ALBERTA FOREST RESOURCE IMPROVEMENT PROGRAM

1997 OPERATIONAL FISH AND STREAM INVENTORY ANNUAL REPORT

Weldwood of Canada Ltd. (Hinton Division)
&
Foothills Model Forest

by

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ABSTRACT

The objectives of this project were to collect current fish and aquatic habitat data, to increase the number of streams where inventory data exist, to assess remediation activities on road crossings, and to gain an increased understanding of fish-habitats and the relation of these to fish populations. This annual report is intended to serve as an interim report that summarizes the findings from the 1997 field season. The 1997 inventory field season began on 23 April and continued through to 5 November 1997. Some of the streams were sampled in more than one location, resulting in 255 sites in 1997. The total number of sites sampled in all surveys from 1995 to 1997 is 481. In 1997 this project surveyed more sites than in previous years combined. We focused our efforts on collecting data to fill in data gaps that were identified from the 1995 and 1996 inventories and analyses. Most of our efforts with respect to culverts were directed to assessment of fish barriers and their effects on fish populations. The remaining effort spent on culverts was directed to an assessment of remedial actions taken by Weldwood to repair identified crossings.

Any comments suggestions about this project or report would be appreciated and can be directed to either:

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Weldwood of Canada (Hinton Division) has provided logistical support throughout the project. They have provided us access to their GIS system and operators, ortho-photos, as well as direction and advice, especially from Gordon Stenhouse.

The Foothills Model Forest staff has provided considerable help with our project. We would like to thank Rick Blackwood, Tammy Kobliuk for their assistance throughout the project. Special mention goes to Leanne Anderson for ensuring that our budgets balanced, bills got paid and of course, payroll.

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Alberta Conservation Association provided the funding for the third crew that joined and rounded out the FRIP crew. We also appreciate the efforts of Chris Davis (man) in providing us with whatever support he could give us to make our lives easier.

Jasper National Park was able to provide us with an alternate electrofisher, as well as the block-nets that were used for population estimates. The efforts of both Ward Hughson and George Mercer made this possible.

Finally, the most significant contribution to the project was the efforts of the folks in the field. Jason Cooper, Heather Conroy, Cameron Davis, Krista Hammett, Hilary Jones, Troy Searson, and Stephen Spencer spent more than a little time out in the field (that place that most biologists don't get to see). We are appreciative of all your hard work (and are somewhat envious). Although all of the crewmembers deserve special mention, Stephen Spencer has provided me with the peace of mind that the world will continue to spin in its proper direction regardless of my presence. Thanks.

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INTRODUCTION

Up-to-date fish and aquatic inventory data are required to help support the long-term timber harvest and integrated resource planning undertaken by Weldwood of Canada (Hinton Division). Fish species occurrence, an understanding of fish-habitat relationships and information pertaining to relative importance of a particular resource are required for these objectives to be effective. This information will be useful for developing compartment operating plans and future Forest Management Plans, aquatic ecosystems plans and for aquatic/terrestrial integration. The purpose of this project is to increase the information known of the fish populations and aquatic habitats found within the Weldwood FMA/Foothills Forest. The focus for this study is on four sport species: rainbow trout, *Oncorhynchus mykiss*; Arctic grayling, *Thymallus arcticus*; bull trout, *Salvelinus confluentus*; and mountain whitefish, *Prosopium williamsoni*. This information will be useful in harvest scheduling, operational planning and for evaluation of fish populations in this area.

The objectives of this project were to collect current fish and aquatic habitat data, to increase the number of streams where inventory data exist, to assess remediation attempts for road crossings, and to gain an understanding of fish-habitats and the relation of these to fish populations. A proposal (December 1996) to continue the multi-year fish and stream inventory project in the Weldwood FMA and Foothills Model Forest was submitted to the Forest Resource Improvement Program (FRIP) from Weldwood of Canada (Hinton Division) and the Foothills Model Forest. This proposal was approved and the deliverables were considered to be the terms of reference for this project (Appendix I).

A proposal from the Foothills Model Forest (FMF) for a third inventory crew was submitted to the Alberta Fish Habitat Development Program (FHDP, January 1997) (now the Alberta Conservation Association) for the 1997 field season. This proposal was approved ($40,000) and resulted in a third field crew for 1997. Both managing agencies (Weldwood of Canada and Alberta Fish and Wildlife) agreed that these crews and projects should be run as a single project, sharing both personnel and resources. Because of this, it should be noted that those data collected in 1997 and presented in this report are not the results of the FRIP project exclusively, but are the result of a combined effort between both FRIP and FHDP.

This annual report is intended to serve as an interim report that summarizes the findings from the 1997 field season. The following reports will be produced: effects of hanging culverts on fish populations and comparisons of fish habitat and watershed parameters to fish presence and abundance.

METHODS AND MATERIALS

Sites were inventoried using a backpack electrofisher and biological information was collected from all fish captured. At each site, habitat parameters were collected using visual estimations and physical measurements. Except for the following, the methods and materials have remained unchanged from the 1995 and 1996 surveys (Johnson and Lech 1996, Johnson 1997).

Description of study area

The Foothills Model Forest is located in west central Alberta, and encompasses the Weldwood of Canada (Hinton Division) FMA, Willmore Wilderness Park, Jasper National Park, and several Crown Forest Management Units. Most of the inventory sites were located within Weldwood's FMA Area, with a small number of sites surveyed inside the Willmore Wilderness Park and Crown Forest Management Units (Figure 1). Fewer than 5% of the sites were outside the Foothills Model Forest boundaries.

