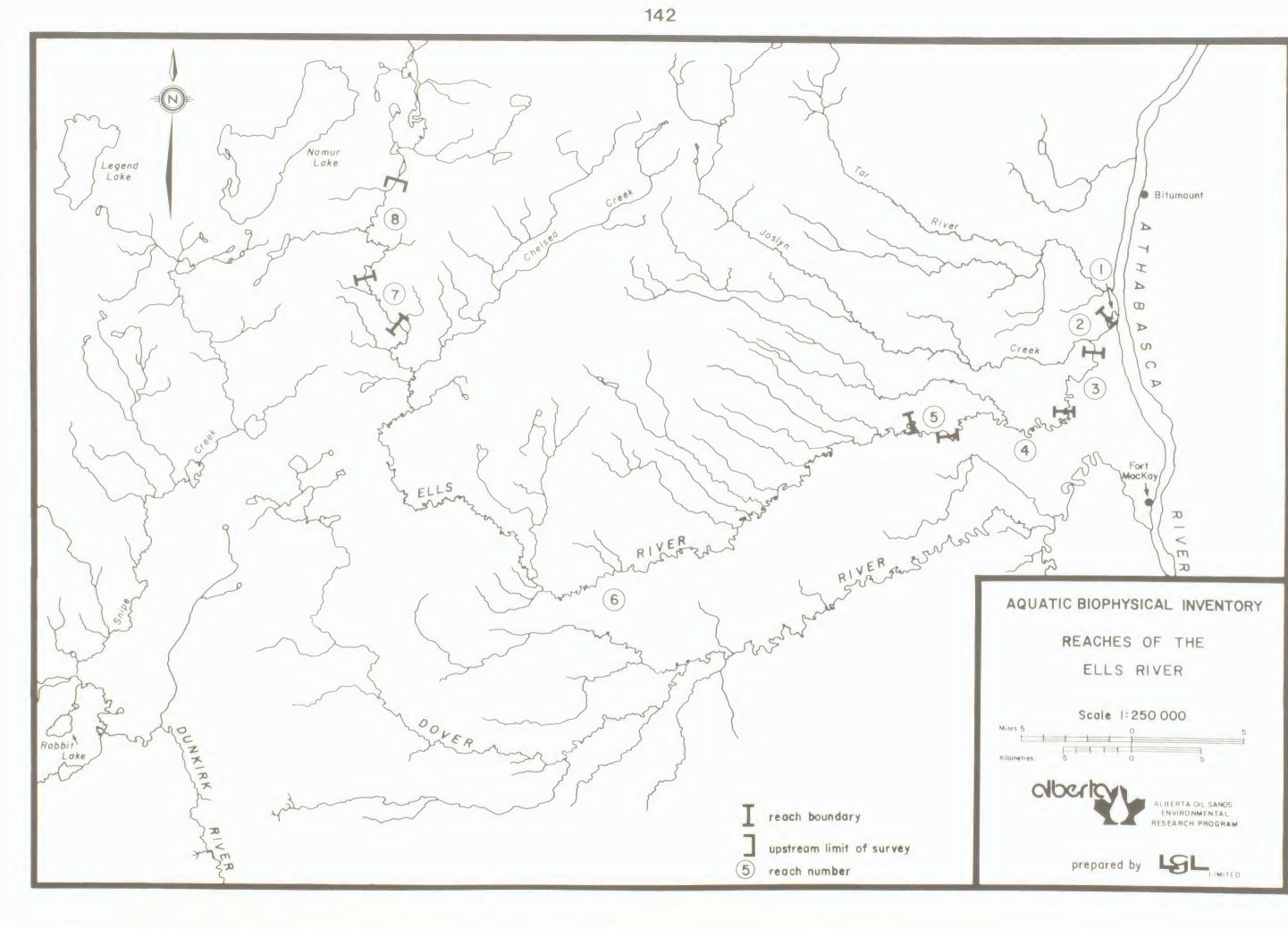
	arctic grayling
	brook stickleback
į.	brassy minnow
	Durbot
	Dolly Varden
	unidentified fish eggs
	emerald shiner
	flathead chub
	finescale dace
1	fathead minnow
	goldeye
	lake chub
	loke cisco
	lake whitefish
	longnose dace
	longnose sucker
1	mountain whitefish
	northern redbelly dace
	ninespine stickleback
	northern pike
	pearl dace
	slimy sculpin
	spaanhead sculpin
	spottail shiner
	trout-perch
(unidentified sucker species
	walleye
<	white sucker
2	yellow perch



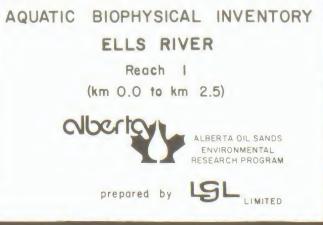


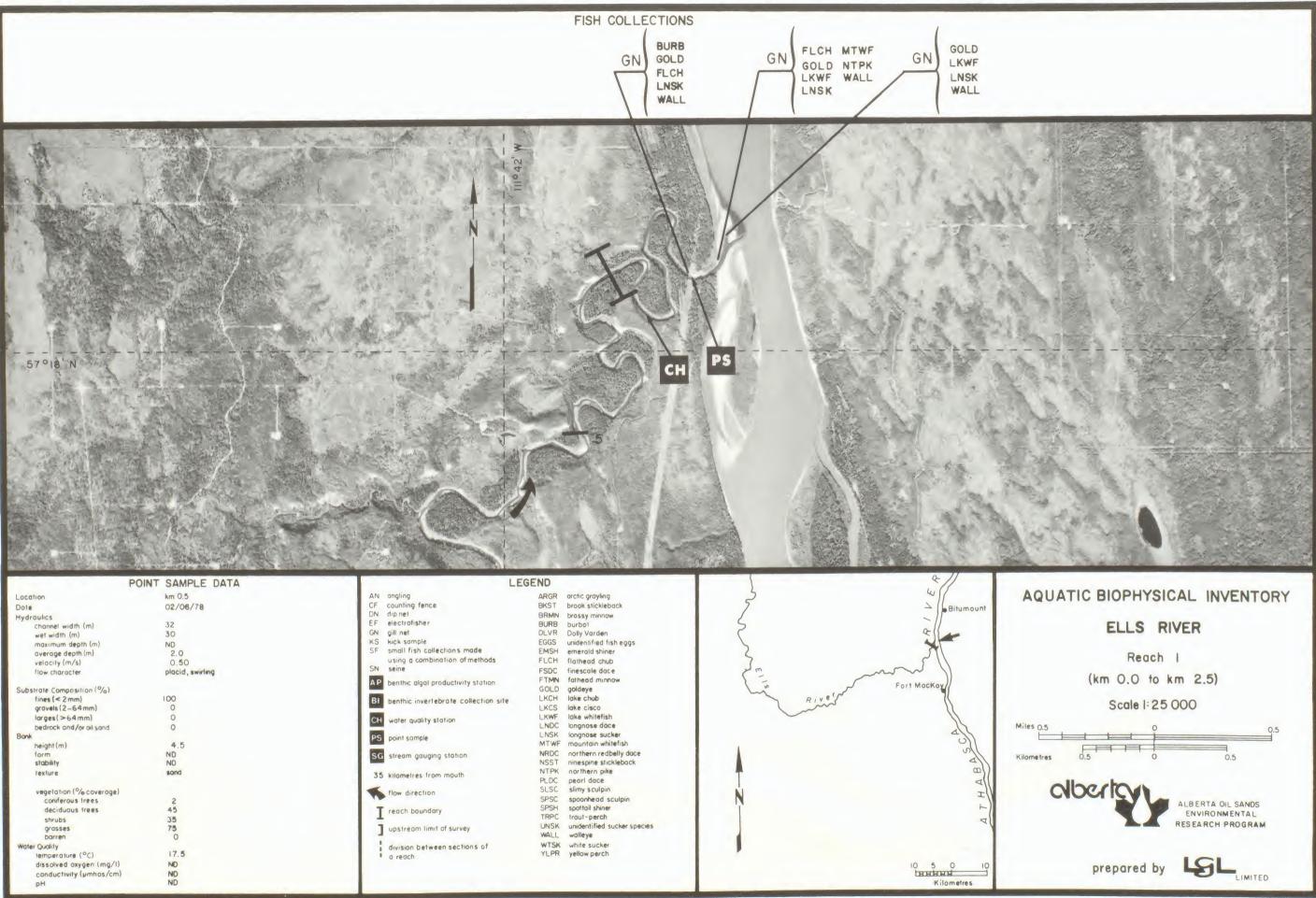






			143			
ABERS OF FISH COLLECTED (1978 Species burbot flathead chub goldeye lake whitefish longnose sucker mountain whitefish northern pike walleye Total	Adults June September ND 1 ND 0 ND 1 ND 0 ND 1 ND 1 ND 7 ND 6 ND 6 ND 0 ND 3 ND 1 ND 1 ND 0 ND 3 ND 1 ND 1 ND 0 ND 22 ND 11 ND 1 1 ND 1 ND 0 1 ND 1 ND	Total Numbers ber June September ND 1 ND 2 ND 13 ND 6 ND 4 ND 1 ND 1 ND 1 ND 1 ND 5	PHYSICAL CHARACTERISTICS Reach length (km) Channel width (m) Channel area (ha) Gradient (m/km) Flow character Total pools (%) Pattern Confinement Unstable banks (%) Substrate composition fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil su Debris	100 0 0	within the Athabasca R reach is a pool with e the water is relativel riparian vegetation is are present. There is vegetation overhangs t Spawning potentia strates is considered species that require g suitable for fish rear inhabit waters within that provide suitable considered to be moder tinuous pool. However	t, tortuously meandering section of the Ells River lies iver floodplain. The gradient is fairly low and the entire ither placid or swirling flow. In most areas of the reach, y deep. The substrate material is entirely fines. The dominated by deciduous trees and shrubs, but some conifers also a fairly dense growth of grasses. None of the bank he channel. I for those fish species that usually spawn over sandy sub- to be excellent. No suitable spawning areas exist for ravel substrates. Very few areas within this reach are ing. The slow water velocities may permit young fish to the reach, but there are only a limited number of areas shelter. Resting and feeding potential for larger fish is ate to good because the reach is essentially a deep con- ', there are few areas that provide any shelter. Because water and extensive pools, the overwintering potential
ENTHIC INVERTEBRATES No benthic samples were taken in this reach.	RIPARIAN VEGETATION Bank coverage (%) Coniferous trees 5 Deciduous trees 45 Shrubs 35 Grasses 75 Barren 0 Channel cover (%) Overhang 0 Crown 0	BENTHIC ALGAL PRODUCTIVITY No data available for this	reach	STREAM GAUGING DATA No data available for this read	ch	WATER QUALITY Water Survey of Canada station number 00AT07DA0098 Mean Maximum Min Total alkalinity (mg CaC0 ₃ /1) 799 105.1 62 PH 7.70 8.05 7 Total alkalinity (mg CaC0 ₃ /1) 75.0 8.05 7 Total hardness (mg CaC0 ₃ /1) 75.0 8.05 7 Total hardness (mg CaC0 ₃ /1) 75.0 8.05 7 Total hardness (mg CaC0 ₃ /1) 75.0 8.05 7 Total hardness (mg CaC0 ₃ /1) 75.0 8.0 Total non-filterable residue fixed (mg/1) 10.0 10.0 10.0 Total non-filterable residue fixed (mg/1) 1.1 38 0 Total registion (mg C/1) 1.2 9.0 0
	Wide, placid section of the Ell	s River at km 1.				AQUATIC BIOPHYSICAL INVENTOR ELLS RIVER Reach I (km 0.0 to km 2.5) ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by



