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	Re				5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Re				6	•	•	•	•	•	·	•	•	•	•	•	•	•	•	•
	Re				7	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
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# FIREBAG RIVER



BERS OF FISH COLLECTED (1	978)						PHYSICAL CHARACTERISTICS		REACH DESCRIPTION AND FISH
Species lake chub lake whitefish longnose sucker northern pike walleye white sucker Total	May ND ND ND ND ND ND	Adults September 0 22 2 1 2 1 28		eniles and of-the-year September 3 1 0 0 2 0 - 6	-	1 Numbers September 3 23 2 1 4 1 34	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 sand Debris	13.0 95 123.5 0.3 swirling, rolling 90 irregularly meandering unconfined 40 95 5 0 0 10w	This reach, which regularly meandering an in at least the lower p tions in the Athabasca the lowest in the stud swirling and a high pro- is almost entirely find of the riparian vegetal Northern pike, wh stickleback, which were in the occasional grass whitefish, captured in lake whitefish prefer the substrates. Several for spawn over sandy substra River; they may spawn in tively good rearing are of log debris and grass jams, overhanging banks feeding areas for adult pike. The many pools an overwintering areas for
THIC INVERTEBRATES No benthic samples were taken in this reach.		RIPARIAN VEGETA Bank cover Conifero Deciduou Shrubs Grasses Barren Channel co Overhang Crown	age (%) bus trees is trees wer (%)	30 30 45 10 0 0	BENTHIC ALGAL	PRODUCTIVITY lable for this re		REAM GAUGING DATA Mo data available for this reach	
		Slow-moving poo	l condition	ns at km 5.			Swirling flow at km	9 is typical of reach 1.	

#### SH UTILIZATION

lies largely within the Athabasca River floodplain, is irand has many areas of unstable banks. Water levels and flow portion of this reach are affected by water level fluctua-River. Gradient and water velocities in this section are lied portion of the Firebag River. Water flow is primarily roportion of the reach is composed of pools. The substrate nes. Although deciduous shrubs are an abundant component ation, little of this growth overhangs the channel. hich were captured in this reach, and brook and ninespine re captured further upstream in the Firebag River, may spawn ssy shallows along the banks within this reach. Adult lake this reach during autumn, may also spawn here. Although to spawn over rocky substrates, they will spawn over sandy forage fish species (e.g., trout-perch and pearl dace) that trates were captured within other reaches of the Firebag in this reach. The reach is considered to be a relarea for fish because of the slow waters and the presence ssy shallows within which young fish may take refuge. Log ks, and the many deep pools provide excellent resting and It fish of larger piscivores such as walleye and northern and relatively deep water in the reach provide abundant or fish.

WATER QUALITY			
Water Survey of Canada station number	00AT07DC	0011	
	Mean	Maximum	Minimum
Total alkalinity (mg CaCO <sub>3</sub> /l) pH	111.7 7.77		7.68
Total hardness (mg CaCO <sub>3</sub> /1)	108.5	124.0	94.1
Conductance (µS/cm)	198	231	171
Total filterable			
residu <b>e</b> fixed (mg/1)	110	130	100
Total non-filterable			
residue fixed (mg/1)	6	13	<0.4
Total organic carbon (mg C/l)	9.2	11.0	7.0
Silica (mg SiO <sub>2</sub> /1)	11.8	16.0	9.7
Nitrate and nitrite nitrogen (mg N/l)	0.046	0.090	< 0.003
Total Kjeldahl nitrogen (mg N/1)	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 SO4/1)	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) albertar ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by LIMITED



Location		km 6.5
Date		26/05/78
Hydraulics	5	
chan	nel width (m)	60
weth	width (m)	60
	mum depth (m)	ND
	age depth (m)	2.0
	city (m/s)	0.70
flow	character	placid,swirling
	Composition (%)	
	(< 2 mm)	80
	els (2-64 mm)	10
	es(>64mm)	10
	ock and/or oil sand	0
Bank		
heigh	it(m)	3.5
form		repose
stabi	,	stable
lextu	re	sand
	tation (% coverage)	
	niferous trees	40
de	ciduous trees	20
sh	rubs	20
gr	asses	10
-	rren .	0
Water Quali		
	erature (°C)	9.0
	lved oxygen (mg/l)	ND
	uctivity (µmhos/cm)	ND
pН		ND

Ter De	
AN	angling
CF	counting fence
	dip net
EF	electrofisher
GN	gill net
	kick sample
SF	
SN	using a combination of methods seine
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
I	reach boundary
]	upstream limit of survey
ł	division between sections of a reach

ND	
ARGR	arctic grayling
BKST	broak 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
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch



## FIREBAG RIVER

## Reach I (km O to km 13) Scale 1: 25 000 Miles 0.5 0.5 0.5 Kilometres alberta ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by

	978)						PHYSICAL CHARACTERISTICS			REACH DESCRIPT This r
							Reach length (km)		32.5	meandering
							Channel width (m)		80	banks are d
				eniles and			Channel area (ha)		260.0	Reach 1 but
		Adults	Young	of-the-year	Tota	al Numbers	Gradient (m/km)		0.6	is moderate
Species	Мау	September	May	September	May	September	Flow character		swirling, rolling,	the total
									broken 90	waters. Fi
rctic grayling	0	0	1	0	1	0	Total pools (%) Pattern		irregularly meandering	trees prede
rook stickleback	0	0	1	0	1	0	Confinement		confined	vegetation
ake chub	0		37	0	37	0	Unstable banks (%)		25	Lake
ake whitefish	0	3 0	30	0	-	3 0	Substrate composit	ion (%)	22	River that
ongnose dace	0	0	0	1	30 0	1	fines (<2 mm)	1011 (%)	70	of other f
ongnose sucker		0	11		11		gravels (2-64 mm)	١	25	Because of
earl dace	0			0		0		)	3	potential
imy sculpin	0	0	9	2	9	2	larges (>64 mm) bedrock and/or o	il cond	2	numbers of
alleye	0	1	0	0	0	1		ii sano	low	presence o
ite sucker	0		73	0	73	1	Debris		TOW	tial for n
otal	0	5	162	3	162	8				deep water
Gyraulus Stagnicola ELECYPODA Musculium Sphaerium NSECTA Ephemeroptera Baetis Ephemerella Faraleptophlebia		Deciduou: Shrubs Grasses Barren Channel co Overhang Crown	ver (%)	35 10 20 0 0				Minim Maxim Minim Maxim Minim Data fo	um monthly mean discharge: um monthly mean discharge:	21.72 m <sup>3</sup> /s (1974 97.13 m <sup>3</sup> /s (Aug 7.08 m <sup>3</sup> /s (Feb 238.14 m <sup>3</sup> /s (Aug 6.94 m <sup>3</sup> /s (Feb n Loepoky and Spil
Odonata Ophiogomphus Plecoptera Isoperla			• • •						. 1.	*
Pteronarcys										
Taeniopteryx Trichoptera Amiocentrus Brachycentrus Cheumatopsyche Glossosoma Hydropsyche Lepidostoma Oecetis Polycentropus										
Taeniopteryx Trichoptera Amiocentrus Brachycentrus Cheumatopsyche Glossosoma Hydropsyche Lepidostoma Oecetis										

Broken waters at km 28.5.

Empididae

Swirling pool conditions, typical of reach 2, at km 36.

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.

WATE Wate Tota рH Tota 97.13 m<sup>3</sup>/s (August 1973) Cond 7.08 m<sup>3</sup>/s (February 1972) Tota 238.14 m<sup>3</sup>/s (Aug. 10, 1973) 6.94 m<sup>3</sup>/s (Feb. 10, 1978) re Tota re Loeppky and Spitzer (1977) ner (1979). Tota sil Nitr Tota Tota

WATER QUALITY			
Water Survey of Canada station number	00AT07DC	0010	
	Mean	Maximum	Minimum
Total alkalinity (mg CaCO <sub>3</sub> /l) pH	111.0 7.70	219.0 8.40	43.2 5.60
Total hardness (mg CaCO <sub>3</sub> /1)		227.0	
Conductance (µS/cm) Total filterable	208	433	105
residue fixed (mg/l) Total non-filterable	105	149	60
residue fixed (mg/l)	4	56	<0.4
Total organic carbon (mg C/1)	11.0	24.5	1.0
Silica (mg SiO <sub>2</sub> /1)	13.1	29.6	6.6
Nitrate and nitrite nitrogen (mg N/I)	0.080	0.400	<0.003
Total Kjeldahl nitrogen (mg N/l)	0.89	5.40	0.20
Total Phosphorus (mg P/l)	0.050	0.180	0.023
Orthophosphate (mg P/I)	0.020	0.060	0.005
Sulphate (mg SO.,/1)	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) albertary ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by LIMITED







	POINT SAM	PLE DATA	ł		L	EGEND			
Location	km 29.5	km 33	km 41	km 45	AN angling	ARGR	arctic grayling		R
Date	25/05/78	25/05/78	25/05/78	23/05/78	CF counting fence	BKST	brook stickleback	](	لر` _
Hydraulics					DN dipinet	BRMN	brassy minnow		Marguerite
channel width (m)	50	55	80	45	EF electrofisher	BURB	burbot	(2)	
wet width (m)	50	55	80	45	GN gill net	DLVR	Dolly Varden	4/R	M or J
maximum depth (m)	ND	ND	ND	ND	KS kick sample	EGGS	unidentified fish eggs		$( \sum_{n} )$
average depth (m)	2.0	1.0	1.0	1.0	SF small fish collections made	EMSH	emerald shiner	T . Mar	$\rightarrow$
velocity (m/s)	0.80	0.80	0.90	1.40	using a combination of methods	FLCH	flathead chub	all mer	
flow character	placid,	swirling	swirling,	rolling,	SN seine	FSDC	finescale dace		
	swirling	-	rolling	broken	AP benthic algal productivity station	FTMN	fathead minnow	2	°~~ /
Substrate Composition (%)						GOLD	goldeye		<b>*</b> {
fines (< 2 mm)	80	40	30	25	BI benthic invertebrate collection site	LKCH	lake chub		5 V~
gravels (2-64 mm)	20	30	20	15		LKCS	lake cisco	V) McChilland	}
larges(>64mm)	0	30	50	60	CH water quality station	LKWF	lake whitefish		£ <sup>7</sup>
bedrock and/or oil sand	0	0	0	0		LNDC	longnose dace	S Lake	7
Bank					PS point sample	LNSK	longnose sucker		Summer >
height (m)	4.5	0.8	1.5	2.0		MTWF		st l	
form	repose	ND	repose	repose	SG stream gauging station	NRDC	northern redbelly dace	A	
stability	stable	ND	stable	stable		NSST	ninespine stickleback		Viller
texture	sand	sand, clay	sand,	sand	35 kilometres from mouth	NTPK	northern pike	₹ / Bitumount	
		city	clay			PLDC	pearl dace	лI	<u>}</u>
vegetation (% coverage)					flow direction	SLSC	slimy sculpin		}
coniferous trees	30	40	60	45		SPSC	spoonhead sculpin	7	
deciduous trees	20	30	30	25	reach boundary	SPSH	spott <b>a</b> il shiner		÷.
shrubs	15 -	15	20	55		TRPC	trout-perch		}
grasses	15	20	20	30	upstream limit of survey	UNSK	unidentified sucker species		
barren	10	0	0	0		WALL	walleye		
Water Quality				12.0	division between sections of	WTSK	while sucker		
temperature (°C)	11.0	11,0	11.0	12.0	a reach	YLPR	yellow perch	Fort MacKay 🖌	
dissolved oxygen (mg/l)	ND	ND	ND	ND					10 5 0 10
conductivity (µmhos/cm)	ND	ND	ND ND	ND ND					Тнини
На	ND	ND	NU	NU					Kilometres



NUMBERS OF FISH COLLECTED (19	978)						PHYSICAL CHARACTERISTICS Reach length (km)	6.5	REACH DESCRIPTION AND This section to 40 m high and u
		Adults	Juve Young-	eniles and of-the-yea	ar Total	Numbers	Channel width (m) Channel area (ha) Gradient (m/km)	45 29.3 1.9	moderately high. and pools comprise boulders) and grav
Species	May	September	May	Septembe		September	Flow character	rolling	nant component of
arctic grayling	1	1	1	0	2	1	Total pools (%)	50	shrubs and grasses
lake chub	0	0	136	381	136	381	Pattern	irregular	hangs the river.
longnose dace	0	0	0	19	0	19	Confinement	frequently confined	The potential lent for most fish
longnose sucker	5	1	56	10	61	11	Unstable banks (%) Substrate composition		substrate sizes, c
northern pike	0	2	0	0	0	2	fines (<2 mm)	10	collected in late
pearl dace	0	0	13	0	13	0	gravels (2-64 mm)	25	arctic grayling an
slimy sculpin	0	0	0	3	0	3	larges (>64 mm)	60	The combination of
trout-perch	0	0	11	0	11	0	bedrock and/or oil	sand 5	hanging vegetation
unidentified suckers	0	0	0	20	0	20	Debris	low	rearing areas for
white sucker	0	0	251	27	251	27			chub, white sucker
Total	6	4	468	460	474	464			forage fish prefer
									prefer rocky subst
									numerous pools pro
									high numbers of fo
									for piscivorous fi
									tively shallow wat
		en rent 1967 och som svervarige (krans som för	2	T	n a na ant an			STREAM GAUGING DATA	
BENTHIC INVERTEBRATES OLIGOCHAETA	-	RIPARIAN VEGETA			BENTHIC ALGAL	PRODUCTIVITY			
GASTROPODA Physa		Bank cover Conifero	age (%) us trees	20	No data av	ailable for th	is reach	No data available for this	reach
PELECYPODA		Deciduou		40					
Musculium INSECTA		Shrubs Grasses		20 20					
Ephemeroptera <i>Baetis</i>		Barren		0					
Rhithrogena		Channel co							
<i>Stenonema</i> Odonata		Overhang Crown		2 0					
Ophiogomphus									
Plecoptera Isoperla									
Trichoptera Cheumatopsyche				X					
Glossosoma	100	Kare	A.A.						
<i>Hydropsyche</i> Diptera							1845 W		
Chironomidae	and a second								
Chironominae Tanypodinae									
Orthocladiinae				and the	CONTRACTOR IN				
Rhagionidae Atherix			E. M.						
	19 <sup>76</sup>		14						
	17. ju	les de la							
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		1 March 1	arine the						
			14 1 5 " A	and the second			21년 19일 전화·전경 2017년 - 11년 11년 11년 11년 11년 11년 11년 11년 11년		
						in les			
		- 1949 - 1949 - 			are the rest of the state	REFERENCIA - :			
	A	placid section	ı at km 51.	5 near the	e upper boundary	y of reach 3.			

### ND FISH UTILIZATION

on is a short, irregularly meandering reach. River banks are up unstable areas are common. Water velocities and gradient are Flow character throughout the reach is almost entirely rolling, se about half of the total reach area. Larges (rubble and avels are dominant substrates. Deciduous trees form the domiof the riparian vegetation, and coniferous trees, deciduous es are all present in smaller amounts. Some vegetation over-

al of this reach for spawning is considered to be good or excelsh that occur in the river, because it contains a diversity of current velocities and water depths. Unidentified fish eggs, e May, provided proof of spawning in the reach. Adults of and longnose sucker, both spring spawners, were captured in May. of occasional grassy shallow backwaters, areas shaded by overon, and substrate composed of gravels and larges provides good most fish species in the river. Large numbers of young lake er and longnose sucker were captured in this reach. Most young er the quiet sheltered areas, whereas young arctic grayling strates. The areas of overhanging riparian vegetation and the rovide good resting and feeding areas for larger fish. The forage fish, particularly lake chub, provide a good food source fishes. Although there are many pools in this reach, the relaater depths may preclude overwintering of fish.

WATER QUALITY

No data available for this reach

## AQUATIC BIOPHYSICAL INVENTORY

## FIREBAG RIVER

Reach 3 (km 45.5 to km 52.0)







POINT	SAMPLE	DATA

	PUINI	SAN
Location		km 5
Date		23/0
Hydraulics		
channel width (m)		45
wet width (m)		45
maximum depth (m)		ND
average depth (m)		0.7
velocity (m/s)		0.95
flow character		rolling
Substrate Composition (%)		
fines (< 2mm)		25
gravels (2-64mm)		25
larges(>64mm)		50
bedrock and/or oil sond		0
Bank		
height(m)		1.5
form		repos
stability		stable
texture		clay,
vegetation (% coverage)		
coniferous trees		10
deciduous trees		65
shrubs		25
grasses		30
barren		0
Water Quality		
temperature (°C)		12.0
dissolved oxygen (mg/l)		ND
conductivity (µmhos/cm)		ND
рH		ND



D	
RGR	arctic grayling
KST	brook stickleback
RMN	brossy minnaw
URB	burbot
LVR	Dolly Varden
GGS	unidentified 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
SST .	ninespine stickleback
TPK	northern pike
_DC	pearl dace
LSC	slimy sculpin
PSC	spoonhead sculpin
PSH	spottail shiner
RPC	trout-perch
NSK	unidentified sucker species
ALL	walleye
TSK	white sucker
LPR	yellow perch



	β	dults		eniles and of-the-year	Tot	al Numbers
Species	May	September	May	September	May	September
rctic grayling	3	0	3	0	6	0
ake chub	0	0	0	132	0	132
ongnose dace	0	0	0	50	0	50
ongnose sucker	2	0	1	23	3	23
inespine stickleback	0	0	0	2	0	2
orthern pike	0	4	0	0.	0	4
earl dace	0	0	0	10	0	10
limy sculpin	0	0	2	3	2	3
rout-perch	0	0	0	3	0	3
nidentified suckers	0	0	0	5	0	5
alleye	1	2	1	0	2	2
hite sucker	0	5	2	14	2	19
	_	_	_			
a - Da y Yu (- dalami ya ang sa					ang dan Maria da Kabu	
	R	IPARIAN VEGETA	TION	BENT	THIC ALGAL	PRODUCTIVITY
THIC INVERTEBRATES NEMATODA PELECYPODA Sphaerium INSECTA Ephemeroptera Baetis Ephemerella Rhithrogena Odonata Ophiogomphus Plecoptera Diura Isoperla Pteronarcys	R	IPARIAN VEGETA Bank cover Conifero Deciduou: Shrubs Grasses Barren Channel co Overhang Crown	age (%) us trees s trees	10 70 20 45 0 2 0		<u>PRODUCTIVITY</u> wailable for thi

Swirling flow character at km 60.5 is representative of reach 4.

Sand and clay bank at km 71.5.

TERISTICS

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 (%)				
fines (<2 mm)	15			
gravels (2-64 mm)	35			
larges (>64 mm)	40			
bedrock and/or oil sand	10			
Debris	moderate			

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 overhang 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.

Tanypodinae Simuliidae Rhagionidae Atherix Empididae

STREAM GAUGING DATA

No data available for this reach

WATER QUALITY No data available for this reach

## AQUATIC BIOPHYSICAL INVENTORY

## FIREBAG RIVER

Reach 4 (km 52 to km 75)





	PUINT	SAMPLE DATA	
		km 57.5	
		23/05/78	
th (m)		50	

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,ro
Substrate Composition (%)		
fines (< 2 mm)	90	20
grovels (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
grosses	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
		and the states of the

and in		
		LEGE
	angling	
CF		
	dip net	
	electrofisher	
	gill net	
	kick somple	
SF	small fish collections made	
SN	using a combination of methods seine	
ΑP	benthic algal productivity station	
BI	benthic invertebrate collection site	•
СН	water quality station	
PS	point sample	
SG	stream gauging station	
35	kilometres from mouth	
K	flow direction	
Ι	reach boundary	
]	upstream limit of survey	
!	division between sections of a reach	

R	arctic grayling
Т	brack stickleback
٨N	brassy minnow
۶B	burbot
R	Dolly Varden
s	unidentified fish eggs
SH	emerald shiner
н	flathead chub
С	finescale dace
IN	fathead minnow
D	goldeye
н	lake chub
S	lake cisco
Æ	lake whitefish
C	longnose dace
K	longnose sucker
NF	mountain whitefish
C	northern redbelly dace
Τ	ninespine stickleback
ΡK	northern pike
¢	pearl dace
C	slimy sculpin
С	spoonhead sculpin
н	spottail shiner
C	trout-perch
Ж	unidentified sucker species
L.	walleye
5K	white sucker
R	yellow perch



BERS OF FISH COLLECTED (	978)						PHYSICAL CHARACTERISTICS Reach length (km)	21.0	REACH DESCRIPTION AND This reach is of the reach area i
		Adults		eniles and of-the-year	Tot	al Numbers	Channel width (m) Channel area (ha) Gradient (m/km)	50 105.0 1.7	Areas of unstable Moderate water velo ter varies from sw
Species	May	September	May	September	May	September	Flow character	swirling, rolling	marily of larges an
		-					Total pools (%)	broken 25	grasses and deciduo
arctic grayling Tathead chub	. 0 0	3 0	0	35	0	38 1	Pattern	irregularly meandering	The diversity
ake chub	0	0	0	12	0	12	Confinement	frequently confined	good spawning area
ongnose dace	0	0	0	4	0	4	Unstable banks (%)	30	the Firebag River.
gnose sucker	0	0	0	2	0	2	Substrate composition (%	:)	and pearl dace and
ern pike	0	4	0	-	0	5	fines (<2 mm)	10	in areas with fine
-perch	0	0	o	2	0	2	gravels (2-64 mm)	40	species found in the
ntified suckers	0	0	0	10	0	10	larges (>64 mm)	50	strates composed of from an area with r
e sucker	0	1	3	1	3	2	bedrock and/or oil san	d 0	by overhanging ripa
1	0	8		68		76	Debris	low	provide good rearin
									river, and the abu young arctic grayl captured in this re suitable areas for areas provide good is limited to the f
TROPODA Gyraulus ECYPODA Musculium Sphaerium ECTA phemeroptera Baetis Stenonema Claassenia Diura Isoperla Pteronarcys		Bank covera Coniferou Deciduous Shrubs Grasses Barren Channel cov Overhang Crown	us trees s t <b>re</b> es	10 55 35 40 20 2	NO GATA 2	available for t	s reach	No data available for this re.	acn
Trichoptera Cheumatopsyche Glossosoma Hydropsyche Lepidostoma Coleoptera Elmidae Diptera Chironomidae Chironominae Tanypodinae Simuliidae Rhagionidae Rhagionidae Atherix Empididae									
						al de la constante de la const Internet de la constante de la c			

### FISH UTILIZATION

essentially a riffle area. Only a relatively small proportion is composed of pools, and waters are generally shallow. river banks are numerous in this irregularly meandering reach. ocities and gradient prevail in this reach and the flow characirling to rolling to broken. The substrate consists prind gravels. Riparian vegetation is mostly deciduous trees, ous shrubs, some of which overhang the banks. of water velocities, water depths and substrate sizes provide which are suitable for most fish species that are found in Fine substrates are suitable for spawning of trout-perch also possibly for spawning of lake whitefish. Grassy shallows substrates are suitable for northern pike spawning. All other he river (including arctic grayling) may spawn over the subgravels and larges. Unidentified fish eggs were collected rubble and gravel substrates in this reach. Areas sheltered arian vegetation, grassy shallows and sheltered backwaters ng areas for the young of most fish species in the ndance of gravel and rubble substrates is excellent for ing. Relatively high numbers of young arctic grayling were

each. Backwaters sheltered by overhanging vegetation are most larger fish to rest and feed. The predominating riffle feeding habitat for arctic grayling. Overwintering potential few deep pools in the reach.

### WATER QUALITY

No data available for this reach









		POINT SAMPLE DATA
	Location	km 94
	Date	22/05/78
	Hydraulics	
	channel width (m)	55
	wet width (m)	55
	maximum depth (m)	ND
	average depth (m)	0.4
	velocity (m/s)	0.90
	flow character	rolling,broken
	Substrate Composition (%)	
	fines (< 2 mm)	20
	gravels (2–64mm)	50
	larges(>64mm)	30
	bedrock and/or oil sand	0
	Bank	
	height (m)	0.3
	form	repose
	stability	stable
	texture	ND
	vegetation (% coverage)	
	coniferous trees	10
	deciduous trees	75
	shrubs	25
	grasses	30
	barren	0
	Water Quality	
	temperature (°C)	13.0
	dissolved oxygen (mg/l)	ND
	conductivity (µmhos/cm)	ND
	рH	ND
88		

1.	
	LE
CF	angling counting fence dio net
EF GN	electrofisher gill net kick sample
	small fish collections made using a combination of methods seine
AP	seine benthic algal productivity station
	benthic invertebrate collection site
	water quality station point sample
SG	stream gauging station
35	kilometres from mouth
	flow direction
Ī	reach boundary
]	upstream limit of survey
ł	division between sections of a reach

EGEND	
ARGR	arctic grayling
BKST	brook stickleback
BRMN	brassy minnaw
BUR8	burbot
DLVR	Doily 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
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
<b>W</b> TSK	white sucker
YLPR	yellow perch



MBERS OF FISH COLLECTED (19	78)						PHYSICAL CHARACTERISTICS Reach length (km)	27.0	REACH DESCRIPTION AND FISH This section, the m that was surveyed, meand
		Adults		eniles and of-the-year	Tota	al Numbers	Channel width (m) Channel area (ha) Gradient (m/km)	30 81.0 3.3	zone with the occasional This reach has the steep the surveyed portion of
Species	May	September	May	September	May	September	Flow character	rolling, broken	character is rolling and
arctic grayling	1	1	3	47	4	48	Total pools (%)	30	pools. As in Reach 5, g
lake chub	0	0	0	1	0	1	Pattern	irregularly meandering	strate material. Decidu
longnose dace	0	0	1	5	1	5	Confinement	unconfined	channel in some areas.
longnose sucker	0	1	1	0	1	j	Unstable banks (%)	5	The potential of th
inespine stickleback	0	0	0	2	0	2	Substrate composition (%)		considered to be excelle
orthern pike	5	7	0	12	5	19	fines (<2 mm)	10	areas for northern pike
limy sculpin	0	0	2	5	2	5	gravels (2-64 mm)	30	are excellent spawning a
rout-perch	0	0	0	1	0	]	larges (>64 mm)	60	Walleye in the reach may
nidentified suckers	0	0	0	31	0	31	bedrock and/or oil sand	0	northern pike and walley
alleye	2	0	0	0	2	0	Debris	low	potential for sport fish
white sucker	0	8	0	1	0	9	]		arctic grayling were cap
		_	-						northern pike were captu
lotal .	8	17	7	105	15	122			riffle areas should prov northern pike and walley
NTHIC INVERTEBRATES GASTROPODA Ferrissia PELECYPODA Musculium INSECTA Ephemeroptera Stenonema Trichoptera Ceraalea Cheumatopsyche Glossosoma Polycentropus Coleoptera Elmidae Diptera	<u> </u>	IPARIAN VEGETAT Bank covera Conifero Deciduous Shrubs Grasses Barren Channel co Overhang Crown	age (%) us trees s trees	25 15 40 25 0 2 2 0		<u>PRODUCTIVITY</u>		<u>AM GAUGING DATA</u> No data available for this rea	ch
Tipulidae Chironominae Tanypodinae Orthocladiinae									
	()								

### FISH UTILIZATION

, the most upstream reach of the portion of the Firebag River , meanders irregularly and is primarily an extensive riffle asional moving pool. The river banks are generally stable. e steepest gradient and highest water velocities encountered in ion of the Firebag River. Waters are shallow and the flow ing and broken. A relatively small proportion of the reach is ch 5, gravels and larges are the dominant components of the sub-Deciduous shrubs dominate riparian vegetation and overhang the

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

WATER QUALITY No data available for this reach





	POINT	Ş
Location		kr
Date		2
Hydraulics		
channel width (m)		5
wet width (m)		5
maximum depth (m)		N
average depth (m)		
velocity (m/s)		N
flow character		p
Substrate Composition (%)		
fines (< 2 mm)		4
gravels (2-64mm)		2(
larges(>64mm)		4(
bedrock and/or oil sand		
Bank		
height (m)		
form		re
stability		SI
texture		S
vegetation (% coverage)		
coniferous trees		1
deciduous trees		3
shrubs		5
grasses		8
barren		
Water Quality		
temperature (°C)		12
dissolved oxygen (mg/l)		NN
conductivity (µmhos/cm)		N
рН		IN

ND	
ARGR	arctic grayling
BKST	brook stickleback
BRMN	brassy minnaw
BURB	burbo1
DLVR	Dolly Varden
EGGS	unidentified fish eggs
EMSH	emercld shiner
FLCH	flathead chub
FSDC	finescale dace
FTMN	fathead minnow
GOLD	goldeye
LKCH	lake chub
LKCS	lake cisco
LKWF	lake whilefish
LNDC	longnose dace
LNSK	longnose sucker
MTWF	mountain whitefish
NRDC	northern redbelly dace
NSST	ninespine stickleback
NTPK	northern pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker spec
WALL	walleye
WTSK	white sucker
YLPR	yellow perch





	POINT	SAMPLE D	ATA
Location		km 115.5	km 121
Date		21/05/78	21/05/78
Hydraulics			
channel width (m)		25	35
wet width (m)		25	35
maximum depth (m)		ND	ND
average depth (m)		0.8	1.0
velocity (m/s)		ND	1.20
flow character		rolling	rolling, broken
Substrate Composition (%)			
fines (< 2 mm)		0	2
grovels (2-64mm)		25	3
larges(>64mm)		75	95
bedrock and/or oil sand		0	0
Bank			
height (m)		2.0	2.5
form		repose	repose
stability		stable	stable
texture		ND	ND
vegetation (% coverage)			
coniferous trees		ND	30
deciduous trees		ND	20
shrubs		20	10
grasses		70	70
barren		0	0
Water Quality			
temperature (°C)		ND	14.0
dissolved oxygen (mg/l)		ND	ND
conductivity (µmhos/cm)		ND	ND
ρН		ND	ND

23	The start of the second start of the second se	2 S 1824
		LEGEND
N	angling	AR
	counting fence	BKS
N	dip net	BR
	electrofisher	BU
N.	gill net	DLV
5	kick sample	EGO
-	smoll fish collections made	EM
	using a combination of methods	FLO
N	seine	FSD
Р	benthic algal productivity station	FT
·	bernike digat productivity station	GO
1	benthic invertebrate collection site	LKO
	beinne intertebiere concertor site	. LK
н	water quality station	LK/
	wordt quointy station	LN
s	point sample	LN
		MT
G	stream gauging station	NR
	, ,	NS
5	kilometres from mouth	NT
		PL
6	flow direction	SLS
-		SPS
Т	reach boundary	SP
-		TRI
1	upstream limit of survey	UN
7		WA
i.	division between sections of	WT
ŀ	a reach	YL

)	
GR	arctic grayling
ST	brook stickleback
MN	brassy minnow
RB	burbot
VR	Dolly Varden
GS	unidentified fish eggs
ISH	emerald shiner
СН	flathead chub
DC	finescale dace
MN	fathead minnow
LD	goldeye
СН	lake chub
CS	lake cisco
WF	lake whitefish
DC	iongnose dace
ISK	longnose sucker
WF	mountain whitefish
DC	northern redbelly dace
ST	ninespine stickleback
PK	northern pike
DC	pearl dace
SC	slimy sculpin
SC	spoonhead sculpin
SH	spottail shin <del>er</del>
PC	trout-p <b>erch</b>
ISK	unidentified sucker species
LL	walleye
rsk	white sucker
PR	yellow perch



#### AQUATIC BIOPHYSICAL INVENTORY FIREBAG RIVER Reach 6 Section 2 (km 109.5 to km 123.0) Scale 1: 25000 Miles 0.5 Cost o 0.5

# MARGUERITE RIVER



							2.		
BERS OF FISH COLLECTED (1 Species arctic grayling lake chub longnose dace longnose sucker northern pike slimy sculpin trout-perch unidentified suckers white sucker Total	Adu	11ts September 1 0 1 2 0 1 0 0 5		eniles and of-the-yea Septembe 0 8 13 10 0 1 7 3 8 50		1 numbers September 1 8 13 11 2 1 8 3 8 55	PHYSICAL CHARACTERISTICS Reach length (km) Channel width (m) Channel area (ha) Gradient (m/km) Flow character Total pools (%) Pattern Confinement Unstable banks (%) Substrate compositi fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oi Debris	3.0 40 12.0 1.4 broken, tumbling 10 irregular . frequently confined 10 on (%) 10 25 45	REACH DESCRIPTION AND FIS A relatively shor the river banks are re- gradient is the second A low proportion of th ter is primarily broke the river flows over 1 gravels and larges pre- riparian vegetation and the channel. The diversity of are probably suitable River. Arctic graylin spawn over the rocky st either the rocky or the suckers, both spring st strates, moderate quant rearing areas for seven captured in this reach low number of pools, th sidered to be low, alth are shaded by overhang of pools preclude sign
THIC INVERTEBRATES GASTROPODA Stagnicola PELECYPODA Musculium Sphaerium INSECTA Ephemeroptera Baetis Drunella Ephemera Paraleptophlebia Stenonema Plecoptera Pteronarays Trichoptera Cheumatopsyche Glossosma Lepidostoma Diptera Chironomidae Tanypodinae Rhagionidae Atherix Empididae		ARIAN VEGETAT Bank covera Coniferou Deciduous Shrubs Grasses Barren Channel cov Overhang Crown	nge (%) s trees trees	20 40 20 40 0	BENTHIC ALGAL No data av	PRODUCTIVITY vailable for thi	s reach	<u>STREAM GAUGING DATA</u> No data available for this r	each
	Marg	guerite River	r at km 0.	5.					