Site selection

In addition to the 1996 priorities of targeting; pre-access and pre-harvest areas, historically sampled Fish and Wildlife sites, updating historical population estimates and high and low access areas, we attempted to fill in data gaps that existed in our database. Included in our sites were several road crossings identified as potential barriers to fish passage by Weldwood's road crossing inventory (Marshall, 1996). These sites were classified as high priority crossings for remedial action because of hanging outlets, and documented fish presence (Marshall 1996).

Data collection

Fish data

The addition of a third crew required additional electrofishers. These electrofishers were Smith-Root Type VII and Type 11 backpack electrofishers. The settings on the these electrofishers were similar to those used on the Type 12-A and the other Type VII whenever possible. On occasions where the stream width was sufficiently wide that electrofishing efficiency was in question, a second electrofishing crew would join the first, forming a tandem electrofishing team. Biological data collected from fish in 1997 included total body weight of fish measured to 0.1 g using a CT 1200 Ohaus portable electronic balance. Fish sampling from the Tri-Creeks Experimental Watershed area did not include age samples in 1997. Complete necropsies were performed on all incidental mortalities.

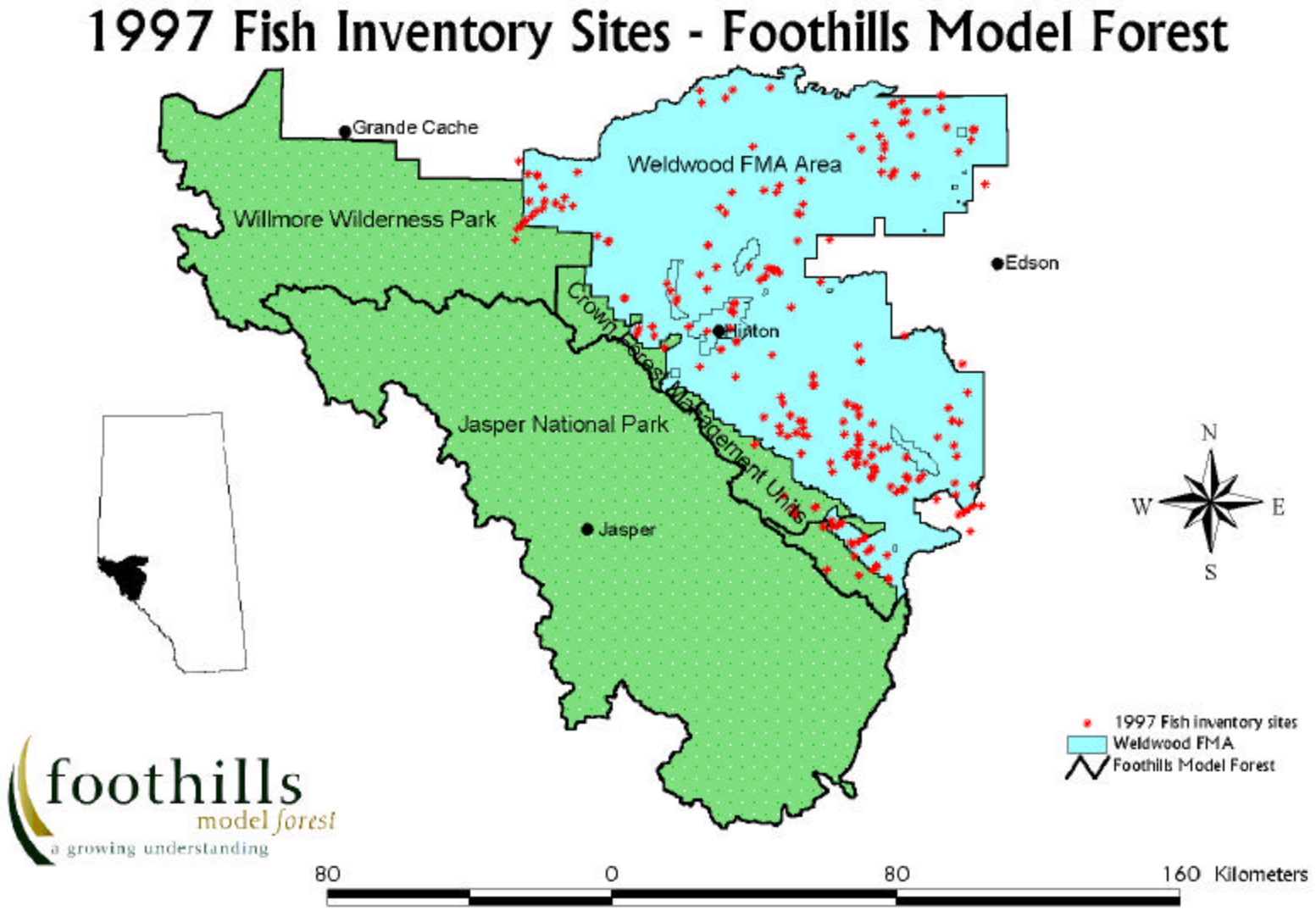

Figure 1. The Foothills Model Forest area and location of 1997 inventory sites.

Habitat data

The following are the changes from the sampling protocols used in 1995 and 1996.

Substrate data was formerly collected from three locations, left, middle and right from each transect. To decrease sampling time, substrate data were collected from along the entire transect.

Differentially corrected GPS data were not collected for several of the sites surveyed in 1997. This was because only one downloadable and correctable GPS unit was available to the project. Two other GPS units, a Garmin GPS 38 and Magellan GPS Trailblazer, were used to collect uncorrected position data. Where these data were not collected, digitizing using Weldwood's GIS generated the UTM coordinates for these sites.

