

1997 CARIBOU MOUNTAINS FISHERIES INVENTORY REPORT

PREPARED FOR ALBERTA ENVIRONMENTAL
PROTECTION, NATURAL RESOURCES
SERVICE, FISH & WILDLIFE DIVISION

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1.0 EXECUTIVE SUMMARY

In September of 1997, the Alberta Conservation Association and Natural Resources Service Fisheries Management staff, had the special opportunity to collect baseline fisheries inventory information in the Caribou Mountains, located 120 kilometers north of Fort Vermillion. This Sub-arctic eco-region, consists of perma-frost, peat bogs, pothole lakes and high fire frequencies. These factors make this area of the province and its fish resources very unique. Prior to this initiative, little was known about the status of the fisheries resource in this area.

Standardized data collection techniques were employed at fifty eight representative stream and lake sites within the Ponton, Whitesands, Yates, Wentzel, Caribou and Lawrence River drainages. Sampling techniques included backpack electroshocking, seine hauls, gill netting and angling. Arctic grayling were found to be the most abundant fish species observed, with northern pike, burbot, longnose sucker, lake chub and slimy sculpin also being present. Aging structures, lengths, weights, maturity information and tissue samples for DNA analysis were collected from all arctic grayling sampled. This information is currently being analyzed as part of the Northwest Boreal Region Arctic Grayling Stock Assessment Program.

Data collected will be added to the Northwest Boreal Region's Fisheries database where it will be used when deciding future land-use issues in the Caribou Mountains. This data will also be used by fisheries managers as a baseline for determining the status of this unique fisheries resource.

2.0 INTRODUCTION

During the summer of 1997, an opportunity arose to collect fisheries information in the Caribou Mountains. Historical fisheries data collected during the mid 1970's indicated thriving populations of Arctic grayling (*Thymallus arcticus*), within the upper reaches of the creeks and rivers in this area (Rhude 1976). With increased industrial activity in the North such as seismic exploration and timber harvest, managers have found it necessary to collect baseline fisheries information (Pers. Comm. J. Rosin 1997). The information collected and documented in this report provides managers with a look at relatively pristine, and unexploited Arctic grayling populations and will provide baseline data for future studies.

The Caribou Mountains are located 120 kilometers north of Fort Vermillion. This ecosystem is contained within Alberta's Boreal Forest Natural Region, with the majority of its area falling within the Subarctic Ecoregion. The remainder of the area studied falls within the High Mixedwood and Mid Mixedwood Ecoregions. (Strong and Leggatt 1992). Elevations rise from a low of 300 meters at the base of the mountains to a height of over 900 meters on top of the plateau. This area's peat bogs, permafrost, pothole lakes and high fire frequency, make this ecosystem and its fisheries resource unique to this province.

Bordered by seven Native Indian Reserves, and by Wood Buffalo National Park to the north east, this area currently has limited vehicle access during the summer months. Two fly-in fishing lodges, Margaret Lake and Pitchimi Lake account for the majority of angling pressure this area receives.

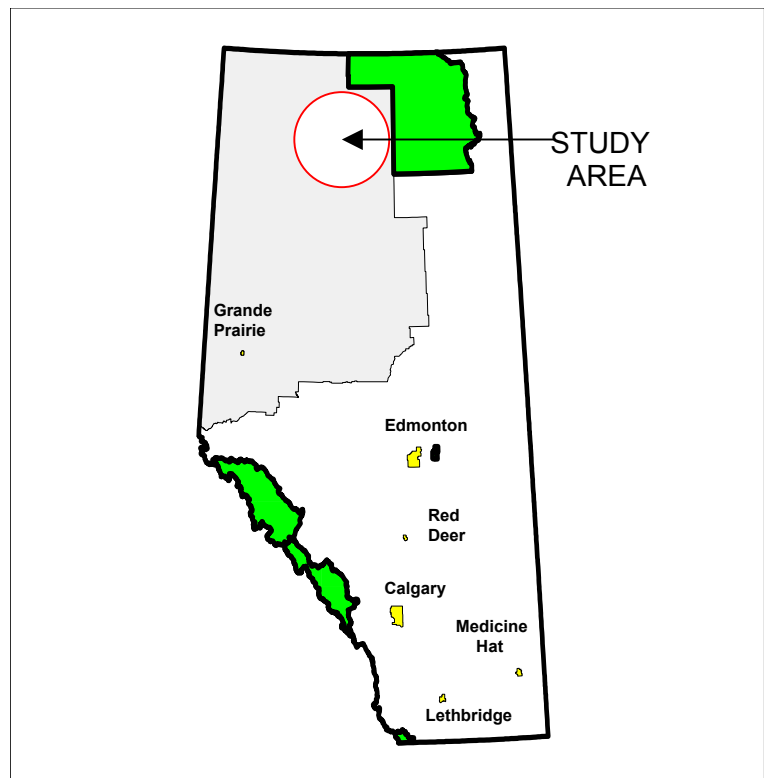


Figure 1. Caribou Mountains study area

3.0 MATERIALS AND METHODS

3.1 Site Selection

Fish inventories were conducted on 8 drainages during this sampling effort. These drainages included the Ponton, Wentzel, Caribou, Lawrence, Whitesands, Dizzy, Yates and Beaver Ranch drainages. Each drainage was sampled on top of the Caribou Mountains plateau and on the slopes leading downstream from the plateau (Figure 2).

All Lakes and streams inventoried during this study were accessed using a Bell 206 Jetranger helicopter. Sample sites were chosen throughout each drainage using 1:50,000 and 1:250,000 NTS maps. Landing opportunities most often dictated the site where each reach of stream was sampled.

3.1.1 Population Index Site

A population index site was established approximately 8 kilometers downstream from the outlet of Margaret Lake on the Ponton River (Figure 2). The purpose of this population index site was to collect some benchmark grayling population data so that changes in the population could be monitored over time. The Ponton River site was chosen from inventory data collected the previous week that suggested a viable grayling population and suitable flow regimes for the float shocking equipment.

3.2 Fish Collection

3.2.1 Stream Inventory

Stream Inventory was carried out with teams of 2 or 3 persons. Type XII, Smithroot™ backpack electroshocking units were used to collect fish wherever wading was possible. Angling and beach seining were used to compliment electroshocking efforts. At some locations, where the volume and depth of water limited the electroshocking efficiency, angling was conducted solely. Angling techniques included both fly and spin-casting gear using a variety of spoons, spinners, wet and dry flies.

