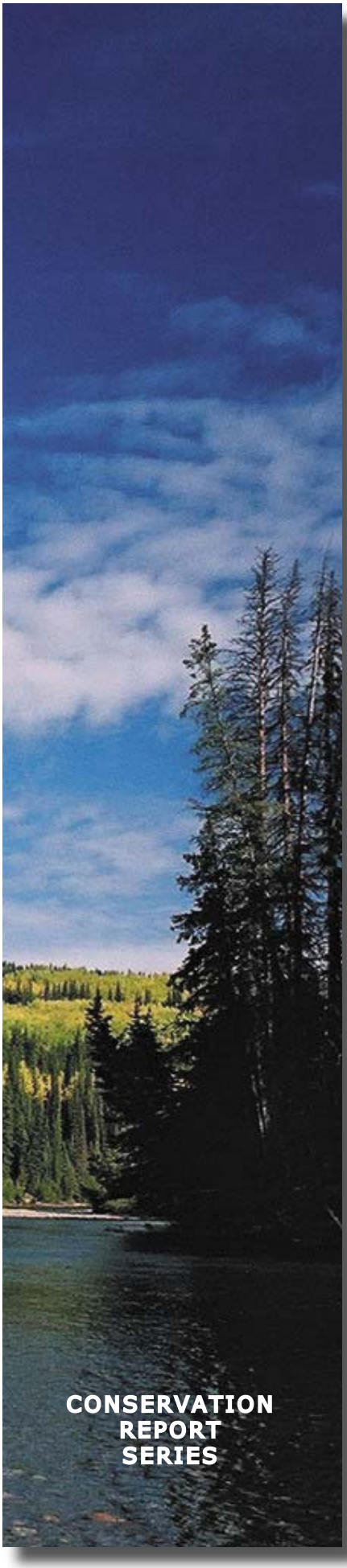

CONSERVATION
REPORT
SERIES

# Inventories of Stream Fish Communities in the Driftwood, Assineau, Mooney and Sawridge Drainages, Alberta

Alberta Conservation Association

# Inventories of Stream Fish Communities in the Driftwood, Assineau, Mooney and Sawridge Drainages, Alberta

Leanne Osokin
Alberta Conservation Association
Box 730
Slave Lake, Alberta, Canada
T0G 2A0

Alberta Conservation Association

GARRY J. SCRIMGEOUR
Alberta Conservation Association
P.O. Box 40027
Baker Centre Postal Outlet
Edmonton, AB, T5J 4M9

STEPHANIE R. GROSSMAN
Alberta Conservation Association
P.O. Box 40027
Baker Centre Postal Outlet
Edmonton, AB, T5J 4M9

**Conservation Report Series Types:**
Interim, Activity, Data, Technical

ISBN printed: 0-7785-3658-0
ISBN online: 0-7785-3659-9
ISSN printed: 1712-2821
ISSN online: 1712-283X
Publication Number: I/201

**Disclaimer:**
This document is an independent report prepared by the Alberta Conservation Association. The authors are solely responsible for the interpretations of data and statements made within this report.



**Suggested citation:**
Osokin, L. 2004. Inventories of stream fish communities in the Driftwood, Assineau, Mooney and Sawridge Drainages, Alberta. Data Report (D-2004-001) produced by Alberta Conservation Association, Slave Lake, Alberta, Canada. 26 pp. + App.

**Cover photo credit:** David Fairless

**Digital copies of conservation reports can be obtained from:**

Alberta Conservation Association

P.O. Box 40027, Baker Centre Postal Outlet

Edmonton, AB, T5J 4M9

Toll Free: 1-877-969-9091

Tel: (780) 427-5192

Fax: (780) 422-6441

Email: info@ab-conservation.com

Website: www.ab-conservation.com

# EXECUTIVE SUMMARY

The Slave Lake area Co-operative Fisheries Inventory Program (CFIP) is a collaboration among the Alberta Conservation Association (ACA), Alberta Sustainable Resource Development (ASRD), Slave Lake Pulp Corporation, and Weyerhaeuser Canada Ltd. (Slave Lake Division). This report presents the results of fish inventories completed in the fourth and final year of CFIP within Slake Lake Corporations Forest Management Agreement (FMA). Specifically, I present information on the distribution and abundance of stream fish communities in the Driftwood River, Assineau River, Mooney Creek, and Sawridge Creek surveyed between 10 June 10 and 3 October 3, 2003. Sample sites in the Assineau River, Mooney and Sawridge drainages, making up the majority of the sites sampled (63%, 73% and 100% respectively) were chosen for study by Slave Lake Pulp Corporation staff. In total, thirty five sites were inventoried in the Driftwood River drainage with an additional 38 sites from the Assineau River (n = 11 sites), Mooney Creek (n = 18 sites) and Sawridge Creek (n = 9 sites). Fish were found at 26% of the sites sampled in the Driftwood River drainage, no fish were found in 57% of the sites and 17% of sites were sampled for habitat parameters alone. Sport fish were not captured in the Driftwood River drainage. Fish inventories conducted on the Assineau River sites resulted in fish species found at nine percent of sites with no fish were found at 55% of sites. Habitat assessments (n = 4) were completed where fish inventory methods could not be applied. Mooney Creek results were 11% were sampled with fish, no fish were found at 44.5% of the sites and 44.5% were sampled for habitat parameters only. Sampling on the Sawridge tributaries resulted with fish not found at any of the sites; 78% of the sites were electrofished and 22% were sampled for habitat parameters only.

## ACKNOWLEDGEMENTS

I thank the following individuals, agencies, and corporations for their contributions and assistance in delivering year four of the Co-operative Fisheries Inventory Program (CFIP).

I am especially grateful to Pat Wearmouth and Trina Torgerson of Weyerhaeuser Canada Ltd. and Terry Kristoff and George Duffy of Slave Lake Pulp Corp. for supporting this project. George Duffy also assisted with arranging helicopter time and also providing logistical information.

I also thank Chad Sherburne, Dave Jackson, John Hallett, and Greg Fortier of ACA; David DeRosa and Martin Brilling of Alberta Sustainable Resource Development (ASRD), for assisting with data collection and to Travis Ripley (ASRD), and Martin Brilling for sharing some of their knowledge on stream fish communities in the NW region. Thanks also to Lyndon Remple for his volunteer effort throughout the field season. Lastly, I thank John Tchir, Paul Hvenegaard (ACA) and David DeRosa (ASRD), Garry Scrimgeour (ACA) and an anonymous reviewer for providing constructive comments on an earlier draft of this report.

## TABLE OF CONTENTS

# LIST OF FIGURES

# LIST OF TABLES

# 1.0 INTRODUCTION

## 1.1 General introduction

This document summarizes results of the fourth season of the Co-operative Fisheries Inventory Program (CFIP) in the Northwest Region. It includes the 2003 stream inventory results as well as brief historical fisheries and watershed information for the Driftwood River, Assineau River, Mooney Creek, and Sawridge Creek drainages. CFIP sampling was conducted on the Sawridge Creek drainage in 2000; watershed history and basic study area descriptions can be referenced from Osokin and Hvenegaard 2001.

## 1.2 Study objectives

The CFIP partnership established between Alberta Conservation Association (ACA), Weyerhaeuser, Slave Lake Pulp (Division of West Fraser Timber), and Alberta Sustainable Resource Development (ASRD) was initiated in 2000. The objective was to address the lack of baseline stream fish and fish habitat information within the Slave Lake area. Information collected is provided to all partners to integrate into land management plans and augment fish distribution knowledge within the area. Increased knowledge on the stream fish communities and habitat would allow for better management of this aquatic resource. Permanent sample plots (N = 10) were established in 2000 on Sawridge and Marten Creek drainages to be re-sampled each year CFIP was in operation to collect seasonal distribution data of Arctic grayling (Thymallus arcticus).

# 2.0 STUDY AREA

## 2.1 Description

The two study areas were located within the Swan Hills and Pelican Mountains of the Northwest Region (Figure 1). Fish sampling efforts concentrated on a fifth order (Strahler 1957) watershed in the Weyerhaeuser Forest Management Area (FMA) and three smaller fifth order drainages within the Slave Lake Pulp FMA. Weyerhaeuser selected the Driftwood River watershed as their priority drainage. This watershed is located approximately 34 kilometers (km) east of the town of Slave Lake and drains into Lesser Slave River. This drainage is approximately 102 km in length and drains the southeast portion of the Marten Hills, an area of approximately 721 $km^2$.