Population estimates

Population estimates were completed on several streams where historical population estimate data existed and population density data were required for specific project objectives (i.e. culvert remediation component). These estimates were depletion-removal estimates with a minimal reach length of 300m. Block-nets were placed across the stream both at the top and bottom of the section. If a barrier already existed (hanging culvert), then the upstream block-net was not used. A three-pass removal pattern was used and all attempts were made to ensure that all assumptions of this estimate type were met (Zippin 1958, Kraft et *al* 1984). Population estimate data were analyzed using MicroFish 3.0 (Van Deventer and Platts 1989). Population densities were calculated by presenting the population estimate over the sampled area.

Culverts

Culverts selected as potential barriers to fish passage received considerable more sampling effort than other crossings. At selected culverts, water velocities were measured (m/second) throughout the entire culvert at several times throughout the field season using a Model FP101 Global Flow Probe velocity meter. Other physical parameters collected from culverts included hang-height (m), wetted width (to 0.01 m) and length of culvert (m). These measurements were collected at 1 meter intervals along the length of the culvert at least once during the field season. Culvert measurements were sub-sampled from 2-5 meter intervals when revisited. Fish and habitat data were also collected above and below these suspected barriers. These data followed the protocols used for the inventory portion of this project. These types of data were also collected at several times throughout the field season.

RESULTS

The 1997 inventory field season began on 23 April and continued through to 5 November 1997. The field season was terminated because of freeze-up. In 1997, an estimated 650 streams were visited. Of these, 175 streams were sampled. Some of these streams were sampled in more than one location, resulting in 255 sites in 1997 (Figure 1). The total number of sites sampled in all surveys from 1995 to 1997 is 481. All of these data were entered into the fish database and site summaries are presented in Appendix II.

Most of the streams sampled in 1997 were within the Athabasca River drainage (223 sites, Table 1), with the exception of those streams sampled in the Cardinal and Brazeau watersheds (32 sites) which belong to the North Saskatchewan River drainage. To date, 440 sites have been sampled in the Athabasca River drainage, and 41 sites in the North Saskatchewan River drainage. The numbers of sites per sub-basin were not divided equally, with most of the sites being in the McLeod River sub-basin (173 sites), followed by the Berland River sub-basin (100 sites), Brazeau River sub-basin (41 sites) and Pembina River sub-basin (37 sites).

Table 1. Number of sites surveyed in Athabasca and North Saskatchewan drainages and sub-basins.

Drainage	**Sub-Basin**	**1995**	**1996**	**1997**	**Total**
Athabasca	Berland	9	50	41	**100**
Athabasca	McLeod	15	75	83	**173**
Athabasca	Pembina	0	15	22	**37**
Athabasca	Tributaries to Athabasca R.	9	44	77	**130**
North Saskatchewan	Brazeau	0	9	32	**41**
Total		**33**	**193**	**255**	**481**

The number of sites per working circle (WC) (defined by Weldwood) were distributed more equally than drainage or sub-basin (mean number of sites/WC = 80.2) (Table 2), with the exception of the Marlboro WC where only 38 sites were surveyed. Most of the sites sampled were in the Embarrass WC (137), followed by McLeod WC (98), Athabasca (87), Berland WC (76). A summary of the sites sampled by working circle and compartment are presented in Appendix IIIa-g.

A total of 9245 fish were captured, identified, and measured from 1995 to 1997 inclusive (Table 3). The largest proportion of cold-water sportfish captured in 1997 were rainbow trout (52.3%) compared to brook trout (23.4%), bull trout (15.0%), mountain whitefish (2.6%), Arctic grayling (0.3%), and cutthroat trout

(0.5%).

Table 2. Number of sites surveyed in Weldwood's working circles.

Working Circle	1995	1996	1997
Athabasca	0	38	49
Berland	10	39	27
Embarras	14	53	70
Marlboro	0	7	31
McLeod	9	54	35
Out Of Weldwood FMA	0	2	43
Total	**33**	**193**	**255**

Table 3. Fish species and number captured during the 1995 to 1997 field seasons.

	1995 totals	% of 1995 total	1996 totals	% of 1996 total	1997 totals	% of 1997 total	Total
bull trout (*Salvelinus confluentus*)	3	0.4%	154	3.3%	586	15.0%	743
rainbow trout (*Oncorhynchus mykiss*)	369	51.3%	2821	60.9%	2037	52.3%	5227
mountain whitefish (*Prosopium williamsoni*)	2	0.3%	21	0.5%	102	2.6%	125
arctic grayling (*Thymallus arcticus*)	0	0.0%	9	0.2%	12	0.3%	21
brook trout (*S. fontinalis*)	258	35.8%	985	21.3%	913	23.4%	2156
cutthroat trout (*O. clarki*)	0	0.0%	5	0.1%	21	0.5%	26
Other species[1]	88	12.2%	636	13.7%	223	5.7%	947
Totals	**720**	**100.0%**	**4631**	**100.0%**	**3894**	**100.0%**	**9245**

[1]other species include: burbot (*Lota lota*), northern pike (*Esox lucius*), longnose sucker (*Catostomus catostomus*), white sucker (*C. commersoni*), longnose dace (*Rhinichthys cataractae*), northern redbelly dace (*Phoxinus eos*), finescale dace (*P. neogaeus*), pearl dace (*Margariscus margarita*), trout perch (*Percopsis omiscomaycus*), brook stickleback (*Culaea inconstans*), and spoonhead sculpin (*Cottus ricei*).

Population estimates

Population estimate data were collected on 14 streams (Table 4) for 24 population estimates (in some situations, there were more than 1 species per site). All of the population estimates were done in order to collect current density data on those streams where population estimates were done previously. Although the focus of these population estimates was on rainbow trout, occasionally other species were present and it was possible to calculate an estimate for these species. The species encountered most often was rainbow trout followed by brook trout, and bull trout. Population estimates are presented with the calculated confidence interval (CI). Differences in CI are a result of several reasons, namely differences in efficiencies between

runs, number of fish captured and creeks that may be too wide to electrofish effectively.