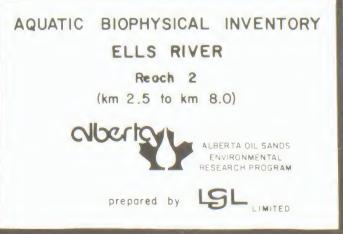


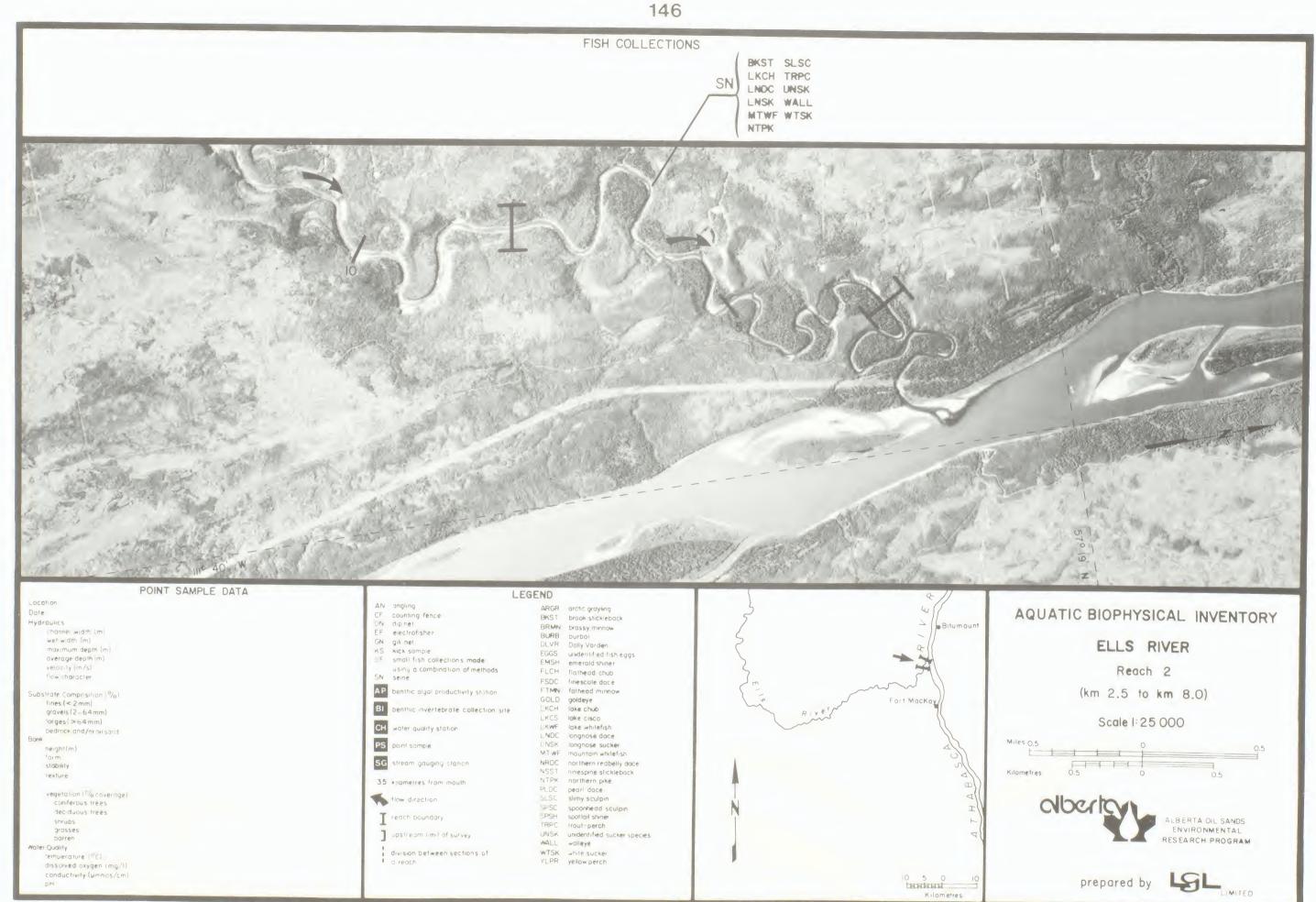
ERS OF FISH COLLECTED (1	1978)						PHYSICAL CHARACTERISTICS		REACH DESCRIPTION AND FI
							Reach length (km)	5.5	River floodplain. Th
							Channel width (m)	35	river consists of dee composed primarily of
	F	Adults		niles and of-the-year	Tota	1 Numbers	Channel area (ha) Gradient (m/km)	19.3	and shrubs are the do
Species	June	September	June	September	June	September	Flow character Total pools (%)	placid, swirling 100	patches of conifers a Most areas with
rook stickleback	0	0	1	2	1	2	Pattern	irregularly meandering	fish that normally s
ake chub	0	21	9	119	9	140	Confinement	confined	for spawning by thos
ongnose dace	0	0	8	13	8	13	Unstable banks (%)	40	this reach is consid quantities of debris
ongnose sucker	0	0	3	21	3	21	Substrate composition (%)		of-the-year and juve
ountain whitefish	0	0	0	0	1	0	fines (<2 mm)	90	section of the river
orthern pike limy sculpin	0	0	0	17	0	17	gravels (2-64 mm) larges (>64 mm)	0	larger fish is cons
rout-perch	0	0	0	18	0	18	bedrock and/or oil sand		and areas sheltered
nidentified suckers	0	0	0	2	0	2	Debris	moderate	reach that may serve
alleye	0	0	2	0	2	0			pike. Overwinterin
hite sucker	0	0	4	12	4	12			pools.
otal	0	21	28	205	28	226			
HIL INVERIEBRATES No benthic samples were taken in this reach.		Deciduo Shrubs Grasses	rage (%) ous trees us trees	10 50 25 15		AL PRODUCTIVITY available for th		STREAM GAUGING DATA No data available for this r	each
No benthic samples were taken in this		Bank cove Conifer Deciduo Shrubs	rage (%) ous trees us trees	10 50 25					each
were taken in this		Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	rage (%) ous trees us trees	10 50 25 15 0					each

H UTILIZATION

hort, irregularly meandering reach lies above the Athabased gradient is relatively low and this entire section of the pools with placid and swirling flow. The substrate is fines, but a few areas contain gravels. Deciduous tree inant components of the riparian vegetation, but some e also present. Little vegetation overhangs the channel. the reach provide suitable spawning grounds for those wn over sandy substrates. Only a few areas are suitable fish that prefer gravel substrates. Rearing potential in red to be moderate; slow water velocities and moderate provide suitable rearing areas. Moderate numbers of youngile fish, particularly lake chub, were captured in this during the study. Resting and feeding potential for ered to be good to excellent because of the many deep pools debris. There is a variety of smaller fishes in this as prey for piscivorous species such as walleye and northern potential is considered to be excellent because of the deep

WATER QUALITY No data available for this reach





0 5 0 Kilometres

8

AN

F

N

E

E

MBERS OF FISH COLLECTED (1978)			PHYSICAL CHARACTERISTICS		FEACH DESCRIPTION AND This section o
	Adults	Juveniles and Young-of-the-year	Total Numbers	Reach length (km) Channel width (m) Channel area (ha) Gradient (m/km)	10.0 30 30.0 3.8	and meanders in an sections are numero of pools. The flow broken, and water d
Species goldeye lake chub longnose dace longnose sucker trout-perch white sucker Total	June September 0 0 4 6 0 0 0 1 0 2 0 0 4 9	June September 3 0 22 119 2 10 0 3 0 4 0 2 27 138	June September 3 0 26 125 2 10 0 4 0 6 0 2 31 147	Flow character Total pools (%) Pattern Confinement Unstable banks (%) Substrate composition (%) fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sand Debris	swirling, rolling, broken 75 irregularly meandcring entrenched 35 25 25 40 10 10 10w	larges predominate of the substrate. ciduous trees; dec vegetation overhan Because of th depths, spawning p cellent for most f the rearing of fis hanging vegetation fish, particularly numerous pools and resting and feedin the reach is compo- suitable overwinte
NTHIC INVERTEBRATES OLIGOCHAETA INSECTA Ephemeroptera Saetis Schemerolia Marannia Odonata Odonata Plecoptera Hastapenia Isogenia Isopenia Therenareys		rage (%) ous trees 45 bus trees 60 25 30 0 cover (%) 19 2	ENTHIC ALGAL PRODUCTIVITY No data available for this ru	each M M M M M M M M M M M M M M M M M M M	EAM GAUGING DATA Vater Survey of Canada station nu Haximum total annual discharge: Linimum total annual discharge: Linimum annual mean discharge: Linimum monthly mean discharge; Linimum monthly mean discharge; Linimum daily discharge; Linimum daily discharge; Linimum daily discharge; a for 1975 to 1978 compiled from Varner and Spitzer (1979) and War	324.4 × 10 (1978) 135.9 × 10 (1977) 10.31 m /s (1978) 4.30 m /s (1977) 27.78 m /s (May 1978) 0.64 m /s (March 1977) 49.84 m /s (Apr. 14, 197 0.46 m /s (Mar. 26, 197) Loeppky and Spitzer (197
Coleoptera Elmidae Diptera Tipulidae Chironomidae Chironominae Tanypodinae Orthocladiinae Simuliidae	A Participant	and the second second				

REACH DESCRIPTION AND FISH UTILIZATION

This section of the Ells River is entrenched within a marrow deep canyon and meanders in an irregular pattern. Although the gradient is high and riffle sections are numerous, a relatively high proportion of the reach is composed of pools. The flow character is mixed, varying from swirling to rolling to broken, and water depths are generally shallow. Substrate composition is varied; larges predominate, but gravels and fines also compose substantial proportions of the substrate. The riparian vegetation is a mixture of coniferous and deciduous trees; deciduous shrubs are also fairly abundant. A small amount of vegetation overhangs the channel.

Because of the diversity of substrate materials and water velocities and depths, spawning potential in this section of the river is considered to be excellent for most fish species that occur in the Ells River. Suitable areas for the rearing of fish include the rocky substrates, a few areas sheltered by overhanging vegetation, and the scattered grassy shallows. Moderate numbers of young fish, particularly lake chub, were captured in this reach during the study. The numerous pools and the few areas shaded by overhanging vegetation provide good resting and feeding potential for larger fish. Although a large proportion of the reach is composed of pools, only a few of these areas are deep enough to provide suitable overwintering areas for fish.

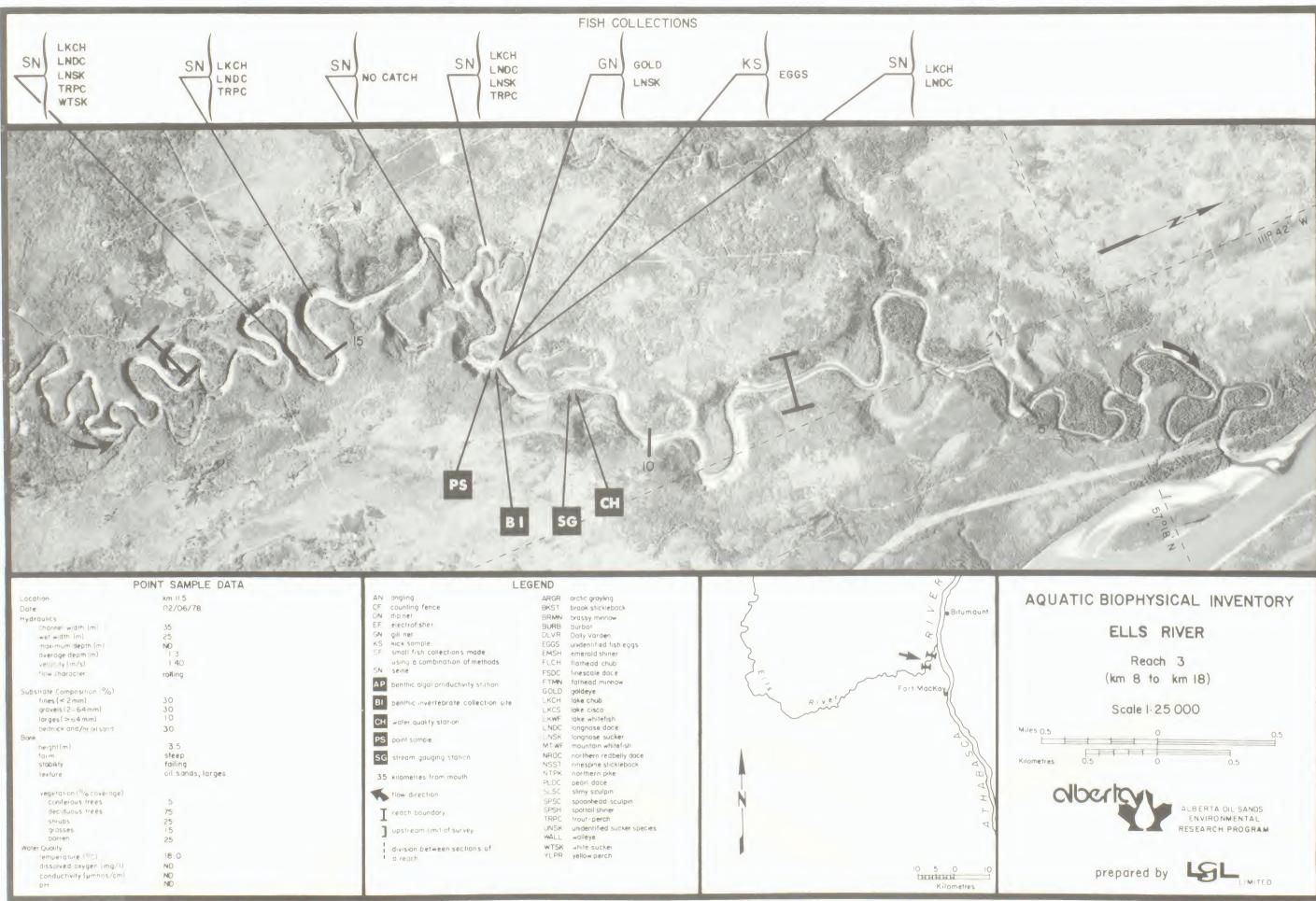
r	r	R	\sim	1.1	٨		i.	TV
	C.			U	h	L.	١.	1.1