#### JTILIZATION

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

bstrate types in this reach provides spawning areas which r many of the fish species found in the Marguerite mountain whitefish, suckers, and some of the minnows may strates, and the remaining species may spawn over sandy substrates. Adult arctic grayling and longnose wners, were captured here in the spring. The rocky subties of debris, and overhanging vegetation provide some l fish species. Young individuals of seven species were Because of the relatively high water velocities and resting and feeding potential for larger fish is conugh some larger fish may inhabit areas near the banks which g vegetation. Shallow water depths and the low number icant overwintering of fish in the reach.

NATER QUALITY No data available for this reach

## AQUATIC BIOPHYSICAL INVENTORY MARGUERITE RIVER

Reach I (km O to km 3)





	PUINT	SAMP
cation		km 0.5
ite		28/05/
draulics		
channel width (m)		50
wet width (m)		50
maximum depth (m)		ND
average depth (m)		1.0
velocity (m/s)		1.00
flow character		swirling
bstrate Composition (%)		
fines (< 2 mm)		5
gravels(2-64mm)		45
larges(>64mm)		50
bedrock and/or oil sand		0
ink		-
height (m)		2.5
form		repose
stability		stable
texture		sand
vegetation (% coverage)		
coniferous trees		5
deciduous trees		70
shrubs		30
grasses		50
borren		0
ater Quality		
temperature (°C)		10.0
dissolved oxygen (mg/l)		ND

Sa.2-20	ACA	A. Although the company with the standard of
	AN	angling
	CF	counting fence
	DN	dip net
	٤F	electrofisher
	GN	gill net
i		kick sample
	SF	small fish collections made
	SN	using a combination of method seine
	ΑP	benthic algol productivity station
	BI	benthic invertebrate collection
	СН	water quality station
	PS	point sample
	SG	stream gauging station
	35	kilometres from mouth
	K	flow direction
	I	reach boundary
	]	upstream limit of survey
		division between sections of a reach

END	
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
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker specie
WALL	walleye
WTSK	white sucker
YLPR	yellow perch



BERS OF FISH COLLECTED (	(1978)						PHYSICAL CHARACTERISTICS		REACH DESCRIPTION AND FISH This section is to
							Reach length (km) Channel width (m)	15.5 30	swirling or placid pool
			lov	eniles and			Channel width (m) Channel area (ha)	46.5	strate is mostly fines we deciduous shrubs are al
		Adults		-of-the-year	Tota	al Numbers	Gradient (m/km)	0.8	grasses are abundant.
Species	May	September	May	September	May	September	Flow character	placid, swirling	The predominating s
arctic grayling	0	0	3	0	3	0	Total pools (%) Pattern	90 tortuously meandering	of a few of the forage
brook stickleback	0	0	0	1	0	1	Confinement	confined	Areas with gravelly sub
lake chub	0	0	1	44	1	44	Unstable banks (%)	25	species found in the riv during the study. Rear
longnose dace	0	0	0	9	0	9	Substrate composition (%		moderate amount of over
ongnose sucker	0	0	2	14	2	14	fines (<2 mm)	70	
limy sculpin	0	0	0	4	0	4			the only suitable areas.
spoonhead sculpin	0	0	2	0	2	0	gravels (2-64 mm)	30	Moderate numbers of small
rout-perch	0	0	0	3	0	3	larges (>64 mm)	0	reach provide a food sou
nidentified suckers	0	0	0	7	0	7	bedrock and/or oil san		feeding potential for la
white sucker	0			8		8	Debris	low	of the many pools in the
nite sucker	-	0	3		3		1		excellent because of the
otal	0	0	11	90	11	90	1		
DLIGOCHAETA PELECYPODA <i>Musculium</i> INSECTA		Deciduou		25 25		available for th	is reach	STREAM GAUGING DATA No data available for this rea	ach
ELECYPODA Musculium NSECTA Hemiptera Corixidae Diptera Tipulidae Chironomidae Chironominae		Bank cove Conifero Deciduou Shrubs Grasses Barren Channel co Overhang	rage (%) Dus trees us trees				îs reach		ach
PELECYPODA Musculium NSECTA Hemiptera Corixidae Diptera Tipulidae Chironomidae		Bank cove Coniferc Deciduo Shrubs Grasses Barren Channel co	rage (%) Dus trees us trees	25 25 60 0			is reach		ach

### SH UTILIZATION

tortuously meandering and is essentially a long continuously ol. Gradient and water velocities are moderate. The subwith some gravels. Coniferous and deciduous trees and all important components of the riparian vegetation, and A moderate amount of vegetation overhangs the channel. sandy substrates provide areas suitable for spawning fish (e.g., trout-perch, pearl dace) found in the reach. ubstrates which may be suitable for spawning of the other river are limited. No adults were captured in this reach aring potential is considered to be poor to moderate; the erhanging vegetation and the small amount of debris provide as. Young lake chub were the most abundant fish collected. mall forage fish and young of larger species captured in the source for piscivores, such as northern pike. Resting and larger fish is considered to be good to excellent because the reach. Overwintering potential is considered to be the generally deep waters and large number of pools.

WATER QUALITY No data available for this reach

## 



	POINT	SAMPLE	DATA
Location		km 5	km 10.5
Date		27/05/78	27/05/78
Hydraulics			
channel width (m)		30	25
wet width (m)		30	25
maximum depth (m)		ND	ND
average depth (m)		ND	2.0
velocity (m/s)		0.80	0.80
flow character		placid	placid
Substrate Composition (%)			
fines (< 2 mm)		100	100
gravels(2-64mm)		0	0
larges(>64mm)		0	0
bedrock and/or oil sand		0	0
Bank			
height(m)		<b>5</b> .0	6.5
form		repose	repose
stability		stable	stable
texture		sond	sand
vegetation (% coverage)			
coniferous trees		80	25
deciduous trees		5	35
shrubs		10	20
grasses		75	10
barren		5	0
Water Quality			
temperature (°C)		10.0	10.0
dissolved oxygen (mg/l)		ND	ND
canductivity (µmhos/cm)		ND	ND
рН		ND	ND

		LE
	angling	
CF		
	dip net electrofisher	
	gill net	
	kick sample	
SF	small fish collections made	
SN	using a combination of methods seine	
AP	benthic algal productivity station	
ВΙ	benthic invertebrate collection site	•
СН	water quality station	
PS	point sample	
SG	stream gauging station	
35	kilometres from mouth	
K	flow direction	
Ι	reach boundary	
]	upstream limit of survey	
ł	division between sections of a reach	

	River Wargueri
	A McClelland Lake
	Bitumount
	Fort MacKay
100 C 10 C 10 C	IO 5 O IO HHHHH Kilometres

							Reach length (km) Channel width (m)	1.5	This reach is a sho is the highest and water of the Marguerite River.
<u></u>		Adults		eniles and of-the-year	Tota	Numbers	Channel area (ha)	3.8	the most abundant. Conii
Species	May	September	 May	September	May	September	Gradient (m/km) Flow character	3.0 broken, tumbling	are all important compone tion of the channel is co
					_		Total pools (%)	10	Because the reach co
ctic grayiing Ke chub	0 0	0	5	4	5	4	Pattern	irregularly meandering	and water depths, spawnin
ngnose dace	0	0	0	3	0	3	Confinement	confined	The collection of unident
ngnose sucker	0	0	0	2 7	1	2	Unstable banks (%)	25	in the reach. Rearing po
ntain whitefish	0	0	0	6	0	7 6	Substrate composition (		substrates, moderate quar
thern pike	0	2	0	0	0	2	fines (<2 mm)	30	hanging vegetation. Your
my sculpin	0	1	13	47	13	48	gravels (2-64 mm)	15	slimy sculpin were especi
it-perch	ů 0	0	1	0	1	0	larges (>64 mm)	40	fish is considered to be
dentified suckers	0	0	0	1	0	1	bedrock and/or oil sa		under overhanging vegetat
te sucker	0	0	4	4	4	4	Debris	moderate	of pools limit the restir
al	 0	- 3	24	74	24	77			depths and the low number
IC INVERTEBRATES IGOCHAETA RUDINEA ISECTA Ephemeroptera Baetis Drunella Rphemerella Stenonema Odonata Ophiogomphus Hemiptera Corixidae		RIPARIAN VEGET Bank cove Conifer Deciduo Shrubs Grasses Barren Channel co Overhang Crown	rage (%) ous trees us trees over (%)	25 25 25 25 25 0 10 0		PRODUCTIVITY vailable for th	is reach	<u>STREAM GAUGING DATA</u> No data available for this rea	ach
Trichoptera Ceraclea Glossosoma Lepidostoma Micrasema Oecetis Polycentropus Coleoptera Elmidae Diptera Tipulidae Psychodidae Chironomidae Chironominae Tanypodinae Orthocladiinae Simuliidae Rhagionidae Atherix Empididae								·	

#### UTILIZATION

hort section which is almost entirely riffles. Gradient er velocities the second highest in the surveyed portion r. Substrate types are varied, with larges and fines being niferous and deciduous trees, deciduous shrubs, and grasses ponents of the riparian vegetation and a fairly high proporcovered by overhanging shrubs.

contains a diversity of substrate sizes, current velocities, ning potential is considered to be good to excellent. entified fish eggs in late May provided proof of spawning potential is considered to be good because of the rocky uantities of debris, and the relative abundance of overbung of eight fish species were captured in this reach and ecially abundant. Resting and feeding potential for larger be poor to moderate; the major suitable areas being those tation. Relatively high water velocities and the low number ting and feeding potential for larger fish. Shallow water ber of pools probably preclude overwintering of fish.

WATER QUALITY No data available for this reach





	1978)						PHYSICAL CHARACTERISTICS Reach length (km) Channel width (m)	41.0 25	REACH DESCRIPTION AND F This is the long River, and it is esse velocities and gradie	gest o ential
	٨	dults		eniles and of-the-year	Tata	1 Numbers	Channel area (ha)	102.5	Most of the substrate	
Species	May	September	May	September	May	September	Gradient (m/km) 0.4 Flow character placid		areas. Riparian vegetatio and a relatively high prop	
			_	-			Total pools (%)	90	vegetation. Large qu	
rctic grayling rook stickleback	0	1	4	0	4	1	Pattern	irregularly meandering	The substrate ma	ateria
ake chub	0	0	0	2 244	0	2 244	Confinement	occasionally confined	majority of the fish	
ongnose dace	0	0	0	1	0	244	Unstable banks (%)	20	normally spawn over s	
ongnose sucker	ů O	õ	1	15	1	15	Substrate composition (	1	this reach. Large qu	
orthern pike	0	2	0	0	0	2	fines (<2 mm)	90	and low water velocit	
earl dace	0	0	0	4	0	- 4	gravels (2-64 mm)	0	Very high numbers of	
limy sculpin	0	1	0	17	0	18	larges (>64 mm)	10	in September. Excell	
poonhead sculpin	0	0	1	1	1	1	bedrock and/or oil sar Debris		the reach is provided	
rout-perch	0	0	0	22	0	22	Debris	high	tation and debris. F	
nidentified suckers	0	0	0	8	0	8			Although there are ma	any po
hite sucker	0	2	0	34	0	36			to overwinter in.	
otal	0	6	6	348	6	354		1		
Limmephilus/Phila Diptera Tipulidae Chironomidae Chironominae Tanypodinae Orthocladiinae	retus	Channel cc Overhang Crown		20 0						
	5.00 M C 2	Charles Street	A SALE	and the second second						
				1 (4 (4 - 1))						

### JTILIZATION

of the reaches in the surveyed portion of the Marguerite ally a long, irregularly meandering placid pool. Water are the lowest in the surveyed portion of the river. the reach is fines, but larges are present in some ion is dominated by coniferous trees and deciduous shrubs oportion of the channel area is covered by overhanging ities of debris are present in this reach.

ial in this reach is not suitable for spawning by the cies captured in the reach. A few forage fish that y substrates would find ample suitable spawning areas in ities of debris, an abundance of overhanging vegetation, provide good to excellent rearing areas in the reach. ng fish, particularly lake chub, were captured here resting and feeding habitat for larger fish in the many pools and areas sheltered by overhanging vegeivores have an abundant food supply in this reach. pools in the reach, they may not be deep enough for fish

ATER QUALITY

No data available for this reach

## AQUATIC BIOPHYSICAL INVENTORY MARGUERITE RIVER

Reach 4 (km 20 to km 61)







	POINT SAMPLE
Location	km 45
Date	27/05/78
Hydraulics	
channel width (m)	28
wet width (m)	28
maximum depth (m)	ND
average depth (m)	0.8
velocity (m/s)	0.40
flow character	placid
	•
Substrate Composition (%)	
fines (< 2mm)	100
gravels (2—64 mm)	0
larges(>64mm)	0
bedrock and/or oil sand	0
Bank	
height(m)	2.5
form	repose
stability	stoble
texture	sond
vegetation (% coverage)	
coniferous trees	10
deciduous trees	25
shrubs	40
grasses	20
barren	0
Water Quality	
temperature (°C)	8.0
dissolved oxygen (mg/l)	ND
conductivity (µmhos/cm)	ND
рН	ND
	en an state en anter a st

		LEGEND	
AN	angling	ARGR	07
CF	counting fence	BKST	br
DN	dip net	BRMN	br
EF	electrofisher	BURB	b
	gill net	DLVR	D
	kick sample	EGGS	ur
SF	small fish collections made	EMSH	er
	using a combination of methods	FLCH	fi
SN	seine	FSDC	fi
AP	benthic algal productivity station	FTMN	fc
	bennie alger productivity station	GOLD	ge
BI	benthic invertebrate collection site	LKCH	lo
		LKCS	la
СН	water quality station	LKWF	la
	Hoter duality station	LNDC	lo
PS	point sample	LNSK	lo
_		MTWF	m
SG	stream gauging station	NRDC	n
_	5 5 5	NSST	ni
35	kilometres from mouth	NTPK	n
		PLDC	р
	flow direction	SLSC	Ş
		SPSC	S
т	reach boundary	SPSH	sç
<b>т</b>	2	TRPC	tr
1	upstream limit of survey	UNSK	Uſ
-		WALL	w
	division between sections of	WTSK	w
1	a reach	YLPR	y



	ults						Reach length (km)	14.0		River. It is an irregu
,	September		eniles and of-the-year September	Tota 	1 Numbers September		Channel width (m) Channel area (ha) Gradient (m/km) Flow character	20 28.0 0.8 rolling, broken		water velocities are mo strate is characterized Deciduous trees are the relatively high proport
$\frac{0}{\frac{3}{3}}$	ND ND ND	$\frac{6}{7}$	ND ND ND	6 10 16	ND ND ND		Total pools (%) Pattern Confinement Unstable banks (%) Substrate composition fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil s	20 irregularly meande unconfined 5 (%) 20 20 40		As in Reach 4, large qu Although very few ditions are considered Marguerite River becaus substrate sizes. An ab strate materials provid The potential for resti fair; the few pools pre would be most suitable. pools limit overwinteri
RI	Bank cover Conifero Deciduou Shrubs Grasses Barren Channel co	age (%) us trees s trees ver (%)	15 65 20 10 0			s reach		<u>STREAM GAUGING DATA</u> No data available for	this reac	h
		RIPARIAN VEGETA Bank cover Conifero Deciduou Shrubs Grasses Barren Channel co Overhang	RIPARIAN VEGETATION Bank coverage (%) Coniferous trees Deciduous trees Shrubs Grasses Barren Channel cover (%) Overhang	RIPARIAN VEGETATION         Bank coverage (%)         Coniferous trees       15         Deciduous trees       65         Shrubs       20         Grasses       10         Barren       0         Channel cover (%)       0         Overhang       10	RIPARIAN VEGETATION       BENTHIC ALGA         Bank coverage (%)       No data         Coniferous trees       15         Deciduous trees       65         Shrubs       20         Grasses       10         Barren       0         Channel cover (%)       10	RIPARIAN VEGETATION       BENTHIC ALGAL PRODUCTIVITY         Bank coverage (%)       No data available for thi         Coniferous trees       15         Deciduous trees       65         Shrubs       20         Grasses       10         Barren       0         Channel cover (%)       0	RIPARIAN VEGETATION       BENTHIC ALGAL PRODUCTIVITY         Bank coverage (%)       No data available for this reach         Coniferous trees       15         Deciduous trees       65         Shrubs       20         Grasses       10         Barren       0         Channel cover (%)       10	RIPARIAN VEGETATION       Benthic ALGAL PRODUCTIVITY         Bank coverage (%)       Debris         Coniferous trees       15         Deciduous trees       65         Shrubs       20         Grasses       10         Barren       0         Channel cover (%)       0	RIPARIAN VEGETATION     BENTHIC ALGAL PRODUCTIVITY     Stream GAUGING DATA       Bank coverage (%) Conferous trees     BENTHIC ALGAL PRODUCTIVITY     STREAM GAUGING DATA       No data available for this reach     STREAM GAUGING DATA       No data available for this reach     No data available for Uverhang       Channel cover (%) Overhang     10	RIPARIAN VEGETATION       Benthic ALGAL PRODUCTIVITY         Bank coverage (%)       Stream GAUGING DATA         Conferous trees       15         Decidous trees       65         Shrubs       20         Grasses       10         Barren       0         Channel cover (%)       0         Overhang       10

### SH UTILIZATION

e uppermost section of the surveyed portion of the Marguerite gularly meandering section with stable banks. Gradient and moderate and the majority of the reach is riffles. The subed by an abundance of larges mixed with fines and gravels. he dominant component of the riparian vegetation and a rtion of the channel is shaded by overhanging vegetation. quantities of debris are present in this reach. W fish were collected in this reach during the study, cond to be excellent for spawning of most fish species in the use of the diversity of water depths, water velocities and abundance of debris, overhanging vegetation, and rocky subides good to excellent rearing conditions for most fish. ting and feeding of larger fish is considered to be only resent and those areas shaded by overhanging vegetation e. Shallow water depths and the relative paucity of deep

ing potential in this reach.

WATER QUALITY No data available for this reach





	POINT SAMPLE DAT
Location	km 6l
Date	27/05/78
Hydraulics	
channel width (m)	50
wet width (m)	50
maximum depth (m)	ND
average depth (m)	ND
velocity (m/s)	1.20
flow character	swiring, broken
Substrate Composition (%)	
fin <b>es (&lt;</b> 2mm)	50
gravels(2-64mm)	10
lorges(>64mm)	40
bedrock and/or oil sand	0
Bank	
height (m)	2.5
form	repose
stability	stoble
lexture	sand
vegetation (% coverage)	
coniferous trees	35
deciduous trees	20
shrubs	40
grosses	30
borren	0
Water Quality	
temperature (°C)	8.0
dissolved oxygen (mg/l)	ND
conductivity (µmhos/cm)	ND
ρH	ND

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
flow direction
I reach boundary
I upstream limit of survey

division between sections of a reach

END	
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 doce
LNSK	longnose sucker
MTWF	mountain whitefish
NRDC	northern redbelly doce
NSST	ninespine stickleback
NTPK	northern pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shin <del>er</del>
TRPC	trout-p <b>erch</b>
UNSK	unidentified sucker species
WALL	wolleye
WTSK	white sucker
YLPR	yellow perch



# AQUATIC BIOPHYSICAL INVENTORY MARGUERITE RIVER Reach 5 (km 6l to km 75) Scale 1:25 000

ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM



# MUSKEG RIVER


NUMBERS OF FISH COLLECTED (SEPTER Species pearl dace slimy sculpin Total	HBER 1979) Juveniles and Adults Young-of-the-year 0 2 0 2 0 4	r Total Numbers	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 un of fines and gravels, substantial proportio deciduous trees. Dec are present. Little Although the san 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 of the Muskeg River extends 0.5 km upstream from the con- abasca River. It lies within the floodplain of the Athabasca antly influenced by fluctuations of water levels in that river. Tately high, and although pools comprise the majority of the ence of riffles is a prominent feature. There is a relatively istable banks. The substrate in most areas consists primarily but there are several areas with substrates containing ons of cobbles. The riparian vegetation is dominated by iduous shrubs are also fairly abundant and some conifers vegetation overhangs the river channel. and and gravel substrates and the variety of water velocities appear to provide areas suitable for spawning of several occur in the Muskeg River (e.g., arctic grayling, longnose trout-perch), most of these species are believed to spawn the Muskeg River. Rearing potential for most species is con- are ample shallow backwater areas that provide suitable and young-of-the-year of several species have been collected oresence of forage species and young-of-the-year suckers in the Muskeg River would appear to provide good forage for The mouth region may also be of some importance as a resting migrations of some species (e.g., lake whitefish and walleye) er. Water depths in this reach are generally shallow and may roverwintering of fish.
BENTHIC INVERTEBRATES OLIGOCHAETA GASTROPODA Ferrissia Gyraulus Stagnicola PELECYPODA Musculium INSECTA Ephemeroptera Stenonema Diptera Chironominae Tabanidae	RIPARIAN VEGETATION Bank coverage (%) Coniferous trees 5 Deciduous trees 70 Shrubs 30 Grasses 30 Barren 5 Channel cover (%) Overhang 2 Crown 0	BENTHIC ALGAL PRODUCTIVITY No data available for this re		STREAM GAUGING DATA No data available for this reach		WATER QUALITY         Water Survey of Canada station number 00AT07DA0079         Mean Maximum Minimum         Total alkalinity (mg CaC0 <sub>3</sub> /1)       255.0       79.0       113.6         PH       Cac03/1)       255.0       79.0       113.6         Total alkalinity (mg CaC0 <sub>3</sub> /1)       255.0       79.0       113.6         Total hardness (mg CaC0 <sub>3</sub> /1)       255.0       79.0       113.6         Total filterable       7.40         residue fixed (mg/1)       241       728       90         Total non-filterable       241       728       90         Total non-filterable       20.6       63.0       10.0         Total non-filterable       2.0       63.0       10.0       Silea (mg /1)       15.0       65.0       6.0       10.0       Silea (mg /1)       1.0       0.010       0.020       0.004       Silea (mg /1)



-							
NUMBERS OF FISH COLLECTED (SEP	PTEMBER 1979)			PHYSICAL CHARACTERISTICS		REACH DESCRIPTION AND F This irregularl	
				Reach length (km)	8.5	deep, narrow canyon	
				Channel width (m)	15	banks appear to be c	ompose
<b>C</b>	6.4.3.	Juveniles and	<b>T</b> . 1 <b>H</b> 1 .	Channel area (ha)	12.8	relatively high and	the re
Species	Adults	Young-of-the-year	Total Numbers	Gradient (m/km)	3.2	substrate consists p	
arctic grayling	0	2	2	Flow character	swirling, rolling,	present in pool area	
longnose dace	0	4	L <sub>1</sub>	Total pools (%)	broken 30	and shrubs, but coni	
pearl dace	3	8	11	Pattern	irregularly meandering	overhangs the river	
slimy sculpin	1	11	12	Confinement	entrenched	present along the ed	-
white sucker	0	2	2	Unstable banks (%)	55	The series of p	
Total	4	27	31	Substrate composition		provide excellent sp the Muskeg River (e.	
£	· · · · ·			fines (<2 mm)	10	dace, lake chub, sli	
				gravels (2-64 mm)	70	the sides of the cha	
				larges (>64 mm)	20	shelter, are good re	
				bedrock and/or oil s	sand 0	gravel riffles provi	
				Debris	moderate	of this reach are ve	
						variety of forage sp	
						Water depths in the	
						suitable overwinteri	ng sit
		FTATION					
GASTROPODA	RIPARIAN VEG	ETATION	BENTHIC ALGAL PRODUCTIVITY		STREAM GAUGING DATA		WAT
Ferrissia Gyraulus		verage (%) erous trees 15	No data available for th	is reach	No data available for this re	ach	
Stagnicola	Decid	uous trees 65					
PELECYPODA Musculium	Shrub Grass						
INSECTA	Barre						
Ephemeroptera <i>Baetis</i>	Channe I	cover (%)					
Baetisca Ephemerella	Overh Crown						
Stenonema	CTOWN	۷.					
Odonata Ophiogomphus							
Plecoptera Acroneuria	1	7	· · · · · · · · · · · · · · · · · · ·				1
Acroneuria Diura		i da u					
Isogenus Oemopteryx		A Carter State					
Pteronarcys						and the first of the second	
<i>Taeniopteryx</i> Trichoptera						Contraction of the second	
Brachycentrus							
Cheumatopsyche Hudropsyche						t ASTA	┣──
Hydropsyche Lepidostoma							
Oecetis Polycentropus				Sector States			Α
Coleoptera							
Dryopidae Elmidae			ALL OF SUVER		and the second second		
Diptera			and the second second				
Tipulidae Chironomidae							
Chironominae Tanyoodinae							
Tanypodinae Tabanidae				ND .			I
Rhagionidae Atherix							Í
Atherix Dolichopodidae	and the second second		and the second se				1
							1
							4
	Muskeg River	at km 4.2.		Unstable bedrock	<pre>&lt; and grave! bank at km 7.</pre>		1

# UTILIZATION

eandering section of the Muskeg River is entrenched in a h a high proportion of unstable banks. The high, slumping osed primarily of sand, gravel and silt. The gradient is reach is a series of alternating pools and riffles. The arily of gravels and larges, but some sand and silt are The riparian vegetation is dominated by deciduous trees ous trees are also fairly abundant. Little vegetation nnel in this reach. Moderate amounts of woody debris are of the channel.

s and riffles and the variety of substrates in this reach ing potential for many of the fish species that occur in arctic grayling, white sucker, longnose sucker, longnose sculpin, trout-perch). The numerous shallow areas along 1, where water velocities are low and debris provides some ng areas for a variety of fish species. The many shallow good feeding areas for juvenile arctic grayling. The pools good areas for resting and feeding of larger fish, and the es provides an abundant food source for piscivorous species. Is are moderately deep and at least some pool areas may be 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)





々

FORT MCMURRAY

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Kilometres

<sup>F</sup> Data from Bond and Machniak (1979)

9 255

7.96

dissolved oxygen (mg/l)

conductivity (µmhos/cm)

DH

245

8.15



NUMBERS OF FISH COLLECTED (SEPTI	EMBER 1979)			PHYSICAL CHARACTERISTICS		REACH DESCRIPTION AND F This relatively	
				Reach length (km)	7.5	is a region of trans	ition bet
			X	Channel width (m)	14	Reach 2. The gradie	
Species	Adults	Juveniles and Young-of-the-year	Total Numbers	Channel area (ha) Gradient (m/km)	10.5	placid to swirling to The substrate is com	-
longnose sucker	0	2	2	Flow character	placid, swirling,	present in pools and	
northern pike	2	2	2 4		rolling	trees and shrubs, wi	th some c
pearl dace	0	17	17	Total pools (%) Pattern	80	vegetation overhangs	the chan
slimy sculpin	1	I	2	Confinement	irregularly meandering occasionally confined	present along the ed	-
Total		22	25	Unstable banks (%)	10	The spawning po	
				Substrate composition	(%)	over gravel substrate trout-perch, longnos	
				fines (<2 mm)	30	moderate amounts of a	
				gravels (2-64 mm)	50	limited spawning of r	
				larges (>64 mm)	20	erous shallow areas	with low
				bedrock and/or oil Debris		al weedy shallows, a	nd the mc
				Deorrs	moderate	provide good rearing	
						deep, and at least s	ome of th
						fish.	
	T		BENTHIC ALGAL PRODUCTIVITY		T		
OLIGOCHAETA	RIPARIAN VEC	GETATION	Standing crop expressed as o	cell counts (number·m <sup>-2</sup> )	STREAM GAUGING DATA		WATER Q Water S
GASTROPODA <i>Gyraulus</i>		overage (%) ferous trees - 10 - 1	mean: <b>1.</b> 9 x 10 <sup>10</sup> maximum: 3.9 x 10 <sup>10</sup>		Water Survey of Canada station nur Maximum total annual discharge:		Water
PELECYPODĂ		duous trees 65	minimum: 1.1 x 10 <sup>10</sup> Standing crop expressed as o	$(ma, m^{-2})$	Minimum total annual discharge:	65.6 x 10 <sup>6</sup> m <sup>3</sup> (1976)	Total a
Musculium Pisidium	Grass	ses 55	mean: 27.3 maximum: 65.7	interophyri a (mg·m )	Maximum annual mean discharge: Minimum annual mean discharge:	6.31 m <sup>3</sup> /s (1974) 2.07 m <sup>3</sup> /s (1976)	pH Total h
Sphaerium INSECTA	Barre	en 2	minimum: 8.7	-1 2)	Minimum monthly mean discharge:	21.95 m <sup>3</sup> /s (September 1978) 0.21 m <sup>3</sup> /s (December 1976)	Conduct Total f
Ephemeroptera <i>Ameletus</i>	Channel Overh	l cover (%) hang 5	Primary productivity (mg C·H mean: 26.5	i *•m *)	Maximum daily discharge: Minimum daily discharge:	42.19 m <sup>3</sup> /s (Apr. 28, 1974) 0.14 m <sup>3</sup> /s (Dec. 17, 1976)	resid Total n
Baetis	Crown		maximum: 107.8 minimum: 6.9				resid
Baetisca Paraleptophlebia			Data from Hickman et al. (1980	).	Data for 1974 to 1978 compiled from Warner and Spitzer (1979) and Warr		Total c Silica
<i>Stencnema</i> Odonata	· · · · · · · · · · · · · · · · · · ·						Nitrate Total K
Perithemis Plecoptera							Total P Orthoph
Pteronarcys		and the second second					Sulphat
<i>Taeniopteryx</i> H <b>emi</b> ptera		1 Martin					Data fo
Corixidae Trichoptera							the N
Cheumatopsyche							
<i>Lepidostoma</i> Coleoptera							
Elmidae Diptera							
Chironomidae Tanypodinae						No. of States	AQ
Tabanidae				No. State of the second second	And the second sec		
Dolichopodidae				AN A SEA	the second second		
				CAL (m)			
		A The second second		the second se			
	_	a (1777)		IN Maria			
	Swirling and	frolling flow, common	n this reach, at km 10.4.	A large, swirli	ng pool at km 13.8.		