Table 4. Summary of population estimates completed in 1997.

Stream name	Date	Species	POPN est	+/- % CI	density (#/100m^2)	+/- density CI
Deerlick	22-May-97	RNTR	13	10%	3.1	0.3
Fish	30-May-97	BKTR	31	51%	2.2	1.1
Fish	30-May-97	RNTR	16	22%	1.1	0.2
Gorge	24-Aug-97	BKTR	47	7%	4.0	0.3
Gorge	24-Aug-97	MNWH	3	28%	0.3	0.1
Gorge	24-Aug-97	RNTR	61	9%	5.2	0.4
Gorge	25-Aug-97	BKTR	62	10%	5.5	0.6
Gorge	25-Aug-97	RNTR	62	5%	5.5	0.3
Wampus	29-Aug-97	RNTR	304	6%	22.5	1.4
Wampus	03-Sep-97	BKTR	4	30%	0.2	0.1
Wampus	03-Sep-97	RNTR	84	14%	4.9	0.7
Deerlick	05-Sep-97	BKTR	6	22%	0.7	0.1
Deerlick	05-Sep-97	MNWH	27	7%	3.0	0.2
Deerlick	05-Sep-97	RNTR	76	14%	8.4	1.2
Deerlick	06-Sep-97	RNTR	96	9%	11.9	1.1
Eunice	07-Sep-97	BLTR	5	40%	0.9	0.3
Anderson	23-Sep-97	BLTR	42	19%	2.9	0.6
Anderson	23-Sep-97	RNTR	94	13%	6.5	0.8
Antler	26-Sep-97	RNTR	29	29%	1.5	0.4
Mary Gregg	07-Oct-97	BLTR	13	15%	0.5	0.1
Mary Gregg	07-Oct-97	MNWH	18	10%	0.8	0.1
Mary Gregg	07-Oct-97	RNTR	25	30%	1.1	0.3
Anderson	22-Oct-97	BLTR	18	6%	4.1	0.3
Anderson	22-Oct-97	RNTR	54	9%	12.2	1.2

Culverts

Culverts where remediation activities were planned for 1997, were assessed periodically from 23 April to 6 November 1997. Most of these crossings were examined once or twice after remedial efforts by Weldwood were complete. Four of the crossings identified by Marshall (1996) were re-visited multiple occasions. Some of these crossings, like the Emerson Creeks Road crossings on Baseline and Gorge creeks, did not have any remedial work done to repair the problem. For these crossings we examined some of the physical parameters of the culvert (water velocity, culvert length, wetted width, depth, etc.). Fish populations were also sampled intensively, upstream and downstream from the crossing, and at several times of the open water season. For a list of crossings that were assessed, see Table 5. The comments presented for these crossings (Table 5) refer to post-remediation, except for Baseline and Gorge creeks. These data and results will be presented in a detailed report that will be complete by 31 March 1998 (Johnson and Spencer, *in prep.*).

Table 5. Physical parameters of culverts visited during the 1997 field season.

Creek Name	Date Sampled	Location of Culvert	Electro-fished	Remediation Work	Comments
Baseline	23Apr	A-road, km 23	Yes	No	Hanging outflow, likely a barrier to fish
Fish	4Oct	C- road km 17.1	Yes	Yes	Remediation looks good, revisit
Oldman	4Oct	C- road, km 22.5	Yes	Yes	Remediation looks good, revisit
Unnamed tributary to Cold	4Oct	T- road, km 31.9	Yes	Yes	Erosion occurring, needs stabilization
Unnamed tributary to Cold	4Oct	T- road, km 16	Yes	Yes	Remediation looks good, revisit
Unnamed tributary to Wigwam	4Oct	T- road, km 22.6	Yes	Yes	Erosion occurring, needs stabilization
Unnamed tributary to Wigwam	4Oct	T- road, km 18.2	Yes	Yes	Remediation looks good, revisit
Unnamed tributary to Wigwam	4Oct	T- road, km 20.2	Yes	Yes	Erosion occurring, needs stabilization
Gorge	5Oct	A-road, km 34	Yes	No	Hanging outflow, likely a barrier to fish
Hay	5Oct	R-road, km 52	Yes	Yes	Remediation looks good, revisit
Unnamed tributary to Wickman -	5Oct	R-road, km 72	Yes	Yes	Erosion occurring, needs stabilization
Unnamed tributary to Wickman	5Oct	R-road, km 68	Yes	Yes	Remediation looks good, revisit
Unnamed tributary to Erith	16Oct	3-3-102 road, km 0.7	Yes	Yes	New culvert -needs stabilization around it
Unnamed tributary to Lund	16Oct	O-road, km 94.3	Yes	Yes	Erosion occurring, needs further stabilization
Unnamed tributary to McPherson	17Oct	M-road, km 16.5	Yes	Yes	Outlet hanging somewhat. Additional work may be needed

DISCUSSION

The combination of 3 field crews, 2 from FRIP and 1 from FHDP, was again advantageous from an efficiency perspective. The increased number of crews resulted in a greater number of sites that were sampled. Given the results of the 1996 and 1997 field seasons, I recommend this project continue to combine field crews from different funding agencies, as long as the respective objectives are similar and are not compromised between projects.