Water Survey of Canada station dumber 00AT07DA0170

	Mean	Maximum	Minimum
tal alkalinity (mg CaCO /1)	93.4	150.4	53.6 7.20
tal hardness (g CaCO1/1)	92.5	140.2	58.5
nductance (µS/cm)	211	370	110
tal filterable residue fixed (mg/l)	110	179	57
tal non-filterable	110	1/3	27
residue fixed (mg/1)	22	326	-0.4
tal organic carbon (mg C/l)	15.0	41.5	7.5
lica (mg SiO ₂ /1)	4.0	9.9	0.4
trate and nitrite nitrogen (mg N/1)	0.130	0.430	0.003
tal Kjeldahl nitrogen (mg N/l)	0.87	2.17	0.20
tal Phosphorus (mg P/I)	0.050	0.340	0.009
thophosphate (ng P/1)	0.010	0.060	0.003
lphate (g S04/1)	6.7	30.2	9.3

Data for the period January 1976 to December 1979 obtained from the National Water Quality Data Bank (NAQUADAT).

AQUATIC BIOPHYSICAL INVENTORY ELLS RIVER Reach 3 (km 8 to km 18) aberta ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by LSL LIMITED



ABERS OF FISH COLLECTED (1978)						PHYSICAL CHARACTERISTICS Reach length (km)	27.0 30	REACH DESCRIPTION AND FISH This reach is a to relatively low gradient composed of pools and t	rtuous and s
	Ac	dults		niles and of-the-year	Tota	Numbers	Channel width (m) Channel area (ha) Gradient (m/km)	81.0 0.9	marily of larges and gr areas. Riparian vegeta	avels
Species lake chub longnose dace longnose sucker northern pike pearl dace trout-perch unidentified suckers white sucker Total	June 0 0 0 0 0 0 0 0	September 15 0 2 1 3 0 1 22	June 288 24 33 0 4 9 0 80 438	September 428 17 46 0 59 1 6 43 600	June 288 24 33 0 4 9 0 80 438	September 443 17 46 2 60 4 6 44 622	Flow character Total pools (%) Pattern Confinement Unstable banks (%) Substrate composition (%) fines (<2 mm) gravels (2-64 mm) larges (=64 mm) bedrock and/or oil sand Debris	swirling, rolling 80 tortuously meandering confined 40 15 30 50 5 10w	trees are present. The Spawning potential lent for those fish tha those that normally spa sheltered areas alongsi vegetation, and rocky s fish species found in t larly lake chub, were c Resting and feeding pot cause of the many pools hanging vegetation. Th fish. Particularly lar Overwintering potential able areas for larger f	in t t nor wn ov de th ubstr he El aptur entia and ere a ge nu is r
NTHIC INVERTEBRATES NEMATODA OLIGOCHAETA INSECTA Ephemeroptera Baetis Ephemerella Stenonema Odonata Ophiogomphus Plecoptera Isoperla Leuetra Trichoptera	R		rage (%) ous trees us trees over (%)	5 85 10 10 5 2 0		A <u>L PRODUCTIVITY</u> available for t		TREAM GAUGING DATA No data available for this	reach	WATE
Hydropsyche Rydropsyche Coleoptera Elmidae Diptera Chironomidae Chironominae Tanypodinae Simuliidae				M.						AQ
							V. Harris		and the second	

FISH UTILIZATION

a tortuously meandering section of the Ells River, with a adient and swirling and rolling flow. Most of the reach is and the water is moderately deep. The substrate consists priand gravels, but sand and silt substrates are present in some vegetation is mostly deciduous trees, but scattered coniferous There is a relatively small amount of overhanging vegetation. ential in this section of the river is considered to be excelsh that normally spawn over rocky substrates, and moderate for ly spawn over sandy substrates. Numerous backwater pools, weedy longside the river bank, areas shaded by overhanging riparian ocky substrates provide excellent rearing opportunities for most I in the Ells River. Very high numbers of young fish, particuwere captured in this section of the river during the survey. ng potential for larger fish is considered to be excellent bepools and the areas along the banks that are sheltered by over-. There appears to be an abundant food supply for piscivorous ly large numbers of smaller fish were collected in this reach. ential is rated as moderate to good; the many pools provide suit-

> WATER QUALITY No data available for this reach

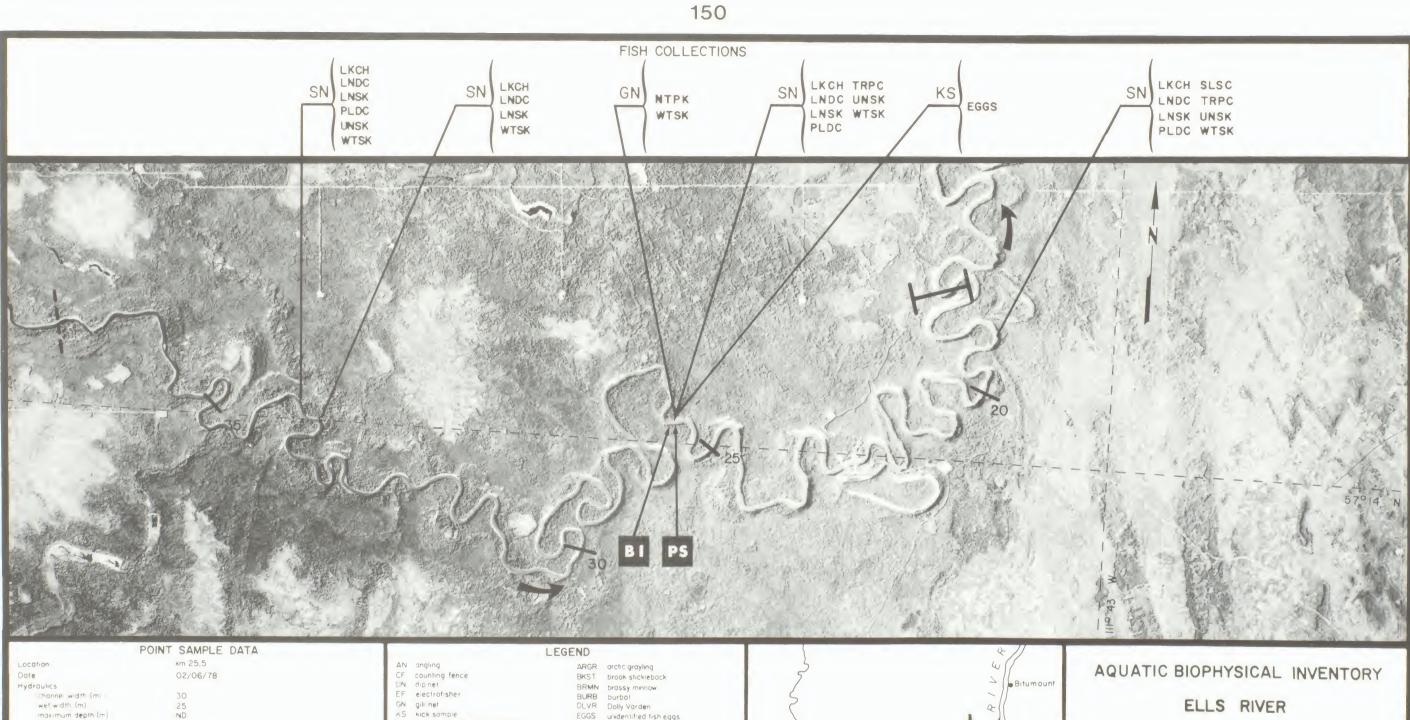
AQUATIC BIOPHYSICAL INVENTORY

ELLS RIVER

Reach 4 (km 18 to km 45)







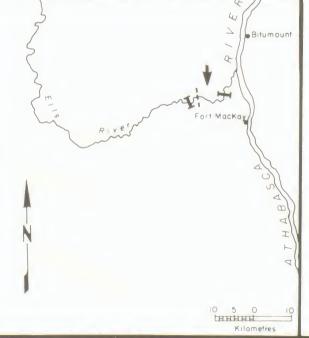
	POINT	SAMPLE	DATA
ocation		km 25.5	
ate		02/06/78	
draulics			
channel width (m)		30	
we! w dth (m)		25	
maximum depth (m		ND	
average depth (m)		1.0	
velacity (m/s)		1.60	
flaw character		swirling, rollin	9
ubstrate Composition %)			
fines (< 2 mm)		15	
gravels (2-64mm)		30	
larges(>64mm)		55	
bedrock and/or bill sarid		0	
onk		0.11	
height(m)		2.3	
form		undercut	
stability		stable	
texture		sand, gravel, a	sand
vegetation 1% coverage)			
coniferous trees		5	
deciduous trees		85	
Shrubs		10	
grasses		10	
parren		2	
ater Quality			
'emperature (ac)		16.0	
dissolved oxygen (mg/1)		NO	
conductivity (umhos/cm)		NO	
0 H		NO	

DH

ND

AN	angling
CF	counting fence
	dip net
	electrofisher
	gili net
	kick sample
SF	small fish collections made
SN	using a combination of methods seine
and the second second	
AP	benthic algal productivity station
BI	benthic invertebrate collection site
СН	water quality station
PS	point sample
SG	stream gauging station
35	kilometres from mouth
-	flow direction
Ι	reach boundary
]	upstream limit of survey
	division between sections of a reach

END	
ARGR	arctic grayling
BKST	brook stickleback
BRMN	brassy minnow
BURB	burbol
DLVR	Dolly Varden
EGGS	unidentified fish eggs
EMSH	emerald shiner
FLCH	flathead chub
FSDC	finescale dace
FTMN	fathead minnow
GOLD	goldeye
LKCH	loke chub
LKCS	lake cisco
LKWF	lake whitefish
LNDC	longnose dace
LNSK	longnose sucker
MTWF	mountain whitefish
NRDC	northern redbelly dace
NSST	ninespine slickleback
NTPK	northern pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
5PSH	spottoil shine
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
	white sucker
YLPR	yellow perch