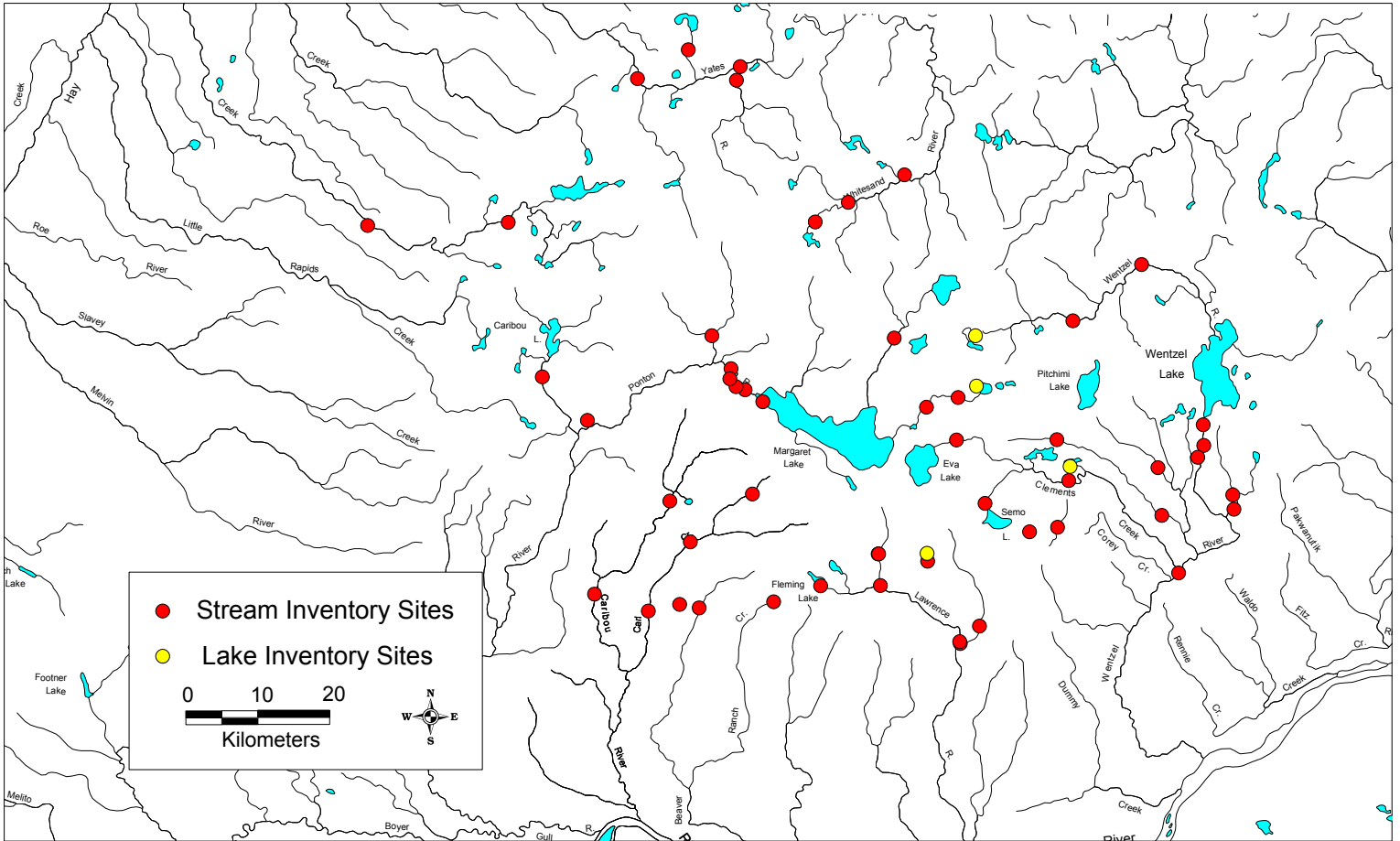


Figure 2. Map displaying sampling effort during the 1997 Caribou Mountains Fisheries Inventory Project.

All sport fish captured were counted and fork lengths recorded. In addition, total length data was recorded from all grayling captured. Maturity data was collected from all grayling between the fork lengths 150 and 240 millimeters. Incidental mortalities were also sampled for maturity. Scale samples were extracted and analyzed to determine age (Mackay, Ash, and Norris 1990) (Brown 1943).

3.2.2 Lake Inventory

A 3.7 meter inflatable Zodiac™ equipped with a 15 horsepower outboard motor was assembled and used to survey each lake.

Fish populations were sampled using 23 meter monofilament gill nets with mesh sizes 38, 64, 89 and 114 millimeters respectively. A standard gang consisted of one, 23 meter panel of each mesh size. Nets were set throughout each lake with mesh sizes being chosen at random. Catch per unit of effort for each species captured was calculated and recorded.

All fish captured were counted and recorded. Aging structures, maturity data, weights, fork and total length data were taken as time permitted.

3.2.3 Population Index Site

An inflatable 3.7 meter river raft powered by oars was used to float the Ponton River near the mouth of Margaret Lake. The raft was outfitted with a 5.0 Smithroot™ generator powered electroshocking unit. Three crew members were aboard the raft with one person navigating, one person operating the electroshocking unit and one person dip netting fish.

Grayling greater than 200 millimeters were marked using FLOY™ tags, while grayling under 200 millimeters were marked using a series of fin clips dependant on the study section. Scales were taken for aging purposes and fork lengths were recorded.

Population abundance of grayling within the Ponton River was estimated using mark-recapture methods (Ricker 1975). The study design for this population estimate followed that outlined in the Kakwa River Grayling Assessment Project (Ripley, 1997).

3.3 Habitat Parameters

3.3.1 Stream Inventory

Habitat parameters were collected using standardized stream inventory methodologies outlined in the Cooperative Fisheries Inventory Program Report (C.F.I.P.)(Hvenegaard 1996). All information collected was recorded on C.F.I.P. Stream Inventory forms. (Appendix.) All data was then entered into the Peace River Fisheries database (PRFish 1997) and given a "Main I.D." reference number that is specific to each site location. All fish and habitat parameters and photographs for each site can be accessed using the PRFish software.

3.3.2 Lake Inventory

Physical parameters collected included air temperature, water temperature, vegetation types, shoreline habitat mapping and depth transects. All information was recorded on Regional Lake Inventory Forms (Appendix ??).

4.0 SPECIES COMPOSITION BY DRAINAGE

A total of 8 fish species were encountered during this sampling event with Arctic grayling being the most abundant and widely distributed throughout the habitats sampled (Table 1).

Table 1. Common name, scientific names and abbreviations of fish species captured

Species	Taxa	Acronym ¹
Arctic grayling	<i>Thymallus arcticus</i>	ARGR
northern pike	<i>Esox lucius Linnaeus</i>	NRPK
lake whitefish	<i>Coregonus clupeaformis</i>	LKWH
burbot	<i>Lota lota</i>	BURB
longnose sucker	<i>Catostomus catostomus</i>	LNSC
white sucker	<i>Catostomus commersoni</i>	WHSC
lake chub	<i>Couesius plumbeus</i>	LKCH
slimy sculpin	<i>Cottus cognattus</i>	SLSC

¹ (Mackay, Ash, and Norris. 1990)

Species that have been reported by other studies within the Caribou Mountains, but were not encountered during this effort are recorded in Table 2 (Rhude 1976) (Scrimgeour et al. 1997).

Table 2. Common name, scientific names and abbreviations of fish species previously reported (Scrimgeour et al. 1997) but not encountered during the 1997 Caribou Mountains Fisheries Inventory.

Species	Taxa	Acronym ¹
lake trout	<i>Salvelinus namaycush</i>	LKTR
cisco	<i>Coregonus artedii</i>	CISC
walleye	<i>Stizostedion vitreum vitreum</i>	WALL
ninespine stickleback	<i>Pungitius punitius</i>	NNST

¹ (Mackay, Ash, and Norris 1990)

A total of one thousand and twenty six fish were captured, processed and for the majority, released unharmed. Grayling by far made up the majority of fish captured during this effort (Figure 3).