The inventory component of this project surveyed more sites than had been surveyed in previous years combined. The increase in sites sampled from 2 crews to 3 crews was not as dramatic as was the increase from 1 crew to 2 crews. This is a result of extra effort expended on other components of the project like culvert assessment, etc. In addition to sampling streams in areas of pre-harvest and pre-access development, we focused our efforts on data gaps that were identified from the 1995 and 1996 inventories and analyses (Jones and Johnson *in prep*). In 1997, more effort was expended sampling bull trout and their habitats. Comparing 1997 to previous years, the proportions of bull trout, and mountain whitefish increased while rainbow trout decreased which was likely due to our change in sampling. The Marlboro Working Circle is one area where considerably more effort was spent sampling fish populations. A change in 1997 was an attempt to sample larger systems that could not be efficiently sampled with one crew. These "tandem" sites will broaden our perspective on the creeks in the Weldwood FMA. Another focus that differed slightly from previous years was the addition of the watershed concept. In previous years we would sample only a few sites in a watershed. We sampled at least 2 watersheds, Beaverdam Creek (tributary to the McLeod River) and Moon Creek (tributary to the Berland River) intensively in 1997. These types of data will allow us to begin to examine fish populations and habitat data from a watershed perspective. Specific reports detailing the results and analyses of these inventory data will be available late-spring 1998.

Most of our efforts with respect to culverts were directed to assessment of fish barriers and their effects on fish populations. This work was primarily focused on 4 culverts located on Baseline, Gorge, and Center creeks. Analyses for these data are presently being done and a detailed report outlining these results will be available late-spring 1998. The remaining effort spent on culverts was directed to an assessment of remedial action taken by Weldwood on crossings that had been identified in Marshall (1996). The results of these assessments will also be included in the detailed report. In addition to this, a summary of our assessments was given to Weldwood staff. We recommend that the crossings that were still identified with potential problems be re-visited in 1998.

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Appendix I. Deliverables from 1997 FRIP proposal.

1. Fish and aquatic habitat information for use in operation planning and harvest scheduling.

2. Computer database of inventory information including past fisheries studies and inventory linked to the Weldwood GIS.

3. Development of a qualitative habitat sampling protocol and associated manual. This protocol is being developed in conjunction with Alberta Natural Resources Service, and the Alberta Lotic Systems Steering Committee. Funding for this project is being proposed jointly to the Fish Habitat Development Program (Alberta Fisheries Trust Fund) and the Foothills Model Forest.

4. Standard inventory reports generated from the database and GIS on all sampled streams.

5. Training program to demonstrate to Weldwood staff the use and utility of the fish database.

6. Management recommendations, based on data collected to date, will be prepared for incorporation into the 1998 FMP.

Appendix II. Summary output reports by site; 1997. (Note: this appendix is over 300 pages long, and is available from the author upon request).

Appendix III a. Summary of sites surveyed in the Athabasca Working Circle; Foothills Model Forest, 1997.

Site ID	Creek Name	Drainage	Tributary To	Compartment	Total # Of Fish
97167	Winter Creek	Athabasca	Jarvis Ck	1	0
97168	Powder Creek	Athabasca	Jarvis Ck	1	12
97171	Unnamed Creek	Athabasca	Ice Water Ck	1	0
97227	Prine Creek	Athabasca	Solomon Ck	2	0
97002	Winter Creek	Athabasca	Jarvis Ck	3	0
97169	Icewater Creek	Athabasca	Wildhay	4	0
97170	Solomon Creek	Athabasca	Athabasca	4	1
97179	West Solomon Creek	Athabasca	Athabasca	4	6
97180	Sheba Creek	Athabasca	West Solomon	4	33
97003	Orchard Creek	Athabasca	Athabasca	5	19
97020	Fish Creek	Athabasca	Athabasca	6	26
97177	Centre Creek	Athabasca	Athabasca	8	59
97183	Canyon Creek	Athabasca	Athabasca	8	70
97013	Baseline Creek	Athabasca	Athabasca	9	33
97014	Baseline Creek	Athabasca	Athabasca	9	45
97016	Baseline Creek	Athabasca	Athabasca	9	18
97017	Baseline Creek	Athabasca	Athabasca	9	30
97178	Baseline Creek	Athabasca	Athabasca	9	48
97182	Baseline Creek	Athabasca	Athabasca	9	61
97198	Baseline Creek	Athabasca	Athabasca	9	74
97235	Baseline Creek	Athabasca	Athabasca	9	38
97249	Unnamed Creek	Athabasca	Athabasca	9	0
97015	Baseline Creek	Athabasca	Athabasca	10	71
97019	Baseline Creek	Athabasca	Athabasca	10	1
97012	Fish Creek	Athabasca	Athabasca	13	38
97160	Oldman Creek	Athabasca	Athabasca	13	12
97231	Fish Creek	Athabasca	Athabasca	13	2
97232	Oldman Creek	Athabasca	Athabasca	13	7
97008	Centre Creek	Athabasca	Athabasca	14	36
97197	Gorge Creek	Athabasca	Athabasca	17	58
97001	Gorge Creek	Athabasca	Athabasca	18	19
97184	Gorge Creek	Athabasca	Athabasca	18	134
97185	Gorge Creek	Athabasca	Athabasca	18	135
97021	Unnamed Creek	Athabasca	Oldman Ck	19	0
97027	Felix Creek	Athabasca	Oldman Ck	19	8
97165	Unnamed Creek	Athabasca	Jarvis Ck	20	0
97166	Unnamed Creek	Athabasca	Jarvis Ck	20	0
97024	Unnamed Creek	Athabasca	Oldman Ck	22	0
97028	Plante Creek	Athabasca	Athabasca	22	13
97029	Unnamed Creek	Athabasca	Plante Ck	22	3
97030	Unnamed Creek	Athabasca	Plante Ck	22	13
97011	Barbara Creek	Athabasca	Wild Hay	23	1
97022	Oldman Creek	Athabasca	Athabasca	24	6

Site ID	Creek Name	Drainage	Tributary To	Compartment	Total # Of Fish
97023	Unnamed Creek	Athabasca	Oldman Ck	24	1
97031	Marsh Creek	Athabasca	Oldman Ck	24	3
97025	Unnamed Creek	Athabasca	Oldman Ck	27	1
97026	Unnamed Creek	Athabasca	Oldman Ck	27	7
97248	Unnamed Creek	Athabasca	Oldman	27	0
97018	Unnamed Creek	Athabasca	Wildhay	30	24
	Total Number Of Sites = 49		**Total Number Of Fish = 1166**		

Appendix III b. Summary of sites surveyed in the Berland Working Circle; Foothills Model Forest, 1997.