Slave Lake Pulp selected the Assineau River, Mooney Creek and select tributaries to the Sawridge Creek drainage as priority watersheds. The Assineau River watershed is located approximately 30 km west of the town of Slave Lake. It originates from the northwest aspect of the Grizzly Ridge and is approximately 44 km in length, draining an estimated 143 $km^2$. Mooney Creek, adjacent to the Assineau drainage, is located approximately three km west of the town of Slave Lake. This drainage is approximately 34 km in length and drains an estimated 128 $km^2$.

## 2.2 Ecoregion, forest cover and soils

The Driftwood River flows through two Natural Regions, including the Lower Foothills and Central Mixedwood Region before entering the Lesser Slave River. Forest cover found within this drainage is typically Aspen – Balsam poplar, birch, white spruce, and sub-alpine fir (Strong and Leggat 1992). The dominant soil type is Gray Luvisols (Strong and Leggat 1992).

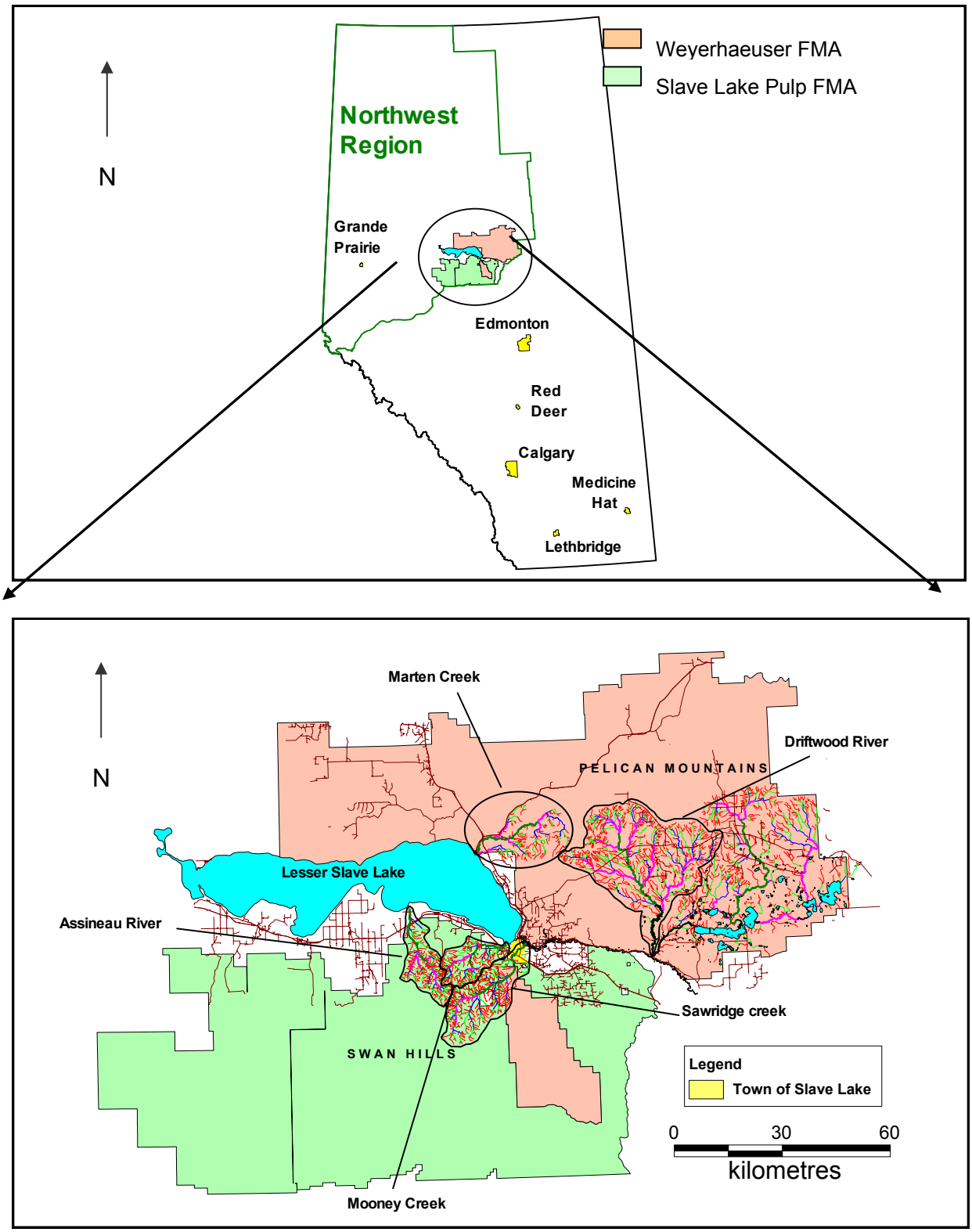


Figure 1. Study area of the Slave Lake Co-operative Fisheries Inventory Program, Alberta, Canada.

The Assineau River originates in the Upper Foothills and flows through two additional natural regions, including the Lower Foothills and Central Mixedwood, before emptying into the Lesser Slave Lake. The dominant forest cover found in this area includes white and black spruce, lodgepole pine, aspen-balsam poplar, birch, and subalpine fir (Strong and Leggat 1992). Two main soil types (Gray Luvisols and Brunisols) are found within these three natural regions.

The majority of the Mooney Creek drainage is located in the Lower Foothills with small portions of the headwaters originating in the Upper Foothills. The lower section of the drainage flows through the Central Mixedwood before entering Lesser Slave Lake. The drainage is located east of the Assineau drainage and contains the same dominant forest cover and soil type.

# 3.0 METHODS

## 3.1 Sampling methods

Staff from the ACA along with efforts from the staff of ASRD reviewed the small streams inventory protocol, including the measured and observed parameters in January 2003. New small stream inventory forms were created to ensure minimum standard data collections were maintained for the 2003 field season until further evaluation could be conducted on all protocols. As such, cover composition parameters were not collected this year. The new sample forms are provided in Appendices 6.1 and 6.2. Data collections continued to follow methods developed for the Northwest Region's CFIP (Hvenegaard 1998). All data collected were entered into the Provincial Fisheries Management Information System (FMIS) database. Detailed measurements and comments for each site can be found in Co-operative Fisheries Inventory Program 2003 – Catalogue of sample sites for the Driftwood River, Assineau River, Mooney Creek and Sawridge Creek drainage (Osokin 2003).

## 3.2 Site selection

Sampling in the Driftwood River drainage in 2003 followed the same site selection process adopted in Year One: representation of all stream orders (Strahler 1957) and

access. The majority of sites on priority drainages in Slave Lake Pulp's FMA were pre-selected by a representative of Slave Lake Pulp. These sites were located on first and second order tributaries to the Assineau River, Mooney Creek and Sawridge Creek. They were selected according to future harvest and road development in the area. The Sawridge Creek drainage was inventoried by CFIP in 2000, and as such, one site (second order) was re-sampled this year (Osokin and Hvenegaard 2001).

### 3.3 Permanent sample plots

Seasonal re-sampling of the permanent plots established on Marten and Sawridge Creek drainages were continued this year. This year (2003) represents the fourth consecutive inventory of these sites. These sites were sampled temporally each year in an effort to capture possible seasonal presence / absence of Arctic grayling.

## 4.0 RESULTS AND SUMMARY

Stream inventories were conducted between June 10 and October 3, 2003. A total of 73 sites were sampled on the Driftwood River, Assineau River, Mooney Creek, and Sawridge Creek drainages combined. Sites (N = 35) completed in the Driftwood drainage included one site sampled in 2002 as part of the Fawcett River sampling (Figure 2).

Assineau River (N = 11), Mooney Creek (N = 18), and Sawridge Creek (N = 9) drainages were sampled with a combined total of 38 sites (Figure 3). Sites pre-selected by Slave Lake Pulp comprised 53% of the total sampled with the remainder sampled as part of ACA's priority sites. Additional sampling on mainstem and larger order tributaries is recommended to better evaluate the fisheries status or potential in these watersheds.