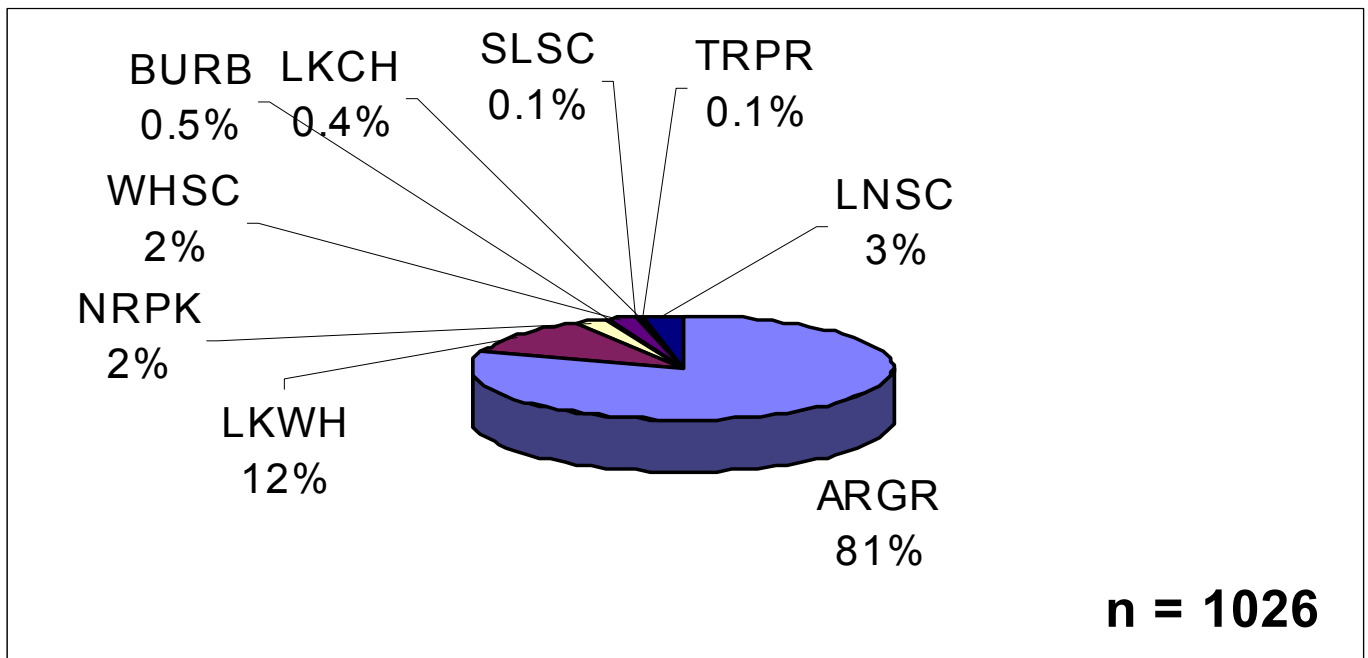


Figure 3. Chart indicating species composition of fish captured during the 1997 Caribou Mountains Inventory Project. (n = total number of fish captured.)

4.1 Ponton River Drainage

A total of eleven stream inventory sites and one lake inventory site were completed in the Ponton River drainage. In addition one population assessment index site was established to monitor grayling at the outlet of Margaret Lake

4.1.1 Stream Inventory

Arctic grayling, northern pike, burbot and longnose suckers were captured in the Ponton River basin. A total of 2435 seconds of electroshocking and 21.25 hours of angling were conducted in this drainage (Table 3).

Table 3. Summary of all species fish captured in the Ponton River drainage with C.P.U.E.s for all capture methods employed.

	NUMBER OF SITES	EFFORT	ARGR		NRPK		BURB		LNSC	
			# Captured	Average C.P.U.E.	# Captured	Average C.P.U.E.	# Captured	Average C.P.U.E.	# Captured	Average C.P.U.E.
Electro-shocking	7	2435 seconds	43	1.77	1	0.04	1	0.04	4	0.16
Angling	9	21.25 hours	119	5.6						

- Electroshocking C.P.U.E.s recorded in FISH/100seconds ** Angling CPUE recorded in FISH/ hour

4.1.2 Lake Inventory Sites

A total of two standard gangs were set at unnamed lake #2 (UTME 611466 N6544278) overnight between September 5th and 6th.

Table 4. Sampling protocols for Unnamed Lake #2 in the Ponton drainage.

Set #	Depth (m)	Time set	Time Lift	Soak Time (hrs:min)
1	0.9 - 2.1	18:00	09:30	15:50
2	0.9 - 3.7	18:30	11:30	17:00

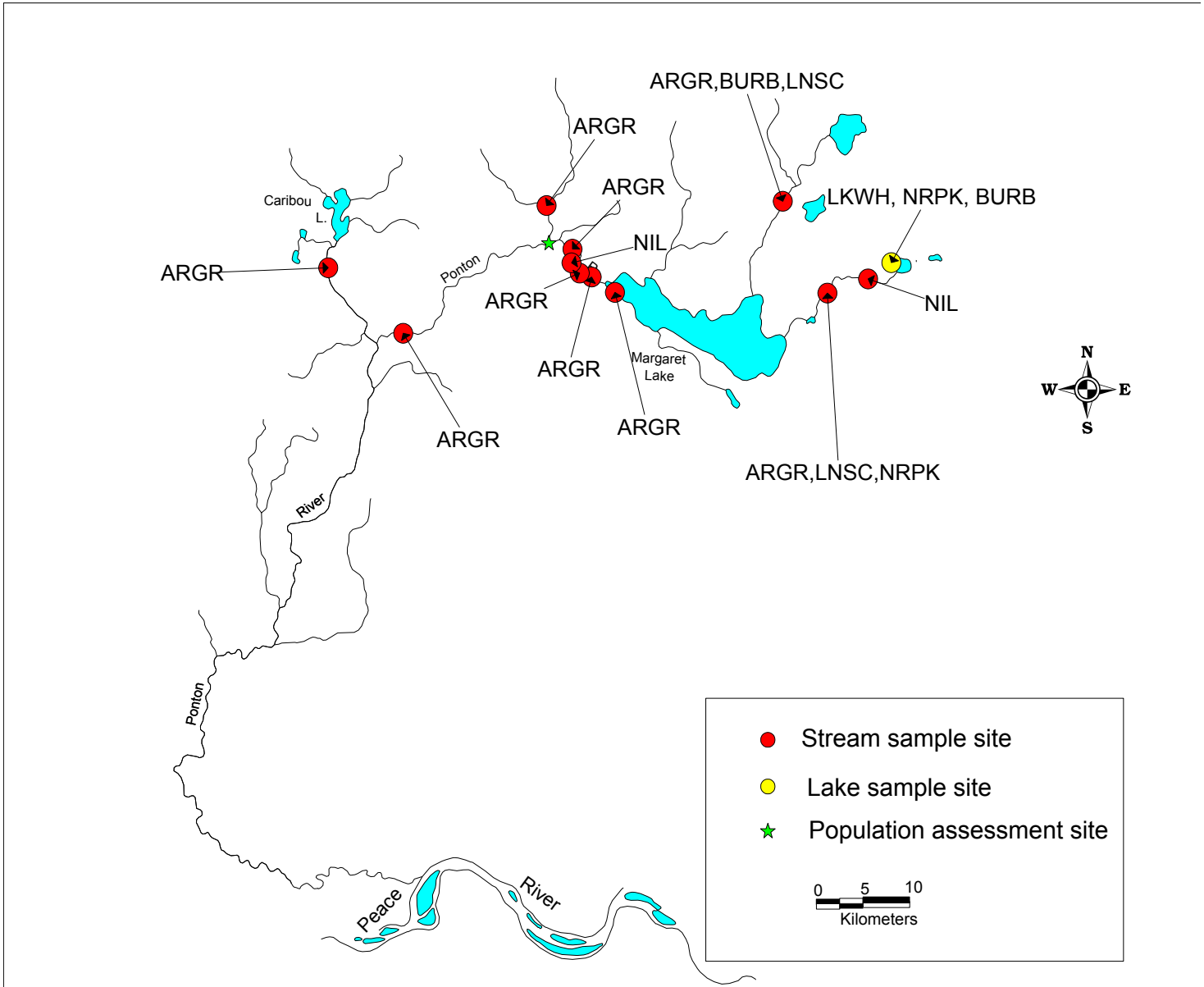


Figure 4. Ponton River watershed indicating species distribution based on 1997 inventory data.

A total of 17 northern pike, 113 lake whitefish and 1 burbot were captured. C.P.U.E. and habit data is recorded on the Lake Inventory Form (Appendix). The maximum depth encountered was 5.5 meters. Much of the shoreline of this lake was cobble and sand.

4.1.2 Population Index Site

A 30 kilometer float downstream from the outlet of Margaret Lake produced, in total 100 grayling in 11 411 seconds of electrofishing. The C.P.U.E. for this calculates to 0.87 grayling per 100 seconds. Only 52 grayling were captured during the initial marking run and only 48 grayling, of which 3 had been marked were captured during the recapture run. The resultant estimate for grayling in this stretch of the Ponton River was 611.5 (251.8, $p > 0.05$). The high standard of error is due to the low number of initially marked fish.