Site ID	Creek Name	Drainage	Tributary To	Compartment	Total # Of Fish
97175	Cabin Creek	Athabasca	Berland	1	0
97176	Hendrickson Creek	Athabasca	Cabin Ck	1	4
97203	Vogel Creek	Athabasca	Cabin Ck	1	5
97204	Cabin Creek	Athabasca	Berland	1	15
97237	Pasture Creek	Athabasca	Berland	1	0
97162	Moon Creek	Athabasca	Berland	3	21
97163	Moon Creek	Athabasca	Berland	3	55
97186	Unnamed Creek	Athabasca	Berland	3	0
97187	Unnamed Creek	Athabasca	Moon Ck	3	1
97217	Unnamed Creek	Athabasca	Moon Ck	3	16
97218	Star Creek	Athabasca	Moon Ck	3	2
97219	Moon Creek	Athabasca	Berland	3	19
97220	Moon Creek	Athabasca	Berland	3	62
97225	Moon Creek	Athabasca	Berland	3	39
97226	Moon Creek	Athabasca	Berland	3	16
97238	Fox Creek	Athabasca	Little Berland	3	0
97240	Unnamed Creek	Athabasca	Fox Ck	3	0
97241	Fox Creek	Athabasca	Little Berland	3	0
97242	Little Berland River	Athabasca	Berland	3	20
97005	Fred Creek	Athabasca	Teige Ck	8	0
97243	Fred Creek	Athabasca	Teige Ck	8	2
97209	Beaver Creek	Athabasca	Berland	26	7
97213	Unnamed Creek	Athabasca	Berland	33	1
97214	Unnamed Creek	Athabasca	Berland	33	0
97215	Unnamed Creek	Athabasca	Berland	33	2
97216	Unnamed Creek	Athabasca	Berland	33	8
97004	Teitge Creek	Athabasca	Pinto Ck	330	0
	Total Number Of Sites = 27		**Total Number Of Fish = 295**		

Appendix III c. Summary of sites surveyed in the Embarras Working Circle; Foothills Model Forest, 1997.

Site ID	Creek Name	Drainage	Tributary To	Compartment	Total # Of Fish
97036	Unnamed Creek	Athabasca	Pembina	1	4
97074	Unnamed Creek	Athabasca	Lund Ck	2	32
97070	Lund Creek	Athabasca	Erith	3	1
97073	Unnamed Creek	Athabasca	Lendrum Ck	3	64
97076	Lendrum Creek	Athabasca	Erith	3	4
97078	Unnamed Creek	Athabasca	Lund Ck	3	4
97081	Erith River	Athabasca	Embarras	3	4
97086	Hanlon Creek	Athabasca	Erith	3	1
97087	Erith River	Athabasca	Embarras	3	8
97006	Watson Creek	Athabasca	Mcleod	6	39
97047	Taylor Creek	Athabasca	Beaverdam Ck	6	4
97048	Unnamed Creek	Athabasca	Taylor Ck	6	0
97049	Unnamed Creek	Athabasca	Taylor Ck	6	0
97050	Chief Creek	Athabasca	Beaverdam Ck	6	1
97051	Erickson Creek	Athabasca	Beaverdam Ck	6	14
97052	Unnamed Creek	Athabasca	Beaverdam Ck	6	0
97053	Unnamed Creek	Athabasca	Beaverdam Ck	6	2
97054	Beaverdam Creek	Athabasca	Mcleod	6	20
97056	Thompson Creek	Athabasca	Beaverdam Ck	6	10
97057	Chief Creek	Athabasca	Beaverdam Ck	6	0
97058	Beaverdam Creek	Athabasca	Mcleod	6	2
97061	Taylor Creek	Athabasca	Beaverdam Ck	6	0
97062	Unnamed Creek	Athabasca	Beaverdam Ck	6	0
97063	Beaverdam Creek	Athabasca	Mcleod	6	1
97065	Mercoal Creek	Athabasca	Mcleod	6	0
97066	Mercoal Creek	Athabasca	Mcleod	6	0
97067	Unnamed Creek	Athabasca	Pembina	6	1
97071	Unnamed Creek	Athabasca	Rainbow Ck	6	13
97072	Rainbow Creek	Athabasca	Beaverdam Ck	6	2
97244	Unnamed Creek	Athabasca	Beaverdam Ck	6	0
97245	Taylor Creek	Athabasca	Beaverdam Ck	6	11
97250	Unnamed Creek	Athabasca	Beaverdam Ck	6	0
97251	Unnamed Creek	Athabasca	Taylor Ck	6	2
97039	Embarras River	Athabasca	Mcleod	12	5
97040	Unnamed Creek	Athabasca	Lovett	12	0
97041	Lovett River	Athabasca	Pembina	12	0
97064	Dummy Creek	Athabasca	Embarras	12	22
97084	Embarras River	Athabasca	Mcleod	12	1
97037	Unnamed Creek	Athabasca	Pembina	13	0
97044	Unnamed Creek	Athabasca	Centre Ck	13	1
97045	Unnamed Creek	Athabasca	Centre Ck	13	0
97046	Unnamed Creek	Athabasca	Centre Ck	13	15
Site ID	**Creek Name**	**Drainage**	**Tributary To**	**Compartment**	**Total # Of Fish**