## H UTILIZATION

short and irregularly meandering section of the Muskeg River ion between the low gradient Reach 4 and the high gradient is moderate and the flow character is mixed, varying from rolling. Most of the reach area is composed of pools. used mainly of sand, gravels and cobbles, but some silt is ackwaters. The riparian vegetation is mostly deciduous some conifers in the lower portion of the reach. Some he channel in most areas. Moderate amounts of debris are of the river channel.

ntial of this reach is good for those species that spawn (e.g., arctic grayling, longnose sucker, white sucker, dace). There are a few backwater areas with low to uatic vegetation that may provide suitable habitat for orthern pike and brook stickleback in this reach. The numth low water velocities and gravel substrates, the occasionthe moderate amounts of debris and overhanging vegetation nabitat. In most areas of this reach the water is moderately ne of the pools are probably suitable for overwintering of

WATER QUALITY			
Water Survey of Canada station number	00AT07DA0	080	
	Mean	Maximum	Minimum
Total alkalinity (mg CaCO <sub>3</sub> /1) pH	172.4 7.80	289.0 8.29	55.7 7.28
Total hardness (mg CaCO <sub>3</sub> /1)	171.5	280.9	59.7
Conductance (µS/cm)	309	520	115
Total filterable			
residue fixed (mg/l) .	156	308	49
Total non-filterable			
residue fixed (mg/l)	2	39	<0.4
Total organic carbon (mg C/1)	25.0	53.0	6.0
Silica (mg SiO <sub>2</sub> /1)	9.0	25.0	1.8
Nitrate and nitrite nitrogen (mg N/1)	0.040	0.310	< 0.003
Total Kjeldahl nitrogen (mg N/I)	1.20	3.00	0.28
Total Phosphorus (mg P/1)	0.040	0.190	0.005
Orthophosphate (mg P/1)	0.010	0.041	< 0.003
Sulphate (mg SO4/1)	5.3	42.5	0.1

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

# AQUATIC BIOPHYSICAL INVENTORY MUSKEG RIVER Reach 3 (km 9.0 to km 16,5) aberlan ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by LSL



	FUINT	SAMPLE DATA	
		km 10.4	k
		21/09/79	2
1.5		10.7	

Hydraulics		
channel width (m)	18.3	13.7
wet width (m)	14.6	10.7
maximum depth (m)	1.1	1.5
average depth (m)	0.8	0.8
velocity (m/s)	0.83	0.98
flow character	swirling, rolling	placid, swirling
Substrate Composition (%)		
fines (< 2 mm)	20	30
gravels(2-64mm)	30	70
larges(>64 mm)	50	õ
bedrock and/or oil sand	0	Ō
Bonk	-	-
height(m)	1.5	0.5
form	repose	repose
stability	stable	stable
texture	sondy silt	silty sond, gravel
vegetation (% coverage)		
coniferous trees	40	0
deciduous trees	55	75
shrubs	35	30
grasses	85	20
barren	0	10
Water Quality		
temperature (°C)	10.5	10.0
dissolved oxygen (mg/l)	9	9
conductivity (umhos/cm)	190	235
рН	7.88	7.68

AN	angling
CF	counting fence
DN	dip net
EF	electrofisher
GN	ailt net
	kick sample
	small fish collections made
	using a combination of methods
SN	seine
_	
ΑP	benthic algal productivity station
BL	benthic invertebrate collection site
Сн	water quality station
PS	point sample
2.0	
56	stream gauging station
• •	
35	kilometres from mouth
	Que d'antina
	flow direction
Ŧ	anab baundau
1	reach boundary
ъ	upstream limit of survey
1	opsilean limit of survey
1	division between sections of
•	a reach
	0.1000
F Dat	a from Bond and Machniak (1979)
501	a nom bone and machinak (1373)

INU	
ARGR	arctic grayling
BKST	brook stickleback
BRMN	brassy minnow
BURB	burbot
DLVR	Doliy 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	north <b>er</b> n redbelly dace
NSST	ninespine stickleback
NTPK	north <b>ern</b> pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch





				40			
NUMBERS OF FISH COLLECTED (SEPTEN Species pearl dace white sucker Total	Juve	niles and of-the-year 1 1 2	Total Numbers	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	100 0 0	muskeg. The reach i deep and the banks d beaver dams in this strate is entirely s content. Aquatic ver entirely deciduous th cover due to overham reach to very high in from moderate to high The abundant aqu for spawning of brood to be suitable for sp there is ample shelt	gradient reach meanders through a large area of marshy treed s nearly all pools and the water flow is slow. The stream is rop off sharply at the edge of the channel. There are many reach, particularly upstream from Hartley Creek. The sub- ilt and sand with moderate to very high organic detritus getation is abundant. The riparian vegetation is almost rees and shrubs with a very dense growth of grasses. Channel ging shrubs varies from moderate in the lower portion of the in the upper portion of the reach. Channel debris also varies
BENTHIC INVERTEBRATES OLIGOCHAETA GASTROPODA Ferrissia PELECYPODA Sphaerium CRUSTACEA Cladocera Copepoda Amphipoda Gammarus pseudolimnaeus INSECTA Ephemeroptera Ameletus Paraleptophlebia Plecoptera Isoparla. Hemiptera Corixidae Megaloptera Sialis Trichoptera Onocosmoecus Diptera Chironomidae	RIPARIAN VEGETATION Bank coverage (%) Coniferous trees Deciduous trees Shrubs Grasses Barren Channel cover (%) Overhang Crown	2 80 15 95 0 15 10	BENTHIC ALGAL PRODUCTIVITY No data available for this rea	ach	STREAM GAUGING DATA No data available for this reach		$ \begin{array}{llllllllllllllllllllllllllllllllllll$
Chironominae Tanypodinae	Placid flow and heavily g	rassed banks	at km 27.5 are typical of this	a reach. Dense overhangin	mg bank vegetation at km 42.		AQUATIC BIOPHYSICAL INVENTORY MUSKEG RIVER Reach 4 (km 16.5 to km 80.0) ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM



	POINT SAMPLE DATA		LEGEND		
Location	km 27.5	AN ar	ngling	ARGR	orctic grayling
Date	20/09/79		ounting fence	BKST	brook stickleback
Hydroulics			p net	BRMN	brassy minnow
channel width (m)	10.7	<b>-</b>	ectrofisher	BURB	burbol
wet width (m)	10.7		ll net	DLVR	Dolly Vorden
maximum depth (m)	2.0		ck sample	EGGS	unidentified fish eggs
average depth (m)	1.0		nall fish collections made	EMSH	emerold shiner
velocity (m/s)	0.59		sing a combination of methods	FLCH	flathead chub
flow character	placid, swirling	SN se	eine	FSDC	finescale dace
		AP be	enthic algal productivity station	FTMN	fothead minnow
Substrate Composition (%)				GOLD	goldeye
fines (< 2mm)	100	BI be	enthic invertebrate collection site	LKCH	lake chub
gravels (2-64 mm)	0			LKCS	lake cisco
lorges(>64mm)	0	Сн "	ater quality station	LKWF	lake whitefish
bedrock and/or oil sand	0		,,	LNDC	longnose doce
Bonk		PS pc	pint sample	LNSK	longnose sucker
height (m)	1.0			MTWF	mountain whitefish
form	repose	SG st	ream gauging station	NRDC	northern redbelly doce
stability	stable	· · · ·		NSST	ninespine stickleback
texture	sandy silt, organic	35 ki	lometres from mouth	NTPK	northern pike
		-		PLDC	pearl dace
vegetation (% coverage)	0	fle	ow direction	SLSC	slimy sculpin
coniferous trees				SPSC	spoonhead sculpin
deciduous trees	75	T re	ach boundary	SPSH	spottail shiner
shrubs	20			TRPC	trout-perch
grasses	95	υp	ostream limit of survey	UNSK	unidentified sucker species
barren	0	1.7		WALL	walleye
Water Quality	10.5		vision between sections of	WTSK	white sucker
temperature (°C)		• a	reach	YLPR	yellow perch
dissolved oxygen (mg/l)	8   82				
conductivity (µmhos/cm)		*			
рH	7.78	Data	from Bond and Machniak (197	9)	





	POINT SAMPLE DAT
Location	km 42.0
Date	21/09/79
Hydraulics	
channel width (m)	11.0
wet width (m)	11.0
maximum depth (m)	1.5
average depth (m)	1.0
velocity (m/s)	0.25
flow character	placid
Substrate Composition (%)	
fines (< 2 mm)	100
gravels (2-64mm)	0
larges(>64mm)	0
bedrock and/or oil sand	0
Bank	
height(m)	0.5
form	repose
stability	stable
lexture	silt, or <b>ga</b> nic
vegetation (% coverage)	
coniferous trees	0
deciduous trees	75
shrubs	10
grasses	95
borren	0
Water Quality	
temperature (°C)	9.0
dissolved oxygen (mg/l)	8
conductivity (umhos/cm)	195
рH	7.56







Location	
Date	
Hydraulics	
channel width (m)	
wet width (m)	
maximum depth (m)	
average depth (m)	
velocity (m/s)	
flow character	
Substrate Composition (%)	
fin <b>es (&lt;</b> 2 mm)	
gravels (2-64mm)	
larges(>64mm)	
bedrock and/or oil sand	
Bonk	
height(m)	
form	
stability	
texture	
vegetation (% coverage)	
conferous trees	
deciduous trees	
shrubs	
grasses	
barren	
Water Quality	
temperature (°C)	
dissolved oxygen (mg/l)	
conductivity (µmhos/cm)	
рH	

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 flow direction T reach boundary upstream limit of survey division between sections of a reach

ND.	
ARGR	arctic grayling
BKST	brook stickleback
BRMN	brassy minnow
BURB	burbot
DLVR	Dolly Vard <b>e</b> n
EGGS	unidentified fish eggs
EMSH	emerold 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 doce
NSST	ninespine stickleback
NTPK	northern pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shin <del>e</del> r
TRPC	trout-p <b>er</b> ch
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch



MUSKEG RIVER Reach 4 Section 3 (km 54 to km 67) Scale 1:25 000 Miles 0.5 0.5 0.5 0 Kilometres alberta ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by



maximum depth (m)	1.5
average depth (m)	1.0
velocity (m/s)	0.15
flow character	placid
Substrate Composition (%)	
fines (< 2mm)	100
gravels (2-64mm)	
larges(>64mm)	õ
bedrock and/or oil sand	õ
Bonk	-
height(m)	0.4
form	steep
stability	stable
lexture	organic, silt
vegetation (% coverage)	
coniferous trees	5
deciduous trees	90 90
shrubs	15
grasses	95
barren	0
Water Quality	-
temperature (°C)	8.5
dissolved oxygen (mg/l)	6
conductivity (umhos/cm)	205

		LEGEND
N	angling	AR
F	counting fence	BK
N	dip net	BR
F	electrofisher	BU
N	gill net	DL
S	kick sample	EG
F	small fish collections made	EM
	using a combination of methods	FL
N	seine	FS
Ρ	benthic algal productivity station	FT
	bernine digar producitivity station	GO
	benthic invertebrate collection site	LK
		LK
н	water guality station	LK
	warer quarry station	LN
s	point sample	LN
<u> </u>		MT
G	stream gauging station	NR
		NS
35	kilometres from mouth	NT
_		PL.
6	flow direction	\$L
~		SP
Т	reach boundary	SP
Ŧ		TR
1	upstream limit of survey	UN
1		WA
÷	division between sections of	WI
ı	a reach	YL
	-	

	arctic grayling
	brook stickleback
ł	brassy minnow
ŧ.	burbot
	Dolly Varden
	unidentified fish eggs
	emerald shiner
	flathead chub
	finescale dace
ł	fathead minnow
)	goldeye
	lake chub
	lake cisco
	lake whitefish
;	longnose dace
-	longnose sucker
-	mountain whitefish
	north <b>er</b> n redbelly dace
	ninespine stickleback
	northern pike
	pearl dace
	slimy sculpin
	spoonhead sculpin
	spottail shin <b>e</b> r
	trout-perch
	unidentified sucker species
	walleye
(	white sucker
1	yellow perch





UMBERS OF FISH COLLECTED (SEPTEM Species brook stickleback pearl dace white sucker Total	Juvenil       Juvenil       Adults     Young-of-       2     2       0     2       0     2       2     6	Total Number 2 4 2 2 2 2 2 2	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 sand Debris	13.0 9 11.7 2.8 placid, swirling 90 irregularly meandering occasionally confined 0 80 10 10 0 high	The reach is almost ent ous beaver dams. The detritus content, but t and cobbles. Coniferou reach, but deciduous tr growth of grasses. Cha Sunken woody debris is Movement of the la severely limited by bea and a few young-of-the-	he Muskeg River has a much higher gradient than does Reach 4. tirely pools, however, because the flow is impeded by numer- substrate is generally sand and silt with moderate organic there are some areas with fairly high proportions of gravels us trees dominate the riparian vegetation over much of the rees and shrubs are also abundant and there is a dense annel cover is very high due to overhanging shrubs. abundant. arger fish into this reach from downstream regions is aver dams. Cnly brook stickleback, lake chub, pearl dace, -year white suckers have been collected in this reach. lake chub, and pearl dace are almost certainly year-round	
THIC INVERTEBRATES OLIGOCHAETA GASTROPODA Gyraulus Physa Valvata PELECYPODA Anodonta Museulium Pisidium Sphaerium INSECTA Ephemeroptera Ameletus Ephemerella Paraleptophlebia Stenonema Odonata Libellulidae Plecoptera Nemoura Oemopteryx Pteronaroys Hemiptera Corixidae Trichoptera Brachycentrus Glossosoma Hydropsyche Lepidostoma Limmephilus/Philarctus Miarasema Oxyethira Potamyia Ptilostomis Coleoptera Elmidae Diptera Ceratopogonidae Chironominae Tanypodinae Orthocladiinae	Deciduous trees Shrubs Grasses Barren Channel cover (%) Overhang	benthic ALGAL PRODUCTIV No data available for 0 45 30	— I ÷	TREAM GAUGING DATA No data available for this reach		WATER QUALITY         Water Survey of Canada station number 00AT07DA0094         Mean Maximum Minim         Total alkalinity (mg CaC0 <sub>3</sub> /1)       238.3       720.0       74.2         pH       7.80       8.00       7.4.2         pH       7.80       8.00       7.4.2         pH       7.80       8.00       7.4.2         pH       7.80       8.00       7.4.2         pH       7.80       8.00       7.5         Conductance (uS/cm)       417       1200       142         Total hardness (mg/l)       206       691       81         Total organic carbon (mg C/l)       21.0       29.0       12.0         Total hitride introgen (mg N/l)       0.010       0.010       0.010       0.010       0.020       0.060       0.0         Total hopsphorus (mg P/l)       0.020 <td cols<="" th=""></td>	





	IN CAMPER DATA						
Loc <b>a</b> tion Dat <b>e</b>	km 83.7 21/09/79	km 90.0 24/09/79	AN angling CF counting fence	ARGR BKST	arctic grayling brook stickleback		
Hydraulics			DN dip net	BRMN		C Bitumount	1
Channel width (m)	7.9	9.5	EF electrofisher	BURB	burbot		
wet width (m)	7.9	9.5	GN gillinet	DLVR	Dolly Varden		
maximum depth (m)	1.2	0.7	KS kick sample	EGGS	unidentified fish eggs		T
average depth (m)	0.8	0.4	SF small fish collections made	EMSH	emerald shiner	- U <sup>3</sup>	
velocity (m/s)	ND	0.29	using a combination of methods	FLCH	flathead chub		N
flow character	placid, swirling	placid, swirling	SN seine	FSDC	finescale dace	$\alpha / \frac{1}{2}$	
	P-1-1-1 1	F	AP benthic algal productivity station		fathead minnow		
Substrate Composition (%)			Dennie digar productivity station	GOLD		Fort MacKay	
fines (< 2 mm)	100	60	BI benthic invertebrate collection site	LKCH	lake chub	7 ( 2/)	
graveis (2-64mm)	0	15	bennie invertebidie conection she	LKCS	lake cisco		
larges(>64mm)	0	25	CH water quality station	LKWF	lake whitefish		P
bedrock and/or oil sand	0	0	Chi water quality station	LNDC	longnose dace		
Bank			PS point sample	LNSK	longnose sucker		
height(m)	0.6	0.8	point sample	MTWF	mountain whitefish		
form	repose	steep	SG stream gauging station	NRDC	northern redbelly dace		
stability	stable	stable		NSST	ninespine stickleback	Tar Island 🔹 🔪	
texture	silt, sand	sandy silt, organic	35 kilometres from mouth	NTPK	northern pike		
				PLDC	pearl dace		
vegetation (% coverage)		_	flow direction	SLSC	slimy sculpin	4	
coniferous trees	15	70	<b>TP</b>	SPSC	spoonhead sculpin		
deciduous trees	65	25	T reach boundary	SPSH	spottail shin <del>er</del>	S	
shrubs	15	10		TRPC	trout-perch	-	
grasses	90	90	upstream limit of survey	UNSK	unidentified sucker species		
barren	0	0		WALL	walleye	(0)	
Water Quality		10.0	division between sections of	WTSK		2	
temperature (°C)	10.0	10.0	a reach	YLPR	yellow perch	10 5 0 10	
dissolved oxygen (mg/1)	9	8					
conductivity (µmhos/cm)	212	2 15				Kilometres	
рH	7.85	7.81	*Data from Bond and Machniak (1979)			PORT MCMORRAT	

NUMBERS OF FISH COLLECTED (SEPTEM			Reac Chann Grad Flow Tota Patto Conf Unsta Subsi fin gra la	inement able banks (%) trate composition nes (<2 mm) avels (2-64 mm) rges (>64 mm) drock and/or oil s	100 0 0	REACH DESCRIPTION AND F This section of a very marshy fegion that reduce the flow pools. No sites wer strate is probably s vegetation consists The stream channel i woody debris is abun No fish collect the habitat is suita residents of the are	f the Musk n. Althou w, and the re sampled sand and s of decidu s almost dant. tions were able only
BENTHIC INVERTEBRATES No benthic samples were taken in this reach.	RIPARIAN VEGETATION Bank coverage (%) Coniferous trees 2 Deciduous trees 65 Shrubs 25 Grasses 90 Barren 0 Channel cover (%) Overhang 60 Crown 20	<u>BENTHIC ALGAL PRODUCTIVITY</u> No data available for thi	S reach		<u>STREAM GAUGING DATA</u> No data available for this rea	ich	<u>WATER</u> N
							AQ

# ILIZATION

uskeg River meanders in an irregular pattern through hough the gradient is high, there are many beaver dams the reach consequently consists entirely of placid led in this reach, but it is expected that the subsilt with a high organic detritus content. Riparian iduous trees and shrubs and a dense growth of grasses. st completely covered by overhanging vegetation, and

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

TER QUALITY No data available for this reach





shrubs grasses Darren Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm) oН

upstream limit of survey division between sections of a reach

END	
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
FTMIN	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
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shin <del>er</del>
TRPC	trout-p <b>er</b> ch
UNSK	unidentified sucker species
WALL	walleye
<b>WTSK</b>	white sucker
YLPR	yellow perch



prepared by

POINT SAMPLE DATA

Lo	cation	
Da	te	
Hy	draulics	
	channel width (m)	
	wet width (m)	
	maximum depth (m)	
	average depth (m)	
	velocity (m/s)	
	flow character	
Sul	bstrate Composition (%)	
	fines (< 2 mm)	
	gravels (2—64 mm)	
	larges(>64mm)	
	bedrock and/or oil sand	
Bor	nk	
	height (m)	
	form	
	stability	
	lexture	
	vegetation (% coverage)	
	coniferous trees	
	deciduous trees	
	shrubs	
	grass <b>es</b>	
	barren	
₩a	ter Quality	
	temperature (°C)	
	dissolved oxygen (mg/l)	
	conductivity (µmhos/cm)	
	o.₩	

# AN angling AI CF counting fence BI DN dip net BI EF electrofisher BI GN gill net DI KS kick sample EF SF small fish collections made EF using a combination of methods FI SN seine F3 AP benthic algal productivity station F1 BI benthic invertebrate collection site L1 CH water quality station L1 PS point sample MI SG stream gauging station Ni 35 kilometres from mouth Ni M SG flow direction S2 I reach boundary S3 S4 J upstream limit of survey U1 W1 division between sections of W1 W1

ND	
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
FTMIN	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 doce
NSST	ninespine stickleback
NTPK	northern pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shin <b>e</b> r
TRPC	trout-p <b>erch</b>
UN\$K	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch



FISH COLLECTIONS





# HARTLEY CREEK



				57				
NUMBERS OF FISH COLLECTED (SEPTEM Species brook stickleback pearl dace Total	Adults  1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Juveniles and Young-of-the-year 0 3 - 3	Total Numbers	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 Debris	100 0 0	REACH DESCRIPTION AND FISH UTILIZATION This short, tortuously meandering reach extends upstream 4.5 km from the confluence of Hartley Creek and the Muskeg River. The gradient is relatively low and the reach is almost entirely pools with placid or swirling flow. The substrate is entirely silt and sand with a low organic detritus content. The riparian vegetation consists of deciduous trees and shrubs and a dense growth of grasses. Substantial amounts of shrubs overhang the stream channel throughout this reach. There is a moderate amount of debris in the channel. Weedy areas along the banks provide good spawning habitat for brook stickle- back and northern pike. The spawning potential of this reach for other species is considered poor. Some areas with sand substrates may be suitable for spawning of pearl dace and lake chub. The low water velocities and the abundant debris, overhanging vegetation, and aquatic vegetation along the banks provide good rearing conditions in this reach. The water is moderately deep throughout the reach and appears to be sufficient for overwintering of fish.		
BENTHIC INVERTEBRATES NEMATODA OLIGOCHAETA PELECYPODA Musculium INSECTA Ephemeroptera Ameletus Paraleptophlebia Hemiptera Corixidae Diptera Chironomidae Tanypodinae Orthocladiinae Tabanidae Dolichopodidae	Conif Decid Shrub Grass Barre	verage (%) ierous trees 0 luous trees 75 is 35 ies 90 in 0 cover (%) hang 10	<u>BENTHIC ALGAL PRODUCTIVITY</u> No data available for this r	reach	Maximum monthly mean discharge: Minimum monthly mean discharge: Maximum daily discharge:	62.2 x 10 <sup>6</sup> m <sup>3</sup> (1978) 20.1 x 10 <sup>6</sup> m <sup>3</sup> (1977) 1.97 m <sup>3</sup> /s (1978) 0.63 m <sup>3</sup> /s (1977) 9.20 m <sup>3</sup> /s (September 1978) 0.01 m <sup>3</sup> /s (February 1978) 14.81 m <sup>3</sup> /s (July 20, 1975) 0.01 m <sup>3</sup> /s (Jan. 12, 1978) Loeppky and Spitzer (1977),	$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	
	Hartley Creek at km l.			Placid flow and this reach.	abundant overhanging vegetation at k	m 1 are characteristic of	AQUATIC BIOPHYSICAL INVENTORY HARTLEY CREEK Reach I (km 0.0 to km 4.5) ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM	





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

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.

RQUALITY			
er Survey of Canada station number	00AT07DA0	082	
	Mean	Maximum	Minimum
al alkalinity (mg CaCO <sub>3</sub> /l)		303.0 8.30	56.4 7.30
al hardness (mg CaCO <sub>3</sub> /1)	116.6	275.9	51.0
luctance (uS/cm)	247	550	115
al filterable			
esidue fixed (mg/l)	125	346	50
al non-filterable			
esidue fixed (mg/l)	5	14	<0.4
al organic carbon (mg C/1)	25.0	41.0	12.0
ica (mg SiO <sub>2</sub> /1)	7.8	17.0	1.8
rate and nitrite nitrogen (mg N/1)	0.060	0.240	0.010
al Kjeldahl nitrogen (mg N/1)	0.85	1.50	0.30
al Phosphorus (mg P/1)	0.040	0.080	0.005
nophosphate (mg P/1)	0.010	0.011	0.005
phate (mg SO <sub>4</sub> /1)	3.9	13.2	0.1

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) aberta ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by LIMITED



	POINT SAMPLE DATA		LE	GEND		
Location	km, 8.7	km 16.2	AN angling	ARGR	orctic grayling	
Date	22/09/79	22/09/79	CF counting fence	BKST	brook stickleback	
Hydraulics			DN dipnet	BRMN	brassy minnow	
channel width (m)	11.0	9.0	EF electrofisher	BURB	burbot	
wet width (m)	0.11	9.0	GN gil⊧net	DLVR	Dolly Varden	
maximum depth (m)	1.5	1.5	KS kick sample	EGGS	unidentified fish eggs	
average depth (m)	0.8	0.7	SF small fish collections made	EMSH	emerald shiner	
velocity (m/s)	0,76	0.61	using a combination of methods	FLCH	flathead chub	
flow character	placid, swirling,	placid, swirling,	<u>SN</u> seine	FSDC	finescale dace	
	rolling	rolling	AP benthic algal productivity station	FTMN	fathead minnow	
Substrate Composition (%)				GOLD	goldeye	Fort MacKaye ( 2 0
fines (< 2 mm)	90	95	<b>Bl</b> benthic invertebrate collection site	LKCH	lake chub	
gravels (2-64mm)	5	5		LKCS	lake cisco	
larges(>64mm)	5	0	CH water quality station	LKWF	lake whitefish	
bedrock and/or oil sand	0	0		LNDC	longnose dace	
Bank			PS point sample	LNSK	longnose sucker	
height(m)	1.5	1,0		MTWF	mountain whitefish	
form	r epose	undercut	SC stream gauging station	NRDC	northern redbelly doce	
stability	stable	stable		NSST	ninespine stickleback	Tar Island •
texture	sandy silt	silty sand	35 kilometres from mouth	NTPK	northern pike	
			-	PLDC	pearl dace	
vegetation (% coverage)	_		flow direction	SLSC	slimy sculpin	
coniferous trees	2	30		SPSC	spoonhead sculpin	
deciduous trees	40	45	reach boundary	SPSH	spottail shiner	s)/
shrubs	30	35		TRPC	trout-perch	
grasses	80	95 0	upstream limit of survey	UNSK	unidentified sucker species	
barren	0	0		WALL	walleye	(0)
Water Quality	7.5		division between sections of	WTSK		// 7
temperature (°C)	7.5	9.0	a reach	YLPR	yellow perch	
dissolved oxygen (mg/l)	9	9				10 5 0 10 × )
conductivity (µmhos/cm)	ND	130	*			FORT MCMURRAY
рН	7.80	7.6	* Data from Bond and Machniak (1979)			Kilometres P

				UI			
NUMBERS OF FISH COLLECTED (SEPTEM)	BER 1979) Adults 0 	Juveniles and Young-of-the-year 3 3	Total Numbers	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 Debris	90 5 5	marshy area. The gr A high proportion of riffle areas. Sever stream was surveyed sists of sand and si The riparian vegetat of coniferous trees the channel cover du woody debris are pre The spawning po substrates is consid riffle areas. Many spawning of pearl da spawning habitat for vegetation, and the	Hartley Creek meanders in a tortuous pattern through a adient is low and the flow is generally placid or swirling. the reach consists of pools, but there are some small al beaver dams were present in this reach at the time the in 1979. Although the substrate in most of the reach con- lt, there are a few areas with gravel and cobble substrates. ion is dominated by deciduous trees and shrubs and some areas are present. There is a very dense growth of grasses, and e to overhanging shrubs is fairly high. Large amounts of sent in the stream channel. tential of this reach for those species that require gravel ered poor. The only suitable locations are the few small areas with sand substrates are probably suitable for ce, and the abundant aquatic vegetation provides suitable brook stickleback. The low water velocities, the aquatic large amounts of debris provide many areas that appear purposes. Water depths in this reach appear to be suf-
BENTHIC INVERTEBRATES OLIGOCHAETA PELECYPODA ARACHNIDA Hydracarina CRUSTACEA Amphipoda Gammarus pseudolimnaeus Hyalella azteca INSECTA Ephemeroptera Baetis Faraleptophlebia Odonata Libellulidae Hemiptera Corixidae Trichoptera Limmephilus/Philarctus Oxyethira Coleoptera Gyrinidae Elmidae Diptera Ceratopogonidae		rage (%) ous trees 15 us trees 60 20 95 0 over (%)	BENTHIC ALGAL PRODUCTIVITY No data available for this r	reach	STREAM GAUGING DATA No data available for this reach		WATER QUALITYWater Survey of Canada station number 00AT07DA0095Mean Maximum MinimumTotal alkalinity (mg CaC0_3/1)163.0307.07.508.107.508.107.508.107.508.107.00Total hardness (mg CaC0_3/1)135.0252.660.5Conductance (µS/cm)306590131Total hardness (mg CaC0_3/1)15532274Total non-filterableresidue fixed (mg/1)154.6residue fixed (mg/1)154.6residue fixed (mg/1)154.6residue fixed (mg/1)154.6Total non-filterableresidue fixed (mg/1)154.6residue fixed (mg/1)154.6<
Chironomidae Chironominae Tanypodinae Tabanidae	Hartley Creek a	at km 26.		Overhanging shru	ubs and heavily grassed banks at km	38.5.	AQUATIC BIOPHYSICAL INVENTORY HARTLEY CREEK Reach 3 (km 21 to km 49) ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM





NUMBERS OF FISH COLLECTED (SEPTE Species brook stickleback white sucker Total	Adults 6 0 6 6	Juveniles and Young-of-the-yea 4 22 26	r Total Numbers	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 Debris	95 5 0	REACH DESCRIPTION AND F This irregular and the flow charact Although the gradien some of which are pa many beaver dams, th areas are present im of the reach consist riffle areas. The r in much of the reach relatively small amo This reach is n suitable substrates movements of larger that are good spawnin undoubtedly a year-re
BENTHIC INVERTEBRATES OLIGOCHAETA HIRUDINEA Glossiphoniidae GASTROPOA CRUSTACEA Amphipoda Hyalella azteca INSECTA Ephemeroptera Caenis Paraleptophlebia Odonata Libellulidae Hemiptera Corixidae Megaloptera Sialis Trichoptera dlossosoma Hydropsyche Lepidostoma Ptilostomis Coleoptera Haliplidae Dytiscidae Elmidae Diptera Tipulidae Ceratopogonidae Chironominae Tanypodinae Orthocladiinae	Decidua Shrubs Grasses Barren Channel o Overhan Crown	erage (%) rous trees 30 25 5 90 0 cover (%)	BENTHIC ALGAL PRODUCTIVITY No data available for this		STREAM GAUGING DATA No data available for this real	ch

# FISH UTILIZATION

rly meandering section of Hartley Creek has a high gradient, cter is mixed, varying from placid to swirling to rolling. ent is high, flow is impeded by the very many beaver dams, partially vegetated and appear to be very old. Because of the the majority of the reach consists of pools. Some riffle immediately downstream from beaver dams. Substrates in most st of silt and sand, but some gravel is present in the short riparian vegetation is dominated by deciduous trees and shrubs ch, but coniferous trees are abundant in some areas. There are mounts of overhanging vegetation and large amounts of debris. not considered to be suitable for spawning of most fish species; are extremely limited and the beaver dams severely limit fish. There are many areas with abundant aquatic vegetation ning and rearing areas for brook stickleback. This species is -round resident in this reach.