4.2 Wentzel River Drainage

In total of 16 Stream inventory sites and 2 lake inventory sites were completed in the Wentzel River drainage (Figure 4).

4.2.1 Stream Inventory Sites

Arctic grayling, northern pike, burbot, and longnose suckers were captured in the Wentzel River drainage. A total of 4570 seconds of electroshocking and 12.33 hours of angling were conducted. Beach seining was also employed at 2 of these sites (Table 5).

Table 5. Summary of all species fish captured in the Wentzel River drainage with C.P.U.E.s for all capture methods employed.

	NUMBER OF SITES	EFFORT	ARGR		NRPK		BURB		LNSC	
			# Captured	Average C.P.U.E.	# Captured	Average C.P.U.E.	# Captured	Average C.P.U.E.	# Captured	Average C.P.U.E.
Electro-shocking	11	4570 seconds	38	0.83	1	0.02	1	0.02	15	0.33
Angling	11	12.33 hours	75	6.08						
Beach seining	2	65 m ²	2	0.03						

* Electroshocking C.P.U.E.s recorded in FISH/100seconds ** Angling CPUE recorded in FISH/ hour

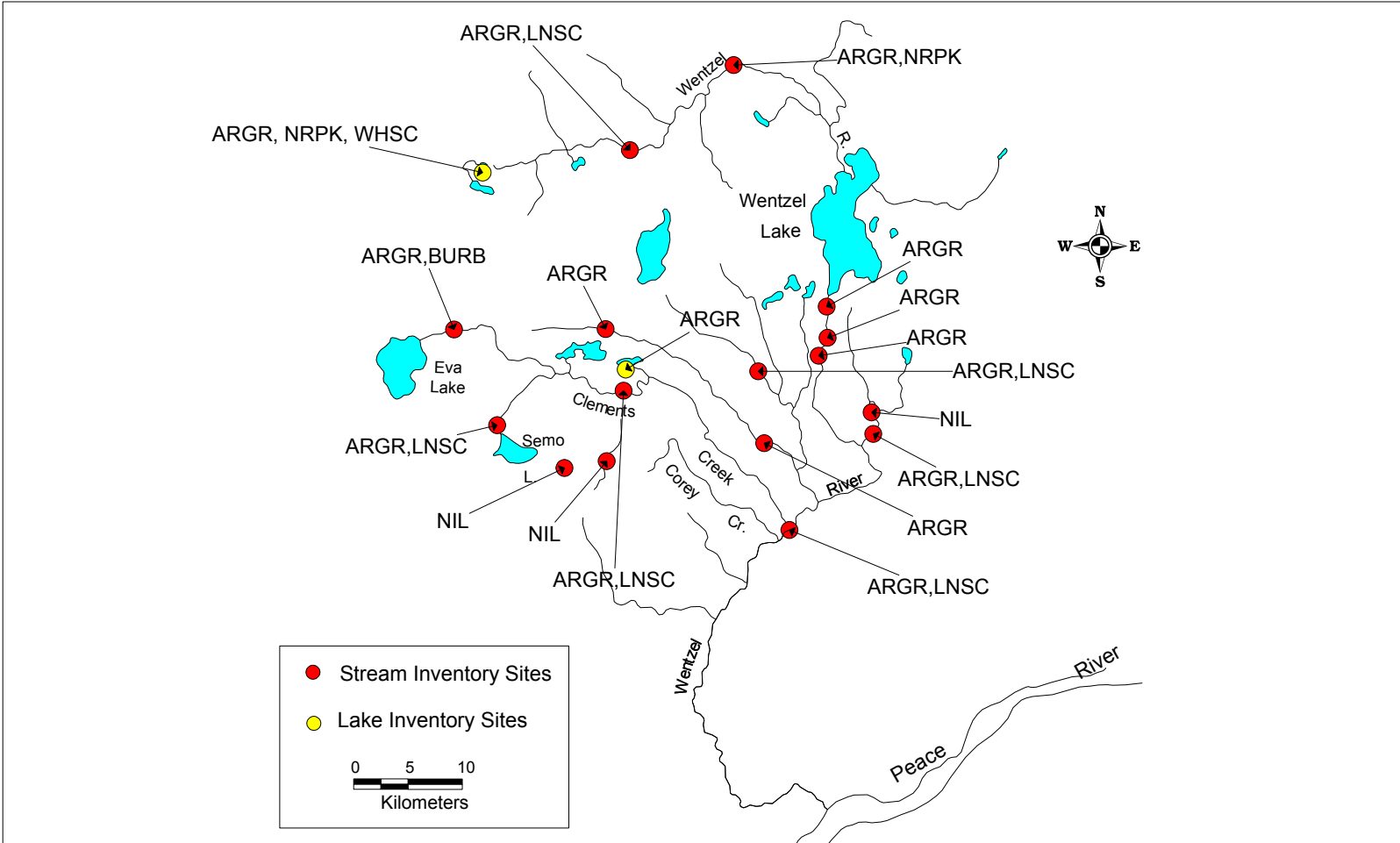


Figure 5. Wentzel River watershed indicating species distribution based on 1997 inventory data.

4.2.2 Lake Inventory Sites

Two lakes were surveyed in the Wentzel River drainage. Unnamed Lake number one is located at UTME 625437, N6532397, was surveyed using two standard gangs set overnight between September 05th and September 06th (Table 6).

Table 6. Sampling protocols for Unnamed Lake #1 in the Wentzel River drainage.

Set #	Depth (m)	Time set	Time Lift	Soak Time (hrs:min)
1	0.9 - 2.4	13:15	13:30	24:15
2	1.2 - 2.13	13:30	14:30	25:00

A total of 10 grayling were captured. C.P.U.E. and habit data is recorded on the Lake Inventory Form (Appendix). The maximum depth encountered was 4.0 meters.

Unnamed Lake #3 located at UTME611171, N6550140 was surveyed overnight between September 06th and 07th. One standard gang was set at this lake.

Table 7. Sampling protocols for Unnamed Lake #3 in the Wentzel River drainage.

Set #	Depth (m)	Time set	Time Lift	Soak Time (hrs:min)
1	0.5 - 1.07	18:00	09:30	16:30

In total, 4 Arctic grayling, 3 northern pike and 20 white suckers were captured. C.P.U.E. and habit data is recorded on the Lake Inventory Form (Appendix). The maximum depth encountered was 1.2 meters.

4.3 Lawrence River Drainage

A total of 8 stream inventory sites were completed in the Lawrence drainage (Figure 6). In addition, one lake inventory site was completed in this drainage.

4.3.1 Stream Inventory

Arctic grayling and burbot were the only species captured in the Lawrence River drainage. In total 3518 seconds of electroshocking was expended at 8 sites. Angling was also conducted at 3 sites for a total of 1.7 hours (Table 6).

4.3.2 Lake Inventory

A total of two standard gangs of nets were set at unnamed lake number four at UTME605885, N6519753. Sets were left in the water for short durations to avoid high numbers of mortalities. It should be noted that this lake was not indicated on the 1:500 000 hydrology layer.

Table 8. Summary of all species fish captured in the Lawrence River drainage with C.P.U.E.s for all capture methods employed.

	NUMBER OF SITES	EFFORT	ARGR		BURB	
			# Captured	Average C.P.U.E.	# Captured	Average C.P.U.E.
Electro-shocking	8	3518 seconds	134	3.81	1	0.03
Angling	3	1.7 hours	5	2.94		

* Electroshocking C.P.U.E.s recorded in FISH/100seconds ** Angling CPUE recorded in FISH/ hour

Table 8. Sampling protocols for Unnamed Lake 4 in the Lawrence River drainage.