97068	Unnamed Creek	Athabasca	Lovett	13	1
97077	Centre Creek	Athabasca	Pembina	13	0
97254	Unnamed Creek	Athabasca	Centre Ck	13	0
97042	Unnamed Creek	Athabasca	Pembina	14	1
97043	Bailey Creek	Athabasca	Pembina	14	12
97055	Unnamed Lake	Athabasca	Beaverdam Ck	14	1
97059	Unnamed Creek	Athabasca	Beaverdam Ck	14	0
97060	Beaverdam Creek	Athabasca	Mcleod	14	1
97083	Lovett River	Athabasca	Pembina	14	1
97246	Centre Creek	Athabasca	Pembina	14	53
97033	Unnamed Creek	Athabasca	Pembina	15	0
97099	Redcap Creek	North Sask	Cardinal	16	47
97102	Unnamed Creek	North Sask	Redcap Ck	16	4
97121	Redcap Creek	North Sask	Cardinal	16	0
97095	Nomad Creek	North Sask	Cardinal	18	13
97096	Nomad Creek	North Sask	Cardinal	18	13
97097	Unnamed Creek	North Sask	Nomad Ck	18	1
97098	Unnamed Creek	North Sask	Nomad Ck	18	0
97103	Chimney Creek	North Sask	Thistle Ck	18	20
97104	Unnamed Creek	North Sask	Chimney Ck	18	21
97105	Unnamed Creek	North Sask	Unnamed Ck	18	0
97106	Flapjack Creek	North Sask	Ruby Ck	18	39
97112	Unnamed Creek	North Sask	Thistle Ck	18	0
97113	Unnamed Creek	North Sask	Thistle Ck	18	1
97114	Unnamed Creek	North Sask	Thistle Ck	18	2
97115	Flapjack Creek	North Sask	Ruby Ck	18	2
97119	Cardinal River	North Sask	Brazeau	18	1
97120	Russell Creek	North Sask	Cardinal	18	27
	Total Number Of Sites = 70		**Total Number Of Fish = 549**		

Appendix III d. Summary of sites surveyed in the Marlboro Working Circle; Foothills Model Forest, 1997.

Site ID	Creek Name	Drainage	Tributary To	Compartment	Total # Of Fish
97143	Unnamed Creek	Athabasca	Beaver Ck	2	17
97144	Jackpine Creek	Athabasca	Athabasca	2	5
97147	Unnamed Creek	Athabasca	Beaver Ck	2	6
97148	Beaver Creek	Athabasca	Athabasca	2	21
97154	Beaver Creek	Athabasca	Athabasca	2	58
97141	Beaver Creek	Athabasca	Athabasca	3	14
97142	Unnamed Creek	Athabasca	Beaver Ck	3	7
97159	Nosehill Creek	Athabasca	Athabasca	3	3
97145	Pine Creek	Athabasca	Athabasca	4	1
97146	Pine Creek	Athabasca	Athabasca	4	1
Site ID	**Creek Name**	**Drainage**	**Tributary To**	**Compartment**	**Total # Of Fish**
97152	Unnamed Creek	Athabasca	Pine Ck	4	5
97094	Unnamed Creek	Athabasca	Trout Ck	5	0

97134	Unnamed Creek	Athabasca	Trout Ck	5	0
97093	Unnamed Creek	Athabasca	Trout Ck	6	17
97158	Unnamed Creek	Athabasca	Trout Ck	6	2
97151	Unnamed Creek	Athabasca	Nosehill Ck	7	0
97157	Unnamed Creek	Athabasca	Trout Ck	7	12
97009	Unnamed Creek	Athabasca	Edson River	8	5
97153	Pine Creek	Athabasca	Athabasca	8	2
97149	Unnamed Creek	Athabasca	Nosehill Ck	9	1
97156	Unnamed Creek	Athabasca	Edson River	9	0
97195	Nosehill Creek	Athabasca	Athabasca	9	0
97150	Unnamed Creek	Athabasca	Nosehill Ck	10	0
97135	Unnamed Creek	Athabasca	Lynx Ck	11	0
97137	Lynx Creek	Athabasca	Athabasca	12	16
97229	Obed Creek	Athabasca	Athabasca	14	23
97155	Unnamed Creek	Athabasca	Edson River	17	1
97136	Pine Creek	Athabasca	Athabasca	21	1
97138	Unnamed Creek	Athabasca	Nosehill Ck	25	13
97139	Unnamed Creek	Athabasca	Nosehill Ck	25	0
97140	Nosehill Creek	Athabasca	Athabasca	25	1
	Total Number Of Sites = 31		**Total Number Of Fish = 232**		

Appendix III e. Summary of sites surveyed in the McLeod Working Circle; Foothills Model Forest, 1997.

Site ID	**Creek Name**	**Drainage**	**Tributary To**	**Compartment**	**Total # of fish**
97010	Deerlick Creek	Athabasca	Mcleod	3	15
97188	Wampus Creek	Athabasca	Mcleod	3	106
97189	Wampus Creek	Athabasca	Mcleod	3	55
97190	Deerlick Creek	Athabasca	Mcleod	3	144
97191	Deerlick Creek	Athabasca	Mcleod	3	138
97192	Mary Gregg Creek	Athabasca	Mcleod	3	70
97193	Trapper Creek	Athabasca	Mary Gregg Ck	3	44
97208	Anderson Creek	Athabasca	Mcleod	3	120
97212	Deerlick Creek	Athabasca	Mcleod	3	54
97233	Wampus Creek	Athabasca	Mcleod	3	301
97196	Antler Creek	Athabasca	Mcleod	4	22
97210	Antler Creek	Athabasca	Mcleod	4	47
97211	Neat Creek	Athabasca	Mcleod	4	10
97230	Mary Gregg Creek	Athabasca	Mcleod	4	79
97200	Unnamed Creek	Athabasca	Athabasca	6	21
97201	Unnamed Creek	Athabasca	Felton Ck	6	0
97202	Felton Creek	Athabasca	Mcleod	6	2
97090	Unnamed Creek	Athabasca	Wigwam Ck	7	5
97132	Wigwam Creek	Athabasca	Mcleod	7	13
97172	Seabolt Creek	Athabasca	Maskuta Ck	8	0
Site ID	**Creek Name**	**Drainage**	**Tributary To**	**Compartment**	**Total # of fish**
97173	Seabolt Creek	Athabasca	Maskuta Ck	8	2