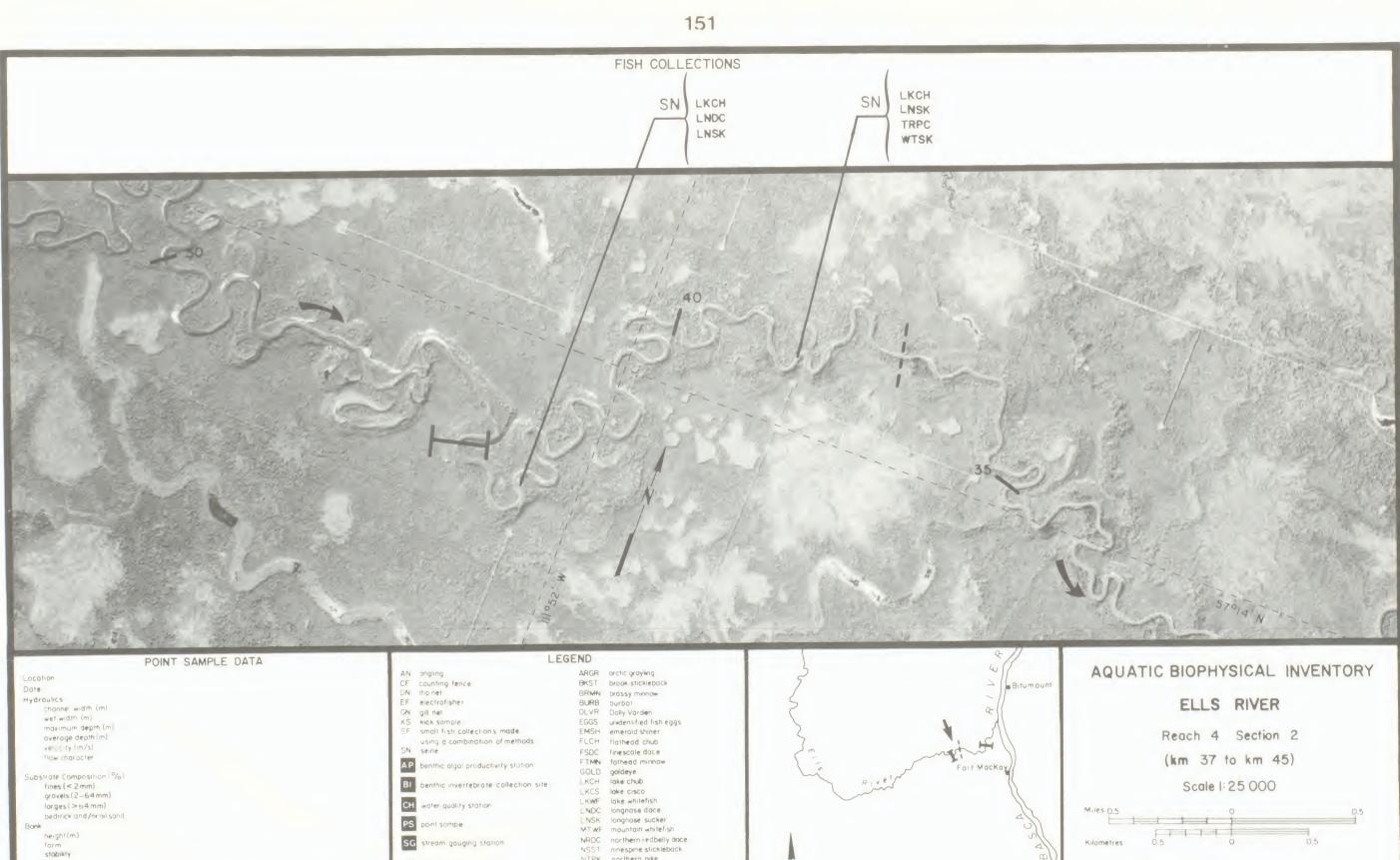


Reach 4 Section 1 (km 18 to km 37) Scale 1:25 000 Miles 0.5 Kilometres 0.5 0 0.5 E

LY LY LY LY LY LY LY LY LY



0.5

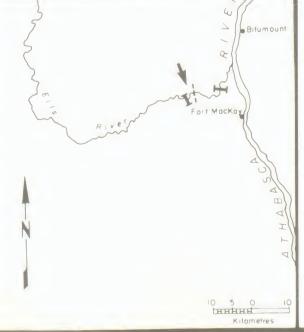




dissolved oxygen (mg/l) conductivity (umhos/cm)

35 kilometres from mouth tiow direction I reach boundary upstream limit of survey division between sections of a reach

KST	brook stickleback
RMN	brassy minnow
URB	burbot
LVR	Dolly Varden
GGS	unidentified fish eggs
MSH	emerald shiner
LCH	flathead chub
SDC	finescale dace
TMN	fathead minnow
SOLD	goldeye
KCH	lake chub
KCS	loke cisco
KWF	lake whitefish
NDC	longnose dace
NSK	longnose sucker
ATWE	mountain whitefish
VRDC	northern redbelly dace
ISST	ninespine stickleback
NTPK	northern pike
2 DC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
JNSK	unidentified sucker specie
MALL	walleye
WTSK	white sucker
YLPR	yellow perch



abert ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by

NUMBERS OF FISH CAPTURED (197	8)						PHYSICAL CHARACTERISTICS Reach length (km)	6.0 25	REACH DESCRIPTION AND F This section is a series of riffles. there is a moderate	a short, Althoug
			luve	niles and			Channel width (m) Channel area (ha)	15.0	of the reach. Subst	
	,	Adults		of-the-year	Tota	1 Numbers	Gradient (m/km)	4.1	also numerous areas	
Species	June	September	June	September	June	September	Flow character	rolling, broken	the major part of the tation that overhang	
arctic grayling	ND	0	ND	1	ND	1	Total pools (%)	25 irregularly meandering	reach.	
lake chub	ND	10	ND	56	ND	66	Pattern Confinement	confined	The diversity o	of substra
longnose dace	ND	0	ND	17	ND	17	Unstable banks (%)	20	vides excellent spaw	vning pote
longnose sucker	ND	1	ND	11	ND	12	Substrate composition (%)		River, particularly	for those
northern pike	ND	1	ND	0	ND	1	fines (<2 mm)	20	Rearing potential is	consider
pearl dace	ND	0	ND	4	ND	4	gravels (2-64 mm)	30	debris and the rocky	/ substrat
trout-perch	ND	28	ND	1	ND	29	larges (>64 mm)	45	banks that are shade	
unidentified suckers	ND	0	ND	1	ND	1	bedrock and/or oil sand	5	Suitable resting and	
Total	ND	40	ND	91	ND	131	Debris	moderate	sheltered by overhan	
									pools and eddies in resting and feeding	
BENTHIC INVERTEBRATES No benthic samples were taken in this reach.			rage (%) Dus trees Us trees	10 60 25 20 0 2 2 0		AL PRODUCTIVITY available for th		STREAM GAUGING DATA No data available for this rea	ach	WATER
										AQ

ILIZATION

rt, irregularly meandering reach that is essentially ough gradient and water velocities are relatively high, of pools. Water depths are fairly shallow over most are predominantly larges and gravels, but there are andy substrates. Deciduous trees and shrubs comprise rian vegetation, and there is a small amount of vegechannel. There is a moderate amount of debris in this

trate sizes, current velocities and water depths prootential for most fish species that occur in the Ells ose fish that prefer to spawn over rocky substrates. dered to be good because the moderate quantities of rates provide suitable shelter. Some areas along the verhanging vegetation are also suitable rearing areas. ng areas for larger fish are found in some of the areas egetation and debris. However, only a few backwater sach provide sufficiently deep waters for larger fish; ial for these fish is therefore considered to be poor. he paucity of deep pools preclude significant overreach.

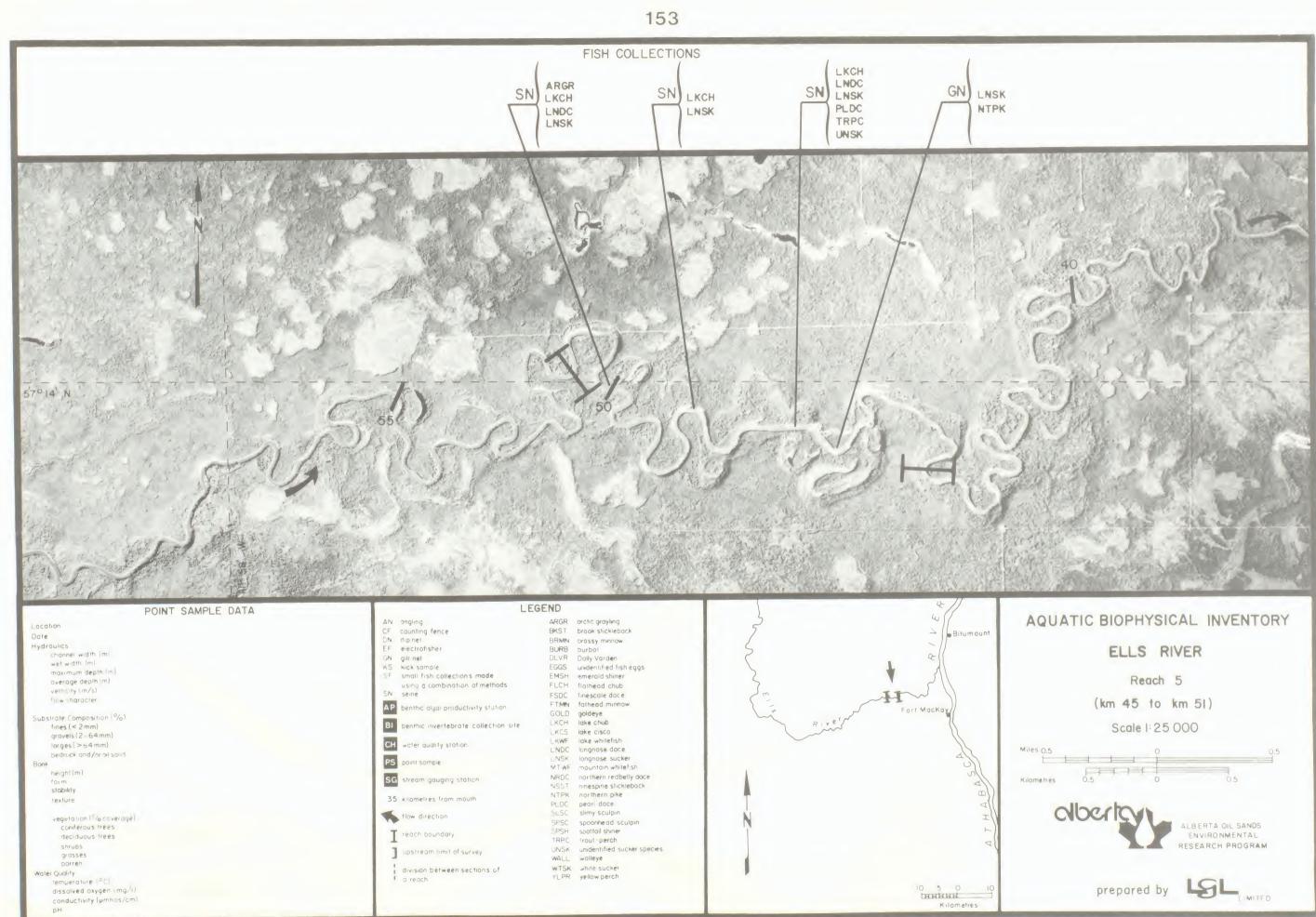
No data available for this reach

QUATIC BIOPHYSICAL INVENTORY

ELLS RIVER

Reach 5 (km 45 to km 51)





NUMBERS OF		SH COLL	ECTED (1	9781
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	Adults		Juveniles and Young-of-the-year		Total Numbers	
Species	May/June	September	May/June	September	May/June	September
arctic prayling	0	0	29	4	29	4
lake chub	0	48	238	298	238	346
longnose dace	1	1	97	38	98	39
longnose sucker	1	0	32	1.1	33	11
northern pike	0	5	0	0	0	5
nearl dace		0	2	48	2	48
slimy Sculpin	39	3	2	3	41	6
spoonhead sculpin	0	0	1	0	1	
trout-perch	19	61	35	27	54	88
unidentified suckers		0	0	1.1	0	11
walleye	2		0	0	2	2
hite sucker	3	9	42	37	45	46
Total	65	129	478	477	543	606

SICAL CHARACTERISTICS	
Reach length (km)	123.0
Channel width (m)	30
Channel area (ha)	369.0
Gradient (/km)	1.9
Flow character	swirling, calling, broke
Total pools ()	60
Pattern	tortuously meandering
Confinement	frequently confined
Unstable banks ()	35
Substrate composition 1)	
fines (=2 mm)	30
gravels (2-64 mm)	30
larges (-64 mm)	40
bedrock and/or oil sand	0
Debris	moderate

REACH DESCRIPTION AND FISH UTILIZATION

This section is a long, tortuously meandering reach with a moderate graduer . "It is a series of alternating pools and riffles, and just over helf of the react reach. Substrates are varied, depending on location in the reach, and consist of larges, gravely and fines. The riparian venetation is dominated by decideous nees and skrubs, but grasses and significant numbers of conifers are also Because of the variety of habitats provided by the long series of pools and

fish that nor ally spawn over rocky or sandy substrates. Adults of several species that spawn in the spring were captured mere in May and June nuring this study. oreas sheltered by overhanging bank vegetation and debris and areas with rocky members of young fish, particularly lake chub, were captured in the reach during this study. Averhanding venetation, momerate quantities of debris, and numerous usels provide nood resting and feeding areas for larger fish, particularly the piscivorous succies. Overwintering potential for fish is considered to be

Epheneroutern La Tiv Frichoptery Tanypudinae

5 Imiliidae Rhanianidae

RIPARIAN VEGETATION		BENTHIC ALGAL FRODUCTIVITY	STREAM GAUGING DATA
Bank coverage () Coniferous trees Deciduous trees Shrubs Grasses Barren	20 50 30 30 0	No data available for this reach	No data available for this reach
©hannel cover (∘) Overhang Crown	5 0		
-		and an and the second	
		1 March March March 199 (1997) 1997 (1997) 1997 (1997) 1997	
a hi	14		
s. dy			
e de			
s. di			

A rifle section and high, unstable bank at km 107.