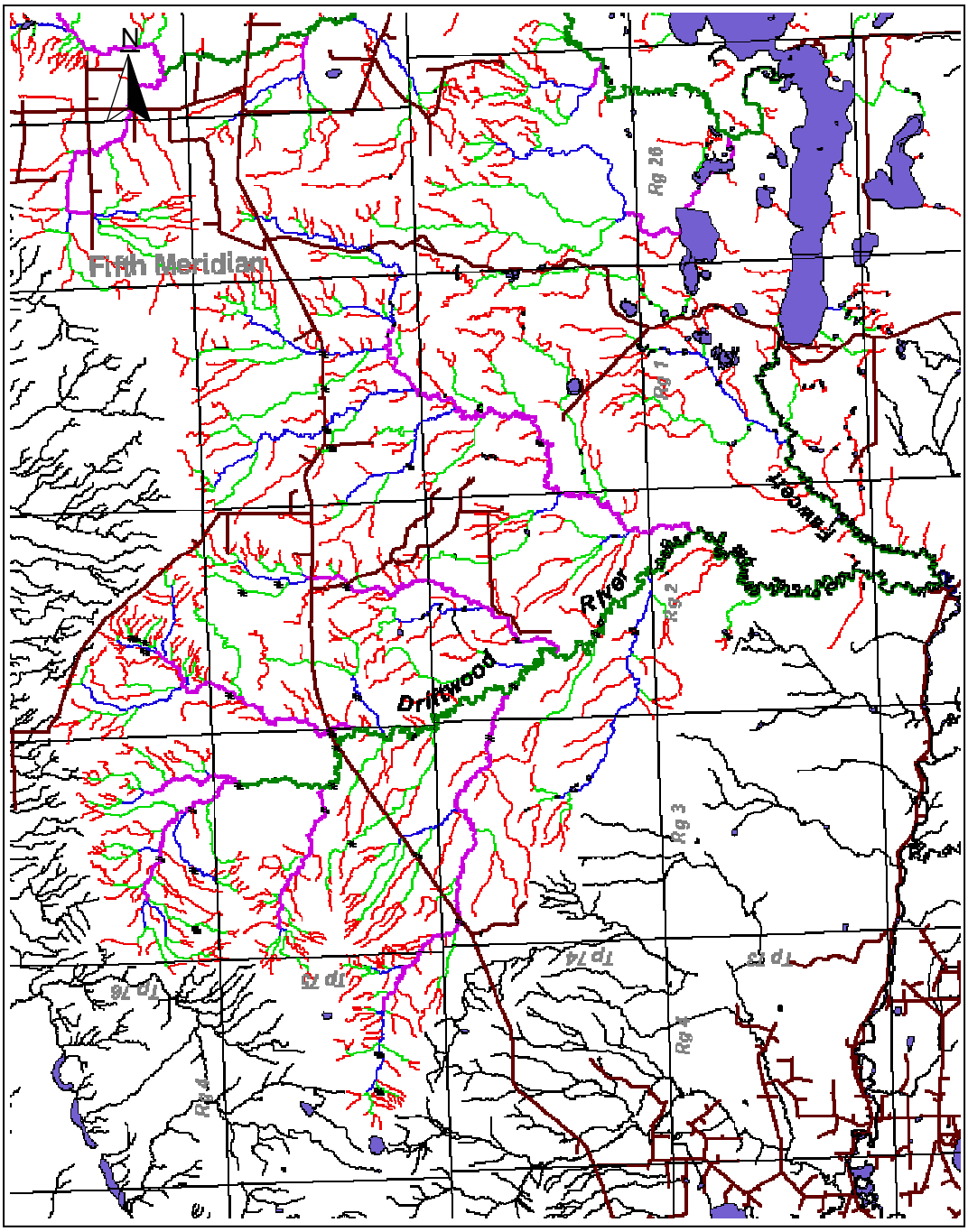


Figure 2. CFIP sites completed on the Driftwood River Drainage in 2003, Alberta. Stream orders: red = 1, light green = 2, light blue = 3, purple = 4, dark green = 5, dark blue = 6, road = brown.

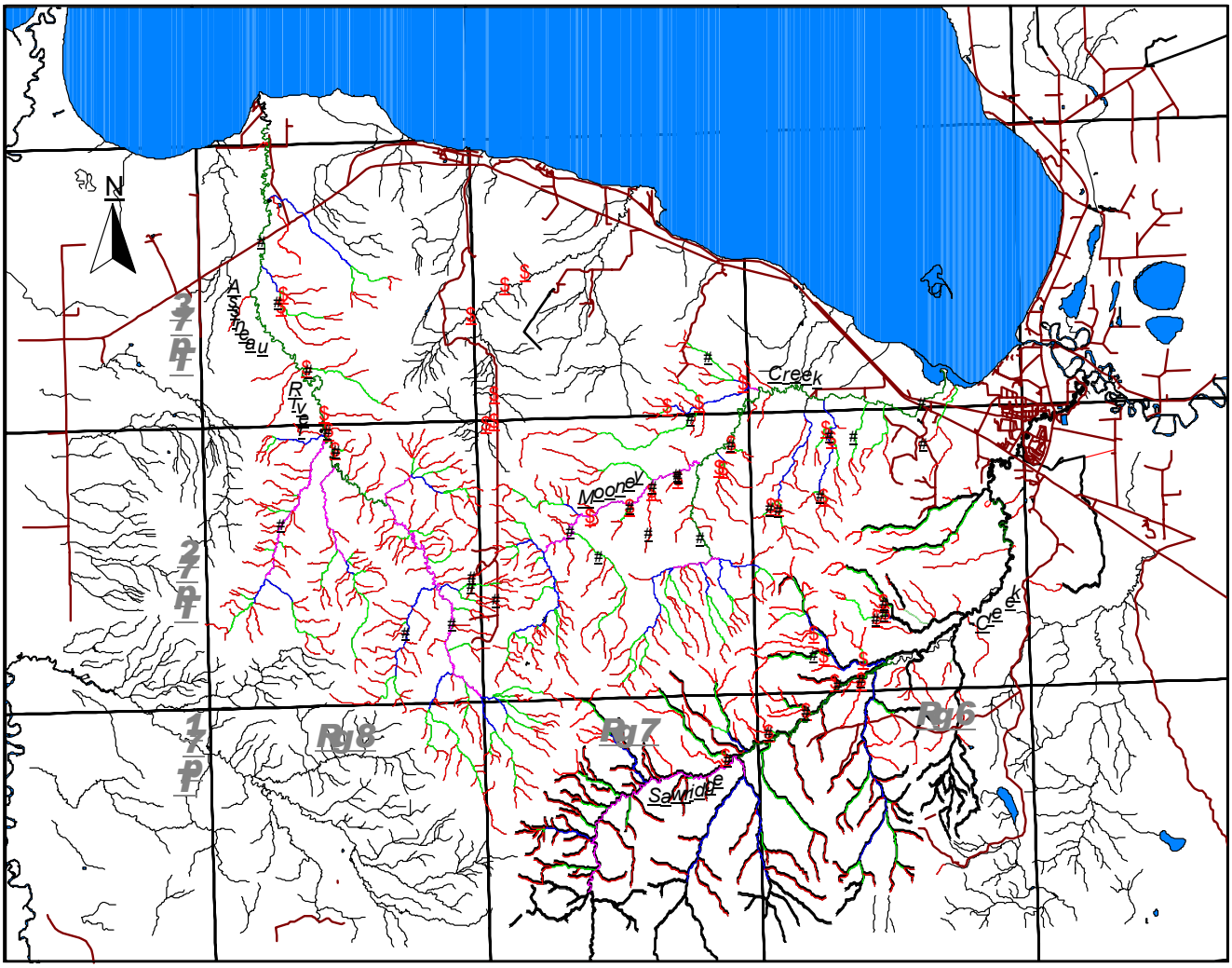


Figure 3. Slave Lake Pulp's priority site locations and actual sites completed in 2003 on Assineau River, Mooney Creek and Sawridge Creek drainages, Alberta. Stream orders: red = 1, light green = 2, light blue = 3, purple = 4, dark green = 5, dark blue = 6, road = brown, red symbol denotes SLP Survey point, black symbol denotes CFIP sample site.