97236	Anderson Creek	Athabasca	Mcleod	9	69
97088	Unnamed Creek	Athabasca	Hardisty Ck	10	0
97091	Unnamed Creek	Athabasca	Hardisty Ck	10	1
97092	Unnamed Creek	Athabasca	Hardisty Ck	10	0
97228	Unnamed Creek	Athabasca	Cold Ck	10	0
97239	Unnamed Creek	Athabasca	Mcleod	12	0
97234	Corral Creek	Athabasca	Mcleod	18	16
97206	Mcneil Creek	Athabasca	Prest Ck	21	0
97207	Prest Creek	Athabasca	Embarras	21	35
97079	Jackson Creek	Athabasca	Embarras	23	0
97080	Jackson Creek	Athabasca	Embarras	23	15
97085	Unnamed Creek	Athabasca	Chance Ck	23	0
97247	Unnamed Creek	Athabasca	Chance Ck	23	3
97194	Eunice Creek	Athabasca	Mcleod	24	6
	Total number of sites = 35		**Total number of fish = 1393**		

Appendix III f. Summary of sites surveyed in the Foothills Model Forest and outside the Weldwood of Canada (Hinton Division) FMA, 1997.

Appendix III f. Within Foothills Model Forest & outside Weldwood FMA

Site ID	Creek Name	Drainage	Tributary To	Compartment	Total # of fish
97161	Solomon Creek	Athabasca	Athabasca	FMU E4	1
97007	Berry's Creek	Athabasca	Gregg	FMU E5	2
97108	Mcleod River	Athabasca	Athabasca	FMU E5	2
97109	Thornton Creek	Athabasca	Mcleod	FMU E5	0
97110	Unnamed Creek	Athabasca	Mcleod	FMU E5	0
97127	Unnamed Creek	Athabasca	Mcleod	FMU E5	0
97128	Mackenzie Creek	Athabasca	Mcleod	FMU E5	3
97133	Prospect Creek	Athabasca	Mcleod	FMU E5	0
97252	Prospect Creek	Athabasca	Mcleod	FMU E5	0
97253	Thornton Creek	Athabasca	Mcleod	FMU E5	0
97100	Cardinal River	North Sask	Brazeau	FMU ELL	0
97101	Toma Creek	North Sask	Cardinal	FMU ELL	5
97107	Unnamed Creek	North Sask	Ruby Ck	FMU ELL	7
97111	Thistle Creek	North Sask	Brazeau	FMU ELL	40
97116	Ruby Creek	North Sask	Cardinal	FMU ELL	0
97089	Whiskeyjack Creek	Athabasca	Hardisty Ck	Hinton Townsite	1
97174	Unnamed Creek	Athabasca	Athabasca	Hinton Townsite	27
97181	Fish Creek	Athabasca	Athabasca	Hinton Townsite	38
97199	Fish Creek	Athabasca	Athabasca	Hinton Townsite	47
97255	Maskuta Creek	Athabasca	Athabasca	Hinton Townsite	14
97164	Star Creek	Athabasca	Moon Ck	Wilmore	0
Site ID	**Creek Name**	**Drainage**	**Tributary To**	**Compartment**	**Total # of fish**
97221	Moon Creek	Athabasca	Berland	Wilmore	0

97222	Planet Creek	Athabasca	Moon Ck	Wilmore	0
97223	Moon Creek	Athabasca	Berland	Wilmore	0
97224	Crescent Creek	Athabasca	Moon Ck	Wilmore	0
	Total number of sites = 25		**Total number of fish = 187**		

Appendix III g. Summary of sites surveyed outside the Foothills Model Forest, 1997.

Site ID	Creek Name	Drainage	Tributary To	Compartment	Total # of fish
97032	Unnamed Creek	Athabasca	Crooked Ck	Out of FMF	2
97034	Unnamed Creek	Athabasca	Pembina	Out of FMF	3
97035	Unnamed Creek	Athabasca	Pembina	Out of FMF	3
97038	Unnamed Creek	Athabasca	Pembina	Out of FMF	0
97069	Gravel Pit	None	None	Out of FMF	10
97075	Unnamed Creek	Athabasca	Pembina	Out of FMF	1
97082	Raven Creek	Athabasca	Erith	Out of FMF	9
97117	Unnamed Creek	North Sask	Brown Ck	Out of FMF	2
97118	Unnamed Creek	North Sask	Brazeau	Out of FMF	3
97122	Unnamed Creek	North Sask	Blackstone	Out of FMF	0
97123	Cutoff Creek	North Sask	Blackstone	Out of FMF	0
97124	Chungo River	North Sask	Blackstone	Out of FMF	2
97125	Brown Creek	North Sask	Blackstone	Out of FMF	29
97126	Clark Creek	North Sask	Brown Ck	Out of FMF	3
97129	Unnamed Creek	North Sask	Brown Ck	Out of FMF	3
97130	Brown Creek	North Sask	Blackstone	Out of FMF	2
97131	Unnamed Creek	North Sask	Brazeau	Out of FMF	0
97205	Lambert Creek	Athabasca	Embarras	Out of FMF	0
	Total number of sites = 18		**Total number of fish = 72**		