WATER QUALITY

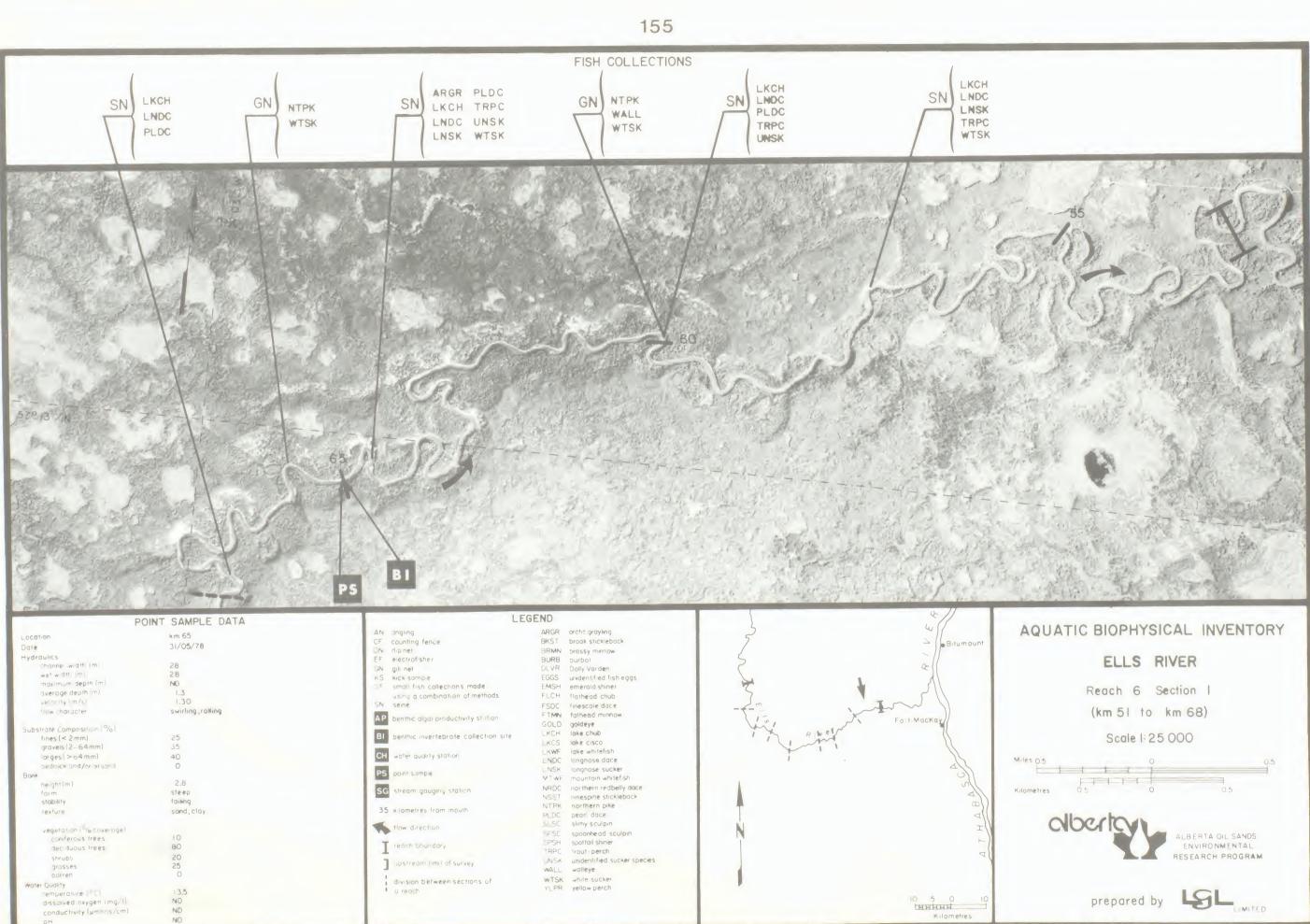
No data available for this reach

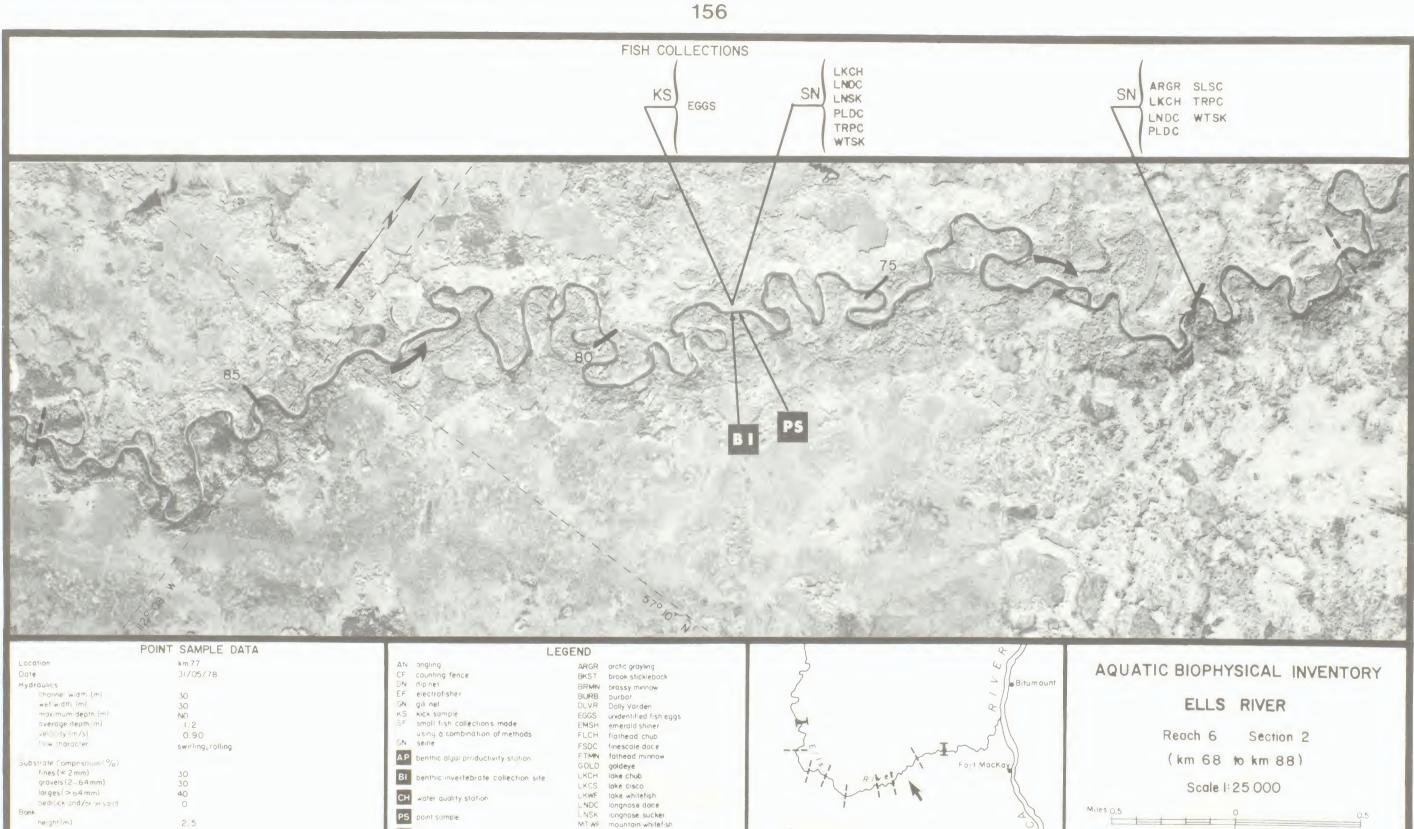
AQUATIC BIOPHYSICAL INVENTORY

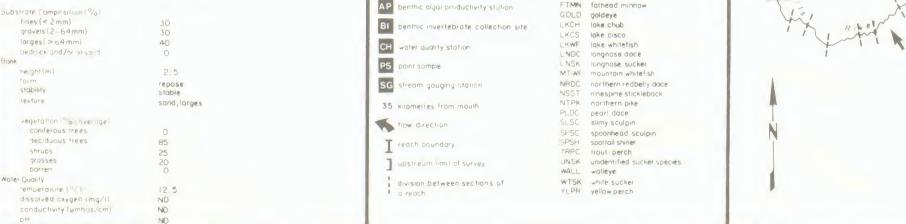
ELLS RIVER

Reach 6 (km 51 to km 174)