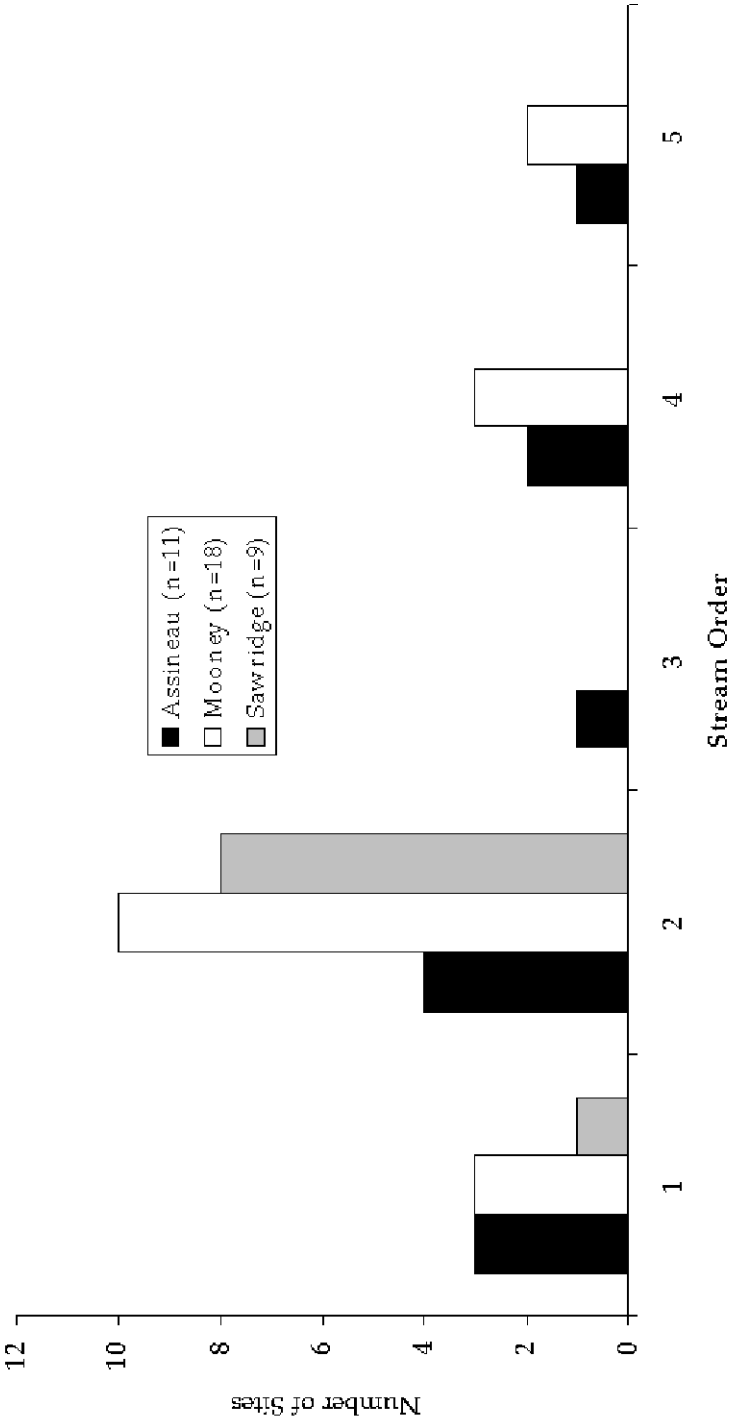


Figure 4. Number of sites sampled on the Assineau River, Mooney Creek and Sawridge Creek Drainages by stream order, Alberta.

## 4.1 Driftwood River Drainage

### *4.1.1 Historical surveys*

A preliminary fisheries evaluation was conducted by Rhude (1976) at two sites on the Driftwood River drainage. Of the two sample stations evaluated, one was located near the river's headwaters and the other below the Martin Hills road crossing. Rhude (1976) commented on the numerous tributary streams within the drainage; however their small size and inaccessibility prevented them from being surveyed. Fisheries sampling was conducted at both sites using explosive B line, capturing Arctic grayling, Spoonhead sculpin (Cottus ricei), and Longnose sucker (Catostomus catostomus). Rhude (1976) also reported that the construction of a power line crossing the northern portions of the drainage caused considerable damage to river banks creating siltation downstream of the crossing. Based on the Fisheries Management Lake and River Classification System, a Class 3 rating (poor to fair) for sport fish was assigned to the Driftwood River.

Lucko (1987b) conducted baseline fish and habitat inventory on the Driftwood River in an effort to update existing knowledge on fish distribution and location of critical spawning and rearing habitats for sport fish. Seven stations were established in this study: three sites on the mainstem Driftwood River and four on tributaries. Lucko (1987b) rated the spawning potential at the mainstem sites from fair to excellent, with the headwater portions of the Driftwood River providing "excellent spawning and rearing potential for Arctic grayling." This rating was supported by the capture of 17 Arctic grayling, four of which were young-of-the-year (YOYs) at the headwater site; other captures included Walleye (n = 1) and Longnose sucker (n = 14). Tributary sites were deemed to have limited fisheries potential; of those surveyed, only one, a site below the Marten Hills Road culvert crossing, produced Arctic grayling (n = 4). Within the tributary sites, Lucko (1987b) reported limiting factors such as low flow and high beaver activity. ASRD, Fisheries Management Division attributed the lack of adult Arctic grayling in this drainage to angling pressure and recommended that issues such as culverts obstructing fish passage be addressed.

### *4.1.2 Habitat evaluation*

Sampling in the Driftwood River drainage took place on tributaries to the mainstem. Overall, limited spawning and overwintering habitats were available at the survey sites. Two (six percent) sites in the Driftwood River Drainage, located on tributary streams north of the Marten Hills Road, were rated high for Arctic grayling spawning potential because they contained pockets of small, suitable spawning substrates and clean flowing water throughout the survey section. Sites classified as moderate for spawning potential made up 34% of the total sample. Overwintering potential appeared to be limited by a lack of deep pool habitat and potential hypoxic conditions in the winter.

Several (43%) of the sites sampled were rated high for Arctic grayling rearing potential. These sites, at third to fifth order streams, were characterized by diverse cover such as rock / cobble substrates, debris, and terrestrial canopy. These results contradict Rhude (1976) and Lucko's (1987b) Class 3 rating for the drainage; however, their rating was based on a limited sampling effort that concentrated on the mainstem of the river. Consistent with CFIP findings, Lucko (1987b) had identified the upper headwaters as important spawning and rearing habitats for Arctic grayling.

Beaver activity and inadequate culvert crossings on the Marten Hills road have limited fish access to upper headwaters and small tributaries throughout the drainage. Poor crossings were identified as issues in the reports completed by Rhude (1976) and Lucko (1987b). Adult Arctic grayling were reported to congregate in plunge pools below these crossings, making them readily available to anglers (Martin Brilling, Alberta Sustainable Resource Development, High Prairie, pers. comm.). Nelson and Paetz (1992) describe Arctic grayling as an easily caught sport fish and suggest that even under moderate angling pressure, the proportion of large individuals can decline rapidly. Beaver activity has also limited access to fisheries habitat within the drainage. Heavy siltation and habitat alteration caused by beaver dams was common throughout the smaller tributaries surveyed.

### *4.1.3 Fisheries evaluation*

Of 35 sites sampled on the Driftwood River drainage, nine (26%) contained fish; 20 (57%) of contained no fish, and six were surveyed for habitat parameters only because of inadequate water flow. No sport fish were found at sites sampled despite historical reports of Arctic grayling presence (Rhude 1976; Lucko 1987b; Martin Brilling, Alberta Sustainable Resource Development, High Prairie, pers. comm.). Fish assemblages included six species of non-sport fish; Lake chub (Couesius plumbeus) accounted for the majority of the catch (43%), followed by White sucker (Catostomus commersoni) at 29% (Table 1).

Electrofishing efficiency was reduced on larger, deep-water sections of the Driftwood River. Gill nets, sample angling, and minnow traps were employed when these habitat conditions were encountered. However, gear selectivity may have influenced the number and species sampled at those sites.

Table 1. Fish species present in the Driftwood River Drainage, Alberta (from 2003 stream inventory).

| Species | Taxonomic Name | Acromym | Total | Percent of the total catch |
|---|---|---|---|---|
| Number of Inventory Sites | | | 35 | - |
| NON SPORT FISH | | | | |
| Lake chub | Couesius plumbeus | LKCH | 42 | 43 |
| Longnose dace | Rhinichthys cataractae | LNDC | 2 | 2 |
| Pearl dace | Margariscus margarita | PRDC | 2 | 2 |
| Brook stickleback | Culaea inconstans | BRST | 20 | 21 |
| Longnose sucker | Catostomus catostomus | LNSC | 3 | 3 |
| White sucker | C. commersoni | WHSC | 28 | 29 |
| TOTAL | | | 97 | 100 |

## 4.2 Assineau River, Mooney and Sawridge Creek Drainages

### *4.2.1 Historical surveys*

Historical Fish and Wildlife fisheries surveys conducted on the Assineau River and Mooney Creek drainages are limited. Historical information is based on records from Fish and Wildlife files and the Fisheries Management Information System (FMIS). Historical anecdotal accounts from anglers indicate Arctic grayling fishing was common on both the Mooney Creek and Assineau River drainages (Martin Brilling, Alberta Sustainable Resource Development, High Prairie, pers. comm.).