WATER QUALITY No data available for this reach

# AQUATIC BIOPHYSICAL INVENTORY HARTLEY CREEK

# Reach 4

(km 49.0 to km 61.5)







	POINT SAMPLE DATA	
Location	km 52.5	km 61.0
Date	23/09/79	24/09/79
Hydroulics		
channel width (m)	18.0	24.0
wet width (m)	9.5	6.7
maximum depth (m)	2.0	0.8
average depth (m)	0.6	0.4
velocity (m/s)	0.13	0.24
flow character	placid, swirling	placid, swirling, rolling
Substrate Composition (%)		
fin <del>es</del> (< 2 mm)	100	95
grovels (2-64mm)	0	5
larges(>64mm)	0	0
bedrock and/or oil sand	0	0
Bonk	0 F	0.6
height (m)	0,5	
form	repose	repose stable
stability	stable	
texture	sity sond, organic	silt, sand, organic
vegetation (% coverage)		
coniferous trees	35	35
deciduous trees	40	5
shrubs	25	15
grosses	95	90
barren	0	0
Water Quality		
temperature (°C)	10.5	7.5
dissolved oxygen (mg/l)	8	9
conductivity (µmhos/cm)	130	84
рH	7,66	7, <b>3</b> 9

AN	angling	AF
CF	counting fence	BK
DN	dip net	BF
EF	electrofisher	BL
GN		DL
кs	kick sample	EG
SF	small fish collections made	EN
	using a combination of methods	FL
SN	seine	FS
AP	benthic algal productivity station	FT
Enclosed Enclosed		GC
BI	benthic invertebrate collection site	
100000		LK
Сн	water quality station	LK
		LM
PS	point sample	M
SG	stream gauging station	NF
	shearn googing sharron	NS
35	kilometres from mouth	NT
55	kilometres nom moun	PL
1	flow direction	SL
4.0		SF
Т	reach boundary	SP
T	,	TF
1	upstream limit of survey	UN
<u>م</u>		W#
i	division between sections of	W
1	a reach	YL

10.53.07	
D	
RGR	arctic graying
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
OLD	goldeye
KCH	lake chub
KCS	loke cisco
KWF	lake whitefish
NDC	longnose doce
NSK	iongnose sucker
1T WF	mountain whitefish
RDC	northern redbelly dace
ISST	ninespine stickleback
ITPK	northern pike
LDC	pearl dace
LSC	slimy sculpin
PSC	spoonhead sculpin
PSH	spottail shiner
RPC	trout-perch
INSK	unidentified sucker species
#ALL	walleye
VTSK	white sucker
'LPR	yellow perch





NUMBERS OF FISH COLLECTED (SEPTEMS			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	100 0 0	REACH DESCRIPTION AND Fil This section of fivery marshy area. All ous beaver dams and ti of placid pools. Alt is believed to consist detritus content. The deciduous trees, and of grasses. A large pro- and there is a large a No fish collection the habitat is suitab residents of the area
BENTHIC INVERTEBRATES No benthic samples were taken in this reach.	Bank coverage (%)         Coniferous trees       35         Deciduous trees       35         Grasses       95         Barren       0         Channel cover (%)       0         Overhang       35         Crown       20	BENTHIC ALGAL PRODUCTIVITY No data available for this	reach	STREAM GAUGING DATA No data available for this rea	ch

# SH UTILIZATION

Hartley Creek meanders in an irregular pattern through a though the gradient is high, water flow is impeded by numerhe region is poorly drained. The reach consists entirely hough no sites were sampled in this reach, the substrate of sand and silt, and it probably has a high organic riparian vegetation is a mixture of coniferous trees, deciduous shrubs. There is also a very dense growth of portion of the stream is covered by overhanging vegetation amount of debris.

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

WATER QUALITY No data available for this reach

# AQUATIC BIOPHYSICAL INVENTORY HARTLEY CREEK Reach 5 (km 61.5 to km 69.0)







POINT SAMPLE DATA

	PUIN
Location	
Date	
Hydraulics	
Channel width (m)	
wet width (m)	
maximum depth (m)	
average depth (m)	
velocity (m/s)	
flow character	
Substrate Composition (%)	
fines (< 2 mm)	
gravels (2–64 mm)	
larges(>64mm)	
bedrock and/or oil sand	
Bonk	
height (m)	
form	
stability	
texture	
vegetation (% coverage)	
coniferous trees	
deciduous trees	
shrubs	
grasses	
barren	
Water Quality	
temperature (°C)	
dissolved oxygen (mg/l)	
conductivity (µmhos/cm)	
pH	

CF C DN C EF C GN C KS K SF S SN S BI L	angling counting fence dip net electrofisher gill net wick somple small fish collections made using a combination of methods seine benthic algal productivity station benthic invertebrate collection site	ARGR BKST BRMN BURB DLVR EGGS EMSH FLCH FSDC FTMN GOLD	flathead chub finescale dace fathead minnow
DN C EF C GN C KS K SF S SN S AP L BI L	tip net electrofisher gill net sick somple small fish collections made using a combination of methods seine benthic algal productivity station	BRMN BURB DLVR EGGS EMSH FLCH FSDC FTMN GOLD	brassy minnow burbot Dolly Varden unidentified fish eggs emerald shiner flathead chub finescale dace fathead minnow
EF GN	electrofisher gill net small fish collections made using a combination of methods seine benthic algal productivity station	BURB DLVR EGGS EMSH FLCH FSDC FTMN GOLD	burbot Dolly Varden unidentified fish eggs emerald shiner flathead chub finescale dace fathead minnow
GN G KS SF S SF S SN S AP L BI L	gill net kick sample small fish collections made using a combination of methods seine benthic algal productivity station	DLVR EGGS EMSH FLCH FSDC FTMN GOLD	Dolly Varden unidentified fish eggs emeroid shiner flathead chub finescale dace fathead minnow
KS SF SN AP BI	ick sample small fish collections made using a combination of methods seine benthic algal productivity station	EGGS EMISH FLCH FSDC FTMIN GOLD	unidentified fish eggs emerald shiner flathead chub finescale dace fathead minnow
SF SN	small fish collections made using a combination of methods seine benthic algal productivity station	EMSH FLCH FSDC FTMN GOLD	emerald shiner flathead chub finescale dace fathead minnow
SN S	using a combination of methods seine benthic algal productivity station	FLCH FSDC FTMIN GOLD	flathead chub finescale dace fathead minnow
SN 9 AP 1 BI 1	seine benthic algal productivity station	FSDC FT <b>MN</b> GOLD	finescale dace fathead minnow
AP BI	benthic algal productivity station	FTMIN GOLD	fathead minnow
BI		GOLD	
BI			- alda
	henthic invertebrate collection site		goldeye
		LKCH	lake chub
CILL		LKCS	lake cisco
	water quality station	LKWF	lake whitefish
Q, I	worer quality station	LNDC	longnose doce
PS I	point sample	LNSK	longnose sucker
		MTWF	mountain whitefish
SG	stream gauging station	NRDC	north <b>er</b> n redbelly dace
1000	,, ,	NSST	ninespine stickleback
35	vilometres from mouth	NTPK	northern pike
55 .	anomenes a on moon	PLDC	pearl dace
f 🔊	flow direction	SLSC	slimy sculpin
		SPSC	spoonhead sculpin
T	reach boundary	SPSH	spottail shiner
Τ.		TRPC	trout-perch
1	upstream limit of survey	UNSK	unidentified sucker species
1.		WALL	walleye
1,	division between sections of	WTSK	white sucker
	a reach	YLPR	yellow perch



FISH COLLECTIONS





# STEEPBANK RIVER



NUMBERS OF FISH COLLECTED (1	978)						PHYSICAL C	CHARACTERISTICS		REACH DESCRIPTION AND FIS
		Adults		niles and of-the-year	Tota	Numbers	Reac Chan Chan	ch length (km) nnel width (m) nnel area (ha) lient (m/km)	2.0 20 4.0 2.7	This short, lower River floodplain and i relatively high and th is primarily swirling composed of pools. Gr
Species	June	September	June	September	June	September		v character	swirling, rolling	Riparian vegetation is
arctic grayling	0	0	0	6	0	6		al pools (%)	50	abundant. There is no
lake chub	1	0	0	7	0	8	Patt		irregular occasionally confined	Spawning potentia
longnose dace	1	0	4	3	5	3		finement table banks (%)	10	excellent and there ar
longnose sucker	0	0	2	4	2	4	8	strate composition (		spawn over sandy subst
mountain whitefish	0	0	0	4	0	4		ines (<2 mm)	15	in this reach during t the most suitable read
pearl dace	0	0	0	2	0	2	8	ravels (2-64 mm)	50	and rocks. Young slir
slimy sculpin	0	0	0	48	Ő	48		arges (>64 mm)	35	moderately deep water
spoonhead sculpin	2	0	0	0	2	0		edrock and/or oil sa		feeding and overwinter
trout-perch	1	4	3	7	4	11	Debr	ris	low	and young of larger sp
unidentified suckers	0	0	0	2	0	2				(e.g., northern pike,
white sucker	0	0	0	2	0	2				
Total	5	4	9	85	13	90				
Stenonema Odonata Ophiogomphus Plecoptera Isoperla Trichoptera Cheumatopsyche Diptera		Grasses Barren Channel c Overhan Crown	over (%)	15 5 0 0	mean: maximum: minimum:	43.5 229.8 3.0 uctivity (mg C· 9.9 19.3 3.4 ckman <i>et al.</i> (1				
Chironomidae Chironominae Tanypodinae Orthocladiinae Simuliidae Rhagionidae <i>Atherix</i> Empididae										
		Confluence of	the Steep	oank River w	with the Athab	asca River.		Undercut bank at	km 2.	

# ISH UTILIZATION

er reach of the Steepbank River lies within the Athabasca is affected by water levels in that river. Gradient is there are a few areas of unstable banks. Flow character and rolling and about half of the total reach area is Gravels and larges are the dominant substrate materials. is dominated by deciduous trees but conifers are also fairly no vegetation overhanging the river channel.

ial for fish that normally spawn over rocky substrates is are also some areas that are suitable for fish that normally strates. Adults of several forage fish species were captured the study. Rearing potential is considered to be moderate; aring areas in the reach are the spaces between large stones imy sculpin were particularly abundant in September. The and numerous pools in the reach provide suitable resting, ering areas for larger fish. There are numerous forage species species in this reach that would serve as prey for piscivores walleye).

WATER QUALITY No data available for this reach

# AQUATIC BIOPHYSICAL INVENTORY STEEPBANK RIVER Reach i (km O to km 2) alberton ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM

prepared by **LIM**ITED



	POINT SAMPLE DA
Location	km 2
Date	04/06/78
Hydraulics	
channel width (m)	20
wet width (m)	10
maximum depth (m)	ND
average depth (m)	0.5
velocity (m/s)	1.80
flow character	rolling
Substrate Composition (%)	
fines (< 2mm)	15
gravels (2-64mm)	50
larges(>64mm)	35
bedrock and/or oil sand	0
Bonk	
height(m)	1.5
form stability	undercut failing
,	sand, gravel
texture	sana, gravei
vegetation (% coverage)	
coniferous trees	25
deciduous trees	50
shrubs	15
grasses	5
barren	5
Water Quality	15.0
temperature (°C)	15.0
dissolved oxygen (mg/l)	N D N D
conductivity (µmhos/cm)	ND
ρH	NU

GN gill net KS kick sample SF small fish collections made using a combination of methods SN seine AP benthic algal productivity station 61 benthic invertebrate collection site CH water quality station PS point sample SC stream gauging station 35 kilometres from mouth flow direction reach boundary upstream limit of survey division between sections of a reach \* Data from Machnick and Bond (1979)

END	
ARGR	arctic grayling
BKST	brook stickleback
BRMN	brassy minnow
BURB	burboi
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	
NRDC	northern redbelly dace
NSST	ninespine stickleback
NTPK	northern pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottoil shiner
TRPC	trout-perch
UNSK	unidentified sucker specie
WALL	walleye
WTSK	white sucker
YLPR	yellow perch



Reach | (km O to km 2)

Scale 1:25 000



UMBERS OF FISH COLLECTED (1978 Species arctic grayling lake chub longnose dace longnose sucker pearl dace slimy sculpin white sucker Total	Adults     Juveniles and Young-of-the-ye       June     September     June     September       0     31     0     6       0     0     0     6       0     0     0     6       0     0     0     2       0     0     0     1       0     0     2     0       0     9     0     51       0     42     2     66	ear Total Numbers	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 for	15 30 40	in deep (up to 60 m) of of unstable banks are relatively high, about The substrate is compo- is dominated by decide is no vegetation overl Because of the d the spawning potential species that prefer to adult arctic grayling purposes is considered the major suitable are were slimy sculpin.	meandering section of the Steepbank River is confined with- canyon walls of the McMurray Oil Sands formation, and areas numerous. Although gradient and water velocities are t half of the area of this reach is composed of pools. osed primarily of larges and gravels. Riparian vegetation yous trees, but conifers are also fairly abundant. There
ENTHIC INVERTEBRATES No benthic samples were taken in this reach.	RIPARIAN VEGETATION       Benthic ALGAL PRODUCTIVITY         Bank coverage (%)       No data available for this reach         Coniferous trees       20         Deciduous trees       50         Shrubs       15         Grasses       10         Barren       15         Channel cover (%)       0         Overhang       0         Crown       0		reach	<pre>STREAM GAUGING DATA Water Survey of Canada station number 07DA006 Maximum total annual discharge: 331.8 × 10<sup>6</sup> m<sup>3</sup> (1975) Minimum total annual discharge: 35.8 × 10<sup>6</sup> m<sup>3</sup> (1977) Maximum annual mean discharge: 10.53 m<sup>3</sup>/s (1975) Minimum monthly mean discharge: 3.03 m<sup>3</sup>/s (September 1977) Maximum monthly mean discharge: 0.30 m<sup>3</sup>/s (December 1977) Maximum daily discharge: 0.30 m<sup>3</sup>/s (Apr. 27, 1974) Minimum daily discharge: 0.25 m<sup>3</sup>/s (Dec. 18, 1977) Data for 1972 to 1978 compiled from Loeppky and Spitzer (1977), Warner and Spitzer (1979) and Warner (1979).</pre>		$\begin{array}{c c c c c c c c c c c c c c c c c c c $
	Site of the Water Survey of Canada	stream gauging station at km 8.	Steepbank River	at km l2.		Total Kjeldahi nitrogen (mg N/1) Total Phosphorus (mg P/1) Orthophosphate (mg P/1) Sulphate (mg S0,/1) Data for the period January 1976 to December 1979 obtained from the National Water Quality Data Bank (NAQUADAT). AQUATIC BIOPHYSICAL INVENTORY STEEPBANK RIVER Reach 2 (km 2 to km 14) MERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by




NUMBERS OF FISH COLLECTED (1	1978)						PHYSICAL	CHARACTERISTICS		REACH DESCRIPTION AND FI This reach exten
Species arctic grayling lake chub longnose dace longnose sucker pearl dace slimy sculpin trout-perch walleye white sucker Total	A June 2 0 1 2 0 5 0 0 0 0 0 0 10	Adults September 0 4 0 0 0 0 0 0 0 0 0 0 4		eniles and -of-the-year September 2 22 10 8 11 69 7 0 8 137		al Numbers September 2 26 10 8 11 69 7 0 8 141	Cha Cha Gra Flo Tot Pat Con Uns Sub f g 1 b	ach length (km) annel width (m) annel area (ha) adient (m/km) ow character cal pools (%) ctern afinement stable banks (%) ostrate composition (%) Fines (<2 mm) gravels (2-64 mm) larges (>64 mm) oedrock and/or oil sand oris	15 45 40	to the confluence of flows in a sinuous pa Steepbank River. Wat from swirling to roll reach than in other s of gravels and larges and there is little v The diversity of vides areas that shou the river, particular Arctic grayling adult spent adults, and may in this reach are exc Rearing potential for substrates and grassy Higher numbers of you other sections of the larly high. Suitable pools. Moderately de for fish.
BENTHIC INVERTEBRATES OLIGOCHAETA INSECTA Ephemeroptera Baetis Baetisea Dranella Ephemerella Ephemerella Ephemerella Stenonema Odonata Ophiogomphus Plecoptera Classenia Diura Hastaperla Isogenus Pteronarcys Taeniopterys: Trichoptera	<u>R</u>		erage (%) rous trees pus trees s cover (%)	60 25 10 10 0 2 0		L PRODUCTIVITY available for	:his reach		STREAM GAUGING DATA No data available for this re	each
Brachycentrus Ceraelea Cheumatopsyche Glossosoma Hydropsyche Hydropsyche Hydroptila Lepidostoma Micrasema Polycentropus Diptera Tipulidae Psychodidae Ceratopogonidae Chironomidae Chironomidae Chironomiae Tanypodinae Orthocladiinae Simuliidae Rhagionidae Rhagionidae Atherix Empididae		High, unstable	e sand and	gravel bank	at km 15.			Section of riffles	a at km 30.	

#### FISH UTILIZATION

ends upstream from the near-vertical canyon walls of Reach 2 the Steepbank and North Steepbank rivers. This section pattern and the gradient is the highest recorded for the ater velocity is generally high and flow character varies lling to broken. Pools compose a lower proportion of the sections of the river. Substrates are composed primarily es. Coniferous trees are the dominant riparian vegetation vegetation overhanging the channel.

of substrate sizes, stream velocities, and water depths proould be excellent for spawning of most fish species found in arly those that require rocky substrates to spawn over. lts netted here during this study were either developing or ay have spawned in this reach. The grassy shallows present xcellent for spawning of northern pike and stickleback. or most fish is considered to be good because of the rocky sy areas along the insides of bends where the water is shallow. oung fish were captured in the reach during this study than in he Steepbank River. The numbers of slimy sculpin were particule areas for larger fish to rest and feed are found in the deep waters and pools provide some overwintering potential

WATER QUALITY No data available for this reach





	POINT SAMPLE DATA	
Location	km 15	
Date	04/06/78	
Hydraulics		
channel width (m)	25	
wet width (m)	10	
maximum depth (m)	ND	
average depth (m)	0.5	
velocity (m/s)	1.25	
flow character	rolling	
Substrate Composition (%)		
fines (< 2 mm)	10	
gravels (2-64mm)	25	
larges(>64mm)	65	
bedrock and/or oil sand	0	
Bank		
height(m)	1.0	
form	undercut	
stability	failing	
texture	sand , gravel	
vegetation (% coverage)		
coniferous trees	15	
deciduous trees	55	
shrubs	15	
grasses	10	
barren	20	
Water Quality		
temperature (°C)	19.0	
dissolved axygen (mg/l)	ND	
conductivity (µmhos/cm)	ND	
ρH	ND	

1. A 1997	111 A A A A A A A A A A A A A A A A A A
AN	angling
CF	counting fence
DN	dip net
ΈF	electrofisher
	gill net
	kick sample
SF	small fish collections made
	using a combination of methods
SN	seine
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
I	reach boundary
]	upstream limit of survey
	division between sections of
'	a reach
* Do	ta from Machniak and Bond

ND	
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	finescole 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 doce
NSST	ninespine stickleback
NTPK	northern pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shin <b>e</b> r
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch





PO	INT SAMPLE DATA		LE	GEND	$\alpha$
Location	km 26	km 30	AN angling	ARGR arctic grayling	
Date	04/06/78	04/06/78	CF counting fence	BKST brook stickleback	>\)
Hydraulics			DN dip net	BRMN brassy minnow	چ))
channel width (m)	12	14	EF electrofisher	BURB burbot	Fort MacKay
wet width (m)	12	14	GN gill net	DLVR Dolly Varden	Port Machay
maximum depth (m)	ND	ND	KS kick sample	EGGS unidentified fish eggs	
average depth (m)	1.0	0.5	SF small fish collections made	EMSH emerald shiner	
velocity (m/s)	0.60	0.90	using a combination of methods	FLCH flathead chub	
flow character	placid , swirling	rolling , broken	SN seine	FSDC finescale dace	
			AP benthic algal productivity station	FTMN fathead minnow	
Substrate Composition (%)				GOLD goldeye	lle
fines (< 2 mm)	40	25	BL benthic invertebrate collection site	LKCH lake chub	Tar Island 🌒
gravels (2-64 mm)	10	10		LKCS lake cisco	
larges(>64mm)	50	65	CH water quality station	LKWF lake whitefish	
bedrock and/or oil sand	0	0		LNDC longnose dace	)) • ¢ 0.
Bank			PS point sample	LNSK longnose sucker	
height(m)	2.5	2.5		MTWF mountain whitefish	1 20
form	repose	repose	SG stream gauging station	NRDC northern redbelly dace	Pt.
stability	stoble	stable		NSST ninespine stickleback	۲ <b>۲</b> ۲
texture	sand, grovel	sand, gravel	35 kilometres from mouth	NTPK northern pike	0
				PLDC pearl dace	6
vegetation (% coverage)			flow direction	SLSC slimy sculpin	
coniferous trees	20	45		SPSC spoonhead sculpin	8 11
deciduous trees	30	15	reach boundary	SPSH spottail shiner	FORT MCMURRAY
shrubs	30	40		TRPC trout-perch	
grasses	45	30	upstream limit of survey	UNSK unidentified sucker species	TH
borren	0	0		WALL walleye	
Water Quality			division between sections of	WTSK white sucker	P /
temperature (°C)	17.0	18.0	a reach	YLPR yellow perch	
dissolved oxygen (mg/l)	ND	ND			10 5
conductivity (µmhos/cm)	ND	ND	* Determinent Marketer and David dir		
рH	ND.	ND	* Data from Machniak and Bond (19)	979)	



S OF FISH COLLECTED (	1978)						PHYSICAL CHARACTERISTICS		REACH DESCRIPTION This short
							Reach length (km)	5.0	velocities are
			Juve	niles and			Channel width (m) Channel area (ha)	10 5.0	The river banks amounts of both
		dults		of-the-year	Tota	1 Numbers	Gradient (m/km)	2.0	growth of grass
pecies	June	September	June	September	June	September	Flow character Total pools (%)	swirling, rolling, broken 50	trees. Little Spawning p
ic grayling	0	0	0	0	0	0	Pattern	sinuous	rocky substrate
< stickleback	0	0	0	1	0	1	Confinement	confined	normally spawn
nose dace	2	0	0	1	2	1	Unstable banks (%)	5	found in the ro
dace sculpin	0 2	0	2	0	2	0	Substrate composition (%		by overhanging
tified fry	Z N/A	N/A	3 13	17 0	5 13	18 0	fines (<2 mm)	20	resting and fee
						. —	gravels (2-64 mm)	20	reach, they are
	4	1	18	19	22	20	larges (>64 mm) bedrock and/or oil san	60 d 0	limited.
INVERTEBRATES ECVPODA	P	IPARIAN VEGETA	ATION		BENTHIC ALGA	L PRODUCTIVITY	T	STREAM GAUGING DATA	
Musculium ECTA phemeroptera Baetis Cinygmula Drunella Ephemerella Stenonema donata			ous trees us trees	30 30 50 0 2 0		available for this		Ho data available for this re	ach
<i>Ophiogomphus</i> Trichoptera									

### ND FISH UTILIZATION

reach flows in a sinuous pattern and the gradient and water moderate. Approximately half of the reach area consists of pools. are stable. The substrate consists mainly of larges with smaller fines and gravels. The riparian vegetation consists of a dense es and a mixture of deciduous shrubs, deciduous trees and coniferous vegetation overhangs the channel.

tential in this reach is excellent for those fish that require There are also numerous areas that are suitable for fish that over sandy substrates. Suitable rearing areas for many fish are cky substrates (young-of-the-year fish) and the few areas sheltered vegetation (juvenile fish). Pools provide the major suitable ing areas for larger fish. Although pools are numerous in this not particularly deep; therefore, overwintering potential may be

> WATER QUALITY No data available for this reach

# AQUATIC BIOPHYSICAL INVENTORY STEEPBANK RIVER Reach 4 (km 42 to km 47) albertary ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM

prepared by LIMITED



Location Date	POINT SAMPLE DATA km 44 03/06/78
Hydraulics channel width (m) wet width (m) maximum depth (m) average depth (m) velocity (m/s) flow character	IO IO ND I.O I.OO rolling , broken
Substrate Composition (%) fines (< 2mm) gravels (2-64mm) larges (>64mm) bedrock and/or oil sand Bonk height (m) form stability lexture	25 15 60 0 2.0 repose stable sand
vegetation (% coverage) conferous trees deciduous trees shrubs grosses barren Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm) pH	15 25 50 50 0 16.0 ND ND ND ND

AN angling CF counting fence DN dip net EF electrofisher GN gill net KS kick sample SF smoll 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 flow direction  ${f I}$  reach boundary upstream limit of survey division between sections of a reach \* Data from Machniak and Bond (1979)

END		
ARGR	arctic grayling	
BKST	brook stickleback	
BRMN	brassy minnow	
BURB	burbot	-
DLVR	Dolly Varden	For
EGGS		
	emerald shiner	
FLCH	flathead chub	
FSDC	finescale dace	1
	fathead minnow	
	goldeye	
	lake chub	
	lake cisco	
	lake whitefish	
	longnose dace	
LNSK	longnose sucker	
MTWF	•••	
	northern redbelly dace	
NSST	ninespine stickleback	
NTPK	northern pike	
PLDC		
SLSC		
SPSC	spoonhead sculpin	
SPSH	spottail shiner	
TRPC		
UNSK		
WALL	walleye	
WTSK		
	yellow perch	h
UFRY	unidentified fry	
9)		



## AQUATIC BIOPHYSICAL INVENTORY

# STEEPBANK RIVER

Reach 4 (km 42 to km 47)