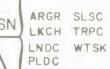




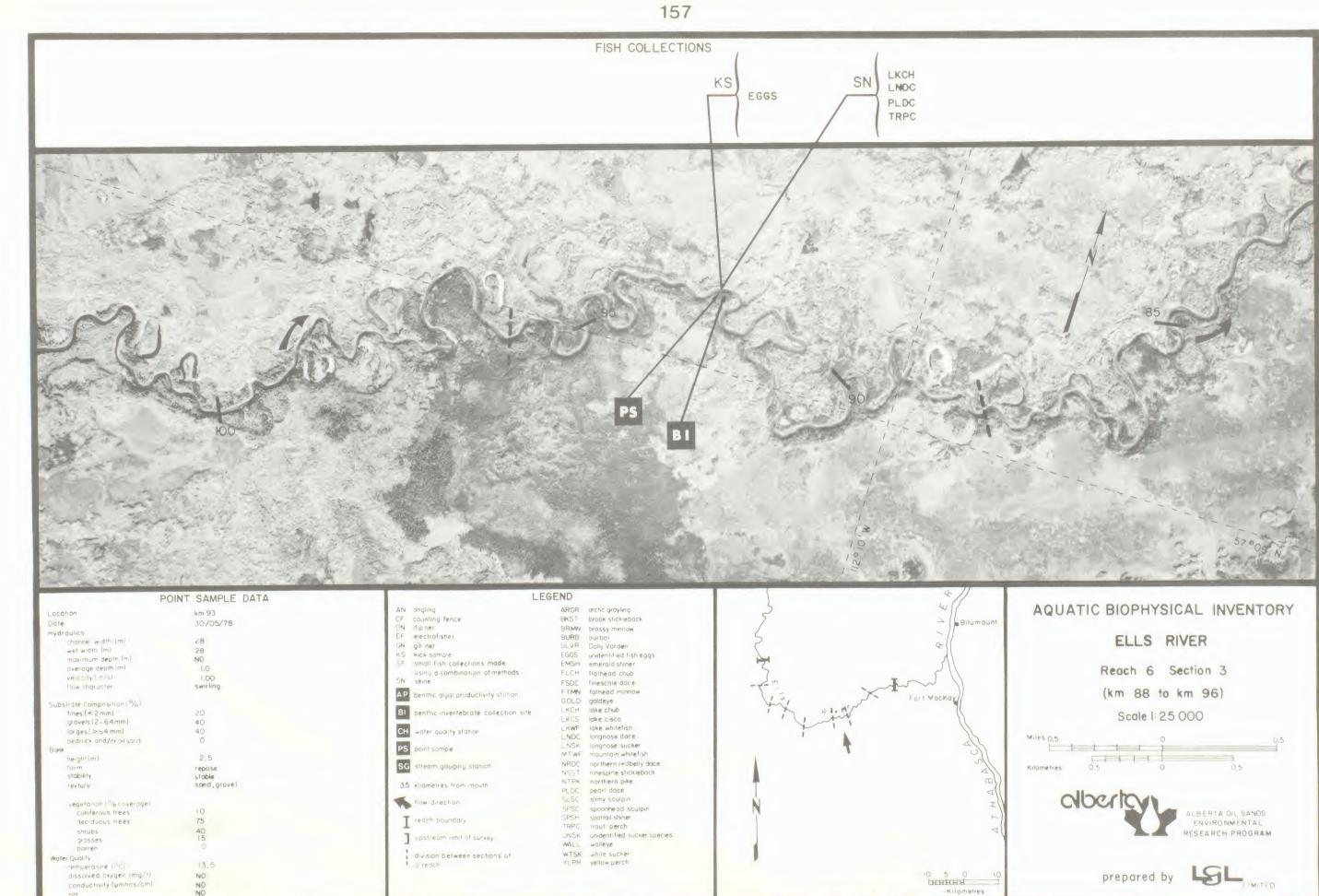


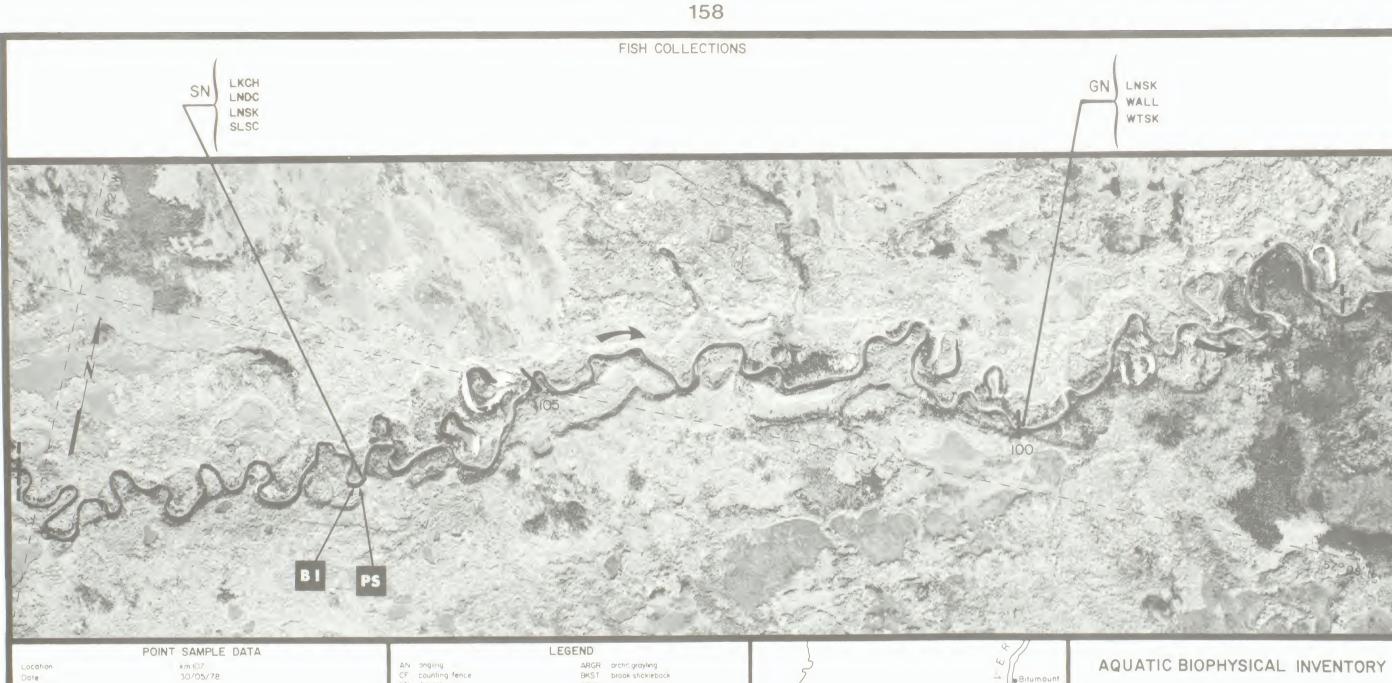


0 5 0 тняння Kilometres





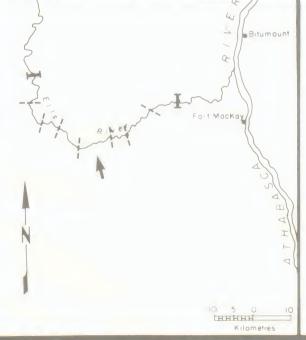




Location	K m 1017		
Date	30/05/78		
Hydraulics			
Thannel width Im	52		
wet width im)	32		
maximum depth (m)	ND		
average depth m)	1.5		
velar ly In/s)	2.00		
forw character	swirling, rolling, broken		
Substrate Composition %)			
fines (< 2 mm)	15		
gravels (2-64mm)	10		
larges >64 mm)	75		
bedrock and/or billsand	0		
Bonk			
height(m)	2.D		
form	steep		
stability	failing		
lexture	sand, gravel		
vegetation 1% coverage)			
coniferous trees	5		
deciduous trees	75		
shrubs	25		
grasses	40		
borren	0		
Water Quality			
temperature (Pr)	12 0		
dissolved axygen (mg/l)	NO		
conductivity (umbes (cm)	NO		

CF	counting tence
DN	dip riet
EF	electrofisher
GN	gill net
KS	kick sample
SF	small fish collections made
	using a combination of methods
SN	seine
AP	benthic algae preductivity station
BI	benthic invertebrate collection s
СН	water quality station
PS	point sumple
SG	stream gauging station
35	kilometres from mouth
-	tiow direction
I	reach blundary
]	pstream unit of survey
1	division between sections of a reach

-	
RGR	arctic grayling
KST	brook stickleback
RMN	brassy minnow
URB	burbot
LVR	Dolly Varden
GGS	unidentified fish eggs
MSH	emerald shiner
LCH	flothead chub
SDC	finescale dace
TMN	fathead minnow
OLD	goldeye
ксн	lake chub
KCS	lake cisco
KWF	lake whitefish
NDC	longnose dace
NSK	longnose sucker
TWF	mountain whitefish
RDC	northern redbelly dace
IS_T	ninespine stickleback
TPK	northern pike
LDC	pearl dace
	slimy sculpin
PSC	spoonheod sculpin
PSH	spottail shiner
RPC	trout-perch
INSK	unidentified sucker species
VALL	walleye
VTSK	white sucker
LPR	yellow perch





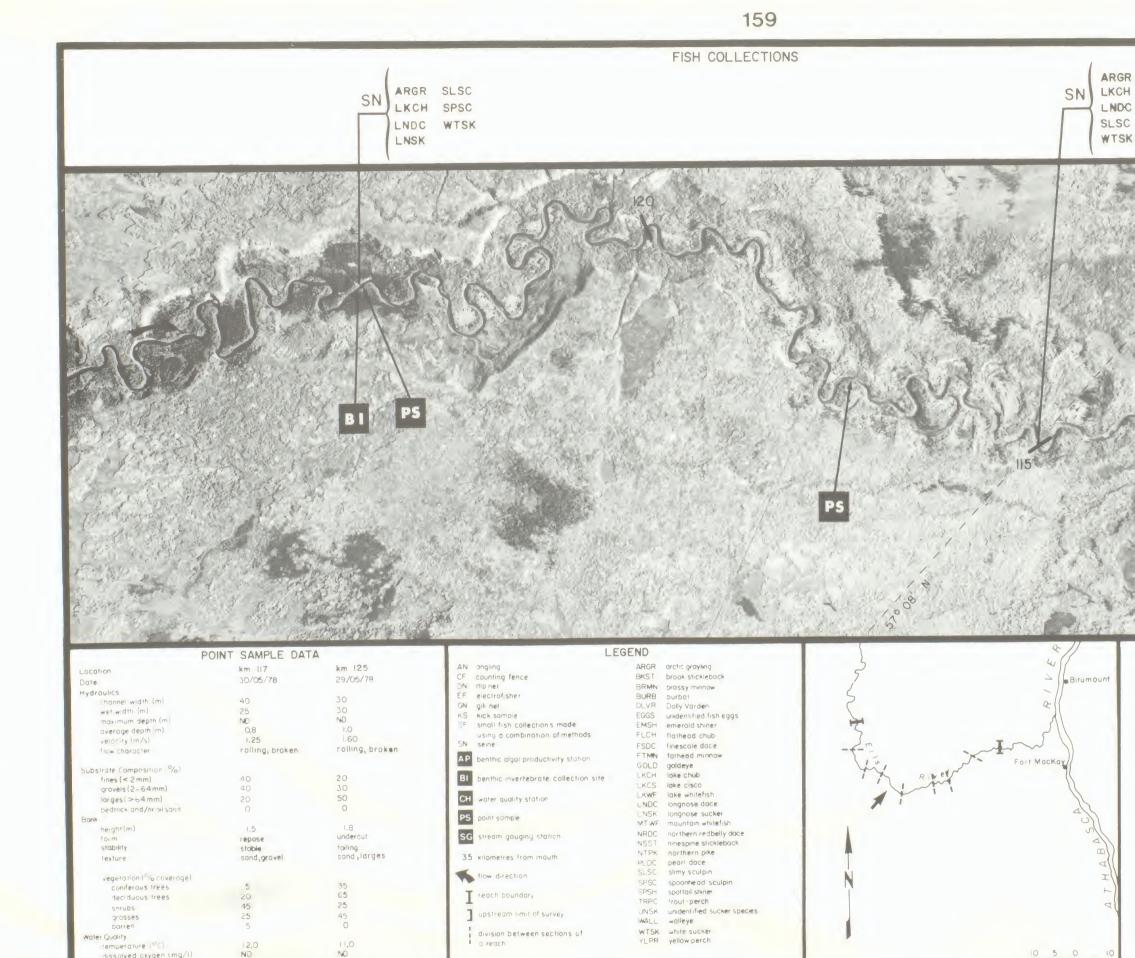
ELLS RIVER

Reach 6 Section 4

(km 96 to km 112)

Scale 1:25 000





ND

ND

ND

ND

dissolved oxygen img/1)

conductivity (µmhos/cm)

0 5 0 ранны Kilometres



AQUATIC BIOPHYSICAL INVENTORY

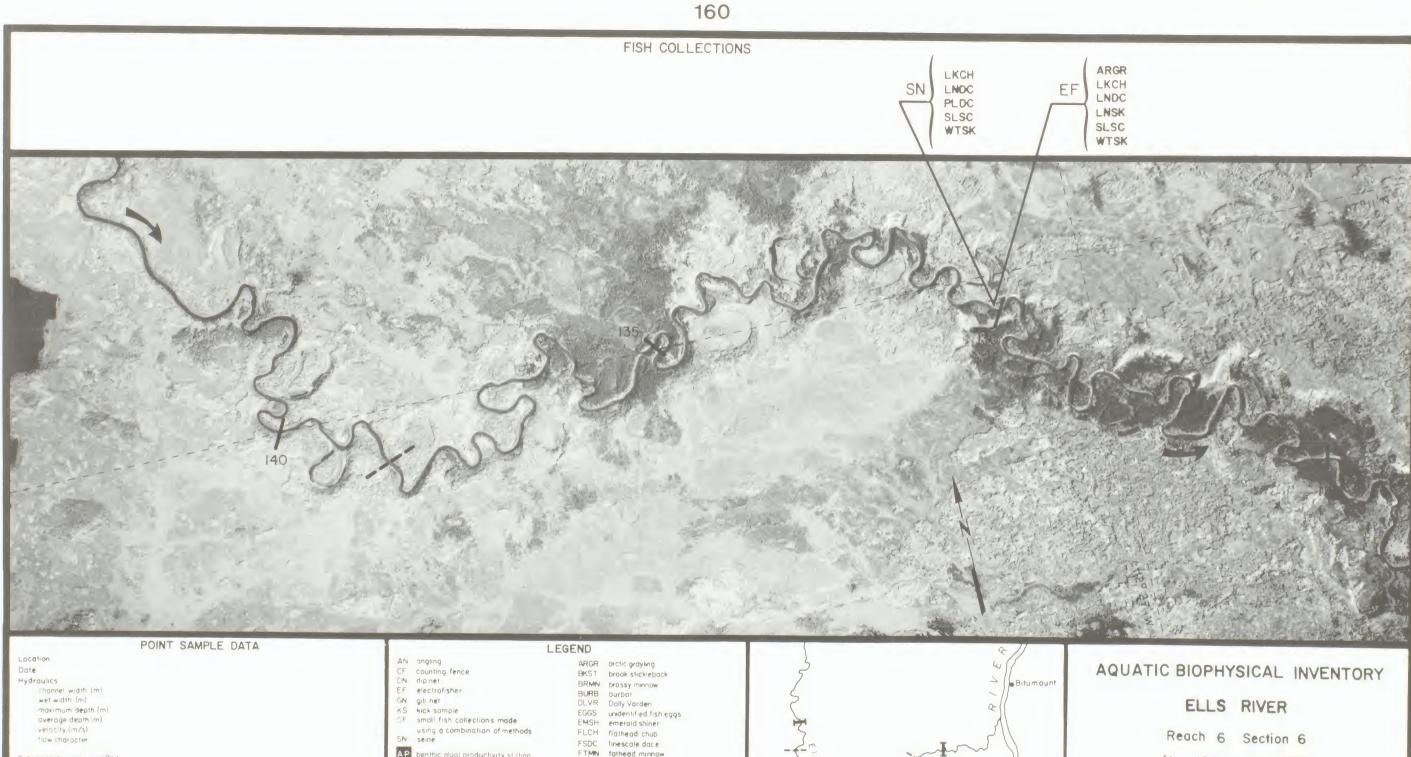
ELLS RIVER

Reach 6 Section 5

(km 112 to km 129)