Rhude (1976) completed a preliminary habitat survey of the Assineau River drainage and described it as "small muskeg brown, clear water stream with gravel and rubble found throughout the riffle sections." During the survey, Rhude (1976) noted that siltation in the drainage occurred only within pool sections. The report also indicated that the Assineau River could be used by Arctic grayling for spawning. Although a fish inventory was not conducted as part of the survey, sport fish potential was rated as low with possible seasonal importance coinciding with higher flows for spawning Arctic grayling.

In 1987, Fish and Wildlife completed a baseline habitat and fisheries survey at four stations established on the lower mainstem of the Assineau River. Lucko (1987a) reported that low water levels, high silt load, and beaver activity were limiting fisheries potential in the drainage. Gill and seine netting at the survey sites yielded Arctic grayling, Longnose sucker, White sucker, and Lake chub. Lucko (1987a) concluded that the Assineau River supports a very limited Arctic grayling population that depends heavily on the headwater portions for survival.

In 1997, Alberta Conservation Association surveyed the lower reaches of the Assineau River for the presence of spawning walleye. Subsequent fish inventories in the river produced Walleye (one observed), Lake whitefish (n = 1), Longnose sucker (n = 15), and White sucker (n = 1). High turbidity lowered electrofisher efficiency while large woody debris limited upstream boat access. Eight kick samples conducted below the hamlet of Assineau's bridge crossing produced 159 Northern pike and / or sucker eggs (Lucko

and Todd 1997). This report recorded good walleye spawning habitat on the extreme upper portion of the survey reach, although this drainage was not considered a main spawning channel for walleye.

In August 2000, Upside Engineering Ltd located in Calgary, Alberta, collected fisheries information on two sites within the Mooney drainage as part of a proposed pipeline crossing by Fortune Energy. The site on the mainstem of Mooney Creek, upstream of the highway crossing, was rated low for sport fish potential because of migration barriers caused by woody debris. Backpack electroshocking captured Lake chub and Longnose sucker (the number of fish caught and biological information was not provided). A pipeline crossing on an unnamed tributary to Mooney Creek was also assessed. Fisheries potential at this site was deemed limited by a lack of cover and low velocity and water depth. However, it was reported that habitat potential increased downstream of the crossing as cover habitat, woody debris, undercut banks, and overhanging vegetation were more prevalent. Electroshocking was not conducted at this site.

#### *4.2.2 Habitat evaluation*

The Assineau River is a small, shallow-water drainage limited in its potential to support all life-stages of Arctic grayling. However, diverse cover habitat in the form of rock / cobble substrates, debris and canopy allow for rearing Arctic grayling. Of the sites sampled, 36% were rated high to moderate for rearing potential. The upper sections of the river were better suited for Arctic grayling rearing compared to lower sections. This is attributed to increased gradient and ground water intrusion in the headwater portions of the drainage. Low water conditions, a factor identified in previous surveys (Rhude 1976; Lucko 1987a), limited the drainage's ability to support Arctic grayling. Low overwintering potential is also attributed to low water conditions; only two sites were rated moderate despite the current beaver activity throughout the drainage. Unstable banks, contributing to silt deposition, were predominant at the majority of the sites. No sites were rated high for spawning potential for Arctic grayling, however, limited pockets of suitable spawning substrates qualified a moderate rating at 36% of the sample sites. In general, with higher water levels this drainage has potential to support spawning and rearing life-stages of Arctic grayling.

Typical of watersheds in the Slave Lake area, Mooney Creek's headwater sections exhibited rock / cobble substrates and frequent riffle habitats while lower sections were characterized by slow moving, silt-dominant run habitat. The tributaries inventoried were typically clear water creeks with high gradients. Conversely, mainstem sites had large flood plains with tannin-stained water. Of 18 sites sampled in this drainage, 39% (n = 7) were rated either high or moderate for the potential to support rearing Arctic grayling. Diverse cover habitats, in the form of canopy, undercuts, debris, and rock / cobble substrates were found at these sites. The presence of aquatic invertebrates at the majority of sites also contributed to this rating. However, high quality spawning substrates and habitat were more limited; only 17% (n = 3) of the sites rated moderate for spawning with no sites rated high. Again, low water levels were the main limiting factor reported on this drainage. The lack of deep-water habitat resulted in low overwintering potential throughout the survey sites.

Low water levels were the main limiting factor at sites sampled on the Sawridge Creek tributaries; some sites had either negligible or sub-surface flow at the time of survey. All of the sites rated low for overwintering potential. These creeks, however, contribute clean water to the drainage and support a high number of aquatic invertebrates, which was observed at a majority of the survey sites. Diverse cover habitat and an abundance of aquatic invertebrates resulted in a moderate rearing potential rating for 67% of the sample sites. Spawning substrates were limited at these sites; two sites were rated high or moderate for spawning potential. Low water levels also contributed to the overall low spawning potential.

#### *4.2.3 Fisheries evaluation*

In the limited survey of the Assineau River watershed, one of the 11 sites (nine percent) had fish present. This site, sampled at the Highway 2 crossing, was one of two sampled on the main stem of the river. None of the sites sampled had Arctic grayling despite historical reports that this species inhabited the drainage (Rhude 1976; Lucko 1987a). Burbot (Lota lota) was the only sport fish captured (n = 4). Fish were not observed at six sites (55%), and four sites were sampled for habitat parameters only. The species composition for the Assineau River watershed is shown in Table 2.

At the Mooney Creek drainage, fish were captured in two of 18 sites, both located on the mainstem of the drainage. The only sport fish found, a burbot (n = 1), was captured below the Highway 2 bridge crossing (Table 2). The majority of the catch was Lake chub (66%), followed by White sucker (19%). Fish were not observed at eight sites (44%), and eight sites were sampled for habitat parameters only.

No fish were captured in seven of the nine sites electrofished on Sawridge Creek tributaries. A lack of flowing water dictated that two sites be inventoried for habitat parameters only.

Table 2. Fish species captured in the Assineau River, Mooney Creek and Sawridge Creek Drainages, Alberta, 2003.

| Species | Taxonomic name | Acromym | Assineau River | Mooney Creek | Sawridge Creek | Total | Percent of the total catch |
|---|---|---|---|---|---|---|---|
| Number of inventory sites | | | 11 | 18 | 9 | 38 | - |
| SPORT FISH | | | | | | | |
| Burbot | Lota lota | BURB | 4 | 1 | 0 | 5 | 15 |
| NON SPORT FISH | | | | | | | |
| Lake chub | Couesius plumbeus | LKCH | 21 | 0 | 0 | 21 | 1 |
| White sucker | Catastomus commersoni | WHSC | 3 | 3 | 0 | 6 | 19 |
| TOTAL | | | 28 | 4 | 0 | 32 | 100 |
| PERCENT OF TOTAL SPECIES CAUGHT | | | 88 | 12 | 0 | 100 | - |

## 4.3 Permanent sample plots

### *4.3.1 Marten Creek*

In general, the habitat composition of Marten Creek permanent sample plots (PSPs) has not changed over four years of sampling. The greatest habitat alteration was seen at Location ID 20713 (UTM coordinates: 646897 mE, 6160760 mN), where extensive beaver activity caused heavy siltation and debris buildup. For example, rock / cobble substrates once observed between transects within the survey section (2000 / 2001) were later to be silted over. It is possible that the stagnant water flow caused by various dams could be creating hypoxic conditions and lowering the overwintering potential (Schlosser 2000). The habitat at the remaining PSPs contained woody debris, abundant invertebrates and pool / riffle / run sections, which provide diverse conditions recognized as optimum for rearing Arctic grayling (Deegan et al. 1999; Nykänen et al. 2001; Uiblein et al. 2001).

Location ID 20776 was the only PSP inventoried this season to have sport fish species (Arctic grayling and burbot). Sampled in October, this site had higher species diversity than previous summer samples (June 2000 / July 2001 / August 2002). This may indicate the site's seasonal importance, a factor which could have been enhanced by changing water levels and debris cover caused by beaver activity. Through the creation of new habitat, newly formed beaver impoundments have been documented to initially increase fish species richness (Snodgrass 1998; Schlosser and Kallemeyn 2000). The small dam found at this site was not considered a barrier to fish migration nor did it dramatically increase the water level at the time of the survey. Dates and fish species composition can be found in Table 3.