Scale 1:25 000



June 0 0 0 0 0 1 0 0 0 1 1 0 0 1 1 1 0 0 1 1 1 0 0 0 1 1 0 0 0 1 1 0 0 0 0 1 0	Deciduo Shrubs Grasses Barren Channel c Overhan	Young- June 0 4 1 27 3 5 0 2 42 42	eniles and of-the-year September 0 1 3 21 3 4 3 2 38 15 30 30 65 0	r June 0 4 1 27 4 5 0 2 43 BENTHIC ALGA	1 Numbers September 0 1 3 39 8 7 3 2 64	Char Grad Flow Tota Patt Conf Unst Subs fi gr 1a be Debr	ach length (km) annel width (m) annel area (ha) adient (m/km) bw character tal pools (%) ttern nfinement stable banks (%) bstrate composition ( fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sam bris	90 10 0	andering confined	conifers and grasses hanging vegetation. Spawning potenti (e.g., several minnow reach. Waters are pr winter under the ice shallows in this reac Because of the slow w tered areas provided potential for many fi sheltered by overhang and feeding areas for generally deep waters
	0 0 0 18 5 3 0 0 26 26 RIPARIAN VEGET Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	0 0 4 1 27 3 5 0 2 42 42 TATION rage (%) rous trees pous trees	0 1 3 21 3 4 3 2 38	0 0 4 1 27 4 5 0 2 43 BENTHIC ALGA	0 1 3 39 8 7 3 2 64	Flow Tota Patt Conf Unst Subs fi gr la be Debr	Dw character tal pools (%) ttern nfinement stable banks (%) bstrate composition (% fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sam	placid 90 irregularly me occasionally co 5 (%) 90 10 0 and 0 high high	i candering confined	Large amounts of debr Deciduous trees and s conifers and grasses hanging vegetation. Spawning potenti (e.g., several minnow reach. Waters are pr winter under the ice shallows in this reac Because of the slow w tered areas provided potential for many fi sheltered by overhang and feeding areas for generally deep waters
	0 0 0 18 5 3 0 0 26 26 RIPARIAN VEGET Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	0 0 4 1 27 3 5 0 2 42 42 TATION rage (%) rous trees pous trees	0 1 3 21 3 4 3 2 38	0 0 4 1 27 4 5 0 2 43 BENTHIC ALGA	0 1 3 39 8 7 3 2 64	Patt Conf Unst Subs fi gr la be Debr	ttern nfinement stable banks (§) bstrate composition ( fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sam	90 irregularly me occasionally co 5 (%) 90 10 0 10 0 and 0 high <u>STREAM GAUGING DATA</u>	eandering confined	Spawning potenti (e.g., several minnow reach. Waters are pr winter under the ice shallows in this reac Because of the slow w tered areas provided potential for many fi sheltered by overhang and feeding areas for generally deep waters
	0 0 18 5 3 0 0 26 RIPARIAN VEGET Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	0 4 1 27 3 5 0 2 42 42	1 3 21 3 4 3 2 38	0 4 1 27 4 5 0 2 43 BENTHIC ALGA	1 1 3 39 8 7 3 2 64 AL PRODUCTIVI	Conf Unst Subs fi gr la be Debr	nfinement stable banks (\$) bstrate composition ( fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sam	occasionally co 5 (%) 90 10 0 and 0 high <u>STREAM GAUGING DATA</u>	confined	hanging vegetation. Spawning potenti (e.g., several minnow reach. Waters are pr winter under the ice shallows in this reac Because of the slow w tered areas provided potential for many fi sheltered by overhang and feeding areas for generally deep waters
	0 0 18 5 3 0 0 26 26 RIPARIAN VEGET Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	4 1 27 3 5 0 2 42 TATION FATION Parage (%) rous trees pous trees	1 3 21 3 4 3 2 38	4 1 27 4 5 0 2 43 BENTHIC ALGA	1 3 39 8 7 3 2 64	Unst Subs fi gr la be Debr	stable banks (\$) bstrate composition ( fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sam	(%) 90 10 0 and 0 high <u>STREAM GAUGING DATA</u>		Spawning potenti (e.g., several minnow reach. Waters are pr winter under the ice shallows in this reac Because of the slow w tered areas provided potential for many fi sheltered by overhang and feeding areas for generally deep waters
	0 18 5 3 0 26 RIPARIAN VEGET Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	I 27 3 5 0 2 42 TATION rage (%) rous trees s	3 21 3 4 3 2 38	1 27 4 5 0 2 43 BENTHIC ALGA	3 39 8 7 3 2 64	Subs fi Ja Debr	bstrate composition ( fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sam	(%) 90 0 and 0 high <u>STREAM GAUGING DATA</u>	e for this rea	(e.g., several minnow reach. Waters are pro- winter under the ice shallows in this reac Because of the slow w tered areas provided potential for many fi sheltered by overhang and feeding areas for generally deep waters
	18 5 3 0 26 26 RIPARIAN VEGET Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	27 3 5 0 2 42 42 TATION erage (%) rous trees bus trees	21 3 4 3 2 38	27 4 5 0 2 43 BENTHIC ALGA	39 8 7 3 <u>2</u> 64	fi gr la Debr	fines (<2 mm) gravels (2-64 mm) larges (>64 mm) pedrock and/or oil sam	90 10 0 high <u>STREAM GAUGING DATA</u>	e for this rea	reach. Waters are pr winter under the ice shallows in this reac Because of the slow w tered areas provided potential for many fi sheltered by overhang and feeding areas for generally deep waters
	5 3 0 26 RIPARIAN VEGET Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	TATION Prage (%) rous trees s	3 4 3 2 38	4 5 0 2 43 BENTHIC ALGA	8 7 3 2 64	gr la Debr	gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sau	10 0 high <u>STREAM GAUGING DATA</u>	e for this rea	winter under the ice shallows in this reac Because of the slow wa tered areas provided I potential for many fir sheltered by overhang and feeding areas for generally deep waters
	3 0 26 RIPARIAN VEGET Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	5 0 2 42 FATION erage (%) rous trees ous trees	4 3 2 38	5 0 2 43 BENTHIC ALGA	7 3 2 64	la be Debr	larges (>64 mm) bedrock and/or oil sam	0 high <u>STREAM GAUGING DATA</u>	e for this rea	shallows in this reac Because of the slow w tered areas provided potential for many fi sheltered by overhang and feeding areas for generally deep waters
0 1	0 0 26 RIPARIAN VEGET Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	0 2 42 FATION erage (%) rous trees bus trees	3 2 38	0 2 43 BENTHIC ALGA	3 2 64	be Debr	bedrock and/or oil sa	and O high	e for this rea	Because of the slow wa tered areas provided H potential for many fis sheltered by overhang and feeding areas for generally deep waters
1	26 RIPARIAN VEGET Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	2 42 TATION erage (%) rous trees bus trees	2 38	2 43 BENTHIC ALGA	2 64	Debr		high STREAM GAUGING DATA	e for this rea	tered areas provided H potential for many fis sheltered by overhang and feeding areas for generally deep waters
- 1 <u><u><u>R</u></u></u>	26 RIPARIAN VEGET Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	42 FATION erage (%) rous trees ous trees	38 15 30 30 65 0	43 BENTHIC ALGA	64 AL PRODUCTIVI			STREAM GAUGING DATA	e for this rea	potential for many fig sheltered by overhang and feeding areas for generally deep waters
- - -	RIPARIAN VEGET Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	TATION erage (%) rous trees ous trees	15 30 30 65 0	BENTHIC ALGA	AL PRODUCTIVI	-			e for this rea	sheltered by overhang and feeding areas for generally deep waters
<u>R</u>	Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	erage (%) rous trees bus trees	30 30 65 0			-			e for this rea	and feeding areas for generally deep waters
R	Bank cove Conifer Deciduo Shrubs Grasses Barren Channel c Overhan	erage (%) rous trees bus trees	30 30 65 0			-			e for this rea	generally deep waters
57	Crown	ng	10 0							
					4					

#### ND FISH UTILIZATION

n of the Steepbank River is essentially a narrow, irregularly with relatively placid waters. Both gradient and water velociest recorded for the river, and water depths are somewhat greater ctions of the river. The river banks in this reach are stable. almost entirely fines, with a very low proportion of gravels. debris and frequent log obstructions exist in the reach. and shrubs are more abundant in the riparian vegetation than are sses are very abundant. There is a moderate amount of over-

tential for those fish that will spawn over sandy substrates innows, trout-perch, coregonids, and goldeye) is good in this re probably sufficiently deep to allow burbot spawning in the ice (this species will spawn over sandy substrates). Grassy reach are suitable for spawning of northern pike and stickleback. low water velocities, grassy shallows, and the abundance of shelided by debris, logs, and overhanging vegetation, the rearing any fish is considered to be excellent. The many pools and areas rhanging vegetation, debris, and logs provide excellent resting s for larger fish. Overwintering potential is good due to the vaters and numerous pools.

> WATER QUALITY No data available for this reach

# AQUATIC BIOPHYSICAL INVENTORY STEEPBANK RIVER

Reach 5 (km 47 to km 75)







	POINT SAMPLE DATA	
Location	ixm 60	km 75
Date	03/06/78	03/06/78
Hydraulics		
Channel width (m)	5.0	5.0
wet width (m)	5.0	5.0
maximum depth (m)	ND	ND
average depth (m)	1.5	1.0
velocity (m/s)	0.45	0.45
flow character	placid	placid
Substrate Composition (%)		
fines (< 2 mm)	100	100
gravels(2-64mm)	0	0
larges(>64mm)	0	0
bedrock and/or oil sand	0	0
Bank		
height(m)	3.5	2.5
form	repose	undercut
stability	stable	stable
lexture	sand, clay	sand
vegetation (% coverage)		
coniferous trees	20	35
deciduous trees	35	15
shrubs	20	30
grasses	65	50
barren	5	0
Water Quality		
temperature (°C)	16.0	15.0
dissolved oxygen (mg/l)	ND	ND
conductivity (µmhos/cm)	ND	ND
ρH	ND	ND

۰.		and the second
		LEGEN
N	angling	AF
-	counting fence	BH
N	dip net	BF
-	electrofisher	BL
N	gill net	DL
s	kick sample	EG
F	small fish collections made	EN
	using a combination of methods	FL
N	seine	FS
Ρ	benthic algal productivity station	F
Ċ.	bernine digai productivity station	G
I.	benthic invertebrate collection sit	- Lt
		Č LH
н	water quality station	LH
	nore: quanty enabled	Lł
S	point sample	LI
		Μ
G	stream gauging station	N
_		N
55	kilometres from mouth	N PL
r		PL SI
►	flow direction	SF
-		SF
Ι	reach boundary	T
٦	upstream limit of survey	U
L	apon call min or our cy	W
1	division between sections of	w
i	a reach	Υl

arctic grayling	
brook stickleback	
brassy minnow	
burbol	
Dolly Vard <b>e</b> n	
unidentified fish eggs	
emerald shiner	
flathead chub	
finescale dace	
fathead minnow	
goldeye	
iake chub	
lake cisco	
lake whitefish	
longnose dace	
longnose sucker	
mauntain whitefish	
northern redbelly dace	1
ninespine stickleback	
northern pike	
pearl dace	
slimy sculpin	
spoonhead sculpin	
spottall shiner	
trout-perch	
unidentified sucker species	
walleye	
white sucker	
yellow perch	









				07	4	
IBERS OF FISH COLLECTED (SEPTE	MBER 1979)			PHYSICAL CHARACTERISTICS		REACH DESCRIPTION AND FISH UT This wide lower reach
Species	Adults	Juveniles and Young-of-the-year	Total Numbers	Reach length (km) Channel width (m) Channel area (ha) Gradient (m/km)	1.4 70 9.8 1.4	floodplain and flows in a and many areas with unstab sand bars are present at t flow characteristics in th
longnose dace bearl dace √hite sücker Total	0 0 4 4 4	1 13 2 16	$\frac{1}{13}$ $\frac{6}{20}$	Flow character Total pools (%) Pattern Confinement Unstable banks (%)	swirling 90 straight confined 45	ditions. The substrate co Deciduous trees and shrubs also fairly numerous and g the wide channel. The gravel substrate
				Substrate composition (5 fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil san Debris	25 45 15	for some of the fish speci white sucker, trout-perch) currents may be suitable f ticularly pearl dace. Bec this area is not considere area may provide a resting River, the potential for r the majority of the reach shallow. The shallow wate reach.
ITHIC INVERTEBRATES OLIGOCHAETA INSECTA Ephemeroptera Bactis Paraleptophlebia Trichoptera Hydropsyche Diptera Simuliidae	Conit Decid Shrut Grass Barre	overage (%) ferous trees 30 duous trees 65 os 70 ses 85 en 5 l cover (%) nang 1	BENTHIC ALGAL PRODUCTIVITY No data available for this	s reach	STREAM GAUGING DATA No data available for this r	reach WA
						A
	Bridge on h	ighway 63 at km 0.6.		Looking downstream	from km 0.6 towards confluence w	ith the Athabasca River.

#### TILIZATION

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

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

No data available for this reach



	88		
	FISH COLLECTION SF* LNDC TRI LNSK WA NTPK WT SLSC YL	SH PC SN LL SK	PLDC KS WTSK LNDC
	T.		
	P5	BI	Muteonu
POINT SAMPLE DATA	LEGEND	ه( )	Fort MacKay

	POINT SAMPLE DATA
Location	km 0.6
Date	14/09/79
Hydraulics	
channel width (m)	72.0
wet width (m)	42.0
maximum depth (m)	0.8
average depth (m)	0.5
velocity (m/s)	0.78
flow character	swirling
Substrate Composition (%)	
fines (< 2 mm)	15
graveis (2-64mm)	50
larges(>64mm)	10
bedrock and/or oil sand	25
Bonk	
height(m)	1.5
form	steep
stability	failing
texture	silty sand, gravel
vegetation (% coverage)	
coniferous trees	25
deciduous trees	50
shrubs	70
grasses	85
barren	5
Water Quality	
temperature (°C)	13.0
dissolved oxygen (mg/l)	9 320
conductivity (µmhos/cm)	8.39
ρH	0.39

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 flow direction T reach boundary upstream limit of survey division between sections of a reach

\* Data from Machniak *et al.* (1980)

ND	
ARGR	arctic grayling
BKST	brook stickleback
BRMN	brassy minnow
BURB	burbot
DLVR	Dolly Vorden
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	peari dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottoil shiner
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch



				89			
NUMBERS OF FISH COLLECTED (SEPTEN pearl dace trout-perch walleye white sucker Total	MBER 1979) Adults 2 0 0 0 2	Juveniles and Young-of-the-yea 42 26 4 10 82	r Total Numbers 44 26 4 10 84	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 Debris	35 60 0	REACH DESCRIPTION AND F This short reach a sinuous pattern thu high and there are so gradient is moderate The substrate consist primarily deciduous to also abundant. This reach provi fish species that reach white sucker and thread MacKay River and all sidered fair; some go Because of the relati fish resting and feed good areas for overwi	h lies ju rough a na everal and and the ts of gra- trees and ides many quire gra- out-perch spawn over rassy sha ively deep ding is co
ENTHIC INVERTEBRATES OLIGOCHAETA GASTROPODA PELECYPODA Musculium INSECTA Collembola Ephemeroptera Ameletus Baetisea Caenis Paraleptophlebia Odonata	Coni Deci Shrul Gras Barro	overage (%) ferous trees 30 duous trees 60 os 30 ses 60 en 5 l cover (%) nang 1	. <u>BENTHIC ALGAL PRODUCTIVITY</u> No data available for thi	s reach	STREAM GAUGING DATA No data available for this re	each	<u>WATER</u> N
Aeshna Ophiogomphus Plecoptera Pteronarcys Trichoptera Oecetis Polycentropus Diptera Tipulidae Ceratopogonidae Chironomidae Chironominae Simuliidae Tabanidae							Αοι
	Swirling flo	w character, typical o	of reach 2, at km 2.5.	MacKay River at	km 2.5.		

#### LIZATION

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

any areas that should be good for spawning of those gravel substrates. Arctic grayling, longnose sucker, ich have all been collected in the lower reaches of the over gravel substrates. Rearing potential is conshallow areas provide the only suitable habitat. deep water and the many pools, the potential for adult is considered good. The deep pools also provide several ing of fish.

TER QUALITY No data available for this reach





Adults 0	Juveniles and Young-of-the-year	Total Numbers	Reach length (km) Channel width (m) Channel area (ha)	35.5 28 99.4	This tortuously m 40 to 50 m deep into t proportion of unstable
		Total Numbers			areas. Exposed oil sa
0			Gradient (m/km)	1.3	surface is visible fro
	3	3	Flow character Total pools (%)	swirling, rolling, broken 75	are moderate, and ther deep pools. The subst
0	9	10 5	Pattern	tortuously meandering	being a major componen
0	2	2	Confinement	entrenched	is dominated by decidu
0 0	207	207	Unstable banks (%)	60	conifers. Very little
0	2	2			Several areas, wh
1	0	1	fines (<2 mm)	10	spawning of a number o
8	11	19			sucker, trout-perch).
N/A	20	20	-		species are provided b
0	3	3			and rock substrates.
0	6	6	Debris	Iow	MacKay River have been
10	268	278			provide good resting a
					fish species and young piscivores. The water
Coni Deci Shrui Gras Barru Channe Overl	ferous trees 5 duous trees 65 bs 40 ses 60 een 10 Cl cover (%) chang 1	mean: 381.0 x 10 <sup>10</sup> maximum: 1400.0 x 10 <sup>10</sup> minimum: 14.0 x 10 <sup>10</sup> Standing crop expressed as o mean: 12.6 maximum: 30.7 minimum: 0.3 Primary productivity (mg C-H mean: 8.2 maximum: 26.0 minimum: 0.5	chlorophyll a (mg·m <sup>-2</sup> ) n <sup>-1</sup> ·m <sup>-2</sup> )	Maximum total annual discharge: Minimum total annual discharge: Maximum annual mean discharge: Minimum annual mean discharge: Maximum monthly mean discharge: Minimum monthly mean discharge: Maximum daily discharge: Minimum daily discharge:	852.3 x 10 <sup>6</sup> m <sup>3</sup> (1973) 185.0 x 10 <sup>6</sup> m <sup>3</sup> (1977) 27.01 m <sup>3</sup> /s (1973) 5.89 m <sup>3</sup> /s (1977) 157.16 m <sup>3</sup> /s (June 1973) 0.10 m <sup>3</sup> /s (February 1973) 302.99 m <sup>3</sup> /s (June 18, 1973) 0.02 m <sup>3</sup> /s (March 2, 1973)
	0 1 8 N/A 0 0 0 10 10 RIPARIAN VEI Bank cr Coni Shrui Grass Barro Channe Overl	0 2 1 0 8 11 N/A 20 0 3 0 6 10 268 <u>RIPARIAN VEGETATION</u> Bank coverage (%) <u>Coniferous trees</u> 5 <u>Deciduous trees</u> 65 <u>Shrubs</u> 40 <u>Grasses</u> 60 <u>Barren</u> 10 <u>Channel cover</u> (%) <u>Overhang</u> 1	0         2         2           1         0         1           8         11         19           N/A         20         20           0         3         3           0         6         6           10         268         278           Bank coverage (%)         Standing crop expressed as one and maximum: 14.0 × 10 <sup>10</sup> Coniferous trees         5           Deciduous trees         65           Shrubs         40           Grasses         60           Barren         10           Channel cover (%)         0           Overhang         1           Channel cover (%)         0           Overhang         1           Crown         0	0         20/         20/         20/         20/         Substrate composition (3         3           1         0         1         <	$\begin{array}{c c c c c c c c c c c c c c c c c c c $

### WATER QUALITY Water Survey

Total alkalir Total hardnes Conductance Total filter residue fi: Total non-fi residue fi Total organi Silica (mg S Nitrate and Total Kjeldah Total Phospho Orthophosphat Sulphate (mg

### TION AND FISH UTILIZATION

tortuously meandering section is entrenched within a canyon that is cut deep into the McMurray Oil Sands formation. There is a very high of unstable banks, which are primarily high, near-vertical, slumping posed oil sands deposits are common, and a film of oil on the water visible from the air in many places. Gradient and water velocities ate, and there are numerous riffle areas in addition to many relatively . The substrate consists primarily of gravels and larges with oil sand ajor component of the substrate in many places. The riparian vegetation ed by deciduous trees and shrubs and there are scattered patches of Very little vegetation overhangs the banks.

ral areas, where the substrate is primarily gravel, appear suitable for of a number of fish species (e.g., arctic grayling, longnose sucker, white rout-perch). Suitable rearing areas for young-of-the-year of many re provided by the numerous shallow areas with slow currents and gravel ubstrates. Adults and juveniles of most fish species that occur in the ver have been collected in this reach. The numerous pools of this reach od resting and feeding areas for adult fish and the abundance of forage ies and young of other species provides good feeding potential for . The water depths in many of the large pools in this reach are probicient to allow overwintering by fish.

Y			
of Canada station number	OOATO7DB0	1100	
	Mean	Maximum	Minimum
nity (mg CaCO <sub>3</sub> /1)		577.0 8.50	
ess (mg CaCO <sub>3</sub> /l)		493.1	59.3
(µS/cm)	392	1370	102
able			
xed (mg/l)	198	781	51
lterable			
xed (mg/l)	35	463	<0.li
c carbon (mg C/l)	31.0	59.0	9.0
i0 <sub>2</sub> /1)	6.9	20.0	1.0
nitrite nitrogen (mg N/l)	0.130	0.694	<0.003
hl nitrogen (mg N/l)	1.35	4.20	0.31
iorus (mg P/1)	0.080	0.260	0.024
ite (mg P/1)	0.030	0.100	<0.003
S0./1)	34.0	100.0	1.2

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

# AQUATIC BIOPHYSICAL INVENTORY MACKAY RIVER Reach 3 (km 4.2 to km 40.0) abertavi ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by LSL LIMITED

FISH COLLECTIONS



Date Hydraulics Channel width (m) wet width (m) average depth (m) average depth (m) velocity (m/s) flow character Substrate Composition (%) fines (< 2 mm) gravels (2 - 64 mm) bedrack and/or oil sand Bonk height (m) form stability texture vegetation (% coverage) conferous trees deciduous trees shrubs grasses barren Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm) pH	Location
channel width (m) wet width (m) maximum depth (m) average depth (m) velocity (m/s) flow character Substrate Composition (%) fines (< 2 mm) gravels (2 – 64 mm) bedrock and/or oil sand Bonk height (m) form stability texture vegetation (% coverage) - conferous trees strubs grasses barren Water Quality temperature (°C) dissolved oxygen (mg/t) conductivity (µmhos/cm)	Date
wet width (m) maximum depth (m) average depth (m) velocity (m/s) flow character Substrate Composition (%) fines (< 2 mm) gravels (2 - 64 mm) bedrack and/or oit sand Bonk height (m) form stability texture vegetation (% coverage) conferous trees deciduous trees shrubs grasses parten Water Quality temperature (°C) dissolved oxygen (mg/t) conductivity (umhos/cm)	Hydraulics
maximum depth (m) average depth (m) velocity (m/s) flow character Substrate Composition (%) fines (< 2 mm) grovels (2 - 64 mm) lorges(>64 mm) bedrock and/or oil sand Bonk height (m) form stability texture vegetation (% coverage) - conferous trees deciduous trees shrubs grasses parren Water Quality hemperature (°C) dissolved oxygen (mg/ti) conductivity (µmhos/cm)	Channel width (m)
average depth (m) velocity (m/s) flow character Substrate Composition (%) fines (< 2 mm) gravels (2 – 64 mm) bedrack and/or oil sand Bonk height (m) form stability lexture vegetation (% coverage) - conferous trees deciduous trees shrubs grasses parren Water Quality temperature (°C) dissolved oxygen (mg/ti) conductivity (µmhos/cm)	
velocity (m/s) flow character Substrate Composition (%) fines (< 2 mm) gravels (2 - 64 mm) bedrock and/or oit sand Bonk height (m) for m stability texture vegetation (% coverage) conferous trees deciduous trees shrubs grasses parren Water Quality temperature (°C) dissolved oxygen (mg/t) conductivity (µmhos/cm)	
flow character Substrate Composition (%) fines (< 2 mm) gravels (2-64 mm) lorges(>64 mm) bedrock and/or oil sand Bonk height(m) form stability texture vegetation (% coverage) - conferous trees deciduous trees shrubs grasses barren Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)	
Substrate Composition (%) fines (< 2 mm) gravels (2 - 64 mm) larges (> 64 mm) bedrack and/or oil sand Bonk height (m) form stability lexture vegetation (% coverage) - conferous trees deciduous trees strubs grasses parren Water Quality temperature (°C) dissolved oxygen (mg/t) conductivity (µmhos/cm)	
fines (< 2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sand Bonk height (m) form stability texture vegetation (% coverage) conferous trees deciduous trees shrubs grasses barren Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)	flow character
gravels (2-64 mm) lorges(>64 mm) bedrock and/or oil sand Bonk height (m) form stability texture vegetation (% coverage) - conferous trees deciduous trees shrubs grasses parren Water Quality hemperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)	Substrate Composition (%)
larges(>64 mm) bedrock and/or oil sand Bonk height (m) form stability texture vegetation (% coverage) - conferous trees deciduous trees shrubs grasses parren Water Quality temperature (°C) dissolved oxygen (mg/t) conductivity (µmhos/cm)	
bedrock and/or oil sand Book height (m) form stability texture vegetation (% coverage) coniferous trees deciduous trees shrubs grasses parren Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)	gravels(2-64mm)
Bonk height (m) form stability texture vegetation (% coverage) conferous trees deciduous trees shrubs grasses barren Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)	larges(>64mm)
height (m) form stability lexture vegetation (% coverage) - conferous trees deciduous trees shrubs grasses parren Water Quality temperature (°C) dissolved oxygen (mg/t) conductivity (µmhos/cm)	bedrock and/or oil sand
form stability texture vegetation (% coverage) - coniferous trees deciduous trees shrubs grasses parren Water Quality temperature (°C) dissolved oxygen (mg/t) conductivity (µmhos/cm)	
stability texture vegetation (% coverage) conferous trees deciduous trees shrubs grasses parren Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)	
texture vegetation (% coverage) conferous trees deciduous trees shrubs grasses parren Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)	
vegetation (% coverage) - coniferous trees deciduous trees shrubs grasses parren Water Quality temperature (°C) dissolved oxygen (mg/t) conductivity (µmhos/cm)	1
<ul> <li>coniferous trees deciduous trees shrubs grasses parren</li> <li>Water Quality temper ature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)</li> </ul>	fexture
deciduous trees shrubs grasses parren Water Quality temperature (°C) dissolved oxygen (mg/t) conductivity (µmhos/cm)	vegetation (% coverage)
shrubs grasses parren Water Quality temperature (°C) dissolved oxygen (mg/t) conductivity (µmhos/cm)	coniferous trees
grasses barren Water Quality temperature (°C) dissolved oxygen (mg/t) conductivity (µmhos/cm)	deciduous trees
parren Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)	shrubs
Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)	
temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)	
dissolved oxygen (mg/l) conductivity (µmhos/cm)	
conductivity (µmhos/cm)	
рн	
	рн

AN	angling
CF	
	dip net
	electrofisher
8	gill net
	kick sample
SF	small fish collections made
	using a combination of methods
SN	seine
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
M	flow direction
I	reach boundary
]	upstream limit of survey
	division between sections of a reach

# ARGR arctic grayling BKST brook stickleback BRMN brassy minnow BURB burbat DLVR Dolly Varden EGGS unidentified fish eggs EGGS unidentified fish egg 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 dace LNSK longnose sucker MTWF mountain whitefish NBDC northern redebily da NRDC northern redbelly dace NSST ninespine stickleback NTPK northern pike NTPK northern pike PLDC pearl dace SLSC slimy sculpin SPSC spoonhead sculpin SPSH spottail shiner TRPC trout-perch UNSK unidentified sucker species Wall u wallance WALL walleye WTSK white sucker YLPR yellow perch



# 94

## AQUATIC BIOPHYSICAL INVENTORY

## MACKAY RIVER

Reach 3 Section 3 (km 35.5 to km 40.0)

Scale 1:25 000



NUMBERS OF FISH COLLECTED (SEPTE	MBER 1979)			PHYSICAL CHARACTERISTICS	2F F	REACH DESCRIPTION AND FISH I This irregularly me.
Species finescale dace longnose dace	Adults 4 0	Juveniles and Young-of-the-year 15 11	Total Numbers	Reach length (km) Channel width (m) Channel area (ha) Gradient (m/km) Flow character Total pools (%) Pattern	25.5 50 127.5 2.2 swirling, rolling 60 irregularly meandering	evidence of lateral chan valley is present. The steep and slumping, but less than in Reach 3. Th water velocities are rela reach area and are genera marily of larges and coa
pearl dace trout-perch white sucker Total		128 3 4 161	128 3 4 165	Pattern Confinement Unstable banks (%) Substrate composition ( fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sa Debris	confined 15 20 40 40	Although the riparian ver patches of conifers are The gravel substrate excellent for spawning o nose dace and trout-percl probably suitable for spa tial of this reach is con provide adequate shelter are provided by the numer dant in this reach, feed Because the pools in this probably not possible exc
BENTHIC INVERTEBRATES NEMATODA OLIGOCHAETA GASTROPODA Gyraulus PELECYPODA Musaulium Pisidium INSECTA Ephemeroptera Ameletus Baetisea Ephemera Ephemerella Faraleptophlebia	Conif Decid Shrub Grass Barre	verage (%) erous trees 15 jous trees 50 s 45 es 70 n 5 cover (%)	BENTHIC ALGAL PRODUCTIVITY No data available for thi	is reach	STREAM GAUGING DATA No data available for this re	ach
Stenonema Odonata Ophiogomphus Plecoptera Trichoptera Trichoptera Diptera Tipulidae Chironomidae Chironominae Tanypodinae Orthocladiinae Tabanidae Dolichopodidae						
	Section of ri	ffles with slumping ban	k on left at km 45.1.	High, eroding ba	nk of sand and silt at km 63.8.	

#### H UTILIZATION

meandering section is confined by the valley walls, but hannel movement (i.e., oxbows and meander scars) within the be banks on the outside of bends in the river are often at the proportion of the banks that are unstable is much The gradient in this reach is steeper than in Reach 3 and relatively high. Pools comprise a little over half of the herally shallow. The substrate in this reach consists pricoarse gravels, with sand and silt present in the pools. vegetation is mostly deciduous trees and shrubs, some re present and grasses are abundant.

rates and many riffles in this reach provide areas that are of arctic grayling, longnose sucker, white sucker, longarch. Those areas with large rocks and slower currents are spawning of lake chub and slimy sculpin. The rearing potenconsidered good because areas with large rock substrates er. Areas suitable for resting and feeding of adult fish merous pools in this reach. Because forage fish are abuneding potential for piscivorous species is considered good. his reach are relatively shallow, overwintering of fish is except in isolated deep pools.