Set #	Depth (m)	Time set	Time Lift	Soak Time (hrs:min)
1	0.3 - 1.8	13:15	15:15	2:00
2	0.0 - 3.0	13:30	16:30	3:00

A total of 204 Arctic grayling were captured. Very high densities of grayling reside in this lake. The maximum depth encountered was 6.1 meters.

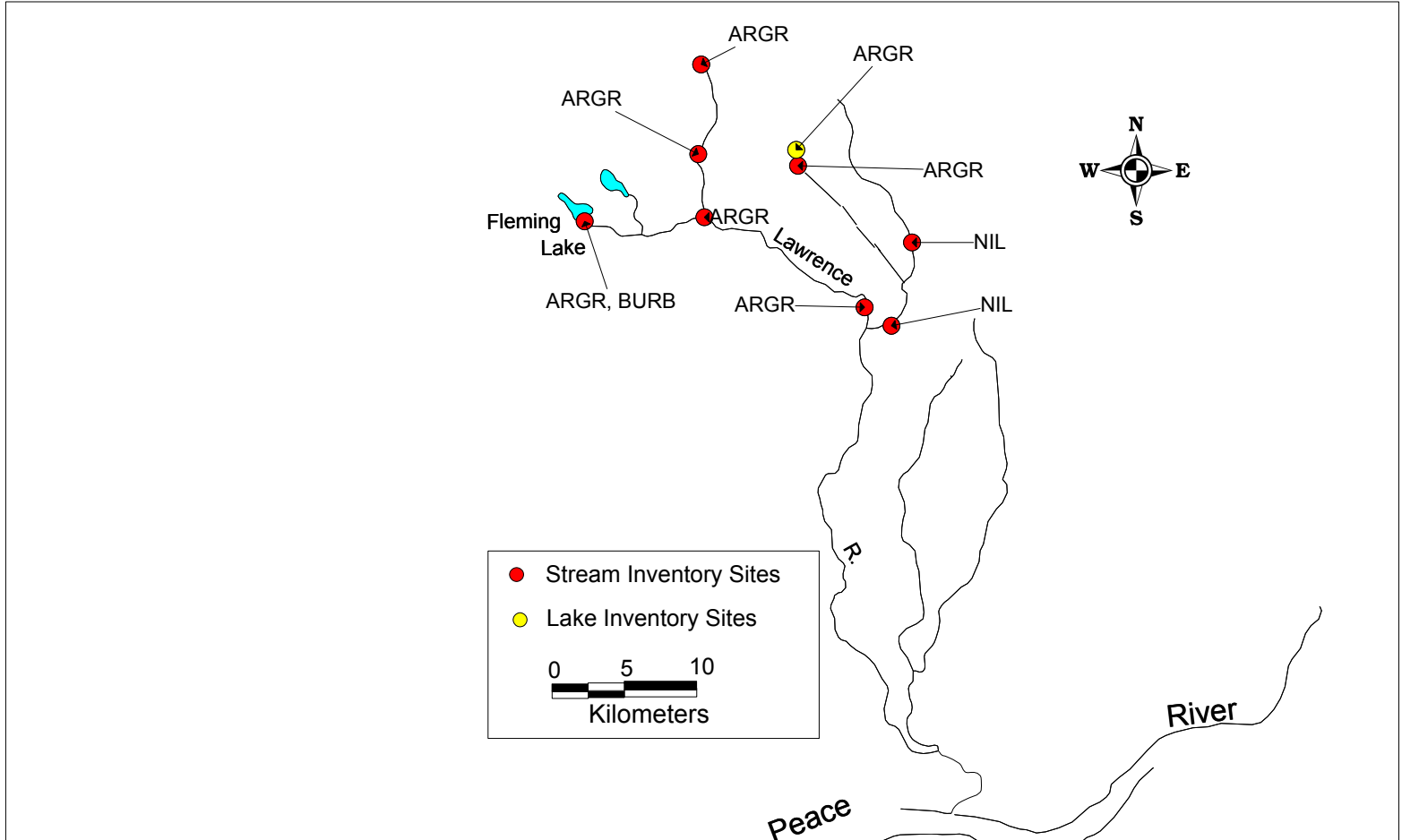


Figure 6. Lawrence River watershed indicating species distribution based on 1997 inventory data.

4.4 Caribou River Drainage

A total of five stream inventory sites were completed in the Caribou River drainage (Figure 7). Lakes were not inventoried in this drainage.

4.4.1 Stream Inventory

Arctic grayling, lake chub and longnose suckers were captured in the Caribou River basin. In total, electroshocking was conducted at all 5 sites for a total of 2354 seconds combined. In addition 6.5 hours were spent angling at 4 of the 5 sites.

Table 9. Summary of all species fish captured in the Caribou River drainage with C.P.U.E.s for all capture methods employed.

	NUMBER OF SITES	EFFORT	ARGR		LNSC		LKCH	
			# Captured	Average C.P.U.E.	# Captured	Average C.P.U.E.	# Captured	Average C.P.U.E.
Electro-shocking	5	2354 seconds	42	1.78	7	0.23	7	0.23
Angling	4	6.5 hours	6	1.08				

* Electroshocking C.P.U.E.s recorded in FISH/100seconds ** Angling CPUE recorded in FISH/ hour

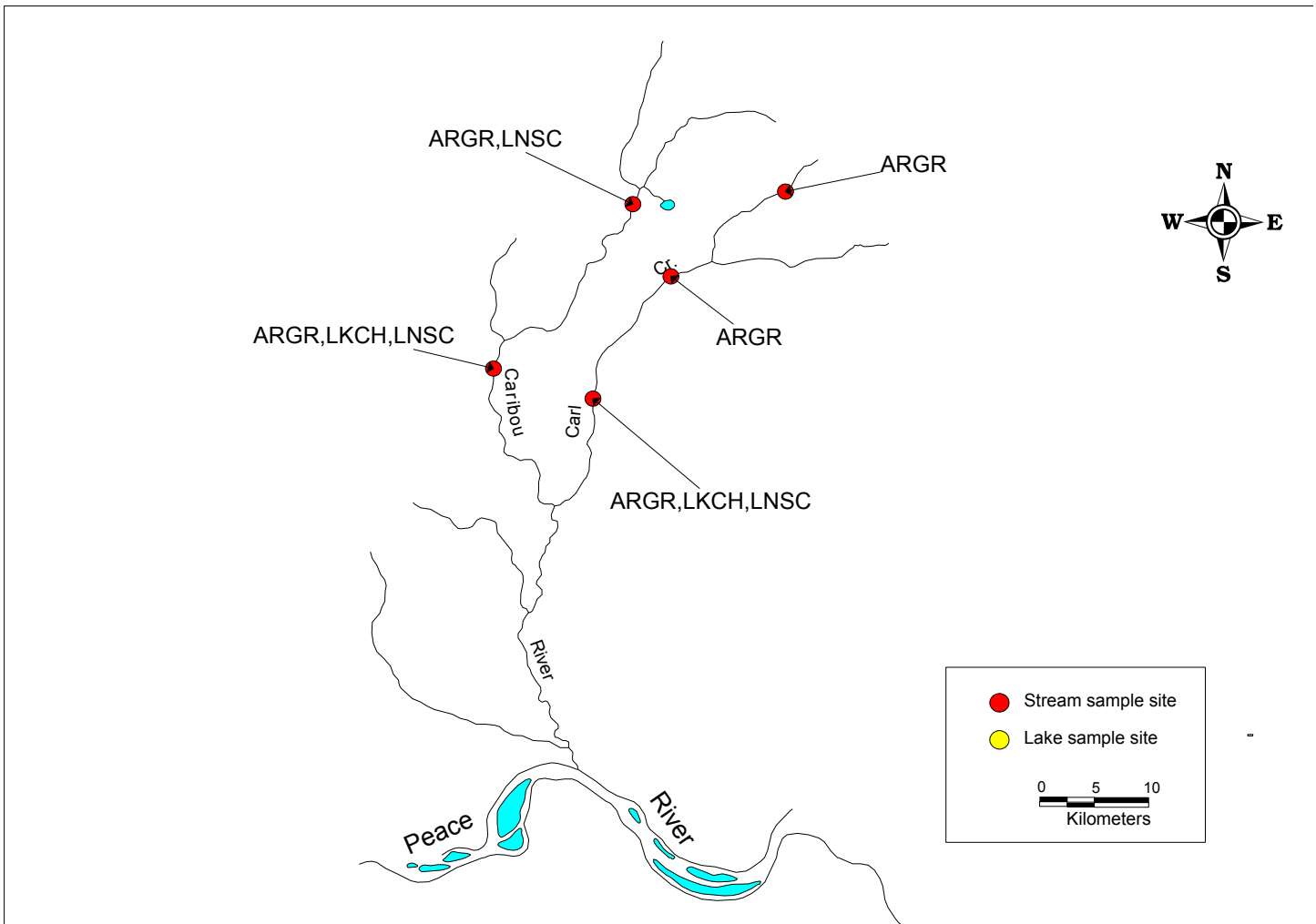


Figure 7. Caribou River watershed indicating species distribution based on 1997 inventory data.