Arctic grayling were again absent from Location ID 20707 and 20713 despite captures (16 and four fish respectively) during June sampling events. July (Location ID 20707) and September (Location ID 20713) sampling did not result in the capture or observation of any fish. The corresponding habitat degradation and potential migration barriers seen at Location ID 20713 may have influenced this result. Location ID 20707, however, still possesses excellent rearing potential for this sport species owed to an availability of diverse cover and invertebrate food sources (Deegan et al. 1999;

Table 3. Summary of fish species captured between 2000 and 2003 on permanent sample plots in Marten Creek, Alberta.

| Location ID | | 20776 | | | | 20703 | | | | 20707 | | | | 20710 | | | | 20713 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | | Jun 2000 | Jul 2001 | Aug 2002 | Oct 2003 | May 2000 | Jul 2001 | Aug 2002 | Jul 2003 | Jun 2000 | Aug 2001 | Aug 2002 | Jul 2003 | May 2000 | Aug 2001 | Aug 2002 | Jun 2003 | Jun 2000 | Aug 2001 | Aug 2002 | Sept 2003 |
| Species | | | | | | | | | | | | | | | | | | | | | |
| SPORT FISH | Acronym | | | | | | | | | | | | | | | | | | | | |
| Arctic grayling | ARGR | 2 | 1 | | 2 | 3 | 9 | | | 16 | | | | | | | | 4 | | | |
| Burbot | BURB | | 1 | | 7 | | | | 1 | | | | | | | | | | | | |
| NON SPORT FISH | | | | | | | | | | | | | | | | | | | | | |
| Lake chub | LKCH | 99 | 56 | 68 | 38 | 56 | 40 | 50 | 62 | | | | | 1 | 1 | | 1 | 53 | 6 | 13 | |
| Longnose dace | LNDC | 11 | | | | | | | | | | | | | | | | | | | |
| Brook stickleback | BRST | | | | | | | | | | | | | 24 | 41 | 67 | 56 | | | | |
| Pearl dace | PRDC | | | 1 | 2 | 18 | | | | | | | | | | | | | | | |
| Longnose sucker | LNSC | 24 | 2 | 4 | 6 | 10 | 1 | 9 | | | | | | 18 | 5 | 1 | | 1 | | | |
| White sucker | WHSC | 1 | | | 2 | 3 | | | 3 | | | | | | 9 | | 3 | 3 | | | |
| Trout perch | TRPR | | 1 | | 1 | | | | | | | | | | | | | | | | |
| Spottail shiner | SPSH | | | | | 2 | | | | | | | | | | | | | | | |

Nykänen et al. 2001; Uiblein et al. 2001). Early season sampling coinciding with high spring flows, is needed for this creek in order to determine whether Arctic grayling use it for spawning.

Variable spawning success with the Marten Creek PSPs may be indicated by the continued absence of YOY Arctic grayling, especially at Location ID 20703 where they were present in 2001. Several factors could be attributed to this result, including low water events, lack of mature adult fish, seasonal distributions and / or migration barriers. Successive low water events have been known to inhibit adult Arctic graylings' growth and egg production (Deegan et al. 1999). While these conditions are favorable for growth and survivorship of age-0 Arctic grayling (Deegan et al. 1999), consecutive years of low water as experienced in the Slave Lake area, may be limiting adult grayling success at this drainage. In order to ensure this sport fish persists here, existing habitat must remain intact and accessible throughout the various life-stages.

#### *4.3.2 Sawridge Creek*

Lateral channel movement and braiding were common in all Sawridge Creek PSPs. Newly formed channels provided added cover from woody debris and canopy cover and made for excellent microhabitats and refugia for smaller fish (Deegan et al. 1999). A new channel formed within Location ID 20742 contained two of the three YOYs Arctic grayling inventoried at this site.

The main tributary to Sawridge Creek (Location ID 20742; UTM coordinates: 631550 mE, 6116402 mN) is considered an integral spawning and rearing drainage for Arctic grayling. During the four years of sampling, both juvenile and YOYs were consistently observed or captured at this site. Diverse cover and an abundance of aquatic invertebrates made for optimal habitat for these life-stages (Deegan et al. 1999; Nykänen et al. 2001; Uiblein et al. 2001). It is speculated that this is the main spawning and rearing tributary for the Sawridge Creek Arctic grayling population. See Table 4 for the Sawridge Creek PSPs sampling events.

Sampling over four years at Location ID 20739, site of an elevated culvert crossing (UTM coordinates: 635903 mE, 6117995 mN), yielded no fish despite excellent cover

from woody debris, terrestrial canopy, and diverse substrate composition. Although the culvert crossing does not block water flow, it may still create a barrier to fish from passage length and corresponding water velocity (Jones et al. 1974; Belford and Gould 1989).

The two mainstem Sawridge PSPs, Location ID's 20731 and 20751, were sampled during fall 2003. Despite gill netting, sample angling and good conditions for electroshocking, only one Arctic grayling was observed at Location ID 20731, a lesser yield compared to earlier seasonal sampling events. YOY Arctic grayling, captured in past sampling events (June 2000, August 2001 and August 2002) at Location ID 20751, were absent this year (October), although one juvenile was captured. Overall, both sites contained exceptional habitat for rearing and staging Arctic grayling. One explanation could be that the fish moved to more optimal, deeper water habitats farther downstream during late fall sampling (Nykänen et al. 2001). Previous reports on Arctic grayling suggest that these fish shift habitats from swift flowing water in summer (Dahl 1962; Dyk 1984; Hughes and Dill 1990; Nykänen et al. 2001), to lower current velocities in winter (Brittain and Eikeland 1988; Mäki-Petäys et al 2000; Nykänen et al. 2001). The PSPs in this study are characterized by shallower riffle than deep-water pool / run habitat, thus, staging conditions are better in summer than in fall / winter.

Table 4. Fish summary of species captured per year sampled on Sawridge Creek permanent sample plots, Alberta.

| Location ID | | 20731 | | | | 20739 | | | | 20741 | | | | 20742 | | | | 20751 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLED | | August 2000 | August 2001 | August 2002 | October 2003 | June 2000 | August 2001 | August 2002 | June 2003 | June 2000 | August 2001 | August 2002 | July 2003 | July 2000 | August 2001 | August 2002 | July 2003 | June 2000 | August 2001 | August 2002 | September 2003 |
| Species | | | | | | | | | | | | | | | | | | | | | |
| SPORT | Acronym | | | | | | | | | | | | | | | | | | | | |
| Arctic grayling | ARGR | 3 | 8 | 9 | | | | | | | 2 | | | 7 | 5 | 53 | 3 | 17 | 9 | 25 | 1 |
| Northern pike | NRPK | 1 | 2 | 5 | | | | | | | | | | | | | | | | | |
| Burbot | BURB | | 18 | | 1 | | | | | | | | | | | | | | | | |
| NON SPORT | | | | | | | | | | | | | | | | | | | | | |
| Lake chub | LKCH | 157 | 39 | 21 | 12 | | | | | | | | | | | 2 | | 2 | 1 | 1 | 5 |
| Longnose dace | LNDC | 164 | 142 | 24 | 17 | | | | | | | | | | | | | | | | |
| Pearl dace | PRDC | | | | | | | | | | | | | | | | | 21 | | | |
| Longnose sucker | LNSC | 24 | 22 | 5 | 2 | | | | | | | | | 1 | 1 | 1 | | 6 | 3 | 4 | |
| White Sucker | WHSC | 34 | 5 | | 2 | | | | | | | | | | | | | | | | 2 |
| Trout perch | TRPR | | | | | | | | | | | | | | | | | | | | |
| Spoonhead Sculpin | SPSC | 11 | 3 | 6 | 4 | | | | | | | | | | | | | | | | 1 |