Scale 1:25 000





AP benthic algal productivity station FTMN fathead minnow Substrate Composition 1%) GOLD goldeye LKCH loke chub Fort Mack fines (< 2mm) BI benthic invertebrate collection site gravels (2-64mm) LKCS loke cisco lorges (>64mm) CH water quality station LKWF lake whitefish LNDC longnose doce LNSK longnose sucker MTWF mountain whitefish bedrock and/or oil sand PS point sample Bonk height(m) form SG stream gauging station NRDC northern redbelly doce NSST ninespine stickleback NTPK northern pike stability texture 35 kilometres from mouth PLDC pearl dace SLSC slimy sculpin vegetation (% coverage) tlow direction coniferous trees SPSC spoonhead sculpin SPSH spottail shiner TRPC trout-perch deciduous trees T reach boundary shrubs grasses] upstream limit of survey UNSK unidentified sucker species Darren WALL walleye Water Quality division between sections of a reach WTSK white sucker YLPR yellow perch temperature 1ºcl dissolved oxygen (mg/l) conductivity (umhos/cm) 10 5 0 Kilometres

(km 129 to km 139)

A A

Sel la

B

-

P

E

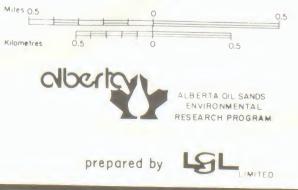
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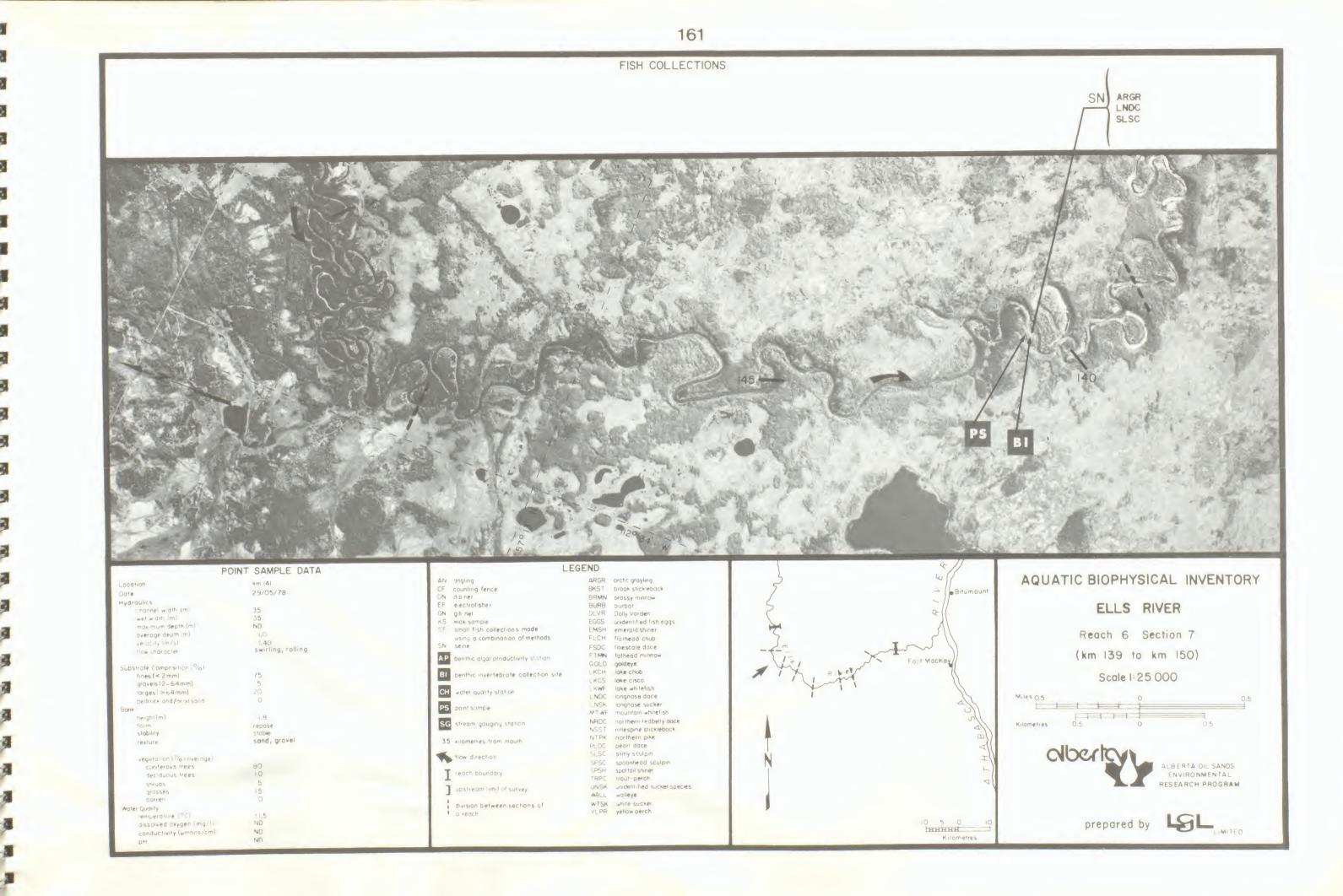
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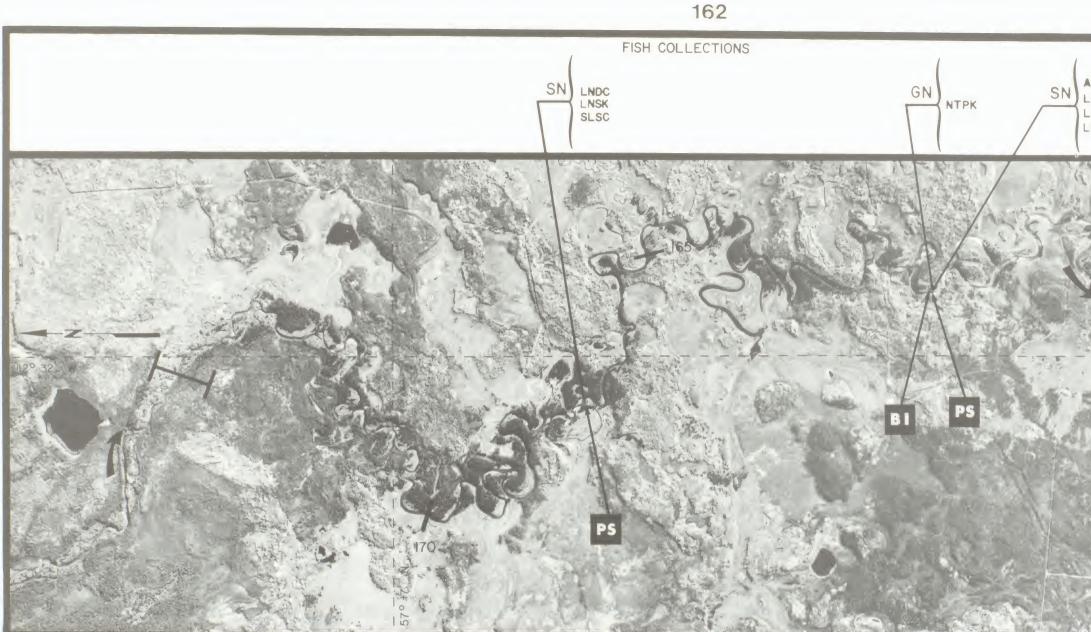
E

E

Scale 1:25 000



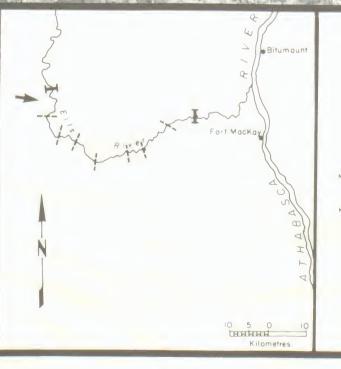




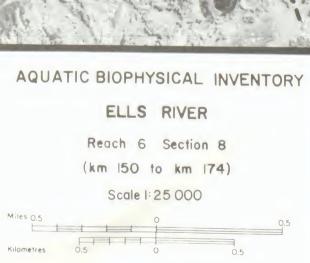
	POINT SAMPLE DATA	
Location	km 160	km 167
Dote	29/05/78	29/05/78
Hydraulics		23/00/10
Thanne width (m)	40	25
wet width (m)	20	25
maximum depth (m)	ND	ND
average depth (m)	0.8	1.0
velocity (m/s)	1.10	1.10
flow character	rolling, broken	swirting
Substrate Composition 1%)		
fines (< 2 mm)	45	100
gravels (2-64mm)	35	0
larges(>64mm)	20	0
bedrock and/or pitsard	0	0
Bank		
height (m)	2.5	2.0
form	repose	ND
stability	stoble	ND
lexture	sand, gravel	sand
vegetation (^b /o coverage)		
coniferous trees	5	70
deciduous trees	5	0
shrubs	65	10
grasses	35	15
barren	0	0
Water Quality		
emperature 190	11.0	ND
dissolved oxygen (mg/l)	ND	ND
conductivity (umbos/cm)	ND	ND
рH	NID	ND

		LEGEND
N	angling	ARGR
F	counting fence	BKST
N	dipinet	BRMN
F	electrofisher	BURB
N	gill net	DLVR
S	kick sample	EGGS
F	small fish collections made	EMSH
	using a combination of methods	FLCH
N	seine	FSDC
P	benthic algal productivity station	FTMN
•	bennie organ productivity station	GOLD
31	benthic invertebrate collection site	
	bennic invertebrate conection she	LKCS
СН	water quality station	LKWE
	water quality station	LNDC
PS.	point sample	INSK
3	point sumple	MTWF
SG	stream gauging station	NRDC
50	shear gauging station	NSST
35	kilometres from mouth	NTPK
55	knomenes from modifi	PLDC
<	flow direction	SLSC
	How direction	SPSC
T	reach boundary	SPSH
Ι	reach boandary	TRPC
]	upstream limit of survey	UNSK
1	0,0000	WALL
1	division between sections of	WTSK
i.	a reach	YLPR

arctic graying
brook stickleback
brassy minnow
burbot
Dolly Varden
unidentified fish eggs
emerald shiner
flathead chub
finescale dace
fathead minnow
goldeye
lake chub
lake cisco
lake whitefish
longnose dace
longnose sucker
mountain whitefish
northern redbelly doce
ninespine stickleback
northern pike
pearl dace
slimy sculpin
spoonhead sculpin
spottail shiner
trout-perch
unidentified sucker species
wolleye
white sucker
yellow perch



SN ARGR SLSC LNDC UNSK LNSK WTSK



ALT.