4.5 Yates River Drainage

Four stream inventory sites were completed in the Yates River Drainage (Figure 8). Lakes were not inventoried in this drainage.

4.5.1 Stream Inventory

Arctic grayling, lake chub and longnose suckers were captured in the Yates River Drainage. Electroshocking was conducted for a total of 1375 seconds at 4 sites. Angling was conducted at 3 sites for a total of 2.15 hours (Table 9).

Table 10. Summary of all species fish captured in the Yates River drainage with C.P.U.E.s for all capture methods employed.

	NUMBER OF SITES	EFFORT	ARGR		LNSC		LKCH	
			# Captured	Average C.P.U.E.	# Captured	Average C.P.U.E.	# Captured	Average C.P.U.E.
Electro-shocking	4	1375 seconds	10	0.73	1	0.07	2	0.15
Angling	3	2.15 hours						

* Electroshocking C.P.U.E.s recorded in FISH/100seconds ** Angling CPUE recorded in FISH/ hour

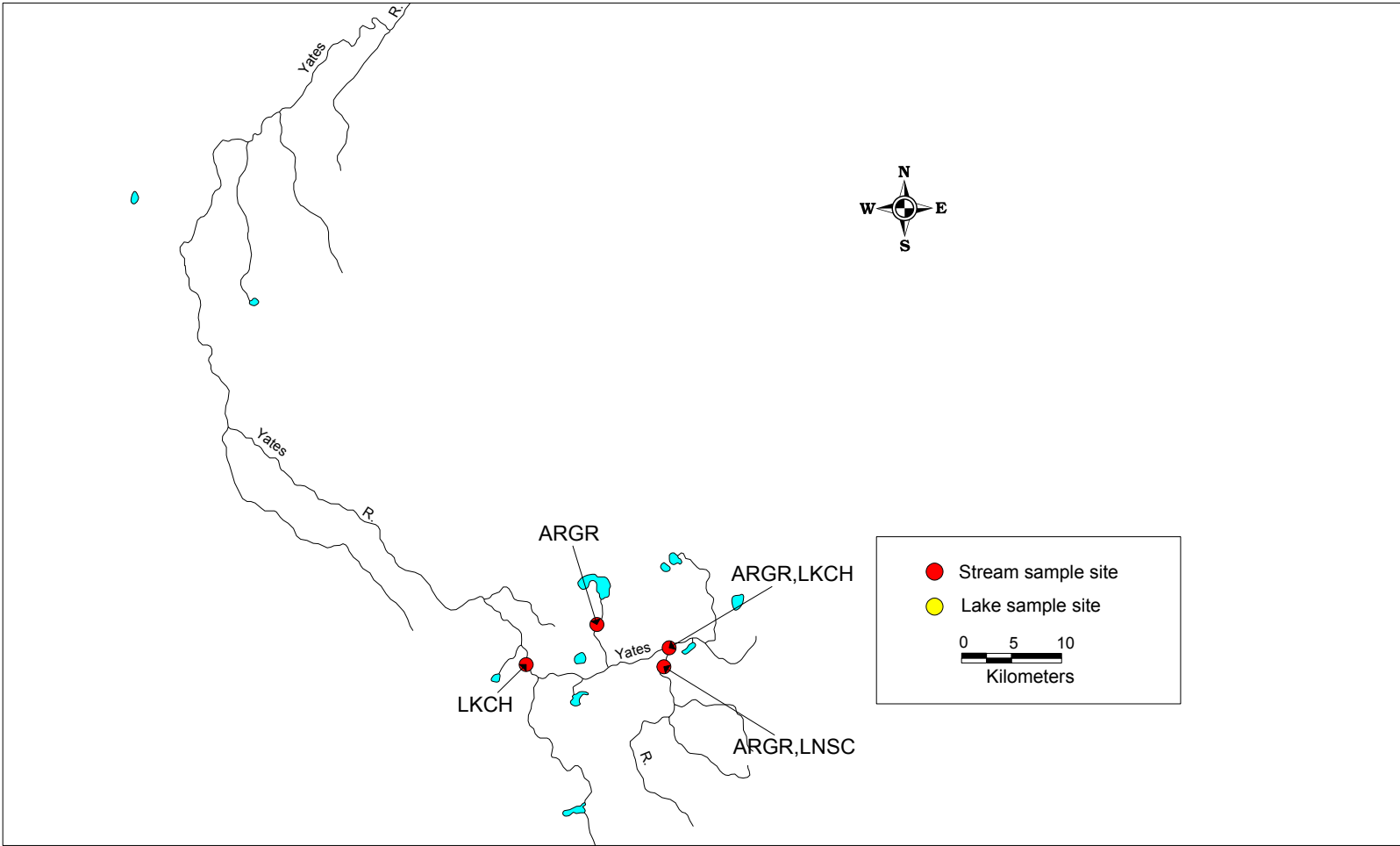


Figure 8. Yates River drainage indicating species distribution based on 1997 inventory data.

4.6 Whitesands River Drainage

Three stream inventory sites were established in the Whitesands River drainage (Figure 9). Lakes were not inventoried in this drainage.

4.6.1 Stream Inventory

Only Arctic grayling were found in the Whitesands River drainage. Electroshocking was conducted at three sites for a total of 1375 seconds. Angling was conducted at two sites for a total of 1.25 hours (Table 10).

Table 11. Summary of all species fish captured in the Whitesands River drainage with C.P.U.E.s for all capture methods employed.

	NUMBER OF SITES	EFFORT	ARGR	
			# Captured	Average C.P.U.E.
Electro-shocking	3	1408 seconds	19	1.35
Angling	3	1.25 hours	0	0

* Electroshocking C.P.U.E.s recorded in FISH/100seconds ** Angling C.P.U.E. recorded in FISH/ hour