WATER QUALITY No data available for this reach





	FUNI SAMPLE DATA
Location	<b>14m</b> 45.1
Date	13/09/79
Hydraulics	
channel width (m) wet width (m) maximum depth (m) average depth (m) velocity (m/s) flow character	42.7 25.9 0.8 0.6 0.96 swirling , rolling , broken
Substrate Composition (%)	
fines (< 2mm)	20
gravels (2-64mm)	40
larges(>64mm)	40
bedrock and/or oil sand	0
Bonk	
height (m)	1.5
form	undercut
stability	failing
rexture	silt, sand, gravel, larges
vegetation (% coverage)	
coniferous trees	0
deciduous trees	40
shrubs	30
grasses	45
barren	15
Water Quality	
temperature (°C)	9.0
dissolved oxygen (mg/l)	9
conductivity (µmhos/cm)	210 8,04
РН	0.04
	<u>.</u>

	•
	angling
CF	
	dip net
	electrofisher
-	gill net
	kick sample
SF	small fish collections made
	using a combination of methods
SN	seine
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
K	flow direction
I	reach boundary
]	upstream limit of survey
1	division between sections of a reach
v	

ARGR	arctic grayling
BKST	brook stickleback
BRMN	brassy minnow
BURB	burbol
DLVR	Dolly Vorden
EGGS	unidentified fish eggs
EMSH	emerold shiner
FLCH	flathead chub
FSDC	finescale dace
FTMN	fathead minnow
GOLD	goldeye
LKCH	loke chub
LKCS	lake císco
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
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker spec
WALL	walleye
<b>WTSK</b>	white sucker





the second s	and the second second second second	-	
POINT	SAMPI	F	ΠΔΤΔ

	PUINT SAMPLE DATA
Location	km 63.8
Date	13/09/79
Hydraulics	
channel width (m)	55.0
wet width (m)	30.5
maximum d <b>epth</b> (m)	1.0
average depth (m)	0.5
velocity (m/s)	0.81
flow character	swirli <b>ng, rolling , b</b> roken
Substrate Composition (%)	
fines (< 2 mm)	15
gravels (2-64mm)	45
larges(>64mm)	40
bedrock and/or all sand	0
Bonk	
height(m)	1.5
form stability	undercut stable
texture	silt, sand, gravel, larges
vegetation (% coverage)	
coniferous trees/	0
deciduous trees	45
shrubs	65
grasses	80
barren	2
Water Quality	
temperature (°C)	10.5
dissolved oxygen (mg/l)	9
conductivity (µmhos/cm)	270
рH	8.12

100	The second second	
and the second se		
1020000	AN	angling
10100	CF	counting fence
2426	DN	dip net
1000	EF	electrofisher
1.0	GN	gili net
ALC: N		kick sample
1000	SF	small fish collections made
10000		using a combination of methods
1.0.63	SN	seine
COLOR WAYS	ΑP	benthic algal productivity station
CONTRACTOR OF	BI	benthic invertebrate collection site
00070425420	Сн	water quality station
115111111120	PS	point sample
26447023000	SG	stream gauging station
0110-0353030	35	kilometres from mouth
Apple Seven lights	K	flow direction
AutoMetric Scale	I	reach boundary
このできたい、あいたちにないないできたのであるとなっていたのであるとないのできたかできたのであると	]	upstream limit of survey
NaGere	1	division between sections of
ALCOND.	1	a reach
12633036		
Trively.		
8		

ID	
RGR	arctic grayling
KST	brook stickleback
BRMN	brassy minnow
BURB	burbot
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	longnose sucker
AT WF	mountain whitefish
RDC	northern redbelly dace
ISST	ninespine stickleback
ITPK	northern pike
LDC	peari dace
SLSC	slimy sculpin
SPSC	spoanhead sculpin
PSH	spottail shiner
RPC	trout-perch
INSK	unidentified sucker species
VALL	walleye
<b>∀</b> TSK	white sucker
LPR	yellow perch



Adults  Adults  1 0 0 0 11 11	Juveniles and Young-of-the-year 0 2 206 2 9 219	Total Numbers	fines (<2 mm) gravels (2-64 mm) larges (>64 mm)	10 50 40	REACH DESCRIPTION AND FI This long, irreg is essentially a seri sists of pools is the flow character varies banks are fairly comm of the river. The su sandy areas in quiet component of the ripa numerous. There is u little overhanging ve Although the spa grayling, suckers, lo large sizes of the su The rearing potential by large rocks in sha Because there are rel swiftly flowing, the is relatively poor. habitat for arctic gr not sufficient for ov
Bank cov Conife Decidu Shrubs Grasse Barren Channel	erage (2) rous trees 50 ous trees 30 30 s 85 5 cover (%)	BENTHIC ALGAL PPODUCTIVITY No data available for th	is reach	STREAM GAUGING DATA No data available for this re	each
	1 0 10 0 11 11 <u>RIPARIAN VEGE</u> Bank cov Conife Decidu Shrubs Grasse Barren Channel Overha	Juveniles and Young-of-the-year       1     0       0     2       10     206       0     2       0     9       11     219         RIPARIAN VEGETATION       Bank coverage (?)       Coniferous trees     50       Deciduous trees     30       Shrubs     30       Grasses     85       Barren     5       Channel cover (%)     0       Overhang     1	Juveniles and Young-of-the-year     Total Numbers       1     0     1       0     2     2       10     206     216       0     2     2       0     9     9       11     219     230       Bank coverage (?) Coniferous trees 50 Deciduous trees 50 Shrubs 30 Grasses 85 Barren 5       Channel cover (?) Overhang 1	Adults     Juveniles and Young-of-the-year     Total Numbers       1     0     1       0     2     2       10     206     216       0     2     2       0     2     2       0     2     2       0     2     2       0     2     2       0     3     9       11     219     230	Adults     Juveniles and Young-of-theryear     Total Numbers       1     0     1       1     0     1       1     0     1       10     206     216       0     2     2       1     219     230       11     219     230       11     219     230       11     219     230       11     219     230       11     219     230       11     219     230       11     219     230       11     219     230       11     219     10       11     219     10       11     219     10       11     219     10       11     219     10       11     219     10       11     219     10       11     219     10       11     219     10       11     10     10       11     10     10       12     10     10       13     10     10       14     10     10       15     10       16     10       17     10       1

τ.

### FISH UTILIZATION

egularly meandering section has a relatively high gradient and ries of riffles. The proportion of the reach area that conhe lowest in the surveyed portion of the MacKay River, and the es from swirling to rolling to broken. Areas with unstable mmon but are less frequent here than in the four lower reaches substrate is almost entirely larges and gravels, with some t shallows along the banks. Coniferous trees are a dominant parian vegetation and deciduous trees and shrubs are also usually a dense growth of grasses along the banks and very vegetation.

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

WATER QUALITY No data available for this reach

# AQUATIC BIOPHYSICAL INVENTORY MACKAY RIVER

Reach 5 (km 65.5 to km 111.5)



ENVIRONMENTAL RESEARCH PROGRAM





			100		
		1	FISH COLLECTIO	NS	
	SN FSDC	EF	PLDC TRPC		
	WTS	ĸ /	WTSK		
					the second second
	M. 100				
		$\rightarrow 1 \rightarrow 1$		85	
					YNN Y
					N V V
		star >3		E. C.	× Th
		- the			St - 12-
				A Company	1.1516
	70 -		125	U have a second	
		90		de la construcción de la	1 3 - 3 - 4 A
		K. P		and the	
	PS		and the species		A grant
	SAMPLE DATA		EGEND		Fort MacKay
Location Date Hydraulics	km 91.5 13/09/79	AN angling CF counting fence DN dip net	ARGR arctic grayling BKST brook stickleback BRMN brassy minnow	2ª L	and the second
channel width (m) wet width (m)	35.0   8.0	EF electrofisher GN gill net	BURB burbot DLVR Dolly Vard <b>e</b> n		Rivernor
maximum depth (m) average depth (m)	0.9 0.5	KS kick sample SF small fish collections made using a combination of methods	EGGS unidentified fish eggs EMSH emerald shiner FLCH flathead chub		Se se
velocity (m/s) flow character	0.85 swirling , rolling , broken	SN seine AP benthic algal productivity station	FECH Hathead chub FSDC finescale dace FTMN fathead minnow	O over	
Substrate Composition (%) fines (< 2 mm)	10 50	B1 benthic invertebrate collection site	GOLD goldeye LKCH lake chub	< r to the second secon	1 ontone 1
gravels (2–64mm) larges (>64mm)	50 40 0	CH water quality station	LKCS lake cisco LKWF lake whilefish LNDC lacasana dasa		And A
bedrock and/or oil sand Bonk height (m)	1.5	PS point sample	LNDC longnose dace LNSK longnose sucker MTWF mountain whitefish	P. Mock	
form stability	repose stable	SG stream gauging station	NRDC northern redbelly dace NSST ninespine stickleback	· · · · · · · · · · · · · · · · · · ·	
lexture	sandy silt , gravel , larges	35 kilometres from mouth	NTPK northern pike PLDC pearl dace SLSC slimy sculpin	m	
vegetation (% coverage) coniferous trees deciduous trees	40 25	flow direction T reach boundary	SLSC slimy sculpin SPSC spoonhead sculpin SPSH spottail shiner		, ,
shrubs grosses	20 90 0	L reach boundary     J upstream limit of survey	TRPC trout-perch UNSK unidentified sucker species		R I VER
barren Water Quality	0	division between sections of	WALL walleye WTSK white sucker	THABA	SCA RIVE
temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)	9 220	l a reach	YLPR yellow perch		10 5 0 10
pH	8.07	* Data from Machniak <i>et al.</i> (19	980)		Kilometres



FISH COLLECTIONS





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 dams 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.

> WATER QUALITY No data available for this reach



prepared by LSL



Location Date Hydraulics channel width (m) wet width (m)	
maximum depth (m) average depth (m) velocity (m/s)	
flow character	
Substrate Composition (%) fines (< 2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sand	
Bonk	
height (m)	
form	
stability	
lexture	
vegetation (% coverage) coniferous trees	
deciduous trees	
shrubs grass <b>es</b>	
barren	
Water Quality	
temperature (°C)	
dissolved oxygen (mg/l)	
conductivity (µmhos/cm)	
рH	

SG stream gauging station 35 kilometres from mouth flow direction I reach boundary upstream limit of survey division between sections of a reach

ND	
ARGR	arctic grayling
BKST	brook stickleback
BRMN	brassy minnow
BURB	burbot
DLVR	Dolly Vorden
EGGS	unidentified fish eggs
EMSH	emerald shiner
FLCH	flathead chub
FSDC	finescale dace
FTMIN	fathead minnow
GOLD	goldeye
LKCH	lake chub
LKCS	lake cisco
LK₩F	lake whitefish
LNDC	longnose dace
LNSK	longnose sucker
MTWF	mountain whitefish
NRDC	northern redbelly dace
NSST	ninespine stickleback
NTPK	northern pike
PLDC	pear! dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shin <del>er</del>
TRPC	trout-p <b>er</b> ch
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch



0.5 Kilometres alberter ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by LIMITED



47.65 e.C. 온다. 이			
	POINT	SAMPLE	DATA

Location	km 122.8
Date	14/09/79
Hydraulics channel width (m) wet width (m) maximum depth (m) average depth (m) velocity (m/s) flow character	48.8 33.5 2.0 0.9 0.29 placid, swi
Substrate Composition (%) fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil sand Bank height (m) form stability texture	65 20 15 0 1.5 undercut stable sandy silt
vegetation (% coverage) conferous trees deciduous trees shrubs grasses barren Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm) pH	10 65 95 2 11.0 9 240 7.86

AN angling CF counting fence DN dipnet EF electrofisher GN gill net KS kick sample SF small fish collections made using a combination of mathe 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 flow direction I reach boundary upstream limit of survey

division between sections of a reach

\* Data from Machniak *et al.* (1980)

END	
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 sticklebock
NTPK	northern pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shin <b>e</b> r
TRPC	trout-p <b>erch</b>
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch



# MACKAY RIVER Reach 6 Section 2 (km 120.0 to km 131.8) Scale |: 25 000







	PUINT	5
Location		
Dote		
Hydraulics		
channel width (m)		
wet width (m)		
maximum d <b>e</b> pth (m)		
average depth (m)		
velocity (m/s)		
flow character		
Substrate Composition (%)		
fin <b>es (&lt;</b> 2 mm)		
gravels(2-64mm)		
larges(>64mm)		
bedrock and/or oil sand		
Bonk		
height(m)		
farm		
stability		
lexture		
vegetation (% coverage)		
coniferous trees		
deciduous trees		
shrubs		
grasses		
barren		
Water Quality		
temperature (°C)		
dissolved oxygen (mg/l)		
conductivity (µmhos/cm)		
рH		

	LEGE
AN	angling
	counting fence
DN	dip net
EF	electrofisher
	gill net
	kick sample
SF	small fish collections made
SN	using a combination of methods seine
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
1	division between sections of a reach

ARGR	arctic grayling
BKST	brook stickleback
BRMN	brassy minnow
Burrb	burbot
DLVR	Dolly Vard <b>e</b> n
EGGS	unidentified fish eggs
EMSH	emerald shiner
FLCH	flathead chub
FSDC	finescale dace
FTMIN	fathead minnow
GOLD	goldeye
LKCH	lake chub
LKCS	lake cisco
LK₩F	lake whitefish
LNDC	longnose dace
LNSK	longnose sucker
MTWF	mountain whitefish
NRDC	northern redbelly dace
NSST	ninespine stickleback
NTPK	northern pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch



# MACKAY RIVER Reach 6 Section 3 (km 131.8 to km 140.0) Scale |: 25 000 Miles 0.5 0,5 Kilometres albertar ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by LIMITED



	TOINT SAMELE DATA
Location	km 141.5
Date	4/09/79
Hydraulics	
Channel width (m)	33.5
wet width (m)	24.4
maximum depth (m)	1.3
average depth (m)	0.8
velocity (m/s)	0.36
flow character	placid, swirling,
Substrate Composition (%)	
fines (< 2 mm)	30
gravels(2-64mm)	55
larges(>64mm)	15
bedrock and/or oil sand	0
Bonk	
height(m)	1.0
form	undercut
stability	stable
rexture	sand , silt
vegetation (% coverage)	
coniferous trees	60
deciduous trees	10
shrubs	30
grasses	95
barren	2
Water Quality	
temperature (°C)	11.0
dissolved oxygen (mg/l)	8
conductivity (µmhos/cm)	270
рH	7.84

RGR	arctic grayling
ST	brook stickleback
(MN	brassy minnow
JRB	burbot
VR	Dolly Vard <b>e</b> n
GS	unidentified fish eggs
1SH	emerald shiner
CH.	flathead chub
DC	finescale dace
MN	fathead minnow
DLD	goldeye
КСН	lake chub
CS	lake cisco
WF	lake whitefish
NDC	longnose dace
<b>I</b> SK	longnose sucker
T WF	mountain whitefish
RDC	northern redbelly doce
ST	ninespine stickleback
PK	northern pike
DC	pearl dace
.SC	slimy sculpin
SC	spoonhead sculpin
'SН	spottail shiner
RPC	trout-perch
√SK	unidentified sucker specie
<b>LL</b>	walleye
TSK	white sucker
PR	yellow perch



NUMBERS OF FISH COLLECTED (SEPTEN	<u>1BER 1979)</u>		PHYSICAL CHARACTERISTICS Reach length (km)	he e	REACH DESCRIPTION AND FISH This uppermost rea in a tortuous pattern t	
Species	Juveniles Adults Young-of-the		Reach length (km) 45.5 Channel width (m) 10 Channel area (ha) 45.5 Gradient (m/km) 0.5		dams were present at t very low and the flow sists of silt and clay	
	NO FISH CAUGHT		Flow character Total pools (%) Pattern Confinement	placid 100 tortuously meandering unconfined	and there is a large and there is a large and is dominated by decidure trees are also numeroure The abundant aqua	
			Unstable banks (%) Substrate composition fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil s Debris	100 0 0	habitat for northern p be suitable for spawnir vegetation in this reac brook stickleback and r to be sufficient to all	
BENTHIC INVERTEBRATES NEMATODA OLIGOCHAETA HIRUDINEA GASTROPODA Aplexa Gyraulus Helisoma Physa Promeretus Valvata PELECYPODA Sphaerium CRUSTACEA Cladocera Amphipoda	RIPARIAN VEGETATIONBank coverage (%)Coniferous trees20Deciduous trees45Shrubs60Grasses90Barren0Channel cover (%)0Overhang10Crown2		is reach	<u>STREAM GAUGING DATA</u> No data available for this re	ach	
Amphipoda Gammarus pseudolimnaeus Hyalella asteca INSECTA Ephemeroptera Ameletus Baatis Baatisea Caenis Paraleptophlebia Odonata Libellulidae Perithemis Agriidae Hemiptera Corixidae Trichoptera Limmephilus Oncoosmoecus Phyrygamea Polycentropus Ptilostomis Coleoptera Dytiscidae Elmidae Chrysomelidae Diptera Chaoboridae Culicidae Ceratopogonidae Chironominae Tanypodinae Orthocladiinae						
Tabanidae	Placid flow and dense aquatic reach 7.	vegetation at km 158 is characteri	stic of Very sluggish	flow and dense aquatic vegetation at	km 186.	

### H UT!LIZATION

ach of the surveyed portion of the MacKay River meanders through a marshy area of treed muskeg. Several beaver he time the river was surveyed in 1979. The gradient is is sluggish through the entire reach. The substrate conwith organic detritus. Aquatic vegetation is abundant, mount of debris in the channel. The riparian vegetation ous shrubs and a very dense growth of grasses. Deciduous s and there are some patches of conifers.

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

WATER QUALITY No data available for this reach





DOINT	~		-	-	T	
	12017-	200,200	100000	STREET,		2001.6

	JANII LL
Location	km 15
Date	15/09/
Hydraulics	
channel width (m)	23.0
wet width (m)	23.0
maximum depth (m)	1.5
average depth (m)	0.9
velocity (m/s)	0.24
flow character	placid
Substrate Composition (%)	
fines (< 2 mm)	100
gravels(2-64mm)	0
larges(>64mm)	0
bedrock and/or oil sand	0
Bank	
height(m)	1.5
form	repose
stability	stable
lexture	silt, or
vegetation (% coverage)	
coniferous trees	10
deciduous trees	60
shrubs	20
grasses	95
barren	0
Water Quality	
temperature (°C)	3.0
dissolved oxygen (mg/l)	7
conductivity (µmhos/cm)	220
рН	7.43

END	
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
FTMIN	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
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker spec
WALL	walleye
WTSK	white sucker
YLPR	yellow perch







Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)

oН

14.0

240 7.19

division between sections of a reach

5 0 Kilometres

prepared by

DOVER RIVER

ļ


Backs         Averal is and tangent decemponential become stater         Averal is and tangent decemponential become stater         Data is the set tangent decemponential becom	HBERS OF FISH COLLECTED (SEPT	FEMBER 1979)			PHYSICAL CHARACTERISTICS Reach length (km)	12.5	REACH DESCRIPTION AND FIS This lower reach upstream 12.5 km from
Improve suber       0       3       3         mediace       0       10       11       11         mediace       0       10       11       11         mediace       0       10       112       112       112         Total       0       10       112       112       112       112         Total       0       113       113       112       112       115       116 <td< th=""><th>Species</th><th>Adults</th><th></th><th>r Total Numbers</th><th>Channel width (m) Channel area (ha)</th><th>10</th><th>is irregularly meander banks that consist of at the time the river</th></td<>	Species	Adults		r Total Numbers	Channel width (m) Channel area (ha)	10	is irregularly meander banks that consist of at the time the river
<ul> <li>             first (2 m)             20             present in the river             moderate             moderate         </li> <li>             first (2 m)             20             present in the river             moderate             moderate             moderate             moderate             first (2 m)             30             present in the river             moderate             moderate             moderate             moderate             first (2 m)             30             provide system             moderate             moderate             moderate             moderate             moderate             first             moderate             moderate</li></ul>	longnose sucker pearl dace white sucker	0 0 	13 122 1	13 122 1	Total pools (%) Pattern Confinement Unstable banks (%)	70 irregularly meandering confined 40	is relatively high and are moderate and a hig consists primarily of fine gravel substrates shrubs, with some patc of grasses and little
di LOCIMITA Hardina Castegroba Acastegroba Acastegroba Acastegroba Acastegroba Acastegroba Manualian					fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil s	20 40 35 sand 5	present in the river of The spawning pote of fish that have been provide suitable spawn strates (e.g., white s gravel substrates may ticularly pearl dace. vided by debris and so in this reach. Good n by the numerous swirli are probably suitable
FaraLaprophilabila Stemmena Odonata Ophogemphua Plecotera Isoperia Taentopterage Corixidae Megaloptera Stalis Trichoptera Coleoptera Elmidae Diptera Tipulidae Coleoptera Elmidae Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Contrametopogonia Chironominae Tanypodinae Simuli Idae Simuli Idae	OLIGOCHAETA HIRUDINEA Glossiphoniidae GASTROPODA Ferrissia Gyraulus Lymmaea PELECYPODA Musculium ARACHNIDA Hydracarinà INSECTA Ephemeroptera Ameletus Caenis	Bank cc Conif Decid Shrub Grass Barre Channel Overh	(&) erous trees 2 uous trees 60 is 40 es 80 in 5 cover $(2)$ ang 2	*	each	Water Survey of Canada station nu Maximum total annual discharge: Minimum total annual discharge: Maximum annual mean discharge: Minimum annual mean discharge: Maximum monthly mean discharge: Mininum monthly mean discharge: Maximum daily discharge: Minimum daily discharge: Data for 1975 to 1977 compiled from	ND ND 9.74 m <sup>3</sup> /s (April 1976) 0.03 m <sup>3</sup> /s (March 1977) 24.61 m <sup>3</sup> /s (April 13, 1976) 0.03 m <sup>3</sup> /s (March 3, 1977)
Cheumatopiguehe Heticopiguehe Lapidostoma Oecetis Potamyia Coleoptera Elmidae Diptera Tipulidae Ceratopogonidae Chironomiae Tahypodinae Simuliidae Simuliidae Rhagionidae	Paraleptophlebia Stenonema Odonata Ophiogomphus Plecoptera Isoperla Taeniopteryx Hemiptera Corixidae Megaloptera Stalis						
Atherix Syrphidae Ephyridae	Cheumatopsyche Helicopsyche Lepidostoma Ocaetis Fotamyia Coleoptera Elmidae Diptera Tipulidae Ceratopogonidae Chironominae Tanypodinae Simuliidae Rhagionidae Atherix Syrphidae						

### UTILIZATION

the Dover River is a high gradient section that extends ne confluence with the MacKay River. The river channel ng, and there is a relatively high proportion of unstable ilt, sand and gravel. Several beaver dams were present as surveyed in 1979. Although the gradient in this reach riffles are numerous, water velocities in most of the reach proportion of the reach consists of pools. The substrate arges and coarse gravels, but there are areas with sand and The riparian vegetation is mostly deciduous trees and es of coniferous trees. There is a relatively dense growth verhanging vegetation. A moderate amount of debris is annel.

tial of this reach is considered good for several species collected from the Dover River. The numerous riffle areas ng locations for some species that spawn over gravel subcker, longnose dace). Other areas with sand and fine suitable for spawning of some of the forage fish, parlumerous shallow backwaters and the abundant shelter proaquatic vegetation provide very good rearing potential sting and feeding locations for larger fish are provided pools. There are a number of moderately deep pools that or overwintering of fish.

### ATER QUALITY

Water Survey of Canada station number 00AT07DB0020 Mean Maximum Minimum 286.1 462.2 67.2 otal alkalinity (mg CaCO<sub>3</sub>/1) 7.90 216.7 8.40 7.50 otal hardness (mg CaCO<sub>3</sub>/l) 339.4 56.9 564 onductance (uS/cm) 920 120 otal filterable residue fixed (mg/l) 323 519 123 otal non-filterable residue fixed (mg/l) 17 92 47.0 otal organic carbon (mg C/1) 26.0 14.0 ilica (mg SiO<sub>2</sub>/1) 8.9 15.7 2.1 0.140 itrate and nitrite nitrogen (mg N/1) 0.500 <0.003 otal Kjeldahl nitrogen (mg N/l) 1.24 2.12 0.50 Total Phosphorus (mg P/l) Drthophosphate (mg P/l) 0.090 0.300 0.030 0.020 0.039 0.005 ulphate (mg SO./1) 31.4 83.0 6.5

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

# AQUATIC BIOPHYSICAL INVENTORY

## DOVER RIVER

Reach I (km 0.0 to km 12.5)





				115			
UMBERS OF FISH COLLECTED (SEPTE	MBER 1979)			<u>PHYSICAL CHARACTERISTICS</u> Reach length (km) Channel width (m)	7.0	REACH DESCRIPTION AND FISH U This short reach is gradient, and Reach 1, wh in an irregular pattern a	a i
Species	Adults	Juveniles and Young-of-the-year	Total Numbers	Channel area (ha) Gradient (m/km)	10.5	These banks appear to be deposits are also evident	С
slimy sculpin white sucker Total	0 0 0	$\frac{3}{\frac{1}{4}}$	3 1 4	Flow character Total pools (%) Pattern Confinement Unstable banks (%)	placid, swirling 95 irregularly meandering frequently confined 15	the flow is mostly placid this reach. There are hig gravels and larges are al The riparian vegetation is are some scattered patches	g s
		Ϋ́.		Substrate composition fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil Debris	(%) 40 35 20	overhanging vegetation in the river channel. The potential of this sidered low; suitable subs dams probably severely lin gravelly areas downstream forage fish species (e.g. may also spawn in this rea	r s st f
BENTHIC INVERTEBRATES NEMATODA OLIGOCHAETA HIRUDINEA GASTROPODA Ferrissia Gyraulus PELECYPODA	Conif	verage (%) erous trees 2 Huous trees 40 is 50 ies 70	BENTHIC ALGAL PRODUCTIVITY No data available for this	reach	<u>STREAM GAUGING DATA</u> No data available for this rea	hanging vegetation provide ments are suitable overwin ach	nt
Musculium Sphaerium INSECTA Ephemeroptera Ameletus Ccanis Ephemera Stenonema Odonata Ophiogomphus Trichoptera Brachycentrus Cheumatopsyche Helicopsyche Hydropsyche Lepidostoma Oecetis		cover (%) hang 5					
Coleoptera Elmidae Diptera Tipulidae Chironomidae Tanypodinae Tabanidae Rhagionidae <i>Atherix</i> Dolichopodidae		and the second s	- Contraction of the second se				7
	Placid and s	wirling pool area at km	15.9 is representative of reac	h 2. Dover River at k	m 15.9.		

### UTILIZATION

s a region of transition between Reach 3, which has a low which has a steep gradient. The river channel meanders and there are a few areas with high, unstable banks. e composed of silt, sand and gravel. Exposed oil sands nt in some places. Although the gradient is moderate, id and slow due to the large number of beaver dams in high proportions of silt and sand in the substrate, but also abundant, particularly downstream from beaver dams. is dominated by deciduous trees and shrubs, but there hes of conifers. Grasses are abundant and there is some in most areas. There is a moderate amount of debris in

his reach for spawning of the larger fish species is conubstrates and riffle areas are not abundant, and the beaver limit upstream movement of the larger fish. The small am from beaver dams may be suitable for spawning of some g., pearl dace, trout-perch, slimy sculpin). Some suckers reach. The shallow backwaters, abundant debris, and overide very good rearing habitat, and the deep beaver impoundvintering areas for forage fish and possibly suckers.

WATER QUALITY No data available for this reach





MBERS OF FISH COLLECTED (SE	PTEMBER 1979)			PHYSICAL CHARACTERISTICS		REACH DESCRIPTION AND FISH UT This section of the D
Species	Adults	Juveniles and Young-of-the-year	Total Numbers	Reach length (km) Channel width (m) Channel area (ha) Gradient (m/km)	19.7 20 39.4 0.9	area of treed muskeg. The pools. Beaver dams are ve silt with some organic det strates immediately downst
northern pike trout-perch white sucker Total		1 2 5 8	1 2 5 8	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 100 irregularly meandering occasionally confined 5 95 5 0 0 moderate	well vegetated. The ripar dense growth of grasses. patches of conifers are pr the river channel. Debris result of beaver activity, Because the numerous of larger fish and because tential for most of the la many areas, however, that that will spawn over sandy spawning of suckers may al aquatic vegetation may pro northern pike. The numero vegetation provide good re trout-perch and white suck beaver dams provide good o
THIC INVERTEBRATES NEMATODA OLIGOCHAETA GASTROPODA <i>Gyraulus</i> PELECYPODA <i>Pisidium</i> CRUSTACEA Cladocera <i>Daphnia</i> sp. Amphipoda <i>Hyalella</i> azteca INSECTA Ephemeroptera <i>Ameletus</i> <i>Bastic</i>	Conif Decid Shrub Grass Barre	boverage (%) Ferous trees 2 duous trees 30 os 60 ses 90 en 0 i cover (%) hang 5	THIC ALGAL PRODUCTIVITY No data available for this		TREAM GAUGING DATA Ю data available for this r	each
Baetis Caenis. Ephemera Ephemerella Paraleptophlebia Odonata Aeshna Ophiogomphus Hemiptera Corixidae Megaloptera Sialis Trichoptera Lenarchus Nemotaulius Polycentropus Ptilostomis Coleoptera Dytiscidae Gyrinidae Elmidae Chrysomelidae Donacia Diptera Chironomidae Chironominae Tanypodinae						

### UTILIZATION

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

us beaver dams are certain to severely limit the movement use areas with gravel substrates are few, the spawning polarger fish species is considered to be poor. There are at appear to be suitable for spawning of those forage fish ndy substrates (e.g., pearl dace, trout-perch). Some also occur in this reach and the moderate amounts of provide some spawning areas for brook stickleback and rous weedy shallows, abundant debris, and overhanging rearing areas in this reach. Juvenile northern pike, ucker were collected here. The deep ponds formed behind overwintering areas.

WATER QUALITY No data available for this reach





	km 31.5	km
	10/09/79	10/
lth (m)	16.2	20.
m)	16.2	20.
epth (m)	1.5	2.0
pth (m)	1.0	0.
/s)	0.15	0.0
ler	placid	pla

flow character	placid	placid
Substrate Composition (%)		
fines (< 2 mm)	95	100
gravels (2-64mm)	5	0
larges(>64mm)	0	0
bedrock and/or oil sand	0	0
Bonk		
height(m)	2.0	1.5
form	undercut	repose
stability	stable	stable
texture	sandy silt	silty sond
vegetation (% coverage)		
coniferous trees	2	0
decíduous trees	35	15
shrubs	70	25
grasses	85	95
barren	0	0
Water Quality		
temperature (°C)	11.0	11.0
dissolved oxygen (mg/l)	8	8
conductivity (µmhos/cm)	540	500
рH	8.25	8.14

	LEG
AN	angling
	counting fence
	dip net
_	electrofisher
	gill net
	kick sample
SF	small fish collections made
	using a combination of methods
SN	seine
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
K	flow direction
Ι	reach boundary
]	upstream limit of survey
	division between sections of a reach

ND	
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
FTMIN	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
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch



				119			
Species pearl dace slimy sculpin white sucker Total	Adults 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Juveniles and Young-of-the-year 1 3 1 - 5	Total Numbers	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 sand Debris	36.8 14 51.5 1.0 placid, swirling 100 tortuously meandering unconfined 5 60 40 0 0 high	REACH DESCRIPTION AND FI This tortuously 3, and the entire readous, although not as banks are undercut and and sand throughout mostrates are fairly nu and trees with scatte grasses. Shrubs and there are large amoun The areas with s spawning areas for se here (e.g., lake chub and white suckers hav species may also occu of aquatic vegetation The large amounts of abundant rearing area wintering of fish.	mean ach c abun d st umero gras gras ats o sand ever b ever b ever b ur in are d ebr
BENTHIC INVERTEBRATES OLIGOCHAETA GASTROPODA Ferrissia Gyraulus Stagnicola Valvata PELECYPODA Musculium Sphaerium CRUSTACEA Cladocera INSECTA Ephemeroptera Ameletus	Coni Deci Shru Gras Barr	boverage (%) ferous trees 10 duous trees 50 bs 65 bes 90 en 0 1 cover (%) hang 10	ENTHIC ALGAL PRODUCTIVITY No data available for this		<u>AM GAUGING DATA</u> No data available for this re	each	<u>w</u> ,
Baetisea Caenis Ephemera Ephemerella Paraleptophlebia Parameletus Stenonema Plecoptera Isogenus Hemiptera Corixidae Megaloptera Sialis Trichoptera Aretopsyche Oecetis Polycentropus Diptera Chironomidae Chironominae Tabanidae	Placid flow a	nd overhanging bank vegeta	tion at km 47.5 are typical of	f reach 4. Dover River at km 63.			A

### UTILIZATION

eandering reach has a low gradient similar to that of Reach h consists of slowly flowing pools. Beaver dams are numerbundant as in Reach 3. The stream is fairly deep and the stabilized by vegetation. The substrate consists of silt ch of the reach, but areas with sand and fine gravel suberous. The riparian vegetation consists of deciduous shrubs ed patches of conifers. There is also a dense growth of rasses overhang the river channel throughout the reach and s of debris in the channel.