ERS OF FISH CAPTURED (19	78)			PHYSICAL CHARACTERISTICS		REACH DESCRIPTION AND FI	
	Adults	Juveniles and Young-of-the-year	Total Numbers	Reach length (km) Channel width (m) Channel area (ha) Gradient (m/km) Flow character	6.0 20 12.0 7.2 rolling, broken	broken riffles and wh are the highest recor average water depth i materials, but fines Deciduous trees and s	ded w s sha are a
Species rctic grayling ake chub ongnose dace ongnose sucker limy sculpin hite sucker otal	June September 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 1 0 0 1 0 0 0 0	June September 3 1 3 0 3 0 15 0 4 5 <u>34</u> 0 <u>62</u> 6	June September 3 1 3 0 3 0 15 0 4 6 34 0 62 7	Total pools (*) Pattern Confinement Unstable banks (*) Substrate composition (*) fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sand Debris	20 irregularly meandering confined 10 15 40 40 5 moderate	bank, but coniferous vegetation. A small The diversity of reach provides a numb species of fish, part In many areas, howeve Moderate quantities o areas for most fish s may limit the rearing is considered poor to of debris provide a n larger fish to inhabi of pools preclude sig	trees amou wate per of icula er, th of det pote o fain number t.
THIC INVERTEBRATES OLIGOCHAETA CRUSTACEA Amphipoda Hyainila asteen INSECTA Ephemeroptera Batis Odonata Othing mphus Trichoptera Corac en Ticss norma Hydropychs Lanidase Coleoptera Elmidae Diptera Tipulidae Chironomidae	Conil Decid Shrut Grass Barre	$\begin{array}{c} \text{verage } (\begin{smallmatrix} x \\ \text{verous trees} & 20 \\ \text{vous trees} & 50 \\ \text{vs} & 30 \\ \text{ves} & 40 \\ \text{m} & 10 \\ \text{cover } (\begin{smallmatrix} x \\ x \\ \text{nang} & 2 \\ \end{array}$	EENTHIC ALGAL PRODUCTIVITY No data available for th		PEAM GAUGING DATA No data available for this r	reach	WAA
Chironominae Orthocladiinae Simuliidae Tabanidae							4

JTILIZATION

hort, irregularly meandering reach that is predominantly water rapids. Both the gradient and the water velocities within the surveyed portion of the Ells River. The hallow. Larges and gravels are the predominant substrate also found in numerous areas within the reach.

bs are the most abundant vegetation types along the river es also comprise a significant proportion of the riparian ount of vegetation overhangs the channel.

ter depths, water velocities, and substrate sizes in this of areas that may be suitable for spawning of several larly those that normally spawn over rocky substrates. the water velocities may be too high for spawning to occur. ebris and rocky substrates provide moderate to good rearing ies, but high water velocities throughout most of the reach tential. Resting and feeding potential for larger fish ir. Some overhanging vegetation and moderate quantities er of sheltered areas, but very few pools exist for The generally shallow water depths and the limited number icant overwintering of fish in this reach.

WATER QUALITY No data available for this reach

AQUATIC BIOPHYSICAL INVENTORY

ELLS RIVER

Reach 7 (km 174 to km 180)



	164	
	FISH COLLECTIONS	SN ARGR LKCH LNDC LNSK SLSC WTSK
POINT SAMPLE DATA	LEGEND	& //
Location km 177.5 Date 01/06/78 Hydraulics	AN angling ARGR arctic grayling CF counting fence BKST brook stickieback 5 EN dip net BRMN brossy minnow	

Location	km 177.5
Date	01/06/78
Hydraulics	
channe width (m)	35
wet width (m)	35
maximum depth (m)	ND
average depth m)	08
velocity (m/s)	3 30
low character	rolling, broken
Substrate composition %)	
fines (< 2 mm)	20
gravels (2-64mm)	30
larges > 64 mm)	50
bedrock and/or billsorid	0
Bonk	
neight m)	1.3
form	repose
stability	stable
'exture	sand, gravel
vegetation % coverage)	
coniferous trees	15
deciduous trees	35
shrubs	65
grosses	50
barren	0
Nater Quality	
emperature (PC)	12.0
dissolved oxygen (mg/l)	ND
conductivity (umbos/cm)	ND
DH	ND

 An angling
 An

 CF
 counting fence

 CN
 dip net

 EF
 electrofisher

 GN
 gil net

 KS
 kick sample

 EF
 small fish collections made

 Using a combination of methods
 EF

 SN
 seine

 AP
 benthic algal productivity station

 BI
 benthic invertebrate collection site

 CH
 water quality station

 PS
 point sample

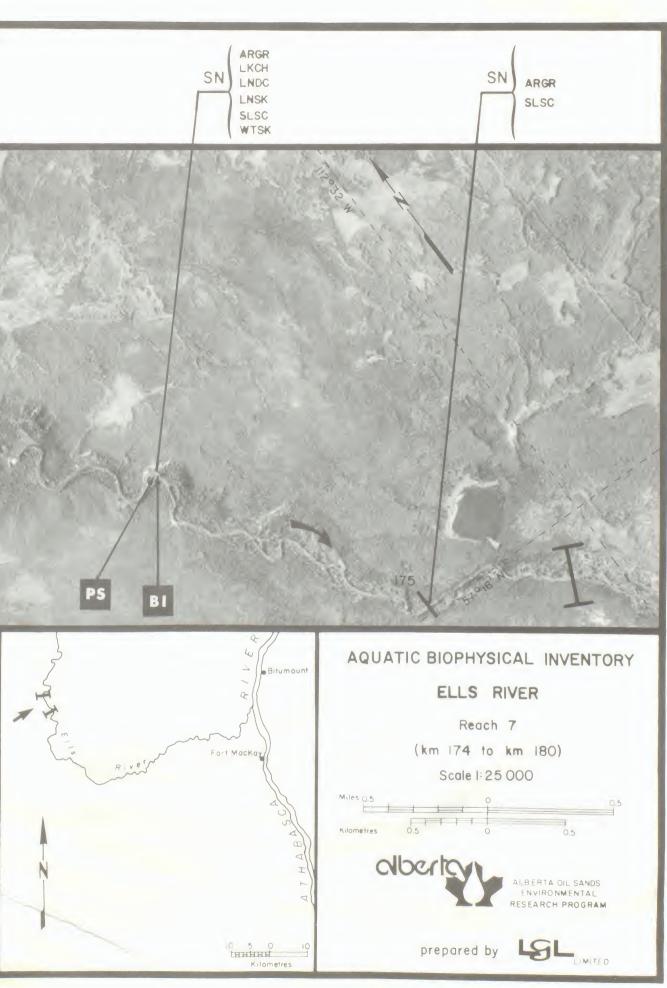
 SG
 stream gauging station

 Tow direction
 Treach boundary

 Upstream timit of survey
 I division between sections of

 Id reach
 areach

D	
RGR	arctic grayling
KST	brook stickleback
RMN	brassy minnow
URB	burbol
LVR	Dolly Varden
GGS	unidentified fish eggs
MSH	emerald shiner
LCH	flathead chub
SDC	finescale dace
TMN	fathead minnow
OLD	goldeye
ксн	lake chub
KCS	lake cisco
KWF	lake whitefish
NDC	longnose dace
NSK	onghose sucker
IT WF	mountain whitefish
RDC	northern redbelly dace
ISST	ninespine stickleback
TPK	northern pike
LDC	pearl dace
	slimy sculpin
PSC	spoonhead sculpin
PSH	spottail shiner
RPC	trout-perch
INSK	unidentified sucker species
VALL	walleye
VTSK	white sucker
LPR	yellow perch



grayling hub se dace	Adults ine September 0 0	Juveniles and Young-of-the-year		Reach length (km) Channel width (m) Channel area (ha)	13.0 30	River. The gradien
grayling hub se dace			Total Numbers	Gradient (m/km)	39.0 5.0	is composed of poo rocks and boulders
hub se dace	0 0	June September	June September	Flow character	swirling, rolling, broken	of gravels and fine
hub se dace	0	4 0	4 0	Total pools (2)	50	of deciduous trees
	0 5	6 3	6 8	Pattern	irregularly meandering	amount of overhang The spawning p
	0 0	4 38	4 38	Confinement Unstable banks (1)	confined 5	of the fish species
se sucker	0 0	99 32	99 32	Substrate composition (%)		-ubstrate sizes, w
n pike	0 2	0 1	0 3	fines (<2 mm)	15	attractive spawning
culpin	3 0	6 0	9 0	gravels (2-64 mm)	25	Substrates and mode
ified suckers	0 0	1 32	1 32	larges (=64 mm)	60	opportunities for
	0 0	0 1	0 1	bedrock and/or oil sand	0	the banks that are
ucker	0 0	134 19	134 19	Debris	moderate	habitat. Moderate
	3 7	254 126	257 133			Suckers, were captu
VERTEBRATES DODA Very Very 2 Meroptera Amilita Pohemirulla Stenanama Ita Optera Leucina Demptera Tanén ruha Stenanama Stenanama	Conife Decidu Shrubs Grasse Barren	erage (2) rous trees 5 55 40 s 30 0 cover (2) ng 2	BENTHIC ALGAL PRODUCTIVITY Standing crop expressed as mean: 435.0 × 10 ¹ maximum: 702.0 × 10 ¹ minimum: 36.0 × 10 ² Standing crop expressed as mean: 43.3 maxi um: 84.5 minimum: 24.0 Primary productivity (mg Comean: 20.6 maxi um: 52.5 minimum: 1.1 Data from Hickman et al. (198	cell counts (number ·m ⁻²)	TREAM GAUGING DATA Water Survey of Canada station nu Maximum total annual discharge: Minimum annual mean discharge: Minimum annual mean discharge: Minimum monthly mean discharge: Minimum monthly mean discharge: Minimum daily discharge: Maximum daily discharge: Minimum daily discharge: Minimum daily discharge: Minimum daily discharge: Minimum daily discharge:	203.5 x 10^{6} m [*] (1978) 108.4 x 10^{8} m ³ (1977) 6.46 m ³ /s (1978) 3.43 m [*] /s (1977) 25.46 m ³ /s (July 1975) 0.21 m ³ /s (March 1977) 34.83 ⁻ /s (July 6, 1975) 0.20 m [*] /s (Mar. 15, 1977) Loeppky and Spitzer (1977)

FISH UTILIZATION

is the most upstream reach of the surveyed portion of the Ells nt is relatively high and the flow character is mixed, varying olling to broken. Approxi ately half of the total reach area are the dominant substrate materials, but significant a punts es are also present. The riparian vegetation consists primarily and shrubs, With some scattered conifers. There is a small ing vegetation.

potential of this reach is considered to be excellent for many that occur in the Ells River, because of the diversity in ater velocities and water depths. The reach is a particularly area for those fish that prefer rocky substrates. Rocky erate quantities of debris provide good to excellent rearing ost fish species found in the Ells River. Some areas along shaded by overhanging vegetation also provide suitable rearing ly high numbers of young fish, particularly white and longnase ared in the reach during this study. Resting and feeding er fish is considered to be good, because of the numerous pools by debris. Suitable overwintering areas are found in the ly deep pools.

WATER QUALITY

Water Survey of Canada station nu ber OOATO7DA0100

	Mean	Maximum	Minimu
Total alkalinity (g CaCO /1)		211.6	37.8
pH Total bardness (pa CaCO (1)		72.6	
Total hardness (mg CaCO./1)	P - P		70
Conductance (uS/cm)	130	400	70
Total filterable	10	1 = 2	0.7
residue fixed (mg/1)	62	173	37
Total non-filterable			
residue fixed (mg/l)	4	56	-0.4
Total organic carbon (mg C/I)	13.0		7.0
Silica (mg SiOz/1)	3.8	12.5	0.4
Nitrate and nitrite nitrogen (mg N/1)	0.090	0.370	=0.003
Total Kjeldahl nitrogen (ng N/l)	1.00	7.85	0.10
Total Phosphorus (q P/1)	0.050	0.150	0.026
Orthophosphate (mg P/1)	0.010	0.040	< 0.003
Sulphate (mg S0./1)	6_4	9.5	3.2

Data for the period January 1976 to December 1979 obtained from the National Water Quality Data Bank (NAQUADAT).

AQUATIC BIOPHYSICAL INVENTORY

ELLS RIVER

Reach 8 (km 180 to km 193)