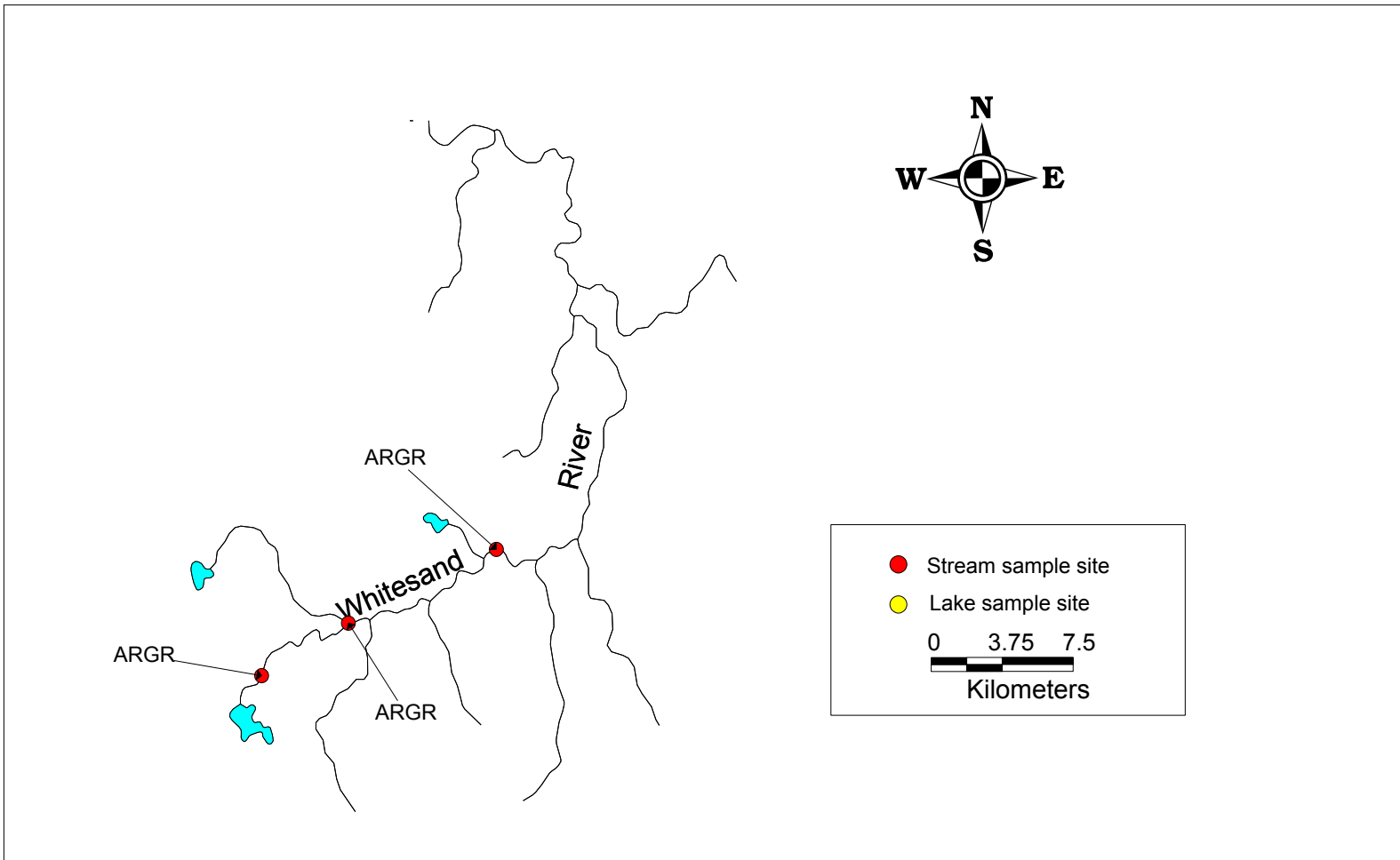


Figure 9. Whitesands River watershed indicating species distribution based on 1997 inventory data.

4.7 Dizzy Creek Drainage

A total of 2 stream inventory sites were established in the Dizzy Creek drainage (Figure 10). Lakes were not inventoried in this drainage.

4.7.1 Stream Inventory

Arctic grayling, trout perch and longnose suckers were captured in the Dizzy Creek drainage. Electroshocking was conducted for a total of 1184 seconds at 2 sites (Table 11).

Table 11. Summary of all species fish captured in the Dizzy Creek drainage with C.P.U.E.s for all capture methods employed.

	NUMBER OF SITES	EFFORT	ARGR		LNSC		TRPR	
			# Captured	Average C.P.U.E.	# Captured	Average C.P.U.E.	# Captured	Average C.P.U.E.
Electro-shocking	2	1184 seconds	9	0.76	3	0.25	1	0.08

* Electroshocking C.P.U.E.s recorded in FISH/100seconds ** Angling C.P.U.E. recorded in FISH/ hour

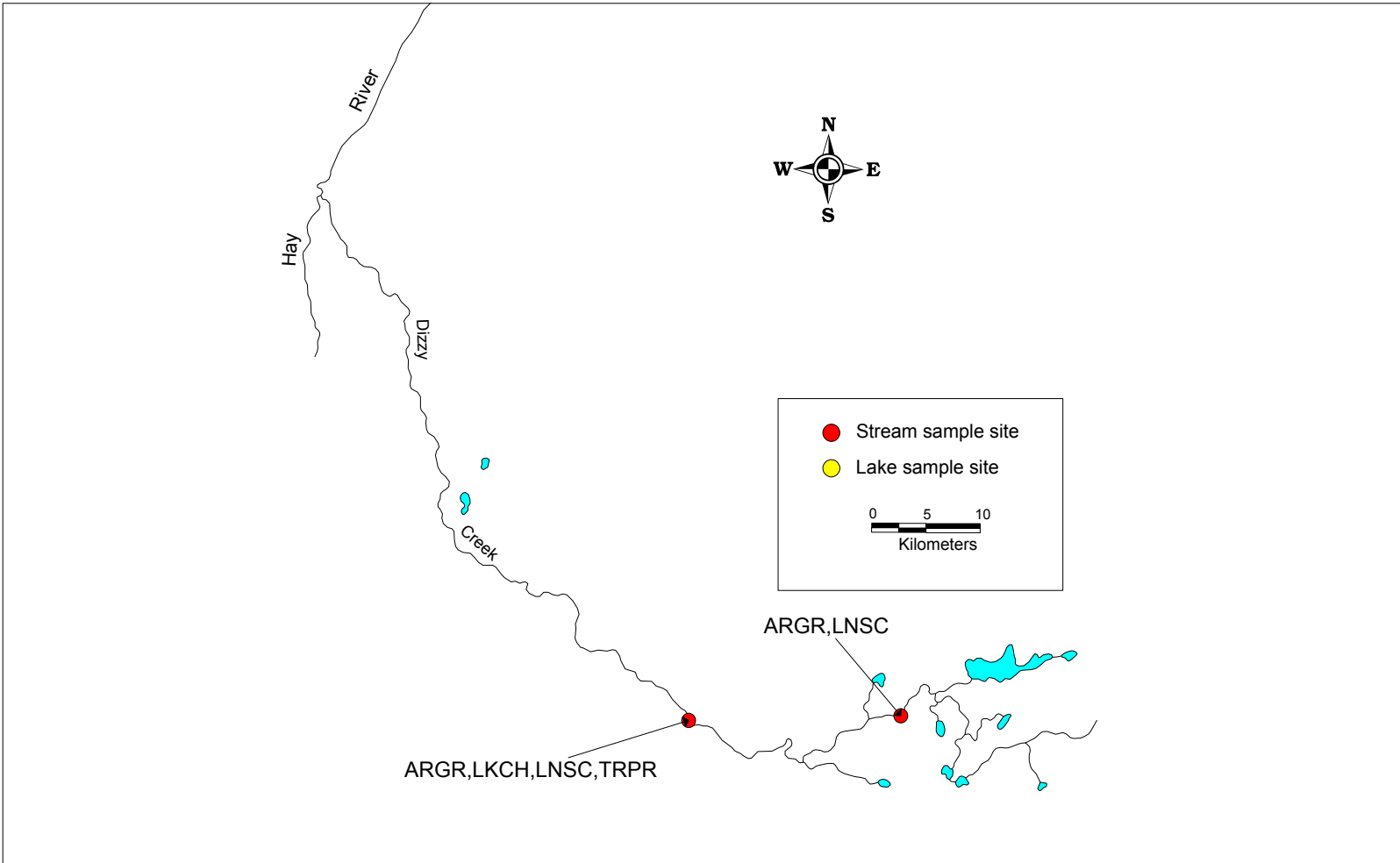


Figure 10. Dizzy Creek watershed indicating species distribution based on 1997 inventory data.