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

WATER QUALITY No data available for this reach

# AQUATIC BIOPHYSICAL INVENTORY DOVER RIVER Reach 4 (km 39.2 to km 76.0) ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM prepared by LIMITED



POINT SAMPLE DATA

	PUINT	SAMPLE DATA
Location		km 47,5
Date		11/09/79
Hydraulics		,, .
channel width (m)		14.0
wet width (m)		14.0
maximum d <b>e</b> pth (m)		1.0
average depth (m)		0.9
velocity (m/s)		0.28
flow character		plocid, swirling
Substrate Composition (%)		
fines (< 2mm)		20
gravels (2-64mm)		70
larges(>64mm)		10
bedrock and/or oil sand		0
Bonk		
height(m)		2.5
form		undercut
stability		stable
lexture		sandy silt
vegetation (% coverage)		
coniferous trees		2
deciduous trees		40
shrubs		15
grasses		95
barren		0
Water Quality		
temperature (°C)		10.0
dissolved oxygen (mg/1)		8
conductivity (umhos/cm)		410
рН		8.05

	en de la section de la sec La section de la section de	LE
	angling	
	counting fence	
-	dip net	
	electrofisher	
	gili net kick somple	
	smoll fish collections made	
JF.	using a combination of methods	
SN	seine	
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	
ł	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	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
IT WF	mountain whitefish
RDC	northern redbelly dace
ISST	ninespine stickleback
ITPK	north <b>ern</b> pike
LDC	pearl dace
LSC	slimy sculpin
PSC	spoonhead sculpin
PSH	spattail shin <del>e</del> r
RPC	trout-perch
INSK	unidentified sucker species
ALL	walleye
VTSK	white sucker
LPR	yellow perch



# AQUATIC BIOPHYSICAL INVENTORY DOVER RIVER

Reach 4 Section 1 (km 39.2 to km 61.0)

Scale 1:25 000





	POINT SAMPLE DATA
Location	km 63.0
Date	09/09/79
Hydraulics	
channei 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 (< 2 mm)	25
gravels(2—64mm)	40
larges(>64mm)	35
bedrock and/or oil sand	0
Bank	
height (m)	2.0
form	undercut
stability	stable
lexfure	silty sand
vegetation (% coverage)	
coniferous trees	2
deciduous trees	50
shrubs	80
grass <b>es</b>	70
barren	0
Water Quality	
temperature (°C)	11.0
dissolved oxygen (mg/1)	7
conductivity (µmhos/cm)	340
рН	8.15



	192 T
rctic grayling	
rook stickleback	
rassy minnow	
urbot	
olly Varden	
nidentified fish eggs	\$
merald shiner	5
athead chub	$\sim$
nescale dace	,
athead minnow	1
oldeye	$\sim$
ske chub	
oke cisco	
oke whitefish	
ongnose dace	
ongnose sucker	
nountain whitefish	
orthern redbelly dace	
inespine stickleback	
iorthern pike	
earl dace	
limy sculpin	
poanhead sculpin	
pottail shiner	
rout-perch	
nidentified sucker species	
valleye	
hite sucker	
ellow perch	





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

This reach does not contain areas suitable for spawning of most fish species that occur in the Dover River. There are some areas with aquatic vegetation that may be suitable for brook stickleback spawning. Pearl dace may also spawn over some of the sandy substrates in this reach. The rearing potential is good due to the large amounts of debris, undercut banks, and abundant overhanging vegetation. Water depths 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)



ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM







Location
Date
Hydraulics
channel width (m)
wet width (m)
maximum depth (m)
average depth (m)
velocity (m/s)
flow character
Substrate Composition (%)
fines (< 2 mm)
gravels (2-64 mm)
larges(>64mm)
bedrock and/or oil sand
Bank
height(m)
form
stability
texture
vegetation (% coverage)
coniferous trees
deciduous trees
shrubs
grosses
barren
Water Quality
temperature (°C)
dissolved oxygen (mg/l)
conductivity (µmhos/cm)
рH

LI 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 Mod direction I reach boundary J upstream limit of survey i division between sections of o reach

ND	
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	north <b>ern</b> pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shin <del>er</del>
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch



DOVER RIVER Reach 5 Section 2 (km 93.0 to km 120.5)

Scale 1:25 000







This reach is a long marshy section in a muskeg region. The gradient is low and the stream flow is very slow. Many beaver dams are present throughout this reach. The substrate consists almost entirely of sand, silt, and organic detritus, but there are a few areas with fine gravel substrates. The riparian vegetation is primarily grasses and deciduous shrubs, but there are also some deciduous and coniferous trees. There is a relatively large amount of overhanging vegetation and moderate amounts of debris in the river channel.

The abundant aquatic vegetation in this reach provides good spawning potential for brook stickleback and possibly northern pike (only brook stickleback were collected from this reach). Spawning potential for other species is considered poor, but some forage species (e.g., pearl dace) may be able to spawn successfully in this reach. Rearing potential is considered good because ample cover is provided by log debris and aquatic vegetation. Water depths are probably sufficient to allow overwintering of fish.

> WATER QUALITY No data available for this reach

## AQUATIC BIOPHYSICAL INVENTORY

## DOVER RIVER

# Reach 6

## (km 132.5 to km 154.0)













						3	
IMBERS OF FISH COLLECTED (SEPTEM	BER 1979)			PHYSICAL CHARACTERISTICS Reach length (km) Channel width (m)	16.5	REACH DESCRIPTION AND This lower rea flows through an ar reach is a placid p	ich of th ea of tr
Species	Adults	Juveniles and Young-of-the-yea	r Total Numbers	Channel area (ha) Gradient (m/km)	28.1	fairly high content the riparian vegeta	-
Species prook stickleback worthern pike bearl dace crout-perch white sucker fotal	Adults 3 0 4 0 	Young-of-the-yea 0 1 11 6 11 29	r Total Numbers 3 1 1 1 1 1 0 1 1 3 6 .	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	placid 100 tortuously meandering unconfined 0 (%) 100 0 0	the riparian vegeta also a very dense g channel throughout a and there are many Aquatic vegeta spawning habitat fo for other species i substrates may spaw velocities, and the an excellent rearin forage species. Th is also suitable fo ficient to allow ove	prowth of most of location stion is or northe s poor, wh succes ample s ang habita he presen
THIC INVERTEBRATES NEMATODA OLIGOCHAETA HIRUDINEA Glossiphoniidae GASTROPODA Aplexa Gyrmalus		erage (%) rous trees 25 bus trees 45 50 5 95	<u>BENTHIC ALGAL PRODUCTIVITY</u> No data available for th	nis reach	<u>STREAM GAUGING DATA</u> No data available for this r	reach	WATI
Stagnicola ELECYPODA Musculium Ophaerlum RUSTACEA Amphipoda Gammarue pseudolimmaeus Hyalella asteca NSECTA Ephemeroptera Ameletus Baetisca Hexagemia Paraleptophlebia Siphlomurus Odonata Aeshnidae Aeshnia	Channel o Overhar Crown	cover (%)					
Plecoptera <i>Tteronarays</i> Hemiptera Corixidae Gerridae Trichoptera <i>Agrypnia</i> <i>Brachycentrus</i> <i>Lepidostoma</i> Coleoptera Dytiscidae Noteridae Elmidae Diptera Tipulidae Ceratopogonidae Chironominae Tanypodinae Orthocladiinae							A
Tabanidae Empididae	Placid pool c	onditions, typical of	<sup>=</sup> this reach, at km 4.5.	Slumping, underc	ut bank at km 14.2.		

### UTILIZATION

the Dunkirk River is a tortuously meandering section that treed muskeg. The gradient is very low and the entire rea. 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 thern pike and brook stickleback. The spawning potential r, 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.

NATER QUALITY No data available for this reach





	I OINT SAMELE DATA	-
Location	km 4.5	km 14.2
Date	18/09/79	18/09/79
Hydraulics		
channel width (m)	16.5	18.0
wet width (m)	16.5	15.0
maximum d <b>e</b> pth (m)	1.5	0.7
average depth (m)	1.0	0.6
velocity (m/s)	0.32	1.44
flow character	placid	placid,swirling
Substrate Composition (%)		
fines (< 2 mm)	100	100
gravels(2-64mm)	0	0
larges(>64mm)	0	0
bedrock and/or oil sand	0	0
Bank		
height (m)	2.0	2.0
form	repose	u <b>nde</b> rcut
stability	stable	failing
texture	silty sand	silty sand
vegetation (% coverage)		
coniferous trees	5	50
deciduous trees	65	35
shrubs	30	20
grass <b>es</b>	90	60
barren	0	2
Water Quality		
temperature (°C)	11.0	11.5
dissolved oxygen (mg/l)	8	8
conductivity (µmhos/cm)	240	235
рН	8.03	8.06
a di dataman kana kalendar kana kana kana kana kana kana kana ka	5. 1964년 - 2012년 1월 1971년 - 2012년 1월 1971년 1월 19	

	LEGI
	angling
CF	counting fence dip net
	electrofisher
	gill net
	kick sample
SF	small fish collections made
SN	using a combination of methods seine
AP	benthic algal productivity station
Bļ	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
ł	division between sections of a reach
¥ <sub>Da</sub>	ta from Machniak et al. (1980)

arctic grayling
brook stickleback
brassy minnow
burbot
Dolly Varden
unidentified fish eggs
emerald shiner
flathead chub
finescale dace
fothead minnow
goldeye
lake chub
lake cisco
lake whitefish
longnose dace
longnose sucker
mountain whitefish
northern redbelly dace
ninespine stickleback
northern pike
pearl dace
slimy sculpin
spoonhead sculpin
spottail shin <del>e</del> r
trout-perch
unidentified sucker species
walleye
white sucker
yellow perch



				100	· · · · · · · · · · · · · · · · · · ·		
NUMBERS OF FISH COLLECTED (SER Species brook stickleback longnose sucker northern pike pearl dace slimy sculpin trout-perch white sucker Total	Adults Adults 2 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	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	50 30 20	REACH DESCRIPTION AND F This irregularl steeper gradient tha with placid and swir fairly numerous in t gravel with some cob substrate is compose portion of the reach The riparian vegetat deciduous shrubs. T shrubs and grasses o woody debris in the The gravel and appear to be suitabl sucker, slimy sculpi tential of this reac cities and abundant The pools in this re	ly meande an Reach rling flo this reac obles and ed of mor n. The r tion is a There is overhang channel. sand sub le for sp in, lake ch is ver shelter each are
BENTHIC INVERTEBRATES OLIGOCHAETA HIRUDINEA GASTROPODA Ferrissia Gyraulus Valvata PELECYPODA Musculium Sphaerium ARACHNIDA Hydracarina INSECTA Ephemeroptera Ameletus Baetis Baetis Baetisca -Ephemera Paraleptophlebia Stenonema Odonata Ophiogomphus Plecoptera Diura Isogerus Isogerus Isogerus Faeriopteryx	Coni Deci Shrul Grass Barre	overage (%) ferous trees 45 duous trees 45 bs 35 ses 80 en 0 1 cover (%) hang 5	BENTHIC ALGAL PRODUCTIVITY No data available for this	reach	STREAM GAUGING DATA Water Survey of Canada station nu Maximum total annual discharge: Minimum annual mean discharge: Maximum monthly mean discharge: Maximum monthly mean discharge: Maximum daily discharge: Minimum daily discharge: Data for 1975 to 1978 compiled from Warner and Spitzer (1979) and War	182.6 x 10 <sup>6</sup> m <sup>3</sup> (1978) 70.8 x 10 <sup>6</sup> m <sup>3</sup> (1977) 5.78 m <sup>3</sup> /s (1978) 2.25 m <sup>3</sup> /s (1977) 23.11 m <sup>3</sup> /s (September 1978) 0.03 m <sup>3</sup> /s (January 1976) 33.70 m <sup>3</sup> /s (Sept. 18, 1978) 0.02 m <sup>3</sup> /s (Feb. 28, 1978) 1 Loeppky and Spitzer (1977),	) Total resi Total
Hemiptera Corixidae Megaloptera Sialis Trichoptera Apatania Brachycentrus Ceraclea Cheumatopsyche Glossosoma Helicopsyche Hydropsyche Hydropsyche Hydropsyche Hydropsyche Bydropsyche Elistostoma Oecetis Polycentropus Coleoptera Dryopidae Elmidae Diptera Tipulidae Chironomidae Tabanidae Ephydridae	Swirling poc	ol conditions at km 26.5		Dunkirk River a	t km 40.8.		AC

### H UTILIZATION

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

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

WATER QUALITY			
Water Survey of Canada station number	00AT07DB0	030	
	Mean	Maximum	Minimum
Total alkalinity (mg CaCO <sub>3</sub> /1) pH		273.0 8.50	
Total hardness (mg CaCO₃/l)	156.0	267.1	47.2
Conductance (µS/cm)	313	595	83
Total filterable			
residue fixed (mg/l)	150	348	49
Total non-filterable			
residue fixed (mg/l)	12	105	< 0.4
Total organic carbon (mg C/I)	29.0	44.0	17.0
Silica (mg SiO <sub>2</sub> /1)	8.0	14.5	1.5
Nitrate and nitrite nitrogen (mg N/l)	0.130	0.470	< 0.003
Total Kjeldahl nitrogen (mg N/1)	1.37		
Total Phosphorus (mg P/1)		0.500	0.046
Orthophosphate (mg P/1)		0.180	
Sulphate (mg SO <sub>4</sub> /1)	31.0	159.0	9.2
		2211	-

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)





	PUNI	5/
Location		kr
Date		11
Hydraulics		
channel width (m)		21
wet width (m)		23
, maximum depth (m)		(
average depth (m)		(
velocity (m/s)		(
flow character		pi
Substrate Composition (%)		
fines (< 2 mm)		15
gravels (2-64mm)		50
larges(>64mm)		3
bedrock and/or oil sand		
Bonk		
height (m)		
form		r
stability		si
lexture		s
vegetation (% coverage)		
coniferous trees		7
deciduous trees		13
shrubs		2
grasses		5
barren		
Water Quality		
temperature (°C)		1
dissolved oxygen (mg/l)		
conductivity (µmhos/cm)		249
рН		8
		10000

\* Data from Machniak et al. (1980)

ND	
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	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
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker specie
WALL	walleye
WTSK	white sucker
YLPR	yellow perch





FISH COLLECTIONS



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MBERS OF FISH COLLECTED (SEPTE Species arctic grayling brook stickleback northern pike pearl dace Total	Adults  Adults  0  0	Juveniles and Young-of-the-year 0 0 2 7 - 9	Total Numbers	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 sand Debris	100 0 0	REACH DESCRIPTION AND FI This uppermost r in an irregular patte low, the stream chann entirely silt with a dant. The riparian v but patches of conife of shrubs and grasses amounts of debris are The abundant aqu for spawning of north to be suitable for sp because of the low wa and the ample shelter depths in this reach	reach of ern thro hel is d high or vegetatio erous tr s overha e presen hatic ve hern pik bowning hter vell provid
HIC INVERTEBRATES OLIGOCHAETA HIRUDINEA Glossiphoniidae GASTROPODA PELECYPODA Musculium Pisidium CRUSTACEA Cladocera Amphipoda Gammarus pseudolimnaeua Hyalella azteca INSECTA Ephemeroptera Ameletus Caenis Nexagenia Paraleptophlebia Odonata Aeshna Hemiptera Corixidae Megaloptera Stalis Trichoptera Lepidostoma Limnephilus/Philaretus Phyryganea Polycentropus Ptilostomis Coleoptera Dryopidae Elmidae Diptera Ceratopogonidae Chironominae Tanypodinae	Conife Decidu Shrubs Grasse Barren Channel Overha	erage (%) rous trees 15 ous trees 40 15 s 95 0 cover (%)	BENTHIC ALGAL PRODUCTIVITY No data available for this		STREAM GAUGING DATA No data available for this r	each	AQ

### TILIZATION

of the surveyed portion of the Dunkirk River meanders hrough a marshy muskeg region. The gradient is very s deep, and the water flow is slow. The substrate is organic detritus content. Aquatic vegetation is abunation consists primarily of deciduous trees and shrubs, trees are also fairly numerous. Fairly large amounts rhang the river channel throughout the reach. Moderate sent in the channel.

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

ATER QUALITY

No data available for this reach

# AQUATIC BIOPHYSICAL INVENTORY DUNKIRK RIVER Reach 3 (km 56.2 to km 84.0) MUNICIPAL ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM Prepared by

	138	
	FISH COLLECTIONS	1
		EF)
		NO NO
57°		
POINT SAMPLE DATA         Location       km 58.5         Date       16/09/79         Hydroulics       16.5         maximum depth (m)       16.5         maximum depth (m)       1.5         average depth (m)       1.0         vetocity (m/s)       0.30         flow character       placid         Substrate Composition (%)       100         fines (<2mm)       100         gravels (2-64mm)       0         bedrack and/or oil sand       0         Bank       1.0         height(m)       1.0         form       repose         stability       stable         texture       silt, organic         vegetation (% coverage)       condeciduous trees         grasses       85         barren       0         Water Quality       12.0         iemperature (°C)       12.0         dissolved oxygen (mg/l)       8         conductivity (pmhos/cm)       245         pH       7.81	LEGENDANanglingARGRarctic graylingCFcounting fenceBKSTbroak sticklebackDNdip netBRMNbrassy minnowEFelectrofisherBURBDurbatGNgill netDLVRDolly VardenKSkick sampleEGSunidentified fish eggsSFsmall fish collections madeEGSunidentified fish eggsusing a combination of methodsFLCHflanhad chubSNseineFSDCfinescale daceFMbenthic algai productivity stationGOLgoldeyeMater quality stationFTMNfathead minnowGOgoldeyeLKCHlake chubLKCHlake chubLKCSlake iscoMater quality stationLNDClongnose daceMater quality stationLNDClongnose suckerMater quality stationNNDCnartern redbelly daceMater quality stationNDCnartern redbelly daceMater quality stationNDCperchMater quality stationNDCMater quality stationNDCMater quality station <td< th=""><th>Piver Pi</th></td<>	Piver Pi





Location	km 82.2
Date	16/09/79
Hydraulics	
channel width (m)	10.0
wet width (m)	10.0
maximum d <b>e</b> pth (m)	2.0
av <b>erage depth</b> (m)	1.0
velocity (m/s)	0.29
flow character	placid
Substrate Composition (%)	
fines (< 2 mm)	100
gravels (2-64 mm)	0
larges(>64mm)	0
bedrock and/or oil sand	0
Bonk	
height (m)	1.5
form	repose
stability	stable
lexture	silt, organic
vegetation (% coverage)	
coniferous trees	5
deciduous trees	45
shrubs	5
grasses	1 00
barren	0
Water Quality	
temperature (°C)	11.0
dissolved oxygen (mg/1)	8
conductivity (µmhos/cm)	215
ρH	7.84



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
TMIN	fathead minnow
OLD	goldeye
KCH	lake chub
KCS	lake cisco
KWF	lake whitefish
NDC	longnose dace
NSK	longnose sucker
1TWF	mountain whitefish
RDC	northern redbelly dace
ISST.	ninespine stickleback
ITPK	northern pike
LDC	pearl dace
LSC	slimy sculpin
PSC	spoonhead sculpin
PSH	spottail shin <del>er</del>
RPC	trout-p <b>erch</b>
INSK	unidentified sucker species
ALL	walleye
VTSK	white sucker
ĽPR	yellow perch



prepared by

-

ELLS RIVER



			140			
burbot flathead chub goldeye lake whitefish longnose sucker mountain whitefish northern pike walleye	AdultsJuveniles and Young-of-the-young-of	ear Total Numbers	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 sa Debris	100 0 0	REACH DESCRIPTION AND FISH UTILIZATION Much of this short, tortuously meandering se within the Athabasca River floodplain. The gradi reach is a pool with either placid or swirling flu- the water is relatively deep. The substrate mate riparian vegetation is dominated by deciduous tre are present. There is also a fairly dense growth vegetation overhangs the channel. Spawning potential for those fish species th strates is considered to be excellent. No suitab species that require gravel substrates. Very few suitable for fish rearing. The slow water veloci inhabit waters within the reach, but there are on that provide suitable shelter. Resting and feedi considered to be moderate to good because the rea tinuous pool. However, there are few areas that of the generally deep water and extensive pools, of this reach is considered to be excellent.	ent is fairly low and the entire ow. In most areas of the reach, rial is entirely fines. The es and shrubs, but some conifers of grasses. None of the bank at usually spawn over sandy sub- le spawning areas exist for areas within this reach are ties may permit young fish to ly a limited number of areas ng potential for larger fish is ch is essentially a deep con- provide any shelter. Because
ENTHIC INVERTEBRATES No benthic samples were taken in this reach.	RIPARIAN VEGETATIONBank coverage (%)Coniferous trees5Deciduous trees45Shrubs35Grasses75Barren0Channel cover (%)Overhang0Crown0	BENTHIC ALGAL PRODUCTIVITY No data available for this r	each	STREAM GAUGING DATA No data available for this reach	WATER QUALITY Water Survey of Canada stati Total alkalinity (mg CaCO <sub>3</sub> /1) pH Total hardness (mg CaCO <sub>3</sub> /1) Conductance (µS/cm) Total filterable residue fixed (mg/1) Total non-filterable residue fixed (mg/1) Total organic carbon (mg C/1 Silica (mg SiO <sub>2</sub> /1) Nitrate and nitrite nitrogen	Mean         Maximum         Minim           )         79.9         105.1         62.9           7.70         8.05         7.3           75.0         88.0         65.0           178         250         115           80         114         50           11         38         <0.4
	Wide, placid section of the Ells	River at km 1.			Total Kjeldahl nitrogen (mg Total Phosphorus (mg P/l) Orthophosphate (mg P/l) Sulphate (mg S04/l) Data for the period January the National Water Quality AQUATIC BIOPH ELL Ri (km 0.0	N/1) 0.99 1.78 0.6 0.051 0.170 0.0 0.013 0.034 0.00 17.0 23.8 7.4 1976 to December 1979 obtained from Data Bank (NAQUADAT).



I

BERS OF FISH COLLECTED (	1978)						PHYSICAL CHARACTERISTICS Reach length (km)	5.5	REACH DESCRIPTION AND This relativel River floodplain. river consists of d	ly short, in The gradier
				niles and			Channel width (m) Channel area (ha)	35 19.3	composed primarily	of fines,
Species	June	Adults September		of-the-year		September	Gradient (m/km) Flow character	1.6 placid, swirling	and shrubs are the patches of conifers	
	Julie		Julie	September	r June	September	Total pools (%)	100	Most areas wit	thin the re
brook stickleback	0	0	1	2	1	2	Pattern	irregularly meandering	fish that normally	
lake chub	0	21	9	119	9	140	Confinement	confined	for spawning by the	
longnose dace longnose sucker	0	0	8 3	13 21	8	13 21	Unstable banks (%)	40	this reach is consi quantities of debri	
mountain whitefish	ů O	0	0	1	0	]	Substrate composition		of-the-year and juv	
northern pike	0	0	1	0	1	0	fines (<2 mm) gravels (2-64 mm)	90 10	section of the rive	
slimy sculpin	0	0	0	1.7	0	17	larges (>64 mm)	0	larger fish is cons	
trout-perch	0	0	0	18	0	18	bedrock and/or oil s		and areas sheltered	
unidentified suckers	0	0	0	2	0	2	Debris	moderate	reach that may serv	
walleye	0	0	2	0	2	0	-		pike. Overwinterin	ng potentia
white sucker	0	0	4	12	4	12			pools.	
Total	0	21	28	205	28	226				
		Barren Channel c Overhan Crown		0 2 0						
										AQ

### LIZATION

irregularly meandering reach lies above the Athabasca ent is relatively low and this entire section of the with placid and swirling flow. The substrate is but a few areas contain gravels. Deciduous trees components of the riparian vegetation, but some present. Little vegetation overhangs the channel. reach provide suitable spawning grounds for those er sandy substrates. Only a few areas are suitable that prefer gravel substrates. Rearing potential in be moderate; slow water velocities and moderate suitable rearing areas. Moderate numbers of youngsh, particularly lake chub, were captured in this the study. Resting and feeding potential for be good to excellent because of the many deep pools is. There is a variety of smaller fishes in this for piscivorous species such as walleye and northern ial is considered to be excellent because of the deep

<u>ER QUALITY</u> No data available for this reach



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	FISH COLLECTIONS SN BKST SLSC LKCH TRPC LNDC UNSK LNSK WALL MTWF WTSK NTPK
	CEN S
10	e a solo
1 	

POINT SAMPLE DATA

Location
Date
Hydraulics
Channel width (m)
wet width (m)
maximum depth (m)
average depth (m)
velocity (m/s)
flow character
Substrate Composition (%)
fin <b>es ( &lt;</b> 2 mm)
gravels (2-64mm)
larges(>64mm)
bedrock and/or oil sand
Bonk
height (m)
form
stability
texture
(8/
vegetation (% coverage) coniferous trees
deciduous trees
shrubs
grasses barren
Water Quality
temperature (°C)
dissolved oxygen (mg/l)
conductivity (umhos/cm)
oH
μm

		LEGEND
AN	angling	ARGR
CF	counting fence	BKST
	dip net	BRMN
	electrofisher	BURB
	gili net	DLVR
	kick sample	EGGS
SF	small fish collections made	EMSH
	using a combination of methods	FLCH
SN	seine	FSDC
AP	benthic algal productivity station	FTMAN
	,,	GOLD
BI	benthic invertebrate collection site	e LKCH
		LKCS
СН	water quality station	LKWF
	·····	LNDC
PS	point sample	LNSK
		MTWF
SG	stream gauging station	NRDC
		NSST
35	kilometres from mouth	NTPK
_		PLDC
	flow direction	SLSC
		SPSC
ΙΤ	reach boundary	SPSH
1 1		TRPC
	upstream limit of survey	UNSK
1		WALL
	division between sections of	WTSK
•	a reach	YLPR

ARGR	arctic grayling
BKST	brook stickleback
BRMN	brassy minnow
BURB	burbot
DLVR	Dolly Vard <b>e</b> n
EGGS	unidentified fish eggs
EMSH	emerald shiner
FLCH	flathead chub
FSDC	finescale dace
FTMAN	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
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shin <del>er</del>
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch





# AQUATIC BIOPHYSICAL INVENTORY

# ELLS RIVER

## Reach 2

(km 2.5 to km 8.0)

## Scale 1:25 000



BERS OF FISH COLLECTED (1	978)						PHYSICAL CHARACTERISTICS Reach length (km) Channel width (m)	10.0	REACH DESCRIPTION AND FI This section of and meanders in an ir sections are numerous	the El rregula
	Adu	ults		niles and of-the-yea	Tota	1 Numbers	Channel area (ha)	30 30.0	of pools. The flow c	charact
Species		September		Septembe		September	Gradient (m/km) Flow character	3.8 swirling, rolling, broken	broken, and water dep larges predominate, b	
oldeye	0						Total pools (%)	75	of the substrate. Th	he ripa
ike chub	4	0 6	3 22	0 119	3 26	0	Pattern	irregularly meandcring	ciduous trees; decidu	
ngnose dace	0	0	22	10	20	125	Confinement	entrenched	vegetation overhangs	
gnose sucker	0	1	0	3	0	4	Unstable banks (%) Substrate composition	35	Because of the d depths, spawning pote	
it-perch	0	2	0	4	0	6	fines (<2 mm)	25	cellent for most fish	
e sucker	0	0	0	2	0	2	gravels (2-64 mm)	25	the rearing of fish i	
al	4	9	27	138	31	147	larges (>64 mm)	40	hanging vegetation, a	
		-					bedrock and/or oil s		fish, particularly la	
							Debris	low	numerous pools and th	he few a
									resting and feeding p	potentia
									the reach is composed	d of poc
INVERTEBRATES GOCHAETA ECTA Dehemeroptera Baetis Ephemerella Hexagenia Jonata Ophiogomphus ecoptera Hastaperla Isogenus Isoperla	KI	PARIAN VEGETA Bank cover Conifero Deciduou Shrubs Grasses Barren Channel co Overhang Crown	rage (%) Dus trees Us trees	45 60 25 30 0 2 0		PRODUCTIVITY	each	Minimum annual mean discharge: Maximum monthly mean discharge: Minimum monthly mean discharge:	324.4 x 10 <sup>6</sup> m <sup>3</sup> (1978) 135.9 x 10 <sup>6</sup> m <sup>3</sup> (1977) 10.31 m <sup>3</sup> /s (1978) 4.30 m <sup>3</sup> /s (1977) 27.78 m <sup>3</sup> /s (May 1978) 0.64 m <sup>3</sup> /s (March 1977) 49.84 m <sup>3</sup> /s (Apr. 14, 1976) 0.46 m <sup>3</sup> /s (Marc 26, 1977) Loeppky and Spitzer (1977).	WATER Water Total pH Total Condu Total res Total Silic
<i>Pteronarcys</i> oleoptera Elmidae					승규는 문제가 가장했어?					Nitrat Total
Pteronarcys oleoptera Elmidae iptera Tipulidae Chironomidae Chironominae Tanypodinae Orthocladiinae Simuliidae Rhagionidae										Data f
Pteronarcys Coleoptera Elmidae Diptera Tipulidae Chironominae Tanypodinae Orthocladiinae Simuliidae			in the second		a la granda					Total Total Orthop Sulpha Data f
Pteronarcys Coleoptera Elmidae Diptera Tipulidae Chironomidae Chironominae Tanypodinae Orthocladiinae Simuliidae Rhagionidae										Total Total Orthop Sulpha Data f the
Pteronarcys Coleoptera Elmidae Diptera Tipulidae Chironomidae Chironominae Tanypodinae Orthocladiinae Simuliidae Rhagionidae	And the second se									Total Total Orthop Sulpha Data 1 the

### SH UTILIZATION

the Ells River is entrenched within a narrow deep canyon rregular pattern. Although the gradient is high and riffle s, a relatively high proportion of the reach is composed character is mixed, varying from swirling to rolling to pths are generally shallow. Substrate composition is varied; but gravels and fines also compose substantial proportions he riparian vegetation is a mixture of coniferous and deuous shrubs are also fairly abundant. A small amount of the channel.

diversity of substrate materials and water velocities and ential in this section of the river is considered to be exh species that occur in the Ells River. Suitable areas for include the rocky substrates, a few areas sheltered by overand the scattered grassy shallows. Moderate numbers of young ake chub, were captured in this reach during the study. The he few areas shaded by overhanging vegetation provide good potential for larger fish. Although a large proportion of d of pools, only a few of these areas are deep enough to provide ng areas for fish.