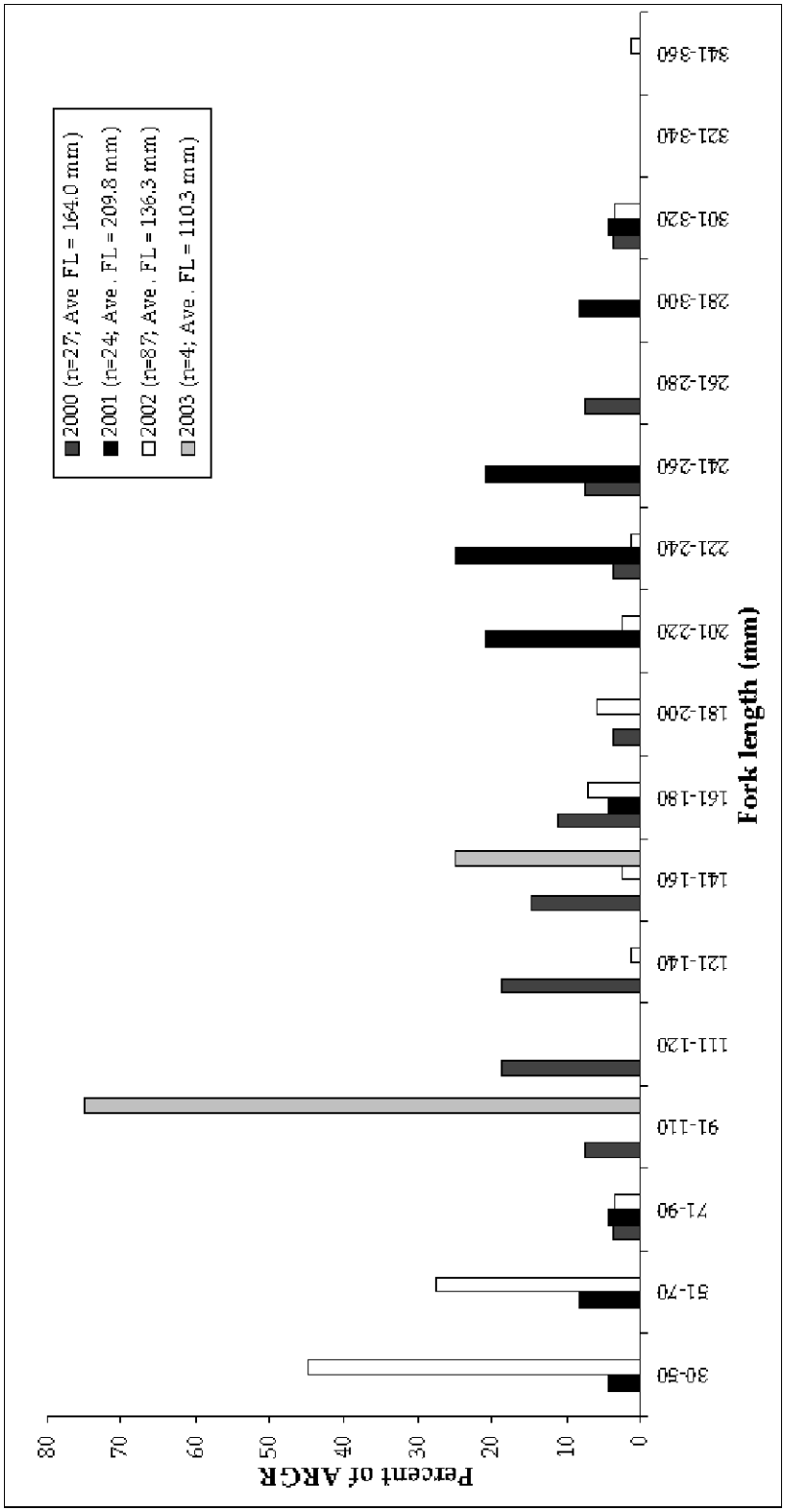


Figure 5. Fork length frequency histogram for Arctic grayling (ARGR) sampled from 2000 - 2003 for the Sawridge Creek permanent sample plots, Alberta.

### 4.4 Summary

Fisheries and habitat information collected in 2003 at Driftwood River, Assineau River, Mooney Creek and Sawridge Creek will be beneficial for future reference of habitat conditions and species composition. Baseline data on stream fish and fish habitat are essential for proper management of this aquatic resource (D.A. Westworth 1992; Meador and Matthews 1992). To date, CFIP information has been used for proactive management of the fisheries resource, primarily Arctic grayling. The PSP data have provided important insight into the Arctic grayling within the Marten and Sawridge Creek drainages and helped to strengthen management decisions. In addition, fisheries data collected through the CFIP have increased the knowledge base on fish species with undetermined or may be at risk status, including pearl dace (Margariscus margarita) and spoonhead sculpin (Cottus ricei) (Alberta Sustainable Resource Development 2000). The program has also highlighted human-induced impacts on the watershed and on the fish community. Overall, the CFIP has been an important tool for determining the status of fisheries resources and aid in management and conservation, in the Slave Lake area.

Arctic grayling, a species ranked sensitive in Alberta (Alberta Sustainable Resource Development 2000), has benefited from the CFIP in the Slave Lake area. Information collected on the various drainages since 2000, has been used to increase awareness of this species and protection of its habitats. With CFIP data, ASRD - Fisheries Management developed an "Arctic grayling Regulation Review and Data Summary Report" for the region (Travis Ripley, Alberta Sustainable Resource Development, Grande Prairie, pers. comm.) to outline Arctic grayling distribution and relative abundance. In addition, ASRD used CFIP information to propose stream reclassification, from Class C to Class B, for reaches within the Marten and Sawridge Creek watersheds to afford greater protection of Arctic grayling habitat. The benefits of increased awareness of Arctic grayling for the area will ensure that this species is considered in future land-use planning.

Despite this being the final season of CFIP sampling, the PSP data can still be used to compare seasonal habitat conditions and species composition. However, in order to effectively capture the spatial and temporal distribution of Arctic grayling populations

in the Marten and Sawridge Creek drainages, trapping and / or movement studies should be considered. The PSP data cannot conclude which habitats Arctic grayling use for all seasons. It does, however, provide insight into the recruitment of the drainages, and highlight critical spawning and rearing locations (e.g. Location ID 20742 on Sawridge Creek). It also emphasizes that this sport fish uses smaller tributaries, as seen at Location ID 20741 (2001) in the Sawridge Creek drainage; to determine exact usage of these drainages, telemetry or a trapping study should be implemented.

Stream crossing concerns highlighted by the CFIP have also benefited the fisheries resource. The Swan River Drainage Stream Crossing Inventory Program, completed in 2002 by ACA, was initiated by information provided by CFIP work completed in 2001. CFIP was also instrumental in highlighting stream crossing issues in the Driftwood River drainage. Culvert crossing concerns (migration barriers) on this drainage were presented to land managers who are now addressing those issues. This proactive approach directly benefits the fisheries resource while educating users on the landscape as to the importance of watercourse connectivity in the area.

The CFIP has proved to be a great success in the Slave Lake area. It has highlighted areas of concern for fish populations and has served as a starting point for additional environmental scoping exercises (e.g. stream crossing inventories and fish population monitoring, etc.). The partners of CFIP are recognized as proactive leaders in the stewardship and management of the stream fisheries resource. Information collected through the program will no doubt benefit the fisheries resource beyond 2004 and contribute to better management of Alberta's natural resources.

## 5.0 LITERATURE CITED


Alberta Sustainable Resource Development. 2000. The general status of Alberta wild species 2000. Alberta Environment, Edmonton, Alberta, Canada. 46 pp.

Belford, D.A. and W.R. Gould. 1989. An evaluation of trout passage through six highway culverts in Montana. North American Journal of Fisheries Management 9:437-445.

Brittain, J.E. and T.J. Eikeland. 1988. Invertebrate drift – a review. Hydrobiologia 166:77-93.

Dahl, J. 1962. Studies on the biology of Danish stream fishes. 1. The food of grayling (Thymallus thymallus) in some Jutland streams. Meddelelser fra Danmarks Fiskeri-og Havundersøgelser 3:199-264.

D.A Westworth and Associates Ltd. 1992. An overview of potential forest harvesting impacts of fish and fish habitat in the northern boreal forests of Canada's prairie provinces. Technical report prepared for the Department of Fisheries and Oceans. D.A. Westworth and Associates Ltd. Edmonton, Alberta. 169 pp. + App.

Deegan, L.A., H.E. Golden, C.J. Harvey, and B.J. Peterson. 1999. Influence of environmental variability on the growth of age-0 and adult Arctic grayling. Transactions of the American Fisheries Society 128:1163-1175.

Dyk, V. 1984. The characteristics of grayling biotopes. Acta Veterinaria Brno 53:71-80.

Hughes, N.F. and L.M. Dill. 1990. Position choice by drift-feeding salmonids: model and test for Arctic grayling (Thymallus arcticus) in subarctic mountain streams, interior Alaska. Canadian Journal for Fisheries and Aquatic Sciences 47:2039-2048.

Hvenegaard, P. 1998. Co-operative fisheries inventory program. Final Report 1998. Technical report produced for the Department of Fisheries and Oceans by the Alberta Conservation Association, Peace River, Alberta, Canada. 22 pp. + App.

Jones, D.R., J.W. Kiceniuk, and O.S. Bamford. 1974. Evaluation of the swimming performance of several fish species from the Mackenzie River. Journal of Fisheries Research Board of Canada 31:1641-1647.