4.8 Beaver Ranch Creek Drainage

4.8.1 Stream Inventory

Three inventory sites were conducted on the Beaver Ranch Creek drainage. In total 488 seconds were spent electroshocking (Figure 11). No fish were captured. There were not any lakes in this watershed to sample.

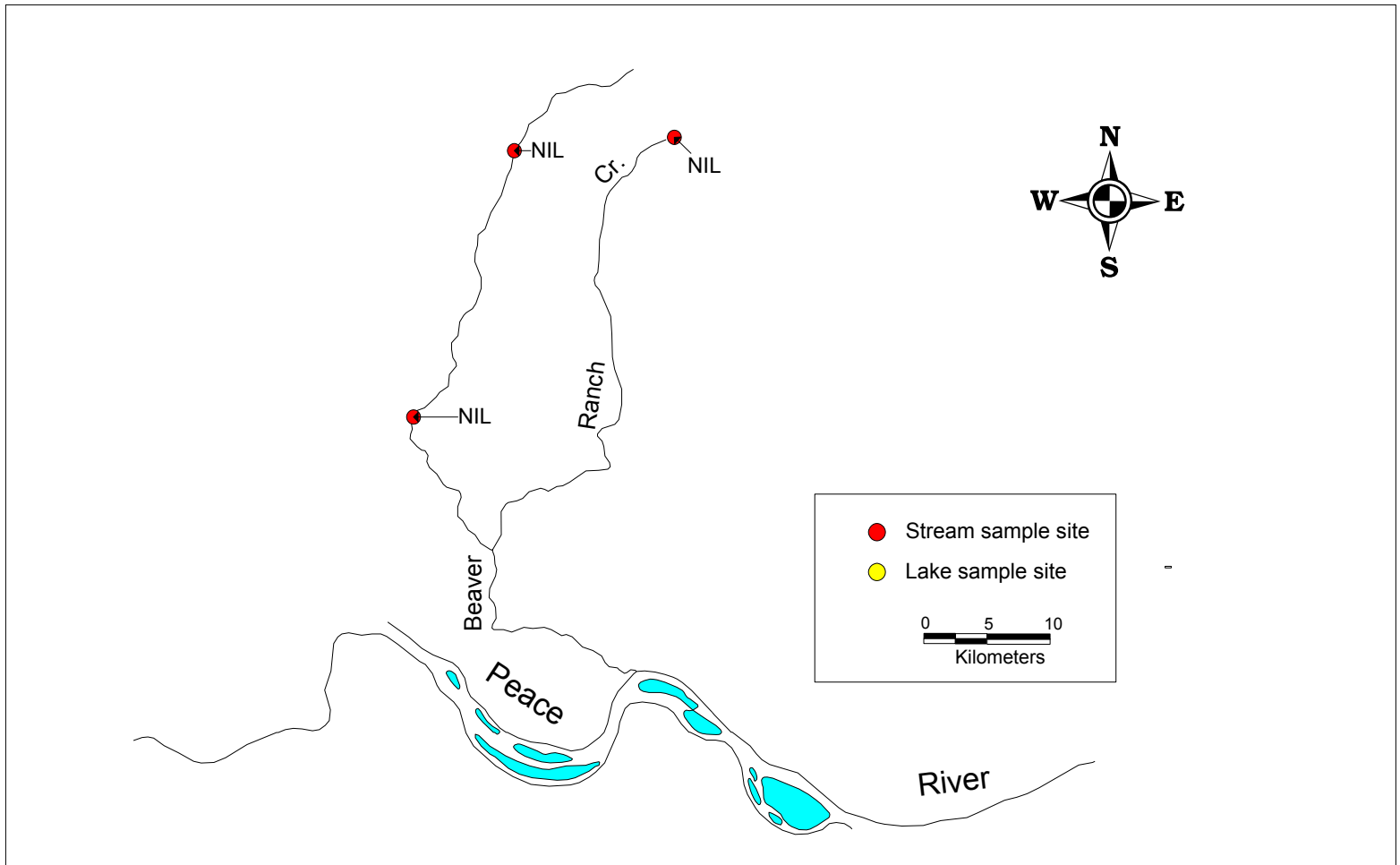


Figure 11. Beaver Ranch Creek watershed indicating species distribution based on 1997 inventory data.

5.0 FISH POPULATION DYNAMICS

5.1 Arctic Grayling

5.1.1 Relative Abundance

In total, 294 grayling were captured using electroshocking and 205 grayling were captured using angling. Site Main I.D. 1711 located at the outflow of Unnamed Lake #4 (NW1/2-7-113-7W5) had the highest densities of grayling found during this study. Densities of 165.3 grayling per 100 seconds of electroshocking were recorded; all of which were young of the year (PRFish 1997).

Table 15. Average electroshocking and angling C.P.U.E.s for grayling by drainage.

DRAINAGE	AVERAGE C.P.U.E.	AVERAGE C.P.U.E. FOR
	FOR ANGLING (FISH/HOUR)	ELECTROSHOCKING (FISH/100 SECONDS)
Ponton R.	5.61	1.77
Wentzel R.	6.08	0.83
Lawrence R.	1.7	3.81
Caribou R.	1.08	1.78
Yates R.	0.00	0.73
Whitesands R.	0.00	1.35
Dizzy Ck.	0.00	0.76
Beaver Ranch Ck.	n/a	0.00

Angling C.P.U.E.s averaged highest in the Wentzel River drainage. A catch rate of more than 21 grayling per hour recorded at site Main I.D. 1735, at the outflow of Wentzel lake (PRFish 1997). Angling catch rates as high as 10 grayling per hour were also recorded at the outflow of Margaret Lake (PRFish 1997).

Arctic grayling were captured using gill nets at 3 of the 4 lakes inventoried. Lakes in the Caribou Mountains contain Alberta's only known naturally occurring lake populations (Walty 1997). Extremely high catch results were observed in unnamed lake #4 (Table 16).

Table 16. Number of grayling captured and relevant C.P.U.E. data for all grayling captured in gill nets during the 1997 Caribou Mountains lake inventory.

MESH SIZE	LAKE #1		LAKE #2		LAKE #3		LAKE #4	
	# OF ARGR	C.P.U.E.	# OF ARGR	C.P.U.E.	# OF ARGR	C.P.U.E.	# OF ARGR	C.P.U.E.
38 mm	1	1.8	0	0	1	2.6	167	953.4
63 mm	9	16.2	0	0	3	3.9	27	215.8
89 mm	0	0	0	0	0	0	2	18.2
114 mm	0	0	0	0	0	0	8	69.9

* C.P.U.E.s = # of fish /100m² of net per 24 hour period.

5.1.2 Fork Length Distribution

A total of 598 grayling were captured and measured during the stream inventory and population estimate. The average fork length of grayling captured during the stream inventory was 162.9 millimeters. Grayling captured ranged in fork length from 30 millimeters to 365 millimeters (Figure 13).

In total, 218 grayling were captured during lake inventory; 74 of were processed. The average fork length for grayling was 207 millimeters. Fork lengths of grayling captured ranged from 148 millimeters to a maximum of 289 millimeters (Figure 14). Unnamed lake # 4 had the only adequate sample size for complete analysis.

5.1.3 Age Composition

Age composition of grayling captured from each drainage were determined from scales. Ages of grayling captured ranged from 0 to 7 years while the majority of grayling captured were less than three years of age.

5.1.4 Age of Maturity

Both female and male grayling in stream populations were one hundred percent mature at age five years. Both female and male grayling in lake populations were found to be one hundred percent mature at age four years (Figure 15).

5.1.5 Total Length - Fork Length Relationships

Total length - fork length relationships in stream populations sampled was $T.L. = 2.93578 + 1.07622 F.L.$, excluding all grayling less than 150 millimeters. Total length - fork length relationships in lake populations sampled was $T.L. = 6.08913 + 1.07328 F.L.$ This relationship is important for the application of restrictive regulations placed on grayling for harvest (Ripley 1997).