00AT07DA0	170	
Mean	Maximum	Minimum
		7.20
92.5 211	140.2 370	
110	179	57
22	326	<0.4
4.0 0.130 0.87 0.050 0.010	9.9 0.430 2.17 0.340 0.060	0.4 0.003 0.20 0.009
	Mean 93.4 7.70 92.5 211 110 22 15.0 4.0 0.130 0.87 0.050 0.010	93.4         150.4           7.70         8.30           92.5         140.2           211         370           110         179           22         326           15.0         41.5           4.0         9.9           0.130         0.430           0.87         2.17           0.050         0.340           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 ELLS RIVER Reach 3 (km 8 to km 18) ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM Prepared by ELLIMITED



AMPLE DATA

	POINT SAMPLE DA
Location	km 11.5
Date	02/06/78
Hydraulics	
channel width (m)	35
wet width (m)	25
maximum depth (m)	ND
average depth (m)	1.3
velocity (m/s)	1.40
flow character	rolling
Substrate Composition (%)	
fines (< 2 mm)	30
gravels (2-64mm)	30
larges(>64mm)	10
bedrock and/or oil sand	30
Bonk	
height(m)	3.5
form	steep
stability	failing
texture	oil s <b>ands, large</b> s
vegetation (% coverage)	
coniferous trees	5
deciduous trees	75
shrubs	25
grasses	15
barren	25
Water Quality	10.0
temperature (°C)	18.0
dissolved oxygen (mg/1)	ND
conductivity (µmhos/cm)	ND
рH	ND

AN ongling CF counting fence DN dipnet EF electrofisher GN gill net KS kick sample SF small fish collections made write a combination of mathe using a combination of methods SN seine AP benthic algal productivity station BL benthic invertebrate collection site **GH** water quality station PS point sample SG stream gauging station 35 kilometres from mouth flow direction T reach boundary upstream limit of survey division between sections of a reach

END	
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
FTMIN	fathead minnow
GOLD	goldeye
LKCH	iake chub
LKCS	lake cisco
LK₩F	lake whitefish
LNDC	longnose dace
LNSK	longnose sucker
MTWF	mountain whitefish
NRDC	northern redbelly doce
NSST	ninespine slickleback
NTPK	northern pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker specie
WALL	wolleye
WTSK	white sucker
YLPR	yellow perch





## AQUATIC BIOPHYSICAL INVENTORY

## ELLS RIVER

Reach 3 (km 8 to km |8)

Scale 1:25 000



Species Species lake chub longnose dace longnose sucker northern pike pearl dace trout-perch unidentified suckers white sucker Total	Adult:	ptember 15 2 0 0 2 1 3 0 1	288 24 33 0 4 9 0 80		Total June 288 24 33 0 4 9 0 80 438	Numbers September 443 17 46 2 60 4 6 44 622	Re. Ch. Gr. Fl. To Pa Co: Un: Sul	CHARACTERISTICS ach length (km) annel width (m) annel area (ha) adient (m/km) ow character tal pools (%) ttern nfinement stable banks (%) bstrate composition fines (<2 mm) gravels (2-64 mm) larges (>64 mm) bedrock and/or oil s bris	15 30 50	REACH DESCRIPTION AND FI This reach is a relatively low gradie composed of pools and marily of larges and areas. Riparian vege trees are present. T Spawning potenti lent for those fish t those that normally s sheltered areas along vegetation, and rocky fish species found in larly lake chub, were Resting and feeding p cause of the many poo hanging vegetation. fish. Particularly l Overwintering potenti able areas for larger	tortuous ent and su d the wate gravels, etation is There is a al in th that normal spawn over spide the substration the Elli- e captured botential of and the There app arge numi al is rational substra-
BENTHIC INVERTEBRATES NEMATODA OLIGOCHAETA INSECTA Ephemeroptera Baetis Ephemerella Stenonema Odonata Ophiogomphus Plecoptera Lsoperla Leuatra Trichoptera Hydropsyche Coleoptera Elmidae Diptera Chironomidae Chironominae Tanypodinae Simuliidae		RIPARIAN VEGETATION       BENTHIC ALGAL PRODUCTIVITY         Bank coverage (%)       No data available for to the set of th					his reach		<u>STREAM GAUGING DATA</u> No data available for this re	ach	WATER No
											AQU
	Long	section of ero	ded bank a	t km 22.				Swirling and rol	ling flow character at km 26 is typic	cal of reach 4.	

### UTILIZATION

tuously meandering section of the Ells River, with a and swirling and rolling flow. Most of the reach is water is moderately deep. The substrate consists privels, but sand and silt substrates are present in some ion is mostly deciduous trees, but scattered coniferous is a relatively small amount of overhanging vegetation. in this section of the river is considered to be excelnormally spawn over rocky substrates, and moderate for over sandy substrates. Numerous backwater pools, weedy the river bank, areas shaded by overhanging riparian bstrates provide excellent rearing opportunities for most Ells River. Very high numbers of young fish, particuptured in this section of the river during the survey. ntial for larger fish is considered to be excellent beand the areas along the banks that are sheltered by overre appears to be an abundant food supply for piscivorous numbers of smaller fish were collected in this reach. is rated as moderate to good; the many pools provide suit-

WATER QUALITY No data available for this reach




	POINT SAMPLE DATA
Location	km 25.5
Date	02/06/78
Hydraulics	
channel width (m)	30
wet width (m)	25
maximum depth (m)	ND
average depth (m)	1.0
velocity (m/s)	1.60
flow character	swirling, rolling
Substrate Composition (%)	
fines (< 2 mm)	15
gravels(2-64mm)	30
larges(>64mm)	55
bedrock and/or oil sand	0
Bonk	2.3
height (m)	
form	undercut
stability	stable
lexture	sand,gravei, oil sand
vegetation (% coverage)	
coniferous trees	5
deciduous trees	85
shrubs	10
grasses	10
barren	2
Water Quality	
temperature (°C)	16.0
dissolved oxygen (mg/l)	ND
conductivity (µmhos/cm)	NO
рН	ND

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 flow direction reach boundary upstream limit of survey division between sections of a reach

ND	
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
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shin <del>er</del>
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch



## AQUATIC BIOPHYSICAL INVENTORY

## ELLS RIVER

Reach 4 Section 1 (km 18 to km 37)

Scale 1:25 000





ERS OF FISH CAPTURED (1978)				PHYSICAL CHARACTERISTICS Reach length (km)	6.0	REACH DESCRIPTION AND F This section is a series of riffles. there is a moderate
	Adults	Juveniles and Young-of-the-year	Total Numbers	Channel width (m) Channel area (ha) Gradient (m/km)	25 15.0 4.1	of the reach. Subst also numerous areas
Species J	June September	June September	June September	Flow character	rolling, broken	the major part of th
rctic grayling	ND O			Total pools (%)	25	tation that overhand
	ND 0 ND 10	ND 1 ND 56	ND 1 ND 66	Pattern Confinement	irregularly meandering confined	reach. The diversity o
	ND O	ND 17	ND 17	Unstable banks (%)	20	vides excellent spav
ongnose sucker	ND ì	ND 11	ND 12	Substrate composition (		River, particularly
	ND I	ND O	ND 1	fines (<2 mm)	20	Rearing potential is
	ND O	ND 4	ND 4	gravels (2-64 mm)	30	debris and the rocky
	ND 28	ND 1	ND 29	larges (>64 mm)	45	banks that are shade
	ND 0 	ND 1 	ND 1 ND 131	bedrock and/or oil sa Debris	nd 5 moderate	Suitable resting and sheltered by overhar
						Shallow water depths wintering of fish in
HIC INVERTEBRATES No benthic samples were taken in this reach.	RIPARIAN VEGET Bank cove Conifer Decidue Shrubs Grasses Barren Channel o Overhar Crown	erage (%) rous trees 10 Dus trees 60 25 5 20 0 cover (%)	BENTHIC ALGAL PRODUCTIVITY No data available for th	nis reach	STREAM GAUGING DATA No data available for this re	ach

### FISH UTILIZATION

is a short, irregularly meandering reach that is essentially es. Although gradient and water velocities are relatively high, e number of pools. Water depths are fairly shallow over most estrates are predominantly larges and gravels, but there are is with sandy substrates. Deciduous trees and shrubs comprise the riparian vegetation, and there is a small amount of vegeings the channel. There is a moderate amount of debris in this

A of substrate sizes, current velocities and water depths probawning potential for most fish species that occur in the Ells by for those fish that prefer to spawn over rocky substrates. Is considered to be good because the moderate quantities of the substrates provide suitable shelter. Some areas along the aded by overhanging vegetation are also suitable rearing areas. And feeding areas for larger fish are found in some of the areas manging vegetation and debris. However, only a few backwater in the reach provide sufficiently deep waters for larger fish; and the paucity of deep pools preclude significant overin this reach.

WATER QUALITY No data available for this reach





MTWF mountain whitefish

NRDC northern redbelly date

NSST ninespine stickleback NTPK northern pike

SPSC spoonhead sculpin SPSH spottail shiner

UNSK unidentified sucker species

PLDC pearl dace SLSC slimy sculpin

TRPC trout-perch

WTSK white sucker YLPR yellow perch

WALL walleye

ю 5 0 <del>Теннні</del> Kilometres

BAS

larges(>64mm) bedrock and/or oil sand Bonk height(m) form stability lexture vegetation (% coverage) coniferous trees deciduous trees shrubs grasses barren Water Quality temperature (°C) dissolved oxygen (mg/l) conductivity (µmhos/cm)

CH water quality station PS point sample SG stream gauging station 35 kilometres from mouth flow direction T reach boundary upstream limit of survey division between sections of a reach



BERS OF FISH COLLECTED	(1978)						Re	CHARACTERISTICS		123.0	REACH DESCRIPTION AN This section It is a series of
	Adu	ults		iles and f-the-year	Total	Numbers	Ch	annel width (m) annel area (ha) adient (m/km)		30 369.0 1.9	area is composed reach. Substrate of larges, grave
Species	May/June	September	May/June	September	May/June	September	F ]	ow character	swirlin	g, rolling, broken	trees and shrubs
rctic grayling	0	0	29	4		4	То	tal pools (%)		60	present. There
ke chub	0	48	238	298	29 238	346		ttern		ously meandering	other reaches in
ignose dace	1	1	97	38	98	39		nfinement stable banks (%)	freq	uently confined	Because of t riffles, the spav
gnose sucker	1	0	32	11	33	11		bstrate composition	(%)	35	fish that normall
hern pike	0	5	0	0	0	5		fines (<2 mm)	(%)	30	that spawn in the
dace	0	0	2	48	2	48		gravels (2-64 mm)		30	Areas sheltered b
sculpin	39	3	2	. 3	41	6		larges (>64 mm)		40	substrates provid
nead sculpin	0	0	1	0	1	0	8	bedrock and/or oil s	and	0	numbers of young
-perch	19	61	35	27	54	88	Del	bris		moderate	this study. Over
ntified suckers	0	0	0	11	0	11					pools provide goo
ye	2	2	0	0	2	2					piscivorous speci
e sucker	3	9	42	37	45	46					moderate; many of
	65	129	478	477	543	606					wintering areas.
Musculium ECTA phemeroptera Baetisca Raetisca Eporus Ephemerella Rhithrogena Stenonema donata		Grasses Barren Channel c Overhan Crown	over (%)	30 0 5 0							
Ophiogomphus lecoptera Hastaperla Isogenus Isogenus Isogenla Leuetra Nemoura Oemopteryæ Pteronarcys emiptera richoptera Amiocentrus Brachycentrus Cheumatopsyche Glossosoma Homophylaæ Homophylaæ Homophylaæ Deoptera Dryopidae Elmidae ptera Tipulidae Ceratopogonidae Chironomiae Tanypodinae											
		A riffle sect	ion and hig	h, unstable	e bank at km l(	07.		An area of slow	er, swirling fl	ow and heavily grass	sed banks at km 141.

### AND FISH UTILIZATION

on is a long, tortuously meandering reach with a moderate gradient. of alternating pools and riffles, and just over half of the reach ed of pools. Water depths are relatively shallow over most of the tes are varied, depending on location in the reach, and consist vels and fines. The riparian vegetation is dominated by deciduous os, but grasses and significant numbers of conifers are also is somewhat more overhanging vegetation in this section than in in the surveyed portion of the river.

the variety of habitats provided by the long series of pools and awning potential of this reach is considered to be excellent for lly spawn over rocky or sandy substrates. Adults of several species he spring were captured here in May and June during this study. by overhanging bank vegetation and debris and areas with rocky ide excellent rearing habitat for many fish species. Very high ng fish, particularly lake chub, were captured in the reach during verhanging vegetation, moderate quantities of debris, and numerous ood resting and feeding areas for larger fish, particularly the cies. Overwintering potential for fish is considered to be of the pools are probably too shallow to provide suitable over-

> WATER QUALITY No data available for this reach

# AQUATIC BIOPHYSICAL INVENTORY ELLS RIVER

Reach 6 (km 51 to km 174)







POINT SAMPLE DATA

	FOINT	SAMIFLE D
Location		km 65
Date		31/05/78
Hydraulics		
channel width (m)		28
wet width (m)		28
maximum depth (m)		ND
average depth (m)		1.3
velocity (m/s)		1.30
flow charocter		swirling,rolling
Substrate Composition (%)		
fines (< 2 mm)		25
gravels (2-64mm)		35
larges(>64mm)		40
bedrock and/or bill sand		0
Bank		
height(m)		2.8
form		steep
stability		failing
lexture		sond, clay
vegetation (% coverage)		
coniferous trees		10
deciduous trees		80
shrubs		20
grasses		25
barren		0
Water Quality		
temperature (°C)		13,5
dissolved oxygen (mg/l)		ND
conductivity (µmhos/cm)		ND
pН		ND

	AN CF DN EF GN	L
	AN	angling
	CF	counting fence
	DN	dip net
	EF	electrofisher
	GN	gill net
	n.3	kick sample
	SF	small fish collections made
		using a combination of methods
	SN	seine
	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
1 CONTRACTOR OF	M	flow direction
IN THE OWNER OF THE OWNER OWNER OF THE OWNER OWNE	I	reach boundary
	J	upstream limit of survey
	1	division between sections of a reach

LEGEND	
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
FTMIN	folhead minnow
GOLD	goldeye
LKCH	lake chub
LKCS	lake cisco
LK₩F	lake whitefish
LNDC	iongnose dace
LNSK	longnose sucker
MTWF	mauntain whitefish
NRDC	northern redbelly dace
NSST	ninespine stickleback
NTPK	northern pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shin <del>er</del>
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
<b>WTSK</b>	white sucker
YLPR	yellow perch







	POINT	SA
Location		km 7
Date		31/
Hydraulics		
Channel width (m)		30
wet width (m)		30
maximum depth (m)		ND
average depth (m)		1.
velocity (m/s)		0.
flow character		s₩ir
Substrate Composition (%)		
fines (< 2 mm)		30
gravels(2-64mm)		30
larges(>64mm)		40
bedrock and/or oil sand		0
Bank		
height(m)		2.
form		repo
stability		stab
lexture		sana
vegetation (% coverage)		
coniferous trees		0
deciduous trees		85
shrubs		25
grosses		20
barren		0
Water Quality		
temperature (°C)		12.
dissolved axygen (mg/l)		ND
conductivity (µmhos/cm)		ND
рН		ND
	and the second second second second	and the second sec

ND	
ARGR	orctic grayling
BKST	brook stickleback
BRMN	brassy minnow
BURB	burbot
DLVR	Dolly Vorden
EGGS	unidentified fish eggs
EMSH	emerold shiner
FLCH	flathead chub
FSDC	finescale dace
FTMIN	fathead minnow
GOLD	goldeye
LKCH	lake chub
LKCS	lake cisco
LKWF	lake whitefish
LNDC	longnose doce
LNSK	longnose sucker
MTWF	mountain whitefish
NRDC	north <b>er</b> n redbelly dace
NSST	ninespine stickleback
NTPK	north <b>ern</b> pike
PLDC	pearl dace
SLSC	slimy sculpin
SPSC	spoonhead sculpin
SPSH	spottail shiner
TRPC	trout-perch
UNSK	unidentified sucker species
WALL	walleye
WTSK	white sucker
YLPR	yellow perch





POINT SAMPLE DATA

Location	km 93
Date	30/05/78
Hydraulics	
channel width (m)	28
wet width (m)	28
maximum depth (m)	ND
average depth (m)	1.0
velocity (m/s)	i.00
flow character	swirling
Substrate Composition (%)	
fines (< 2 mm)	20
gravels (2-64 mm)	40
larges(>64mm)	40
bedrock and/or oil sand	0
Bank	
height (m)	2.5
form	repose
stability	stable
lexture	sand, gravel
vegetation (% coverage)	
coniferous trees	10
deciduous trees	75
shrubs	40
grasses	15
barren	0
Water Quality	
temperature (°C)	13.5
dissolved oxygen (mg/l)	ND
conductivity (µmhos/cm)	ND
рН	ND

LEGEND AN angling CF counting fence DN dipinet EF electrofisher GN gill net KS kick sample SF small fish collections made using a combination of mathe using a combination of methods seine SN 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 flow direction T reach boundary upstream limit of survey division between sections of a reach

D	
RGR	arctic grayling
ST	brook stickleback
RWN	brassy minnow
JRB	burbol
٧R	Dolly Varden
GS	unidentified fish eggs
(SH	emerald shiner
CH.	flothead chub
DC	finescale dace
MN	fathead minnow
DLD	goldeye
CH	lake chub
CS	lake cisco
WF	lake whitefish
IDC	longnose dace
ISK	longnose sucker
ΓWF	mountain whitefish
SDC	northern redbelly dace
ST	ninespine stickleback
PK	northern pike
DC	peari dace
SC	slimy sculpin
SC	spoonhead sculpin
SH	spottail shin <del>er</del>
PC	trout-perch
ISK	unidentified sucker species
ALL.	walleye
TSK	white sucker
PR	yellow perch

ΔR

GC

LK

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prepared by LIMITED





km 117 30/05/78 40 25 ND 0,8 1,25 rolling, broken	km 125 29/05/78 30 30 ND 1.0 1.60
40 25 ND 0.8 1.25	30 30 ND 1.0 1.60
25 ND 0.8 1.25	30 ND 1.0 1.60
25 ND 0.8 1.25	30 ND 1.0 1.60
ND 0.8 1.25	ND 1.0 1.60
ND 0.8 1.25	1.0 1.60
0.8 1.25	1.60
rolling, broken	
	rolling, broken
40	20
40	30
20	50
0	0
	•
1.5	1.8
repose	undercut
storble	failing
sand,gravel	sand, larges
5	35
20	65
45	25
25	45
5	ō
12,0	11.0
ND	ND
ND ND	ND ND
	40 20 0 1.5 repose stable sand,gravel 5 20 45 25

		LEGE
GN	angling counting fence dip net electrofisher gill net kick sample small fish collections made using a combination of methods seine	
A P	benthic algal productivity station	
BI	benthic invertebrate collection site	9
СН	water quality station	
PS	point sample	
SG	stream gauging station	
35	kilometres from mouth	
K	flow direction	
Ι	reach boundary	
-	upstream limit of survey	
	division between sections of a reach	

υ	
RGR	arctic grayling
(ST	brook stickleback
RMN	brassy minnow
JRB	burbot
VR	Dolly Vard <b>e</b> n
GS	unidentified fish eggs
ISH	emerald shiner
CH	flothead 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 dace
SST	ninespine stickleback
TPK	northern pike
DC	pearl dace
SC	slimy sculpin
PSC	spoonhead sculpin
×ЗН	spottail shin <del>er</del>
RPC	trout-p <b>erch</b>
vSK	unidentified sucker species
ALL	walleye
TSK	white sucker
_PR	yellow perch





FISH COLLECTIONS



POINT SAMPLE DATA

	1 01111	
Location		km 141
Date		29/05/78
Hydraulics		
channel width (m)		35
wet width (m)		35
maximum depth (m)		ND
average depth (m)		1.0
velocity (m/s)		1.40
flow character		swirling, rolling
Substrate Composition (%)		
fines (< 2 mm)		75
gravels (2—64mm)		5
larges(>64mm)		20
bedrock and/or oil sand		0
Bonk		
height(m)		1.8
form		repose
stability		stable
lexture		sand, gravel
vegetation (% coverage)		
conferous trees		80
deciduous trees		10
shrubs		5
grasses		15
barren		0
Water Quality		
temperature (°C)		11.5
dissolved oxygen (mg/l)		ND
conductivity (µmhos/cm)		ND
рH		ND
The state of the second s	A CONTRACTOR OF	

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 GH water quality station PS point sample SG stream gauging station 35 kilometres from mouth T reach boundary J upstream limit of survey division between sections of a reach

LEG	BEND	
	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
e	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
	SLSC	slimy sculpin
	SPSC	spoonhead sculpin
	SPSH	spottail shiner
	TRPC	trout-perch
	UNSK	unidentified sucker species
	WALL	walleye
	WTSK	white sucker
	YLPR	yellow perch







MBERS OF FISH CAPTURED (19	78)						PHYSICAL CHARACTERISTICS Reach length (km) Channel width (m)	6.0 20	REACH DESCRIPTION AND F This section is broken riffles and v are the highest reco	s a short white wat
				niles and			Channel area (ha)	12.0	average water depth	ı is shall
Course in a		Adults		of-the-year		Numbers	Gradient (m/km) Flow character	7.2 rolling, broken	materials, but fines Deciduous trees and	
Species	June	September	June	September	June	September	Total pools (%)	20	bank, but coniferous	
arctic grayling	0	0	3	1	3	.]	Pattern	irregularly meandering	vegetation. A sma	11 amoun
ake chub	0	0	3	0	3	0	Confinement	confined	The diversity o	
ongnose dace ongnose sucker	0	0	3	0	3	0	Unstable banks (%)	10	reach provides a nur	
my sculpin	0	0	15 4	0 5	15· 4	0 6	Substrate composition		species of fish, par	
ite sucker	0	0	34	0	4 34	0	fines (<2 mm)	15 40	In many areas, howe Moderate quantities	
tal	-0	-	62	- 6		_	gravels (2–64 mm) larges (>64 mm)	40	areas for most fish	
	0	1	62	6	62	7	bedrock and/or oil sa		may limit the rearing	
THIC INVERTEBRATES OLIGOCHAETA CRUSTACEA Amphipoda Hyalella azteca INSECTA Ephemeroptera Baetis Odonata Ophiogomphus Trichoptera		RIPARIAN VEGET/ Bank cover Conifero Deciduou Shrubs Grasses Barren Channel co Overhang	rage (%) Dus trees Us trees	20 50 30 40 10		L PRODUCTIVITY available for th	Debris ·	moderate <u>STREAM GAUGING DATA</u> No data available for this rea	is considered poor to of debris provide a larger fish to inhal of pools preclude s	number o abit. The
Ceraalea Cheumatopsyche Glossosoma Hydropsyche Lepidostoma Coleoptera Elmidae Diptera Tipulidae Chironomidae Chironominae Orthocladiinae Simuliidae Tabanidae		Crown								AG

## TILIZATION

ort, irregularly meandering reach that is predominantly water rapids. Both the gradient and the water velocities within the surveyed portion of the Ells River. The allow. Larges and gravels are the predominant substrate also found in numerous areas within the reach. are the most abundant vegetation types along the river also comprise a significant proportion of the riparian unt of vegetation overhangs the channel. er depths, water velocities, and substrate sizes in this areas that may be suitable for spawning of several arly those that normally spawn over rocky substrates. he water velocities may be too high for spawning to occur. bris and rocky substrates provide moderate to good rearing es, but high water velocities throughout most of the reach ential. Resting and feeding potential for larger fish r. Some overhanging vegetation and moderate quantities of sheltered areas, but very few pools exist for The generally shallow water depths and the limited number cant overwintering of fish in this reach.

ATER QUALITY No data available for this reach

# QUATIC BIOPHYSICAL INVENTORY

# ELLS RIVER

Reach 7 (km 174 to km 180)



		104	
		FISH COLLECTIONS	SN SN ARGR LKCH LNDC LNSK SLSC WTSK
POIN Location Date Hydraulics channel width (m) wet width (m) average depth (m) velocity (m/s) flow character Substrate Composition (%) fines (< 2 mm) gravels (2-64 mm) larges (> 64 mm) bedrock and/or oil sand Bonk height (m) form stability texture vegetation (% coverage) conferous trees deciduous trees shrubs grasses barren Woter Quality temperature (%) dissolved oxygen (mg/t) conductivity (µmhos/cm) pH	T SAMPLE DATA km 177.5 01/06/78 35 35 35 ND 0.8 3.30 rolling, broken 20 30 50 0 1.3 repose stable sond, gravel 15 35 55 50 0 12.0 ND ND ND ND	An angling ARGR arctic grayling   CF counting fence BRST brook stickleback   Did ip net BRW burboi   GA gill net DUVR Duly Varden   SF small fish collections made EGS using a combination of methods   SF small fish collections made EGS file and the dub   using a combination of methods FLCH filehead chub   SN seine FSDC filehead minnow   GOLD goldeye EXCH loke chub   BD benthic invertebrate collection site LKCH loke chub   LKCH loke chub LKCH loke chub   SG stream gauging station NRDC northern redbelly doce   ST flow direction SLSC sime stickleback   ST burboi SSC sponhead sculpin   ST braite SSC indesprise   GS kilometres from mouth NTFX northern pike   ST how direction SSC sponhead sculpin   ST stream limit of survey WALL widl	River Fort MacKay HLV HLV Kilometres



NUMBERS OF FISH COLLECTED (1 Species arctic grayling lake chub longnose dace longnose sucker northern pike slimy sculpin unidentified suckers walleye white sucker Total	Adults   Juveniles and Young-of-the-ye     June   September   June   September     0   0   4   0     0   5   6   3     0   0   4   38     0   0   99   32     0   2   0   1     3   0   6   0     0   0   1   32     0   0   1   32     0   0   1   32     0   0   1   32     0   0   1   32     0   0   1   19     3   7   254   126	ear Total Numbers	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	15 25 60	River. The gradient from swirling to roll is composed of pools rocks and boulders ar of gravels and fines of deciduous trees ar amount of overhanging The spawning pot of the fish species t substrate sizes, wate attractive spawning a substrates and modera opportunities for mos the banks that are sh habitat. Moderately suckers, were capture potential for larger	the most upstream reach of the surveyed portion of the Ells is relatively high and the flow character is mixed, varying ling to broken. Approximately half of the total reach area and the water is moderately deep in many areas. Large re the dominant substrate materials, but significant amounts are also present. The riparian vegetation consists primarily nd shrubs, with some scattered conifers. There is a small g vegetation. tential of this reach is considered to be excellent for many that occur in the Ells River, because of the diversity in er velocities and water depths. The reach is a particularly area for those fish that prefer rocky substrates. Rocky ate quantities of debris provide good to excellent rearing st fish species found in the Ells River. Some areas along maded by overhanging vegetation also provide suitable rearing high numbers of young fish, particularly white and longnose ed in the reach during this study. Resting and feeding fish is considered to be good, because of the numerous pools by debris. Suitable overwintering areas are found in the
BENTHIC INVERTEBRATES GASTROPODA Stagnicola INSECTA Ephemeroptera Ameletus Baetis Ephemerella Stenonema Odonata Ophiogomphus Plecoptera Leuctra Oemopterya Taeniopterya Taeniopterya Taeniopterya Trichoptera Brachyceintrus Cheumatopsyche Lepidostoma Oecetis Polycentropus Coleoptera Elmidae Diptera Tipulidae Chironominae Tanypodinae Orthocladiinae Simuliidae	RIPARIAN VEGETATION   Bank coverage (%)   Coniferous trees 5   Deciduous trees 55   Shrubs 40   Grasses 30   Barren 0   Channel cover (%) 0   Overhang 2   Crown 0	BENTHIC ALGAL PRODUCTIVITY Standing crop expressed as cell mean: 435.0 × 10 <sup>10</sup> minimum: 36.0 × 10 <sup>10</sup> Standing crop expressed as chlo mean: 43.3 maximum: 84.5 minimum: 24.0 Primary productivity (mg C·h <sup>-1</sup> ·r mean: 20.6 maximum: 52.5 minimum: 1.i Data from Hickman <i>et al.</i> (1980).	rophyll α (mg·m <sup>-2</sup> )	Minimum annual mean discharge: Maximum monthly mean discharge: Minimum monthly mean discharge: Maximum daily discharge:	03.5 x 10 <sup>6</sup> m <sup>3</sup> (1978) 08.4 x 10 <sup>6</sup> m <sup>3</sup> (1977) 6.46 m <sup>3</sup> /s (1978) 3.43 m <sup>3</sup> /s (1977) 25.46 m <sup>3</sup> /s (July 1975) 0.21 m <sup>3</sup> /s (March 1977) 34.83 m <sup>3</sup> /s (July 6, 1975) 0.20 m <sup>3</sup> /s (Mar. 15, 1977) Loeppky and Spitzer (1977),	Mater Quality   Water Survey of Canada station number 00AT07DA0100   Mean Maximum Minimum   Total alkalinity (mg CaC03/1) Ka 2, 3 211.6 37.8   Add colspan="2">Maximum Minimum   Maximum Minimum Minimum Minimum   Maximum Minimum Minimum Minimum   Maximum Minimum Minimum Minimum   Maximum Minimum Minimum Minimum Minimum   Minimum Minimum Minimum Minimum Minimum   Minital



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