Lucko, B. 1987a. Fish distribution and general habitat characteristics of the Assineau River drainage. Alberta Fish and Wildlife Division, Peace River, Alberta, Canada. 13 pp. + App.

Lucko, B. 1987b. Fish distribution and general habitat characteristics of the Driftwood River drainage. Alberta Fish and Wildlife Division, Peace River, Alberta, Canada. 20 pp. + App.

Lucko, B. and P.G. Todd. 1997. Lesser Slave Lake walleye spawning assessment, April – June 1997. Technical report produced by the Alberta Conservation Association, Peace River, Alberta, Canada. 27 pp. + App.

Mäki-Petäys, A., T. Vehanen and T. Muotka. 2000. Microhabitat use by age-0 brown trout and grayling: seasonal responses to streambed restoration under different flows. Transactions of the American Fisheries Society, 129:771-781.

Nykänen, M., A. Huusko and A. Mäki-Petäys. 2001. Seasonal changes in habitat use and movements of adult European grayling in a large subarctic river. Journal of Fish Biology 58:506-519.

Nelson, L.A. and M.J. Paetz. 1992. The Fishes of Alberta. Second Edition. University of Alberta Press, Edmonton, Alberta, Canada.

Meador, M.R. and W.J. Matthews. 1992. Spatial and temporal patterns in fish assemblage structure of an intermittent Texas stream. American Midland Naturalist 127:106-114.

Osokin, L. 2003. Co-operative Fisheries Inventory Program 2003 – Catalogue of sample sites for the Driftwood River, Assineau River, Mooney Creek and Sawridge Creek drainages. Produced by Alberta Conservation Association, Slave Lake, Alberta, Canada. 217 pp.

Osokin, L. and P. Hvenegaard. 2001. Co-operative Fisheries Inventory Program 2000 – Summary Report for the Marten and Sawridge Creek Drainages, Northwest Boreal Region – Slave Lake Area. Technical report produced for Weyerhaeuser Canada Ltd., Slave Lake Pulp Ltd. and Alberta Environment by the Alberta Conservation Association, Peace River, Alberta, Canada. 26 pp. + App.

Rhude, L.A. 1976. Preliminary fisheries survey of the lakes and rivers found in the Slave Lake study area. Recreation, Parks and Wildlife, Fish and Wildlife Division, Edmonton, Alberta, Canada. 433 pp.

Schlosser, I.J. and L.W. Kallemeyn. 2000. Spatial variation in fish assemblages across a beaver-influenced successional landscape. Ecology 81:1046-1057.

Snodgrass, J.W. 1998. Influence of beavers on stream fish assemblages: effects of pond age and watershed position. Ecology 79:928-942.

Strahler, A.N. 1957. Quantitative analysis of watershed geomorphology. Transactions of the Geophysical Union 38:913-920.

Strong, W.L. and K.R. Leggat. 1992. Ecoregions of Alberta. Land Information Services Division, Alberta Forestry, Lands and Wildlife, Edmonton, Alberta, Canada.

Uiblein, F., A. Jagsch, W. Honsig-Erlenburg, and S. Weiss. 2001. Status, habitat use, and vulnerability of the European grayling in Austrian waters. Journal of Fish Biology 59:223-247.

# 6.0 APPENDICES

## 6.1 Appendix 1. CFIP small stream habitat inventory form

| Waterbody Name | | Activity Date<br>MM DD YY<br>/ / | Habitat Assessment Notes |
|---|---|---|---|
| Habitat Type | Habitat Rank | For Species | Habitat Ranking Notes |
| Spawning | | | |
| Rearing | | | |
| Overwintering | | | |

| UTM Easting | UTM Northing | Site No./ Location Notes |
|---|---|---|
| | | |

| Stream Stage | Water Temperature (C) | Conductivity (micromhos/cm) | Dissolved Oxygen (mg/L) |
|---|---|---|---|
| D L M H F | | | |

| Transect # | Wetted Width (m) | Rooted Width (m) | Station # | Depth (m) | % Fines / Bedrock (<2mm) | % Small Gravel (2-16 mm) | % Large Gravel (17-64 mm) | % Cobble (65-256 mm) | % Boulders (>256 mm) |
|---|---|---|---|---|---|---|---|---|---|
| T0 | | | | | | | | | |
| T1 | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| T2 | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| T3 | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| T4 | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| T5 | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| | | | Average | | | | | | |

| Bank/Shoreline Segment # | Segment Length (m) | Left Bank Stability | Reason for LB Instability | Right Bank Stability | Reason for RB Instability | % Pool | % Riffle | % Run |
|---|---|---|---|---|---|---|---|---|
| T0 – T1 | 50 | | | | | | | |
| T1 – T2 | 50 | | | | | | | |
| T2 – T3 | 50 | | | | | | | |
| T3 – T4 | 50 | | | | | | | |
| T4 – T5 | 50 | | | | | | | |
| T5 – T6 | 50 | | | | | | | |

Comments:

## 6.2 Appendix 2. CFIP fisheries survey form

**ELECTROFISHING HAULS**

| Time Fished (sec) | Distance Fished (m) | Pulse Width | Frequency |
|---|---|---|---|
| | | | |

**ANGLING**

| Number of Anglers | Hours Fished per Angler |
|---|---|
| | |

**SEINE**

| Mesh Size (mm) | Distance Sampled (m) |
|---|---|
| | |

**GILLNETTING**

| Date Set | Time Set | Date Lifted | Time Lifted | Mesh Size (mm) | Length of Net Set (m) | Depth of Set (m) | Depth of Net (m) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**TRAP NETTING**

| Date Set | Time Set | Date Lifted | Time Lifted | Trap Type | Number of Traps |
|---|---|---|---|---|---|
| | | | | | |

**FISHERIES DATA**

| Capture Method | Sample # | Species | Fork length (mm) | Injuries/Comments | Capture Method | Sample # | Species | Fork length (mm) | Injuries/Comments |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | | | 26 | | | |
| | 2 | | | | | 27 | | | |
| | 3 | | | | | 28 | | | |
| | 4 | | | | | 29 | | | |
| | 5 | | | | | 30 | | | |
| | 6 | | | | | 31 | | | |
| | 7 | | | | | 32 | | | |
| | 8 | | | | | 33 | | | |
| | 9 | | | | | 34 | | | |
| | 10 | | | | | 35 | | | |
| | 11 | | | | | 36 | | | |
| | 12 | | | | | 37 | | | |
| | 13 | | | | | 38 | | | |
| | 14 | | | | | 39 | | | |
| | 15 | | | | | 40 | | | |
| | 16 | | | | | 41 | | | |
| | 17 | | | | | 42 | | | |
| | 18 | | | | | 43 | | | |
| | 19 | | | | | 44 | | | |
| | 20 | | | | | 45 | | | |
| | 21 | | | | | 46 | | | |
| | 22 | | | | | 47 | | | |
| | 23 | | | | | 48 | | | |
| | 24 | | | | | 49 | | | |
| | 25 | | | | | 50 | | | |

GENERAL FISHERIES COMMENTS:

## 6.3 Appendix 3. CFIP methodology on sites little or no water flow

Three habitat transects are required which include widths and depths only (1 transect at the crossing; one 50 meters upstream; and one 50 meters downstream.) A minimum of two photos should be taken illustrating insignificant water flow. The photo should answer why this site was not electrofished. If fish barriers are present, a photo documenting the obstructions should be taken. The habitat rankings should all be low; if not, the stream should have been sampled for fish presence.

Detailed comments are needed. Comment criteria consists of:

- Description of channel (i.e. no consistent channel, no defined bed and banks, creek runs through grass, subterranean flow, etc.) If a defined channel is present it should be sampled.
- Describe why electrofishing wasn't done (i.e. impossible to shock due to a lack of flow, no water, gradient too severe, etc.) If these types of conditions are not present, the site should be electrofished.
- Describe water velocity - (i.e. stagnant, no flow evident, etc.)
- Describe any significant barriers and, if possible, estimate height of barriers (i.e. abundance of ledges present, one measured over two meters high, etc.)
- If the creek flows into a muskeg / pond / bog where it discontinues make a comment explaining this (i.e. cre ek flows into muskeg where flow stops, etc.)
- If the stream is the result of a recent rain (ephemeral) explain this (e.g., flow is likely the result of last Tuesday's rain, creek is likely dry later in the season

**The Alberta Conservation Association acknowledges the following partners for their generous support of this project**

Weyerhaeuser

Alberta
SUSTAINABLE RESOURCE DEVELOPMENT

Ranger
SLAVE LAKE PULP

Alberta Conservation Association